ERO

Consultants in Natural Resources and the Environment

Environmental Assessment
Water Treatment Plant Improvements
Town of Silt
Garfield County, Colorado

Prepared for—

Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246

On behalf of—

Town of Silt
231 North 7th Street
PO Box 70
Silt, Colorado 81652

Prepared by—

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ERO Project #22-295

May 2023

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Town of Silt
Garfield County, Colorado

May 2023

I. SUMMARY

A. Project Identification

Project Name: Town of Silt Water Treatment Plant Improvements
Applicant: Town of Silt
Address: 231 North 7th Street, PO Box 70, Silt, Colorado 81652

B. Contact Person

Mr. Trey Fonner, Public Works Director
231 North 7th Street, PO Box 70
Silt, Colorado 81652
970-876-2353
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ASSESSMENT PREPARATION

The preparation of this Environmental Assessment (EA) was done in accordance with the Colorado Environmental Review Process and was prepared by—

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C. Abstract

The town of Silt (Town or Silt) is proposing to expand and upgrade its water treatment plant (WTP) in Garfield County, Colorado (project area). Improvements would include civil site improvements (grading, paving, stormwater control, utility, piping, and irrigation system modifications); modifications to raw water pumping with new controls; a new ballasted coagulation/flocculation/sedimentation system with increased capacity to accommodate the expected wide range in raw water turbidity from the Colorado

River; installation of conventional mixed media filters; construction of new buildings and modifications to existing facilities to house the new and upgraded processes and systems; and implementation of several other improvements.

Current limited capacity and treatment issues, future capacity requirements and regulations, and increased flows due to projected population growth are primary drivers for the WTP improvements project (Project). The Project is necessary to bring the Town's WTP into compliance with capacity requirements and regulations listed in its current discharge permit and the Safe Drinking Water Act (SDWA), which identifies and sets standards for chemical contaminants, microbial contaminants, and right-to-know rules. The improvements would also provide required facility redundancy and improve operations.

The total costs of the Project are estimated to be about $25.34 million. The cost estimate includes construction costs, plus the estimated planning, engineering, and additional costs related to administrative and State Revolving Fund (SRF) requirements. Funding for construction of the Project is anticipated to come from the Town's current reserves and SRF monies. The estimated SRF loan amount the Town may apply for is $25.34 million. The design of the Project is scheduled for completion in fall 2023 and would be followed by a two-year construction period with projected completion by the end of 2025.

D. Comment Period

In conformance with the requirements of the National Environmental Policy Act and the Colorado Environmental Review Process, a Finding of No Significant Impact (FNSI) would be subject to a 30-day public review period. The FNSI would be distributed to interested persons and agencies for their review. The FNSI would be available for public review at the Colorado Department of Public Health and Environment (CDPHE). Any comments received will be given due consideration. Comments should be addressed to:

Sean Oliver, Project Manager
Water Quality Control Division (WQCD)
CDPHE
WQCD-OA-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

II. PURPOSE AND NEED FOR ACTION

The purpose of the Project is to expand and upgrade the existing Town water treatment system (Figure 1). There are two primary needs for the proposed Project: (1) ensure current and future

regulatory compliance, and (2) expand and upgrade WTP capacities to accommodate projected population growth and improve operations.

- **Ensure current and future regulatory compliance.** The WTP operates under Colorado Public Water Systems Identification No. CO0123710. In addition, the WTP holds Colorado Discharge Permit System (CDPS) No. COG64100, which allows the WTP to discharge to the Colorado River from its backwash pond. The Town operates a public water system, and the water supplied to its customers is required to comply with all applicable federal and state laws, rules, and regulations. The SDWA provides the basis of authorization for regulation of drinking water quality, including identifying and setting standards for chemical contaminants, microbial contaminants, and right-to-know rules. Several of these rules, including the Lead and Copper Rule and the Fifth Unregulated Rule, have recently been revised and require compliance within the next two years. Water system planning must provide for compliance with current, proposed, and anticipated future regulatory requirements covering the collection, treatment, storage, and distribution facilities that are used primarily in connection with the system. The Town is classified as a medium-sized community water system (CWS), which primarily uses surface water from the Colorado River but is able to blend it with groundwater under the direct influence of surface water (GWUDI) from two alluvial wells. The Town must adhere to the specific requirements that apply to its classification type and sources of water used. Annual Drinking Water Quality Reports submitted for years 2016-2020 indicate violations occurred for the following: four violations for failing to monitor and/or report lead and copper, three violations for failing to inform homeowners of lead results, one violation for failing to meet cross connection control and/or backflow prevention requirements, one violation for failing to have a certified operator in 2020, one violation for failing to monitor and/or report total coliform, and one violation for failing to monitor and/or report chlorine/chloramine in 2020. The proposed improvements would include implementation of new data collection software and process control system to improve the data reporting and analysis and to mitigate future monitoring violations from occurring.

- **Expand and upgrade WTP capacities to accommodate projected population growth and improve operations.** The Town currently has an estimated population of 3,536 residents and has estimated a 20-year planning period population of 7,904 by 2042 (Dewberry 2022; Appendix A). This population growth will cause an increase in water demand and required water production from the WTP. The production capacity of the WTP is dependent on upstream equipment and processes. At the end of the 20-year planning period, the average annual daily demand is projected to increase to 671,900 gallons per day (gpd), more than double the current demand. In 2018, the WTP experienced a peak daily demand of 0.48 million gallon per day (mgd), and the projected peak daily demand in 2042 is estimated to be 1.21 mgd. The existing WTP was originally

constructed in 2005 and has not undergone any major upgrades. Currently, the WTP has a peak design capacity of 1 mgd and a rated capacity of 0.5 mgd; however, the true peak capacity is only 0.6 mgd. The Colorado River experiences high turbidity during the runoff season, which currently impacts pretreatment and filtration processes. While the two alluvial groundwater wells in use have lower turbidity than the Colorado River water, the alluvial water tends to have higher levels of manganese and can only provide a maximum of 600 gallons per minute (gpm), which is not sufficient to meet the Town's current demands. The proposed improvements would address these concerns and provide required facility redundancy, improve operations, and accommodate planned future population growth.

III. PROJECT SUMMARY

The proposed improvements have been developed to allow the Town to meet current and future capacity requirements and regulations. The improvements would also provide required facility redundancy, accommodate planned future growth of the Town, and improve operations. The recommended facility improvements take into consideration the treatment needs based on current and anticipated permit compliance requirements for the WTP.

An evaluation of the existing WTP identified the following concerns:

- Raw water delivery and the flow system produce a large amount of excess water. To meet future demands and improve operations, additional pumps and control improvements would be required.
- The Colorado River experiences high turbidity during the runoff season, which impacts pretreatment and filtration processes. It may be worthwhile to investigate expanding the use of the wells and/or use of the gravel pond across the river in an effort to reduce turbidity to the WTP.
- The alluvial groundwater wells have lower turbidity than the Colorado River water; however, the alluvial water tends to be higher in iron and manganese. The existing alluvial wells do not have capacity to meet the full summer demands.
- The plate settler lacks sufficient capacity to meet future demands. This should be expanded or replaced with a system that can accommodate a large variation in raw water turbidity.
- Use of aluminum chlorohydrate (ACH) as a coagulant reduces the need to modify the pH to improve flocculation and coagulation and should be continued. The dose should be confirmed with regular testing. The WTP currently uses a Clarifloc product, which is a proprietary blend of ACH and a polymer. The Town should consider using pure ACH with no polymer as the use of polymers can negatively impact membrane fouling.
- There is an insufficient coagulation/flocculation system at the WTP. This greatly reduces

the effectiveness of the plate settler and increases the turbidity load to the membranes. In effect, the elevated turbidity load to the membranes increases backwashing and cleaning frequency, which decreases treatment capacity.

- By using membranes for filtration, the WTP is not required to test and document total organic carbon (TOC) removal. However, improving TOC removal would reduce disinfection byproducts (DBP) formation potential. While the WTP does not currently monitor for TOC removal, incorporating regular TOC removal monitoring would provide WTP operations with knowledge regarding DBP formation potential. Additionally, DBP formation potential equipment could be provided to staff to assist with process monitoring.
- The membranes lack sufficient treatment to meet future demand projections. During a peak day, the WTP operates at or near capacity. Additional filtration capacity is needed.
- The life of the membranes could be extended by performing a Clean in Place (CIP). CIPs are currently not performed because the heaters do not work, and the time required for a CIP significantly impacts production time.
- Maintenance and CIPs are manually intensive processes. New controls should be incorporated to automate this process.
- The tablet chlorination system currently works. However, it should be upgraded to a system that can be easily flow controlled with sufficient instrumentation to determine chlorine demand and dose. This improvement would likely improve the reliability of meeting the DBP requirements.
- Iron and manganese removal should be addressed. Currently, the addition of SeaQuest water treatment additive masks the impacts of iron and manganese. A long-term resilient removal solution should be identified and installed.
- The chlorine contact chamber has sufficient capacity to provide four log virus inactivation at the projected future water demands. Should the regulations change or should the WTP replace the membranes with a conventional mixed media filter system, additional disinfection credits would be needed to provide additional giardia inactivation credits. This could be accomplished via ultraviolet (UV) disinfection or additional contact chamber volume.
- There is one disinfection contact chamber. This limits the ability of staff to clean and maintain the chamber.
- The Town should monitor its raw water sources for the unregulated contaminants.
- Finished water pumping capacity is currently not sufficient to meet the projected demands and would need to be expanded in the future.

Treatment alternatives that address the abovementioned issues were identified. A total of four alternatives were retained for evaluation that could meet the needs of increased capacity and accommodate a wide range in raw water turbidity. All evaluated alternatives would include a new strainer to prevent fish and large items from entering the WTP. In addition, all alternatives would produce residuals. The residuals would be disposed of at a landfill. If there is discharge water from the WTP to the Colorado River, the discharge water would meet the requirements of the general permit. The technical features and costs of the alternatives considered, along with the advantages and disadvantages of each, are briefly summarized below and described in further detail in the Project engineer's Master Plan (Dewberry 2022; Appendix A). Planning level estimates of construction costs, annual operation and maintenance (O&M) costs, and net present values (NPV) were developed for the four pretreatment and filtration process alternatives evaluated as part of the analysis. The NPV was calculated by adding the construction costs and the present value of the estimated 20-year plan O&M costs.

A. Alternative 1

Alternative 1 consists of a solids contact clarifier, mixed media filtration with green sand for iron and manganese removal, and UV and chlorine disinfection.

- Solids Contact Clarifier – consists of combining the process of mixing, flocculation, and sedimentation in a single tank. Recirculation of solids and mixing is accomplished by a radial or axial turbine, flocculation occurs in the reaction well and sedimentation occurs in the clarification zone. The clarifier consists of a mixing zone, flocculation zone, sludge blanket zone, and clarification zone. Solids contact clarifiers are typically used in water softening, whereas color and turbidity removal clarifiers are used in water treatment plants. However, solids contact clarifiers are particularly advantageous in lime softening or groundwater since the precipitated solids help speed the flow, growing larger crystals of precipitate to provide a thicker waste sludge. Solids contact clarifiers have also been applied in the chemical treatment of industrial wastes, such as metals removal, and have been used successfully for cooling tower make up water. The helical, upflow, "slurry blanket" design of a solids contact clarifier requires no internal moving parts and provides thorough mixing, tapered flocculation, and sedimentation in a hydraulically driven system. Mixing, precipitation, coagulation, and flocculation all occur in the blanket. Excess solids are removed through an in-vessel slurry concentrator that is vertically adjusted to control the blanket depth and solids contact time. The waste slurry concentration is maximized by adjusting the frequency and duration of the slurry discharge. Clarification occurs above the slurry blanket. The conical shape causes the water to slow as it flows upward through the

vessel. A radial weir system located at the water surface varies the weir rate to maximize clarification efficiency.

- Mixed Media Filtration – filtration of water through porous granular media has been the most commonly used water treatment for several decades. Granular media filters can produce filtered water with low turbidity but can experience high turbidity spikes if good pretreatment is not maintained. Mixed media filters consist of an underdrain system that supports the approximately 3 feet of mixed media. The mixed media typically consists of garnet, sand, and anthracite. Settled water from the pretreatment process enters at the top of the filter; it flows by gravity through the layers of anthracite, sand, and garnet. Flowing through media, particles are removed, and the filtered water flows through the underdrains. Periodically (approximately once per day), the accumulated filtered particles are backwashed off the media and sent to a residual handling process. Mixed media filters typically are sized to accommodate a maximum flow rate of 5 gpm per square foot. Green sand can be incorporated into the filters as it is a catalyst used in the removal of iron and manganese.
- UV and Chlorine Disinfection – currently, the WTP uses calcium hypochlorite tablets as the only method of disinfection. While this system currently works, the dose is difficult to tightly control, which increases the Disinfection Byproduct (DBP) formation potential. DBPs are formed as a result of chlorine reacting with organic matter in the finished water from the WTP. Regulated DBPs include two categories, trihalomethanes (TTHM) and haloacetic acids (HAA5). The residual chlorine drives TTHM and HAA5 formation in the distribution system. To date, the WTP has been able to maintain regulated DBP levels below the maximum contaminant limits. The Town may wish to upgrade to a disinfection system that can have a more tightly controlled chlorine dose or, potentially, a combination system (UV and chlorine) to meet the required disinfection requirements. UV treatment is an acceptable disinfection option under the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), Groundwater Rule, and Stage 2 Disinfectant/Disinfectant By-Product Rule (D/DBPR). Many state regulatory agencies, including Colorado, have not developed approval requirements specifically for UV disinfection. In Colorado, UV disinfection must be approved on a case-by-case basis. Simple operation, small footprint, and moderate costs make UV technology a good primary disinfection alternative. However, UV produces no residual, so a secondary chemical disinfectant must be used in the distribution system. UV disinfection at UV doses up to 200 millijoules per square centimeter (mJ/cm2) do not change the pH, turbidity, dissolved organic carbon level, UV transmittance, color, nitrate, nitrite, bromide, iron, or manganese of the water being treated. UV

light at doses less than 400 mJ/cm2 does not significantly affect the formation of TTHMs or HAA5s upon subsequent chlorination. A chlorine system would consist of storage tanks or totes, chemical feed pumps, an online chlorine residual meter, and controls.

The total Project cost for Alternative 1 would be approximately $28.22 million. Additional detail for Alternative 1 can be found in the Project engineer's Master Plan (Dewberry 2022; Appendix A).

B. Alternatives 2a and 2b

Alternative 2a consists of plate settlers, mixed media filtration with green sand for iron and manganese removal, and UV and chlorine disinfection.

- Plate Settlers – also known as tube settlers or lamella clarifiers, plate settlers are used in drinking and wastewater treatment plants to settle out suspended solids. Depending on the application of the total suspended solids (TSS), loading can vary from 50 to 500 milligrams per liter or more. When the solid settling force is higher than all drag forces, solids will settle down on the channel surface of the tube settler, accumulate with other solids, and slide down as sludge. Tube settlers are designed to provide as much settling surface as possible but at the same time they must prevent channel clogging. Detailed design features and criteria are included in the Master Plan (Dewberry 2022; Appendix A).
- Mixed Media Filtration – the approach described under Alternative 1 would also apply to this alternative.
- UV and Chlorine Disinfection – the approach described under Alternative 1 would also apply to this alternative.

The total Project costs for Alternative 2a would be approximately $27.74 million. Additional detail for Alternative 2a can be found in the Project engineer's Master Plan (Dewberry 2022; Appendix A).

Alternative 2b consists of plate settlers, membrane skids, and chlorine disinfection. UV disinfection is not needed with membrane filtration.

- Plate Settlers – the approach as described under Alternative 2a would also apply to this alternative.
- Membrane Skids – almost all currently available membrane filtration systems use pressure filters. In these pressure systems, the hollow fibers are bundled together longitudinally and encased in a cylindrical pressure vessel to form a filter module. At each end of the chamber, the fibers are embedded in an epoxy resin or urethane plug. The cylindrical pressure vessel housing the membranes

is constructed of molded nylon, PVC, or fiberglass. Several cylindrical modules operating in parallel form a treatment array or unit. Several modules in a manifold are connected with piping, valves, and automated controls. Feed water is pumped directly into each module and around the bundle of hollow fibers. During normal operation, water passes from the outside of the membrane into the hollow center and exits as filtrate (permeate) through openings at the terminal end of each hollow fiber. TSS and microorganisms accumulate on the outside surface of the hollow fibers. Filtered particles that accumulate on the membrane surface are removed from the system by periodic backwash cycles. A microfiltration filter has a pore size of about 0.1 micron, so when water undergoes microfiltration, many microorganisms are removed, but viruses remain in the water. Ultrafiltration would remove these larger particles and may remove some viruses. Neither microfiltration nor ultrafiltration can remove dissolved substances unless they are first adsorbed (with activated carbon) or coagulated (with alum or iron salts).

- Chlorine Disinfection – because UV disinfection is not needed with a membrane filtration system, this alternative would only consist of chlorine disinfection. The approach for chlorine disinfection is described in Alternatives 1 and 2a.

The total Project cost for Alternative 2b would be approximately $25.39 million. Additional detail for Alternative 2b can be found in the Project engineer's Master Plan (Dewberry 2022; Appendix A).

C. Alternative 3

Alternative 3 consists of a conventional package system, including mixed media filtration with green sand for iron and manganese removal, and UV and chlorine disinfection.

- Conventional Package System – various package water treatment systems are available that include pretreatment and filtration. A conventional package system contains coagulation, flocculation, sedimentation, and filtration.
- Mixed Media Filtration – the approach described under Alternatives 1 and 2a would also apply to this alternative.
- UV and Chlorine Disinfection – the approach described under Alternatives 1 and 2a would also apply to this alternative.

The total Project costs for Alternative 3 would be approximately $26.97 million. Additional detail for Alternative 3 can be found in the Project engineer's Master Plan (Dewberry 2022; Appendix A).

D. Alternative 4

Alternative 4 consists of ballasted flocculation, mixed media filtration with green sand for iron and manganese removal, and UV and chlorine disinfection.

- Ballasted Flocculation – this process provides turbidity removal by coagulation, flocculation with a microsand ballast, and sedimentation for high-rate turbidity removal. This process has a short hydraulic residence time and can easily handle rapid raw water load and/or flow fluctuations. Ballasted flocculation systems have a small footprint, which is advantageous with the Town's limited WTP property. The microsand buffers the effect of raw water flow or load variations, making the process easy to operate. Frequent shutdowns and restarts are possible with ballasted flocculation systems, and the system can achieve up to 99 percent removal efficiencies of turbidity, TSS, and associated pollutants.
- Mixed Media Filtration – the approach described under Alternatives 1, 2a, and 3 would also apply to this alternative.
- UV and Chlorine Disinfection – the approach described under Alternatives 1, 2a, and 3 would also apply to this alternative.

The total Project costs for Alternative 4 would be approximately $25.34 million. Additional detail for Alternative 4 can be found in the Project engineer's Master Plan (Dewberry 2022; Appendix A).

The results from the NPV analysis are summarized in Table 1. These costs are from the Silt Water Treatment Plant Upgrade – Cost Revision Technical Memorandum dated May 2023 and can be found as an addendum to the Master Plan (Appendix A). The NPV for each alternative includes the labor, disinfection chemical, coagulant, residuals, power, equipment, and membrane or filter replacement costs. O&M costs are based on average annual O&M costs over 20 years.

Table 1. Opinion of Probable Costs for WTP alternatives.

Item	Cost ($)				
	Alternative 1	Alternative 2a	Alternative 2b	Alternative 3	Alternative 4
Project Cost	$28,220,000	$27,735,000	$25,394,000	$26,967,000	$25,336,000
Average Annual O&M Cost	$704,000	$749,000	$676,000	$721,000	$676,000
NPV	$40,726,000	$41,235,000	$37,281,000	$39,848,000	$37,223,000

Upon review of the alternatives, the Town selected Alternative 4 as the preferred alternative as it would effectively increase capacity, which would improve the WTP's resiliency and allow staff to produce water year-round. Alternative 4 has the lowest NPV and it is the alternative that can most easily adapt to rapidly changing raw water turbidity. High turbidity spikes up to 3,500 Nephelometric Turbidity Units (NTU) have been measured in the Colorado River upstream of the

Town. These turbidity spikes are believed to be caused by rain events on recent burn areas along the Colorado River. The wide range of raw water turbidities requires the selected treatment processes to be robust and adaptable. The ballasted flocculation and conventional mixed media filtration that make up Alternative 4 have both of these attributes. The sand and mixing system in the ballasted flocculation process along with the relatively short hydraulic retention time, allowing for quick changes to the coagulant dose, enable the system to remove most of the turbidity from the water. Additionally, the ballasted flocculation pretreatment system is able to do this while maintaining a small footprint, which is important because the WTP site is relatively constrained. The filters are well equipped to remove the remaining turbidity with the main operation change being more frequent backwashes during periods with higher raw water turbidity levels. A detailed plan to construct Alternative 4 is provided in Section 7 of the Master Plan (Dewberry 2022; Appendix A).

IV. AFFECTED ENVIRONMENT

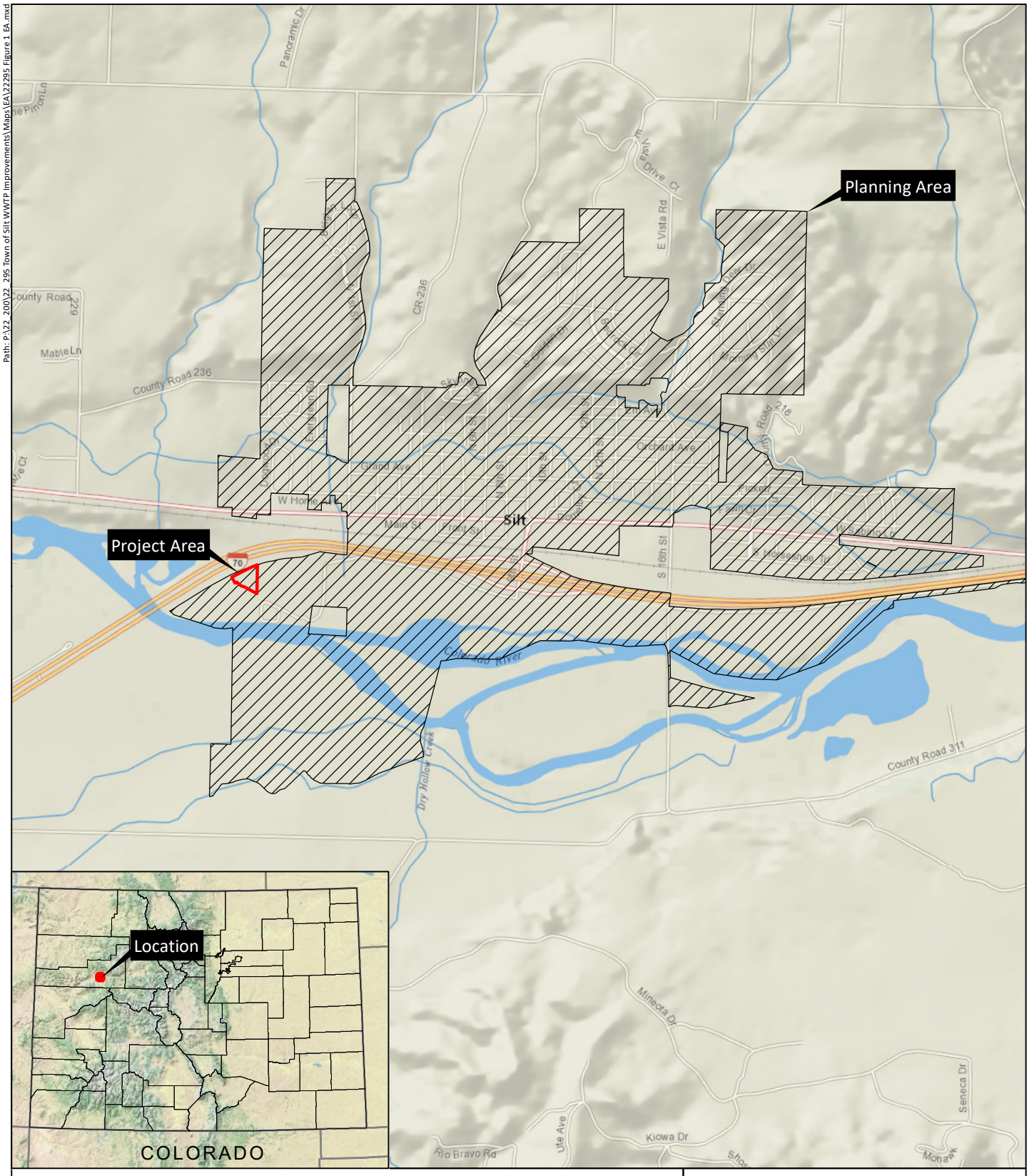
A. Description of the Planning Area

The Town is located in west-central Colorado, along the Interstate 70 (I-70) corridor and Colorado River, in Garfield County. The planning area is the current service area of the WTP, which is the Town's existing boundary (Figure 1). The project area is confined to the footprint of the existing WTP, approximately 2 acres (Figure 2).

B. Population and Flow Projections

Originally a farming and ranching town, Silt experienced a significant impact during the oil shale boom during the late 1970s and early 1980s. Historical growth (through 2020) was obtained from Colorado Department of Local Affairs (DOLA). Silt has seen continuous growth from less than 1,200 residents in 1990 to more than 3,600 residents in 2022. The rate of growth during the timeframe has varied considerably, typically in response to local and regional economic conditions. While long-term growth from 1990 through 2020 averaged 3.7 percent annually, growth slowed abruptly with the beginning of the recession in 2008 and remained lower than historical growth. In 2009, the growth rate was 0.2 percent. The historical population trends suggest that the Town will continue to grow in the future. The rate of growth in recent years has returned to long-term historical rates after the extended period of recession. A return to a more typical long-term rate of growth is supported by the continued need for affordable housing by workers in nearby resort areas such as Vail and Aspen. In addition, the Town has made efforts to encourage growth and development by promoting the Town's inclusion in the federal Opportunity Zone Program that offers investors tax incentives for investing in financially stressed areas with economic potential. Starting with the 2020 Town population of 3,536, projections were made

using three different rates: the 4.6 average annual percentage rate observed from the Silt population data between 1990 and 2010, an annual rate of 1.65 percent obtained from DOLA in October 2021 for population projection in Garfield County for the 2020 to 2040 period, and the 3.7 percent annual rate derived from the Silt population data for the 30-year period from 1990 through 2020. As further detailed in the Master Plan (Dewberry 2022; Appendix A), the median growth rate of 3.7 percent was used for demand projections, which results in an estimated 20-year planning period population of about 7,904. This growth in population would increase water flows and demands to the WTP. Historical and projected populations for the Town are provided in Table 2.



Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\EA\22295 Figure 1 EA.mxd

Town of Silt Water Treatment Plant

Sections 2-4 and 9-11, T9S, R92W; 6th PM

UTM NAD 83: Zone 13N; 270748mE, 4380585mN

Longitude 107.667885°W, Latitude 39.544339°N

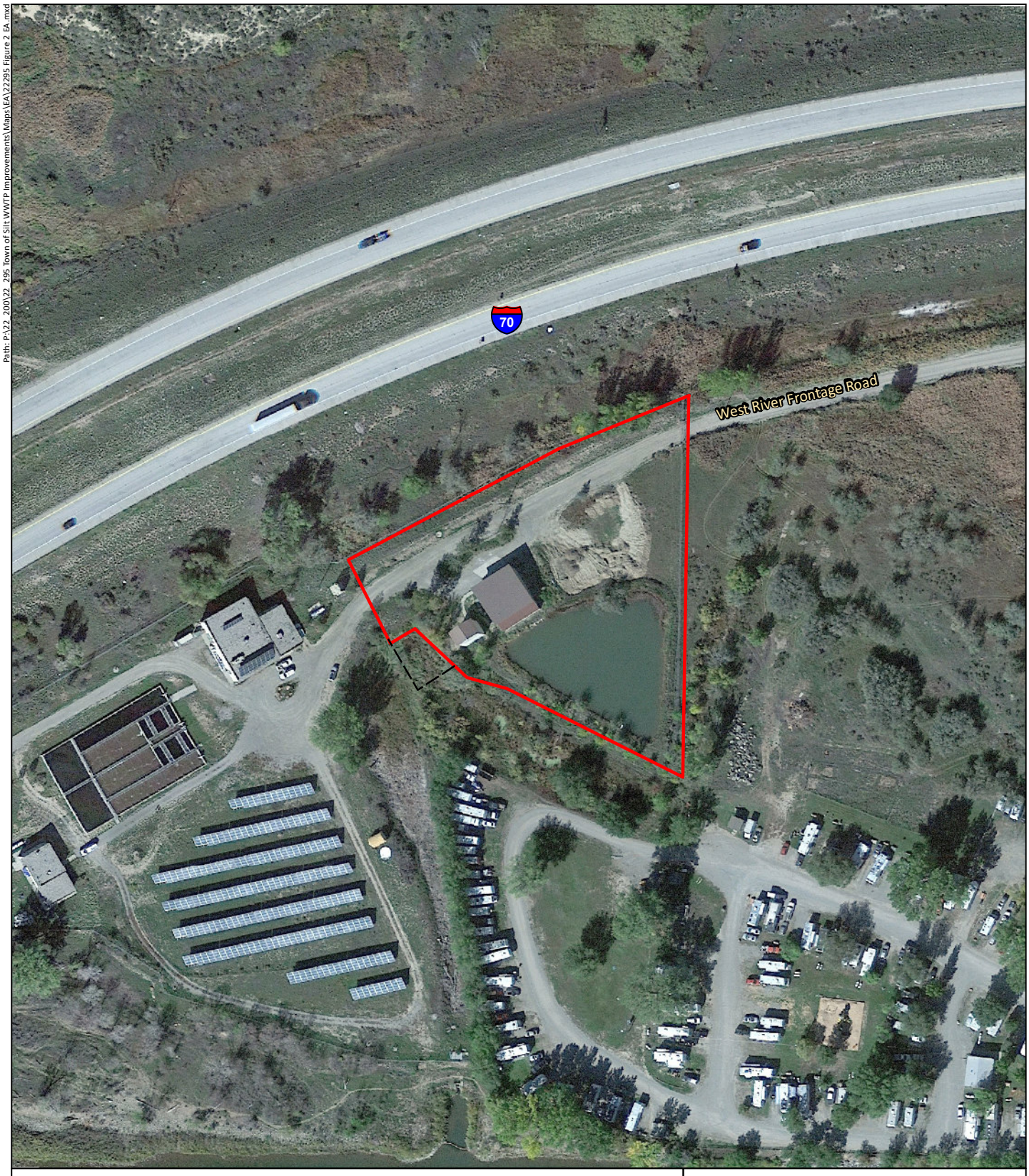
USGS Silt, CO Quadrangle

Garfield County, Colorado

Figure 1
Vicinity Map

Prepared for: CDPHE
File: 22295 Figure 1 EA.mxd [dlH]
February 9, 2023

ERO Resources Corp.



Town of Silt Water Treatment Plant

Project Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2 EA.mxd [dlH]
April 20, 2023

ERO Resources Corp.

Table 2. Historical and projected populations for the Town.

Historical Population		Projected Population (median 3.7 percent)	
Year	Population	Year	Population
1990	1,181	2025	4,245
2010	2,930	2030	5,097
2011	3,127	2035	6,119
2012	3,158	2040	7,346
2013	3,179	2045	8,820
2014	3,216		
2015	3,249		
2016	3,295		
2017	3,348		
2018	3,415		
2019	3,478		
2020	3,536		

Source: Dewberry 2022.

The growth described above would result in increased water demand for the Town. Future water use projections were made for the 20-year planning period based on the Project population developed. A per capita use of 85 gallons per capita per day was used to project average daily flow, and a maximum month to average day peaking factor of 1.8 was applied to establish corresponding maximum month average daily flows. These numbers were determined using the maximum month historical per capita use and peaking factors from the monthly historical adjusted data from 2016 through 2021. The projected average and maximum month demands are provided in Table 3. Average annual daily demand (AAD) and maximum month demand are projected to increase to 0.67 mgd and 1.21 mgd in 2042, an increase of approximately 42 percent from the existing water demands. Peak day flow demands would be met by drawing down system storage. It is recommended that the upgraded facility be planned and designed to meet the projected maximum month demand of 1.21 mgd and include redundancy.

Table 3. Projected WTP water demand.

TOTAL			
Year	Population	AAD, GPD	Peak Day, GPD
2027	4,567	388,200	698,800
2032	5,484	466,100	839,000
2037	6,584	559,600	1,007,300
2042	7,904	671,900	1,209,300

Source: Dewberry 2022.

V. ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

A. Direct and Secondary Impacts

Construction of proposed WTP improvements may have direct impacts from facility construction and secondary and cumulative impacts from future development in the service area. Secondary impacts are those induced or stimulated by, or as a result of, the proposed action. These can include cumulative, social, and land use impacts, among others. Cumulative impacts are the collective incremental impacts of the proposed

action regardless of the entity undertaking the action. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time. From the characteristics of the proposed Project, and descriptive elements of the environmental setting, probable impacts would be direct and/or secondary. Potential secondary and cumulative impacts on the environment from new development, such as increased quantity and decreased quality of urban runoff, degradation of wetland and wildlife habitat, and increased air pollution and noise are likely to affect the planning area. Some of the more specific impacts are described below.

Surface Water and Groundwater Quality and Quantity

The Colorado River is the major water body located in the planning area. The Town's WTP is located adjacent to Colorado River Segment COLCLC01, which consists of the mainstem of the Colorado River from the confluence with the Roaring Fork River to immediately below the confluence with Rifle Creek. The stream designation is reviewable and is classified for the beneficial uses of Aquatic Life Cold 1, Recreation Class E, Agriculture, and Water Supply. Several segments of the Colorado River and tributary systems, including Segment COLCLC01, are on the 303(d) list of impaired waters and exceed water standards for certain analytes. Segment COLCLC01 is listed as impaired for temperature and total arsenic. Several tributaries to the Colorado River upstream of the Town, including portions of Segments COLCLC04 and COLCLC07, are listed as impaired for selenium, sulfate, cadmium, copper, and macroinvertebrates.

Agriculture is a large component to the area's economy and land use. Farms and ranches are spread along all of the major drainages within the Middle Colorado Watershed, in which the Town is contained. In addition to the major drainages, several ditches and canals have been established for irrigation use.

The Colorado River has been adversely impacted by historical mining. The Middle Colorado Watershed contains several mining claims, most of which are inactive. Extensive historical mining included extraction of uranium, vanadium, lead, coal, zinc, and selenium.

In August 2020, the Grizzly Creek Fire broke out in Glenwood Canyon, approximately 24 miles east of the Town. The fire burned for about four months, engulfing more than 32,000 acres along both sides of the I-70 corridor. The fire caused debris and ash to fall directly into the Colorado River, which runs parallel to I-70. Subsequent mudslides from rain events in the burn scar areas further deposited sediment, soil, and chemicals into the Colorado River. Turbidity measurements in the Colorado River above South Canyon Circle Near Glenwood Springs and upstream of the Town began during the Grizzly Creek fire in October 2020. High turbidity events have been seen with spikes of up to 3,500 NTUs at this monitoring location. These high turbidity events could be triggered by rain

events on the Grizzly Fire burn areas or by other factors. Revegetation of the burn area could take several years and while revegetation could mitigate turbidity, other causes of turbidity may not be mitigated and future forest fires and mudslides could cause turbidity issues in the Colorado River.

The Town is classified as a medium-sized CWS, which currently uses a blend of surface water from the Colorado River and GWUDI. The Town must adhere to the specific requirements that apply to its classification type and sources of water used. Annual Drinking Water Quality Reports submitted for years 2016-2020 indicate violations occurred for the following: four violations for failing to monitor and/or report lead and copper, three violations for failing to inform homeowners of lead results, one violation for failing to meet cross connection control and/or backflow prevention requirements, one violation for failing to have a certified operator in 2020, one violation for failing to monitor and/or report total coliform, and one violation for failing to monitor and/or report chlorine/chloramine in 2020.

Under the proposed WTP improvements, new data collection software and process control system with automation would be implemented to improve the data reporting and analysis to mitigate future monitoring violations from occurring.

The Town's existing WTP currently discharges waste from the plate settler and the membrane system to a backwash pond. The backwash pond discharges to the Colorado River via CDPS No. COG641000. Currently, the backwash pond exceeds permitted discharge flow rate as a result of the significant overflow from the raw water pumps and plate settler.

The proposed WTP improvements would enhance control of the raw water pumps to allow them to provide the correct amount of water for treatment. By incorporating a ballasted flocculation system, the WTP would be better equipped to handle rapid raw water load and/or flow fluctuations. The revised O&M manual would also include a new Emergency Response Plan, which would provide detailed instructions for responding to power failures, flooding, fire, lightning strikes, equipment breakdowns, process failures, chemical spills, chemical shortages, and personnel injury. The revised manual would ensure that WTP staff take immediate and appropriate actions to limit adverse effects and protect lives and property during emergency situations.

Cumulative impacts from urban infill development could include increased runoff from paved surfaces and increased nonpoint source pollutants entering the Colorado River and its tributaries. Stormwater and erosion control best management practices (BMPs) would be used during construction to prevent nonpoint source water quality impacts, as further detailed in the *Mitigation of Adverse Impacts* section of this EA.

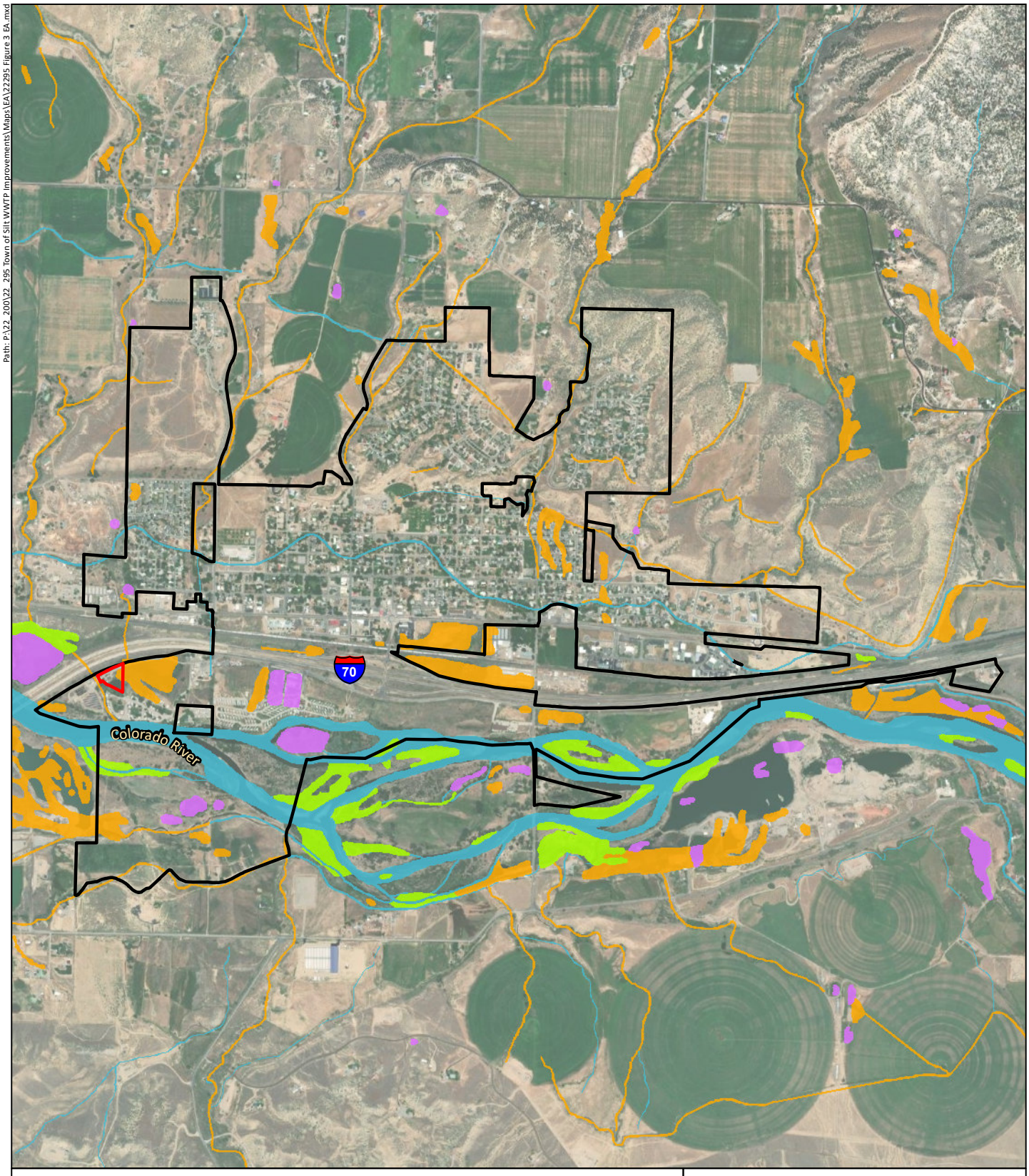
Wetlands

Under Executive Order (EO) 11990, "Protection of Wetlands," federal agencies are required to evaluate and address potential effects of their actions on wetlands to avoid adverse impacts wherever possible. Wetlands occur along the mainstem of the Colorado River and associated tributaries. According to National Wetlands Inventory (NWI) data produced by the U.S. Fish and Wildlife Service (USFWS) (Dewberry 2022; USFWS 2022), most wetlands identified in the planning area include freshwater emergent wetland, freshwater forested/shrub wetland, and freshwater pond areas (Figure 4). Most wetlands identified include palustrine emergent and scrub-shrub or herbaceous wetlands.

ERO reviewed NWI USFWS mapping to identify wetlands in the project area and planning area. NWI maps are prepared from interpretation of high-altitude imagery, and wetlands are identified based on vegetation, visible hydrology, and geography (USFWS 2022). A margin of error is inherent in the use of imagery. ERO also conducted a site visit on January 26, 2023 (2023 site visit) to identify and map wetlands in the project area that could be directly affected by the proposed Project. NWI wetlands are shown on Figure 3 and field-mapped wetlands are shown on Figure 4. A photo log from the site visit is included in Appendix B.

Wetlands occur as a narrow fringe along a backwash pond adjacent to the Colorado River in the project area. A total of 0.17 acre of wetlands occurs in the project area and consists primarily of palustrine scrub-shrub wetlands. Vegetation in the wetlands is dominated by softstem bulrush (*Schoenoplectus tabernaemontani*), narrowleaf cattail (*Typha angustifolia*), common reed (*Phragmites australis),* and reed canarygrass (*Phalaris arundinacea*) (Photo 1). The Project would include construction of a new backwash pond access road, consisting of graded and compacted gravel that would permanently impact less than 0.02 acre of mapped wetlands. Approximately 1,000 square feet of temporary impacts on wetlands could occur from construction staging and access along the northern edge of the backwash pond in mapped Wetland 1 (Figure 4). There could be temporary disturbances between W1-1 and W1-3 on Figure 4 during construction and there may be minimal permanent disturbances to the wetlands due to building of a retaining wall. Before construction of the access road and buildings, the WTP would coordinate with the U.S. Army Corps of Engineers (Corps) to obtain the proper Section 404 permit and ensure compliance with the Clean Water Act (CWA).

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\EA\22295 Figure 3 EA.mxd



Town of Silt Water Treatment Plant

- Project Area
- Planning Area
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine

0 1,000 2,000 feet

N

Figure 3
National Wetlands Inventory

Prepared for: CDPHE
File: 22295 Figure 3 EA.mxd [dlH]
February 9, 2023

ERO Resources Corp.

Town of Silt Water Treatment Plant

- Soil Pit
- Wetland Flag
- Project Area
- Ordinary High Water Mark (0.38 ac)
- Wetland (0.17 ac)
- Freshwater Emergent Wetland (National Wetland Inventory)

0 30 60 feet

N

Figure 4
Wetlands Within Project Area

Prepared for: CDPHE
File: 22295 Figure 4 EA.mxd [dlH]
February 15, 2023

ERO Resources Corp.

The wetland indicator status of plant species was identified using the National Wetland Plant List (Corps 2020), taxonomy was determined using Flora of Colorado (Ackerfield 2015) and *Colorado Flora: Eastern Slope* (Weber and Wittmann 2012), and nomenclature was determined using *The PLANTS Database* (USDA, NRCS 2022). Soil points were not taken in any wetland soil points (SP) due to frozen surface water; however, soil data were collected at SP4 and SP6 where soils were less frozen (Figure 4). Nonhydric soils were observed at SP4 at 0 to 6 inches with a matrix color of 10YR 3/3 sandy loam, and at SP6 from 0 to 6 inches with a matrix color of 10YR 3/3 sandy loam. Soil data were not always collected if hydrophytic vegetation and hydrology were present and did not appear altered (Environmental Laboratory 1987) or when environmental conditions prohibited collection. In addition, soil data were not collected in conditions where there was a clear lack of hydrology and hydrophytic vegetation indicators. Where soil data were collected, a Munsell soil color chart was used to determine soil color.

Floodplains

Under EO 11988, "Floodplain Management," federal agencies are required to evaluate and address potential effects of their actions on floodplains to avoid adverse impacts wherever possible to ensure that projects' planning and budget reflect consideration of flood hazards and floodplain management, and to prescribe procedures to implement the policies and procedures of EO 11988.

The most recent Federal Emergency Management Agency (FEMA) floodplain map (Map No. 0802331091C effective August 2, 2006) shows a majority of the facility to be located in Zone A, within the 100-year floodplain, but just outside the regulatory floodway (Zone AE), where the base floodplain elevation for the 100-year flood has been determined. A floodplain permit would be required for the Project. The floodplain elevations in Zone AE immediately adjacent to the WTP on the south and east, range from 5,404 to 5,408 feet above sea level. Portions of the planning area are within the 100-year and 500-year floodplains of the Colorado River. The majority of the Town north of I-70 is located outside of the floodplain.

The finished floor elevations of all buildings would be at least 1 foot above the flood elevation of the adjacent floodway. Construction activities would be monitored, and erosion- and sediment-control BMPs would be implemented to minimize erosion and sediment movement toward the river. The improvements are within the existing WTP and would be located away from the Colorado River.

Town of Silt Water Treatment Plant

- Project Area
- Planning Area
- 100-year Floodplain
- 500-year Floodplain

0 250 500 feet

N

Figure 5
Floodplains

Prepared for: CDPHE
File: 22295 Figure 5 EA.mxd [dlH]
February 9, 2023

ERO Resources Corp.

Terrestrial and Aquatic Plants and Wildlife

Federally Listed Species

Federally threatened and endangered species are protected under the Endangered Species Act of 1973, as amended (ESA) (16 United States Code 1531, et seq.). Significant adverse effects (or take) of a federally listed species or its habitat require consultation with the USFWS under Section 7 of the ESA if there is a federal nexus. No regulations require consultations for effects on candidate species; however, if a species were to become listed during Project planning or construction, consultation with the USFWS would be required.

The USFWS lists several threatened and endangered species with potential habitat in Garfield County (USFWS 2022a). Habitat requirements and the likelihood to be found in the planning area are presented in Table 4.

Table 4. Federally listed threatened and endangered species in the planning area.

Common Name	Scientific Name	Status[1]	Habitat	Potential for Effects in Planning Area[2]
Mammals				
Canada lynx	*Lynx canadensis*	FT	Climax boreal forest with a dense understory of thickets and windfalls	No
Gray wolf	*Canis lupus*	FE	Temperate forests, mountains, tundra, taiga, grasslands, and deserts	No
Birds				
Mexican spotted owl	*Strix occidentalis lucida*	FT	Closed canopy forests in steep canyons	No
Yellow-billed cuckoo	*Coccyzus americanus*	FT	Riparian habitat along streams and rivers	No
Fish[2]				
Bonytail	*Gila elegans*	FE	Lower Colorado River downstream of the Grand Valley	No; no impacts on open water habitats
Colorado pikeminnow	*Ptychochelius lucius*	FE	Colorado River Basin; critical habitat downstream of Rifle	No; no impacts on open water habitats
Humpback chub	*Gila cypha*	FE	Lower Colorado River downstream of the Grand Valley	No; no impacts on open water habitats
Razorback sucker	*Xyrauchen texanus*	FE	Colorado River Basin; critical habitat downstream of Rifle	No; no impacts on open water habitats

Common Name	Scientific Name	Status[1]	Habitat	Potential for Effects in Planning Area[2]
Insects				
Monarch butterfly	*Danaus plexippus plexippus*	FC	Dependent on milkweeds (*Asclepiadoideae*) as host plants and forage on blooming flowers; a summer resident	Potential
Plants				
Colorado hookless cactus	*Sclerocactus glaucus*	FT	Upland semidesert, or shrublands in western Colorado	No
Debeque phacelia	*Phacelia submutica*	FT	Upland habitat in the Piceance Basin	No
Parachute beardtongue	*Penstemon debilis*	FT	Steep shale slopes and talus	No
Ute ladies'-tresses orchid (ULTO)	*Spiranthes diluvialis*	FT	Moist to wet alluvial meadows, floodplains of perennial streams, and around springs and lakes below 7,800 feet in elevation	No

[1]FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate Species.
[2]Species that may be impacted by depletions to the Colorado River.
Source: USFWS 2022a.

No federally listed threatened or endangered species have the potential to occur in the planning area and the Project would have no effect on any federally threatened or endangered species. The Canada lynx, gray wolf, and Mexican spotted owl are more likely to occur north and west of the Town in more remote and higher elevation areas. The yellow-billed cuckoo inhabits riparian habitat throughout western Colorado, and critical habitat for this species exists in the Grand Valley and Gunnison River Valley. Habitat for yellow-billed cuckoo is not present in the project area. Monarch butterflies depend on milkweed plants for food and breeding. While scattered milkweed plants occur in places along the Colorado River, none were seen in the project area during the 2023 site visit. Furthermore, the project area is located outside of the primary range for this species. The Colorado River species (bonytail, Colorado pikeminnow, humpback chub, and razorback sucker) do not occur in the planning area but could be affected by depletions to the Colorado River system. The Colorado hookless cactus, Debeque phacelia, and Parachute beardtongue are all located west of the project area and inhabit upland grasslands, shrublands, and desert. ULTO has been documented in Garfield County and nearby Eagle County. Wetlands in the project area consist of dense stands of reed canarygrass and sandbar willow that are likely too dense for ULTO to become established. The wetlands also quickly transition to upland habitat, which is not suitable for ULTO establishment.

State-Listed Species

In addition to federally listed species, several species listed by Colorado as state threatened, endangered, or species of special concern have the potential to occur in the planning area. Habitat requirements and the likelihood for effects in the planning area are presented in Table 5.

Table 5. State-listed threatened, endangered, and species of concern in the planning area.

Common Name	Scientific Name	Status[1]	Habitat	Potential for Effects in Planning Area
Mammals				
Kit fox	*Vulpes velox*	SE	Open shrublands and semidesert	None. Outside of known geographic range.
Northern river otter	*Lutra canadensis*	ST	Riparian habitats with permanent water	Low. Colorado River is potential habitat; unlikely to be affected by the Project.
Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	SC	Caves, mines, and abandoned buildings	Low. Limited suitable habitat. Project activities are unlikely to affect this species.
Birds				
American peregrine falcon	*Falco peregrinus anatum*	SC	Rocky outcrops, cliffs, and canyons	None. No suitable habitat.
Bald eagle	*Haliaeetus leucocephalus*	SC	Trees near rivers and lakes; forages in open water, at times in prairie dog towns	Low. Previous nests have been identified along the Colorado River about 0.5 mile from the WTP. Nests are surrounded by development and near I-70. Visual screens from other trees form a barrier between the nests and the WTP.
Greater sage grouse	*Centrocercus urophasianus*	SC	Sagebrush shrublands	Low. Limited habitat in the planning area. No habitat in the project area.
Western burrowing owl	*Athene cunicularia*	ST	Prairie dog colonies	None. No habitat in the planning area or project area.
Amphibians				
Northern leopard frog	*Rana pipiens*	SC	Wetlands and other aquatic habitat	Low. Could occur in wetland areas in the planning area. Unlikely to occur in the project area.

Common Name	Scientific Name	Status[1]	Habitat	Potential for Effects in Planning Area
Fish				
Colorado River cutthroat trout	*Hybognathus hankinsoni*	SC	High-elevation stream channels (particularly pools), back waters, and beaver ponds	None. No impacts are expected on open water habitats.
Common shiner	*Luxilus cornutus*	ST	Streams of moderate gradient with cool and clear water, gravel bottoms, and shaded by brush or trees	None. No impacts are expected on open water habitats.
Mountain sucker	*Catostomus playtrhynchus*	SC	Streams of moderate gradient with riffles and pools	None. No impacts are expected on open water habitats.

[1]ST = Colorado Threatened Species, SE = Colorado Endangered Species, SC = Colorado Species of Special Concern.
(CPW 2022).

The proposed Project would have no effect on the kit fox, American peregrine falcon, western burrowing owl, Colorado River cutthroat trout, common shiner, or mountain sucker because these species are unlikely to occur in the project area and planning area. The project area is located within the overall range of the northern river otter, Townsend's big-eared bat, greater sage grouse, and northern leopard frog. However, no habitat in the project area exists for these species, and they are therefore unlikely to be affected by the Project. A bald eagle nest and roosting area have been identified about 0.5 mile from the project area. Both the roost and nest are near I-70 and other developed areas, suggesting that the nesting eagles may be tolerant of disturbance. Furthermore, several large trees exist between the WTP and roost and nest, which provides a visual screen. It is unlikely that construction activities would impact nesting or roosting eagles because of the high amount of disturbance that occurs near the nest and roost sites.

Big Game

Big game wildlife species, such as mule deer, elk, and bighorn sheep are considered economically important species in Colorado. The project area is not located within any big game winter or severe winter ranges or concentration area. Portions of the planning area consist of elk and mule deer severe winter range as mapped by Colorado Parks and Wildlife (CPW) (CNDIS 2022). Severe winter range include areas that provide thermal refuge for elk and deer during winter months that may bring severe weather (extreme temperatures and snowfall). The WTP is located within elk and mule deer overall range (Figure 6). Construction activities on the WTP may result in temporary displacement of individual deer or elk, but population level effects are not expected due to the large amount of similar habitat surrounding the project area and planning area.

Migratory Birds and Raptors

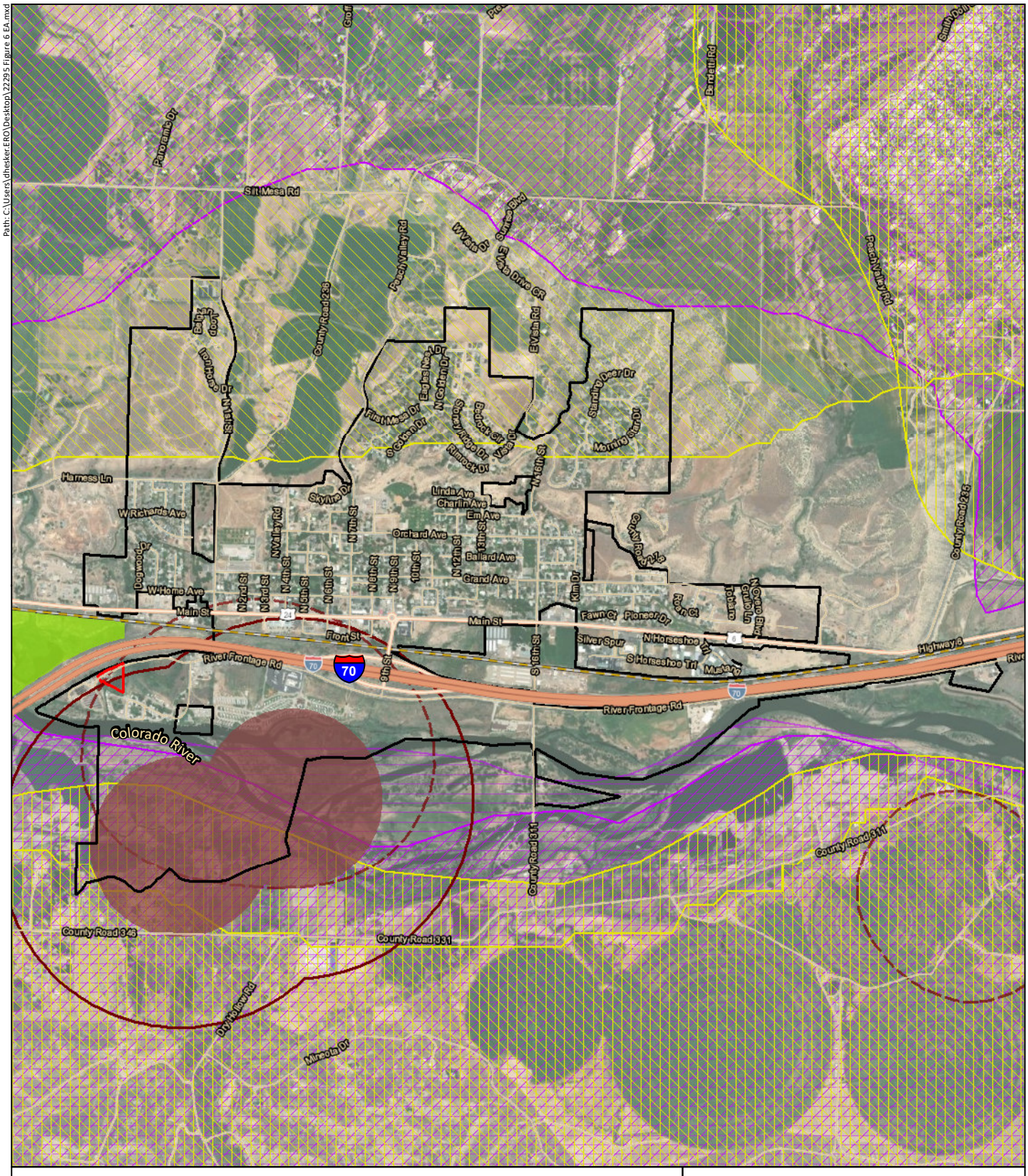
The Migratory Bird Treaty Act (MBTA) prohibits the killing of birds covered under the act (most native North American bird species except invasive species and game birds) or destruction of active nests (containing eggs or young). The planning area consists mostly of residential, commercial, and industrial development. Forested areas, shrublands, and aquatic habitat are in portions of the planning area and surrounding areas. All of these areas provide nesting and foraging habitat for several species of migratory birds. It is possible that several species of migratory birds nest in different habitats throughout the planning area.

Raptor surveys have not been conducted in the planning area or project area on foot, but according to the CPW, areas along the Colorado River provide adequate nesting and foraging habitat for raptors (Stanton 2023). In 2020, a bald eagle nest and roost was observed about 0.5 mile upstream of the WTP. The nest and roost site are located close to areas where constant human activity is present, including a sand and gravel mining operation less than 0.25 mile from the reported nest location. Additionally, several large trees exist between the roost and nest sites, which may form a visual screen between the WTP and roost and nest sites.

Construction activities during the active breeding season (April 1 through August 31 for songbirds and raptors and January 1 through July 31 for eagles) (CPW 2020) may temporarily displace some individuals but would not negatively affect the overall population of nesting birds in the area. Construction would occur on the WTP site, which is mostly developed. If construction requires removal of vegetation, it is recommended that it be done outside the breeding season (September 1 to December 31). If this schedule cannot be met, it is recommended that the Project proponent coordinate with CPW prior to construction.

Vegetation

Vegetation in the majority of the project area consists of upland grassland and is dominated by desert salt grass (*Distichlis spicata*), rye brome (*Bromus secalinus*), slender wheatgrass (*Elymus trachycaulus*), Kentucky bluegrass (*Poa pratensis*), kochia (*Bassia scoparia*), and crested wheatgrass (*Agropyron cristatum*). Additionally, surrounding the project area are many big sagebrush plants (*Artemesia tridentata*). Tree species occur along the western, northern, and eastern boundaries of the project area and dominant species include narrowleaf cottonwood (*Populus angustifolia*), Siberian elm (*Ulmus pumila*), and Russian olive (*Elaeagnus angustifolia)*.


Path: C:\Users\dhesker.ERO\Desktop\22295 Figure 6 EA.mxd
Silt Mesa Rd
Panorama Dr
Peach Valley Rd
County Road 239
W Vista Dr
E Vista Dr
Vista Drive CR
Standing Deer Dr
Morning Star Dr
Eagle Nest Dr
N Golden Dr
S Golden Dr
First Mesa Dr
Sunset Ridge Dr
Rimrock Dr
Bighorn Court
Longhorn Dr
N 11th St
Harness Ln
W Richards Ave
Skyline Dr
N 7th St
Linda Ave
Charlin Ave
Em Ave
Orchard Ave
N 12th St
Ballard Ave
Grand Ave
W Home Ave
Main St
Front St
River Frontage Rd
Interstate 70
9th St
S 16th St
Fawn Ct
Pioneer Dr
Silver Spur
N Horseshoe Trl
S Horseshoe Trl
Mustang
Highway 6
Colorado River
County Road 311
County Road 346
Dry Hollow Rd
Mineola Dr
County Road 215
Brandt Rd
Smith Dr
Town of Silt Water Treatment Plant
Project Area
Planning Area
Bald Eagle Active Nest Site
0.5-mile Bald Eagle Active Nest Site Buffer
Bald Eagle Roost Site
CPW State Wildlife Areas And State Parks
Elk Severe Winter Range
Elk Winter Concentration Area
Mule Deer Severe Winter Range
Mule Deer Winter Concentration Area
0
1,000
2,000
feet
N
Figure 6
Bald Eagle and Big Game Usage
Prepared for: CDPHE
File: 22295 Figure 6 EA.mxd [dlH]
February 9, 2023
ERO
ERO Resources Corp.
Aerial Image: © Copyright Google Earth Pro 10/13/2022

No List A noxious weed species were found in the project area during the 2023 site visit. Three Colorado Department of Agriculture noxious weed List B species were identified in the project area during the 2023 site visit. The List B species included Canada thistle (*Cirsium arvense*), Russian knapweed (*Rhaponticum repens*), and Russian olive.

Cultural, Historical, and Archaeological Resources

The Town is seeking funding through CDPHE's SRF loan program; therefore, the Project is required to provide compliance under Section 106 of the National Historic Preservation Act (NHPA). The results of the file and literature review provide the Town's planners with information regarding known and potential cultural resources as well as a summary of potential regulatory requirements that could stipulate additional cultural resource identification and documentation.

The purpose of the cultural resource file and literature review is to determine if any previously documented cultural resources listed in or eligible for listing in the National Register of Historic Places (NRHP) or State Register of Historic Places (SRHP) could be impacted by the proposed Project. A "cultural resource" is defined as an archaeological site, structure, or building constructed 50 or more years ago (Little et al. 2000). A cultural resource listed in or eligible for listing in the NRHP/SRHP is a "historic property."

To assist with Project planning and potential consultation obligations under Section 106 of the NHPA (Code of Federal Regulations 800) and the State Register Act (Colorado Revised Statutes 34-80.1-104), ERO reviewed the previous cultural resource surveys and resource documentation completed in the area of potential effects (APE) by conducting a file review using the Office of Archaeology and Historic Preservation online Compass database on November 8, 2022.

As further detailed in ERO's Technical Memorandum found in Appendix C, the file review indicated that no previously documented or potential historical resources are in the APE. In addition, ERO conducted a review of historical maps, Garfield County records, General Land Office records, and aerial images to assess the potential for unknown historical resources, such as roads, ditches, and buildings, in the APE. No potential historical resources are mapped on any of the historical maps or images. Given the presence of heavy disturbance due to construction of the existing WTP, there is no potential for any undocumented Native American or historical resources in the APE.

Air Quality

The project area is located in the Colorado Air Quality Control Commission's Western Slope Region for air quality planning and is in attainment of all National Ambient Air Quality Standards (NAAQS) (Colorado Air Quality Control Commission 2021). Sources of

air pollution in the Western Slope Region include motor vehicles; oil and gas development; the Craig coal-fired power plant; coal mines in Delta, Rio Blanco, and Moffat Counties; sand and gravel operations; windblown dust; wildfires; and prescribed fire.

The proposed Project would not violate NAAQS and would have no long-term adverse effects on ambient air quality. In addition, while the Project is subject to general conformity rules, it does not appear that the Project would be required to seek a conformity determination as the total of direct and indirect emissions of the criteria pollutants would not be exceeded. The proposed Project may have short-term impacts on air quality related to dust and vehicular emissions during construction. The short-term impacts on air quality would be minimized by proper control measures, and any air pollution permits or air pollution emission notices required during construction would be obtained from the CDPHE, Air Pollution Control Division.

Environmental Justice

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" issued in 1994, directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. The EO is in response to Title VI of the Civil Rights Act of 1964 which states: "No person in the U.S. shall, on the grounds of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance."

Under Council on Environmental Quality guidance, minority populations are identified where the percentage of minorities in the affected area exceeds 50 percent, or where the minority population percentage and poverty rate of the affected area is meaningfully greater than the minority population percentage of a much broader area (U.S. Census Bureau 2020).

For this assessment, U.S. Census data were collected at the Census Tract level to compare the planning area to neighboring populations in Garfield County, Garfield County, and the state of Colorado (U.S. Census Bureau 2020a, U.S. Census Bureau 2020b, U.S. Census Bureau 2020c). The Census Tracts selected are as follows:

- Census Tract 9519.01 (planning area): consists of the town of Silt to the southern boundary of Garfield County.
- Census Tract 9519.2: consists of the town of New Castle, which is east of the planning area.

- Census Tract 9520.01: consists of the area west of the planning area and east of the town of Rifle.
- Census Tract 9520.03: consists of the rural portion of the town of Rifle, west of the planning area.
- Census Tract 9520.04: consists of the urban portion of Rifle, west of the planning area.

Table 6 and Table 7 provide the minority race and ethnicity population proportions of Census Tracts, Garfield County, and the state of Colorado. Table 8 provides the proportion of the population of Census Tracts, Garfield County, and the state of Colorado that has fallen below poverty level in the past 12 months.

Table 6. Racial characteristics of Colorado, Garfield County, and Census Tracts in and near the planning area.

	Percent of Population						
Racial Characteristics	**Colorado**	**Garfield County**	**Census Tract 9519.01 (Silt), Garfield County**	**Census Tract 9519.02 (New Castle), Garfield County**	**Census Tract 9520.01 (Between Rifle and Silt), Garfield County**	**Census Tract 9520.03 (Rifle: Rural), Garfield County**	**Census Tract 9520.04 (Rifle: Urban), Garfield County**
White	81.5	84.7	87.8	88.0	81.6	86.4	92.2
Black or African American	4.1	0.5	0.3	0.0	0.3	1.4	0.0
American Indian and Alaska Native	0.9	0.5	0.1	0.3	0.7	0.0	0.5
Asian	3.2	0.8	0.2	0.6	0.0	0.0	0.8
Native Hawaiian and Other Pacific Islander	0.2	0.1	0.0	0.0	0.3	0.0	0.0
Some other race	4.1	8.6	4.5	4.1	13.7	0.8	0.6
Two or more races	5.9	4.7	7.1	7.0	3.5	11.3	5.8

Source: U.S. Census Bureau 2020a, Table B02001.

Table 7. Ethnicity characteristics of Colorado, Garfield County, and Census Tracts in and near the planning area.

	Percent of Population						
Ethnicity Characteristics	**Colorado**	**Garfield County**	**Census Tract 9519.01 (Silt), Garfield County**	**Census Tract 9519.02 (New Castle), Garfield County**	**Census Tract 9520.01 (Between Rifle and Silt), Garfield County**	**Census Tract 9520.03 (Rifle: Rural), Garfield County**	**Census Tract 9520.04 (Rifle: Urban), Garfield County**
White Alone, Not Hispanic or Latino	67.5	67.8	75.1	75.5	50.2	52.5	66.6
Hispanic or Latino	21.7	28.6	21.5	22.4	47.3	46.1	28.5

Source: U.S. Census Bureau 2020b, Table B03002.

Table 8. Poverty rates for families in Colorado, Garfield County, and Census Tracts in and near the planning area in the past 12 months.

Poverty Rate for Families (percent)						
Colorado	Garfield County	Census Tract 9519.01 (Silt), Garfield County	Census Tract 9519.02 (New Castle), Garfield County	Census Tract 9520.01 (Between Rifle and Silt), Garfield County	Census Tract 9520.03 (Rifle: Rural), Garfield County	Census Tract 9520.04 (Rifle: Urban), Garfield County
6.1	5.0	5.7	2.1	5.6	3.0	6.5

Source: U.S. Census Bureau 2020c, Table DP03.

Census Tract 9519.01 does not have minority populations greater than 50 percent of the total population. However, Census Tract 9519.01 has a slightly higher population of two or more races, 7.1 percent, compared to Garfield County and the state, with 4.7 and 5.9 percent, respectively.

While Garfield County has a higher proportion of Hispanic or Latino ethnicity (of any race) population (28.6 percent) compared to the state (21.7 percent), Census Tract 9519.01 has a slightly lower Hispanic or Latino population (21.5 percent) compared to the state and a significantly lower population compared to Census Tracts 9520.01 (47.3 percent) and 9520.03 (46.1 percent).

According to CDPHE's EnviroScreen Tool (CDPHE 2023), Census Tract 9519.01 is not categorized as a disproportionately impacted community; however, it reports that 44.9 percent of households are considered housing burdened. This rate is higher than most adjacent communities. Census Tract 9520.01, just west of the planning area, is categorized as a disproportionately impacted community due to its higher proportion of people of color (CDPHE 2023).

The proposed Project would serve all residents in the planning area, providing reliable and clean drinking water to the Town's residents. The Town is currently seeking all funding and grant opportunities, including through the SRF loan program and Bipartisan Infrastructure Law Principal Forgiveness, to offset as much of the Project costs and mitigate cost increases to its residents. A rate study is being performed for the Town to determine the potential cost impacts to its residents. The current water bill for the average ratepayer is around $50 per month. The rate study found that the Town's water fund is underfunded to maintain the current WTP and distribution systems. If the Town does not move forward with the Project but instead elects to maintain current WTP operations, a proper funding strategy would need to be implemented. Under this approach, the average water rate would increase to about $90 per month. If the proposed Project is implemented, the average water rate would increase to about $140 per month.

Project construction would not affect minorities or lower income groups disproportionately than the greater population and could result in direct and indirect short-term beneficial impacts on the local economy. These short-term impacts would

occur during construction and would be mostly limited to a slight increase in the construction workforce and beneficial impacts from associated spending in the immediate community. Construction is limited to the footprint of the existing WTP site, which would minimize impacts on residential areas. Short-term increases in noise and traffic would occur in the immediate vicinity of the project area, which would be minimized by proper control measures, as further described in the *Mitigation of Adverse Impacts* section below. The WTP serves all individuals in the planning area with respect to race, ethnicity, and income. As such, no EO 12898 populations would be impacted disproportionately by the proposed Project.

B. Unavoidable Adverse Impacts

Unavoidable adverse impacts of all construction and development-related projects that may not be fully mitigated include:

- Short-term increases in noise and ambient air particulate levels and increased traffic in the immediate vicinity of construction activities.
- Increased traffic from construction activities in the immediate vicinity of the project area during construction.
- Increased pollution in stormwater runoff from future residential and construction sites and impervious surfaces throughout the planning area.
- Commitment of resources including capital, manpower, and materials.
- Loss of potential wildlife habitat due to future residential or commercial development in the planning area.
- Increased traffic associated with residential and commercial development served by the proposed Project.

C. Mitigation of Adverse Impacts

The following mitigation alternatives are recommended to minimize or compensate for impacts from the proposed Project:

- Stormwater BMPs would be implemented according to the WTP's CDPS No. COG641000.
- A grading, erosion, and sediment control plan would be developed to control erosion and sedimentation resulting from Project activities.
- Stormwater management plans required for new development would mitigate the adverse effects of increased runoff from impervious surfaces.

- The use of herbicides and storage of petroleum products, chemicals, toxic substances, and hazardous materials would be handled and stored properly to avoid groundwater contamination.
- Wetland impacts would be avoided and minimized to the extent practicable.
- Temporary impacts on wetlands would be restored in place. The top 6 to 12 inches of wetland topsoil would be stockpiled and replaced following construction, and preconstruction contours would be restored. Before excavating or placing fill material in wetlands, the Town would coordinate with the Corps to obtain the proper permits and ensure compliance with the CWA.
- Construction access roads, staging areas, and disturbed areas would be reclaimed by restoring the existing grade and revegetating the area of disturbance.
- Water would be applied with standard construction practices to control airborne fugitive dust.
- Construction equipment (especially diesel equipment) would meet opacity standards for operating emissions.
- To avoid harming potential migratory birds and their nests, vegetation would be removed in the project area during the September 1 through March 31 nonbreeding season, if possible.
- If construction would occur during the April 1 through August 31 bird breeding season, preconstruction nest searches would be conducted prior to removal of trees and shrubs to ensure compliance with the MBTA.
- If construction would occur during the January 1 to July 31 bald eagle breeding season, CPW should be contacted to determine if monitoring or mitigation measures are required.
- Baffles on construction lighting fixtures would be installed to direct light onto the construction activity only.

In 2017, the Town finalized its Comprehensive Master Plan (Town of Silt 2017) to direct sustainable economic growth and improve quality of life. The goal of the Master Plan is to "guide Silt in becoming a progressive, sustainable town that embraces the positive aspects of directed growth while capitalizing on a western, rural legacy of self-sufficiency and strong community connections" (Town of Silt 2017). In 2019, the Town published its Water/Wastewater/Irrigation Master Plan, which presents facts and recommendations resulting from a comprehensive analysis of the water, wastewater, and irrigation division for the Town through 2038 (Town of Silt 2019).

In addition to the Town's efforts, the following local organizations are actively engaged in monitoring water quality and wildlife habitat in the Colorado River Basin and will have opportunities to review and comment on modifications to the WTP during the public participation process:

- Middle Colorado Watershed Council – was formed in 2012 to complete a Watershed Assessment and Watershed Plan. The Middle Colorado Watershed Council's mission is to, "evaluate, protect, and enhance the health of the middle Colorado River watershed through the cooperative effort of watershed stakeholders" (Middle Colorado Watershed Council 2016).
- Garfield County Public Health – the environmental health department works to "protect public health from detrimental conditions in the environment through promotion, education, collaboration, and the evaluation of environmental health risks" (Garfield County 2023). The public health department oversees the planning and design of public works projects.
- Silt Water Conservancy District (District) – the District was formed to educate, represent, and advocate for private landowners and water rights holders. The mission of the District is "conserving and developing land and water resources for the greatest beneficial use of water within the District boundaries" (District 2023).

VI. PUBLIC PARTICIPATION

Information on the Project was presented to the Town's Board of Trustees at its November 28, 2022 board meeting. An open house was held on Monday, December 19, 2022 to inform citizens of the Project and to solicit public input on the Master Plan. In addition, a follow-up public meeting was convened on January 9, 2023 to further solicit public input on the proposed Project. During the January 9, 2023 public meeting, an overview of the alternatives, the preferred alternative, and the impact range of rate increases were presented. In addition, the Town posted a public service information video to its YouTube channel for those members of the public who were unable to attend the public meeting: https://www.youtube.com/watch?v=OQxOwhFJgpI. A copy of the public notice, public meeting sign-in sheet, and presentation slides are included in Appendix D.

As part of this EA effort, a 30-day comment period is expected to commence in May 2023. This will allow an additional opportunity for the public to comment on the proposed Project.

VII. REFERENCE DOCUMENTS

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VIII. AGENCIES CONTACTED

Letters giving a brief description of the proposed Project were sent to the following agencies on December 7, 2022:

A. U.S. Fish and Wildlife Service (USFWS)
B. Colorado State Historic Preservation Office (SHPO)
C. U.S. Army Corps of Engineers (Corps)
D. Natural Resources Conservation Service (NRCS)
E. Colorado Parks and Wildlife (CPW)
F. Colorado Division of Water Resources (DWR)
G. Colorado Air Pollution Control Division (APCD)
H. National Park Service (NPS)

The scoping letters that were submitted to the agencies are included in Appendix E. Agency responses were received from the SHPO, Corps, and NRCS; and copies are included in Appendix F. The comments received from the responding agencies are summarized below:

- The SHPO provided a letter indicating that it did not appear that any properties nominated for inclusion in or accepted by the SRHP are present that could be adversely affected by the work proposed in the project area.
- The Corps did not provide any comments but indicated that no CWA permit is required at this time and assigned the Project a project number.
- NRCS provided a letter that confirmed the project area is not subject to the Farmland Protection Policy Act as the Project would occur in existing rights-of-way or developed areas.

Appendix A. Town of Silt WTP Master Plan and Silt Water Treatment Plant Upgrades – Cost Revision Technical Memorandum

Dewberry

TECHNICAL MEMORANDUM

PREPARED FOR: The Colorado Department of Public Health and Environment and the Town of Silt

PREPARED BY: Dewberry Engineers Inc.

DATE: May 5, 2023

SUBJECT: Silt Water Treatment Plant Upgrades – Cost Revision

1.0 Purpose

The purpose of this technical memorandum is to update the cost in the Project Needs Assessment submitted in November 2022 for the Town of Silt Water Treatment Plant (WTP) Improvements.

2.0 Rationale for Updated Opinions of Probable Cost

The project has progressed, and the alternatives have been better defined. With better definition, Dewberry revisited the opinions of probable construction costs (OPCC). This memo updates the PNA OPCCs submitted in November 2022. Specific changes are summarized below:

- The building size for Alternative 4 - ballasted flocculation with mixed media filters was 6,350 square feet while the building size for the plate settler was only 5,500 square feet, despite the fact that the plate settler will take more area.
- Increased piping costs to reflect recent observations in project costs.
- Incorporated a concrete cost to form the tanks for the plate settlers. The plate settlers are too large to utilize prefabricated steel/aluminum tanks.
- UV costs were reduced to reflect updated equipment budget quotes.
- Updated operations, maintenance, and replacement costs to include only mechanical components and not structural components.

3.0 Updated Opinions of Probable Cost

The following tables show the updated opinions of probable costs for the Silt WTP alternatives.

Table 1. Updated Construction Cost and Total Project Cost for WTP Alternatives

ITEM	CLARICONE	PLATE SETTLER W/ MEMBRANE FILTRATION	PLATE SETTLER W/ MIXED MEDIA FILTER	PULSAPAK	BALLASTED FLOCCULATION W/ MIXED MEDIA FILTER
	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4
Site Civil	$272,000	$326,000	$341,000	$259,000	$289,000
Structural	$127,000	$1,160,000	$1,160,000	$471,000	$635,000
Architectural	$5,141,000	$4,288,000	$4,172,000	$3,763,000	$3,472,000
Process/Mechanical	$5,649,000	$5,223,000	$4,172,000	$6,200,000	$5,650,000
HVAC	$1,679,000	$1,650,000	$1,511,000	$1,604,000	$1,507,000
Electrical	$2,015,000	$1,980,000	$1,813,000	$1,925,000	$1,809,000
Capital Cost Subtotal	$14,883,000	$14,627,000	$13,393,000	$14,222,000	$13,362,000
Contingency	$4,465,000	$4,389,000	$4,018,000	$4,267,000	$4,009,000
Mobilization/Demobilization	$745,000	$732,000	$670,000	$712,000	$669,000

Table 1. Updated Construction Cost and Total Project Cost for WTP Alternatives

ITEM	CLARICONE	PLATE SETTLER W/ MEMBRANE FILTRATION	PLATE SETTLER W/ MIXED MEDIA FILTER	PULSAPAK	BALLASTED FLOCCULATION W/ MIXED MEDIA FILTER
	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4
Contractor OH&P	$2,977,000	$2,926,000	$2,679,000	$2,845,000	$2,673,000
Bonding and Insurance	$447,000	$439,000	$402,000	$427,000	$401,000
Total Opinion of Probable Construction Cost	**$23,517,000**	**$23,113,000**	**$21,162,000**	**$22,473,000**	**$21,114,000**

Table 2. Updated Engineering and Administrative Costs for WTP Alternatives

ITEM	CLARICONE	PLATE SETTLER W/ MEMBRANE FILTRATION	PLATE SETTLER W/ MIXED MEDIA FILTER	PULSAPAK	BALLASTED FLOCCULATION W/ MIXED MEDIA FILTER
	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4
Design (10%)	$2,352,000	$2,311,000	$2,116,000	$2,247,000	$2,111,000
Construction Mgmt./Inspection (8%)	$1,881,000	$1,849,000	$1,693,000	$1,798,000	$1,689,000
Administrative	$470,000	$462,000	$423,000	$449,000	$422,000
Total - Engineering/Administrative	$4,703,000	$4,622,000	$4,232,000	$4,494,000	$4,222,000
Total Project Cost	**$28,220,000**	**$27,735,000**	**$25,394,000**	**$26,967,000**	**$25,336,000**

Table 3. Updated Buildout Operation, Maintenance, and Replacement Costs for WTP Alternatives

ITEM	CLARICONE	PLATE SETTLER W/ MEMBRANE FILTRATION	PLATE SETTLER W/ MIXED MEDIA FILTER	PULSAPAK	BALLASTED FLOCCULATION W/ MIXED MEDIA FILTER
	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4
Annual Labor	$267,000	$267,000	$267,000	$267,000	$267,000
Annual Chemical	$288,000	$288,000	$288,000	$288,000	$288,000
Annual Power	$82,000	$98,000	$82,000	$82,000	$82,000
Annualized Equipment Replacement and General Equipment Maintenance	$67,000	$29,000	$28,000	$84,000	$28,000
Membrane Replacement	$0	$67,000	$0	$0	$0
Filter Media Replacement	$0	$0	$11,000	$0	$11,000
Total Annual Cost	**$704,000**	**$749,000**	**$676,000**	**$721,000**	**$676,000**
Net Present Value	$40,726,000	$41,235,000	$37,281,000	$39,848,000	$37,223,000

4.0 Summary

The updated OPCC indicate Alternative 4 is the most cost-effective solution of the four alternatives evaluated for the Town of Silt. As shown in Tables 1, 2, and 3, the ballasted flocculation with mixed media filter alternative has the lowest construction cost and Net Present Value costs. A Construction Manager at Risk has been added to the project team and will be providing construction cost estimates for the team moving forward.

TOWN OF SILT
WATER TREATMENT PLANT
Master Plan

DECEMBER 2022

Dewberry

SUBMITTED BY
Dewberry Engineers Inc.
990 South Broadway, Suite 400
Denver, CO 80209
303.825.1802

TABLE OF CONTENTS

SECTION 1 - EXECUTIVE SUMMARY

This Water Treatment Plant (WTP) Facility Plan (Plan) provides the Town of Silt (Town) with an evaluation of their existing water treatment plant infrastructure and processes, water quality, future demand flows, treatment alternatives, and regulations. This report also describes the evaluation processes in selecting the recommended improvements to their WTP as well as a roadmap outlining the Town's water treatment needs over the next 20 years.

1.1 Summary of Existing Water Treatment Plant

The Town of Silt's Water Treatment Plant (WTP) is located on the southwest side of Town on the south side of Interstate 70. The WTP has not undergone any major upgrades since its original construction in 2005 by Schmueser Gordon Meyer Engineers and Surveyors. The Silt WTP currently has a peak design capacity of 1 million gallons per day (MGD); however, the true capacity is only 0.6 MGD. The existing potable water distribution system consists of four water storage tanks and two raw water pump stations. The WTP utilizes the Colorado River as the main source water and two groundwater wells that are considered groundwater under the direct influence (GWUDI) of surface water. In addition to high turbidity in the Colorado River source water, the GWUDI source water contains high levels of iron and manganese.

The existing plant consists of the following major unit processes:

- Two submerged raw water pump stations
- A strainer
- ACH and polymer blend for coagulant and a coagulant mixer
- A plate settler
- Two membrane filters
- Calcium hypochlorite tablets for disinfection
- Finished water pump station

The drinking water service area for the Town of Silt WTP is the Town boundary. The Town of Silt WTP serves an area that encompasses approximately 2.8 square miles of area.

1.2 Planning Criteria

The Town of Silt currently has an estimated population of 3,536 and is anticipating a 20-year planning period population of 7,904 in 2042. The projected population growth will cause an increase in water demand and therefore required water production from the WTP. The production capacity of the WTP is dependent on upstream equipment and processes. Average annual water demand per capita has remained relatively constant between 80 and 88 gallons per capita per day. The WTP experienced a peak daily demand of 0.48 MGD in 2018.

Planning criteria for the Town of Silt WTP are provided in **Table 1.2**. At the end of the 20-year planning period, the average annual daily demand is projected to increase to 671,900 GPD. The projected peak day demand in 2042 is 1.21 million GPD.

Table 1.2 Projected WTP Water Demand

PARAMETER	YEAR 2027	YEAR 2037	YEAR 2042
Average Annual Day, GPD	388,200	559,600	671,900
Peak Day, GPD	698,800	1,007,300	1,209,300

1.3 Regulatory Review Summary

The WTP operates under the Colorado Discharge Permit System (CDPS) Permit No. CO0123710. The Safe Drinking Water Act identifies and sets standards for chemical contaminants, microbial contaminants, and right-to-know rules. Specifics of these rules are detailed in Section 4.

1.3.1 Lead and Copper

The Lead and Copper Rule has been revised and requires compliance on October 16, 2024. For further detail, see **Section 4.1.17**.

1.3.2 Disinfectants/Disinfection Byproducts Rule

The Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR) sets limits for exposure to three disinfectants and many disinfection byproducts. The rule established maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for chlorine, chloramine, and chlorine dioxide. The Stage 2 D/DBPR focuses on monitoring and reducing concentrations of two classes of DBPs: total trihalomethanes (TTHM) and haloacetic acids (HAA5). For further detail, see **Section 4.1.11**.

1.3.3 Primary and Secondary Drinking Water Standards

Primary Drinking Water Standards are legally enforceable standards that must be met by public water systems. Secondary Drinking Water Standards are non-enforceable guidelines for contaminants that may cause cosmetic effects in drinking water. For further information, see **Section 4.1.12** and **Section 4.1.14**, respectively.

1.3.4 Disinfection Requirements

The Revised Total Coliform Rule requires PWSs to test for total coliforms monthly. The Surface Water Treatment Rule, Long-Term 1: Enhanced Surface Water Treatment Rule, and Long-Term 2: Enhanced Surface Water Treatment Rule require disinfection, filtration, and contact time to meet minimum requirements, depending on the system and disinfectant used. For more details, see **Sections 4.1.2** through **4.1.6**.

1.3.5 Monitoring Reports

The Consumer Confidence Report Rule requires community water systems to provide annual water quality reports to their customers. All utilities must submit the report to the state annually and deliver the report directly to each customer by July 1 each year. For more information, see **Section 4.1.10**.

1.3.6 Recommended Additional Monitoring

Additional monitoring of certain contaminants and analytes will help prepare the Town of Silt's WTP for future regulations and improve operations.

1.3.6.1 TOC

It is recommended that TOC is monitored as it is an indicator of potential DBP formation and can help inform operator staff how well treatment is performing.

1.3.6.2 PFAS

In advance of the Fifth Unregulated Contaminant Rule, which requires monitoring for PFAS between 2023 and 2025, it is recommended to sample PFAS to gauge the level of PFAS in the raw and finished water. This will help inform future decisions regarding treatment of PFAS if a future PFAS regulation is enforced.

1.3.6.3 Raw Water

Water quality monitoring of raw water for unregulated contaminants (See **Section 4.1.20**) and contaminants on the Contaminant Candidate List (See **Section 4.1.22**) is recommended to gauge levels of these contaminants, which may be regulated in the future.

1.3.6.4 Disinfection Byproducts

There is a Stage 3 DBP Rule in development that will likely further lower the TTHM and HAA5 MCLs and, perhaps, increase TOC removal requirements. However, this rule is unlikely to be formulated until 2027 or later. In preparation for these future potential rules, it is recommended that TTHM and HAA5 are monitored more frequently than currently required.

1.3.6.5 Technologically Enhanced Naturally Occurring Radioactive Material

It is recommended that Technologically Enhanced Naturally Occurring Radioactive Material is sampled and monitored in preparation for the CDPHE Part 20 TENORM regulation, which is enforceable on July 14, 2022.

1.3.6.6 Jar Testing

Periodic jar testing is recommended to monitor coagulation and flocculation and estimate the minimum coagulant dose required to optimize pretreatment. Turbidities, water temperatures, source water, and other water quality parameters can affect coagulant dosing and coagulation and flocculation, especially seasonally.

1.3.6.7 Provisional Considerations for PFOA/PFAS Regulations

Per- and polyfluoroalkyl substances (PFAs) are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s because of their useful properties. PFAS is an emerging contaminant and while there are currently no drinking water regulations for PFAS, there are likely to be future regulations for these contaminants. MCLs are in development and are likely to promulgated prior to 2030.

1.4 Water Treatment Plant Performance and Evaluation Overview

The Town of Silt WTP treats approximately 0.33 MGD (annual average day production for 2021). Annual Drinking Water Quality Reports for the last five years (2016-2020; the report was not yet available for 2021) indicate nine violations in the last five years. The violations were: (1) four violations for failing to monitor and/or report lead and copper, two in 2019 and two in 2020, (2) three violations for failing to inform homeowners of lead results, two in 2019 and one in 2020, (3) one violation for failing to meet cross connection control and/or backflow prevention requirements in 2019, (4) one violation for failing to have a certified operator in 2020, (5) one violation for failing to monitor and/or report total coliform in 2020, and (6) one violation for failing to monitor and/or report chlorine/chloramine in 2020. There were no reported water quality violations in 2016 through 2021.

The evaluation of the WTP recommended the following improvements:

- Raw water delivery and flow system produce a lot of excess water. To meet future demands and improve operations, additional pumps and control improvements will be required.
- The Alluvial wells have lower turbidity than the Colorado River water. However, the alluvial water tends to be higher in iron and manganese. The existing alluvial wells do not have capacity to meet the full summer
- The plate settler lacks sufficient capacity to meet future demands. This should be expanded or replaced with a system that can accommodate a large variation in raw water turbidity.

- Colorado River was during the runoff season has high turbidity which impacts pretreatment and filtration processes. It may be worthwhile to investigate expanding the use of the wells and/or use of the gravel pond across the river in an effort to reduce turbidity to the WTP.
- Use of ACH as a coagulant reduces the need to modify the pH to improve flocculation and coagulation and should be continued. Dose should be confirmed with regular testing. The WTP currently utilizes a Clarifloc product which is a proprietary blend of ACH and a polymer. Silt should consider utilizing pure ACH with no polymer as the use of polymers can negatively impact membrane fouling.
- There is an insufficient coagulation/flocculation system at the WTP. This greatly reduces the effectiveness of the plate settler and increases the turbidity load to the membranes. In effect, the elevated turbidity load to the membranes increases backwashing and cleaning frequency which decreases treatment capacity.
- By utilizing membranes for filtration, the WTP is not required to test and document TOC removal. However, improving TOC removal will reduce DBP formation potential. While it currently doesn't monitor for TOC removal, incorporating regular TOC removal monitoring will provide Operations with knowledge regarding DBP formation potential. Additionally, DBP formation potential equipment could be provided to staff to assist with process monitoring.
- The membranes lack sufficient treatment to meet future demand projections. The membranes have a capacity of 0.6 MGD when operating 24 hours a day. Operating 18 hours a day, the membranes have a capacity of 0.5 MGD which is equivalent to the current peak day summer demands. During a peak day, the WTP is operating at or near capacity. Additional filtration capacity is needed.
- The life of the membranes could be extended by performing a Clean In Place (CIP). CIPs are currently not performed because: (1) the heaters do not work and (2) the time required for a CIP significantly impacts production time.
- Maintenance and CIPs are manually intensive processes. New controls should be incorporated to automate the future filter backwashing and cleaning process.
- The table chlorination system currently works. However, it should be upgraded to a system that can be easily flow controlled with sufficient instrumentation to determine chlorine demand and dose. This improvement will likely improve the reliability of meeting TOC removal goals and reducing DBP formation potential.
- Iron and manganese removal should be addressed. Currently, the addition of seaquest masks the impacts of iron and manganese. A long term, resilient removal solution should be identified and installed.
- The chlorine contact chamber has sufficient capacity to provide 4 log virus inactivation at the projected future water demands. Should the regulations change or should the WTP replace the membranes with a conventional mixed media filter system, additional disinfection credits will need to be provided to provide additional giardia inactivation credits. This could be accomplished via UV disinfection or additional contact chamber volume.
- There is one disinfection contact chamber. This limits the ability of staff to clean and maintain the chamber.
- Silt should monitor their raw water sources for the unregulated contaminants.
- Finished water pumping capacity is currently not sufficient to meet the projected demands.

1.5 Water Treatment Plant Alternatives Summary

Four alternatives for the pretreatment and filtration processes were evaluated for the Silt WTP. Planning level estimates of construction costs, annual operation and maintenance (O&M) costs, and the net present value were developed for the four pretreatment and filtration process alternatives. The net

present value of each treatment alternative includes construction costs of the labor, disinfection, coagulant, power, equipment, and membrane or filter replacement. O&M costs are based on average annual O&M costs over the 20 years. Pretreatment and filtration process construction costs and total construction costs for the four alternatives are presented in **Table 1.3**. Current annual costs are summarized in **Table 1.4** and annual costs in 2042 are summarized in **Table 1.5**, including costs for labor, coagulant, disinfection chemical, power, residuals, and equipment/structure O&M. Additional information on the process evaluation can be found in **Section 6**.

Table 1.3 Estimated Construction Cost for WTP Alternatives

ALTERNATIVE	PROBABLE OPINION OF CONSTRUCTION COST, $ MILLION	OPINION OF TOTAL PROJECT COST, $ MILLION
Alt 1 – Solids Contact Clarifier with Mixed Media Filtration	$21.3	$25.6
Alt 2a – Plate settlers with Mixed Media Filtration	$19.6	$23.5
Alt 2b – Plate settlers with Membrane Filtration	$19.2	$23.1
Alt 3 – Package Media Filtration	$21.5	$25.8
Alt 4 – Ballasted Flocculation with Mixed Media Filtration	$23.3	$27.9
New Additional 0.5 MG Water Storage Tank	$2.2	$2.6

Table 1.4 Annual O&M Costs - Current

ITEM	ANNUAL COST, $				
	ALTERNATIVE 1	ALTERNATIVE 2A	ALTERNATIVE 2B	ALTERNATIVE 3	ALTERNATIVE 4
Labor	178,000	178,000	178,000	178,000	178,000
Sodium Hypochlorite	38,000	38,000	38,000	38,000	38,000
Coagulant	86,000	86,000	86,000	86,000	86,000
Power	66,000	82,000	66,000	66,000	66,000
Annualized Equipment Maintenance	67,000	34,000	34,000	84,000	58,000
Annualized Membrane Replacement	0	67,000	0	0	0
Annualized Filter Replacement	0	0	11,000	0	11,000
Total	435,000	485,000	413,000	452,000	437,000

Table 1.5 Annual O&M Costs - 2042

ITEM	ANNUAL COST, $				
	ALTERNATIVE 1	ALTERNATIVE 2A	ALTERNATIVE 2B	ALTERNATIVE 3	ALTERNATIVE 4
Labor	267,000	267,000	267,000	267,000	267,000
Disinfectant	89,000	89,000	89,000	89,000	89,000
Coagulant	199,000	199,000	199,000	199,000	199,000
Power	82,000	98,000	82,000	82,000	82,000
Annualized Equipment Maintenance	67,000	34,000	34,000	84,000	58,000
Annualized Membrane Replacement	0	67,000	0	0	0
Annualized Filter Replacement	0	0	11000	0	11000
Total	704,000	754,000	682,000	721,000	706,000

Alternative 2b has the lowest construction costs (**Table 1.3**). The Town of Silt has chosen Alternative 4 due to ease of operation and ballasted flocculation can accommodate the wide range in turbidity from the raw water with minimal operational adjustment and green sand could be added to the mixed media filtration to address the iron and manganese levels in the raw water.

1.6 Implementation Plan

The section presents the Implementation Plan for the recommended upgrades to the Town of Silt WTP. The improvements have been developed to upgrade the facility to meet current and future capacity demands, treat the wide range of turbidity of raw water and remove iron and manganese from the raw water. The improvements will also provide required facility redundancy, accommodate planned future growth of the Town, and improve operations. The recommended facility improvements take into consideration the treatment needs based on current and anticipated regulatory compliance requirements for the WTP. The recommended improvements developed in **Sections 5 and 6** will upgrade the permitted capacity of the WTP to 2 MGD. The recommended improvements are listed below.

- (1) strainer
- (1) mixed media filtration system with green sand
- (1) ballasted flocculation system
- UV disinfection system
- Chlorine disinfection system
- (1) 0.5 MG finished water storage tank
- Periodic cleaning of the backwash pond and residuals disposal
- Data collection software
- New process control system with automation

A site plan for the complete upgraded WTP has been developed and is provided in **Figure 1.1**. The locations shown on **Figure 1.1** are approximate and it is recommended the final location of the facilities be determined during design once a geotechnical investigation has been completed. New facilities are not confined to one portion of the site; care will need to be taken during design to ensure that existing processes can continue to operate while the new facilities are being constructed.

Figure 1.1 Silt WTP Preliminary Site Plan – Alternative 4

Construction for Alternative 4 includes a ballasted flocculation, mixed media filtration with green sand, and UV and chlorine disinfection. The recommended improvements and a summary of the construction and total project costs for Alternative 4 are provided in **Table 1.4**. Estimated planning level construction cost of the improvements is $23.3 million and the total project cost of the improvements is estimated to be $27.9 million. Refer to **Section 6** for details regarding estimated costs.

Table 1.4 WTP Improvements Costs

UNIT PROCESS	COST, $
Site/Civil	313,000
Structural/Architectural	5,185,000
Process	5,581,000
HVAC	1,662,000
Electrical	1,995,000
Total Materials and Equipment	14,736,000
Construction Cost[1]	23,285,000
Total Project Cost[2]	27,942,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

1.7 Schedule

It is recommended that the improvements be constructed in the near future to address capacity issues, aide in turbidity ranges and treat iron and manganese issues. The Town has expressed interest in pursuing an alternative delivery project, such as construction manager at risk (CMAR). A CMAR project has the potential to overlap construction tasks with design tasks to shorten the entire duration of a project. As shown in **Table 1.5** below shows a preliminary schedule based on a CMAR project delivery. Design, CDPHE review, and construction of the improvements is estimated to have a duration of 36 months (assuming the project is delivered via Construction Manager at Risk). If a conventional delivery (design, bid, build) is utilized to deliver the project, the project schedule will increase by 20 percent or more. This schedule assumes a design period of eight months for the improvements and is considered a consolidated schedule. The existing facility is believed to be near capacity as detailed in the flow projections described in **Section 3.**

Table 1.5 Project Duration

ITEM	PROJECTED START	PROJECTED END	DURATION, MONTHS
PHASE 1			
Design	August 2022	March 2023	8
Site Application	September 2022	October 2022	2
Process Design Report CDPHE Review	December 2022	January 2023	2
Construction (with CMAR)	July 2023	July 2025	3
Total Phase 1	August 2022	July 2025	36

1.8 Funding

The Town of Silt is planning to cash-fund the design of the project with current reserves. Funding for the construction of the project is anticipated to come from current reserves, future bond proceeds and, potentially, State Revolving Fund (SRF) monies.

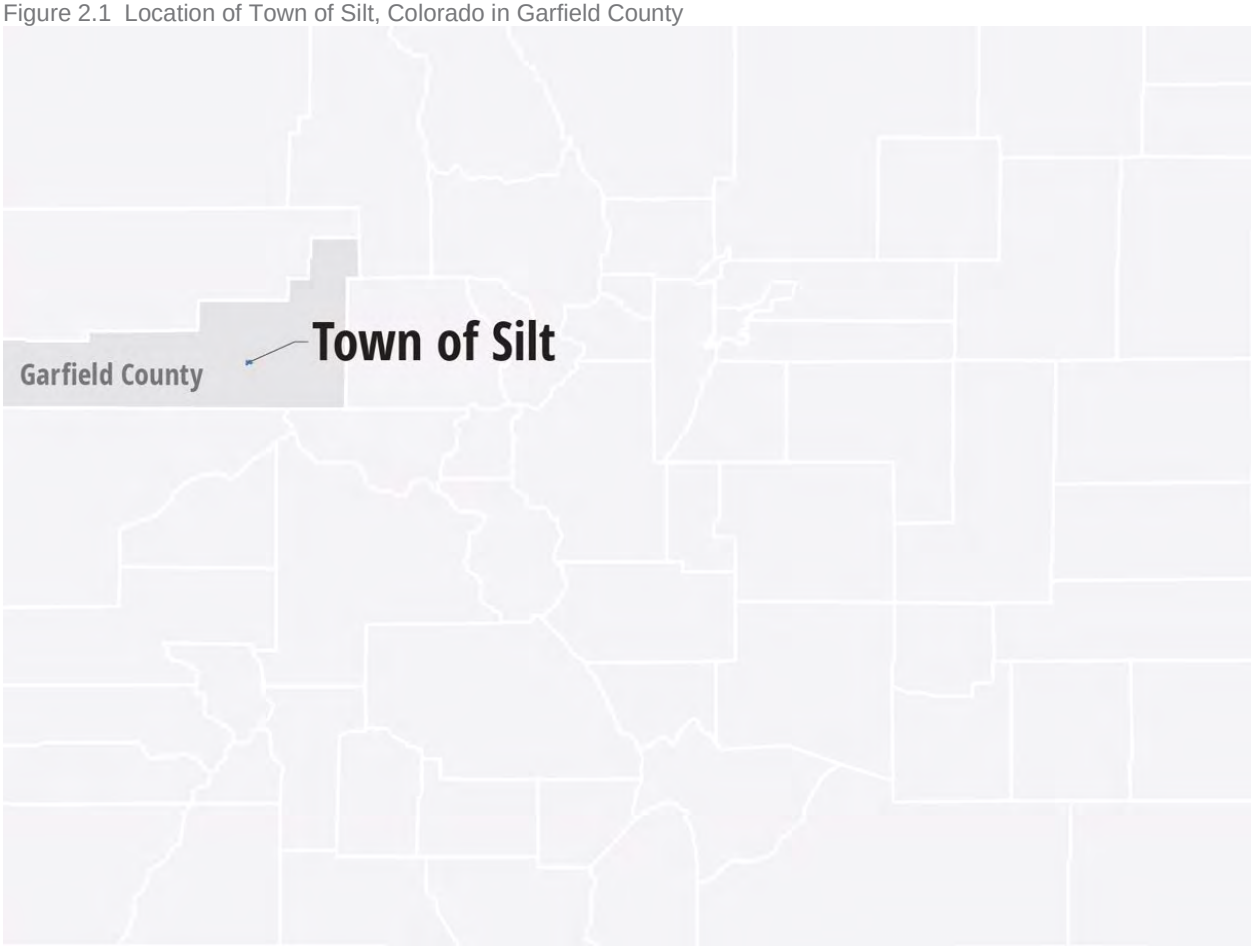
1.9 Public Meeting

The anticipated date for the Town of Silt Water Treatment Plant Upgrades project public meeting will be held during August of 2022 in the Town of Silt Council Chambers. A summary of the planning study and cost impacts will be presented including the recommended improvements. A public notice of at least 30 days is required as part of the public meeting process. A summary of the public meeting will be added as an appendix after the public meeting occurs.

SECTION 2 - GENERAL PLANNING

The Town of Silt (Town) is located in west central Colorado, along the I-70 corridor in eastern Garfield County between Glenwood Springs and Grand Junction, as shown in **Figure 2.1**. Named after the silt deposits at the original town site, Silt was first founded in 1881 and incorporated in 1915. Originally a farming and ranching town with fruit and sugar beets the main agricultural crops. The oil shale boom and bust of the late 1970's and early 1980's had a significant impact on the small towns in the region including Silt. The Town currently encompasses approximately 2.8 square miles and the population has grown to above 3,500 residents with recent economic and demographic trends favoring continued growth. The Town of Silt owns and operates its own water treatment plant (WTP) to provide drinking water to the residents within the Towns boundary.

Figure 2.1 Location of Town of Silt, Colorado in Garfield County



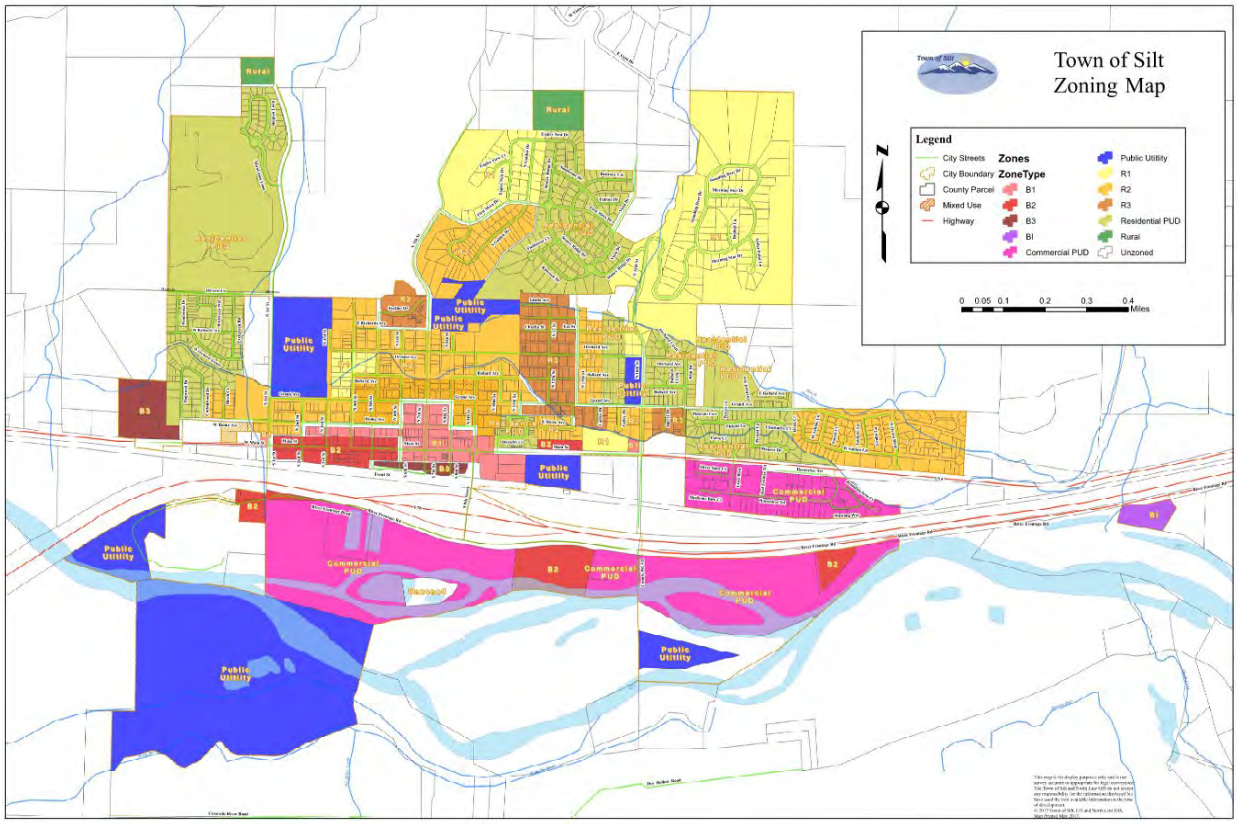
2.1 Overview of Service Area and Population

2.1.1 Service Area

The water service area for the Town of Silt WTP is the Town boundary. The Town of Silt WTP serves an area that encompasses approximately 2.8 square miles of area. A map of the Town of Silt boundary and zoning is shown in **Figure 2.2**. The service area is comprised of primarily single family and multifamily residential homes with some industrial, commercial, and retail space. The Town Limits include undeveloped areas which are anticipated to develop generally following the land use types incorporated in the current zoning plan.

The Town of Silt is situated along the I-70 corridor between Glenwood Springs and the Town of Rifle. The Town of Silt WTP is located at the western end of the Town boundary along the Colorado River. Town residents enjoy year-round recreational activities including hiking, fishing, camping, biking, and hiking due to the temperate climate and easy access to the outdoors. Nearby attractions include the Harvey Gap State Park to the north, Glenwood Canyon to the east, and world class ski resorts such as Beaver Creek and Vail to the east of Town.

Figure 2.2 Town of Silt Zoning Map



2.1.2 Historical Population

The demand for water services is driven by the size and type of activities such as residential, commercial, service, industrial, etc. occurring within the service area. Although all of these activities change in scale over time the relative proportion within a given jurisdiction tends to change slowly. As a result, over time, changes in demands tend to closely track the service area population.

The population of Silt has a history of continuous growth from less than 1,200 people in 1990 to over 3,600 in 2022. Over that time the rate of growth has varied considerably, typically in response to local and regional economic conditions. **Table 2.1** indicates the population of the Town over the 30-year period between 1990 and 2020 based on Colorado Department of Local Affairs (DOLA) data. U.S. Census Bureau population estimates were similar; however, the DOLA estimates were chosen due to more consistent growth in interim years between U.S Census data.

Table 2.1 Town of Silt Historical Populations

YEAR	POPULATION
1990	1,181
2010	2,930
2011	3,127
2012	3,158
2013	3,179
2014	3,216
2015	3,249
2016	3,295
2017	3,348
2018	3,415
2019	3,478
2020	3,536

Long term growth from 1990 through 2020 averaged 3.7 percent annually. For the twenty years from 1990 to 2010 annual growth averaged 4.8 percent and was relatively steady. Growth slowed abruptly with the beginning of the recession in 2008 and remained lower than historical growth. In 2009, the growth rate was 0.2 percent. From 2015 to 2020 growth averaged 1.6 percent annually.

2.2 Overview of Water Treatment and Supply Infrastructure

2.2.1 Water Supply and Treatment

The Town's water treatment plant is located in the southwest portion of the Town along the Colorado River. Town receives its potable water supply from the Colorado River. The existing treatment plant has a capacity of 1.0 MGD and generally consists of raw water pumping, chemical pretreatment, plate settling, membrane filtration, chlorine disinfection, and finished water pumping.

2.2.2 Water Distribution and Storage

Finished drinking water generated at the WTP in pumped to the distribution system by two existing vertical turbine pumps located at the WTP site and two transmission mains that cross the nearby railroad and interstate I-70 that provide potable water to the remainder of the Town. The water distribution system generally consists of water main of varying sizes and a total of approximately 1.8 million gallons of storage. Storage tanks and estimated storage tank volumes for the Town are provided in **Table 2.2.**

Table 2.2 Average Precipitation and Temperature by Month for the Town of Silt

TANK LOCATION	VOLUME, GALLONS
Eagle's View	800,000
Sunrise	600,000
Sunrise	150,000
Mesa View	250,000
TOTAL	1,800,000

Source: Water/Wastewater/Irrigation Master Plan 2019

2.3 Population Projections

The demand for water service is driven by the size and type of activities such as residential, commercial, service, industrial, etc. within the service area. Although all of these activities change in scale over time the relative proportion within a given jurisdiction tends to change slowly. As a result, over time, change in demand tends to closely track the service area population.

2.3.1 Town of Silt Population Projections

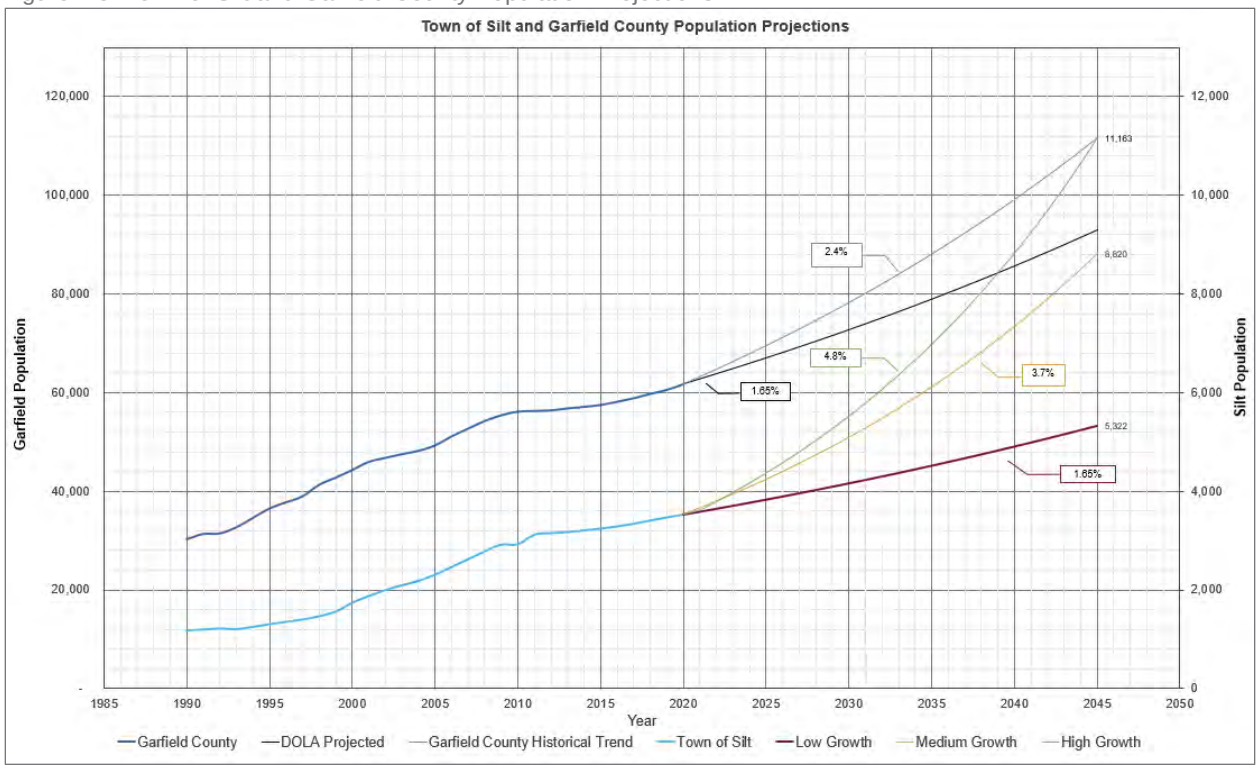
The historical population trends suggest that the population of Silt will continue to grow in the future. This is evidenced by the rate of growth in recent years returning to long term historical rates after the extended period of recession driven non-typical low growth rates. A return to a more typical long term rate of growth is supported by the continued need for affordable housing by workers in nearby resort areas such as Vail and Aspen as well as efforts by the Town to encourage growth and development such as promoting the Town's inclusion in the federal Opportunity Zone Program that offers investors tax incentives for investing in financially stressed areas with economic potential. Starting with the 2020 population of 3,536, projections were made using three different rates: the 4.6 average annual rate observed from the Silt population data between 1990 and 2010; an annual rate of 1.65 percent obtained from the Colorado Department of Local Affairs (DOLA) October 2021 population projection for Garfield County for the 2020 to 2040 period; and the 3.7 annual rate derived from the Silt population data for the 30 year period from 1990 through 2020. **Table 2.3** presents these projections at five year intervals from 2020 through 2045.

Table 2.3 Town of Silt Historical Populations

YEAR	LOW, 1.65%	MEDIAN, 3.7%	HIGH, 4.8%
2020	3,536	3,536	3,536
2025	3,836	4,245	4,371
2030	4,164	5,097	5,526
2035	4,519	6,119	6,985
2040	4,904	7,346	8,831
2045	5,322	8,820	11,163

Figure 2.3 shows the low, median, and high growth rates for Silt through 2045 as well as the historical population of Silt and Garfield county. The DOLA projected growth rate for Garfield County is 1.65 percent and is shown on the graph with the historical growth rate of 2.4 percent for the Garfield County data.

Figure 2.3 Town of Silt and Garfield County Population Projections



These projections provide a range that the Town's population will likely fall within in any given year. For facility planning purposes this report will utilize demand projections based on the median, 3.7 percent growth curve to produce a practical plan that is reasonably conservative so as to provide facilities of adequate capacity while avoiding excessive spending for unneeded capacity. The projected population for the Town of Silt in 2042 with a 3.7 percent rate of growth is 7,904. This number will be used to estimate future projections of flows and loads.

2.3.2 Growth in Commercial and Industrial Connections

The exact number of commercial and industrial connections for the Town of Silt is currently unknown. The Town is currently anticipating the percentage of commercial/industrial accounts will remain relative to the number of residential accounts.

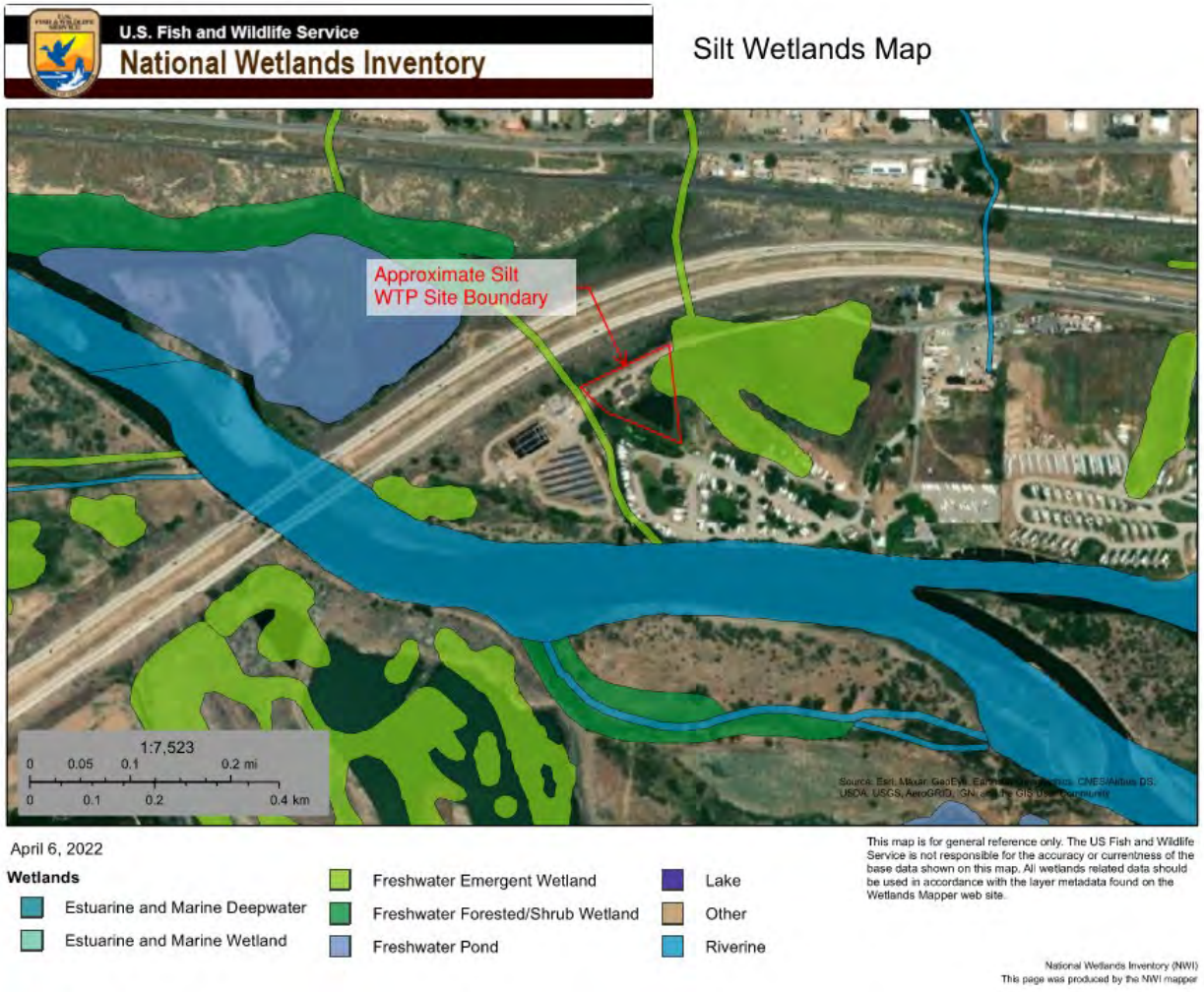
2.4 Environmental Elements

ESRI's ArcGIS online and ArcMap version 10.8.1 has been used to evaluate wetlands and floodplain mapping.

2.4.1 Wetlands

The area surrounding the Town's WTP includes multiple wetland areas. The most obvious being the Colorado River, which is used as source water for the WTP. Neighboring the existing discharge pond is a Freshwater Emergent Wetland made up of 9.45 acres. The WTP building stands 70-feet away from this wetland area. A wetland of the same classification can be found between the WWTP and WTP; approximately 20-feet to the east of the WWTP and 100-feet to the west of the WTP Plate Settler Building. A National Wetlands Inventory map from the U.S. Fish and Wildlife Service is shown in **Figure 2.4** below.

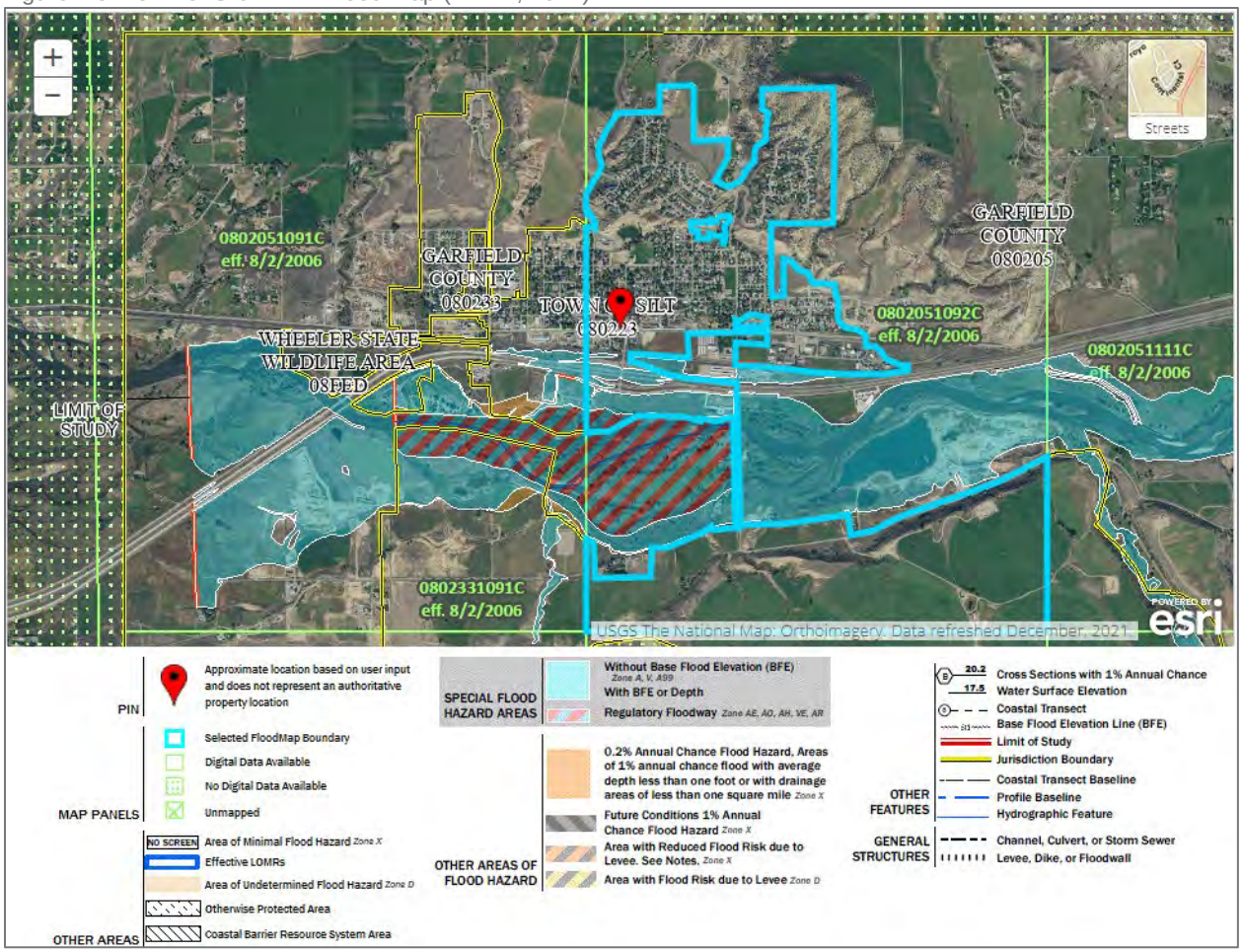
Figure 2.4 Wetlands Surrounding the Town of Silt WTP (U.S. Fish and Wildlife Service, 2021)



2.4.2 Floodplain

The most recent FEMA floodplain map (Map No. 0802331091C effective August 2, 2006) shows a majority of the facility to be located in Zone A, just outside of the 100-year floodplain (Zone AE), where the base floodplain elevation for the 100-year flood has been determined. The floodplain elevations in the Zone AE immediately adjacent to the WTP on the east, range from 5,404 – 5,408 feet above sea level. **Figure 2.5** shows the FEMA floodplain map for the Town of Silt.

Figure 2.5 Town of Silt FEMA Flood Map (FEMA, 2022)



2.4.3 Water Rights

The treated water system uses the following water rights for its supply:

Table 2.4 Town of Silt Water Rights

WATER RIGHT	APPROPRIATION DATE	ADJUDICATION DATE	AMOUNT	CASE NO.
Silt Pipeline	2/1/1939	3/28/1940	1.43 cfs Absolute 0.07 cfs Conditional	CA 3322
Silt Pipeline First Enlargement	9/20/2001	10/18/2002	8.5 cfs Conditional	01CW321
Silt Well No. 1	7/5/1977	8/11/1979	0.35 cfs Absolute 0.033 cfs Conditional	W-3927
Silt Well Field	9/26/11	12/31/2013	3.0 cfs Conditional	13CW52

As discussed in the report from Resource Engineering (6/26/2009), many of these water rights are junior to the Cameo Call and otherwise not protected under the Historic Users Pool in Green Mountain Reservoir. To that end, augmentation water supplies are required to allow the Town to continue diverting water at its treatment plan at times when the Cameo Call is in effect. The Town has the following augmentation supplies available:

Table 2.5 Town of Silt Augmentation Supplies

SOURCE OF SUPPLY	CASE OR CONTRACT NO.	AMOUNT OF WATER SUPPLY
Plan for Augmentation using Loesch & Crann Ditch water	07CW219	130 acre feet of historic consumptive use that can be used to offset diversions at the Silt Pipeline, Silt Well No. 1, and Silt Well Field (pending).
Ruedi Reservoir	Contract No. 099D6C0147	217 acre feet of water stored in Ruedi Reservoir. Paid up-front contract. 10% transit loss. Incorporated into augmentation plan decreed in Case NO. 07CW219 and can be used to offset diversions at the Silt Pipeline, Silt Well No. 1, and Silt Well Field (pending).
Ruedi Reservoir	Contract No. 0099D6C0149	83 acre feet of water stored in Ruedi Reservoir. Annual pay contract. Not incorporated into augmentation plan at current time.

Under the Silt Town Code, water from the treated water system is accounted for as either a domestic EQR or an irrigation EQR. The consumptive use associated with a domestic EQR is 0.02 acre feet per year. The consumptive use associated with a domestic EQR is 0.2536 acre feet per year. Silt Municipal Code section 13.04.410 prohibits the use of water from the Town's treated water system for irrigation unless a special exemption is granted by the Town. As a result, most lawn and garden irrigation in Silt is accomplished through the Town's raw water irrigation system. There are two approved users of treated water for irrigation use: (a) Lyon Subdivision and (b) Mira Loma PUD. Other than these approved uses of treated water for irrigation, all of the Town's treated water supply is used for domestic purposes.

2.4.3.1 Town Raw Water Irrigation Supply

The bulk of outdoor irrigation in Town is accomplished through a raw water irrigation system. The Town operates a separate piped system providing irrigation water to the majority of Town residents during the irrigation season. Raw water irrigation supplies are obtained from the Lower Cactus Valley Ditch Company in which the Town is a substantial shareholder. The Lower Cactus Valley Ditch is a very senior water right on the Colorado River with an appropriation date of 9/24/1888 and an adjudication date of 5/11/1889. The Lower Cactus Valley Ditch water rights have never been subject to call.

2.4.4 Climate

The Town of Silt has an annual average temperature of 54°F and receives an average of 11.9 inches of precipitation per year. Silt has a warm-summer, cold-winter, humid, continental climate according to the Köppen climate classification system. This climate type has large temperature variations between seasons with precipitation relatively evenly distributed throughout the year. The average summer temperature in July is 80°F and the average temperature in December is 31°F. A summary of average monthly precipitation and precipitation for the Town is provided in **Table 2.4**.

Table 2.4 Average Precipitation and Temperature by Month for the Town of Silt

MONTH	AVERAGE PRECIPITATION, INCHES	AVERAGE DAILY TEMPERATURE, °F
January	1.1	31
February	1.3	32
March	1.4	42
April	1.6	49
May	1.0	61
June	0.7	75

Table 2.4 Average Precipitation and Temperature by Month for the Town of Silt

MONTH	AVERAGE PRECIPITATION, INCHES	AVERAGE DAILY TEMPERATURE, °F
July	0.7	80
August	0.6	78
September	0.5	71
October	1.1	55
November	0.8	42
December	1.1	31
Annual Total/Average	11.9	54

(weather-us.com/2021)

2.4.5 Elevation

The Town is located at an elevation of 5,456 ft above sea level. Elevation is important in water treatment design when considering electrical equipment and generator sizing.

SECTION 3 - HISTORICAL AND PROJECTED WATER USAGE AND PRODUCTION

This section presents the historical water usage production rates and projected future water demands and production rates.

3.1 Historical Potable Water Usage

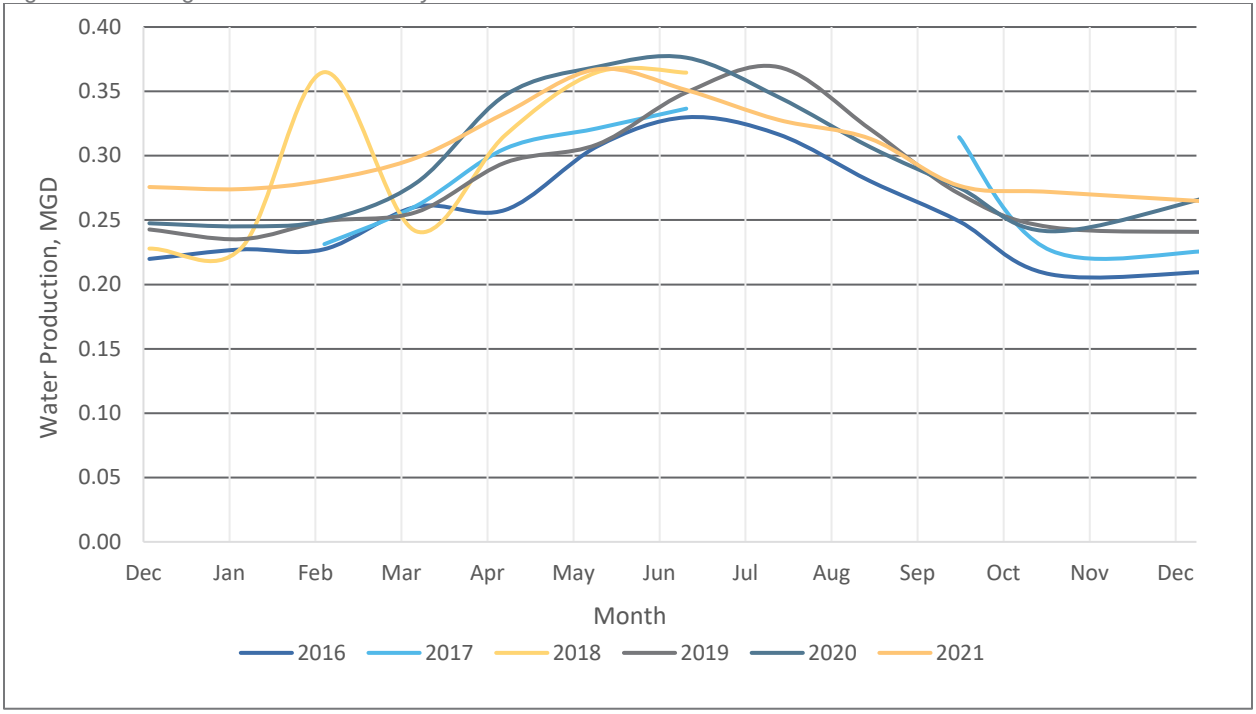
The Town of Silt's current water treatment plant has provided the residents and commercial connections within the Town of Silt with potable water since 2005. Monthly average water production rates from the Water Treatment Plant (WTP) between the years of 2016 and 2021 are given in **Table 3.1** and is shown graphically in **Figure 3.1**. The values are based on the water produced at the WTP and consist of residential usage, commercial usage, and system losses.

Table 3.1 Water Production, 2016 - 2021

MONTH	MONTHLY AVERAGE DAY WATER PRODUCTION, MGD					
	2016	2017[1]	2018[2]	2019	2020	2021
Jan	0.22	0.22	0.23	0.24	0.25	0.28
Feb	0.23	-	0.23	0.24	0.25	0.27
Mar	0.23	0.23	0.36	0.25	0.25	0.28
Apr	0.26	0.26	0.24	0.26	0.28	0.30
May	0.26	0.31	0.32	0.29	0.35	0.33
Jun	0.31	0.32	0.36	0.31	0.37	0.37
Jul	0.33	0.34	0.36	0.35	0.38	0.35
Aug	0.32	-	-	0.37	0.35	0.33
Sep	0.28	-	-	0.32	0.31	0.31
Oct	0.25	0.31	-	0.27	0.28	0.28
Nov	0.21	0.23	-	0.24	0.24	0.27
Dec	0.21	0.23	-	0.24	0.27	0.26
AADP[3]	0.26	0.27	0.30	0.28	0.30	0.30
Peak Day[4]	0.48	0.53	0.48	0.47	0.47	0.47
MMDP[5]	0.33	0.34	0.36	0.37	0.38	0.37
MDPF[6]	1.28	1.24	1.21	1.31	1.27	1.22
PF[7]	1.86	1.96	1.59	1.65	1.60	1.57

[1] Daily production data was not available for August and September 2017
[2] Daily production data was not available for August through December 2018
[3] AADP - Average annual daily production
[4] Peak Day = Annual Max. Day
[5] MMDP - Average day production during the maximum month
[6] MDPF - Maximum month daily peaking factor = MMDP divided by AADP.
[7] PF - Peaking factor = Annual Max Day divided by AADP.

Figure 3.1 Average Water Production by Month



Between 2016 and 2021, the Average Annual Daily Production (AADP) at the WTP ranged from a minimum production rate of 0.26 million gallons per day (MGD) in 2016 to a maximum of 0.30 MGD in 2018, 2020 and 2021, an increase of approximately 13 percent over two years. Most water utilities have seen a decrease in AADP in recent years due to water conservation efforts; however, Silt's WTP AADP data does not show this trend, with the highest AADP numbers in 2018, 2020 and 2021. The rate of water production increases from April through September each year due to irrigation demands. The ratio of this increased demand during the summer irrigation months to the average annual daily production is the Maximum Month Daily Peaking Factor (MDPF). The MDPF values ranged from a minimum of 1.21 MGD in 2018 to a maximum of 1.31 MGD in 2019. Peak summer water production for the years 2016-2021 was 0.36 MGD in 2018.

3.1.1 Comparison of Water Production and Water Usage

A comparison of water production at the WTP to water use as recorded at the individual water meters installed at the individual connections is given in **Table 3.2**. There is approximately a 36 percent difference between the amount of water produced and the amount of water billed for the years 2019-2021. The data in this Table excludes data from the Town provided spreadsheets listed as "No Charge." If that data is included, the billed water exceed the produced water by almost 50 percent.

Table 3.2 Annual Water Production vs. Water Used, 2020 - 2021

YEAR	AADP, MGD	AVERAGE DAY USAGE, MGD	DIFFERENCE, PERCENT
2019	0.28	0.18	35.7
2020	0.30	0.19	36.7
2021	0.30	0.19	36.7

3.1.2 Water Demand per Capita

Table 3.4 summarizes historical population and water demand per capita (calculated in units of gallons per capita per day - gpcd) from 2016 through 2020. The residential per capita water consumption rates were calculated dividing the average annual or max month daily flow by the population.

Table 3.4 Population and Water Demand per Capita

YEAR	POPULATION	AVERAGE ANNUAL DEMAND		PEAK DAY DEMAND	
		MGD	GPCD	MGD	GPCD
2016	3,295	0.26	78.9	0.48	145.7
2017	3,348	0.27	80.6	0.53	158.3
2018	3,415	0.30	87.8	0.48	140.6
2019	3,478	0.28	80.5	0.47	135.1
2020	3,536	0.30	84.8	0.47	132.9
2021	3,596	0.30	83.4	0.47	130.7

Note: Population data estimated for 2021

Average annual water demand per capita has remained relatively constant between 80 and 88 gallons per capita per day. Per capita water demands for the Town are within published ranges for similar sized communities. Most communities have had a declining trend in per capita water demand due to water conservation efforts. In 2010, the noted average per capita demand was 98 gallons per capita per day.

3.2 Water Projections

3.2.1 Water Demand Projections

The growth described in **Section 2** will result in increased the water demand in the Town. Future water use projections were made for the planning period of 2022 through 2042 based on the projected population developed in **Section 2**. A per capita use of 85 gpcd was used to project average daily flow and a maximum month to average day peaking factor of 1.8 was applied to establish corresponding maximum month average daily flows. These numbers were determined using the maximum month historical per capita use and peaking factors from the monthly historical adjusted data from 2016 through 2021.

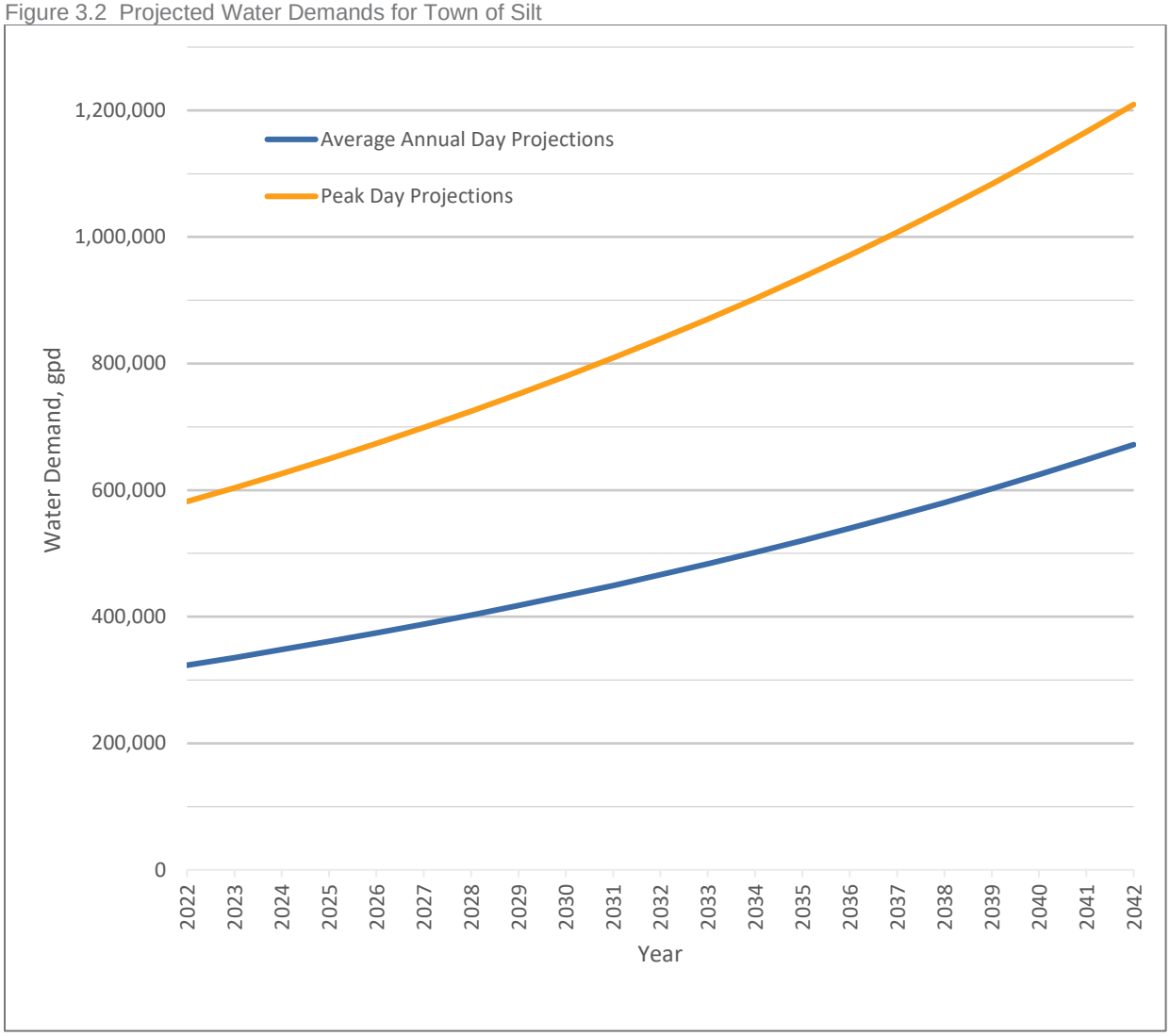
The projected average and max month water demand is shown in **Table 3.5**. Average annual daily demand and maximum month demand are projected to increase to 0.67 MGD and 1.21 MGD in 2042; an increase of approximately 42 percent from the existing water demands. It is recommended that the upgraded facility be planned and designed to meet the projected max day demand of 1.21 MGD and include redundancy.

Table 3.5 Projected Water Treatment Plant Water Demand

TOTAL			
YEAR	POPULATION	AAD, GPD	PEAK DAY, GPD
2027	4,567	388,200	698,800
2032	5,484	466,100	839,000
2037	6,584	559,600	1,007,300
2042	7,904	671,900	1,209,300

Figure 3.2 shows the projected water demands for the Town of Silt until 2042. Max daily water demand is projected to be 1.21 million GPD in 2042.

Figure 3.2 Projected Water Demands for Town of Silt



SECTION 4 - REGULATORY REVIEW

This section presents an overview of the current and upcoming regulatory issues as well as summarizes the drinking water regulations and standards related to the Town's water treatment plant.

4.1 Safe Water Drinking Act

The Safe Drinking Water Act (SDWA) provides the basis of authorization for regulation of drinking water quality. All of the drinking water rules and regulations were developed to address the requirements of the SDWA and its amendments.

The original SDWA authorized in 1974 gave the U.S. Environmental Protection Agency (EPA) responsibility for drinking water regulations. It also gave state regulatory agencies the opportunity to assume primary responsibility (primacy) for enforcing those regulations. Most states, including Colorado, have assumed primacy, and established regulatory programs to implement and enforce drinking water regulations.

The SDWA was amended in 1986 and 1996. Under the Safe Drinking Water Act amendments of 1986, EPA was required to set enforceable water quality standards to protect human health using the "best available" technology. EPA rules set water testing schedules, methods that water systems must follow, and acceptable water treatment techniques.

The SDWA amendments of 1996 made broad changes to the SDWA and created several new programs. EPA was required to develop rules that maintain protection against microbial contaminants while reducing potential health risks from disinfection byproducts. The 1996 SDWA amendments also require that EPA consider a detailed risk and cost assessment, and best available peer-reviewed science, when developing standards.

Current regulations that water systems must comply with, summarized in **Table 4.1**, have been developed, implemented, and in some cases, revised through a series of major rulemakings under the SDWA as amended. Each rule sets contaminant limits and prescribes test schedules for contaminants. A rule may also describe treatment techniques that are accepted as the best available technology (BAT) for removing a specific contaminant.

Table 4.1 Drinking Water Rules Under the Safe Drinking Water Act

WATER QUALITY STANDARD	PUBLICATION DATE	EFFECTIVE DATE
Phase I Rule (VOCs)	July 8, 1987	January 9, 1989
Surface Water Treatment Rule	June 29, 1989	January 1991
Revised Total Coliform Rule	February 13, 2013	April 1, 2016
Phase II Rule (VOCs)	January 30, 1991	July 30, 1992
Lead and Copper Rule Revision	January 15, 2021	December 16, 2021
Phase IIb Rule (SOCs)	July 1, 1991	January 1, 1993
Phase V Rule (PFAS)	July 17, 1992	January 17, 1994
Information Collection Rule (ICR)	May 1996	July 1997
Consumer Confidence Report Rule	August 19, 1998	January 1999
Public Notification Rule	May 4, 2000	June 5, 2000
Interim Enhanced Surface Water Treatment Rule	December 16, 1998	March 1999
Disinfectants and Disinfection Byproducts Rule		
Stage 1	December 16, 1998	December 17, 2001

Table 4.1 Drinking Water Rules Under the Safe Drinking Water Act

WATER QUALITY STANDARD	PUBLICATION DATE	EFFECTIVE DATE
Stage 2	January 4, 2006	March 2006
Revisions to the Unregulated Contaminant Monitoring Regulation for Public Water Systems and Announcement of Public Meetings	December 27, 2021	January 26, 2022
Unregulated Contaminant Monitoring Rule (Revised)	September 17, 1999	January 1, 2001
The Third Unregulated Contaminant Monitoring Rule (UCMR 3)	May 2, 2012	June 1, 2012
The Fifth Unregulated Contaminant Monitoring Rule (UCMR 5)	December 27, 2021	January 26, 2022
Interim Enhanced Surface Water Treatment Rule	December 1998	January 2002
Long Term 1 Enhanced Surface Water Treatment Rule	January 14, 2002	January 2002
Long Term 2 Enhanced Surface Water Treatment Rule	January 5, 2006	March 2006
Filter Backwash Recycling Rule	June 8, 2001	2004
Revised Radionuclides Rule	December 7, 2000	December 2003
Part 20 TENORM Rule	November 18, 2020	January 14, 2021
Radon-222 Rule	November 2, 1999	
Arsenic Rule	January 22, 2001	January 23, 2006
Removal of the MCLG for Chloroform	May 30, 2000	May 30, 2000
Public Health Security and Bioterrorism Prevention and Response Act	June 12, 2002	June 12, 2002

4.1.1 System Classification

The Town of Silt operates a public water system and the water supplied to its customers is required to comply with all applicable federal and state laws, rules, and regulations. Water system planning must provide for compliance with current, proposed, and anticipated future regulatory requirements covering collection, treatment, storage, and distribution facilities that are used primarily in connection with the system.

Public water systems vary in size, by source water type, type of treatment, and treatment processes used. The rules and regulations contain provisions that attempt to cover all possible system configurations. As a result, each individual system will have a set of specific requirements that need to be met while others don't apply. For example, a system that uses exclusively surface water as a source has to meet all the requirements that apply to surface water use but the requirements that apply to only groundwater use are not applicable. To minimize the confusion that is common when the discussion of rules and regulations covers all system types, sizes, and source waters this section will focus on those requirements that apply to the Town of Silt's system.

4.1.1.1 Classification by Type

Drinking water systems are classified as community water systems (CWS) and non-community water systems (NCWS). The regulatory rules contain provisions that cover both CWS and NCWS, typically with different requirements. A CWS is a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. The Town of Silt is a CWS. Consequently, the requirements pertaining to NCWS do not apply to the Silt system and are not discussed in detail in this summary.

4.1.1.2 Classification by Size

Certain SDWA regulations have specific requirements and compliance timelines that differ depending on the size of a system based on the number of people served. For example, lead and copper treatment technique provisions depend on the size of the water system with a small system defined as one that serves no more than 3,300 people; a medium system serving between 3,301 and 50,000 people; and a

large system serving more than 50,000 people. The Town of Silt will be defined as a medium system and, where applicable, the requirements for this system size will be included in this summary.

4.1.1.3 Classification by Source Type

A system's water source determines, in part, the types of contaminants that are likely to be found in the water. For example, bacteria are much more likely to appear in surface water than in groundwater. Consequently, some microbial control regulations only apply to systems using surface water and to systems using groundwater under the direct influence of surface water (GWUDI). Silt currently uses a blend of river water and GWUDI water. At the present time, only those rules that regulate surface water and groundwater under the direct influence of surface water apply to Silt and discussion of groundwater requirements has therefore been minimized. If Silt decides to use groundwater in the future, the applicable regulatory requirements in effect at the time would need to be met.

4.1.2 Revised Total Coliform Rule

Bacteria, parasites, and viruses can cause acute health problems when ingested in drinking water. Testing water for each of these pathogens would be impractical and expensive. To simplify monitoring for microbial contamination, coliform bacteria have long been an accepted indicator that other pathogenic organisms may be present.

The Total Coliform Rule (TCR) set both health goals (MCLGs) and legal limits (MCLs) for total coliform levels in drinking water. The rule also details the type and frequency of testing required. The Environmental Protection Agency (EPA) published the Revised Total Coliform Rule (RTCR) in the Federal Register (FR) on February 13, 2013 (78 FR 10269) and minor corrections on February 26, 2014 (79 FR 10665). The RTCR is the revision to the 1989 Total Coliform Rule (TCR) and is intended to improve public health protection. PWSs must test for total coliforms monthly. To comply with the monthly MCL for total coliforms (TC), PWSs must not find coliforms in more than five percent of the samples they take each month to meet EPA's standards. If more than five percent of the samples contain coliforms, PWS operators must report this violation to the state and the public.

To date, bacteriological sampling at the Town of Silt has shown an excellent history of "safe" samples in the distribution system indicating that disinfection practices are adequate to meet the requirements of the revised TCR.

If a sample tests positive for TC, the system must collect a set of repeat samples located within 5 or fewer sampling sites adjacent to the location of the routine positive sample within 24 hours.

When a routine or repeat sample tests positive for total coliforms, it must also be analyzed for fecal coliforms or E. coli, which are types of coliform bacteria that are directly associated with fresh feces. A positive result for fecal coliforms or E. coli can signify an acute MCL violation, which necessitates rapid state and public notification because it represents a direct health risk.

At times, an acute violation due to the presence of fecal coliform or E. coli may result in a "boil water" notice. The system must also take at least 5 routine samples the next month of operation if any sample tests positive for total coliforms.

4.1.3 Surface Water Treatment Rule (1989)

Surface water is susceptible to microbial contamination primarily from storm water drainage and snowmelt. The Surface Water Treatment Rule (SWTR) requires systems using surface water or groundwater under the direct influence of surface water to (1) disinfect the water, and (2) filter the water to control contaminants to meet the following minimum requirements:

- Giardia lamblia: 3-log (99.9 percent) removal or inactivation

- Viruses: 4-log (99.99) percent removal or inactivation
- Turbidity: Less than 5 nephelometric turbidity units (NTU) at all times and less than 0.5 NTU in at least 95 percent of the daily samples in any month
- Heterotrophic Plate Count: No more than 500 bacterial colonies per milliliter

The SWTR requires water systems to maintain a minimum disinfection residual of 0.2 mg/L of chlorine for water entering the distribution system. A detectable disinfectant residual must be maintained at all points throughout the distribution system for a minimum of 95 percent of all samples analyzed on a monthly basis. When no residual is detected, the sample is still considered acceptable if a heterotrophic plate count (HPC) analysis indicates less than 500 colonies per mL. Sampling frequencies and locations for the Town of Silt is 2 samples per month.

4.1.4 Interim Enhanced Surface Water Treatment Rule (1998)

The Interim Enhanced Surface Water Treatment Rule (IESWTR) applies to public water systems that use surface water or groundwater under the direct influence of surface water (GWUDI) and serve at least 10,000 people. The IESWTR amended the Surface Water Treatment Rule to strengthen microbial protection, including provisions for Cryptosporidium, and to balance microbial contaminant protection benefits with risks from disinfection byproducts. The SWTR remained in effect with the following revisions:

- Set the Maximum Contaminant Level Goal (MCLG) at zero for Cryptosporidium
- Added a 2-log Cryptosporidium removal requirement for systems that filter
- Reduced combined filter effluent turbidity standards from 0.5 ntu to 0.3 ntu in at least 95 percent of the daily samples in any month.
- Added a requirement for continuous monitoring of turbidity from individual filters to the requirement for measuring combined filter effluent turbidity
- Required disinfection profiling and benchmarking for systems with disinfection byproducts > 0.064 mg/L for TTHM and > 0.048 mg/L for HAA5.

4.1.5 Long-Term 1: Enhanced Surface Water Treatment Rule (2002)

The Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) is a simplified version of the IESWTR that applies to small systems of less than 10,000 persons. Since Silt serves less than 10,000 people this rule applies.

- Max contaminant level goal (MCLG) of zero for cryptosporidium
- 2-log Cryptosporidium removal requirement
- CFE turbidity less than or equal to 1 NTU, 95 percent of the time based on 4-hour measurements
- CFE max turbidity, 5 NTU based on 4-hour measurements
- Required disinfection profiling and benchmarking for systems with disinfection byproducts > 0.064 mg/L for TTHM and > 0.048 mg/L for HAA5.

4.1.6 Long-Term 2: Enhanced Surface Water Treatment Rule (promulgated 2006)

The Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and Stage 2 Disinfection Byproducts Rule (DBPR) were promulgated by EPA on January 4, 2006 and went into effect in March 2006. The LT2ESWTR rule requires proportional treatment levels or watershed-based treatment levels based on Giardia and Cryptosporidium levels in source water.

LT2ESWTR builds on the foundations laid by the previous Surface Water Treatment Rules; SWTR, IESWTR, and LT1ESWTR. The LT2ESWTR aims to improve control of Cryptosporidium in drinking water. EPA will require additional treatment in water systems that have higher concentrations of the microorganism in source water supplies.

Systems that serve fewer than 10,000 people (Schedule 4) were required to submit a plan for source water monitoring for Cryptosporidium for review and approval electronically through the EPA website by January 2010. Initial monitoring for schedule 4 systems began in April 2010 and continued for 12 to 24 months. Depending on the initial monitoring results, systems that filter were put into groups or "bins". Higher bin numbers indicate higher average concentrations of Cryptosporidium in the source water. The majority of systems fall into Bin 1 with no additional treatment required. Filtered systems classified in bins higher than one will be required to provide an additional 0.5 to 2.5 log reduction of Cryptosporidium levels depending on the concentration of Cryptosporidium in the source water and resulting bin number. The rule includes a list of approved technologies referred to as the "Microbial Toolbox". Each item in the Toolbox has an assigned log removal credit as shown in **Table 4.2**. Silt's source water currently qualifies as Bin 1 with no additional treatment required. However, the Microbial Toolbox is included for future reference should the bin classification change.

The LT2ESWTR also requires utilities to profile their disinfection performance. This requirement ensures that adequate microbial control is maintained even as steps are taken to comply with the requirements of the companion Stage 2 Disinfection Byproducts Rule.

Table 4.2 LT2ESWTR Microbial Toolbox

TOOLBOX OPTION	PROPOSED CRYPTOSPORIDIUM LOG CREDIT WITH DESIGN & IMPLEMENTATION CRITERIA
Watershed control program	0.5-log credit for state approved program that compromises USEPA-specified elements. Potential for additional credit based on Cryptosporidium reduction demonstrated through monitoring.
Alternative source/intake management	No presumptive credit. Systems may be assigned to a lower bin based on Cryptosporidium monitoring at new intake location. Re-binning would occur after system begins using new intake location.
Offstream raw water storage	0.5-log credit for reservoir with HRT of at least 21 days; 1.0 log credit for reservoir with HRT of at least 61 days. All flow must pass through offstream storage, system must maintain hydraulic control, no other flow outlets may exist, and system must control sources of contamination. Systems with existing offstream storage may monitor effluent to determine bin classification.
Presedimentation basin with coagulation	0.5-log credit with continuous operation and coagulant addition; maximum loading rate of 1.6 gpm/sft; mean influent turbidity > 10 ntu or maximum influent turbidity > 100 ntu. All flow must pass through basin. Systems with existing presedimentation basins may monitor effluent to determine bin classification.
Lime softening	0.5-log credit for second-stage softening with coagulant (single-stage softening is assumed equivalent to conventional treatment). Coagulant addition includes metal salts or polymers or precipitation of magnesium. System must treat 100% of flow.
Bank filtration	0.5-log credit for 25 ft setback; 1.0-log credit for 50 ft setback; aquifer must be unconsolidated sand; effluent turbidity below 1 NTU; systems may be assigned to a lower bin based on Cryptosporidium monitoring in well. Systems with existing wells must monitor effluent to determine bin classification.
Lower finished water turbidity	0.5-log credit for combined filter effluent turbidity < 0.15 NTU in 95% of samples each month. 1.0-log credit for individual filter effluent turbidity < 0.15 NTU in 95% of samples each month.
Roughing filters	No presumptive credit proposed.
Slow sand filters	2.5-log credit as add-on technology (stand-alone assumed equivalent to conventional treatment); no prior chlorination

Table 4.2 LT2ESWTR Microbial Toolbox

TOOLBOX OPTION	PROPOSED CRYPTOSPORIDIUM LOG CREDIT WITH DESIGN & IMPLEMENTATION CRITERIA
Second stage filtration	0.5-log credit for separate second stage filtration; treatment train must include coagulation prior to filtration. No presumptive credit for roughing filter.
Membranes (MF, UF, NF, RO)	Log credit equivalent to removal efficiency demonstrated in challenge test for device if supported by direct integrity testing. Note: State of Colorado design criteria allows for 3 log credit for cryptosporidium and giardia.
Bag filters	1-log credit with demonstration of at least 2-log removal efficiency in challenge test. State may award greater credit.
Cartridge filters	2-log credit with demonstration of at least 3-log removal efficiency in challenge test. State may award greater credit.
Chlorine dioxide	Log credit based on demonstration of compliance with contact timetable or alternative values approved by the state.
Ozone	Log credit based on demonstration of compliance with contact timetable or alternative values approved by the state.
UV	Log credit based on demonstration of compliance with UV dose table or alternative values approved by the state; requires reactor testing to establish validated operating conditions.
Peer review	No specific peer-review program. 1.0-log credit under lower finished water turbidity for performance equivalent to Partnership for Safe Drinking Water Phase IV
Demonstration of performance	1.0-log credit if average spore removal > 4 log based on one year of weekly monitoring.

The LT2ESWTR also includes the requirement that systems with uncovered finished water storage facilities cover the storage facility or treat the storage facility discharge to achieve 4-log virus inactivation. The State may exempt systems with uncovered finished water storage facilities if it determines that existing risk mitigation is adequate. Where the State makes such a determination, systems must develop and implement a risk mitigation plan that addresses physical access, surface water run-off, animal and bird wastes, and on-going water quality assessments.

4.1.7 Filter Backwash Recycling Rule (2001)

The final Filter Backwash Rule (FBR) was published in the Federal Register on June 8, 2001 concurrently with the Long Term 1 Enhanced Surface Water Treatment Rule (LTESWTR). These rules were the second part of the Microbial-Disinfectants/Disinfection Byproducts Cluster (M-DBP Cluster). These rules are intended to control microbial pathogens while minimizing the public health risks of disinfectants and disinfection byproducts (DBPs). The FBR regulates the recycle of filter backwash within the treatment facility to ensure that contaminants captured in filtration do not subsequently penetrate the treatment barrier. The FBR applies to public water systems employing conventional or direct filtration that use surface water or ground water under the direct influence of surface water and recycle within the treatment process.

Pathogenic microorganisms contaminating source water are removed during the water treatment plant sedimentation and/or filtration processes. Recycle streams, such as spent filter backwash or sedimentation basin sludge may contain a high concentration of pathogens, including Cryptosporidium, as well as chemicals added during the treatment process (e.g., oxidants, coagulants, polymers). The FBR requires that recycle streams be returned to the head of the treatment process and limits the maximum return rate to 10 percent of the plant influent flow.

4.1.8 Proposed Biological and Chemical Warfare Agents Rule

The Public Health Security and Bioterrorism Prevention and Response Act of 2002 was enacted on June 12, 2002. The Act added several new sections to the SDWA. Water systems in the United States that serve 3,300 or more people must conduct vulnerability assessments and update or revise emergency response plans based on the results. Emergency planning for a natural disaster or terrorism incident is required so that the utility will be ready to respond quickly in a manner that will protect customers and minimize or prevent noncompliance.

4.1.9 Vulnerability Assessments

Water supplies may be vulnerable to contamination by a currently regulated chemical or microorganism, or a common unregulated chemical or microorganism that a water treatment system is not designed to remove or inactivate because the agent normally would not be expected to occur. Treatment failures, inadequate treatment, or lack of treatment for poor quality or contaminated source waters are well documented as causes of outbreaks of waterborne disease and may pose an equal or greater threat than the introduction of a toxin, chemical, or biological agent.

Monitoring requirements for synthetic organic contaminants may be modified based on vulnerability of a water supply to contamination. To minimize costs of compliance with limits on organic contaminants, monitoring is required only by those systems where contamination is possible. State Source Water Quality Assessments delineated boundaries of water supplies, identified origins, and evaluated susceptibility of public water systems to contaminants.

4.1.10 Consumer Confidence Reports

The Consumer Confidence Report rule (SDWA, 1996 reauthorization) requires community water systems to provide annual water quality reports to their customers. All utilities must submit the report to the state annually and deliver the report directly to each customer by July 1 each year. The required information for the CCR is:

- Name and location of water source
- Type of water (groundwater, surface water, imported water)
- Concentrations of regulated contaminants detected in the water
- Concentrations of unregulated (monitoring only) contaminants detected in the water
- Concentrations of disinfection by-products
- Concentrations of microbial contaminants
- Allowable Maximum Contaminant Levels (MCLs) for each contaminant monitored
- Health effects of contaminants exceeding any allowable Maximum Contaminant Level (MCL)
- Probable sources of any contaminants
- Violations of monitoring, reporting, treatment, or record keeping requirements
- Public involvement opportunities
- Sources of additional information

Utilities may include additional information to explain or help customers interpret the CCR data.

4.1.11 Disinfectants/Disinfection Byproducts Rule (Stage 1 2001/Stage 2 promulgated 2006)

4.1.11.1 Stage 1 Disinfectants and Disinfection Byproducts Rule

The Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 D/DBPR) applies to all CWS that use a chemical disinfectant for either primary or residual treatment. The Stage 1 D/DBPR updated and superseded the 1979 regulations for total trihalomethanes. All CWS were required to comply by December 2003.

The Stage 1 D/DBPR sets limits for exposure to three disinfectants and many disinfection byproducts. The rule established maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for chlorine, chloramine, and chlorine dioxide. It also established maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for total trihalomethanes, haloacetic acids, chlorite and bromate. **Table 4.3** shows the effective limits and compliance criteria for the rule.

Conventional filtration systems that use surface water or groundwater under the direct influence of surface water are required to remove specified percentages of total organic carbon (TOC) that may react with disinfectants to form DBPs. Removal will be achieved through a treatment technique unless a system meets alternative criteria. The removal of TOC is achieved by enhanced coagulation or enhanced softening that specifies the percentage of influent TOC that must be removed based on the raw water TOC and alkalinity levels. **Table 4.4** lists the required removal based on TOC and alkalinity.

Table 4.3 Stage 1 Disinfectants and Disinfection Byproducts Rule

ITEM	MRDLG (mg/L)	MRDL (mg/L)	COMPLIANCE BASED ON
Disinfectant Residual			
Chlorine	4 (as Cl_2)	4.0 (as Cl_2)	Annual Average
Chloramine	4 (as Cl_2)	4.0 (as Cl_2)	Annual Average
Chlorine Dioxide	0.8 (as ClO_2)	0.8 (as ClO_2)	Daily Samples
Disinfection Byproducts			
Total trihalomethanes (TTHM)[1] Chloroform Bromodichloromethane Dibromochloromethane Bromoform	N/A - 0 0.06 0	0.080	Annual Average
Haloacetic acids (five) (HAA5)[2] Monochloroacetic acid Dichloroacetic acid Trichloroacetic acid Bromoacetic acid Dibromoacetic acid	N/A - 0 0.3 - -	0.060	Annual Average
Chlorite	0.8	1.0	Monthly Average
Bromate	0	0.010	Annual Average

N/A - Not applicable because there are individual MCLGs for TTHMs or HAAs
Total trihalomethanes is the sum of the concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.
Haloacetic acids (five) is the sum of the concentrations of mono-, di-, and trichloroacetic acids and mono- and dibromoacetic acids.

Table 4.4 Required Removal of Total Organic Carbon for Conventional Filtration WTPs

SOURCE WATER TOC (MG/L)	REQUIRED TOC REMOVAL, PERCENT, %		
	SOURCE WATER ALKALINITY (mg/L AS $CACO_3$)		
	0-60	> 60 -120	> 120
> 2.0 - 4.0	35	25	15
> 4.0 - 8.0	45	35	25
> 8.0	50	40	30

Systems meeting at least one alternative compliance criteria in the rule are not required to meet removals in this table. Systems using softening must meet TOC removal requirements in the right column.
Please note that while direct filtration and membrane WTPs are not required to document TOC removal. However, TOC removal is inversely proportional to DBP formation potential (e.g. higher TOC removal = lower DBP formation potential) and it is recommended that TOC removal be documented and optimized.

4.1.11.2 Stage 2 Disinfectants and Disinfection Byproducts Rule

The Stage 2 DBPR focuses on monitoring and reducing concentrations of two classes of DBPs: total trihalomethanes (TTHM) and haloacetic acids (HAA5). Concentrations of TTHM and HAA5 are monitored for compliance and are considered representative of other DBPs that may also be present in the water.

The Stage 2 DBPR applies to CWS that add a primary or residual disinfectant other than ultraviolet light or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light. The TTHM and HAA5 MCL values will remain at 80 µg/L and 60 µg/L as in the Stage 1 DBPR, but compliance calculations differ. The Stage 2 DBPR also includes MCLGs for chloroform, monochloroacetic acid, and trichloroacetic acid, but these new MCLGs do not affect the MCLs for TTHM or HAA5.

The second provision of the Stage 2 DBPR, which is designed to address variations in temporal and spatial exposure, is the compliance calculation of the MCLs. The Stage 1 DBPR running annual average (RAA) calculation allowed some locations within a distribution system to have higher DBP annual averages than others as long as the system-wide average is below the MCL. The Stage 2 DBPR bases compliance on a locational running annual average (LRAA) calculation where the annual average at each sampling location in the distribution system must be in compliance with the MCLs. The LRAA reduces exposures to peak DBP concentrations by ensuring that each monitoring site is in compliance with the MCLs as an annual average. Monitoring locations were selected to be representative based on an initial distribution system evaluation based on a minimum of one-year monitoring data, a system specific study or system water quality model. Compliance is based on meeting the DBP limits for a running annual average of quarterly samples at each monitoring location individually.

There is a Stage 3 DBP Rule in development that will likely further lower the TTHM and HAA5 MCLs and, perhaps, increase TOC removal requirements. However, this rule is unlikely to be formulated until 2027 or later.

4.1.12 Primary Drinking Water Standards

The National Primary Drinking Water Regulations (NPDWR or primary standard) are legally enforceable standards that must be met by public water systems. The Primary Drinking Water Standards (CFR 40 Part 141) regulate a broad range of chemical, physical, and microbial contaminants in drinking water. Primary standards set Maximum Contaminant Levels (MCLs) or Treatment Techniques (TT) to limit specific contaminants that can adversely affect public health. The regulations also stipulate frequency of water quality monitoring, analytical methods, reporting, and record keeping requirements, and public notification of compliance failures. Currently, NPDWRs are set for 92 contaminants including turbidity, 8 microbial or indicator organisms, 4 radionuclides, 29 inorganic compounds, and 60 organic compounds.

MCLs have been set for 83 contaminants and 9 of these have treatment technique requirements. These standards are summarized in **Tables 4.5, 4.6, 4.7, and 4.8**.

Table 4.5 National Primary Drinking Water Regulations

CONTAMINANTS	MCL OR TT, mg/L	HEALTH EFFECTS FROM CONTAMINANT	MONITORING REQUIREMENTS
TOTAL COLIFORM RULE			
Total Coliform	1 + sample	Fecal coliforms and E. coli indicate potential contamination by bacterial pathogens	2 samples per month during the collection period
Fecal Coliforms	0		
E. coli	0		
SURFACE WATER TREATMENT RULE			
Turbidity*	1 NTU	None, interferes with disinfection	Measure combined filter effluent turbidity 4 times per day while plant is in operation.
Cryptosporidium	2 log	Cryptosporidiosis	
STAGE 1 DISINFECTANTS/DISINFECTION BY-PRODUCTS RULE			
DISINFECTANTS			
Chlorine	4 as Cl_2	Hemolytic anemia in-dialysis	Measure every time you collect a total coliform bacteria sample
Chloramines	4 as Cl_2		
Chlorine Dioxide	0.8 as ClO_2		
DISINFECTION BY-PRODUCTS			
Total Trihalomethanes (TTHMs)	0.080	Cancer risk	TTHM/HAA –1 sample per sample point for a total of 1 sample per Quarter.
Haloacetic Acids (HAA5)	0.060	Cancer risk	
Chlorite	1	Cancer risk	
Bromate	0.010	Cancer risk/nervous system/liver effects	1 sample per month (ozone systems only) and running annual average
Total Organic Carbon (TOC)	TT	Precursor of TTHMs and HAA5s, increase cancer risk.	Source and treated water TOC sampled once a month for surface water systems

Table 4.6 National Primary Drinking Water Regulations Inorganic Chemicals and Radionuclides

CONTAMINANTS	MCL OR TT, mg/L	HEALTH EFFECTS FROM CONTAMINANT	MONITORING REQUIREMENTS
Antimony	0.006	Increase in blood cholesterol; decrease in blood glucose	1 sample per year
Arsenic	0.01	Skin damage; circulatory system problems; increased risk of cancer	
Asbestos (fiber >10 um)	7 MFL	Increased risk of developing benign intestinal polyps	Asbestos – Once every 9 years
Barium	2	Increase in blood pressure	1 sample per year
Beryllium	0.004	Intestinal lesions	1 sample per year
Cadmium	0.005	Kidney damage	1 sample per year
Chromium (total)	0.1	allergic dermatitis	1 sample per year

Table 4.6 National Primary Drinking Water Regulations Inorganic Chemicals and Radionuclides

CONTAMINANTS	MCL OR TT, mg/L	HEALTH EFFECTS FROM CONTAMINANT	MONITORING REQUIREMENTS
Copper	Action Level=1.3; TT	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage.	10 samples per year
Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	
Fluoride	4.0	Bone disease; Children may get mottled teeth.	1 sample per year
Gross Alpha Emitters	15pCi/L	Cancer Risk	1 sample per 9 years; Sample must be collected at the same time as the combined uranium sample
Gross beta Particle and Photon Emitters	4 mrem per year	Cancer Risk	Every 4 years – quarterly samples
Lead	Action Level=0.010; TT	Infants and children: Delays in physical or mental development. Adults: Kidney problems; high blood pressure	10 samples per year
Inorganic Mercury	0.002	Kidney damage	1 sample per year
Nitrate – N	10	Methyloglobanemia (Blue baby syndrome) in infants.	1 sample per year
Nitrite - N	1	"Blue baby syndrome" in infants under six months - life threatening without immediate medical attention.	1 sample per 9 years
Radium 226/228	5 pCi/l	Cancer Risk	1 sample per 9 years
Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	1 sample per year
Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	1 sample per year
Uranium	0.03	Cancer Risk, kidney toxicity	1 sample per 9 years

KEY:
PCi/l = Picocuries Per Liter
HPC = Heterotrophic Plate Count
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
ND = No Detect
CDC = Center for Disease Control
Mrem ede/yr = Mrem Effective Dose Equivalent/yr
MRDL = Maximum Disinfectant Residual Level
Mg/L = Milligram per Liter
PWSs = Public Water Systems
NAS = National Academy of Sciences
MFL = Million Fibers Per Liter
TT = Treatment Technique

Table 4.7 National Primary Drinking Water Regulations - Synthetic Organics

CONTAMINANTS	MCL OR TT, µG/L	HEALTH EFFECTS FROM CONTAMINANT
Dioxin (2,3,7,8-TCDD)	0.00003	Reproductive difficulties; increased risk of cancer
2,4,5-TP (Silvex)	50	Liver problems
2,4-D	70	Kidney, liver, or adrenal gland problems
Acrylamide	TT	Nervous system or blood problems; increased risk of cancer
Alachlor	2	Eye, liver, kidney or spleen problems; anemia; increased cancer risk
Aldicarb2	3	
Aldicarb sulfoxide2	4	
Aldicared sulfone2	2	
Atrazine	3	Cardiovascular system problems; reproductive difficulties
Carbofuran	40	Problems with blood or nervous system; reproductive difficulties
Chlordane	2	Liver or nervous system problems; increased risk of cancer
Dalapon	200	Minor kidney changes
Di(2-ethylhexyl)adipate	400	General toxic effects or reproductive difficulties
1,2-Dibromo-3-chloropropane (DBCP)	0.2	Reproductive difficulties; increased risk of cancer
Di(2-ethylhexyl)phthalate	6	Reproductive difficulties; liver problems; increased risk of cancer
Dinoseb	7	Reproductive difficulties
Diquat	20	Cataracts
Endothall	100	Stomach and intestinal problems
Endrin	2	Nervous system effects
Epichlorohydrin	TT	Stomach and reproductive problems; increased cancer risk
Ethelyne dibromide	0.05	Stomach and reproductive problems; increased cancer risk
Glyphosate	700	Kidney and reproductive problems
Heptachlor	0.4	Liver damage; increased risk of cancer
Heptachlor epoxide	0.2	Liver damage; increased risk of cancer
Hexachlorobenzene	1	Liver, kidney, or reproductive problems; increased cancer risk
Hexachlorocyclopentadiene	50	Kidney or stomach problems
Lindane	0.2	Liver or kidney problems
Methoxychlor	40	Reproductive difficulties
Oxamyl (Vydate)	200	Slight nervous system effects
Benzo(a)pyrene (PAHs)	0.2	Reproductive difficulties; increased risk of cancer
Polychlorinated biphenyls (PCBs)	0.5	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased cancer risk
Pentachlorophenol	1	Liver or kidney problems; increased risk of cancer
Picloram	500	Liver problems
Simazine	4	Problems with blood
Toxaphene	3	Kidney, liver, or thyroid problems; increased risk of cancer

Notes:

1. Monitoring Requirements: Original monitoring for SOCs required four quarterly samples every 3 years. After one round of no detects; systems > 3,300 reduce to 2 samples per year every 3 years. Systems < 3,300 reduce to 1 sample every 3 years. Monitoring may be reduced or eliminated based on the results of the vulnerability assessment.

Table 4.7 National Primary Drinking Water Regulations - Synthetic Organics

CONTAMINANTS	MCL OR TT, µG/L	HEALTH EFFECTS FROM CONTAMINANT

2. Each water system must certify, in writing, to the State (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination or product of dose and moner level does not exceed: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).
3. The Aldicarbs are currently under "administrative stay" as a result of litigation. They are therefore treated as unregulated contaminants until further notice.

Table 4.8 National Primary Drinking Water Regulations – Volatile Organic Chemicals

CONTAMINANTS	MCL, µG/L	HEALTH EFFECTS FROM CONTAMINANT
1,1,1-Trichloroethane	200	Liver, nervous system, or circulatory problems
1,1,2-Trichloroethane	5	Liver, kidney, or immune system problems
1-1-Dichloroethylene	7	Liver problems
1,2,4-Trichlorobenzene	7	Changes in adrenal glands
1,2-Dichloroethane	5	Increased risk of cancer
1-2-Dichloropropane	5	Increased risk of cancer
Benzene	5	Anemia; decrease in blood platelets; increased risk of cancer
Carbon tetrachloride	5	Liver problems; increased risk of cancer
Monochlorobenzene	100	Liver or kidney problems
cis-1, 2-Dichloroethylene	70	Liver problems
Dichloromethane	5	Liver problems; increased risk of cancer
Ethylbenzene	700	Liver or kidney problems
o-Dichlorobenzene	600	Liver, kidney, or circulatory system problems
p-Dichlorobenzene	75	Anemia; liver, kidney or spleen damage; changes in blood
Styrene	100	Liver, kidney, and circulatory problems
Tetrachloroethylene	5	Liver problems; increased risk of cancer
Toluene	1000	Nervous system, kidney, or liver problems
trans-1,2-Dichloroethylene	100	Liver problems
Trichloroethylene	5	Liver problems; increased risk of cancer
Vinyl chloride	2	Increased risk of cancer
Xylenes (total)	10	Nervous system damage

Monitoring Requirements: Original monitoring for VOCs required 4 quarterly samples during the first 3 years. Monitoring annually beginning in 1996 if no detects. Monitor every 3 years after 3 years of no detects. Monitoring may be reduced based upon results of vulnerability assessment.

4.1.13 Chemical Contaminant Rules

There are four Chemical Contaminants Rules: Phase I, Phase II, Phase IIB, and Phase V. These chemical contaminant rules are collectively called the Phase II/V Rules.These rules regulate over 65 contaminants in three contaminant groups:

- Inorganic Contaminants (IOCs) (including nitrate and arsenic),
- Volatile Organic Contaminants (VOCs), and

- Synthetic Organic Contaminants (SOCs).

These contaminants are listed in **Tables 4.6, 4.7, and 4.8**, above and are described below.

4.1.13.1 Phase I Rule

The Phase I Rule limits exposure to eight VOCs that may be present in tap water. The rule requires water systems to monitor regulated VOCs and take corrective action if levels exceed legal limits. The regulated VOCs are commonly used in dry cleaning, automotive service stations, and industrial processes.

4.1.13.2 Phase II and IIB Rules

USEPA updated or created legal limits on 37 contaminants when it issued the Phase II and IIb Rules. These contaminants include 10 VOCs, 18 SOCs, and nine IOCs. PCBs, nitrate, and nitrite are a few of the contaminants regulated under the Phase II and IIb rules.

4.1.13.3 Phase V Rule

The Phase V Rule set standards for 23 more contaminants, including three VOCs, 15 SOCs, and five IOCs.

4.1.14 Secondary Drinking Water Standards

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) summarized in **Table 4.9** are non-enforceable guidelines for contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards for water systems but does not require compliance. Although states may adopt secondary standards as enforceable compliance limits, Colorado does not currently enforce secondary standards.

Table 4.9 National Secondary Drinking Water Standards

CONTAMINANT	SECONDARY STANDARD	CONTAMINANT	SECONDARY STANDARD
Aluminum	0.05 to 0.2 mg/L	Manganese	0.05 mg/L
Chloride	250 mg/L	Odor	3 threshold odor
Color	15 (color units)	pH	6.5-8.5
Copper	1.0 mg/L	Silver	0.10 mg/L
Corrosivity	Non-corrosive	Sulfate	250 mg/L
Fluoride	2.0 mg/L	Total Dissolved Solids	500 mg/L
Foaming Agents	0.5 mg/L	Zinc	5 mg/L
Iron	0.3 mg/L		

4.1.15 Radionuclides

When ingested in drinking water, all of the regulated radionuclides increase the risk of cancer. In addition, uranium may adversely affect kidneys. USEPA published the final Radionuclides Rule on December 7, 2000 which updated an earlier rule published in 1976. It applies only to community water systems. The regulation retained existing standards and added a standard for Uranium. **Table 4.10** indicates the current regulations for radionuclides. On December 7, 2003, systems began initial monitoring under state-specified monitoring plans except when the state permits allowed use of grand-fathered data. All systems were required to complete initial monitoring by December 31, 2007.

The rule required water systems to determine initial compliance under the new monitoring requirements of using the average of four quarterly samples or, at state discretion, using appropriate grandfathered data. Compliance was determined immediately based upon the annual average of the quarterly samples for that fraction of systems required by the state to monitor in any given year or based on the results from the grandfathered data.

Under the 1976 rule, water systems with multiple entry points to the distribution system were not required to test every entry point but rather at a "representative point" in the distribution system. The new rule requires monitoring at all entry points to ensure that all customers receive water that meets the MCLs.

Table 4.10 Maximum Contaminant Levels for Radionuclides

RADIONUCLIDES	MCLG (mg/L)	MCL	SOURCES OF CONTAMINANT
Beta particles and photon emitters	0	4 millirems per year	Natural and man-made deposits
Gross alpha particle activity	0	15 pCi/L	Erosion of natural deposits
Radium 226[1] Radium 228	0 0	Combined: 5 pCi/L	Erosion of natural deposits
Uranium	0	30 pCi/L	Erosion of natural deposits
Radon[2]	0	AMCL =4,000 pCi/L	Natural deposits

MCLG = Maximum Contaminant Level Goal.
MCL = Maximum Contaminant Level. pCi/L is picocuries per liter.
[1] Source: Federal Register, Radionuclides NODA and Final Rule, December 7, 2000
[2] Source: Federal Register, Radon 222 Proposed Rule, November 2, 1999

4.1.15.1 Naturally Occurring Radioactive Material

Naturally Occurring Radioactive Material (NORM) are radionuclides that occur naturally in earth's crust. They can also be produced in the atmosphere though interactions between atoms and cosmic rays.

4.1.15.2 Technologically Enhanced Naturally Occurring Radioactive Material

Technologically Enhanced Naturally Occurring Radioactive Material (TENORMs) are produced when, in water treatment activities, radioactive material concentrate. These radioactive materials occur naturally in ores, soils, water, or other natural materials. The Colorado Department of Public Health and Environment (CDPHE) recently published the Part 20 TENORM regulation. This regulation is enforceable on July 14, 2022. This regulation includes requirements around the generation, handling, processing, transportation, disposal, possession, distribution, and other factors of TENORM.

Table 4.11 Approved Background Values

RADIONUCLIDES	VALUE (PCI/G)
Ra-226	1.5
Ra-228	1.3
Pb-210	1.4
Po-210	1.4

Table 4.12 Exempt TENORM Concentrations

RADIONUCLIDES	VALUE (PCI/G)
Ra-226	5
Ra-228	5
Pb-210	5
Po-210	5

4.1.16 Radon-222 Rule

The Radon Rule is focused on reducing exposure from radon in indoor air while also reducing risks from radon in drinking water. The half-life of radon-222 is 3.8 days. As radon-222 undergoes radioactive decay to polonium-218, it releases alpha radiation. After several sequential transformations, the end product is lead-206, which is stable.

The 1996 SDWA amendments provided for a multimedia approach to the public health risks from radon in drinking water and radon in indoor air from soil. The proposed MCLG for radon in drinking water is zero. This is a non-enforceable goal. The proposed regulation provides two options for the maximum level of radon that is allowable in community water supplies. The proposed MCL is 300 picoCuries per liter (pCi/L) and the proposed AMCL is 4,000 pCi/L (Federal Register, Radon 222 Proposed Rule, November 2, 1999). The less stringent AMCL is applicable if the affected water system has an approved MMM program plan developed by the State or by the water utility. This rule applies to systems using groundwater or a blend of groundwater and surface water.

4.1.17 Revised Lead and Copper Rule

Lead and copper in drinking water may affect neurological and physical development of fetuses and young children. Lead may also affect the kidneys, brain, nervous system, and red blood cells, and is considered a possible carcinogen. At high concentrations, copper causes nausea, vomiting, and diarrhea. Exposure to drinking water containing copper above the MCL over many years increases the risk of liver and kidney damage. To prevent these effects, all CWS are required to monitor and, if necessary, control the amount of lead and copper in the potable water system.

Lead and copper are commonly found in household plumbing fixtures and pipes. Although Congress banned the installation of lead solder, pipe, and fittings in 1986, lead remains in many older plumbing systems. Most lead and copper in potable water systems dissolves into the water from copper piping, lead soldered joints, and plumbing fixtures inside residences. For this reason, lead and copper is monitored at user fixtures within the distribution system. Based on first-draw samples, lead and copper concentrations must be less than 0.015 mg/L and 1.3 mg/L, respectively, in 90 percent of the samples.

When a water system exceeds the MCL for either lead or copper, the source water must be analyzed. If high levels of either lead or copper are found in the source water, the raw water must be treated to remove these metals. Treatment of the raw water in conjunction with corrosion control in the distribution system may be required to reduce the concentration of lead and copper at the tap. Monitoring data and corrosion control study results must be submitted to CDPHE for determination of the required treatment. If a water system continues to exceed the lead action level after completing corrosion control and source water treatments, the utility may have to replace lead water mains. The rule also requires systems that exceed the lead action level to educate the affected public about reducing its lead intake.

The new lead and copper rule revision requires compliance on October 16th, 2024. The main features of the lead and copper rule revision are as follows:

- Uses science-based testing protocols to find more sources of lead in drinking water.
- Establishes a trigger level of 0.010 mg/L, which would require public water systems to take action to decrease lead levels and remove lead from their distribution system.
- Drives more and complete lead service line replacements.
- For the first time, requires testing in schools and child care facilities.
- Requires water systems to identify and make public the locations of lead service lines

For the Town of Silt, 10 samples per year are required. Samples are first draw at cold water taps in homes and buildings that are at high risk of lead and/or copper contamination. Generally, sampling sites consist of single-family structures that contain copper pipes with lead solder installed after 1982, contain lead pipes, and/or are served by a lead service line. When multiple-family residences comprise at least 20 percent of the structures served by a water system, the system may include these types of structures in its sampling pool. Systems may qualify for reduced monitoring if they meet specific criteria for system size, lead and copper concentrations, and other water quality parameters.

4.1.18 Arsenic

The final Arsenic Rule was issued on January 22, 2001 setting the MCL at 10 µg /L. The Arsenic Rule applies to CWS. The MCLG for arsenic is zero. Treatment technologies include enhanced coagulation/filtration, lime softening, ion exchange, activated alumina, reverse osmosis, nanofiltration and electrodialysis. Because complying with the rule may be challenging for some Colorado public water systems, the Water Quality Control Division developed the Colorado Strategy for Arsenic Removal (CO-STAR). CO-STAR is a five-phase compliance assistance program designed to help public water systems with arsenic levels above 10 parts per billion comply with the new maximum contaminant level. The program established partnerships with public water systems and other interested groups (e.g. Colorado Rural Water Association, EPA, etc.) to provide compliance assistance.

4.1.19 Sulfate Rule

Sulfate occurs naturally in drinking water. Ingestion of water containing high levels of sulfate may cause diarrhea. Some people may be at risk from the laxative effects of sulfate when they experience an abrupt change from drinking water with low sulfate concentrations to drinking water with high sulfate concentrations.

Sulfate in drinking water currently has a secondary maximum contaminant level (SMCL) of 250 milligrams per liter (mg/L), based on aesthetic effects (i.e., taste and odor). This regulation is not a Federally enforceable standard but is provided as a guideline for States and public water systems. EPA estimates that about 3 percent of the public drinking water systems in the country may have sulfate levels of 250 mg/L or greater.

Sulfate was included on the Drinking Water Contaminant Candidate List published on March 2, 1998 (63 FR 10273). SDWA, section 1412 (b)(12)(B)(ii), directed EPA to include sulfate among the five or more contaminants for which the Agency would determine by August 2001, whether or not to regulate.

The Safe Drinking Water Act (SDWA), as amended in 1996, directs the U.S. Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC) to jointly conduct a study to establish a reliable dose-response relationship for the adverse human health effects from exposure to sulfate in drinking water, including the health effects that may be experienced by sensitive subpopulations (infants and travelers). SDWA specified that the study be based on the best available peer-reviewed science and be completed in February 1999.

EPA and CDC completed a study, "Health Effects from Exposure to High Levels of Sulfate in Drinking Water Study" ("Sulfate Study") in January 1999. The study examined the association between consumption of tap water containing high levels of sulfate and reports of osmotic diarrhea in susceptible populations (infants and transients). CDC researchers were unable to conduct a study of infants because the number of exposed individuals was insufficient for the study. CDC conducted an experimental trial of adults exposed to high levels of sulfate (up to 1200 mg/L) in the drinking water. The CDC found no statistically significant increase in reports of diarrhea with increasing dose of sulfate.

4.1.20 Unregulated Contaminant Rule

Every five years, the EPA is required under the 1996 Safe Drinking Water Act (SDWA) to issue a list of unregulated contaminants to be monitored by public water systems. Data is collected on these contaminants that are suspected to be present in drinking water and do not have health-based standards set under the SDWA. This monitoring provides a basis for future regulatory actions to protect public health.

4.1.20.1 First Unregulated Contaminant Rule

The First Unregulated Contaminant Rule was published on September 17, 1999 and, through supplemental actions on March 2, 2000 and January 11, 2001. This Rule required monitoring for 26 contaminants between 2001 and 2003.

4.1.20.2 Second Unregulated Contaminant Rule

The Second Unregulated Contaminant Rule was published on January 4, 2007 and required monitoring for 25 contaminants between 2008 and 2010.

4.1.20.3 Third Unregulated Contaminant Rule

The Third Unregulated Contaminant Rule was published on May 2, 2012 and required monitoring for 30 contaminants (28 chemical and two viruses) between 2013 and 2015.

4.1.20.4 Fourth Unregulated Contaminant Rule

The Fourth Unregulated Contaminant Rule was published on December 20, 2016 and required monitoring for 30 contaminants, including three brominated haloacetic acid groups, between 2018 and 2020.

4.1.20.5 Fifth Unregulated Contaminant Rule

The Fifth Unregulated Contaminant Rule was published on December 27, 2021 and requires monitoring for 30 contaminants between 2023 and 2025. Lithium and all 29 per- and polyfluoroalkyl substances (PFAS) that are within the scope of EPA methods 533 and 537.1 are included in this Fifth Unregulated Contaminant Rule. PFAS is described, below.

4.1.20.5.1.1 Per- and Polyfluoroalkyl Substances

Per- and polyfluoroalkyl substances (PFAS) are a group of manmade chemicals, including Perfluorooctanoic Acid (PFOA), Perfluorooctanesulfonic Acid (PFOS), Hexafluoropropylene Oxide Dimer Acid (HFPO-DA or ‘Gen-X’) and over 4,000 other variants. PFAS have been used in a wide variety of industrial and commercial processes and products since the 1940s, for their thermal and chemical stability dispersant and surfactant properties, and their ability to resist heat, stains, oil, grease, and water. PFAS are used in industrial and consumer products and some examples include furniture, food packaging, waterproof clothing, heat-resistant non-stick cooking surfaces, stain-resistant carpet, building and construction, firefighting foams, chemical processing, electronics, food packaging coatings, and more.

Many PFAS do not break down in the environment under normal conditions, can move through soils and contaminate drinking water sources, and can bioaccumulate in fish and wildlife. PFAS also have the potential to accumulate within the human body. An area of growing science to help environmental and public health professionals understand the risks of PFAS to the environment and human health, is studying the routes of human exposure (e.g., in drinking water and in food sources) and the occurrence of PFAS in the environment (e.g., air, surface water, groundwater, and land). Federal regulatory drinking water standards set Maximum Contaminant Levels (MCLs) for most contaminants; however, there are no current MCLs for PFAS. While non-regulatory, the U.S. Environmental Protection Agency (EPA) has issued a Health Advisory Level (HAL) of 70 parts per trillion (ppt) for the sum of the concentrations of the two most studied PFAS compounds, PFOA+PFOS, in drinking water. The EPA HAL provides drinking water customers, even the most sensitive populations, with a margin of protection from lifetime exposure to PFOA+PFOS in drinking water.

4.1.21 Future Regulations

4.1.21.1 Synthetic Organic Compounds

In March 2010, the USEPA announced that four organic chemicals regulated under the primary drinking water standards (NPDWRs) were selected as candidates for more stringent MCLs. These four chemicals include acrylamide, epichlorohydrin, tetrachloroethylene (PCE), and trichloroethylene (TCE). New MCLs for these four synthetic organic compounds have not yet been determined but are scheduled to be adopted in 2012. In addition, 14 other NPDWRs are being reviewed or revised by recent or ongoing regulatory actions. The existing treatment facilities need to be evaluated for the capability to remove these potentially regulated chemicals.

4.1.21.2 Disinfection By-Products

Currently, drinking water regulations have been developed for only 6 trihalomethanes (THMs) and 5 haloacetic acids (HAAs) of the more than 600 DBPs that have been discovered. Nitrosamines such as NDMA, NDEA, and NDPA are a class of DBPs which have been found in many drinking water systems. USEPA classifies several nitrosamines as probable human carcinogens. As a result of their potential health effects, these compounds are likely to be regulated in the future. UV disinfection might be a good upgrade alternative to reduce both regulated and currently unregulated DPBs. Similarly, use of chloramines for disinfectant residual could reduce the concentration of regulated and currently unregulated DPBs in the distribution system.

4.1.21.3 Hexavalent Chromium

USEPA is considering new regulations for hexavalent chromium in drinking water. Hexavalent chromium (CrO3) is a probable carcinogen (National Toxicology Program, 2008). In 2009, California proposed a public health goal of 0.06 µg/L for hexavalent chromium to reduce cancer risk from drinking water. The California proposed public health goal for hexavalent chromium was subsequently reduced to 0.02 µg/L. Hexavalent chromium has been found in drinking water at concentrations above the California proposed public health goal in more than 30 U.S. cities. Based on toxicity, carcinogenicity, and widespread occurrence in drinking water, new regulations for hexavalent chromium appear likely. The current federal drinking water standard for total chromium is 0.1 mg/L or 100 ppb. Chromium-6 and chromium-3 are covered under the total chromium standard because these forms of chromium can convert back and forth in water and in the human body.

4.1.22 Contaminant Candidate List

The 1996 SDWA amendments required EPA to publish a list of contaminants every five years which, at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulations but are known or anticipated to occur in public water systems and may require regulation in the future. The original list was published by EPA in 1998 and was revised in 2005, 2009, 2016, and 2021. The fifth draft Drinking Water Contaminant Candidate List (CCL 5) published in July 19, 2021 is presented in **Table 4.13**. The draft CCL 5 includes 66 chemicals, three chemical groups (per- and polyfluoroalkyl substances (PFAS), cyanotoxins, and disinfection byproducts (DBPs)), and 12 microbiological contaminants. The draft CCL5 chemicals were selected from a universe of chemicals used in commerce, pesticides, biological toxins, disinfection byproducts, and waterborne pathogens.

The USEPA will continue to research and collect data related to the list, make regulatory determinations, and complete ongoing work with the National Drinking Water Advisory Council (NDWAC) on an expanded process for classifying drinking water contaminants in the future.

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Microbial Contaminants						
Acanthamoeba (guidance expected for contact lens wearers)		●	No action	No action	No action	No action
Adenoviruses		●	●	●	●	●
Aeromonas hydrophila		●	●	●	No action	No action
Caliciviruses		●	●	●	●	●
Campylobacter jejuni		No action	No action	●	●	●
Coxsackieviruses		●	●	●	No action	No action
Cyanobacteria (blue-green algae), other freshwater algae, and their toxins		●	●	●	No action	No action
Echoviruses		●	●	●	No action	No action
Enterovirus		No action	No action	●	●	●
Escherichia coli (0157)		No action	No action	●	●	●
Helicobacter pylori		●	●	●	●	●
Hepatitis A virus		No action	No action	●	●	No action
Legionella pneumophila		No action	No action	●	●	●
Microsporidia (Enterocytozoon & Septata)		●	●	●	No action	No action
Mycobacterium abscessus		No action	No action	No action	No action	●
Mycobacterium avium intracellulare (MAC)		●	●	●	●	●
Naegleria fowleri		No action	No action	●	●	●
Pseudomonas aeruginosa		No action	No action	No action	No action	●
Salmonella enterica		No action	No action	●	●	No action
Shigella sonnei		No action	No action	●	●	●
Chemical Contaminants	CASRN					
1,1,1,2-tetrachloroethane	79-34-5	●	●	●	●	No action
1,2,3-trichloropropane	96-18-4	No action	No action	●	●	●
1,2,4-trimethylbenzene	95-63-6	●	●	●	No action	No action
1,1-dichloroethane	75-34-3	●	●	●	●	No action

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
1,1-dichloropropene	563-58-6	●	●	●	No action	No action
1,2-diphenylhydrazine	122-66-7	●	●	●	No action	No action
1,3-butadiene	106-99-0	No action	No action	●	●	No action
1,3-dichloropropane	142-28-9	●	●	●	No action	No action
1,3-Dichloropropene (Telone)	542-75-6	●	●	No action	No action	No action
1,4-dioxane	123-91-1	No action	No action	●	●	●
17alpha-estradiol	57-91-0	No action	No action	●	●	●
1-butanol	71-36-3	No action	No action	●	●	No action
2,4,6-trichlorophenol	88-06-2	●	●	●	No action	No action
2,2-dichloropropane	594-20-7	●	●	●	No action	No action
2,4-dichlorophenol	120-83-2	●	●	●	No action	No action
2,4-dinitrophenol	51-28-5	●	●	●	No action	●
2,4-dinitrotoluene	121-14-2	●	●	No action	No action	No action
2,6-dinitrotoluene	606-20-2	●	●	No action	No action	No action
2-Hydroxyatrazine	2163-68-0	No action	No action	No action	No action	●
4-Nonylphenol (all isomers)	25154-52-3	No action	No action	No action	No action	●
2-methyl-Phenol (o-cresol)	95-48-7	●	●	●	No action	No action
2-methoxyethanol	109-86-4	No action	No action	No action	●	No action
2-Propen-1-ol	107-18-6	No action	No action	No action	●	No action
3-Hydroxycarbofuran	16655-82-6	No action	No action	●	●	No action
4,4'-Methylenedianiline	101-77-9	No action	No action	●	●	No action
6-Chloro-1,3,5-triazine-2,4-diamine	3397-62-4	No action	No action	No action	No action	●
Acephate	30560-19-1	No action	No action	●	●	●
Acetaldehyde	75-07-0	No action	No action	●	●	No action

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Acetamide	60-35-5	No action	No action	●	●	No action
Acetochlor	34256-82-1	●	●	●	●	No action
Acetochlor ethanesulfonic acid (ESA)	187022-11-3	No action	No action	●	●	No action
Acetochlor oxanilic acid (OA)	194992-44-4	No action	No action	●	●	No action
Acrolein	107-02-8	No action	No action	●	●	●
Alachlor ESA & other acetanilide pesticide degradation products	N/A	●	●	●	●	No action
Alachlor oxanilic acid (OA)	171262-17-2	No action	No action	●	●	No action
Aldrin	309-00-2	●	No action	No action	No action	No action
Alpha-Hexachlorocyclohexane	319-84-6	No action	No action	●	●	●
Anthraquinone	84-65-1	No action	No action	No action	No action	●
Aluminum	7429-90-5	●	●	●	No action	No action
Bensulide	741-58-2	No action	No action	●	●	●
Benzyl chloride	100-44-7	No action	No action	●	●	No action
Bisphenol A	80-05-7	No action	No action	No action	No action	●
Boron	7440-42-8	●	●	No action	No action	●
Bromobenzene	108-86-1	●	●	●	No action	No action
Bromoxynil	1689-84-5	No action	No action	No action	No action	●
Butylated hydroxyanisole	25013-16-5	No action	No action	No action	●	No action
Captan	133-06-2	No action	No action	●	●	No action
Carbaryl	63-25-2	No action	No action	No action	No action	●
Carbendazim (MBC)	10605-21-7	No action	No action	No action	No action	●
Chlorate	14866-68-3	No action	No action	●	●	No action
Chlordecone (Kepone)	143-50-0	No action	No action	No action	No action	●
Chloromethane (Methyl chloride)	74-87-3	No action	No action	●	●	No action

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Chlorpyrifos	2921-88-2	No action	No action	No action	No action	●
Clethodim	110429-62-4	No action	No action	●	●	No action
Cobalt	7440-48-4	No action	No action	●	●	●
Cumene hydroperoxide	80-15-9	No action	No action	●	●	No action
Cyanotoxins	N/A	No action	No action	●	●	●
DCPA mono-acid degradate	887-54-7	●	●	No action	No action	No action
DCPA di-acid degradate	2136-79-0	●	●	No action	No action	No action
DDE (1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene)	72-55-9	●	●	●	No action	No action
Deethylatrazine	6190-65-4	No action	No action	No action	No action	●
Desisopropyl atrazine	1007-28-9	No action	No action	No action	No action	●
Desvenlafaxine	93413-62-8	No action	No action	No action	No action	●
Diazinon	333-41-5	●	●	●	No action	●
Dicrotophos	141-66-2	No action	No action	●	●	●
Dieldrin	60-57-1	●	No action	No action	No action	●
Dimethipin	55290-64-7	No action	No action	●	●	No action
Dimethoate	60-51-5	No action	No action	●	No action	●
Disinfection byproducts (DBPs)4	Multiple	No action	No action	No action	No action	●
Disulfoton	298-04-4	●	●	●	No action	No action
Diuron	330-54-1	●	●	●	●	●
EPTC (s-ethyl-dipropylthiocarbamate)	759-94-4	●	●	No action	No action	No action
Equilenin	517-09-9	No action	No action	●	●	No action
Equilin	474-86-2	No action	No action	●	●	No action
Erythromycin	114-07-8	No action	No action	●	●	No action
Estradiol (17-beta estradiol)	50-28-2	No action	No action	●	●	No action

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Estriol	50-27-1	No action	No action	●	●	No action
Estrone	53-16-7	No action	No action	●	●	No action
Ethalfluralin	55283-68-6	No action	No action	No action	No action	●
Ethinyl estradiol (17-alpha ethynyl estradiol)	57-63-6	No action	No action	●	●	No action
Ethoprop	13194-48-4	No action	No action	●	●	●
Ethylene glycol	107-21-1	No action	No action	●	●	No action
Ethylene oxide	75-21-8	No action	No action	●	●	No action
Ethylene thiourea	96-45-7	No action	No action	●	●	No action
Fipronil	120068-37-3	No action	No action	No action	No action	●
Fluconazole	86386-73-4	No action	No action	No action	No action	●
Flufenacet	142459-58-3	No action	No action	No action	No action	●
Fluometuron	2164-17-2	No action	No action	No action	No action	●
Fonofos	944-22-9	●	●	No action	No action	No action
Formaldehyde	50-00-0	No action	No action	●	●	No action
Germanium	7440-56-4	No action	No action	●	●	No action
HCFC-22	75-45-6	No action	No action	●	●	No action
Halon 1011 (bromochloromethane)	74-97-5	No action	No action	●	●	No action
Hexachlorobutadiene	87-68-3	●	No action	No action	No action	No action
Hexane	110-54-3	No action	No action	●	●	No action
Hydrazine	302-01-2	No action	No action	●	●	No action
Iprodione	36734-19-7	No action	No action	No action	No action	●
p-Isopropyltoluene (p-cymene)	99-87-6	●	●	●	No action	No action
Linuron	330-55-2	●	●	●	No action	No action
Lithium	7439-93-2	No action	No action	No action	No action	●

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Malathion	121-75-5	No action	No action	No action	No action	●
Manganese	7439-96-5	●	No action	No action	●	●
Mestranol	72-33-3	No action	No action	●	●	No action
Methamidophos	10265-92-6	No action	No action	●	●	No action
Methanol	67-56-1	No action	No action	●	●	No action
Methomyl	16752-77-5	No action	No action	No action	No action	●
Methyl bromide	74-83-9	●	●	●	●	No action
Methylmercury	22967-92-6	No action	No action	No action	No action	●
Methyl-t-butyl ether (MTBE)	1634-04-4	●	●	●	●	●
Metolachlor	51218-45-2	●	●	●	●	No action
Metolachlor ethanesulfonic acid (ESA)	171118-09-5	No action	No action	●	●	No action
Metribuzin	21087-64-9	●	No action	No action	No action	No action
Molinate	2212-67-1	●	●	●	No action	No action
Molybdenum	7439-98-7	No action	No action	●	●	●
Naphthalene	91-20-3	●	No action	No action	No action	No action
Nitrobenzene	98-95-3	●	●	●	●	No action
Nitroglycerin	55-63-0	No action	No action	No action	●	No action
N-Methyl-2-pyrrolidone	872-50-4	No action	No action	●	●	No action
N-nitrosodiethylamine (NDEA)	55-18-5	No action	No action	●	●	No action
N-nitrosodimethylamine (NDMA)	62-75-9	No action	No action	●	●	No action
N-nitroso-di-n-propylamine (NDPA)	621-64-7	No action	No action	●	●	No action
N-Nitrosodiphenylamine	86-30-6	No action	No action	●	●	No action
N-nitrosopyrrolidine (NPYR)	930-55-2	No action	No action	●	●	No action
Nonylphenol2	25154-52-3	No action	No action	No action	●	No action

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Norethindrone (19-Norethisterone)	68-22-4	No action	No action	No action	●	No action
Norflurazon	27314-13-2	No action	No action	No action	No action	●
n-Propylbenzene	103-65-1	No action	No action	●	●	No action
o-Toluidine	95-53-4	No action	No action	●	●	No action
Organotins	N/A	●	●	●	No action	No action
Oxirane, methyl	75-56-9	No action	No action	●	●	No action
Oxydemeton-methyl	301-12-2	No action	No action	●	●	No action
Oxyfluorfen	42874-03-3	No action	No action	●	●	●
Perchlorate	N/A	●	●	●	No action	No action
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	No action	No action	●	●	No action
Perfluorooctanoic acid (PFOA)	335-67-1	No action	No action	●	●	No action
Per- and polyfluoroalkyl substances (PFAS)5	Multiple	No action	No action	No action	No action	●
Permethrin	52645-53-1	No action	No action	●	●	●
Phorate	298-02-2	No action	No action	No action	No action	●
Phosmet	732-11-6	No action	No action	No action	No action	●
Phostebupirim	96182-53-5	No action	No action	No action	No action	●
Profenofos	41198-08-7	No action	No action	●	●	●
Prometon	1610-18-0	●	●	●	No action	No action
Propachlor	1918-16-7	No action	No action	No action	No action	●
Propanil	709-98-8	No action	No action	No action	No action	●
Propargite	2312-35-8	No action	No action	No action	No action	●
Propazine	139-40-2	No action	No action	No action	No action	●
Propoxur	114-26-1	No action	No action	No action	No action	●
Quinoline	91-22-5	No action	No action	●	●	●

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
RDX	121-82-4	●	●	●	●	No action
sec-Butylbenzene	135-98-8	No action	No action	●	●	No action
Sodium	7440-23-5	●	No action	No action	No action	No action
Sulfate	14808-79-8	●	No action	No action	No action	No action
Tebuconazole	107534-96-3	No action	No action	●	●	●
Tebufenozide	112410-23-8	No action	No action	●	●	No action
Tellurium	13494-80-9	No action	No action	●	●	No action
Terbacil	5902-51-2	●	●	No action	No action	No action
Terbufos	13071-79-9	●	●	●	No action	●
Thiamethoxam	153719-23-4	No action	No action	No action	No action	●
Thiodicarb	59669-26-0	No action	No action	●	●	No action
Thiophanate-methyl	23564-05-8	No action	No action	●	●	No action
Toluene diisocyanate	26471-62-5	No action	No action	●	●	No action
Tri-allate	2303-17-5	No action	No action	No action	No action	●
Triazines & degradation products including: Cyanazine Atrazine-desethyl	21725-46-2 6190-65-4	● ● ●	● ● ●	● ● ●	No action	No action
Tribufos	78-48-8	No action	No action	●	●	●
Tributyl phosphate	126-73-8	No action	No action	No action	No action	●
Triethylamine	121-44-8	No action	No action	●	●	No action
Trimethylbenzene (1,2,4-)	95-63-6	No action	No action	No action	No action	●
Triphenyltin hydroxide (TPTH)	76-87-9	No action	No action	No action	●	No action
Tris(2-chloroethyl) phosphate (TCEP)	115-96-8	No action	No action	No action	No action	●
Tungsten	7440-33-7	No action	No action	No action	No action	●
Urethane	51-79-6	No action	No action	●	●	No action

Table 4.13 Drinking Water Contaminant Candidate List

CONTAMINANTS		MAR 1998	FEB 2005	MAY 2007	NOV 2016	JUL 2021
Vanadium	7440-62-2	●	●	●	No action	●
Vinclozolin	50471-44-8	No action	No action	●	●	No action
Ziram	137-30-4	No action	No action	●	●	No action

Table 4.14 Fifth Unregulated Contaminant Monitoring Rule (UCMR 5)-PFAS

CONTAMINANTS	MINIMUM REPORTING LEVEL ug/L
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.005
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	0.002
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.003
hexafluoropropylene oxide dimer acid (HFPO DA)	0.005
nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.02
perfluorobutanoic acid (PFBA)	0.005
perfluorobutanesulfonic acid (PFBS)	0.003
1H,1H, 2H, 2H-perfluorodecane sulfonic acid (8:2FTS)	0.005
perfluorodecanoic acid (PFDA)	0.003
perfluorododecanoic acid (PFDoA)	0.003
perfluoro(2-ethoxyethane) sulfonic acid (PFEESA)	0.003
perfluoroheptanesulfonic acid (PFHpS)	0.003
perfluoroheptanoic acid (PFHpA)	0.003
1H,1H, 2H, 2H-perfluorohexane sulfonic acid (4:2FTS)	0.003
perfluorohexanesulfonic acid (PFHxS)	0.003
perfluorohexanoic acid (PFHxA)	0.003
perfluoro-3-methoxypropanoic acid (PFMPA)	0.004
perfluoro-4-methoxybutanoic acid (PFMBA)	0.003
perfluorononanoic acid (PFNA)	0.004
1H,1H, 2H, 2H-perfluorooctane sulfonic acid (6:2FTS)	0.005
perfluorooctanesulfonic acid (PFOS)	0.004
perfluorooctanoic acid (PFOA)	0.004
perfluoropentanoic acid (PFPeA)	0.003
perfluoropentanesulfonic acid (PFPeS)	0.004
perfluoroundecanoic acid (PFUnA)	0.002
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.005
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.006
perfluorotetradecanoic acid (PFTA)	0.008
perfluorotridecanoic acid (PFTrDA)	0.007
lithium	9

4.2 Existing Water Quality Requirements

The Safe Drinking Water Act identifies and sets standards for chemical contaminants, microbial contaminants, and right-to-know rules. Specifics of these rules are detailed in the sections, above, and a general summary is listed, below.

4.2.1 Lead and Copper

The Lead and Copper Rule has been revised and requires compliance on October 16, 2024. For further detail, see **Section 4.1.17**.

4.2.2 Disinfectants/Disinfection Byproducts Rule

The Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR) sets limits for exposure to three disinfectants and many disinfection byproducts. The rule established maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for chlorine, chloramine, and chlorine dioxide. The Stage 2 D/DBPR focuses on monitoring and reducing concentrations of two classes of DBPs: total trihalomethanes (TTHM) and haloacetic acids (HAA5). For further detail, see **Section 4.1.11**.

4.2.3 Primary and Secondary Drinking Water Standards

Primary Drinking Water Standards are legally enforceable standards that must be met by public water systems. Secondary Drinking Water Standards are non-enforceable guidelines for contaminants that may cause cosmetic effects in drinking water. For further information, see **Section 4.1.12** and **Section 4.1.14**, respectively.

4.2.4 Disinfection Requirements

The Revised Total Coliform Rule requires PWSs to test for total coliforms monthly. The Surface Water Treatment Rule, Long-Term 1: Enhanced Surface Water Treatment Rule, and Long-Term 2: Enhanced Surface Water Treatment Rule require disinfection, filtration, and contact time to meet minimum requirements, depending on the system and disinfectant used. For more details, see **Sections 4.1.2** through **4.1.6**.

4.2.5 Monitoring Reports

The Consumer Confidence Report Rule requires community water systems to provide annual water quality reports to their customers. All utilities must submit the report to the state annually and deliver the report directly to each customer by July 1 each year. For more information, see **Section 4.1.10**.

4.3 Recommended Additional Monitoring

Additional monitoring of certain contaminants and analytes will help prepare the Town of Silt's WTP for future regulations and improve operations.

4.3.1 TOC

It is recommended that TOC is monitored as it is an indicator of potential DBP formation and can help inform operator staff how well treatment is performing.

4.3.2 PFAS

In advance of the Fifth Unregulated Contaminant Rule, which requires monitoring for PFAS between 2023 and 2025, it is recommended to sample PFAS to gauge the level of PFAS in the raw and finished water. This will help inform future decisions regarding treatment of PFAS if a future PFAS regulation is enforced.

4.3.3 Raw Water

Water quality monitoring of raw water for unregulated contaminants (See **Section 4.1.20**) and contaminants on the Contaminant Candidate List (See **Section 4.1.22**) is recommended to gauge levels of these contaminants, which may be regulated in the future.

4.3.4 Disinfection Byproducts

There is a Stage 3 DBP Rule in development that will likely further lower the TTHM and HAA5 MCLs and, perhaps, increase TOC removal requirements. However, this rule is unlikely to be formulated until 2027 or later. In preparation for these future potential rules, it is recommended that TTHM and HAA5 are monitored more frequently than currently required.

4.3.5 Technologically Enhanced Naturally Occurring Radioactive Material

It is recommended that Technologically Enhanced Naturally Occurring Radioactive Material is sampled and monitored in preparation for the CDPHE Part 20 TENORM regulation, which is enforceable on July 14, 2022.

4.3.6 Jar Testing

Periodic jar testing is recommended to monitor coagulation and flocculation and estimate the minimum coagulant dose required to optimize pretreatment. Turbidities, water temperatures, source water, and other water quality parameters can affect coagulant dosing and coagulation and flocculation, especially seasonally.

4.4 Provisional Considerations for PFOA/PFAS Regulations

Per- and polyfluoroalkyl substances (PFAs) are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s because of their useful properties. PFAS is an emerging contaminant and while there are currently no drinking water regulations for PFAS, there are likely to be future regulations for these contaminants. MCLs are in development and are likely to promulgated prior to 2030.

4.5 Public Participation

Several environmental organizations are actively engaged in monitoring water quality and wildlife habitat in the Colorado River basin and will also have opportunities to review and comment on modifications to the WTP during the public participation process conducted by state and local governments. The Town should keep these local environmental organizations informed regarding upgrades to the Town of Silt WTP and seek their support during design and construction of the modifications.

4.5.1 Middle Colorado Watershed Council

The Middle Colorado Watershed Council was formed in 2012 to complete a Watershed Assessment and a Watershed Plan. The Middle Colorado Watershed Council's mission is to "evaluate, protect and enhance the health of the middle Colorado River watershed through the cooperative effort of watershed stakeholders." Their goals are to:

- Support the long-term health of the watershed for the well-being of the community and the local economy.
- Advance water quality monitoring, enhancement, and improvement efforts.
- Promote smart, efficient water use and conservation.
- Increase knowledge, awareness and stimulate interest in the watershed.

- Offer educational opportunities and informational resources to watershed stakeholders.
- Inform planning and decision-making with unbiased, fact-based information.
- Create partnerships and collaboration among stakeholders.
- Manage the organization and finances effectively and efficiently.

Their work includes:

- Information: Gather, evaluate, and disseminate information pertinent to watershed health.
- Projects: On-the-ground projects and educational campaigns to promote watershed health.
- Education: Increase knowledge, awareness and understanding to promote balanced stewardship in our watershed.
- Resources: Assemble money and resources to allow our work, and work with our partners to continue.

4.5.2 Garfield County Public Health

Garfield County Public Health has an Environmental Health department that works to "protect public health from detrimental conditions in the environment through promotion, education, collaboration, and the evaluation of environmental health risks." The Public Health department oversees the planning and design of public works projects.

4.5.3 Silt Water Conservancy District

The Silt Water Conservancy District was formed to educate, represent, and advocate for private landowners and water rights holders. The mission of the District is "conserving and developing land and water resources for the greatest beneficial use of water within the District boundaries."

SECTION 5 - WTP EVALUATION

5.1 Water Treatment Plant Site

The Water Treatment Plant (WTP) is located at 500 River Frontage Rd, Silt, Colorado. As shown in **Figure 5.1**, the site is bordered by I-70 on the north, and a detention pond to the south. The Town of Silt's wastewater treatment plant is to the west of the water treatment plant. The Public Land Survey System coordinates for the site are Lot 6, Section 9, T6S, R62W, 6th P.M.

Figure 5.1 Town of Silt WTP (Google Earth, 2022)

5.2 Water Treatment Plant Performance

The Town of Silt WTP treats approximately 0.33 MGD (annual average day production for 2021 – **Table 4-1**). Annual Drinking Water Quality Reports for the last five years (2016-2020; the report was not yet available for 2021) indicate nine violations in the last five years. The violations were: (1) four violations for failing to monitor and/or report lead and copper, two in 2019 and two in 2020, (2) three violations for failing to inform homeowners of lead results, two in 2019 and one in 2020, (3) one violation for failing to meet cross connection control and/or backflow prevention requirements in 2019, (4) one violation for failing to have a certified operator in 2020, (5) one violation for failing to monitor and/or report total coliform in 2020, and (6) one violation for failing to monitor and/or report chlorine/chloramine in 2020. There were no reported water quality violations in 2016 through 2021.

5.2.1 Hardness

Water hardness represents the total concentration of calcium and magnesium ions and is expressed as milligrams per liter (mg/L) of calcium carbonate. Calcium and magnesium are naturally occurring elements within geological formations found throughout watersheds and are also found in surface and groundwater sources. "Ideal" water hardness for drinking water ranges between approximately 50 to 100

mg/L. Above this level, hardness can contribute to scaling of water heaters and boilers. Water with hardness below this level tends to be more aggressive and can cause deterioration of the inner surface of pipes, eventually leading to pinholes or leaks. Water softeners may be used in households to reduce water hardness. Silt's water is classified as "hard" or "very hard" as defined by the USGS.

The Town of Silt has limited total hardness data for the raw river water, raw well water, and finished water from 2017 through 2021. Where multiple samples were taken in one month, the data was averaged and presented in **Table 5.1**. The maximum finished water total hardness is 387 mg/L $CaCO_3$ in 2017, the minimum was 109 mg/L $CaCO_3$ in 2021, and the average is 226 mg/L. Based on the source and finished total hardness data, Silt's WTP does not appear to be reducing total hardness. The hardness does seem to vary by season with a decrease during the runoff months and an increase during the low flow months.

Table 5.1 Monthly Average Source and Finished Water Total Hardness

DATE	RAW RIVER WATER TOTAL HARDNESS, MG/L $CACO_3$	RAW WELL WATER TOTAL HARDNESS, MG/L $CACO_3$	BLENDED RAW WATER TOTAL HARDNESS, MG/L $CACO_3$	FINISHED WATER TOTAL HARDNESS, MG/L $CACO_3$
January 2017	-	-	-	230
February 2017	-	-	-	232
March 2017	-	-	-	218
April 2017	-	-	-	336
May 2017	-	-	-	263
June 2017	-	-	-	261
July 2017	-	-	-	147
August 2017	-	-	-	171
September 2017	-	-	-	165
October 2017	-	-	-	192
November 2017	-	-	-	203
December 2017	-	-	-	222
January 2018	-	-	-	225
February 2018	-	-	-	219
March 2018	-	-	-	204
April 2018	-	-	-	200
May 2018	-	-	-	191
June 2018	-	-	-	-
July 2018	-	-	-	-
August 2018	-	-	-	-
September 2018	-	-	-	-
October 2018	-	-	-	235
November 2018	-	-	-	231
December 2018	-	-	-	231
January 2019	-	-	-	229
February 2019	-	-	-	219

Table 5.1 Monthly Average Source and Finished Water Total Hardness

DATE	RAW RIVER WATER TOTAL HARDNESS, MG/L $CACO_3$	RAW WELL WATER TOTAL HARDNESS, MG/L $CACO_3$	BLENDED RAW WATER TOTAL HARDNESS, MG/L $CACO_3$	FINISHED WATER TOTAL HARDNESS, MG/L $CACO_3$
March 2019	-	-	-	209
April 2019	-	-	-	188
May 2019	-	-	-	206
June 2019	-	-	-	192
July 2019	-	-	-	192
August 2019	-	-	-	-
September 2019	-	-	-	182
October 2019	-	-	-	150
November 2019	-	-	-	176
December 2019	-	-	-	221
January 2020	-	-	-	-
February 2020	-	-	-	-
March 2020	-	-	-	182
April 2020	-	-	-	201
May 2020	-	-	-	-
June 2020	-	-	-	-
July 2020	-	-	-	-
August 2020	-	-	-	-
September 2020	-	-	-	-
October 2020	-	-	-	-
November 2020	-	-	-	-
December 2020	266	-	-	274
January 2021	254	-	-	255
February 2021	252	349	-	258
March 2021	238	544	-	263
April 2021	190	521	-	209
May 2021	162	583	-	177
June 2021	138	569	-	145
July 2021	238	453	319	257
August 2021	204	323	259	256
September 2021	220	374	296	230
October 2021	243	402	-	240
November 2021	278	415	376	252
December 2021	266	-	-	258

5.2.2 Alkalinity

The Town of Silt has limited alkalinity data for the raw river water, raw well water, and finished water. Finished water alkalinity data is available from 2017 through 2021. Where multiple samples were taken in one month, the data was averaged and presented in **Table 5.2**. The maximum finished water alkalinity is 380 mg/L $CaCO_3$ in 2017, the minimum was 78 mg/L $CaCO_3$ in 2021, and the average is 155 mg/L. There is a seasonal variation in raw river water alkalinity, where higher alkalinity is seen in the winter and lower alkalinity is seen in the summer. Based on the source and finished total hardness data, Silt's WTP is reducing alkalinity.

Table 5.2 Monthly Average Source and Finished Water Alkalinity

DATE	RAW RIVER WATER ALKALINITY, MG/L $CACO_3$	RAW WELL WATER ALKALINITY, MG/L $CACO_3$	BLENDED RAW WATER ALKALINITY, MG/L $CACO_3$	FINISHED WATER ALKALINTY, MG/L $CACO_3$
January 2017	-	-	-	147
February 2017	-	-	-	153
March 2017	-	-	-	145
April 2017	-	-	-	244
May 2017	-	-	-	340
June 2017	-	-	-	219
July 2017	-	-	-	123
August 2017	-	-	-	130
September 2017	-	-	-	140
October 2017	-	-	-	130
November 2017	-	-	-	140
December 2017	-	-	-	143
January 2018	-	-	-	143
February 2018	-	-	-	150
March 2018	-	-	-	130
April 2018	-	-	-	120
May 2018	-	-	-	127
June 2018	-	-	-	-
July 2018	-	-	-	-
August 2018	-	-	-	-
September 2018	-	-	-	-
October 2018	-	-	-	230
November 2018	-	-	-	140
December 2018	-	-	-	140
January 2019	-	-	-	150
February 2019	-	-	-	135
March 2019	-	-	-	140
April 2019	-	-	-	125
May 2019	-	-	-	228

Table 5.2 Monthly Average Source and Finished Water Alkalinity

DATE	RAW RIVER WATER ALKALINITY, MG/L $CACO_3$	RAW WELL WATER ALKALINITY, MG/L $CACO_3$	BLENDED RAW WATER ALKALINITY, MG/L $CACO_3$	FINISHED WATER ALKALINTY, MG/L $CACO_3$
June 2019	-	-	-	120
July 2019	-	-	-	130
August 2019	-	-	-	-
September 2019	-	-	-	130
October 2019	-	-	-	214
November 2019	-	-	-	172
December 2019	-	-	-	145
January 2020	-	-	-	-
February 2020	-	-	-	-
March 2020	-	-	-	130
April 2020	-	-	-	175
May 2020	-	-	-	-
June 2020	-	-	-	-
July 2020	-	-	-	-
August 2020	-	-	-	-
September 2020	-	-	-	-
October 2020	-	-	-	-
November 2020	-	-	-	-
December 2020	199	-	-	168
January 2021	254	-	-	140
February 2021	252	219	-	154
March 2021	238	358	-	149
April 2021	190	363	-	119
May 2021	162	375	-	129
June 2021	138	363	-	107
July 2021	238	297	234	182
August 2021	204	228	204	185
September 2021	220	251	243	138
October 2021	243	310	-	135
November 2021	278	318	195	156
December 2021	266	-	-	120

5.2.3 pH

The National Secondary Drinking Water Standard for pH is 6.5 to 8.5. Raw river water, raw well water, blended raw water, and finished water pH data is presented in **Table 5.3**. Where multiple samples were taken in one month, the data was averaged. The finished water pH maximum was 9.1 in April 2020, the

minimum was 6.8 in June 2021, and the average pH for the data between 2017 and 2021 was 8.1. The limited pH data for the raw river, well, and blended water trend towards a lower pH in the winter and a higher pH in the spring.

Table 5.3 Monthly Average Source and Finished Water pH

DATE	RAW RIVER WATER PH	RAW WELL WATER PH	BLENDED RAW WATER PH	FINISHED WATER PH
January 2017	-	-	-	8.0
February 2017	-	-	-	8.1
March 2017	-	-	-	8.1
April 2017	-	-	-	7.8
May 2017	-	-	-	7.7
June 2017	-	-	-	7.9
July 2017	-	-	-	8.2
August 2017	-	-	-	8.6
September 2017	-	-	-	7.2
October 2017	-	-	-	8.1
November 2017	-	-	-	8.2
December 2017	-	-	-	8.2
January 2018	-	-	-	8.2
February 2018	-	-	-	8.3
March 2018	-	-	-	8.3
April 2018	-	-	-	8.3
May 2018	-	-	-	8.4
June 2018	-	-	-	-
July 2018	-	-	-	-
August 2018	-	-	-	-
September 2018	-	-	-	-
October 2018	-	-	-	8.6
November 2018	-	-	-	8.9
December 2018	-	-	-	8.9
January 2019	-	-	-	8.4
February 2019	-	-	-	8.6
March 2019	-	-	-	8.7
April 2019	-	-	-	8.6
May 2019	-	-	-	8.2
June 2019	-	-	-	8.6
July 2019	-	-	-	8.4
August 2019	-	-	-	-
September 2019	-	-	-	8.7

Table 5.3 Monthly Average Source and Finished Water pH

DATE	RAW RIVER WATER PH	RAW WELL WATER PH	BLENDED RAW WATER PH	FINISHED WATER PH
October 2019	-	-	-	8.7
November 2019	-	-	-	8.8
December 2019	-	-	-	9.0
January 2020	-	-	-	-
February 2020	-	-	-	-
March 2020	-	-	-	8.4
April 2020	-	-	-	8.8
May 2020	-	-	-	-
June 2020	-	-	-	-
July 2020	-	-	-	-
August 2020	-	-	-	-
September 2020	-	-	-	-
October 2020	-	-	-	-
November 2020	-	-	-	-
December 2020	8.3	-	-	8.2
January 2021	7.8	-	-	7.8
February 2021	7.7	8.1	-	7.6
March 2021	8.1	7.2	-	7.8
April 2021	8.5	7.9	-	8.3
May 2021	8.1	7.4	-	8.3
June 2021	8.1	7.6	-	7.8
July 2021	8.3	7.7	7.6	8.0
August 2021	8.4	7.3	8.2	8.3
September 2021	7.9	8.0	7.8	7.9
October 2021	7.9	7.7	-	8.1
November 2021	8.4	8.1	8.1	8.2
December 2021	7.0	-	-	7.1

5.2.4 Temperature

Colder temperatures can affect water treatment processes, such as flocculation and membrane efficiency. As temperature decreases, the viscosity of water increases and the rate of sedimentation decreases. Raw river water, raw well water, blended raw water, and finished water temperature data is presented in **Table 5.4**. Where multiple samples were taken in one month, the data was averaged. Temperature varies by season and source and finished water is colder in the winter and fall and warmer in the summer and spring. The maximum raw river water temperature between 2020 and 2021 was 18.1 °C in September 2021, the minimum was 0.60 °C in December 2021 and the average was 7.9 °C. The maximum raw well water temperature in 2021 was 21.1 °C in April 2021, the minimum was 4.2 °C in

March 2021 and the average was 9.9 °C. The maximum finished water temperature between 2017 and 2021 was 18.7 °C in July 2017, the minimum was 0.0 °C in December 2020 and the average was 7.1 °C.

Table 5.4 Monthly Average Source and Finished Water Temperature

DATE	RAW RIVER WATER TEMPERATURE, °C	RAW WELL WATER TEMPERATURE, °C	BLENDED RAW WATER TEMPERATURE, °C	FINISHED WATER TEMPERATURE, °C
January 2017	-	-	-	1.2
February 2017	-	-	-	5.1
March 2017	-	-	-	7.0
April 2017	-	-	-	10.5
May 2017	-	-	-	10.0
June 2017	-	-	-	13.0
July 2017	-	-	-	17.3
August 2017	-	-	-	14.9
September 2017	-	-	-	15.2
October 2017	-	-	-	0.0
November 2017	-	-	-	4.8
December 2017	-	-	-	0.3
January 2018	-	-	-	0.5
February 2018	-	-	-	2.6
March 2018	-	-	-	6.0
April 2018	-	-	-	12.0
May 2018	-	-	-	12.0
June 2018	-	-	-	-
July 2018	-	-	-	-
August 2018	-	-	-	-
September 2018	-	-	-	-
October 2018	-	-	-	6.5
November 2018	-	-	-	2.0
December 2018	-	-	-	0.4
January 2019	-	-	-	0.5
February 2019	-	-	-	3.5
March 2019	-	-	-	4.5
April 2019	-	-	-	12.0
May 2019	-	-	-	10.4
June 2019	-	-	-	12.0
July 2019	-	-	-	11.0
August 2019	-	-	-	-
September 2019	-	-	-	15.0
October 2019	-	-	-	6.0

Table 5.4 Monthly Average Source and Finished Water Temperature

DATE	RAW RIVER WATER TEMPERATURE, °C	RAW WELL WATER TEMPERATURE, °C	BLENDED RAW WATER TEMPERATURE, °C	FINISHED WATER TEMPERATURE, °C
November 2019	-	-	-	4.0
December 2019	-	-	-	1.4
January 2020	-	-	-	-
February 2020	-	-	-	-
March 2020	-	-	-	8.0
April 2020	-	-	-	9.8
May 2020	-	-	-	-
June 2020	-	-	-	-
July 2020	-	-	-	-
August 2020	-	-	-	-
September 2020	-	-	-	-
October 2020	-	-	-	-
November 2020	-	-	-	-
December 2020	5.1	-	-	4.7
January 2021	4.9	-	-	4.7
February 2021	6.4	6.4	-	6.1
March 2021	6.5	7.6	-	7.2
April 2021	12.7	13.7	-	12.1
May 2021	9.4	6.4	-	16.1
June 2021	8.8	7.2	-	8.6
July 2021	11.3	8.2	8.5	9.5
August 2021	9.4	15.9	7.1	7.7
September 2021	13.2	10.4	6.6	11.7
October 2021	9.8	13.4	-	8.7
November 2021	5.3	12.4	11.3	7.3
December 2021	2.0	-	-	2.8

5.2.5 Total Organic Carbon (TOC) Removal

Total Organic Carbon (TOC) is prevalent in surface water as a result of decaying natural organic matter (NOM). When water is chlorinated while TOC is present, the chlorine compounds react with the TOC, producing disinfection byproducts (DBPs). Higher levels of TOC at chlorination result in higher levels of DBPs formed. For this reason, the EPA has set required TOC removal limits based on the source water TOC and alkalinity levels shown in **Table 3.15**.

Water treatment plants that use membranes do not require regular TOC measurement; however, limited data is available for raw water TOC and finished water TOC, as shown in **Table 5.5**. No TOC data from the raw well water was available. Both the raw river water and finished water values are below 4.0 mg/L. The source water alkalinity, as shown in Table 5.2, is above 120 mg/L $CaCO_3$ for both the well and river water. At these values of source water TOC and alkalinity, the required TOC removal for conventional

filtration WTPs is 15%. Based on the data in **Table 5.5**, in October 2019, a TOC removal of 13.6% was achieved and in April of 2020, a TOC removal of 29.4% was achieved. However, Silt's WTP utilizes membrane filtration and is therefore not subject to the requirement of 15% TOC removal. However, increased TOC removal leads to a decrease in DBP formation potential.

Table 5.5 Total Organic Carbon

DATE	RAW RIVER TOC (MG/L)	TREATED TOC (MG/L)
7/11/2016	-	2.1
10/16/2016	-	1.5
1/22/2018	-	1.7
10/16/2019	2.2	1.9
4/13/2020	3.4	2.4

5.2.6 Disinfection Byproduct Formation

Trihalomethanes (TTHMs) and Haloacetic acids (HAA) are produced when chlorine reacts with natural organic matter in the water. The identification of these disinfection byproducts (DBPs) in chlorinated water has led to concerns over potential health effects, such as reproductive issues and cancer. The Disinfectants and Disinfection Byproducts Rule (DBPR) set a maximum containment level (MCL) of 0.08 mg/L for TTHMs in drinking water and 0.06 mg/L for HAA5.

5.2.6.1 HAA5

Haloacetic acids (five) (HAA5) is the sum of the concentrations of mono-, di-, and trichloroacetic acids and mono- and dibromoacetic acids. HAA5 are disinfection byproducts from drinking water disinfection that are monitored quarterly and reported on an annual basis. The Maximum Contaminant Level (MCL) for HAA5 is 0.060 mg/L (60 ppb). **Table 5.6** shows the HAA5 reported on Consumer Confidence Reports from 2016 through 2021. HAA5 was below the MCL for all six years from 2016 through 2021; however, the values on the high range are close to the MCL.

Table 5.6 HAA5

YEAR	AVERAGE (PPB)	RANGE LOW-HIGH (PPB)	SAMPLE SIZE	MCL	MCL VIOLATION
2016	8.66	0 – 19.5	4	60	NO
2017	5.15	0 – 11.8	4		NO
2018	10.88	0 – 17.6	4		NO
2019	12.35	5.3 – 28.4	4		NO
2020	20	10.8 – 32.9	4		NO
2021	14.3	9.6 – 21.5	4		NO

5.2.6.2 TTHM

Total trihalomethanes (TTHM) is the sum of the concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform. TTHM are disinfection byproducts from drinking water chlorination that are monitored quarterly and reported on an annual basis. The MCL for TTHMs is 0.080 mg/L (80 ppb). **Table 5.7** shows the TTHMs reported on Consumer Confidence Reports from 2016 through 2021. TTHMs were below the MCL for all six years from 2016 through 2021; however, the values on the high range are close to the MCL.

Table 5.7 TTHM

YEAR	AVERAGE (PPB)	RANGE LOW-HIGH (PPB)	SAMPLE SIZE	MCL (PPB)	MCL VIOLATION
2016	29.15	19.7 – 37.6	4	80	NO
2017	25.9	8.9 – 43.2	4		NO
2018	40	21.1 – 60.1	4		NO
2019	50.9	28.7 – 71.6	4		NO
2020	40.65	30.6 – 51.8	4		NO
2021	37.4	24.3 – 63.6	4		NO

5.2.7 Turbidity

High turbidity can affect drinking water treatment process and make disinfection more difficult. The membrane filters at the Town of Silt's WTP require an influent turbidity of 1 NTU. If the influent turbidity to the membrane filters is higher than 1 NTU, the membrane filters may not perform as efficiently, and their useful life could be shortened. Pretreatment, such as coagulation, flocculation, and sedimentation can reduce turbidity, streamline disinfection, and help produce high quality drinking water.

Table 5.8 presents the limited raw and finished water turbidity data available for the Town of Silt WTP. The maximum raw river water turbidity between 2020 and 2021 was 103 NTU in December 2020, the minimum was 0.31 NTU in March 2021 and the average was 15.1 NTU. Available data for the raw well water turbidity was below 5 NTU in 2021. No blended raw water turbidity was available. The maximum finished water turbidity between 2017 and 2021 was 0.57 NTU in March 2021, the minimum was 0.04 NTU in January 2018 and the average was 0.08 NTU. The Town of Silt generally sees raw water high turbidity events in the range of 300 to 500 NTU that last around three months; however, raw water turbidity can be as low as less than 1 NTU at other times of the year.

Table 5.8 Monthly Average Source and Finished Water Turbidity

DATE	RAW RIVER WATER TURBIDITY, NTU	RAW WELL WATER TURBIDITY, NTU	FINISHED WATER TURBIDITY, NTU
January 2017	-	-	0.05
February 2017	-	-	0.06
March 2017	-	-	0.07
April 2017	-	-	0.07
May 2017	-	-	0.05
June 2017	-	-	0.05
July 2017	-	-	0.07
August 2017	-	-	0.07
September 2017	-	-	0.16
October 2017	-	-	0.05
November 2017	-	-	0.05
December 2017	-	-	0.04
January 2018	-	-	1.70
February 2018	-	-	0.05
March 2018	-	-	0.06

Table 5.8 Monthly Average Source and Finished Water Turbidity

DATE	RAW RIVER WATER TURBIDITY, NTU	RAW WELL WATER TURBIDITY, NTU	FINISHED WATER TURBIDITY, NTU
April 2018	-	-	0.06
May 2018	-	-	0.06
June 2018	-	-	-
July 2018	-	-	-
August 2018	-	-	-
September 2018	-	-	-
October 2018	-	-	0.07
November 2018	-	-	0.07
December 2018	-	-	0.07
January 2019	-	-	0.07
February 2019	-	-	0.06
March 2019	-	-	0.07
April 2019	-	-	0.09
May 2019	-	-	0.07
June 2019	-	-	0.06
July 2019	-	-	0.05
August 2019	-	-	-
September 2019	-	-	0.07
October 2019	-	-	0.07
November 2019	-	-	0.07
December 2019	-	-	0.07
January 2020	-	-	-
February 2020	-	-	-
March 2020	-	-	0.07
April 2020	-	-	0.13
May 2020	-	-	-
June 2020	-	-	-
July 2020	-	-	-
August 2020	-	-	-
September 2020	-	-	-
October 2020	-	-	-
November 2020	-	-	-
December 2020	50.3	-	-
January 2021	4.7	-	-
February 2021	5.0	3.4	0.18
March 2021	4.6	0.2	0.37
April 2021	21.2	0.2	-

Table 5.8 Monthly Average Source and Finished Water Turbidity

DATE	RAW RIVER WATER TURBIDITY, NTU	RAW WELL WATER TURBIDITY, NTU	FINISHED WATER TURBIDITY, NTU
May 2021	-	-	-
June 2021	-	-	-
July 2021	-	-	-
August 2021	-	-	-
September 2021	-	-	-
October 2021	-	-	-
November 2021	-	-	-
December 2021	-	-	-

Turbidity data from raw water and post plate settler is available from Silt's WTP from March through April 2022. This data is presented in **Table 5.9**. The raw water is sourced from either the Colorado River or wells 1 or 2, or both. This data shows a maximum raw water turbidity of 95.2 NTU on March 14, 2022 from the Colorado River, a minimum of 1.31 NTU on April 18, 2022 from the well. The average percent reduction in turbidity post plate settler is 45.7%. Raw water turbidities are significantly lower for well water than river water. On occasion, the post plate settler turbidity is higher than the raw water turbidity.

Table 5.9 Raw and Post Settler Water Turbidity

DATE	RAW WATER TURBIDITY, NTU	POST PLATE SETTLER TURBIDITY, NTU	SOURCE OF RAW WATER	PERCENT REDUCTION OF TURBIDITY
March 1, 2022	67.70	2.74	River	96.0%
March 2, 2022	6.82	5.01	River	26.5%
March 3, 2022	11.10	4.12	River	62.9%
March 4, 2022	39.20	4.60	River	88.3%
March 7, 2022	42.20	4.78	River	88.7%
March 8, 2022	3.12	6.13	River	-96.5%
March 9, 2022	6.11	3.28	River	46.3%
March 14, 2022	95.20	19.30	River	79.7%
March 15, 2022	9.90	5.17	River	47.8%
March 16, 2022	7.99	5.13	River	35.8%
March 17, 2022	7.94	6.84	River	13.9%
March 18, 2022	14.30	7.88	River	44.9%
March 21, 2022	16.40	5.14	River	68.7%
March 22, 2022	4.59	2.64	River	42.5%
March 23, 2022	5.45	4.16	River	23.7%
March 24, 2022	6.07	4.52	River	25.5%
March 25, 2022	7.65	5.36	River	29.9%
March 28, 2022	18.10	16.10	River	11.0%
March 29, 2022	4.03	2.70	Well	33.0%

Table 5.9 Raw and Post Settler Water Turbidity

DATE	RAW WATER TURBIDITY, NTU	POST PLATE SETTLER TURBIDITY, NTU	SOURCE OF RAW WATER	PERCENT REDUCTION OF TURBIDITY
March 30, 2022	41.10	19.30	~50% River, 50% Well	53.0%
March 31, 2022	33.30	22.80	~50% River, 50% Well	31.5%
April 1, 2022	26.60	21.40	River	19.5%
April 4, 2022	2.11	2.18	Well	-3.3%
April 5, 2022	4.04	2.54	Well	37.1%
April 6, 2022	4.57	1.40	Well	69.4%
April 7, 2022	8.54	1.19	Well	86.1%
April 8, 2022	15.30	0.99	Well	93.5%
April 11, 2022	1.75	2.58	Well	-47.4%
April 12, 2022	4.00	0.86	Well	78.4%
April 13, 2022	6.53	0.58	Well	91.1%
April 15, 2022	1.61	0.77	Well	52.0%
April 18, 2022	1.31	0.73	Well	44.4%
April 19, 2022	1.72	0.66	Well	61.8%
April 20, 2022	10.00	0.56	Well	94.4%
April 21, 2022	4.43	0.80	Well	81.9%
April 22, 2022	1.62	1.23	Well	24.1%
April 26, 2022	1.47	0.51	Well	65.6%
April 27, 2022	1.43	0.92	Well	35.7%

Additional turbidity data was taken from USGS stream gauge 09085150 from the Colorado River above South Canyon Creek below Glenwood Springs. Turbidity data is measured multiple times per month and multiple times per day at this USGS stream gauge and data is available from October 2020 through present. Turbidity data was averaged on a monthly basis from this stream gauge and data from October 2020 through April 2022 is presented in **Table 5.10**. The maximum turbidity measured in this timeframe was 2,880 NTU in July 2021, the minimum was 0.8 NTU measured in December 2020, and the average turbidity is 21.5. Turbidity varies seasonally, with higher turbidities in runoff season and summer (April through August) and lower turbidities in the fall and winter (November through March).

Table 5.10 Average Monthly Turbidity from USGS Station 09085150

DATE	AVERAGE (NTU)
October 2020	2.2
November 2020	1.8
December 2020	1.6
January 2021	1.4
February 2021	2.5
March 2021	2.7
April 2021	4.0

Table 5.10 Average Monthly Turbidity from USGS Station 09085150

DATE	AVERAGE (NTU)
May 2021	14.3
June 2021	13.4
July 2021	106.5
August 2021	85.4
September 2021	20.0
October 2021	13.1
November 2021	5.5
December 2021	5.3
January 2022	5.3
February 2022	4.9
March 2022	11.0
April 2022	52.8

5.2.8 Lead and Copper

The Town of Silt's distribution system does not contain lead pipes; however, lead and copper can enter drinking water through the corrosion of household plumbing systems. The Action Level (AL) is the concentration of a contaminant which, if exceeded, triggers treatment and other regulatory requirements. The 90th percentile AL for Copper is 1.3 ppm and the 90th percentile AL for lead is 15 ppb. **Table 5.11** and **Table 5.12** show the copper and lead results reported on Consumer Confidence Reports from 2016 through 2021, respectively. Both copper and lead were below the 90th percentile AL for all six years from 2016 through 2021.

Table 5.11 Copper Sampled in the Town of Silt's Distribution System

TIME PERIOD	90TH PERCENTILE (PPM)	SAMPLE SIZE	90TH PERCENTILE AL (PPM)	90TH PERCENTILE AL EXCEEDANCE
08/07/2016 to 08/17/2016	0.24	10	1.3	NO
08/11/2017 to 08/11/2017	0.21	10		NO
08/08/2018 to 08/08/2018	0.14	10		NO
08/08/2019 to 08/08/2019	0.14	10		NO
09/22/2020 to 09/25/2020	0.1	10		NO
07/20/2021 to 07/20/2021	0.37	10		NO

Table 5.12 Lead Sampled in the Town of Silt's Distribution System

TIME PERIOD	90TH PERCENTILE (PPB)	SAMPLE SIZE	90TH PERCENTILE AL (PPB)	90TH PERCENTILE AL EXCEEDANCE
08/07/2016 to 08/17/2016	1	10	15	NO
08/11/2017 to 08/11/2017	3	10		NO
08/08/2018 to 08/08/2018	1	10		NO
08/08/2019 to 08/08/2019	1	10		NO
09/22/2020 to 09/25/2020	2.7	10		NO
07/20/2021 to 07/20/2021	2	10		NO

5.2.9 Iron

Iron has a National Secondary Drinking Water Standard of 0.3 mg/L. Drinking water with high levels of iron can cause taste, odor, and color issues with reddish or orange water and can lead to buildup in pipes, causing clogging. Raw river water, raw well water, blended raw water, and finished water iron data is presented in **Table 5.13**. Where multiple samples were taken in one month, the data was averaged. The raw river water iron maximum was above 5 mg/L in December 2020, the minimum was 0.05 mg/L in April 2021, and the average iron for the data between 2020 and 2021 was 0.73 mg/L. The raw well water iron maximum was 0.41 in February and July 2021, the minimum was 0.00 in multiple months in 2021, and the average iron for the data in 2021 was 0.06. The finished water iron maximum was 0.26 in August 2021, the minimum was 0.00 in multiple months in 2021, and the average iron for the data between 2020 and 2021 was 0.05. The limited iron data does not appear to have a seasonal trend. While the finished water has not exceeded 0.3 mg/L iron, the maximum values have been close to exceeding.

Table 5.13 Monthly Average Source and Finished Water Iron

DATE	RAW RIVER WATER IRON, MG/L	RAW WELL WATER IRON, MG/L	BLENDED RAW WATER IRON, MG/L	FINISHED WATER IRON, MG/L
December 2020	2.58	-	-	0.16
January 2021	0.23	-	-	0.02
February 2021	0.36	0.41	-	0.02
March 2021	0.29	0.06	-	0.02
April 2021	0.73	0.02	-	0.05
May 2021	0.92	0.02	-	0.05
June 2021	0.50	0.04	-	0.03
July 2021	0.82	0.13	0.19	0.04
August 2021	1.05	0.00	0.35	0.08
September 2021	0.53	0.04	0.18	0.03
October 2021	1.05	0.04	-	0.03
November 2021	0.56	0.00	0.23	0.02
December 2021	0.18	-	-	0.06

5.2.10 Manganese

Manganese has a National Secondary Drinking Water Standard of 0.05 mg/L. Drinking water with high levels of manganese can cause taste, odor, and color issues with brownish water and can lead to buildup in pipes, causing scaling. Raw river water, raw well water, blended raw water, and finished water manganese data is presented in **Table 5.14**. Where multiple samples were taken in one month, the data was averaged. The raw river water manganese maximum was 0.67 mg/L in October 2021, the minimum was 0.02 mg/L in June 2021, and the average manganese for the data between 2020 and 2021 was 0.16 mg/L. The raw well water manganese maximum was 0.45 in March 2021, the minimum was 0.14 in August 2021, and the average manganese for the data in 2021 was 0.31. The finished water manganese maximum was 0.35 in July 2021, the minimum was 0.00 in December 2020, and the average manganese for the data between 2020 and 2021 was 0.05. The limited manganese data does not appear to have a seasonal trend. The finished water has exceeded 0.05 mg/L manganese and the average is at the National Secondary Drinking Water Standard of 0.05 mg/L.

Table 5.14 Monthly Average Source and Finished Water Manganese

DATE	RAW RIVER WATER MANGANESE, MG/L	RAW WELL WATER MANGANESE, MG/L	BLENDED RAW WATER MANGANESE, MG/L	FINISHED WATER MANGANESE, MG/L
December 2020	0.15	-	-	0.01
January 2021	0.06	-	-	0.03
February 2021	0.11	-	-	0.04
March 2021	0.05	0.42	-	0.02
April 2021	0.15	0.40	-	0.05
May 2021	0.19	0.38	-	0.06
June 2021	0.06	0.39	-	0.02
July 2021	0.32	0.25	0.20	0.12
August 2021	0.27	0.14	0.26	0.14
September 2021	0.19	0.16	0.18	0.04
October 2021	0.32	0.16	-	0.03
November 2021	0.19	0.16	0.21	0.03
December 2021	0.09	-	-	0.04

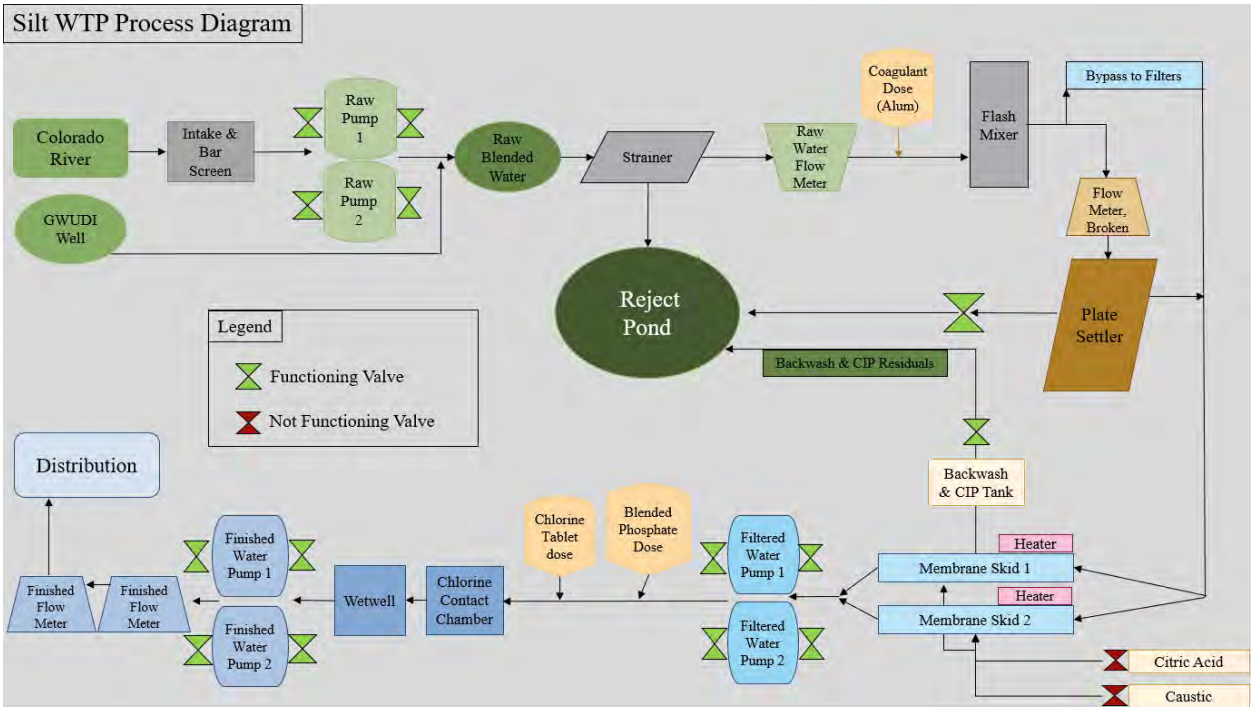
5.2.11 Coagulant

The coagulant used at Silt's WTP is Clarifloc C1400, which is a corrosive, acidic, inorganic aluminum chlorohydrate solution. The dose of coagulant is just under 10 ppm. Operations staff modify this dose as needed to accommodate changes in turbidity, water source, and temperature. Modifications are based upon experience or jar testing. It should be noted while the polymer is mixed into the raw water, there is no flocculation zone so the ability of the coagulant to remove turbidity is not ideal.

5.3 Water Treatment Plant Evaluation

The Silt WTP is a microfiltration plant currently rated for 1.0 MGD. Raw water is pumped to the main WTP building from an intake structure located on the bank of the Colorado River. The first step in treatment consists of coagulation with in-line mixing to aid in coagulation and flocculation. After chemical addition, the water enters the plate settler for precipitation of flocculated solids. Water is then treated by two membrane filters followed by chlorine disinfection and finished water pumping to the distribution system. A process flow diagram is shown in **Figure 5.2.**

Figure 5.2 Town of Silt WTP Process Diagram



5.3.1 Raw Water Intake

The raw water intake structure consists of concrete structure with a manually cleaned bar screen. The intake structure is connected to the raw water pump station with an 18 inch pipe, 18 inch isolation valve, and 48 inch access manhole. The screen on the intake structure is designed to operate with a varying water level of 8.5 feet between lower and high river water levels. Detailed information regarding the intake structure is provided in **Table 5.15.**

Table 5.15 Intake Structure Details

PARAMETER	VALUE
Screen Width	3'-11"
Screen Height	8'-9"
Bar Spacing	2"
Design Flow	2,400 gpm

5.3.2 Raw Water Pump Station

Screened raw water flows into the raw water pump station located adjacent to the raw water intake south of the water treatment plant near the Colorado River. The raw water pump station consists of a concrete vault a two submersible raw water pumps. The top of the vault is equipped with access hatches and davit crane for pump removal. **Table 5.16** provides a summary of the raw water pumping vault and pumping equipment. Alternatively, the Town has two alluvial wells that can be utilized to provide water to the WTP. The alluvial well information is also provided in **Table 5.16**.

Table 5.16 Raw Details

PARAMETER	VALUE
Colorado River Pump Station	
Raw Water Vault Size (lxw)	12'-6" x 8'-0" (approx.)
Vault Depth	18'
Pump Type	non-clog submsersible
Pump HP	20
Pump Quantity	2 (1 duty, 1 standby)
Firm Capacity	800 gpm
Total Future Buildout Capacity	2,400 gpm
Alluvial Well Pumps	
Type	
Capacity and HP pump 1	
Capacity and HP Pump 2	

5.3.3 Strainer

Straining is a necessary first step in the treatment process to remove large debris from the water stream and protect downstream equipment. The raw water strainer is located in the WTP building. The existing strainer was relocated to the new WTP facility when it was constructed in 2004. The strainer is an auto-backwashing type strainer that with a design capacity of 2,400 gpm. **Table 5.17** provides a summary of the auto-strainer. The strainer backwashes automatically; it typically produces about 700 gallons of backwash waste per cycle and it typically backwashes twice per hour.

Table 5.17 Intake Structure Details

PARAMETER	VALUE
Quantity	1
Year Built	2003
Connection Size	10"
Strainer Size	380-micron
Capacity	2,400 gpm

5.3.4 Raw Water Flow Metering

Raw water is metered to provide a record of the amount of raw water the facility pumps from the raw water pump station. The raw water flow meter is located downstream of the auto-strainer. A magnetic flow meter (Seametrics) was recently installed to replace the v-cone type flow meter installed in 2004. Details of the flow meter are provided in **Table 5.18.**

Table 5.18 Raw Water Flow Meter

PARAMETER	VALUE
Quantity	1
Type / Manufacturer	MAG / Seametrics
Size	12"

Table 5.18 Raw Water Flow Meter

PARAMETER	VALUE
Min Flow Rate	58 gpm
Max Flow Rate	11,565 gpm

5.3.5 Flash Mixer

Mixing is an important step in the coagulation/flocculation process in order to successfully remove colloidal matter with sedimentation. Coagulant (Clarifloc C1400 a propriety blend of aluminum chlorohydrate and a polymer) is fed into the raw water pipe downstream of the raw water flow meter. Immediately after chemical injection, a vertical shaft impeller rapid mixer uniformly disperses and blends the coagulant into the raw water prior to sedimentation. The existing rapid mixer was installed prior to the 2004 WTP upgrade and was relocated to the new facility. **Table 5.19** provides a detailed summary of the rapid mixer. While the mixer is sufficient to distribute the coagulant and polymer into the raw water, there is "less mixed" zone to promote flocculation or aggregation of the particles. This likely reduces the performance of the plate settler.

Table 5.19 Flash Mixer Product Data

PARAMETER	VALUE
Quantity	1
Type / Manufacturer	Vertical SHAFT impeller / lightnin
Model No.	EV1L25
Pipe Size, diameter	12"
MIxing G (5°C)	1,600 l/s
Detention Time (2,400 gpm)	0.32 sec
Motor HP / Speed	0.25 hp / 1750 rpm
Impeller Size / Material	3.1" / 316SS
Power Requirements	1ph, 115/230V

5.3.6 Plate Settler

Presedimentation at the Silt WTP consists of a plate settler located adjacent to the main WTP building. The plate settler was repurposed from the original facility and is housed in an enclosure to protect the unit from freezing. The plate settler provides sedimentation with the use of multiple inclined plates to maximize settling effective settling area. The incline of the plates creates a countercurrent flow in which water flows upwards through the plates and collected particles settle downward towards the base of the unit. Clarified water flow over a weir at the top of the unit and collected solids are discharged by gravity to the backwash pond with a manual discharge valve. **Table 5.20** provides a summary of the plate settler.

Table 5.20 Plate Settler Product Data

PARAMETER	VALUE
Quantity	1
Design Capacity	600 gpm
Effective Settling Area	2,000 ft^2
Loading Rate at 650 gpm	0.30 gpm/sf
Sludge Storage Capacity	4,580 gal

5.3.7 Membrane Filtration

Filtration at the Silt WTP consists of two microfiltration membrane units. Each unit contains a filter tank with 48 individual filter modules. Each skid generally consists of the following: filtrate/backwash/clean in place (CIP) pumping, backwash storage tank, blower for backwashing, pneumatic valves, and integrated controls. Membrane cleaning is achieved with intermittent CIP and maintenance cleans that utilize citric acid and sodium hypochlorite. Operations staff have indicated that backwashing and membrane cleaning is utilized more often than intended with the original design. In conversations with Operations Staff, maintenance cleans are performed daily with an exception for lack of time. Backwashing occurs every 20 minutes. Clean in Place (CIP) cleans are not performed; the heaters do not work and the temperature of the respective chemicals cannot be achieved. Additionally, a true CIP requires about 6 hours and staff assert there is insufficient time to accomplish a CIP while trying to ensure sufficient production. The heaters improve viscosity of water and increase the activity of the chemicals; however, the water heaters installed on the actual membrane units are too small to meet the temperature ranges listed in the membrane O&M manual (77ºF for sodium hypochlorite and 40ºC for citric acid). Membranes that fail the leak test are pinned; this event requires a significant shutdown and is performed when necessary. CIP waste is stored in a neutralization vault prior to discharge to the backwash pond. Membrane backwash waste is also sent to the backwash pond for disposal. Detailed information on the microfiltration skids is provided in **Table 5.21.**

The true capacity of the membrane system is not 1 mgd. Membrane systems are designed to operate at an average capacity under continuous operation with the ability to operate at a peak capacity while an adjacent system is backwashing or cleaning. Peak capacity is NOT for continuous use capacity. If redundancy or resiliency is not accounted for in the capacity of the system, the treatment capacity could be considered the peak capacity. However, a more common sense approach would be to utilize the average design capacity of both units or the peak design capacity of one unit (with the other out of service for cleaning). This would reduce the WTP capacity to between 0.5 mgd to 0.76 mgd; significantly less than the current belief of a 1 MGD rating. The plant currently operates for approximately 18 hours per day and produces a 0.29 mgd (201 gpm) which corresponds to 0.39 mgd (268 gpm) If the facility were operated for 24 hours a day. Thus the system is operating at approximately 80 percent capacity with limited ability to accommodate additional cleanings or pinning episodes. On a peak production day in 2021 (0.47 mgd), the facility was operating at almost 95 percent of its capacity. Considering the settled water feed to the system is typically higher than the design criteria value of 1 NTU (higher turbidities reduce capacity), the filter system is operating near capacity a majority of the time.

Table 5.21 Microfiltration Skid

PARAMETER	VALUE
Quantity	2
Manufacturer	US Filter
Model	AXia cmf-s 48s10v
Modules Per Unit	48
Peak Design Capacity, each	350 gpm (700 gpm or 1 mgd total)
Average Design Capacity, each	265 gpm (530 gpm or 0.76 mgd total)
Membrane Material	pvdf, hollow fiber
Membrane Pore Size	0.1 micron avg, 0.4 microns absolute
Raw Water Turbidity to Achieve Rated Capacity	1 NTU
Filtration Area, per module	272 ft^2
Design Flux	42.8 gpd/ft^2
Backwashing Frequency	Every 20 minutes
Maintenance Clean Frequency	Weekly or as needed

Table 5.21 Microfiltration Skid

PARAMETER	VALUE
CIP Clean Frequency	Minimum Every 45 days

5.3.8 Filter Water Pumps

The filter water pumps are on the membrane skids are have a capacity equal to the skid capacities.

5.3.9 Chlorine Disinfection

Disinfection is required by the CDPHE Regulation 11 Colorado Primary Drinking Water Regulations as a means of protecting the community from dangerous pathogens such as cryptosporidium, giardia lamblia, and various virus that can be present in surface waters. Chlorine disinfection at the Silt WTP generally consists of calcium hypochlorite solution injection followed by a chlorine contact basin. Chlorine analyzers are utilized to monitor and maintain target chlorine disinfection and chlorine residual concentrations. The sections below summarize the chlorine chemical feed equipment and chlorine contact basin currently utilized at the facility.

5.3.9.1 Chemical Feed

Disinfection is achieved with calcium hypochlorite tablet feed unit. The chlorine solution generator uses calcium hypochlorite tables to create a feed solution that is fed into the finished water pipe upstream of the chlorine contact basin. Chlorine levels are monitored feed solution is fed to maintain an operator set chlorine dose. A photo of the calcium hypochlorite tablet solution generator is shown in **Figure 5.3.**

Figure 5.3 Town of Silt WTP Calcium Hypochlorite Tablet Solution Generator

5.3.9.2 Chlorine Contact

Chlorinated filtered water is fed to the beginning of the chlorine contact chamber. The basin is a concrete structure located below the WTP building main level slab. Baffle curtains in the basin provide a serpentine flow path that is necessary to provide substantial contact time for adequate inactivation of pathogens. **Table 5-22** provides a summary of design criteria for the chlorine contact basin. As shown in **Table 5.22**, the disinfection contact chamber has sufficient design to meet the disinfection requirements for viruses, but not for giardia (as long as membranes are utilized).

Table 5.22 Chlorine Contact Basin

PARAMETER	VALUE
Basin Area	566 ft^2
Sidewater Depth	9 ft
Volume, gallons	38,117
Baffle Curtain Material	nsf-61 hypalon
Design Flow	1.0 mgd
Contact Time @ 1.0 mgd	55 min
Design Baffling Factor	0.7
Effective Contact Time @ 1.0 mgd	38.5 min
Disinfection Credit Goal	4 log virus inactivation
Water Temperature	0.5º C
Ct value (4 log credit virus), mg-min/l	12
Ct value (0.5 log credit giardia), mg-min/l (provided for reference only)	51
Design Finished Water pH	8.0, s.u.
Finished Water Chlorine Residual, Minimum	1 mg/L
Capacity to Accomplish Virus Ct	3.26 MGD (BF 0.7 and cl = 1.0)
Capacity to Accomplish Giardia Ct	0.75 (BF 0.7 and cl =1.0)

5.3.10 Blended Phosphate

The Town of Silt does not have lead pipes in their distribution system and therefore is not using orthophosphate or other optimal corrosion control treatment for lead pipes. However, due to the manganese in the raw water, they are using blended phosphate to reduce manganese in their finished water. The Town currently uses SeaQuest® blended phosphates that are fed into the system with an LMI microprocessor dosing pump. The chemical feed pump is rated for a maximum flow rate of 1.6 gph and maximum pressure of 150 psi. The Town currently doses approximately 2 mg/L

5.3.11 Finished Water Pumps

The Town of Silt WTP is located at a hydraulically low point relative to the remainder of town. As such, pumping is necessary to convey water throughout the distribution system and storage tanks. The finished water pumps are located in the WTP building and provide water to the distribution system and Town's storage tanks. The finished water pump station consists of a below-grade wetwell immediately after the chlorine contact chamber with two vertical turbine pumps. Typical operating side water depth of the finished water wet well ranges from approximately 4.0 to 8.5 feet. **Table 5.23** provides product data for the finished water pumps. A photo of the finished water pumps is provided in **Figure 5.4**.

Table 5.23 Finished Water Pumps

PARAMETER	VALUE
Pump Quantity	2 (1 duty, 1 standby)
Design Flow	700 gpm
Design Head	337 feet tdh

Figure 5.4 Town of Silt WTP Finished Water Pumps

5.3.12 Finished Water Metering

Finished water flow is measured downstream of the finished water pumps. The town currently utilizes a v-cone differential pressure type flow meter manufactured by McCrometer. A photo of the finished water flow meter is shown in **Figure 5.5**.

Figure 5.5 Town of Silt WTP Finished Water Flow Meter

5.3.13 Storage

The town currently has 4 storage tanks that are located in different areas throughout Town. The Town currently has approximately 1,800,000 gallons of storage. The tanks were constructed at different periods as demand has increased over the years. The following sections provide sizing and volume parameters for each tank currently utilized by the Town.

5.3.13.1 Eagles View Tank

The largest water storage tank in the Town of Silt is the Eagle View Tank. It is located at 547 Eagles Nest Drive and has a capacity of 800,000 gallons. It was constructed in 1987 and was recently refurbished in 2017. **Table 5.24** provides a summary of tank details for the Eagle's View Tank.

Table 5.24 Eagle's View Storage Tank

PARAMETER	VALUE
Year Built	1987 (refurbished in 2017)
Tank Material	N/A
Tank Volume	800,000 gallons
Tank Diamter	77.5 feet
Tank Height	24 feet
Tank Floor Elevation	5,666

5.3.13.2 Sunrise Tanks

Two water storage tanks are located in the Sunrise Division of the Town at 240 E. Vista Drive. These tanks are located adjacent to one another and provide a total of 750,000 gallons of storage. A summary of the tanks located in the Sunrise subdivision is provided in Table 5.25 below.

Table 5.25 Sunrise Storage Tanks

PARAMETER	VALUE
SUNRISE TANK 1	
Year Built	1987
Tank Material	N/A
Tank Volume	150,000 gallons
Tank Diamter	34 feet
Tank Height	24 feet
Tank Floor Elevation	5,826
SUNRISE TANK 2	
Year Built	2009
Tank Material	N/A
Tank Volume	600,000 gallons
Tank Diamter	68 feet
Tank Height	24 feet
Tank Floor Elevation	5,828

5.3.13.3 Mesa View Tank

The Mesa View tank is located in the Mesa View subdivision at 1234 Standing Door Drive. This tank provides 250,000 gallons of storage. It was constructed in 1999 and has recently been cleaned in 2018. A summary of the Mesa View Tank is provided in **Table 5.26**.

Table 5.26 Mesa View Storage Tank

PARAMETER	VALUE
Year built	1999
Tank Material	N/A
Tank Volume	250,000
Tank Diamter	43.5 feet
Tank Height	24 feet
Tank Floor Elevation	5,869

5.3.14 Backwash Pond

Waste from the plate settler and the membrane system is discharged to a backwash pond. The backwash pond discharges to the Colorado River via discharge permit # 641000. The backwash pond currently exceeds permitted discharge flow rate as a result of the significant overflow from the raw water pumps/plate settler.

5.4 Existing Water Treatment Plant Evaluation Summary

Below is a list of shortcomings identified as part of the evaluation of the WTP.

- Raw water delivery and flow system produce a lot of excess water. To meet future demands and improve operations, additional pumps and control improvements will be required.
- The Alluvial wells have lower turbidity than the Colorado River water. However, the alluvial water tends to be higher in iron and manganese. The existing alluvial wells do not have capacity to meet the full summer
- The plate settler lacks sufficient capacity to meet future demands. This should be expanded or replaced with a system that can accommodate a large variation in raw water turbidity.
- Colorado River was during the runoff season has high turbidity which impacts pretreatment and filtration processes. It may be worthwhile to investigate expanding the use of the wells and/or use of the gravel pond across the river in an effort to reduce turbidity to the WTP.
- Use of ACH as a coagulant reduces the need to modify the pH to improve flocculation and coagulation and should be continued. Dose should be confirmed with regular testing. The WTP currently utilizes a Clarifloc product which is a proprietary blend of ACH and a polymer. Silt should consider utilizing pure ACH with no polymer as the use of polymers can negatively impact membrane fouling.
- There is an insufficient coagulation/flocculation system at the WTP. This greatly reduces the effectiveness of the plate settler and increases the turbidity load to the membranes. In effect, the elevated turbidity load to the membranes increases backwashing and cleaning frequency which decreases treatment capacity.

- By utilizing membranes for filtration, the WTP is not required to test and document TOC removal. However, improving TOC removal will reduce DBP formation potential. While it currently doesn't monitor for TOC removal, incorporating regular TOC removal monitoring will provide Operations with knowledge regarding DBP formation potential. Additionally, DBP formation potential equipment could be provided to staff to assist with process monitoring.
- The membranes lack sufficient treatment to meet future demand projections. During a peak day, the WTP is operating at or near capacity. Additional filtration capacity is needed.
- The life of the membranes could be extended by performing a Clean In Place (CIP). CIPs are currently not performed because: (1) the heaters do not work and (2) the time required for a CIP significantly impacts production time.
- Maintenance and CIPs are manually intensive processes. New controls should be incorporated to automate this process.
- The table chlorination system currently works. However, it should be upgraded to a system that can be easily flow controlled with sufficient instrumentation to determine chlorine demand and dose. This improvement will likely improve the reliability of meeting the DBP requirements.
- Iron and manganese removal should be addressed. Currently, the addition of seaquest masks the impacts of iron and manganese. A long term, resilient removal solution should be identified and installed.
- The chlorine contact chamber has sufficient capacity to provide 4 log virus inactivation at the projected future water demands. Should the regulations change or should the WTP replace the membranes with a conventional mixed media filter system, additional disinfection credits will need to be provided to provide additional giardia inactivation credits. This could be accomplished via UV disinfection or additional contact chamber volume.
- There is one disinfection contact chamber. This limits the ability of staff to clean and maintain the chamber.
- Silt should monitor their raw water sources for the unregulated contaminants.
- Finished water pumping capacity is currently not sufficient to meet the projected demands.

SECTION 6 - WTP PROCESS ALTERNATIVES

The Town of Silt's WTP has not undergone any major upgrades since its original construction in 2005. The Silt WTP is currently rated to treat 1 million gallons per day (MGD). The Silt WTP is a microfiltration plant currently rated for 1.0 MGD; however, the true capacity is only 0.6 MGD. Raw water is pumped to the main WTP building from an intake structure located on the bank of the Colorado River. The first step in treatment consists of coagulation with in-line mixing to aid in coagulation and flocculation. After chemical addition, the water enters the plate settler for precipitation of flocculated solids. Water is then treated by two membrane filters followed by chlorine disinfection and finished water pumping to the distribution system.

This section evaluates treatment alternatives that address issues at the WTP identified in **Section 5**. Specifically, **Section 5** identified the following areas that needed improvement:

- Able to meet projected peak day demands with one treatment train out of service. Upgraded WTP should have 2.0 MGD of capacity now and will be expandable to 3.0 MGD in the future.
- A good pretreatment system capable of treating the historical range of turbidity (5-1,000 NTU) down to a consistent 1 NTU.
- Install a new process control system with sufficient instrumentation to automate many of the treatment processes and that is capable of trending/analyzing historical data.
- Incorporate a process to oxidize and remove iron and manganese.
- Upgrade the filtration technology to a minimum of 2 units each with a capacity of 1.0 mgd (average).
- Account for periodic cleaning of the backwash pond and residuals disposal
- Plan to a future capacity of 3.0 mgd to accommodate potential future changes in water demands. The Town currently reduces the impacts of irrigation through the use of a raw water irrigation system. As the town expands, it is possible that the raw water irrigation system will not be expanded.
- Provide sufficient inactivation credits for cryptosporidium, giardia, and virus for the selected filtration technology.

6.1 Consolidation and Water Supply Considerations

6.1.1 Consolidation Analysis

The project team investigated the feasibility of consolidating with the neighboring communities of Rifle and New Castle. New Castle lacks sufficient treatment infrastructure so consolidating with them would require expanding their treatment infrastructure in addition to connecting a pipeline; estimates of this cost are higher than the cost for Silt to construct their own treatment system. Connection with Rifle would require construction of a four-mile-long pipeline along with a chlorine booster station. Estimated cost of the pipeline and booster station is $10 million; this does not include tap fees. Tap fees are an additional $18 million. Due to these additional costs, consolidation with New Castle and Rifle were not pursued further at this time.

6.1.2 Water Supply Analysis

Expansion of Silt's alluvial well system, utilization of riverbed filtration to reduce the raw water turbidity, and use of a gravel pond across I-70 as a pre-settling basin were also evaluated. Expansion of the alluvial well system could be performed; however, the zone of influence is very large requiring a significant spacing between the wells. Cost of the additional infrastructure (wells and pipeline) is

estimated to be $2.5 million. Utilization of the gravel pond would require construction of a pump station and pipeline at an estimated cost of $1.5 million. Additionally, the infiltration rate to the pond is not sufficient based upon preliminary hydraulic testing and would require expansion of the alluvial well system. Estimated total cost for the settling pond and well system is approximately $2.5 million. The costs for these systems (riverbank filtration and pre-settling pond) are over and above the treatment system cost, i.e., pretreatment and filtration are still required so these costs would increase the overall project cost by approximately $2.5 million. For this reason, riverbank filtration and pre-settling pond were not considered at this time; however, it is recommended that the Town consider this infrastructure in the future.

6.2 Cost Estimate Assumptions

Capital, operation, and maintenance (O&M), and net present values were prepared for all alternatives evaluated as part of this analysis. Assumptions utilized in the analysis are detailed below.

6.2.1 Capital Cost

Construction costs are based on the quantities of raw materials, construction labor, major equipment, supplies, excavation, and contractor's markup for overhead and profit. During the planning and design process, these items provide a rational basis to estimate total construction costs and develop project budgets. Construction cost estimates were developed with cost data from recently completed projects, published literature, and equipment manufacturer's quotations.

The itemized construction cost estimates contain contingencies to allow for unknown or uncertain conditions. At present, detailed design has not occurred and many project details have not yet been determined. The contingency factor accounts for hidden or unknown physical conditions such as conflicting utilities and construction details which cannot be identified, predicted, or accurately estimated but are likely to occur based on experience with similar projects. Contingencies vary with the level of detail associated with the planning, budgeting, or design process. As a project becomes more defined, the unknowns are identified, and contingency factors decrease. The construction cost estimates represent "order-of-magnitude" costs for each alternative. The American National Standards Institute (ANSI) and the American Association of Cost Engineers (AACE) define order-of-magnitude estimates as "an approximate estimate made without detailed engineering data". The American Association of Cost Engineers recommends that facility planning reports include a contingency of 20 to 40 percent. Cost estimates for final engineered plans may have contingencies reduced to 10 to 15 percent based on detailed design information. Based on the current level of uncertainty associated with this project, a contingency factor of 30 percent of estimated construction costs has been assumed. Cost factors given in **Table 6.1** have been added to the materials and equipment costs to develop total project costs for each alternative.

Table 6.1 Cost Factors Used to Develop Estimated Total Project Cost

COST FACTOR	PERCENT OF CONSTRUCTION	DESCRIPTION
Mobilization/ demobilization	5	Contractor cost
Contractor overhead & profit	20	Markup on subcontracts, materials, & labor
Bonding and insurance	3	Contractor cost
Contingencies	30	Unknown conditions & conflicting utilities
Planning, Engineering, and Administration	20	Planning, design, survey, geotechnical investigation, construction observation, training, O&M manual, startup services

6.2.1.1 Operation and Maintenance Costs

Estimates of operation and maintenance (O&M) costs are provided for each piece of equipment in this evaluation. O&M costs include an estimate of power consumption, chemical costs, structural and equipment maintenance/replacement costs. O&M estimates are utilized in the NPV analysis. The breakdown of estimated O&M costs is provided in **Appendix D**. O&M cost assumptions are provided in **Table 6.2**.

Table 6.2 Operation and Maintenance Cost Estimate Assumptions

ITEM	VALUE
Electrical Energy Cost $/kWh	0.042
Demand Charge $/kW	15.26
Structural Life, years	50
Structure Upkeep/Maintenance, percent of structural cost	2
Equipment Life, years	20
Equipment Maintenance/Replacement Costs, percent of mechanical cost	4
Lighting Costs, kW/1000 ft^2	1.0
Solids Hauling Costs, $/ton	80
Number of WTP Staff	3
Water Plant Operator Salary with benefits, $/employee	89,000
Sampling Cost, $/year	150,000

6.2.1.2 Net Present Value

Net present values of all alternatives were calculated for each alternative. The net present value of the alternatives was calculated by adding the construction cost and the present value of the estimated 20-year plant operation and maintenance cost. Assumptions utilized to calculate the net present value are provided in **Table 6.3**.

Table 6.3 Net Present Value Assumptions

ITEM	VALUE
Real Interest Rate, percent	-0.5
Project Design Life, years	20

Note: Real interest rate for 20-year time period was used as published by the Executive Office of the President, 2022.

6.3 Planning Level Estimates for Improvements and Alternatives

The Town is committed to producing high quality potable water that meets all regulatory requirements as well aesthetic (taste, color, and odor) qualities that are expected from the Town's residents. This section includes an evaluation of alternatives to increase plant capacity, provide reliable turbidity removal, provide iron and manganese removal, improve disinfection reliability, and provide for the management of residuals.

There are four alternatives presented in this section. All alternatives will include a new strainer to prevent fish and other large items from entering the WTP. All alternatives utilize the residuals pond which will require periodic dredging and cleaning.

Demand Increase

The Town currently has two membrane filter skids, each with a rated average design capacity of approximately 0.76 MGD and peak design capacity of 1.0 MGD. Accounting for backwash and cleaning, the true capacity of the membrane system is only 0.6 MGD. With a projected max daily water demand of 1.21 MGD in 2042, additional capacity will be necessary. The alternatives presented below will increase the capacity to 2 MGD with an option to upgrade in the future to 3 MGD.

Turbidity

The Town currently observes periods of high turbidity in excess of 2,000 NTU. The existing plate settler is undersized for this load and is unable to remove turbidity reliably. As a result, membrane performance is reduced due to an increase in backwashing and cleaning frequency. The alternatives presented below can accommodate a wide range in raw water turbidity.

6.3.1 Alternative 1

Alternative 1 consists of a solids contact clarifier, mixed media filtration with green sand for iron/manganese removal, and ultraviolet and chlorine disinfection. The sections, below, describe the components of Alternative 1.

6.3.1.1 Solids Contact Clarifier

Solids contact clarifiers combine the process of mixing, flocculation and sedimentation in a single tank. Recirculation of solids and mixing is accomplished by a radial or axial turbine. Flocculation occurs within the reaction well. Sedimentation occurs in the clarification zone. The clarifier is comprised of a mixing zone, flocculation (reaction) zone, sludge blanket zone, and a clarification zone. A turbine draws concentrated settled solids from the bottom, and mixes them with the lower solids concentration influent and disperses it into the reaction well. Solids Contact Clarifiers are typically used in water softening and color and turbidity removal clarifiers in water treatment plants, and polishing or tertiary clarifiers in wastewater treatment plants. Solids Contact Clarifiers are particularly advantageous in lime softening of groundwater since the precipitated solids help speed the flow, growing larger crystals of precipitate to provide a thicker waste sludge. Solids Contact Clarifiers have also been applied in the chemical treatment of industrial wastes such as metals removal, and used successfully for cooling tower make up water.

The helical, upflow, “slurry blanket” design of a solids contact clarifier requires no internal moving parts and provides thorough mixing, tapered flocculation and sedimentation in a hydraulically-driven system. Mixing, precipitation, coagulation and flocculation all occur within the blanket. Excess solids are removed through an in-vessel slurry concentrator that is vertically adjusted to control the blanket depth and solids contact time. The waste slurry concentration is maximized by adjusting the frequency and duration of the slurry discharge. Clarification occurs above the slurry blanket. The conical shape causes the water to slow as it flows upward through the vessel. A radial weir system located at the water surface varies the weir rate to maximize clarification efficiency. **Figure 6.1** shows the component view of a solids contact clarifier system. **Table 6.5** shows the design criteria for the solids contact clarifier.

Figure 6.1 Component View of ClariCone System (McDermott, 2022)

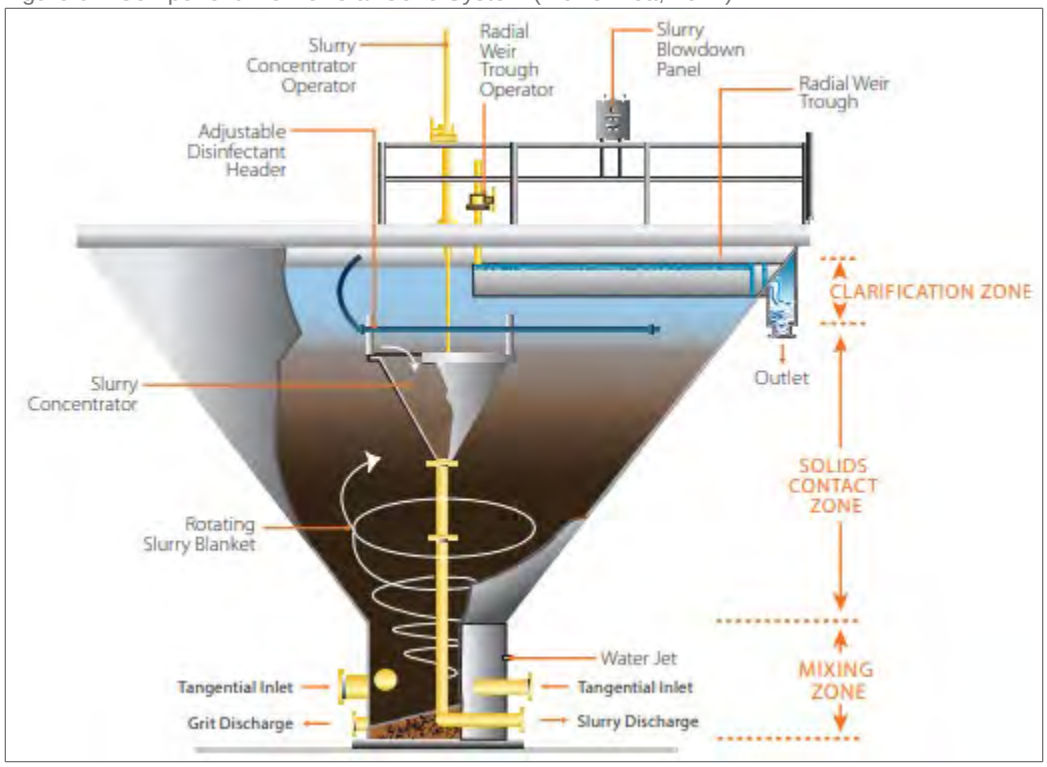


Table 6.5 Solids Contact Clarifier Design Criteria

PARAMETER	VALUE
Number of Claricones	2
Plant Design Flow, gpm	695
DIameter, ft	30
Height	22'-11"
Surface Rise Rate, gpm/ft^2	≤ 1
Hydraulic Retention Time, Minutes	≥ 60

6.3.1.2 Mixed Media

Filtration of water through porous granular media has been the most commonly used water treatment process for several decades. Granular media filters can produce filtered water with low turbidity, but can experience high turbidity spikes if good pretreatment is not maintained. Mixed media filters consist of an underdrain system that supports the approximately three feet of mixed media. The mixed media is typically composed of garnet, sand, and anthracite. Settled water from the pretreatment process enters at the top of the filter; it flows by gravity through the layers of anthracite, sand, and garnet. Flowing through media, particles are removed and the filtered water flows through the underdrains. Periodically (approximately 1/day), the accumulated filtered particles are backwashed off the media and sent to a residual handling process. Mixed media filters typically are sized to accommodate a max flow rate of 5 gpm per ft^2. Green sand can be incorporated into the filters; green sand is a catalyst used in the removal of iron and manganese.

6.3.1.3 Disinfection Alternatives

Currently, the Silt WTP uses calcium hypochlorite tablets as their only method of disinfection. While this system currently works, the dose is difficult to tightly control which increases the Disinfection Byproduct (DBP) formation potential. DBPs are formed as a result of chlorine reacting with organic matter in the finished water from the water treatment plant. Regulated DBPs include two categories, trihalomethanes (TTHM) and haloacetic acids (HAA5). The residual chlorine drives THM and HAA5 formation in the distribution system. To date, the WTP has been able to maintain regulated DBP levels below the maximum contaminant limits (MCLs). The Town may wish to upgrade to a disinfection system that can have a more tightly controlled chlorine dose or, potentially, a combination system (UV and chlorine) to meet the required disinfection requirements.

6.3.1.3.1 Sodium Hypochlorite

Sodium hypochlorite (NaOCl) is a compound that is used on a large scale for odor removal and water purification and disinfection. Sodium hypochlorite is a liquid and can be dosed in a liquid feed system that connects to SCADA for dosing control. Chlorine is very effective for the inactivation of viruses, but is not as effective for the inactivation of giardia and chlorine does not inactivate cryptosporidium. A chlorine system would consist of two sodium hypochlorite storage tanks, 3 chemical feed pumps, an online chlorine residual meter, and controls. Storage tanks for the selected chlorine disinfectant would be installed in the building containing the existing WTP. Sodium hypochlorite was used for cost estimation purposes.

6.3.1.3.2 Ultraviolet (UV) Disinfection

UV treatment is an acceptable disinfection option under the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), Groundwater Rule, and Stage 2 Disinfectant/Disinfectant By-Product Rule (D/DBPR). Many state regulatory agencies, including Colorado, have not developed approval requirements specifically for UV disinfection. In Colorado, UV disinfection must be approved on a case-by-case basis.

The LT2ESWTR specifies the UV doses for different levels of inactivation credit, performance validation testing of UV reactors, monitoring, reporting, and off-specification operation. EPA developed UV dose required to receive credit for inactivation of *Cryptosporidium*, *Giardia*, and viruses (**Table 6.6**). The UV dose values in **Table 6.6** are applicable only to post-filter applications of UV disinfection. Many WTPs operate UV systems with doses that are 10 to 20 percent higher than the required dose to ensure compliance.

Table 6.6 UV Dose Requirements – millijoules per centimeter squared (mJ/cm2)

TARGET	LOG INACTIVATION							
Pathogens	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Cryptosporidium	1.6	2.5	3.9	5.8	8.5	12	15	22
Giardia	1.5	2.1	3.0	5.2	7.7	11	15	22
Virus	39	58	79	100	121	143	163	186

Source: 40 CFR 141.720(d)(1)

Log Removal Credits

Regulations require public water systems to provide a minimum of 3-log removal of *Giardia lamblia*, 4-log removal of viruses, and 3-log removal of *Cryptosporidium* (bin 1 requirements). For the pretreatment and filtration technologies of this alternative, UV would be required to provide 0.5 log inactivation of giardia as the existing disinfection system lacks sufficient capacity.

UV Equipment Validation

UV reactors must be tested to validate disinfection performance at specific UV doses and a range of operating conditions. UV reactors can be validated either off-site or on-site. UV reactors that are validated off-site before installation (i.e., pre-validated) by a third-party validation test center or a UV manufacturer facility will meet the LT2ESWTR requirements. UV reactors can also be validated on-site at the WTP after they have been installed. If pre-validated reactors are used, the hydraulic conditions (inlet and outlet configuration, etc.) used for the validation tests must be incorporated into the facility. In a new UV building, the inlet and outlet piping configuration would be designed to duplicate the configuration used when the procured UV reactor was validated.

The LT2ESWTR requires Public Water Systems (PWS) to monitor UV reactors to demonstrate operation within the validated range of conditions for the required UV dose. Operators must monitor each reactor for flow rate, lamp status, UV intensity as measured by a UV sensor, and other parameters as required by the state. UV absorbance should also be measured when it is used in a dose-monitoring strategy. Operators must verify the calibration of UV sensors and recalibrate sensors in accordance with a state approved protocol.

To receive disinfection credit for UV, at least 95 percent of the water delivered to the public during each month must be treated at the required UV dose by UV reactors operating within validated conditions. Operators generally deliver the required UV dose at all times during treatment. Operating outside the validated limits of the UV reactors (off-specification) must be avoided but compliance is based on the volume of off-specification water treated.

Simple operation, small footprint, and moderate costs make UV technology a good primary disinfection alternative. However, UV produces no residual, so a secondary chemical disinfectant must be used in the distribution system.

UV disinfection at UV doses up to 200 mJ/cm^2 do not change the pH, turbidity, dissolved organic carbon level, UVT, color, nitrate, nitrite, bromide, iron, or manganese of the water being treated. UV light at doses less than 400 mJ/cm^2 do not significantly affect the formation of THMs or HAAs upon subsequent chlorination

UV Disinfection Installation

UV disinfection is best applied to the combined filtered effluent downstream of the filters and ahead of the storage tank (**Figure 6.3**). Sodium hypochlorite would then be injected following the UV system. If the UV system failed, additional chemical disinfectant could be added to maintain operation.

Figure 6.3 Typical Inline UV Disinfection System

UV treatment inactivates microorganisms including viruses by damaging their genetic structure. Although UV disinfection does not produce any known DPBs, it also has no effect on TOC. The organic compounds that would generate chlorine demand in a chlorine contact basin pass into the distribution system. When chlorine is used as the secondary disinfectant, the organic compounds remaining in the filtered water will react with residual chlorine and produce DBPs in the distribution system. This however does not appear to be an area of concern since Silt is consistently below the MCLs for DBPs.

UV Disinfection Equipment

UV disinfection systems for potable water are compact, inline units that allow retrofitting in existing pipe galleries with minimal space. The reactors can be installed vertically or horizontally as long as the piping configuration allows for the lamps to be continuously submerged.

The systems typically employ low pressure lamps with variable output to respond to flow requirements and water quality changes. The inline lamps are housed in quartz sleeves that are typically situated parallel to the flow of the water. The UV reactors are equipped with sensors that monitor UV output within the reactor and UV irradiance sensor close to the most effective germicidal range (254nm) that would be strongly absorbed by DNA.

To minimize the potential of water scaling on the sleeves reducing disinfection, UV disinfection systems are provided with an automatic cleaning system. The cleaning system operates on-line while the UV reactor is in operation. Stainless steel wiper collars are fitted around each quartz sleeve and each collar is mounted on a common yoke and driven along the length of the sleeve by the same drive. The wiper collars contain a cleaning agent between two seals which is NSF-Standard 60 certified for food-grade service. The cleaning agent dissolves scale, natural organic matter, algae, and iron while the seals wipe the surface the quartz sleeves. The cleaning system may be operated manually at the local control panel, may be set to operate at a fixed time interval, or can run in automatic mode. In the auto mode, the system logic calculates the fouling rate and adjusts the cleaning interval. The automatic self-cleaning process enables the lamps in the UV system to operate for extended periods without manual mechanical or chemical cleaning.

Table 6.7 shows the estimated costs for Alternative 1, a solids contact clarifier with mixed media filtration with green sand, ultraviolet and chlorine disinfection.

Table 6.7 Construction Cost and Total Project Cost Estimate for Alternative 1

ITEM	ALTERNATIVE 1 COST, $
Site/Civil	272,000
Structural/Architectural	5,268,000
Process	4,616,000
HVAC	1,524,000
Electrical	1,829,000
Total Materials and Equipment	13,509,000
Construction Cost[1]	21,346,000
Total Project Cost[2]	25,616,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

6.3.2 Alternative 2

Alternative 2a consists of plate settlers, mixed media filtration with green sand, and ultraviolet and chlorine disinfection. Alternative 2b consists of plate settlers, membranes, and chlorine disinfection. Ultraviolet disinfection is not needed with membrane filtration. See Section 6.2.1.2 for information on the mixed media system and Section 6.2.1.3 for information on disinfection. The sections, below, describe the components of Alternatives 2a and 2b.

6.3.2.1 Plate Settlers

Plate settlers, also known as tube settlers, or lamella clarifiers are used in drinking- and wastewater treatment plants to settle out suspended solids. Depending on the application the TSS (total suspended solids) loading can vary between 50 to 500 mg/l or more. When the solid settling force is higher as all drag forces, solids will settle down on the channel surface of the tube settler, accumulate with other solids and slide down as sludge.

Tube settlers are designed to provide as much settling surface as possible but at the same time they must prevent channel clogging. To reduce the risk of clogging, tube settlers usually have the following design features:

- Polypropylene or PVC material with lubricating additives to provide a smooth, antifriction surface
- 60-degree channel inclination to create a countercurrent flow of water and sludge. Compared to a vertical channel, particles settle faster within 60degree inclined channels because settling solids do not interfere with raising obstacles.
- Channel sizing or plate distance varies depending on the application and TSS loading
- Channel geometry includes a V-shaped groove for sludge accumulation and sliding

Figure 6.4 shows the MRI plate settler process schematic and **Table 6.8** shows the plate settler design criteria.

Figure 6.4 MRI Plate Settler Schematic (MRI, 2022)

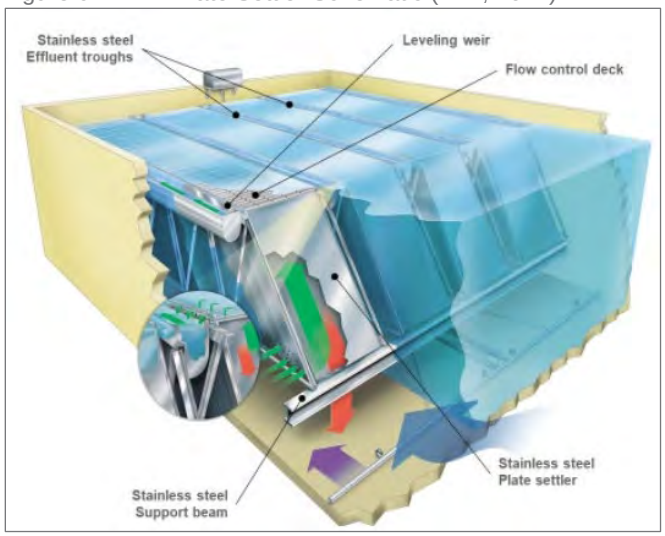


Table 6.8 MRI Plate Settler Design Criteria

PARAMETER	VALUE
Design Flow Per Basin, mgd	1
Number of Basins, #	2
Basin Dimensions (l x w x swd), 15	30 x 13 x 15
Plate Loading Rate, gpm/ft^2	0.30
Plate Area Efficiency Factor, %	90
Plate Angle, degrees	55
Estimated Head Loss Through System, ft	0.83
Materials of Construction	304 SS
Sludge Flow Per Collector, gpm	150-200
Solids Removal Concentration, %	0.5-2
Drive Power, HP	1/4

6.3.2.2 Membrane Skids

Almost all of the MF and UF systems currently available are pressure filters. In pressure systems, the hollow fibers are bundled together longitudinally and encased in a cylindrical pressure vessel to make a filter module. At each end of the chamber, the fibers are embedded in an epoxy resin or urethane plug. The cylindrical pressure vessel housing the membranes is constructed of molded nylon, PVC, or fiberglass. Several cylindrical modulesoperating in parallel form a treatment array or unit. Several modules in a manifold are connected with piping, valves, and automated controls.

Feed water is pumped directly into each module and around the bundle of hollow fibers. Feed pressure is 25 to 35 psig and normal operating differential pressure for the membrane is 5 to 30 psi. During normal operation, water passes from the outside of the membrane into the hollow center and exits as filtrate (permeate) through openings at the terminal end of each hollow fiber. Suspended solids and microorganisms accumulate on the outside surface of the hollow fibers. Filtered particles that accumulate on the membrane surface are removed from the system by periodic backwash cycles.

A microfiltration filter has a pore size around 0.1 micron, so when water undergoes microfiltration, many microorganisms are removed, but viruses remain in the water. Ultrafiltration would remove these larger particles and may remove some viruses. Neither microfiltration nor ultrafiltration can remove dissolved substances unless they are first adsorbed (with activated carbon) or coagulated (with alum or iron salts). **Figure 6.4** shows a membrane filtration system and **Table 6.9** shows the membrane skid design criteria.

Figure 6.5 Membrane Filtration System (MEMCOR, 2022)

Table 6.9 Membrane Skid Design Criteria

PARAMETER	VALUE
Quantity	2
Manufacturer	Memcor
Model	CPII MR2
Modules Per Unit	48
Average Design Capacity, each	625 gpm (1,250 gpm or 1.8 mgd total)
Membrane Material	pvdf, hollow fiber
Membrane Pore Size, micron	0.04
Raw Water Turbidity to Achieve Rated Capacity	1-10 NTU
Filtration Area, per module	721 ft^2
Design Flux	45.8 gpd/ft^2
Backwashing Frequency	Every 30 minutes
Maintenance Clean Frequency	Every 24 hours
CIP Clean Frequency	Minimum every 30 days

Table 6.10 shows the estimated costs for Alternative 2a consisting of plate settlers, mixed media filtration with green sand, and ultraviolet and chlorine disinfection and Alternative 2b consisting of plate settlers, membranes, and chlorine disinfection.

Table 6.10 Construction Cost and Total Project Cost Estimate for Alternative 2a and Alternative 2b

ITEM	ALTERNATIVE 2A COST, $	ALTERNATIVE 2B COST, $
Site/Civil	266,000	287,000
Structural/Architectural	4,453,000	4,806,000
Process	4,602,000	4,051,000
HVAC	1,388,000	1,372,000
Electrical	1,666,000	1,646,000
Total Materials and Equipment	12,398,000	12,162,000
Construction Cost[1]	19,590,000	19,218,000
Total Project Cost[2]	23,508,000	23,062,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

6.3.3 Alternative 3

Alternative 3 consists of a conventional package system, including mixed media filtration with green sand, and ultraviolet and chlorine disinfection. See Section 6.2.1.2 for information on the mixed media system and Section 6.2.1.3 for information on disinfection. The sections, below, describe the components of Alternative 3.

6.3.3.1 Conventional Package System

Various package water treatment systems are available and include pretreatment and filtration. Package conventional systems contains coagulation, flocculation, sedimentation, and filtration. **Figure 6.6** shows a conventional package system and **Figure 6.7** shows the process overview for conventional package systems. **Table 6.11** shows the design criteria for conventional package systems.

Figure 6.6 PulsaPak™ System (SUEZ, 2022)

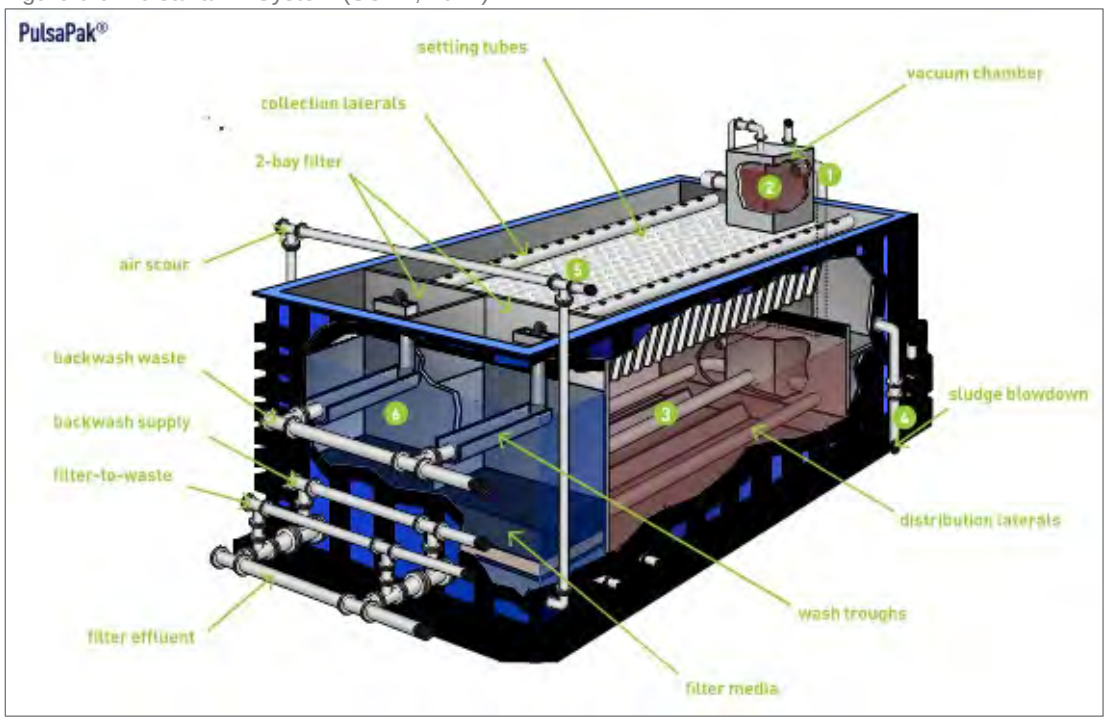


Figure 6.7 PulsaPak™ Process Overview (SUEZ, 2022)

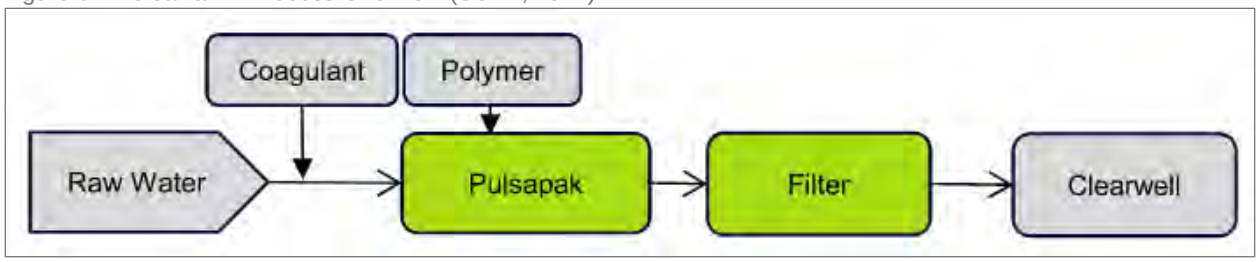


Table 6.11 Conventional Package System Design Criteria

PARAMETER	VALUE
Flow Rate, gpm	1,389
Number of Units	2
Dimensions of Filter Cells Per Unit, ft	5.5 x 21
Loading Rate, gpm/ft^2	1.61
Filtration Rate, gpm/ ft^2	3.01
Backwash – Water, gpm/ ft^2	20
Backwash – Air Scour, scfm/ ft^2	3

Table 6.12 shows the estimated costs for Alternative 3 with a conventional package system, mixed media with green sand and UV and chlorine disinfection.

Table 6.12 Construction Cost and Total Project Cost Estimate for Alternative 3

ITEM	ALTERNATIVE 3 COST, $
Site/Civil	259,000
Structural/Architectural	4,234,000
Process	5,718,000
HVAC	1,532,000
Electrical	1,838,000
Total Materials and Equipment	13,581,000
Construction Cost[1]	21,461,000
Total Project Cost[2]	25,754,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

6.3.4 Alternative 4

Alternative 4 consists of ballasted flocculation, mixed media filtration with green sand, and ultraviolet and chlorine disinfection. See Section 6.2.1.2 for information on the mixed media system and Section 6.2.1.3 for information on disinfection. The sections, below, describe the components of Alternative 4.

6.3.4.1 Ballasted Flocculation

Ballasted flocculation is a high rate clarification process. The ballasted flocculation process provides turbidity removal by coagulation, flocculation with a microsand ballast, and sedimentation for high-rate turbidity removal. This process has a short hydraulic residence time and can easily handle rapid raw water load and/or flow fluctuations. Ballasted flocculation systems have a small footprint, which is

advantageous with Silt's limited WTP property. The microsand buffers the effect of raw water flow or load variations, making the process easy to operate. Frequent shutdowns and restarts are possible with ballasted flocculation systems, and the system can achieve up to > 99% removal efficiencies of turbidity, suspended solids and associated pollutants. **Figure 6.8** shows a process schematic for a ballasted flocculation process and **Table 6.13** shows the design criteria for the system.

Figure 6.8 Actiflo™ ACP2 Process Schematic (Actiflo, 2022)

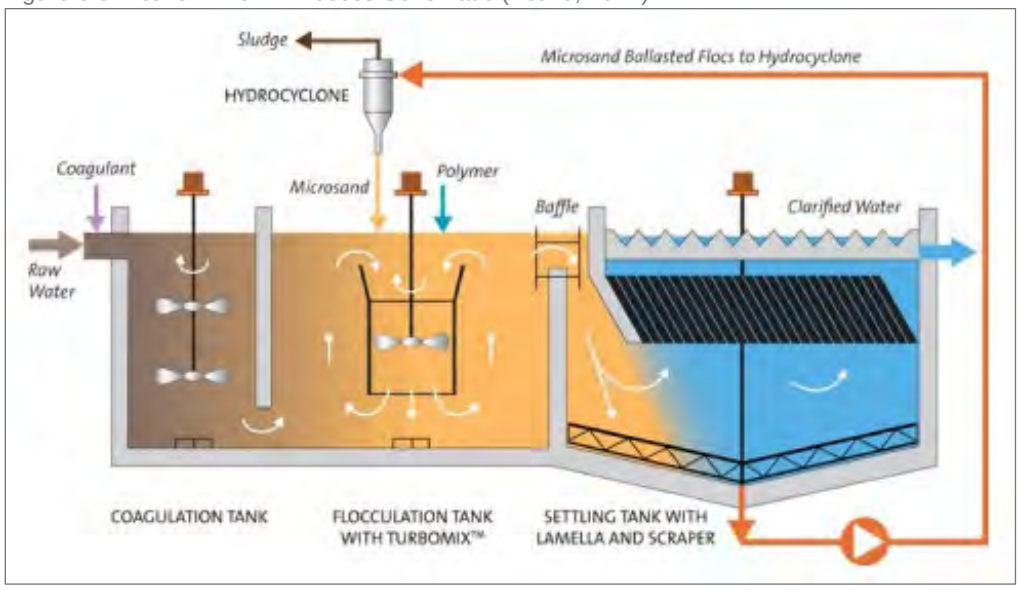


Table 6.13 Actiflo™ ACP2 Design Criteria

PARAMETER	VALUE
Pre-Coagulation Tank Hrt, min	1.6
Coagulation Tank Hrt, min	1.6
Maturation Tank Hrt, min	4.9
Settling Tank Hlr, gpm/sf	15.9
Coagulation Tank Mixers, 1 hp, qty	2
Sand Recirculation Pumps, qty, hp	4 @ 5
Hydrocyclones, qty	4

Table 6.14 shows the estimated costs for Alternative 4 with ballasted flocculation, mixed media filtration with green sand, and UV and chlorine disinfection.

Table 6.14 Construction Cost and Total Project Cost Estimate for Alternative 4

ITEM	ALTERNATIVE 4 COST, $
Site/Civil	313,000
Structural/Architectural	5,185,000
Process	5,581,000
HVAC	1,662,000
Electrical	1,995,000

Table 6.14 Construction Cost and Total Project Cost Estimate for Alternative 4

ITEM	ALTERNATIVE 4 COST, $
Total Materials and Equipment	14,736,000
Construction Cost[1]	23,285,000
Total Project Cost[2]	27,942,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

6.3.5 Alternatives not Considered

A FRC high-rate PCL Dissolved Air Flotation (DAF) system was investigated; however, the DAF system was not considered as it requires raw water with turbidity less than 10 NTU and the Town currently observes periods of high turbidity in excess of 2,000 NTU.

6.3.6 Tank

The Town of Silt has four water tanks in their distribution system; however, one is out of service. The total tank capacity the Town of Silt has in use is 1.65 million gallons (MG). A new additional 0.5 MG tank is recommended to increase the Town of Silt finished water storage capacity. **Table 6.15** shows the estimated construction cost for the 0.5 MG tank.

Table 6.15 Construction Cost and Total Project Cost Estimate for 0.5 MG Storage Tank

ITEM	COST, $
Construction Cost[1]	2,180,000
Total Project Cost[2]	2,616,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

6.3.7 Residuals Production and Disposal

The residuals pond shall be dredged and cleaned periodically – on an annual or semi-annual basis. When dredged, the solids shall be tested for TENORM and metals and disposed of properly. The estimated cost for this process is $500,000.

6.3.8 Operation and Maintenance Costs

O&M costs were compiled for each alternative, including costs for labor, disinfectant, coagulant, residuals, power, and annual equipment costs as well as annual membrane replacement and filter replacement costs. Future costs are based on the projected peak day demand. All of the alternatives had similar O&M costs; however, Alternative 2B, has the lowest O&M costs at $413,000 per year, currently and $682,000 in 2042. A summary of the current and future annual O&M costs are presented in **Table 6.16 and Table 6.17**, respectively. Detailed O&M costs are provided in **Appendix D**.

Table 6.16 Annual O&M Costs - Current

ITEM	ANNUAL COST, $				
	ALTERNATIVE 1	ALTERNATIVE 2A	ALTERNATIVE 2B	ALTERNATIVE 3	ALTERNATIVE 4
Labor	178,000	178,000	178,000	178,000	178,000
Sodium Hypochlorite	38,000	38,000	38,000	38,000	38,000
Coagulant	86,000	86,000	86,000	86,000	86,000

Table 6.16 Annual O&M Costs - Current

ITEM	ANNUAL COST, $				
	ALTERNATIVE 1	ALTERNATIVE 2A	ALTERNATIVE 2B	ALTERNATIVE 3	ALTERNATIVE 4
Power	66,000	82,000	66,000	66,000	66,000
Annualized Equipment Maintenance	67,000	34,000	34,000	84,000	58,000
Annualized Membrane Replacement	0	67,000	0	0	0
Annualized Filter Replacement	0	0	11,000	0	11,000
Total	435,000	485,000	413,000	452,000	437,000

Table 6.17 Annual O&M Costs - 2042

ITEM	ANNUAL COST, $				
	ALTERNATIVE 1	ALTERNATIVE 2A	ALTERNATIVE 2B	ALTERNATIVE 3	ALTERNATIVE 4
Labor	267,000	267,000	267,000	267,000	267,000
Disinfectant	89,000	89,000	89,000	89,000	89,000
Coagulant	199,000	199,000	199,000	199,000	199,000
Power	82,000	98,000	82,000	82,000	82,000
Annualized Equipment Maintenance	67,000	34,000	34,000	84,000	58,000
Annualized Membrane Replacement	0	67,000	0	0	0
Annualized Filter Replacement	0	0	11000	0	11000
Total	704,000	754,000	682,000	721,000	706,000

6.3.9 Net Present Value Analysis of Alternatives

Results from the net present value (NPV) analysis for the process alternatives are provided in **Table 6.18**. The net present value of each alternative includes the labor, disinfection chemical, coagulant, residuals, power, equipment, and membrane or filter replacement. O&M costs are based on average annual O&M costs over the 20 years. The alternative with the lowest NPV is the Alternative 2B ($34.9 million) followed by Alternative 2A ($36.9 million).

Table 6.18 Net Present Value for WTP Alternatives

ITEM	COST, $				
	ALT 1	ALT 2A	ALT 2B	ALT 3	ALT 4
Construction Cost	$25,616,000	$23,336,000	$22,890,000	$25,754,000	$27,942,000
Average Annual O&M Cost	$497,000	$513,000	$497,000	$497,000	$497,000

Net Present Value	$38,121,000	$36,945,000	$34,909,000	$38,634,000	$40,491,000

6.4 Conclusions and Recommendations

The recommended upgrades to the Town of Silt WTP include the following:

- Increase WTP capacity
- New strainer
- New mixed media filtration with green sand
- New ballasted flocculation process
- New UV disinfection and updated chlorine disinfection system
- Additional distribution pumping
- New finished water storage tank
- Expand alluvial well system or presettling pond in the future.

The current WTP is operating at capacity. The recommended alternative, Alternative 4, will increase capacity, which will improve WTP resiliency that will allow Operations Staff to produce water year-round. While this alternative has the highest NPV, it is the alternative that can most easily adapt to rapidly changing raw water turbidity. For this reason, it was selected as the path forward. Iron and manganese removal will also be included, which will improve finished water quality for the residents. The recommendation is comparable from a cost perspective to the other alternatives investigated. A detailed plan to construct this infrastructure, including potential phasing of Alternative 4, is provided in **Section 7**.

SECTION 7 - WTP UPGRADES IMPLEMENTATION PLAN

The section presents the Implementation Plan for the recommended upgrades to the Town of Silt WTP. The improvements have been developed to meet current and future capacity requirements and regulations. The improvements will also provide required facility redundancy, accommodate planned future growth of the Town, and improve operations. The recommended facility improvements take into consideration the treatment needs based on current and anticipated permit compliance requirements for the WTP. The recommended improvements developed in **Sections 5** and **6** will upgrade the WTP to have a 2.0 MGD capacity (firm capacity of 1.8 MGD firm capacity which includes time for backwashing the filters). The recommended improvements are listed below. The Town of Silt will complete Phase 1 of the improvements – filtration and capacity upgrade to 2.0 MGD first, then will monitor the town's population and decide when to expand to 3 MGD. The Town may wish to consider expansion of the alluvial well system or inclusion of a presettling pond in the future.

- (1) strainer
- (1) mixed media filtration system with green sand with 2 filters
- (1) ballasted flocculation system (two systems)
- UV disinfection system
- Chlorine disinfection system
- (1) 0.5 MG finished water storage tank
- Periodic cleaning of the backwash pond and residuals disposal
- Data collection software
- New process control system with automation

7.1 Preliminary Site Plan

A site plan for the complete upgraded WTP to Alternative 4 has been developed and is provided in **Figure 7.1**. The locations shown on these figures are approximate and it is recommended the final location of the facilities be determined during design once a geotechnical investigation has been completed. New facilities are not confined to one portion of the site; care will need to be taken during design to ensure that existing processes can continue to operate while the new facilities are being constructed.

Two new buildings will be constructed, one for the ballasted flocculation system and one for the mixed media filtration process. Alternatively, both processes can be co-located in one building. The existing WTP building will remain and be utilized for chemical storage. The existing plate settler and building housing the plate settler will be removed.

Figure 7.1 Silt WTP Preliminary Site Plan – Alternative 4

7.2 Preliminary Operating Plan

The preliminary operating plan presents a general staffing pattern for the WTP including the number of operators, required certification levels, and expected number of shifts per week. This Section also provides information about process control, the residuals management process, and an emergency response plan.

7.2.1 Staffing Plan

The staffing requirement for the WTP is anticipated to be approximately three employees. The estimated staffing requirement is based on the WTP hydraulic capacity and number of equipment in service, and is therefore independent of time, inflation, or other cost factors. The upgraded WTP is estimated to cost approximately $368,000 per year to operate and maintain after construction and increase to $637,000 per year at buildout. Refer to **Section 6** for a summary of projected O&M costs. The operating cost estimate reflects anticipated staff, annual energy, coagulant dosing, disinfection dosing, residuals, building maintenance, equipment maintenance and replacement, sampling, and permitting.

The WTP is only staffed during the day for 8 to 10 hours per day, depending on the day. During unstaffed periods, e.g. night, the plant will rely on autodialer to communicate issues to the on-call Operator-In-Charge.

7.2.2 Certification Level

The Operator-In-Charge must hold a Class A certification for water treatment plant operation. An Operator-In-Charge must be either on-duty or on-call when the plant is in operation. An operator working under the direction of the Operator-In-Charge may hold a valid water treatment plant certification or be in the process of obtaining a valid water treatment plant operator's certification.

7.2.3 Operating Configuration

The performance of the new retrofit system is expected to increase plant capacity, provide reliable turbidity removal, provide iron and manganese removal, improve disinfection reliability, and provide residuals management.

A Local Control Center (LCC) located in the existing WTP will serve as a relay station for all equipment monitoring and control functions. The LCC will house motor control centers (MCCs), and programmable logic controllers (PLCs) that provide digital controls for alarm functions, equipment programmable control functions, and equipment start and stop functions. The PLC programs will be accessible through a local control console such that all equipment monitoring and control functions can be modified by the operators.

The facility will have a supervisory control and data acquisition (SCADA) system that receives automated process information from the LCC. The SCADA system will be located in the building with the existing WTP. The SCADA system will provide a graphical interface with all of the treatment processes and equipment. Equipment status and data from process analyzers will be shown on the graphical interface. Control set points will be accessible and adjustable through the SCADA system. Access to the SCADA controls will be limited to authorized personnel through a hierarchical password system. In the event of a SCADA system failure, monitoring and control functions will be maintained through the LCC and local PLCs.

The SCADA system will use standard process monitoring and control software. New PLC software will be compatible with the existing SCADA system.

7.2.4 Residuals Management

The residuals pond shall be dredged and cleaned periodically – on an annual or semi-annual basis. When dredged, the solids shall be tested for TENORM and metals and disposed of properly.

7.2.5 Phased Operation to Maintain Compliance

The chosen alternative, Alternative 4, will increase plant capacity to 2.0 MGD (1.8 when backwashing is included), provide reliable turbidity removal, provide iron and manganese removal, improve disinfection reliability, and provide residuals management. There will be the option to expand the WTP to a capacity of 3 MGD in the future.

7.2.6 Initial Start-Up Conditions

The WTP is projected to be operational in 2025. The initial operating conditions are expected to be operating significantly below the WTP's rated capacity during start-up and Plant Staff will not be forced to operate a new treatment process that is already at capacity. Each train has a capacity of 0.9 MGD.

Plant staff will be provided with operational flexibility to meet treatment goals during startup and at the end of the 20-year planning horizon. Even at the end of the 20-year planning horizon, the recommended plan will allow Staff the ability to remove a train from service to perform necessary maintenance activities without compromising effluent quality. Variable frequency drives will be included with each new process pump to allow for further operational flexibility. The Town of Silt will monitor the population growth and can expand to a 3 MGD capacity in the future.

7.3 Emergency Response Plan

The Emergency Response Plan ensures that plant staff takes immediate and appropriate actions to limit adverse effects and protect lives and property during emergency situations. The emergency response procedures included in the current plant O&M Manual provides detailed instructions for responding to power failures, flooding, fire, lightning strikes, equipment breakdowns, process failures, chemical spills, chemical shortages, and personnel injury. A new WTP O&M manual will be prepared during construction of the improvements and will include an updated emergency response plan.

7.3.1 Emergency Assistance

The operator notifies designated authorities of each emergency. In case of personal injury or if fire protection, rescue, or other assistance is needed, plant staff are instructed to contact the local fire department or other emergency assistance. A contact list will be posted at the plant for ready accessibility. Mutual aid agreements with outside organizations for specialized assistance will be identified in the plant O&M Manual.

7.3.2 Safety & Security Equipment.

The WTP site is fenced off with a security gate at the front entrance and access is provided via a key code. Safety equipment, such as fire extinguishers and self-contained breathing apparatus, will be provided at critical locations in the plant. Electrical disconnect switches will be located immediately adjacent to all motorized equipment to allow immediate shutdown and isolation of damaged equipment. Alarm signals will be generated by automatic monitoring instruments. The plant O&M Manual will provide an inventory of available emergency equipment.

7.3.3 Emergency Power Supply

The WTP receives power via solar panels located on the laboratory building roof as well as in the field to the southeast of the existing wastewater treatment basins. In case of a power failure, a new generator will be used to power the essential equipment to keep the plant running.

7.4 Project Phasing

Phase 1 of construction is to construct Alternative 4 and Phase 2 is to expand to 3 MGD capacity. Phase 1 includes increasing plant capacity, providing reliable turbidity removal, providing iron and manganese removal, improving disinfection reliability, and providing residuals management. The recommended improvements and a summary of the construction and total project costs for Phase 1 are provided in **Table 7.1**. Estimated planning level construction cost of the Phase 1 improvements is $23.3 million and the total project cost of the Phase 1 improvements is estimated to be $27.9 million. Refer to **Section 6** for details regarding estimated construction and total project costs.

Table 7.1 Construction Cost and Total Project Cost Estimate for Alternative 4

ITEM	ALTERNATIVE 4 COST, $
Site/Civil	313,000
Structural/Architectural	5,185,000
Process	5,581,000
HVAC	1,662,000
Electrical	1,995,000
Total Materials and Equipment	14,736,000
Construction Cost[1]	23,285,000
Total Project Cost[2]	27,942,000

[1] Construction costs include mobilization/demobilization, contractor overhead and profit, insurance, bonds, and contingency.
[2] Total Project Cost is the construction cost plus the estimated planning, engineering, and administrative cost.

7.5 Schedule

It is recommended that the Phase 1 improvements be constructed in the near future to address life safety concerns, plant capacity, and resiliency. The Town has expressed interest in pursuing an alternative delivery project, such as construction manager at risk (CMAR). A CMAR project has the potential to overlap construction tasks with design tasks to shorten the entire duration of a project. **Table 7.3** below shows a preliminary schedule based on a CMAR project delivery. Design, CDPHE review, and construction of Phase 1 improvements is estimated to have a duration of 36 months (assuming the project is delivered via Construction Manager at Risk). If a conventional delivery (design, bid, build) is utilized to deliver the project, the project schedule will increase by 20 percent or more. This schedule assumes a design period of eight months for Phase 1 improvements and is considered a consolidated schedule. Phase 2 could be assessed in the future, as the Town of Silt decides to expand to 3 MGD.

Table 7.3 Project Duration

ITEM	PROJECTED START	PROJECTED END	DURATION, MONTHS
PHASE 1			
Design	August 2022	March 2023	8
Site Application	September 2022	October 2022	2
Process Design Report CDPHE Review	December 2022	January 2023	2
Construction (with CMAR)	July 2023	July 2025	3
Total Phase 1	August 2022	July 2025	36

[1] Phase 1 construction could potentially begin sooner depending on coordination with CMAR entity

7.6 Funding

The Town of Silt is planning to cash-fund the design of the project with current reserves. Funding for the construction of the project is anticipated to come from current reserves, future bond proceeds and, potentially, State Revolving Fund (SRF) monies.

7.7 Public Meeting

A public meeting will be held during August of 2022 in the Town of Silt Council Chambers. A summary of the planning study and cost impacts will be presented including the recommended improvements. A public notice of at least 30 days is required as part of the public meeting process. A summary of the public meeting will be added as an appendix after the public meeting occurs.

7.8 Environmental Checklist

The environmental checklist for the recommended improvements is provided in **Appendix C**.

7.9 Construction Constraints

The site is not believed to have any known geotechnical concerns. A detailed geotechnical investigation will be performed during the preliminary design stage of the project to confirm soils are suitable. The site is located in the 100-year floodplain based upon the available FEMA floodplain maps. All basins and buildings will have walls constructed above the 100-yr floodplain elevation.

SECTION 8 - REFERENCES

Colorado Parks and Wildlife (2022). Threatened and Endangered List. https://cpw.state.co.us/learn/Pages/SOC-ThreatenedEndangeredList.aspx.

Silt Water Conservancy District (2021). https://www.siltwatercd.org/

Middle Colorado Watershed Council (2022). https://www.midcowatershed.org/

Garfield County Public Health (2022). https://www.garfield-county.com/public-health/

Schmueser Gordon Meyer (2005). Town of Silt Water Treatment System Construction Plans, Glenwood Springs, Colorado.

Chemical Contaminant Rules (2022). https://www.epa.gov/dwreginfo/chemical-contaminant-rules.

Trout Unlimited (2019). Voices from the River: Protecting a unique native in Colorado.

U.S. Department of Homeland Security (2007). Federal Emergency Management Agency Flood Insurance Rate Map, Garfield County, Colorado and Incorporated Areas.

U.S. Fish and Wildlife Service (2015). Environmental Conservation Online System. https://ecos.fws.gov/ecp/

U.S. Fish and Wildlife Service (2022). National Wetlands Inventory. https://www.fws.gov/wetlands/data/mapper.html

U.S. Forest Service, Air, Water and Aquatic Environments Science Program (2019). Fish and Cattle Grazing Reports: Roundtail chub (Gila robusta).

Upper Colorado River Endangered Fish Recovery Program (2022). https://www.coloradoriverrecovery.org/index.html

McDermott (2022). Claricone System.

MRI (2022). MRI Plate Settler.

SUEZ (2022). PulsaPak System.

Actiflo (2022). Actiflo ACP2 Process.

MEMCOR (2022). Membrane Filtration System.

PWSID No CO0123710.

U.S. Census Bureau (2021).

Federal Register, Radionuclides NODA and Final Rule, December 7, 2000.

Federal Register, Radon 222 Proposed Rule, November 2, 1999.

APPENDIX A

Environmental Checklist

COLORADO
Department of Public Health & Environment

ENVIRONMENTAL CHECKLIST

Use the Discussion and References space at the end of each section to document your responses. For example, explain how you determined the level of impact and document the reasoning if checking PA (possible adverse) for any resource. Attach additional pages if necessary.

1. Brief project description, including identification of selected alternative:

   The Town of Silt Water Treatment Plant (WTP) serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project. An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration .

2. Describe if the project will improve or maintain water quality, and if the project addresses a TMDL, and/or Watershed Management Plan.

   The project will improve water quality to the residents of Site and treatment resiliency. The project does not address a TMDL or a Watershed Management Plan.

3. Provide latitude and longitude of the proposed project (if a transmission / distribution / collection line identify the center point not the whole line):

   39.540278°, 107.673056°

4. Provide discharge (WW) or source (DW) information: N/A □

   Drinking water sources are from the Colorado River and two alluvial wells that pull water from the Colorado River.

5. Provide NPDES/PWSID number:

   PWSID: CO0123710

6. Provide primary waterbody name and waterbody ID, secondary name (if available), and State designated surface water use:

   The Colorado River, Segment COLCLC01_A. The stream designation is Reviewable. It is classified as Aquatic Life Cold 1, Recreation Class E, Agriculture, and Water Supply.

7. Did your analysis consider how this project impacts community planning efforts in other areas (i.e. transportation, housing, etc.)?

Yes, the population projections provided by the Town of Silt took into account planned developments and community planning efforts based on the Town's planning and zoning. The project will accommodate expected future growth from planning efforts. No other impacts to community planning efforts are anticipated.

Y = Yes N = No PA = Possible Adverse

1. Physical Aspects - Topography, Geology and Soils

Y ☐ N ☑ PA ☐	a.	Are there physical conditions (e.g., steep slopes, shrink-swells soils, etc.) that might be adversely affected by or might affect construction of the facilities?
Y ☐ N ☑ PA ☐	b.	Are there similar limiting physical conditions in the planning area that might make development unsuitable?
Y ☐ N ☑ PA ☐	c.	Are there any unusual or unique geological features that might be affected?
Y ☐ N ☑ PA ☐	d.	Are there any hazardous areas (slides, faults, etc.) that might affect construction or development?

Discussion and References:

Construction has taken place within the site footprint previously. The project site does not contain any anticipated adverse physical conditions that might interfere with construction.

2. Climate

Y ☐ N ☑ PA ☐	a.	Are there any unusual or special meteorological constraints in the planning area that might result in an air quality problem?
Y ☐ N ☑ PA ☐	b.	Are there any unusual or special meteorological constraints in the planning area that might affect the feasibility of the proposed alternative?

Discussion and References:

The project site area does not contain any anticipated unusual or special meteorological constraints.

3. Population

Y ☐ N ☑ PA ☐	a.	Are the proposed growth rates excessive (exceeding State projections, greater than 6% per annum for the 20 year planning period)?
Y ☐ N ☑ PA ☐	b.	Will additional growth be induced or growth in new areas encouraged as a result of facilities construction?
Y ☐ N ☑ PA ☐	c.	Will the facilities serve areas which are largely undeveloped areas at present?

Discussion and References:

A growth rate of 3.7 percent estimated by the Town includes developments that are currently underway or planned in the near future. The project will not induce growth beyond what is already planned by the Town.

4. Housing, Industrial and Commercial Development and Utilities

Y ☐ N ☑ PA ☐	a.	Will existing homes or business be displaced as a result of construction of this property?
Y ☐ N ☑ PA ☐	b.	Will new housing serviced by this facility affect existing facilities, transportation patterns, environmentally sensitive areas, or be in special hazard or danger zones?
Y ☐ N ☑ PA ☐	c.	Will new housing create strains on other utilities and services - policies, power, water supply, schools, hospital care, etc.?

Discussion and References:

The WTP improvements will be within the existing site boundary so no homes or businesses will be displaced. Impacts to other utilities will be assessed by the Town and developers. No other impacts are anticipated.

5. Economics and Social Profile

Y ☐ N ☑ PA ☐ a. Will certain landowners benefit substantially from the development of land due to location and size of the facilities?
Y ☐ N ☑ PA ☐ b. Will the facilities adversely affect land values?
Y ☐ N ☑ PA ☐ c. Are any poor or disadvantaged groups especially affected by this project?

Discussion and References:

The WTP has been in its current location since its original construction in 2005. The project will take place entirely within the existing site. Land values should not be impacted by the improvements.

6. Land Use

Y ☐ N ☑ PA ☐ a. Will projected growth defeat the purpose of local land use controls (if any)?
Y ☐ N ☑ PA ☐ b. Is the location of the facilities incompatible with local land use plans?
Y ☐ N ☑ PA ☐ c. Will inhabited areas be adversely impacted by the project site?
Y ☐ N ☑ PA ☐ d. Will new development have adverse effects on older existing land uses (agriculture, forest land, etc.)?
Y ☐ N ☑ PA ☐ e. Will this project contribute to changes in land use in association with recreation (skiing, parks, etc.), mining or other large industrial or energy developments?

Discussion and References:

No impacts on land use are anticipated. Improvements will take place within the existing site. Planned development is consistent with the Town's 2013 Zoning District Map.

7. Floodplain Development

Y ☑ N ☐ PA ☐ a. Does the planning area contain 100 year floodplains?
If yes -
Y ☑ N ☐ PA ☐ b. Will the project be constructed in a 100 year floodplain?
Y ☐ N ☑ PA ☐ c. Will the project serve direct or indirect development in a 100 year floodplain anywhere in the planning area?

Discussion and References:

Please refer to the supplemental information. All structures will be built above the 100 year floodplain.

8. Wetlands

Y ☑ N ☐ PA ☐ a. Does the planning area contain wetlands as defined by the U.S. Fish and Wildlife Service?
If yes -
Y ☐ N ☑ PA ☐ b. Will any structure of the facility be located in wetlands?
Y ☐ N ☑ PA ☐ c. Will the project serve growth and development which will directly or indirectly affect wetlands?

Discussion and References:

Please refer to the supplemental information.

9. Wild and Scenic Rivers

Y ☐ N ☑ PA ☐ a. Does the planning area contain a designated or proposed wild and scenic river?
If yes -
Y ☐ N ☐ PA ☐ b. Will the project be constructed near the river?

Y ☐ N ☐ PA ☐ c. Will projected growth and development take place contiguous to or upstream from the river segment?

Y ☐ N ☐ PA ☐ d. Will the river segment be used for disposal of effluent?

Discussion and References:

The Colorado River is not designated as Wild and Scenic. The remaining questions are not applicable

10. Cultural Resources (Archeological/Historical)

Y ☑ N ☐ PA ☐ a. Are there any properties (historic, architectural, and archeological) in the planning area which are listed on or eligible for listing on the National Register of Historic Places?

If yes -

Y ☐ N ☑ PA ☐ b. Will the project have direct or indirect adverse impacts on any listed or eligible property?

Discussion and References:

Please refer to the supplemental information.

11. Flora and Fauna (including endangered species)

Y ☑ N ☐ PA ☐ a. Are there any designated threatened or endangered species or their habitat in the planning area?

Y ☐ N ☑ PA ☐ b. Will the project have direct or indirect adverse impacts on any such designated species?

Y ☐ N ☑ PA ☐ c. Will the project have direct or indirect adverse impacts on fish, wildlife or their habitat including migratory routes, wintering or calving areas?

Y ☐ N ☑ PA ☐ d. Does the planning area include a sensitive habitat area designed by a local, State or Federal wildlife agency?

Discussion and References:

The WTP has been at its location since around 2005. Please refer to the supplemental information

12. Recreation and Open Space

Y ☐ N ☑ PA ☐ a. Will the project eliminate or modify recreational open space, parks or areas of recognized scenic or recreational value?

Y ☐ N ☑ PA ☐ b. Is it feasible to combine the project with parks, bicycle paths, hiking trails, waterway access and other recreational uses?

Discussion and References:

Please refer to the supplemental information.

13. Agricultural Lands

Y ☑ N ☐ PA ☐ a. Does the planning area contain any environmentally significant agricultural lands (prime, unique, statewide importance, local importance, etc.) as defined in the EPA Policy to Protect Environmentally Significant Agricultural Lands dated September 8, 1978?

Y ☐ N ☑ PA ☐ b. Will the project directly or indirectly encourage the irreversible conversion of Environmentally Significant Agricultural Lands to uses which result in the loss of these lands as an environmental or essential food production resource?

Discussion and References:

The agricultural land, which is likely of environmental significance to the Town, is remaining as established in the 2013 Zoning Map. Please refer to the supplemental information.

14. Air Quality

Y ☐ N ☑ PA ☐	a.	Are there any direct air emissions from the project (e.g., odor controls, sludge incinerator) which do not meet Federal and State emission standards contained in the State Air Quality Implementation Plan (SIP)?
Y ☐ N ☑ PA ☐	b.	Is the project service area located in an area without an approved or conditionally approved SIP?
Y ☑ N ☐ PA ☐	c.	Is the increased capacity of the project greater than 1 mgd?
Y ☐ N ☑ PA ☐	d.	Do the population projections used in the facilities plan exceed the Sate or area wide projections in the SIP by more than 5%?
Y ☑ N ☐ PA ☐	e.	Does the project conform to the requirements of the SIP? (See EPA regulations under Section 316 of the Clean Air Act.)
Y ☐ N ☑ PA ☐	f.	Is the project inconsistent with the SIP of an adjoining State that may be impacted by the Project?
Y ☐ N ☑ PA ☐	g.	Does the project violate national ambient Air Quality Standards in an attainment or unclassified area?
Y ☐ N ☑ PA ☐	h.	Will the facilities create an odor nuisance problem?

Discussion and References:

Please refer to the supplemental information.

15. Water Quality and Quantity (Surface/Groundwater)

Y ☐ N ☑ PA ☐	a.	Are present stream classifications in the receiving stream being challenged as too low to protect present or recent uses?
Y ☐ N ☑ PA ☐	b.	Is there a substantial risk that the proposed discharge will not meet existing stream standards or will not be of sufficient quality to protect present or recent stream uses?
Y ☐ N ☑ PA ☐	c.	Will construction of the project and development to be served by the project result in non-point water quality problems (sedimentation, urban stormwater, etc.)?
Y ☐ N ☑ PA ☐	d.	Will water rights be adversely affected by the project?
Y ☐ N ☑ PA ☐	e.	Will the project cause a significant amount of water to be transferred from one sub-basin to another (relative to the 7-day, 10 year flow of the diverted basin)?
Y ☐ N ☑ PA ☐	f.	Will stream habitat be affected as a result of the change in flow or stream bank modification?
Y ☐ N ☑ PA ☐	g.	Are stream conditions needed for deciding upon the required limitations inadequately specified in the 208 Plan? If so, have the wasteload allocations calculations been performed and approved by the State and EPA?
Y ☐ N ☑ PA ☐	h.	Is an Antidegradation Review required?
Y ☐ N ☑ PA ☐	i.	Will the project adversely affect the quantity or quality of a groundwater resource?
Y ☐ N ☑ PA ☐	j.	Does the project adversely affect an aquifer used as a potable drinking water supply?
Y ☑ N ☐ PA ☐	k.	Are there additional cost effective water conservation measures that could be adopted by community to reduce sewage generation?

Discussion and References:

16. Public Health

Y ☐ N ☑ PA ☐	a.	Will there be adverse direct or indirect noise impacts from the project?
Y ☐ N ☑ PA ☐	b.	Will there be a vector problem (e.g., mosquito) from the project?

Y ☐ N ☑ PA ☐ c. Will there be any unique public health problems as a result of the project (e.g., increased disease risks)?

Discussion and References:

There will be temporary noise impacts during construction. No noise impacts other than those that current exist are anticipated. No unique public health problems are anticipated.

17. Solid Waste (Sludge Management)

Y ☐ N ☑ PA ☐ a. Will sludge disposal occur in an area with inadequate sanitary landfills or on land unsuitable for land application?

Y ☐ N ☑ PA ☐ b. Are there special problems with the sludge that makes disposal difficult (hazardous, difficult to treat)?

Y ☐ N ☑ PA ☐ c. Is the technology selected for sludge disposal controversial?

Discussion and References:

Waste residuals are sent to the residuals pond to the south of the WTP. After the WTP improvements are made, the new process will produce more waste residuals and the residuals pond will need to be dredged and cleaned more frequently. When the residuals pond is dredged and cleaned, the waste will be tested and disposed of properly.

18. Energy

Y ☑ N ☐ PA ☐ a. Are there additional cost effective measures to reduce energy consumption or increase energy recovery which could be included in this project?

Discussion and References:

The upgraded system will be more efficient and can treat more water without adding substantial energy usage and costs.

19. Land Application

Y ☐ N ☑ PA ☐ a. Has a new or unproven technique been selected?

Y ☐ N ☑ PA ☐ b. Is there considerable public controversy about the project?

Y ☐ N ☑ PA ☐ c. Will the project require additional water rights or impact existing water Rights?

Y ☐ N ☑ PA ☐ d. Is the project multi-purpose?

Discussion and References:

No considerable public controversy about the project is anticipated.

20. Regionalization

Y ☐ N ☑ PA ☐ a. Are there jurisdictional disputes or controversy over the project?

Y ☐ N ☑ PA ☐ b. Is conformance with the 208 plan in question?

Y ☐ N ☑ PA ☐ c. Is the proliferation of small treatment plants and septic systems creating a significant health problem?

Y ☐ N ☐ PA ☐ d. Have inter-jurisdictional agreements been signed?

Discussion and References:

There are no IGAs so the question does not apply to the Town.

21. Public Participation

Y ☐ N ☑ PA ☐ a. Is there a substantial level of public controversy?

Y ☑ N ☐ PA ☐ b. Is there adequate evidence of public participation in the project?

Discussion and References:

A public meeting will be held during Q3/Q4 of 2022. Copies of the public notice, presentation materials, and an attendee list will be provided to CDPHE when available.

22. Environmental Laws

Y ☐ N ☑ PA ☐ a. Does the project threaten to violate any State, Federal or local law or requirement imposed to protect the environment?

Discussion and References:

Upgrades to the WTP will improve drinking water quality by reducing iron, manganese, and TSS.

Prepared By: Patrick Radabaugh, PE - Senior Associate, Dewberry
Name, Title, and Affiliation

Date: 08/04/2022

Environmental Assessment Checklist Supplemental Information

Question 1: Physical Aspects – Topography, Geology, and Soils

No supplemental information provided.

Question 2: Climate

No supplemental information provided.

Question 3: Population

No supplemental information provided.

Question 4: Housing, Industrial and Commercial Development and Utilities

No supplemental information provided.

Question 5: Economics and Social Profile

The WTP has been in its current location since its original construction. The project will take place entirely within the existing site. Land values should not be impacted by the improvements. Demographic data was obtained through the US EPA's Environmental Justice Screening and Mapping Tool (EJSCREEN) and summarized in **Table B-1** (1). A copy of the full EJSCREEN analysis is provided in **Attachment 2**.

Demographic data indicates that the population characteristics do not differ significantly between the 1-mile and 3-mile radius areas. The populations for both areas are about 29percent people of color with similar breakdowns among different races. The education level and household income levels do not differ significantly between the two areas. Improvements to the existing site should not benefit or adversely affect any particular group.

Table B-1 Demographic Profile of Area Surrounding the Silt WTP

Parameter	1-Mile Radius	3-Mile Radius
Population in Area	1,337	4,642
Households in Area	507	1,667
Housing Units in Area	521	1,710
Percent People of Color Population	384 (29%)	1,348 (29%)
White	1,215 (91%)	4,197 (90%)
Black	3 (0%)	10 (0%)
Hispanic	357 (27%)	1,261 (27%)
American Indian	0 (0%)	12 (0%)
Asian	3 (0%)	9 (0%)
Pacific Islander	0 (0%)	0 (0%)
Two or More Races	32 (2%)	93 (2%)
Education Level		
Less than 9th Grade	37 (4%)	151 (5%)
9^{th} – 12^{th} Grade, No Diploma	50 (6%)	183 (6%)
High School Graduate	262 (32%)	943 (32%)
Some College, No Degree	229 (28%)	784 (27%)
Associate Degree	123 (15%)	423 (14%)
Bachelor's Degree or more	130 (16%)	433 (15%)
Household Income Breakdown		
< $15,000	29 (6%)	85 (5%)
$15,000 - $25,000	38 (8%)	131 (8%)
$25,000 - $50,000	115 (23%)	381 (23%)
$50,000 - $75,000	92 (18%)	324 (19%)
$75,000 +	232 (46%)	747 (45%)

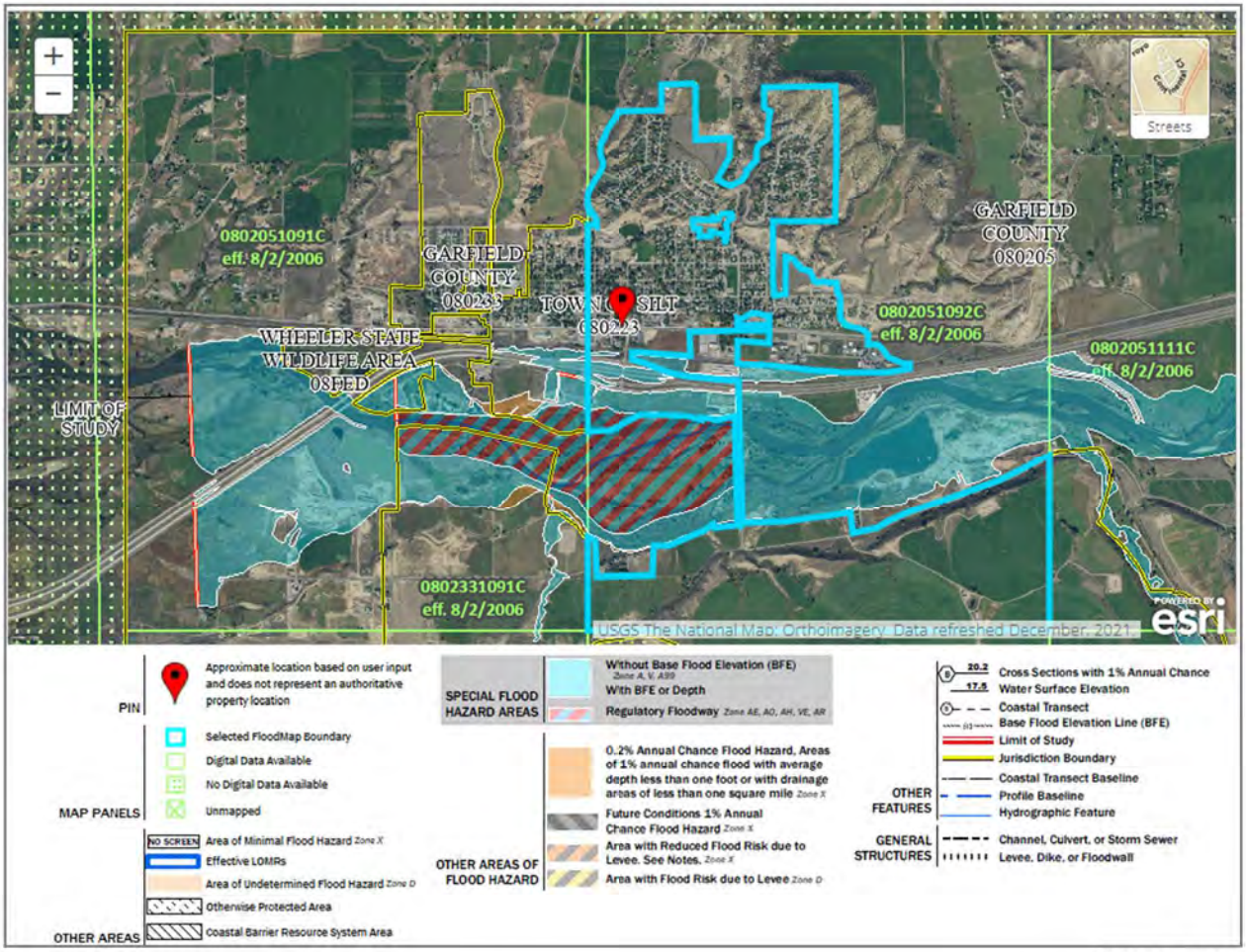
Question 6: Land Use

No supplemental information provided.

Question 7: Floodplain Development

The entire WTP project site is in the 100-year floodplain, including the new proposed structures. All new structures will be constructed with finished floors that are a minimum of 1 ft above the published flood elevation. A copy of the FEMA floodplain map is provided in **Figure B-1** (2).

Planned development in the Town was established in 2013 per the Official Zoning District Map of the Town of Silt, Colorado. A copy of the Zoning Map is provided in **Attachment 3**. The project is not influencing direct or indirect development in the planning area. Development will be in accordance with the Town's Municipal Code, including flood damage prevention.

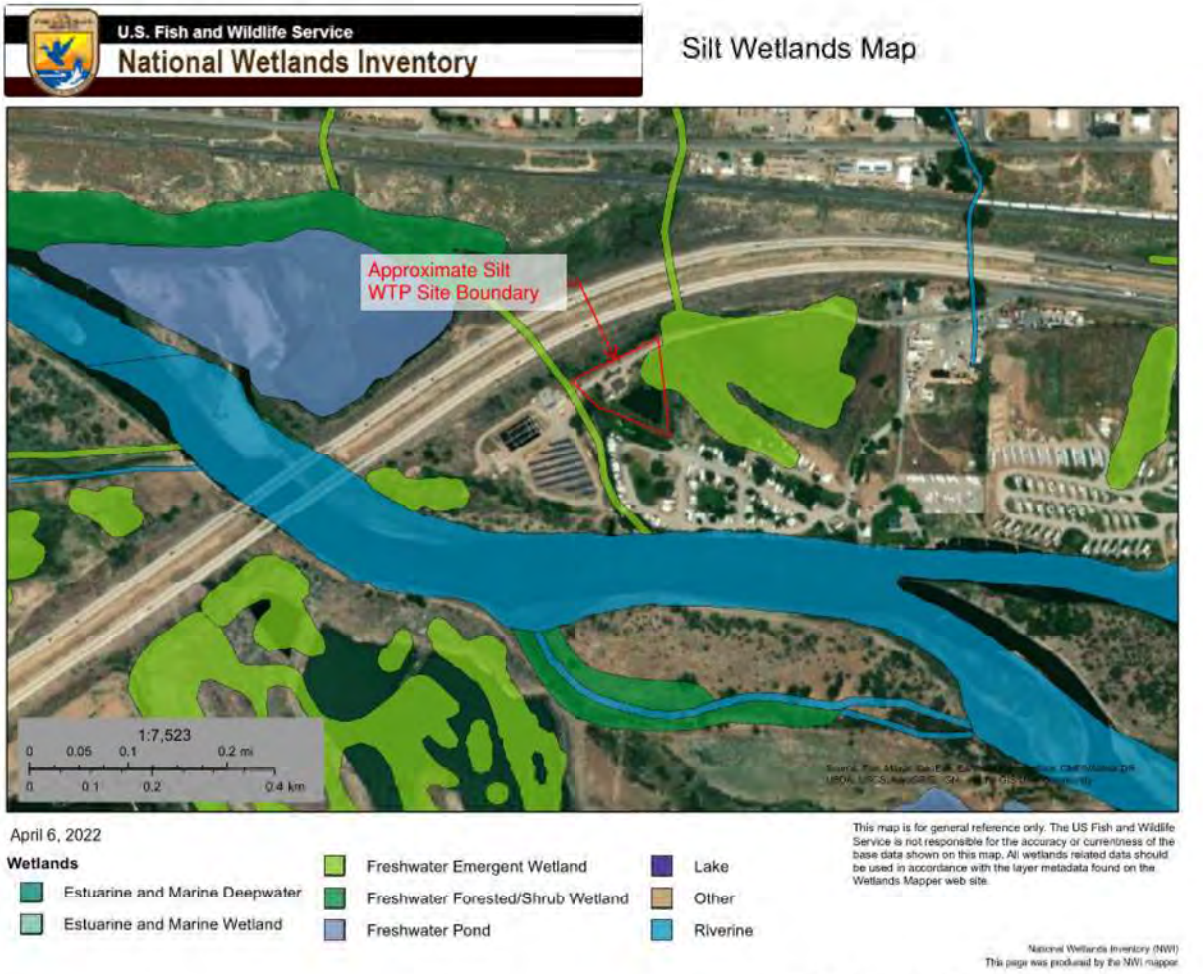


(FEMA, 2022)

Figure B-1 Town of Silt FEMA Floodplain Map

Question 8: Wetlands

The USFWS National Wetlands Inventory mapping tool was used to assess presence of wetlands within the planning area (3). A copy of the wetlands map for the Silt WTP is provided in **Figure B-2**. Additional information is provided in Section 2 of the Facility Plan. The project site includes a portion of Freshwater Emergent Wetland. The design team will take care to ensure that all new structures will be constructed outside the existing wetlands.



(U.S. Fish and Wildlife Service, 2022)

Figure B-2 USFWS National Wetlands Inventory Map Near the Silt WTP

Question 9: Wild and Scenic Rivers

The National Wild and Scenic Rivers System inventory was used to confirm that the Colorado River is not designated as Wild and Scenic (4).

Question 10: Cultural Resources (Archeological/Historical)

The John Herbert Nunns House (Property ID: 13000871) located at 311 N 7th St is the one property within the Town of Silt that is listed on the National Register of Historic Places as of December 3, 2013 (5). The WTP is geographically separate from the John Herbert Nunns House and, therefore, no impacts are anticipated. The proposed project will take place entirely within the existing site.

Question 11: Flora and Fauna

The U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC) tool was used to identify threatened and endangered species that may be present in the planning area (6). A copy of the results from the IPaC tool is provided in **Attachment 4**. A potential presence in the planning area does not indicate potential or probable presence at the project site. The WTP has been at its location since 2005. The presence of threatened or endangered species has not been observed.

Five species are listed as threatened including the following:

- Mammals: Canada Lynx
- Birds: Mexican Spotted Owl and Yellow-billed Cuckoo
- Fish: Humpback Chub
- Flowering plant: Colorado Hookless Cactus, Debeque Phacelia, Parachute Beardtongue, and Ute Ladies'-tresses.

Three fish species are listed as endangered including the Bonytail Chub, Colorado Pikeminnow, and Razorback Sucker. Additionally, the Monarch Butterfly is identified as a candidate and the Gray Wolf is listed as endangered. Thirteen species of migratory birds of concern were identified with the IPaC tool including the Bald Eagle, Black Rosy-finch, Black Swift, Brown-capped Rosy-finch, Cassin's Finch, Clark's Grebe, Evening Grosbeak, Lesser Yellowlegs, Lewis's Woodpecker, Long-eared Owl, Olive-sided Flycatcher, Pinyon Jay, and Virginia's Warbler. Critical habitats were identified within the project area for the following: Colorado Pikeminnow, Debeque Phacelia, Parachute Beardtongue, and Razorback Sucker.

No adverse impacts are anticipated and the project will have a limited construction footprint.

Question 12: Recreation and Open Space

The project area will not impact recreation and open space. The site footprint is already limited for expansion and safe access to the river is restricted due to steep slopes along the river bank adjacent to the site. Introducing public access may raise security / safety concerns. Combining the project with public access will not be considered.

Question 13: Agricultural Lands

Planned development in the Town was established in 2013 per the Official Zoning District Map of the Town of Silt, Colorado (see **Attachment 3**). The agricultural land, which is likely of environmental significance to the Town, is remaining as established in the 2013 Zoning Map. The project is not influencing direct or indirect development of agricultural land in the planning area. Development will be in accordance with the Town's Municipal Code. A map of the cropland in and near the Town of Silt in included **Figure B-3** (7).

(USGS, 2022)

Figure B-3 Map of Croplands in the Unites States Near the Town of Silt

Question 14: Air Quality

Eleven Colorado communities once violated federal standards for fine particles or carbon monoxide (9). The Town of Silt has not violated the federal clean air standards. These areas were classified as "nonattainment" by the U.S. Environmental Protection Agency (EPA). All these areas have since been re-designated by EPA to "attainment/maintenance" status.

The WTP site is bordered by Interstate-70 and the nearest residential area is an RV park located to the southeast of the site. There have not been odor issues with the community due to the WTP. The need for odor control will be evaluated for each unit process during the pre-design phase and the appropriate technologies selected to mitigate odors where needed.

Question 15: Water Quality and Quantity (Surface/Groundwater)

Non-point source contamination should be addressed by the anticipated developments, including considerations given to runoff impacts from increased non-permeable surfaces. Newer developments will incorporate more water efficient fixtures. The Town could encourage existing plumbing and fixtures be replaced with newer, water efficient fixtures, such as faucet aerators.

Question 16: Public Health

No supplemental information provided.

Question 17: Solid Waste (Sludge Management)

No supplemental information provided.

Question 18: Energy

No supplemental information provided.

Question 19: Land Application

No supplemental information provided.

Question 20: Regionalization

No supplemental information provided.

Question 21: Public Participation

No supplemental information provided.

Question 22: Environmental Laws

No supplemental information provided.

References

1. U.S. Environmental Protection Agency (2020). Environmental Justice Screening and Mapping Tool (EJSCREEN). https://ejscreen.epa.gov/mapper/

2. U.S. Department of Homeland Security (2007). Federal Emergency Management Agency Flood Insurance Rate Map, Garfield County, Colorado and Incorporated Areas.

3. U.S. Fish and Wildlife Service (2021). National Wetlands Inventory, Wetlands Mapper. https://www.fws.gov/wetlands/data/mapper.html

4. National Wild and Scenic Rivers System (2021). Colorado National Wild and Scenic Rivers. https://www.rivers.gov/colorado.php

5. National Park Service, U.S. Department of the Interior (2020). National Register of Historic Places. https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466

6. U.S. Fish and Wildlife Service (2021). Information for Planning and Consulting (IPaC). https://ecos.fws.gov/ipac/location/index

7. U.S. Geologic Survey (2021). Global Food Security Analysis – Support Data at 30 Meters (GFSAD30) Project. https://www.croplands.org/app/map?lat=0.17578&lng=0&zoom=2

EJSCREEN ACS Summary Report

Location: User-specified point center at 39.544314, -107.668116
Ring (buffer): 1-miles radius
Description: WTP - 1 Mile Radius

Summary of ACS Estimates	2015 - 2019
Population	1,337
Population Density (per sq. mile)	551
People of Color Population	384
% People of Color Population	29%
Households	507
Housing Units	521
Housing Units Built Before 1950	45
Per Capita Income	29,233
Land Area (sq. miles) (Source: SF1)	2.43
% Land Area	99%
Water Area (sq. miles) (Source: SF1)	0.03
% Water Area	1%

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	1,337	100%	402
Population Reporting One Race	1,304	98%	625
White	1,215	91%	400
Black	3	0%	12
American Indian	0	0%	18
Asian	3	0%	15
Pacific Islander	0	0%	12
Some Other Race	83	6%	168
Population Reporting Two or More Races	32	2%	52
Total Hispanic Population	357	27%	210
Total Non-Hispanic Population	980		
White Alone	952	71%	400
Black Alone	3	0%	12
American Indian Alone	0	0%	12
Non-Hispanic Asian Alone	3	0%	15
Pacific Islander Alone	0	0%	12
Other Race Alone	0	0%	12
Two or More Races Alone	21	2%	50
Population by Sex			
Male	651	49%	285
Female	686	51%	174
Population by Age			
Age 0-4	125	9%	107
Age 0-17	392	29%	183
Age 18+	945	71%	276
Age 65+	133	10%	110

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019 .

EJSCREEN ACS Summary Report

Location: User-specified point center at 39.544314, -107.668116
Ring (buffer): 1-miles radius
Description: WTP - 1 Mile Radius

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population 25+ by Educational Attainment			
Total	831	100%	253
Less than 9th Grade	37	4%	67
9th - 12th Grade, No Diploma	50	6%	69
High School Graduate	262	32%	151
Some College, No Degree	229	28%	156
Associate Degree	123	15%	81
Bachelor's Degree or more	130	16%	105
Population Age 5+ Years by Ability to Speak English			
Total	1,212	100%	333
Speak only English	912	75%	274
Non-English at Home[1+2+3+4]	300	25%	182
[1]Speak English "very well"	187	15%	152
[2]Speak English "well"	70	6%	102
[3]Speak English "not well"	43	4%	61
[4]Speak English "not at all"	0	0%	12
[3+4]Speak English "less than well"	43	4%	61
[2+3+4]Speak English "less than very well"	113	9%	118
Linguistically Isolated Households*			
Total	33	100%	68
Speak Spanish	25	76%	56
Speak Other Indo-European Languages	8	24%	36
Speak Asian-Pacific Island Languages	0	0%	12
Speak Other Languages	0	0%	12
Households by Household Income			
Household Income Base	507	100%	130
< $15,000	29	6%	48
$15,000 - $25,000	38	8%	55
$25,000 - $50,000	115	23%	105
$50,000 - $75,000	92	18%	88
$75,000 +	232	46%	124
Occupied Housing Units by Tenure			
Total	507	100%	130
Owner Occupied	351	69%	128
Renter Occupied	156	31%	108
Employed Population Age 16+ Years			
Total	1,008	100%	259
In Labor Force	757	75%	192
Civilian Unemployed in Labor Force	33	3%	59
Not In Labor Force	251	25%	138

Data Note: Datail may not sum to totals due to rounding. Hispanic population can be of anyrace.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS)
*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified point center at 39.544314, -107.668116
Ring (buffer): 1-miles radius
Description: WTP - 1 Mile Radius

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Language Spoken at Home*			
Total (persons age 5 and above)	N/A	N/A	N/A
English	N/A	N/A	N/A
Spanish	N/A	N/A	N/A
French	N/A	N/A	N/A
French Creole	N/A	N/A	N/A
Italian	N/A	N/A	N/A
Portuguese	N/A	N/A	N/A
German	N/A	N/A	N/A
Yiddish	N/A	N/A	N/A
Other West Germanic	N/A	N/A	N/A
Scandinavian	N/A	N/A	N/A
Greek	N/A	N/A	N/A
Russian	N/A	N/A	N/A
Polish	N/A	N/A	N/A
Serbo-Croatian	N/A	N/A	N/A
Other Slavic	N/A	N/A	N/A
Armenian	N/A	N/A	N/A
Persian	N/A	N/A	N/A
Gujarathi	N/A	N/A	N/A
Hindi	N/A	N/A	N/A
Urdu	N/A	N/A	N/A
Other Indic	N/A	N/A	N/A
Other Indo-European	N/A	N/A	N/A
Chinese	N/A	N/A	N/A
Japanese	N/A	N/A	N/A
Korean	N/A	N/A	N/A
Mon-Khmer, Cambodian	N/A	N/A	N/A
Hmong	N/A	N/A	N/A
Thai	N/A	N/A	N/A
Laotian	N/A	N/A	N/A
Vietnamese	N/A	N/A	N/A
Other Asian	N/A	N/A	N/A
Tagalog	N/A	N/A	N/A
Other Pacific Island	N/A	N/A	N/A
Navajo	N/A	N/A	N/A
Other Native American	N/A	N/A	N/A
Hungarian	N/A	N/A	N/A
Arabic	N/A	N/A	N/A
Hebrew	N/A	N/A	N/A
African	N/A	N/A	N/A
Other and non-specified	N/A	N/A	N/A
Total Non-English	N/A	N/A	N/A

Data Note: Detail may not sum to totals due to rounding. Hispanic popultion can be of any race.
N/A meansnot available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019.
*Population by Language Spoken at Home is available at the census tract summary level and up.

EJSCREEN ACS Summary Report

Location: User-specified point center at 39.544314, -107.668116
Ring (buffer): 3-miles radius
Description: WTP - 3 Mile Radius

Summary of ACS Estimates	2015 - 2019
Population	4,642
Population Density (per sq. mile)	182
People of Color Population	1,348
% People of Color Population	29%
Households	1,667
Housing Units	1,710
Housing Units Built Before 1950	143
Per Capita Income	28,954
Land Area (sq. miles) (Source: SF1)	25.53
% Land Area	99%
Water Area (sq. miles) (Source: SF1)	0.33
% Water Area	1%

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	4,642	100%	707
Population Reporting One Race	4,549	98%	1,109
White	4,197	90%	557
Black	10	0%	36
American Indian	12	0%	53
Asian	9	0%	15
Pacific Islander	0	0%	12
Some Other Race	322	7%	436
Population Reporting Two or More Races	93	2%	76
Total Hispanic Population	1,261	27%	617
Total Non-Hispanic Population	3,381		
White Alone	3,294	71%	434
Black Alone	10	0%	36
American Indian Alone	8	0%	53
Non-Hispanic Asian Alone	9	0%	15
Pacific Islander Alone	0	0%	12
Other Race Alone	0	0%	12
Two or More Races Alone	60	1%	65
Population by Sex			
Male	2,329	50%	338
Female	2,314	50%	455
Population by Age			
Age 0-4	402	9%	195
Age 0-17	1,337	29%	280
Age 18+	3,305	71%	365
Age 65+	496	11%	113

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019 .

EJSCREEN ACS Summary Report

Location: User-specified point center at 39.544314, -107.668116
Ring (buffer): 3-miles radius
Description: WTP - 3 Mile Radius

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population 25+ by Educational Attainment			
Total	2,916	100%	385
Less than 9th Grade	151	5%	127
9th - 12th Grade, No Diploma	183	6%	107
High School Graduate	943	32%	165
Some College, No Degree	784	27%	230
Associate Degree	423	14%	119
Bachelor's Degree or more	433	15%	219
Population Age 5+ Years by Ability to Speak English			
Total	4,240	100%	590
Speak only English	3,154	74%	409
Non-English at Home[1+2+3+4]	1,086	26%	435
[1]Speak English "very well"	684	16%	301
[2]Speak English "well"	249	6%	188
[3]Speak English "not well"	131	3%	228
[4]Speak English "not at all"	21	1%	99
[3+4]Speak English "less than well"	152	4%	228
[2+3+4]Speak English "less than very well"	401	9%	249
Linguistically Isolated Households*			
Total	108	100%	74
Speak Spanish	86	80%	73
Speak Other Indo-European Languages	22	20%	36
Speak Asian-Pacific Island Languages	0	0%	12
Speak Other Languages	0	0%	12
Households by Household Income			
Household Income Base	1,667	100%	182
< $15,000	85	5%	48
$15,000 - $25,000	131	8%	86
$25,000 - $50,000	381	23%	158
$50,000 - $75,000	324	19%	144
$75,000 +	747	45%	194
Occupied Housing Units by Tenure			
Total	1,667	100%	182
Owner Occupied	1,192	72%	185
Renter Occupied	475	28%	108
Employed Population Age 16+ Years			
Total	3,492	100%	399
In Labor Force	2,560	73%	320
Civilian Unemployed in Labor Force	118	3%	92
Not In Labor Force	932	27%	203

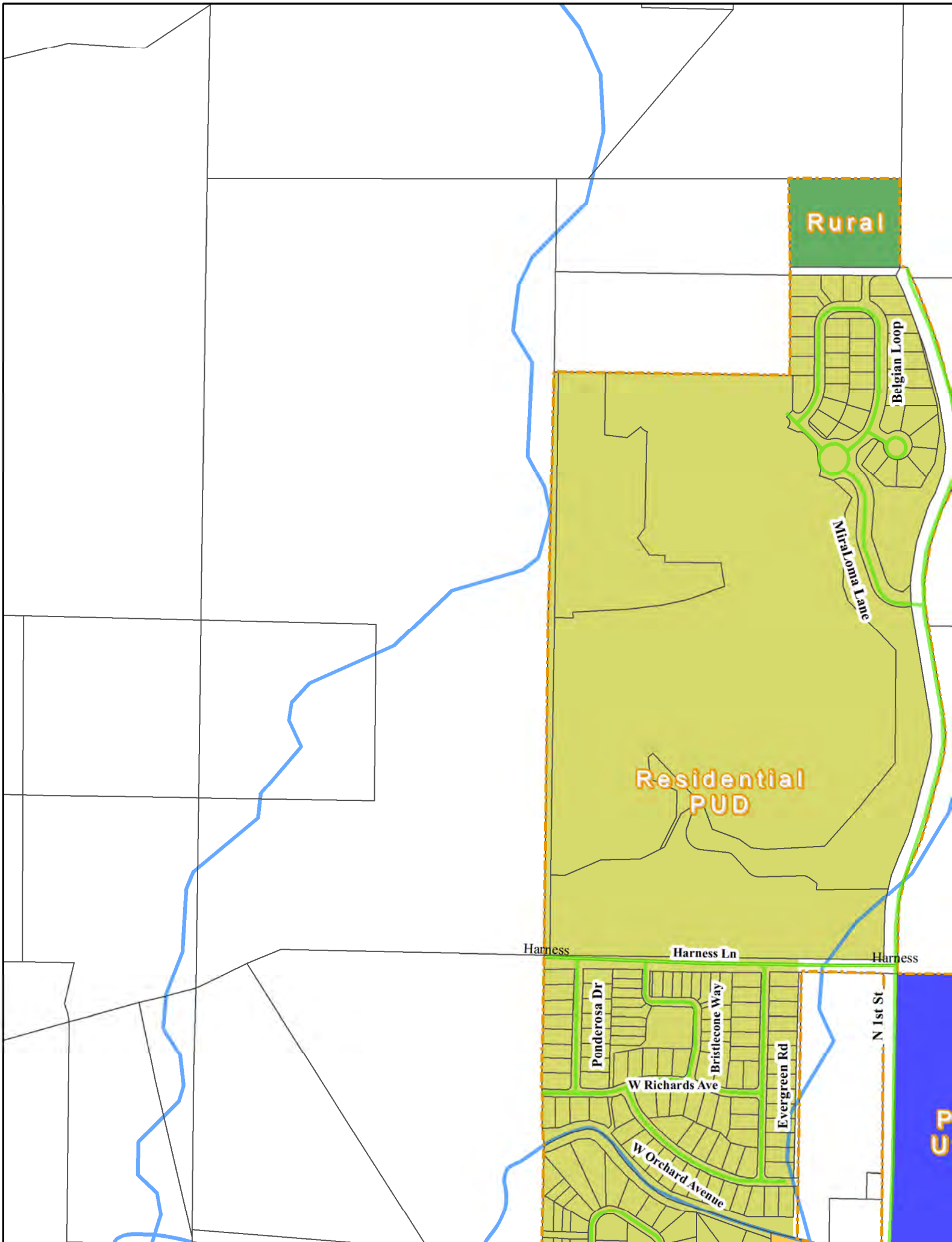
Data Note: Datail may not sum to totals due to rounding. Hispanic population can be of anyrace.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS)
*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified point center at 39.544314, -107.668116
Ring (buffer): 3-miles radius
Description: WTP - 3 Mile Radius

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Language Spoken at Home*			
Total (persons age 5 and above)	3,593	100%	363
English	2,874	80%	349
Spanish	649	18%	186
French	0	0%	13
French Creole	N/A	N/A	N/A
Italian	N/A	N/A	N/A
Portuguese	N/A	N/A	N/A
German	2	0%	7
Yiddish	N/A	N/A	N/A
Other West Germanic	N/A	N/A	N/A
Scandinavian	N/A	N/A	N/A
Greek	N/A	N/A	N/A
Russian	N/A	N/A	N/A
Polish	N/A	N/A	N/A
Serbo-Croatian	N/A	N/A	N/A
Other Slavic	N/A	N/A	N/A
Armenian	N/A	N/A	N/A
Persian	N/A	N/A	N/A
Gujarathi	N/A	N/A	N/A
Hindi	N/A	N/A	N/A
Urdu	N/A	N/A	N/A
Other Indic	N/A	N/A	N/A
Other Indo-European	7	0%	13
Chinese	0	0%	12
Japanese	N/A	N/A	N/A
Korean	0	0%	12
Mon-Khmer, Cambodian	N/A	N/A	N/A
Hmong	N/A	N/A	N/A
Thai	N/A	N/A	N/A
Laotian	N/A	N/A	N/A
Vietnamese	0	0%	12
Other Asian	0	0%	12
Tagalog	0	0%	12
Other Pacific Island	N/A	N/A	N/A
Navajo	N/A	N/A	N/A
Other Native American	N/A	N/A	N/A
Hungarian	N/A	N/A	N/A
Arabic	0	0%	12
Hebrew	N/A	N/A	N/A
African	N/A	N/A	N/A
Other and non-specified	0	0%	12
Total Non-English	719	20%	504

Data Note: Detail may not sum to totals due to rounding. Hispanic popultion can be of any race.
N/A meansnot available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019.
*Population by Language Spoken at Home is available at the census tract summary level and up.


Rural
Belgian Loop
MiraLoma Lane
Residential PUD
Harness
Harness Ln
Harness
Ponderosa Dr
Bristlecone Way
Evergreen Rd
N 1st St
W Richards Ave
W Orchard Avenue

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Garfield County, Colorado

Local office

Western Colorado Ecological Services Field Office

(970) 628-7180
(970) 245-6933

445 West Gunnison Avenue, Suite 240
Grand Junction, CO 81501-5711

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf Canis lupus This species only needs to be considered if the following condition applies: • Lone, dispersing gray wolves may be present throughout the state of Colorado. If your activity includes a predator management program, please consider this species in your environmental review. There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/4488	Endangered

Birds

NAME	STATUS
Mexican Spotted Owl Strix occidentalis lucida Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/8196	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS

Bonytail Gila elegans — Endangered
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/1377

Colorado Pikeminnow (=squawfish) Ptychocheilus lucius — Endangered
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/3531

Humpback Chub Gila cypha — Threatened
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/3930

Razorback Sucker Xyrauchen texanus — Endangered
Wherever found
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/530

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Colorado Hookless Cactus Sclerocactus glaucus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2280	Threatened

Debeque Phacelia Phacelia submutica — Threatened
Wherever found
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/4639

Parachute Beardtongue Penstemon debilis — Threatened
Wherever found
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/7099

Ute Ladies'-tresses Spiranthes diluvialis — Threatened
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2159

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Colorado Pikeminnow (=squawfish) Ptychocheilus lucius https://ecos.fws.gov/ecp/species/3531#crithab	Final
Debeque Phacelia Phacelia submutica https://ecos.fws.gov/ecp/species/4639#crithab	Final
Parachute Beardtongue Penstemon debilis https://ecos.fws.gov/ecp/species/7099#crithab	Final
Razorback Sucker Xyrauchen texanus https://ecos.fws.gov/ecp/species/530#crithab	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH

IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus* — Breeds Dec 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1626

Black Rosy-finch *Leucosticte atrata* — Breeds Jun 15 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9460

Black Swift *Cypseloides niger* — Breeds Jun 15 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8878

Brown-capped Rosy-finch *Leucosticte australis* — Breeds Jun 15 to Sep 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Cassin's Finch *Carpodacus cassinii* — Breeds May 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9462

Clark's Grebe *Aechmophorus clarkii* — Breeds Jun 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Evening Grosbeak *Coccothraustes vespertinus* — Breeds May 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Long-eared Owl asio otus — Breeds Mar 1 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Pinyon Jay Gymnorhinus cyanocephalus — Breeds Feb 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9420

Virginia's Warbler Vermivora virginiae — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9441

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey

effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

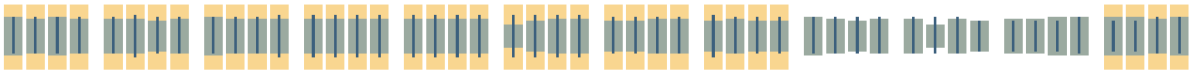
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

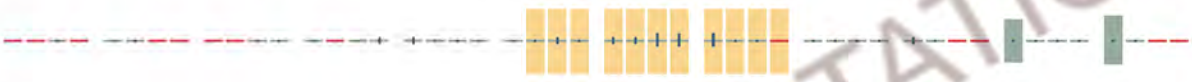
▪ probability of presence ▪ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

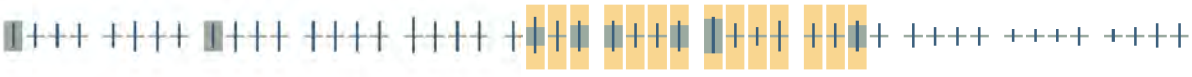


Black Rosy-finch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

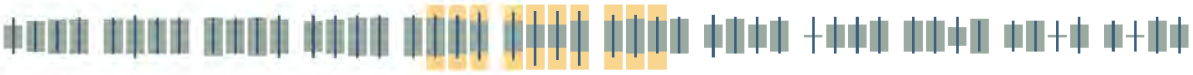


Black Swift
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Brown-capped Rosy-finch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



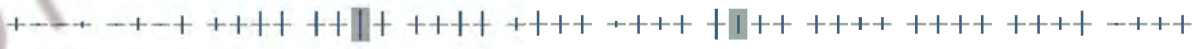
Cassin's Finch BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

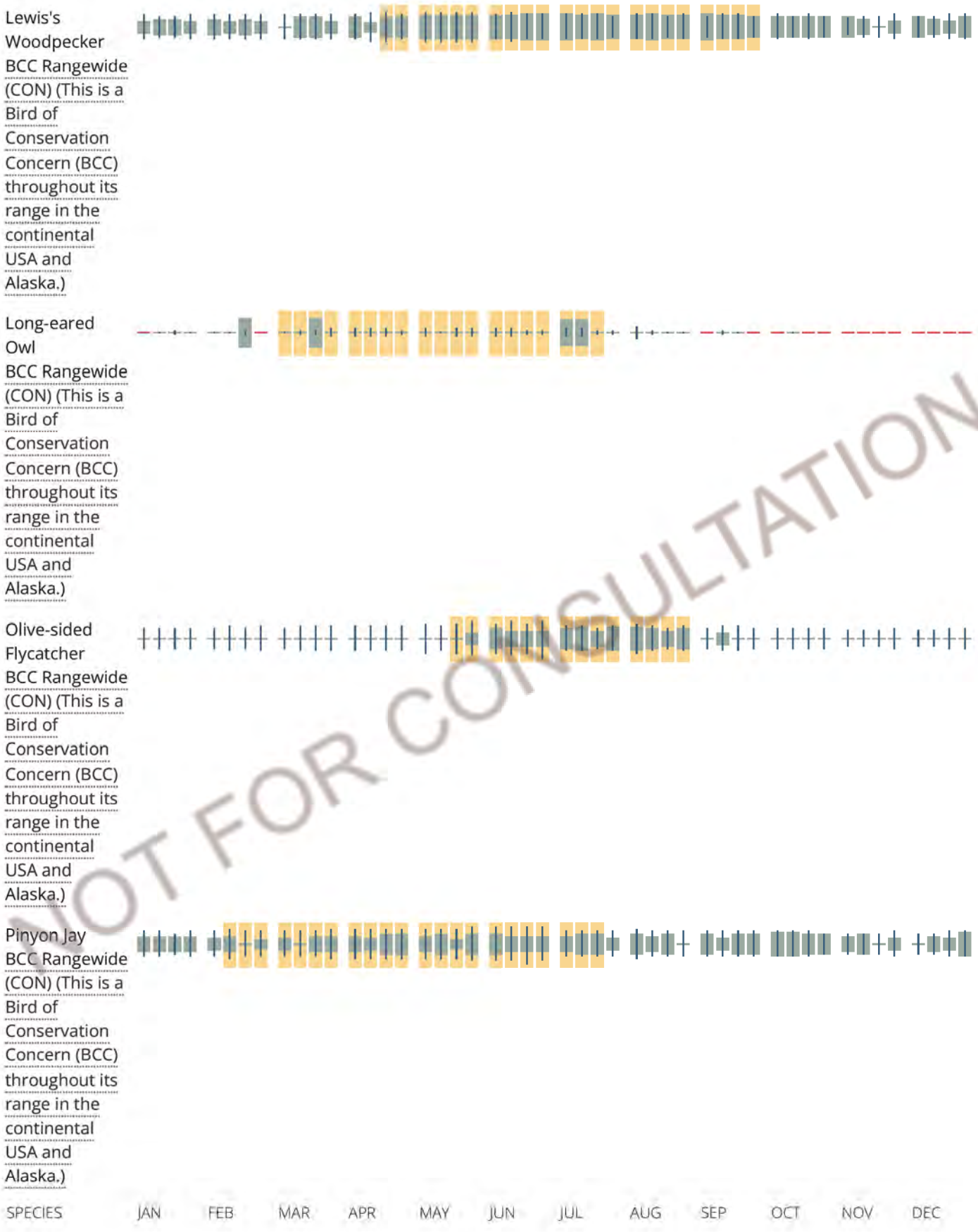


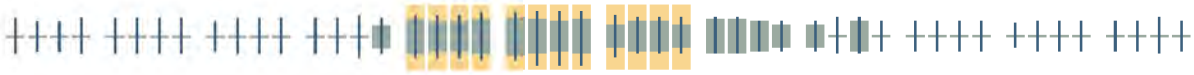
Clark's Grebe BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Evening Grosbeak BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Lesser Yellowlegs BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)







Virginia's Warbler BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barrier Resources System

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

THERE ARE NO KNOWN COASTAL BARRIERS AT THIS LOCATION.

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the official CBRS maps. The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be

subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

APPENDIX B

Discharge Permit

CERTIFICATION
AUTHORIZATION TO DISCHARGE UNDER THE
CDPS INDUSTRIAL GENERAL WATER TREATMENT PLANT PERMIT
NOT DISCHARGING TO WATERS THAT ARE DESIGNATED
AS THREATENED AND ENDANGERED HABITAT
Category 07, Sub-category 6 - General Permits,
Annual fee $340/year per (intermittent discharge)
SIC Code 4941

This certification specifically authorizes: Town of Silt
Richard Aluise, Town Administrator
P.O. Box 70
Silt, CO 81652
(970) 876-2353 Fax (970) 876-2937

with the facility contacts of: James Taylor, Operations Supervisor
Gerry Pace, Public Works

*to discharge from the facility identified as the **Silt Water Treatment Plant**, located in the NE ¼ of Section 9, T6S, R92W (Latitude 39° 32' 34" Longitude 107° 40' 06"), 500 West Frontage Road, Silt, Garfield County, Colorado (81652); from Outfalls 001A-002A, as shown in Figures 1-2 of the permit and further identified and described in this table.*

Outfall	***Description***	***Estimated Flow Rate/Volume***
001A	*Discharge from the backwash-settling pond prior to entering a tributary to the Colorado River.*	*Max = 0.0431 MGD*
002A	*Discharge from the backwash-settling pond prior to entering a tributary to the Colorado River.*	*Max = 0.68MG*

The discharges are to a tributary to the Lower Colorado River, Segment 4a of the Lower Colorado River, found in the Classifications and Numeric Standards for the Lower Colorado River Basin (5 CCR 1109-37); last update effective January 20, 2004. This segment has been designated Use Protected and is classified for the following uses: Recreation, Class 2; Aquatic Life, Class 2 (Cold); Water Supply; and Agriculture.

Applicable limitations and monitoring requirements are listed the following table.

Parameter	***Discharge Limitations Maximum Concentrations***			***Measurement Frequency***	***Sample Type***
	30-Day Avg	***7-Day Average***	***Daily Max.***		
Flow, MGD	*Report*	*NA*	*Report*	*Weekly*	*Instantaneous*
Total Suspended Solids, mg/l	*30*	*45*	*NA*	*Monthly*	*Grab*
BOD_5, mg/l	*30*	*45*	*NA*	*Monthly*	*Grab*
Oil and Grease, mg/l	*NA*	*NA*	*10*	*Weekly*	*Visual*
pH, s.u. (Minimum-Maximum)	*NA*	*NA*	*6.5-9.0*	*Weekly*	*In-situ*
Total Residual Chlorine, mg/l	*0.011*	*NA*	*0.019*	*Weekly*	*Grab*
Total Dissolved Selenium, mg/l	*Report*	*NA*	*Report*	*Quarterly*	*Grab*
Total Dissolved Solids, mg/l	*Report*	*NA*	*Report*	*Quarterly*	*Grab*

*Salinity (TDS) monitoring of the discharge **will** be required.*
*Phosphorus monitoring of the discharge **will not** be required.*
*Antidegradation is **not** applicable because the receiving stream is designated Use Protected.*
Additional monitoring has been imposed because the receiving segment is listed as impaired for selenium; and, it is uncertain if the permittee is causing or contributing to this impairment.

Chemicals Used: As part of its permit application signed April 7, 2005, the permittee indicated that the following chemicals are used in the treatment process, also included were the material safety data sheets ("MSDS") for these chemicals:

Chemical	***Purpose***
Aluminum Hydrochloride (Al_2HCl)	*Coagulant*
Calcium Hypochlorite ($Ca(OCl)_2$)	*Disinfectant*
Citric Acid ($C_6H_8O_7$)	*Membrane Cleaning*
Sodium Bisulfite ($NaHSO_3$)	*Cl_2 Neutralizer*
Sodium Hydroxide (NaOH)	*Citric Acid Neutralizer*
Sodium Hypochlorite (NaOCl)	*Membrane Cleaning*

Until approved, use of any chemical in waters that may be discharged could result in a discharge of pollutants not authorized under the permit. However, the permittee may be allowed to use a different vendor for the same compound.

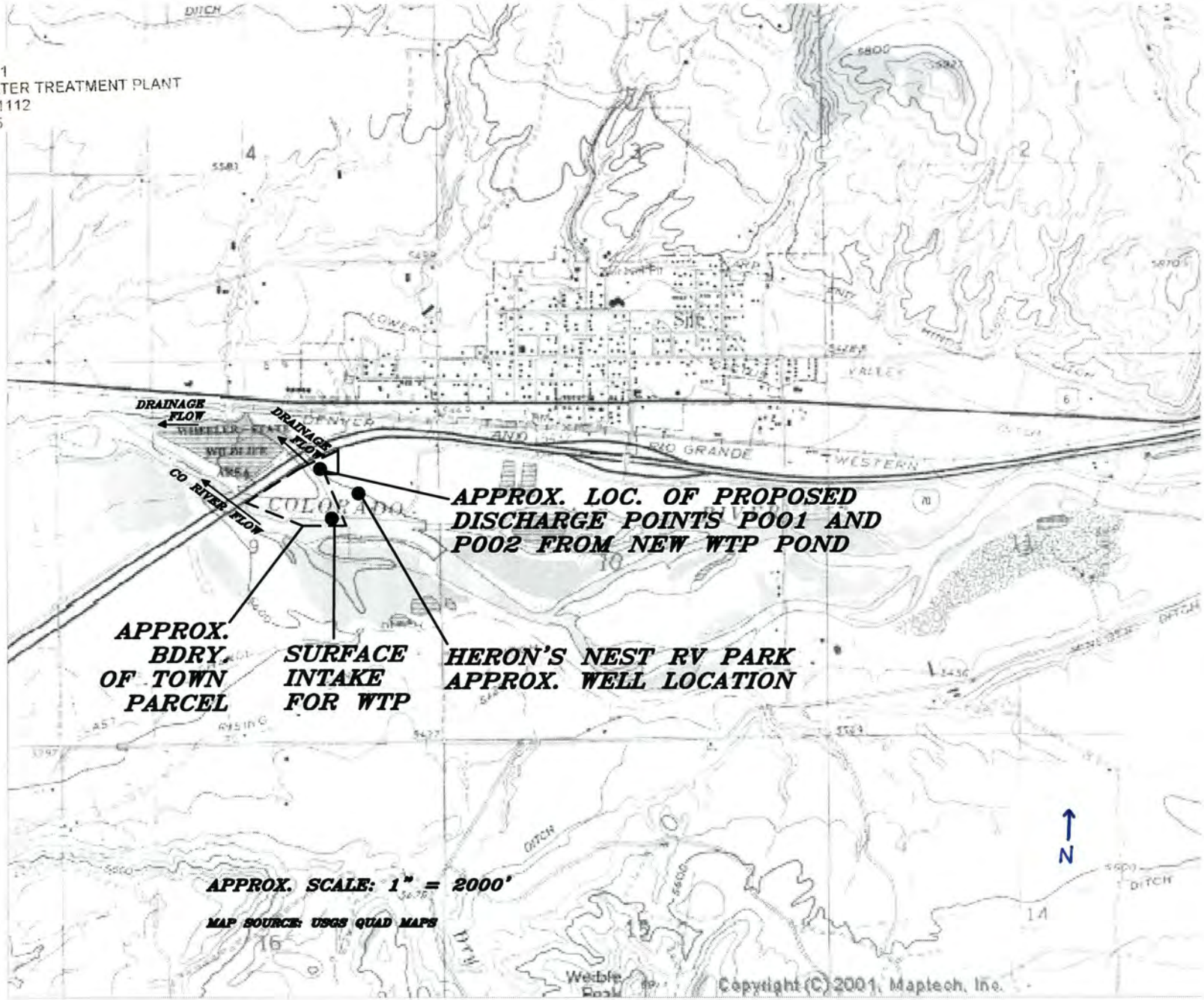
The permittee is encouraged to read the general rationale for an understanding of how this permit was developed and to read the permit to see what requirements exist.

All correspondence relative to this facility should reference the specific facility number, COG-641112.

Christopher L. Gates
January 4, 2006

ISSUED JANUARY 5, 2006 EFFECTIVE FEBRUARY 1, 2006 EXPIRATION DATE OCTOBER 31, 2010

FIGURE 1
SILT WATER TREATMENT PLANT
COG-641112
PAGE 15



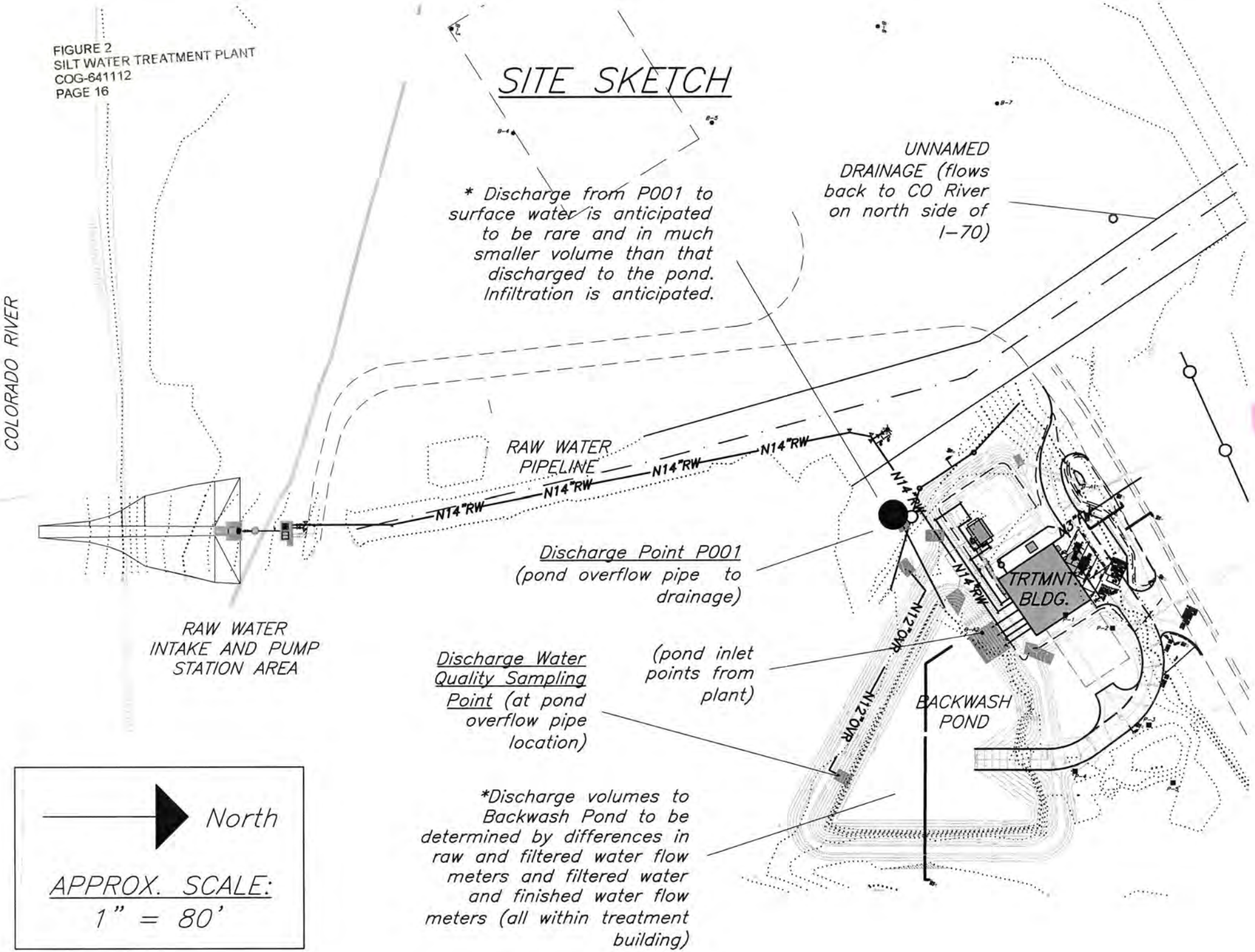
1	TOWN OF SILT WTP LOCATION MAP	Job #	2002-151.006
		Drawn by:	WJS
		Date:	4-6-05
Revision:	0	File:	LocMap.dwg

SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

118 W. 6TH STREET, SUITE 200
GLENWOOD SPRINGS, COLORADO 81601
(970) 945-1004 FAX (970) 945-5948
ASPEN, COLORADO (970) 925-6727

FIGURE 2
SILT WATER TREATMENT PLANT
COG-641112
PAGE 16

SITE SKETCH



APPENDIX C

Opinion of Project Costs

Date: 6/30/2022
Last Updated: 7/5/2022
Calculated By: MDS
Checked By: PDR
Subject: Summary

Capital Cost	CLARICONE ALT 1	PLATE SETTLER W/ MEMBRANE FILTRATION ALT 2A	PLATE SETTLER W/ MIXED MEDIA FILTER ALT 2B	PULSAPAK ALT 3	ACTIFLO W/ MIXED MEDIA FILTER ALT 4
Site Civil	$ 272,000	$ 266,000	$ 287,000	$ 259,000	$ 313,000
Structural	$ 127,000	$ 923,000	$ 751,000	$ 471,000	$ 635,000
Architectural	$ 5,141,000	$ 3,530,000	$ 4,055,000	$ 3,763,000	$ 4,550,000
Process/Mechanical	$ 4,616,000	$ 4,602,000	$ 4,055,000	$ 5,718,000	$ 5,581,000
HVAC	$ 1,524,000	$ 1,399,000	$ 1,372,000	$ 1,532,000	$ 1,662,000
Electrical	$ 1,829,000	$ 1,678,000	$ 1,646,000	$ 1,838,000	$ 1,995,000
Capital Cost Subtotal	$ 13,509,000	$ 12,398,000	$ 12,162,000	$ 13,581,000	$ 14,736,000
Contingency	$ 4,053,000	$ 3,720,000	$ 3,649,000	$ 4,075,000	$ 4,421,000
Mobilization / Demobilization	$ 676,000	$ 620,000	$ 609,000	$ 680,000	$ 737,000
Contractor Overhead and Profit	$ 2,702,000	$ 2,480,000	$ 2,433,000	$ 2,717,000	$ 2,948,000
Bonding and Insurance	$ 406,000	$ 372,000	$ 365,000	$ 408,000	$ 443,000
Total Opinon of Probable Construction Cost	**$ 21,346,000**	**$ 19,590,000**	**$ 19,218,000**	**$ 21,461,000**	**$ 23,285,000**

Engineering/Administrative Cost					
Design (10%)	$ 2,135,000	$ 1,959,000	$ 1,922,000	$ 2,146,000	$ 2,329,000
Construction Mgmt./Inspection (8%)	$ 1,708,000	$ 1,567,000	$ 1,537,000	$ 1,717,000	$ 1,863,000
Administrative (2%)	$ 427,000	$ 392,000	$ 384,000	$ 429,000	$ 466,000
Total (Engineering/Administrative)	**$ 4,270,000**	**$ 3,918,000**	**$ 3,843,000**	**$ 4,292,000**	**$ 4,658,000**
Total Project Cost	**$ 25,616,000**	**$ 23,508,000**	**$ 23,061,000**	**$ 25,753,000**	**$ 27,943,000**

Date: 6/30/2022
Last Updated: 7/5/2022
Calculated By: MDS
Checked By: PDR
Subject: Operations and Maintenance Costs

	CURRENT					FUTURE				
	Alt 1	Alt 2A Plate Settler +	Alt 2B Plate Settler +	Alt 3	Alt 4	Alt 1	Alt 2A +	Alt 2B Plate Settler	Alt 3	Alt 4
Annual Cost	**Claricone**	**Membranes**	**Filter**	**Pulsapak**	**Actiflo+filter**	**Claricone**	**Membranes**	**+ Filter**	**Pulsapak**	**Actiflo+filter**
Labor	178,000	178,000	178,000	178,000	178,000	267,000	267,000	267,000	267,000	267,000
NaOCl	38,000	38,000	38,000	38,000	38,000	89,000	89,000	89,000	89,000	89,000
ACH	86,000	86,000	86,000	86,000	86,000	199,000	199,000	199,000	199,000	199,000
Power	66,000	82,000	66,000	66,000	66,000	82,000	98,000	82,000	82,000	82,000
Annualized Equipment Maintenance	67,000	35,000	35,000	84,000	58,000	67,000	35,000	35,000	84,000	58,000
Annualized Membrane Replacement	0	67,000	0	0	0	0	67000	0	0	0
Annualized Filter Replacement	0	0	11,000	0	11,000	0	0	11000	0	11000
SUM	**435,000**	**486,000**	**414,000**	**452,000**	**437,000**	**704,000**	**755,000**	**683,000**	**721,000**	**706,000**

Date: 6/30/2022
Last Updated: 7/5/2022
Calculated By: MDS
Checked By: PDR
Subject: NPV

Discount Rate	-0.5	20 years	https://www.whitehouse.gov/wp-content/uploads/2020/12/M-21-09.pdf
Inflation Rate	0.02	percent	

SUMMARY	Alt 1 - Claricone		Alt 2A		Alt 2B		Alt 3		Alt 4	
Annual Cost	Claricone		Plate Settler + Membranes		Plate Settler + Filters		Pulsapak		Actiflo + Filter	
	Current	Future	Current	Future	Current	Future	Current	Future	Current	Future
Plant Staff	$178,000	$267,000	$178,000	$267,000	$178,000	$267,000	$178,000	$267,000	$178,000	$267,000
NaOCl	$38,000	$89,000	$38,000	$89,000	$38,000	$89,000	$38,000	$89,000	$38,000	$89,000
ACH	$86,000	$199,000	$86,000	$199,000	$86,000	$199,000	$86,000	$199,000	$86,000	$199,000
Power	$66,000	$82,000	$82,000	$98,000	$66,000	$82,000	$66,000	$82,000	$66,000	$82,000
Annualized Equipment Maintenance	$67,000	$67,000	$35,000	$35,000	$35,000	$35,000	$84,000	$84,000	$58,000	$58,000
Annualized Membrane Replacement	$0	$0	$67,000	$67,000	$0	$0	$0	$0	$0	$0
Annualized Filter Replacement	$0	$0	$0	$0	$11,000	$11,000	$0	$0	$11,000	$11,000
TOTAL	**$435,000**	**$704,000**	**$486,000**	**$755,000**	**$414,000**	**$683,000**	**$452,000**	**$721,000**	**$437,000**	**$706,000**

Alternative 1 - Claricone

Year	Capital Cost	Plant Staff	NaOCl	ACH	Power	Annualized Equipment Maintenance	Annualized Membrane Replacement	Annualized Filter Replacement	Annual Total	Discounted Current Dollars	Cumulative Total	O&M Annual Cost
2023	$ 25,616,000	$ 178,000	$ 38,000	$ 86,000	$ 66,000	$ 67,000	$ -	$ -	$ 26,051,000	$ 26,051,000	$ 26,051,000	$ 368,000
2024		$ 182,238	$ 40,429	$ 91,381	$ 66,762	$ 67,000	$ -	$ -	$ 447,810	$ 450,060	$ 26,501,060	$ 380,810
2025		$ 186,476	$ 42,857	$ 96,762	$ 67,524	$ 67,000	$ -	$ -	$ 460,619	$ 465,260	$ 26,966,320	$ 393,619
2026		$ 190,714	$ 45,286	$ 102,143	$ 68,286	$ 67,000	$ -	$ -	$ 473,429	$ 480,602	$ 27,446,921	$ 406,429
2027		$ 194,952	$ 47,714	$ 107,524	$ 69,048	$ 67,000	$ -	$ -	$ 486,238	$ 496,086	$ 27,943,007	$ 419,238
2028		$ 199,190	$ 50,143	$ 112,905	$ 69,810	$ 67,000	$ -	$ -	$ 499,048	$ 511,713	$ 28,454,720	$ 432,048
2029		$ 203,429	$ 52,571	$ 118,286	$ 70,571	$ 67,000	$ -	$ -	$ 511,857	$ 527,485	$ 28,982,205	$ 444,857
2030		$ 207,667	$ 55,000	$ 123,667	$ 71,333	$ 67,000	$ -	$ -	$ 524,667	$ 543,403	$ 29,525,608	$ 457,667
2031		$ 211,905	$ 57,429	$ 129,048	$ 72,095	$ 67,000	$ -	$ -	$ 537,476	$ 559,467	$ 30,085,075	$ 470,476
2032		$ 216,143	$ 59,857	$ 134,429	$ 72,857	$ 67,000	$ -	$ -	$ 550,286	$ 575,679	$ 30,660,755	$ 483,286
2033		$ 220,381	$ 62,286	$ 139,810	$ 73,619	$ 67,000	$ -	$ -	$ 563,095	$ 592,040	$ 31,252,795	$ 496,095
2034		$ 224,619	$ 64,714	$ 145,190	$ 74,381	$ 67,000	$ -	$ -	$ 575,905	$ 608,551	$ 31,861,345	$ 508,905
2035		$ 228,857	$ 67,143	$ 150,571	$ 75,143	$ 67,000	$ -	$ -	$ 588,714	$ 625,212	$ 32,486,558	$ 521,714
2036		$ 233,095	$ 69,571	$ 155,952	$ 75,905	$ 67,000	$ -	$ -	$ 601,524	$ 642,026	$ 33,128,584	$ 534,524
2037		$ 237,333	$ 72,000	$ 161,333	$ 76,667	$ 67,000	$ -	$ -	$ 614,333	$ 658,993	$ 33,787,577	$ 547,333
2038		$ 241,571	$ 74,429	$ 166,714	$ 77,429	$ 67,000	$ -	$ -	$ 627,143	$ 676,115	$ 34,463,692	$ 560,143
2039		$ 245,810	$ 76,857	$ 172,095	$ 78,190	$ 67,000	$ -	$ -	$ 639,952	$ 693,391	$ 35,157,083	$ 572,952
2040		$ 250,048	$ 79,286	$ 177,476	$ 78,952	$ 67,000	$ -	$ -	$ 652,762	$ 710,825	$ 35,867,908	$ 585,762
2041		$ 254,286	$ 81,714	$ 182,857	$ 79,714	$ 67,000	$ -	$ -	$ 665,571	$ 728,416	$ 36,596,323	$ 598,571
2042		$ 258,524	$ 84,143	$ 188,238	$ 80,476	$ 67,000	$ -	$ -	$ 678,381	$ 746,165	$ 37,342,489	$ 611,381
2043		$ 267,000	$ 89,000	$ 199,000	$ 82,000	$ 67,000	$ -	$ -	$ 704,000	$ 778,236	$ 38,120,724	$ 637,000
									Net Present Value	**38,121,000**		

Alternative 2A - Plate Settler + Membranes

Year	Capital Cost	Plant Staff	NaOCl	ACH	Power	Annualized Equipment Maintenance	Annualized Membrane Replacement	Annualized Filter Replacement	Annual Total	Discounted Current Dollars	Cumulative Total	O&M Annual Cost
2023	$ 23,508,000	$ 178,000	$ 38,000	$ 86,000	$ 82,000	$ 35,000	$ 67,000	$ -	$ 23,994,000	$ 23,994,000	$ 23,994,000	$ 384,000
2024		$ 182,238	$ 40,429	$ 91,381	$ 82,762	$ 35,000	$ 67,000	$ -	$ 498,810	$ 501,316	$ 24,495,316	$ 396,810
2025		$ 186,476	$ 42,857	$ 96,762	$ 83,524	$ 35,000	$ 67,000	$ -	$ 511,619	$ 516,774	$ 25,012,090	$ 409,619
2026		$ 190,714	$ 45,286	$ 102,143	$ 84,286	$ 35,000	$ 67,000	$ -	$ 524,429	$ 532,374	$ 25,544,464	$ 422,429
2027		$ 194,952	$ 47,714	$ 107,524	$ 85,048	$ 35,000	$ 67,000	$ -	$ 537,238	$ 548,119	$ 26,092,583	$ 435,238
2028		$ 199,190	$ 50,143	$ 112,905	$ 85,810	$ 35,000	$ 67,000	$ -	$ 550,048	$ 564,008	$ 26,656,590	$ 448,048
2029		$ 203,429	$ 52,571	$ 118,286	$ 86,571	$ 35,000	$ 67,000	$ -	$ 562,857	$ 580,042	$ 27,236,633	$ 460,857
2030		$ 207,667	$ 55,000	$ 123,667	$ 87,333	$ 35,000	$ 67,000	$ -	$ 575,667	$ 596,224	$ 27,832,857	$ 473,667
2031		$ 211,905	$ 57,429	$ 129,048	$ 88,095	$ 35,000	$ 67,000	$ -	$ 588,476	$ 612,554	$ 28,445,411	$ 486,476
2032		$ 216,143	$ 59,857	$ 134,429	$ 88,857	$ 35,000	$ 67,000	$ -	$ 601,286	$ 629,033	$ 29,074,443	$ 499,286
2033		$ 220,381	$ 62,286	$ 139,810	$ 89,619	$ 35,000	$ 67,000	$ -	$ 614,095	$ 645,662	$ 29,720,105	$ 512,095
2034		$ 224,619	$ 64,714	$ 145,190	$ 90,381	$ 35,000	$ 67,000	$ -	$ 626,905	$ 662,442	$ 30,382,546	$ 524,905
2035		$ 228,857	$ 67,143	$ 150,571	$ 91,143	$ 35,000	$ 67,000	$ -	$ 639,714	$ 679,374	$ 31,061,921	$ 537,714
2036		$ 233,095	$ 69,571	$ 155,952	$ 91,905	$ 35,000	$ 67,000	$ -	$ 652,524	$ 696,460	$ 31,758,381	$ 550,524
2037		$ 237,333	$ 72,000	$ 161,333	$ 92,667	$ 35,000	$ 67,000	$ -	$ 665,333	$ 713,701	$ 32,472,082	$ 563,333
2038		$ 241,571	$ 74,429	$ 166,714	$ 93,429	$ 35,000	$ 67,000	$ -	$ 678,143	$ 731,097	$ 33,203,179	$ 576,143
2039		$ 245,810	$ 76,857	$ 172,095	$ 94,190	$ 35,000	$ 67,000	$ -	$ 690,952	$ 748,650	$ 33,951,829	$ 588,952
2040		$ 250,048	$ 79,286	$ 177,476	$ 94,952	$ 35,000	$ 67,000	$ -	$ 703,762	$ 766,361	$ 34,718,190	$ 601,762
2041		$ 254,286	$ 81,714	$ 182,857	$ 95,714	$ 35,000	$ 67,000	$ -	$ 716,571	$ 784,231	$ 35,502,421	$ 614,571
2042		$ 258,524	$ 84,143	$ 188,238	$ 96,476	$ 35,000	$ 67,000	$ -	$ 729,381	$ 802,261	$ 36,304,682	$ 627,381
2043		$ 267,000	$ 89,000	$ 199,000	$ 98,000	$ 35,000	$ 67,000	$ -	$ 755,000	$ 834,613	$ 37,139,295	$ 653,000
									Net Present Value	**37,139,000**		

Alternative 2B - Plate Settler + Filters												
Year	Capital Cost	Plant Staff	NaOCl	ACH	Power	Maintenance	Membrane	Replacement	Annual Total	Dollars	Cumulative Total	O&M Annual Cost
2023	$ 23,062,000	$ 178,000	$ 38,000	$ 86,000	$ 66,000	$ 35,000	$ -	$ 11,000	$ 23,476,000	$ 23,476,000	$ 23,476,000	$ 368,000
2024		$ 182,238	$ 40,429	$ 91,381	$ 66,762	$ 35,000	$ -	$ 11,000	$ 426,810	$ 428,954	$ 23,904,954	$ 380,810
2025		$ 186,476	$ 42,857	$ 96,762	$ 67,524	$ 35,000	$ -	$ 11,000	$ 439,619	$ 444,048	$ 24,349,003	$ 393,619
2026		$ 190,714	$ 45,286	$ 102,143	$ 68,286	$ 35,000	$ -	$ 11,000	$ 452,429	$ 459,283	$ 24,808,286	$ 406,429
2027		$ 194,952	$ 47,714	$ 107,524	$ 69,048	$ 35,000	$ -	$ 11,000	$ 465,238	$ 474,660	$ 25,282,947	$ 419,238
2028		$ 199,190	$ 50,143	$ 112,905	$ 69,810	$ 35,000	$ -	$ 11,000	$ 478,048	$ 490,180	$ 25,773,127	$ 432,048
2029		$ 203,429	$ 52,571	$ 118,286	$ 70,571	$ 35,000	$ -	$ 11,000	$ 490,857	$ 505,844	$ 26,278,971	$ 444,857
2030		$ 207,667	$ 55,000	$ 123,667	$ 71,333	$ 35,000	$ -	$ 11,000	$ 503,667	$ 521,653	$ 26,800,624	$ 457,667
2031		$ 211,905	$ 57,429	$ 129,048	$ 72,095	$ 35,000	$ -	$ 11,000	$ 516,476	$ 537,608	$ 27,338,232	$ 470,476
2032		$ 216,143	$ 59,857	$ 134,429	$ 72,857	$ 35,000	$ -	$ 11,000	$ 529,286	$ 553,710	$ 27,891,942	$ 483,286
2033		$ 220,381	$ 62,286	$ 139,810	$ 73,619	$ 35,000	$ -	$ 11,000	$ 542,095	$ 569,961	$ 28,461,902	$ 496,095
2034		$ 224,619	$ 64,714	$ 145,190	$ 74,381	$ 35,000	$ -	$ 11,000	$ 554,905	$ 586,360	$ 29,048,263	$ 508,905
2035		$ 228,857	$ 67,143	$ 150,571	$ 75,143	$ 35,000	$ -	$ 11,000	$ 567,714	$ 602,911	$ 29,651,173	$ 521,714
2036		$ 233,095	$ 69,571	$ 155,952	$ 75,905	$ 35,000	$ -	$ 11,000	$ 580,524	$ 619,612	$ 30,270,785	$ 534,524
2037		$ 237,333	$ 72,000	$ 161,333	$ 76,667	$ 35,000	$ -	$ 11,000	$ 593,333	$ 636,467	$ 30,907,252	$ 547,333
2038		$ 241,571	$ 74,429	$ 166,714	$ 77,429	$ 35,000	$ -	$ 11,000	$ 606,143	$ 653,475	$ 31,560,727	$ 560,143
2039		$ 245,810	$ 76,857	$ 172,095	$ 78,190	$ 35,000	$ -	$ 11,000	$ 618,952	$ 670,638	$ 32,231,364	$ 572,952
2040		$ 250,048	$ 79,286	$ 177,476	$ 78,952	$ 35,000	$ -	$ 11,000	$ 631,762	$ 687,957	$ 32,919,321	$ 585,762
2041		$ 254,286	$ 81,714	$ 182,857	$ 79,714	$ 35,000	$ -	$ 11,000	$ 644,571	$ 705,433	$ 33,624,754	$ 598,571
2042		$ 258,524	$ 84,143	$ 188,238	$ 80,476	$ 35,000	$ -	$ 11,000	$ 657,381	$ 723,067	$ 34,347,821	$ 611,381
2043		$ 267,000	$ 89,000	$ 199,000	$ 82,000	$ 35,000	$ -	$ 11,000	$ 683,000	$ 755,021	$ 35,102,842	$ 637,000
									Net Present Value	35,103,000		

Alternative 3 - Pulsapak												
Year	Capital Cost	Plant Staff	NaOCl	ACH	Power	Annualized Equipment Maintenance	Annualized Membrane Replacement	Annualized Filter Replacement	Annual Total	Discounted Current Dollars	Cumulative Total	O&M Annual Cost
2023	$ 25,754,000	$ 178,000	$ 38,000	$ 86,000	$ 66,000	$ 84,000	$ -	$ -	$ 26,206,000	$ 26,206,000	$ 26,206,000	$ 368,000
2024		$ 182,238	$ 40,429	$ 91,381	$ 66,762	$ 84,000	$ -	$ -	$ 464,810	$ 467,145	$ 26,673,145	$ 380,810
2025		$ 186,476	$ 42,857	$ 96,762	$ 67,524	$ 84,000	$ -	$ -	$ 477,619	$ 482,431	$ 27,155,577	$ 393,619
2026		$ 190,714	$ 45,286	$ 102,143	$ 68,286	$ 84,000	$ -	$ -	$ 490,429	$ 497,859	$ 27,653,436	$ 406,429
2027		$ 194,952	$ 47,714	$ 107,524	$ 69,048	$ 84,000	$ -	$ -	$ 503,238	$ 513,430	$ 28,166,866	$ 419,238
2028		$ 199,190	$ 50,143	$ 112,905	$ 69,810	$ 84,000	$ -	$ -	$ 516,048	$ 529,145	$ 28,696,010	$ 432,048
2029		$ 203,429	$ 52,571	$ 118,286	$ 70,571	$ 84,000	$ -	$ -	$ 528,857	$ 545,004	$ 29,241,015	$ 444,857
2030		$ 207,667	$ 55,000	$ 123,667	$ 71,333	$ 84,000	$ -	$ -	$ 541,667	$ 561,010	$ 29,802,024	$ 457,667
2031		$ 211,905	$ 57,429	$ 129,048	$ 72,095	$ 84,000	$ -	$ -	$ 554,476	$ 577,163	$ 30,379,187	$ 470,476
2032		$ 216,143	$ 59,857	$ 134,429	$ 72,857	$ 84,000	$ -	$ -	$ 567,286	$ 593,464	$ 30,972,651	$ 483,286
2033		$ 220,381	$ 62,286	$ 139,810	$ 73,619	$ 84,000	$ -	$ -	$ 580,095	$ 609,914	$ 31,582,565	$ 496,095
2034		$ 224,619	$ 64,714	$ 145,190	$ 74,381	$ 84,000	$ -	$ -	$ 592,905	$ 626,514	$ 32,209,079	$ 508,905
2035		$ 228,857	$ 67,143	$ 150,571	$ 75,143	$ 84,000	$ -	$ -	$ 605,714	$ 643,266	$ 32,852,345	$ 521,714
2036		$ 233,095	$ 69,571	$ 155,952	$ 75,905	$ 84,000	$ -	$ -	$ 618,524	$ 660,171	$ 33,512,516	$ 534,524
2037		$ 237,333	$ 72,000	$ 161,333	$ 76,667	$ 84,000	$ -	$ -	$ 631,333	$ 677,229	$ 34,189,745	$ 547,333
2038		$ 241,571	$ 74,429	$ 166,714	$ 77,429	$ 84,000	$ -	$ -	$ 644,143	$ 694,442	$ 34,884,187	$ 560,143
2039		$ 245,810	$ 76,857	$ 172,095	$ 78,190	$ 84,000	$ -	$ -	$ 656,952	$ 711,811	$ 35,595,998	$ 572,952
2040		$ 250,048	$ 79,286	$ 177,476	$ 78,952	$ 84,000	$ -	$ -	$ 669,762	$ 729,337	$ 36,325,335	$ 585,762
2041		$ 254,286	$ 81,714	$ 182,857	$ 79,714	$ 84,000	$ -	$ -	$ 682,571	$ 747,021	$ 37,072,356	$ 598,571
2042		$ 258,524	$ 84,143	$ 188,238	$ 80,476	$ 84,000	$ -	$ -	$ 695,381	$ 764,864	$ 37,837,220	$ 611,381
2043		$ 267,000	$ 89,000	$ 199,000	$ 82,000	$ 84,000	$ -	$ -	$ 721,000	$ 797,028	$ 38,634,248	$ 637,000
									Net Present Value	38,634,000		

Alternative 4 - Actiflo + Filters												
Year	Capital Cost	Plant Staff	NaOCl	ACH	Power	Annualized Equipment Maintenance	Annualized Membrane Replacement	Annualized Filter Replacement	Annual Total	Discounted Current Dollars	Cumulative Total	O&M Annual Cost
2023	$ 27,942,000	$ 178,000	$ 38,000	$ 86,000	$ 66,000	$ 58,000	$ -	$ 11,000	$ 28,379,000	$ 28,379,000	$ 28,379,000	$ 368,000
2024		$ 182,238	$ 40,429	$ 91,381	$ 66,762	$ 58,000	$ -	$ 11,000	$ 449,810	$ 452,070	$ 28,831,070	$ 380,810
2025		$ 186,476	$ 42,857	$ 96,762	$ 67,524	$ 58,000	$ -	$ 11,000	$ 462,619	$ 467,280	$ 29,298,350	$ 393,619
2026		$ 190,714	$ 45,286	$ 102,143	$ 68,286	$ 58,000	$ -	$ 11,000	$ 475,429	$ 482,632	$ 29,780,982	$ 406,429
2027		$ 194,952	$ 47,714	$ 107,524	$ 69,048	$ 58,000	$ -	$ 11,000	$ 488,238	$ 498,126	$ 30,279,108	$ 419,238
2028		$ 199,190	$ 50,143	$ 112,905	$ 69,810	$ 58,000	$ -	$ 11,000	$ 501,048	$ 513,764	$ 30,792,872	$ 432,048
2029		$ 203,429	$ 52,571	$ 118,286	$ 70,571	$ 58,000	$ -	$ 11,000	$ 513,857	$ 529,546	$ 31,322,418	$ 444,857
2030		$ 207,667	$ 55,000	$ 123,667	$ 71,333	$ 58,000	$ -	$ 11,000	$ 526,667	$ 545,474	$ 31,867,893	$ 457,667
2031		$ 211,905	$ 57,429	$ 129,048	$ 72,095	$ 58,000	$ -	$ 11,000	$ 539,476	$ 561,549	$ 32,429,442	$ 470,476
2032		$ 216,143	$ 59,857	$ 134,429	$ 72,857	$ 58,000	$ -	$ 11,000	$ 552,286	$ 577,771	$ 33,007,213	$ 483,286
2033		$ 220,381	$ 62,286	$ 139,810	$ 73,619	$ 58,000	$ -	$ 11,000	$ 565,095	$ 594,143	$ 33,601,356	$ 496,095
2034		$ 224,619	$ 64,714	$ 145,190	$ 74,381	$ 58,000	$ -	$ 11,000	$ 577,905	$ 610,664	$ 34,212,020	$ 508,905
2035		$ 228,857	$ 67,143	$ 150,571	$ 75,143	$ 58,000	$ -	$ 11,000	$ 590,714	$ 627,336	$ 34,839,356	$ 521,714
2036		$ 233,095	$ 69,571	$ 155,952	$ 75,905	$ 58,000	$ -	$ 11,000	$ 603,524	$ 644,161	$ 35,483,517	$ 534,524
2037		$ 237,333	$ 72,000	$ 161,333	$ 76,667	$ 58,000	$ -	$ 11,000	$ 616,333	$ 661,139	$ 36,144,656	$ 547,333
2038		$ 241,571	$ 74,429	$ 166,714	$ 77,429	$ 58,000	$ -	$ 11,000	$ 629,143	$ 678,271	$ 36,822,927	$ 560,143
2039		$ 245,810	$ 76,857	$ 172,095	$ 78,190	$ 58,000	$ -	$ 11,000	$ 641,952	$ 695,558	$ 37,518,485	$ 572,952
2040		$ 250,048	$ 79,286	$ 177,476	$ 78,952	$ 58,000	$ -	$ 11,000	$ 654,762	$ 713,002	$ 38,231,487	$ 585,762
2041		$ 254,286	$ 81,714	$ 182,857	$ 79,714	$ 58,000	$ -	$ 11,000	$ 667,571	$ 730,604	$ 38,962,092	$ 598,571
2042		$ 258,524	$ 84,143	$ 188,238	$ 80,476	$ 58,000	$ -	$ 11,000	$ 680,381	$ 748,365	$ 39,710,457	$ 611,381
2043		$ 267,000	$ 89,000	$ 199,000	$ 82,000	$ 58,000	$ -	$ 11,000	$ 706,000	$ 780,446	$ 40,490,903	$ 637,000
									Net Present Value	40,491,000		

Date: 6/30/2022							
Last Updated: 7/5/2022							
Calculated By: MDS							
Checked By: PDR						Equipment Installation Factor:	30%
Subject: Tank						2021-2023 Inflation Factor:	1.06
						RS Means Location Factor:	1.00
Cost		**Qty**	**Unit**	**Cost per unit**	**Material Cost**	**Install Cost**	**TOTAL**
Site Civil							
Excavation		1,000	CY	40	42,000		42,000
Backfill		750	CY	30	24,000		24,000
Subtotal							**66,000**
Structural							
		0	CY	0	0		0
Subtotal							**0**
Architectural							
				20%			0
Subtotal							**0**
Process/Mechanical							
0.5 MG water tank - steel above grade		1	LS	1,200,000	1,272,000		1,272,000
Subtotal							**1,272,000**
HVAC							
Planning Estimate				0%			0
Subtotal							**0**
Electrical							
Planning Estimate				3%			41,000
Subtotal							**41,000**
Capital Cost Subtotal							**1,379,000**
Contingency						30%	414,000
Mobilization / Demobilization						5%	69,000
Contractor Overhead and Profit						20%	276,000
Bonding and Insurance						3%	42,000
Opinion of Probable Construction Cost							**2,180,000**
Planning, Regulatory, and Engineering						20%	436,000
Total Estimated Project Cost							**2,616,000**
Range Low						-30%	1,831,200
Range High						50%	3,924,000
Class 4 Estimate	-30 to +50						

Date: 6/30/2022							
Last Updated: 7/5/2022							
Calculated By: MDS						Equipment Installation Factor:	30%
Checked By: PDR						2021-2023 Inflation Factor:	1.06
Subject: 1-Claricone						RS Means Location Factor:	1.00
Cost		**Qty**	**Unit**	**Cost per unit**	**Material Cost**	**Install Cost**	**TOTAL**
Site Civil							
Clearing and Grubbing		1	LS	10,000	11,000		11,000
Excavation		1,300	CY	30	41,000		41,000
Backfill		400	CY	40	17,000		17,000
Structural Fill		700	ea	90	67,000		67,000
Asphalt		5,000	SF	5	27,000		27,000
Site Grading		1	LS	50,000	53,000		53,000
Site Pipe		150	LF	350	56,000		56,000
Subtotal							**272,000**
Structural							
Shallow Foundation Footer		100	CY	1,200	127,000		127,000
Slab on Grade		300	CY	1,200	382,000		382,000
Subtotal							**127,000**
Architectural							
Claricone Building		5,400	sf	750	4,293,000		4,293,000
Existing Building and Plate Settler Demo		1	LS	300,000	318,000		318,000
Existing Building Architectural		1	LS	500,000	530,000		530,000
Subtotal							**5,141,000**
Process/Mechanical							
Claricone Equipment		1	LS	2,100,000	2,226,000	668,000	2,894,000
ACH Tanks		2	ea	20,000	42,000	13,000	55,000
Sodium Hypochlorite Tanks		2	ea	20,000	42,000	13,000	55,000
Chemical Feed Pumps and Associated Eqiupment		4	ea	5,000	21,000	6,000	27,000
UV Equipment		1	LS	1,000,000	1,060,000	318,000	1,378,000
Interior Process Piping		1	LS	150,000	159,000	48,000	207,000
Subtotal							**4,616,000**
HVAC							
Planning Estimate				15%			1,524,000
Subtotal							**1,524,000**
Electrical							
Planning Estimate				18%			1,829,000
Subtotal							**1,829,000**
Capital Cost Subtotal							**13,509,000**
Contingency						30%	4,053,000
Mobilization / Demobilization						5%	676,000
Contractor Overhead and Profit						20%	2,702,000
Bonding and Insurance						3%	406,000
Opinion of Probable Construction Cost							**21,346,000**
Planning, Regulatory, and Engineering						20%	4,270,000
Total Estimated Project Cost							**25,616,000**
Range Low						-30%	17,931,200
Range High						50%	38,424,000
Class 4 Estimate	-30 to +50						

Date: 6/30/2022							
Last Updated: 7/5/2022							
Calculated By: MDS						Equipment Installation Factor:	30%
Checked By: PDR						2021-2023 Inflation Factor:	1.06
Subject: 2A-Plate						RS Means Location Factor:	1.00
Cost		**Qty**	**Unit**	**Cost per unit**	**Material Cost**	**Install Cost**	**TOTAL**
Site Civil							
Clearing and Grubbing		1	LS	10,000	11,000		11,000
Excavation - Plate Settler		800	CY	30	25,000		25,000
Backfill - Plate Settler		300	CY	40	13,000		13,000
Structural Fill - Plate Settler		400	CY	90	38,000		38,000
Excavation - Membranes		500	CY	30	16,000		16,000
Backfill - Membranes		200	CY	40	8,000		8,000
Structural Fill - Membranes		200	CY	90	19,000		19,000
Asphalt		5,000	SF	5	27,000		27,000
Site Grading		1	LS	50,000	53,000		53,000
Site Pipe		150	LF	350	56,000		56,000
Subtotal							**266,000**
Structural							
Shallow Foundation Footer - Plate Settler Building		50	CY	1,200	64,000		64,000
Slab on Grade - Plate Settler Building		300	CY	1,200	382,000		382,000
Shallow Foundation Footer - Membrane Building		30	CY	1,200	38,000		38,000
Slab on Grade - Membrane Building		100	CY	1,200	127,000		127,000
Flocculation Tank Walls		90	CY	1,400	134,000		134,000
Settler Tank Walls		120	CY	1,400	178,000		178,000
Subtotal							**923,000**
Architectural							
New Plate Settler Building		3,000	sf	550	1,749,000		1,749,000
New Membrane Building		1,600	sf	550	933,000		933,000
Existing Building and Plate Settler Demo		1	LS	300,000	318,000		318,000
Existing Building Architectural		1	LS	500,000	530,000		530,000
Subtotal							**3,530,000**
Process/Mechanical							
Plate Settler Equipment		1	LS	590,000	625,000	188,000	813,000
Membrane Filtration Skids		1	LS	1,500,000	1,590,000	477,000	2,067,000
ACH Tanks		2	ea	20,000	42,000	13,000	55,000
Sodium Hypochlorite Tanks		2	ea	20,000	42,000	13,000	55,000
Chemical Feed Pumps and Associated Eqiupment		4	ea	5,000	21,000	6,000	27,000
UV Equipment		1	LS	1,000,000	1,060,000	318,000	1,378,000
Interior Process Piping		1	LS	150,000	159,000	48,000	207,000
Subtotal							**4,602,000**
HVAC							
Planning Estimate				15%			1,399,000
Subtotal							**1,399,000**
Electrical							
Planning Estimate				18%			1,678,000
Subtotal							**1,678,000**
Capital Cost Subtotal							**12,398,000**
Contingency						30%	3,720,000
Mobilization / Demobilization						5%	620,000
Contractor Overhead and Profit						20%	2,480,000
Bonding and Insurance						3%	372,000
Opinion of Probable Construction Cost							**19,590,000**
Planning, Regulatory, and Engineering						20%	3,918,000
Total Estimated Project Cost							**23,508,000**
Range Low						-30%	16,455,600
Range High						50%	35,262,000
Class 4 Estimate	-30 to +50						

Date: 6/30/2022							
Last Updated: 7/5/2022							
Calculated By: MDS						Equipment Installation Factor:	30%
Checked By: PDR						2021-2023 Inflation Factor:	1.06
Subject: 2B-Plate						RS Means Location Factor:	1.00
Cost		**Qty**	**Unit**	**Cost per unit**	**Material Cost**	**Install Cost**	**TOTAL**
Site Civil							
Clearing and Grubbing		1	LS	10,000	11,000		11,000
Excavation - Plate Settler		800	CY	30	25,000		25,000
Backfill - Plate Settler		300	CY	40	13,000		13,000
Structural Fill - Plate Settler		400	CY	90	38,000		38,000
Excavation - Mixed Media Filters		700	CY	30	22,000		22,000
Backfill - Mixed Media Filters		300	CY	40	13,000		13,000
Structural Fill - Mixed Media Filters		300	CY	90	29,000		29,000
Asphalt		5,000	SF	5	27,000		27,000
Site Grading		1	LS	50,000	53,000		53,000
Site Pipe		150	LF	350	56,000		56,000
Subtotal							**287,000**
Structural							
Shallow Foundation Footer - Plate Settler Building		50	CY	1,200	64,000		64,000
Slab on Grade - Plate Settler Building		300	CY	1,200	382,000		382,000
Shallow Foundation Footer - Mixed Media Filter Building		40	CY	1,200	51,000		51,000
Slab on Grade - Mixed Media Filter Building		200	CY	1,200	254,000		254,000
Subtotal							**751,000**
Architectural							
New Plate Settler Building		3,000	sf	550	1,749,000		1,749,000
Mixed Media Filter Building		2,500	sf	550	1,458,000		1,458,000
Existing Building and Plate Settler Demo		1	LS	300,000	318,000		318,000
Existing Building Architectural		1	LS	500,000	530,000		530,000
Subtotal							**4,055,000**
Process/Mechanical							
Plate Settler Equipment		1	LS	590,000	625,000	188,000	813,000
Mixed Media Filter Equipment		1	LS	1,100,000	1,166,000	350,000	1,516,000
ACH Tanks		2	ea	20,000	42,000	13,000	55,000
Sodium Hypochlorite Tanks		2	ea	20,000	42,000	13,000	55,000
Chemical Feed Pumps and Associated Eqiupment		4	ea	5,000	21,000	6,000	27,000
UV Equipment		1	LS	1,000,000	1,060,000	318,000	1,378,000
Interior Process Piping		1	LS	150,000	159,000	48,000	207,000
Subtotal							**4,051,000**
HVAC							
Planning Estimate				15%			1,372,000
Subtotal							**1,372,000**
Electrical							
Planning Estimate				18%			1,646,000
Subtotal							**1,646,000**
Capital Cost Subtotal							**12,162,000**
Contingency						30%	3,649,000
Mobilization / Demobilization						5%	609,000
Contractor Overhead and Profit						20%	2,433,000
Bonding and Insurance						3%	365,000
Opinion of Probable Construction Cost							**19,218,000**
Planning, Regulatory, and Engineering						20%	3,844,000
Total Estimated Project Cost							**23,062,000**
Range Low						-30%	16,143,400
Range High						50%	34,593,000
Class 4 Estimate	-30 to +50						

Date: 6/30/2022							
Last Updated: 7/5/2022							
Calculated By: MDS						Equipment Installation Factor:	30%
Checked By: PDR						2021-2023 Inflation Factor:	1.06
Subject: 3-Pulsapak						RS Means Location Factor:	1.00
Cost		**Qty**	**Unit**	**Cost per unit**	**Material Cost**	**Install Cost**	**TOTAL**
Site Civil							
Clearing and Grubbing		1	LS	10,000	11,000		11,000
Excavation - Pulsapak Building		1,200	CY	30	38,000		38,000
Backfill - Pulsapak Building		400	CY	40	17,000		17,000
Structural Fill - Pulsapak Building		600	CY	90	57,000		57,000
Asphalt		5,000	SF	5	27,000		27,000
Site Grading		1	LS	50,000	53,000		53,000
Site Pipe		150	LF	350	56,000		56,000
Subtotal							**259,000**
Structural							
Shallow Foundation Footer - Pulsapak Building		70	CY	1,200	89,000		89,000
Slab on Grade - Pulsapak Building		300	CY	1,200	382,000		382,000
Subtotal							**471,000**
Architectural							
Pulsapak Building		5,000	sf	550	2,915,000		2,915,000
Existing Building and Plate Settler Demo		1	LS	300,000	318,000		318,000
Existing Building Architectural		1	LS	500,000	530,000		530,000
Subtotal							**3,763,000**
Process/Mechanical							
Pulsapak Equipment		1	LS	2,900,000	3,074,000	922,000	3,996,000
ACH Tanks		2	ea	20,000	42,000	13,000	55,000
Sodium Hypochlorite Tanks		2	ea	20,000	42,000	13,000	55,000
Chemical Feed Pumps and Associated Eqiupment		4	ea	5,000	21,000	6,000	27,000
UV Equipment		1	LS	1,000,000	1,060,000	318,000	1,378,000
Interior Process Piping		1	LS	150,000	159,000	48,000	207,000
Subtotal							**5,718,000**
HVAC							
Planning Estimate				15%			1,532,000
Subtotal							**1,532,000**
Electrical							
Planning Estimate				18%			1,838,000
Subtotal							**1,838,000**
Capital Cost Subtotal							**13,581,000**
Contingency						30%	4,075,000
Mobilization / Demobilization						5%	680,000
Contractor Overhead and Profit						20%	2,717,000
Bonding and Insurance						3%	408,000
Opinion of Probable Construction Cost							**21,461,000**
Planning, Regulatory, and Engineering						20%	4,293,000
Total Estimated Project Cost							**25,754,000**
Range Low						-30%	18,027,800
Range High						50%	38,631,000
Class 4 Estimate	-30 to +50						

Date: 6/30/2022							
Last Updated: 7/5/2022							
Calculated By: MDS						Equipment Installation Factor:	30%
Checked By: PDR						2021-2023 Inflation Factor:	1.06
Subject: 4-Actiflo						RS Means Location Factor:	1.00
Cost		**Qty**	**Unit**	**Cost per unit**	**Material Cost**	**Install Cost**	**TOTAL**
Site Civil							
Clearing and Grubbing		1	LS	10,000	11,000		11,000
Excavation - Actiflo Building		900	CY	30	29,000		29,000
Backfill - Actiflo Building		300	CY	40	13,000		13,000
Structural Fill - Actiflo Building		500	CY	90	48,000		48,000
Excavation - Mixed Media Filters		800	CY	30	25,000		25,000
Backfill - Mixed Media Filters		300	CY	40	13,000		13,000
Structural Fill - Mixed Media Filters		400	CY	90	38,000		38,000
Asphalt		5,000	SF	5	27,000		27,000
Site Grading		1	LS	50,000	53,000		53,000
Site Pipe		150	LF	350	56,000		56,000
Subtotal							**313,000**
Structural							
Shallow Foundation Footer - Actiflo Building		60	CY	1,200	76,000		76,000
Slab on Grade - Actiflo Building		200	CY	1,200	254,000		254,000
Shallow Foundation Footer - Mixed Media Filters		40	CY	1,200	51,000		51,000
Slab on Grade - Mixed Media Filters		200	CY	1,200	254,000		254,000
Subtotal							**635,000**
Architectural							
Actiflo Building		3,600	sf	550	2,099,000		2,099,000
Mixed Media Filter Building		2,750	sf	550	1,603,000		1,603,000
Existing Building and Plate Settler Demo		1	LS	300,000	318,000		318,000
Existing Building Architectural		1	LS	500,000	530,000		530,000
Subtotal							**4,550,000**
Process/Mechanical							
Actiflo Equipment		1	LS	1,700,000	1,802,000	541,000	2,343,000
Mixed Media Filter Equipment		1	LS	1,100,000	1,166,000	350,000	1,516,000
ACH Tanks		2	ea	20,000	42,000	13,000	55,000
Sodium Hypochlorite Tanks		2	ea	20,000	42,000	13,000	55,000
Chemical Feed Pumps and Associated Eqiupment		4	ea	5,000	21,000	6,000	27,000
UV Equipment		1	LS	1,000,000	1,060,000	318,000	1,378,000
Interior Process Piping		1	LS	150,000	159,000	48,000	207,000
Subtotal							**5,581,000**
HVAC							
Planning Estimate				15%			1,662,000
Subtotal							**1,662,000**
Electrical							
Planning Estimate				18%			1,995,000
Subtotal							**1,995,000**
Capital Cost Subtotal							**14,736,000**
Contingency						30%	4,421,000
Mobilization / Demobilization						5%	737,000
Contractor Overhead and Profit						20%	2,948,000
Bonding and Insurance						3%	443,000
Opinion of Probable Construction Cost							**23,285,000**
Planning, Regulatory, and Engineering						20%	4,657,000
Total Estimated Project Cost							**27,942,000**
Range Low						-30%	19,559,400
Range High						50%	41,913,000
Class 4 Estimate	-30 to +50						

Appendix B. Photo Log

Photo Log
Town of Silt Water Treatment Plant Expansion and Improvements
Garfield County, Colorado
January 26, 2023

Photo 1 - Wetlands vegetation adjacent to the backwash pond. View is to the east.

Photo 2 - Backwash pond and existing treatment building. View is to the west.

Photo 3 - Backwash pond. View is to the south.

Photo 4 - Disturbed uplands area near access road. View is to the north.

Photo 5 - Vegetation along western edge of backwash pond. View is to the northwest.

Photo 6 - Access road with wetlands vegetation along fence line. View is to the east.

Appendix C. ERO Cultural Resources Technical Memorandum

Technical Memorandum
File and Literature Review
Town of Silt Water Treatment Plant Project
Garfield County, Colorado

Prepared for:
Dewberry Engineers, Inc.

January 3, 2023

Dewberry Engineers, Inc. (Client) retained ERO Resources Corporation (ERO) to perform a cultural resource file and literature review for proposed water treatment system improvements to the Town of Silt Water Treatment Plant (WTP) project (project) between Interstate 70 and the Colorado River in Silt, Garfield County, Colorado (project area; Figure 1, attached). The project will be funded through the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division's State Revolving Fund and requires compliance with Section 106 of the National Historic Preservation Act (NHPA). The results of the file and literature review will provide the Client's planners with information regarding known and potential cultural resources as well as effects recommendations.

Area of Potential Effects

ERO defined the area of potential effects (APE) including all areas of currently known potential ground disturbance and access and staging areas at the WTP (17.25 acres). The APE is south and east of Interstate 70, north of the Colorado River, and west of River Frontage Road. Undeveloped wetlands of the Colorado River surround most of the APE, with modern interstate and commercial residential developments located to the north and east. The APE is in Section 9, Township 2 South, Range 92 West of the 6th Principal Meridian in Silt, Garfield County, Colorado (Figure 1, attached).

Methodology

The purpose of the cultural resource file and literature review is to determine if any previously documented cultural resources listed in or eligible for listing in the National Register of Historic Places (NRHP) or State Register of Historic Places (SRHP) could be impacted by the proposed project. A "cultural resource" is defined as an archaeological site, structure, or building constructed 50 or more years ago (Little et al. 2000). A cultural resource listed in or eligible for listing in the NRHP/SRHP is a "historic property." To assist with project planning and potential consultation obligations under Section

106 of the NHPA (Code of Federal Regulations (CFR) 800) and the State Register Act (Colorado Revised Statutes 34-80.1-104), ERO reviewed the previous cultural resource surveys and resource documentation completed in the APE by conducting a file review using the Office of Archaeology and Historic Preservation (OAHP) online Compass database on November 8, 2022.

Results

The file search identified no previous cultural resource surveys or documented cultural resources that intersect the APE.

In addition to the OAHP file search, ERO conducted a review of historical maps, Garfield County Assessor records, General Land Office (GLO) records, and aerial images to assess the potential for unknown historical resources, such as roads, ditches, and buildings, in the APE. ERO reviewed maps dating from 1888 to 1970 (U.S. Geological Survey 1910, 1962, 1964, 1970; U.S. Surveyor General's Office 1888) and aerial images from 1960 to 2021 (Google, Inc. 2022; Nationwide Environmental Title Research 2022). No potential historical resources are mapped on any of the historical maps or aerial images.

The original survey plat and topographic maps depict the APE as undeveloped (U.S. Surveyor General's Office 1888). Garfield County Assessor records indicate that the property was sold to the town of Silt in 2000, although dates of construction were unavailable (Garfield County Assessor's Office 2022). Aerial images show that the APE was cleared between 2002 and 2004 for the construction of the WTP.

The APE is completely disturbed by the construction of the WTP (Google, Inc. 2022). By 2016, four buildings, a retention pond, sedimentation and treatment tanks, and solar panels were constructed in the APE (Figure 2, attached) (Google, Inc. 2022; Nationwide Environmental Title Research 2022). Given the presence of heavy disturbance, there is no potential for any undocumented Native American or historical resources in the APE.

Summary

The file and literature review indicates that no previously documented or potential historical resources are in the APE. There is no potential for undocumented cultural resources because the APE was disturbed by the construction of the WTP facilities.

ERO recommends a finding of no historic properties affected for activities in the project area pursuant to 36 CFR 800.4(d)(1) of the NHPA .

Certification of Results

Jonathan Hedlund, Principal Investigator

Attachments

References Cited

Garfield County Assessor's Office
2022 Garfield County Assessor's Office Property Search. https://www.garfield-county.com/assessor/residential-property/.

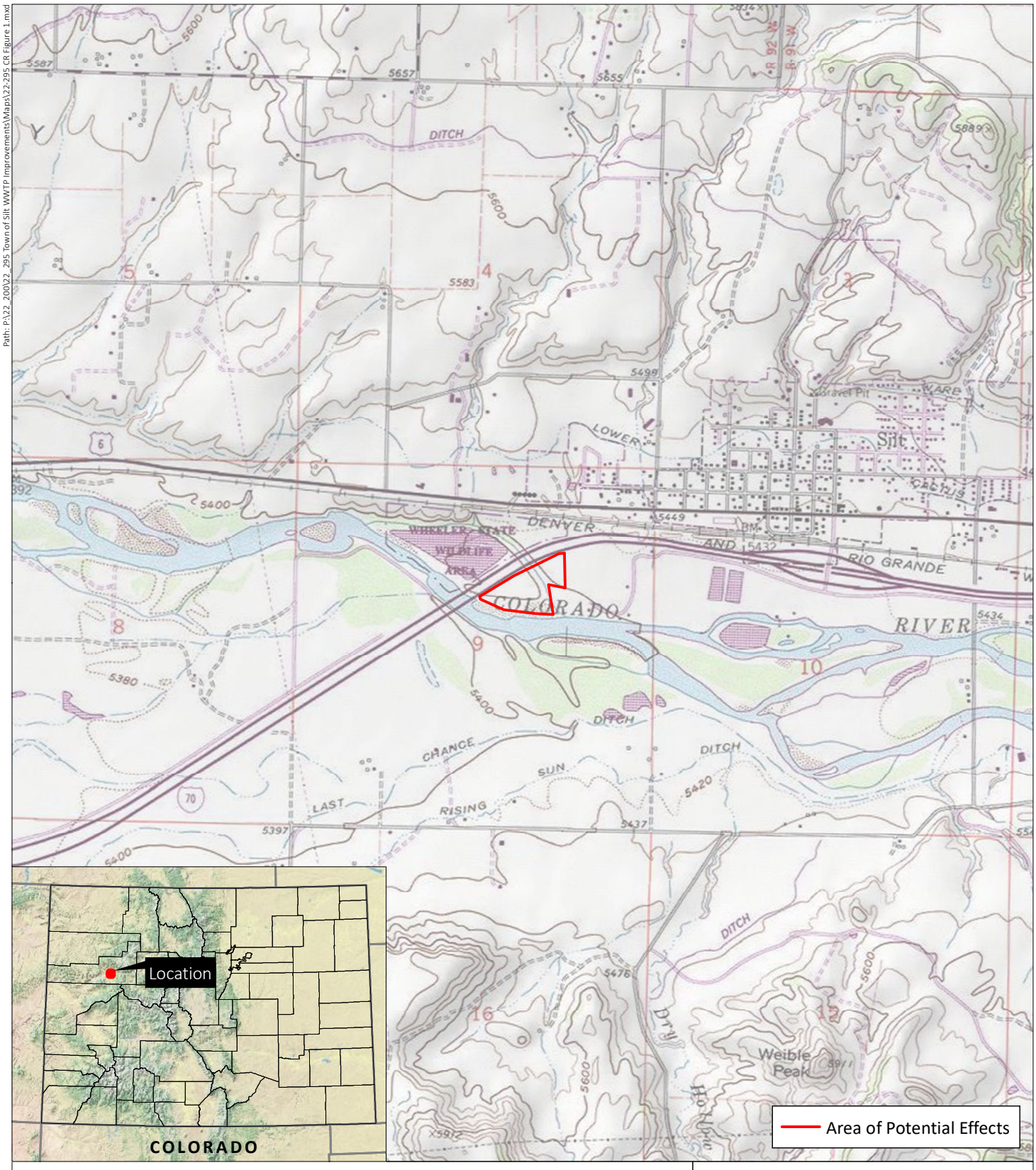
Google, Inc.
2022 Google Earth Pro. *Google Earth Pro version 7.3.3.7786 (64-bit)*. Online database, https://earth.google.com/web.

Little, Barbara, Erika M. Seibert, Jan Townsend, John H. Sprinkle Jr., and John Knoerl
2000 *National Register Bulletin: Guidelines for Evaluating and Registering Archaeological Properties*. Prepared by the U.S. Department of the Interior.

Nationwide Environmental Title Research
2022 Historic Aerials. *National Environmental Title Research LLC*. Online database, https://www.historicaerials.com/viewer.

U.S. Geological Survey
1910 Grand Hogback. Topographic Map. 1:125,000. Denver, Colorado.
1962 Silt, Colorado. Topographic Map. 1:24,000. Denver, Colorado.
1964 Silt, Colorado. Topographic Map. 1:24,000. Denver, Colorado.
1970 Silt, Colorado. Topographic Map. 1:24,000. Denver, Colorado.

U.S. Surveyor General's Office
1888 Township 6 South, Range 92 West of the 6th Principal Meridian. 40 chains to an inch. General Land Office, Denver, Colorado.



Technical Memorandum
File and Literature Review
Town of Silt Water Treatment Plant Project
Garfield County, Colorado

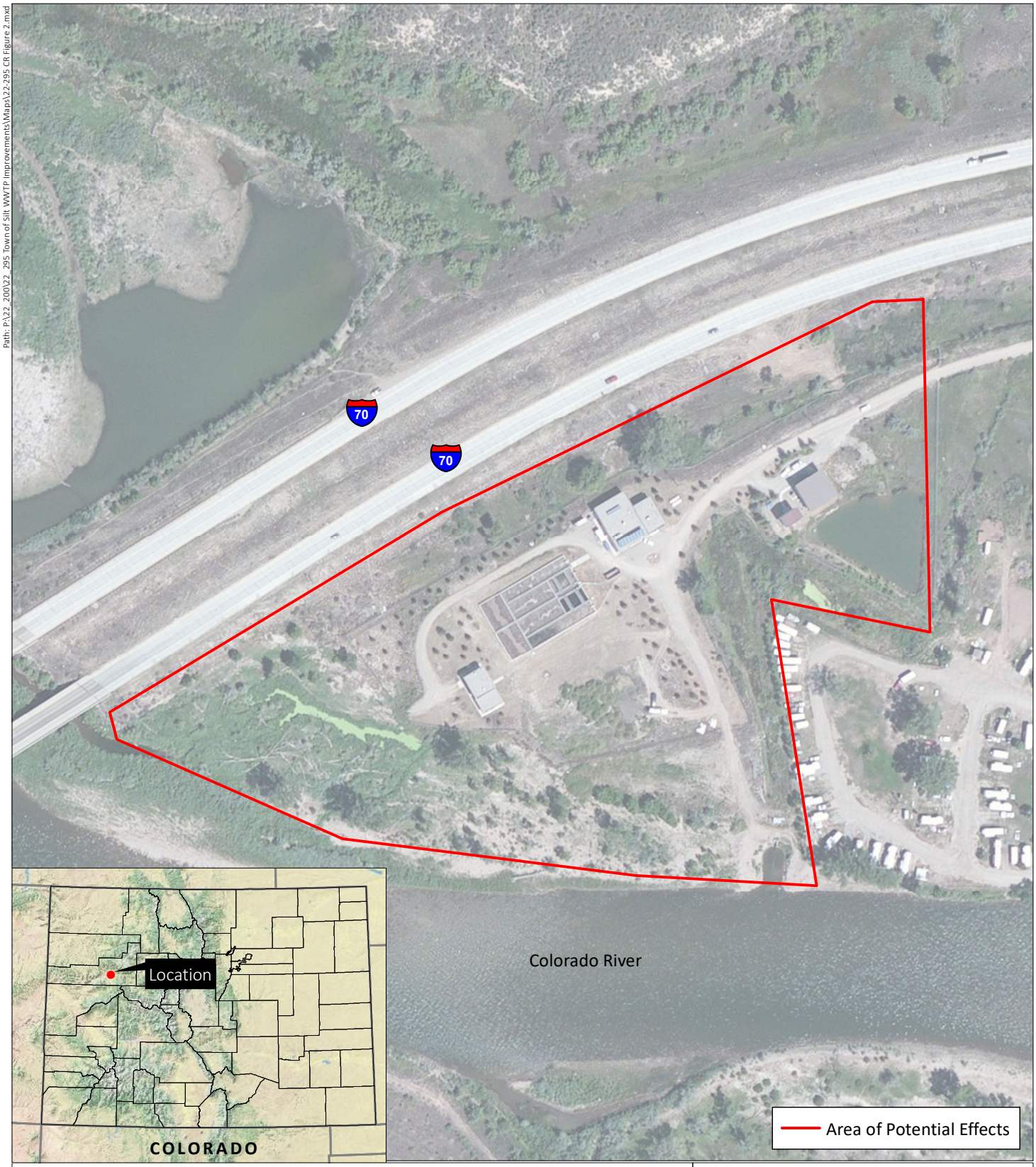
Section 9, T2S, R92W; 6th PM
USGS Silt, CO Quadrangle, (1:24,000; 1984)
Garfield County, Colorado

Figure 1
Project Location

Prepared for:
Dewberry Engineers, Inc.
File: 22-295 CR Figure 1.mxd (ME)
December 8, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\22-295 CR Figure 2.mxd



Technical Memorandum
File and Literature Review
Town of Silt Water Treatment Plant Project
Garfield County, Colorado

Section 9, T2S, R92W; 6th PM
USGS Silt, CO Quadrangle, (1:24,000; 1984)
Garfield County, Colorado

N

0 125 250 Feet
1:2,500

Figure 2
Project Location

Prepared for:
Dewberry Engineers, Inc.
File: 22-295 CR Figure 2.mxd (ME)
January 3, 2023

ERO Resources Corp.

Appendix D. Public Meeting Documentation

Ad #: wajSgCkQYuMYBqcRxtmd
Customer: TOWN OF SILT
8CD06 Hearing Town of Silt Water Trtmt Plant

PROOF OF PUBLICATION
GLENWOOD SPRINGS POST INDEPENDENT

STATE OF COLORADO } **SS**
COUNTY OF GARFIELD }

I, Peter Baumann, do solemnly swear that I am Publisher of , says: The Glenwood Springs Post Independent, that the same weekly newspaper printed, in whole or in part and published in the County of Garfield, State of Colorado, and has a general circulation therein; that said newspaper has been published continuously and uninterruptedly in said County of Garfield for a period of more than fifty-two consecutive weeks next prior to the first publication of the annexed legal notice or advertisement; that said newspaper has been admitted to the United States mails as a periodical under the provisions of the Act of March 3, 1879, or any amendments thereof, and that said newspaper is a weekly newspaper duly qualified for publishing legal notices and advertisements within the meaning of the laws of the State of Colorado.

That the annexed legal notice or advertisement was published in the regular and entire issue of every number of said weekly newspaper for the period of 1 insertion; and that the first publication of said notice was in the issue of said newspaper dated 2 Dec 2022 in the issue of said newspaper.

Total cost for publication: **$32.23**

That said newspaper was regularly issued and circulated on those dates.

Publisher

Subscribed to and sworn to me this date, 12/02/2022

Notary Public, Garfield County, Colorado

My commission expires: August 19, 2024

DENNEL S RIVERA
Notary Public
State of Colorado
Notary ID # 20224007214
My Commission Expires 02-22-2026

Advertiser:
Swift Communications
200 Lindbergh Drive
Gypsum, CO 81637
970.777.3126

Legal Notice

Notice of Public Hearing for ***Town of Silt Water Treatment Plant***

Silt, Colorado

Date: ***January 9, 2023***
Time: ***6:00 PM to 7:00 PM***
Location: ***Board Chambers, Town Hall***
Address: ***231 N 7th Street Silt, Colorado***
Topic: ***Town of Silt Water Treatment Plant Improvements***

A public hearing will be conducted for informing citizens and soliciting public input, written or oral, regarding the **Town of Silt Water Treatment Plant Improvements** and Project Needs Assessment (PNA). The PNA is a report that discusses the rationale for the ***Water Treatment Plant Improvements Project.*** The report has been submitted to the Colorado Department of Public Health and Environment (CDPHE) to qualify ***the Town of Silt*** for a State Revolving Fund (SRF) Loan.

The Town's consultant, Dewberry Engineers, submitted an opinion of probable construction cost of $28 million for the Water Treatment Plant improvements project.

Copies of the PNA are available for public review prior to the Public Hearing at the following location:

Town Hall
231 N 7th Street
Silt, Colorado
www.townofsilt.org

The point of contact for the ***Town of Silt*** is ***Trey Fonner, Public Works Director, 970-876-2353.***

Town of Silt Water Treatment Plant
Trey Fonner
Public Works Director

PUBLISHED IN THE GLENWOOD SPRINGS POST INDEPENDENT ON FRIDAY, DECEMBER 2, 2022.

Silt Water Treatment Plant
Public Meeting Sign-In Sheet

Meeting Date and Time: January 1, 2023 6:00 PM to 7:00 PM

Name	Phone Number	Email Address	Do you buy bottled water or filter your water?	
			Bottled	Filtered
Gary Jacobsen	970-456-5238	GJRJTINMAN@OUTLOOK.COM		✓
Reneel Jacobsen	970-456-9268	" " " "		✓
Rose St. John	970-618-9128	rosest.john@yahoo.com	✓	✓
Doug Jones	703-344-1985			X
Jackie Haumon	970 456 7393	jhmdjachars@aol.com		
Tyson Sillery	303-462-3833	Tyson.Sillery@gmail.com		
Diane Webster	970-366-1360	websterdiane6@gmail.com	✓	
Dina Prieto	970-309-5795	dinaprieto81@gmail.com	✓	
Eddie Aragon	970-274-7582	aragon-e@msn.com		
Vanesa Westmoreland	(303) 900-3323	lorinnesie@gmail.com	✓	✓
KEN JANECEK	9768762575	KENJANECEK@HOTMAIL.COM	✓	
JOE FRANZEN	719 293-1391	FRANZENJOE@YAHOO.COM	✓	
Michael Allen	903-816-0236	turtle970@hotmail.com		✓
Mike STIK	970-319-0552	None	✓	
Carla Vega	970-618-0939	hcn		
Ted + Karen Miller	407.873.1346	ted@tedmillerconsulting.com		✓
Mary Allen	876. 2030	[illegible]		✓
DAVID [illegible]	970-309-3965	hareofirish@gmail.com	✓	
Allyssa Austin	970-319-2773	allyssalittle@gmail.com		
Jennifer Stepasnik	970-309-4451	Stepasn.kj@aol.com		✓
Lindsay Maglione	917 414 3495	levoinnyc@yahoo.com	✓	✓

Silt Water Treatment Plant
Public Meeting Sign-In Sheet

Meeting Date and Time: January 1, 2023 6:00 PM to 7:00 PM

Name	Phone Number	Email Address	Do you buy bottled water or filter your water?	
Todd Kupka	720.883.4966	Toddkupka@gmail.com	YES + YES	
Todd urbat	970 404 1692	urbanshade@comcast.net	yes + yes.	
Rumored	970-366-8883	bditromenoje@yahoo.com	NO	yes
Oscar Terrazas	405-698-7056	Oforcar66@gmail.com	NO	Yes
Briant Lindsey Williams	303 522 3188	Isidererc@gmail.com	NO	Yes
Caroline Llanes	619 306 1063	caroline@aspenpublicradio.org		X

TOWN OF SILT

SIGN IN SHEET
January 9, 2023
(Please Print)

Water Plant Improvement Discussion

Name	Address
Dawn Eveidge	1147 N. 16th St.
Alex Sanchez	507 W Richards Ave
Robin Robinson	680 Grand Ave
Julie Ashinhurst	642 Bristlecone Way
Danny Ashinhurst	654 Bristlecone Way
MICHAEL YORTY	932 STANDING DEER DR.
Tina Cox	211 Valley Dr.
Lindsey Williams	258 S. Golden Drive
Todd Urban	442 BALLARD AVE
Todd Kupka	402 BALLARD AVE.
Martha Frederick	1040 Ballard
Steven Robinson	680 Grand Ave

Dewberry

Town of Silt
Water Treatment Plant Improvements Project Public Meeting

January 9, 2023

Presentation Agenda

- Why?
  - Projections - Planning and Design Criteria
  - Regulatory Review
  - Water Treatment Plant Evaluation
- How?
  - Water Treatment Plant Alternatives
  - Selected Alternative – How the issues are being addressed
  - Construction Manager at Risk
- Summary of Environmental Assessment
- Impact on Rates
- Project Schedule
- Questions

Demand Projections

- Water – 85 gpd/capita with peak day of approximately 150 gpd/capita
- Ratio of AAD to PD is low compared to many other municipalities
- Assumes continued raw water irrigation and limited use of potable water for irrigation
- Recommend capacity of 2 mgd now with room to expand to 3 mgd

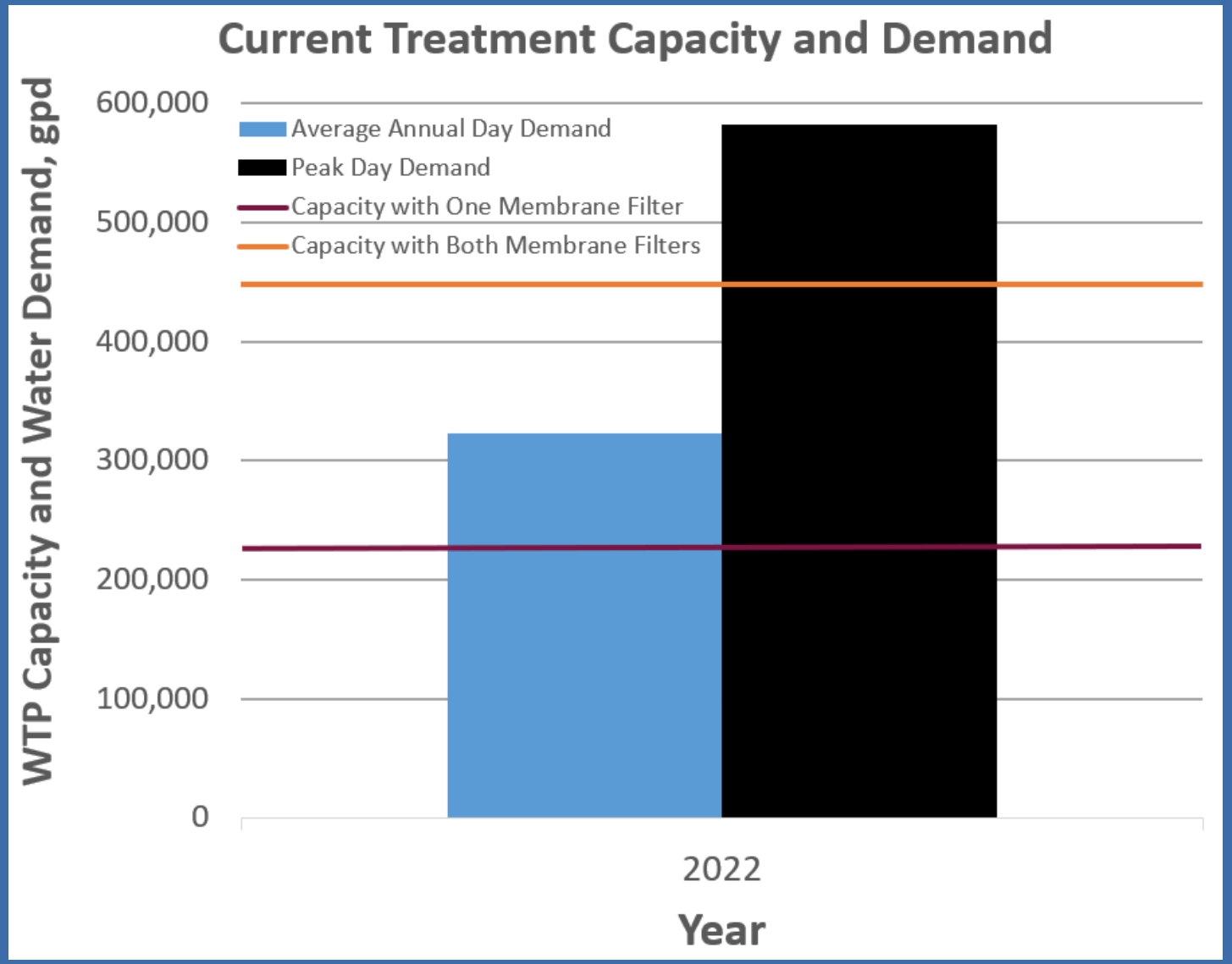
TOTAL			
YEAR	POPULATION	AAD, GPD	PEAK DAY, GPD
Current	3,600	300,000	480,000
2027	4,567	388,200	698,800
2032	5,484	466,100	839,000
2037	6,584	559,600	1,007,300
2042	7,904	671,900	1,209,300

Water Regulatory Review

- Disinfection By Products
  - potential is a function of TOC and chlorine.
- PFAS
  - First surface WTP downstream of Grizzly Creek Fire
  - Potentially an issue in future, not currently a known issue
- TENORM in residuals (not required until disposal)
- Secondary standards for iron and manganese (T&O)
  - Improved taste and color

WTP Evaluation

- Pretreatment to lower turbidity
- Capacity
- Water Taste and Odor (Fe and Mn removal)
- DBP issues
  - TOC removal



WTP Alternatives

- Pretreatment Upgrades – reduce turbidity to filtration process
  - DAF (needs < 10 NTU feed turbidity)
  - Conventional floc/sed with plate settlers
  - Coagulation with Upflow clarifiers
  - Actiflo/Ballasted flocculation
- Taste and Color (iron and manganese removal)
  - Green sand, Chlorine Dioxide, or Ozone
- Filtration
  - Pressure membranes (with FIRM AD capacity of 1.0 MGD)
  - Conventional mixed media filters (with firm AD capacity of 1.0 MGD)

WTP Long Term Alternatives

- Increase in capacity to accommodate growth or increases in peak day demands
  - Pretreatment
  - Filtration

WTP Alternatives

- Alternative 1 – Solids Contact Clarifier with Mixed Media Filtration
- Alternative 2 – Plate Settlers with Filtration
  - A – with mixed media filtration
  - B – with membranes (expanding existing alternative)
- Alternative 3 – Conventional Package WTP
- Alternative 4 – Ballasted Flocculation with Mixed Media Filtration

Alt 1 Site Plan Solid Contact Clarifier with Mixed Media Filtration

ALTERNATIVE 1 – CLARICONE WITH MIXED MEDIA FILTRATION

Alt 2 Site Plan Plate Settlers with Filtration

ALTERNATIVE 2 – PLATE SETTLERS WITH FILTRATION OPTIONS

Alt 3 Site Plan Conventional Package WTP

ALTERNATIVE 3 – PULSAPAK SYSTEM

Alt 4 Site Plan Ballasted Flocculation with Mixed Media Filtration

ALTERNATIVE 4 – ACTIFLO WITH MIXED MEDIA FILTRATION

Summary of Process Improvements

UNIT PROCESS	ALT 1. SOLIDS CONTACT CLARIFIER WITH MIXED MEDIA FILTRATION	ALT 2. PLATE SETTLERS WITH FILTRATION	ALT 3. CONVENTIONAL PACKAGE SYSTEM	ALT. 4 BALLASTED FLOCCULATION WITH MIXED MEDIA FILTRATION
Strainer	Included	Included	Included	Included
Coag/Floc/Sec	Occurs in one solids contact clarifier. Can accommodate	Separate Floc/coag with plate settlers	Package floc/coag/sed system	Utilizes polymer and sand to improve settling.
Filtration	Mixed Media with Fe/Mn removal	(a) Mixed Media with Fe/Mn removal (b) Membranes	Mixed Media with Fe/Mn removal	Mixed Media with Fe/Mn removal Ballasted floc cannot be utilized with membranes
Disinfection	Needs UV and Cl	MM needs UV and Cl. Membranes – Cl only	Needs UV and Cl	Needs UV and Cl
Residuals	Pond with periodic dredging/cleaning	Pond with periodic dredging/cleaning	Pond with periodic dredging/cleaning	Pond with periodic dredging/cleaning

Summary of WTP Costs

ALTERNATIVE	PROBABLE OPINION OF CONSTRUCTION COST, $ MILLION	OPINION OF TOTAL PROJECT COST, $ MILLION
Alt 1 – Solids Contact Clarifier with Mixed Media Filtration	$21.4	$25.6
Alt 2a – Plate Settlers with Mixed Media Filtration	$19.2	$23.1
Alt 2b – Plate Settlers with Membrane Filtration	$18.9 (20.9)	$22.7 (25.1)
Alt 3 – Package Media Filtration	$21.5	$25.8
Alt 4 – Ballasted Flocculation with Mixed Media Filtration	$20.1	$24.2

Summary of WTP Annual Costs

ALTERNATIVE	QTY	ANNUAL COST
Staffing	3	$267k
Coagulant	125 gal/day	$82k
Disinfection Chemical	75 gal/day	$228k
Power	125 hp	$82k
Residuals	Cleaning out pond once every 1-5 years	$75k
Equipment/Structure O&M		$85k
Total		$819k

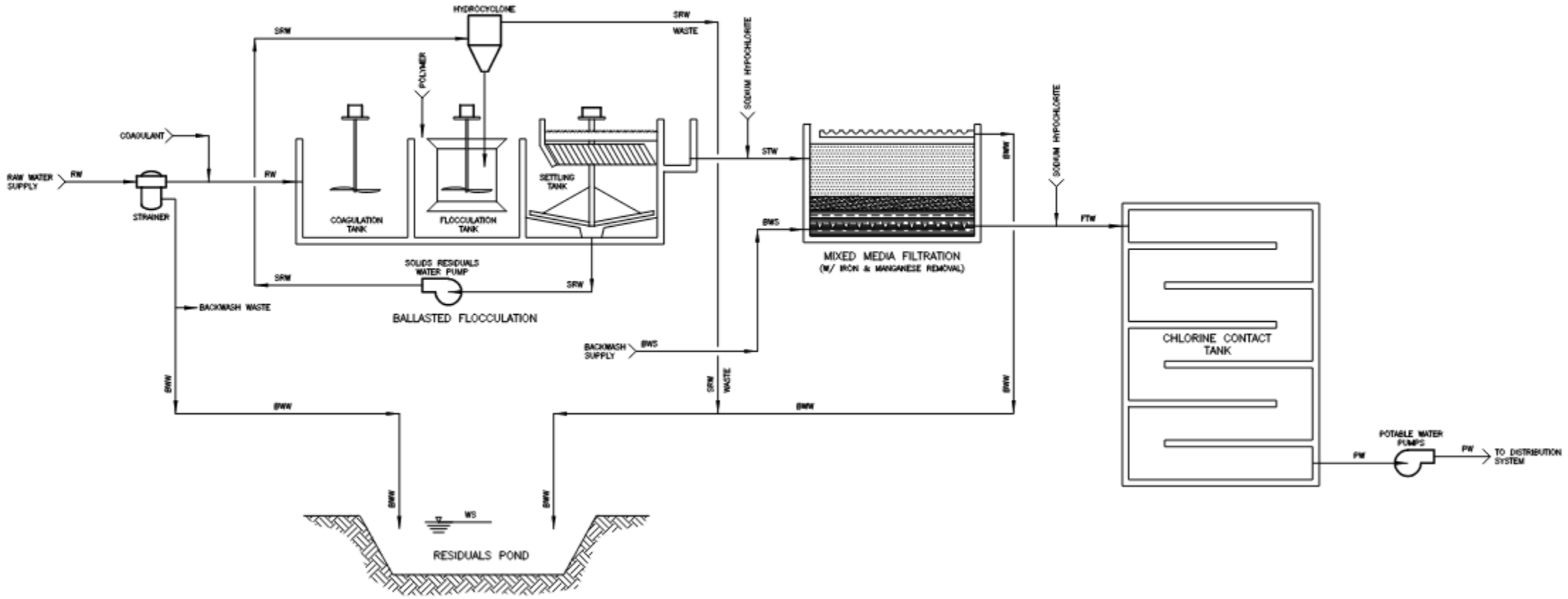
WTP Alternatives Matrix

CRITERIA	ALT 1 – SOLIDS CONTACT CLARIFIER WITH MM FILTRATION	ALT 2- PLATE SETTLERS WITH FILTRATION	ALT 3 – PACKAGE CONVENTIONAL WTP	ALT 4 – BALLASTED FLOC WITH MM FILTRATION
Able to meet projected 20 demand projections	Yes	Yes	Yes	Yes
Chemicals required	Higher chemical use	Higher chemical use	Higher chemical use	Higher chemical use
Redundancy	AD – one train PD – both trains	AD – one train PD – both trains	AD – one train PD – both trains	AD – one train PD – both trains
Expansion Capability	Significant	Moderate	Moderate	Moderate/smallest footprint
Ease of Operations	More accommodating of changes in WQ	Difficult	Difficult	More accommodating of changes in WQ
Can accommodate wide range in turbidity	Great	Average	Average	Great
Energy Use	Moderate	Moderate	Moderate	Moderate

WTP Recommendations

- WTP is NOT in a good spot; it is operating at capacity.
- Recommended Ballasted Flocculation with mixed media filtration Accomodates range in turbidity
  - Improves water taste and color (removes iron and manganese)
- Performed in two phases
  - 1st Phase – Capacity and pretreatment improvements needed now
  - 2nd Phase – Additional capacity (if required) to improve resiliency or increase redundancy.

New Process Flow Diagram



CMAR Delivery for cost surety

- Contractor involved in design process
- Assists with value engineering during design where costs can be most impacted.
- Value engineering items
  - Building type – masonry vs steel
  - Filtration design – on slab or customized filters

Summary of Environmental Assessment

- No comments received from the following agencies
  - U.S. Fish and Wildlife Service
  - Colorado Office of Archaeology and Historic Preservation
  - U.S. Army Corps of Engineers
  - Natural Resources Conservation Service
  - Colorado Parks and Wildlife
  - Department of Natural Resources
  - Colorado Department of Public Health and Environment
  - U.S. National Park Service

Project Financing

- Finance through Colorado Water Resources and Power Development Authority (CWRPDA)
- Principal Forgiveness through the Infrastructure Investment and Jobs Act (2022)
- 20-Year Financing
- Estimated interest rate 3.48%*

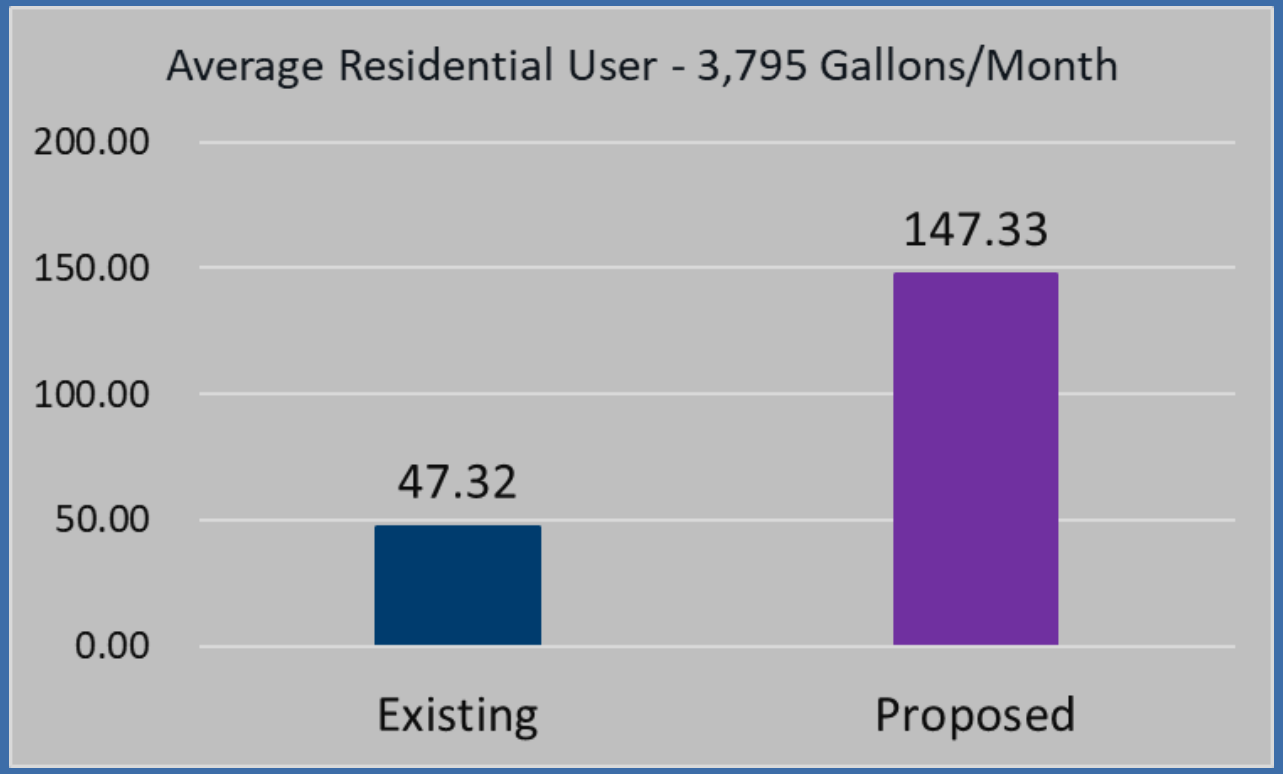
*Information provided by UMBFSI and subject to change

Table 2
2022 CIP - CIP Financing Plan
Town of Silt, CO

	2023 CWRPDA Loan
	2023 Water Projects
CIP Projects[1]	
Projects	27,942,000
Principal Forgiveness	(5,000,000)
Subtotal Project Costs	**22,942,000**
Less Other Available Revenues	
Cash Available	
Premium	(1,438,815)
Net Borrowing Requirement	**21,503,185**
Debt Service Reserve	
Debt Service Reserve Funds On Hand	0
New Debt Service Reserve Requirement	0
Subtotal Reserve Fund Requirement	0
Estimated Issuance Expenses	**250,604**
Subtotal Issuance Expenses	250,604
TOTAL TO BE FINANCED	**21,753,788**
Rounding	1
NET BOND SIZE*	**21,753,789**

Town Impacts

- Increase Tap Fees*
  - Old -
  - Current - $10,000
  - Proposed - $13,912
- Increase User Rates*
  - Base Rate - $70.75
  - Volumetric Rate – Varies



*Information provided by UMBFSI and subject to change

Project Schedule

- Design through 2023
- CMAR onboard in Feb 2023
- Loan Application in June – 2023
- Construction starting in 2024
- Construction Complete end of 2025

Questions?

Patrick Radabaugh, PE

- pradabaugh@dewberry.com
- Tel: 303.951.0642

Sam Franzen, PE

- sfranzen@dewberry.com
- Tel: 303.951.0618

WTP Evaluation

- Membranes
  - True WTP capacity (both skids) is only 0.6 million gallons per day (mgd) and NOT 1.0 mgd
    - Average capacity per skid – 265 gpm (0.38 mgd)
    - Peak capacity per skid – 350 gpm (0.5 mgd)
  - Influent turbidity is higher than design criteria of 1 NTU
  - Maintenance
    - Backwashing
    - Maintenance clean performed daily.
    - CIPs not performed. No heater and insufficient time (6 hrs required)
    - Pinning performed when required. Requires additional staff and takes 1 unit out of service

WTP Evaluation

- Disinfection
  - Tablet system works but seems to produce inconsistent dosage.
  - Which could lead to increased DBP formation potential
  - Contact basin
    - One basin
    - Sufficient for 4 log virus removal/inactivation at projected future capacity
    - Insufficient for 0.5 log giardia inactivation at current and projected capacity.
      - Only required if change from membranes to conventional
- Finished water pumping
  - Will need to be expanded

Appendix E. Agency Scoping Letters – Sent

ERO Resources Corporation

Denver 1842 North Clarkson Street, Denver, CO 80218
Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Ann Timberman, Western Colorado Field Supervisor
U.S. Fish and Wildlife Service
445 West Gunnison Ave, Suite 240
Grand Junction, CO 81501-5711

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear Ms. Timberman,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

The improvements have been developed to meet current and future capacity requirements and regulations. The improvements will also provide required facility redundancy, accommodate planned future growth of the Town, and improve operations. The projected 20-year peak day demand for the Town of Silt is 1.2 million gallons per day (mgd). To accommodate projected demand with a level of resiliency, the new WTP will include two modular 1 mgd treatment trains and will be easily expandable to three trains. The recommended facility improvements take into consideration the treatment needs based on current and anticipated permit compliance requirements for the WTP. The Town will complete Phase 1 of the improvements – filtration and capacity upgrade to 2.0 mgd first, then will monitor the town's population and decide when to expand to 3 mgd. The recommended improvements are listed below:

- Civil site improvements including grading, paving, storm water control, utility design, piping, and irrigation system modifications
- Raw water pumping modifications (new pump and controls)
- New ballasted coagulation/flocculation/sedimentation system with a capacity of 2 mgd designed to accommodate the expected wide range in raw water turbidity from the Colorado River
- New mixed media filtration system that also removes iron/manganese

- Incorporation of new ultraviolet (UV) disinfection system
- Modification of existing chlorine disinfection system to meet regulatory requirements
- New finished water distribution system pump(s)
- Modification of the existing building
    - New sodium hypochlorite (NaOCl) storage and delivery system
    - New aluminum sulfate storage and delivery system
    - New sodium bicarbonate storage and delivery system
- Two new buildings (potentially both new processes in one building) to house the new processes
- SCADA system design
- Design of onsite stormwater system modifications
- New emergency generator for WTP

Construction of proposed project facilities would take place entirely within the footprint of the existing WTP property (Figure 2) and would disturb less than two acres.

The Town is applying for funding through the State Revolving Fund for the proposed improvements. As part of the funding process, an environmental assessment is being prepared to analyze potential impacts on the physical, biological, and human environment from the proposed WTP Project. The Town would like your comments on the proposed Project, including resources and issues that should be included in the environmental analysis. Please respond with your comments by **January 6, 2023**. Please send your comments by email to Charly Hoehn, choehn@eroresources.com, or by mail to:

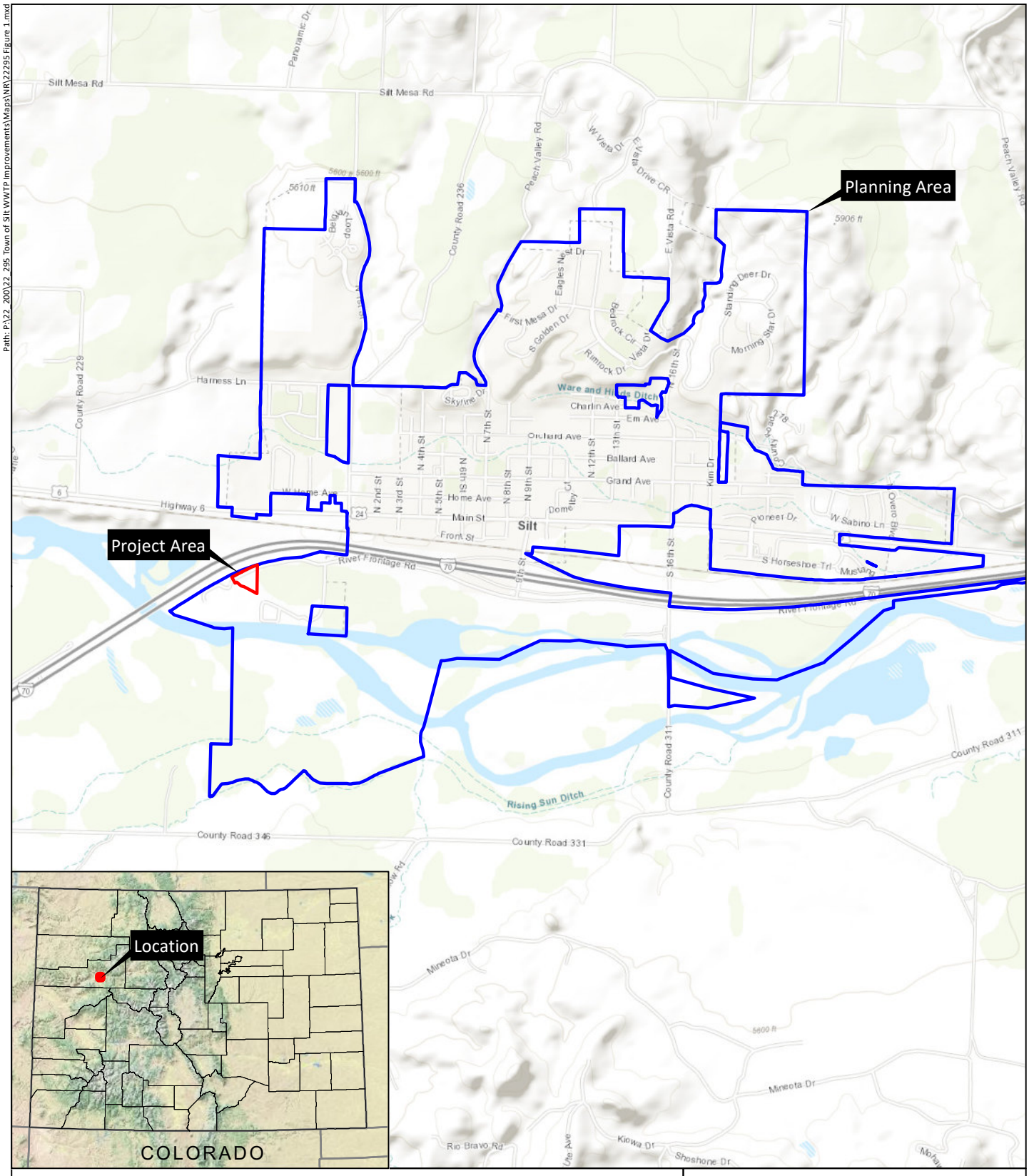
ERO Resources Corporation
Attn: Charly Hoehn
1842 Clarkson Street
Denver, CO 80218

Please feel free to reach out with any questions.

Sincerely,

Charly Hoehn
Environmental Planner/Project Manager

Attachments: Figure 1 – Vicinity Map
Figure 2 – Existing Conditions



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Town of Silt Water Treatment Plant

Sections 2-4 and 9-11, T9S, R92W; 6th PM

UTM NAD 83: Zone 13N; 270748mE, 4380585mN

Longitude 107.667885°W, Latitude 39.544339°N

USGS Silt, CO Quadrangle

Garfield County, Colorado

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

ERO Resources Corporation

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Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Dawn DiPrince, State Historic Preservation Officer
Colorado Office of Archaeology and Historic Preservation
1200 Broadway
Denver, CO 80203

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear Ms. DiPrince,

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Attn: Charly Hoehn
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Denver, CO 80218

Please feel free to reach out with any questions.

Sincerely,

Charly Hoehn
Environmental Planner/Project Manager

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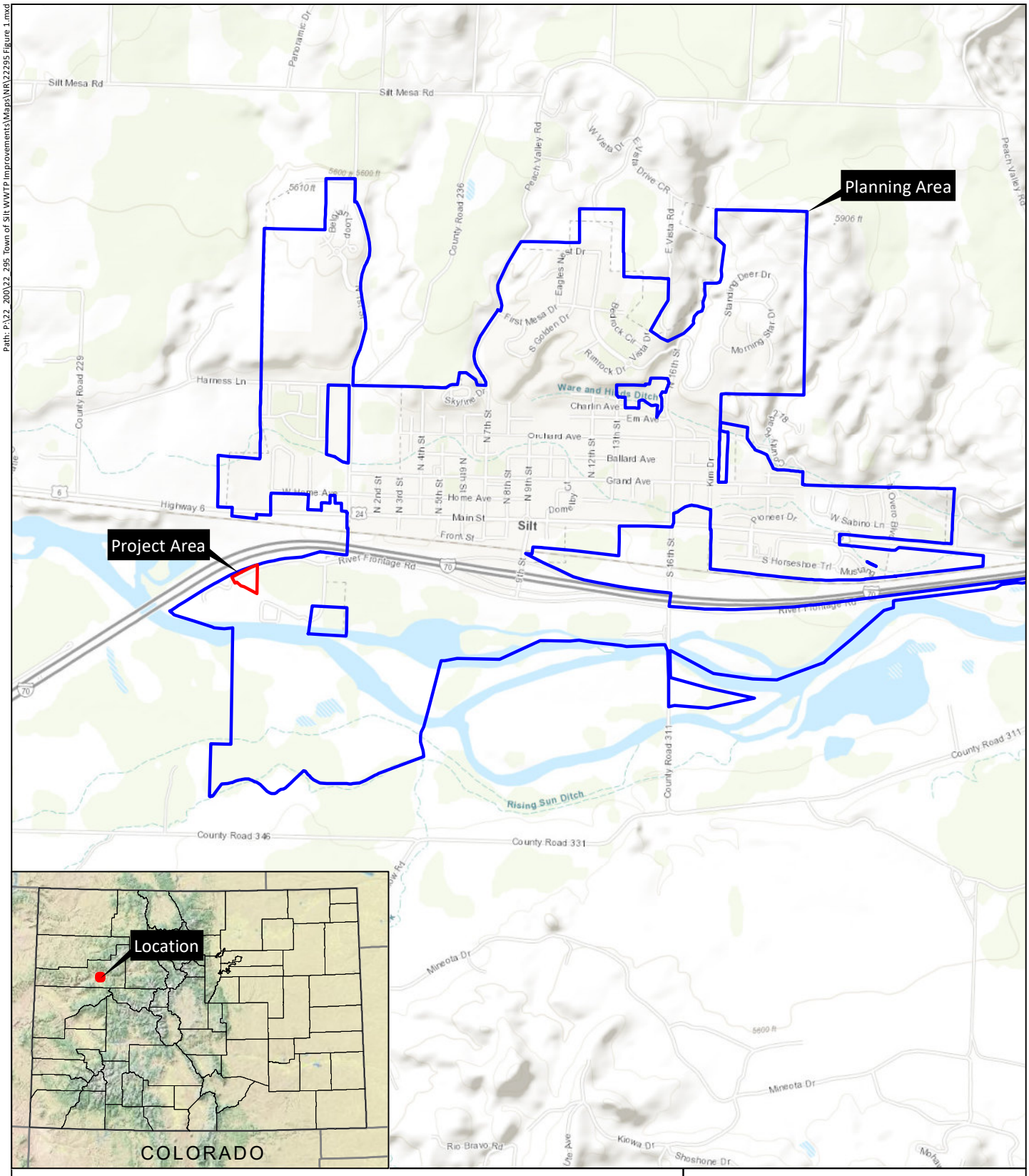

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Town of Silt Water Treatment Plant

Sections 2-4 and 9-11, T9S, R92W; 6th PM

UTM NAD 83: Zone 13N; 270748mE, 4380585mN

Longitude 107.667885°W, Latitude 39.544339°N

USGS Silt, CO Quadrangle

Garfield County, Colorado

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Project Area

Planning Area

0 1,000 2,000 feet

N

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Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

ERO Resources Corporation

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Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Kara Hellige, Office Chief
Southern Colorado Regulatory Branch
U.S. Army Corps of Engineers
1970 E 3rd Ave, Ste 109
Durango, CO 81301-5025

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear Ms. Hellige,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

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- New mixed media filtration system that also removes iron/manganese

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Construction of proposed project facilities would take place entirely within the footprint of the existing WTP property (Figure 2) and would disturb less than two acres.

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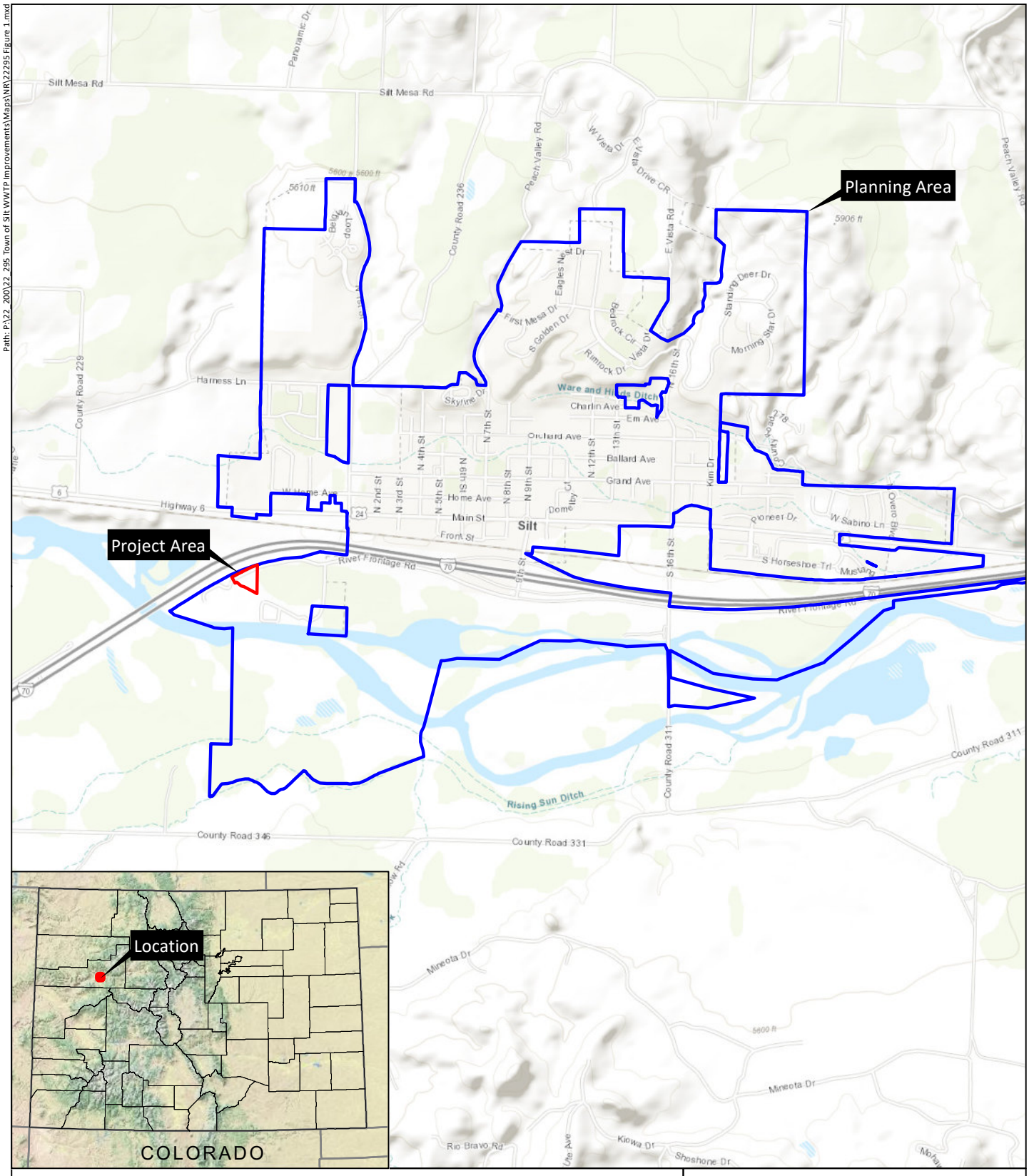
ERO Resources Corporation
Attn: Charly Hoehn
1842 Clarkson Street
Denver, CO 80218

Please feel free to reach out with any questions.

Sincerely,

Charly Hoehn
Environmental Planner/Project Manager

Attachments: Figure 1 – Vicinity Map
Figure 2 – Existing Conditions



Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 1.mxd

Town of Silt Water Treatment Plant

Sections 2-4 and 9-11, T9S, R92W; 6th PM

UTM NAD 83: Zone 13N; 270748mE, 4380585mN

Longitude 107.667885°W, Latitude 39.544339°N

USGS Silt, CO Quadrangle

Garfield County, Colorado

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Copyright:© 2013 National Geographic Society, i-cubed

Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

ERO Resources Corporation

Denver 1842 North Clarkson Street, Denver, CO 80218
Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Natural Resources Conservation Service
Attn: State Conservationist
Denver Federal Center
Building 56, Room 2604
PO Box 25426
Denver, CO 80225-0426

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear State Conservationist,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

The improvements have been developed to meet current and future capacity requirements and regulations. The improvements will also provide required facility redundancy, accommodate planned future growth of the Town, and improve operations. The projected 20-year peak day demand for the Town of Silt is 1.2 million gallons per day (mgd). To accommodate projected demand with a level of resiliency, the new WTP will include two modular 1 mgd treatment trains and will be easily expandable to three trains. The recommended facility improvements take into consideration the treatment needs based on current and anticipated permit compliance requirements for the WTP. The Town will complete Phase 1 of the improvements – filtration and capacity upgrade to 2.0 mgd first, then will monitor the town's population and decide when to expand to 3 mgd. The recommended improvements are listed below:

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- New mixed media filtration system that also removes iron/manganese
- Incorporation of new ultraviolet (UV) disinfection system
- Modification of existing chlorine disinfection system to meet regulatory requirements
- New finished water distribution system pump(s)
- Modification of the existing building
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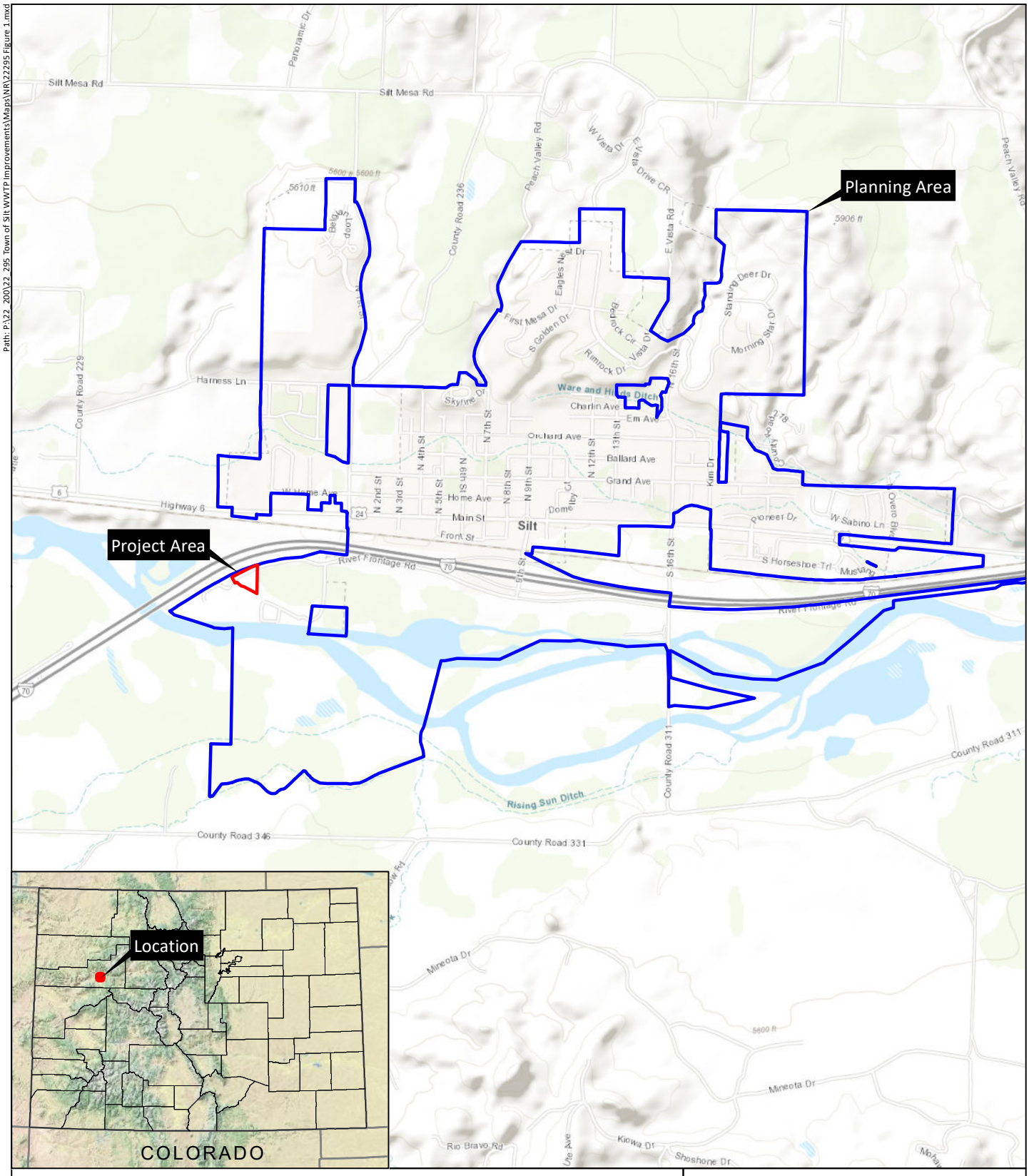

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 1.mxd

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Sections 2-4 and 9-11, T9S, R92W; 6th PM

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Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

ERO Resources Corporation

Denver 1842 North Clarkson Street, Denver, CO 80218
Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Brian Wodrich, District Wildlife Manager
Colorado Parks and Wildlife
0088 Wildlife Way
Glenwood Springs, CO 81601

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear Mr. Wodrich,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

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Environmental Planner/Project Manager

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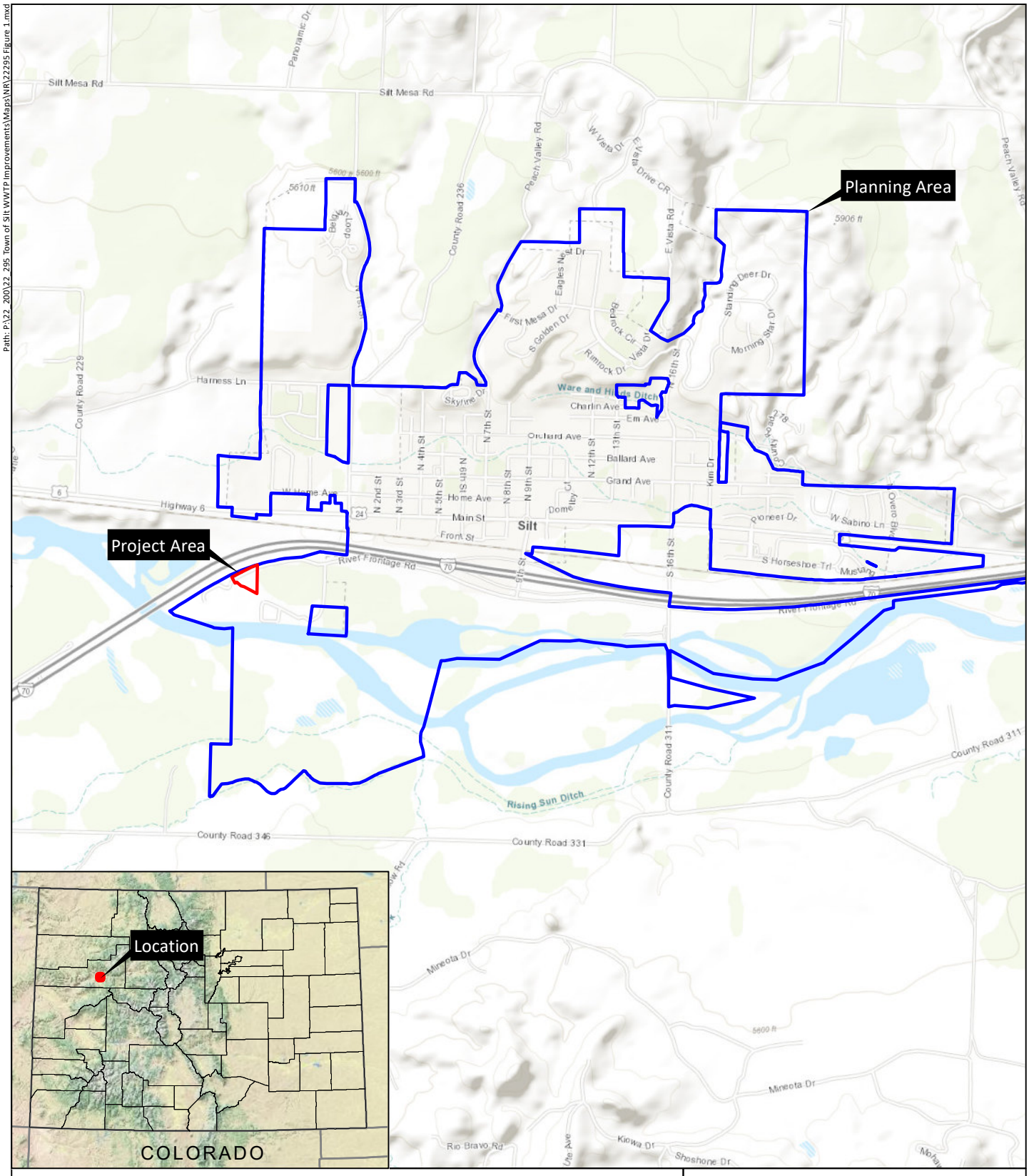

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 1.mxd

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Sections 2-4 and 9-11, T9S, R92W; 6th PM

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Garfield County, Colorado

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Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

ERO Resources Corporation

Denver 1842 North Clarkson Street, Denver, CO 80218
Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Kevin Rein, State Engineer
Colorado Division of Water Resources
1313 Sherman St, Ste 821
Denver, CO 80203

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear Mr. Rein,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

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Attn: Charly Hoehn
1842 Clarkson Street
Denver, CO 80218

Please feel free to reach out with any questions.

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Environmental Planner/Project Manager

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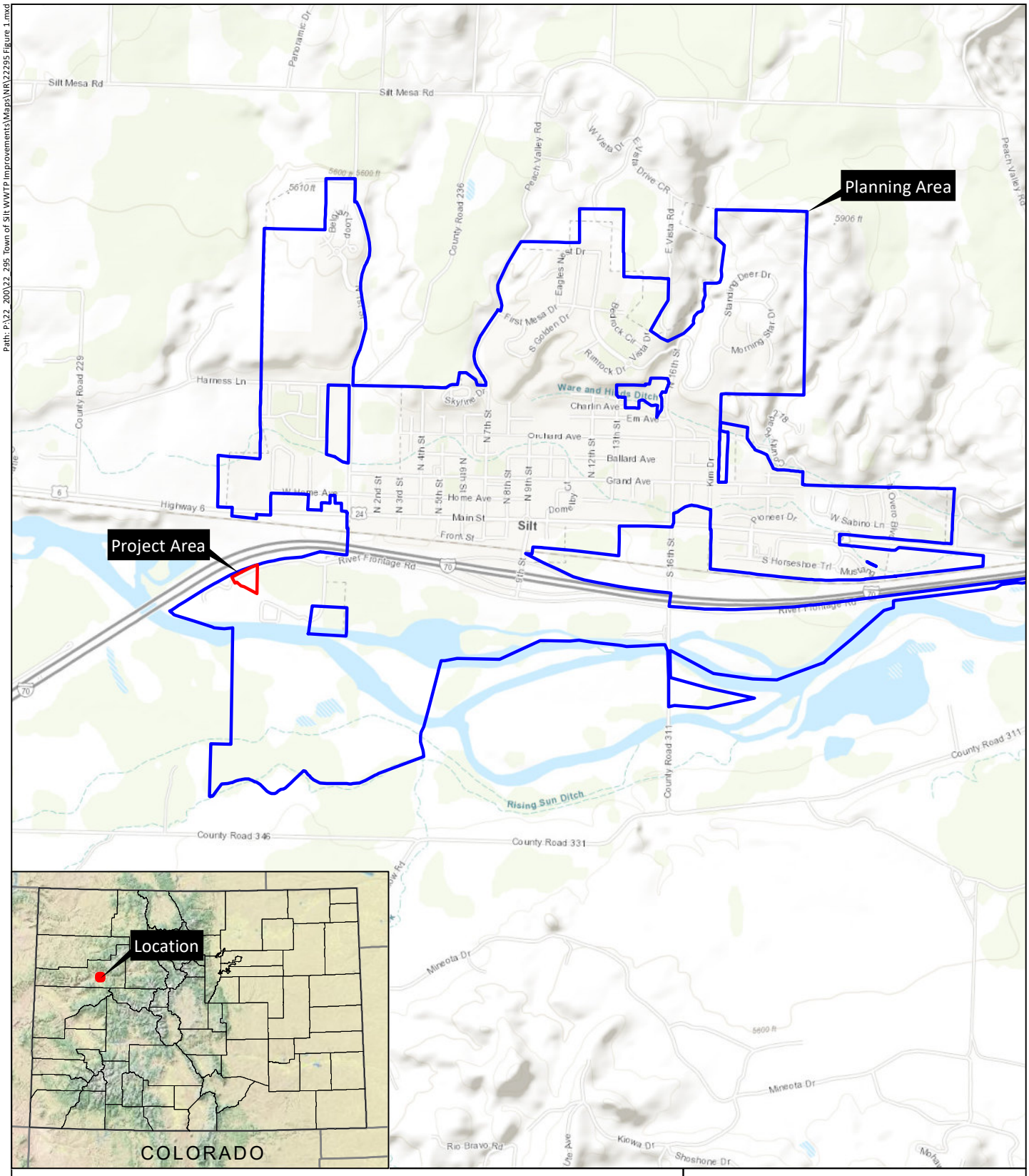

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 1.mxd

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Sections 2-4 and 9-11, T9S, R92W; 6th PM

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Garfield County, Colorado

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Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

ERO Resources Corporation

Denver 1842 North Clarkson Street, Denver, CO 80218
Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Colorado Air Pollution Office
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

RE: Town of Silt Water Treatment Plant Expansion and Improvements

Dear Colorado Air Pollution Office,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

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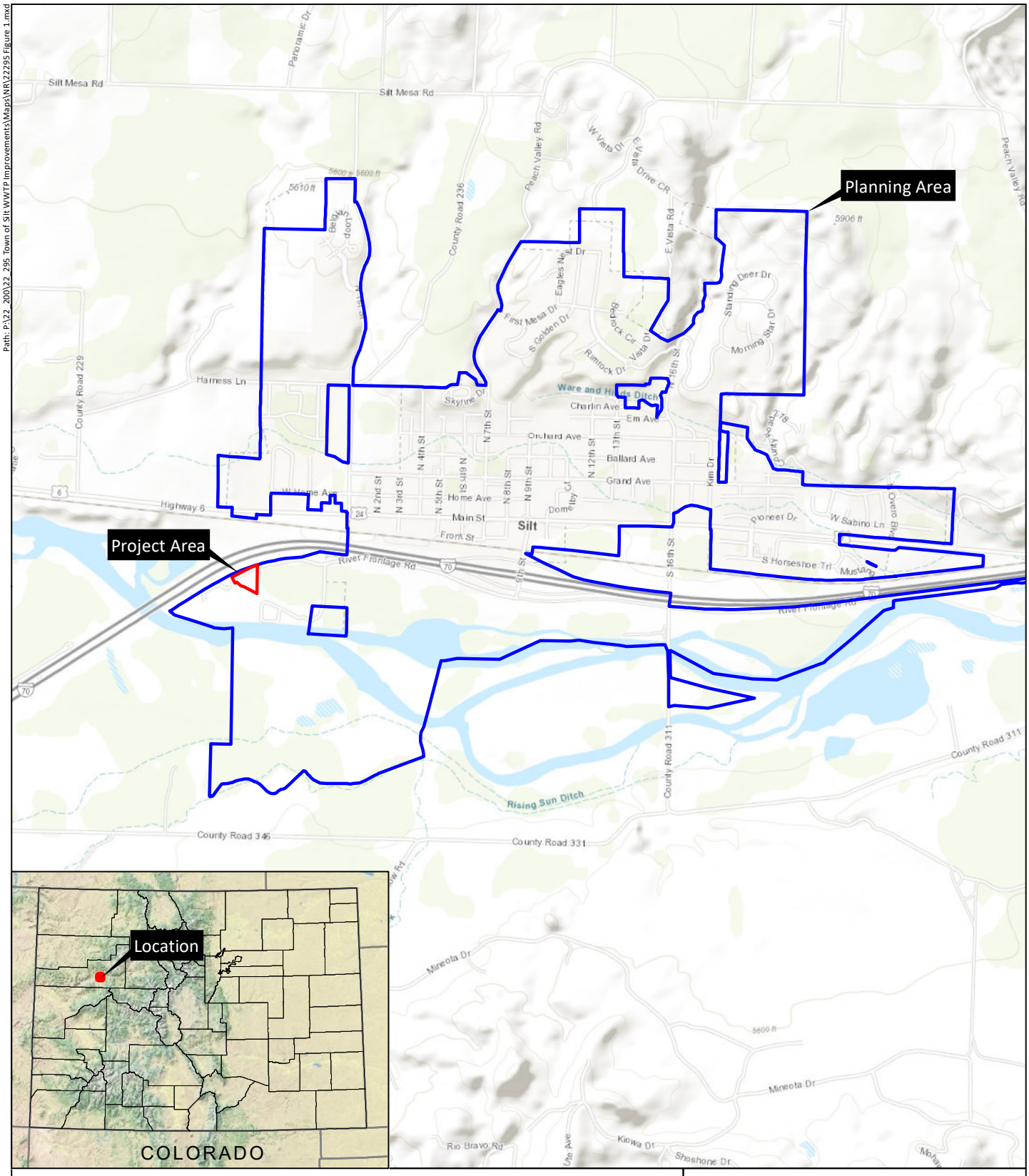

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Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

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Denver 1842 North Clarkson Street, Denver, CO 80218
Durango 1015 ½ Main Avenue, Durango, CO 81301
Hotchkiss 161 South 2nd Street, PO Box 932, Hotchkiss, CO 81419
Idaho 7154 West State Street, STE 398, Boise, ID 83714

December 7, 2022

Wild and Scenic Rivers – Intermountain Regional Office
U.S. National Park Service
Attn: Environmental Quality
12795 West Alameda Parkway
Lakewood, CO 80228

RE: Town of Silt Water Treatment Plant Expansion and Improvements

To Whom it May Concern,

The Town of Silt (Town) is proposing an expansion and improvements to its existing water treatment plant (WTP) located on the southwest side of Town on the south side of Interstate 70 (project area, Figure 1). The project area is in Section 9, Township 6 South, Range 92 West of the 6th Principal Meridian in Garfield County, Colorado. The WTP serves the Town of Silt and has not undergone any major upgrades since its original construction in 2005. Current limited capacity, pretreatment, and increased flow due to projected population growth are drivers for the WTP expansion and improvements project (Project). An alternatives evaluation has been performed with a selected alternative of ballasted flocculation with mixed media filtration.

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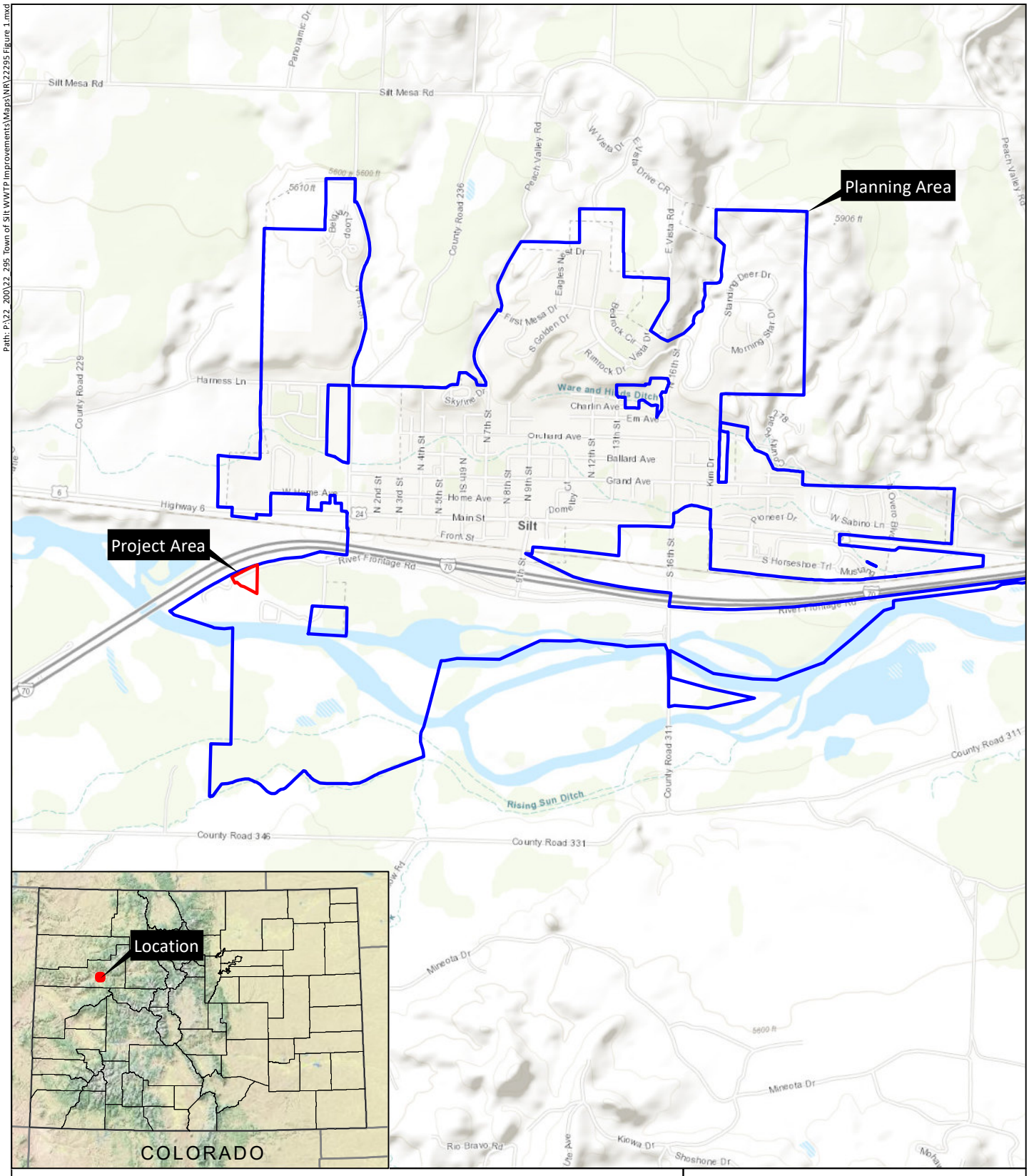
Please feel free to reach out with any questions.

Sincerely,

Charly Hoehn
Environmental Planner/Project Manager

Attachments: Figure 1 – Vicinity Map
Figure 2 – Existing Conditions



Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 1.mxd

Town of Silt Water Treatment Plant

Sections 2-4 and 9-11, T9S, R92W; 6th PM

UTM NAD 83: Zone 13N; 270748mE, 4380585mN

Longitude 107.667885°W, Latitude 39.544339°N

USGS Silt, CO Quadrangle

Garfield County, Colorado

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Project Area

Planning Area

0 1,000 2,000 feet

N

Figure 1
Vicinity Map

Prepared for: CDPHE

File: 22295 Figure 1.mxd [dlH]

December 6, 2022

ERO Resources Corp.

Path: P:\22_200\22_295 Town of Silt WWTP Improvements\Maps\NR\22295 Figure 2.mxd

Town of Silt Water Treatment Plant

Project Area

Planning Area

0 75 150 feet

N

Figure 2
Existing Conditions

Prepared for: CDPHE
File: 22295 Figure 2.mxd [dlH]
December 7, 2022

ERO Resources Corp.

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community 7/17/2021

Appendix F. Agency Comment Letters – Received

History Colorado

Charly Hoehn
Environmental Planner/Project Manager
ERO Resources Corporation
1842 Clarkson Street
Denver, CO 80218

RE: Town of Silt Water Treatment Plant Expansion and Improvements (HC # 82364)

Dear Mr. Hoehn,

This letter is provided in response to your correspondence received on December 14, 2022 requesting consultation with our office for the above mentioned subject action pursuant to the Colorado State Register Act – Colorado Revised Statute (CRS) 24-80.1.

Your letter notes that the subject action consists of improvements to a water treatment plan and would occur entirely within the footprint of the existing water treatment plant property. Based on the documentation provided, it does not appear that any properties nominated for inclusion in or accepted by the State Register of Historic Properties are present in or adjacent to the project area that could be adversely affected.

Please note that our comments should not be interpreted as concurrence under the National Historic Preservation Act or any other environmental law or regulation. If human remains are discovered during ground disturbing activities, the requirements under CRS 24-80 part 13 apply and must be followed. Should the current subject action change, please contact our office for continued consultation under CRS 24-80.1.

In the event that there is federal agency involvement, please note that it is the responsibility of the federal agency to meet the requirements of Section 106 as set forth in 36 CFR Part 800 titled "Protection of Historic Properties". This includes not only reasonable and good faith identification efforts of any historic properties located within the area of potential effects, but determining whether the undertaking will have an effect upon such properties. The State Historic Preservation Office, Native American tribes, representatives of local governments, and applicants for federal permits are entitled to consultative roles in this process.

We thank you for the opportunity to comment. If we may be of further assistance, please contact Matthew Marques, Section 106 Compliance Manager, at (303) 866-4678 or matthew.marques@state.co.us.

Sincerely,

Dr. Holly Kathryn Norton

Digitally signed by Dr. Holly Kathryn Norton
Date: 2022.12.22 14:16:51 -07'00'

Dawn DiPrince
State Historic Preservation Officer

Charly Hoehn

From: Frank, Robert CIV (USA) <Robert.W.Frank@usace.army.mil>
Sent: Wednesday, December 14, 2022 3:49 PM
To: Charly Hoehn
Cc: Crosson, Steven B (Brad) CIV CESPA
Subject: Town of Silt Wastewater Treatment Plant NRP

Good afternoon Charly,

We have received your submitted letter. No Permit Required. Project number assigned is DA# SPA-2022-00501. Please reach out to me if you have any questions.

Thanks,

Robert Frank
Regulatory Project Manager, NW Colorado Branch
Albuquerque District, US Army Corps of Engineers
400 Rood Avenue, Room 224
Grand Junction, Colorado 81501
(970) 243-1199 X 1017 (office)
(970) 837-6870 (cell)

The Northwest Colorado Branch now has an opening for a new GS 7/9/11 Regulatory Project Manager in the Grand Junction Office! If you are interested in applying, please contact Brad Crosson at steven.b.crosson@usace.army.mil for more information. This is a great opportunity for a motivated individual to join a small but enthusiastic and highly supportive team of dedicated regulators.

Charly Hoehn

From: Dayberry, Riley - NRCS, Denver, CO <thomas.dayberry@usda.gov>
Sent: Friday, December 16, 2022 2:45 PM
To: Charly Hoehn
Cc: Backhaus, Eugene - NRCS, Denver, CO; Evans, Clinton - NRCS, Denver, CO; Shoup, William - NRCS, Denver, CO
Subject: Town of Silt Water Treatment Plant Project - Environmental Assessment
Attachments: FPPA Response_TownofSilt_Water_System_Project_Response.pdf

Hi Charly,

Attached is the NRCS response to your request for environmental assessment. Please contact me with any questions or concerns.

Thank you,

T. Riley Dayberry
Asst. State Soil Scientist for Colorado
USDA-NRCS
720-544-2855

Web Soil Survey – Check it out!
https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

NRCS

Natural Resources Conservation Service
Denver Federal Center
Building 56, Room 2604
P.O. Box 25426
Denver, CO 80225

SUBJECT: Farmland Protection Policy Act December 16th, 2022

Charly Hoehn
Environmental Planner/Project Manager
ERO Resources Corporation
1842 Clarkson Street
Denver, CO 80218

RE: Town of Silt Wastewater Treatment Plant Improvements

Dear Charly,

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural use. It assures that to the extent possible federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland.

For the purpose of the FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to the FPPA requirements does not have to be currently used for cropland. Projects are subject to the FPPA requirements if they may irreversibly convert farmland to non-agriculture use and are completed by a federal agency or with assistance from a federal agency.

All aspects of this project will occur in existing rights-of-way or developed areas and the project is not subject to the FPPA. NRCS encourages the use of accepted erosion control practices during the construction of this project.

If you have any further questions, please call at (720) 544-2855.

Thank you,

T. Riley Dayberry
Asst. State Soil Scientist
thomas.dayberry@usda.gov

cc:
Eugene Backhaus - State Resource Conservationist, NRCS, Denver CO
Clint Evans – State Conservationist, NRCS, Denver CO
William Shoup - State Soil Scientist, NRCS, Denver CO