CITY OF WHITE SULPHUR SPRINGS
Water System Improvements
Preliminary Engineering Report
November 2023

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GreatWest ENGINEERING

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ENGINEERING

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1.0 EXECUTIVE SUMMARY

1.1 Introduction and Background

The City of White Sulphur Springs is a community located in central Montana and serves as the county seat of Meagher County. According to the 2020 Census, the population of White Sulphur Springs is 955. The planning and service area for this study encompasses the city limits of White Sulphur Springs which contains the city's water distribution system and the land immediately east and southeast of the city which contain the city's surface water intake on the South Fork of Willow Creek, transmission main, storage tank, and water treatment plant.

The city water system consists of two groundwater wells, a diversion structure and intake dam on the South Fork of Willow Creek, slow sand filter treatment facility, water storage reservoir, transmission mains, and a distribution system. White Sulphur Springs has the capability to obtain municipal water supply from two separate supply sources. The first is a surface water source located on the South Fork of Willow Creek approximately five miles southeast of the city center. A diversion structure and dam/intake provide water to a 6-inch PVC transmission main that flows via gravity from the intake to a slow sand filter treatment building, approximately three miles northwest of the intake. After treatment, water flows to the storage tank where it is chlorinated before entering the distribution system. The second supply source is two groundwater wells located fairly close together in the northeast part of the city. The wells are pumped directly into the distribution system, feeding the user demands and filling the water storage tank located east of the city. A telemetry system is used to control the tank level and cycling of the well pumps. The storage facility consists of one 560,000-gallon partially buried concrete storage tank. The distribution system consists of main lines varying in size from one to 12 inches.

The city has specified numerous issues with the current water system and needed improvements including replacement of a 1940's era leaking transmission main, Willow Creek intake reservoir improvements, concerns of security of the Willow Creek surface water source due to the threat of wildfire, older cast iron mains in the city in need of replacement, treatment plant deficiencies, implementation of a fire hydrant replacement program, and upsizing/looping water distribution mains.

To best address the deficiencies in the water system and to develop a technically and financially feasible plan to implement the necessary improvements, the city has retained Great West

Engineering to complete the Preliminary Engineering Report (PER) of its water system. The PER follows the interagency Uniform Preliminary Engineering Report Outline and meets all associated requirements.

1.2 Problem Definition

The greatest immediate water system health, sanitation, and security concern is the age and condition of approximately 4,000 feet of 1940s era 12-inch steel water transmission main originating near the water storage tank. It is roughly estimated that the system loses approximately 40-50% of the water delivered to the system. The transmission main is believed to be the biggest source of leakage in the system and operators report the line has shown to be actively leaking with the leakage surfacing in the field. Leakage is also probable in the older parts of the distribution system within the city limits. The city's projected 2045 water demands are just at the capacity limit of the system. If leakage is not reduced in the system, the city may be faced with water quantity issues in the future.

Aside from water loss, leaking pipes also increase the threat of backflow contamination. Main breaks result in a loss of pressure, which increases the potential for backflow and contamination of the water system. The transmission main is a critical piece of infrastructure for water delivery to the system and for filling the storage tank. A break along the transmission main would disconnect the storage tank from the system and the city would have to rely solely on delivery of water from the pumped groundwater wells. The system could potentially struggle to meet peak demands and there would be no available source of stored water in the event of a fire.

There are a number of additional concerns with the current state of the water system in White Sulphur Springs. The Willow Creek intake dam wooden catwalk decking is deteriorated and not capable of supporting operations staff and a slide gate flushing valve mounted on the upstream face of the dam is not functional in its current state. As a result of the inability to use the flushing valve, the intake pond is filled with silt, aquatic plants, and deadfall. It is currently not functioning as a storage reservoir or a settling basin and is nothing more than a wide spot in the channel. The buildup of sediment appears to be affecting the quality of water which flows into the intake collection system to the water treatment plant. The Willow Creek drinking water source is only used as turbidity allows, is currently not in use, and has not been used reliably for the past two to three years. It is crucial for this water source to be maintained and sufficiently delivered to customers for domestic and fire flow uses. The city does not have enough capacity from the groundwater wells alone to meet future maximum day demands. Use of the surface water source is entirely by gravity so it must also be maintained to save energy and costs related to groundwater pumping. Not having a reliable surface water source makes the entire water system dependent on the groundwater system which is limited to a maximum flow rate of 500 gpm. The existing maximum daily demand is 505 gpm which is just slightly above the existing capacity of the wells. If improvements are not made to the intake facility and surface water treatment plant, the city will likely face water quantity issues in the future.

Additional concerns are present within the White Sulphur Springs water distribution system due to undersized and dead-end water mains. Approximately 20 percent of the distribution system is four-inch diameter or less. Undersized lines limit flows that could be critical in an emergency fire situation, creating a safety hazard for the residents of White Sulphur Springs.

1.3 Alternatives Considered

Various alternatives exist to address the deficiencies that have been identified in the city's water system. The supply alternatives considered include taking no action, intake pond improvements to replace the catwalk and flushing valve, or groundwater well improvements to improve metering capabilities.

Treatment system improvements include replacement of the filter media at the slow sand filter building, implementation of a new filter cleaning method, installation of a combined filter effluent turbidimeter, and expansion of the slow sand filter facility to include two new filter units.

The alternatives considered for the distribution system consist of taking no action, replacement of 4,000 lineal feet of 12-inch transmission main, replacing cast iron, steel, and undersized pipe in the distribution system, and addition of several segments of 6-inch pipe to the distribution system to create water mains loops for improvement of fire flows and reduction of stagnant water.

1.4 Preferred Alternative

The city has identified replacement of the 1940s era deteriorated steel transmission main as one of its top priorities due to concerns regarding the age of this pipe, the suspected large amounts of leakage from this pipe, and the threat of breaks among this pipe. The line has shown to be actively leaking with the leakage surfacing in the field. The city wishes to replace the 1946 steel line and re-align the main along Castle Mountain Road and along property lines in the adjoining subdivision.

This preferred alternative includes construction of approximately 4,000 lineal feet of new 12-inch PVC water transmission main from the water storage tank to the existing water main connection near the Townsend Ranch property line. The project will abandon the existing 1940's era steel transmission main which is known to be leaking excessively. The new PVC transmission main will deviate from the original 1940s alignment and will follow the Castle Mountain Road alignment as well as existing property lines in the adjoining subdivision. Easement negotiations will be required for this realignment with the goal to benefit property owners by re-aligning the water line along property lines versus the current alignment which traverses through the properties and potentially limits the owner's use of their properties. There will be no water services off of the new transmission main as the subdivision has its own drinking water source and is outside of the city limits. The project will include a pipeline bore underneath the South Side Canal.

1.5 Project Costs and Budget

The total project cost for the proposed project is $1,325,500. This cost is detailed in Table 7-1. The city's preferred funding package and that recommended by this PER includes:

- ARPA MAG: $306,708
- SRF Loan Forgiveness: $750,000
- SRF Loan: $268,792

Table 8-2 presents a detailed project budget based upon the proposed funding strategy. With the proposed funding package, water rates are anticipated to increase by approximately $4 per month per EDU.

2.0 PROJECT PLANNING

2.1 Location

The City of White Sulphur Springs is a community located in central Montana and serves as the county seat of Meagher County. The city, located near the Smith River Canyon, was named after the white deposits that were formed by the hot springs that are located in the city park. According to the 2020 Census, the population of White Sulphur Springs is 955. The location of White Sulphur Springs is further depicted on Figure 2-1.

The City of White Sulphur Springs and surrounding agricultural land is generally located within the foothills of two forested mountain ranges, the Castle Mountains to the southeast and the expansive Little Belt Mountains to the northeast. The North Fork of the Smith River borders the north portion of the city limits and converges with the South Fork of the Smith River to form the Smith River just southwest of the city. Willow Creek is another major surface water in the vicinity that is located east of the city and flows north to converge with the North Fork of the Smith River. Major transportation routes in the area include US Highway 12 and US Highway 89. More specifically, the City of White Sulphur Springs and project planning area is located at:

Township/Range/Section:	Township 9N, Range 6E, Sections 12, 13
	Township 9N, Range 7E, Sections 7, 14, 15, 16, 17, 18, 22, 23, 26
Latitude/Longitude:	46.55° N / 110.90° W
Elevation:	5,036 ft. near the center of the city

The planning and service area for this study is shown on Figure 2-2. It encompasses the city limits of White Sulphur Springs which contains the city's water distribution system and the land immediately east and southeast of the city which contain the city's surface water intake on the South Fork of Willow Creek, transmission main, storage tank, and water treatment plant.

The topography in the area is primarily gently rolling hills which slope to the northwest. Elevation within the planning area ranges from 5,710 feet at the Willow Creek intake reservoir to 5,000 feet at the western portion of the planning area. Figure 2-3 presents a topographic map of the planning area.

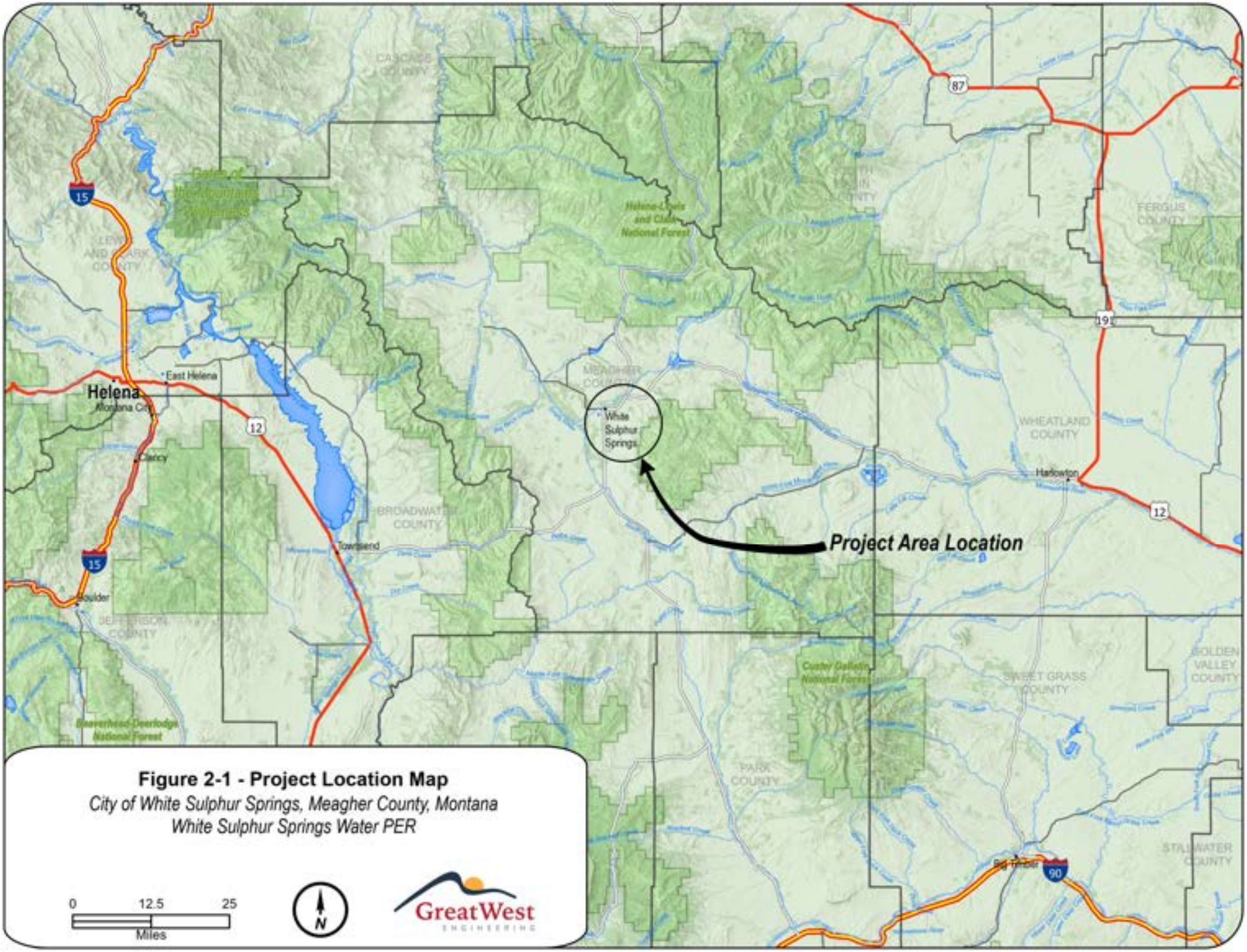


Figure 2-1 - Project Location Map

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

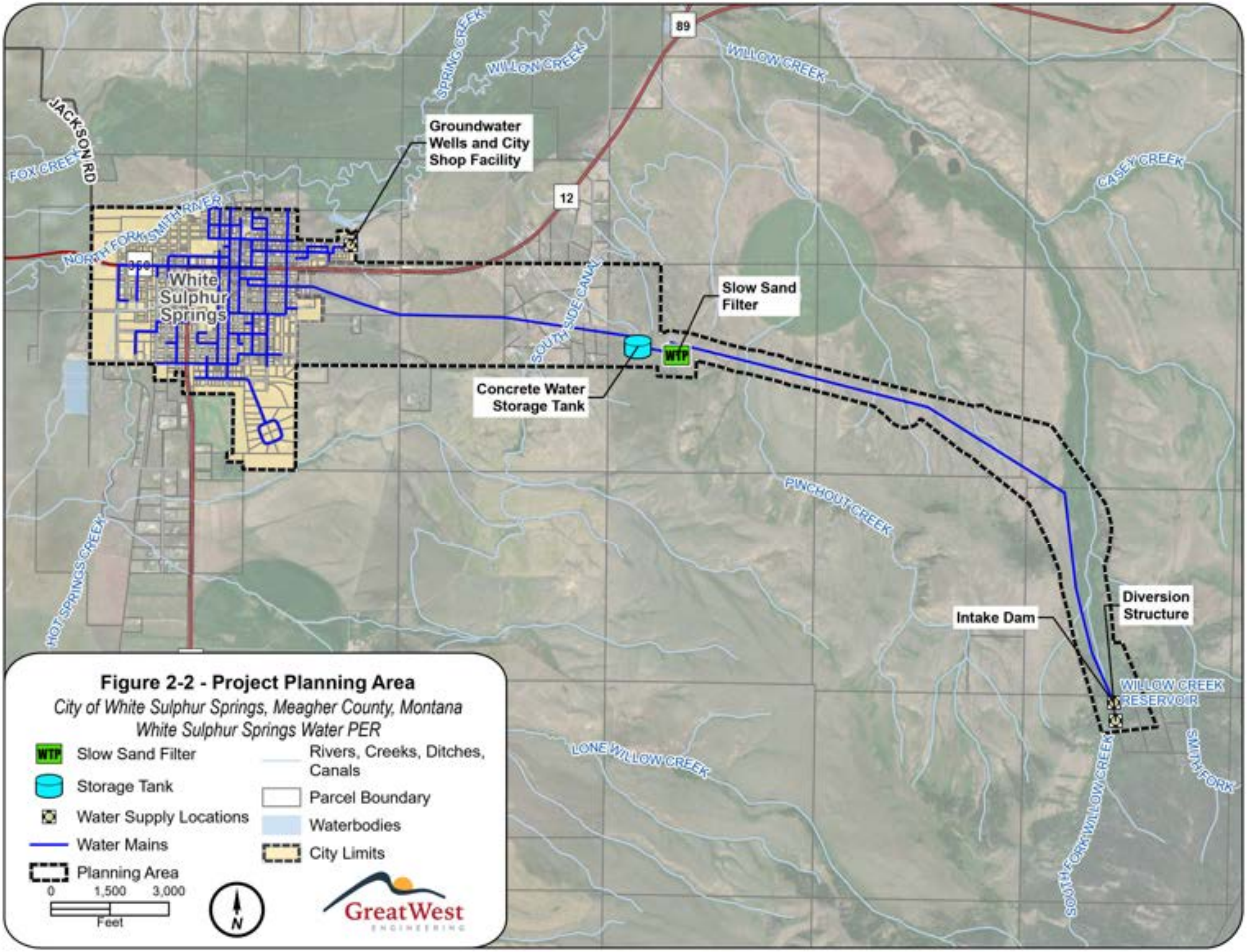


Figure 2-2 - Project Planning Area

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

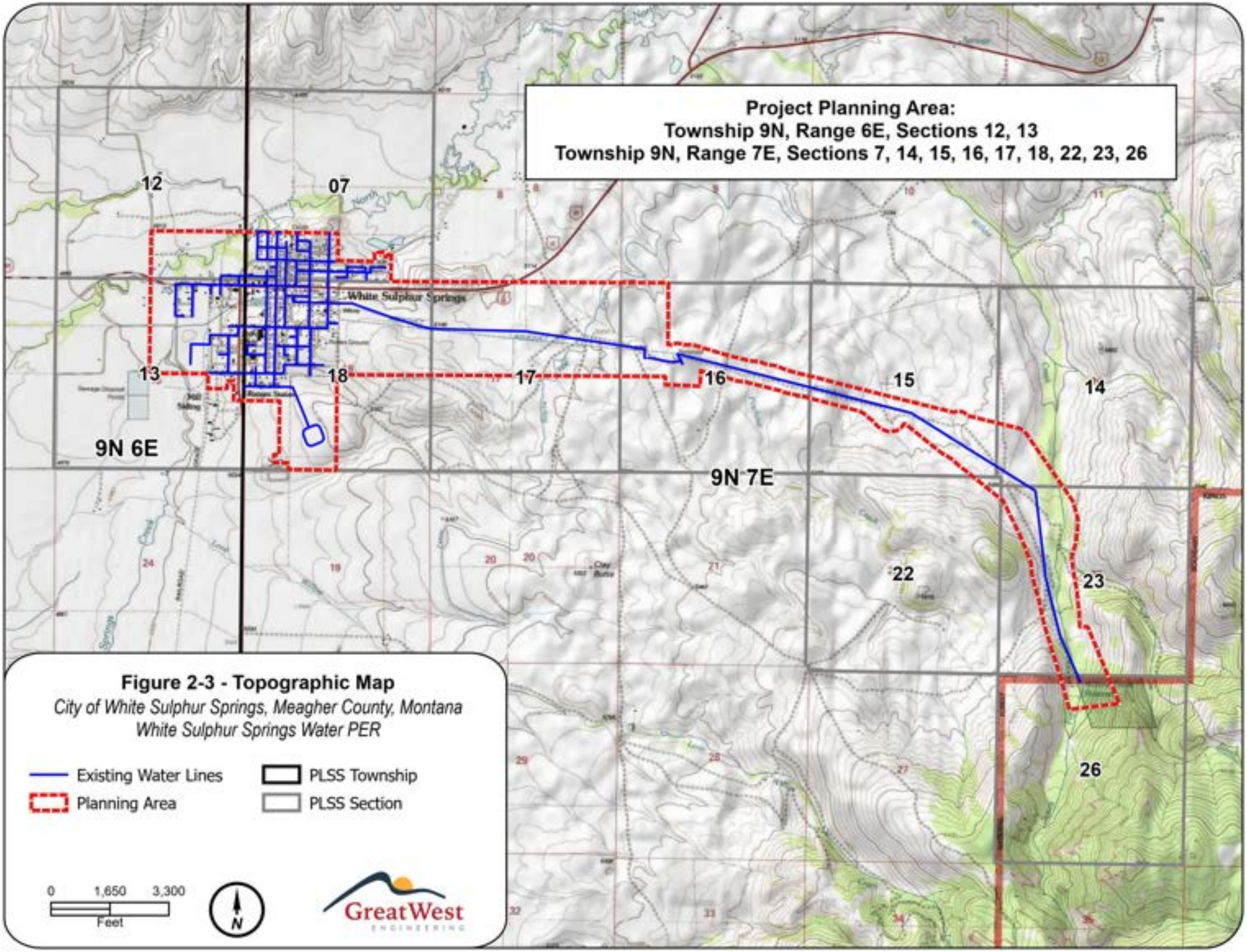


Figure 2-3 - Topographic Map

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

2.2 Environmental Resources Present

As part of any major construction project, the potential impacts on the surrounding environment must be considered and provisions made to mitigate any negative impacts. The Uniform Application for Montana Public Facility Projects contains the common forms, requirements, and checklists that must be submitted when applying for financial assistance from agencies that fund water, wastewater, and solid waste projects in Montana. The Uniform Environmental Checklist is a standard form included in the Uniform Application. A completed Uniform Environmental Checklist for the proposed water system improvements in White Sulphur Springs is included in Appendix A.

In addition to the analysis of historic, cultural, and environmental resources, the Uniform Environmental Checklist requires a letter be sent to relevant local, state, and federal agencies to obtain comments on any potential environmental impacts by the proposed project. The letter and agencies' responses can be found in Appendix B.

2.2.1 Land Resources

The Montana Natural Heritage Program (MNHP) map viewer was used to determine land cover and land management within the planning boundary and surrounding areas of White Sulphur Springs. These reports are included in Appendix C. Land use within the planning boundary and outside of the city limits of White Sulphur Springs is primarily ranchland and farmland. Areas that are not cultivated for crops are generally sagebrush shrubland or foothill grasslands. National Forest land surrounds the Willow Creek intake reservoir at the southeast end of the planning area and there are some floodplain and riparian systems adjacent to Willow Creek. There is a semi-developed rural residential area within the planning area, approximately one mile east of the city limits. This residential area consists of approximately 15 lots ranging in size from five to 15 acres. Developed areas with the city limits of White Sulphur Springs are comprised primarily of low-intensity residential and commercial areas.

Land ownership within the planning area is primarily private. The Helena-Lewis and Clark National Forest surrounds the Willow Creek intake and diversion structure, although the intake facilities are located on private land. The transmission main from the intake to the city limits traverses private land as well, with a large portion of the private land also designated as a conservation easement managed by the Montana Land Reliance. There are several parcels within the city limits owned by local government entities such as Meagher County and the City of White Sulphur

Springs. Water distribution mains within the city limits are principally located within street rights-of-way.

Farmland classifications within the planning area were determined from the United States Department of Agriculture's (USDA) National Resources Conservation Service (NRCS) Web Soil Survey online database. Soils maps and reports of the area and information on soil characteristics from the Web Soil Survey area are found in Appendix D. Farmland classifications are assessed to determine impacts from conversion of farmland to nonagricultural uses.

Table 2-1 provides a summary of the major soil characteristics within the planning area. Most of the planning area is not classified as prime farmland. The area in the central/southeast city limits is classified as prime farmland if irrigated. Small, isolated segments along the intake transmission main are classified as farmland of statewide importance and one other small area along the intake transmission main is classified as prime farmland. A map of farmland classifications in the area is included as part of the soil survey found in Appendix D.

Table 2-1 – Soils Data Summary

Planning Area Location	Soil Map Unit Names	Setting	Depth to Water Table	Farmland Classification
East of city limits	Reedwest-Roundor-Cabba complex, 2 to 8 percent slopes	Loam/clay loam in valley floor landforms	More than 80 inches	Not prime farmland
Central city limits	Fairfield gravelly loam, 1 to 4 percent slopes	Gravelly loam/gravelly clay loam in valley floor landforms	More than 80 inches	Prime farmland if irrigated
Area adjacent to the South Fork of Willow Creek and the North Fork of Smith River	Mannixlee-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes	Loams in flood-plain steps, stream terraces	About 0 to 24 inches	Not prime farmland
Area adjacent to intake transmission main	Sixteenmile-Krakon-Breeton complex, 4 to 15 percent slopes	Sandy loams in plains landforms	More than 80 inches	Not prime farmland
East of city limits and north city limits	Reedwest-Bacbuster-Cabba complex, 8 to 35 percent slopes	Loam in valley floor landforms	More than 80 inches	Not prime farmland
West city limits	Bigsandy loam, 0 to 4 percent slopes	Clay loam/sandy loam in flood plain landforms	About 12 to 24 inches	Not prime farmland
Northwest city limits	Villsprings silt loam, 0 to 2 percent slopes	Silt loams in alluvial fan landforms	About 12 to 24 inches	Not prime farmland

If water distribution system improvements are made, temporary disturbance will occur mostly in previously disturbed areas within the city limits. If water system transmission main, treatment system, storage tank, or intake improvements are made, temporary disturbance will occur within the privately owned rural residential area and agricultural land east and southeast of the city. Landowner input and coordination will be important during final design, so any project does not adversely affect land use and function of the landowner's property.

Areas of disturbance will be restored to their original conditions to the greatest extent possible upon completion of construction. Ultimately, the project will result in minimal change in land use and minimal adverse impacts to land resources. Any water system improvements constructed southeast of town will generally preserve the open space and maintain the rural character of the land.

2.2.2 Biological Resources

Wildlife in White Sulphur Springs and surrounding areas primarily consists of small and large mammals such as deer, antelope, coyote, rabbit, skunk, rodents and others, fish such as trout, and numerous species of birds. A MNHP search was conducted and revealed Species of Concern (SOC) within the general vicinity of the planning area. Montana SOC are at-risk due to declining population trends, threats to their habitats, restricted distribution, and/or other factors. The search revealed thirteen SOC within the project area based on mapped Species Occurrence (SO) polygons. The SOC include one fish species (Westslope Cutthroat Trout), two mammal bat species (Little Brown Myotis and Long-eared Myotis), and ten bird species (Bobolink, Brewer's Sparrow, Cassin's Finch, Clark's Nutcracker, Evening Grosbeak, Great Blue Heron, Greater Sage-Grouse, Green-tailed Towhee, Long-billed Curlew, and Verry).

SO polygons for one other Special Status Species (SSS) and two other Important Animal Habitats (IAH) were also identified within the planning area. The identified SSS species is the Bald Eagle and the identified IAHs are bat roosts (cave and non-cave). Although the Bald Eagle is not classified as a Montana SOC, the SSS status indicates the species has some legal protections in place. The MNHP species data can be found in Appendix E, along with lists of other observed non-SOC, observed SOC not associated with SO polygons, and other potentially present species within the planning area. The planning area does fall within sage grouse general habitat, as defined by the Montana Sage Grouse Habitat Conservation Map.

A response was received from the U.S. Fish and Wildlife Service (USFWS) regarding the proposed water system improvements in White Sulphur Springs. The response is included in Appendix B. The USFWS had no comments regarding federally listed or proposed threatened or endangered species or other trust species. The USFWS provided a link to the Information for Planning and Consultation (IPaC) project-planning tool, which is an additional listed species information source used as part of the USFWS environmental review process. The IPac report generated from input of the planning boundary is included within Appendix E. The report identifies potentially affected species in the area such as the Canada lynx, North American Wolverine, Monarch butterfly, Whitebark Pine, and several migratory birds including the Bald Eagle.

An additional response was received from the Montana Department of Fish, Wildlife and Parks (FWP) regarding the proposed water system improvements in White Sulphur Springs. The response is included in Appendix B. FWP noted the native Westslope Cutthroat Trout population upstream of the diversion structure on Willow Creek and stressed the high conservation value of this species. FWP requested that any improvements to the diversion structure not promote or enable additional fish passage upstream. Additionally, FWP would prefer enhancement of the structure to prevent all passage of non-native fish with the goal to preserve the integrity of the upstream Westslope Cutthroat Trout population.

Any disturbance associated with distribution, transmission main, treatment system, or storage infrastructure water system improvements will be temporary in nature. All disturbed areas will be restored to nearly existing conditions upon completion of construction. Overall, minimal adverse impacts to biological resources are anticipated. Potential improvements to the diversion or intake facilities on Willow Creek will involve close consultation with FWP and other agencies to ensure conservation of the Westslope Cutthroat Trout population and other affected biological species and all required environmental permits will be obtained prior to construction.

2.2.3 Water Resources

Montana's Groundwater Information Center (GWIC) was used to collect information on groundwater in the planning area and well information was acquired in spatial format through the Montana State Library. GWIC well locations within the planning area and accompanying well data is included in Appendix F. The average depth of wells in the area is 101 feet below ground surface. The average static water level is 36 feet below ground surface with an average yield of 52 gallons per minute. Most of the wells in the vicinity are domestic, monitoring, or stockwater wells. There is a grouping of domestic wells within the rural subdivision one mile east of the city in the proximity of where a potential transmission main project would occur. According to well log data, these wells are approximately 130 feet deep with surface water levels ranging from 40 to 90 feet below ground surface.

White Sulphur Springs obtains municipal water supply from two groundwater wells located at the city shop facility at the northeastern edge of the city limits. Appendix F includes available well log data for the public water supply groundwater wells. The two city wells are positioned approximately 20 feet apart, are both 200 feet deep, have static water levels of approximately 20 feet below ground surface, and yield 1,000 gpm and 200 gpm respectively, according to the well log data. The drinking water wells for White Sulphur Springs have sufficient quantity and the quality is generally good. Groundwater from both wells is disinfected using chlorine gas since both wells have static water tables less than 25 feet. The city groundwater supply will be discussed further in Chapter 3. The GWIC well data also revealed two additional wells within the city limits that are classified as public water supply. These two wells are associated with the Spa Hot Springs Motel located at the center of the city and these wells are the source of geothermal water for the swimming pools.

There is the potential to encounter groundwater during construction of water system improvements. Groundwater could be a concern during construction, especially if construction takes place during the spring when the groundwater table is at its highest or in the late summer/fall when groundwater is influenced from irrigation practices. Encountering groundwater is not uncommon during construction projects and will be accounted for as part of the project cost. Further, the location of existing groundwater wells will be examined carefully during design of any water system improvements and the contractor will be responsible for developing a pollution prevention plan that details planned contamination avoidance techniques in place during construction.

Surface water within the planning boundary generally consists of the Willow Creek Reservoir, South Fork of Willow Creek, Willow Creek, Pinchout Creek, Hot Springs Creek, and the North Fork of the Smith River. The South Side Canal also runs through the rural subdivision one mile east of the city. In addition to the two groundwater wells, the South Fork of Willow Creek also provides drinking water to the City of White Sulphur Springs. The surface drinking water system and associated water rights will be discussed further in Chapter 3.

Surface water quality information was obtained from DEQ's Clean Water Act Information Center (CWAIC) website and interactive maps. Montana classifies its waters according to present and future beneficial uses they are expected to support. The South Fork of Willow Creek is classified as A-1 use which is considered high-quality with the principal beneficial use of public water supply. All other surface waters in the planning area are classified as B-1. The water quality use class map can be found in Appendix G. Both A-1 and B-1 waters are to be maintained suitable for drinking water after conventional treatment, recreation, agriculture, industry, and propagation of salmonid fishes and associated aquatic life. The only difference between A-1 and B-1 class is that B-1 water must support beneficial use for drinking water after conventional treatment while A-1 water must support beneficial use for drinking water after conventional treatment for removal of naturally occurring impurities only. Beneficial uses for the surface waters within the planning area are not currently threatened or impaired with the exception of the North Fork of the Smith River. The most recent CWIAC surface water report was completed in 2020 and documents that the North Fork of the Smith River in the planning area is not fully supporting the beneficial use of primary contact recreation and a TMDL is required to address the factors causing the impairment or threat. CWIAC surface water reports are provided in Appendix G.

The city is concerned with the quality of water in Willow Creek in terms of turbidity. Willow Creek Reservoir is currently built up with sediment and appears to be affecting the quality of water which flows into the intake collection system to the treatment plant. There are current operational deficiencies at the intake dam which prevent the city from being able to properly operate a flushing valve to eliminate the sediment. As a result, the city has not been able to reliably use the Willow Creek source for the past two to three years. Potential intake improvements are discussed later in this report.

Water quality in Willow Creek may also be affected through increased sediment transport to the water source due to increased deadfall in the area from the effects of recent beetle kill. The city is currently in discussions with the Forest Service and associated planning agencies on the importance of fuels mitigation in the area to manage the increased deadfall. Continued coordination will be important so that appropriate operation and maintenance activities are in place to protect the Willow Creek watershed and water source for the city.

Proposed improvements at the intake dam would take place within Willow Creek Reservoir and Creek. Environmental permitting would be required as part of the construction project and all appropriate approvals would be obtained from FWP, DEQ, U.S. Army Corps of Engineers

(USACE), and other agencies as necessary to assure no adverse impacts to surface water quality as a result of construction activities. Water system improvements in other parts of the planning area will implement appropriate storm water pollution prevention measures during construction to eliminate sediment transport to nearby surface waters and minimize disturbance to affected surface waters.

2.2.4 Floodplains

A review of the Federal Emergency Management Agency (FEMA) flood map service center reveals there is one flood map for the White Sulphur Springs area. The current FEMA floodplain map for the project area is included in Appendix H. The map indicates there is a small portion of the northwestern corner of the city limits within the 100-year floodplain of the North Fork of the Smith River. The area within the unincorporated portions of Meagher County is unmapped and no flood insurance rate maps currently exist.

It is unlikely that water system improvements will take place within the floodplain. Based on existing water system mapping, there are currently no water lines within the floodplain area of the northwestern city limits and no planned water system improvements in this location at this time. The potential for floodplain disturbance will be considered carefully, however, during preliminary design. If any floodplains are impacted by the proposed project, all appropriate permits will be obtained prior to construction of the improvements.

2.2.5 Wetlands

Mapped riparian and wetland areas of Montana are provided by the Montana Natural Heritage Program. Wetland data can be found within Appendix I. Mapped wetland areas fall within the planning area. Most of the mapped wetlands are associated with the North Fork of the Smith River in the northwestern corner of the city limits and the upper reaches of Willow Creek near the intake facility. There are also a few isolated small emergent wetlands located throughout the planning area.

The wetlands directly adjacent to the North Fork of the Smith River are classified as palustrine emergent wetland characterized by erect, rooted herbaceous vegetation present during most of the growing season and palustrine scrub-shrub wetland which is dominated by woody vegetation less than 20 feet tall. The wetlands within the planning area adjacent to Willow Creek are riparian forested and riparian scrub-shrub wetland characterized by woody vegetation that can be greater than 20 feet tall.

Improvements at the intake could likely impact wetlands. There could also likely be a stream/canal crossing if the transmission main is replaced within the rural residential subdivision east of the city, near the existing storage tank. Precautions will be taken during construction to prohibit any sedimentation or other potential adverse impact on the wetlands. A site-specific wetlands inventory will be conducted prior to construction for all stream crossings or low-lying areas. In the event final design proposes any disruption to existing wetlands, all necessary permits and plans for mitigation will be completed prior to construction of any improvements.

2.2.6 Cultural Resources

Cultural resources include historic and prehistoric archaeological sites, historic architecture, engineering features and structures, and resources of significance to Native Americans. The Montana State Historic Preservation Office (SHPO) was contacted to determine whether there are significant historical and cultural resources within the project area. A copy of the correspondence with SHPO is included in Appendix B.

SHPO conducted a file search for the project area and determined there have been several previously recorded historic sites within the area relating to historic residences, architecture, homestead/farmsteads, commercial development, railroads, a courthouse, irrigation systems, a school, and mining. Four of the listed sites provided by SHPO were identified as currently being listed in the National Register of Historic Places. SHPO also provided a list of previously conducted cultural resource inventories within the area.

SHPO recommends that any found structure over fifty years old be considered historic and potentially eligible for listing in the National Register of Historic Places. A found structure over fifty years old should be recorded and assessed prior to any disturbance taking place. SHPO did express concern over the fact the Willow Creek diversion and intake structures may be over fifty years old. SHPO asked that these structures be recorded prior to any rehabilitation taking place through further site investigation and coordination with SHPO.

With the exception of a potential project at the Willow Creek intake, it is not anticipated that cultural properties will be impacted by other improvements to the water system. SHPO will be contacted immediately however, in the event any cultural materials are discovered during construction.

2.2.7 Socio-economic and Environmental Justice Issues

According to the 2015-2019 American Community Survey (ACS) 5-Year estimates, the median household income in the City of White Sulphur Springs is $41,458 and 14.4 percent of its residents live below the poverty level. The low to moderate income (LMI) percentage for White Sulphur Springs is 50.8 percent. The LMI percent is based on the U.S. Housing and Urban Development (HUD) 2015 low- and moderate-income data. Census and income data is summarized in Appendix J.

There are no socio-economic and environmental justice issues identified as a result of this project. The proposed improvements will not adversely impact the environment, and no demographic group will experience disproportionate effects. The analysis and improvements across the entire water system provide benefits equally among residents by improving public health and safety. Temporary disproportionate effects could be perceived with construction activities depending upon final design. Some residents/business owners may have construction activity affect them differently.

2.3 Population Trends

Population analyses provide the basis for all planning efforts and play a significant role in decision making. Projections of future population are used in planning and engineering design to properly size facilities. Historic populations for the City of White Sulphur Springs and Meagher County are summarized in Tables 2-2 and 2-3 respectively. Supporting decennial Census data is included in Appendix J.

Table 2-2 – Historical Population Data – White Sulphur Springs

Year	Population	Total Period Growth	Annual Growth per Period
1980	1,302	-	
1990	963	-26%	-3.0%
2000	984	2%	0.2%
2010	939	-5%	-0.5%
2020	955	2%	0.2%

Table 2-3 – Historical Population Data – Meagher County

Year	Population	Total Period Growth	Annual Growth per Period
1980	2,154	-	
1990	1,819	-16%	-1.7%
2000	1,932	6%	0.6%
2010	1,891	-2%	-0.2%
2020	1,927	2%	0.2%

The city has experienced a decline in population since 1980 but population over the last thirty years has remained relatively unchanged. The 2020 Census population of White Sulphur Springs is currently 955. The population of Meagher County has exhibited a similar trend to that of the city.

The proposed water system improvements are anticipated to be completed by the end of 2025. A 20-year design life is a typical assumption for major capital improvements. As a result, the design year of 2045 is assumed for this Preliminary Engineering Report (PER). According to the Census, the population of White Sulphur Springs grew from 939 in 2010 to 955 in 2020, resulting in an annual growth rate of 0.2%. Growth scenarios for 0.2%, 1%, and 2% annual growth are presented below in Table 2-4.

Table 2-4 – Population Projections

Year	0.2% Annual Growth	1% Annual Growth	2% Annual Growth
2020	955	955	955
2025	965	1,004	1,054
2030	974	1,055	1,164
2035	984	1,109	1,285
2040	994	1,165	1,419
2045	1,004	1,225	1,567

Based on the population analysis presented above, an annual growth rate of 1% appears appropriate to estimate future population in White Sulphur Springs over the planning period.

The city and county completed a consolidated city/county growth policy in early 2021. One of the primary purposes of the growth policy is to establish the foundations for where and how growth will occur within the city and county. The growth policy identified two major resource development projects, the Black Butte Copper Mine and Gordon Butte Pumped Hydro Project, that are expected to occur in the coming years, and which will have an impact on population within the city and county. The Black Butte Copper Mine is estimated to add an additional 225 people to the population of the city while the Gordon Butte project is estimated to add 60 additional residents to Meagher County. Although these development projects have been identified, they are in the early stages of development and many details remain uncertain. Therefore, all projects evaluated within the PER will assume a 2045 design population of 1,225 people (based on 1% annual growth).

2.4 Community Engagement

Great West Engineering conducted a public hearing on March 21, 2023, at 5:30 pm at White Sulphur Springs City Hall at 105 West Hampton. The proposed project was explained in detail, including the purpose, proposed area of the project, activities, budget, funding, and financial impacts that may result for local citizens as a result of the project. The environmental assessment was also presented. The public was then given the opportunity to ask questions and express opinions regarding the project.

The notice of the public hearing was published in the Meagher County News on March 9 and March 16, 2023. Copies of the affidavit of publication, presentation handouts, and meeting minutes are included in Appendix K.

3.0 EXISTING FACILITIES

This chapter describes each part of the White Sulphur Springs existing water system and identifies deficiencies throughout the system.

3.1 Location Map

Figure 3-1 presents a map of the White Sulphur Springs existing water system, including the intake diversion structure, intake dam, slow sand filter building, storage tank, transmission main, well locations, and distribution system. The Montana Department of Environmental Quality (MDEQ) completed a Sanitary Survey for the White Sulphur Springs water system in November 2022, a copy of which is included in Appendix L. The survey includes photographs of the water system facilities.

White Sulphur Springs has the capability to obtain municipal water supply from two separate supply sources. The first is a surface water source located on the South Fork of Willow Creek approximately five miles southeast of the city center. A diversion structure and dam/intake provide water to 6-inch PVC transmission main that flows via gravity from the intake to a slow sand filter treatment building, approximately three miles northwest of the intake. After treatment, water flows to the storage tank where it is chlorinated before entering the distribution system. The second supply source are two groundwater wells located fairly close together in the northeast part of the city. The wells are pumped directly into the distribution system, feeding the user demands and filling the water storage tank located east of the city. A telemetry system is used to control the tank level and cycling of the well pumps. The storage facility consists of one 560,000-gallon partially buried concrete storage tank. The distribution system consists of main lines varying in size from one to 12 inches.

3.2 History

The city water system consists of two groundwater wells, a diversion structure and intake dam on the South Fork of Willow Creek, slow sand filter treatment facility, water storage reservoir, transmission mains, and a distribution system. The water system was originally constructed in the late 1800's and early 1900's using wood stave pipe. The original transmission main from the South Fork of Willow Creek to the city was also likely constructed during this time as Willow Creek water rights date from 1872 to 1898.

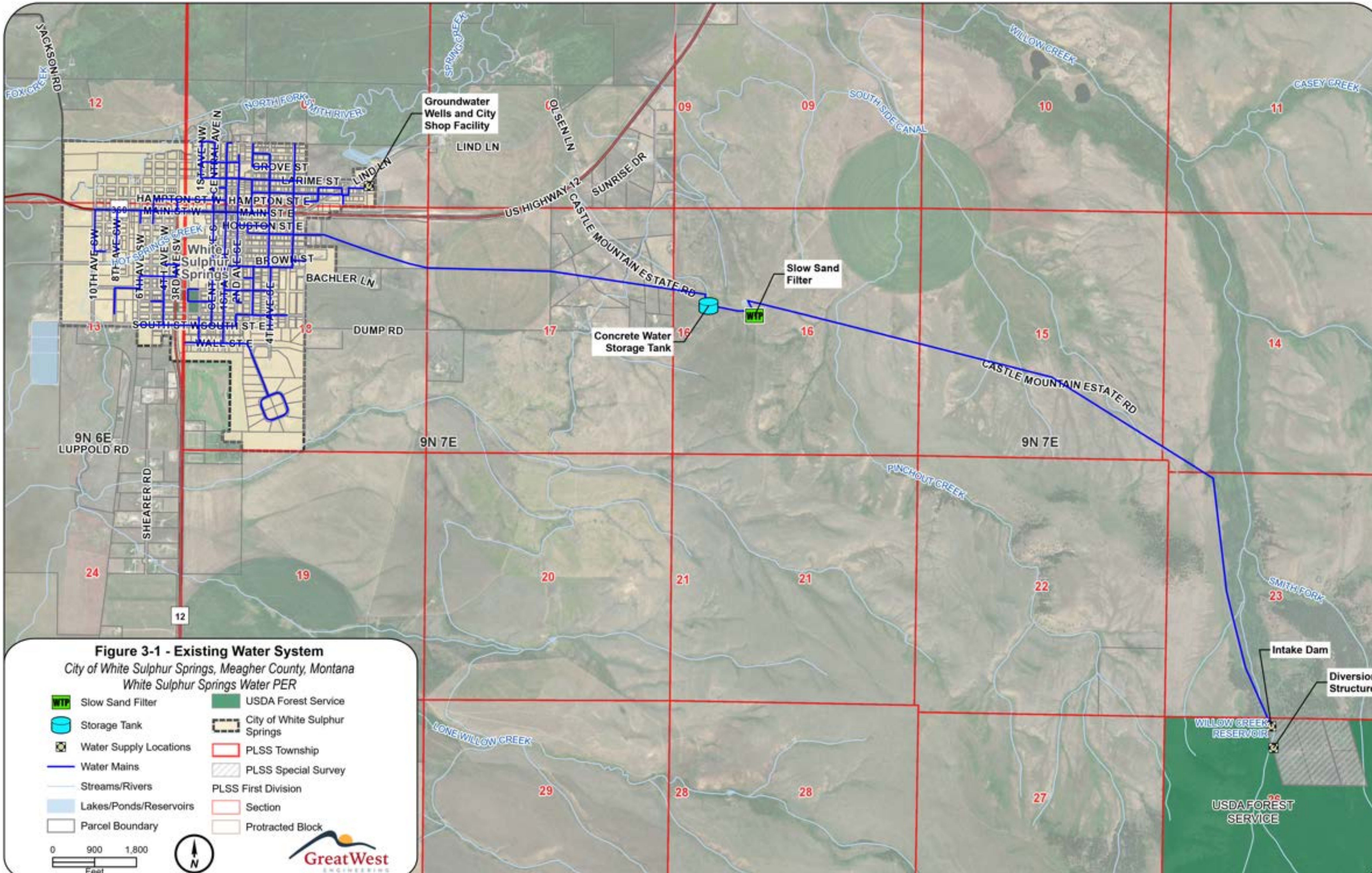


Figure 3-1 - Existing Water System

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

Available record drawings document that in 1946, a 450,000-gallon concrete storage tank was constructed in the same general vicinity as today's existing tank. A new 12-inch cast iron/steel transmission main was also constructed from the storage tank to city limits and a new diversion dam and intake was constructed at the Willow Creek Reservoir. Available plans showed the intake as a concrete tower in the reservoir with a single 8-inch diameter pipe exiting the bottom of it. While there is no available record based on reviewed documents and files of any other water system improvements at this time, it is likely that much of the distribution system was upgraded to cast iron or steel within the 1940s and 1950s timeframe.

A major water system improvement project in 1986 replaced water distribution mains in about half the city with new PVC pipe based on available record drawings. Groundwater well No. 1 and its associated chlorine facility were also constructed at this time. It is believed the transmission main from Willow Creek to the storage tank was upgraded to 6-inch PVC during the 1980s as well as 2,600 lineal feet of 12-inch cast iron/steel transmission main replaced with 12-inch PVC along the portion of the transmission main directly east of the city limits. Record drawings for the 1980s transmission main improvements were unable to be located in preparation of this PER.

Although record drawings and documentation are limited, there appears to have been an improvement project at the intake sometime in the 1990s. The 1940s intake tower structure was likely removed at this time and a newly engineered slow sand filter was constructed upstream of the Willow Creek Reservoir dam. The filter system consists of filter sand and graded drain gravel layers underlain with perforated pipes that collect water. The perforated pipes manifold together and then flow to the 6-inch transmission main to the water treatment plant, approximately three miles away.

Groundwater well No. 2 was constructed in 1999 and the sand filter treatment facility was constructed in 2004. The treatment facility is located near the storage tank and consists of a 4-cell sand filter system that allows for a future 2-cell expansion. A design report for the sand filter facility was unable to be located in preparation of this PER.

A catastrophic water main break occurred in 2007 that caused flooding, home evacuations, business closures, major property damage, and a resulting boil order for eight days. The water main break occurred on the corner of Lincoln and 4th Streets.

In 2010, the city replaced the middle portion of the 12-inch cast-iron/steel transmission main with a new segment of 12-inch PVC. A water system PER was also prepared in 2010. The recommended improvements from the PER included replacing the storage tank with a new concrete tank, new chlorination facilities at the tank and at the two wells, and replacement of the water transmission main from the sand filter to a point about a mile east of the city. The recommended PER project was completed in 2012 with the exception of the transmission main replacement. The 2012 improvement project included:

- Removal of the 1946 concrete water tank and construction of a new 560,000-gallon pre-stressed concrete water tank.
- Construction of a new chlorination facility adjacent to the new tank.
- Upgrades to the chlorination unit for the two wells including the installation of a new chlorine detection unit and alarm system.
- Addition of telemetry controls to link the remote tank/chlorination site to the city shop complex well house together.
- Replacement of the water line on West Main Street from 3rd Ave SW to Central Avenue.

A tornado destroyed much of the sand filter building's roof and walls in 2012. Repairs were made and the sand filter building was put back online in 2013.

A portion of transmission main was replaced in 2020 with new 12-inch PVC along 4th Avenue SE and Lincoln Street.

A Capital Improvements Plan (CIP) was completed in 2021 and identified the following priority projects pertaining to the water system:

- Replacement of the water transmission main from the east end of the alfalfa field east to the tank. This is the remaining portion of 1940s cast iron/steel transmission main that has yet to be replaced. It was identified in the 2010 PER as part of the preferred project but was never constructed.
- Replacement of undersized 4-inch water mains in the city.
- Looping of dead-end mains. Approximately 13 dead end mains exist within the city water system.
- Modifications to plumbing in the current well house. The current configuration only allows water to be metered from well no 1 which is located inside the well house. Well no. 2 is located just outside the well house and is plumbed in without a meter.

The city is currently in the construction phase for a project to install a backup generator for the groundwater well pumping system. The city is also in the process of updating their CIP.

The city has specified numerous issues with the current water system and needed improvements including replacement of the final segment of the leaking transmission main, Willow Creek intake reservoir improvements, concerns of security of the Willow Creek surface water source due to the threat of wildfire, older cast iron mains in the city in need of replacement, treatment plant deficiencies, implementation of a fire hydrant replacement program, and upsizing/looping water distribution mains.

3.3 Condition of Existing Facilities

As mentioned in the previous section, the city is in need of water system improvements. The following sub-sections discuss in greater detail the condition and analysis of each component of the city's existing water system and provide the basis for the development of alternatives for improvements.

3.3.1 Supply

White Sulphur Springs has the capability to obtain municipal water supply from two separate supply sources. The first is a surface water source located on the South Fork of Willow Creek approximately five miles southeast of the city center. A diversion structure and dam/intake provide water to a 6-inch PVC transmission main that flows via gravity from the intake to a slow sand filter treatment building, approximately three miles northwest of the intake. After treatment, water flows to the storage tank where it is chlorinated before entering the distribution system.

The second supply source is two groundwater wells located fairly close together in the northeast part of the city. The wells are pumped directly into the distribution system, feeding the user demands and filling the water storage tank located east of the city. A telemetry system is used to control the tank level and cycling of the well pumps.

Specifics on each water supply source and applicable infrastructure are discussed further below.

Surface Water Diversion Structure

A diversion structure was constructed in the South Fork of Willow Creek for the purpose of diverting flow to the water system for the city. The structure was constructed in the 1940s and consists of two concrete channels (one for the diverted flow and one for the mainstream flow) and a bar screen and slide gate on the diversion channel. The slide gate is used to isolate the city's water system from Willow Creek. The concrete, bar screen, and slide gate are all in good condition and functional. There is no visible cracking/scaling, or apparent structural issues present. The bar screen is cleaned out whenever operators are able to access the site.

There is an old culvert across the creek upstream of the diversion structure that appears to be causing some deadfall to collect but does not appear to affect the flow of the stream. The Forest Service has said not to move it based on discussions with the city.

Access to the diversion structure/intake is limited. The road is impassible in the winter months and requires four-wheel drive in the summer months. There have been reports of access problems due to downed trees on forest land as well.

Upstream Side of Diversion Channel, Bar Screen, and Slide Gate

Slide Gate and Section of Downstream Channel

Surface Water Intake Pond and Dam

The diversion structure supplies water through a natural channel to a pond that is created by a concrete dam in the channel. The dam has a spillway, flushing valve, and wooden catwalk. The flushing valve is used to drain the pond and flush the sediment from the pond. The actuator for the flushing valve is on an orange-colored pedestal that is mounted to the deck of the catwalk and the actuator is located in the middle of the span of the catwalk. To access the actuator, staff must walk across the catwalk. The pond is full, and water is flowing over the spillway.

The 1946 design drawings show an intake tower in the pond on the upstream side of the dam. The tower is constructed of concrete and is a 3' x 3' x 10' high box with a single 8-inch diameter pipe exiting the bottom of it. The intake tower does not appear to be there anymore. Although record drawings and documentation are limited, there appears to have been an improvement project at the intake sometime in the 1990s based on operator knowledge and landowner input. The 1940s intake tower structure was likely removed at this time and a newly engineered slow sand filter was constructed in the intake pond. The filter system consists of filter sand and graded drain gravel layers underlain with perforated pipes that collect water. The perforated pipes manifold together and then flow to the 6-inch transmission main to the water treatment plant. The city provided schematic drawings of the intake pond sand filter which are provided in Appendix M. A Source Water Delineation and Assessment Report for White Sulphur Springs was completed in 2002. This report states that the slow sand filter requires the use of supplemental pumping to drain and is difficult to clean. As such, filtered water has a higher turbidity than water in the creek before filtration. The report notes that future improvements are planned for the slow sand filter in Willow Creek.

The decking of the catwalk is deteriorated and not capable of supporting operations staff, however, the concrete for the dam and spillway is in good condition. The 1946 design drawings indicate the flushing valve is a slide gate mounted on the upstream face of the dam. The valve is a non-self-contained slide gate valve so the force of opening and closing the gate is transferred through the pedestal directly to the deck. The planks on the deck are subject to the upward force of closing the gate and the repeated closing of the gate has caused the pedestal to lift the supporting planks up off the deck. Therefore, the flushing valve is not functional in its current state.

The intake pond is filled with silt, aquatic plants, and deadfall. It is currently not functioning as a storage reservoir or a settling basin and is nothing more than a wide spot in the channel. The buildup of sediment appears to be affecting the quality of water which flows into the intake collection system to the water treatment plant. The Willow Creek drinking water source is only used as turbidity allows and is currently not in use and has not been used reliably for the past two to three years. The city does not believe the aquatic plants and algae are imparting taste and odor compounds to the water.

Lastly, there is currently no way to monitor raw water quality at the pond as there is no monitoring equipment installed at the pond. This makes it difficult to know when the city can put the treatment plant into service or to address changes in turbidity before they hit the plant.

Upstream Side of Dam showing Catwalk, Orange-Colored Pedestal, and Pond

Downstream Side of Dam showing Spillway, Catwalk, Orange-Colored Pedestal, and Lifted Decking

Intake Pond showing Aquatic Life, Algae, and Deadfall

Surface Water Transmission Main

The surface water transmission line leaves the intake/dam area and follows Willow Creek for a distance. It eventually veers away from the creek and generally follows the access road on the east/north side of the road. There are intermittent valves and blowoffs which allow for flushing of the line when the city starts using the water source after a period of unuse. There are also a few air release valves along the route.

There are no known issues with the transmission main. The line was last upgraded in 1986 to 6-inch PVC according to information in the 2010 PER and verification by the city.

The surface water transmission main is located on private property. The easement agreement with the landowner indicates the easement for this pipeline is 15 feet on each side of the pipeline. The easement agreement also documents use of the two-track road for access to the pipeline and reservoir. The diversion structure resides about half on Forest Service property and half on private land. The intake dam is also located on private property.

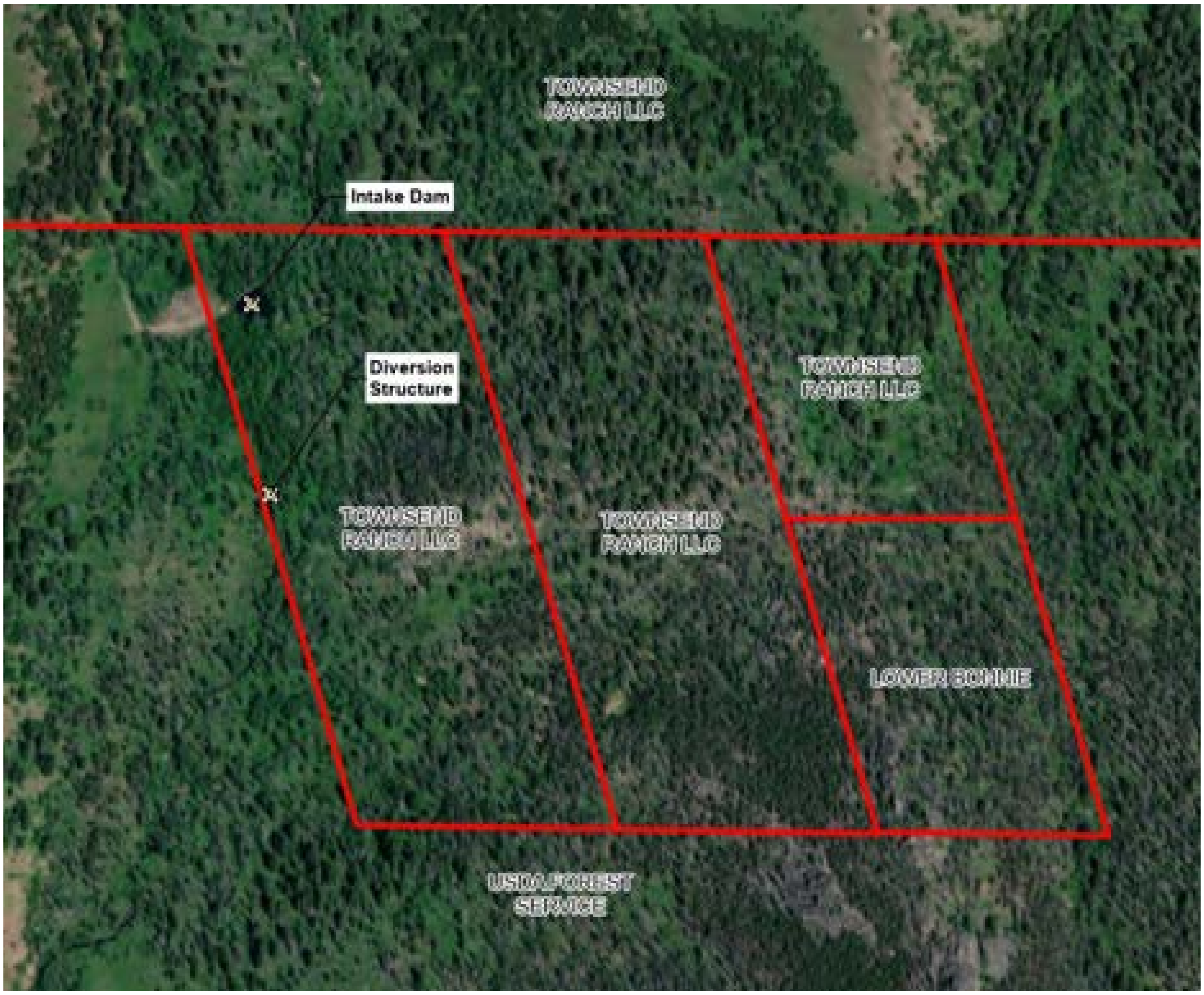


Image showing Ownership and Property Lines from Cadastral

Based on the evaluation of the surface water source infrastructure, the division structure is in good condition and there are no apparent issues. Therefore, this PER will not make any recommendations for improvements to the structural components of the diversion structure. Improvements at the intake pond are needed in order for the city to be able to use the Willow Creek surface water source. Alternatives for intake pond improvements will be presented in Chapter 5 and will include recommendations for replacing the catwalk and valve, monitoring turbidity at the pond, and improving access to the diversion and intake facilities. No improvements are needed to the 6-inch surface water source transmission main at this time.

Any improvements to the intake facility will require coordination with the private landowner to determine what issues should be addressed with a proposed construction project at the intake dam and any concerns with access. Long term, it will be important for the city to stay involved in discussions with the Forest Service on operation and maintenance and fuels mitigation/deadfall issues so that access to the diversion and intake is maintained and degradation of water quality is minimized.

Groundwater

The city uses its two groundwater wells when the Willow Creek source is not in use, and as a supplement to the Willow Creek source as necessary when it is in use. The wellhouse is located in the city maintenance shop yard, at the northeastern edge of the city limits. Well #1 is located within the wellhouse, and well #2 is just outside of the wellhouse. Wells #1 and #2 are only about 20 feet apart.

The wells are equipped with submersible pumps and are controlled by the water levels of the storage tank. Groundwater is disinfected using a gas chlorine injection system. The treated water is pumped directly into the distribution system, feeding user demands and filling the water storage tank. The water level in the tank is communicated to the well site through a radio telemetry and SCADA control system. Well #1 is equipped with a variable frequency drive (VFD), but well #2 is not. If the storage tank is ever offline, the city utilizes well #1 to moderate flow and pressure in the system. The city operates well #2 as its main well and well #1 functions as a backup well when needed.

Table 3-1 summarizes available well log data. Full well log reports are included in Appendix F.

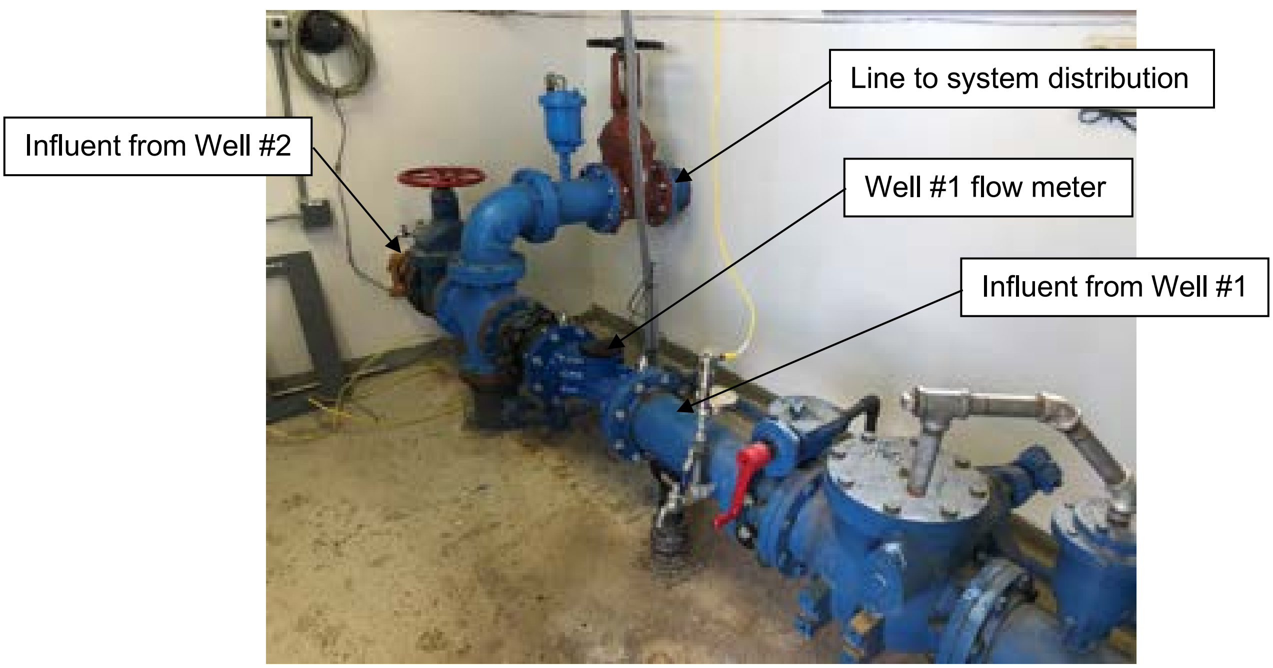
Table 3-1 – White Sulphur Springs Public Water Supply Wells

Well Name	GWIC ID	Well Completion Date	Total Depth (ft.)	Static Water Level (ft.)	Test Pumping Rate (gpm)(1)	Current Pumping Rate (gpm)(2)
Well #1	260672	1986	200	19	200	350(3)
Well #2	172711	1999	201	22	1,000	534

(1)Based on original well logs.
(2)Based on operator information.
(3)Well #1 flow rate can be increased to 500 gpm if needed with the VFD.

There are no significant deficiencies with the groundwater supply system. There is a deficiency within the wellhouse related to metering, however. The meter in the well house is only capable of recording the flow from well #1 because of where it is placed. There isn't an ideal spot to install another meter that would be capable of recording accurate flow measurements for both wells. Because of the meter placement deficiency, the operator records the pump run time hours each day and estimates usage based on the run time and estimated pump flow rate determined from the pump curve.

Existing Well Pump House showing Well #2 Location outside of Pump House



Existing Well Pump House Plumbing

Water Demand

Knowing current water demand is necessary to calculate future water needs throughout the planning period. Water use can be evaluated two ways:

1. Water use based on source data. This is the amount of water that comes directly from the groundwater source or the surface water source.
2. Water use based on metered data. This is the amount of water that is used at each house or service connection.

The calculation of average daily demand is dependent on the specific community and the information available for the community. The water operator maintains daily pump run time data from each of the wells. The daily groundwater source water use logs and spreadsheets are provided in Appendix N. The groundwater source pump run time hours were used to estimate source water use by calculating the number of hours the pumps run each day and multiplying the pump run time hours by the well pump flow rates (500 gpm for well #2 and 350 gpm for well #1). The end result is an estimate of gallons per day pumped at the groundwater source each day. This data was compiled for the time period from February 2019 through September 2022, and was summarized by month as shown below in Table 3-2.

The Willow Creek surface water source was used minimally over this time period. Well #1 was also used minimally over this time period. Months with no data represent months when the Willow Creek source was used for any time during that month or for where there are data gaps in the groundwater pumped usage records. Due to the minimal time the surface water source was used, the source water usage summary is only based on groundwater source data. The average day use based on source meter data is 242,537 gallons per day (gpd) or 254 gallons per capita per day (gpcd).

Water meters are installed on each service in the city and a similar water use analysis can be conducted with the use of water meter data. Table 3-3 summarizes monthly meter usage and resulting per capita per day water use for the time period 2019 through 2022. Meter usage report spreadsheets are provided in Appendix N. The average day use based on water meter data is 97,095 gpd or 102 gallons gpcd. This is a very low usage rate as compared to other Montana communities. Based on information from the city, the watering of the city parks is not included in the metered usage numbers. There are also a number of meters that are currently not being read because they need to be replaced. Because of these unmetered sources, the actual average metered usage for White Sulphur Springs is likely on the order of 150 to 160 gpcd, as is comparable to other Montana communities of similar size.

Table 3-2 – Water Use Based on Groundwater Source Data

Month	Gallons per Month				Average Gallons per Day	Average Gallons per Capita per Day(1)
	2019	2020	2021	2022		
January	-	-	-	5,616,000	181,161	190
February	6,264,000	-	5,265,000	-	205,875	216
March	6,936,000	-	6,930,000	-	223,645	234
April	6,309,000	-	6,780,000	5,409,000	205,533	215
May	6,168,000	5,805,000	7,404,000	6,123,000	205,645	215
June	8,838,000	8,658,000	13,173,000	8,172,000	323,675	339
July	10,353,000	10,764,000	15,531,000	12,491,100	396,283	415
August	11,133,000	12,588,000	10,950,000	11,493,300	372,293	390
September	-	7,719,000	-	7,974,900	261,565	274
October	-	5,142,000	-	-	165,871	174
November	-	-	5,751,000	-	191,700	201
December	-	-	5,493,000	-	177,194	186
Average	**8,000,143**	**8,446,000**	**8,586,333**	**8,182,757**	**242,537**	**254**

(1)Based on 955 people.

Table 3-3 – Water Use Based on Metered Use

Month	Gallons per Month				Average Gallons per Day	Average Gallons per Capita per Day(1)
	2019	2020	2021	2022		
January	1,656,202	1,707,245	1,603,355	1,745,297	54,130	57
February	1,656,927	11,608,699	1,762,933	1,854,237	62,787	66
March	1,461,245	1,375,673	1,241,167	1,855,994	47,855	50
April	1,521,017	1,074,361	1,755,072	1,749,503	50,833	53
May	1,695,792	1,469,660	1,885,036	1,829,005	55,480	58
June	3,611,797	3,406,335	4,083,788	2,749,575	115,429	121
July	3,878,626	4,146,258	8,359,875	4,614,712	169,351	177
August	5,566,485	7,934,684	7,540,549	7,571,978	230,756	242
September	3,703,791	5,191,111	4,398,336	6,164,668	162,149	170
October	2,123,403	2,521,775	2,998,389	5,723,696	107,801	113
November	1,728,004	1,847,439	9,589,683	1,398,060	55,261	58
December	1,949,028	1,616,164	11,785,844	1,392,380	53,307	56
Average	**2,546,026**	**3,658,284**	**4,750,336**	**3,220,759**	**97,095**	**102**

(1)Based on 955 people.
Highlighted cells indicate higher than normal usage reflecting potential meter reading errors or outliers. These month's data were excluded from the average calculations.

Unaccounted for Water

Table 3-4 details the estimated loss of water in the system by comparing the average monthly source demand data (Table 3-2) to the average monthly meter data (Table 3-3). The comparison indicates that over 145,000 gpd or approximately 60% of the water pumped into the system is lost or unaccounted for. It should be noted that utilizing pump run time and assumed flow for the source use is only an estimate as pumping rates would actually fluctuate throughout the day based on system hydraulics. Having accurate meters at the source would allow for a more precise estimation of system leakage. Additionally, the metered usage is likely low due to unmetered sources which results in an over estimation of water loss. If more typical metered usage values are used, the percentage of water loss would be estimated to be 40 to 50% on average. Nevertheless, the data available suggests that White Sulphur Springs is losing a substantial amount of water.

Table 3-4 – Estimated Water Loss

Month	Source Average Gallons per Day	Meter Average Gallons per Day	Unaccounted for Gallons per Day	Percent Water Loss
January	181,161	54,130	127,031	70%
February	205,875	62,787	143,088	70%
March	223,645	47,855	175,790	79%
April	205,533	50,833	154,700	75%
May	205,645	55,480	150,165	73%
June	323,675	115,429	208,246	64%
July	396,283	169,351	226,932	57%
August	372,293	230,756	141,537	38%
September	261,565	162,149	99,416	38%
October	165,871	107,801	58,070	35%
November	191,700	55,261	136,439	71%
December	177,194	53,307	123,886	70%
Average	**242,537**	**97,095**	**145,442**	**60%**

Water loss in excess of 10 to 15% is considered excessive. Typically, water lost or unaccounted for in a system is the result of leaks, unmetered uses, inaccurate meters, and/or flushing of fire hydrants. The amount of leakage in a system varies but a correlation generally exists between system age and amount of leakage. New systems may have as little as 5% leakage while older systems can have much higher percentages. Approximately 30% of the White Sulphur Springs water system is old cast iron, steel, or ductile iron pipe that could have strong potential for leakage.

Leakage can also occur throughout the system at service connections. There is likely a large portion of unaccounted for water in White Sulphur Springs that could be recovered through increased metering and/or waterline repairs.

Projected Water Demand

With a projected population and existing water demand analysis, projected water demands can be made. The projections will be utilized to determine the adequacy of the system's source of supply, storage availability, and distribution system sizing and proposed improvements. The future demands will also establish the design criteria for future improvements related to all aspects of the water system.

Projected water demands are presented in Tables 3-5 and 3-6. Table 3-5 water use projections are based on the future population determined from a 1% growth rate in conjunction with the current source average day use rate of 254 gpcd. Because this method uses the current amount of water pumped into the system as its baseline and it has been shown that the system has a substantial amount of unaccounted for water, it is logical to assume the overall system demand will decrease if leakage can be reduced. Table 3-6 presents projected water demands based on a reduced per capita usage rate of 150 gpcd for reference in order to demonstrate the difference in demand if leakage can be reduced to a more acceptable tolerance. Design alternatives presented in this PER will however utilize the projected system demands presented in Table 3-5 which assume the current source demand.

The projections also present maximum day demand in addition to average day demand. The definition of maximum day demand is the highest volume of water consumed on any day in a year. The maximum day source demand for a month with complete data over the 2019-2022 period was 702,000 gallons per day occurring on July 17, 2021. The peaking factor is then the highest daily use divided by the average daily use. The resulting peak day to average day factor for White Sulphur Springs is 2.89. According to the American Water Works Association (AWWA), typical peaking coefficients for the U.S. range from 1.5 to 3.5. The projections for White Sulphur Springs utilize a slightly more conservative value of 3.0 as the peaking factor.

Table 3-5 – Projected Water System Demands (based on current source use)

Year	Estimated Service Population	Average Day Demand		Maximum Day Demand	
		(gpd)[1]	(gpm)	(gpd)[2]	(gpm)
2020	955	242,537	168	727,610	505
2025	1,004	254,908	177	764,725	531
2030	1,055	267,911	186	803,734	558
2035	1,109	281,578	196	844,733	587
2040	1,165	295,941	206	887,823	617
2045	1,225	311,037	216	933,110	648

(1)Based on 254 gpcd.
(2)Based on a max. day to average day factor of 3.0

Table 3-6 – Projected Water System Demands (with assumed reduced leakage)

Year	Estimated Service Population	Average Day Demand		Maximum Day Demand	
		(gpd)[1]	(gpm)	(gpd)[2]	(gpm)
2020	955	143,250	99	429,750	298
2025	1,004	150,557	105	451,672	314
2030	1,055	158,237	110	474,711	330
2035	1,109	166,309	115	498,926	346
2040	1,165	174,792	121	524,377	364
2045	1,225	183,708	128	551,125	383

(1)Based on 150 gpcd.
(2)Based on a max. day to average day factor of 3.0

Water Rights

Appendix O includes documentation of water rights for the White Sulphur Springs groundwater and surface water sources. Table 3-7 summarizes data for the water rights general abstracts on file with the DNRC. It appears there is one water right for the groundwater wells with a maximum allowable flow rate of 500 gpm. Three water rights exist for the Willow Creek surface water source with flowrates of 112, 637, and 148 gallons per minute, respectively. It is unclear from the general abstracts whether the surface water source rights can be added together. The general abstracts also did not make any reference to an irrigation season or water rights being limited during an irrigation season.

The 2045 projected average day use for White Sulphur Springs is 311,037 gallons per day as shown in Table 3-5. This equates to 348 acre-feet per year, which is below the maximum allowed volume for the 1985 groundwater water right and is also below the maximum allowed volume for the combined surface water rights (181 + 476 + 194 = 851 acre-feet per year). It appears the existing municipal water rights are likely adequate for the projected water demands. The groundwater right, however, has a maximum flow rate of 500 gpm and the existing maximum day demand is 505 gpm. If the groundwater source remains the only source of supply to the city as it is in the current condition, the maximum daily demand is in excess of the allowable flow rate of 500 gpm for both existing and future demands.

Table 3-7 – Water Rights Summary

DNRC Water Right No.	Type of Water Right	Priority Date	Source Type	Maximum Flow Rate (gpm)	Maximum Volume (ac-ft/yr.)	Maximum Volume (MG/yr.)	Diversion Means
41J 61342-00	Provisional Permit	1985	Groundwater	500	806.5	263	Wells
41J 193193-00	Statement of Claim	1872	Surface Water	112	181	59	Headgate
41J 193194-00	Statement of Claim	1878	Surface Water	637	476	155	Headgate
41J 193195-00	Statement of Claim	1898	Surface Water	148	194	63	Headgate

Water Quantity

The city utilizes two wells plus a surface water source for its water supply. In the past few years, the surface water source has not been reliably used due to turbidity issues which will be discussed later on in this report. The surface water source is the preferred source of water for the city because operation is by gravity and the energy requirements are minimal.

Looking at the groundwater system separately, well #2 can produce at least 500 gpm which is consistent with the water right. Well #1 currently produces 350 gpm but can be increased to a maximum of 500 gpm with the VFD. Per DEQ, groundwater systems must be able to provide the maximum daily demand with the highest capacity pump out of service. The 2045 projected maximum day demand is 648 gpm. Well #1 is the lowest producing well and is not sufficient to meet the projected maximum day demand of 648 gpm. Also, water rights appear to limit the flow from the wells to 500 gpm which may be the maximum allowable rate that can be taken from the wells at any time. Therefore, the groundwater supply alone is not sufficient to meet the demands of the system. The fact the groundwater system does not meet DEQ requirements for water supply alone further strengthens the need for improvements to increase the reliability of the surface water system.

When the surface water system is online, it can reliably treat approximately 112 gpm at the slow sand filter treatment facility. The treatment system and associated deficiencies will be discussed further in Section 3.3.2 with additional details on capacity. Recommended treatment system improvements will not be expected to substantially change the capacity of the plant, which can be expected to remain at the current 112 gpm or potentially increase slightly to a maximum of 150 gpm. Therefore, the sand filter facility requires assistance from the groundwater system in order to satisfy both average and maximum day requirements.

When considering the total capacity of a surface water system which requires treatment, the firm capacity of a water treatment plant (WTP) is defined as what the system can treat with one unit out of service. The unit could be one pump, one basin, etc. In the case of the slow sand filter treatment system, it is defined as the capacity of the treatment plant with one of the treatment cells out of service. Therefore, the firm capacity of the WTP is 84 gpm under normal operating conditions. It may be possible to increase that firm capacity for short periods of time, i.e., increase the flow to each cell while one of the cells is out of service, however, that cannot be determined without further evaluation and possible changes to the existing sand filters.

Additionally, for the WTP and surface water source to be considered for the total capacity of the water system, the WTP must be able to function at any given time. Currently that is not the case as there are limitations for when the Willow Creek source can be used based on raw water quality and the ability of the WTP to treat the water adequately.

To summarize the discussion on water quantity, the city requires both water sources in order to meet demands. The groundwater source capacity is 500 gpm and with the surface water plant capacity expanded to its maximum of 150 gpm, the city will be right at its projected 2045 maximum day demand of around 650 gpm. If leakage can be reduced through distribution system improvements, the issue with water supply capacity will be less significant.

Water Quality

Montana regulations require all community public water systems to monitor microbiological, chemical, and radiological quality. Appendix P includes water quality reports and data for the White Sulphur Springs water system, including consumer confidence reports for the past three years.

Microbiological quality in the distribution system is addressed through the Total Coliform Rule (TCR), which monitors fecal pathogens through control of total coliform bacteria, including fecal coliforms and Escherichia coli (E. coli). The city is required to sample for coliform a minimum of twice per month. Coliform/microbial sample results were queried for the past ten years. Results for all samples within this time period indicate the absence of coliform and E. coli with the exception of two routine samples in 2018 that were coliform positive and one routine sample in 2023 that was coliform positive. Repeat samples showed the absence of coliform and no violations resulted from these instances.

The city also monitors for nitrate-nitrite at the wells on a yearly basis and at the surface water treatment plant on a quarterly basis. Inspection of the past ten years of sample results indicates nitrate-nitrite levels have remained relatively constant with concentrations generally on the order of 0.91 mg/L at the wells and 0.04 mg/L or non-detectable levels at the treatment plant. The maximum contaminant level (MCL) for nitrate-nitrite is 10 mg/L.

The water system also monitors for asbestos, lead, copper, and disinfection byproducts in the distribution system and arsenic, volatile organic, synthetic organic, and radiological contaminants at the wells and treatment plant. Inorganic contaminants are also monitored for the wells. Monitoring for these contaminants occurs on an annual, three-year, or nine-year basis depending on contaminant. According to DEQ records, all contaminants are below the MCL and in most cases concentrations are non-detectable indicated by no result reported. White Sulphur Springs has had some reporting and monitoring violations over the years. There were also some occasional issues with maintaining disinfection residual as well as some occasional turbidity violations during the 2004 – 2014 timeframe.

Turbidity continues to be problematic for operation of the surface water treatment plant. The operators typically turn off the treatment facility during periods of high turbidity and rely on well water. However as previously mentioned, the non-functioning flushing valve at the intake facility has prevented the city from using the surface water source at all over the past few years. Turbidity as it relates to the surface water treatment plant will be discussed further in Section 3.3.2. Section 3.3.2 will also address the water quality parameters associated with surface water treatment plants and related treatment technique requirements.

Source Water Protection

A Source Water Delineation and Assessment Report (SWDAR) was completed in 2002 for the White Sulphur Springs Public Water System and is included in Appendix Q. The SWDAR purpose is to identify potential contaminants to the drinking water sources and provide information on how to mitigate those threats of contamination through a source water projection plan.

Source water sensitivity criteria was used to determine how sensitive each water source is to contamination threats. The White Sulphur Springs groundwater wells were determined to have low sensitivity to contaminants since the wells are completed in deep fractured siltstone and appear to be confined. Water obtained via the slow sand filter/infiltration gallery intake system in Willow Creek was determined to have high sensitivity to potential contaminant sources since the source is derived from surface water. The groundwater source and surface water source are blended in the storage tank so the overall sensitivity to contaminants sources is moderate.

Per the SWDAR, contamination threats to the groundwater wells include sewer main line breaks, accidental surface spills from highway transportation accidents, septic system effluent or agricultural chemicals leaching into the groundwater, and potential threats from storm water injection wells. The greatest threats to the surface water source are the Ringling Mine which is a past producing mine located upgradient of the Willow Creek intake, extreme rain events, and wildfire events.

A Source Water Projection Plan was prepared in 2015 that expanded on the 2002 SWDAR. The 2015 report is also included in Appendix Q. The 2015 report provided recommendations on how to protect the source water, such as replacing sewer lines when necessary and creating spill response and emergency plans. The Forest Service Castle Mountains Restoration project was identified and emphasized the significance of cooperation between the city and the forest on planning for and implementing techniques for reduction of wildfire hazards. The source water protection plan also proposed coordination with the forest service on road maintenance and firefighting response plans in an effort to project the Willow Creek watershed and surface water drinking water source.

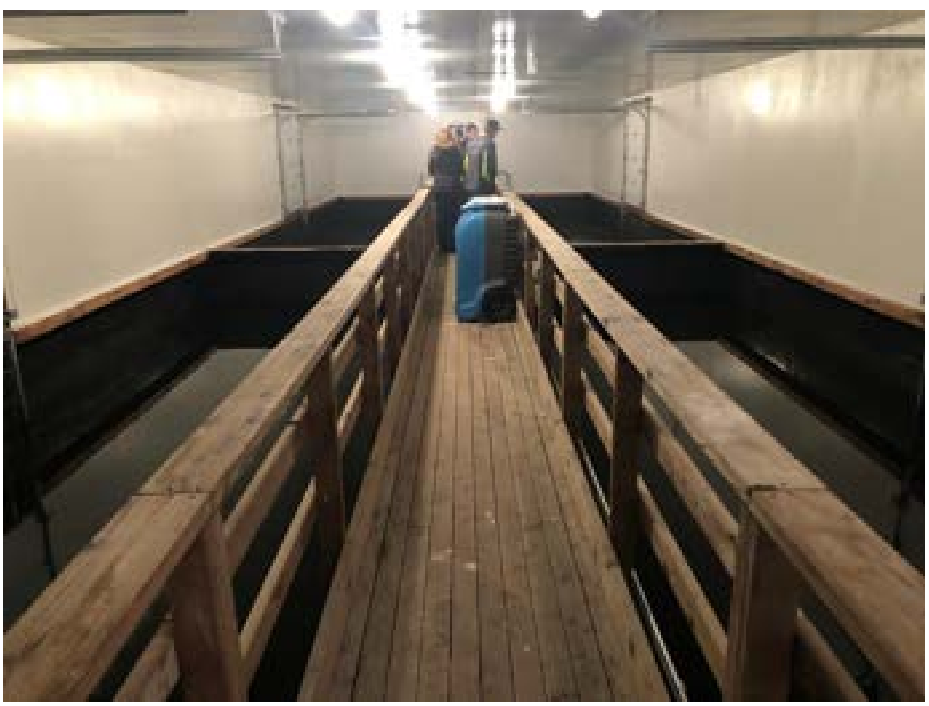
3.3.2 Treatment

Water treatment facilities consist of the slow sand filtration facility located near the storage tank as well as two gas chlorination systems that provide disinfection.

Slow Sand Filter Facility

The slow sand filtration facility treats the water diverted from Willow Creek. Slow sand filtration is a process involving passage of raw water through a bed of sand at low velocity that results in particulate removal by physical and biological mechanisms. The facility was constructed in 2004, is in excellent condition, and includes four filter compartments. Two additional compartments are planned for future expansion. The filters in all four compartments are used when the treatment plant is in service.

Raw water enters the building in ductile iron pipe where the flow is split if desired and a perforated PVC header distributes the water across one or two sand filter chambers that interconnect with another two chambers allowing for isolation of chambers if needed. The sand filters contain two layers of gravel and two layers of sand. WTP construction plans were reviewed as part of this PER, but a design report was unable to be found. Consequently, information on the gradation of the filter sand was unable to be determined for incorporation into this PER. Sand filter construction plans are provided in Appendix R. Finished water is then collected off the bottom of the sand filters via the underdrain system and four collection pipes, two per side where water then enters a concrete surge tank. From the surge tank, water flows to the chlorination building and 560,000-gallon storage tank, located approximately 1,000 feet to the west of the WTP.



Slow Sand Filters

The sand filter system is entirely gravity based. There are no pumps between the intake and WTP and no pumps between the WTP and storage tank. The sand filter system is therefore desired over the groundwater system and its operation is maximized under allowable turbidity requirements. The WTP is capable of treating around 120 to 140 gpm when the raw water NTU is 0.6 or below. The system can treat water with an NTU of up to 1, however, it is not as efficient.

Turbidity is measured through a raw water turbidimeter and separate effluent turbidimeters for each individual sand filter. There is currently not a combined effluent turbidimeter. All analyzers are continuous when the plant is running, but the information must be read onsite. There is no SCADA connection to allow for remote monitoring. The plant is also equipped with a raw water flow meter as well as a finished water flow meter. With raw water turbidity only monitored at the WTP and not at the intake, there is no way to monitor the raw water turbidity when the plant is not in use. This makes it difficult to know when the city can put the plant into service or to address changes in turbidity before they hit the plant.

The city currently uses the following cleaning procedure for the sand filters. After spring runoff and just prior to starting up the plant, the operators rake and occasionally remove a small layer of sand. Sand is replaced as necessary. After raking or removing sand, the plant is started and is run for a bit to build up the “schmutzdecke”, or biological layer of microorganisms, prior to sending water to the tank and distribution system. When capacity of the plant decreases to 100 gpm, the plant is shut down, drained, and the top layer of sand is raked without removing any.

The city submits reports to DEQ with a variety of data related to the treatment process in order to comply with the surface water treatment rule. The surface water treatment rule protects against microbial contaminants found in surface water which are *Cryptosporidium, Giardia*, and viruses. The reports to DEQ provide documentation that the required contact time for the disinfectant system is achieved every day the plant is in operation and also documents turbidity performance. Turbidity must be less than or equal to 1.0 NTU in at least 95% of the measurements taken each month and the disinfection inactivation ratio for contact time must be greater than or equal to 1. These reports were reviewed for the past few years and data on the raw and finished water turbidities, finished water pH, and peak hourly flows are summarized in Table 3-8. The WTP was only in operation for the time frames specified since 2020. The available data shows White Sulphur Springs is meeting the requirements for disinfection and finished water turbidity. Full surface water DEQ reports for these months are included in Appendix S.

Table 3-8 – Slow Sand Filter WTP Data

Time Frame	Category	Raw Water Turbidity (NTU)	Finished Water Turbidity (NTU)	Finished Water pH	Peak Hourly Flow (gpm)(1)	Disinfection Inactivation Ratio (IR)
March 2020	Min.	0.41	0.28	6.42	114	1.2
	Ave.	0.97	0.35	6.81	115	3.0
	Max.	1.32	0.58	7.04	115	6.4
12 days in April 2020	Min.	0.86	0.33	6.79	102	1.5
	Ave.	0.92	0.47	6.94	113	2.0
	Max.	1.01	0.87	7.33	116	3.2
21 days in February 2022	Min.	0.51	0.31	7.01	77	1.2
	Ave.	0.53	0.37	7.15	109	2.0
	Max.	0.54	0.43	7.28	114	7.7
March 2022	Min.	0.54	0.19	6.88	113	1.6
	Ave.	0.55	0.39	7.16	119	2.0
	Max.	0.59	0.98	7.64	130	2.6

(1)Operating time is 24 hours/day

To further evaluate the performance of the WTP, a comparison was made between the city's slow sand filters and design criteria for slow sand filters as documented in Montana DEQ regulations and industry standards. The results of this comparison are summarized in Table 3-9.

Compared to the regulations and industry standards, the city's filters are operated on the low end of the filtration rate. Unknowns are the effective size and uniformity coefficient for the city's filter sand. Of significance is the fact the city's filters are unable to treat raw water that has a turbidity greater than 1 NTU. Based on the design standards review, slow sand filters should be able to treat water with a turbidities on the order of 10 to 20 NTU. Therefore, the city's slow sand filters are not performing at the level that they are known to operate at. The cause of the degradation in performance could possibly be attributed to the presence of colloidal clays and algae in the raw water, the wrong size of filter sand, an ineffective cleaning procedure, or a combination of any of these factors.

Table 3-9 – Comparison of Requirements and Guidelines for Slow Sand Filters

Criterion	Reference		
	Montana DEQ-1, 2022	Integrated Design of Water Treatment Facilities, Susumu Kawamura, 1991	White Sulphur Springs Slow Sand Filters
Raw Water Quality Concerns	Colloidal clay, algae	Filters are easily clogged by excess algae	City does not typically see algal blooms at the pond or algae in the raw water.
Maximum Turbidity (NTU)	Maximum of 10 NTU	Slow sand filters can tolerate raw water with turbidities greater than 15 NTU as long as turbidity spikes are less than 50 NTU and last no more than 2-3 days.	Can treat water with turbidity of up to 1 NTU, however 0.6 NTU coming into the WTP is acceptable, but anything higher than that does not allow for the WTP to function well.
Filtration Rate (gpm/sf)	0.03 - 0.10	0.04 - 0.08	0.04 @ 112 gpm design flow and four filter compartments in service
Filter Sand Depth (ft.)	> 2.5	3 - 5	3
Filter Sand Effective Size (ES) (mm)	0.15 < ES < 0.30	0.15 < ES < 0.35	Unknown
Filter Sand Uniformity Coefficient	< 2.5	< 3, preferably near 2	Unknown
Cleaning Process	The sand must be rebedded when scraping has reduced the bed depth to no less than 19 inches. Where sand is to be reused in order to provide biological seeding and shortening of the ripening process, rebedding must utilize a "throw over" technique whereby new sand is placed on the support gravel and existing sand is replaced on top of the new sand.	Minimum filter bed depth after multiple scrapings is 20 – 28 inches. To resand, 1) 12 – 20 inches of the old sand is moved to one side of the filter. The depth of the remaining old bed should be approximately 8 inches. 2) Place new sand on top of the old sand. 3) Cover the new sand with the old sand that was moved to one side of the filter in step 1.	Filters are raked and resanded approximately once a year.

The city's current practice of raking the sand may not be effective at removing the colloidal debris from the filter. Sand filter cleaning is important for the treatment performance of the filter. The goal of the cleaning process is to remove the colloidal debris material from the filter bed but also maintain an active biological population that is important for the treatment process. Industry literature specifies a method for cleaning that involves scraping the sand to a specified depth, placing a layer of new or cleaned sand, and then placing some of the previously scraped sand back on top. The Montana DEQ guidelines refer to this method as the "throw over" technique which is meant to seed the replacement sand with microorganisms.

Another cleaning process that has shown to be effective and less labor intensive than scraping is a practice called harrowing. In the 1950's, operators at the West Hartford, Connecticut, slow sand filtration facility developed a unique method of cleaning slow sand filters to reduce the time and expense for cleaning. In this method, a tractor with a mounted spring-tooth harrow operates in the bed while water about 6 inches deep is flowing across the sand surface. The harrow breaks up the top of the filter surface and the water carries away the debris. The method removes the accumulated colloidal debris while maintaining an active biological material in the top several inches of the sand. The ability to maintain a high biological population enables the harrowed filter to be quickly placed back into service without a deterioration in treatment performance. The entire filter sand bed is removed and thoroughly cleaned once every 8 – 10 years. Harrowing creates wastewater as the bed is being cleaned. The wastewater needs to be removed from the filter to keep the colloidal debris from going back into the bed.

Alternatives for treatment system improvements will be presented in Chapter 5 and will include recommendations for further investigation into the treatment plant performance, potential replacement of the filter sand, implementation of new cleaning procedure such as scraping or harrowing, installation of a new combined filter effluent turbidimeter, and installation of two new slow sand filters if desired results cannot be achieved by the steps outlined above. A pre-treatment facility for turbidity is not recommended at this time.

Chlorination Facilities

The city's water supply is chlorinated with two gaseous chlorination systems. A new chlorination facility was built as part of the 2012 water storage tank construction project and is located adjacent to the tank. The chlorination building is a 16' x 21' masonry structure and houses mechanical and electrical equipment, instrumentation and controls, a gas chlorination system, a chlorine gas detector, and chlorine analyzer.

The second chlorination facility is located in the well house at the city shop complex. The wells share a common header pipe with continuous disinfection provided for both wells. The 2012 project also consisted of upgrades to the well house chlorination facility including the installation of a new chlorine detection unit and alarm system.

The city has not experienced any operational or performance problems with the chlorination systems and routinely meets federal and state standards for quality. The 2022 sanitary survey recommended the system have a second portable chlorine analyzer for treatment and distribution operators.

3.3.3 Storage

Storage facilities in White Sulphur Springs consist of one 560,000-gallon partially buried prestressed concrete tank located approximately 1.5 miles east of the city limits near the slow sand filter WTP. The storage tank was constructed in 2012 and is in excellent condition. The tank is 80 feet in diameter and has a height of 15 feet. The water elevation in the tank provides pressure to the distribution system and water from the storage tank feeds the system by gravity.

Water storage can generally be thought of as satisfying three needs, including operational storage, emergency storage, and fire suppression storage. Operational storage supplements water supply during peak periods. Whenever peak hourly demands exceed available flows from the supply, the difference must be provided with flows from storage. Emergency storage is not based on any formula, but rather on a judgement regarding the perceived vulnerability of the community’s water supply. If several sources are available with auxiliary power, the need for emergency storage is minimal. White Sulphur Springs does not currently have backup power for the groundwater wells, but a backup generator is expected to be installed for the wells in spring of 2024. If backup power is provided at the wells, the need for emergency storage can be minimized. Fire suppression storage is dependent upon the community’s firefighting capabilities, recommendations from the local fire authority, and Uniform Fire Codes. Typical recommended fire flow values are 2,500 gpm over a two-hour period for commercial facilities and 1,000 gpm over a two-hour period for residential facilities.

DEQ requires “the minimal allowable storage must be equal to the average daily demand for a 24-hr period plus fire flow demand where fire protection is provided”. Based on this methodology, storage requirements for White Sulphur Springs are summarized in Table 3-10. Storage requirements are based on commercial fire flow requirements since they are the greater of the two. Based on this method current storage volume is adequate but an additional 51,000 gallons of storage is needed to meet future demands in White Sulphur Springs, assuming demands stay elevated due to system leakage. If system leakage can be reduced to a more acceptable level, storage volume is likely adequate throughout the planning period. The city has the option to complete water distribution system improvements first, which may reduce leakage and overall water system demand and storage requirements.

Table 3-10 – Storage Requirements

Storage Need	Year 2020 Demand (gallons)	Year 2045 Demand (gallons)	Year 2045 Demand w/ Reduced Leakage Assumption (gallons)
Operational (average daily demand)	243,000	311,000	184,000
Emergency	0	0	0
Fire Suppression (2,500 gpm for 2 hours)	300,000	300,000	300,000
Total Required	**543,000**	**611,000**	**484,000**
Storage Surplus (+) or Deficit (-)(1)	**+17,000**	**-51,000**	**+76,000**
(1)Based on existing storage capacity of 560,000 gallons.			

This PER will not make any recommendations for improvements to water storage and storage alternatives will not be evaluated at this time. The existing tank was recently constructed in 2012, is in excellent condition, and buried concrete tanks can have a design life on the order of 100 years. Although the projected year 2045 demand shows a slight storage deficiency, this can likely be recovered as distribution system improvements are made and leakage is reduced.

3.3.4 Pumping Stations

The water system does not include any pumping stations except for the groundwater submersible well pumps at each well. The well pumps were previously discussed in Section 3.3.1.

3.3.5 Distribution System

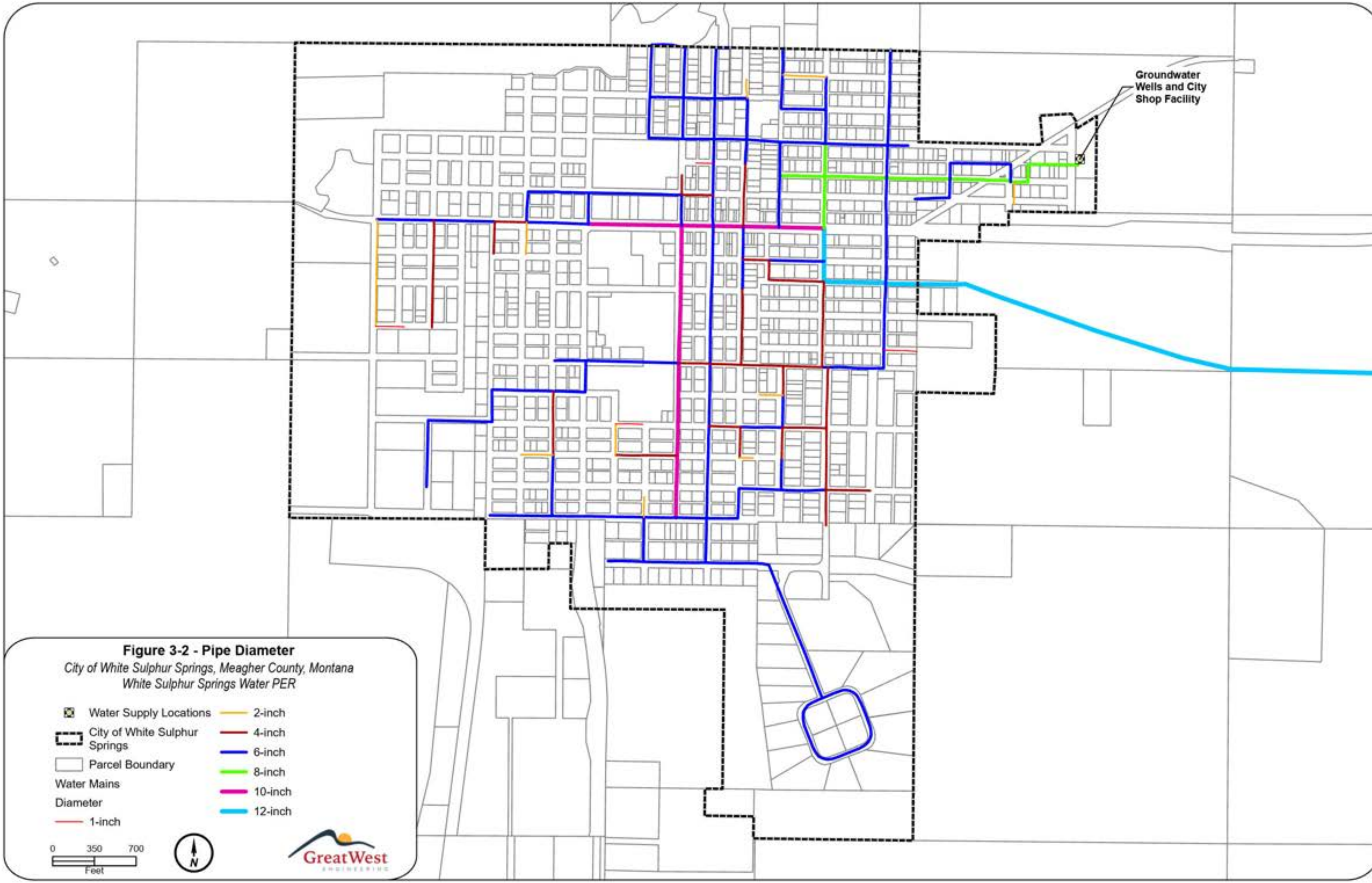
The existing water transmission and distribution system generally consists of asbestos cement, cast iron, PVC, and steel ranging in size from 1-inch to 12-inch with associated fittings, gate valves, and fire hydrants. The original system dates back to the late 1800s but the mains have been replaced over the years. Cast iron and steel mains likely date back to the 1940s/1950s and PVC has been installed since the 1980's. The existing water transmission and distribution system mapping was assembled using the maps from the 2010 PER and 1986 improvement plans as guides. Table 3-11 summarizes pipe diameter and material within the water system. Pipe diameter and pipe material are also displayed graphically in Figures 3-2 and 3-3.

Table 3-11 – Distribution System Summary

Pipe Type and Diameter	Length (ft.)
Asbestos Cement	
4-inch	246
Subtotal	**246**
Cast Iron	
1-inch	238
2-inch	1,171
4-inch	4,572
6-inch	6,412
10-inch	1,194
Subtotal	**13,587**
PVC	
2-inch	1,264
4-inch	3,803
6-inch(1)	27,156
8-inch	4,368
10-inch	3,231
12-inch	6,908
Subtotal	**46,730**
Steel	
4-inch	1,306
12-inch	3,367
Subtotal	**4,673**
Total	**65,236**

(1)Does not include 6-inch transmission main from intake to treatment plant.

The White Sulphur Springs water system includes significant amounts of cast iron and steel pipe which have exceeded, or will soon exceed, their useful life. Asbestos cement, cast iron, and steel mains make up approximately 30% of the distribution system piping. These pipes are prone to break, are likely restricting flow, and are in some cases undersized. The system also contains water mains with diameters 4-inches or less in size. 6-inch is the minimum pipe diameter allowed per DEQ standards and for provision of adequate fire flows. The PER will make recommendations for replacement of all cast iron, asbestos cement, and steel pipes in addition to pipe that is less than 6 inches in diameter.


Groundwater
Wells and City
Shop Facility
Figure 3-2 - Pipe Diameter
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Water Supply Locations
City of White Sulphur Springs
Parcel Boundary
Water Mains
Diameter
1-inch
2-inch
4-inch
6-inch
8-inch
10-inch
12-inch
0
350
700
Feet
N
GreatWest
ENGINEERING

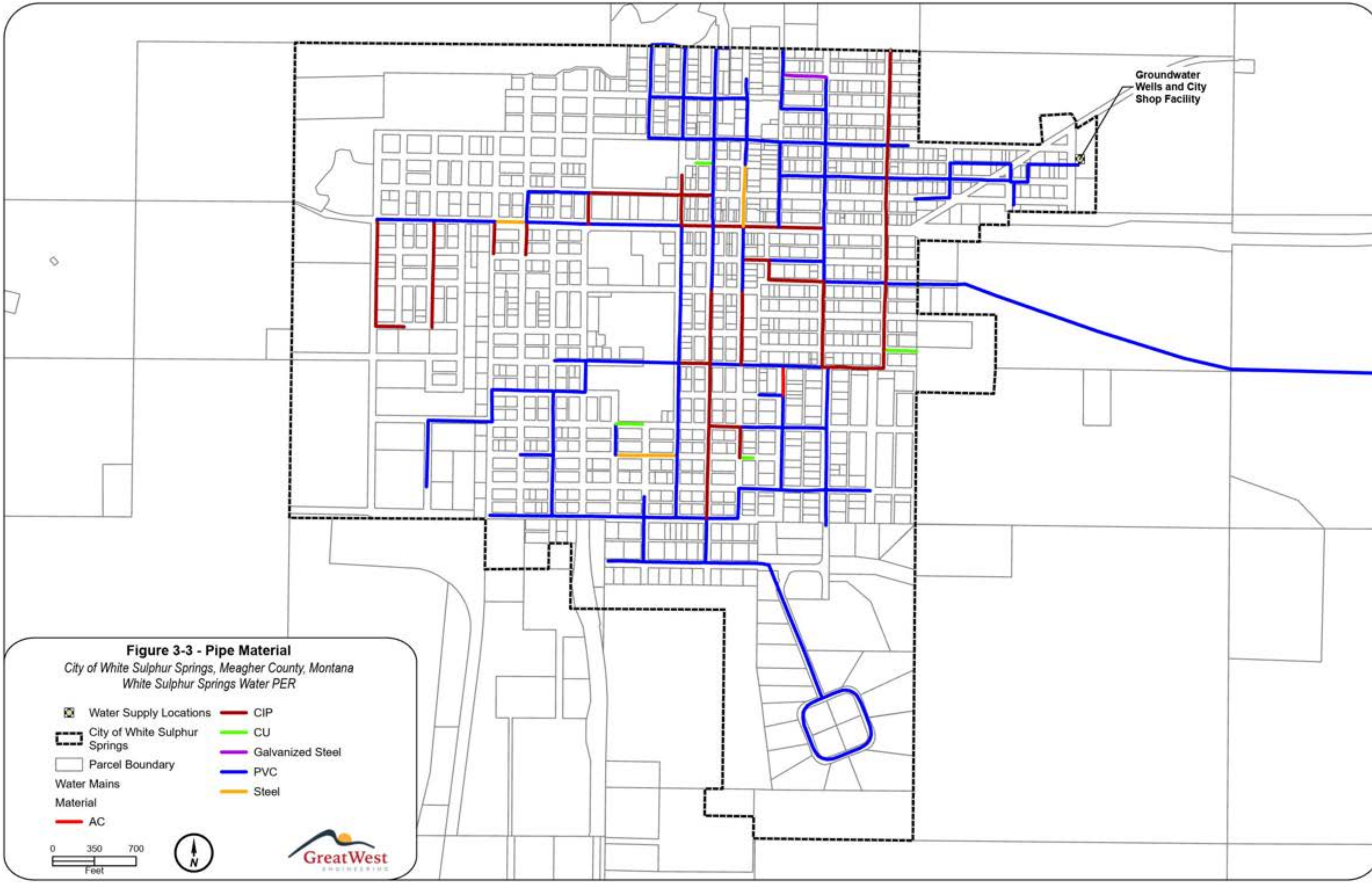


Figure 3-3 - Pipe Material

City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER

The 12-inch transmission line from the storage tank to the city limits has evolved over the years and sections have been replaced. This line was originally constructed in the 1940s as steel. A portion was replaced in 1986 with PVC and another portion replaced by city crews in 2010 with PVC. There is a remaining portion of the main that is still 1946 steel and is believed to be the biggest source of leakage in the system. The line has shown to be actively leaking with the leakage surfacing in the field.

The city wishes to replace the 1946 steel line with new PVC (HDPE could also be considered) and re-align the main along Castle Mountain Road and along property lines in the adjoining subdivision. Easement negotiations will be required for this realignment. Figure 3-4 depicts the existing transmission segments and understanding of current alignment, material types, and years of construction.

Distribution System Modeling

A complete water model of the White Sulphur Springs water system was built in 2010 as part of the 2010 water system PER. The 2010 water model was used as a starting point and updated to evaluate current system hydraulics. The hydraulic model was constructed using the WaterCAD computer modeling package by Bentley systems. The computer model is used to identify specific hydraulic problem areas and to determine the most effective modifications to improve the system. The WaterCAD program uses an iterative procedure, similar to the Hardy Cross method, to solve standard loop equations to arrive at solutions for flow through the pipe network and determine resulting pressures at the system nodes (pipe junctions) using the relationship between flow and headloss defined by the Hazen-Williams equation. The Hazen-Williams equation uses a coefficient “C”, which is based on the roughness of the pipe interior. Standard values can be assumed for different types of materials based on years of pipe service.

The water model was previously calibrated as part of the 2010 effort through field hydrant flow testing and comparison of data to model results. The C factors used in the model are:

- Asbestos Cement: 120
- Cast Iron (6-inch and less): 45
- Cast Iron (10-inch): 80
- PVC: 145
- Steel (4-inch): 80
- Steel (12-inch): 100

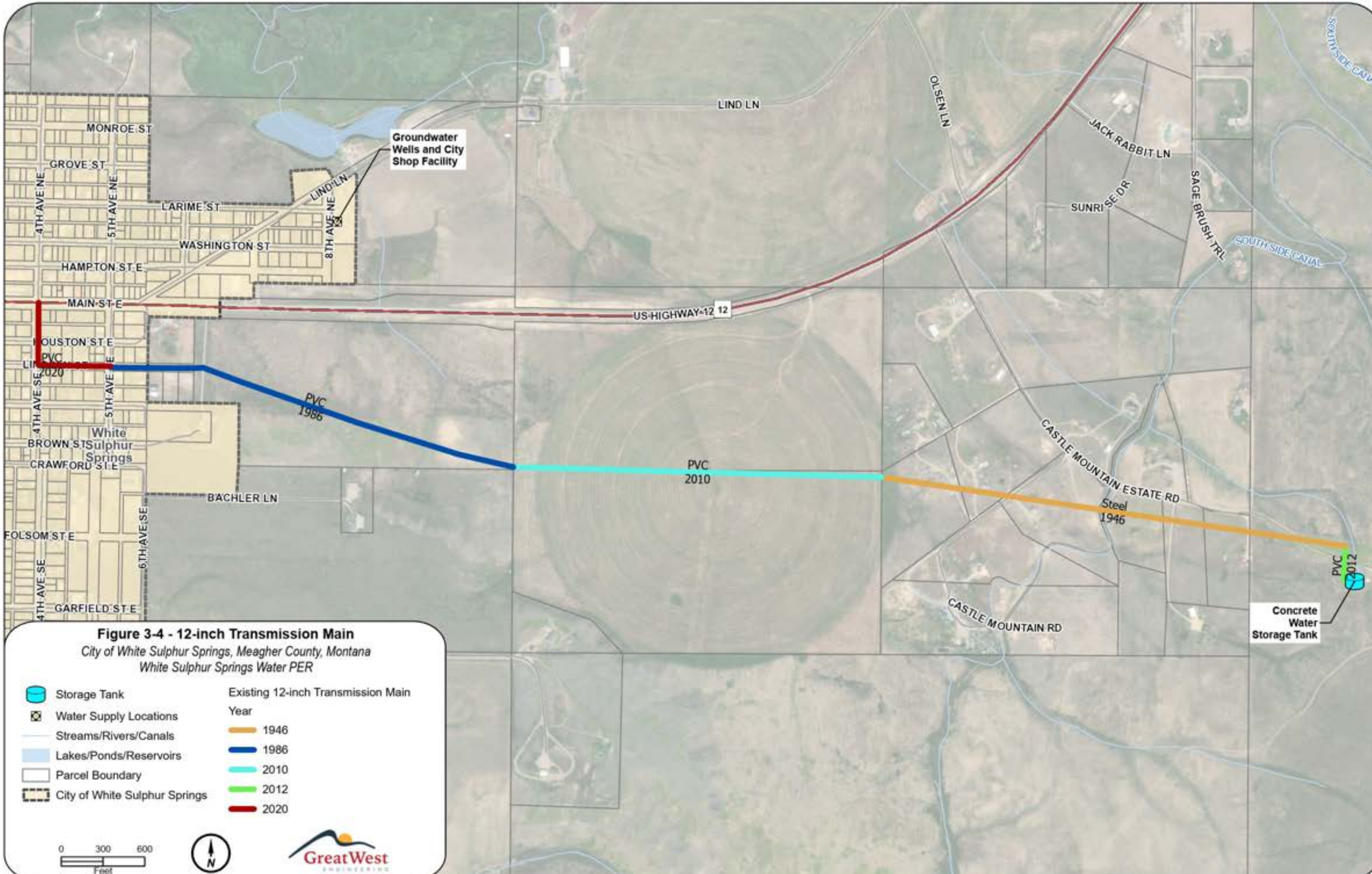


Figure 3-4 - 12-inch Transmission Main

Several scenarios were developed to define the hydraulic response of the system under multiple conditions of consumptive use. Among the scenarios modeled were average daily flow, maximum daily flow, and peak hourly flow at both current and projected daily demands. In addition, the fire flow availability throughout the water system was evaluated by performing a steady state fire flow analysis. The analysis determined the maximum flow that can be obtained from a given location while maintaining a minimum residual pressure of 20 psi throughout the distribution system. Copies of select computer model output reports are included in Appendix T.

Per DEQ requirements, pressure must remain at 35 psi or above at all service locations in the system under domestic demand conditions. Normal domestic demand is any condition other than a fire flow situation. A peak hour to average day factor of 4 was used to calculate peak hour demands, which would be a high demand condition experienced in the system and therefore would result in some of the lowest pressures expected. Figure 3-5 depicts existing system peak hour pressures as calculated by the hydraulic water model with total flows allocated throughout the system to equal an existing system peak hour flow of 672 gpm. Pressure is shown at each model node and is symbolized by color. This scenario assumes the tank is approximately two thirds full and the well pumps are off. Normal domestic operating water system pressures generally range from 40 to 90 psi. Overall, the White Sulphur Springs distribution system experiences high pressures due to the elevation of the storage tank relative to the mean elevation of the city. The existing system peak hour pressures in the White Sulphur Springs water system range from 52 to 109 psi. Future 2045 peak hour pressures range from 47 to 105 psi, showing a slight drop in pressure of about five psi. Pressures throughout the city well exceed 35 psi and there are no low-pressure concerns. Individual homes are equipped with pressure reducing valves to reduce pressure as needed for high pressure locations.

DEQ requirements also state the water system must be able to provide adequate fire flow while keeping all pressure in the system at or above 20 psi. Fire flow availability is calculated during domestic maximum day demand conditions. Figure 3-6 displays existing system fire flow availability. This scenario assumes the tank is approximately two thirds full, and the well pumps are on, providing a maximum flow of 500 gpm. As depicted in Figure 3-6, several areas of the city have fire flows of less than 1,000 gpm which is mostly the result of dead end and small diameter (<6-inch) mains. Additionally, the commercial areas of the city are not able to provide the recommended 2,500 gpm.

Fire flow availability will greatly improve as 4-inch mains are replaced along with old cast-iron and steel mains. The 2010 PER also identified several loops that can be added to the system to eliminate dead end mains and also reduce stagnation of water in the system. Figure 3-7 depicts fire flow availability with all 4-inch and smaller mains increased to 6-inch, all cast-iron and steel pipe replaced with PVC with an improved C factor of 145, and 13 6-inch water main loops added to the system. The improved system also represents an additional 12-inch water main loop that is being constructed in the water system during the summer of 2023. The 12-inch water main loop is being added to serve a new hospital but will also provide significant benefits to the system in terms of hydraulics and redundancy. The improved system results reflect the year 2045 maximum day demand of 383 gpm which assumes reduced leakage throughout the system. As shown in Figure 3-7, the improved system results in most of the system being able to provide in excess of 2,500 gpm of fire flow.

Gate Valves and Hydrants

An inspection of all gate valves and fire hydrants in the system was outside the scope of this analysis. Circular DEQ 1 suggests valve spacing at not more than 500-foot intervals in commercial districts and not more than one block or 800-foot intervals in other areas.

The location and spacing of fire hydrants should be recommended by the fire protection agency. They should typically be located at each street intersection as well as at intermediate points between intersections.

Some of the hydrants encountered while performing hydrant tests during the 2010 PER effort showed signs of needing repair, maintenance, or replacement. The city intends to initiate a fire hydrant replacement program over the next several years to replace all of the old hydrants which are currently incapable of providing adequate fire flow.

Water Meters

The city uses the Black Mountain Utility Billing Software to meter water usage. The billing system has proven to be effective, and city personnel are satisfied with its performance. Meters are read by driving through city streets at a slow pace and a radio signal is transmitted to a data collector in the truck as the operator passes by a service. The data is then downloaded to a computer in the city clerk's office, and invoices are generated. Meter records were used in computing overall water usage and in estimating unaccountable water as discussed previously in this report.

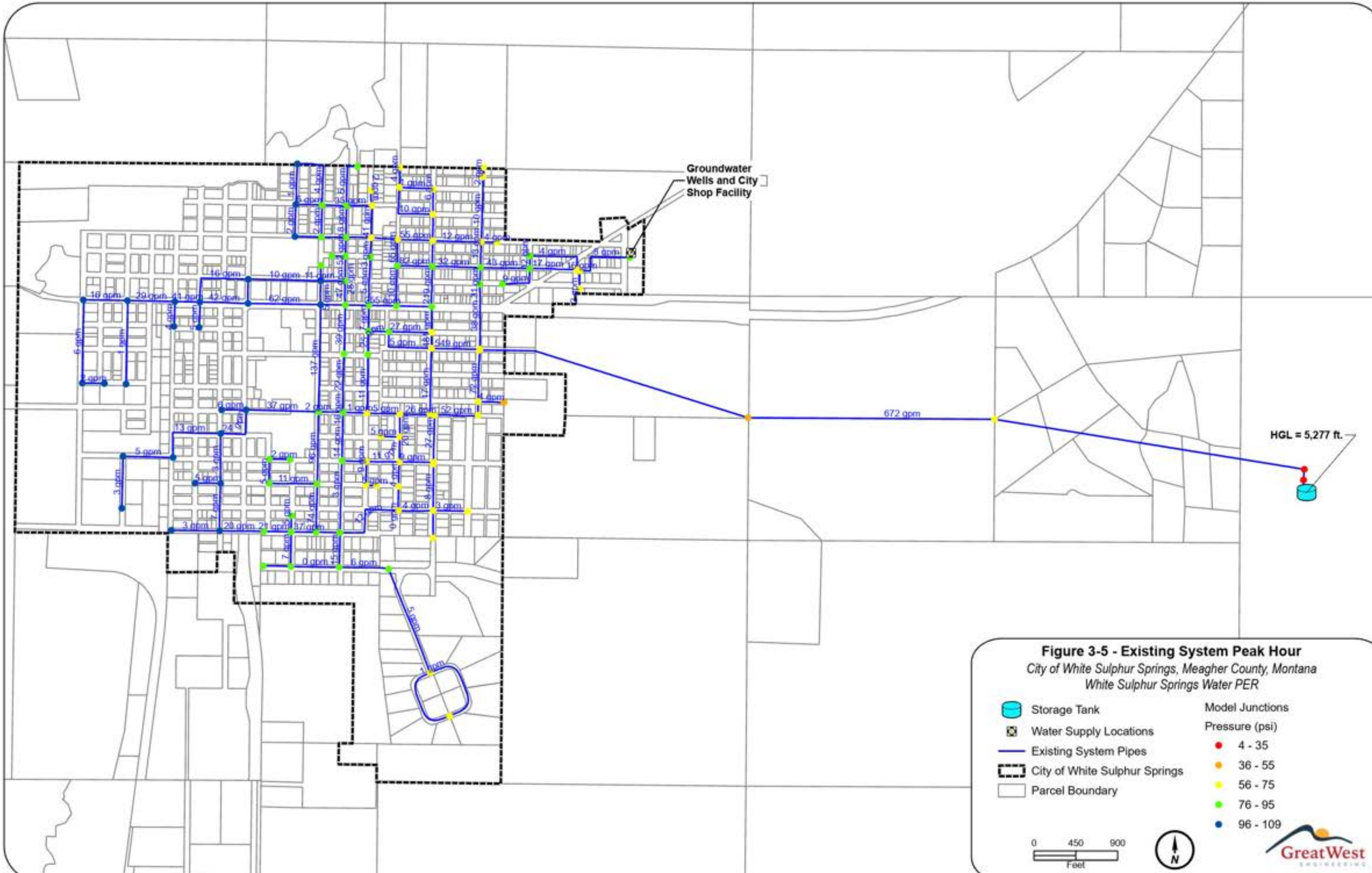


Figure 3-5 - Existing System Peak Hour

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

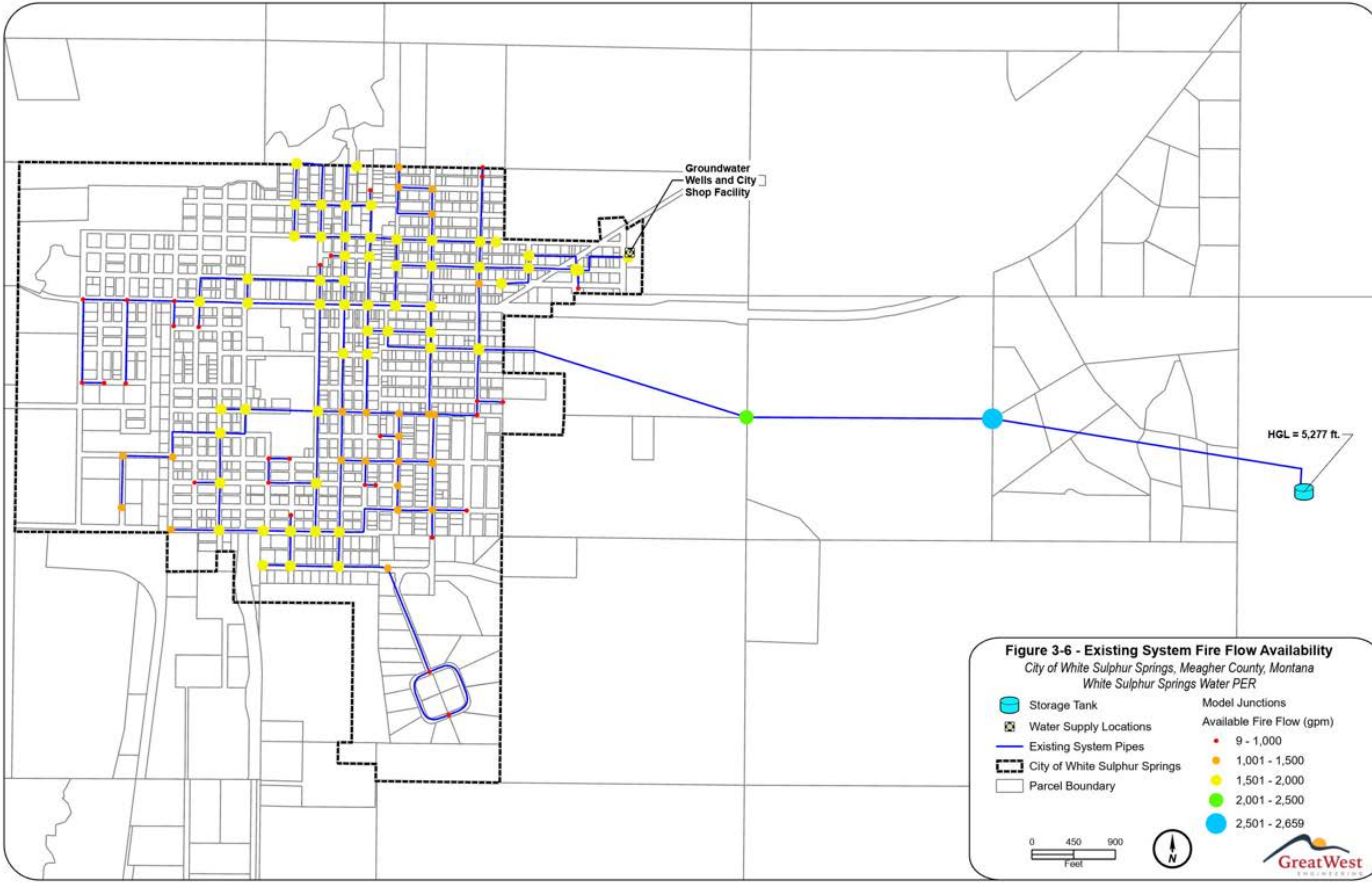
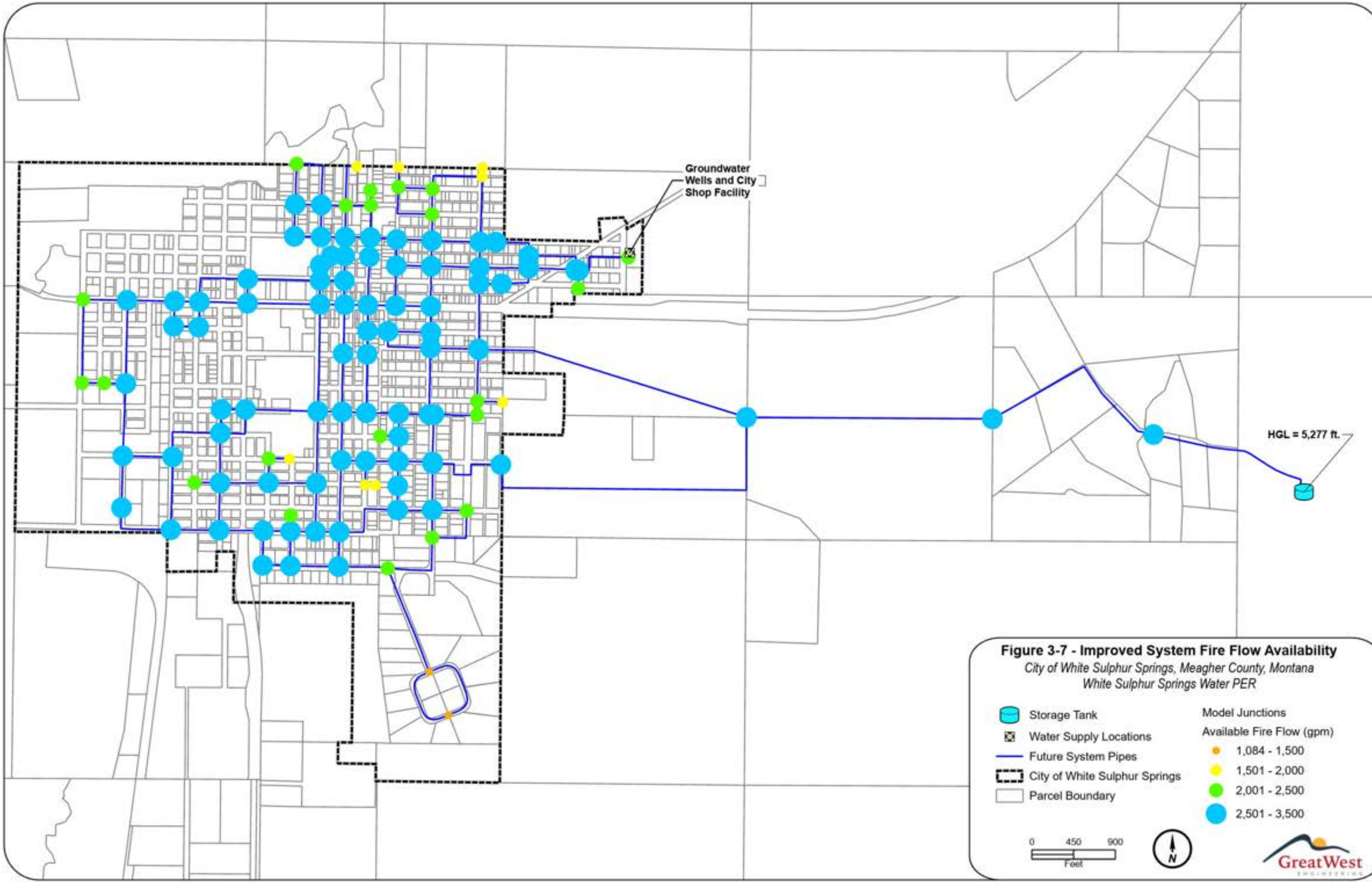


Figure 3-6 - Existing System Fire Flow Availability

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER



Groundwater Wells and City Shop Facility
HGL = 5,277 ft.
Figure 3-7 - Improved System Fire Flow Availability
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Storage Tank
Water Supply Locations
Future System Pipes
City of White Sulphur Springs
Parcel Boundary
Model Junctions
Available Fire Flow (gpm)
1,084 - 1,500
1,501 - 2,000
2,001 - 2,500
2,501 - 3,500
0
450
900
Feet
N
GreatWest

3.4 Operational and Management Practices and Capabilities

The White Sulphur Springs water system employs operators who are tasked with maintaining the water infrastructure. The Mayor oversees the day-to-day operations of the city, and the Council directs policies, procedures, budgeting, and assessments.

The most recent DEQ Sanitary Survey, completed in 2023, states “the operators demonstrated extensive knowledge of the system and cooperated with the inspection. Maintenance and management of the existing equipment is proactively accomplished, and the operators conduct daily inspections of the tank, sources, and distribution system. This PWS and its operators are following DEQ’s operator certification requirements.” The most recent sanitary survey can be found in Appendix L.

While the staff perform an exemplary job of operating and maintaining the water system with the staff and budget available, there are significant components of the system which need repair and replacement. Annual operation and maintenance procedures are not able to address the repairs needed at the intake facility, the large amount of cast iron and steel pipe remaining in the system, or the water treatment plant deficiencies and investigations needed to improve performance. Many of the issues facing the city can be largely attributed to the age of the system.

3.5 Financial Status of any Existing Facilities

The main source of revenue for the water system is the collection of water sales in the form of water rates. The revenue for the water system in White Sulphur Springs is represented in three different fund categories. Metered water sales are funds collected from assessing water users a base rate plus a usage fee that corresponds with metered usage. Bond principal assessments represent funds collected from residents to cover the city’s loans for water system construction projects. Finally, unmetered water sales are funds collected from residents as set aside to cover future needs or emergencies.

Table 3-12 summarizes the water system revenue for the past four years. On average, the water system revenue from the collection of water rates is approximately $392,000 per year. Additional revenue from the water system also comes through intergovernmental revenue, miscellaneous revenue, investment earnings, installation charges, and permits. These additional revenues are generally relatively minor and can vary substantially from year to year. Detailed revenue reports are included in Appendix U.

Table 3-12 – Water System Revenue Summary

Description	FY 2019	FY 2020	FY 2021	FY 2022
Metered Water Sales	$180,853	$163,837	$186,952	$209,709
Bond Principal Assessments	$171,535	$170,622	$171,066	$171,822
Unmetered Water Sales	$34,875	$34,993	$36,138	$36,164
Total Revenue from Rate Charges	***$387,263***	***$369,452***	***$394,156***	***$417,694***
Intergovernmental Revenue	$1,505	$891	$2,483	$121,550
Miscellaneous (meter, or turn on/off)	$11,195	$9,342	$3,834	$9,342
Investment Earnings	$8,003	$5,268	$1,331	$1,658
Water Installation Charges	$4,500	$2,216	$5,462	$3,581
Water Permits	$0	$80	$0	$0
Miscellaneous Revenues	-$31	$0	$0	$0
Total Other Revenue	***$25,171***	***$17,797***	***$13,109***	***$136,131***
Total Revenue	**$412,434**	**$387,249**	**$407,266**	**$553,825**

Table 3-13 summarizes the water system expenses for the past four years. Personnel salaries make up the largest component of operation and maintenance expenses with power costs coming in second. The average cost of power to run the city's well pumps is approximately $47,000 per year which equates to 21% of total operation and maintenance expenses. On average, the water system operation and maintenance expenses are approximately $250,000 per year. Year 2020 appeared to have been a less than normal year in terms of O&M. Additional expenses apply to depreciation, debt service, and engineering. These expenses are broken out separately from general operation and maintenance expenses and vary from year to year. Detailed expense reports are included in Appendix U.

The city is currently paying on four SRF drinking water loans to cover costs for water projects that date back to 2012. The current balance of the revenue bonds to be repaid is $1,026,000 ($619,000 + $58,000 + $118,000 + $231,000) The combined average annual payment for the four bonds is approximately $119,000. These bonds will reach maturity in 2033, 2034, 2035, and 2042. The loan balance sheets, and loan coverage calculation are included in Appendix U.

Table 3-14 summarizes the net revenue for the water system by subtracting the operation and maintenance and debt service expenses from the water sales revenue.

Table 3-13 – Water System Expense Summary

Description	FY 2019	FY 2020	FY 2021	FY 2022
Salaries	$69,070	$49,124	$109,255	$52,645
Power	$53,941	$46,069	$42,267	$44,614
Repair Parts	$26,941	$21,576	$64,731	$26,576
Repair and Maintenance Supplies	$53,603	$1,710	$12,342	$17,900
Repair and Maintenance Services	$14,720	$8,193	$19,441	$28,330
Employer Contributions	$8,420	$9,351	$10,773	$8,011
Office Supplies and Materials	$5,272	$6,007	$6,548	$5,721
Payroll	$18,120	$0	$0	$0
Machinery and Equipment	$0	$0	$0	$16,577
Communication and Transportation	$4,044	$3,770	$2,897	$3,355
Water Testing	$1,803	$3,297	$1,074	$1,080
Travel	$1,222	$2,208	$659	$1,664
Consumer Fee	$1,200	$1,200	$1,200	$1,200
Other O&M Expense(1)	$3,003	-$1,656	$2,997	$1,870
Total O&M Expense	***$261,358***	***$150,850***	***$274,183***	***$209,543***
Depreciation	$91,920	$92,276	$93,673	$0
Debt Service	$34,585	$32,585	$30,510	$108,622
Engineering	$34,293	$549	$1,365	$122,503
Total Other Expense	***$160,799***	***$125,410***	***$125,548***	***$231,126***
Total Expense	**$422,157**	**$276,260**	**$399,732**	**$440,669**

(1)Includes a summation of several minor items which are generally each less than $1,000.

Table 3-14 – Net Revenue Summary

Description	FY 2019	FY 2020	FY 2021	FY 2022
Total Revenue from Rate Charges	$387,263	$369,452	$394,156	$417,694
Total O&M Expense	$261,358	$150,850	$274,183	$209,543
Debt Service	$34,585	$32,585	$30,510	$108,622
Net Revenue	**$91,320**	**$186,017**	**$89,463**	**$99,528**

White Sulphur Springs currently implements the water rate schedule as summarized in Table 3-15. Water rate and user category information is provided in Appendix V. Per the rate structure, users are charged a flat fee of $42.87 (base fee + pipe fee + tank fee) plus an additional usage fee based on the amount of gallons used each month. This rate structure has been in place since 2018. The city does not currently use a rate structure based on water meter size.

Table 3-15 – Existing Water Rate Structure

Usage per Month (Gallons)	Base Fee	Pipe Fee	Tank Fee	Usage Fee	Total Fee
1,000	$16.00	$5.00	$21.87	$1.80	$44.67
1,500	$16.00	$5.00	$21.87	$2.70	$45.57
2,000	$16.00	$5.00	$21.87	$3.60	$46.47
2,500	$16.00	$5.00	$21.87	$4.50	$47.37
3,000	$16.00	$5.00	$21.87	$5.40	$48.27
4,000	$16.00	$5.00	$21.87	$7.20	$50.07
5,000	$16.00	$5.00	$21.87	$9.00	$51.87
6,000	$16.00	$5.00	$21.87	$10.80	$53.67
7,000	$16.00	$5.00	$21.87	$12.60	$55.47
8,000	$16.00	$5.00	$21.87	$14.40	$57.27
9,000	$16.00	$5.00	$21.87	$16.20	$59.07
10,000	$16.00	$5.00	$21.87	$18.00	$60.87
20,000	$16.00	$5.00	$21.87	$36.00	$78.87
30,000	$16.00	$5.00	$21.87	$54.00	$96.87
40,000	$16.00	$5.00	$21.87	$72.00	$114.87
50,000	$16.00	$5.00	$21.87	$90.00	$132.87
60,000	$16.00	$5.00	$21.87	$108.00	$150.87
70,000	$16.00	$5.00	$21.87	$126.00	$168.87
80,000	$16.00	$5.00	$21.87	$144.00	$186.87
90,000	$16.00	$5.00	$21.87	$162.00	$204.87
100,000	$16.00	$5.00	$21.87	$180.00	$222.87

In order to gain insight into how costs are distributed among users, an analysis was conducted on a March 2023 billing report provided by the city. This report is included in Appendix V. The report breaks out monthly water charges by meter size and the analysis is summarized in Table 3-16. The city currently has 623 active accounts with a resulting average charge per account of $47.94.

Because of the large variation in demand that can occur between commercial users, many communities classify customers on the basis of meter size rather than classes such as residential, commercial, industrial, etc. The premise behind this method is the smallest meter size is used as the base level of service with an established base rate, and equivalent ratios are applied to the larger meters to calculate resulting water rates by multiplying the equivalent ratio by the base rate. If this methodology is applied to the White Sulphur Springs billing data using the average charge per meter for the ¾-inch meter as the base rate, the resulting equivalent ratios and equivalent dwelling units (EDUs) are shown in Table 3-16. The resulting equivalent ratios for 2-inch meters and larger are generally only slightly above 1, indicating the larger metered users are not being charged much more than a standard residential connection.

Table 3-16 – Charges Based on Meter Size

Meter Size	No. of Meters	Total Charges (March 2023 Billing)	Average Charge per Meter	Equivalent Ratios	EDUs
3/4"	596	$27,648.98	$46.39	1.00	596.00
1"	9	$786.82	$87.42	1.88	16.96
1-1/2"	3	$442.69	$147.56	3.18	9.54
2"	13	$891.09	$68.55	1.48	19.21
3"	1	$42.87	$42.87	0.92	0.92
4"	1	$56.35	$56.35	1.21	1.21
Total	**623**	**$29,869**	**$47.94**		**644**

There are many different methodologies for computing equivalent ratios for larger meters. An EDU calculation is presented in Table 3-17 which utilizes the White Sulphur Spring meter numbers with an area-based equivalent EDU method. Equivalent EDUs are calculated based on the cross-sectional area of the pipe diameter for each service line size, assuming a ¾-inch pipe diameter is the base value. This method results in relatively high ratios for meters 2-inch and larger and may not always be an appropriate method, depending on the community and the type of commercial account associated with the larger meter.

Table 3-17 – EDU Calculation based on Meter Size (Area Method)

Meter Size	No. of Meters	Area (in^2)	Equivalent EDUs	EDUs
3/4"	596	0.44	1.00	596.00
1"	9	0.79	1.78	16.00
1-1/2"	3	1.77	4.00	12.00
2"	13	3.14	7.11	92.44
3"	1	7.07	16.00	16.00
4"	1	12.57	28.44	28.44
Total	**623**			**761**

White Sulphur Springs may want to re-evaluate its current rate structure and look at ways to allocate a larger portion of the water rate charges to the larger commercial users. The city could implement a rate study to determine a rate methodology appropriate for the community.

3.6 Water/Energy/Waste Audits

No water, energy, or waste audits have been conducted for White Sulphur Spring’s water system.

4.0 NEED FOR PROJECT

The city is in need of water system improvements to proactively maintain the reliability of its water sources, plan for emergencies, maintain existing infrastructure, improve fire flows, reduce leakage, and support the overall goal for provision of safe and reliable drinking water to the City of White Sulphur Springs.

4.1 Health, Sanitation and Security

The greatest immediate water system health, sanitation, and security concern is the age and condition of approximately 4,000 feet of 1940s era 12-inch steel water transmission main originating near the water storage tank. Chapter 3 assesses system leakage, and it is roughly estimated that the system loses approximately 40 to 50% of the water pumped into the system. The transmission main is believed to be the biggest source of leakage in the system and operators report the line has shown to be actively leaking with the leakage surfacing in the field. Leakage is also probable in the older parts of the distribution system within the city limits. The city's projected 2045 water demands are just at the capacity limit of the system. If leakage is not reduced in the system, the city may be faced with water quantity issues in the future.

Aside from water loss, leaking pipes also increase the threat of backflow contamination. Main breaks result in a loss of pressure, which increases the potential for backflow and contamination of the water system. The transmission main is also a critical piece of infrastructure for water delivery to the system and for filling the storage tank. A break along the transmission main would disconnect the storage tank from the system and the city would have to rely solely on delivery of water from the pumped groundwater wells. The system could potentially struggle to meet peak demands and there would be no available source of stored water in the event of a fire.

Water main breaks can be catastrophic as demonstrated during the 2007 water main break near the intersection of Lincoln and 4th Streets. The break occurred on a section of 12-inch old steel water main and ended up causing flooding, home evacuations, business closures, major property damage, and a resulting boil order for eight days. The age and degrading condition of the cast iron and steel water pipes creates a higher risk of failure and contamination, which is a health and safety risk to the system's users as well as an economic risk as the city continues to repair lines that will likely continue to break in new locations until fully replaced.

There are a number of additional concerns with the current state of the water system in White Sulphur Springs in terms of security. Although the city has multiple sources of water, the surface water source is currently unusable due to deficiencies at the intake dam, coupled with the inefficiencies at the treatment plant and the inability to treat water with turbidity greater than 1 NTU. Not having a reliable surface water source puts the entire water system dependency on the groundwater system which is limited to a maximum flow rate of 500 gpm. The existing maximum daily demand is 505 gpm which is just slightly above the existing capacity of the wells. If improvements are not made to the intake facility and surface water treatment plant, or leakage is not reduced, the city will likely face water quantity issues in the future.

Planning for emergencies has become increasingly important in recent years when considering factors related to climate change such as drought, extreme weather events, wildfires, and flooding, placing even greater importance on having a secure supply of water or multiple sources of water. According to the National Integrated Drought Information System (NIDIS), Meagher County experienced exceptional drought, the most severe drought impact designation category, in 2004 and again in 2022. Exceptional drought is categorized by widespread pasture and crop loss, widespread fires, and extremely high fire risk. Meagher County also experienced prolonged periods of extreme drought generally from 2002 to 2005, and again from 2021 to 2022.

The National Interagency Fire Center (NIFC) provides downloadable geospatial data products as part of their Wildland Fire Data Program. This data is displayed in Figure 4-1. There were 22 recorded wildland fire incidents within 30 miles of the White Sulphur Springs planning area in 2022 and 2023. White Sulphur Springs is also located in the Wildfire Urban Interface (WUI). The WUI is a line, area, or zone [MCA 76-13-102(16)] where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. A WUI exists anywhere that structures are located close to natural vegetation and where a fire can spread from vegetation to structures or vice versa. The most extreme situation with respect to fuel conditions and values at risk occurs in rural areas where numerous high-value individual homes and subdivisions are located in the WUI near or within the wildland boundary. A significant loss of life could occur to residents, firefighters, and others in the wildfire area that do not evacuate. Areas rated as WUI are encouraged to comply with special design standards, including water supply. A fire-fighting water source and access to that source must exist and be maintained as defensible space.

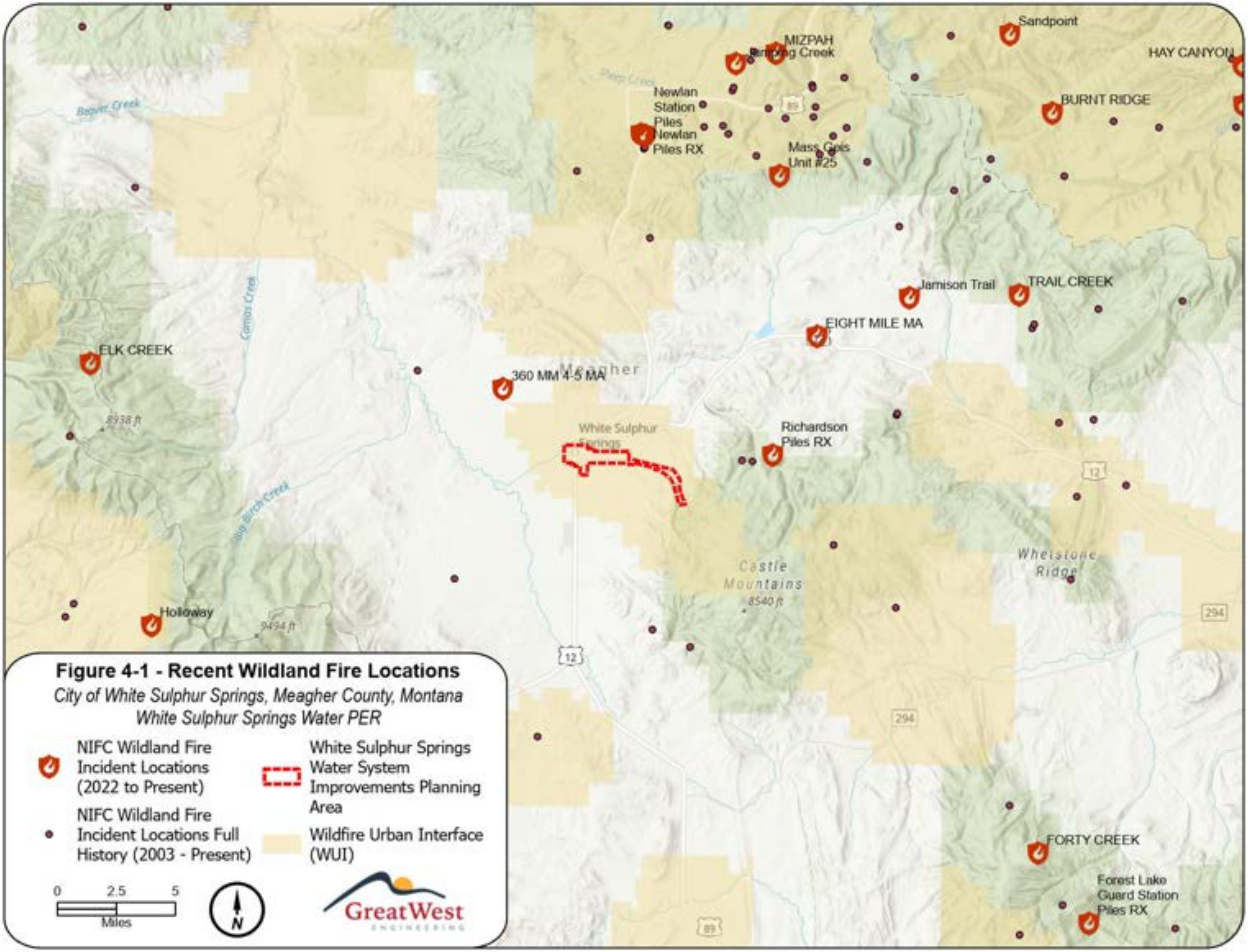


Figure 4-1 - Recent Wildland Fire Locations

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

Wildfire risk is also elevated near White Sulphur Springs due to increased deadfall in the Willow Creek watershed from the effects of recent beetle kill. The threat of wildland fires near White Sulphur Springs is significant, making a secure source of water supply a necessity for the community.

Additional safety and security concerns are present within the White Sulphur Springs water distribution system due to undersized and dead-end water mains. Approximately 20 percent of the distribution system is four-inch diameter or less. Undersized lines limit flows that could be critical in an emergency fire situation, creating a safety hazard for the residents of White Sulphur Springs.

4.2 Aging Infrastructure

One of the most immediate public health and safety needs in the Whtie Sulphur Springs water system is associated with an aging water transmission and distribution system. Approximately 4,000 feet of transmission main is over 70 years old, has exceeded its service life, and has shown evidence of high leakage through water surfacing in the field where the main is buried. There is also a significant amount of old cast iron pipe in the distribution system that is likely contributing to system leakage and increases the threat of water main breaks.

The other most significant deficiency associated with an aging system is the Willow Creek intake dam wooden catwalk and inoperable flushing valve. The decking of the catwalk is deteriorated and not capable of supporting operations staff and a slide gate flushing valve mounted on the upstream face of the dam is not functional in its current state. As a result of the inability to use the flushing valve, the intake pond is filled with silt, aquatic plants, and deadfall. It is currently not functioning as a storage reservoir or a settling basin and is nothing more than a wide spot in the channel. The buildup of sediment appears to be affecting the quality of water which flows into the intake collection system to the water treatment plant. The Willow Creek drinking water source is only used as turbidity allows, is currently not in use, and has not been used reliably for the past two to three years. It is crucial for this water source to be maintained and sufficiently delivered to customers for domestic and fire flow uses. The city does not have enough capacity from the groundwater wells alone to meet current and future maximum day demands. Use of the surface water source is entirely by gravity so it must also be maintained to save energy and costs related to groundwater pumping.

4.3 Reasonable Growth

Growth and projected population estimates are discussed in detail in Section 2.3. The City of White Sulphur Springs has experienced a decline in population since 1980 but the population over the last thirty years has remained relatively unchanged. An annual population increase of 1% has been assumed for the 20-year planning period (year 2045) to allow for additional growth in the community. This growth is anticipated to occur throughout the city, as no areas of concentrated growth are identified. This correlates to a design year population of 1,225 or an increase of 336 water users over the current 2020 number of 955 users. This growth rate does not cause drastic increases to the water demand in the system; however, it will require that the city find ways to reduce system leakage and rehabilitate its surface source of supply if the population does continue to increase.

The City Council is committed to this project. Project planning is not dependent on population growth or support by new customers, but a reasonable growth rate is used for planning and design purposes.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative Screening

Various alternatives exist to address the deficiencies that have been identified in the city's water system. Some alternatives are not viable because of technical feasibility, regulatory compliance, or capital and operation and maintenance costs. In the case of White Sulphur Springs' water system, alternatives for supply, treatment, and distribution system improvements have been considered. No alternatives were considered that have been determined to be technically infeasible or nonviable solutions to the problems at hand. This section contains a description of the alternatives that were considered in planning for the various solutions to meet the identified needs of the water system. All alternatives were then conceptually designed and evaluated to determine the estimated probable capital and operation and maintenance costs.

5.2 Supply Alternatives

White Sulphur Springs is fortunate to have both high-quality surface and groundwater sources of supply for drinking water. The surface water source is the preferred source of water for the city because operation is by gravity and the energy requirements are minimal. However, either source on its own is not sufficient to meet the existing or projected demands of the system.

There are deficiencies at the Willow Creek intake which currently make the surface water supply unusable. A wooden catwalk that spans the intake dam is deteriorated and unable to support operations staff which require use of the catwalk to operate a flushing valve mounted on the upstream face of the dam. Structural deficiencies make the flushing valve inoperable in its current state. As a result, the intake pond is filled with silt, aquatic plants, and deadfall which contributes to high turbidity of the water delivered to the treatment plant. Other deficiencies are likely present with the slow sand filter system at the intake and further investigations are needed. Access to the diversion structure and intake is limited and there is currently no way to monitor raw water quality at the pond which makes it difficult to know when the city can put the treatment plant into service.

A deficiency with the groundwater wells exists with the meter placement and only one well can currently be metered. The operator currently estimates water use by recording pump run times each day which is not accurate due to fluctuation of the pump flow rates throughout the day based on system hydraulics.

5.2.1 Alt. S-1: No Action

The no action alternative involves the continued use of the groundwater wells as the source of water supply for the city without any use of the surface water system. This alternative will not be considered further due to the fact that it does not meet the requirements of DEQ-1 regarding source capacity. Per DEQ, groundwater systems must be able to provide the maximum daily demand with the highest capacity pump out of service. The 2045 projected maximum day demand is 648 gpm and neither well can provide more than 500 gpm. The groundwater supply alone is not sufficient to meet the demands of the system. Because the system also experiences significant leakage within the distribution system and leakage is factored into the overall demand calculations, the city may wish to select a no action supply alternative for now and complete distribution system improvements first.

5.2.2 Alt. S-2: Intake Pond Improvements

This alternative includes draining and dredging the intake pond (Willow Creek Reservoir) to remove built up sediment, deadfall, and aquatic plants. When the filter sand of the engineered sand filter is exposed, core samples will be taken of the filter sand to determine the condition of the sand. If the core samples reveal the filter sand is significantly plugged, the filter sand will need to be removed and replaced. If the filter sand is removed, the alternative will also involve inspection and evaluation of the condition of the filter fabric and graded drain gravel layer. The existing wooden catwalk will be demolished as part of this alternative and replaced with a new aluminum frame catwalk with grating and handrails. The existing non-self-contained flushing valve will also be replaced with a new self-contained flushing valve. The intake pond improvements alternative also includes purchase of a side-by-side all-terrain vehicle for improved access to the intake facility by city personnel, an allowance for some minor access road improvements, and installation of a battery/solar powered raw water turbidimeter at the pond.

Alternative S-2 is rehabilitation of an existing supply source with existing water rights. Alternative S-2 is not expected to change the amount of water used from Willow Creek Reservoir and is not expected to have water right implications.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the intake reservoir, structures, and filter system will meet the requirements stated in Chapter 3 – Source Development and Chapter 4 – Treatment. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-1 shows the location of the existing intake reservoir that will be rehabilitated in Alternative S-2. Schematic drawings of the existing intake pond engineered sand filter are provided in Appendix M.

Environmental Impacts

There are several project components associated with Alternative S-2 that will require actions in order to assure no adverse environmental impacts from construction of the project. There is an existing native Westslope Cutthroat Trout population upstream of the diversion structure on Willow Creek. Improvements to the intake facilities on Willow Creek will involve close consultation with FWP and other agencies to ensure conservation of the Westslope Cutthroat Trout population and other affected biological species. Additionally, proposed improvements will take place within surface waters and could also likely impact wetlands. The project will require appropriate approvals from FWP, DEQ, U.S. Army Corps of Engineers and other agencies as necessary to assure no adverse impacts to surface water quality or wetlands as a result of construction activities. Finally, a project at the intake will also require consultation with SHPO since the intake structures are likely over fifty years old. The structures will likely require the proper historical documentation procedures to be followed prior to any construction work taking place.

Land Requirements

The Helena-Lewis and Clark National Forest surrounds the Willow Creek intake, although the intake facilities are located on private land. If intake improvements are made, temporary disturbance will occur within privately owned land and adjacent Forest Service land. Landowner input and coordination will be important during design, so any project does not adversely affect land use and function of the landowner’s property or adversely affect public lands.

There will be no additional land required as part of the project and the City of White Sulphur Springs currently has access agreements and easements in place with Townsend Ranch, LLC for access to and maintenance of Willow Creek Reservoir.

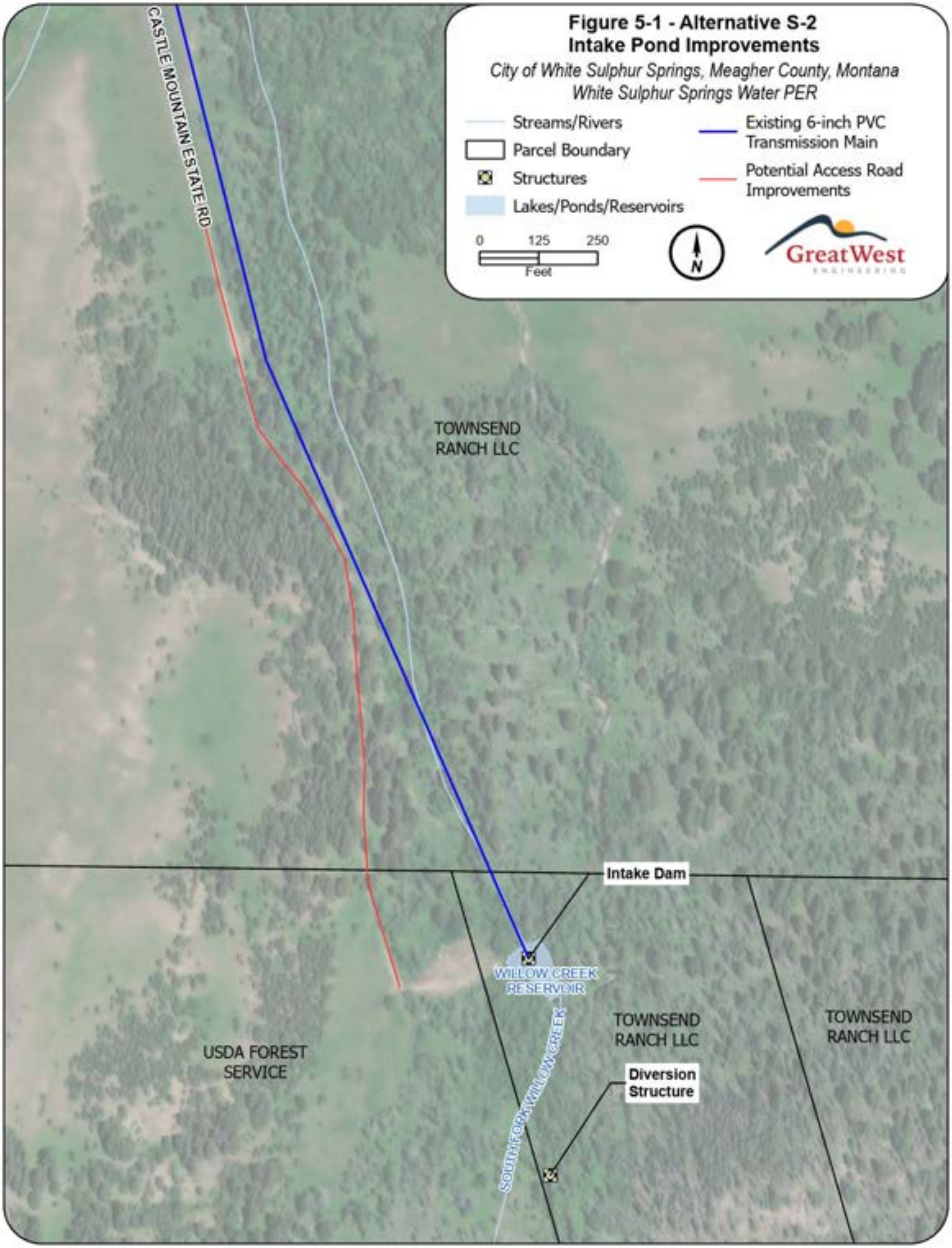


Figure 5-1 - Alternative S-2
Intake Pond Improvements
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Streams/Rivers
Parcel Boundary
Structures
Lakes/Ponds/Reservoirs
Existing 6-inch PVC Transmission Main
Potential Access Road Improvements
0
125
250
Feet
N
GreatWest
ENGINEERING
CASTLE MOUNTAIN ESTATE RD
TOWNSEND RANCH LLC
Intake Dam
WILLOW CREEK RESERVOIR
TOWNSEND RANCH LLC
TOWNSEND RANCH LLC
USDA FOREST SERVICE
Diversion Structure
SOUTH FORK WILLOW CREEK

Potential Construction Problems

Alternative S-2 could pose potential construction problems related to remote site work, limited access, and project unknowns. The project site is located within forested land that requires access via approximately three miles of rough gravel access road, of which the last mile is particularly rough terrain. Additionally, it is difficult to estimate the subsurface conditions in the reservoir without draining it. Higher budgetary and contingency money has been estimated to address these situations.

Sustainability Considerations

Alternative S-2 will replace aging and deteriorated water system infrastructure which is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. Additionally, preserving the existing surface water source ensures the city will provide an adequate capacity of water to handle the demands of the system.

Water and Energy Efficiency

If the city is able to put the Willow Creek Reservoir surface water source back on-line which operates entirely by gravity, there will be less required use of the pumped groundwater source. Therefore, the project will reduce energy consumption.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-1 presents an estimated opinion of probable cost for Alternative S-2 which includes costs for construction, engineering, and administration. The cost estimate assumes removal and replacement of filter sand. The cost estimate will be adjusted accordingly pending evaluation of the filter sand.

Table 5-1 – Alternative S-2 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[1]	Total
1	Remove deadfall and aquatic plants from pond	1	LS	$10,000.00	$10,000
2	Dredge pond	1	LS	$25,000.00	$25,000
3	Remove top 2 inches of filter sand	1	LS	$15,000.00	$15,000
4	Core filter sand	1	LS	$2,500.00	$2,500
5	Remove replace/filter sand	1	LS	$50,000.00	$50,000
6	Evaluate condition of filter fabric/gravel layer	1	LS	$5,000.00	$5,000
7	Demolish catwalk and flushing valve	1	LS	$5,000.00	$5,000
8	Install new alum. frame catwalk with grating	84	LF	$300.00	$25,200
9	Install new self-contained flushing valve	1	EA	$40,000.00	$40,000
10	Misc. concrete work	1	LS	$10,000.00	$10,000
11	Access road improvements allowance	1	LS	$5,000.00	$5,000
12	Remote site work	1	LS	$10,000.00	$10,000
13	Turbidimeter	1	LS	$25,000	$25,000
14	Side-by-Side with tracks	1	EA	$30,000.00	$30,000
	Direct Construction Subtotal				**$258,000**
	Mobilization	10%			$26,000
	Construction Subtotal				**$284,000**
	2024 Construction Cost[2]	8.0%			$307,000
	Contingency	30%			$92,000
	Permitting				$50,000
	Engineering Design	10%			$40,000
	Engineering Construction	10%			$40,000
	Grant Admin, Legal, & Administrative	3%			$12,000
	TOTAL[3]				**$541,000**

(1)Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
(3)The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

Annual O&M costs are anticipated to increase as a result of Alternative S-2. Increased O&M will be required to maintain the side-by-side vehicle and with improved access, personnel will be able to access the site more frequently for site visits and flushing. Table 5-2 presents a summary of estimated annual operation and maintenance costs.

Table 5-2 – Alternative S-2 Opinion of Probable O&M Costs

#	O&M Item	Quantity	Units	Unit Price	Total
1	Once a week site visit	208	HRS	$35.00	$7,280
2	Annual flushing, removal of deadfall, and clearing	80	HRS	$35.00	$2,800
3	Weekly turbidimeter maintenance	52	HRS	$35.00	$1,820
4	Side-by-side maintenance	24	HRS	$35.00	$840
	TOTAL				**$12,700**

5.2.3 Alt. S-3: Groundwater Well Improvements

This alternative includes source meter improvements for the groundwater wells located at the city shop facility at the northeastern edge of the city limits so that each well can be metered individually. Alternative S-3 includes constructing a manhole with a new flow meter on the well #2 influent piping just outside of the existing pump house. This alternative would involve some piping and appurtenance modifications on the well #2 influent line, placement of the new manhole and flow meter, and any necessary electrical or chlorination system modifications. The meter placement will depend on maintaining adequate lengths of pipe upstream for accurate meter readings.

Alternative S-3 is rehabilitation of an existing supply source with existing water rights. Alternative S-3 is not expected to change the amount of water used from the groundwater supply and is not expected to have water right implications. The maximum allowable flowrate from the groundwater system according to water rights is 500 gpm.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 are applicable to each alternative considered, but specifically the well improvements will meet the requirements stated in Chapter 3 – Source Development. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-2 shows the location of the existing wells that will be improved in Alternative S-3.

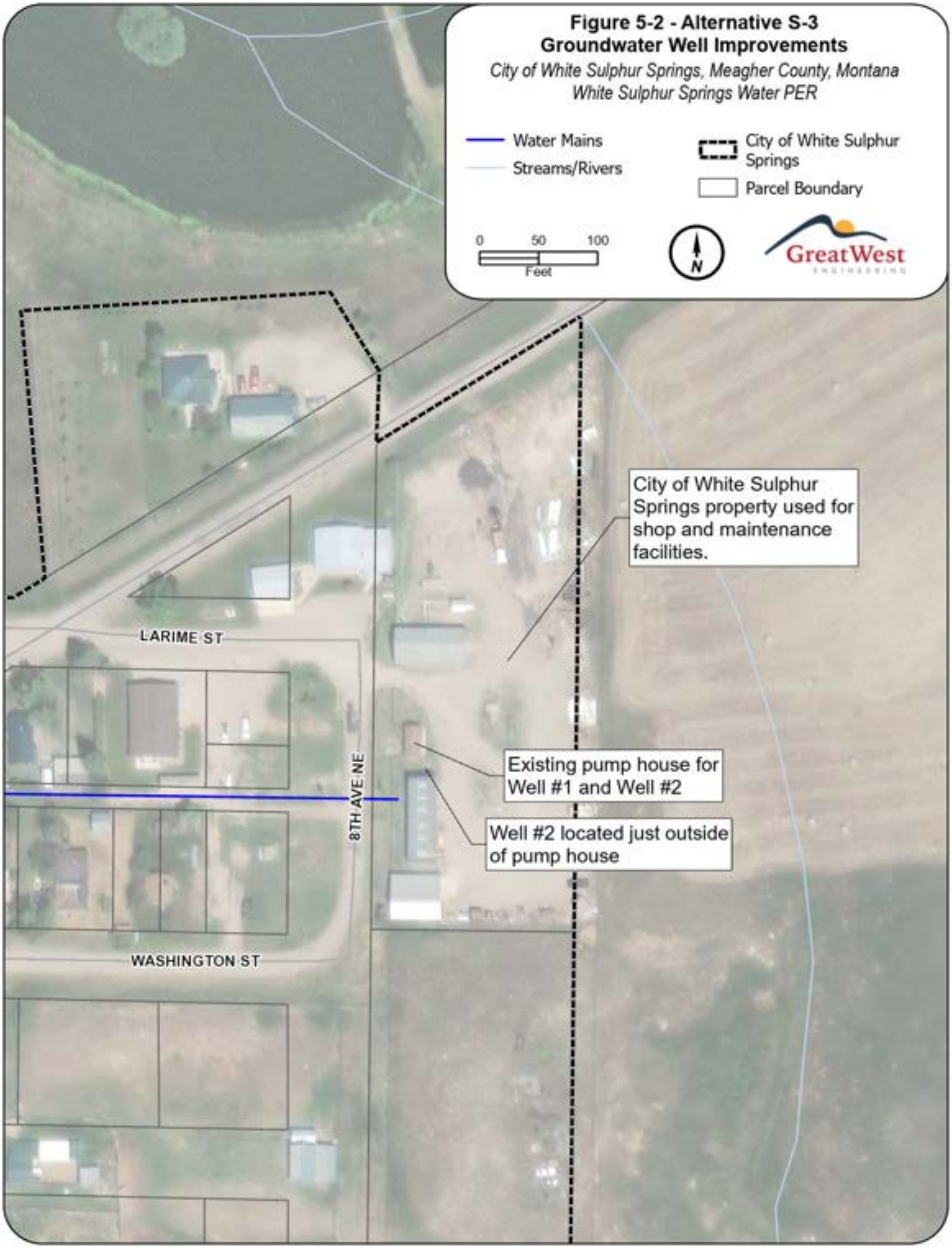


Figure 5-2 - Alternative S-3
Groundwater Well Improvements
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Water Mains
Streams/Rivers
City of White Sulphur Springs
Parcel Boundary
0
50
100
Feet
N
GreatWest
City of White Sulphur Springs property used for shop and maintenance facilities.
Existing pump house for Well #1 and Well #2
Well #2 located just outside of pump house
LARIME ST
8TH AVE NE
WASHINGTON ST

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor.

Land Requirements

This alternative will upgrade existing well sites and does not require additional land. The existing wells currently reside on the City of White Sulphur Springs property.

Potential Construction Problems

Alternative S-3 could pose potential construction problems due to limited space surrounding well #2 and project unknowns associated with a retrofit project. Higher budgetary and contingency money has been estimated to address this situation.

Sustainability Considerations

Alternative S-3 aids in creating a resilient utility and provides social, economic, and environmental benefits. The meter improvements will allow the city to measure water consumption more accurately and will result in better management of the system and understanding of water loss.

Water and Energy Efficiency

Energy costs are not anticipated to notably increase or decrease with the groundwater well improvements. The meter improvements will allow the city to better manage its supply and account for water loss which is a critical step towards increasing water use efficiency.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no or minimal impervious areas created as a result of the project. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-3 presents an estimated opinion of probable cost for Alternative S-3 which includes costs for construction, engineering, and administration. Overall, operation and maintenance costs are not anticipated to increase. This alternative assumes no change to operation and maintenance costs.

Table 5-3 – Alternative S-3 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[(1)]	Total
1	Well #2 Influent Piping/Appurtenance Mods.	1	LS	$35,000.00	$35,000
2	Electrical Modifications	1	LS	$5,000.00	$5,000
3	Chlorination System Modifications	1	LS	$5,000.00	$5,000
4	Manhole	1	LS	$10,000.00	$10,000
5	Flow Meter	1	LS	$10,000.00	$10,000
	Direct Construction Subtotal				**$65,000**
	Mobilization	10%			$7,000
	Construction Subtotal				**$72,000**
	2024 Construction Cost[(2)]	8.0%			$78,000
	Contingency	30%			$23,000
	Engineering Design	10%			$10,000
	Engineering Construction	10%			$10,000
	Grant Admin, Legal, & Administrative	3%			$3,000
	TOTAL[(3)]				**$124,000**

[(1)]Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[(2)]The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
[(3)]The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.3 Treatment Alternatives

Water treatment facilities consist of the slow sand filtration facility located near the storage tank as well as two gas chlorination systems that provide disinfection. The slow sand filtration facility treats the water diverted from Willow Creek and consists of four filter compartments. The facility was constructed in 2004 and is in excellent condition, however, turbidity continues to be problematic for operation of the slow sand filtration facility. The WTP is capable of treating around 120 to 140 gpm when the raw water NTU is 0.6 or below. The system can treat water with an NTU of up to 1, however, it is not as efficient. The operators typically turn off the treatment facility during periods of high turbidity and rely on well water. Turbidity is measured through a raw water turbidimeter and separate effluent turbidimeters for each individual sand filter. There is currently not a combined effluent turbidimeter.

The city's slow sand filters are not performing at the level that they are known to operate at and should be able to treat water with turbidites on the order of 10 to 20 NTU. The cause of the degradation in performance could possibly be attributed to the presence of colloidal clays and algae in the raw water, the wrong size of filter sand, an ineffective cleaning procedure, or a combination of any of these factors.

5.3.1 Alt. T-1: No Action

The no action alternative involves the continued use of the slow sand filter without any improvements to the filters or the current operational or cleaning procedures. The plant would continue to only be used when raw water turbidity is less than 1 NTU. The slow sand filter facility would be turned off and all drinking water would be provided from the groundwater wells during periods of high turbidity. The sand filter facility is currently completely inoperable due to the non-functioning flushing valve at the intake facility which has prevented the city from using the surface water source at all over the past few years.

This alternative will not be considered further due to the fact that it does not meet the requirements of DEQ-1 regarding source capacity. The groundwater supply alone is not sufficient to meet the peak demands of the system, however, the city may wish to select a no action treatment alternative for now and complete distribution system improvements first in order to reduce leakage and overall demand on the system.

5.3.2 Alt. T-2: Reduce Algae and Turbidity Loads on WTP

This alternative is identical to Alternative S-2 (Intake Pond Improvements) previously presented in Section 5.2.2. Alternative S-2/T-2 is a crucial first step in any improvements to the slow sand filter facility. Draining and dredging the intake pond in conjunction with the valve improvements will re-establish the functionality of the intake pond to that of a settling basin to reduce turbidity and sediment and allow the city to put the slow sand filter facility back into operation. Once this alternative has been completed and the slow sand filter facility is again operable, the city may choose to initiate further treatment alternatives as further described within this section if performance of the slow sand filter facility does not improve with intake improvements alone. The estimated capital cost of Alternative S-2/T-2 is $541,000 with an annual anticipated increase in O&M of $20,000. Refer to Section 5.2.2 for additional specifics related to this alternative.

5.3.3 Alt. T-3: Replace Filter Media

Information on the gradation of the filter sand is currently unknown based on review of available information. This alternative would first involve core sampling of the existing filter media and subsequent sieve analysis of the media. If results of the sieve analysis indicate the filter sand is sized correctly, this alternative would be complete, and it would be recommended the city proceed with further treatment alternatives to implement a new filter cleaning procedure. If the sieve analysis reveals the sand is sized incorrectly, the filter sand will need to be replaced. Alternative T-3 includes removal of the existing filter sand within the four compartments of the slow sand filter facility, purchase of new filter media, and installation of new filter media.

Design Criteria

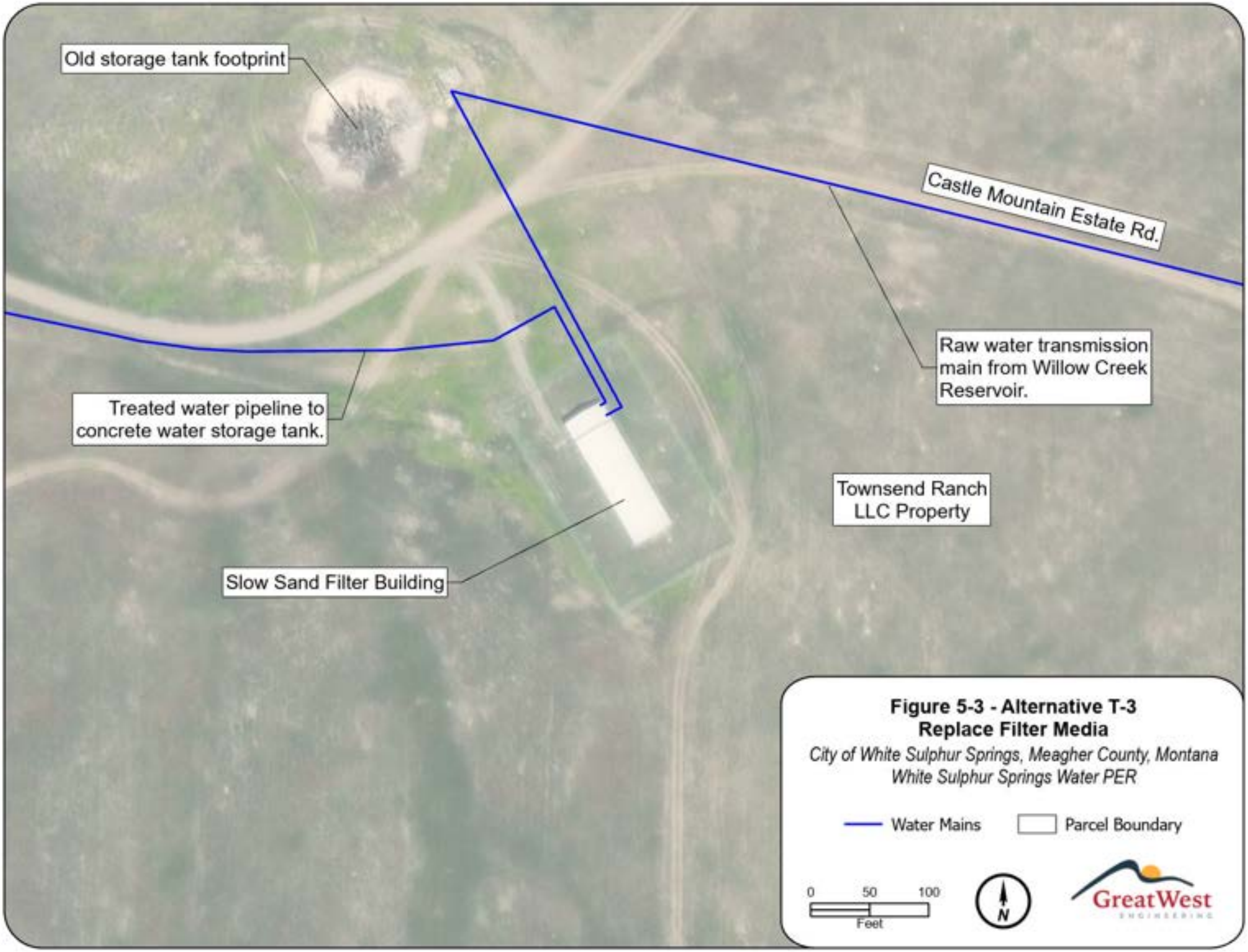
All water system improvements will comply with those requirements set forth in Circular DEQ 1.All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the slow sand filter treatment system will meet the requirements stated in Chapter 4 – Treatment. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-3 shows the location of the existing slow sand filter facility. Alternative T-3 will take place within the existing slow sand filter building. Sand filter original construction plans are provided in Appendix R for additional details on compartment dimensions.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor. The media replacement construction project will take place within the sand filter building or within the fenced area around the building.


Old storage tank footprint
Castle Mountain Estate Rd.
Raw water transmission main from Willow Creek Reservoir.
Treated water pipeline to concrete water storage tank.
Townsend Ranch LLC Property
Slow Sand Filter Building
Figure 5-3 - Alternative T-3
Replace Filter Media
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Water Mains
Parcel Boundary
0
50
100
Feet
N
GreatWest
ENGINEERING

Land Requirements

The sand filter building is located on private land owned by Townsend Ranch, LLC. There will be no additional land required as part of the project and the City of White Sulphur Springs currently has access agreements and easements in place with Townsend Ranch, LLC for access to and maintenance of the slow sand filter facility. The landowner will be informed during design so any project does not adversely affect land use and function of the landowner’s property.

Potential Construction Problems

This is a technically feasible alternative and no unique construction problems are anticipated.

Sustainability Considerations

Alternative T-3 will replace filter media to improve drinking water treatment system performance which is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. Additionally, preserving the existing surface water source and treatment system ensures the city will provide an adequate capacity of water to handle the demands of the system.

Water and Energy Efficiency

If the city is able to optimize treatment performance with new filter media and treat water with a higher turbidity, the surface water source will be able to be used more reliably and more often. Since the surface water source and treatment system operates entirely by gravity, there will be less required use of the pumped groundwater source. Therefore, the project will reduce energy consumption.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-4 presents an estimated opinion of probable cost for Alternative T-3 which includes costs for construction, engineering, and administration. Overall, operation and maintenance costs are not anticipated to increase. This alternative assumes no change to operation and maintenance costs.

Table 5-4 – Alternative T-3 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[1]	Total
1	Core filter media and perform sieve analysis	4	EA	$2,000.00	$8,000
2	Remove media	316	CY	$10.00	$3,160
3	Purchase filter media	316	CY	$1,500.00	$474,000
4	Install filter media	316	CY	$20.00	$6,320
	Direct Construction Subtotal				**$491,000**
	Mobilization	10%			$49,000
	Construction Subtotal				**$540,000**
	2024 Construction Cost[2]	8.0%			$583,000
	Contingency	20%			$117,000
	Engineering Design	10%			$70,000
	Engineering Construction	10%			$70,000
	Grant Admin, Legal, & Administrative	3%			$21,000
	TOTAL[3]				**$861,000**

[1]Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[2]The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
[3]The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.3.4 Alt. T-4a: Implement Scraping/Throw Over Cleaning Technique

This alternative involves implementation of a new sand filter cleaning technique and discontinuance of the city's current raking technique. The goal of the cleaning process is to remove the colloidal debris material from the filter bed but also maintain an active biological population that is important for the treatment process. Industry literature specifies a method for cleaning that involves scraping the sand to a specified depth, placing a layer of new or cleaned sand, and then placing some of the previously scraped sand back on top. The Montana DEQ guidelines refer to this method as the "throw over" technique which is meant to seed the replacement sand with microorganisms.

Alternative T-4a is not a construction project but rather the costs associated with purchase of the equipment necessary to implement the scraping cleaning method including a quad all-terrain vehicle, plow blade for quad to move sand back and forth across the filters, and lift to move the quad in and out of the filters.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1.All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the slow sand filter treatment system and cleaning procedure will meet the requirements stated in Chapter 4 – Treatment.

Map

Figure 5-3 (previously) shows the location of the existing slow sand filter facility. The Alternative T-4a cleaning technique will take place within the existing slow sand filter building. Sand filter original construction plans are provided in Appendix R for additional details on compartment dimensions.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The scraping/throw-over technique will be implemented by city operations staff and will take place within the sand filter building or within the fenced area around the building.

Land Requirements

The sand filter building is located on private land owned by Townsend Ranch, LLC. There will be no additional land required as part of the project and the City of White Sulphur Springs currently has access agreements and easements in place with Townsend Ranch, LLC for access to and maintenance of the slow sand filter facility.

Potential Construction Problems

This is a technically feasible alternative, and no unique problems are anticipated.

Sustainability Considerations

Alternative T-4a will implement a filter cleaning procedure to improve drinking water treatment system performance which is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. Additionally, preserving the existing surface water source and treatment system ensures the city will provide an adequate capacity of water to handle the demands of the system.

Water and Energy Efficiency

If the city is able to optimize treatment performance with implementation of a new filter cleaning method and treat water with a higher turbidity, the surface water source will be able to be used more reliably and more often. Since the surface water source and treatment system operates entirely by gravity, there will be less required use of the pumped groundwater source. Therefore, the project will reduce energy consumption.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project. Operators will take precautions so assure the filter cleaning procedure does not cause erosion of soils or transport of sediment offsite as a result of maintenance activities.

Cost Estimates

Table 5-5 presents an estimated opinion of probable cost for Alternative T-4a which includes costs to purchase equipment for implementation of the scraping/throw-over sand filter cleaning method. Overall, operation and maintenance costs are not anticipated to notably change. There will be some additional labor required in order to implement the throw over technique for re-sanding but also some labor savings by discontinuation of the raking method as the new scraping method will utilize mechanical techniques versus hand raking. There will also be some small labor increases associated with maintenance of the quad all-terrain vehicle. This alternative assumes no change to operation and maintenance costs.

Table 5-5 – Alternative T-4a Opinion of Probable Cost

#	Equipment Item	Quantity	Units	Unit Price(1)	Total
1	Quad all-terrain vehicle	1	EA	$8,000	$8,000
2	Plow blade for quad	1	EA	$2,000	$2,000
3	Lift to move quad in and out of filters	1	EA	$5,000	$5,000
	Equipment Subtotal				**$15,000**
	2024 Equipment Cost(2)	8.0%			$16,000
	TOTAL(3)				**$16,000**

(1)Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
(3)The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.3.5 Alt. T-4b: Implement Harrowing Cleaning Technique

This alternative involves implementation of a new sand filter cleaning technique and discontinuance of the city's current raking technique. This alternative involves implementation of the harrowing cleaning technique which has shown to be effective and less labor intensive than scraping. In this method, a tractor with a mounted spring-tooth harrow operates in the filter beds while water about 6 inches deep is flowing across the sand surface. The harrow breaks up the top of the filter surface and the water carries away the debris. The method removes the accumulated colloidal debris while maintaining an active biological material in the top several inches of the sand. The ability to maintain a high biological population enables the harrowed filter to be quickly placed back into service without a deterioration in treatment performance. The entire filter sand bed is removed and thoroughly cleaned once every 8 – 10 years. Harrowing creates wastewater as the bed is being cleaned. The wastewater needs to be removed from the filter to keep the colloidal debris from going back into the bed.

Alternative T-4b includes the costs associated with purchase of the equipment necessary to implement the harrowing cleaning method including a quad all-terrain vehicle, harrow, and lift to move the quad in and out of the filters. Alternative T-4b also includes a construction component in order to install wash water collection troughs, piping, and a waste wash water drying lagoon at the site.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1.All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the slow sand filter treatment system and cleaning procedure will meet the requirements stated in Chapter 4 – Treatment. Design, construction, and maintenance of the wash water waste drying lagoon will comply with those requirements set forth in Circular DEQ-2. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-3 (previously) shows the location of the existing slow sand filter facility. The Alternative T-4b cleaning technique will take place within the existing slow sand filter building. Sand filter original construction plans are provided in Appendix R for additional details on compartment dimensions. The wash water waste lagoon will be constructed within the fenced area outside of the filter building.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The harrowing technique will be implemented by city operations staff and will take place within the sand filter building or within the fenced area around the building. The wash water drying lagoon will be a total retention lagoon that will periodically require sludge removal. All necessary permits will be obtained for operation of the lagoon.

Land Requirements

The sand filter building is located on private land owned by Townsend Ranch, LLC. There will be no additional land required as part of the project and the City of White Sulphur Springs currently has access agreements and easements in place with Townsend Ranch, LLC for access to and maintenance of the slow sand filter facility.

Potential Construction Problems

This is a technically feasible alternative, and no unique construction problems are anticipated.

Sustainability Considerations

Alternative T-4b will implement a filter cleaning procedure to improve drinking water treatment system performance which is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. Additionally, preserving the existing surface water source and treatment system ensures the city will provide an adequate capacity of water to handle the demands of the system.

Water and Energy Efficiency

If the city is able to optimize treatment performance with implementation of a new filter cleaning method and treat water with a higher turbidity, the surface water source will be able to be used more reliably and more often. Since the surface water source and treatment system operates entirely by gravity, there will be less required use of the pumped groundwater source. Therefore, the project will reduce energy consumption.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project. Operators will take precautions to assure the filter cleaning procedure does not cause erosion of soils or transport of sediment offsite as a result of maintenance activities. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-6 presents an estimated opinion of probable cost for Alternative T-4b which includes costs to purchase equipment for implementation of the harrowing sand filter cleaning method and construction costs associated with construction of the wash water waste lagoon. Filter harrowing in general, is much less labor-intensive and time-consuming than filter scraping and re-sanding and there could likely be some labor savings by discontinuation of the raking method as the new harrowing method will utilize mechanical techniques versus hand raking. There will also be some small labor increases associated with maintenance of the quad all-terrain vehicle. This alternative assumes no change to operation and maintenance costs.

Table 5-6 – Alternative T-4b Opinion of Probable Cost

#	Equipment or Bid Item	Quantity	Units	Unit Price(1)	Total
1	Waste wash water troughs	4	EA	$10,000	$40,000
2	Piping and valving	4	EA	$5,000	$20,000
3	Waste wash water lagoon	1	LS	$15,000	$15,000
4	Quad all-terrain vehicle	1	EA	$8,000	$8,000
5	Harrow	1	EA	$1,200	$1,200
6	Lift to move quad and harrow in and out of filters	1	EA	$5,000	$5,000
	Direct Construction and Equipment Subtotal				**$89,000**
	Mobilization (Construction Only)	10%			$8,000
	Construction and Equipment Subtotal				**$97,000**
	2024 Construction and Equipment Cost(2)	8.0%			$105,000
	Contingency (Construction Only)	20%			$18,000
	Permitting				$5,000
	Engineering Design	10%			$11,000
	Engineering Construction	10%			$11,000
	Grant Admin, Legal, & Administrative	3%			$3,000
	TOTAL(3)				**$153,000**

(1)Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
(3)The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.3.6 Alt. T-5: Install Combined Filter Effluent Turbidimeter

Turbidity values are critical to determining compliance with surface water treatment rules so maintaining accurate turbidimeters is very important. DEQ surface water regulations require that turbidity be measured for the combined filter effluent as well as the individual filter effluent. The combined filter effluent refers to a sample that combines the effluent water from all filters in operation at the time the sample is collected. Typical sampling locations include the combined filter effluent piping prior to water reaching the clearwell, or water sampled from the water treatment plant clearwell. Individual filter effluent refers to the effluent water from individual filters, measured at a point prior to mixing with effluent from other filters or other sources.

The most representative location to measure the combined effluent turbidity of the filtered water is in the pipe where the individual filter effluents are first combined, measured as close to the final filter(s) effluent as possible, prior to storage. Effluent turbidity from the slow sand filters in White Sulphur Springs is currently measured via separate effluent turbidimeters for each individual sand filter and there is currently not a combined effluent turbidimeter. This alternative involves installation of a new combined effluent turbidimeter and associated appurtenances at the slow sand filter treatment building in order to increase the accuracy of the combined effluent turbidity measurement.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1.All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the slow sand filter combined effluent turbidimeter will meet the requirements stated in Chapter 4 – Treatment. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-3 (previously) shows the location of the existing slow sand filter facility. Alternative T-5 will take place within the existing slow sand filter building.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor. The turbidimeter installation will take place within the sand filter building.

Land Requirements

The sand filter building is located on private land owned by Townsend Ranch, LLC. There will be no additional land required as part of the project and the City of White Sulphur Springs currently has access agreements and easements in place with Townsend Ranch, LLC for access to and maintenance of the slow sand filter facility. The turbidimeter installation will not adversely affect land use and function of the landowner's property.

Potential Construction Problems

This is a technically feasible alternative and no unique construction problems are anticipated.

Sustainability Considerations

Alternative T-5 will install turbidity monitoring equipment to more accurately measure effluent turbidity which is a critical component for compliance with surface water treatment rules. Improved monitoring is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

Water and Energy Efficiency

The turbidimeter will require some additional power consumption.

Green Infrastructure

The project will not have an impact on post-construction stormwater management as there will be no impervious areas created as a result of the project. The turbidimeter installation will not cause erosion of soils or transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-7 presents an estimated opinion of probable cost for Alternative T-5 which includes costs for construction, engineering, and administration. Overall, operation and maintenance costs are not anticipated to increase. This alternative assumes no change to operation and maintenance costs.

Table 5-7 – Alternative T-5 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[(1)]	Total
1	Power cable	100	LF	$8.00	$800
2	Control cable	100	LF	$10.00	$1,000
3	Turbidimeter	1	EA	$10,000.00	$10,000
4	Feed pump	1	EA	$2,000.00	$2,000
5	Piping	100	LF	$10.00	$1,000
6	Data logger	1	EA	$5,000.00	$5,000
	Direct Construction Subtotal				**$20,000**
	Mobilization	10%			$2,000
	Construction Subtotal				**$22,000**
	2024 Construction Cost[(2)]	8.0%			$24,000
	Contingency	20%			$5,000
	Engineering Design	10%			$3,000
	Engineering Construction	10%			$3,000
	Grant Admin, Legal, & Administrative	3%			$1,000
	TOTAL[(3)]				**$36,000**

[(1)]Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[(2)]The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
[(3)]The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.3.7 Alt. T-6: Install Two New Slow Sand Filters

This alternative involves installation of the two additional planned future sand filters as shown in the 2004 construction design plans provided in Appendix R. Alternative T-6 would increase the capacity of the slow sand filters and should only be implemented if Alternatives T-2 through T-4 do not produce the desired treatment performance results.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1.All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the slow sand filter treatment system will meet the requirements stated in Chapter 4 – Treatment. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-4 shows the location of the existing slow sand filter facility and proposed expansion area for the two new filters. Sand filter original construction plans are provided in Appendix R for additional details on compartment dimensions.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor. The filter construction project will take place at the south end of the existing sand filter building and generally within the fenced area around the building.

Land Requirements

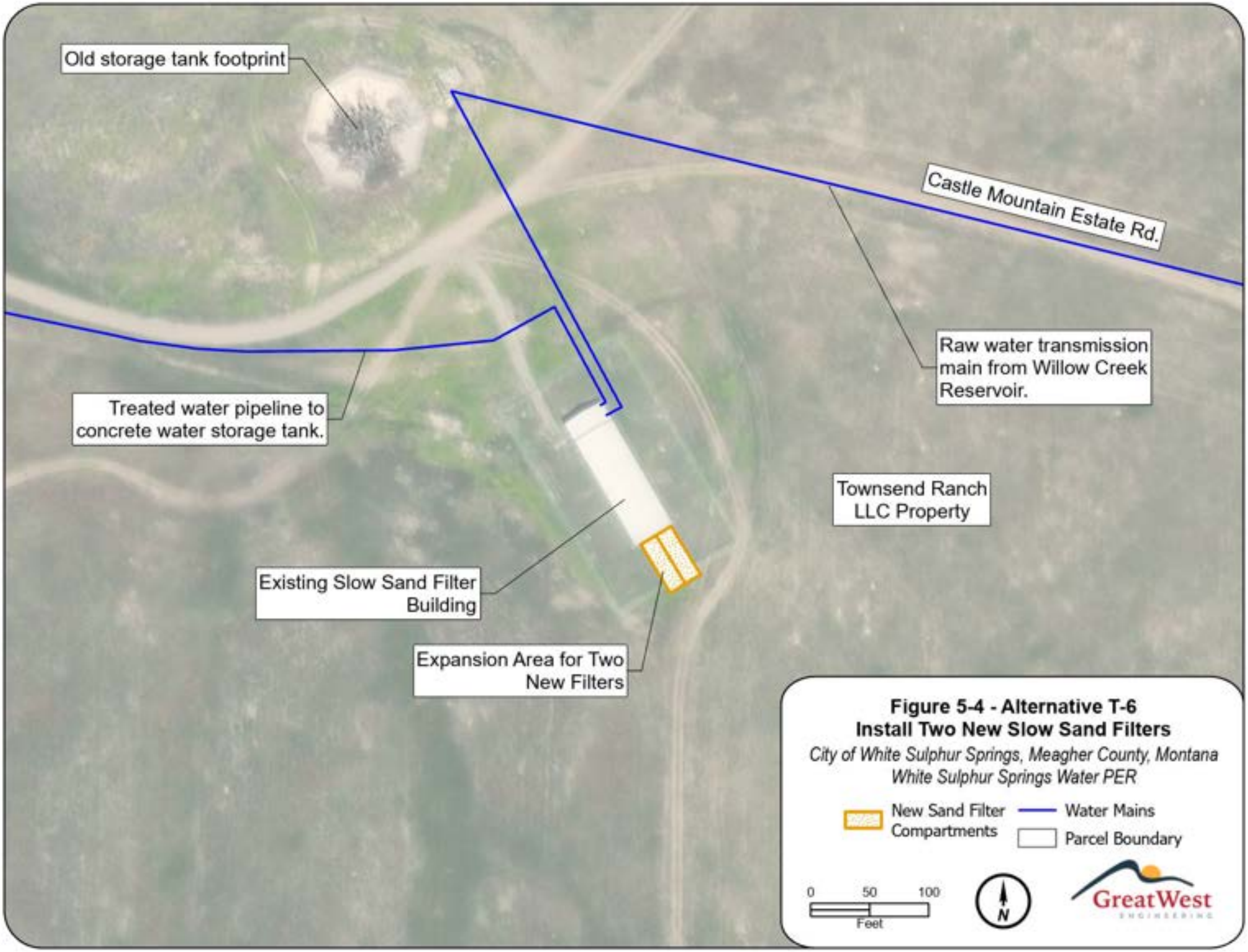
The sand filter building is located on private land owned by Townsend Ranch, LLC. The City of White Sulphur Springs currently has access agreements and easements in place with Townsend Ranch, LLC for access to and maintenance of the slow sand filter facility. There may be some additional land required and required easement negotiations as part of the project in order to have adequate room for the filter expansion. The landowner will be informed during design, so any project does not adversely affect land use and function of the landowner's property.

Potential Construction Problems

This is a technically feasible alternative and no unique construction problems are anticipated.

Sustainability Considerations

Alternative T-6 will increase the capacity of the sand filter system to improve drinking water treatment system performance which is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. Additionally, preserving the existing surface water source and treatment system ensures the city will provide an adequate capacity of water to handle the demands of the system.


Old storage tank footprint
Castle Mountain Estate Rd.
Raw water transmission main from Willow Creek Reservoir.
Treated water pipeline to concrete water storage tank.
Townsend Ranch LLC Property
Existing Slow Sand Filter Building
Expansion Area for Two New Filters
Figure 5-4 - Alternative T-6
Install Two New Slow Sand Filters
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
New Sand Filter Compartments
Water Mains
Parcel Boundary
0
50
100
Feet
N
GreatWest
ENGINEERING

Water and Energy Efficiency

If the city is able to optimize treatment performance with additional filters and treat water with a higher turbidity, the surface water source will be able to be used more reliably and more often. Since the surface water source and treatment system operates entirely by gravity, there will be less required use of the pumped groundwater source. Therefore, the project will reduce energy consumption.

Green Infrastructure

The project will create some impervious area as a result of the building expansion to house the additional filters. Stormwater management will be addressed during design to ensure there are no adverse impacts to adjoining properties. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-8 presents an estimated opinion of probable cost for Alternative T-6 which includes costs for construction, engineering, and administration. Annual O&M costs are anticipated to increase as a result of Alternative T-6 due to increased labor for maintenance of the additional filters. Table 5-9 presents a summary of estimated annual operation and maintenance costs.

Table 5-8 – Alternative T-6 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[1]	Total
1	Excavation	1,500	CY	$15.00	$22,500
2	Backfill	500	CY	$10.00	$5,000
3	Concrete Walls	150	CY	$1,200.00	$180,000
4	Slab on Grade	80	CY	$900.00	$72,000
5	Filter Media	158	CY	1,500.00	$237,000
6	Install filter media	158	CY	20.00	$3,160
7	Piping & Valving	1	LS	$120,000.00	$120,000
8	Filter Underdrain Piping	1	LS	$40,000.00	$40,000
9	Gravel & Torpedo Sand	100	CY	$500.00	$50,000
10	Walkway	48	LF	$200.00	$9,600
11	Enclosure	1,600	SF	$200.00	$320,000
12	Turbidimeters	2	EA	$10,000.00	$20,000
13	Structural Fill	100	CY	$15.00	$1,500
	Direct Construction Subtotal				**$1,081,000**
	Mobilization	10%			$108,000
	Construction Subtotal				**$1,189,900**
	2024 Construction Cost[2]	8.0%			$1,284,000
	Contingency	20%			$257,000
	Geotechnical Investigation				$10,000
	Engineering Design	10%			$154,000
	Engineering Construction	10%			$154,000
	Grant Admin, Legal, & Administrative	3%			$46,000
	TOTAL[3]				**$1,905,000**

[1]Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[2]The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
[3]The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

Table 5-9 – Alternative T-6 Opinion of Probable O&M Costs

#	O&M Item	Quantity	Units	Unit Price	Total
1	Additional scraping and re-sanding	160	HRS	$35.00	$5,600
	TOTAL				**$5,600**

5.4 Storage Alternatives

No storage alternatives are presented. The existing storage tank was recently constructed in 2012 and is in excellent condition. Buried concrete tanks can have a design life on the order of 100 years. Although the projected year 2045 demand shows a slight storage deficiency, this can likely be recovered as distribution system improvements are made and leakage is reduced.

5.5 Pumping Station Alternatives

No pumping station alternatives are considered in this analysis. White Sulphur Springs does not operate any pumping stations in its water system.

5.6 Distribution System Alternatives

The White Sulphur Springs water distribution system includes significant amounts of cast iron and steel pipe which have exceeded, or will soon exceed, their useful life. Asbestos cement, cast iron, and steel mains make up approximately 30% of the distribution system piping. These pipes are prone to break, are likely restricting flow, and are in some cases undersized. The system also contains water mains with diameters 4-inches or less in size. All remaining cast iron, asbestos cement, and steel pipes in addition to pipe that is less than 6 inches in diameter should eventually be replaced. Fire flow availability will greatly improve as 4-inch mains are replaced along with old cast-iron and steel mains. The distribution system could also benefit from elimination of several dead-end mains in order to reduce stagnant water and improve the system's fire flow availability.

Another critical concern within the system is the deteriorated condition of a section of 1940's era steel transmission main that is believed to be the biggest source of leakage in the system. The line has shown to be actively leaking with the leakage surfacing in the field. The city wishes to replace the 1946 steel line and re-align the main along Castle Mountain Road and along property lines in the adjoining subdivision.

The city's immediate goal is to eliminate the excessive leakage occurring from the 1940's era streel transmission main through the replacement of this pipe. A lower priority is to replace the remaining old cast iron, steel, and undersized mains within the distribution system. Finally, there are areas of the system which would benefit from line looping to improve water flow that can be addressed as phases of pipe replacement are completed.

Completing all of the distribution system upgrades as part of a single project will be cost prohibitive, however, through planning of a phased project to maximize grant and low interest loan funding, the city will be able to make very significant improvements.

5.6.1 Alt. D-1: No Action

The No Action alternative was considered and determined not to be a viable alternative despite the fact the city is not under any type of administrative order requiring it to replace the transmission or distribution piping. The age of the transmission main and much of the distribution system coupled with the risks associated with backflow/contamination potential from water main breaks make the possibility of no action an unacceptable path forward for the city. Without improvements, the transmission/distribution system will continue to require more and more operation and maintenance attention and provide inadequate fire protection. Replacing undersized and leaking mains will reduce leakage and in turn, reduce pumping costs, as well as reduce the risks of contamination associated with leaking mains and main repairs. The need for water line replacement is evident and supported through the analysis completed and the no action alternative will not be considered further.

5.6.2 Alt. D-2: Replace 12-inch Transmission Main

This alternative includes construction of approximately 4,000 lineal feet of new 12-inch PVC water transmission main from the water storage tank to the existing water main connection near the Townsend Ranch property line. The project will abandon the existing 1940's era steel transmission main which is known to be leaking excessively. The new PVC transmission main will deviate from the original 1940s alignment and will follow the Castle Mountain Road alignment as well as existing property lines in the adjoining subdivision. Easement negotiations will be required for this realignment with the goal to benefit property owners by re-aligning the water line along property lines versus the current alignment which traverses through the properties and potentially limits the owner's use of their properties. There will be no water services off of the new transmission main as the subdivision has its own drinking water source and is outside of the city limits. The project will include a pipeline bore underneath the South Side Canal.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 are applicable to each alternative considered, but specifically the transmission main project will meet the requirements in Chapter 8 – Transmission Mains, Distribution Systems, Piping & Appurtenances. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

Map

Figure 5-5 presents a map of the proposed transmission main replacement in Alternative D-2.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor.

The project will involve a bore underneath the South Side Canal. Precautions will be taken during construction to prohibit any sedimentation or other potential adverse impact on the surface water or associated wetlands. The project will require permitting from the Army Corps of Engineers for the crossing and other agencies as necessary to assure no adverse impacts to surface water quality or wetlands as a result of construction activities. No disturbance to the canal bed or banks is expected through use of this boring technique.

Land Requirements

The proposed transmission main will be installed within the County road right-of-way of Castle Mountain Estate Road and may require permitting from the County and/or subdivision homeowner’s association for placement of the pipeline within the right-of-way. Additionally, a portion of the transmission main will traverse private land and easement negotiations will be required for final placement of the water main. The project intends to place the new water line along existing property lines. Landowner input and coordination will also be important during design, so any project does not adversely affect land use and function of the landowner’s property during construction.

Potential Construction Problems

There are no known construction problems or other conditions which may affect construction for this alternative. It will be important for the contractor to coordinate with local residents during construction.

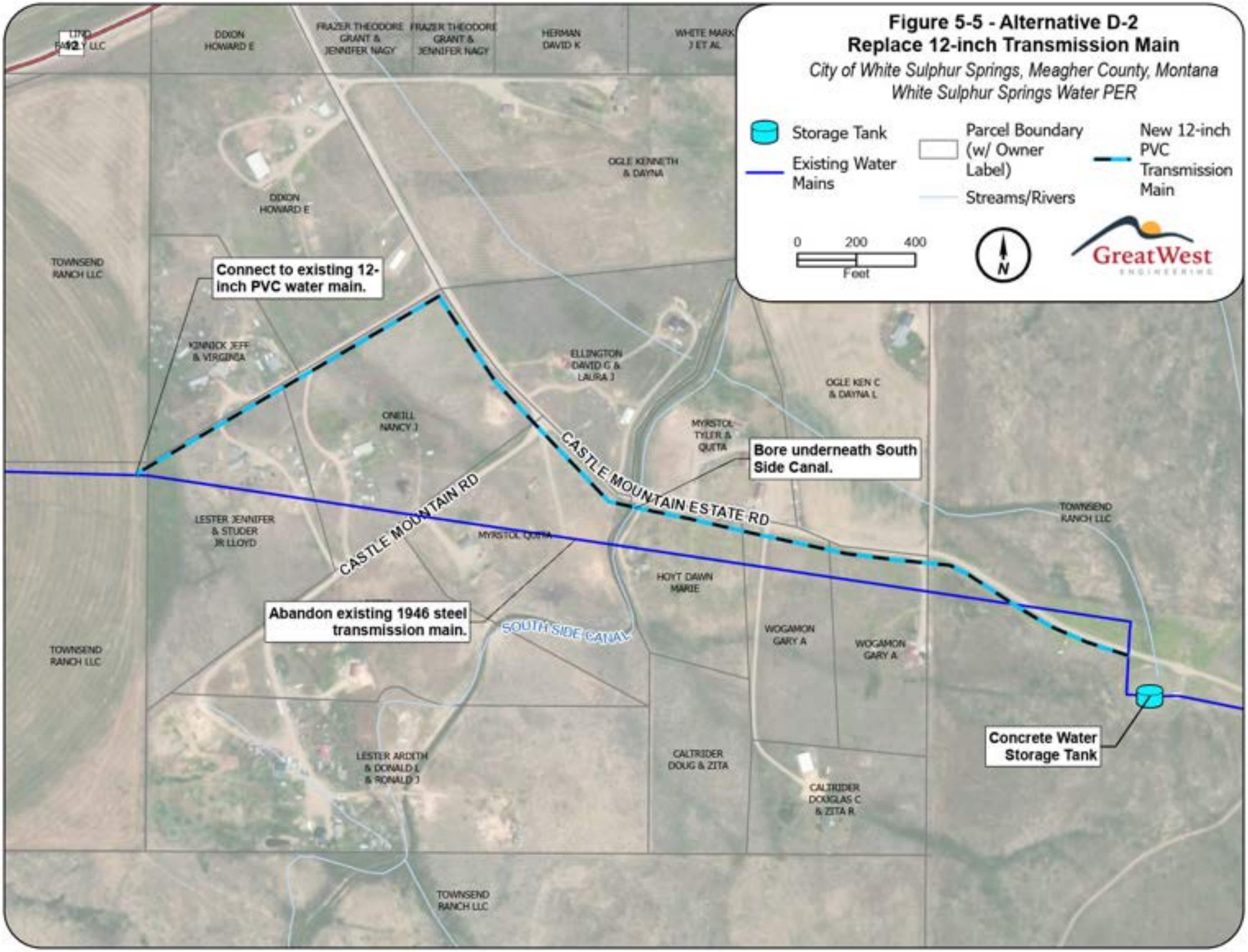


Figure 5-5 - Alternative D-2
Replace 12-inch Transmission Main
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Storage Tank
Existing Water Mains
Parcel Boundary (w/ Owner Label)
Streams/Rivers
New 12-inch PVC Transmission Main
0
200
400
Feet
N
GreatWest
ENGINEERING
Connect to existing 12-inch PVC water main.
Bore underneath South Side Canal.
Abandon existing 1946 steel transmission main.
Concrete Water Storage Tank
CASTLE MOUNTAIN RD
CASTLE MOUNTAIN ESTATE RD
SOUTH SIDE CANAL
12
DIXON HOWARD E
FRAZER THEODORE GRANT & JENNIFER NAGY
FRAZER THEODORE GRANT & JENNIFER NAGY
HERMAN DAVID K
WHITE MARK J ET AL
OGLE KENNETH & DAYNA
DIXON HOWARD E
TOWNSEND RANCH LLC
KINNICK JEFF & VIRGINIA
ONEILL NANCY J
ELLINGTON DAVID G & LAURA J
OGLE KEN C & DAYNA L
MYRSTOL TYLER & QUITA
LESTER JENNIFER & STUDER JR LLOYD
MYRSTOL QUITA
HOYT DAWN MARIE
TOWNSEND RANCH LLC
TOWNSEND RANCH LLC
WOGAMON GARY A
WOGAMON GARY A
LESTER ARDITH & DONALD L & RONALD J
CALTRIDER DOUG & ZITA
CALTRIDER DOUGLAS C & ZITA R
TOWNSEND RANCH LLC

Sustainability Considerations

Alternative D-2 will replace a key component of water system infrastructure and is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. The current risk of contamination associated with the leaking and failing transmission main will be reduced with the implementation of this alternative.

Water and Energy Efficiency

Replacing the leaking transmission main will reduce pumping costs and eliminate unnecessary demand on the system, resulting in energy and water conservation.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project and surface conditions will be restored upon completion of construction activities. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-10 presents an estimated opinion of probable cost for Alternative D-2 which includes costs for construction, engineering, and administration. Overall, operation and maintenance costs are not expected to increase and in fact may decrease because of improvements. This report assumes no change to operation and maintenance costs.

Table 5-10 – Alternative D-2 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price(1)	Total
1	12-inch PVC Water Main	4,000	LF	$125.00	$500,000
2	12-inch Gate Valve	5	EA	$8,000.00	$40,000
3	12-inch Fittings	5	EA	$4,500.00	$22,500
4	HDPE Bore for Canal Crossing	150	LF	$250.00	$37,500
5	Gravel Surface Restoration	4,000	LF	$25.00	$100,000
6	Seed and Fertilize	1	LS	$8,000.00	$8,000
	Direct Construction Subtotal				**$708,000**
	Mobilization	10%			$71,000
	Traffic Control	1%			$7,000
	Construction Subtotal				**$786,000**
	2024 Construction Cost(2)	8.0%			$849,000
	Contingency	20%			$170,000
	Permitting				$5,000
	Land Acquisition				$2,500
	Geotechnical Investigation				$10,000
	Engineering Design	10%			$102,000
	Engineering Construction	10%			$102,000
	Grant Admin, Legal, & Administrative				$85,000
	TOTAL(3)				**$1,325,500**

(1)Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
(3)The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.6.3 Alt. D-3: Water Main Distribution Replacements

This alternative would replace all the remaining cast-iron, steel, and asbestos cement pipe in the system as well as replace all undersized pipe (less than 6-inches) with new PVC. Replacement is needed to eliminate pipe that has exceeded its useful life, reduce system leakage, improve fire flows, and reduce the threat of water line breaks. The total cost of performing all the distribution replacements at once would be cost prohibitive from an economic point of view, therefore, should this be the preferred alternative, a phased approach to pipe replacement will be necessary.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 are applicable to each alternative considered, but specifically the transmission main project will meet the requirements in Chapter 8 – Transmission

Mains, Distribution Systems, Piping & Appurtenances. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

Map

Figure 5-6 presents a map of the proposed water main distribution replacements that are part of Alternative D-3. It is assumed that all pipe identified for replacement will be replaced with the same diameter pipe as existing. In the case of undersized pipe (less than 6-inches), replacement pipe is assumed to be 6-inch PVC. Pipe size will be re-evaluated during final design and adjusted if necessary.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor. Existing water mains will be replaced within existing rights-of-way that have been previously disturbed.

This alternative involves water main replacement within right-of-way on Main Street which is a highway route owned by the Montana Department of Transportation (MDT). Construction within MDT right-of-way will require permitting that will be completed during preliminary design of the project.

Land Requirements

The water system improvements will occur in existing rights-of-way and no land acquisition is expected. Permitting will likely be required for water main replacements within MDT right-of-way.

Potential Construction Problems

There are no known construction problems or other conditions which may affect construction for this alternative. It will be important the contractor coordinates with local businesses and residents during construction. Traffic control will be required, and temporary water service will be provided where existing mains must be taken out of service during installation of the new mains.

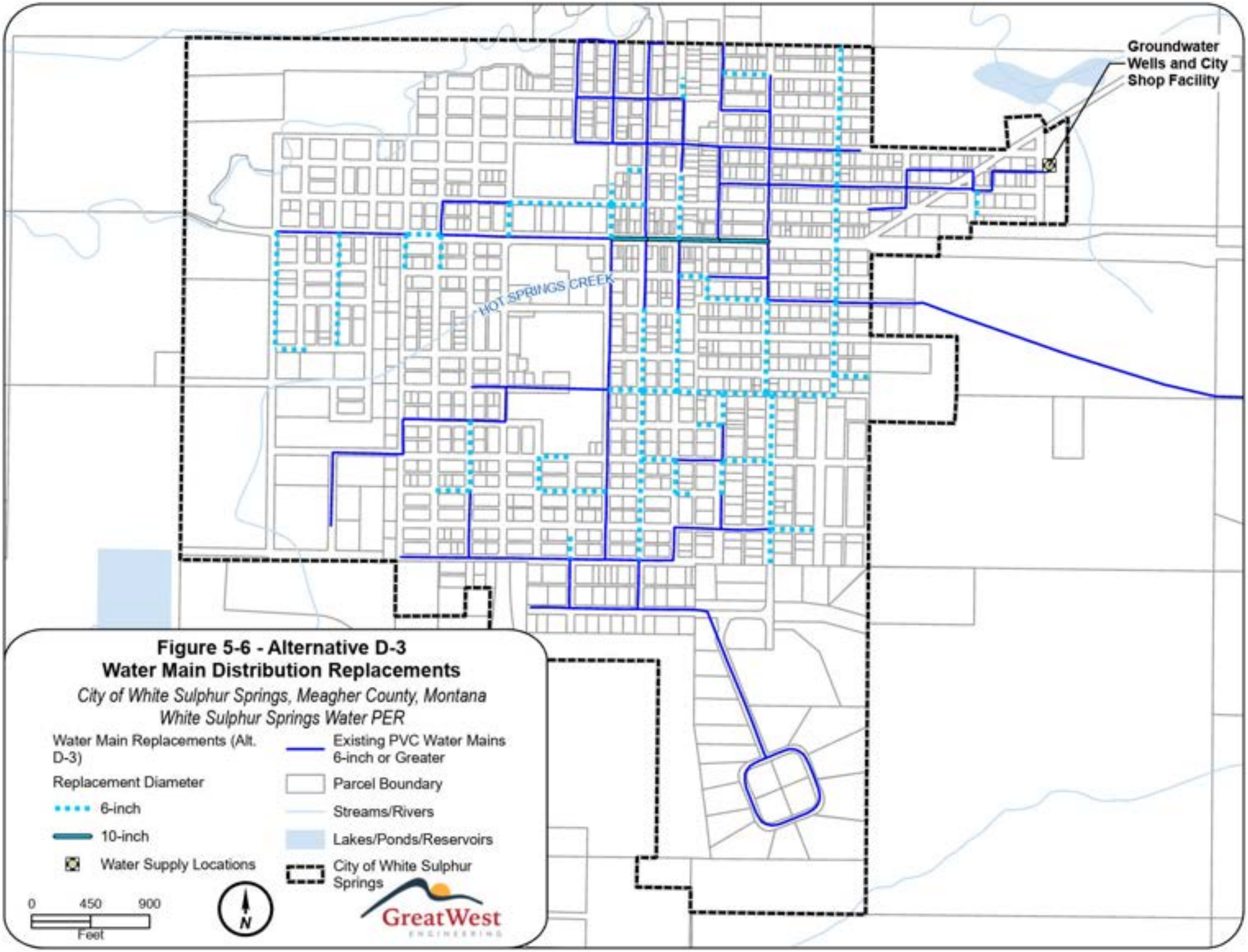


Figure 5-6 - Alternative D-3
Water Main Distribution Replacements
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER

Sustainability Considerations

Maintaining water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. The current risks of contamination associated with leaking and failing distribution mains and limited fire flow due to undersized mains will be reduced with the implementation of this alternative.

Water and Energy Efficiency

Replacing the cast iron, asbestos cement, and steel distribution mains may result in energy and water conservation by eliminating leaks in the aging distribution system. Reducing leakage will reduce pumping costs and eliminate unnecessary demand on the system, resulting in energy and water conservation.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project and surface conditions will be restored upon completion of construction activities. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-11 presents an estimated opinion of probable cost for Alternative D-3 which includes costs for construction, engineering, and administration. Overall, operation and maintenance costs are not expected to increase and in fact may decrease because of improvements. This report assumes no change to operation and maintenance costs.

Table 5-11 – Alternative D-3 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[1]	Total
1	Connect to Existing Water	45	EA	$2,900.00	$130,500
2	Exploratory Excavation	160	HR	$300.00	$48,000
3	6-inch PVC Water Main	20,100	LF	$110.00	$2,211,000
4	6-inch Gate Valve w/ Valve Box	65	EA	$2,300.00	$149,500
5	6-inch Fittings	150	EA	$940.00	$141,000
6	10-inch PVC Water Main	1,200	LF	$190.00	$228,000
7	10-inch Gate Valve	4	EA	$6,000.00	$24,000
8	10-inch Fittings	9	EA	$2,500.00	$22,500
9	6-inch Fire Hydrant with Gate Valve	30	EA	$8,700.00	$261,000
10	Water Service Connection, Curb Box and Valve	190	EA	$1,200.00	$228,000
11	Temporary Water Service	1	LS	$140,000.00	$140,000
12	3/4-inch PE Water Service	5,900	LF	$50.00	$295,000
13	Flowable Fill	1,010	CY	$170.00	$171,700
14	Type A Surface Restoration (Asphalt)	23,000	SY	$75.00	$1,150,000
15	Type B Surface Restoration (Aggregate)	500	SY	$20.00	$10,000
	Direct Construction Subtotal				**$5,210,000**
	Mobilization	10%			$521,000
	Traffic Control	1%			$52,000
	Construction Subtotal				**$5,783,000**
	2024 Construction Cost[2]	8.0%			$6,246,000
	Contingency	20%			$1,249,000
	Permitting				$40,000
	Geotechnical Investigation				$100,000
	Engineering Design	10%			$750,000
	Engineering Construction	10%			$750,000
	Grant Admin, Legal, & Administrative	3%			$225,000
	TOTAL[3]				**$9,360,000**

(1)Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
(3)The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

5.6.4 Alt. D-4: Water Main Looping

This alternative would install sections of 6-inch PVC throughout the city in an effort to eliminate existing dead-end water mains. The added water mains will create loops in the system which will both improve system hydraulics and reduce the potential for stagnant water that can occur in dead-end mains. Reducing stagnant water is beneficial to the system by improving water quality and potentially reducing flushing maintenance requirements. Additionally, fire flow availability will greatly improve with the addition of the loops as demonstrated in Figures 3-6 and 3-7.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 are applicable to each alternative considered, but specifically the transmission main project will meet the requirements in Chapter 8 – Transmission Mains, Distribution Systems, Piping & Appurtenances. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

Map

Figure 5-7 presents a map of the proposed water main distribution additions that are part of Alternative D-4. It is assumed that all pipe loops will be 6-inch diameter PVC. Pipe size will be re-evaluated during final design and adjusted if necessary.

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The generation of residuals and waste is expected to be minimal, and containment and disposal would be the responsibility of the contractor. Proposed water mains will be constructed within existing rights-of-way that have been previously disturbed.

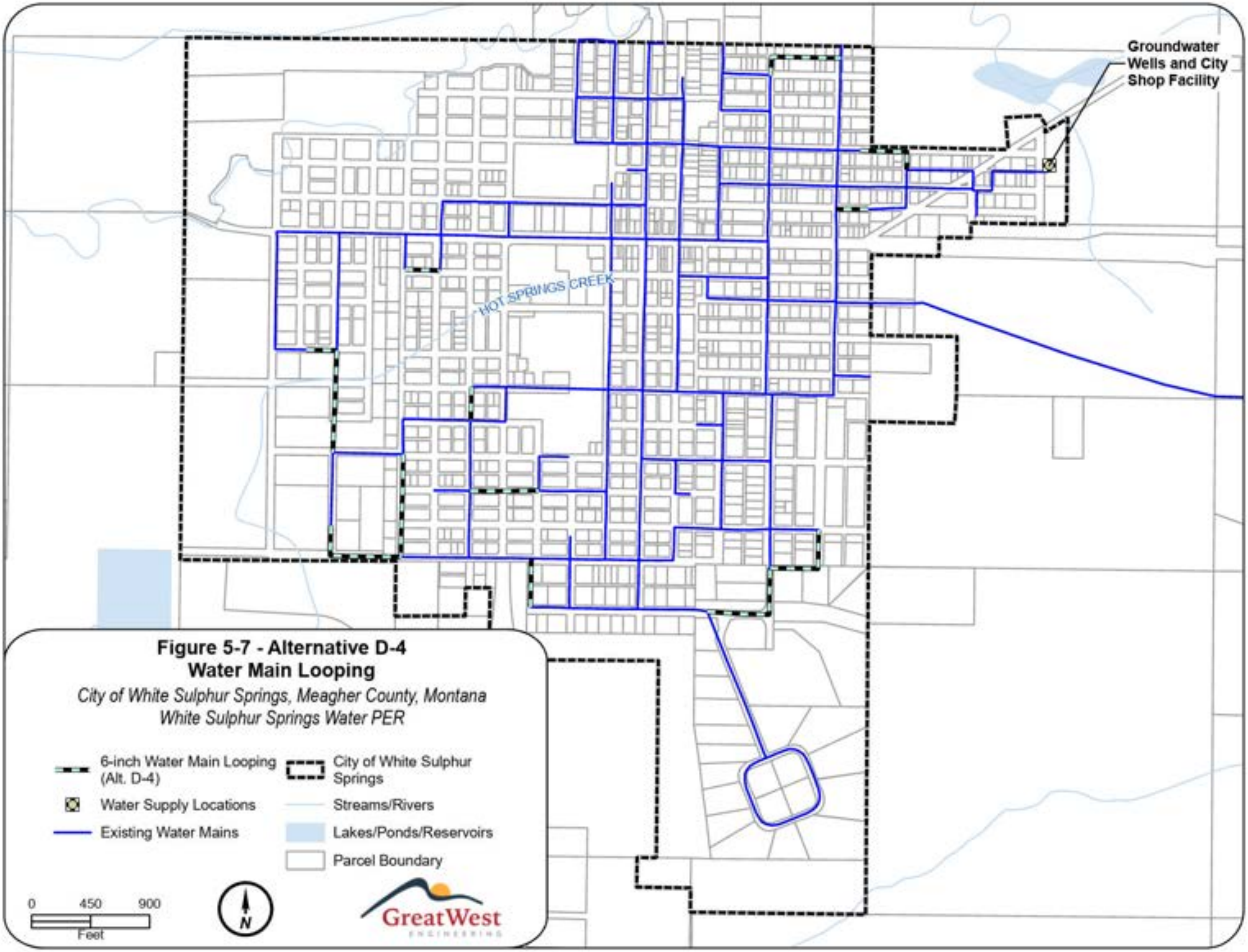
This alternative involves water main construction at the intersection of Highway 12 and Hancock Street. Highway 12/3rd Avenue SW is a highway route owned by the Montana Department of Transportation (MDT). Construction within MDT right-of-way will require permitting that will be completed during preliminary design of the project.

Land Requirements

The water system improvements will occur in existing rights-of-way and no land acquisition is expected. Permitting will likely be required for water main construction within MDT right-of-way.

Potential Construction Problems

There are no known construction problems or other conditions which may affect construction for this alternative. It will be important the contractor coordinates with local businesses and residents during construction. Traffic control will be required, and temporary water service will be provided where existing mains must be taken out of service during installation of the new mains.


Groundwater Wells and City Shop Facility
HOT SPRINGS CREEK
Figure 5-7 - Alternative D-4
Water Main Looping
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
6-inch Water Main Looping (Alt. D-4)
Water Supply Locations
Existing Water Mains
City of White Sulphur Springs
Streams/Rivers
Lakes/Ponds/Reservoirs
Parcel Boundary
0
450
900
Feet
N
GreatWest
ENGINEERING

Sustainability Considerations

Improving system water flow is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. The current risks of limited fire flow due and stagnant water due to dead-end mains will be reduced with the implementation of this alternative.

Water and Energy Efficiency

There will be no changes to the water and energy efficiency of the system as a result of these improvements.

Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project and surface conditions will be restored upon completion of construction activities. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-12 presents an estimated opinion of probable cost for Alternative D-4 which includes costs for construction, engineering, and administration. Table 5-13 presents an estimate of additional annual operation and maintenance costs associated with the project. Since Alternative D-4 adds on to the existing system, additional operation and maintenance can be expected due to labor associated with flushing hydrants and operation of water valves, plus additional mileage and vehicle maintenance for travel associated with regular monitoring by operations staff.

Table 5-12 – Alternative D-4 Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price[1]	Total
1	Connect to Existing Water	23	EA	$2,900.00	$66,700
2	Exploratory Excavation	50	HR	$300.00	$15,000
3	6-inch PVC Water Main	6,900	LF	$110.00	$759,000
4	6-inch Gate Valve w/ Valve Box	20	EA	$2,300.00	$46,000
5	6-inch Fittings	50	EA	$940.00	$47,000
6	6-inch Fire Hydrant with Gate Valve	10	EA	$8,700.00	$87,000
7	Water Service Connection, Curb Box and Valve	60	EA	$1,200.00	$72,000
8	Temporary Water Service	1	LS	$45,000.00	$45,000
9	3/4-inch PE Water Service	1,900	LF	$50.00	$95,000
10	Flowable Fill	50	CY	$170.00	$8,500
11	Type A Surface Restoration (Asphalt)	4,700	SY	$75.00	$235,000
12	Type B Surface Restoration (Aggregate)	2,900	SY	$20.00	$58,000
	Direct Construction Subtotal				**$1,534,000**
	Mobilization	10%			$153,000
	Traffic Control	1%			$15,000
	Construction Subtotal				**$1,702,000**
	2024 Construction Cost[2]	8.0%			$1,838,000
	Contingency	20%			$368,000
	Permitting				$10,000
	Geotechnical Investigation				$20,000
	Engineering Design	10%			$221,000
	Engineering Construction	10%			$221,000
	Grant Admin, Legal, & Administrative	3%			$66,000
	TOTAL[3]				**$2,744,000**

[1]Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[2]The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
[3]The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

Table 5-13 – Alternative D-4 Opinion of Probable O&M Costs

#	O&M Item	Quantity	Units	Unit Price	Total
1	Labor	40	HRS	$35.00	$1,400
2	Spare Parts/Repair/Maintenance	1	LS	$500.00	$500
3	Vehicle Operation and Maintenance	1	LS	$250.00	$250
	TOTAL				**$2,200**

6.0 SELECTION OF AN ALTERNATIVE

Each of the technically feasible alternatives considered meets the design criteria and applicable regulations identified in the alternative description. This section will examine advantages and disadvantages of each in terms of life cycle costs, operational and maintenance considerations, permitting concerns, social impacts, environmental impacts, and other non-monetary considerations.

6.1 Life Cycle Cost Analysis

The cost of extensive capital improvements to meet minimum health and safety requirements, applicable regulations, and environmental impacts is a great concern to small communities with limited budgets and resources. At the same time, some alternatives may have a low capital cost but high O&M costs that will put a continual burden on the community. A life cycle cost analysis provides a method to compare the costs of each alternative to one another.

To complete the life cycle cost analysis, the anticipated annual increase to O&M costs, and estimated salvage value of any improvements based upon a straight-line depreciation are converted to present day dollars using the “real” discount rate from Appendix C of OMB A-94. The “real” interest rate for a 20-year project is currently 2 percent. The useful life of the intake catwalk and flushing valve is assumed to be 50 years as well as all major pipelines and appurtenances for distribution and groundwater well improvements. Concrete work associated with the intake or treatment plant improvements is assumed to have a useful life of 75 years. Filter media, maintenance equipment, minor piping, and roadway components such as asphalt are assumed to have a useful life of 20 years while all electrical components and meters are assumed to have a useful life of 15 years. The net present value is then calculated for each alternative by adding the estimated capital cost and present worth of the increased O&M and then subtracting the present worth of the calculated salvage value.

Table 6-1 summarizes the 20-year life cycle cost analysis for the alternatives.

Table 6-1 – Life Cycle Cost Analysis

Alternative	Capital Cost	Annual Increase to O&M	Present Worth of O&M Increase(1)	20-Year Salvage Value	Present Worth of Salvage(2)	Net Present Worth	Criteria Score
Supply Alternatives							
S-2: Intake Pond Improvements	$541,000	$12,700	$207,700	$38,000	$25,600	$723,100	0.8
S-3: Groundwater Well Improvements	$124,000	$-	$-	$20,000	$13,500	$110,500	9.2
Treatment Alternatives							
T-3: Replace Filter Media	$861,000	$-	$-	$-	$-	$861,000	2.5
T-4a: Implement Scraping/Throw Over Cleaning Technique	$16,000	$-	$-	$-	$-	$16,000	10.0
T-4b: Implement Harrowing Cleaning Technique	$153,000	$-	$-	$-	$-	$153,000	5.1
T-5: Install Combined Filter Effluent Turbidimeter	$36,000	$-	$-	$(6,000)	$(4,100)	$40,100	6.9
T-6: Install Two New Slow Sand Filters	$1,905,000	$5,600	$91,600	$466,000	$313,700	$1,682,900	0.0
Distribution System Alternatives							
D-2: Replace 12-inch Transmission Main	$1,325,500	$-	$-	$360,000	$242,300	$1,083,200	9.3
D-3: Water Main Distribution Replacements	$9,360,000	$-	$-	$1,999,000	$1,345,300	$8,014,700	0.7
D-4: Water Main Looping	$2,744,000	$2,200	$36,000	$620,000	$417,300	$2,362,700	5.8

(1)In accordance with the Uniform Preliminary Engineering Report Outline, annual O&M costs are converted to present day dollars based on a uniform series present worth calculation using the "real" discount rate form the Office of Management and Budget (OMB) and a 20-year life cycle.
(2)Based on a single payment present worth calculation using the "real" discount rate and a 20-year life cycle.

6.2 Ranking Criteria

A matrix to compare each alternative objectively against the other will be developed to select the preferred alternative. Each alternative will be given a score ranging from 0 to 10 for a number of criteria, with 0 representing a negative impact and 10 representing the maximum benefit to the community. The alternatives will begin with a score of 5 for each criterion, and then the score will be adjusted up or down relative to the benefit of the particular alternative in relation to the other alternatives.

In addition to scoring each alternative, the criteria themselves with be weighted in relation to one another. Weighting factors ranging from 1 to 10 will be used to give greater importance to items such as cost. This is appropriate, as often times higher investments are made to overcome many other problems such as reliability or to mitigate problems with technical feasibility or environmental concerns.

6.2.1 Life Cycle Costs

The cost of extensive capital improvements to meet minimum health and safety requirements, applicable regulations, and environmental impacts is a great concern to small communities with limited budgets and resources. Life cycle costs also include anticipated increases to ongoing O&M costs. Accordingly, this criterion will be provided with the maximum weighting factor of 10. This represents over 30% of the total weighting. Public opinion is closely tied to cost also, giving the cost for each alternative even more weight.

In addition to providing the maximum emphasis on costs, a method must be utilized to provide an objective comparison of costs for each alternative relative to one another and not just an overall comparison. Given a range of costs for various alternatives, the relative cost of any alternative can be determined using the lowest cost and the highest cost from the range of costs and the following equation.

$$5 \times [(\text{Lowest Cost}) / (\text{Cost}) + (\text{Highest Cost} - \text{Cost}) / (\text{Highest Cost})]$$

For example, if a number of alternatives were compared having costs of \$500,000, \$1,000,000 and \$2,000,000, the above equation would provide scores of 8.8, 5.0, and 1.3, respectively. The utilization of a formula to score the 20-year life cycle costs in the matrix eliminates any subjectivity and provides a consistent, relative comparison of costs.

6.2.2 Operational and Maintenance Considerations

Operation and maintenance are an important issue when considering any large capital improvements within a small community. The costs for O&M associated with the alternatives is included in the 20-year life cycle costs compared under the financial feasibility, but there are other considerations that must be weighed for the O&M associated with each alternative.

The city has limited resources and manpower, and some alternatives may have O&M requirements that drastically tax those limited resources creating deficiencies in other areas. city personnel also have a much more intrinsic knowledge of the system than the average resident or even Council members. Priorities identified by the operators to facilitate the efficient operation of the system must be given some weight.

This criterion will be provided with a weighting factor of 7.

6.2.3 Permitting Issues

Some alternatives may encounter permitting issues that would significantly delay the project and/or result in additional expenses for the community. Consideration for these concerns will be given under this criterion.

This criterion will be provided with a weighting factor of 4.

6.2.4 Social Impacts

Social impacts will be considered in the final alternative selection as a project poorly supported by the community will have a limited chance of success. Efforts such as public hearings are ways to identify public opinion and perceptions. Costs are always a concern with consumers, but the health and safety of their families is just as important.

This criterion will be provided with a weighting factor of 10.

6.2.5 Environmental Impacts

Environmental impacts for each alternative, whether detrimental or beneficial, need to be considered in the final selection of a preferred alternative.

This criterion will be provided with a weighting factor of 5.

6.2.6 Sustainability Considerations

Sustainable utility management practices can greatly benefit a community and result in cost savings. Consideration will be given to alternatives benefitting the sustainability of the utility.

This criterion will be provided with a weighting factor of 4.

6.2.7 Land Acquisition

Issues with land acquisition often supersede the black-and-white world of engineering. This ranking category will include the feasibility of acquiring sufficient land in terms of lease, right-of-way, and/or land purchases. Although these are not strict engineering issues, problems with land acquisition can greatly impact a project's overall feasibility and require that land issues be given a very serious consideration.

This criterion will be provided with a weighting factor of 3.

6.3 Scoring of Supply Alternatives

Three alternatives were considered to address deficiencies related to the city's supply facilities. The No Action alternative is not scored. The alternatives in this section are:

- Alternative S-1: No Action
- Alternative S-2: Intake Pond Improvements
- Alternative S-3: Groundwater Well Improvements

6.3.1 Life Cycle Costs

The 20-year life cycle costs calculated for each alternative were entered into the equation in Section 6.2.1. Alternatives received the following scores:

- Alternative S-2 (Intake): 0.8
- Alternative S-3 (Groundwater): 9.2

6.3.2 Operational and Maintenance Considerations

The operational and maintenance considerations extend beyond those of total cost. The cost of O&M has already been considered as part of the life cycle costs, therefore this criteria is based on the actual work involved in the O&M of each alternative versus the cost of it.

Alternative S-2 will require some additional maintenance due to improved infrastructure that will require more frequent access to keep maintained and functional, as it is the city's desire to keep the Willow Creek surface source viable. Additional maintenance will be required to maintain the side-by-side vehicle and raw water turbidimeter at the intake dam. With improved access, personnel will be able to and should access the site more frequently for site visits, flushing, and removal of deadfall.

Alternative S-3 would require minimal changes to operation and maintenance, other than some minimal training to become familiar with the operation of the new flow meter. The operation of the groundwater source would be similar to existing other than with improved flow measurement capabilities, operators will devote less time to recording manual flow measurements.

The alternatives are scored as follows:

- Alternative S-2 (Intake): 3
- Alternative S-3 (Groundwater): 6

6.3.3 Permitting Issues

Alternative S-2 will require permitting and consultation with multiple agencies due to the location of the project within an environmentally sensitive area and due to the nature of the work which involves draining and dredging a surface water body. Alternative S-3 will not require permitting other than approval from DEQ prior to construction.

The alternatives are scored as follows:

- Alternative S-2 (Intake): 2
- Alternative S-3 (Groundwater): 5

6.3.4 Social Impacts

The Willow Creek source operates entirely by gravity and is a high-quality water source that many residents prefer in terms of taste. City personnel, Council members, and residents recognize the importance of maintaining the Willow Creek surface water source and have indicated strong preference in proceeding with construction of Alternative S-2 over any improvements to the groundwater system.

The alternatives are scored as follows:

- Alternative S-2 (Intake): 10
- Alternative S-3 (Groundwater): 5

6.3.5 Environmental Impacts

The potential for environmental impacts is higher with Alternative S-2 due to the location of the project in forested land and within surface water. The project will be required to mitigate impacts during and after construction to the Westslope Cutthroat Trout population, wetlands, surface water, and the existing intake facilities which may have historical significance. Implementation of the project will benefit the environment post-construction due to improved water quality within and downstream of Willow Creek reservoir. Environmental impacts from Alternative S-3 will be minimal other than temporary ground disturbance during construction.

The alternatives are scored as follows:

- Alternative S-2 (Intake): 2
- Alternative S-3 (Groundwater): 4

6.3.6 Sustainability Considerations

Alternative S-2 will provide a greater benefit in terms of sustainability since use of the Willow Creek surface source operates entirely by gravity. Improvements to the intake will allow the city continued use of the surface water source and less reliance on the pumped groundwater source, thereby reducing energy consumption. Alternative S-3 will have little impact on sustainability other than allowing the city to better manage its supply and account for water loss through improved metering capabilities.

The alternatives are scored as follows:

- Alternative S-2 (Intake): 10
- Alternative S-3 (Groundwater): 6

6.3.7 Land Acquisition

Neither supply alternative will require land acquisition, however Alternative S-2 will require landowner input and coordination during design since the project is accessed via easements on private land. The project must not adversely affect land use and function of the landowner’s property or adversely affect public lands. Alternative S-3 is located on city property.

The alternatives are scored as follows:

- Alternative S-2 (Intake): 4
- Alternative S-3 (Groundwater): 5

6.4 Scoring of Treatment Alternatives

Six alternatives were considered to address deficiencies related to the city's treatment facilities. The No Action alternative is not scored. Alternative T-2 is identical to Alternative S-2 and was scored in the previous section. The alternatives in this section are:

- Alternative T-1: No Action
- Alternative T-2: Reduce Algae and Turbidity Loads on WTP (Identical to Alternative S-2)
- Alternative T-3: Replace Filter Media
- Alternative T-4a: Implement Scraping/Throw Over Cleaning Technique
- Alternative T-4b: Implement Harrowing Cleaning Technique
- Alternative T-5: Install Combined Filter Effluent Turbidimeter
- Alternative T-6: Install Two New Sand Filters

6.4.1 Life Cycle Costs

The 20-year life cycle costs calculated for each alternative were entered into the equation in Section 6.2.1. Alternatives received the following scores:

- Alternative T-3 (Filter Media): 2.5
- Alternative T-4a (Scraping Technique): 10.0
- Alternative T-4b (Harrowing Technique): 5.1
- Alternative T-5 (Turbidimeter): 6.9
- Alternative T-6 (New Sand Filters): 0.0

6.4.2 Operational and Maintenance Considerations

The operational and maintenance considerations extend beyond those of total cost. The cost of O&M has already been considered as part of the life cycle costs, therefore this criteria is based on the actual work involved in the O&M of each alternative versus the cost of it.

Alternative T-3 is not expected to have an effect on operation and maintenance. Implementation of a new cleaning technique (scraping or harrowing) can be expected to reduce operation and maintenance slightly due to the implementation of mechanical techniques versus the hand raking technique that is currently used. Alternative T-5 will have minimal effect on operation and maintenance and Alternative T-6 will require some additional operation and maintenance labor due to cleaning and maintenance of additional filters.

The alternatives are scored as follows:

- Alternative T-3 (Filter Media): 5
- Alternative T-4a (Scraping Technique): 6
- Alternative T-4b (Harrowing Technique): 7
- Alternative T-5 (Turbidimeter): 5
- Alternative T-6 (New Sand Filters): 3

6.4.3 Permitting Issues

No anticipated permitting issues exist for the treatment alternatives. All alternatives received a score of 5 with the exception of Alternative T-4b. Implementation of the harrowing technique was scored lower since the alternative will require construction and associated additional permitting through DEQ for a wash water waste drying lagoon.

The alternatives are scored as follows:

- Alternative T-3 (Filter Media): 5
- Alternative T-4a (Scraping Technique): 5
- Alternative T-4b (Harrowing Technique): 3
- Alternative T-5 (Turbidimeter): 5
- Alternative T-6 (New Sand Filters): 5

6.4.4 Social Impacts

Public opinion for system improvements is often based on the maximum benefit received by the community that would increase monthly rates the least. The Willow Creek source operates entirely by gravity and is a high-quality water source that many residents prefer in terms of taste. City personnel, Council members, and residents recognize the importance of maintaining the Willow Creek surface water source and treatment plant. The city intends to begin evaluation of the treatment plant performance through implementation of some of the lower cost items such as evaluation the filter media and implementing a more effective cleaning technique. The turbidimeter and new sand filters are less important at this time. The city will only consider new sand filters as a last resort should the implementation of Alternatives T-3, T-4a, or T-4b prove insufficient to increase plant performance.

The alternatives are scored as follows:

- Alternative T-3 (Filter Media): 10
- Alternative T-4a (Scraping Technique): 9
- Alternative T-4b (Harrowing Technique): 8
- Alternative T-5 (Turbidimeter): 5
- Alternative T-6 (New Sand Filters): 3

6.4.5 Environmental Impacts

There are no significant environmental impacts with any of the treatment alternatives. The majority of alternatives will take place within the existing sand filter building enclosure. The harrowing technique and new sand filter alternatives were scored slightly lower due to additional disturbance that would occur outside of the building due to a new wash water drying lagoon and larger footprint associated with the new sand filters.

The alternatives are scored as follows:

- Alternative T-3 (Filter Media): 5
- Alternative T-4a (Scraping Technique): 5
- Alternative T-4b (Harrowing Technique): 4
- Alternative T-5 (Turbidimeter): 5
- Alternative T-6 (New Sand Filters): 4

6.4.6 Sustainability Considerations

All treatment alternatives will provide a greater benefit in terms of sustainability since use of the Willow Creek surface source operates entirely by gravity. Improvements to the treatment plant performance will allow the city continued use of the surface water source and less reliance on the pumped groundwater source, thereby reducing energy consumption. Alternative T-5 will have little impact on sustainability other than providing the city with improved monitoring capabilities.

The alternatives are scored as follows:

- Alternative T-3 (Filter Media): 10
- Alternative T-4a (Scraping Technique): 10

- Alternative T-4b (Harrowing Technique): 10
- Alternative T-5 (Turbidimeter): 5
- Alternative T-6 (New Sand Filters): 10

6.4.7 Land Acquisition

Neither treatment alternative will require land acquisition with the exception of Alternative T-6. Expansion of the sand filter treatment building has the potential to extend outside of the current easement footprint and may require negotiations as part of the project.

The alternatives are scored as follows:

- Alternative T-3 (Filter Media): 5
- Alternative T-4a (Scraping Technique): 5
- Alternative T-4b (Harrowing Technique): 5
- Alternative T-5 (Turbidimeter): 5
- Alternative T-6 (New Sand Filters): 4

6.5 Scoring of Distribution System Alternatives

Four alternatives were considered to address deficiencies related to the city's distribution system. The No Action alternative is not scored. The alternatives in this section are:

- Alternative D-1: No Action
- Alternative D-2: Replace 12-inch Transmission Main
- Alternative D-3: Water Main Distribution Replacements
- Alternative D-4: Water Main Looping

6.5.1 Life Cycle Costs

The 20-year life cycle costs calculated for each alternative were entered into the equation in Section 6.2.1. Alternatives received the following scores:

- Alternative D-2 (Transmission Main): 9.3
- Alternative D-3 (Distribution Replacements): 0.7
- Alternative D-4 (Looping): 5.8

6.5.2 Operational and Maintenance Considerations

It is very likely that O&M costs will be reduced with the implementation of distribution system improvements. The only distribution system alternative expected to slightly increase operation and maintenance is Alternative D-4 due to the construction of new mains the city will be required to maintain.

The alternatives are scored as follows:

- Alternative D-2 (Transmission Main): 8
- Alternative D-3 (Distribution Replacements): 8
- Alternative D-4 (Looping): 4

6.5.3 Permitting Issues

The transmission main project will likely require some stream permitting as the proposed pipeline will bore underneath the South Side Canal. Portions of the distribution improvements within the city will require permitting with MDT as portions of the proposed alignments are within MDT right-of-way.

The alternatives are scored as follows:

- Alternative D-2 (Transmission Main): 4
- Alternative D-3 (Distribution Replacements): 3
- Alternative D-4 (Looping): 4

6.5.4 Social Impacts

Implementing the water transmission and distribution system improvements would reduce leakage, reduce pumping costs, and improve fire flow in the system, providing benefit to the residents of White Sulphur Springs. The City Council has indicated preference in replacement of the leaking 1940s era transmission main over distribution replacements or water main looping within the city.

The alternatives are scored as follows:

- Alternative D-2 (Transmission Main): 10
- Alternative D-3 (Distribution Replacements): 8
- Alternative D-4 (Looping): 5

6.5.5 Environmental Impacts

Environmental impacts are expected to be minimal as water mains within the city will be replaced or constructed within existing rights-of-way. The transmission main was scored slightly lower due to the canal crossing and associated permitting.

The alternatives are scored as follows:

- Alternative D-2 (Transmission Main): 4
- Alternative D-3 (Distribution Replacements): 5
- Alternative D-4 (Looping): 5

6.5.6 Sustainability Considerations

Distribution and transmission system improvements are a sustainable utility management practice that will increase system reliability and safety, as well as reduce pumping and energy consumption due to water loss. Alternative D-2 provides the greatest benefit to sustainability as the transmission main is believed to be the largest source of leakage in the system. Alternative D-4 provides less benefit to sustainability since the project will not have an effect on reducing water loss but will greatly improve fire flows.

The alternatives are scored as follows:

- Alternative D-2 (Transmission Main): 10
- Alternative D-3 (Distribution Replacements): 9
- Alternative D-4 (Looping): 5

6.5.7 Land Acquisition

Land acquisition is not required for the distribution system alternatives as water mains will be replaced and constructed within existing rights-of-way with the exception of Alternative D-2. A portion of the transmission main will traverse private land and easement negotiations will be required for final placement of the water main.

The alternatives are scored as follows:

- Alternative D-2 (Transmission Main): 3
- Alternative D-3 (Distribution Replacements): 5
- Alternative D-4 (Looping): 5

6.6 Decision Matrix and Selection of Preferred Alternative

The scores and weighted scores for each alternative were compiled to provide a comparison using a decision matrix, presented in Table 6-2. At this time, the city has selected to replace the existing leaking transmission main (Alternative D-2). It is their intent to include intake and treatment improvements as a future phase in order to put the Willow Creek surface source back online. A detailed description of the preferred alternative is provided in Chapter 7.

Table 6-2 – Decision Matrix

Alternative	Life Cycle Costs		Operation and Maintenance		Permitting		Social Impacts		Environmental Impacts		Sustainability		Land Acquisition		TOTAL
	Weight:	10	Weight:	7	Weight:	4	Weight:	10	Weight:	5	Weight:	4	Weight:	3	
	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	
Supply Alternatives															
S-2	0.8	8	3.0	21	2.0	8	10.0	100	2.0	10	10.0	40	4.0	12	**199**
S-3	9.2	92	6.0	42	5.0	20	5.0	50	4.0	20	6.0	24	5.0	15	**263**
Treatment Alternatives															
T-3	2.5	25	5.0	35	5.0	20	10.0	100	5.0	25	10.0	40	5.0	15	**260**
T-4a	10.0	100	6.0	42	5.0	20	9.0	90	5.0	25	10.0	40	5.0	15	**332**
T-4b	5.1	51	7.0	49	3.0	12	8.0	80	4.0	20	10.0	40	5.0	15	**267**
T-5	6.9	69	5.0	35	5.0	20	5.0	50	5.0	25	5.0	20	5.0	15	**234**
T-6	0.0	0	3.0	21	5.0	20	3.0	30	4.0	20	10.0	40	4.0	12	**143**
Distribution Alternatives															
D-2	9.3	93	8.0	56	4.0	16	10.0	100	4.0	20	10.0	40	3.0	9	**334**
D-3	0.7	7	8.0	56	3.0	12	8.0	80	5.0	25	9.0	36	5.0	15	**231**
D-4	5.8	58	4.0	28	4.0	16	5.0	50	5.0	25	5.0	20	5.0	15	**212**

The above scoring and weighting are subjective. Alternatives that score overall within 10 points of each other may essentially hold the same degree of preference.

7.0 PROPOSED PROJECT

As discussed in Chapter 6, the preferred project is Alternative D-2. The preferred alternative will be discussed in this chapter.

7.1 Preliminary Project Design

The city has identified replacement of the 1940s era deteriorated steel transmission main as one of its top priorities due to concerns regarding the age of this pipe, the suspected large amounts of leakage from this pipe, and the threat of breaks among this pipe. The line has shown to be actively leaking with the leakage surfacing in the field. The city wishes to replace the 1946 steel line and re-align the main along Castle Mountain Road and along property lines in the adjoining subdivision.

This preferred alternative includes construction of approximately 4,000 lineal feet of new 12-inch PVC water transmission main from the water storage tank to the existing water main connection near the Townsend Ranch property line. The project will abandon the existing 1940's era steel transmission main which is known to be leaking excessively. The new PVC transmission main will deviate from the original 1940s alignment and will follow the Castle Mountain Road alignment as well as existing property lines in the adjoining subdivision. Easement negotiations will be required for this realignment with the goal to benefit property owners by re-aligning the water line along property lines versus the current alignment which traverses through the properties and potentially limits the owner's use of their properties. There will be no water services off of the new transmission main as the subdivision has its own drinking water source and is outside of the city limits. The project will include a pipeline bore underneath the South Side Canal.

The project will be designed in accordance with Circular DEQ 1 and will receive MDEQ approval prior to commencement of any construction activity.

Figure 7-1 presents a map of the proposed project.

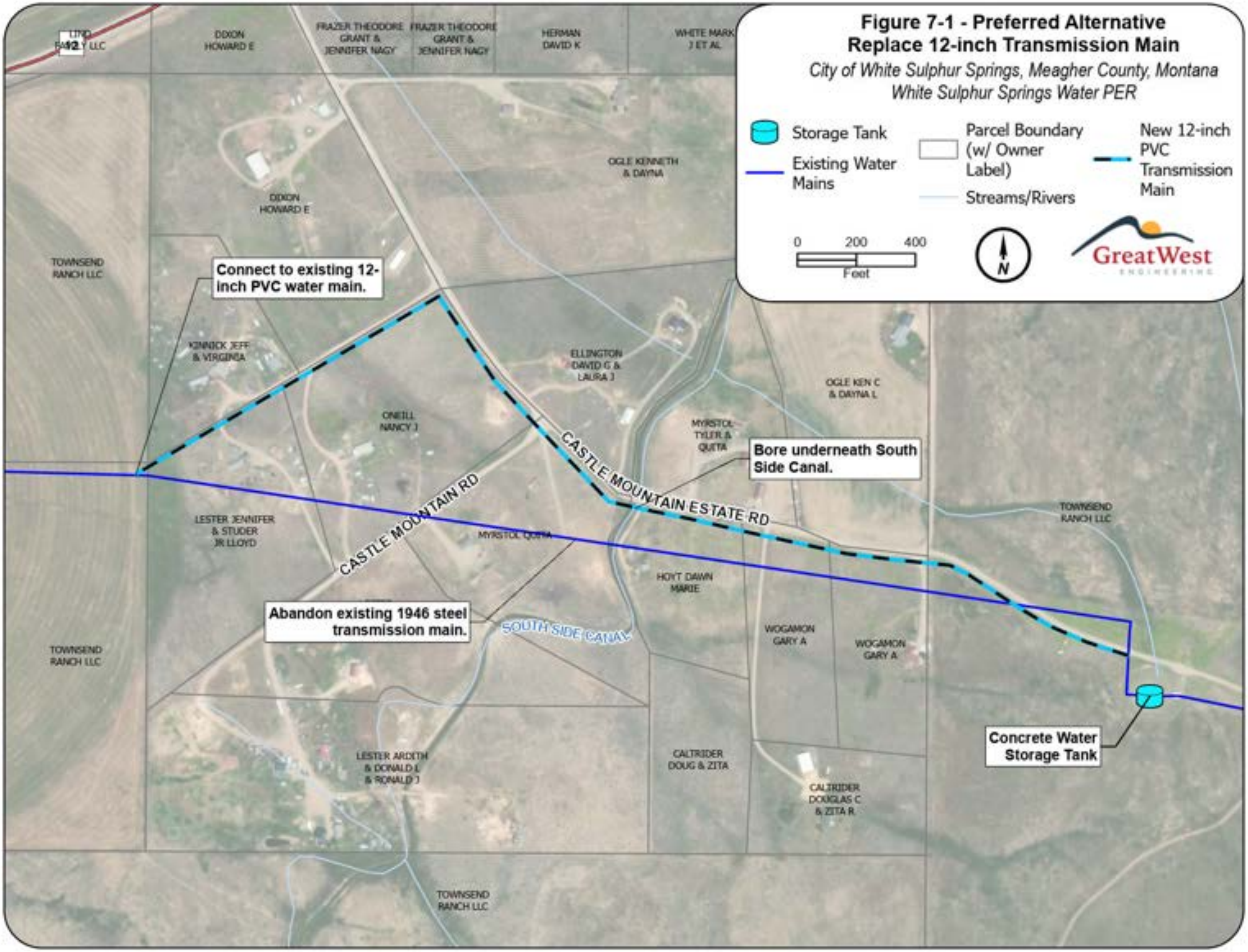


Figure 7-1 - Preferred Alternative Replace 12-inch Transmission Main

City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER

7.2 Project Schedule

Chapter 8 of this report includes a detailed implementation schedule. Tasks associated with implementation of the project include securing funding, easement negotiations, permitting, design, bidding, and construction. It is anticipated that permitting, easement negotiation, and design will commence in fall of 2023. Design plans and specifications for the water system improvements will be submitted to MDEQ and other required agencies for approval by the end of 2023 and bidding and construction for the project will take place in the winter and spring of 2024. Construction is anticipated to be completed by the end of 2024. It is likely this PER will then be updated to address intake and treatment plant deficiencies and used to support future funding applications.

7.3 Permit Requirements

The design phase of the project will include obtaining plans and specifications approval from the Montana Department of Environmental Quality Public Water Supply Section. The project will involve a bore underneath the South Side Canal which will likely require permitting from the Army Corps of Engineers for the crossing and other agencies as necessary to assure no adverse impacts to surface water quality or wetlands as a result of construction activities.

The proposed transmission main will be installed within the County road right-of-way of Castle Mountain Estate Road and may require permitting from the County and/or subdivision homeowner’s association for placement of the pipeline within the right-of-way. Additionally, easement negotiations will need to occur concurrently with the design process.

Construction permits will likely include a Stormwater Pollution Prevention Plan (SWPPP), which will be the responsibility of the selected contractor.

7.4 Sustainability Considerations

The preferred alternative will replace a critical component of water system infrastructure and is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits. The current risk of contamination associated with the leaking and failing transmission main will be reduced with the implementation of this alternative.

7.4.1 Water and Energy Efficiency

It is roughly estimated that the system loses approximately 40-50% of the water pumped into the system. The transmission main is believed to be the biggest source of leakage in the system and operators report the line has shown to be actively leaking with the leakage surfacing in the field. Replacing the leaking transmission main will reduce pumping costs and eliminate unnecessary demand on the system, resulting in energy and water conservation.

7.4.2 Green Infrastructure

The project will have little impact on post-construction stormwater management as there will be no impervious areas created as a result of the project and surface conditions will be restored upon completion of construction activities. Erosion and sediment control measures will be implemented during construction to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

7.5 Total Project Cost Estimate

Table 7-1 presents an estimated opinion of probable cost for the preferred alternative which includes costs for construction, engineering, and administration.

Table 7-1 – Preferred Alternative Opinion of Probable Cost

#	Bid Item	Quantity	Units	Unit Price(1)	Total
1	12-inch PVC Water Main	4,000	LF	$125.00	$500,000
2	12-inch Gate Valve	5	EA	$8,000.00	$40,000
3	12-inch Fittings	5	EA	$4,500.00	$22,500
4	HDPE Bore for Canal Crossing	150	LF	$250.00	$37,500
5	Gravel Surface Restoration	4,000	LF	$25.00	$100,000
6	Seed and Fertilize	1	LS	$8,000.00	$8,000
	Direct Construction Subtotal				**$708,000**
	Mobilization	10%			$71,000
	Traffic Control	1%			$7,000
	Construction Subtotal				**$786,000**
	2024 Construction Cost(2)	8.0%			$849,000
	Contingency	20%			$170,000
	Permitting				$5,000
	Land Acquisition				$2,500
	Geotechnical Investigation				$10,000
	Engineering Design	10%			$102,000
	Engineering Construction	10%			$102,000
	Grant Admin, Legal, & Administrative				$85,000
	TOTAL(3)				**$1,325,500**

(1)Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
(2)The ENR average Construction Cost Index is +8.0% (as of January 2022), so capital costs are projected to an anticipated construction date in 2024 using an 8% inflation rate.
(3)The total cost estimate is a Class 5 Estimate as defined by the Association for the Advancement of Cost Engineering.

7.6 Annual Operating Budget

The system's annual operating budget was discussed in Chapter 3, and potential impacts to O&M costs were discussed for each alternative. The following sections will summarize this information for ease of reference. Appendix U can be referenced for detailed records from the city.

7.6.1 Income

The main source of revenue for the water system is the collection of water sales in the form of water rates. Users are charged a flat fee of $42.87 plus an additional usage fee based on the amount of gallons used each month. This rate structure has been in place since 2018. The city does not currently use a rate structure based on water meter size.

Revenue from the collection of water rates for recent years was discussed in Section 3.5 of this report and on average is about $392,000 per year. The projected income as a result of the user rate increase that is proposed for the transmission main project is approximately $32,303 annually, or $4.18 per month per equivalent dwelling unit (EDU).

7.6.2 Annual O&M Costs

O&M costs are not anticipated to increase with the proposed project and may in fact be reduced with proposed improvements due to less power required for pumping costs. If the city does recognize a cost savings, the extra funds can be used to pay down the debt that will result from this project or to further build a reserve account for future system improvements.

Current O&M costs are approximately $250,000 per year, excluding debt service payments. O&M costs are currently covered by the existing water rates.

7.6.3 Debt Repayments

The city is currently paying on four SRF drinking water loans to cover costs for water projects that date back to 2012. The combined average annual payment for the existing four bonds is approximately $119,000. The total proposed financing for this project includes a $268,792 SRF loan. The estimated annual debt service for the loan is $19,569. The loan payments will be covered through user fees which will increase as necessary to cover the additional loan payments. The proposed funding package is discussed further in Chapter 8.

7.6.4 Reserves

Debt Service Reserve

As shown on the coverage calculation included within Appendix U, the highest existing debt service payment is expected to be $121,133 occurring in fiscal year 2026. Assuming a 10% loan coverage, the highest total existing annual debt service cost is $133,246.

The proposed funding scenario for the transmission main project will include a fifth low-interest loan from the Drinking Water State Revolving Fund. SRF requires a 10% bond reserve to be maintained on loan funds. The estimated debt service annual reserve amount for this project is $19,569, bringing the total proposed debt service cost to approximately $153,000.

Short-Lived Asset Reserve

Short-lived assets are water system components that are typically replaced every 15 years or less and are not associated with projects that are usually funded with long-term capital financing. Examples of short-lived assets include parts such pumps, pump motors and controls, telemetry, meters, meter boxes, vaults, lids, access hatches, and other small equipment. Table 7-2 provides a summary of estimated short-lived asset costs for components within the White Sulphur Springs water system. It is recommended the city have an annual reserve of at least $25,000 to fund replacement of short-lived assets.

Table 7-2 – Short-Lived Assets

Short-Lived Asset	Replacement Cost	Useful Life/Service Required	Annual Contribution
Computer equipment/software/office supplies	$1,500	5	$300
Tank cleaning and inspection	$10,000	5	$2,000
Chemical feed system ($5,000 x 2)	$10,000	10	$1,000
Tank mixer	$10,000	10	$1,000
Tank vents, access hatches	$5,000	10	$500
Telemetry control system	$15,000	10	$1,500
Well source flow meter	$5,000	10	$500
Emergency generator	$15,000	15	$1,000
Fencing	$10,000	15	$667
Individual water meters ($250 x 623)	$155,750	15	$10,383
New pump motors ($4,500 x 2)	$9,000	15	$600
New well pumps ($10,000 x 2)	$20,000	15	$1,333
Pump control upgrades ($5,000 x 2)	$10,000	15	$667
Turbidimeters ($6,000 x 5)	$30,000	15	$2,000
Valving at treatment plant	$7,500	15	$500
Valving at well site	$7,500	15	$500
Vehicle replacement	$15,000	15	$1,000
		Total Annual Contributions	**$25,450**

8.0 CONCLUSIONS AND RECOMMENDATIONS

The previous sections of this report have focused on the need for the project, physical and socioeconomic characteristics of the community, project costs, and the technical viability. This section will focus on the financial strategy and implementation schedule. One of the main goals of a comprehensive PER is to provide a workable funding plan for recommended improvements included in the preferred alternative. This section will discuss available funding sources as well as develop various funding scenarios. Ultimately, a preferred funding scenario will be selected and further analyzed along with an associated implementation plan.

8.1 Funding

Due to the high cost of the proposed improvements, the City of White Sulphur Springs plans to pursue outside assistance to fund the project in the form of grants and loans. Prior to examining the funding sources available to the city, it is important to understand the concept of “Target Rate” as established by the Montana Department of Commerce (MDOC). The target rate is used to determine if a municipality is paying its fair share of a project’s cost. To apply for grant funding from the MDOC, user rates after completion of the project must meet or exceed the established target rates.

The target rates are calculated as a percentage of the median household income (MHI) for the municipality, as listed in the 2019 American Community Survey. The MDOC has determined, based on surveying communities that have undergone recent upgrades to their water and/or wastewater systems that the “fair share” of cost per user after completing a project should be approximately 1.4% of the median household income for water only, 0.9% for wastewater only, or 2.3% for water and wastewater combined.

According to the MDOC’s website, the MHI for the City of White Sulphur Springs is $41,458 and the target rate for the combined water and sewer system is $79.46. The existing average water rate for the city is $47.94 and the existing sewer rate is $42.00. The current combined rate of $89.94 is 113% of the target rate, prior to implementation of this project. Appendix W includes MHI and target rate information for White Sulphur Springs.

8.1.1 Funding Sources

The following sections provide a brief description of the potential funding sources and whether or not the City of White Sulphur Springs would be eligible for those funds.

Montana Coal Endowment Program (MCEP)

MCEP is a state funded grant program, which is administered by the Montana Department of Commerce (MDOC). MCEP provides financial assistance to local governments for infrastructure improvements. Grants can be obtained from MCEP for up to $500,000 if the projected user rates are less than 125% of the target rate, for up to $625,000 if projected user rates are between 125% and 150% of the target rate, and for up to $750,000 if the projected user rates are over 150% of the target rate. MCEP grant recipients are required to match the grant dollar for dollar, but the match may come from a variety of sources including other grants, loans, or cash contributions.

The proposed project is eligible for MCEP funds. The city's user rates are currently 113% of the target rate for the community. With the existing rates, the city is eligible for a $500,000 MCEP grant. Additionally, the focus of the MCEP program is public health and safety. Preserving the integrity of the city's water transmission system is vital to protecting public health and safety of the White Sulphur Springs residents. A new transmission main will greatly reduce the threat of main breaks and backflow contamination of the water system.

The use of MCEP grant funding was ultimately not selected in the city's preferred funding strategy for this project due to timing of the availability of grant funds. MCEP grant applications are only accepted every other year, in the spring of even numbered years. If applied for, MCEP funds for this project would not become available until spring of 2025. The city prefers to pursue an alternate funding package that would allow for earlier design and construction of the transmission main project.

Renewable Resource Grant and Loan Program (RRGL)

RRGL is a state program that is funded through interest accrued on the Resource Indemnity Trust Fund and the sale of Coal Severance Tax Bonds and is administered by the Montana Department of Natural Resources and Conservation (DNRC). The primary purpose of the RRGL is to enhance Montana's renewable resources. For public facilities projects that conserve, manage, develop, or protect renewable resources, grants of up to $125,000 are available.

The proposed project will be promoting the city's water conservation efforts by eliminating leaking transmission system components. This will also promote energy conservation in that less pumping will be required if the leaks are reduced. Replacing deteriorated infrastructure will greatly reduce wasted water and improve the city's competitiveness in obtaining up to $125,000 of grant funds through the DNRC-RRGL program.

The use of RRGL grant funding was ultimately not selected in the city's preferred funding strategy for this project due to the timing of the availability of grant funds. Similar to MCEP, RRGL grant applications are only accepted every other year, in the spring of even numbered years. If applied for, RRGL funds for this project would not become available until spring of 2025. The city prefers to pursue an alternate funding package that would allow for earlier design and construction of the transmission main project.

Community Development Block Grant (CDBG)

CDBG is a federally funded program that is also administered by the Montana Department of Commerce (MDOC). The primary purpose of CDBG funds is to benefit low to moderate income (LMI) families. Hence, a municipality must have an LMI of 51% or greater. This is usually determined by the current Census. However, under certain circumstances, the MDOC may allow an income survey to be completed (such as there have been major economic changes since the Census or if a community is only slightly under the required LMI percentage).

The maximum CDBG grant award is $750,000 with a limit of $20,000 per LMI household, so a community needs 37 LMI households to apply for the maximum grant funds. The use of CDBG funds require a 25% local match that can be provided through cash funds, loans, or a combination thereof.

The City of White Sulphur Springs has an LMI of 50.8%, which is below the required LMI of 51%. The community does not qualify for CDBG funding and does not wish to pursue an income survey at this time. The preferred funding strategy assumes no CDBG funds will be available for the transmission main project.

State Revolving Fund (SRF)

SRF provides low-interest loan funds for both water and wastewater projects through the Drinking Water State Revolving Fund (DWSRF) and the Water Pollution Control State Revolving Fund (WPCSRF), respectively. The SRF program is administered by the Montana Department of

Environmental Quality and the DNRC. Current loan terms include an interest rate of 2.5% for a 20-year period. In some instances, SRF has approved a 30-year term. The loan requires a debt service reserve (1/2-year payment) and requires 10% annual loan coverage.

SRF also has a limited amount of “principal forgiveness” funds available for projects. For water projects, 75% or up to $750,000 of SRF funding for a project may include principal forgiveness, depending on the availability of funds.

The preferred funding strategy utilizes a 20-year SRF loan of $268,792 with $750,000 in loan forgiveness.

USDA Rural Development (RD)

RD provides grant and loan funding to municipalities for water and wastewater projects that improve the quality of life and promote economic development in Rural America. Municipalities with a population of less than 10,000 are eligible to apply, though; priority is given to those with a population of less than 5,500.

Grant eligibility and loan interest rates are based on the community’s median household income (MHI) and user rates. If the area to be served has a MHI of $50,894 or lower and the project is necessary to alleviate a health and/or sanitation concern, up to 75% of the project costs are grant eligible. Up to 45% of the project costs are grant eligible if the planning area has an MHI between $50,894 and $63,617.

RD currently offers the following loan interest rates, effective until January 1, 2024:

- Poverty – 2.375%. A community qualifies for the poverty rate if its median household income (MHI) is less than $50,894 and the project is needed to alleviate a health and/or sanitary problem (potential threat not eligible).
- Intermediate – 3.125%. Applies to communities with an MHI greater than $50,894 and less than $63,617 without an existing health and/or sanitary problem. This rate also applies to communities with an MHI less than $50,894 and no documented health and/or sanitary problem.
- Market – 3.875%. Applies to communities with an MHI greater than $63,617.

The RD program uses MHI data from the 2021 American Community Survey 5-Year Estimates. According to this data, the city’s MHI is $67,631. White Sulphur Springs qualifies for the market rate for loan interest rates, and they are not eligible for a grant through RD. A larger loan is required from RD than SRF, therefore, the city is interested in pursuing SRF instead of RD.

Montana Coal Board

The Coal Board provides grant funding to municipalities to adequately provide for the expansion of public services or facilities needed as a direct consequence of coal development activities. There is no maximum limit to the amount the Coal Board can fund, but available funding is very limited so it can be difficult to receive any funds from the Coal Board, especially large sums.

White Sulphur Springs is not within the region the Coal Board identifies as impacted by the coal industry and cannot associate an impact due to coal development with the proposed project, thus a Coal Board grant will not be pursued.

Economic Development Administration (EDA)

EDA provides grant funding for projects that are demonstrated to be needed for the placement of a new business. The amount of grant is dependent on the number of jobs created.

The city will not pursue an EDA grant. The proposed project will not create many jobs and thus would not be competitive in this program.

INTERCAP

INTERCAP provides loan funds at a low cost, variable interest rate to local governments. INTERCAP is administered by the Montana Board of Investments and is very flexible in the variety of funding, which would include both water and wastewater projects. There is no funding cycle (funds are always available), however, the maximum loan term is 15 years.

Due to the relatively large amount of financing required, an INTERCAP loan with the shorter loan term would cause an undesirable increase in user rates for the residents and is not recommended for long-term financing.

American Rescue Plan Act (ARPA)

ARPA funding was made available to Montana communities through the March 11, 2021, American Rescue Act (H.R. 1319). The act generally aided Montana communities in two different ways:

- ARPA Local Fiscal Recovery Funds (LFR) – The act provided direct assistance from Treasury to towns, cities, and counties. Direct assistance was given to local governments in two tranches. The first tranche became available in June 2021, and the second in June 2022. The funds can be used for various purposes, including water and sewer infrastructure.
- ARPA Minimum Allocation Grants (MAG) – The act appropriated $463 million to the State of Montana. The State of Montana, through House Bill 632, allocated $150 million of the appropriation to towns, cities, districts, and counties through the Minimum Allocation grant process that was developed in Montana's 2021 legislative session through House Bill 632. Minimum Allocation Grants can be used for water and sewer infrastructure and must be committed by January 1, 2023. A commitment of funds requires local governments to have all matching funds for the proposed project in place by January 1, 2023.

The city has dedicated its Local Fiscal Recovery Funds for other uses. The city submitted an ARPA MAG application in November 2022 and has dedicated $306,708 for the proposed water transmission main project.

8.1.2 Funding Strategy

Table 8-1 shows various funding strategies for the proposed project. The potential funding scenarios are:

- Scenario 1 – ARPA MAG, DNRC Grant, MCEP Grant, and RD Loan (3.875% for 40 years)
- Scenario 2 – ARPA MAG, SRF Loan Forgiveness, and SRF Loan (2.5% for 20 years)
- Scenario 3 – ARPA MAG, DNRC Grant, MCEP Grant, SRF Loan Forgiveness, and SRF Loan (2.5% for 20 years)

The city's preferred funding package and that recommended by this PER includes:

- ARPA MAG: $306,708
- SRF Loan Forgiveness: $750,000
- SRF Loan: $268,792

With the proposed funding package, water rates are anticipated to increase by approximately $4 per month per EDU. Using the preferred Scenario 2 as a basis, a detailed project budget is presented in Table 8-2, which provides a breakdown of each of the line item costs by funding source.

8.2 Implementation

The city submitted an ARPA MAG application in November 2022 and will submit an SRF application in November 2023. Upon securing all funding, the project start-up for the grant programs is expected to be about a two-month process. It is anticipated that final design and approvals would be completed by February 2024 and bidding could take place in March 2024. Commencement of construction activities is anticipated to start in June 2024. Table 8-3 provides a summary of the project implementation schedule.

Table 8-1 – Funding Scenarios for Water System Improvements

ITEM	SCENARIO #1	SCENARIO #2	SCENARIO #3
Preferred Alternative Project Cost	**$1,325,500**	**$1,325,500**	**$1,325,500**
ARPA MAG (City & County Combined)	$306,708	$306,708	$306,708
DNRC Grant	$125,000		$125,000
MCEP Grant	$500,000		$500,000
RD Grant or SRF Loan Forgiveness		$750,000	$295,344
RD or SRF Loan	$393,792	$268,792	$98,448
Total Project Funds	**$1,325,500**	**$1,325,500**	**$1,325,500**
SRF Bond Reserve (1/2-year payment)		$8,615	$3,155
Total Loan Amount	**$393,792**	**$277,407**	**$101,603**
Annual Loan Payment	$19,540	$17,790	$6,520
Total Loan Payments Over Life of Loan	$781,600	$355,800	$130,400
Total Interest Paid Over Life of Loan	**$387,808**	**$78,393**	**$28,797**
Annual Loan Coverage	$1,954	$1,779	$652
TOTAL ANNUAL CAPITAL DEBT	**$21,494**	**$19,569**	**$7,172**
User Capital Cost/Month(1)	**$2.78**	**$2.53**	**$0.93**
Current Annual O&M(2)	$250,000	$250,000	$250,000
Current Annual Debt Service(3)	$133,246	$133,246	$133,246
Additional O&M Due To Project	$0	$0	$0
TOTAL ANNUAL O&M COSTS	**$383,246**	**$383,246**	**$383,246**
User O&M Cost/Month(1)	**$49.59**	**$49.59**	**$49.59**
TOTAL USER COST/MONTH(1)	**$52.37**	**$52.12**	**$50.52**
Existing Average User Cost/Month/EDU	$47.94	$47.94	$47.94
COST/MONTH INCREASE/EDU	**$4.43**	**$4.18**	**$2.58**
Existing Other System Cost/Month	$42.00	$42.00	$42.00
Total Proposed Water & Sewer	$94.37	$94.12	$92.52
Combined Systems Target Rate	$79.46	$79.46	$79.46
PERCENT OF COMBINED TARGET	**119%**	**118%**	**116%**

(1)Based on 644 EDUs.
(2)Based on analysis of last four years actual expenditures.
(3)Based on highest calculated coverage calculation - SRF Debt Service Schedule on Current Drinking Water Loans

Table 8-2 – Project Budget

ADMINISTRATIVE/FINANCIAL COSTS	Source ARPA MAG	Source: SRF A	Source: SRF B	Total
Grant & Loan Administration Services	$20,000	$10,000		**$30,000**
Legal Costs		$2,000		**$2,000**
Audit Fees	$15,000			**$15,000**
Loan Reserves			$8,000	**$8,000**
Bond Counsel and Related Costs			$30,000	**$30,000**
TOTAL ADMINISTRATIVE/FINANCIAL COSTS	**$35,000**	**$12,000**	**$38,000**	**$85,000**
CONSTRUCTION RELATED ACTIVITY COSTS:				
Permitting and Land Acquisition	$7,500			**$7,500**
Geotechnical Investigation	$10,000			**$10,000**
Engineering - Design, Bidding, Post Construction	$102,000			**$102,000**
Engineering - Construction Management & RPR	$102,000			**$102,000**
Construction	$50,208	$618,319	$180,473	**$849,000**
Contingency		$119,681	$50,319	**$170,000**
TOTAL ACTIVITY COSTS	**$271,708**	**$738,000**	**$230,792**	**$1,240,500**
TOTAL PROJECT COSTS	**$306,708**	**$750,000**	**$268,792**	**$1,325,500**

Table 8-3 – Project Implementation Schedule

Action	Date
Public Hearing on Draft PER & EA	March 2023
Prepare Final PER	March – October 2023
Submit SRF Application	November 2023
Finalize Grant Financing	December 2023
Begin Design	September 2023
Design Basis Report/Cost Estimates to the Town	November 2023
Submit Design Plans and Specifications to MDEQ	December 2023
MDEQ Review & Approval	February 2024
Advertise for Bids	March 2024
Start Construction	June 2024
Complete Construction	December 2024

9.0 REFERENCES

Census and Economic Information Center – GIS Resources. Montana Department of Commerce. Retrieved on 11/18/2022 from https://ceic-mtdoc.opendata.arcgis.com/search?tags=dec

Census and Economic Information Center Income and Poverty. Montana Department of Commerce. Retrieved on 3/17/23 from https://ceic.mt.gov/People-and-Housing/Income-and-Poverty

City of White Sulphur Springs & Meagher County Consolidated City/County Growth Policy. February, 2021. https://www.whitesulphurspringsmontana.com/documents/77/Consolidated_City_County_Growth_Policy_-_February_2021__3.pdf

Clean Water Act Information Center (CWAIC) 2020. Montana Department of Environmental Quality. Retrieved on 3/17/23 from https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id=708aae89f060403db2710378ac4945f0

Clean Water Act Information Center (CWAIC) Water Quality Use Class Map. Montana Department of Environmental Quality. Retrieved on 3/17/23 from https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id=507f07b69b7c4d69bd855fb2b78ef9e7

Collins, Robin M., T. Taylor Eighmy, and James P. Malley Jr. “Evaluating Modifications to Slow Sand Filters.” Journal AWWA. (1991): 62-70.

FEMA Flood Map Service Center: Search by Address. FEMA. Retrieved on 3/17/23 from https://msc.fema.gov/portal/search?AddressQuery=White%20Sulphur%20Springs%2C%20Montana#searchresultsanchor

IPaC Information for Planning and Consultation. U.S. Fish & Wildlife Service. Retrieved on 3/16/23 from https://ipac.ecosphere.fws.gov/location/index

Low- and Moderate-Income Area Data Map Application, based on 2011-2015 ACS. US Department of Housing and Urban Development. Retrieved on 3/18/23 from https://hud.maps.arcgis.com/apps/webappviewer/index.html?id=ffd0597e8af24f88b501b7e7f326bedd

Montana Department of Environmental Quality Circular DEQ-1 Standards for Water Works. 2022.

Montana Department of Environmental Quality Source Water Protection Program. White Sulphur Springs Public Water System Source Water Delineation and Assessment Report PWSID # MT0000360. 2002.

Montana Department of Environmental Quality Source Water Protection Program. Source Water Protection Plan City White Sulphur Springs Public Water Supply PWSID # MT0000360. 2015.

Montana Department of Environmental Quality Surface Water Regulations Summary. May 2010.

Montana Groundwater Information Center Water Well Data. Montana Bureau of Mines and Geology (MBMG). Retrieved on 3/16/23 from https://mbmgftp.mtech.edu/#/gwic/

Montana Natural Heritage Program. Environmental Summary Report for Latitude 46.47856 to 46.59148 and Longitude -110.76008 to -110.96478. Retrieved on 3/15/2023.

Montana Sage Grouse Habitat Conservation Map. Montana Sage Grouse Habitat Conservation Program. Retrieved on 10/18/22 from https://sagegrouse.mt.gov/ProgramMap

National Interagency Fire Center Wildland Fire Interagency Geospatial Services. Wildland Fire Incident Locations | Wildland Fire Incident Locations | National Interagency Fire Center (arcgis.com)

National Integrated Drought Information System. https://www.drought.gov/states/montana/county/Meagher

Natural Heritage Map Viewer for Land Cover and Land Management. Montana Natural Heritage Program. Retrieved on 3/14/23 from http://mtnhp.org/MapViewer/

Natural Heritage Map Viewer for Wetland and Riparian Mapping. Montana Natural Heritage Program. Retrieved on 3/17/23 from http://mtnhp.org/MapViewer/

Web Soil Survey. United States Department of Agriculture Natural Resources Conservation Service. Retrieved on 3/14/23 from https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Appendix A

Uniform Environmental Checklist

Environmental Checklist

Environmental Checklist Prepared by: On: 10/24/2023

Jessica Salo, PE	Great West Engineering, Inc.
Name of Person 1	Organization
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Phone Number	Email
Casey Bereszniewicz	Great West Engineering, Inc.
Name of Person 2	Organization
978-460-3785	cbereszniewicz@greatwesteng.com
Phone Number	Email

Click or tap here to enter text.

List additional people above. Include organization, phone number and email for all.

As the engineer that prepared the preliminary engineering report, I _Jessica Salo, PE__________________________,

(print name of engineer)

have reviewed the information presented in this checklist and believe that it accurately identifies the environmental resources in the area and the potential impacts that the project could have on those resources. In addition, the required state and federal agencies were provided with the required information about the project and requested to provide comments on the proposed public facility project. Their comments have been incorporated into and attached to the Preliminary Engineering Report.

Engineer's Signature: Jessica L. Salo

Date: 10/24/23

Physical Environment			
Impact Code	Impact Type	Permits/ Mitigation Required?	Explanation of Impact to Resource

1. Soil Suitability, Topographic and/or Geologic Constraints (example: soil slump, steep slopes, subsidence, seismic activity)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Topography in the area is primarily gently rolling hills which slope to the northwest. Slopes are not excessive or unstable. Soils characteristics vary depending on location within the planning area. Soils are generally classified as loam (clay loam, gravelly loam, sandy loams, and silt loams). There are no identified soil or topographical constraints, and the area is not a high seismic area. Preferred Alternative Environmental Narrative: Water system improvements will generally require a geotechnical engineering site evaluation and report to provide specific guidance for construction. There are no identified soil or topographic issues with construction of the backup generator project and this portion of the project does not require a geotechnical evaluation.
2. Hazardous Facilities (example: power lines, hazardous waste sites, acceptable distance from explosive and flammable hazards including chemical/petrochemical storage tanks, underground fuel storage tanks, and related facilities such as natural gas storage facilities and propane storage tanks)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: According to the Montana DEQ Interactive GIS map, there are some abandoned hard rock mine areas near the intake facility, a resolved petroleum release and junk vehicle site in the general vicinity of the subdivision east of the City, and several other regulated storage tanks, petroleum release sites, and Superfund facilities located within the City limits. There are also existing powerlines in the project area that the Contractor will be made aware of in the design plans. Preferred Alternative Environmental Narrative: The new distribution system pipes within the City may be installed adjacent to some of these locations. The project specifications will provide special provisions for soil and groundwater handling, removal and imported backfill requirements should contaminated soils be encountered.
3. Surrounding Air Quality (example: dust, odors, emissions)			
☐ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: There are no current/existing air quality concerns in the City of White Sulphur Springs. Preferred Alternative Environmental Narrative: There is an expected temporary negative impact on the air quality during construction due to dust and equipment emissions. Prudent measures will be taken to reduce the impact. There will be no long-term effects to the surrounding air quality from the proposed projects.

4. Groundwater Resources and Aquifers (example: quantity, quality, distribution, depth to groundwater, sole source aquifers)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Montana's Groundwater Information Center (GWIC) was used to collect information on groundwater in the planning area and well information was acquired in spatial format through the Montana State Library. The average depth of wells in the area is 101 feet below ground surface. The average static water level is 36 feet below ground surface with an average yield of 52 gallons per minute. Most of the wells in the vicinity are domestic, monitoring, or stockwater wells. There is a grouping of domestic wells within the rural subdivision one mile east of the city in the proximity of where a potential transmission main project would occur. According to well log data, these wells are approximately 130 feet deep with surface water levels ranging from 40 to 90 feet below ground surface. White Sulphur Springs obtains municipal water supply from two groundwater wells located at the City shop facility at the northeastern edge of the city limits. The two city wells are positioned approximately 20 feet apart, are both 200 feet deep, have static water levels of approximately 20 feet below ground surface, and yield 1,000 gpm and 200 gpm respectively, according to the well log data. The drinking water wells for White Sulphur Springs have sufficient quantity and the quality is generally good. Groundwater from both wells is disinfected using chlorine gas since both wells have static water tables less than 25 feet. The GWIC well data also revealed two additional wells within the city limits that are classified as public water supply. These two wells as associated with the Spa Hot Springs Motel located at the center of the city and these wells are the source of geothermal water for the swimming pools. Preferred Alternative Environmental Narrative: There is the potential to encounter groundwater during construction of water system improvements. Groundwater could be a concern during construction, especially if construction takes place during the spring when the groundwater table is at its highest or in the late summer/fall when groundwater is influenced from irrigation practices. Encountering groundwater is not uncommon during construction projects and will be accounted for as part of the project cost. Further, the location of existing groundwater wells will be examined carefully during design of any water system improvements and the contractor will be responsible for developing a pollution prevention plan that details planned contamination avoidance techniques in place during construction. Therefore, groundwater will not be adversely impacted by construction activities.

<table>
<tr><th colspan="4">5. Surface Water/Water Quality, Quantity and Distribution (example: streams, lakes, storm runoff, irrigation systems, canals)</th></tr>
<tr>
<td>☒ No Impact
☒ Beneficial
☐ Adverse</td>
<td>☒ Direct
☐ Indirect
☐ Cumulative</td>
<td>☒Permit
☐Mitigation
☐ NA</td>
<td><u>Current Conditions:</u>
Surface water within the planning boundary generally consists of the Willow Creek Reservoir, South Fork of Willow Creek, Willow Creek, Pinchout Creek, Hot Springs Creek, and the North Fork of the Smith River. The South Side Canal also runs through the rural subdivision one mile east of the city. In addition to the two groundwater wells, the South Fork of Willow Creek also provides drinking water to the city of White Sulphur Springs.

Surface water quality information was obtained from DEQ's Clean Water Act Information Center (CWAIC) website and interactive maps. Montana classifies its waters according to present and future beneficial uses they are expected to support. The South Fork of Willow Creek is classified as A-1 use which is considered high-quality with the principal beneficial use of public water supply. All other surface waters in the planning area are classified as B-1. Both A-1 and B-1 waters are to be maintained suitable for drinking water after conventional treatment, recreation, agriculture, industry, and propagation of salmonid fishes and associated aquatic life. The only difference between A-1 and B-1 class is that B-1 water must support beneficial use for drinking water after conventional treatment while A-1 water must support beneficial use for drinking water after conventional treatment for removal of naturally occurring impurities only. Beneficial uses for the surface waters within the planning area are not currently threatened or impaired with the exception of the North Fork of the Smith River. The most recent CWIAC surface water report was completed in 2020 and documents that the North Fork of the Smith River in the planning area is not fully supporting the beneficial use of primary contact recreation and a TMDL is required to address the factors causing the impairment or threat.

The city is concerned with the quality of water in Willow Creek in terms of turbidity. Willow Creek Reservoir is currently built up with sediment and appears to be affecting the quality of water which flows into the intake collection system to the treatment plant. There are current operational deficiencies at the intake dam which prevent the city from being able to properly operate a flushing valve to eliminate the sediment. As a result, the city has not been able to reliably use the Willow Creek source for the past two to three years.
<u>Preferred Alternative Environmental Narrative:</u>
Proposed improvements at the intake dam would take place within Willow Creek Reservoir and Creek. Environmental permitting would be required as part of the construction project and all appropriate approvals would be obtained from FWP, DEQ, U.S. Army Corps of Engineers (USACE), and other</td>
</tr>
</table>

			agencies as necessary to assure no adverse impacts to surface water quality as a result of construction activities. Overall, intake improvements have the potential to improve water quality through reduction of turbidity. Water system improvements in other parts of the planning area will implement appropriate storm water pollution prevention measures during construction to eliminate sediment transport to nearby surface waters and minimize disturbance to affected surface waters.
6. Floodplains and Floodplain Management (Identify any floodplains within one mile of the boundary of the project.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: A review of the Federal Emergency Management Agency (FEMA) flood map service center reveals there is one flood map for the White Sulphur Springs area. The map indicates there is a small portion of the northwestern corner of the city limits within the 100-year floodplain of the North Fork of the Smith River. The area within the unincorporated portions of Meagher County is unmapped and no flood insurance rate maps currently exist. Preferred Alternative Environmental Narrative: Based on existing water system mapping, there are currently no water lines within the floodplain area of the northwestern city limits and no planned water system improvements in this location at this time. The potential for floodplain disturbance will be considered carefully, however, during preliminary design. If any floodplains will be impacted by the proposed project, all appropriate permits will be obtained prior to construction of the improvements.

7. Wetlands (Identify any wetlands within one mile of the boundary of the project and state potential impacts.)			
☐ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☒ Permit ☐ Mitigation ☐ NA	Current Conditions: Mapped riparian and wetland areas of Montana are provided by the Montana Natural Heritage Program. Mapped wetland areas fall within the planning area. Most of the mapped wetlands are associated with the North Fork of the Smith River in the northwestern corner of the city limits and the upper reaches of Willow Creek near the intake facility. There are also a few isolated small emergent wetlands located throughout the planning area. The wetlands directly adjacent to the North Fork of the Smith River are classified as palustrine emergent wetland characterized by erect, rooted herbaceous vegetation present during most of the growing season and palustrine scrub-shrub wetland which is dominated by woody vegetation less than 20 feet tall. The wetlands within the planning area adjacent to Willow Creek are riparian forested and riparian scrub-shrub wetland characterized by woody vegetation that can be greater than 20 feet tall. Preferred Alternative Environmental Narrative: Improvements at the intake could likely impact wetlands. There would also be a stream/canal crossing if the transmission main is replaced within the rural residential subdivision east of the city, near the existing storage tank. Precautions will be taken during construction to prohibit any sedimentation or other potential adverse impact on the wetlands. A site-specific wetlands inventory will be conducted prior to construction for all stream crossings or low-lying areas. (CWA Section 404 permit likely)

8. Agricultural Lands, Production, and Farmland Protection (example: grazing, forestry, cropland, prime or unique agricultural lands) Identify any prime or important farm ground or forest lands within one mile of the boundary of the project.

☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The Montana Natural Heritage Program (MNHP) map viewer was used to determine land cover and land management within the planning boundary and surrounding areas of White Sulphur Springs. Land use within the planning boundary and outside of the city limits of White Sulphur Springs is primarily ranchland and farmland. Areas that are not cultivated for crops are generally sagebrush shrubland or foothill grasslands. There is some National Forest land surrounding the Willow Creek intake reservoir at the southeast end of the planning area and some floodplain and riparian systems adjacent to Willow Creek. There is a semi-developed rural residential area within the planning area, approximately one mile east of the city limits. This residential area consists of approximately 15 lots ranging in size from five to 15 acres. Developed areas with the city limits of White Sulphur Springs are comprised primarily of low-intensity residential and commercial areas. Land ownership within the planning area is primarily private. The Helena-Lewis and Clark National Forest surrounds the Willow Creek intake and diversion structure, although the intake facilities are located on private land. The transmission main from the intake to the city limits traverses private land, with a large portion of the private land also designated as a conservation easement managed by the Montana Land Reliance. There are several parcels within the city limits owned by local government entities such as Meagher County and the City of White Sulphur Springs. Water distribution mains within the city limits are principally located within street rights-of-way. Farmland classifications within the planning area were determined from the United States Department of Agriculture's (USDA) National Resources Conservation Service (NRCS) Web Soil Survey online database. Most of the planning area is not classified as prime farmland. The area in the central/southeast city limits is classified as prime farmland if irrigated. Small, isolated segments along the intake transmission main are classified as farmland of statewide importance and one other small area along the intake transmission main is classified as prime farmland. Preferred Alternative Environmental Narrative: If water distribution system improvements are made, temporary disturbance will occur mostly in previously disturbed areas within the city limits. If water system transmission main, treatment system, storage tank, or intake improvements are made, temporary disturbance will occur within the privately owned rural residential area and agricultural land east and southeast of the city. Landowner input and coordination will be important during final design, so any project does not adversely affect land use and function of the landowner's property.

			Areas of disturbance will be restored to original conditions to the greatest extent possible upon completion of construction. Ultimately, the project will result in minimal change in land use and minimal adverse impacts to land resources. Any water system improvements constructed southeast of town will generally preserve the open space and maintain the rural character of the land.
9. Vegetation and Wildlife Species and Habitats, Including Fish (example: terrestrial, avian and aquatic life and habitats)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Wildlife in White Sulphur Springs and surrounding areas primarily consists of small and large mammals such as deer, antelope, coyote, rabbit, skunk, rodents and others, fish such as trout, and numerous species of birds. Preferred Alternative Environmental Narrative: Any disturbance associated with distribution, transmission main, treatment system, or storage infrastructure water system improvements will be temporary in nature. All disturbed areas will be restored to nearly existing conditions upon completion of construction. Overall, minimal adverse impacts to biological resources are anticipated

10. Unique, Endangered, Fragile, or Limited Environmental Resources, Including Endangered Species (example: plants, fish or wildlife)			
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☐ NA	Current Conditions: The Montana Species of Concern (SOC) include one fish species (Westslope Cutthroat Trout), two mammal bat species (Little Brown Myotis and Long-eared Myotis), and ten bird species (Bobolink, Brewer's Sparrow, Cassin's Finch, Clark's Nutcracker, Evening Grosbeak, Great Blue Heron, Greater Sage-Grouse, Green-tailed Towhee, Long-billed Curlew, and Verry). The planning area falls within sage grouse general habitat. The USFWS Information for Planning and Consultation (IPaC) report identifies potentially affected species in the area such as the Canada lynx, North American Wolverine, Monarch butterfly, Whitebark Pine, and several migratory birds including the Bald Eagle. FWP noted the native Westslope Cutthroat Trout population upstream of the diversion structure on Willow Creek and stressed the high conservation value of this species. FWP requested that any improvements to the diversion structure not promote or enable additional fish passage upstream. Additionally, FWP would prefer enhancement of the structure to prevent all passage of non-native fish with the goal to preserve the integrity of the upstream Westslope Cutthroat Trout population. Preferred Alternative Environmental Narrative: Any disturbance associated with distribution, transmission main, treatment system, or storage infrastructure water system improvements will be temporary in nature. All disturbed areas will be restored to nearly existing conditions upon completion of construction. Overall, minimal adverse impacts to biological resources are anticipated Potential improvements to the diversion or intake facilities on Willow Creek will involve close consultation with FWP and other agencies to assure conservation of the Westslope Cutthroat Trout population and other affected biological species.
11. Unique Natural Features (example: geologic features)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The only known unique natural feature in the planning area are the hot springs that White Sulphur Springs is named for. The two groundwater wells for the hot springs are located at the center of the city. Preferred Alternative Environmental Narrative: The only project that would be in the vicinity of the hot springs would be potential water line replacement on Main Street. The location of the wells will be carefully examined during design of the water system improvements on Main Street.

12. Access to, and Quality of, Recreational and Wilderness Activities, Public Lands and Waterways (including Federally Designated Wild & Scenic Rivers), and Public Open Space			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The eastern extent of the project, by the Willow Creek intake, is U.S. Forest Service land with multiple recreation and wilderness activities. There is no existing public access point to the National Forest through the planning area. Preferred Alternative Environmental Narrative: There is no anticipated impact to access or quality of recreational and wilderness activities, public lands, waterways and open spaces associated with water system improvements.
Human Environment			
Impact Code	**Impact Type**	**Resource**	
1. Visual Quality – Coherence, Diversity, Compatibility of Use and Scale, Aesthetics			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Current conditions consist of developed residential and commercial conditions within the City of White Sulphur Springs. Conditions outside of the City are characteristic of a rural, agricultural landscape with rolling hills and distant mountainous features. Preferred Alternative Environmental Narrative: The proposed project will not impact visual quality. The majority of water system construction will be buried and there are no proposed permanent features that will significantly alter existing visual quality.
2. Nuisances (example: glare, fumes)			
☐ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Current conditions consist of developed residential and commercial conditions within the City of White Sulphur Springs. Conditions outside of the City are characteristic of a rural, agricultural landscape with rolling hills and distant mountainous features. Preferred Alternative Environmental Narrative: During construction there will be temporary nuisances such as dust, fumes, and noise. Measures will be taken to reduce these nuisances. There will be no permanent nuisance impacts from the proposed improvements.

3. Noise – Suitable Separation Between Housing and Other Noise Sensitive Activities and Major Noise Sources (example: aircraft, highways and railroads.)			
☐ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Current conditions consist of developed residential and commercial conditions within the City of White Sulphur Springs. Conditions outside of the City are characteristic of a rural, agricultural landscape with rolling hills and distant mountainous features. Preferred Alternative Environmental Narrative: During construction, nearby residential and commercial areas will be affected by some noise such as large trucks and equipment. The proposed backup generators for the water and wastewater systems may produce some noise, however, the generators are only anticipated for use during a power outage and will not be routinely used. There will be no long-term noise impacts from this proposed project.
4. Historic Properties, Cultural, and Archaeological Resources			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: SHPO conducted a file search for the project area and determined there have been several previously recorded historic sites within the area relating to historic residences, architecture, homestead/farmsteads, commercial development, railroads, a courthouse, irrigation systems, a school, and mining. Four of the listed sites provided by SHPO were identified as currently being listed in the National Register of Historic Places. SHPO recommends that any found structure over fifty years old be considered historic and potentially eligible for listing in the National Register of Historic Places. A found structure over fifty years old should be recorded and assessed prior to any disturbance taking place. SHPO did express concern over the fact the Willow Creek diversion and intake structures may be over fifty years old. SHPO asked that these structures be recorded prior to any rehabilitation taking place through further site investigation and coordination with SHPO. Preferred Alternative Environmental Narrative: It is not anticipated that cultural properties will be impacted by improvements to the water system. The work to the diversion and intake structures will proceed through coordination with SHPO to assure proper documentation of any historic structures.

5. Changes in Demographic (Population) Characteristics (example: quantity, distribution, density)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The City has experienced decline in population since 1980 but population over the last thirty years has remained relatively unchanged. Preferred Alternative Environmental Narrative: There will be no impacts to the demographics from the proposed project. The proposed project is designed to sustain the needs of the community. The implementation of water system improvements will make the community a more desirable place to live, however, a noteworthy change in population is not anticipated. The project is designed to accommodate a 1% annual growth rate over the next 20 years.
6. General Housing Conditions – Quality, Quantity, Affordability			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Current conditions consist of developed residential and commercial conditions within the City of White Sulphur Springs. Conditions outside of the City are characteristic of a rural, agricultural landscape with rolling hills and distant mountainous features. Meagher County has an established housing coalition working on ways to improve housing conditions in the area. Preferred Alternative Environmental Narrative: Proposed water system improvements will have no general effect on housing conditions although having a reliable, safe, water system may make the community a more desirable place to live.
7. Businesses or Residents (example: loss of, displacement, or relocation)			
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☐ NA	Current Conditions: Current conditions consist of developed residential and commercial conditions within the City of White Sulphur Springs. Conditions outside of the City are characteristic of a rural, agricultural landscape with rolling hills and distant mountainous features. Preferred Alternative Environmental Narrative: Some residents and businesses may be temporarily impacted during construction. There are no anticipated permanent impacts of loss of, displacement, or relocation for the proposed project. In the long-term, businesses and residents will benefit from fewer service disruptions as a result of improved infrastructure.

8. Public Health and Safety			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The city has clear, identifiable issues present in their water system related to health, sanitation, and security. The city currently has no backup source of power for their water system wells or wastewater lift station. The city also experiences a high amount of water system leakage due to old cast iron mains which not only wastes a valuable resource but also increases the threat of backflow contamination of the drinking water source. Deficiences at the intake and treatment facilities currently limit use of the surface water source which threatens the reliability of the city's overall drinking water sources. Preferred Alternative Environmental Narrative: Improving the current water system will have beneficial impacts to the public health and safety of the community. Water system improvements will reduce health risks and risk of failures of the current system.
9. Local Employment – Quantity or Distribution of Employment, Economic Impact			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Several local businesses, hotels, restaurants, and retail stores are located within the city. Preferred Alternative Environmental Narrative: The proposed projects have the potential to result in significant direct capital expenditures in the local economy. During construction, workers would strengthen the economy by spending money on food, lodging, and other recreational activities. The contractor may also look to hire local help for various construction positions.
10. Income Patterns – Economic Impact			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: According to the 2015-2019 American Community Survey (ACS) 5-Year estimates, the median household income in the City of White Sulphur Springs is $41,458 and 14.4 percent of its residents live below the poverty level. The low to moderate income (LMI) percentage for White Sulphur Springs is 50.8 percent. Preferred Alternative Environmental Narrative: The proposed projects will have no long-term effects on income patterns.
11. Local and State Tax Base and Revenues			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Several local businesses, hotels, restaurants, and retail stores are located within the city. The city's tax base has not experienced notable growth in recent years. Preferred Alternative Environmental Narrative: Benefits from the proposed improvements will create a more dependable system thus potentially creating growth in the residential and commercial industries in the area.

<table>
<tr><td colspan="4">12. Community and Government Services and Facilities (example: educational facilities; health and medical services and facilities; police; emergency medical services; and parks, playgrounds and open space)</td></tr>
<tr><td>☐ No Impact
☒ Beneficial
☐ Adverse</td><td>☐ Direct
☐ Indirect
☒ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
The community consists of existing educational facilities, a hospital and medical center, library, police and emergency services, several parks, and open spaces.
<u>Preferred Alternative Environmental Narrative:</u>
The proposed projects will have a beneficial effect on the community and government facilities by creating a more dependable system that is vital to a community.</td></tr>
<tr><td colspan="4">13. Commercial and Industrial Facilities – Production and Activity, Growth or Decline</td></tr>
<tr><td>☐ No Impact
☒ Beneficial
☐ Adverse</td><td>☐ Direct
☐ Indirect
☒ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
Commercial buildings and small businesses rely on the existing water system for their water needs.
<u>Preferred Alternative Environmental Narrative:</u>
The proposed project will have a beneficial effect on the commercial and industrial facilities by creating a more dependable system that is vital to a community. Commercial or industrial facilities would likely be severely compromised if they lost their source of water supply.</td></tr>
<tr><td colspan="4">14. Social Structures and Mores (example: standards of social conduct/social conventions)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☐ Direct
☐ Indirect
☐ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
The whole community is dependent on the existing water infrastructure.
<u>Preferred Alternative Environmental Narrative:</u>
There are no anticipated impacts to social structures or mores.</td></tr>
<tr><td colspan="4">15. Land Use Compatibility (example: growth, land use change, development activity, adjacent land uses and potential conflicts)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☐ Direct
☐ Indirect
☐ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
Land use within the planning boundary and outside of the city limits of White Sulphur Springs is primarily ranchland and farmland. Areas that are not cultivated for crops are generally sagebrush shrubland or foothill grasslands. There is some National Forest land surrounding the Willow Creek intake reservoir at the southeast end of the planning area and some floodplain and riparian systems adjacent to Willow Creek. There is a semi-developed rural residential area within the planning area, approximately one mile east of the city limits. This residential area consists of approximately 15 lots ranging in size from five to 15 acres. Developed areas with the city limits of White Sulphur Springs are comprised primarily of low-intensity residential and commercial areas.
<u>Preferred Alternative Environmental Narrative:</u>
The proposed projects are not anticipated to create any substantial changes in land use in either the adjacent areas or the service area within the city.</td></tr>
</table>

16. Energy Resources – Consumption and Conservation			
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	<u>Current Conditions:</u> The existing water system utilizes energy for treatment and conveyance needs. Average day use based on the source meter data is 242,537 gpd. Average day use based on individual meter data is 120,487 gpd, indicating that over 122,000 gpd, or 50% of the water pumped into the system is lost or unaccounted for. As a rule of thumb, any amount of lost and unaccounted for water greater than 10 to 15% is considered excessive. Typically, water lost or unaccounted for in a system is the result of leaks, unmetered uses, inaccurate meters, and/or flushing of fire hydrants. In White Sulphur Springs, the largest known source of unaccounted for water is leaking transmission and distribution mains. <u>Preferred Alternative Environmental Narrative:</u> Water distribution and transmission main replacements will greatly reduce the operational energy that is currently lost. The project will benefit energy resources, as a significant amount of water is currently being lost due to leakage. The addition of backup generators will have little effect on energy resources. Improvements at the intake and treatment facility will increase the operational efficiency of these facilities but should not have a notable effect on energy resources as these facilities operate via gravity.

17. Solid Waste Management			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	<u>Current Conditions:</u> The city provides solid waste management. <u>Preferred Alternative Environmental Narrative:</u> There will be no impact to solid waste management from the proposed water projects.

18. Wastewater Treatment – Sewage System			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	<u>Current Conditions:</u> The city maintains a wastewater collection and treatment system. <u>Preferred Alternative Environmental Narrative:</u> There will be no impact to the wastewater system as a result of the proposed water projects.

19. Storm Water – Surface Drainage			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	<u>Current Conditions:</u> Storm drainage generally flows to the northwest as overland flow. There is no storm sewer/inlet system. Several roads within the city are unpaved. <u>Preferred Alternative Environmental Narrative:</u> Stormwater drainage and discharge may be temporarily impacted by construction activities. No long-term impacts are anticipated. The contractor will be required to manage excess runoff from construction activities via a Stormwater Pollution Prevention Plan (SWPPP) if necessary.

20. Community Water Supply			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☐ NA	<u>Current Conditions:</u> The White Sulphur Springs existing water system includes the intake diversion structure, intake dam, slow sand filter building, storage tank, transmission main, well locations, and distribution system. There are deficiencies at the intake dam, slow sand filter, wells, and leaking transmission and distribution mains. There is currently no backup power source for the groundwater wells. <u>Preferred Alternative Environmental Narrative:</u> There will be numerous beneficial impacts from the proposed water projects including improving health and safety, removing deficiencies, updating an aging infrastructure, and adding emergency power.
21. Fire Protection – Hazards			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☐ NA	<u>Current Conditions:</u> The City has a local fire department and maintains the water infrastructure including fire hydrants. The city's water system is used for fire protection. <u>Preferred Alternative Environmental Narrative:</u> The proposed improvements will improve water conveyance and provide new hydrants which will increase the reliability of the system and its ability to provide fire protection. The addition of backup power will allow the system to maintain it's fire protection capabilities throughout a power outage.
22. Cultural Facilities, Cultural Uniqueness and Diversity			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	<u>Current Conditions:</u> SHPO conducted a file search for the project area and determined there have been several previously recorded historic sites within the area relating to historic residences, architecture, homestead/farmsteads, commercial development, railroads, a courthouse, irrigation systems, a school, and mining. Four of the listed sites provided by SHPO were identified as currently being listed in the National Register of Historic Places. SHPO recommends that any found structure over fifty years old be considered historic and potentially eligible for listing in the National Register of Historic Places. A found structure over fifty years old should be recorded and assessed prior to any disturbance taking place. SHPO did express concern over the fact the Willow Creek diversion and intake structures may be over fifty years old. SHPO asked that these structures be recorded prior to any rehabilitation taking place through further site investigation and coordination with SHPO. <u>Preferred Alternative Environmental Narrative:</u> No impacts are anticipated to any cultural facilities, cultural uniqueness, or diversity. The work to the diversion and intake structures will proceed through coordination with SHPO to assure proper documentation of any historic structures.

<table>
<tr><td colspan="4">23. Transportation Networks and Traffic Flow Conflicts (example: rail; auto including local traffic; airport runway clear zones – avoidance of incompatible land use in airport runway clear zones)</td></tr>
<tr><td>☐ No Impact
☐ Beneficial
☒ Adverse</td><td>☒ Direct
☐ Indirect
☐ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
Residential roadways, as well as major transportation routes in the area including US Highway 12 and US Highway 89.
<u>Preferred Alternative Environmental Narrative:</u>
There will be temporary impacts of traffic flow during construction. Contractors will be required to submit traffic control plans as a part of the construction contract in order to coordinate the traffic flow in the construction area. There are no long-term impacts to the transportation networks.</td></tr>
<tr><td colspan="4">24. Consistency with Local Ordinances, Resolutions, or Plans (example: conformance with local comprehensive plans, zoning, or capital improvement plans.)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☐ Direct
☐ Indirect
☐ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
The city has local ordinances and several local planning documents including a capital improvements plan and growth policy.
<u>Preferred Alternative Environmental Narrative:</u>
All applicable local, state, and federal rules and regulations will be adhered to during the design and implementation of the proposed improvements.</td></tr>
<tr><td colspan="4">25. Private Property Rights (example: a regulatory action or project activity that reduces, minimizes, or eliminates the use of private property.)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☒ Adverse</td><td>☒ Direct
☐ Indirect
☐ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
Land ownership within the planning area east and southeast of the City is primarily private. Distribution improvements and generator improvements would take place on City property and public right-of-way.
<u>Preferred Alternative Environmental Narrative:</u>
If water system transmission main, treatment system, storage tank, or intake improvements are made, temporary disturbance will occur within the privately owned rural residential area and agricultural land east and southeast of the city. Landowner input and coordination will be important during final design, so any project does not adversely affect land use and function of the landowner's property.</td></tr>
<tr><td colspan="4">26. Environmental Justice (example: does the project avoid placing lower income households in areas where environmental degradation has occurred, such as adjacent to brownfield sites?)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☐ Direct
☐ Indirect
☐ Cumulative</td><td>☐Permit
☐Mitigation
☒ NA</td><td><u>Current Conditions:</u>
N/A .
<u>Preferred Alternative Environmental Narrative:</u>
The project will not force low-income households into environmentally degraded areas.</td></tr>
</table>

27. Lead Based Paint and/or Asbestos (example: does the project replace asbestos-lined pipes? Do any structures qualify as containing lead-based paint?)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: There are no known lead service lines within the water system. Existing water system information indicates only a small amount of AC pipe (250 feet). Preferred Alternative Environmental Narrative: No anticipated impacts from lead-based paint or asbestos are anticipated as a result of the water system improvement projects.

Additional Information

List all sources of information used to complete the Environmental Checklist. Sources may include studies, plans, documents, or the individuals, organizations, or agencies contacted for assistance. For individuals, groups, or agencies, please include a contact person and phone number. List any scoping documents or meetings and/or public meetings during project development.

Agencies Consulted:

Bureau of Indian Affairs

Bureau of Land Management

City of White Sulphur Springs Floodplain Administrator

Department of Commerce, Census and Economic Information Center

Department of Environmental Quality

Department of Fish, Wildlife and Parks

Department of Labor and Industry

Department of Natural Resources and Conservation

Department of Natural Resources and Conservation Water Resources Regional Office

Department of Transportation

Federal Aviation Administration

Helena-Lewis and Clark National Forest

Meagher County Conservation District

Meagher County Floodplain Administrator

Meagher County Historical Association

Montana Land Reliance

National Park Service

Natural Resource Conservation Service

Occupational Safety and Health Administration

State Historic Preservation Office

US Department of Transportation

US Environmental Protection Agency

US Fish and Wildlife Service

US Army Corps of Engineers

Agency Responses/Documents Referenced:

Department of Natural Resources and Conservation Water Resources Regional Office

Rebekah Luchterhand – Meagher County Floodplain Administrator

Matt Bell – Montana Land Reliance

Damon Murdo – Montana State Historic Preservation Office (SHPO)

Jacob Martin – U.S. Fish and Wildlife Service (USFWS)

Helen Smith – Helena-Lewis and Clark National Forest

Gary Bertellotti – Montana Fish, Wildlife and Parks

US Army Corps of Engineers – Montana Regulatory Team

References:

Census and Economic Information Center – GIS Resources. Montana Department of Commerce. Retrieved on 11/18/2022 from https://ceic-mtdoc.opendata.arcgis.com/search?tags=dec

Census and Economic Information Center Income and Poverty. Montana Department of Commerce. Retrieved on 3/17/23 from https://ceic.mt.gov/People-and-Housing/Income-and-Poverty

City of White Sulphur Springs & Meagher County Consolidated City/County Growth Policy. February, 2021. https://www.whitesulphurspringsmontana.com/documents/77/Consolidated_City_County_Growth_Policy_-_February_2021__3.pdf

Clean Water Act Information Center (CWAIC) 2020. Montana Department of Environmental Quality. Retrieved on 3/17/23 from https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id=708aae89f060403db2710378ac4945f0

Clean Water Act Information Center (CWAIC) Water Quality Use Class Map. Montana Department of Environmental Quality. Retrieved on 3/17/23 from https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id=507f07b69b7c4d69bd855fb2b78ef9e7

FEMA Flood Map Service Center: Search by Address. FEMA. Retrieved on 3/17/23 from https://msc.fema.gov/portal/search?AddressQuery=White%20Sulphur%20Springs%2C%20Montana#searchresultsanchor

IPaC Information for Planning and Consultation. U.S. Fish & Wildlife Service. Retrieved on 3/16/23 from https://ipac.ecosphere.fws.gov/location/index

Low- and Moderate-Income Area Data Map Application, based on 2011-2015 ACS. US Department of Housing and Urban Development. Retrieved on 3/18/23 from https://hud.maps.arcgis.com/apps/webappviewer/index.html?id=ffd0597e8af24f88b501b7e7f326bedd

Montana DEQ Interactive Map. Retrieved on 4/6/2023 from https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id=f554f421c3e64f5599e76b5cb8dd3391

Montana Groundwater Information Center Water Well Data. Montana Bureau of Mines and Geology (MBMG). Retrieved on 3/16/23 from https://mbmgftp.mtech.edu/#/gwic/

Montana Natural Heritage Program. Environmental Summary Report for Latitude 46.47856 to 46.59148 and Longitude -110.76008 to -110.96478. Retrieved on 3/15/2023.

Montana Sage Grouse Habitat Conservation Map. Montana Sage Grouse Habitat Conservation Program. Retrieved on 10/18/22 from https://sagegrouse.mt.gov/ProgramMap

Natural Heritage Map Viewer for Land Cover and Land Management. Montana Natural Heritage Program. Retrieved on 3/14/23 from http://mtnhp.org/MapViewer/

Natural Heritage Map Viewer for Wetland and Riparian Mapping. Montana Natural Heritage Program. Retrieved on 3/17/23 from http://mtnhp.org/MapViewer/

Web Soil Survey. United States Department of Agriculture Natural Resources Conservation Service. Retrieved on 3/14/23 from https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Below is a list of electronic resources available for data gathering to aid in the development of the Environmental Checklist:

Abandoned Mines (DEQ): https://deq.mt.gov/cleanupandrec/Programs/aml

Agricultural Statistics (USDA): USDA - National Agricultural Statistics Service - Data and Statistics

Air Quality

- Nonattainment Areas: Plan and Rule Development | Montana DEQ (mt.gov)
- Opening Burning Guidelines: Open Burning | Montana DEQ (mt.gov)

Army Corps of Engineers: http://www.usace.army.mil/Home.aspx

Bureau of Business and Economic Research, UM: http://www.bber.umt.edu/

Appendix B

Agency Correspondence

Agency Letters Requesting Comments

GreatWest ENGINEERING

November 17, 2022

Bureau of Indian Affairs
2021 4th Ave N.
Billings MT 59101

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

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Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Bureau of Indian Affairs has reviewed the enclosed information and has no comment on the project at this time.

Signature   Date

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November 17, 2022

Bureau of Land Management
5001 Southgate Drive
Billings MT 59101

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

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Signature | Date

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GreatWest ENGINEERING

November 17, 2022

City of White Sulphur Springs Floodplain Administrator
Julian Theriault
PO Box 442
White Sulphur Springs MT 59645

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

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______________________________ ______________
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November 17, 2022

Department of Commerce, Census and Economic Information Center
PO Box 200505
Helena MT 59620

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Signature Date

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GreatWest ENGINEERING

November 17, 2022

Department of Environmental Quality
Permitting and Compliance Division
PO Box 200901
Helena MT 59620

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November 17, 2022

Department of Fish, Wildlife and Parks
1420 E. 6th Ave.
Helena MT 59620

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Signature Date

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GreatWest ENGINEERING

November 17, 2022

Department of Labor and Industry
PO Box 1728
Helena MT 59624

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Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Department of Labor and Industry has reviewed the enclosed information and has no comment on the project at this time.

Signature　　　　　　　　　　　　　　　　　　　　Date

See what's possible.

GreatWest ENGINEERING

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Ph: (509) 413-1430

November 17, 2022

Department of Natural Resources and Conservation
Attn: Resource Development Bureau Engineer
PO Box 201601
Helena MT 59620

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

The City of White Sulphur Springs is proposing to review and upgrade its water system. The purpose of this letter is to solicit comments about any concerns about construction within the community and surrounding area to the east and southeast. White Sulphur Springs is a city of 955 residents and is the county seat of Meagher County, located in central Montana. The City of White Sulphur Springs and surrounding agricultural land is generally located within the foothills of two forested mountain ranges, the Castle Mountains to the southeast and the expansive Little Belt Mountains to the northeast. Major transportation routes in the project vicinity include U.S Highway 12 and Montana Highway 360. Major surface waters in the vicinity include the North Fork of the Smith River, located just north of the City limits, and Willow Creek, located east of the community.

Drinking water for the City comes from both groundwater and surface water sources. Groundwater is obtained from two groundwater wells located in the northeastern portion of the City. The South Fork of Willow Creek is the surface water source for the system, located approximately five miles southeast of the City.

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- Well pump house improvements.

- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
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Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Department of Natural Resources and Conservation has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

See what's possible.

GreatWest ENGINEERING

November 17, 2022

Department of Natural Resources and Conservation Water Resources Regional Office
Lewistown Regional Office
613 NE Main, Suite E
Lewistown MT 59457

RE: White Sulphur Springs Water System Preliminary Engineering Report

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- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
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Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Department of Natural Resources and Conservation Water Resources Regional Office has reviewed the enclosed information and has no comment on the project at this time.

Signature   Date

GreatWest
ENGINEERING

November 17, 2022

Department of Transportation
PO Box 201001
Helena MT 59620

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

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Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Department of Transportation has reviewed the enclosed information and has no comment on the project at this time.

______________________________ ______________
Signature Date

See what's possible.

GreatWest
ENGINEERING

November 17, 2022

Federal Aviation Administration
Airport District Office
2725 Skyway Drive
Suite 2
Helena MT 59602

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Federal Aviation Administration has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

See what's possible.

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GreatWest ENGINEERING

November 17, 2022

Helena-Lewis and Clark National Forest
Emily Platt
2880 Skyway Drive
Helena MT 59602

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Helena-Lewis and Clark National Forest has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

See what's possible.

GreatWest ENGINEERING

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November 17, 2022

Meagher County Conservation District
PO Box 589
White Sulphur Springs MT 59645

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Meagher County Conservation District has reviewed the enclosed information and has no comment on the project at this time.

______________________________________ ______________
Signature Date

GreatWest ENGINEERING

November 17, 2022

Meagher County Floodplain Administrator
Rebekah Luchterhand
PO Box 309
White Sulphur Springs MT 59645

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Meagher County Floodplain Administrator has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

See what's possible.

GreatWest
ENGINEERING

November 17, 2022

Meagher County Historical Association
310 2nd Ave NE
White Sulphur Springs MT 59645

RE: White Sulphur Springs Water System Preliminary Engineering Report

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SPOKANE
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- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
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Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Meagher County Historical Association has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

See what's possible.

HELENA
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GreatWest ENGINEERING

November 17, 2022

Montana Land Reliance
PO Box 355
Helena MT 59624

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

The City of White Sulphur Springs is proposing to review and upgrade its water system. The purpose of this letter is to solicit comments about any concerns about construction within the community and surrounding area to the east and southeast. White Sulphur Springs is a city of 955 residents and is the county seat of Meagher County, located in central Montana. The City of White Sulphur Springs and surrounding agricultural land is generally located within the foothills of two forested mountain ranges, the Castle Mountains to the southeast and the expansive Little Belt Mountains to the northeast. Major transportation routes in the project vicinity include U.S Highway 12 and Montana Highway 360. Major surface waters in the vicinity include the North Fork of the Smith River, located just north of the City limits, and Willow Creek, located east of the community.

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Sincerely,

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Montana Land Reliance has reviewed the enclosed information and has no comment on the project at this time.

Signature ______________________ Date ____________

GreatWest
ENGINEERING

November 17, 2022

National Park Service
PO Box 25287
Denver CO 80225

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] National Park Service has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

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GreatWest ENGINEERING

November 17, 2022

Natural Resource Conservation Service
10 E. Babcock St.
Bozeman MT 59771

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Natural Resource Conservation Service has reviewed the enclosed information and has no comment on the project at this time.

______________________________________ _______________
Signature Date

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GreatWest ENGINEERING

November 17, 2022

Occupational Safety and Health Administration
2900 4th Ave. N
Billings MT 59101

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

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2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] Occupational Safety and Health Administration has reviewed the enclosed information and has no comment on the project at this time.

Signature　　　　　　　　　　　　　　　　　　Date

GreatWest
ENGINEERING

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November 17, 2022

State Historic Preservation Office
PO Box 201202
Helena MT 59620

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] State Historic Preservation Office has reviewed the enclosed information and has no comment on the project at this time.

Signature　　　　　　　　　　　　　　　　　　Date

File Search Request Form

Contact Name:	Jessica Salo
Organization:	Great West Engineering
Address:	2501 Belt View Drive
City/State/Zip:	Helena/MT/59604
Telephone:	406-422-1288
Email:	jsalo@greatwesteng.com

MONTANA HISTORICAL SOCIETY

Historic Preservation Office
1301 E. Lockey, PO Box 201202
Helena, MT 59620-1202

SEND TO: Damon Murdo
dmurdo@mt.gov (406) 444-7767

Project Name:	City of White Sulphur Springs - Water System Improvements
Describe the proposed project:	Projects being considered include: • Rehabilitation of the Willow Creek diversion and intake structure. • Intake facility access road/safety improvements. • Water treatment system upgrades at the slow sand filter building. • Replacement of leaking transmission main east of the City limits. • Replacement of aging water distribution system piping within the City limits. • Construction of water mains within the City limits to eliminate dead-end mains. • Upgrade of other water distribution system appurtenances. • Well pump house improvements. • The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station. • Telemetry system and control upgrades at the tank control and well pump house buildings.

Land Use:	Sagebrush, Cropland, Grassland, Forest, Developed	**County:**	Meagher County
Agency Involved: (Private,FWP,BLM)	City of White Sulphur Springs, US Forest Service, Private, MDT, Meagher County	**Land Ownership:**	Federal, Local Government, Private

Project Area Location Information

Township(N/S)	Range (E/W)	Section(s)
9N	6E	12, 13
9N	7E	7, 14, 15, 16, 17, 18, 23, 26

File Search Fee Structure

$35 / section

Please complete this form and attach a map showing the proposed project location. Feel free to attach additional project information if available.

All fields must be completed in order to process your request.
All sections must be added up and entered in to the box below before a file search will take place.
An invoice will be sent with your file search results.

Total Sections to be searched:	10
Total amount to be paid to SHPO:	**$350.00**

GreatWest
ENGINEERING

November 17, 2022

US Department of Transportation
585 Shephard Way
Helena MT 59601

RE: White Sulphur Springs Water System Preliminary Engineering Report

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Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] US Department of Transportation has reviewed the enclosed information and has no comment on the project at this time.

Signature Date

GreatWest ENGINEERING

November 17, 2022

US Environmental Protection Agency
Montana Office
Federal Building
10 West 15th Street, Suite 3200
Helena MT 59625

RE: White Sulphur Springs Water System Preliminary Engineering Report

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www.greatwesteng.com

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If you have no comment on this project, please check the box below and countersign the bottom of this letter and return both pages to Great West Engineering, Inc. at the address listed below. Please send your response back to me by **December 17, 2022**, at jsalo@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] US Environmental Protection Agency has reviewed the enclosed information and has no comment on the project at this time.

______________________________ ____________
Signature Date

See what's possible.

HELENA
2501 Belt View Drive
Helena, MT 59601
Ph: (406) 449-8627
F: (406) 449-8631

BILLINGS
6780 Trade Center Avenue
Billings, MT 59101
Ph: (406) 652-5000
F: (406) 248-1363

BOISE
3050 N Lakeharbor Lane
Suite 201
Boise, ID 83703
Ph: (208) 576-6646

GREAT FALLS
702 2nd Street S, #2
Great Falls, MT 59405
Ph: (406) 952-1109

SPOKANE
9221 N Division Street
Suite F
Spokane, WA 99218
Ph: (509) 413-1430

GreatWest ENGINEERING

November 17, 2022

US Fish and Wildlife Service
Ecological Services
585 Shepherd Way
Helena MT 59601

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

The City of White Sulphur Springs is proposing to review and upgrade its water system. The purpose of this letter is to solicit comments about any concerns about construction within the community and surrounding area to the east and southeast. White Sulphur Springs is a city of 955 residents and is the county seat of Meagher County, located in central Montana. The City of White Sulphur Springs and surrounding agricultural land is generally located within the foothills of two forested mountain ranges, the Castle Mountains to the southeast and the expansive Little Belt Mountains to the northeast. Major transportation routes in the project vicinity include U.S Highway 12 and Montana Highway 360. Major surface waters in the vicinity include the North Fork of the Smith River, located just north of the City limits, and Willow Creek, located east of the community.

Drinking water for the City comes from both groundwater and surface water sources. Groundwater is obtained from two groundwater wells located in the northeastern portion of the City. The South Fork of Willow Creek is the surface water source for the system, located approximately five miles southeast of the City.

The extents of the project area are the current city limits as well as the intake, slow sand filter treatment system, storage tank, and transmission mains located to the east and southeast of the community. The project area is contained within:

- Township 9 North, Range 6 East, Sections 12, 13
- Township 9 North, Range 7 East, Sections 7, 14, 15, 16, 17, 18, 23, 26

Enclosed is a map of the Area of Potential Effect (APE) (Figure 1) to help illustrate the proposed project location and water system components.

The purpose of this project is to identify deficiencies within the current water system, design rehabilitative or replacement efforts, and implement the design. Projects to address identified deficiencies are currently being considered. Such projects may include:

- Rehabilitation of the Willow Creek diversion and intake structure.
- Intake facility access road/safety improvements.
- Water treatment system upgrades at the slow sand filter building.
- Replacement of leaking transmission main east of the City limits.
- Replacement of aging water distribution system piping within the City limits.
- Construction of water mains within the City limits to eliminate dead-end mains.
- Upgrade of other water distribution system appurtenances.
- Well pump house improvements.

- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
- Telemetry system and control upgrades at the tank control and well pump house buildings.

Please take a few moments to review the site and the proposed projects. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, avoidance, or mitigation measures.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return both pages to Great West Engineering, Inc. at the address listed below. Please send your response back to me by **December 17, 2022**, at jsalo@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] US Fish and Wildlife Service has reviewed the enclosed information and has no comment on the project at this time.

Signature   Date

See what's possible.

HELENA
2501 Belt View Drive
Helena, MT 59601
Ph: (406) 449-8627
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Great Falls, MT 59405
Ph: (406) 952-1109

SPOKANE
9221 N Division Street
Suite F
Spokane, WA 99218
Ph: (509) 413-1430

GreatWest ENGINEERING

March 15, 2023

US Army Corps of Engineers
email: Montana.Reg@usace.army.mil

RE: White Sulphur Springs Water System Preliminary Engineering Report

Dear to Whom It May Concern:

The City of White Sulphur Springs is proposing to review and upgrade its water system. The purpose of this letter is to solicit comments about any concerns about construction within the community and surrounding area to the east and southeast. White Sulphur Springs is a city of 955 residents and is the county seat of Meagher County, located in central Montana. The City of White Sulphur Springs and surrounding agricultural land is generally located within the foothills of two forested mountain ranges, the Castle Mountains to the southeast and the expansive Little Belt Mountains to the northeast. Major transportation routes in the project vicinity include U.S Highway 12 and Montana Highway 360. Major surface waters in the vicinity include the North Fork of the Smith River, located just north of the City limits, and Willow Creek, located east of the community.

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- Intake facility access road/safety improvements.
- Water treatment system upgrades at the slow sand filter building.
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- Well pump house improvements.

- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
- Telemetry system and control upgrades at the tank control and well pump house buildings.

Please take a few moments to review the site and the proposed projects. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, avoidance, or mitigation measures.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return both pages to Great West Engineering, Inc. at the address listed below. Please send your response back to me by **April 15, 2023**, at jsalo@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[ ] «Company» has reviewed the enclosed information and has no comment on the project at this time.

____ ________________

Signature Date

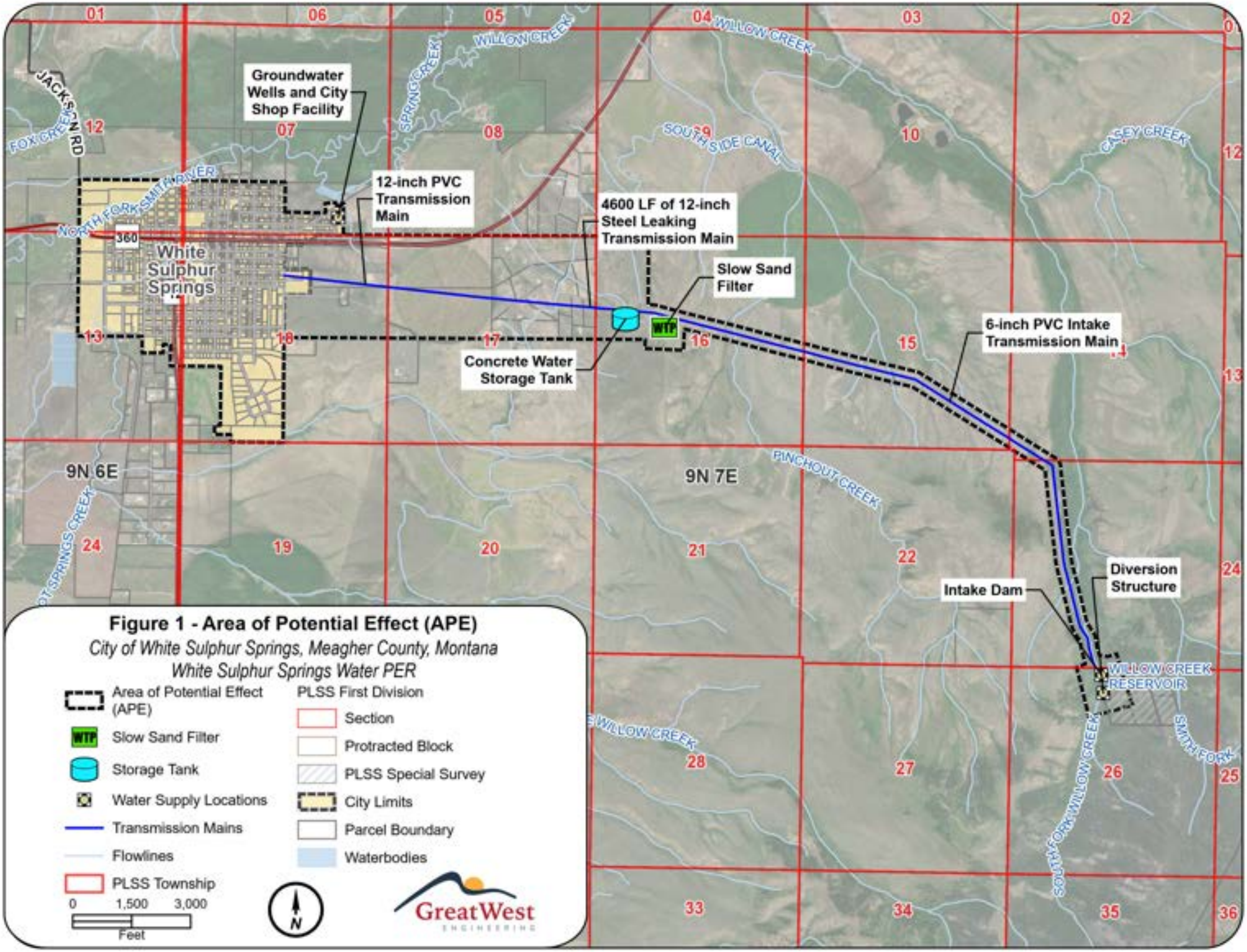


Figure 1 - Area of Potential Effect (APE)

City of White Sulphur Springs, Meagher County, Montana

White Sulphur Springs Water PER

Agency Responses

GreatWest
ENGINEERING

- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
- Telemetry system and control upgrades at the tank control and well pump house buildings.

Please take a few moments to review the site and the proposed projects. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, avoidance, or mitigation measures.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return both pages to Great West Engineering, Inc. at the address listed below. Please send your response back to me by **December 17, 2022**, at jsalo@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[X] Department of Natural Resources and Conservation Water Resources Regional Office has reviewed the enclosed information and has no comment on the project at this time.

______________________ Signature   11-22-22 Date

Jessica Salo

From: Rebekah Luchterhand <rluchterhand@meagherco.net>
Sent: Tuesday, November 22, 2022 11:50 AM
To: Jessica Salo
Subject: Comments on White Sulphur Springs Water System Preliminary Engineering Report

Hello Ms. Salo,

According to the attached Community Status Book Report from the Federal Emergency Management Agency Meagher County participates in the National Flood Program. That being said there are currently no flood insurance rate maps (FIRM) for the unincorporated portions of Meagher County. Therefore, the County does not administer floodplain regulations in the unincorporated areas of the County.

Let me know if you need anything else.

Sincerely,

Rebekah Luchterhand
Clerk to the Commission
P.O. Box 309
White Sulphur Springs, MT 59645
406-547-3037
rluchterhand@meagherco.net

Jessica Salo

From: Matt Bell <matt@mtlandreliance.org>
Sent: Wednesday, November 23, 2022 12:22 PM
To: Jessica Salo
Subject: White Sulphur Springs Water System

Hi Jessica,

My name is Matt Bell and I work for The Montana Land Reliance (MLR). I'm reaching out to you today because I'm the MLR employee who monitors the Stone Temple Ranch and we received notice regarding the water system review/upgrade.

There appears to be a right of access to the pipeline conveyance from Willow Creek Reservoir to the City of White Sulphur Springs, however MLR is interested in the details regarding surface disturbance, timeline, and remedial aspects of the project. Please keep us informed as this project moves along. If you need anything from us please let us know.

Best regards,
Matt

Matt Bell
GIS Coordinator/Land Steward
Montana Land Reliance
324 Fuller Ave.
P.O. Box 355 | Helena, MT 59624
(406) 443-7027

Jessica Salo

From: Murdo, Damon <dmurdo@mt.gov>
Sent: Monday, November 28, 2022 11:10 AM
To: Jessica Salo
Subject: WHITE SULPHUR SPRINGS WATER SYSTEM PER
Attachments: 2022112801.pdf; Reports.pdf; Sites.pdf

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

November 28, 2022

MONTANA HISTORICAL SOCIETY
Historic Preservation Office
1301 E Lockey, PO Box 201202
Helena, MT 59620-1202

Jessica Salo
Great West Engineering
2501 Belt View Drive
Helena MT 59601

RE: WHITE SULPHUR SPRINGS WATER SYSTEM PER. SHPO Project #: 2022112801

Dear Jessica:

I have conducted a cultural resource file search for the above-cited project. According to our records there have been several previously recorded sites within the designated search locales. In addition to the sites there have been a few previously conducted cultural resource inventories done in the areas. I've attached a list of these sites and reports. If you would like any further information regarding these sites or reports, you may contact me at the number listed below.

It is SHPO's position that any structure over fifty years of age is considered historic and is potentially eligible for listing in the National Register of Historic Places. If any structures are within the Area of Potential Effect, and are over fifty years old, we would recommend that they be recorded, and a determination of their eligibility be made prior to any disturbance taking place.

The only concern that the MT SHPO has with the proposed project would be if the Willow Creek diversion and intake structures are over fifty years of age. We would ask that they be recorded prior to any rehabilitation taking place. As long as there will be no disturbance or alteration to structures over fifty years of age, we feel that there is a low likelihood cultural properties will be impacted. We, therefore, feel that a recommendation for a cultural resource inventory is unwarranted at this time. However, should structures need to be altered or if cultural materials are inadvertently discovered during this project, we would ask that our office be contacted, and the site investigated.

If you have any further questions or comments, you may contact me at (406) 444-7767 or by e-mail at dmurdo@mt.gov. I have attached an invoice for the file search. Thank you for consulting with us.

Sincerely,

Damon Murdo
Cultural Records Manager
State Historic Preservation Office

File: DEQ/AWWM/2022

STATE HISTORIC PRESERVATION OFFICE
Cultural Resource Information Systems
CRIS Township, Range, Section Report

Report Date:11/28/2022

Site #	Twp	Rng	Sec	Qs	Site Type 1	Site Type 2	Time Period	Owner	NR Status
24ME0293	9N	7E	23		Historic Residence		1920-1930	Private	Eligible
24ME0258	9N	7E	7	SW	Historic Architecture		1890-1899	Private	NR Listed
24ME0309	9N	6E	13	SE	Historic Homestead/Farmstead		Prehistoric More Than One Period	Private	Undetermined*
24ME0310	9N	6E	13	SE	Historic Homestead/Farmstead		Prehistoric More Than One Period	Private	Undetermined*
24ME0345	9N	7E	18	NW	Historic Commercial Development		Historic More Than One Decade	Private	NR Listed
24ME0491	9N	7E	18	NW	Historic Architecture		Historic More Than One Decade	Private	NR Listed
24ME0703	9N	6E	13	Comb	Historic Railroad		Historic More Than One Decade	No Data	Eligible
24ME0746	9N	6E	13	SW	Historic Homestead/Farmstead		Historic More Than One Decade	State Owned	Eligible
24ME0836	9N	7E	18	NW	Historic Courthouse		Historic More Than One Decade	Other	Eligible
24ME0875	9N	7E	18	NW	Historic District		Historic More Than One Decade	Private	NR Listed
24ME0909	9N	7E	17	comb	Historic Irrigation System		Historic More Than One Decade	Private	Undetermined*
24ME0904	9N	6E	13	NW	Historic Irrigation System		Historic More Than One Decade	Private	Undetermined*
24ME0939	9N	6E	13	NE	Historic Railroad Building/Structure		Historic Period	Private	Undetermined*
24ME1115	9N	7E	18	NW	Historic School		Historic More Than One Decade	Other	Undetermined*
24ME1120	9N	6E	13	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	14	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	15	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	16	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	17	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	18	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	23	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible
24ME1120	9N	7E	26	Comb	Historic Mining		Historic More Than One Decade	Combination	Eligible

Township:9 N Range:7 E Section: 26

ELLINGTON WAYNE

6/10/1986 WILLOW CREEK RESERVOIR REHABILITATION

CRABS Document Number: ME 1 5819 Agency Document Number: 86-LC-7-25

Township:9 N Range:6 E Section: 12

ROBSON LARRY G.

9/29/1980 ROBERT FOWLIE, 404 PERMIT APPLICATION

CRABS Document Number: ME 6 5905 Agency Document Number: 00

Township:9 N Range:7 E Section: 18

GCM SERVICES INC. ANONYMOUS

4/22/1992 WHITE SULPHUR SPRINGS-SOUTH FEDERAL AID PROJECT-F 14-2(9)34 MEAGHERCOUNTY, MONTANA

CRABS Document Number: ME 4 13528 Agency Document Number: F14-2(9)34

Township:9 N Range:7 E Section: 17

DAU BARRY J.

5/1/1996 MARTINSDALE TO WHITE SULPHUR SPRINGS AND HARLOWTON TO P.O.M. BURIED TELEPHONE CABLE CULTURAL RESOURCES INVENTORY

CRABS Document Number: ME 6 17979 Agency Document Number:

Township:9 N Range:7 E Section: 18

DAU BARRY J.

5/1/1996 MARTINSDALE TO WHITE SULPHUR SPRINGS AND HARLOWTON TO P.O.M. BURIED TELEPHONE CABLE CULTURAL RESOURCES INVENTORY

CRABS Document Number: ME 6 17979 Agency Document Number:

Township:9 N Range:6 E Section: 13

RENNIE PATRICK J.

6/1/2001 CULTURAL RESOURCES INVENTORY OF THE MIKESELL RANGE RENOVATION PROJECT: MEAGHER COUNTY MONTANA

CRABS Document Number: ME 5 23702 Agency Document Number: 2001-3-1

Township:9 N Range:7 E Section: 18

FRENCH SANDRA L

9/14/2003 LEWIS AND CLARK NATIONAL FOREST - 2003 ANNUAL PROGRAMMATIC REPORT IN MONTANA FOR 2002 PROJECTS

CRABS Document Number: ZZ 1 26354 Agency Document Number:

Township:9 N Range:7 E Section: 18

AXLINE JON

7/20/2006 MEAGHER COUNTY COURTHOUSE (24ME0836)

CRABS Document Number: ME 4 28903 Agency Document Number:

Township:9 N Range:7 E Section: 18

FRENCH SANDRA L., et.al.

7/10/2007 ANNUAL PA REPORT FOR PROJECTS CONDUCTED IN 2006 ON THE LEWIS AND CLARK NATIONAL FOREST

CRABS Document Number: ZZ 1 29494 Agency Document Number: 07-LC-00-007

Township:9 N Range:6 E Section: 12

BRUMLEY JOHN H., ET AL.

12/1/2010 A CULTURAL RESOURCE INVENTORY OF CENTRAL MONTANA COMMUNICATIONS, INC.'S WHITE SULPHER SPRINGS EXCHANGE

CRABS Document Number: ME 6 32708 Agency Document Number:

Township:9 N Range:6 E Section: 13

BRUMLEY JOHN H., ET AL.

12/1/2010 A CULTURAL RESOURCE INVENTORY OF CENTRAL MONTANA COMMUNICATIONS, INC.'S WHITE SULPHER SPRINGS EXCHANGE

CRABS Document Number: ME 6 32708 Agency Document Number:

Township:9 N Range:7 E Section: 7

BRUMLEY JOHN H., ET AL.

12/1/2010 A CULTURAL RESOURCE INVENTORY OF CENTRAL MONTANA COMMUNICATIONS, INC.'S WHITE SULPHER SPRINGS EXCHANGE

CRABS Document Number: ME 6 32708 Agency Document Number:

Township:9 N Range:7 E Section: 16

BRUMLEY JOHN H., ET AL.

12/1/2010 A CULTURAL RESOURCE INVENTORY OF CENTRAL MONTANA COMMUNICATIONS, INC.'S WHITE SULPHER SPRINGS EXCHANGE

CRABS Document Number: ME 6 32708 Agency Document Number:

Township:9 N Range:7 E Section: 17

BRUMLEY JOHN H., ET AL.

12/1/2010 A CULTURAL RESOURCE INVENTORY OF CENTRAL MONTANA COMMUNICATIONS, INC.'S WHITE SULPHER SPRINGS EXCHANGE

CRABS Document Number: ME 6 32708 Agency Document Number:

Township:9 N Range:7 E Section: 18

BRUMLEY JOHN H., ET AL.

12/1/2010 A CULTURAL RESOURCE INVENTORY OF CENTRAL MONTANA COMMUNICATIONS, INC.'S WHITE SULPHER SPRINGS EXCHANGE

CRABS Document Number: ME 6 32708 Agency Document Number:

Township:9 N Range:6 E Section: 12

HOPE SHANE

5/1/2012 TRILEAF: VISUAL IMPACT ASSESSMENT FOR A CELLULAR COMMUNICATION TOWER IN WHITE SULPHUR SPRINGS, MEAGHER COUNTY, MONTANA

CRABS Document Number: ME 6 33604 Agency Document Number:

Township:9 N Range:6 E Section: 13

HOPE SHANE

5/1/2012 TRILEAF: VISUAL IMPACT ASSESSMENT FOR A CELLULAR COMMUNICATION TOWER IN WHITE SULPHUR SPRINGS, MEAGHER COUNTY, MONTANA

CRABS Document Number: ME 6 33604 Agency Document Number:

Township:9 N Range:7 E Section: 7

HOPE SHANE

5/1/2012 TRILEAF: VISUAL IMPACT ASSESSMENT FOR A CELLULAR COMMUNICATION TOWER IN WHITE SULPHUR SPRINGS, MEAGHER COUNTY, MONTANA

CRABS Document Number: ME 6 33604 Agency Document Number:

Township:9 N Range:7 E Section: 17

HOPE SHANE

5/1/2012 TRILEAF: VISUAL IMPACT ASSESSMENT FOR A CELLULAR COMMUNICATION TOWER IN WHITE SULPHUR SPRINGS, MEAGHER COUNTY, MONTANA

CRABS Document Number: ME 6 33604 Agency Document Number:

Township:9 N Range:7 E Section: 18

HOPE SHANE

5/1/2012 TRILEAF: VISUAL IMPACT ASSESSMENT FOR A CELLULAR COMMUNICATION TOWER IN WHITE SULPHUR SPRINGS, MEAGHER COUNTY, MONTANA

CRABS Document Number: ME 6 33604 Agency Document Number:

Township:9 N Range:7 E Section: 18

FRENCH SANDRA

5/1/2007 WHITE SULPHUR SPRINGS HOUSES DECOMMISSIONING/SALE

CRABS Document Number: ME 1 36521 Agency Document Number: 06-LC-07-042

Township:9 N Range:7 E Section: 18

PAYETTE JACQUIE

6/24/2010 MT-06-WHITE SULPHUR SPRINGS DI-DV PROPOSED TELECOMMUNICATIONS TOWER, MEAGHER COUNTY

CRABS Document Number: ME 6 37596 Agency Document Number:

Township:9 N Range:7 E Section: 26

KEIM KELLY M.

10/25/2019 WSS CITY WATER.

CRABS Document Number: ME 1 40222 Agency Document Number: R201601150014A

Township:9 N Range:7 E Section: 26

BODILY MARK, ET AL.

9/26/2020 CASTLES VEG RESTORATION PROJECT 2014, 2015, 2016, 2019, AND 2020 INVENTORIES REPORT, HERITAGE IMPLEMENTATION PLAN, AND ADDENDUM REPORT.

CRABS Document Number: ME 1 40656 Agency Document Number: R201401150026

Township:9 N Range:7 E Section: 18

WELLS SHELLEY

7/16/2021 A CLASS III CULTURAL RESOURCE INVENTORY FOR THE MOUNTAINVIEW MEDICAL - USDA PROJECT IN MEAGHER COUNTY, MONTANA.

CRABS Document Number: ME 6 41014 Agency Document Number:

Jessica Salo

From: Martin, Jacob <jacob_martin@fws.gov>
Sent: Tuesday, December 6, 2022 3:26 PM
To: Jessica Salo
Subject: water system improvement project at White Sulphur Springs, Meagher County, Montana

Dear Ms. Salo:

Thank you for your November 17, 2022, letter, received on November 28, 2022, requesting U.S. Fish and Wildlife Service (USFWS) comment on a proposed water system improvement project at White Sulphur Springs, Meagher County, Montana. The City of White Sulphur Springs is considering repairs and upgrades to existing facilities as detailed in your letter.

The USFWS reviewed your letter. Based on the information provided, we have no comments regarding federally listed or proposed threatened or endangered species or other trust species. Additional information regarding listed species that may occur within the project footprint may be obtained using the IPaC project-planning tool, which streamlines the USFWS environmental review process at https://ecos.fws.gov/ipac/.

Thank you for the opportunity to comment. If you have any questions or comments about this correspondence, please contact me via reply email or at the address or phone numbers, below.

Sincerely,

Jacob M. (Jake) Martin
Assistant Field Supervisor
Montana Ecological Services Office
585 Shephard Way, Suite 1
Helena, Montana 59601
(406) 422-8524 (cell, preferred, I’m teleworking)
(406) 430-9007 (office)
jacob_martin@fws.gov

Jessica Salo

From: Smith, Helen -FS <helen.smith@usda.gov>
Sent: Tuesday, December 13, 2022 4:35 PM
To: Jessica Salo
Subject: Response: White Sulphur Springs Water System Preliminary Engineering Report
Attachments: great west letter signed HSmith USFS.pdf

Good afternoon, Jessica

Please see my signed indicating no comment on the project at this time. Please keep us in the loop as this moves forward.

Thanks,
Helen

Helen Smith, District Ranger
Forest Service
Helena-Lewis & Clark National Forest,
Belt Creek-White Sulphur Springs Ranger District
p: 406-547-3361

helen.smith@usda.gov
204 W. Folsom
P.O. Box A
White Sulphur Springs, MT 59645

www.fs.usda.gov

Tenderfoot Creek Experimental Forest: https://arcg.is/4uDP9

Caring for the land and serving people

- The addition of emergency power at the City shop facility for the groundwater wells and wastewater lift station.
- Telemetry system and control upgrades at the tank control and well pump house buildings.

Please take a few moments to review the site and the proposed projects. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, avoidance, or mitigation measures.

If you have no comment on this project, please check the box below and countersign the bottom of this letter and return both pages to Great West Engineering, Inc. at the address listed below. Please send your response back to me by **December 17, 2022**, at jsalo@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Sincerely,

Great West Engineering, Inc.

Jessica L. Salo

Jessica Salo, PE
Project Engineer

Attached: Figure 1 – Area of Potential Effect (APE)

[X] Helena-Lewis and Clark National Forest has reviewed the enclosed information and has no comment on the project at this time.

Helen J. Smith ______________________ 29 Nov 2022
Signature   Date
District Ranger
BC-WSS

4600 Giant Spring Road
Great Falls, MT 59405

January 4, 2022

Great West Engineering, Inc.
Attn: Jessica Salo
2501 Belt View Drive
Helena, MT 59601

Dear Ms. Salo,

We received your notice that the City of White Sulphur Springs is proposing to review and upgrade its water system. Thank you for the opportunity to provide comment.

It is important to note the native westslope cutthroat trout population upstream of the diversion structure on Willow Creek. This population is of high conservation value, and we ask that any modifications to the diversion structure do not promote or enable additional fish passage upstream. The diversion structure prevents upstream fish passage to a fair degree, and we recommend that any modifications to the structure maintain or enhance this barrier. In fact, our preference would be that the diversion structure would be enhanced to prevent all passage of non-native fish in order to preserve the integrity of the westslope cutthroat trout population upstream.

We would be happy to discuss the diversion structure, the native westslope cutthroat trout population, and potential conservation opportunities within the drainage with the city and its consultants in more detail, at any time.

Sincerely,

Gary Bertellotti

Gary Bertellotti
Region 4 Supervisor
Montana Fish, Wildlife and Parks

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
MONTANA REGULATORY OFFICE
100 NEILL AVENUE
HELENA, MONTANA 59601-3329

May 1, 2023

SUBJECT: City of White Sulphur Springs - Water System Improvements - North Fork Smith River (Meagher County), File No. **NWO-2019-00462-MTH**

Jessica Salo
Great West Engineering
2501 Belt View Drive
Helena, Montana 59601

Dear Ms. Salo:

This letter is in response to correspondence we received requesting comments or permitting information regarding the above-referenced project. Specifically, the project involves Water System Improvements throughout the City of White Sulphur Springs. The project is located on or near North Fork Smith River, at Latitude 46.545543°, Longitude -110.868898°, in Section 17, Township 9 N, Range 7 E, White Sulphur Springs, Meagher County, Montana.

This letter contains our initial comments on this project for your consideration. The purpose of this letter is to inform you that based on the information provided in your submittal, we are unable to ascertain if regulated activities are proposed or if jurisdictional waters of the U.S. are present within the project area. A Department of the Army (DA) permit may be required for the proposed activity. In lieu of a specific response, please consider the following general information concerning our regulatory program that may apply to the proposed project.

If the proposal involves activity in navigable waters of the United States, it may be subject to the U.S. Army Corps of Engineers (USACE) jurisdiction under Section 10 of the Rivers and Harbors Act of 1899 (RHA). Within the state of Montana, portions of the Kootenai River, the Missouri River, and the Yellowstone River[1] are considered a navigable water of the U.S. Section 10 prohibits the construction, excavation, or deposition of materials in, over, or under navigable waters of the United States unless the work has been authorized by a DA permit. Structures or work outside the limits defined for navigable waters of the United States require a Section 10 permit if the structure or work affects the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling,

[1] Section 10 waters in Montana are the Kootenai River (from the International Border between the United States and Canada downstream to Jennings Rapids near Jennings, Montana), the Missouri River and its impoundments (from its headwaters near Three Forks to the North Dakota state line), and the Yellowstone River (from Emigrant to the North Dakota state line).

rechannelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking.

If the proposal involves a discharge of dredged or fill material into waters of the United States, it may be subject to USACE jurisdiction under Section 404 of the Clean Water Act (CWA). Discharges of fill material generally include, without limitation: placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; property protection or reclamation devices such as riprap, weirs, bulkheads, and revetments; levees or berms; fill for intake and outfall pipes and trenched utility lines; fill associated with the creation of ponds; and any other work involving the discharge of fill or dredged material. A DA permit is required whether the work is permanent or temporary. Waters of the U.S. include the area below the ordinary high water mark of stream channels, lakes or ponds connected to the tributary system, and wetlands adjacent to these waters (33 CFR § 328.3). Isolated waters and wetlands, as well as man-made channels, may be waters of the U.S. in certain circumstances, which must be determined on a case-by-case basis. CWA Section 301(a) prohibits discharges of dredged or fill material into waters of the United States, unless the work has been authorized by a Department of the Army permit under Section 404. Information about the USACE permitting process can be obtained online at http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Montana.

The mission of the USACE Regulatory Program is to protect the Nation's aquatic resources while allowing reasonable development through fair, flexible and balanced permit decisions. Under Section 404 of the Clean Water Act, we work to protect the biological, physical, and chemical integrity of the Nation's aquatic resources. Projects are evaluated on a case-by-case basis to determine the potential benefits and detriments that may occur as a result of the proposal.

Before a permit is issued or verified, the Corps must ensure that we've met all our obligations under any related federal and state laws. For all projects, the Corps will consult with other state and federal agencies and Native American tribes, as appropriate. USACE evaluation of a Section 10 and/or a Section 404 permit application involves multiple analyses; please see the attached document for additional information and resources for permitting.

Useful documents, links, and information about Jurisdictional Determinations, Pre-Application Meetings, Permit Exemptions, Nationwide Permits, Regional Permits, Individual Permits, and Permit Applications and Permit Resources are available on our webpage: http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Montana.

Prior to applying for a DA permit, the project proposer may request a pre-application consultation meeting with USACE (virtual or in-person, on or off-site) to obtain information regarding the information needed, alternatives, and options for permitting before an applicant makes irreversible commitments of resources (funds, detailed designs, materials, etc.). A pre-application meeting is strongly recommended if the proposal has substantial impacts to waters of the U.S., or if it is a large, unique, or controversial project.

USACE Section 10/404 permits do not cover other potential authorizations that are often required. Others may include state or local permits such as a 310 Permit, SPA 124 Permit, 318 Authorization or 401 Water Quality Certification, Navigable Rivers Land Use License, or Floodplain Permit. Local and state governments issue permits or other authorizations to ensure compliance with local and state laws and regulations. The Corps permitting program is in place to ensure your project is in compliance with federal laws and regulations.

Note that this letter is not a DA authorization to proceed. It only informs you of the need to obtain a DA permit if waters of the U.S. will be affected. If the final design includes the placement of fill material in any jurisdictional area described above, or otherwise requires authorization by a DA permit, please submit a Montana Joint Permit Application to this office prior to starting any work. After a review of the materials submitted, we will determine what type of permit, if any, will be required. If waters of the U.S. will not be affected by a jurisdictional activity a DA permit will not be required for the project.

Please refer to identification number **NWO-2019-00462-MTH** in any correspondence concerning this project. If you have any questions, please contact the Montana Regulatory Office by email at Montana.Reg@usace.army.mil, or by telephone at (406) 441-1375.

Sincerely,

Montana
Regulatory Team

Enclosure

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at: https://regulatory.ops.usace.army.mil/customer-service-survey/. Paper copies of the survey are also available upon request for those without Internet access.

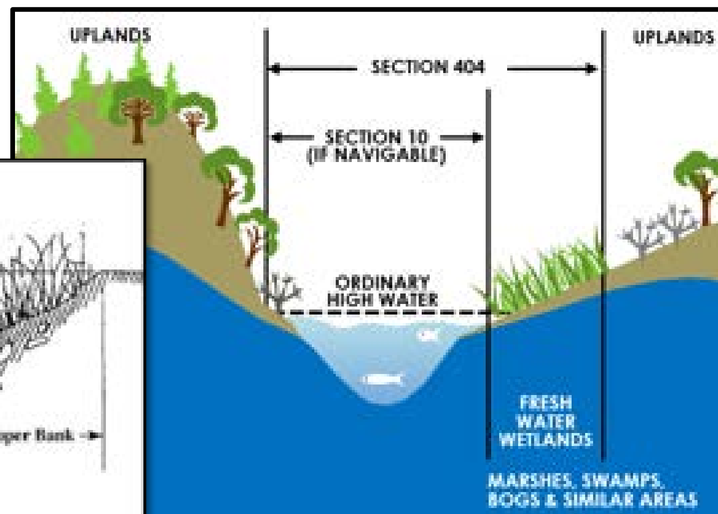
U.S. Army Corps of Engineers – Omaha District, Montana
Additional Information and Resources for Permitting

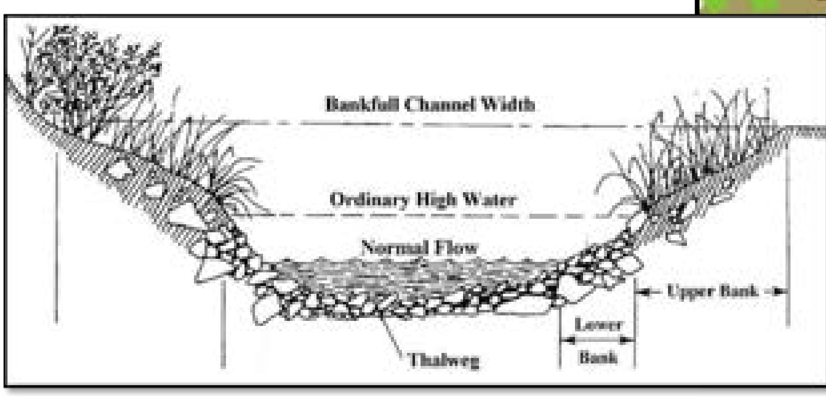
1. Geographic and Activity Jurisdiction: The U.S. Army Corps of Engineers (USACE) Regulatory Program, administers and enforces **Section 10 of the Rivers and Harbors Act of 1899 (RHA)** and **Section 404 of the Clean Water Act (CWA).**

Under **Section 10 of the RHA**, a permit is required to do **any work in, over or under** a navigable water of the United States or to do **any work that affects the course, location or condition** of the waterbody in such a manner as to impact on its navigable capacity. Navigable waters in Montana include the Missouri River, most of the Yellowstone River and a portion of the Kootenai River, their impoundments and side channels.

Under **Section 404 of the CWA**, a permit is required for the **discharge of dredged or fill material** into waters of the United States (WOTUS). WOTUS includes the area below the ordinary high water mark of river and stream channels, lakes or ponds connected to the tributary system, and wetlands adjacent to these waters. Isolated waters and wetlands, as well as man-made ditches and channels, may be WOTUS in certain circumstances, which must be determined by the Corps on a case-by-case basis.

There are some activities that have been determined to be exempt from USACE regulation. For example, discharges resulting from normal farming, silviculture, and ranching activities (plowing, seeding, cultivating, etc.) are generally not subject to regulation under Section 404 of the CWA. To be considered exempt, these activities must occur in the context of established (on-going) farming operations. You should obtain confirmation from the Corps to avoid a potential violation of federal law before conducting any discharge you believe is exempt.





2. Pre-Application Meeting: Applicants can request a pre-application consultation or meeting – virtual or in-person, on or off-site. This is an optional step, but helpful in determining the information needed for permitting, additional authorizations that may be needed, alternatives, and options for permitting before an applicant makes irreversible commitments of resources (funds, detailed designs, materials, etc.). Send requests for Pre-App meetings to Montana.Reg@usace.army.mil and include information on point of contacts, location, and preliminary project details.

3. Application Submission: Applicants should submit their application package, including maps, plans and drawings to Montana.Reg@usace.army.mil. Submit complete, detailed, and thorough information regarding the project. Processing time cannot begin until the Corps receives complete application information, including proper drawings. We need to be able to locate the project (detailed location map) and easily determine and verify dimensions and position of the project (site plan and cross section drawings).

4. Aquatic Resource Inventory: The application package must include a delineation of waters of the United States and special aquatic sites, including wetlands or pool and riffle complexes, and other waters, such as lakes, ponds and ditches, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by USACE to include the use of the 1987 Wetland Delineation Manual and appropriate Regional Supplements. USACE can perform the delineation upon request; however, this may take time to schedule due to often high workloads in USACE District Regulatory offices. Therefore, delineations are typically performed by a consultant hired by the property owner and verified by USACE personnel.

5. Project Evaluations & Alternatives: USACE evaluation of a Section 10 and/or a Section 404 permit application involves multiple analyses, including (1) evaluating the proposal's impacts in accordance with the National Environmental Policy Act (NEPA) (33 CFR part 325), (2) determining whether the proposal is contrary to the public interest (33 CFR § 320.4), and (3) in the case of a Section 404 permit, determining whether the proposal complies with the Section 404(b)(1) Guidelines (Guidelines) (40 CFR part 230). If the proposal requires a Section 404 permit application, the Guidelines specifically require that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR § 230.10(a)). Time and money spent on the proposal prior to applying for a Section 404 permit cannot be factored into the Corps' decision whether there is a less damaging practicable alternative to the proposal.

6. Endangered Species and Critical Habitat: The Endangered Species Act requires Federal agencies to consult with the U.S. Fish and Wildlife Service (Service) and the National Marine Fisheries Service, as appropriate, if an activity that requires Federal authorization (such as a USACE permit) may affect endangered or threatened species or critical habitat. For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the application must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. The Service has developed an online system that allows users to find information about sensitive resources that may occur within the vicinity of a proposed project. The "Information, Planning and Conservation System," (IPaC), is located at: https://ipac.ecosphere.fws.gov/.

7. Historic and Cultural Resources: Section 106 of the National Historic Preservation Act (NHPA) requires the Corps to take into account the effects that activities authorized by Department of the Army permits are likely to have on historical properties listed in, or eligible for listing in, the National Register of Historic Places (NRHP). Any structure over fifty years of age is considered historic and is potentially eligible for listing on the NRHP unless it has been previously determined ineligible. State Historic Preservation Officers (SHPO) and Tribal Historic Preservation Officers (THPO) are provided the opportunity to review and comment on all individual permit activities and certain general permit activities. For non-Federal permittees, if the activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the NRHP, the application must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. Inquiry with the Montana SHPO is recommended to determine the presence of any associated historic resources in the area. Contact information can be found at http://mhs.mt.gov/shpo.

8. Water Quality Certification: Section 401 of the Clean Water Act requires any applicant for a permit for an activity that may result in the discharge of a pollutant into WOTUS to obtain a certification that the discharge will comply with applicable effluent limitations and water quality standards. Applications for water quality certifications are reviewed by states, Tribes, or the U.S. Environmental Protection Agency (EPA). Water quality certifications are required for USACE permits that authorize discharges of

dredged or fill materials into WOTUS. Some of the Nationwide Permits (NWP) or Regional General Permits (RGP) have WQC granted for them already; individual permits and other NWP/RGP will require individual certification. Contact our office to determine the appropriate Water Quality Agency for your project.

9. Mitigation: Mitigation consists of avoidance, minimization, and compensation. USACE requires that applicants consider and use all reasonable and practical measures to avoid and minimize impacts to aquatic resources. You are required to submit a mitigation plan/statement with an application if impacts will occur to 0.10 acre of wetlands and/or 0.03 acre of stream.

Compensatory mitigation is the restoration, establishment, enhancement, and in certain circumstances, preservation of aquatic resources to offset unavoidable adverse impacts. Compensatory mitigation is accomplished through purchase of credits from a mitigation bank or in-lieu fee program, or permittee-responsible mitigation. During the application review process, the Corps will determine whether compensatory mitigation is necessary, and may require the applicant submit a plan for conducting proposed compensatory mitigation.

10. Activities Affecting Structures or Works Built by the United States: If any aspect of your proposed project is located within the vicinity of an existing USACE federally authorized Civil Works project (a "USACE project"), you may be required to seek permission from USACE pursuant to 33 U.S.C. 408 (Section 408) and/or real estate related permissions. Alterations/modifications to completed USACE projects requires a USACE permission pursuant to Section 408. In addition, real estate permissions may be necessary if the proposed project would affect United States real estate interests managed by USACE. For information on our Section 408 request process or to determine whether a Section 408 or real estate permission is required, please contact: Section408NWO@usace.army.mil

11. United States Coast Guard (USCG): In Montana, the Missouri River, portions of the Kootenai River, and the majority of the Yellowstone River are considered navigable waters of the U.S. as determined by USACE. The state of Montana considers additional waterways to be navigable waterways. The USCG is the agency with the authority to regulate the construction, operation, and maintenance of bridges and causeways in or across navigable waters under Section 9 of the Rivers and Harbors Act. Aerial trams and conveyors, aqueducts, utility lines, overhead pipelines, and similar structures that are affixed to a bridge span over waters of the U.S., are themselves considered a bridge structure. If the proposed work involves bridging or crossing of a navigable water the work may be regulated by the USCG.

To determine USCG requirements, please contact:

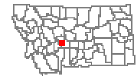
Mr. Steven Fischer
Commander, Thirteenth Coast Guard District (dpw)
Federal Building
915 Second Avenue
Seattle, Washington 98174-1067
(206) 220-7282 | Steven.M.Fischer3@uscg.mil

12. Other Federal, State, or Local Permits: A USACE Section 10/404 permit does not cover other potential authorizations that may be required. Others may include state or local permits such as a 310 Permit, SPA 124 Permit, 318 Authorization or 401 Water Quality Certification, Navigable Rivers Land Use License, or Floodplain Permit. Local and state governments issue permits or other authorizations to ensure compliance with local and state laws and regulations. The Corps permitting program is in place to ensure your project is in compliance with federal laws and regulations.

See the Montana Department of Natural Resources & Conservation – Stream Permitting website for details: http://dnrc.mt.gov/divisions/cardd/conservation-districts/the-310-law

Appendix C

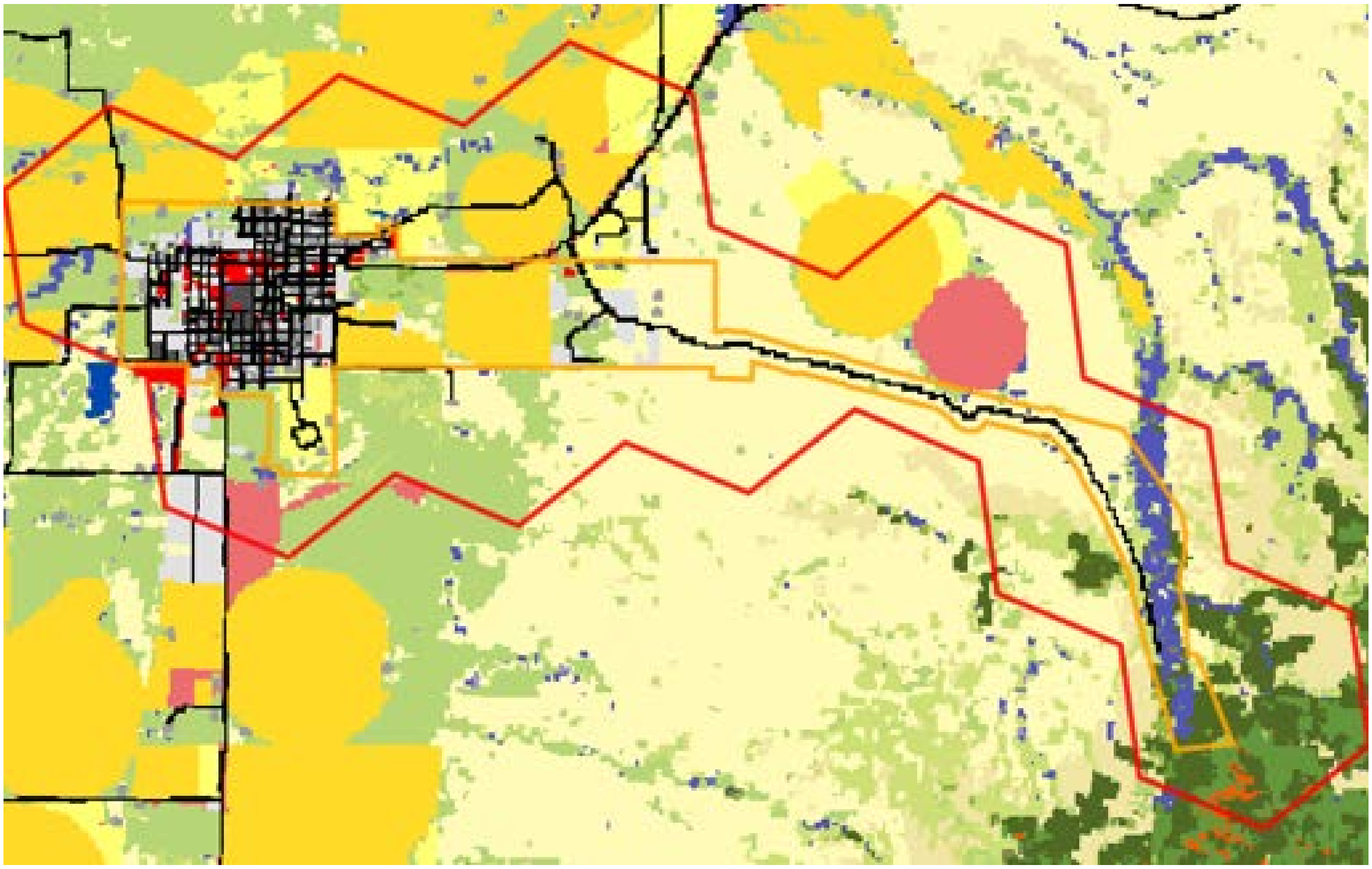
National Heritage Program Land Cover and Land Management Classifications

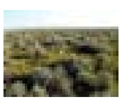


Latitude	Longitude
46.51014	-110.79556
46.56431	-110.92652

Land Cover

Summarized by: *(Custom Area of Interest)*





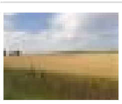
27% (*1,570* Acres)

Shrubland, Steppe and Savanna Systems

Sagebrush Steppe

Big Sagebrush Steppe

This widespread ecological system occurs throughout much of central Montana, and north and east onto the western fringe of the Great Plains. In central Montana, where this system occurs on both glaciated and non-glaciated landscapes, it differs slightly, with more summer rain than winter precipitation and more precipitation annually. Throughout its distribution, soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs with greater than 25% cover. Overall shrub cover is less than 10 percent. In Montana and Wyoming, stands are more mesic, with more biomass of grass, and have less shrub diversity than stands farther to the west, and 50 to 90% of the occurrences are dominated by Wyoming big sagebrush with western wheatgrass (*Pascopyrum smithii*). Japanese brome (*Bromus japonicus*) and cheatgrass (*Bromus tectorum*) are indicators of disturbance, but cheatgrassis typically not as abundant as in the Intermountain West, possibly due to a colder climate. The natural fire regime of this ecological system maintains a patchy distribution of shrubs, preserving the steppe character. Shrubs may increase following heavy grazing and/or with fire suppression. In central and eastern Montana, complexes of prairie dog towns are common in this ecological system.



17% (*962* Acres)

Human Land Use

Agriculture

Cultivated Crops

These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.

15% (*863* Acres)

Grassland Systems

Montane Grassland

Rocky Mountain Lower Montane, Foothill, and Valley Grassland

This grassland system of the northern Rocky Mountains is found at lower montane to foothill elevations in mountains and valleys throughout Montana. These grasslands are floristically similar to Big Sagebrush Steppe but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. They are found at elevations from 548 - 1,650 meters (1,800-5,413 feet). In the lower montane zone, they range from small meadows to large open parks surrounded by conifers; below the lower treeline, they occur as extensive foothill and valley grasslands. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline. Microphytic crust may be present in high-quality occurrences. This system is typified by cool-season perennial bunch grasses and forbs (>25%) cover, with a sparse shrub cover (<10%). Rough fescue (*Festuca campestris*) is dominant in the northwestern portion of the state and Idaho fescue (*Festuca idahoensis*) is dominant or co-dominant throughout the range of the system. Bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs as a co-dominant throughout the range as well, especially on xeric sites. Western wheatgrass (*Pascopyrum smithii*) is consistently present, often with appreciable coverage (>10%) in lower elevation occurrences in western Montana and virtually always present, with relatively high coverages (>25%), on the edge of the Northwestern Great Plains region. Species diversity ranges from a high of more than 50 per 400 square meter plot on mesic sites to 15 (or fewer) on xeric and disturbed sites. Most occurrences have at least 25 vascular species present. Farmland conversion, noxious species invasion, fire suppression, heavy grazing and oil and gas development are major threats to this system.

No Image

6% (*337* *Acres*)

Human Land Use

Developed

Other Roads

County, city and or rural roads generally open to motor vehicles.

5% (*304* *Acres*)

Human Land Use

Agriculture

Pasture/Hay

These agriculture lands typically have perennial herbaceous cover (e.g. regularly-shaped plantings) used for livestock grazing or the production of hay. There are obvious signs of management such as irrigation and haying that distinguish it from natural grasslands. Identified CRP lands are included in this land cover type.

5% (*286* *Acres*)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Montane Douglas-fir Forest and Woodland

In Montana, this ecological system occurs on the east side of the Continental Divide, north to about the McDonald Pass area, and along the Rocky Mountain Front. This system is associated with a dry to submesic continental climate regime with annual precipitation ranging from 51 to 102 centimeters (20-40 inches), with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from valley bottoms to 1,980 meters (6500 feet) in northern Montana and up to 2,286 meters (7500 feet) on warm aspects in southern Montana. It occurs on north-facing aspects in most areas, and south-facing aspects at higher elevations. This is a Douglas-fir (*Pseudotsuga menziesii*) dominated system without any maritime floristic composition. Fire disturbance intervals are as infrequent as 500 years, and as a result, individual trees and forests can attain great age on some sites (500 to 1,500 years). In Montana, this system occurs from lower montane to lower subalpine environments and is prevalent on calcareous substrates. Common understory shrubs include common ninebark (*Physocarpus malvaceus*), common juniper (*Juniperus communis*), Rocky Mountain juniper (*Juniperus scopulorum*), birch-leaf spiraea (*Spiraea betulifolia*), snowberry (*Symphoricarpos* species), creeping Oregon grape (*Mahonia repens*) and Canadian buffaloberry (*Shepherdia canadensis*). The Douglas-fir/pinegrass (C*alamogrostis rubescens*) type is the most ubiquitous association found within this system in Montana.

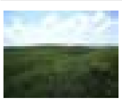
4% (*227* *Acres*)

Shrubland, Steppe and Savanna Systems

Sagebrush Steppe

Montane Sagebrush Steppe

This system dominates the montane and subalpine landscape of southwestern Montana from valley bottoms to subalpine ridges and is found as far north as Glacier National Park. It can also be seen in the island mountain ranges of the north-central and south-central portions of the state. It primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system occurs in areas of gentle topography, fine soils, subsurface moisture or mesic conditions, within zones of higher precipitation and areas of snow accumulation. It occurs on all slopes and aspects, variable substrates and all soil types. The shrub component of this system is generally dominated by mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*). Other co-dominant shrubs include silver sagebrush (*Artemisia cana ssp. viscidula)*, subalpine big sagebrush (*Artemisia tridentata ssp. spiciformis*), three tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) and antelope bitterbrush (*Purshia tridentata*). Little sagebrush (*Artemisia arbuscula ssp. arbuscula*) shrublands are only found in southwestern Montana on sites with a perched water table. Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) sites may be included within this system if occurrences are at montane elevations, and are associated with montane graminoids such as Idaho fescue (*Festuca idahoensis),* spike fescue (*Leucopoa kingii*), or poverty oatgrass (*Danthonia intermedia)*. In ares where sage has been eliminated by human activities like burning, disking or poisoning, other shrubs may be dominant, especially rubber rabbitbrush (*Ericameria nauseosa*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Because of the mesic site conditions, most occurrences support a diverse herbaceous undergrowth of grasses and forbs. Shrub canopy cover is extremely variable, ranging from 10 percent to as high as 40 or 50 percent.



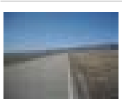
4% (*208* *Acres*)

Recently Disturbed or Modified

Introduced Vegetation

Introduced Upland Vegetation - Annual and Biennial Forbland

Land cover is significantly altered/disturbed by introduced annual and biennial forbs. Natural vegetation types are no longer recognizable. Typical species that dominate these areas are knapweed, oxeye daisy, Canada thistle, leafy spurge, pepperweed, and yellow sweetclover.



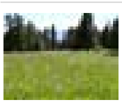
3% (*198* *Acres*)

Human Land Use

Developed

Developed, Open Space

Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. This category often includes highway and railway rights of way and graveled rural roads.



3% (*189* *Acres*)

Grassland Systems

Montane Grassland

Rocky Mountain Subalpine-Montane Mesic Meadow

This system is restricted to sites from lower montane to subalpine elevations where finely textured soils, snow deposition, or windswept conditions limit tree establishment. Many occurrences are small patches, and are often found in mosaics within woodlands, dense shrublands, or just below alpine communities. Elevations range from 600 to2,011 meters (2,000-6,600 feet) in the northern Rocky Mountains and up to 2,286- 2,682 meters (7,500-8,800 feet) in the mountains of southwestern Montana. This system occurs on gentle to moderate-gradient slopes and in relatively moist habitats. Soils are typically seasonally moist to saturated in the spring, but dry out later in the growing season. At montane elevations, soils are usually clays or silt loams, and some occurrences may have inclusions of hydric soils in low, depressional areas. At subalpine elevations, soils are derived a variety of parent materials, and are usually rocky or gravelly with good aeration and drainage, but with a well developed organic layer. Some occurrences are more heavily dominated by grasses, while others are more dominated by forbs. Common grasses include tufted hairgrass (*Deschampsia caespitosa*), showy oniongrass (*Melica spectabilis*), mountain brome (*Bromus carinatus*), blue wildrye (*Elymus glaucus*), awned sedge (*Carex atherodes*), and small wing sedge (*Carex microptera*). Forb dominated meadows usually comprise a wide species diversity which differs from montane to subalpine elevations. Shrubs such as shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*) and snowberry (*Symphoricarpos* species) are occasional but not abundant. This system differs from the Rocky Mountain Alpine Montane Wet Meadow system in that it soils dry out by mid-summer.

3% (*172 Acres*)

Wetland and Riparian Systems
Floodplain and Riparian
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland

This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions. In Montana, it ranges from approximately 945 to 2,042 meters (3,100 to 6,700 feet), characterristically occuring as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and on immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Dominant trees may include boxelder maple (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), Plains cottonwood (*Populus deltoides*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), river birch (*Betula occidentalis*), redoiser dogwood (*Cornus sericea*), hawthorne (*Crataegus spp*.), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), Drummondâ€™s willow (*Salix drummondiana*), sandbar willow (*Salix exigua*), Pacific willow (*Salix lucida*), rose (*Rosa* species), silver buffaloberry (*Shepherdia argentea*), or snowberry (*Symphoricarpos* species). Exotic trees of Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix* species) may invade some stands in southeastern and south-central Montana.

2% (*124 Acres*)

Human Land Use
Developed
Low Intensity Residential

Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units in rural and suburban areas. Paved roadways may be classified into this category.

2% (*105 Acres*)

Forest and Woodland Systems
Conifer-dominated forest and woodland (xeric-mesic)
Rocky Mountain Lodgepole Pine Forest

This forested system is widespread in upper montane to subalpine zones of the Montana Rocky Mountains, and east into island ranges of north-central Montana and the Bighorn and Beartooth ranges of south-central Montana. These are montane to subalpine forests where the dominance of lodgepole pine (*Pinus contorta*) is related to fire history and topoedaphic conditions. In Montana, elevation ranges from 975 to 2,743 meters (3,200-9000 feet). These forests occur on flats to slopes of all degrees and aspect, as well as valley bottoms. Fire is frequent, and stand-replacing fires are common. Following stand-replacing fires, lodgepole pinewill rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests persisting for 50-200 years on warmer, lower elevation forests, and 150-400 years in subalpine forests. They generally occur on dry to intermediate sites with a wide seasonal range of temperatures and long precipitation-free periods in summer. Snowfall is heavy and supplies the major source of soil water used for growth in early summer. Vigorous stands occur where the precipitation exceeds 533 millimeters (21 inches). These lodgepole forests are typically associated with rock types weathering to acidic substrates, such as granite and rhyolite. In west-central Montana ranges such the Big Belts and the Rocky Mountain Front, these forests are found on limestone substrates. These systems are especially well developed on the broad ridges and high valleys near and east of the Continental Divide. Succession proceeds at different rates, moving relatively quickly on low-elevation, mesic sites and particularly slowly in high-elevation forests such as those along the Continental Divide in Montana.

Additional Limited Land Cover

1% (*60 Acres*) Major Roads
1% (*50 Acres*) Commercial / Industrial
1% (*31 Acres*) High Intensity Residential
<1% (*21 Acres*) Rocky Mountain Montane-Foothill Deciduous Shrubland
<1% (*15 Acres*) Rocky Mountain Ponderosa Pine Woodland and Savanna
<1% (*11 Acres*) Insect-Killed Forest
<1% (*11 Acres*) Aspen Forest and Woodland
<1% (*3 Acres*) Alpine-Montane Wet Meadow
<1% (*3 Acres*) Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
<1% (*2 Acres*) Open Water
<1% (*2 Acres*) Rocky Mountain Subalpine-Upper Montane Grassland
<1% (*1 Acres*) Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
<1% (*0 Acres*) Aspen and Mixed Conifer Forest
<1% (*0 Acres*) Emergent Marsh

Introduction to Land Cover

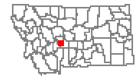
Land Use/Land Cover is one of 15 Montana Spatial Data Infrastructure framework layers considered vital for making statewide maps of Montana and understanding its geography. The layer records all Montana natural vegetation, land cover and land use, classified from satellite and aerial imagery, mapped at a scale of 1:100,000, and interpreted with supporting ground-level data. The baseline map is adapted from the Northwest ReGAP (NWGAP) project land cover classification, which used 30m resolution multi-spectral Landsat imagery acquired between 1999 and 2001. Vegetation classes were drawn from the Ecological System Classification developed by NatureServe (Comer et al. 2003). The land cover classes were developed by Anderson et al. (1976). The NWGAP effort encompasses 12 map zones. Montana overlaps seven of these zones. The two NWGAP teams responsible for the initial land cover mapping effort in Montana were Sanborn and NWGAP at the University of Idaho. Both Sanborn and NWGAP employed a similar modeling approach in which Classification and Regression Tree (CART) models were applied to Landsat ETM+ scenes. The Spatial Analysis Lab within the Montana Natural Heritage Program was responsible for developing a seamless Montana land cover map with a consistent statewide legend from these two separate products. Additionally, the Montana land cover layer incorporates several other land cover and land use products (e.g., MSDI Structures and Transportation themes and the Montana Department of Revenue Final Land Unit classification) and reclassifications based on plot-level data and the latest NAIP imagery to improve accuracy and enhance the usability of the theme. Updates are done as partner support and funding allow, or when other MSDI datasets can be incorporated. Recent updates include fire perimeters and agricultural land use (annually), energy developments such as wind, oil and gas installations (2014), roads, structures and other impervious surfaces (various years): and local updates/improvements to specific ecological systems (e.g., central Montana grassland and sagebrush ecosystems). Current and previous versions of the Land Use/Land Cover layer with full metadata are available for download at the Montana State Library's Geographic Information Clearinghouse

Within the report area you have requested, land cover is summarized by acres of Level 1, Level 2, and Level 3 Ecological Systems.

Literature Cited

Anderson, J.R. E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Geological Survey Professional Paper 964.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.

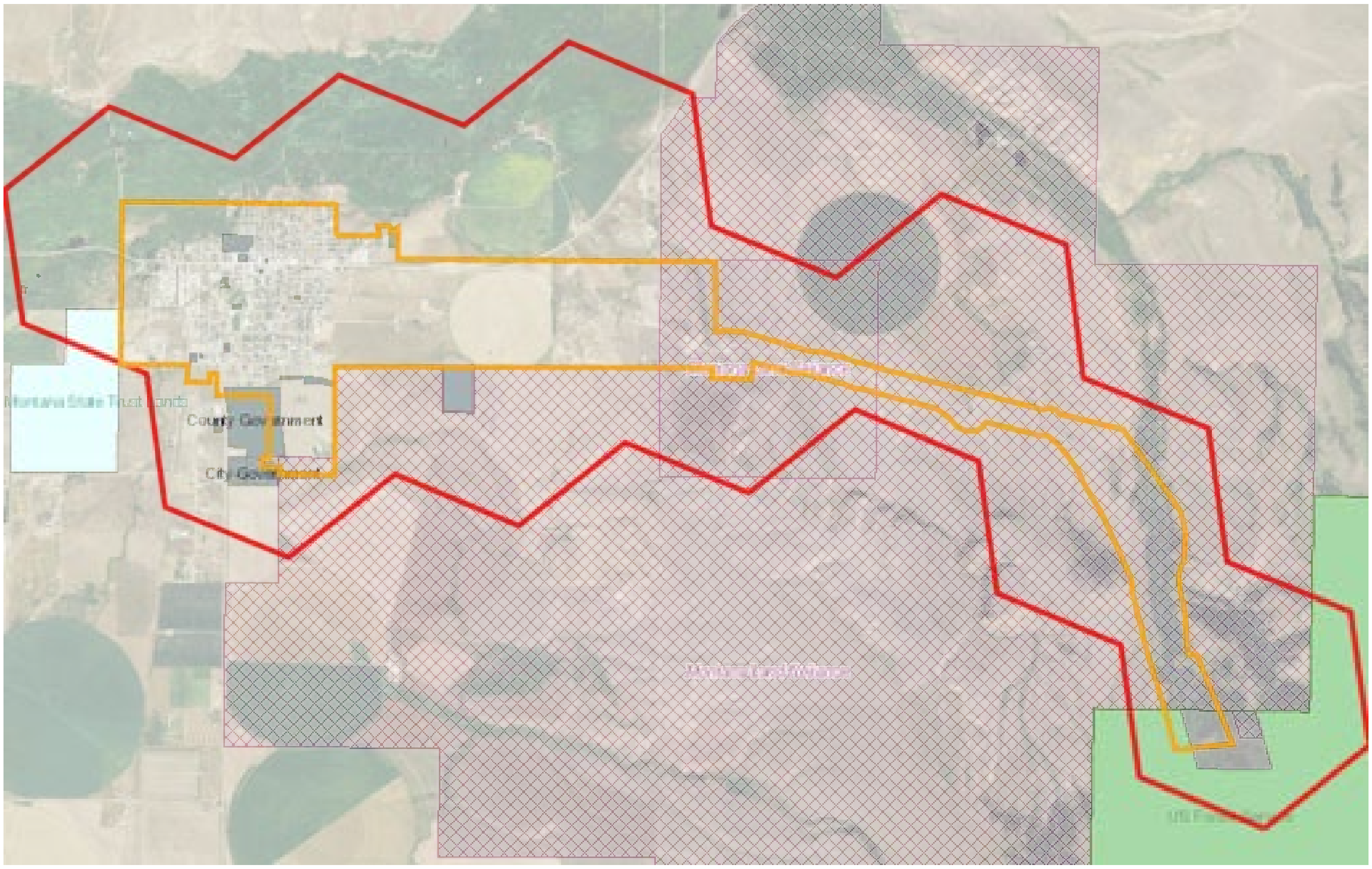


Montana Natural Heritage Program
A program of the **Montana State Library's Natural Resource Information System**

Latitude	Longitude
46.51014	-110.79556
46.56431	-110.92652

Land Management

Summarized by: *(Custom Area of Interest)*



Land Management Summary

Explain

	Ownership	Tribal	Easements	Other Boundaries (possible overlap)
Public Lands	**411 Acres (7%)**			
Federal	**275 Acres (5%)**			
US Forest Service	**275 Acres (5%)**			
USFS Owned	**275 Acres (5%)**			
USFS Ranger Districts				**334 Acres**
Helena-Lewis & Clark National Forest, White Sulphur Springs Ranger District				334 Acres
USFS National Forest Boundaries				**334 Acres**
Helena-Lewis & Clark National Forest				334 Acres
State	**31 Acres (1%)**			
Montana State Trust Lands	**31 Acres (1%)**			
MT State Trust Owned	**31 Acres (1%)**			
Local	**105 Acres (2%)**			
Local Government	**105 Acres (2%)**			
Local Government Owned	**105 Acres (2%)**			
Conservation Easements			**2,788 Acres (48%)**	
Private			**2,788 Acres (48%)**	
Montana Land Reliance			**2,788 Acres (48%)**	
Private Lands or Unknown Ownership	**2,554 Acres (44%)**			

Introduction to Land Management

Within the report area you have requested, land management information is summarized by acres of federal, state, and local government lands, tribal reservation boundaries, private conservation lands, and federal, state, local, and private conservation easements. Acreage for "Owned", "Tribal", or "Easement" categories represents non-overlapping areas that may be totaled. However, "Other Boundaries" represents managed areas such as National Forest boundaries containing private inholdings and other mixed ownership which may cause boundaries to overlap (e.g. a wilderness area within a forest). Therefore, acreages may not total in a straight-forward manner.

Because information on land stewardship is critical to effective land management, the Montana Natural Heritage Program (MTNHP) began compiling ownership and management data in 1997. The goal of the Montana Land Management Database is to manage a single, statewide digital data set that incorporates information from both public and private entities. The database assembles information on public lands, private conservation lands, and conservation easements held by state and federal agencies and land trusts and is updated on a regular basis. Since 2011, the Information Management group in the Montana State Library's Digital Library Division has led the Montana Land Management Database in partnership with the MTNHP.

Public and private conservation land polygons are attributed with the name of the entity that owns it. The data are derived from the statewide Montana Cadastral Parcel layer Conservation easement data shows land parcels on which a public agency or qualified land trust has placed a conservation easement in cooperation with the land owner. The dataset contains no information about ownership or status of the mineral estate. For questions about the dataset or to report errors, please contact the Montana Natural Heritage Program at (406) 444-5363 or mtnhp@mt.gov. You can download various components of the Land Management Database and view associated metadata at the Montana State Library's GIS Data List at the following links:

Public Lands
Conservation Easements
Private Conservation Lands
Managed Areas

Map features in the Montana Land Management Database or summaries provided in this report are not intended as a legal depiction of public or private surface land ownership boundaries and should not be used in place of a survey conducted by a licensed land surveyor. Similarly, map features do not imply public access to any lands. The Montana Natural Heritage Program makes no representations or warranties whatsoever with respect to the accuracy or completeness of this data and assumes no responsibility for the suitability of the data for a particular purpose. The Montana Natural Heritage Program will not be liable for any damages incurred as a result of errors displayed here. Consumers of this information should review or consult the primary data and information sources to ascertain the viability of the information for their purposes.

Appendix D

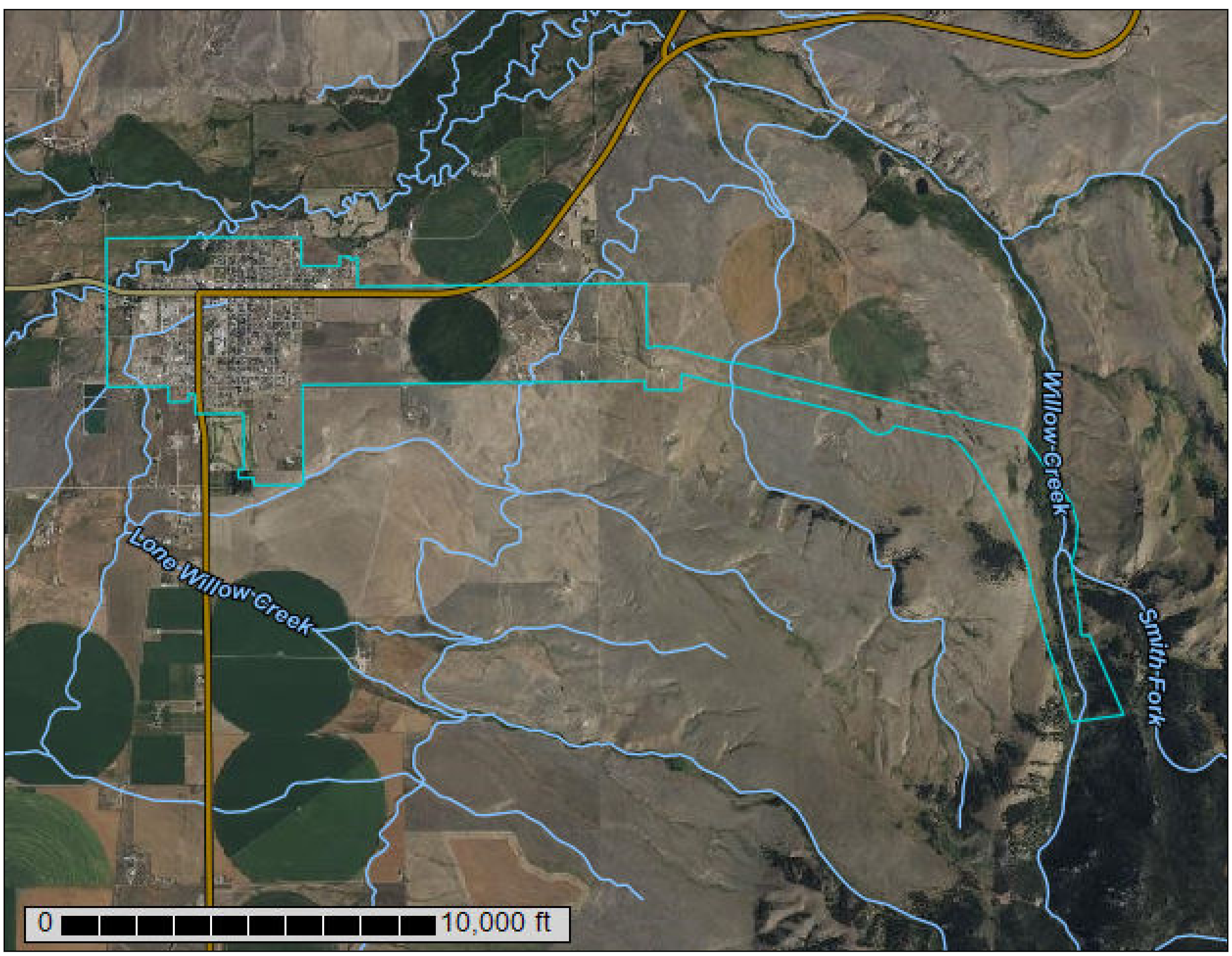
NRCS Soils Report

United States Department of Agriculture

Natural Resources Conservation Service

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

Custom Soil Resource Report for Lewis and Clark National Forest Area, Montana, and Meagher County Area, Montana



March 14, 2023

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

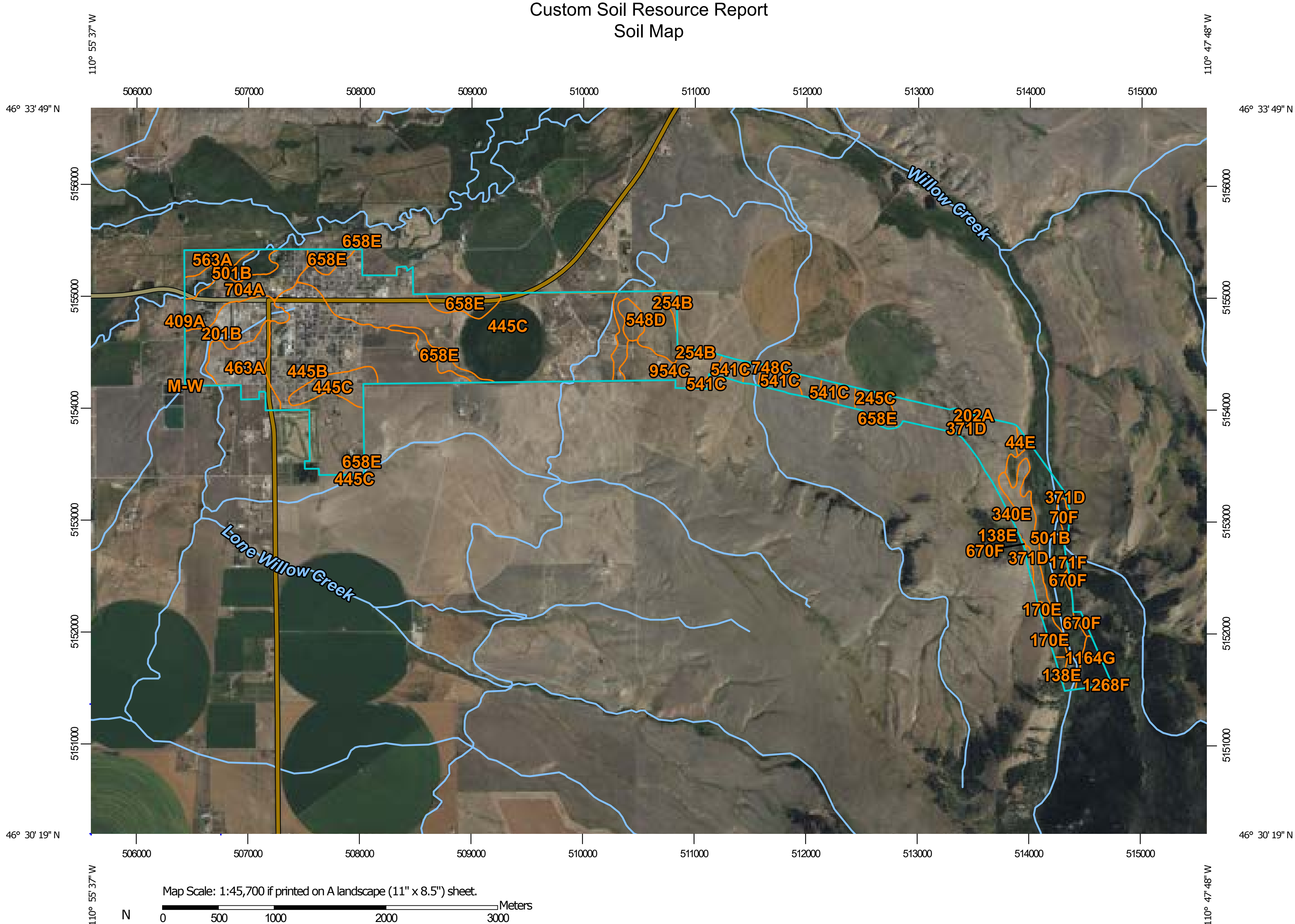
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map



Map Scale: 1:45,700 if printed on A landscape (11" x 8.5") sheet.

N

0 500 1000 2000 3000 Meters

0 2000 4000 8000 12000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: Lewis and Clark National Forest Area, Montana
Survey Area Data: Version 15, Aug 26, 2022

Soil Survey Area: Meagher County Area, Montana
Survey Area Data: Version 22, Aug 30, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Aug 9, 2022—Aug 19, 2022

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
138E	Surdal-Poin complex, 10 to 35 percent slopes, stony	3.4	0.2%
501B	Mannixlee, rarely flooded-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes	9.1	0.6%
1164G	Cowcoulee, stony-Ettienridge families, complex, 35 to 70 percent slopes	16.3	1.0%
1168E	Lake Creek, very stony-Elve, extremely stony-Comad, rubbly families, complex, 8 to 35 percent slopes	0.1	0.0%
1268F	Tigeron, rubbly-Targhee, very bouldery-Como, very stony families, complex, 35 to 60 percent slopes	0.2	0.0%
Subtotals for Soil Survey Area		**29.1**	**1.8%**
Totals for Area of Interest		**1,591.6**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
44E	Tolbert channery loam, 8 to 35 percent slopes	3.6	0.2%
70F	Vershal-Castner-Rock outcrop complex, 25 to 60 percent slopes	6.6	0.4%
138E	Bairspring-Poin complex, 10 to 35 percent slopes, stony	11.5	0.7%
170E	Cheadle-Copenhaver-Sebud complex, 15 to 35 percent slopes	1.7	0.1%
171F	Bairspring-Woodhall-Poin complex, 20 to 60 percent slopes	0.1	0.0%
201B	Bigsandy loam, 0 to 4 percent slopes	77.3	4.9%
202A	Fairberg-Villmeagher complex, 0 to 2 percent slopes	0.0	0.0%
245C	Reedwest gravelly loam, 2 to 8 percent slopes	19.4	1.2%
254B	Meagher gravelly loam, 1 to 4 percent slopes	21.5	1.4%
274C	Perma gravelly loam, 2 to 8 percent slopes	41.4	2.6%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
340E	Duckcreek-Houlihan-Nieman, stony complex, 15 to 45 percent slopes	0.8	0.1%
371D	Sixteenmile-Krakon-Breeton complex, 4 to 15 percent slopes	88.7	5.6%
409A	Meadowcreek loam, 0 to 2 percent slopes	0.1	0.0%
445B	Fairfield gravelly loam, 1 to 4 percent slopes	297.5	18.7%
445C	Reedwest-Roundor-Cabba complex, 2 to 8 percent slopes	438.4	27.5%
463A	Utica-Binna complex, cool, 0 to 2 percent slopes	63.9	4.0%
501B	Mannixlee-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes	141.6	8.9%
541C	Fairfield-Kiev complex, 2 to 8 percent slopes	37.6	2.4%
548D	Shawmut gravelly loam, 8 to 15 percent slopes	59.8	3.8%
563A	Binna-Utica complex, cool, 0 to 2 percent slopes	22.6	1.4%
658E	Reedwest-Bacbuster-Cabba complex, 8 to 35 percent slopes	80.2	5.0%
670F	Castner-Crampton complex, 25 to 60 percent slopes	5.7	0.4%
704A	Villsprings silt loam, 0 to 2 percent slopes	75.4	4.7%
748C	Shawmut stony loam, 4 to 8 percent slopes	6.5	0.4%
954C	Meagher cobbly loam, 2 to 8 percent slopes, stony	55.8	3.5%
1164G	Cowcoulee, stony-Ettienridge families, complex, 35 to 70 percent slopes	4.7	0.3%
M-W	Sewage Lagoon	0.0	0.0%
Subtotals for Soil Survey Area		**1,562.4**	**98.2%**
Totals for Area of Interest		**1,591.6**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.

The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

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

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

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

Lewis and Clark National Forest Area, Montana

138E—Surdal-Poin complex, 10 to 35 percent slopes, stony

Map Unit Setting

National map unit symbol: 2l9w8
Elevation: 6,000 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 36 to 38 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Bairspring, stony, and similar soils: 55 percent
Poin, stony, and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bairspring, Stony

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from rhyolite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 4 inches: gravelly loam
AB - 4 to 9 inches: very cobbly loam
Bw - 9 to 20 inches: very cobbly loam
BC - 20 to 28 inches: extremely cobbly loam
R - 28 to 59 inches: bedrock

Properties and qualities

Slope: 10 to 35 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/snowberry (PK310)
Hydric soil rating: No

Description of Poin, Stony

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium over residuum weathered from rhyolite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 4 inches: cobbly loam
Bw1 - 4 to 11 inches: extremely cobbly loam
Bw2 - 11 to 18 inches: extremely cobbly loam
R - 18 to 59 inches: bedrock

Properties and qualities

Slope: 10 to 25 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F043BP903MT - Shallow Cool Woodland Group
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)
Hydric soil rating: No

Minor Components

Echemoor

Percent of map unit: 10 percent
Landform: Hillslopes
Down-slope shape: Concave, linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/snowberry (PK310)
Hydric soil rating: No

501B—Mannixlee, rarely flooded-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2l9xq
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Mannixlee and similar soils: 35 percent
Clunton and similar soils: 30 percent
Meadowcreek and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mannixlee

Setting

Landform: Stream terraces, flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Oi - 0 to 2 inches: peat
A1 - 2 to 9 inches: loam
A2 - 9 to 25 inches: clay loam
Bw1 - 25 to 45 inches: silt loam
Bw2 - 45 to 52 inches: sandy loam
2Cg - 52 to 59 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w

Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: yellow willow c.t. (HP315), black cottonwood/ redosier dogwood c.t. (HP202)
Hydric soil rating: Yes

Description of Clunton

Setting

Landform: Flood-plain steps, flood plains
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Alluvium

Typical profile

Oa - 0 to 4 inches: muck
Ag - 4 to 18 inches: loam
Cg1 - 18 to 30 inches: clay loam
Cg2 - 30 to 36 inches: silty clay loam
Cg3 - 36 to 42 inches: sandy loam
2Cg4 - 42 to 50 inches: gravelly sandy loam
2Cg5 - 50 to 57 inches: gravelly loamy sand
2Cg6 - 57 to 64 inches: silt loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)
Hydric soil rating: Yes

Description of Meadowcreek

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 10 inches: loam
A2 - 10 to 15 inches: silt loam
Bg - 15 to 31 inches: loam
2C - 31 to 59 inches: very gravelly sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: About 24 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: R043BP801MT - Bottomland Group
Hydric soil rating: No

Minor Components

Lamoose

Percent of map unit: 10 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BY080MT - Riparian Meadow (RM) LRU 01 Subset Y
Hydric soil rating: No

Enbar

Percent of map unit: 5 percent
Landform: Stream terraces, fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)
Hydric soil rating: No

Water

Percent of map unit: 5 percent
Hydric soil rating: Unranked

1164G—Cowcoulee, stony-Ettienridge families, complex, 35 to 70 percent slopes

Map Unit Setting

National map unit symbol: 2lbbd
Elevation: 5,250 to 7,300 feet

Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 34 to 37 degrees F
Frost-free period: 40 to 60 days
Farmland classification: Not prime farmland

Map Unit Composition
Cowcoulee, stony, and similar soils: 45 percent
Ettienridge and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cowcoulee, Stony

Setting
Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from limestone

Typical profile
Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: silt loam
Bt - 6 to 11 inches: gravelly silty clay loam
Btk - 11 to 23 inches: very gravelly clay loam
Bk - 23 to 33 inches: very gravelly loam
R - 33 to 59 inches: bedrock

Properties and qualities
Slope: 35 to 70 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/heartleaf arnica (PK370), Douglas-fir/ninebark-pinegrass phase (PK262), Douglas-fir/snowberry-snowberry phase (PK313)
Hydric soil rating: No

Description of Ettienridge

Setting
Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from limestone

Typical profile

Oi - 0 to 3 inches: slightly decomposed plant material
A - 3 to 8 inches: gravelly loam
Bk1 - 8 to 17 inches: very gravelly loam
Bk2 - 17 to 29 inches: very gravelly loam
R - 29 to 59 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/twinflower-snowberry phase (PK291), Douglas-fir/common juniper (PK360), Douglas-fir/snowberry-snowberry phase (PK313)
Hydric soil rating: No

Minor Components

Checkerboard, very stony

Percent of map unit: 10 percent
Landform: Mountain slopes
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/common juniper (PK360), Douglas-fir/kinnikinnick (PK350)
Hydric soil rating: No

Levengood

Percent of map unit: 5 percent
Landform: Mountain slopes
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/ninebark-pinegrass phase (PK262), Douglas-fir/twinflower-snowberry phase (PK291), Douglas-fir/bluebunch wheatgrass (PK210)
Hydric soil rating: No

Rock outcrop

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

1168E—Lake Creek, very stony-Elve, extremely stony-Comad, rubbly families, complex, 8 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2r6xt
Elevation: 5,410 to 6,890 feet
Mean annual precipitation: 19 to 24 inches
Mean annual air temperature: 34 to 37 degrees F
Frost-free period: 40 to 60 days
Farmland classification: Not prime farmland

Map Unit Composition

Lake creek, very stony, and similar soils: 35 percent
Elve, extremely stony, and similar soils: 25 percent
Comad, rubbly, and similar soils: 15 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lake Creek, Very Stony

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium derived from igneous and metamorphic rock

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 4 inches: cobbly loam
E - 4 to 12 inches: cobbly loam
Bt1 - 12 to 22 inches: very cobbly clay loam
Bt2 - 22 to 35 inches: extremely cobbly sandy clay loam
R - 35 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/twinflower-blue huckleberry phase (PK293), Douglas-fir/pinegrass-pinegrass phase (PK323)
Hydric soil rating: No

Description of Elve, Extremely Stony

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from igneous and metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 6 inches: gravelly sandy loam
E - 6 to 14 inches: very cobbly sandy loam
Bw - 14 to 33 inches: very cobbly sandy loam
BC - 33 to 59 inches: extremely cobbly sandy loam

Properties and qualities

Slope: 8 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/common juniper (PK360), Douglas-fir/elk sedge (PK330)
Hydric soil rating: No

Description of Comad, Rubbly

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from igneous and metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
E - 2 to 8 inches: very cobbly loam
E and Bt - 8 to 26 inches: very cobbly sandy loam
C - 26 to 38 inches: very cobbly loamy coarse sand
R - 38 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Surface area covered with cobbles, stones or boulders: 32.0 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/common juniper (PK360)
Hydric soil rating: No

Minor Components

Sebud, very stony

Percent of map unit: 8 percent
Landform: Mountain slopes
Down-slope shape: Convex
Across-slope shape: Concave
Other vegetative classification: Douglas-fir/pinegrass-pinegrass phase (PK323)
Hydric soil rating: No

Caseypeak, extremely stony

Percent of map unit: 7 percent
Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/common juniper (PK360), Douglas-fir/kinnikinnick (PK350)
Hydric soil rating: No

Rubble land

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

Finn, extremely stony

Percent of map unit: 3 percent
Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: spruce/common horsetail (PK410)
Hydric soil rating: Yes

Rock outcrop

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

1268F—Tigeron, rubbly-Targhee, very bouldery-Como, very stony families, complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2r6xx
Elevation: 6,400 to 7,710 feet
Mean annual precipitation: 25 to 32 inches
Mean annual air temperature: 34 to 37 degrees F
Frost-free period: 30 to 50 days
Farmland classification: Not prime farmland

Map Unit Composition

Tigeron, rubbly, and similar soils: 30 percent
Targhee, very bouldery, and similar soils: 25 percent
Como, very stony, and similar soils: 15 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tigeron, Rubbly

Setting

Landform: Mountain slopes
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Colluvium derived from igneous and metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
E1 - 2 to 7 inches: cobbly sandy loam
E2 - 7 to 13 inches: very cobbly sandy loam
E and Bt - 13 to 18 inches: very cobbly sandy loam
Bt - 18 to 34 inches: very cobbly sandy clay loam
BC - 34 to 59 inches: very cobbly sandy loam

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 32.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F043BP909MT - Upland Cold Woodland Group
Other vegetative classification: subalpine fir/blue huckleberry (PK720), subalpine fir/elk sedge (PK790)
Hydric soil rating: No

Description of Targhee, Very Bouldery

Setting

Landform: Mountain slopes
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from igneous and metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 8 inches: gravelly loam
Bw - 8 to 20 inches: very gravelly sandy loam
C1 - 20 to 28 inches: very gravelly sandy loam
C2 - 28 to 35 inches: very gravelly loamy sand
R - 35 to 59 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP909MT - Upland Cold Woodland Group
Other vegetative classification: subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry-pinegrass phase (PK731)
Hydric soil rating: No

Description of Como, Very Stony

Setting

Landform: Structural benches
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from igneous and metamorphic rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: very gravelly sandy loam

Bw - 7 to 18 inches: very gravelly sandy loam
BC - 18 to 28 inches: very cobbly loamy sand
C - 28 to 59 inches: extremely cobbly loamy sand

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.13 to 7.09 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: F043BP909MT - Upland Cold Woodland Group
Other vegetative classification: subalpine fir/grouse whortleberry-grouse whortleberry phase (PK732)
Hydric soil rating: No

Description of Rock Outcrop

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Cowood, very rubbly

Percent of map unit: 10 percent
Landform: Structural benches
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: subalpine fir/grouse whortleberry-grouse whortleberry phase (PK732)
Hydric soil rating: No

Rubble land

Percent of map unit: 7 percent
Hydric soil rating: No

Redfish, occasionally flooded, very bouldery

Percent of map unit: 3 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Other vegetative classification: spruce/common horsetail (PK410)
Hydric soil rating: Yes

Meagher County Area, Montana

44E—Tolbert channery loam, 8 to 35 percent slopes

Map Unit Setting

National map unit symbol: 4z19
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Tolbert

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from argillite

Typical profile

A - 0 to 4 inches: channery loam
BA - 4 to 7 inches: channery loam
Bt - 7 to 16 inches: very channery clay loam
R - 16 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Minor Components

Absarook

Percent of map unit: 8 percent
Landform: Valley floors
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: R043BP819MT - Upland Sagebrush Shrubland Group
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: Unranked

70F—Vershal-Castner-Rock outcrop complex, 25 to 60 percent slopes

Map Unit Setting

National map unit symbol: n81d
Elevation: 5,300 to 6,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Vershal and similar soils: 45 percent
Castner and similar soils: 35 percent
Rock outcrop: 15 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Vershal

Setting

Landform: Escarpments
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery residuum weathered from sedimentary rock

Typical profile

A1 - 0 to 4 inches: very channery loam
A2 - 4 to 8 inches: extremely channery loam
R - 8 to 59 inches: bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 5 to 10 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R043BP810MT - Shallow Grassland Group
Hydric soil rating: No

Description of Castner

Setting

Landform: Escarpments
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Channery residuum weathered from sedimentary rock

Typical profile

A - 0 to 5 inches: channery loam
Bw - 5 to 8 inches: very channery loam
Bk - 8 to 15 inches: very channery loam
R - 15 to 59 inches: bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R043BP810MT - Shallow Grassland Group
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Escarpments
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Free face
Parent material: Sedimentary rock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Minor Components

Reedwest

Percent of map unit: 4 percent
Landform: Escarpments
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Ecological site: R043BP819MT - Upland Sagebrush Shrubland Group
Hydric soil rating: No

Meadowcreek

Percent of map unit: 1 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP801MT - Bottomland Group
Hydric soil rating: No

138E—Bairspring-Poin complex, 10 to 35 percent slopes, stony

Map Unit Setting

National map unit symbol: 1hf55
Elevation: 6,000 to 6,500 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 36 to 38 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Bairspring, stony, and similar soils: 55 percent
Poin, stony, and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bairspring, Stony

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from rhyolite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 4 inches: gravelly loam

AB - 4 to 9 inches: very cobbly loam
Bw - 9 to 20 inches: very cobbly loam
BC - 20 to 28 inches: extremely cobbly loam
R - 28 to 59 inches: bedrock

Properties and qualities

Slope: 10 to 35 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/snowberry (PK310)
Hydric soil rating: No

Description of Poin, Stony

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium over residuum weathered from rhyolite

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 4 inches: cobbly loam
Bw1 - 4 to 11 inches: extremely cobbly loam
Bw2 - 11 to 18 inches: extremely cobbly loam
R - 18 to 59 inches: bedrock

Properties and qualities

Slope: 10 to 25 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F043BP903MT - Shallow Cool Woodland Group

Other vegetative classification: Douglas-fir/Idaho fescue (PK220)
Hydric soil rating: No

Minor Components

Echemoor

Percent of map unit: 10 percent
Landform: Hillslopes
Down-slope shape: Concave, linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/snowberry (PK310)
Hydric soil rating: No

170E—Cheadle-Copenhaver-Sebud complex, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: nrxh
Elevation: 5,400 to 6,490 feet
Mean annual precipitation: 16 to 19 inches
Mean annual air temperature: 36 to 38 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Cheadle and similar soils: 35 percent
Copenhaver and similar soils: 25 percent
Sebud and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cheadle

Setting

Landform: Hills, escarpments
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

A1 - 0 to 6 inches: channery loam
A2 - 6 to 11 inches: extremely channery loam
Bk - 11 to 19 inches: very channery loam
R - 19 to 59 inches: bedrock

Properties and qualities

Slope: 20 to 35 percent
Depth to restrictive feature: 10 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R043BP823MT - Shallow Alpine Group
Hydric soil rating: No

Description of Copenhaver

Setting

Landform: Hills, escarpments
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

A - 0 to 5 inches: channery loam
Bt - 5 to 13 inches: very channery clay loam
R - 13 to 59 inches: bedrock

Properties and qualities

Slope: 15 to 20 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R043BP823MT - Shallow Alpine Group
Hydric soil rating: No

Description of Sebud

Setting

Landform: Hills, swales
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Colluvium derived from siltstone

Typical profile

A - 0 to 13 inches: gravelly loam
Bw - 13 to 59 inches: very gravelly loam

Properties and qualities

Slope: 15 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R043BP821MT - Upland Alpine Group
Hydric soil rating: No

Minor Components

Dalys

Percent of map unit: 10 percent
Landform: Hills, escarpments
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R043BP811MT - Shallow Sagebrush Shrubland Group
Hydric soil rating: No

Skisams

Percent of map unit: 7 percent
Landform: Hills, escarpments
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R043BP812MT - Shallow Shrubland Group
Hydric soil rating: No

Rock outcrop

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

171F—Bairspring-Woodhall-Poin complex, 20 to 60 percent slopes

Map Unit Setting

National map unit symbol: 1hfhy
Elevation: 5,800 to 6,400 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 36 to 38 degrees F

Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Bairspring and similar soils: 45 percent
Woodhall and similar soils: 25 percent
Poin and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bairspring

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

A - 0 to 4 inches: gravelly loam
Bw - 4 to 18 inches: very gravelly loam
BC - 18 to 23 inches: extremely gravelly sandy loam
R - 23 to 59 inches: bedrock

Properties and qualities

Slope: 20 to 40 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)
Hydric soil rating: No

Description of Woodhall

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 4 inches: gravelly loam
Bt - 4 to 14 inches: very gravelly loam
C - 14 to 24 inches: extremely cobbly loam
R - 24 to 59 inches: bedrock

Properties and qualities

Slope: 20 to 50 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/elk sedge (PK330)
Hydric soil rating: No

Description of Poin

Setting

Landform: Hillslopes
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: very channery sandy loam
Bw - 7 to 13 inches: very channery sandy loam
C - 13 to 16 inches: extremely channery sandy loam
R - 16 to 59 inches: bedrock

Properties and qualities

Slope: 20 to 60 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F043BP903MT - Shallow Cool Woodland Group
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)
Hydric soil rating: No

Minor Components

Hardhart

Percent of map unit: 10 percent

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/snowberry (PK310)
Hydric soil rating: No

201B—Bigsandy loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 4z04
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bigsandy

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 3 inches: loam
C1 - 3 to 11 inches: silty clay loam
C2 - 11 to 14 inches: fine sandy loam
Cg1 - 14 to 46 inches: silty clay loam
Cg2 - 46 to 59 inches: fine sandy loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: Rare
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 13.0

Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: R044BP813MT - Subirrigated Saline-Sodic Grassland
Hydric soil rating: Yes

Minor Components

Lepner

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

202A—Fairberg-Villmeagher complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4z05
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Fairberg and similar soils: 65 percent
Villmeagher and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fairberg

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 8 inches: silt loam
Bk - 8 to 30 inches: silt loam
Bkg1 - 30 to 45 inches: silty clay loam
2Bkg2 - 45 to 59 inches: gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: R044BP815MT - Subirrigated Grassland
Hydric soil rating: No

Description of Villmeagher

Setting

Landform: Flood plains
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium

Typical profile

Akg - 0 to 7 inches: silt loam
Bkg1 - 7 to 40 inches: silt loam
Bkg2 - 40 to 59 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: R044BP815MT - Subirrigated Grassland
Hydric soil rating: Yes

245C—Reedwest gravelly loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4z09
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Reedwest

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

A - 0 to 8 inches: gravelly loam
Bt - 8 to 17 inches: loam
Bk - 17 to 36 inches: loam
Cr - 36 to 59 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R044BB032MT - Loamy (Lo) LRU 01 Subset B
Hydric soil rating: No

Minor Components

Martinsdale

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BB032MT - Loamy (Lo) LRU 01 Subset B
Hydric soil rating: No

254B—Meagher gravelly loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 4z0f
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Meagher

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: gravelly loam
Bt - 6 to 15 inches: gravelly clay loam
Bk1 - 15 to 29 inches: gravelly loam
2Bk2 - 29 to 59 inches: very gravelly loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Gypsum, maximum content: 1 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BP818MT - Upland Grassland
Hydric soil rating: No

Minor Components

Martinsdale

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BC032MT - Loamy (Lo) LRU 01 Subset C
Hydric soil rating: No

274C—Perma gravelly loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4z0m
Elevation: 3,500 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Perma

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from shale and siltstone

Typical profile

A - 0 to 12 inches: gravelly loam
Bw - 12 to 36 inches: very gravelly sandy loam
BC - 36 to 59 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Minor Components

Sawicki

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

340E—Duckcreek-Houlihan-Nieman, stony complex, 15 to 45 percent slopes

Map Unit Setting

National map unit symbol: pdnw
Elevation: 5,600 to 6,500 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 36 to 38 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Duckcreek and similar soils: 40 percent
Houlihan and similar soils: 35 percent
Nieman, stony, and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Duckcreek

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope

Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Residuum weathered from mudstone

Typical profile

A - 0 to 6 inches: clay loam
Bt - 6 to 20 inches: clay loam
Bk - 20 to 36 inches: clay loam
Cr - 36 to 59 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Description of Houlihan

Setting

Landform: Swales
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sandstone and shale

Typical profile

A - 0 to 32 inches: loam
Bw - 32 to 59 inches: gravelly loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B
Ecological site: R043BP821MT - Upland Alpine Group
Hydric soil rating: No

Description of Nieman, Stony

Setting

Landform: Scarp slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from igneous and sedimentary rock

Typical profile

A - 0 to 7 inches: very cobbly loam
Bt - 7 to 16 inches: very cobbly clay loam
R - 16 to 59 inches: bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R043BP823MT - Shallow Alpine Group
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope
Hydric soil rating: Unranked

Redlodge

Percent of map unit: 2 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R043BP815MT - Subirrigated Grassland Group
Hydric soil rating: Yes

371D—Sixteenmile-Krakon-Breeton complex, 4 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1hfhs
Elevation: 5,200 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Sixteenmile and similar soils: 75 percent
Breeton and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sixteenmile

Setting

Landform: Plains
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Slope alluvium over residuum weathered from siltstone

Typical profile

A - 0 to 2 inches: channery sandy loam
Bw - 2 to 8 inches: very channery sandy loam
Cr - 8 to 10 inches: bedrock
R - 10 to 59 inches: bedrock

Properties and qualities

Slope: 4 to 15 percent
Depth to restrictive feature: 2 to 10 inches to paralithic bedrock; 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 0.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R043BP811MT - Shallow Sagebrush Shrubland Group
Hydric soil rating: No

Description of Breeton

Setting

Landform: Swales
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Slope alluvium over residuum weathered from siltstone

Typical profile

A - 0 to 24 inches: coarse sandy loam
Bw - 24 to 40 inches: gravelly coarse sandy loam
BC - 40 to 59 inches: gravelly coarse sandy loam

Properties and qualities

Slope: 4 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.13 to 7.09 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R043BP817MT - Subirrigated Shrubland Group
Hydric soil rating: No

409A—Meadowcreek loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4z12
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 12 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Meadowcreek

Setting

Landform: Flood-plain steps

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A1 - 0 to 10 inches: loam
A2 - 10 to 15 inches: silt loam
Bg - 15 to 31 inches: loam
2C - 31 to 59 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: R044BP815MT - Subirrigated Grassland
Hydric soil rating: No

Minor Components

Fairway

Percent of map unit: 5 percent
Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BP817MT - Subirrigated Shrubland
Hydric soil rating: No

Swampcreek

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

445B—Fairfield gravelly loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 4z17

Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Fairfield

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: gravelly loam
Bt - 6 to 10 inches: gravelly clay loam
Bk - 10 to 59 inches: gravelly clay loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R044BP818MT - Upland Grassland
Hydric soil rating: No

Minor Components

Martinsdale

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BC032MT - Loamy (Lo) LRU 01 Subset C
Hydric soil rating: No

445C—Reedwest-Roundor-Cabba complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2pqkb
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Reedwest and similar soils: 45 percent
Roundor and similar soils: 40 percent
Cabba and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reedwest

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from shale

Typical profile

A - 0 to 8 inches: loam
Bt - 8 to 17 inches: loam
Bk - 17 to 36 inches: loam
Cr - 36 to 59 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R044BB032MT - Loamy (Lo) LRU 01 Subset B
Hydric soil rating: No

Description of Roundor

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Residuum weathered from calcareous shale

Typical profile

A - 0 to 6 inches: loam
Bw - 6 to 11 inches: clay loam
Bk - 11 to 29 inches: clay loam
Cr - 29 to 59 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R044BB032MT - Loamy (Lo) LRU 01 Subset B
Hydric soil rating: No

Description of Cabba

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from calcareous shale

Typical profile

A - 0 to 3 inches: loam
Bk - 3 to 12 inches: clay loam
Cr - 12 to 59 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent

Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R044BB136MT - Shallow Loamy (SwLo) LRU 01 Subset B
Hydric soil rating: No

463A—Utica-Binna complex, cool, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4z1f
Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 39 to 43 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Utica, cool, and similar soils: 70 percent
Binna, cool, and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Utica, Cool

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

A - 0 to 6 inches: gravelly loam
Bk - 6 to 19 inches: very gravelly sandy loam
2C - 19 to 72 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R044BA036MT - Droughty (Dr) LRU 01 Subset A
Hydric soil rating: No

Description of Binna, Cool

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

A - 0 to 9 inches: loam
Bk - 9 to 29 inches: gravelly loam
2C - 29 to 59 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BA030MT - Limy (Ly) LRU 01 Subset A
Hydric soil rating: No

501B—Mannixlee-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 4z1h
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Mannixlee and similar soils: 35 percent
Clunton and similar soils: 30 percent
Meadowcreek and similar soils: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mannixlee

Setting

Landform: Flood-plain steps, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Oi - 0 to 2 inches: peat
A1 - 2 to 9 inches: loam
A2 - 9 to 25 inches: clay loam
Bw1 - 25 to 45 inches: silt loam
Bw2 - 45 to 52 inches: sandy loam
2Cg - 52 to 59 inches: extremely gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: black cottonwood/redosier dogwood c.t. (HP202), yellow willow c.t. (HP315)
Hydric soil rating: Yes

Description of Clunton

Setting

Landform: Flood-plain steps, flood plains
Down-slope shape: Linear
Across-slope shape: Linear, concave
Parent material: Alluvium

Typical profile

Oa - 0 to 4 inches: muck
Ag - 4 to 18 inches: loam
Cg1 - 18 to 30 inches: clay loam

Cg2 - 30 to 36 inches: silty clay loam
Cg3 - 36 to 42 inches: sandy loam
2Cg4 - 42 to 50 inches: gravelly sandy loam
2Cg5 - 50 to 57 inches: gravelly loamy sand
2Cg6 - 57 to 64 inches: silt loam

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.21 to 0.71 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 5w
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)
Hydric soil rating: Yes

Description of Meadowcreek

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Alluvium derived from sedimentary rock

Typical profile

A1 - 0 to 10 inches: loam
A2 - 10 to 15 inches: silt loam
Bg - 15 to 31 inches: loam
2C - 31 to 59 inches: very gravelly sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.71 to 2.13 in/hr)
Depth to water table: About 24 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: R043BP801MT - Bottomland Group

Hydric soil rating: No

Minor Components

Lamoose

Percent of map unit: 10 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BY080MT - Riparian Meadow (RM) LRU 01 Subset Y
Hydric soil rating: No

Water

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Enbar

Percent of map unit: 5 percent
Landform: Fan remnants, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: quaking aspen/Kentucky bluegrass c.t. (HP218)
Hydric soil rating: No

541C—Fairfield-Kiev complex, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1ncbq
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Fairfield and similar soils: 60 percent
Kiev and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fairfield

Setting

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

Typical profile

A - 0 to 6 inches: gravelly loam

Bt - 6 to 10 inches: gravelly clay loam
Bk - 10 to 59 inches: gravelly clay loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Description of Kiev

Setting
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile
A - 0 to 7 inches: loam
Bk1 - 7 to 38 inches: gravelly loam
Bk2 - 38 to 59 inches: gravelly loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups
Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

548D—Shawmut gravelly loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 4z1p
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Shawmut

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 3 inches: gravelly loam
Bt - 3 to 9 inches: gravelly clay loam
Bk1 - 9 to 24 inches: very gravelly loam
Bk2 - 24 to 59 inches: extremely gravelly loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BP818MT - Upland Grassland
Hydric soil rating: No

Minor Components

Reedwest

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BC032MT - Loamy (Lo) LRU 01 Subset C
Hydric soil rating: No

563A—Binna-Utica complex, cool, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4z1v
Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 10 to 19 inches
Mean annual air temperature: 39 to 43 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Binna, cool, and similar soils: 75 percent
Utica, cool, and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Binna, Cool

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

A - 0 to 9 inches: loam
Bk - 9 to 29 inches: gravelly loam
2C - 29 to 59 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BA030MT - Limy (Ly) LRU 01 Subset A
Hydric soil rating: No

Description of Utica, Cool

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone

Typical profile

A - 0 to 6 inches: gravelly loam
Bk - 6 to 19 inches: very gravelly sandy loam
2C - 19 to 72 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R044BA134MT - Shallow to Gravel (SwGr) LRU 01 Subset A
Hydric soil rating: No

658E—Reedwest-Bacbuster-Cabba complex, 8 to 35 percent slopes

Map Unit Setting

National map unit symbol: 4z28
Elevation: 4,800 to 6,300 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Reedwest and similar soils: 40 percent
Bacbuster and similar soils: 35 percent
Cabba and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Reedwest

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

A - 0 to 8 inches: loam
Bt - 8 to 17 inches: loam
Bk - 17 to 36 inches: loam
Cr - 36 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Description of Bacbuster

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

A - 0 to 10 inches: clay loam
Btk - 10 to 39 inches: silty clay
Cr - 39 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Description of Cabba

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

A - 0 to 3 inches: loam
Bk - 3 to 12 inches: clay loam
Cr - 12 to 59 inches: bedrock

Properties and qualities

Slope: 8 to 35 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R044BB136MT - Shallow Loamy (SwLo) LRU 01 Subset B
Hydric soil rating: No

670F—Castner-Crampton complex, 25 to 60 percent slopes

Map Unit Setting

National map unit symbol: 1hfhw
Elevation: 5,200 to 5,800 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

Castner and similar soils: 55 percent
Crampton and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Castner

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

A - 0 to 5 inches: channery loam
Bw - 5 to 8 inches: very channery loam
Bk - 8 to 15 inches: very channery loam
R - 15 to 59 inches: bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F043BP904MT - Shallow Warm Woodland Group
Hydric soil rating: No

Description of Crampton

Setting

Landform: Hillslopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from siltstone

Typical profile

A1 - 0 to 2 inches: loam
A2 - 2 to 5 inches: channery loam
Bt1 - 5 to 9 inches: channery loam
Bt2 - 9 to 13 inches: very channery loam
Bt3 - 13 to 28 inches: very channery clay loam
Cr - 28 to 59 inches: bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 20 to 39 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.00 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/bluebunch wheatgrass (PK210)
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 8 percent
Hydric soil rating: Unranked

Vigilante

Percent of map unit: 7 percent
Landform: Hillslopes
Down-slope shape: Convex
Across-slope shape: Convex
Other vegetative classification: Douglas-fir/Idaho fescue (PK220), Douglas-fir/bluebunch wheatgrass (PK210)
Hydric soil rating: No

704A—Villsprings silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4z2c
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Villsprings

Setting

Landform: Alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

Oi - 0 to 4 inches: slightly decomposed plant material
Ag - 4 to 9 inches: silt loam
Bkg1 - 9 to 19 inches: silty clay loam
Bkg2 - 19 to 32 inches: loam
2Bkg3 - 32 to 36 inches: very gravelly loam
3C - 36 to 59 inches: very gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: NoneRare
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D

Ecological site: R044BP815MT - Subirrigated Grassland
Hydric soil rating: Yes

Minor Components

Fairsmith

Percent of map unit: 10 percent
Landform: Flood-plain steps
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BP817MT - Subirrigated Shrubland
Hydric soil rating: No

748C—Shawmut stony loam, 4 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2kvnq
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 43 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Shawmut

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 3 inches: stony loam
Bt - 3 to 9 inches: gravelly clay loam
Bk1 - 9 to 24 inches: very gravelly loam
Bk2 - 24 to 59 inches: very gravelly loam

Properties and qualities

Slope: 4 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R046XN255MT - Stony (St) RRU 46-N 13-19 PZ
Hydric soil rating: No

Minor Components

Meagher

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BB032MT - Loamy (Lo) LRU 01 Subset B
Hydric soil rating: No

954C—Meagher cobbly loam, 2 to 8 percent slopes, stony

Map Unit Setting

National map unit symbol: 4z2y
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Mean annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Meagher, Stony

Setting

Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 7 inches: cobbly loam
Bt - 7 to 14 inches: gravelly clay loam
Bk - 14 to 59 inches: very gravelly clay loam

Properties and qualities

Slope: 2 to 8 percent

Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Minor Components

Martinsdale

Percent of map unit: 10 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BC032MT - Loamy (Lo) LRU 01 Subset C
Hydric soil rating: No

Shawmut

Percent of map unit: 5 percent
Landform: Valley floors
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

1164G—Cowcoulee, stony-Ettienridge families, complex, 35 to 70 percent slopes

Map Unit Setting

National map unit symbol: 2lbbd
Elevation: 5,250 to 7,300 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 34 to 37 degrees F
Frost-free period: 40 to 60 days
Farmland classification: Not prime farmland

Map Unit Composition

Cowcoulee, stony, and similar soils: 45 percent

Ettienridge and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cowcoulee, Stony

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from limestone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: silt loam
Bt - 6 to 11 inches: gravelly silty clay loam
Btk - 11 to 23 inches: very gravelly clay loam
Bk - 23 to 33 inches: very gravelly loam
R - 33 to 59 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/ninebark-pinegrass phase (PK262), Douglas-fir/snowberry-snowberry phase (PK313), Douglas-fir/heartleaf arnica (PK370)
Hydric soil rating: No

Description of Ettienridge

Setting

Landform: Mountain slopes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium over residuum weathered from limestone

Typical profile

Oi - 0 to 3 inches: slightly decomposed plant material
A - 3 to 8 inches: gravelly loam
Bk1 - 8 to 17 inches: very gravelly loam
Bk2 - 17 to 29 inches: very gravelly loam
R - 29 to 59 inches: bedrock

Properties and qualities

Slope: 35 to 70 percent
Depth to restrictive feature: 20 to 39 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/snowberry-snowberry phase (PK313), Douglas-fir/twinflower-snowberry phase (PK291), Douglas-fir/common juniper (PK360)
Hydric soil rating: No

Minor Components

Checkerboard, very stony

Percent of map unit: 10 percent
Landform: Mountain slopes
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/common juniper (PK360), Douglas-fir/kinnikinnick (PK350)
Hydric soil rating: No

Rock outcrop

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

Levengood

Percent of map unit: 5 percent
Landform: Mountain slopes
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/ninebark-pinegrass phase (PK262), Douglas-fir/twinflower-snowberry phase (PK291), Douglas-fir/bluebunch wheatgrass (PK210)
Hydric soil rating: No

M-W—Sewage Lagoon

Map Unit Composition

Water, miscellaneous: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water, Miscellaneous

Interpretive groups

Land capability classification (irrigated): 8
Hydric soil rating: Unranked

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

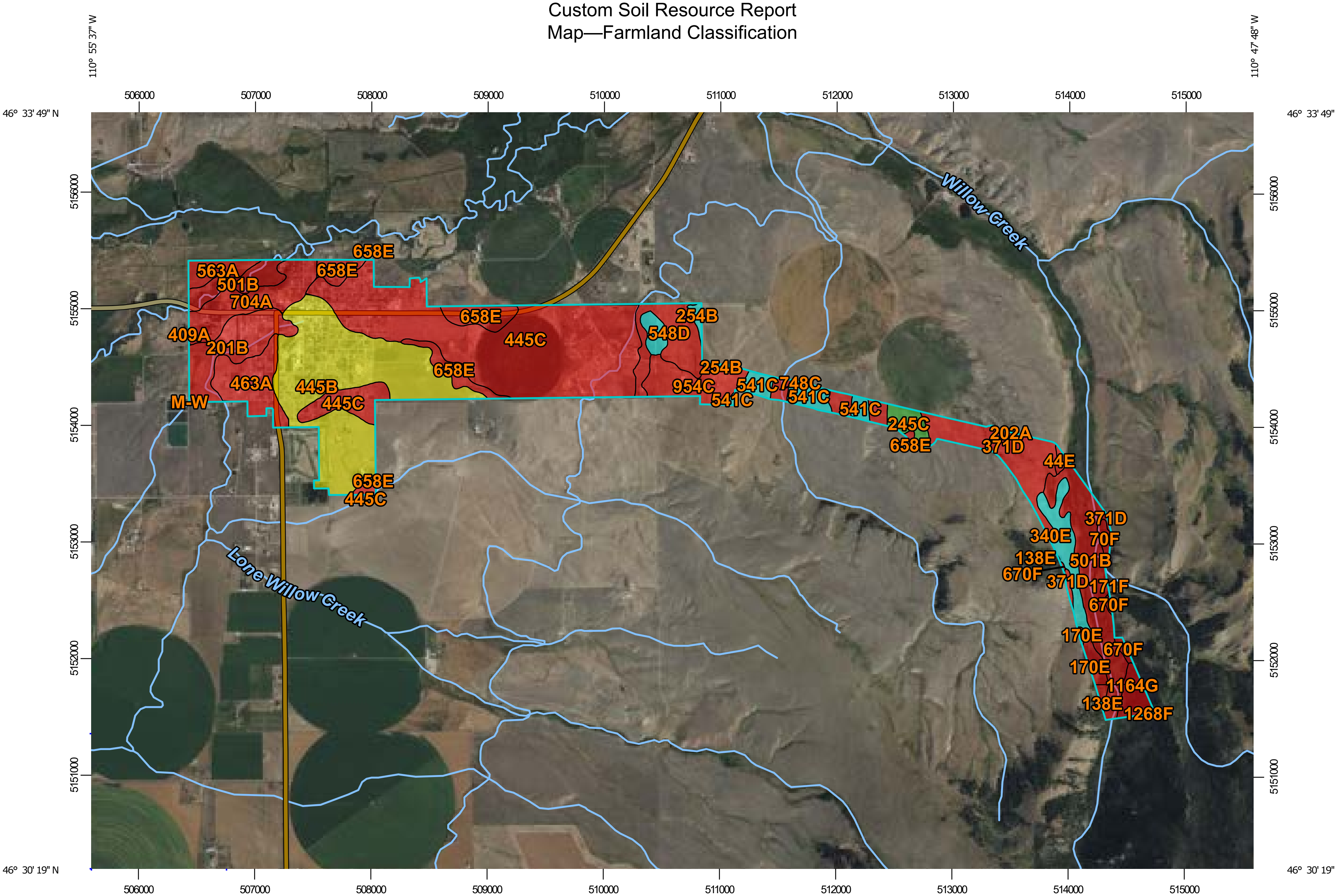
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Map—Farmland Classification



Map Scale: 1:45,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated and drained

Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer

Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough

Farmland of statewide importance, if thawed

Farmland of local importance

Farmland of local importance, if irrigated

Farmland of unique importance

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

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

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

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

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

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

Soil Survey Area: Lewis and Clark National Forest Area, Montana
Survey Area Data: Version 15, Aug 26, 2022

Soil Survey Area: Meagher County Area, Montana
Survey Area Data: Version 22, Aug 30, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Aug 9, 2022—Aug 19, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
138E	Surdal-Poin complex, 10 to 35 percent slopes, stony	Not prime farmland	3.4	0.2%
501B	Mannixlee, rarely flooded-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes	Not prime farmland	9.1	0.6%
1164G	Cowcoulee, stony-Ettienridge families, complex, 35 to 70 percent slopes	Not prime farmland	16.3	1.0%
1168E	Lake Creek, very stony-Elve, extremely stony-Comad, rubbly families, complex, 8 to 35 percent slopes	Not prime farmland	0.1	0.0%
1268F	Tigeron, rubbly-Targhee, very bouldery-Como, very stony families, complex, 35 to 60 percent slopes	Not prime farmland	0.2	0.0%
Subtotals for Soil Survey Area			**29.1**	**1.8%**
Totals for Area of Interest			**1,591.6**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
44E	Tolbert channery loam, 8 to 35 percent slopes	Not prime farmland	3.6	0.2%
70F	Vershal-Castner-Rock outcrop complex, 25 to 60 percent slopes	Not prime farmland	6.6	0.4%
138E	Bairspring-Poin complex, 10 to 35 percent slopes, stony	Not prime farmland	11.5	0.7%
170E	Cheadle-Copenhaver-Sebud complex, 15 to 35 percent slopes	Not prime farmland	1.7	0.1%
171F	Bairspring-Woodhall-Poin complex, 20 to 60 percent slopes	Not prime farmland	0.1	0.0%
201B	Bigsandy loam, 0 to 4 percent slopes	Not prime farmland	77.3	4.9%
202A	Fairberg-Villmeagher complex, 0 to 2 percent slopes	Not prime farmland	0.0	0.0%
245C	Reedwest gravelly loam, 2 to 8 percent slopes	All areas are prime farmland	19.4	1.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
254B	Meagher gravelly loam, 1 to 4 percent slopes	Farmland of statewide importance	21.5	1.4%
274C	Perma gravelly loam, 2 to 8 percent slopes	Farmland of statewide importance	41.4	2.6%
340E	Duckcreek-Houlihan-Nieman, stony complex, 15 to 45 percent slopes	Not prime farmland	0.8	0.1%
371D	Sixteenmile-Krakon-Breeton complex, 4 to 15 percent slopes	Not prime farmland	88.7	5.6%
409A	Meadowcreek loam, 0 to 2 percent slopes	Prime farmland if irrigated	0.1	0.0%
445B	Fairfield gravelly loam, 1 to 4 percent slopes	Prime farmland if irrigated	297.5	18.7%
445C	Reedwest-Roundor-Cabba complex, 2 to 8 percent slopes	Not prime farmland	438.4	27.5%
463A	Utica-Binna complex, cool, 0 to 2 percent slopes	Not prime farmland	63.9	4.0%
501B	Mannixlee-Clunton, frequently flooded-Meadowcreek complex, 0 to 4 percent slopes	Not prime farmland	141.6	8.9%
541C	Fairfield-Kiev complex, 2 to 8 percent slopes	Farmland of statewide importance	37.6	2.4%
548D	Shawmut gravelly loam, 8 to 15 percent slopes	Not prime farmland	59.8	3.8%
563A	Binna-Utica complex, cool, 0 to 2 percent slopes	Not prime farmland	22.6	1.4%
658E	Reedwest-Bacbuster-Cabba complex, 8 to 35 percent slopes	Not prime farmland	80.2	5.0%
670F	Castner-Crampton complex, 25 to 60 percent slopes	Not prime farmland	5.7	0.4%
704A	Villsprings silt loam, 0 to 2 percent slopes	Not prime farmland	75.4	4.7%
748C	Shawmut stony loam, 4 to 8 percent slopes	Not prime farmland	6.5	0.4%
954C	Meagher cobbly loam, 2 to 8 percent slopes, stony	Not prime farmland	55.8	3.5%
1164G	Cowcoulee, stony-Ettienridge families, complex, 35 to 70 percent slopes	Not prime farmland	4.7	0.3%
M-W	Sewage Lagoon	Not prime farmland	0.0	0.0%
Subtotals for Soil Survey Area			**1,562.4**	**98.2%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Totals for Area of Interest			**1,591.6**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

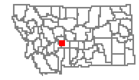
Appendix E

Biological Resource Data

MONTANA Natural Heritage Program
A program of the **Montana State Library's Natural Resource Information System**

Legend

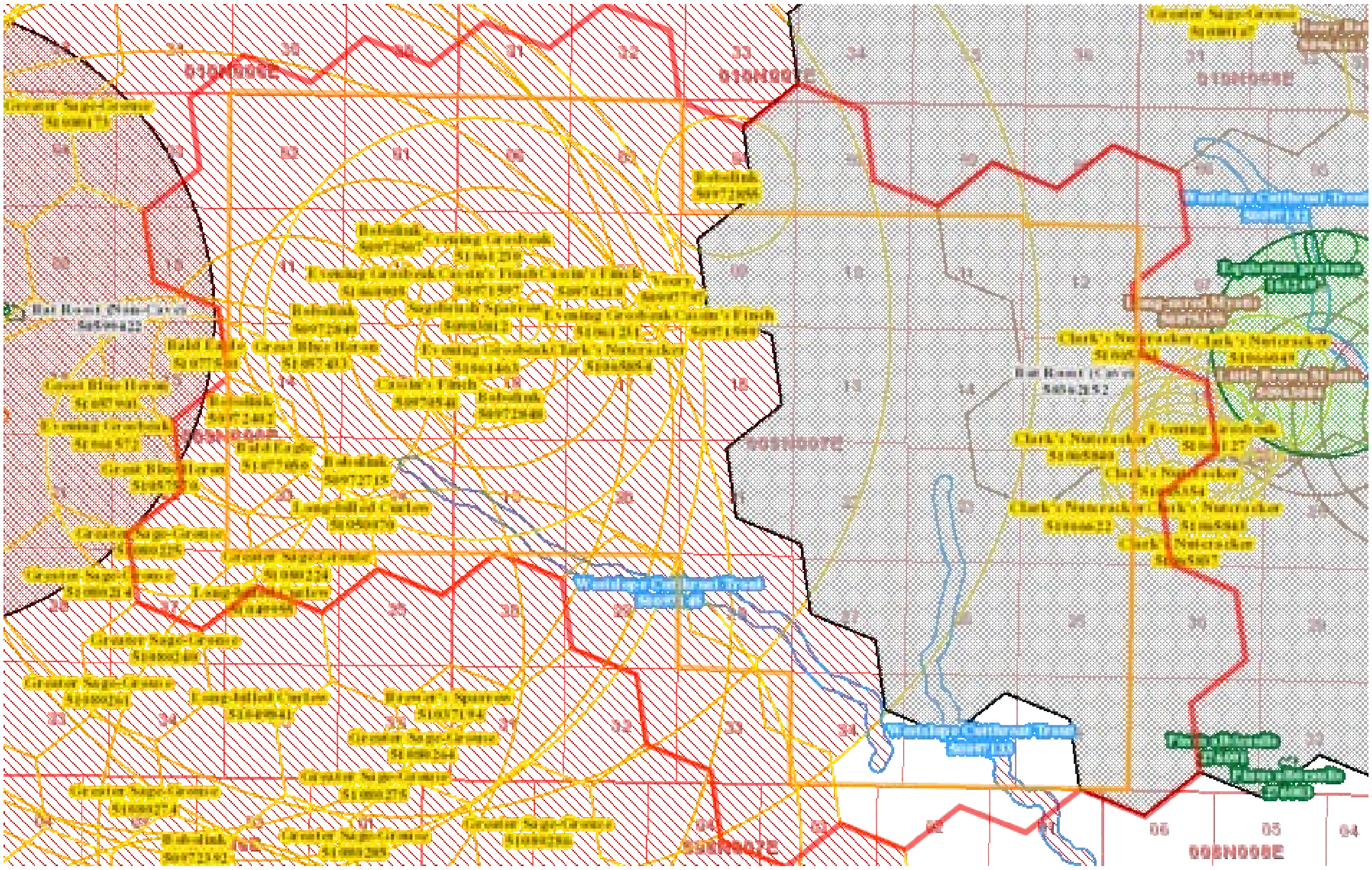
Model Icons	Habitat Icons	Range Icons	Num Obs
Suitable (native range)	Common	Native / Year-round	Count of obs with 'good precision' (<=1000m)
Optimal Suitability	Occasional	Summer	**+** indicates additional 'poor precision' obs (1001m-10,000m)
Moderate Suitability		Winter	
Low Suitability		Migratory	
Suitable (introduced range)		Non-native	
		Historical	



Latitude	Longitude
46.47856	-110.76008
46.59148	-110.96478

Native Species

Summarized by: **23prvt0217** *(Custom Area of Interest)*
Filtered by:
Native Species reports are filtered for Species with MT Status = Species of Concern, Special Status, Important Animal Habitat, Potential SOC



Species Occurrences

	USFWS Sec7	# SO	# Obs	Predicted Model	Range
F - Westslope Cutthroat Trout *(Oncorhynchus clarkii lewisi)* SOC		2	24 +		

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native/Non-native Species - (depends on location or taxa) Global: **G5T4** State: **S2**
USFS: **Sensitive - Known in Forests (BD, BRT, KOOT, LOLO)**
Species of Conservation Concern in Forests (CG, HLC) BLM: **SENSITIVE** FWP SWAP: **SGCN2**

Delineation Criteria Stream reaches and standing water bodies where the species presence has been confirmed through direct capture or where they are believed to be present based on the professional judgement of a fisheries biologist due to confirmed presence in adjacent areas. In order to reflect the importance of adjacent terrestrial habitats to survival, stream reaches are buffered 100 meters, standing water bodies greater than 1 acre are buffered 50 meters, and standing water bodies less than 1 acre are buffered 30 meters into the terrestrial habitat based on PACFISH/INFISH Riparian Conservation Area standards. (Last Updated: Jul 25, 2022)

Predicted Models: 22% Suitable (native range) (deductive)

	USFWS Sec7	# SO	# Obs	Predicted Model	Range
B - Clark's Nutcracker *(Nucifraga columbiana)* SOC		11	36		

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** USFS: **Species of Conservation Concern in Forests (FLAT)** FWP SWAP: **SGCN3** PIF: **3**

Delineation Criteria Observations with direct evidence of breeding activity or indirect evidence of breeding activity between early March and mid-July within forested habitats containing Whitebark Pine (Pinus albicaulis), Limber Pine (Pinus flexilis), or Ponderosa Pine (Pinus ponderosa). Observations are buffered by a minimum distance of 1,000 meters in order to encompass the spring/summer breeding territory size reported for the species or the locational uncertainty of the observation to a maximum distance of 10,000 meters. (Last Updated: Jan 12, 2023)

Predicted Models: 41% Moderate (inductive), 49% Low (inductive)

	USFWS Sec7	# SO	# Obs	Predicted Model	Range
B - Green-tailed Towhee *(Pipilo chlorurus)* SOC		1	4		

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**

Delineation Criteria Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 125 meters in order to encompass the breeding home range size reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Jan 04, 2023)

Predicted Models: 31% Moderate (inductive), 47% Low (inductive)

B - Cassin's Finch *(Haemorhous cassinii)* SOC | 8 | 29

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA; BCC10** FWP SWAP: **SGCN3** PIF: **3**

Delineation Criteria Observations with evidence of breeding activity buffered by a minimum distance of 300 meters in order to be conservative about encompassing the courtship and foraging distance from nesting areas and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Dec 28, 2022)

Predicted Models: 24% Moderate (inductive), 24% Low (inductive)

B - Long-billed Curlew *(Numenius americanus)* SOC | 7 | 15 +

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC11** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

Delineation Criteria Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 200 meters in order to approximate the breeding territory size reported for the species in Idaho and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Jan 04, 2023)

Predicted Models: 18% Moderate (inductive), 57% Low (inductive)

B - Greater Sage-Grouse *(Centrocercus urophasianus)* SOC | 8 | +

View in Field Guide **View Predicted Models** **View Range Maps**

USFS: **Sensitive - Known in Forests (BD)**

Species of Concern - Native Species Global: **G3G4** State: **S2** **Species of Conservation Concern in Forests (CG)** BLM: **SENSITIVE** FWP SWAP: **SGCN2** PIF: **1**

Delineation Criteria Confirmed breeding area based on the presence of a nest, chicks, juveniles, or adults on a lek. Point observations are mapped in the center of a one-square mile hexagon to protect the exact locations of leks. The outer edges of this hexagon are then buffered by a distance of 6,400 meters in order to encompass a body of research indicating that females typically nest within this distance of a lek and that lek numbers are negatively impacted by fossil fuel drilling activities within this distance of a lek. If the locational uncertainty associated with the observation is greater than this distance, it is buffered by the locational up to a maximum distance of 10,000 meters. All of the one-square mile hexagons intersecting this buffered area are presented as the Species Occurrence record. (Last Updated: Jan 25, 2023)

Predicted Models: 10% Moderate (inductive), 43% Low (inductive)

B - Bobolink *(Dolichonyx oryzivorus)* SOC | 8 | 5 +

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC10; BCC11; BCC17** FWP SWAP: **SGCN3** PIF: **3**

Delineation Criteria Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 150 meters in order to conservatively encompass male territory size reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Dec 28, 2022)

Predicted Models: 10% Moderate (inductive), 33% Low (inductive)

B - Evening Grosbeak *(Coccothraustes vespertinus)* SOC | 6 | 18 +

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA; BCC10** FWP SWAP: **SGCN3**

Delineation Criteria Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 1,000 meters in order to encompass the maximum foraging distance from nests reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Jan 12, 2023)

Predicted Models: 10% Moderate (inductive), 31% Low (inductive)

B - Bald Eagle *(Haliaeetus leucocephalus)* SSS | 2 | 35 +

View in Field Guide **View Predicted Models** **View Range Maps**

Special Status Species - Native Species Global: **G5** State: **S4** USFWS: **BGEPA; MBTA** USFS: **Sensitive - Known in Forests (BD, BRT, KOOT, LOLO)** BLM: **SENSITIVE** PIF: **2**

Delineation Criteria Confirmed nesting area buffered by a minimum distance of 2,000 meters in order to be conservative about encompassing the breeding territory and area commonly used for renesting. Only nesting observations with a locational uncertainty of 1,000 meters or less will be used to delineate a nesting area. (Last Updated: Jan 13, 2023)

Predicted Models: 8% Moderate (inductive), 22% Low (inductive)

B - Brewer's Sparrow *(Spizella breweri)* SOC | 1

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

Delineation Criteria Confirmed breeding area based on the presence of a nest, chicks, or territorial adults during the breeding season. Point observation location is buffered by a minimum distance of 100 meters in order to encompass the maximum territory size reported for the species and otherwise is buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Jan 04, 2023)

Predicted Models: 6% Moderate (inductive), 69% Low (inductive)

B - Great Blue Heron *(Ardea herodias)* SOC | 3 | 24

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3**

Delineation Criteria Confirmed nesting area buffered by a minimum distance of 6,500 meters in order to be conservative about encompassing the areas commonly used for foraging near the breeding colony and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Jan 10, 2023)

Predicted Models: 4% Moderate (inductive), 27% Low (inductive)

M - Little Brown Myotis *(Myotis lucifugus)* SOC | 1

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G3G4** State: **S3** FWP SWAP: **SGCN3**

Delineation Criteria Confirmed area of occupancy based on the documented presence (mistnet captures, definitively identified acoustic recordings, or definitively identified roosting individuals) of adults or juveniles. Point observation location is buffered by a distance of 1,600 meters in order to encompass the greater than 1,500 meters foraging distance reported for the species in New Brunswick, Canada and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. When cave locations are involved, point observations are mapped in the center of a one-square mile hexagon to protect the exact location of the cave entrance as per the Federal Cave Resource Protection Act and associated regulations (U.S. Code Title 16 Chapter 63, Code of Federal Regulations Title 43 Subtitle A Part 37). The outer edges of the hexagon are then buffered by a distance of 1,600 meters and otherwise by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. All of the one-square mile hexagons intersecting this buffered area are presented as the Species Occurrence record. (Last Updated: Dec 22, 2022)

Predicted Models: 2% Moderate (inductive), 98% Low (inductive)

B - Veery *(Catharus fuscescens)* SOC | 1 | 2

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

Delineation Criteria Observations with evidence of breeding activity buffered by a minimum distance of 300 meters in order to be conservative about encompassing home ranges and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Dec 29, 2022)

Predicted Models: 2% Moderate (inductive), 61% Low (inductive)

M - Long-eared Myotis *(Myotis evotis)* SOC | 1 | 2

View in Field Guide **View Predicted Models** **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3**

Delineation Criteria Confirmed area of occupancy based on the documented presence (mistnet captures, definitively identified acoustic recordings, and definitively identified roosting individuals) of adults or juveniles. Point observation location is buffered by a minimum distance of 1,000 meters in order to encompass the average distances traveled from capture locations to roosts and between roosts in western Montana, Alberta, and Oregon and otherwise buffered by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. When cave locations are involved, point observations are mapped in the center of a one-square mile hexagon to protect the exact location of the cave entrance as per the Federal Cave Resource Protection Act and associated regulations (U.S. Code Title 16 Chapter 63, Code of Federal Regulations Title 43 Subtitle A Part 37). The outer edges of the hexagon are then buffered by a distance of 1,000 meters and otherwise by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. All of the one-square mile hexagons intersecting this buffered area are presented as the Species Occurrence record. (Last Updated: Jul 20, 2022)

Predicted Models: 96% Low (inductive)

O - Bat Roost (Cave) *(Bat Roost (Cave))* IAH | 1 | Not Assessed

View in Field Guide

Important Animal Habitat - Native Species Global: **GNR** State: **SNR**

Delineation Criteria Confirmed occupancy of a cave based on the documented presence of adults or juveniles of any bat species. Point observation locations are mapped in the center of a one-square mile hexagon to protect the exact location of the cave entrance as per the Federal Cave Resource Protection Act and associated regulations (U.S. Code Title 16 Chapter 63, Code of Federal Regulations Title 43 Subtitle A Part 37). The outer edges of the hexagon are then buffered by a distance of 4,500 meters in order to encompass the 95% confidence interval for nightly foraging distance reported for Townsendâ€™s Big-eared Bat (a resident Montana bat Species of Concern) and otherwise by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. All of the one-square mile hexagons intersecting this buffered area are presented as the Species Occurrence record. (Last Updated: Sep 05, 2017)

O - Bat Roost (Non-Cave) *(Bat Roost (Non-Cave))* IAH | 1 | Not Assessed

View in Field Guide

Important Animal Habitat - Native Species Global: **GNR** State: **SNR**

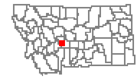
Delineation Criteria Confirmed area of occupancy based on the documented presence of adults or juveniles of any bat species at non-cave natural roost sites (e.g. rock outcrops, trees), below ground human created roost sites (e.g. mines), and above ground human created roost sites (e.g., bridges, buildings). Point observation locations are buffered by a distance of 4,500 meters in order to encompass the 95% confidence interval for nightly foraging distance reported for Townsendâ€™s Big-eared Bat (a resident Montana bat Species of Concern) and otherwise by the locational uncertainty associated with the observation up to a maximum distance of 10,000 meters. (Last Updated: Oct 22, 2019)

Montana Natural Heritage Program

A program of the **Montana State Library's Natural Resource Information System**

Legend

Model Icons	Habitat Icons	Range Icons	Num Obs
Suitable (native range)	Common	Native / Year-round	Count of obs with 'good precision' (<=1000m)
Optimal Suitability	Occasional	Summer	**+** indicates additional 'poor precision' obs (1001m-10,000m)
Moderate Suitability		Winter	
Low Suitability		Migratory	
Suitable (introduced range)		Non-native	
		Historical	



Latitude	Longitude
46.47856	-110.76008
46.59148	-110.96478

Native Species

Summarized by: **23prvt0217** *(Custom Area of Interest)*

Filtered by:

Native Species reports are filtered for Species with MT Status = Species of Concern, Special Status, Important Animal Habitat, Potential SOC

Other Observed Species

Species	USFWS Sec7	# Obs	Predicted Model	Range
B - Short-eared Owl *(Asio flammeus)* PSOC		1		
B - Northern Goshawk *(Accipiter gentilis)* SOC		7		
B - Barrow's Goldeneye *(Bucephala islandica)* PSOC		1		
B - American White Pelican *(Pelecanus erythrorhynchos)* SOC		10		
B - Broad-tailed Hummingbird *(Selasphorus platycercus)* PSOC		1		
B - Ferruginous Hawk *(Buteo regalis)* SOC		6 +		
B - Rufous Hummingbird *(Selasphorus rufus)* PSOC		17		
B - Golden Eagle *(Aquila chrysaetos)* SOC		20		
B - Sharp-tailed Grouse *(Tympanuchus phasianellus)* SOC		2		
B - Thick-billed Longspur *(Rhynchophanes mccownii)* SOC		1		
V - Veratrum californicum *(California False-hellebore)* SOC		1	Not Assessed	
B - Franklin's Gull *(Leucophaeus pipixcan)* SOC		2	Not Assessed	
B - Gray-crowned Rosy-Finch *(Leucosticte tephrocotis)* SOC		27 +	Not Assessed	
I - Enallagma civile *(Familiar Bluet)* PSOC		1	Not Assessed	

B - Short-eared Owl *(Asio flammeus)* PSOC

View in Field Guide View Predicted Models View Range Maps

Potential Species of Concern - Native Species Global: **G5** State: **S4** USFWS: **MBTA; BCC11; BCC17** PIF: **3**

Predicted Models: 22% Moderate (inductive), 35% Low (inductive)

B - Northern Goshawk *(Accipiter gentilis)* SOC

View in Field Guide View Predicted Models View Range Maps

Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **2**

Predicted Models: 20% Moderate (inductive), 4% Low (inductive)

B - Barrow's Goldeneye *(Bucephala islandica)* PSOC

View in Field Guide View Predicted Models View Range Maps

Potential Species of Concern - Native Species Global: **G5** State: **S4** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **2**

Predicted Models: 14% Moderate (inductive), 61% Low (inductive)

B - American White Pelican *(Pelecanus erythrorhynchos)* SOC

View in Field Guide View Predicted Models View Range Maps

Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **3**

Predicted Models: 14% Moderate (inductive), 41% Low (inductive)

B - Broad-tailed Hummingbird *(Selasphorus platycercus)* PSOC

View in Field Guide View Predicted Models View Range Maps

Potential Species of Concern - Native Species Global: **G5** State: **S4B** USFWS: **MBTA; BCC10** FWP SWAP: **SGIN**

Predicted Models: 10% Moderate (inductive), 53% Low (inductive)

B - Ferruginous Hawk *(Buteo regalis)* SOC

View in Field Guide View Predicted Models View Range Maps

Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

Predicted Models: 6% Moderate (inductive), 65% Low (inductive)

B - Rufous Hummingbird *(Selasphorus rufus)* PSOC

View in Field Guide View Predicted Models View Range Maps

Potential Species of Concern - Native Species Global: **G4** State: **S4B** USFWS: **MBTA; BCC10** PIF: **3**

Predicted Models: 6% Moderate (inductive), 45% Low (inductive)

B - Golden Eagle *(Aquila chrysaetos)* SOC

View in Field Guide View Predicted Models View Range Maps

Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **BGEPA; MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3**

Predicted Models: 71% Low (inductive)

B - Sharp-tailed Grouse *(Tympanuchus phasianellus)* SOC

View in Field Guide View Predicted Models View Range Maps

Species of Concern - Native Species Global: **G5** State: **SX,S4** FWP SWAP: **SGCN1** PIF: **2**

Predicted Models: 55% Low (inductive)

B - Thick-billed Longspur *(Rhynchophanes mccownii)* SOC

View in Field Guide View Predicted Models View Range Maps

Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA; BCC10; BCC11; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

Predicted Models: 37% Low (inductive)

V - Veratrum californicum *(California False-hellebore)* SOC

View in Field Guide

Species of Concern - Native Species Global: **G5** State: **S2** USFS: **Sensitive - Known in Forests (BD, BRT)** Plant Threat Score: **Low** CCVI: **Highly Vulnerable**

B - Franklin's Gull *(Leucophaeus pipixcan)* SOC

View in Field Guide View Range Maps

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC10; BCC11; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

B - Gray-crowned Rosy-Finch *(Leucosticte tephrocotis)* SOC

View in Field Guide View Range Maps

Species of Concern - Native Species Global: **G5** State: **S2** USFWS: **MBTA** FWP SWAP: **SGCN2, SGIN**

I - Enallagma civile *(Familiar Bluet)* PSOC

View in Field Guide View Range Maps

Potential Species of Concern - Native Species Global: **G5** State: **S2S4**

B - Common Loon *(Gavia immer)* **SOC** + Not Assessed

View in Field Guide **View Range Maps**

Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** USFS: **Sensitive - Known in Forests (KOOT, LOLO)** FWP SWAP: **SGCN3** PIF: **1**

F - Burbot *(Lota lota)* **PSOC** + Not Assessed

View in Field Guide **View Range Maps**

Potential Species of Concern - Native Species Global: **G5** State: **S4**

F - Yellowstone Cutthroat Trout *(Oncorhynchus clarkii bouvieri)* **SOC** + Not Assessed

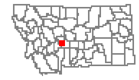
View in Field Guide **View Range Maps**

Species of Concern - Native/Non-native Species - (depends on location or taxa) Global: **G5T4** State: **S2** BLM: **SENSITIVE** FWP SWAP: **SGCN2**

MONTANA Natural Heritage Program
A program of the **Montana State Library's Natural Resource Information System**

Legend

Model Icons	Habitat Icons	Range Icons	Num Obs
Suitable (native range)	Common	Native / Year-round	Count of obs with 'good precision' (<=1000m)
Optimal Suitability	Occasional	Summer	+ indicates additional 'poor precision' obs (1001m-10,000m)
Moderate Suitability		Winter	
Low Suitability		Migratory	
Suitable (introduced range)		Non-native	
		Historical	



Latitude	Longitude
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46.59148	-110.96478

Native Species

Summarized by: **23prvt0217** *(Custom Area of Interest)*
Filtered by:
Native Species reports are filtered for Species with MT Status = Species of Concern, Special Status, Important Animal Habitat, Potential SOC

Other Potential Species

USFWS Sec7 | Predicted Model | Range

I - Bombus suckleyi *(Suckley Cuckoo Bumble Bee)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G2G3** State: **S1**
Predicted Models: 67% Moderate (inductive), 22% Low (inductive)

M - Preble's Shrew *(Sorex preblei)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S3** FWP SWAP: **SGCN3**
Predicted Models: 55% Moderate (inductive), 22% Low (inductive)

M - Merriam's Shrew *(Sorex merriami)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S3** FWP SWAP: **SGCN3**
Predicted Models: 53% Moderate (inductive), 35% Low (inductive)

V - Eleocharis rostellata *(Beaked Spikerush)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3** USFS: **Species of Conservation Concern in Forests (CG, FLAT, HLC)** Plant Threat Score: **Unknown**
CCVI: **Less Vulnerable**
Predicted Models: 43% Moderate (inductive), 37% Low (inductive)

V - Erigeron linearis *(Linear-leaf Fleabane)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S2** Plant Threat Score: **Low** CCVI: **Less Vulnerable**
Predicted Models: 33% Moderate (inductive), 53% Low (inductive)

V - Potentilla plattensis *(Platte Cinquefoil)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S3** Plant Threat Score: **No Known Threats** CCVI: **Highly Vulnerable**
Predicted Models: 33% Moderate (inductive), 31% Low (inductive)

V - Ranunculus pedatifidus *(Northern Buttercup)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S3** USFS: **Species of Conservation Concern in Forests (HLC)** Plant Threat Score: **Unknown**
Predicted Models: 33% Moderate (inductive), 20% Low (inductive)

M - Western Spotted Skunk *(Spilogale gracilis)* PSOC

View in Field Guide **View Predicted Models** **View Range Maps**
Potential Species of Concern - Native Species Global: **G5** State: **SU** FWP SWAP: **SGIN**
Predicted Models: 31% Moderate (inductive), 51% Low (inductive)

V - Carex crawei *(Crawe's Sedge)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G5** State: **S2S3** Plant Threat Score: **Low**
Predicted Models: 31% Moderate (inductive), 39% Low (inductive)

V - Cirsium longistylum *(Long-styled Thistle)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G2G3** State: **S2S3** Plant Threat Score: **Medium** CCVI: **Less Vulnerable**
Predicted Models: 27% Moderate (inductive), 29% Low (inductive)

M - North American Porcupine *(Erethizon dorsatum)* PSOC

View in Field Guide **View Predicted Models** **View Range Maps**
Potential Species of Concern - Native Species Global: **G5** State: **S3S4** FWP SWAP: **SGIN**
Predicted Models: 24% Moderate (inductive), 51% Low (inductive)

M - Dwarf Shrew *(Sorex nanus)* SOC

View in Field Guide **View Predicted Models** **View Range Maps**
Species of Concern - Native Species Global: **G4** State: **S2S3** FWP SWAP: **SGCN2-3**
Predicted Models: 22% Moderate (inductive), 47% Low (inductive)

V - Polygonum austiniae *(Austin's Knotweed)* PSOC

View in Field Guide **View Predicted Models** **View Range Maps**
Potential Species of Concern - Native Species Global: **G5T4** State: **S3S4** USFS: **Sensitive - Known in Forests (BD) Species of Conservation Concern in Forests (HLC)**
Predicted Models: 22% Moderate (inductive), 31% Low (inductive)

I - Oreohelix strigosa berryi *(Berry's Mountainsnail)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5T2** State: **S1S2**
Predicted Models: 22% Moderate (inductive), 10% Low (inductive)

V - Oxytropis lagopus var. conjugans *(Hare's-foot Locoweed)* PSOC

View in Field Guide View Predicted Models View Range Maps
Potential Species of Concern - Native Species Global: **G4G5T3T4** State: **S3S4**
Predicted Models: 22% Moderate (inductive), 6% Low (inductive)

M - Long-legged Myotis *(Myotis volans)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G4G5** State: **S3**
Predicted Models: 18% Moderate (inductive), 78% Low (inductive)

V - Gratiola ebracteata *(Bractless Hedge-hyssop)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G4** State: **S2** Plant Threat Score: **No Known Threats** CCVI: **Moderately Vulnerable**
Predicted Models: 18% Moderate (inductive), 43% Low (inductive)

B - Brown Creeper *(Certhia americana)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **1**
Predicted Models: 18% Moderate (inductive), 6% Low (inductive)

V - Carex stenoptila *(Small-winged Sedge)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G3** State: **S2S3** Plant Threat Score: **No Known Threats** CCVI: **Less Vulnerable**
Predicted Models: 16% Moderate (inductive), 16% Low (inductive)

V - Stellaria crassifolia *(Fleshy Stitchwort)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S2** Plant Threat Score: **No Known Threats**
Predicted Models: 12% Moderate (inductive), 45% Low (inductive)

B - Pileated Woodpecker *(Dryocopus pileatus)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3** PIF: **2**
Predicted Models: 12% Moderate (inductive), 12% Low (inductive)

B - Great Gray Owl *(Strix nebulosa)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3, SGIN** PIF: **3**
Predicted Models: 8% Moderate (inductive), 20% Low (inductive)

B - Sage Thrasher *(Oreoscoptes montanus)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **3**
Predicted Models: 6% Moderate (inductive), 61% Low (inductive)

M - Fringed Myotis *(Myotis thysanodes)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3** BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predicted Models: 6% Moderate (inductive), 43% Low (inductive)

V - Lilium philadelphicum *(Wood Lily)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** Plant Threat Score: **Low** CCVI: **Less Vulnerable**
Predicted Models: 6% Moderate (inductive), 22% Low (inductive)

V - Pinus albicaulis *(Whitebark Pine)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G3G4** State: **S3** USFWS: **LT** USFS: **Sensitive - Known in Forests (BD, BRT, KOOT, LOLO)** BLM: **THREATENED**
Plant Threat Score: **Unknown** CCVI: **Highly Vulnerable**
Predicted Models: 6% Moderate (inductive), 12% Low (inductive)

V - Physaria klausii *(Divide Bladderpod)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G3** State: **S3** Plant Threat Score: **Low** CCVI: **Moderately Vulnerable**
Predicted Models: 4% Moderate (inductive), 59% Low (inductive)

V - Eriogonum caespitosum *(Mat Buckwheat)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S2S3** Plant Threat Score: **No Known Threats**
Predicted Models: 4% Moderate (inductive), 35% Low (inductive)

V - Primula incana *(Mealy Primrose)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3** USFS: **Sensitive - Known in Forests (BD)** Plant Threat Score: **High** CCVI: **Highly Vulnerable**
Predicted Models: 4% Moderate (inductive), 29% Low (inductive)

M - Wolverine *(Gulo gulo)* SOC

View in Field Guide View Predicted Models View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3** USFS: **Sensitive - Known in Forests (BD, BRT, KOOT, LOLO)** BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predicted Models: 4% Moderate (inductive), 22% Low (inductive)

V - **Mimulus suksdorfii** *(Suksdorf Monkeyflower)* PSOC

View in Field Guide   View Predicted Models   View Range Maps
Potential Species of Concern - Native Species   Global: **G4** State: **S3S4**
Predicted Models: 4% Moderate (inductive), 20% Low (inductive)

V - **Salix serissima** *(Autumn Willow)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3** Plant Threat Score: **Unknown** CCVI: **Less Vulnerable**
Predicted Models: 4% Moderate (inductive), 16% Low (inductive)

V - **Goodyera repens** *(Northern Rattlesnake-plantain)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3** USFS: **Species of Conservation Concern in Forests (HLC)** Plant Threat Score: **High - Low**
CCVI: **Moderately Vulnerable**
Predicted Models: 2% Moderate (inductive), 59% Low (inductive)

V - **Stipa lettermanii** *(Letterman's Needlegrass)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S1S3** USFS: **Species of Conservation Concern in Forests (HLC)** Plant Threat Score: **No Known Threats**
Predicted Models: 2% Moderate (inductive), 22% Low (inductive)

B - **White-faced Ibis** *(Plegadis chihi)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**
Predicted Models: 2% Moderate (inductive), 18% Low (inductive)

V - **Botrychium simplex** *(Least Moonwort)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S2** CCVI: **Less Vulnerable**
Predicted Models: 2% Moderate (inductive), 12% Low (inductive)

M - **Hoary Bat** *(Lasiurus cinereus)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G3G4** State: **S3B** BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predicted Models: 98% Low (inductive)

M - **Silver-haired Bat** *(Lasionycteris noctivagans)* PSOC

View in Field Guide   View Predicted Models   View Range Maps
Potential Species of Concern - Native Species   Global: **G3G4** State: **S4**
Predicted Models: 98% Low (inductive)

M - **Grizzly Bear** *(Ursus arctos)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G4** State: **S2S3** USFWS: **LT** BLM: **THREATENED** FWP SWAP: **SGCN2-3**
Predicted Models: 96% Low (inductive)

M - **Spotted Bat** *(Euderma maculatum)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G4** State: **S3** USFS: **Sensitive - Known in Forests (BD)** BLM: **SENSITIVE** FWP SWAP: **SGCN3, SGIN**
Predicted Models: 86% Low (inductive)

M - **Townsend's Big-eared Bat** *(Corynorhinus townsendii)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G4** State: **S3** USFS: **Sensitive - Known in Forests (BD, BRT, KOOT, LOLO)** BLM: **SENSITIVE** FWP SWAP: **SGCN3**
Predicted Models: 71% Low (inductive)

B - **Common Poorwill** *(Phalaenoptilus nuttallii)* PSOC

View in Field Guide   View Predicted Models   View Range Maps
Potential Species of Concern - Native Species   Global: **G5** State: **S4B** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **3**
Predicted Models: 69% Low (inductive)

B - **Ovenbird** *(Seiurus aurocapilla)* PSOC

View in Field Guide   View Predicted Models   View Range Maps
Potential Species of Concern - Native Species   Global: **G5** State: **S4B** USFWS: **MBTA** PIF: **3**
Predicted Models: 47% Low (inductive)

V - **Elodea bifoliata** *(Long-sheath Waterweed)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G4G5** State: **S2?** Plant Threat Score: **No Known Threats**
Predicted Models: 47% Low (inductive)

V - **Cypripedium parviflorum** *(Small Yellow Lady's-slipper)* PSOC

View in Field Guide   View Predicted Models   View Range Maps
Potential Species of Concern - Native Species   Global: **G5** State: **S3S4** USFS: **Sensitive - Known in Forests (KOOT, LOLO)**
Sensitive - Suspected in Forests (BRT)
Species of Conservation Concern in Forests (CG, HLC)
Predicted Models: 43% Low (inductive)

M - **Canada Lynx** *(Lynx canadensis)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3** USFWS: **LT; CH** BLM: **THREATENED** FWP SWAP: **SGCN3**
Predicted Models: 41% Low (inductive)

V - Dichanthelium acuminatum *(Panic Grass)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S2S3** Plant Threat Score: **Unknown**
Predicted Models: 41% Low (inductive)

A - Western Toad *(Anaxyrus boreas)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G4** State: **S2** USFS: **Sensitive - Known in Forests (BD, BRT, KOOT, LOLO)** BLM: **SENSITIVE** FWP SWAP: **SGCN2**
Predicted Models: 37% Low (inductive)

B - Sprague's Pipit *(Anthus spragueii)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G3G4** State: **S3B** USFWS: **MBTA; BCC11; BCC17** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **1**
Predicted Models: 33% Low (inductive)

B - American Bittern *(Botaurus lentiginosus)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **3**
Predicted Models: 33% Low (inductive)

B - Pinyon Jay *(Gymnorhinus cyanocephalus)* SOC

View in Field Guide   View Predicted Models   View Range Maps
Species of Concern - Native Species   Global: **G3** State: **S3** USFWS: **MBTA; BCC10; BCC17** FWP SWAP: **SGCN3**
Predicted Models: 27% Low (inductive)

V - Agoseris aurantiaca var. carnea *(Pink Agoseris)* PSOC

View in Field Guide   View Predicted Models   View Range Maps
Potential Species of Concern - Native Species   Global: **G4Q** State: **S3S4**
Predicted Models: 24% Low (inductive)

M - Bison *(Bos bison)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G4** State: **S2** FWP SWAP: **SGCN2**

R - Western Milksnake *(Lampropeltis gentilis)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S2** BLM: **SENSITIVE** FWP SWAP: **SGCN2**

R - Greater Short-horned Lizard *(Phrynosoma hernandesi)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3** BLM: **SENSITIVE** FWP SWAP: **SGCN3, SGIN**

V - Senecio integerrimus var. scribneri *(Scribner's Ragwort)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5T2T3** State: **S2S3** Plant Threat Score: **No Known Threats** CCVI: **Less Vulnerable**

M - Black-footed Ferret *(Mustela nigripes)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G1** State: **S1** USFWS: **LE; XN** BLM: **ENDANGERED** FWP SWAP: **SGCN1**

B - Western Screech-Owl *(Megascops kennicottii)* PSOC   Not Assessed

View in Field Guide   View Range Maps
Potential Species of Concern - Native Species   Global: **G4G5** State: **S3S4** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **3**

B - Plumbeous Vireo *(Vireo plumbeus)* PSOC   Not Assessed

View in Field Guide   View Range Maps
Potential Species of Concern - Native Species   Global: **G5** State: **S3S4B** USFWS: **MBTA** PIF: **3**

B - Northern Hawk Owl *(Surnia ulula)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S3** USFWS: **MBTA** FWP SWAP: **SGCN3, SGIN**

I - Euphydryas gillettii *(Gillette's Checkerspot)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G3** State: **S2**

I - Polygonia progne *(Gray Comma)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S2**

B - Tennessee Warbler *(Leiothlypis peregrina)* PSOC   Not Assessed

View in Field Guide   View Range Maps
Potential Species of Concern - Native Species   Global: **G5** State: **S3S4B** USFWS: **MBTA**

I - Argia alberta *(Paiute Dancer)* PSOC   Not Assessed

View in Field Guide   View Range Maps
Potential Species of Concern - Native Species   Global: **G4** State: **S2S3**

V - Castilleja exilis *(Annual Indian Paintbrush)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5T5** State: **S2** USFS: **Species of Conservation Concern in Forests (CG)** Plant Threat Score: **Low**
CCVI: **Extremely Vulnerable**

V - Senecio eremophilus *(Desert Groundsel)* SOC   Not Assessed

View in Field Guide   View Range Maps
Species of Concern - Native Species   Global: **G5** State: **S1S2** Plant Threat Score: **No Known Threats**

⊟ **B - Alder Flycatcher** *(Empidonax alnorum)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** FWP SWAP: **SGCN3**

⊟ **B - Hooded Merganser** *(Lophodytes cucullatus)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4** USFWS: **MBTA** FWP SWAP: **SGIN** PIF: **2**

⊟ **B - Trumpeter Swan** *(Cygnus buccinator)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G4** State: **S3** USFWS: **MBTA** USFS: **Sensitive - Known in Forests (BD)** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **1**

⊟ **I - Argia emma** *(Emma's Dancer)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**

⊟ **I - Argia vivida** *(Vivid Dancer)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**

⊟ **I - Colias gigantea** *(Giant Sulphur)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3**

⊟ **I - Somatochlora minor** *(Ocellated Emerald)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S4**

⊟ **I - Aeshna juncea** *(Sedge Darner)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**

⊟ **I - Enallagma clausum** *(Alkali Bluet)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S4**

⊟ **I - Leucorrhinia borealis** *(Boreal Whiteface)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G5** State: **S1**

⊟ **I - Rhionaeschna californica** *(California Darner)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**

⊟ **I - Sympetrum madidum** *(Red-veined Meadowhawk)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S3**

⊟ **B - Black-and-white Warbler** *(Mniotilta varia)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S4B** USFWS: **MBTA**

⊟ **I - Aeshna constricta** *(Lance-tipped Darner)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S1S3**

⊟ **I - Aeshna eremita** *(Lake Darner)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S4**

⊟ **I - Rhionaeschna multicolor** *(Blue-eyed Darner)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S2S4**

⊟ **I - Somatochlora semicircularis** *(Mountain Emerald)* PSOC | Not Assessed

View in Field Guide View Range Maps
Potential Species of Concern - Native Species Global: **G5** State: **S3S5**

⊟ **V - Braya humilis** *(Low Braya)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G5** State: **S2** USFS: **Species of Conservation Concern in Forests (HLC)** Plant Threat Score: **Unknown**
CCVI: **Highly Vulnerable**

⊟ **B - Black Rosy-Finch** *(Leucosticte atrata)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G4** State: **S2** USFWS: **MBTA; BCC10** FWP SWAP: **SGCN2, SGIN** PIF: **2**

⊟ **B - Forster's Tern** *(Sterna forsteri)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

⊟ **B - Clark's Grebe** *(Aechmophorus clarkii)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA; BCC10; BCC11** FWP SWAP: **SGCN3** PIF: **3**

⊟ **B - Horned Grebe** *(Podiceps auritus)* SOC | Not Assessed

View in Field Guide View Range Maps
Species of Concern - Native Species Global: **G5** State: **S3B** USFWS: **MBTA** BLM: **SENSITIVE** FWP SWAP: **SGCN3** PIF: **2**

B - Piping Plover *(Charadrius melodus)* **SOC** | Not Assessed

View in Field Guide **View Range Maps**

Species of Concern - Native Species Global: **G3** State: **S2B** USFWS: **LT; CH; MBTA** BLM: **THREATENED** FWP SWAP: **SGCN2** PIF: **1**

Natural Heritage Program

A program of the **Montana State Library's Natural Resource Information System**

Latitude	Longitude
46.47856	-110.76008
46.59148	-110.96478

Structured Surveys

Summarized by: **23prvt0217** *(Custom Area of Interest)*

The Montana Natural Heritage Program (MTNHP) records information on the locations where more than 80 different types of well-defined repeatable survey protocols capable of detecting an animal species or suite of animal species have been conducted by state, federal, tribal, university, or private consulting biologists. Examples of structured survey protocols tracked by MTNHP include: visual encounter and dip net surveys for pond breeding amphibians, point counts for birds, call playback surveys for selected bird species, visual surveys of migrating raptors, kick net stream reach surveys for macroinvertebrates, visual encounter cover object surveys for terrestrial mollusks, bat acoustic or mist net surveys, pitfall and/or snap trap surveys for small terrestrial mammals, track or camera trap surveys for large mammals, and trap surveys for turtles. Whenever possible, photographs of survey locations are stored in MTNHP databases.

MTNHP does not typically manage information on structured surveys for plants; surveys for invasive species may be a future exception.

Within the report area you have requested, structured surveys are summarized by the number of each type of structured survey protocol that has been conducted, the number of species detections/observations resulting from these surveys, and the most recent year a survey has been conducted.

B-Bald Eagle Nest *(Bald Eagle Nest Survey)*	**Survey Count**: 6	**Obs Count**: 3	**Recent Survey**: 2014
B-Colonial-nesting Waterbirds *(Colonial-nesting Waterbird Surveys)*	**Survey Count**: 1	**Obs Count**: 1	**Recent Survey**: 2011
B-Point Count *(Bird Point Count)*	**Survey Count**: 48	**Obs Count**: 297	**Recent Survey**: 2004
E-Eastern Heath Snail *(Eastern Heath Snail Survey)*	**Survey Count**: 4	**Obs Count**:	**Recent Survey**: 2012
E-Noxious Weed, Road-based *(Noxious Weed Road-based Visual Surveys)*	**Survey Count**: 15	**Obs Count**: 54	**Recent Survey**: 2003
F-Fish Electrofishing *(Fish Electrofishing Surveys)*	**Survey Count**: 13	**Obs Count**: 15	**Recent Survey**: 2010
F-Fish Other Survey *(Fish Other Survey (FWP Survey Type))*	**Survey Count**: 1	**Obs Count**: 1	**Recent Survey**: 1973
I-Aquatic Invert Lotic Dipnet *(Invertebrate Lotic Site Dipnet and Visual Encounter Survey)*	**Survey Count**: 1	**Obs Count**: 18	**Recent Survey**: 1998
I-Mosquito Traps *(Montana Mosquito Surveillance Project)*	**Survey Count**: 2	**Obs Count**: 10	**Recent Survey**: 2015
I-Mussel *(Stream Mussel Survey)*	**Survey Count**: 3	**Obs Count**:	**Recent Survey**: 2008
M-Bat Hibernacula *(Bat Roost (Hibernacula) Survey)*	**Survey Count**: 5	**Obs Count**:	**Recent Survey**: 2013
M-Bat Roost (Active Season) *(Bat Roost (Active Season) Survey)*	**Survey Count**: 2	**Obs Count**: 2	**Recent Survey**: 2017
P-USFS ECODATA Plot *(USFS ECODATA Ecological Inventory Survey Plot)*	**Survey Count**: 8	**Obs Count**: 223	**Recent Survey**: 1991

MONTANA
Natural Heritage Program
A program of the **Montana State Library's Natural Resource Information System**

Legend

Model Icons	Habitat Icons	Range Icons	Num Obs
Suitable (native range)	Common	Non-native	Count of obs with 'good precision' (<=1000m)
Optimal Suitability	Occasional		+ indicates additional 'poor precision' obs (1001m-10,000m)
Moderate Suitability			
Low Suitability			
Suitable (introduced range)			

Latitude	Longitude
46.47856	-110.76008
46.59148	-110.96478

Invasive and Pest Species

Summarized by: **23prvt0217** *(Custom Area of Interest)*

	# Obs	Predicted Model	Range

Aquatic Invasive Species

V - Potamogeton crispus *(Curly-leaf Pondweed)* N2B/AIS

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2B - Aquatic Invasive Species - Non-native Species · Global: **G5** State: **SNA**
Predicted Models: 27% Low (inductive)

V - Nymphaea odorata *(American Water-lily)* AIS

View in Field Guide · View Predicted Models · View Range Maps
Aquatic Invasive Species - Non-native Species · Global: **G5** State: **SNA**
Predicted Models: 33% Suitable (introduced range) (deductive)

Noxious Weeds: Priority 1A

V - Centaurea solstitialis *(Yellow Starthistle)* N1A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 1A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 14% Optimal (inductive), 33% Moderate (inductive), 14% Low (inductive)

V - Isatis tinctoria *(Dyer's Woad)* N1A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 1A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 6% Optimal (inductive), 18% Moderate (inductive), 47% Low (inductive)

Noxious Weeds: Priority 1B

V - Lythrum salicaria *(Purple Loosestrife)* N1B

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 1B - Non-native Species · Global: **G5** State: **SNA**
Predicted Models: 8% Optimal (inductive), 20% Moderate (inductive), 12% Low (inductive)

V - Polygonum cuspidatum *(Japanese Knotweed)* N1B

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 1B - Non-native Species · Global: **GNRTNR** State: **SNA**
Predicted Models: 6% Moderate (inductive), 39% Low (inductive)

V - Polygonum x bohemicum *(Bohemian Knotweed)* N1B

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 1B - Non-native Species · Global: **GNA** State: **SNA**
Predicted Models: 4% Moderate (inductive)

Noxious Weeds: Priority 2A

V - Rhamnus cathartica *(Common Buckthorn)* N2A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 2% Optimal (inductive), 6% Moderate (inductive), 27% Low (inductive)

V - Ventenata dubia *(Ventenata)* N2A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 24% Moderate (inductive), 53% Low (inductive)

V - Lepidium latifolium *(Perennial Pepperweed)* N2A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 2% Moderate (inductive), 41% Low (inductive)

V - Hieracium praealtum *(Kingdevil Hawkweed)* N2A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 2% Moderate (inductive), 35% Low (inductive)

V - Hieracium caespitosum *(Meadow Hawkweed)* N2A

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2A - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 31% Low (inductive)

Noxious Weeds: Priority 2B

V - Lepidium draba *(Whitetop)* N2B · # Obs: 4

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2B - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 16% Optimal (inductive), 27% Moderate (inductive), 31% Low (inductive)

V - Cynoglossum officinale *(Common Hound's-tongue)* N2B · # Obs: 10

View in Field Guide · View Predicted Models · View Range Maps
Noxious Weed: Priority 2B - Non-native Species · Global: **GNR** State: **SNA**
Predicted Models: 63% Moderate (inductive), 37% Low (inductive)

V - Centaurea stoebe *(Spotted Knapweed)* N2B 17

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 53% Moderate (inductive), 47% Low (inductive)

V - Linaria dalmatica *(Dalmatian Toadflax)* N2B 2

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **G5** State: **SNA**
Predicted Models: 39% Moderate (inductive), 53% Low (inductive)

V - Euphorbia virgata *(Leafy Spurge)* N2B 3

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 14% Moderate (inductive), 73% Low (inductive)

V - Linaria vulgaris *(Yellow Toadflax)* N2B

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 10% Moderate (inductive), 71% Low (inductive)

V - Cirsium arvense *(Canada Thistle)* N2B 11

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **G5** State: **SNA**
Predicted Models: 8% Moderate (inductive), 92% Low (inductive)

V - Convolvulus arvensis *(Field Bindweed)* N2B 5

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 4% Moderate (inductive), 29% Low (inductive)

V - Berteroa incana *(Hoary False-alyssum)* N2B

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 73% Low (inductive)

V - Acroptilon repens *(Russian Knapweed)* N2B 1

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 53% Low (inductive)

V - Potentilla recta *(Sulphur Cinquefoil)* N2B

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 53% Low (inductive)

V - Leucanthemum vulgare *(Oxeye Daisy)* N2B 1

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 49% Low (inductive)

V - Centaurea diffusa *(Diffuse Knapweed)* N2B 1

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 47% Low (inductive)

V - Tanacetum vulgare *(Common Tansy)* N2B

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 47% Low (inductive)

V - Potamogeton crispus *(Curly-leaf Pondweed)* N2B/AIS

View in Field Guide View Predicted Models View Range Maps
Noxious Weed: Priority 2B - Aquatic Invasive Species - Non-native Species Global: **G5** State: **SNA**
Predicted Models: 27% Low (inductive)

Regulated Weeds: Priority 3

V - Bromus tectorum *(Cheatgrass)* R3 1

View in Field Guide View Predicted Models View Range Maps
Regulated Weed: Priority 3 - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 80% Low (inductive)

Biocontrol Species

I - Mecinus janthinus *(Yellow Toadflax Stem-boring Weevil)* BIOCNTRL

View in Field Guide View Predicted Models View Range Maps
Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 20% Optimal (inductive), 31% Moderate (inductive), 14% Low (inductive)

I - Aphthona lacertosa *(Brown-legged Leafy Spurge Flea Beetle)* BIOCNTRL

View in Field Guide View Predicted Models View Range Maps
Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 4% Optimal (inductive), 53% Moderate (inductive), 14% Low (inductive)

I - Cyphocleonus achates *(Knapweed Root Weevil)* BIOCNTRL

View in Field Guide View Predicted Models View Range Maps
Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**
Predicted Models: 69% Moderate (inductive), 12% Low (inductive)

I - Mecinus janthiniformis *(Dalmatian Toadflax Stem-boring Weevil)* BIOCNTRL

View in Field Guide View Predicted Models View Range Maps

Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**

Predicted Models: 37% Moderate (inductive), 55% Low (inductive)

I - Aphthona nigriscutis *(Black Dot Leafy Spurge Flea Beetle)* BIOCNTRL

View in Field Guide View Predicted Models View Range Maps

Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**

Predicted Models: 18% Moderate (inductive), 22% Low (inductive)

I - Oberea erythrocephala *(Red-headed Leafy Spurge Stem Borer)* BIOCNTRL

View in Field Guide View Predicted Models View Range Maps

Biocontrol Species - Non-native Species Global: **GNR** State: **SNA**

Predicted Models: 47% Low (inductive)

Introduction to Montana Natural Heritage Program

P.O. Box 201800 • 1515 East Sixth Avenue • Helena, MT 59620-1800 • fax 406.444.0266 • phone 406.444.5363 • mtnhp.org

Introduction

The Montana Natural Heritage Program (MTNHP) is Montana's source for reliable and objective information on Montana's native species and habitats, emphasizing those of conservation concern. MTNHP was created by the Montana legislature in 1983 as part of the Natural Resource Information System (NRIS) at the Montana State Library (MSL). MTNHP is "a program of information acquisition, storage, and retrieval for data relating to the flora, fauna, and biological community types of Montana" (MCA 90-15-102). MTNHP's activities are guided by statute as well as through ongoing interaction with, and feedback from, principal data source agencies such as Montana Fish, Wildlife, and Parks, the Montana Department of Environmental Quality, the Montana Department of Natural Resources and Conservation, the Montana University System, the US Forest Service, and the US Bureau of Land Management. Since the first staff was hired in 1985, the Program has logged a long record of success, and developed into a highly respected, service-oriented program. MTNHP is widely recognized as one of the most advanced and effective of over 80 natural heritage programs throughout the Western Hemisphere.

Vision

Our vision is that public agencies, the private sector, the education sector, and the general public will trust and rely upon MTNHP as the source for information and expertise on Montana's species and habitats, especially those of conservation concern. We strive to provide easy access to our information in order for users to save time and money, speed environmental reviews, and inform decision making.

Core Values

- We endeavor to be a single statewide source of accurate and up-to-date information on Montana's plants, animals, and aquatic and terrestrial biological communities.
- We actively listen to our data users and work responsively to meet their information and training needs.
- We strive to provide neutral, trusted, timely, and equitable service to all of our information users.
- We make every effort to be transparent to our data users in setting work priorities and providing data products.

Confidentiality

All information requests made to the Montana Natural Heritage Program are considered library records and are protected from disclosure by the Montana Library Records Confidentiality Act (MCA 22-1-11).

Information Managed

Information managed at the Montana Natural Heritage Program is botanical, zoological, and ecological information that describes the distribution (e.g., observations, structured surveys, range polygons, predicted habitat suitability models), conservation status (e.g., global and state conservation status ranks, including threats), and other supporting information (e.g., accounts and references) on the biology and ecology of species and biological communities.

Data Use Terms and Conditions

- Montana Natural Heritage Program (MTNHP) products and services are based on biological data and the objective interpretation of those data by professional scientists. MTNHP does not advocate any particular philosophy of natural resource protection, management, development, or public policy.
- MTNHP has no natural resource management or regulatory authority. Products, statements, and services from MTNHP are intended to inform parties as to the state of scientific knowledge about certain natural resources, and to further develop that knowledge. The information is not intended as natural resource management guidelines or prescriptions or a determination of environmental impacts. MTNHP recommends consultation with appropriate state, federal, and tribal resource management agencies and authorities in the area where your project is located.
- Information on the status and spatial distribution of biological resources produced by MTNHP are intended to inform parties of the state-wide status, known occurrence, or the likelihood of the presence of those resources. **These products are not intended to substitute for field-collected data, nor are they intended to be the sole basis for natural resource management decisions.**
- MTNHP does not portray its data as exhaustive or comprehensive inventories of rare species or biological communities. **Field verification of the absence or presence of sensitive species and biological communities will always be an important obligation of users of our data.**
- MTNHP responds equally to all requests for products and services, regardless of the purpose or identity of the requester.
- Because MTNHP constantly updates and revises its databases with new data and information, products will become outdated over time. Interested parties are encouraged to obtain the most current information possible from MTNHP, rather than using older products. We add, review, update, and delete records on a daily basis. Consequently, we strongly advise that you update your MTNHP data sets at a minimum of every four months for most applications of our information.
- MTNHP data require a certain degree of biological expertise for proper analysis, interpretation, and application. Our staff is available to advise you on questions regarding the interpretation or appropriate use of the data that we provide. See Contact Information for MTNHP Staff
- The information provided to you by MTNHP may include sensitive data that if publicly released might jeopardize the welfare of threatened, endangered, or sensitive species or biological communities. This information is intended for distribution or use only within your department, agency, or business. Subcontractors may have access to the data during the course of any given project, but should not be given a copy for their use on subsequent, unrelated work.
- MTNHP data are made freely available. Duplication of hard-copy or digital MTNHP products with the intent to sell is prohibited without written consent by MTNHP. Should you be asked by individuals outside your organization for the type of data that we provide, please refer them to MTNHP.
- MTNHP and appropriate staff members should be appropriately acknowledged as an information source in any third-party product involving MTNHP data, reports, papers, publications, or in maps that incorporate MTNHP graphic elements.
- Sources of our data include museum specimens, published and unpublished scientific literature, field surveys by state and federal agencies and private contractors, and reports from knowledgeable individuals. MTNHP actively solicits and encourages additions, corrections and updates, new observations or collections, and comments on any of the data we provide.
- MTNHP staff and contractors do not enter or cross privately-owned lands without express permission from the landowner. However, the program cannot guarantee that information provided to us by others was obtained under adherence to this policy.

Suggested Contacts for Natural Resource Management Agencies

As required by Montana statute (MCA 90-15), the Montana Natural Heritage Program works with state, federal, tribal, nongovernmental organizations, and private partners to ensure that the latest animal and plant distribution and status information is incorporated into our databases so that it can be used to inform a variety of permitting and planning processes and management decisions. We encourage you to contact state, federal, and tribal resource management agencies in the area where your project is located and review the permitting overviews by the Montana Department of Environmental Quality, the Montana Department of Natural Resources and Conservation and the Index of Environmental Permits for Montana for guidelines relevant to your efforts. In particular, we encourage you to contact the Montana Department of Fish, Wildlife, and Parks for the latest data and management information regarding hunted and high-profile management species and to use the U.S. Fish and Wildlife Service's Information Planning and Consultation (IPAC) website regarding U.S. Endangered Species Act listed Threatened, Endangered, or Candidate species.

For your convenience, we have compiled a list of relevant agency contacts and links below:

Montana Fish, Wildlife, and Parks

Fish Species	Zachary Shattuck zshattuck@mt.gov (406) 444-1231 or Eric Roberts eroberts@mt.gov (406) 444-5334
American Bison Black-footed Ferret Black-tailed Prairie Dog Bald Eagle Golden Eagle Common Loon Least Tern Piping Plover Whooping Crane	Kristian Smucker KSmucker@mt.gov (406) 444-5209
Grizzly Bear Greater Sage Grouse Trumpeter Swan Big Game Upland Game Birds Furbearers	Brian Wakeling Brian.Wakeling@mt.gov (406) 444-3940
Managed Terrestrial Game and Nongame Animal Data	Smith Wells – MFWP Data Analyst smith.wells@mt.gov (406) 444-3759
Fisheries Data	Ryan Alger – MFWP Data Analyst ryan.alger@mt.gov (406) 444-5365
Wildlife and Fisheries Scientific Collector's Permits	https://fwp.mt.gov/buyandapply/commercialwildlifeandscientificpermits/scientific Kammi McClain for Wildlife Kammi.McClain@mt.gov (406) 444-2612 Kim Wedde for Fisheries kim.wedde@mt.gov (406) 444-5594
Fish and Wildlife Recommendations for Subdivision Development	Charlie Sperry CSperry@mt.gov (406) 444-3888 See https://fwp.mt.gov/conservation/living-with-wildlife/subdivision-recommendations
Regional Contacts 	Region 1 (Kalispell) (406) 752-5501 fwprg12@mt.gov Region 2 (Missoula) (406) 542-5500 fwprg22@mt.gov Region 3 (Bozeman) (406) 577-7900 fwprg3@mt.gov Region 4 (Great Falls) (406) 454-5840 fwprg42@mt.gov Region 5 (Billings) (406) 247-2940 fwprg52@mt.gov Region 6 (Glasgow) (406) 228-3700 fwprg62@mt.gov Region 7 (Miles City) (406) 234-0900 fwprg72@mt.gov

Montana Department of Agriculture
General Contact Information: https://agr.mt.gov/About/Office-Locations/Office-Locations-and-Field-Offices
Noxious Weeds: https://agr.mt.gov/Noxious-Weeds

Montana Department of Environmental Quality
Permitting and Operator Assistance for all Environmental Permits: https://deq.mt.gov/Permitting

Montana Department of Natural Resources and Conservation
Overview of, and contacts for, licenses and permits for state lands, water, and forested lands:
http://dnrc.mt.gov/licenses-and-permits

Stream Permitting (310 permits) and an overview of various water and stream related permits (e.g., Stream Protection Act 124, Federal Clean Water Act 404, Federal Rivers and Harbors Act Section 10, Short-term Water Quality Standard for Turbidity 318 Authorization, etc.).
http://dnrc.mt.gov/divisions/cardd/conservation-districts/the-310-law

Flood and Fire Resources: http://dnrc.mt.gov/flood-and-fire

Bureau of Land Management

Montana Field Office Contacts:

Billings	(406) 896-5013
Butte	(406) 533-7600
Dillon	(406) 683-8000
Glasgow	(406) 228-3750
Havre	(406) 262-2820
Lewistown	(406) 538-1900
Malta	(406) 654-5100
Miles City	(406) 233-2800
Missoula	(406) 329-3914

United States Army Corps of Engineers
Montana Regulatory Office for federal permits related to construction in water and wetlands
https://www.nwo.usace.army.mil/Missions/Regulatory-Program/Montana/ (406) 441-1375

United States Environmental Protection Agency
Environmental information, notices, permitting, and contacts https://www.epa.gov/mt
Gateway to state resource locators https://www.envcap.org/srl/index.php

United States Fish and Wildlife Service
Information Planning and Conservation (IPAC) website: https://ecos.fws.gov/ipac/
Montana Ecological Services Field Office: https://www.fws.gov/montanafieldoffice/ (406) 449-5225

United States Forest Service

Regional Office – Missoula, Montana Contacts			
Wildlife Program Leader	Tammy Fletcher	tammy.fletcher2@usda.gov	(406) 329-3086
Wildlife Ecologist	Cara Staab	cara.staab@usda.gov	(406) 329-3677
Fish Program Leader	Scott Spaulding	scott.spaulding@usda.gov	(406) 329-3287
Fish Ecologist	Cameron Thomas	cameron.thomas@usda.gov	(406) 329-3087
TES Program	Lydia Allen	lydia.allen@usda.gov	(406) 329-3558
Interagency Grizzly Bear Coordinator	Scott Jackson	scott.jackson@usda.gov	(406) 329-3664
Acting Regional Botanist	Amanda Hendrix	amanda.hendrix@usda.gov	(651) 447-3016
Regional Vegetation Ecologist	Mary Manning	marry.manning@usda.gov	(406) 329-3304
Invasive Species Program Manager	Michelle Cox	michelle.cox2@usda.gov	(406) 329-3669

Tribal Nations

[Assiniboine & Gros Ventre Tribes – Fort Belknap Reservation]
[Assiniboine & Sioux Tribes – Fort Peck Reservation]
[Blackfeet Tribe - Blackfeet Reservation]
[Chippewa Creek Tribe - Rocky Boy's Reservation]
[Crow Tribe – Crow Reservation]
[Little Shell Chippewa Tribe]
[Northern Cheyenne Tribe – Northern Cheyenne Reservation]
[Salish & Kootenai Tribes - Flathead Reservation]

Natural Heritage Programs and Conservation Data Centers in Surrounding States and Provinces

Alberta Conservation Information Management System
British Columbia Conservation Data Centre
Idaho Natural Heritage Program
North Dakota Natural Heritage Program
Saskatchewan Conservation Data Centre
South Dakota Natural Heritage Program
Wyoming Natural Diversity Database

Invasive Species Management Contacts and Information

Aquatic Invasive Species
Montana Fish, Wildlife, and Parks Aquatic Invasive Species staff
Montana Department of Natural Resources and Conservation's Aquatic Invasive Species Grant Program
Montana Invasive Species Council (MISC)
Upper Columbia Conservation Commission (UC3)

Noxious Weeds
Montana Weed Control Association Contacts Webpage
Montana Biological Weed Control Coordination Project
Montana Department of Agriculture - Noxious Weeds
Montana Weed Control Association
Montana Fish, Wildlife, and Parks - Noxious Weeds
Montana State University Integrated Pest Management Extension
Integrated Noxious Weed Management after Wildfires
Fire Management and Invasive Plants

Introduction to Native Species

Within the report area you have requested, separate summaries are provided for: (1) Species Occurrences (SO) for plant and animal Species of Concern, Special Status Species (SSS), Important Animal Habitat (IAH) and some Potential Plant Species of Concern; (2) other observed non Species of Concern or Species of Concern without suitable documentation to create Species Occurrence polygons; and (3) other non-documented species that are potentially present based on their range, predicted suitable habitat model output, or presence of associated habitats. Each of these summaries provides the following information when present for a species: (1) the number of Species Occurrences and associated delineation criteria for construction of these polygons that have long been used for considerations of documented Species of Concern in environmental reviews; (2) the number of observations of each species; (3) the geographic range polygons for each species that the report area overlaps; (4) predicted relative habitat suitability classes that are present if a predicted suitable habitat model has been created; (5) the percent of the report area that is mapped as commonly associated or occasionally associated habitat as listed for each species in the Montana Field Guide; and (6) a variety of conservation status ranks and links to species accounts in the Montana Field Guide. Details on each of these information categories are included under relevant section headers below or are defined on our Species Status Codes page. In presenting this information, the Montana Natural Heritage Program (MTNHP) is working towards assisting the user with rapidly determining what species have been documented and what species are potentially present in the report area. We remind users that this information is likely incomplete as surveys to document native and introduced species are lacking in many areas of the state, information on introduced species has only been tracked relatively recently, the MTNHP's staff and resources are restricted by budgets, and information is constantly being added and updated in our databases. **Thus, field verification by professional biologists of the absence or presence of species and biological communities will always be an important obligation of users of our data.**

If you are aware of observation datasets that the MTNHP is missing, please report them to the Program Botanist apipp@mt.gov or Senior Zoologist dbachen@mt.gov. If you have animal observations that you would like to contribute, you can submit them to our Animal Observation Entry Tool You can also submit plant and animal observations via Excel spreadsheets posted at https://mtnhp.org/observations.asp or via the Montana Natural Heritage Observations project in iNaturalist

Observations

The MTNHP manages information on several million animal and plant observations that have been reported by professional biologists and private citizens from across Montana. The majority of these observations are submitted in digital format from standardized databases associated with research or monitoring efforts and spreadsheets of incidental observations submitted by professional biologists and amateur naturalists. At a minimum, accepted observation records must contain a credible species identification (i.e. appropriate geographic range, date, and habitat and, if species are difficult to identify, a photograph and/or notes on key identifying features), a date or date range, observer name, locational information (ideally with latitude and longitude in decimal degrees), notes on numbers observed, and species behavior or habitat use (e.g., is the observation likely associated with reproduction). Bird records are also required to have information associated with date-appropriate breeding or overwintering status of the species observed. MTNHP reviews observation records to ensure that they are mapped correctly, occur within date ranges when the species is known to be present or detectable, occur within the known seasonal geographic range of the species, and occur in appropriate habitats. MTNHP also assigns each record a locational uncertainty value in meters to indicate the spatial precision associated with the record's mapped coordinates. Only records with locational uncertainty values of 10,000 meters or less are included in environmental summary reports and number summaries are only provided for records with locational uncertainty values of 1,000 meters or less.

Species Occurrences

The MTNHP evaluates plant and animal observation records for species of higher conservation concern to determine whether they are worthy of inclusion in the Species Occurrence (SO) layer for use in environmental reviews; observations not worthy of inclusion in this layer include long distance dispersal events, migrants observed away from key migratory stopover habitats, and winter observations. An SO is a polygon depicting what is known about a species occupancy from direct observation with a defined level of locational uncertainty and any inference that can be made about adjacent habitat use from the latest peer-reviewed science. If an observation can be associated with a map feature that can be tracked (e.g., a wetland boundary for a wetland associated plant) then this polygon feature is used to represent the SO. Areas that can be inferred as probable occupied habitat based on direct observation of a species location and what is known about the foraging area or home range size of the species may be incorporated into the SO. Species Occurrences generally belong to one of the following categories:

Plant Species Occurrences

A documented location of a specimen collection or observed plant population. In some instances, adjacent, spatially separated clusters are considered subpopulations and are grouped as one occurrence (e.g., the subpopulations occur in ecologically similar habitats, and their spatial proximity likely allows them to interbreed). Tabular information for multiple observations at the same SO location is generally linked to a single polygon. Plant SO's are only created for Species of Concern and Potential Species of Concern.

Animal Species Occurrences

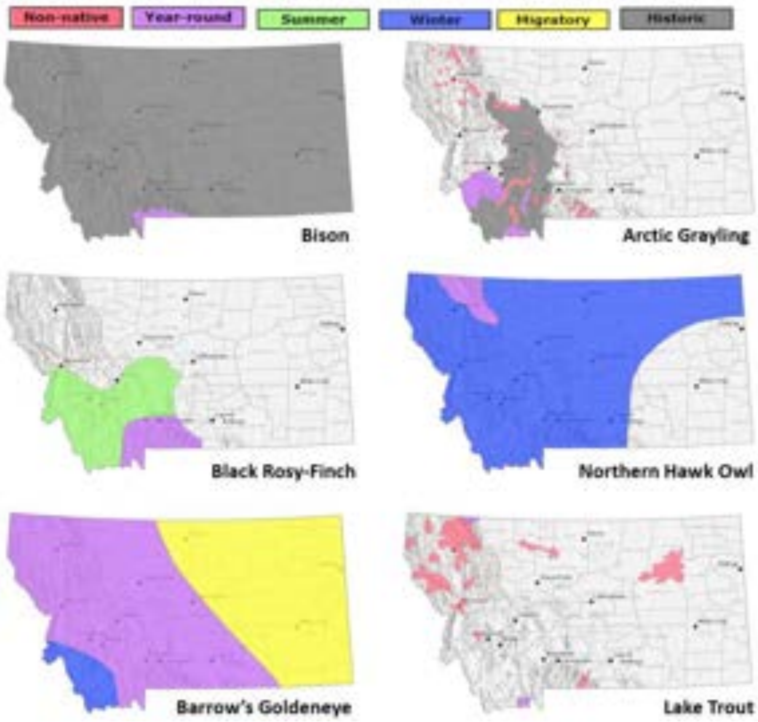
The location of a verified observation or specimen record typically known or assumed to represent a breeding population or a portion of a breeding population. Animal SO’s are generally: (1) buffers of terrestrial point observations based on documented species’ home range sizes; (2) buffers of stream segments to encompass occupied streams and immediate adjacent riparian habitats; (3) polygonal features encompassing known or likely breeding populations (e.g., a wetland for some amphibians or a forested portion of a mountain range for some wide ranging carnivores); or (4) combinations of the above. Tabular information for multiple observations at the same SO location is generally linked to a single polygon. Species Occurrence polygons may encompass some unsuitable habitat in some instances in order to avoid heavy data processing associated with clipping out habitats that are readily assessed as unsuitable by the data user (e.g., a point buffer of a terrestrial species may overlap into a portion of a lake that is obviously inappropriate habitat for the species). Animal SO's are only created for Species of Concern and Special Status Species (e.g., Bald Eagle).

Other Occurrence Polygons

These include significant biological features not included in the above categories, such as Important Animal Habitats like bird rookeries and bat roosts, and peatlands or other wetland and riparian communities that support diverse plant and animal communities.

Geographic Range Polygons

Geographic range polygons are still under development for most plant and invertebrate species. Native year-round, summer, winter, migratory and historic geographic range polygons as well as polygons for introduced populations have been defined for most vertebrate animal species for which there are enough observations, surveys, and knowledge of appropriate seasonal habitat use to define them (see examples to left). These native or introduced range polygons bound the extent of known or likely occupied habitats for non-migratory and relative sedentary species and the regular extent of known or likely occupied habitats for migratory and long-distance dispersing species; polygons may include unsuitable intervening habitats. For most species, a single polygon can represent the year-round or seasonal range, but breeding ranges of some colonial nesting water birds and some introduced species are represented more patchily when supported by data. Some ranges are mapped more broadly than actual distributions in order to be visible on statewide maps (e.g., fish).



Predicted Suitable Habitat Models

Predicted habitat suitability models have been created for plant and animal Species of Concern and are undergoing development for non-Species of Concern. For species for which models have been completed, the environmental summary report includes simple rule-based associations with streams for aquatic species and seasonal habitats for game species as well as mathematically complex Maximum Entropy models (Phillips et al. 2006, Ecological Modeling 190:231-259) constructed from a variety of statewide biotic and abiotic layers and presence only data for individual species for most terrestrial species. For the Maximum Entropy models, we reclassified 90 x 90-meter continuous model output into suitability classes (unsuitable, low, moderate, and optimal) then aggregated that into the one square mile hexagons used in the environmental summary report; this is the finest spatial scale we suggest using this information in management decisions and survey planning. Full model write ups for individual species that discuss model goals, inputs, outputs, and evaluation in much greater detail are posted on the MTNHP's Predicted Suitable Habitat Models webpage. Evaluations of predictive accuracy and specific limitations are included with the metadata for models of individual species. **Model outputs should not be used in place of on-the-ground surveys for species. Instead model outputs should be used in conjunction with habitat evaluations to determine the need for on-the-ground surveys for species.** We suggest that the percentage of predicted optimal and moderate suitable habitat within the report area be used in conjunction with geographic range polygons and the percentage of commonly associated habitats to generate lists of potential species that may occupy broader landscapes for the purposes of landscape-level planning.

Associated Habitats

Within the boundary of the intersected hexagons, we provide the approximate percentage of commonly or occasionally associated habitat for vertebrate animal species that regularly breed, overwinter, or migrate through the state; a detailed list of commonly and occasionally associated habitats is provided in individual species accounts in the Montana Field Guide We assigned common or occasional use of each of the ecological systems mapped in Montana by: (1) using personal knowledge and reviewing literature that summarizes the breeding, overwintering, or migratory habitat requirements of each species; (2) evaluating structural characteristics and distribution of each ecological system relative to the species' range and habitat requirements; (3) examining the observation records for each species in the state-wide point observation database associated with each ecological system; and (4) calculating the percentage of observations associated with each ecological system relative to the percent of Montana covered by each ecological system to get a measure of numbers of observations versus availability of habitat. Species that breed in Montana were only evaluated for breeding habitat use, species that only overwinter in Montana were only evaluated for overwintering habitat use, and species that only migrate through Montana were only evaluated for migratory habitat use. In general, species were listed as associated with an ecological system if structural characteristics of used habitat documented in the literature were present in the ecological system or large numbers of point observations were associated with the ecological system. However, species were not listed as associated with an ecological system if there was no support in the literature for use of structural characteristics in an ecological system, even if point observations were associated with that system. Common versus occasional association with an ecological system was assigned based on the degree to which the structural characteristics of an ecological system matched the preferred structural habitat characteristics for each species as represented in the scientific literature. The percentage of observations associated with each ecological system relative to the percent of Montana covered by each ecological system was also used to guide assignment of common versus occasional association.

We suggest that the percentage of commonly associated habitat within the report area be used in conjunction with geographic range polygons and the percentage of predicted optimal and moderate suitable habitat from predictive models to generate lists of potential species that may occupy broader landscapes for the purposes of landscape-level planning. Users of this information should be aware that land cover mapping accuracy is particularly problematic when the systems occur as small patches or where the land cover types have been altered over the past decade. Thus, particular caution should be used when using the associations in assessments of smaller areas (e.g., evaluations of public land survey sections).

Introduction to Invasive and Pest Species

Within the report area you have requested, separate summaries are provided for: Aquatic Invasive Species, Noxious Weeds, Agricultural Pests, Forest Pests, and Biocontrol species that have been documented or potentially occur there based on the predicted suitability of habitat. Definitions for each of these invasive and pest species categories can be found on our Species Status Codes page.

Each of these summaries provides the following information when present for a species: (1) the number of observations of each species; (2) the geographic range polygons for each species, if developed, that the report area overlaps; (3) predicted relative habitat suitability classes that are present if a predicted suitable habitat model has been created; (4) the percent of the report area that is mapped as commonly associated or occasionally associated habitat as listed for each species in the Montana Field Guide; and (5) links to species accounts in the Montana Field Guide. Details on each of these information categories are included under relevant section headers under the Introduction to Native Species above or are defined on our Species Status Codes page. In presenting this information, the Montana Natural Heritage Program (MTNHP) is working towards assisting the user with rapidly determining what invasive and pest species have been documented and what species are potentially present in the report area. We remind users that this information is likely incomplete as surveys to document introduced species are lacking in many areas of the state, information on introduced species has only been tracked relatively recently, the MTNHP's staff and resources are limited, and information is constantly being added and updated in our databases. **Thus, field verification by professional biologists of the absence or presence of species will always be an important obligation of users of our data.**

If you are aware of observation or survey datasets for invasive or pest species that the MTNHP is missing, please report them to the Program Coordinator bmaxell@mt.gov Program Botanist apipp@mt.gov or Senior Zoologist dbachen@mt.gov. If you have observations that you would like to contribute, you can submit animal observations using our online data entry system at mtnhp.org/AddObs or via Excel spreadsheets posted at mtnhp.org/observations.asp

Additional Information Resources

MTNHP Staff Contact Information

Montana Field Guide

MTNHP Species of Concern Report - Animals and Plants

MTNHP Species Status Codes - Explanation

MTNHP Predicted Suitable Habitat Models (for select Animals and Plants)

MTNHP Request Information page

Montana Cadastral

Montana Code Annotated

Montana Fisheries Information System

Montana Fish, Wildlife, and Parks Subdivision Recommendations

Montana GIS Data Layers

Montana GIS Data Bundler

Montana Greater Sage-Grouse Project Submittal Site

Montana Ground Water Information Center

Montana Index of Environmental Permits, 21st Edition (2018)

Montana Environmental Policy Act (MEPA)

Montana Environmental Policy Act Analysis Resource List

Laws, Treaties, Regulations, and Agreements on Animals and Plants

Montana Spatial Data Infrastructure Layers

Montana State Historic Preservation Office Review and Compliance

Montana Stream Permitting: a guide for conservation district supervisors and others

Montana Water Information System

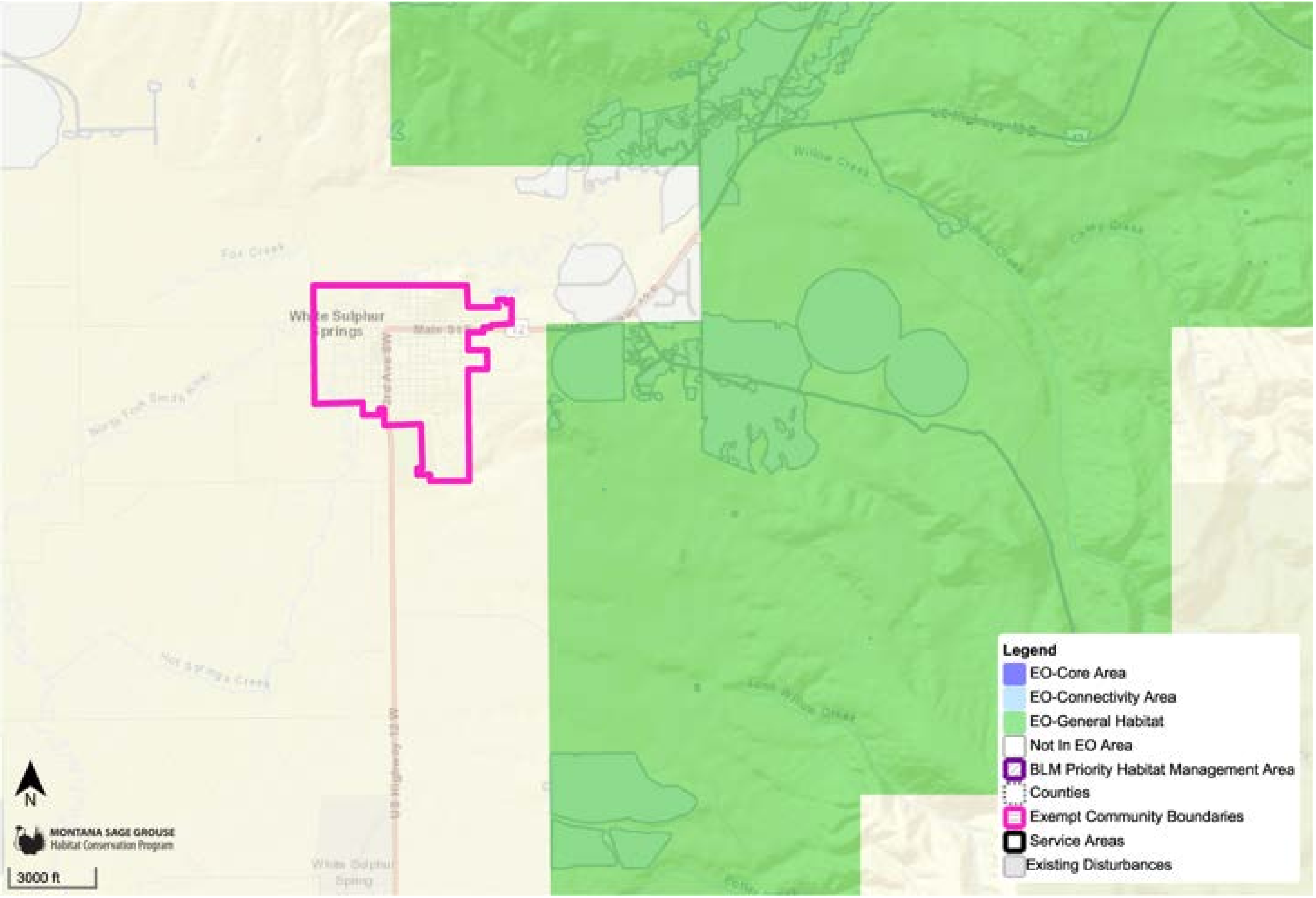
Montana Web Map Services

National Environmental Policy Act

Penalties for Misuse of Fish and Wildlife Location Data (MCA 87-6-222)

U.S. Fish and Wildlife Service Information for Planning and Consultation (Section 7 Consultation)

Web Soil Survey Tool


White Sulphur Springs
Main St
Fox Creek
Willow Creek
Legend
EO-Core Area
EO-Connectivity Area
EO-General Habitat
Not In EO Area
BLM Priority Habitat Management Area
Counties
Exempt Community Boundaries
Service Areas
Existing Disturbances
N
MONTANA SAGE GROUSE
Habitat Conservation Program
3000 ft

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

Meagher County, Montana

Local office

Montana Ecological Services Field Office

(406) 449-5225
(406) 449-5339

585 Shephard Way, Suite 1

303 Shephard Way, Suite 1
Helena, MT 59601-6287

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. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
North American Wolverine Gulo gulo luscus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

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

Conifers and Cycads

NAME	STATUS
Whitebark Pine Pinus albicaulis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1748	Threatened

Critical habitats

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

There are no critical habitats at this location.

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.

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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

Bald Eagle Haliaeetus leucocephalus — Breeds Jan 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.

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31

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

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.

Franklin's Gull Leucophaeus pipixcan — Breeds May 1 to Jul 31

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

Golden Eagle Aquila chrysaetos — Breeds Jan 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/1680

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

Rufous Hummingbird selasphorus rufus — Breeds Apr 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/8002

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.

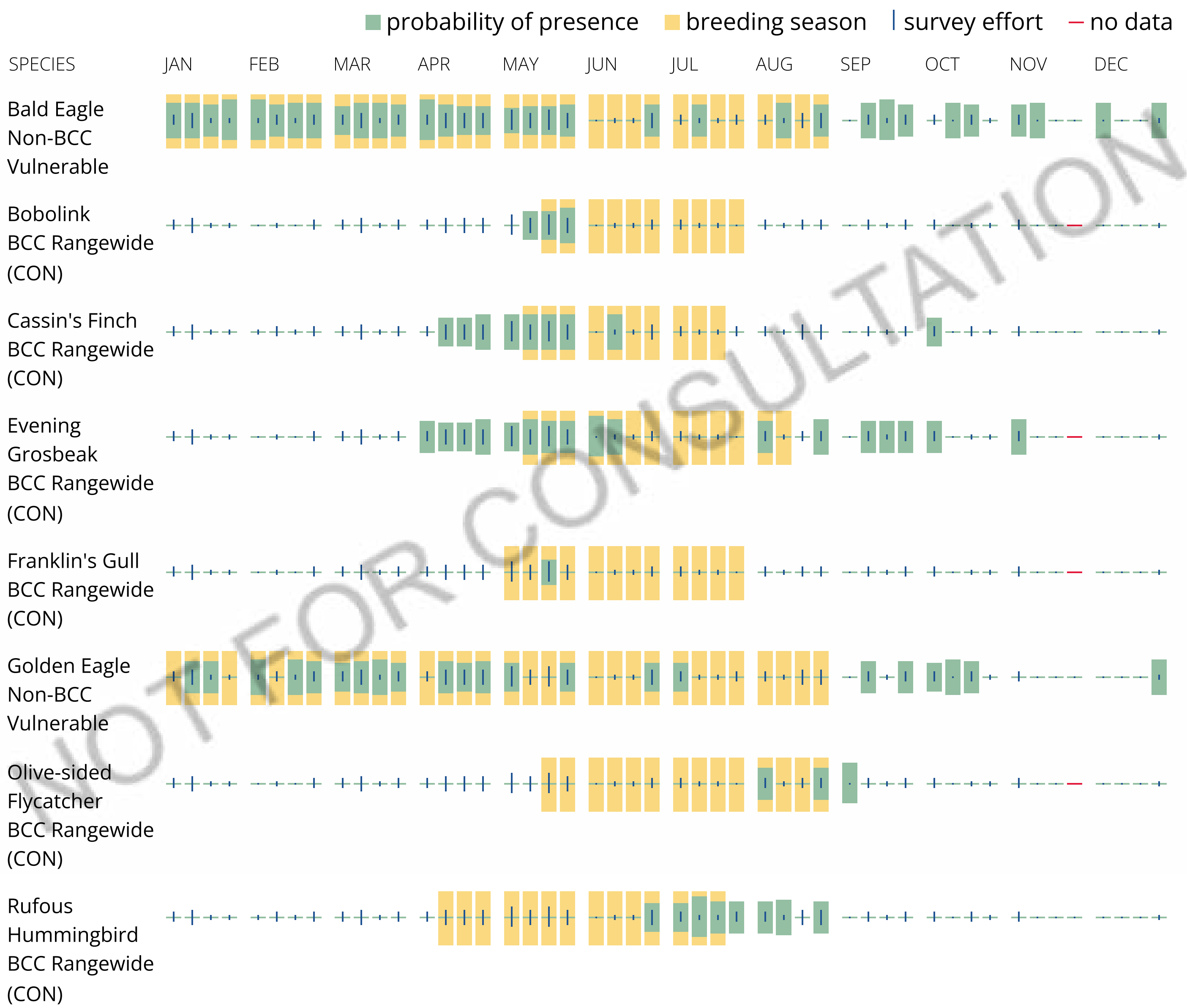
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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.



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 list of migratory birds that potentially occur 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 Rapid Avian Information Locator (RAIL) 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 or migrating in my 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 query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. 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.

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 (NWI)

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

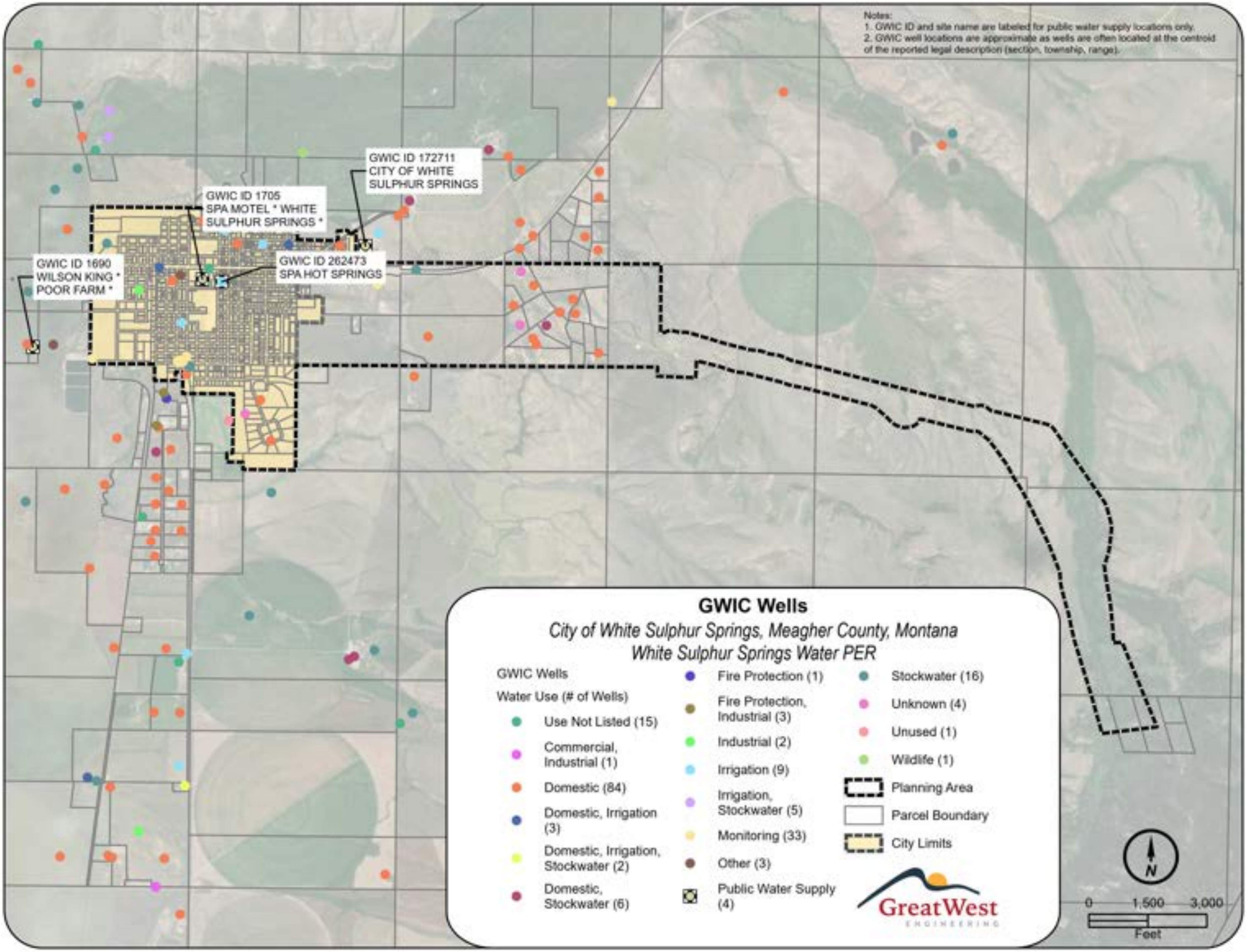
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and 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 F

Ground Water Information Center Summary of Area Wells



Notes:
1. GWIC ID and site name are labeled for public water supply locations only.
2. GWIC well locations are approximate as wells are often located at the centroid of the reported legal description (section, township, range).
GWIC ID 172711
CITY OF WHITE
SULPHUR SPRINGS
GWIC ID 1705
SPA MOTEL * WHITE
SULPHUR SPRINGS *
GWIC ID 1690
WILSON KING *
POOR FARM *
GWIC ID 262473
SPA HOT SPRINGS
GWIC Wells
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
GWIC Wells
Water Use (# of Wells)
Use Not Listed (15)
Commercial, Industrial (1)
Domestic (84)
Domestic, Irrigation (3)
Domestic, Irrigation, Stockwater (2)
Domestic, Stockwater (6)
Fire Protection (1)
Fire Protection, Industrial (3)
Industrial (2)
Irrigation (9)
Irrigation, Stockwater (5)
Monitoring (33)
Other (3)
Public Water Supply (4)
Stockwater (16)
Unknown (4)
Unused (1)
Wildlife (1)
Planning Area
Parcel Boundary
City Limits
N
0
1,500
3,000
Feet
GreatWest
ENGINEERING

GWICID	SITE_NAME	LATITUDE	LONGITUDE	GEOMETHOD	DATUM_LATL	DATE_LATLO	ALTITUDE	METHOD_ALT	DATUM_ALTI	DATE_ALTIT	TOWNSHIP	RANGE	SECTION	QSECTION	COUNTY	STATE
1683	JACKSON RONALD L.	46.5636	-110.9211	UNKNOWN	NAD27		4990				09N	06E	1	CCDD	MEAGHER	MT
1687	STOCK WELL AT FOX*.5 MI N WHITE SULPHUR SP	46.555	-110.9169	UNKNOWN	NAD27		5008				09N	06E	12	CAA	MEAGHER	MT
1688	WHITE SULPHUR SPRINGS BANK WELL	46.5477	-110.9063	UNKNOWN	NAD27		5030				09N	06E	13	AAAA	MEAGHER	MT
1689	RALPH JORDAN * WHITE SULPHUR SPRINGS	46.5444	-110.9061	UNKNOWN	NAD27		5040				09N	06E	13	ADAA	MEAGHER	MT
1690	WILSON KING * POOR FARM *	46.5425	-110.9211	UNKNOWN	NAD27		4993				09N	06E	13	BCDA	MEAGHER	MT
1691	COW PALACE *	46.5408	-110.9055	UNKNOWN	NAD27		5041				09N	06E	13	DAAA	MEAGHER	MT
1692	CASTLE MTN LUMBER CO FIRE PROTECTION WELL	46.5391	-110.9075	UNKNOWN	NAD27		5018				09N	06E	13	DACA	MEAGHER	MT
1695	KENNICK JEFF * WHITE SULPHUR SPRINGS	46.533	-110.9136	UNKNOWN	NAD27		4990				09N	06E	24	ABB	MEAGHER	MT
1696	DETERS HOUSE*.5 M S WHITE SULPHUR SPRINGS	46.5291	-110.9088	UNKNOWN	NAD27		5033				09N	06E	24	ADB	MEAGHER	MT
1697	HANSON, BOB	46.5213	-110.905	UNKNOWN	NAD27		5034				09N	06E	24	DDDA	MEAGHER	MT
1698	CORKILL BILL * WELDING SCHOOL	46.505	-110.9077	MAP	NAD27		5038				09N	06E	25	DDCD	MEAGHER	MT
1702	LIND JAMES	46.5525	-110.8838	UNKNOWN	NAD27		5065				09N	07E	8	CBCC	MEAGHER	MT
1703	TOWNSEND RANCH LLC	46.5575709	-110.8303484	SUR-GPS	NAD83	20120404	5234.76	SUR-GPS	NAVD88	20120404	09N	07E	10	ACCA	MEAGHER	MT
1704	ELLINGTON, DAVID & LAURA J.	46.5455	-110.8663	UNKNOWN	NAD27		5190				09N	07E	17	AAD	MEAGHER	MT
1705	SPA MOTEL * WHITE SULPHUR SPRINGS *	46.547342	-110.904893	NAV-GPS	NAD83	20110329130000	4979				09N	07E	18	BBAB	MEAGHER	MT
1706	DOIG, GORDON H.	46.5391	-110.898	UNKNOWN	NAD27		5095				09N	07E	18	CACA	MEAGHER	MT
1707	BAILEY, WALLY	46.5211	-110.8886	UNKNOWN	NAD27		5100				09N	07E	19	CB	MEAGHER	MT
22184	BAIR, HELEN E.	46.55618506	-110.915968	TRS-SEC	NAD83	20190521	0				09N	06E	12		MEAGHER	MT
22185	BAIR HELEN E.	46.556185	-110.915968	TRS-SEC	NAD83		0				09N	06E	12		MEAGHER	MT
22186	HERR, JAMES	46.55618506	-110.915968	TRS-SEC	NAD83	20190521	0				09N	06E	12		MEAGHER	MT
22187	THORNES, BILLIE M	46.56173281	-110.9239727	TRS-SEC	NAD83	20190521	0				09N	06E	12	BB	MEAGHER	MT
22188	JACKSON OAKLEY R.	46.559421	-110.921972	TRS-SEC	NAD83	20090625	5025				09N	06E	12	BCAA	MEAGHER	MT
22189	JACKSON, OAKLEY R.	46.55942125	-110.9219715	TRS-SEC	NAD83	20190521	5025				09N	06E	12	BCAA	MEAGHER	MT
22190	JACKSON ANGUS RANCH	46.5593	-110.9177	SUR-GPS	NAD83	20000306	5025.78				09N	06E	12	BDAB	MEAGHER	MT
22191	HOLMSTROM, AXEL	46.55341119	-110.9199703	TRS-SEC	NAD83	20190521	5000				09N	06E	12	CAC	MEAGHER	MT
22192	FALLANG, KEN AND ALICE	46.55895894	-110.9146338	TRS-SEC	NAD83	20190521	5000				09N	06E	12	ACB	MEAGHER	MT
22193	FALLANG, KEN AND ALICE	46.55710969	-110.9146338	TRS-SEC	NAD83	20190521	5000				09N	06E	12	ACC	MEAGHER	MT
22194	HOLMSTROM RANCH	46.550637	-110.918636	TRS-SEC	NAD83		0				09N	06E	12	CD	MEAGHER	MT
22196	SIEGER, MARY	46.54166629	-110.9158852	TRS-SEC	NAD83	20190521	0				09N	06E	13		MEAGHER	MT
22197	MATHIS, WAYNE	46.54166629	-110.9158852	TRS-SEC	NAD83	20190521	0				09N	06E	13		MEAGHER	MT
22198	FIRST NATIONAL BANK: WHITE SULPHUR SPRINGS	46.54717916	-110.9079457	TRS-SEC	NAD83	20190521	0				09N	06E	13	AA	MEAGHER	MT
22199	FOWLIE, JAMES R.	46.54809797	-110.9172085	TRS-SEC	NAD83	20190521	5010				09N	06E	13	BAA	MEAGHER	MT
22200	FOWLIE, JAMES R.	46.54626035	-110.9225015	TRS-SEC	NAD83	20190521	5000				09N	06E	13	BBD	MEAGHER	MT
22201	DOAK, FANNY	46.54120688	-110.9059609	TRS-SEC	NAD83	20190521	5041				09N	06E	13	DAAA	MEAGHER	MT
22202	CASTLE MTN LUMBER	46.539369	-110.908607	TRS-SEC	NAD83		5018				09N	06E	13	DACA	MEAGHER	MT
22203	YAMHILL LUMBER CO.	46.53707222	-110.909269	TRS-SEC	NAD83	20190521	5010				09N	06E	13	DDB	MEAGHER	MT
22213	BUCSIS, DICK	46.5270205	-110.9157901	TRS-SEC	NAD83	20190521	0				09N	06E	24		MEAGHER	MT
22214	HANSEN, JAN	46.530689	-110.9105321	TRS-SEC	NAD83	20190521	0				09N	06E	24	A	MEAGHER	MT
22215	HANSEN JAN	46.530689	-110.910532	TRS-SEC	NAD83		0				09N	06E	24	A	MEAGHER	MT
22216	NIELSEN, JERRY D.	46.530689	-110.9105321	TRS-SEC	NAD83	20190522	0				09N	06E	24	A	MEAGHER	MT
22217	POTTER & CO.	46.530689	-110.910532	TRS-SEC	NAD83		0				09N	06E	24	A	MEAGHER	MT
22218	DETERS, JAMES	46.53252325	-110.9079031	TRS-SEC	NAD83	20190522	0				09N	06E	24	AA	MEAGHER	MT
22219	GOLBERG, JACK	46.52977188	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	ADA	MEAGHER	MT
22220	DETERS JAMES	46.529772	-110.909218	TRS-SEC	NAD83		0				09N	06E	24	ADB	MEAGHER	MT
22222	BRAND-S CORPORATION	46.51243557	-110.9156072	TRS-SEC	NAD83	20120814	0				09N	06E	25		MEAGHER	MT
22223	BREKKE, HOWARD	46.51197275	-110.9057349	TRS-SEC	NAD83	20190522	5035				09N	06E	25	DAAA	MEAGHER	MT
22224	DOUGLAS STUDS INC.	46.50873307	-110.9103419	TRS-SEC	NAD83	20190523	5020				09N	06E	25	D	MEAGHER	MT
22236	CHAPMAN, FOREST	46.55626076	-110.8949422	TRS-SEC	NAD83	20190521	0				09N	07E	7		MEAGHER	MT
22237	OWENS, WALLY	46.55351538	-110.8962368	TRS-SEC	NAD83	20190521	0				09N	07E	7	CAD	MEAGHER	MT
22238	HARDEN, WARREN & L	46.54985488	-110.9014153	TRS-SEC	NAD83	20190521	0				09N	07E	7	CCD	MEAGHER	MT
22239	SCHENDEL, LLOYD L. & MARIAN R.	46.54985488	-110.8962368	TRS-SEC	NAD83	20190521	0				09N	07E	7	CDD	MEAGHER	MT
22240	MASSEE, GERALD	46.54985488	-110.8910583	TRS-SEC	NAD83	20190521	0				09N	07E	7	DCD	MEAGHER	MT
22241	CHAPMAN, FOREST	46.55626228	-110.8741933	TRS-SEC	NAD83	20190521	0				09N	07E	8		MEAGHER	MT
22242	OLSEN CE &GM	46.55672	-110.876171	TRS-SEC	NAD83		5070				09N	07E	8	BDDC	MEAGHER	MT
22243	OLSEN, CLIFFORD E. & GERALDINE M	46.553059	-110.884082	TRS-SEC	NAD83	20090629	5065				09N	07E	8	CBCC	MEAGHER	MT
22244	SAUNDERS, R E JR	46.55840455	-110.8292837	TRS-SEC	NAD83	20190521	5200				09N	07E	10	AC	MEAGHER	MT
22245	SAUNDERS, R.E.	46.55840455	-110.8292837	TRS-SEC	NAD83	20190521	0				09N	07E	10	AC	MEAGHER	MT
22246	BECKER, PAUL	46.5454678	-110.8687047	TRS-SEC	NAD83	20190521	0				09N	07E	17	A	MEAGHER	MT
22247	LESTER, RICHARD	46.5433	-110.8702	UNKNOWN	NAD27		5160				09N	07E	17	ACDB	MEAGHER	MT
22249	ORCA, PAUL	46.54453949	-110.8726853	TRS-SEC	NAD83	20190521	0				09N	07E	17	ACB	MEAGHER	MT
22250	LYNG, VIRGINIA	46.54825274	-110.8726853	TRS-SEC	NAD83	20190521	0				09N	07E	17	ABB	MEAGHER	MT
22251	KINNICK, JEFF	46.54588659	-110.8733896	SUR-GPS	NAD83	20120403	5145.026	SUR-GPS	NAVD88	20120403	09N	07E	17	ABDC	MEAGHER	MT
22252	WILLIAMS, GEORGE	46.53800042	-110.9003214	TRS-SEC	NAD83	20190521	0				09N	07E	18	C	MEAGHER	MT
22254	BAILEY, RAY E.	46.52392337	-110.8995506	TRS-SEC	NAD83	20190522	5050				09N	07E	19	CACC	MEAGHER	MT
22255	BAILEY, RAY E.	46.52120143	-110.8888551	TRS-SEC	NAD83	20190522	5100				09N	07E	19	DDCB	MEAGHER	MT
22257	BAILEY, RAY E.	46.51732808	-110.8828667	TRS-SEC	NAD83	20190522	5150				09N	07E	29	BBC	MEAGHER	MT
120962	RUSSELL, DOUG	46.53160613	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	AAD	MEAGHER	MT
121574	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121575	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121576	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121577	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121579	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT

GWICID	DRAINAGE_B	ADDITION_S	BLOCK	LOT	CERTOFSURV	PARCEL	ASSESSORTR	GEOCODE	SITE_TYPE	TOTAL_DEPT	SWL	DATE_COMPL	HOW_DRILLE	DRILLING_C	DRILLER_NA
1683	BC								WELL	135	90				
1687	BC								WELL	45	0				
1688	BC								WELL	330	6.4				
1689	BC								WELL	175	31.5				
1690	BC								WELL	125	40				
1691	BC								WELL	110	53.75				
1692	BC								WELL	131	20				
1695	BC								WELL	250	14				
1696	BC								WELL	88	32				
1697	BC								WELL	223	64	19610406	CABLE		CLYDE SANDO
1698	BC								WELL	96	35.17				
1702	BC								WELL	60	10				
1703	BC	WILLOW CREEK							WELL	85	1	19750620	CABLE	LINDSAY DRILLING CO INC	WESLEY LINDSAY
1704	BC	COS 77 - CASTLE MOUNTAIN		2					WELL	130	40	19790731	FORWARD ROTARY	HILLMAN DRILLING	
1705	BC								WELL	0	0				
1706	BC								WELL	160	30	19791018	FORWARD ROTARY	GRIZZLY DRILLING	FRANK CRICK
1707	BC								WELL	184	97	19800917	CABLE	H & L DRILLING INC	HAROLD REID
22184	BC								WELL	0	3	19560101			
22185	BC								WELL	0	0	19560101			
22186	BC								WELL	20	6	19871008	FORWARD ROTARY	GORDON DRILLING INC	JAMES A. GORDON
22187	BC								WELL	23	8	19871009	FORWARD ROTARY	GORDON DRILLING INC	JAMES A. GORDON
22188	BC								WELL	60	22	19470101			UNKNOWN
22189	BC								WELL	55	25	19480101			UNKNOWN
22190	BC								WELL	33	3	19790626	CABLE	H & L DRILLING INC	HAROLD REID
22191	BC								WELL	82	10	19580211	CABLE		ALBERT HECK
22192	BC								WELL	5	3.5	18820101			
22193	BC								WELL	10	4	19160101			
22194	BC								WELL	101	18	19790618	CABLE	H & L DRILLING INC	HAROLD REID
22196	BC								WELL	59	30	19730814	CABLE	LINDSAY DRILLING CO INC	WESLEY LINDSAY
22197	BC								WELL	47	5	19730812	CABLE	LINDSAY DRILLING CO INC	WESLEY LINDSAY
22198	BC								WELL	340	6	19780817	FORWARD ROTARY	JOE JOHNSON DRILLING	JOE JOHNSON
22199	BC								WELL	0	5	19300101			UNKNOWN
22200	BC								WELL	0	5				UNKNOWN
22201	BC								WELL	110	80	19630420	CABLE	A & G DRILLING	ALBERT HECK
22202	BC								WELL	131	20	19560101			
22203	BC								WELL	132	20	19570801			UNKNOWN
22213	BC								WELL	71	45	19771215	CABLE	LINDSAY DRILLING CO INC	WESLEY LINDSAY
22214	BC								WELL	90	43	19771029	FORWARD ROTARY	BILLINGS DRILLING	LAVERN JEWETT
22215	BC								WELL	84	43	19771027	FORWARD ROTARY	BILLINGS DRILLING	LAVERN JEWETT
22216	BC								WELL	92	43	19771031	FORWARD ROTARY	BILLINGS DRILLING	LAVERN JEWETT
22217	BC								WELL	97	39	19821022	FORWARD ROTARY	H & L DRILLING INC	HAROLD REID
22218	BC								WELL	88	32	19780815	FORWARD ROTARY	JOE JOHNSON DRILLING	JOE JOHNSON
22219	BC								WELL	131	35	19820518	CABLE	H & L DRILLING INC	HAROLD REID
22220	BC								WELL	88	32	19780101			
22222	BC								WELL	60	25	19750625	CABLE	HILLMAN DRILLING	ED HILLMAN
22223	BC								WELL	40	40	19420301	DRILLED		TURNER HANSON
22224	BC								WELL	100	50	19580601			UNKNOWN
22236	BC								WELL	12	0	19140101			
22237	BC								WELL	95	50	19900404	ROTARY	HAGGERTY DRILLING	KEVIN HAGGERTY
22238	BC								WELL	91	58	19871003	FORWARD ROTARY	GORDON DRILLING INC	JAMES A. GORDON
22239	BC								WELL	111	41	19871006	FORWARD ROTARY	GORDON DRILLING INC	JAMES A. GORDON
22240	BC								WELL	140	80	19850615	FORWARD ROTARY	MONTANA DRILCO	JACK HERBERT
22241	BC								WELL	69	0	19470101			
22242	BC								WELL	60	10	19000101			
22243	BC								WELL	60	10	18900101			
22244	BC								WELL	51	30	19620413	CHURN	HANSEN ENVIRONMENTAL DRILLING	MARSHALL HANSEN
22245	BC								WELL	119	3	19890613	AIR ROTARY	H & L DRILLING INC	HAROLD REID
22246	BC								WELL	60	40	19830707	FORWARD ROTARY	H & L DRILLING INC	HAROLD REID
22247	BC	PAT WOOD		6					WELL	200	70	19830519	AIR ROTARY	LINDSAY DRILLING CO INC	TERRY LINDSAY
22249	BC								WELL	101	81	19810806	FORWARD ROTARY	H & L DRILLING INC	HAROLD REID
22250	BC								WELL	77	64	19800318	CABLE	H & L DRILLING INC	HAROLD REID
22251	BC								WELL	135	85	19831209	FORWARD ROTARY	H & L DRILLING INC	HAROLD REID
22252	BC								WELL	120	80	19811002	BORED	H & L DRILLING INC	HAROLD REID
22254	BC								WELL	150	45	19610101			
22255	BC								WELL	225	60	19000101			
22257	BC								WELL	203	145	19650126	CABLE TOOLS		ALBERT HECK
120962	BC								WELL	113	61	19891002	ROTARY	H & L DRILLING INC	HAROLD REID
121574	BC								WELL	14.6	11.8	19900508	AUGER		
121575	BC								WELL	20	13.21	19900508	AUGER	CNI	
121576	BC	JOB NO 90-3107							WELL	20	10.25	19900508	AUGER	CNI	
121577	BC	JOB NO 90-3107							WELL	20	3.79	19900508	AUGER	CNI	
121579	BC								WELL	17	8.21	19900509	AUGER		

GWICID	DRILLER_LI	DRILLER_00	DRILLER_FI	VERIFIED_T	ABANDONED_	DATE_ABAND	STATUS	FLOWING	DEPTH_WATE	AQUIFER	PRIORITY	WELL_USE	WELLUSE_PR	CALC_LOC	VER_LOC	NETWORK	FIELD_VISI	SWL_MEAS	SAMPLES
1683		0					NEW WELL		0		0		0	NO	YES		1	0	1
1687		0					NEW WELL		0	110ALVM	1		0	NO	YES		1	0	1
1688		0					NEW WELL		0		0		0	NO	YES		1	0	1
1689		0					NEW WELL		0	120SDMS	1		0	NO	YES		1	0	1
1690		0					NEW WELL		0		0		0	NO	YES		1	0	1
1691		0					NEW WELL		80	120SDMS	1		0	NO	YES		1	0	1
1692		0					NEW WELL		0	110ALVM	1		0	NO	YES		1	0	1
1695		0					NEW WELL		0		0		0	NO	YES		1	0	1
1696		0					NEW WELL		79	110ALVM	1		0	NO	YES		1	0	1
1697		0					NEW WELL		93	110ALVM	1		0	NO	YES		1	0	1
1698		0					NEW WELL		0	110TRRC	1		0	NO	YES		1	0	1
1702		0					NEW WELL		0	110ALVM	1		0	NO	YES		1	0	1
1703	WWC	38		099361			NEW WELL		55	400PIGN	1		0	NO	YES	STATEWIDE	4	92	3
1704		0		111874			NEW WELL		130		0		0	NO	YES		1	0	1
1705		0					NEW WELL		0	110ALVM	1		0	NO	YES		2	0	2
1706	WWC	365		113336			NEW WELL		96		0		0	NO	YES		1	0	1
1707	WWC	334					NEW WELL		130		0		0	NO	YES		1	0	1
22184	WWD	0					NEW WELL		0		0		0	YES	YES		0	0	0
22185		0					NEW WELL		0		0		0	YES	YES		0	0	0
22186	WWC	428		030993			NEW WELL		8		0		0	YES	YES		0	0	0
22187	WWC	428		030994			NEW WELL		9		0		0	YES	YES		0	0	0
22188	WWD	0					DEEPENED		0		0		0	YES	YES		0	0	0
22189	WWD	0					NEW WELL		55		0		0	YES	YES		0	0	0
22190	WWC	334					NEW WELL		33	110ALVM	1		0	NO	YES		1	27	0
22191	WWD	114		080255			NEW WELL		30		0		0	YES	YES		0	0	0
22192		0					NEW WELL		5		0		0	YES	YES		0	0	0
22193		0					NEW WELL		10		0		0	YES	YES		0	0	0
22194	WWC	334					NEW WELL		101		0		0	YES	YES		0	0	0
22196	WWC	38					NEW WELL		59		0		0	YES	YES		0	0	0
22197	WWC	38					NEW WELL		47		0		0	YES	YES		0	0	0
22198	WWC	154					NEW WELL		90		0		0	YES	YES		0	0	0
22199		0					NEW WELL		0		0		0	YES	YES		0	0	0
22200		0					NEW WELL		0		0		0	YES	YES		0	0	0
22201	WWC	114					NEW WELL		80	110ALVM	1		0	YES	YES		0	0	0
22202		0					NEW WELL		0	110ALVM	1		0	YES	YES		0	0	0
22203		0					NEW WELL		132		0		0	YES	YES		0	0	0
22213	WWC	38					NEW WELL		51		0		0	YES	YES		0	0	0
22214	WWC	264					NEW WELL		81		0		0	YES	YES		0	0	0
22215	WWC	264					NEW WELL		80		0		0	YES	YES		0	0	0
22216	WWC	264					NEW WELL		81		0		0	YES	YES		0	0	0
22217	WWC	334		009885			NEW WELL		80		0		0	YES	YES		0	0	0
22218	WWC	154					NEW WELL		79		0		0	YES	YES		0	0	0
22219	WWC	334		009887			NEW WELL		131		0		0	YES	YES		0	0	0
22220		0					NEW WELL		79		0		0	YES	YES		0	0	0
22222	WWC	258					NEW WELL		60	120SDMS	1		0	YES	YES		0	0	0
22223		0					NEW WELL		40		0		0	YES	YES		0	0	0
22224		0					NEW WELL		100		0		0	YES	YES		0	0	0
22236		0		080256			NEW WELL		0		0		0	YES	YES		0	0	0
22237	WWC	353		072917			NEW WELL		80		0		0	YES	YES		0	0	0
22238	WWC	428		030997			NEW WELL		69		0		0	YES	YES		0	0	0
22239	WWC	428		030998			NEW WELL		83		0		0	YES	YES		0	0	0
22240	WWC	466		009889			NEW WELL		110		0		0	YES	YES		0	0	0
22241		0					NEW WELL		0		0		0	YES	YES		0	0	0
22242		0					NEW WELL		0		0		0	YES	YES		0	0	0
22243		0					NEW WELL		0	110ALVM	1		0	YES	YES		0	0	0
22244	WWC	74		099256			NEW WELL		20		0		0	YES	YES		0	0	0
22245	WWC	334		061430			NEW WELL		119		0		0	YES	YES		0	0	0
22246	WWC	334		009890			NEW WELL		60		0		0	YES	YES		0	0	0
22247	WWC	253		009891			NEW WELL		185	120SDMS	1		0	NO	YES		1	9	0
22249	WWC	334					NEW WELL		100		0		0	YES	YES		0	0	0
22250	WWC	334					NEW WELL		0		0		0	YES	YES		0	0	0
22251	WWC	334		009892			NEW WELL		95	120SDMS	1		0	NO	YES	STATEWIDE	4	101	3
22252	WWC	334		009893			NEW WELL		113		0		0	YES	YES		0	0	0
22254		0					NEW WELL		0		0		0	YES	YES		0	0	0
22255		0					NEW WELL		0		0		0	YES	YES		0	0	0
22257	WWC	114					NEW WELL		110		0		0	YES	YES		0	0	0
120962	WWC	334		078519			NEW WELL		93		0		0	YES	YES		0	0	0
121574		0		079244	YES	19980707	ABANDONED		7.1		0		0	YES	YES		0	0	0
121575		0		079245			NEW WELL		10		0		0	YES	YES		0	0	0
121576		0		079258			NEW WELL		10		0		0	YES	YES		0	0	0
121577		0		079246			ABANDONED		10		0		0	YES	YES		0	0	0
121579		0		079248	YES	19980507	ABANDONED		7		0		0	YES	YES		0	0	0

GWICID	REPORT_LIN	ALL_WATER_	YIELD_GPM	PUMPING_WA	DNRC_WATER
1683	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1683&reqby=M&				
1687	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1687&reqby=M&	STOCKWATER			
1688	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1688&reqby=M&	OTHER	50.00 (OTHER)		
1689	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1689&reqby=M&	IRRIGATION			
1690	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1690&reqby=M&	PUBLIC WATER SUPPLY			
1691	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1691&reqby=M&	DOMESTIC			
1692	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1692&reqby=M&	FIRE PROTECTION			
1695	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1695&reqby=M&	DOMESTIC			
1696	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1696&reqby=M&	DOMESTIC	50.00 (OTHER)		
1697	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1697&reqby=M&	IRRIGATION	1200.00 (PUMP)	183.00 (PUMP)	
1698	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1698&reqby=M&	COMMERCIAL, INDUSTRIAL			
1702	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1702&reqby=M&	DOMESTIC			
1703	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1703&reqby=M&	DOMESTIC	2.00 (BAILER)	80.00 (BAILER)	
1704	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1704&reqby=M&	DOMESTIC	5.00 (AIR)	130.00 (AIR)	94908
1705	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1705&reqby=M&	PUBLIC WATER SUPPLY			
1706	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1706&reqby=M&	DOMESTIC	20.00 (AIR)	140.00 (AIR)	26381
1707	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=1707&reqby=M&	DOMESTIC, STOCKWATER	13.00 (BAILER)	176.00 (BAILER)	
22184	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22184&reqby=M&	IRRIGATION, STOCKWATER	0.25 (OTHER)		
22185	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22185&reqby=M&	IRRIGATION, STOCKWATER			
22186	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22186&reqby=M&	DOMESTIC	19.00 (PUMP)	7.00 (PUMP)	66858
22187	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22187&reqby=M&	DOMESTIC	9.00 (AIR)	8.00 (AIR)	66861
22188	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22188&reqby=M&	DOMESTIC	30.00 (OTHER)		
22189	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22189&reqby=M&	STOCKWATER	20.00 (OTHER)		
22190	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22190&reqby=M&	STOCKWATER	15.00 (BAILER)	18.00 (BAILER)	24180
22191	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22191&reqby=M&	STOCKWATER	30.00 (BAILER)	10.00 (BAILER)	30023663
22192	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22192&reqby=M&	IRRIGATION, STOCKWATER			
22193	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22193&reqby=M&	IRRIGATION, STOCKWATER		4.00 (OTHER)	
22194	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22194&reqby=M&	DOMESTIC	9.00 (BAILER)	90.00 (BAILER)	
22196	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22196&reqby=M&	DOMESTIC, IRRIGATION, STOCKWATER	20.00 (BAILER)	38.00 (BAILER)	
22197	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22197&reqby=M&		30.00 (BAILER)	10.00 (BAILER)	
22198	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22198&reqby=M&	OTHER	79.00 (PUMP), 42.00 (PUMP)		37156
22199	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22199&reqby=M&	STOCKWATER	20.00 (OTHER)	5.00 (OTHER)	
22200	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22200&reqby=M&	STOCKWATER	20.00 (OTHER)	5.00 (OTHER)	
22201	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22201&reqby=M&	STOCKWATER	15.00 (BAILER)	80.00 (BAILER)	
22202	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22202&reqby=M&	FIRE PROTECTION, INDUSTRIAL			
22203	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22203&reqby=M&	FIRE PROTECTION, INDUSTRIAL			
22213	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22213&reqby=M&	DOMESTIC	15.00 (BAILER)	67.00 (BAILER)	19191
22214	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22214&reqby=M&	DOMESTIC	75.00 (AIR)	80.00 (AIR)	16188
22215	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22215&reqby=M&	DOMESTIC	75.00 (AIR)	80.00 (AIR)	16187
22216	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22216&reqby=M&	DOMESTIC	75.00 (AIR)	80.00 (AIR)	16775
22217	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22217&reqby=M&		10.00 (AIR)	90.00 (AIR)	
22218	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22218&reqby=M&	DOMESTIC	20.00 (AIR)	80.00 (AIR)	20079
22219	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22219&reqby=M&		26.00 (BAILER)	91.00 (BAILER)	
22220	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22220&reqby=M&	DOMESTIC	20.00 (OTHER)	80.00 (OTHER)	20079
22222	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22222&reqby=M&	DOMESTIC, IRRIGATION	20.00 (BAILER)	48.00 (BAILER)	
22223	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22223&reqby=M&	DOMESTIC, IRRIGATION, STOCKWATER	15.00 (OTHER)	40.00 (OTHER)	
22224	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22224&reqby=M&	INDUSTRIAL			
22236	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22236&reqby=M&	IRRIGATION, STOCKWATER	10.00 (OTHER)		
22237	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22237&reqby=M&	DOMESTIC	8.00 (AIR)	90.00 (AIR)	75159
22238	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22238&reqby=M&	DOMESTIC	13.00 (PUMP)	82.00 (PUMP)	66855
22239	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22239&reqby=M&	DOMESTIC, IRRIGATION	28.00 (AIR)		66877
22240	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22240&reqby=M&	DOMESTIC	50.00 (AIR)	95.00 (AIR)	
22241	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22241&reqby=M&	DOMESTIC	5.00 (OTHER)		
22242	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22242&reqby=M&	DOMESTIC, STOCKWATER	40.00 (OTHER)		
22243	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22243&reqby=M&	DOMESTIC, STOCKWATER	40.00 (OTHER)		
22244	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22244&reqby=M&	DOMESTIC	6.00 (BAILER)	22.00 (BAILER)	
22245	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22245&reqby=M&	STOCKWATER	12.00 (AIR)		71599
22246	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22246&reqby=M&	DOMESTIC	5.00 (AIR)	53.00 (AIR)	
22247	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22247&reqby=M&	DOMESTIC	30.00 (AIR)	196.00 (AIR)	
22249	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22249&reqby=M&	UNKNOWN	39.00 (BAILER)	85.00 (BAILER)	
22250	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22250&reqby=M&	UNKNOWN	20.00 (BAILER)	66.00 (BAILER)	51496
22251	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22251&reqby=M&	DOMESTIC	20.00 (AIR)	120.00 (AIR)	
22252	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22252&reqby=M&	UNKNOWN	50.00 (OTHER)	84.00 (OTHER)	
22254	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22254&reqby=M&	STOCKWATER	25.00 (OTHER)		
22255	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22255&reqby=M&	DOMESTIC, STOCKWATER	50.00 (OTHER)		
22257	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=22257&reqby=M&	STOCKWATER	10.00 (BAILER)	170.00 (BAILER)	
120962	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=120962&reqby=M&	DOMESTIC	50.00 (AIR)		75140
121574	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121574&reqby=M&	MONITORING			
121575	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121575&reqby=M&	MONITORING			
121576	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121576&reqby=M&	MONITORING			
121577	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121577&reqby=M&	MONITORING			
121579	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121579&reqby=M&	MONITORING			

GWICID	SITE_NAME	LATITUDE	LONGITUDE	GEOMETHOD	DATUM_LATL	DATE_LATLO	ALTITUDE	METHOD_ALT	DATUM_ALTI	DATE_ALTIT	TOWNSHIP	RANGE	SECTION	QSECTION	COUNTY	STATE
121580	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121581	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121582	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
121583	VAN OIL * WSS-10	46.548098	-110.904256	TRS-SEC	NAD83		0				09N	07E	18	BBB	MEAGHER	MT
121584	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
122548	JORDAN, RALPH	46.55618506	-110.915968	TRS-SEC	NAD83	20190521	0				09N	06E	12		MEAGHER	MT
122549	JORDAN, MELTON C.	46.54971269	-110.9146338	TRS-SEC	NAD83	20190521	0				09N	06E	12	DCC	MEAGHER	MT
122551	BARFUS, EARNEST	46.55626076	-110.8949422	TRS-SEC	NAD83	20190521	0				09N	07E	7		MEAGHER	MT
123026	OGLE, RAY	46.53160613	-110.9223626	TRS-SEC	NAD83	20190522	0				09N	06E	24	BBD	MEAGHER	MT
123291	SMITH, ISABEL M.	46.54809797	-110.909269	TRS-SEC	NAD83	20190520	0				09N	06E	13	AAB	MEAGHER	MT
123292	GOLBERG, JACK	46.52977188	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	ADA	MEAGHER	MT
123293	CORKILL, BILL	46.51336119	-110.906393	TRS-SEC	NAD83	20190522	0				09N	06E	25	ADD	MEAGHER	MT
123296	CONSTABLE, HENRY S	46.55351538	-110.9014153	TRS-SEC	NAD83	20190521	0				09N	07E	7	CBD	MEAGHER	MT
123297	MATHIS, WAYNE	46.54718042	-110.9029442	TRS-SEC	NAD83	20190521	0				09N	07E	18	BB	MEAGHER	MT
126059	DAVISON, IVAN	46.51706369	-110.9090256	TRS-SEC	NAD83	20190522	0				09N	06E	25	AAC	MEAGHER	MT
126060	HOLM, TIM	46.5118	-110.9133	SUR-GPS	NAD83	20000717	5004.06				09N	06E	25	DBAB	MEAGHER	MT
127777	CITY OF WHITE SULPHUR SPRINGS	46.540826	-110.8833	TRS-SEC	NAD83		0				09N	07E	17	CBB	MEAGHER	MT
127785	HERZOG, IDA	46.53252325	-110.9079031	TRS-SEC	NAD83	20190522	0				09N	06E	24	AA	MEAGHER	MT
130696	GOLDBERG, BRUCE	46.52793763	-110.9092176	TRS-SEC	NAD83	20190522	0				09N	06E	24	ADC	MEAGHER	MT
140987	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
140988	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
140989	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
142754	HOCHSTRAT, CALVIN AND KATHLEEN	46.52060063	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	DDD	MEAGHER	MT
146733	WHITE SULPHUR SPRINGS	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
149039	WELBORN, ROBERT N.	46.52151775	-110.9131611	TRS-SEC	NAD83	20190522	0				09N	06E	24	DC	MEAGHER	MT
149040	BAILEY, WALLACE L	46.54825274	-110.8833003	TRS-SEC	NAD83	20190521	0				09N	07E	17	BBB	MEAGHER	MT
150088	BARTH, TIM	46.53707222	-110.909269	TRS-SEC	NAD83	20190521	0				09N	06E	13	DDB	MEAGHER	MT
150090	KNUPP, TERRY	46.54268287	-110.8647241	TRS-SEC	NAD83	20190521	0				09N	07E	17	ADD	MEAGHER	MT
150457	ELLINGTON, DAVID AND LAURA	46.54639612	-110.8673778	TRS-SEC	NAD83	20190521	0				09N	07E	17	AAC	MEAGHER	MT
152631	SHAW, FRANK AND LUCILLE	46.50688182	-110.9129746	TRS-SEC	NAD83	20190523	0				09N	06E	25	DC	MEAGHER	MT
154308	HOWARD, JAMES AND JOYCE	46.55351634	-110.8649638	TRS-SEC	NAD83	20190521	0				09N	07E	8	DAD	MEAGHER	MT
154309	DIXON, HOWARD AND JOANNA	46.55077041	-110.8715563	TRS-SEC	NAD83	20190521	0				09N	07E	8	DC	MEAGHER	MT
154310	HAUGAN, HAL	46.55077041	-110.8715563	TRS-SEC	NAD83	20190521	0				09N	07E	8	DC	MEAGHER	MT
154311	STANGLER, BRIAN	46.54985509	-110.8649638	TRS-SEC	NAD83	20190521	0				09N	07E	8	DDD	MEAGHER	MT
154313	ONEILL, NANCY & MAT	46.54361118	-110.8713585	TRS-SEC	NAD83	20190521	0				09N	07E	17	AC	MEAGHER	MT
157791	STIDHAM, TRAVIS	46.53615341	-110.9132387	TRS-SEC	NAD83	20190521	0				09N	06E	13	DC	MEAGHER	MT
157792	STANGLER, BRIAN AND PAMELA	46.55168572	-110.8728748	TRS-SEC	NAD83	20170320	0				09N	07E	8	DCB	MEAGHER	MT
157793	MCBRIDE, BOB	46.54985509	-110.8728748	TRS-SEC	NAD83	20190521	0				09N	07E	8	DCC	MEAGHER	MT
159243	MIKESELL, BRYAN AND DONALDA	46.53252325	-110.9184191	TRS-SEC	NAD83	20120621	0				09N	06E	24	BA	MEAGHER	MT
163136	CONSTABLE, HENRY STEVE	46.55351538	-110.898826	TRS-SEC	NAD83	20190521	0				09N	07E	7	CAC	MEAGHER	MT
164078	ADAMS, GARY	46.55168572	-110.8728748	TRS-SEC	NAD83	20190521	0				09N	07E	8	DCB	MEAGHER	MT
168726	JACKSON, RONALD	46.56080819	-110.9226386	TRS-SEC	NAD83	20190521	0				09N	06E	12	BBD	MEAGHER	MT
172711	CITY OF WHITE SULPHUR SPRINGS	46.54985488	-110.888469	TRS-SEC	NAD83	20110407	0				09N	07E	7	DDC	MEAGHER	MT
172712	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
172713	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
172714	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
172715	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
172716	VAN OIL	46.54809842	-110.9042556	TRS-SEC	NAD83	20190521	0				09N	07E	18	BBB	MEAGHER	MT
177531	PALMER, KATHY	46.53252325	-110.9079031	TRS-SEC	NAD83	20190522	0				09N	06E	24	AA	MEAGHER	MT
179518	GOLBERG, BRUCE AND DEBBIE	46.52977188	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	ADA	MEAGHER	MT
180192	BERG GARAGE INC	46.54718042	-110.8872077	TRS-SEC	NAD83	20190521	0				09N	07E	18	AA	MEAGHER	MT
180193	BERG GARAGE INC	46.54718042	-110.8872077	TRS-SEC	NAD83	20190521	0				09N	07E	18	AA	MEAGHER	MT
181860	BERG GARAGE INC	46.54718042	-110.8872077	TRS-SEC	NAD83	20190521	0				09N	07E	18	AA	MEAGHER	MT
181861	BERG GARAGE INC	46.54718042	-110.8872077	TRS-SEC	NAD83	20190521	0				09N	07E	18	AA	MEAGHER	MT
186204	LIND, ANDY	46.55534697	-110.8728748	TRS-SEC	NAD83	20190521	0				09N	07E	8	DBB	MEAGHER	MT
186207	JOHNSON, MARGARET	46.55077041	-110.8715563	TRS-SEC	NAD83	20190521	0				09N	07E	8	DC	MEAGHER	MT
186208	BERG GARAGE INC	46.54718042	-110.8872077	TRS-SEC	NAD83	20190521	0				09N	07E	18	AA	MEAGHER	MT
186272	BUCSIS, DICK AND MARY ANN	46.51706369	-110.906393	TRS-SEC	NAD83	20190522	0				09N	06E	25	AAD	MEAGHER	MT
186273	WILHELM, GARY A.	46.51336119	-110.906393	TRS-SEC	NAD83	20190522	0				09N	06E	25	ADD	MEAGHER	MT
195645	ARNESON, FARRAH	46.54985488	-110.898826	TRS-SEC	NAD83	20190521	0				09N	07E	7	CDC	MEAGHER	MT
196315	MEAGHER COUNTY CONSERVATION DISTRICT	46.5602	-110.8638	SUR-GPS	NAD83	20010508	5098.6				09N	07E	9	BBCC	MEAGHER	MT
198531	BAILEY, WALLACE	46.52165509	-110.8868497	TRS-SEC	NAD83	20190522	0				09N	07E	19	DD	MEAGHER	MT
199819	WHITE SULPHUR SPRINGS AIRPORT	46.503	-110.906	SUR-GPS	NAD83	20021212	5051.94	SUR-GPS	NAVD88		09N	06E	36	AAAD	MEAGHER	MT
199827	CHAPMAN RANCH	46.552	-110.8852	SUR-GPS	NAD83	20000503	5059.79				09N	07E	7	DDAA	MEAGHER	MT
199828	MEAGHER COUNTY - ARROWHEAD MEADOWS GOLF COURSE	46.5375	-110.902	SUR-GPS	NAD83	20000306	5055.49				09N	07E	18	CCAB	MEAGHER	MT
199830	HERR JIM	46.5514	-110.9049	SUR-GPS	NAD83	20000628	5029.34				09N	07E	7	CCBB	MEAGHER	MT
199842	MIKESELL KEN	46.5465	-110.9113	SUR-GPS	NAD83	20000711	5016.17				09N	06E	13	ABDA	MEAGHER	MT
199847	WILHELM GARY	46.5122	-110.9147	SUR-GPS	NAD83	20000308	5000.84				09N	06E	25	ACCC	MEAGHER	MT
201750	JOHNSTON, LIZ AND RUTH E	46.55168513	-110.898826	TRS-SEC	NAD83	20190521	0				09N	07E	7	CDB	MEAGHER	MT
206369	BARRET, RON	46.55534697	-110.8649638	TRS-SEC	NAD83	20190521	0				09N	07E	8	DAA	MEAGHER	MT
208223	LESTER, RICHARD	46.5454678	-110.8687047	TRS-SEC	NAD83	20190521	0				09N	07E	17	A	MEAGHER	MT
212769	WHITE SULPHUR SPRINGS 2	46.5167	-110.8833	MAP	NAD27		5200				09N	07E	9		MEAGHER	MT

GWICID	DRAINAGE_B	ADDITION_S	BLOCK	LOT	CERTOFSURV	PARCEL	ASSESSORTR	GEOCODE	SITE_TYPE	TOTAL_DEPT	SWL	DATE_COMPL	HOW_DRILLE	DRILLING_C	DRILLER_NA
121580	BC								WELL	20	5.23	19900509	AUGER	CNI	
121581	BC								WELL	20	8.54	19900509	AUGER	CNI	
121582	BC	JOB NO 90-3107							WELL	15	10.79	19900801	AUGER	CNI	
121583	BC								WELL	16.5	8.68	19900801	AUGER		
121584	BC								WELL	16.5	1.38	19900801	AUGER		
122548	BC								WELL	175	21	19820330	CABLE	H & L DRILLING INC	HAROLD REID
122549	BC	PARBERRY TOWNSITE	51	1					WELL	80	6	19830529	UNKNOWN	HILLMAN DRILLING	ED HILLMAN
122551	BC								WELL	70	0	19520101	DRILLED		
123026	BC								WELL	200	18	19910204	ROTARY	RED TIGER DRILLING	DUANE L. HAUSER
123291	BC								WELL	150	80	19850607	FORWARD ROTARY	MONTANA DRILCO	JACK HERBERT
123292	BC								WELL	134	59	19890920	ROTARY	H & L DRILLING INC	HAROLD REID
123293	BC								WELL	93	10	19800325	CABLE	H & L DRILLING INC	HAROLD REID
123296	BC								WELL	40	11	19910416	ROTARY	HAGGERTY DRILLING	VINCENT HILLMAN
123297	BC	PARBERRY	18	6					WELL	50	16	19871011	FORWARD ROTARY	GORDON DRILLING INC	JAMES A. GORDON
126059	BC								WELL	98	45	19911003	ROTARY	H & L DRILLING INC	SHAWN TONEY
126060	BC								WELL	79	34	19911003	ROTARY	H & L DRILLING INC	SHAWN TONEY
127777	BC								WELL	219	110	19911008	ROTARY	H & L DRILLING INC	SHAWN TONEY
127785	BC								WELL	80	55	19911004	ROTARY	H & L DRILLING INC	SHAWN TONEY
130696	BC	SHEARER TRACTS NO 3		2					WELL	159	56	19920526	ROTARY	H & L DRILLING INC	SHAWN TONEY
140987	BC								WELL	35	12.3	19931110	AIR ROTARY	BOLAND DRILLING	
140988	BC								WELL	35	11.3	19931110	AIR ROTARY	BOLAND DRILLING	
140989	BC								WELL	35	10.89	19931109	AIR ROTARY	BOLAND DRILLING	
142754	BC								WELL	120	71	19930409	ROTARY	RED TIGER DRILLING	DUANE L. HAUSER
146733	BC								WELL	20	8.79	19940504	AUGER	CNI	
149039	BC								WELL	124	63	19941007	ROTARY	H & L DRILLING INC	SHAWN TONEY
149040	BC								WELL	159	34	19941007	ROTARY	H & L DRILLING INC	SHAWN TONEY
150088	BC	BARTH MINOR		1					WELL	99	44	19950306	ROTARY	H & L DRILLING INC	SHAWN TONEY
150090	BC	CASTLE MOUNTAIN ESTATES		3					WELL	198	87	19941109	ROTARY	H & L DRILLING INC	SHAWN TONEY
150457	BC	CASTLE MOUNTAIN		1					WELL	120	70	19910417	ROTARY	HAGGERTY DRILLING	KEVIN HAGGERTY
152631	BC								WELL	103	46	19941006	ROTARY	H & L DRILLING INC	SHAWN TONEY
154308	BC	CASTLE VALLEY MEADOWS		13					WELL	118	65	19950825	ROTARY	H & L DRILLING INC	SHAWN TONEY
154309	BC	CASTLE VALLEY MEADOWS							WELL	107	79	19950724	ROTARY	H & L DRILLING INC	SHAWN TONEY
154310	BC	CASTLE VALLEY MEADOWS		12					WELL	158	62	19950725	ROTARY	H & L DRILLING INC	SHAWN TONEY
154311	BC	CASTLE VALLEY MEADOWS		10					WELL	139	54	19950726	ROTARY	H & L DRILLING INC	SHAWN TONEY
154313	BC	ROONEY TRACTS		4					WELL	139	46	19950726	ROTARY	H & L DRILLING INC	SHAWN TONEY
157791	BC	BARTH MINOR		2					WELL	99	47	19960606	ROTARY	H & L DRILLING INC	SHAWN TONEY
157792	BC	CASTLE VALLEY MEADOWS					5		WELL	97	36	19960607	ROTARY	H & L DRILLING INC	SHAWN TONEY
157793	BC	CASTLE VALLEY MEADOWS							WELL	135	38	19960606	ROTARY	H & L DRILLING INC	SHAWN TONEY
159243	BC	SHEARER TRACTS #2							WELL	168	47	19960605	ROTARY	H & L DRILLING INC	SHAWN TONEY
163136	BC								WELL	139	72	19970514	ROTARY	H & L DRILLING INC	SHAWN TONEY
164078	BC	CASTLE VALLEY MEADOWS		TR 9					WELL	134	38	19960606	ROTARY	H & L DRILLING INC	SHAWN TONEY
168726	BC								WELL	99	24	19980605	ROTARY	H & L DRILLING INC	SHAWN TONEY
172711	BC								WELL	201	22	19990421	ROTARY	BUSH DRILLING	BILL MAXWELL
172712	BC								WELL	18	7.3	19980707			
172713	BC								WELL	26	15.6	19980707			
172714	BC								WELL	14	11.3	19981006			
172715	BC								WELL	35	11.7	19981006			
172716	BC								WELL	14	11.3	19981006			
177531	BC		A						WELL	68	0	19990601	ROTARY	HILLMAN DRILLING	RANDY TREY
179518	BC								WELL	110	45	19991026	ROTARY	H & L DRILLING INC	SHAWN TONEY
180192	BC								WELL	20.5	14	20000105	HSA	MAXIM TECHNOLOGIES	PAUL BRAY
180193	BC								WELL	20	14	20000105	HSA	MAXIM TECHNOLOGIES	PAUL BRAY
181860	BC								WELL	25	12	20000104	HOLLOW STEM AUGER	MAXIM TECHNOLOGIES	PAUL BRAY
181861	BC								WELL	16.5	10	20000104	HOLLOW STEM AUGER	MAXIM TECHNOLOGIES	PAUL BRAY
186204	BC								WELL	58	13	20000831	ROTARY	H & L DRILLING INC	SHAWN TONEY
186207	BC								WELL	117	45	20001002	ROTARY	H & L DRILLING INC	SHAWN TONEY
186208	BC								WELL	27	1	20001026	HSA	MAXIM TECHNOLOGIES	PAUL BRAY
186272	BC			3					WELL	138	56	20001003	ROTARY	H & L DRILLING INC	SHAWN TONEY
186273	BC								WELL	160	42	20000908	ROTARY	H & L DRILLING INC	SHAWN TONEY
195645	BC								WELL	140	47	20020422	ROTARY	BRIDGER DRILLING INC	JAY BICK
196315	BC								WELL	28	15.32			H & L DRILLING INC	
198531	BC								WELL	357	150	20020725	ROTARY	H & L DRILLING INC	SHAWN TONEY
199819	BC								WELL	140	54.29				
199827	BC								WELL	25	12.06				
199828	BC								WELL	0	72.85				
199830	BC								WELL	21	7.3				
199842	BC								WELL	25	8.18				
199847	BC								WELL	140	19.02				
201750	BC	HIGGINS ADDITION	41	1					WELL	200	120	20010730	ROTARY	DIAMOND M DRILLING INC	BILL MAXWELL
206369	BC	CASTLE VALLEY MEADOWS		14					WELL	110	58	20030825	ROTARY	H & L DRILLING INC	SHAWN TONEY
208223	BC	APACHE WOODS							WELL	160	81	20031110	ROTARY	VIDIC DRILLING INC	DENNIS VIDIC
212769	BC								PRECIP STATION	0	0				

GWICID	DRILLER_LI	DRILLER_00	DRILLER_FI	VERIFIED_T	ABANDONED_	DATE_ABAND	STATUS	FLOWING	DEPTH_WATE	AQUIFER	PRIORITY	WELL_USE	WELLUSE_PR	CALC_LOC	VER_LOC	NETWORK	FIELD_VISI	SWL_MEAS	SAMPLES
121580		0		079259			ABANDONED		9		0		0	YES	YES		0	0	0
121581		0		079249			ABANDONED		10		0		0	YES	YES		0	0	0
121582		0		079250			ABANDONED		5		0		0	YES	YES		0	0	0
121583		0		079251	YES	19980707	ABANDONED		5.5		0		0	YES	YES		0	0	0
121584		0		079252	YES	19980507	ABANDONED		4.5		0		0	YES	YES		0	0	0
122548	WWC	334		080434			NEW WELL		110		0		0	YES	YES		0	0	0
122549	WWC	258		080435			NEW WELL		80		0		0	YES	YES		0	0	0
122551		0		080437			NEW WELL		0		0		0	YES	YES		0	0	0
123026	WWC	386		081857			NEW WELL		180		0		0	YES	YES		0	0	0
123291	WWC	466		044249			NEW WELL		140		0		0	YES	YES		0	0	0
123292	WWC	334		080761			NEW WELL		134		0		0	YES	YES		0	0	0
123293	WWC	334		080762			NEW WELL		93		0		0	YES	YES		0	0	0
123296	WWC	436		081964			NEW WELL		38		0		0	YES	YES		0	0	0
123297	WWC	428		081965			NEW WELL		34		0		0	YES	YES		0	0	0
126059	WWC	447		086255			NEW WELL		98		0		0	YES	YES		0	0	0
126060	WWC	447		086256			NEW WELL		62	120SNGR	1		0	NO	YES		1	88	0
127777	WWC	447		088633			NEW WELL		199		0		0	YES	YES		0	0	0
127785	WWC	447		088632			NEW WELL		80		0		0	YES	YES		0	0	0
130696	WWC	447		091490			NEW WELL		130		0		0	YES	YES		0	0	0
140987		0		103234			ABANDONED		0		0		0	YES	YES		0	0	0
140988		0		103235			ABANDONED		0		0		0	YES	YES		0	0	0
140989		0		103236			ABANDONED		0		0		0	YES	YES		0	0	0
142754	WWC	386		104822			NEW WELL		0		0		0	YES	YES		0	0	0
146733		0		108562			ABANDONED		7		0		0	YES	YES		0	0	0
149039	WWC	447		110562			NEW WELL		124		0		0	YES	YES		0	0	0
149040	WWC	447		110563			NEW WELL		99		0		0	YES	YES		0	0	0
150088	WWC	447		112094			NEW WELL		79		0		0	YES	YES		0	0	0
150090	WWC	447		111809			NEW WELL		178		0		0	YES	YES		0	0	0
150457	WWC	353		111211			NEW WELL		100		0		0	YES	YES		0	0	0
152631	WWC	447		114142			NEW WELL		103		0		0	YES	YES		0	0	0
154308	WWC	447		115754			NEW WELL		98		0		0	YES	YES		0	0	0
154309	WWC	447		115755			NEW WELL		107		0		0	YES	YES		0	0	0
154310	WWC	447		115756			NEW WELL		138		0		0	YES	YES		0	0	0
154311	WWC	447		115757			NEW WELL		119		0		0	YES	YES		0	0	0
154313	WWC	447		115759			NEW WELL		119		0		0	YES	YES		0	0	0
157791	WWC	447		119065			NEW WELL		99		0		0	YES	YES		0	0	0
157792	WWC	447		119066			NEW WELL		57		0		0	YES	YES		0	0	0
157793	WWC	447		119067			NEW WELL		95		0		0	YES	YES		0	0	0
159243	WWC	447		120183			NEW WELL		145		0		0	YES	YES		0	0	0
163136	WWC	447		125099			NEW WELL		119		0		0	YES	YES		0	0	0
164078	WWC	447		125413			NEW WELL		94		0		0	YES	YES		0	0	0
168726	WWC	447		131192			NEW WELL		79		0		0	YES	YES		0	0	0
172711	WWC	597		134064			NEW WELL		145		0		0	YES	YES		0	0	0
172712		0		134065			ABANDONED		8		0		0	YES	YES		0	0	0
172713		0		134066			ABANDONED		11		0		0	YES	YES		0	0	0
172714		0		134067	YES	19981006	ABANDONED		10		0		0	YES	YES		0	0	0
172715		0		134068			ABANDONED		10		0		0	YES	YES		0	0	0
172716		0		134069			ABANDONED		10		0		0	YES	YES		0	0	0
177531	WWC	105		137645			NEW WELL		68		0		0	YES	YES		0	0	0
179518	WWC	447		141856			NEW WELL		110		0		0	YES	YES		0	0	0
180192	MWC	344		140017			NEW WELL		5		0		0	YES	YES		0	0	0
180193	MWC	344		140018			NEW WELL		4.5		0		0	YES	YES		0	0	0
181860	MWC	344		140817			NEW WELL		9.5		0		0	YES	YES		0	0	0
181861	MWC	344		140818			NEW WELL		6		0		0	YES	YES		0	0	0
186204	WWC	447					NEW WELL		38		0		0	YES	YES		0	0	0
186207	WWC	447					NEW WELL		77		0		0	YES	YES		0	0	0
186208	MWC	344	MW-2A				NEW WELL		10		0		0	YES	YES		0	0	0
186272	WWC	447					NEW WELL		110		0		0	YES	YES		0	0	0
186273	WWC	447					NEW WELL		60		0		0	YES	YES		0	0	0
195645	WWC	425					NEW WELL		100		0		0	YES	YES		0	0	0
196315		0					NEW WELL		28	110ALVM	1		0	NO	YES		1	115	0
198531	WWC	447					NEW WELL		307		0		0	YES	YES		0	0	0
199819		0					NEW WELL		0	120SDMS	1		0	NO	YES		1	130	0
199827		0					NEW WELL		0	110ALVM	1		0	NO	YES		1	93	0
199828		0					NEW WELL		0		0		0	NO	YES		1	24	0
199830		0					NEW WELL		0	110ALVM	1		0	NO	YES		1	89	0
199842		0					NEW WELL		0	110ALVM	1		0	NO	YES		1	122	0
199847		0					NEW WELL		0	120SDMS	1		0	NO	YES		1	83	0
201750	WWC	597					NEW WELL		180		0		0	YES	YES		0	0	0
206369	WWC	447					NEW WELL		90		0		0	YES	YES		0	0	0
208223	WWC	526	LESTER				NEW WELL		140		0		0	YES	YES		0	0	0
212769		0							0		0		0	NO	YES		0	0	0

GWICID	REPORT_LIN	ALL_WATER_	YIELD_GPM	PUMPING_WA	DNRC_WATER
121580	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121580&reqby=M&	MONITORING			
121581	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121581&reqby=M&	MONITORING			
121582	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121582&reqby=M&	MONITORING			
121583	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121583&reqby=M&	MONITORING			
121584	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=121584&reqby=M&	MONITORING			
122548	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=122548&reqby=M&		3.00 (BAILER)	115.00 (BAILER)	
122549	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=122549&reqby=M&	STOCKWATER	7.00 (AIR)	80.00 (AIR)	66911
122551	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=122551&reqby=M&	WILDLIFE	10.00 (OTHER)		
123026	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=123026&reqby=M&	STOCKWATER	85.00 (AIR)		78541
123291	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=123291&reqby=M&	DOMESTIC, IRRIGATION	10.00 (AIR)	130.00 (AIR)	
123292	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=123292&reqby=M&	DOMESTIC	40.00 (AIR)	120.00 (AIR)	30117411
123293	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=123293&reqby=M&		50.00 (BAILER)	53.00 (BAILER)	
123296	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=123296&reqby=M&	DOMESTIC	60.00 (AIR)	35.00 (AIR)	77895
123297	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=123297&reqby=M&	DOMESTIC	23.00 (AIR)	45.00 (AIR)	
126059	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=126059&reqby=M&	DOMESTIC	20.00 (AIR)	85.00 (AIR)	113640
126060	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=126060&reqby=M&	DOMESTIC	20.00 (AIR)	68.00 (AIR)	88163
127777	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=127777&reqby=M&	DOMESTIC	5.00 (AIR)	209.00 (AIR)	80786
127785	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=127785&reqby=M&	IRRIGATION	25.00 (AIR)	70.00 (AIR)	80712
130696	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=130696&reqby=M&	DOMESTIC	60.00 (AIR)	148.00 (AIR)	96874
140987	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=140987&reqby=M&	MONITORING			
140988	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=140988&reqby=M&	MONITORING			
140989	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=140989&reqby=M&	MONITORING			
142754	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=142754&reqby=M&		30.00 (AIR)	98.00 (AIR)	90317
146733	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=146733&reqby=M&	MONITORING			
149039	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=149039&reqby=M&	DOMESTIC	50.00 (AIR)	102.00 (AIR)	
149040	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=149040&reqby=M&	STOCKWATER	50.00 (AIR)	139.00 (AIR)	
150088	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=150088&reqby=M&	DOMESTIC	35.00 (AIR)	79.00 (AIR)	94873
150090	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=150090&reqby=M&	DOMESTIC	25.00 (AIR)	180.00 (AIR)	93886
150457	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=150457&reqby=M&	DOMESTIC	15.00 (AIR)	115.00 (AIR)	94907
152631	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=152631&reqby=M&	DOMESTIC	45.00 (AIR)	79.00 (AIR)	93846
154308	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=154308&reqby=M&	DOMESTIC	30.00 (AIR)	97.00 (AIR)	94961
154309	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=154309&reqby=M&	DOMESTIC	15.00 (AIR)	93.00 (AIR)	
154310	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=154310&reqby=M&	DOMESTIC	30.00 (AIR)	136.00 (AIR)	
154311	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=154311&reqby=M&	DOMESTIC	50.00 (AIR)	111.00 (AIR)	30002693
154313	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=154313&reqby=M&	DOMESTIC	30.00 (AIR)	120.00 (AIR)	
157791	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=157791&reqby=M&	DOMESTIC	30.00 (AIR)	76.00 (AIR)	
157792	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=157792&reqby=M&	DOMESTIC	35.00 (AIR)	76.00 (AIR)	30110540
157793	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=157793&reqby=M&	DOMESTIC	30.00 (AIR)	110.00 (AIR)	
159243	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=159243&reqby=M&	DOMESTIC	60.00 (AIR)	140.00 (AIR)	
163136	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=163136&reqby=M&	DOMESTIC	30.00 (AIR)	105.00 (AIR)	101599
164078	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=164078&reqby=M&	DOMESTIC	22.00 (AIR)	95.00 (AIR)	
168726	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=168726&reqby=M&	DOMESTIC	20.00 (AIR)	80.00 (AIR)	
172711	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=172711&reqby=M&	PUBLIC WATER SUPPLY	1000.00 (PUMP)	58.00 (PUMP)	61342
172712	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=172712&reqby=M&				
172713	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=172713&reqby=M&				
172714	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=172714&reqby=M&				
172715	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=172715&reqby=M&				
172716	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=172716&reqby=M&				
177531	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=177531&reqby=M&	DOMESTIC	15.00 (AIR)		
179518	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=179518&reqby=M&	IRRIGATION	25.00 (AIR)		
180192	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=180192&reqby=M&	MONITORING			
180193	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=180193&reqby=M&	MONITORING			
181860	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=181860&reqby=M&	MONITORING			
181861	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=181861&reqby=M&	MONITORING			
186204	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=186204&reqby=M&	DOMESTIC	40.00 (AIR)		113623
186207	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=186207&reqby=M&	DOMESTIC	32.00 (AIR)		
186208	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=186208&reqby=M&	MONITORING			
186272	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=186272&reqby=M&	DOMESTIC	21.00 (AIR)		113641
186273	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=186273&reqby=M&	IRRIGATION	275.00 (PUMP)	126.00 (PUMP)	30066514
195645	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=195645&reqby=M&	IRRIGATION	40.00 (AIR)		30002057
196315	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=196315&reqby=M&	MONITORING			
198531	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=198531&reqby=M&	STOCKWATER	20.00 (AIR)		
199819	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=199819&reqby=M&	DOMESTIC			
199827	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=199827&reqby=M&	DOMESTIC			
199828	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=199828&reqby=M&	UNUSED			
199830	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=199830&reqby=M&	DOMESTIC			
199842	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=199842&reqby=M&	INDUSTRIAL			
199847	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=199847&reqby=M&	STOCKWATER			
201750	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=201750&reqby=M&	DOMESTIC	8.00 (AIR)		30001972
206369	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=206369&reqby=M&	DOMESTIC	30.00 (AIR)		
208223	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=208223&reqby=M&	DOMESTIC	50.00 (AIR)		30112700
212769	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=212769&reqby=M&				

GWICID	SITE_NAME	LATITUDE	LONGITUDE	GEOMETHOD	DATUM_LATL	DATE_LATLO	ALTITUDE	METHOD_ALT	DATUM_ALTI	DATE_ALTIT	TOWNSHIP	RANGE	SECTION	QSECTION	COUNTY	STATE
213250	BARRETT, JOHN	46.53616442	-110.8976987	TRS-SEC	NAD83	20190521	0				09N	07E	18	CD	MEAGHER	MT
213456	COLLINS, DAVE AND KAREN	46.50688182	-110.9182398	TRS-SEC	NAD83	20190522	0				09N	06E	25	CD	MEAGHER	MT
228960	HURWITZ, CONNIE	46.50604012	-110.8853485	TRS-SEC	NAD83	20190522	0				09N	07E	30	DDD	MEAGHER	MT
228961	FEDDES, BRIAN AND MEREDITH	46.53344038	-110.9092176	TRS-SEC	NAD83	20190522	0				09N	06E	24	AAB	MEAGHER	MT
234316	BERG GARAGE INC.	46.54718042	-110.8872077	TRS-SEC	NAD83	20190521	0				09N	07E	18	AA	MEAGHER	MT
238837	BAILEY, WALLACE L.	46.56109701	-110.8464382	TRS-SEC	NAD83	20190521	0				09N	07E	9	AAC	MEAGHER	MT
246200	LINK NATHAN	46.544539	-110.870032	TRS-SEC	NAD83	20081009	0				09N	07E	17	ACA	MEAGHER	MT
247141	KAKUK LAURA E.	46.542585	-110.919855	TRS-SEC	NAD83	20081010	0				09N	06E	13	BDC	MEAGHER	MT
250791	BROWN, CLINTON	46.507017	-110.913367	NAV-GPS	NAD83	20090612	0				09N	06E	25	DC	MEAGHER	MT
250850	YAMHILL LUMBER CO.	46.53707222	-110.909269	TRS-SEC	NAD83	20190521	0				09N	06E	13	DDB	MEAGHER	MT
250853	ERIKSON, CLARENCE	46.53344038	-110.9092176	TRS-SEC	NAD83	20190522	0				09N	06E	24	AAB	MEAGHER	MT
250861	FRIZBIE, LLOYD	46.52977188	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	ADA	MEAGHER	MT
250862	MULSKI, PAT	46.52977188	-110.9065886	TRS-SEC	NAD83	20190522	0				09N	06E	24	ADA	MEAGHER	MT
250864	ANDERSON, RICHARD	46.5425851	-110.9225015	TRS-SEC	NAD83	20190521	0				09N	06E	13	BCD	MEAGHER	MT
250865	JACKSON, G. I.	46.55710969	-110.9173021	TRS-SEC	NAD83	20190521	0				09N	06E	12	BDD	MEAGHER	MT
250893	BAILEY, WALLY	46.53254284	-110.8975452	TRS-SEC	NAD83	20190522	0				09N	07E	19	BA	MEAGHER	MT
251624	BERG JACK	46.531606	-110.909218	TRS-SEC	NAD83	20090928	0				09N	06E	24	AAC	MEAGHER	MT
254937	GALT RANCH LP	46.535235	-110.909269	TRS-SEC	NAD83	20100330	0				09N	06E	13	DDC	MEAGHER	MT
260104	WHITE SULPHUR SPRINGS	46.5473	-110.9038	MAP	NAD27		5025	MAP	NGVD29	19610901	09N	07E	18	BB	MEAGHER	MT
261183	MOUNTAIN VIEW MEMORIAL HOSPITAL	46.54718042	-110.9029442	TRS-SEC	NAD83	20190521	0				09N	07E	18	BB	MEAGHER	MT
262473	SPA HOT SPRINGS	46.54718042	-110.9029442	TRS-SEC	NAD83	20110822	0				09N	07E	18	BB	MEAGHER	MT
264319	BONSER, BUCK & JENNY	46.54732443	-110.8713585	TRS-SEC	NAD83	20120207	0				09N	07E	17	AB	MEAGHER	MT
272070	ANDES, SHANE AND CHRISTINA	46.55077041	-110.8662823	TRS-SEC	NAD83	20130516	0				09N	07E	8	DD	MEAGHER	MT
275546	BOSSERT, KEN & ELEANOR	46.535528	-110.907	NAV-GPS	NAD27	20131020	0				09N	06E	13	DDDB	MEAGHER	MT
275761	JARVIS, WOODIE V.	46.54717916	-110.9185317	TRS-SEC	NAD83	20131107	0				09N	06E	13	BA	MEAGHER	MT
278411	GLUHM, JONNY AND EVELYN	46.537075	-110.90825	NAV-GPS	NAD27	20140602	0				09N	06E	13	DDBD	MEAGHER	MT
279353	HOLTHUES, BERRE	46.541583	-110.906722	NAV-GPS	WGS84	20140731	0				09N	06E	13	AD	MEAGHER	MT
279355	HOLTHUES, BERRE	46.541667	-110.907111	NAV-GPS	WGS84	20140801	0				09N	06E	13	AD	MEAGHER	MT
279356	HOLTHUES, BERRE	46.541944	-110.906389	NAV-GPS	WGS84	20140801	0				09N	06E	13	AD	MEAGHER	MT
279357	HOLTHUES, BERRE	46.541611	-110.907278	SUR-GPS	WGS84	20140801	0				09N	06E	13	AD	MEAGHER	MT
279358	HOLTHUES, BERRE	46.541528	-110.906972	NAV-GPS	WGS84	20140802	0				09N	06E	13	AD	MEAGHER	MT
281432	ASKINS, JOHN	46.55077001	-110.8871744	TRS-SEC	NAD83	20150127	0				09N	07E	7	DD	MEAGHER	MT
283934	HOLTHUES, BERRE	46.5415	-110.907167	NAV-GPS	WGS84	20150730	0				09N	06E	13	AD	MEAGHER	MT
283935	HOLTHUES, BERRE	46.5415	-110.907056	NAV-GPS	WGS84	20150730	0				09N	06E	13	AD	MEAGHER	MT
284259	CARVER, TONY AND MEGAN	46.54361118	-110.8819735	TRS-SEC	NAD83	20150911	0				09N	07E	17	BC	MEAGHER	MT
285290	TOWNSEND RANCH LLC	46.53254284	-110.8975452	TRS-SEC	NAD83	20151119	0				09N	07E	19	BA	MEAGHER	MT
285291	OGLE, KEN AND DAYNA	46.50688182	-110.9077093	TRS-SEC	NAD83	20151119	0				09N	06E	25	DD	MEAGHER	MT
289993	BUCKINGHAM, MARGARET	46.55077001	-110.9027099	TRS-SEC	NAD83	20161110	0				09N	07E	7	CC	MEAGHER	MT
293707	BARTH, TIM & MIRIAM	46.536153	-110.913239	TRS-SEC	NAD83	20170905	0				09N	06E	13	DC	MEAGHER	MT
299539	SCHOOL DISTRICT NO. 8	46.54718042	-110.9029442	TRS-SEC	NAD83	20181121	0				09N	07E	18	BB	MEAGHER	MT
300369	MEAGHER COUNTY	46.54166629	-110.9158852	TRS-SEC	NAD83	20190211	0				09N	06E	13		MEAGHER	MT
300371	MEAGHER COUNTY	46.54166629	-110.9158852	TRS-SEC	NAD83	20190211	0				09N	06E	13		MEAGHER	MT
300375	MEAGHER COUNTY	46.54166629	-110.9158852	TRS-SEC	NAD83	20190211	0				09N	06E	13		MEAGHER	MT
300376	MEAGHER COUNTY	46.54166629	-110.9158852	TRS-SEC	NAD83	20190211	0				09N	06E	13		MEAGHER	MT
300377	MEAGHER COUNTY	46.54166629	-110.9158852	TRS-SEC	NAD83	20190211	0				09N	06E	13		MEAGHER	MT
301355	COLLINS, JAMES	46.52151775	-110.9079031	TRS-SEC	NAD83	20190522	0				09N	06E	24	DD	MEAGHER	MT
305887	GALT, WILLIAM W.	46.54717916	-110.9079457	TRS-SEC	NAD83	20200406	0				09N	06E	13	AA	MEAGHER	MT
317387	K REIN PROPERTIES LLC	46.53252325	-110.9079031	TRS-SEC	NAD83	20211028	0				09N	06E	24	AA	MEAGHER	MT
317692	WHITE, MARK/BROWN, GAIL	46.55077041	-110.8662823	TRS-SEC	NAD83	20211201	0				09N	07E	8	DD	MEAGHER	MT

GWICID	DRAINAGE_B	ADDITION_S	BLOCK	LOT	CERTOFSURV	PARCEL	ASSESSORTR	GEOCODE	SITE_TYPE	TOTAL_DEPT	SWL	DATE_COMPL	HOW_DRILLE	DRILLING_C	DRILLER_NA
213250	BC	21 ARROWHEAD CIRCLE							WELL	199	80	19980311	ROTARY	H & L DRILLING INC	SHAWN TONEY
213456	BC								WELL	118	40	20040709	AIR ROTARY	LINDSAY DRILLING CO INC	TERRY LINDSAY
228960	BC								WELL	400	200	20060622	ROTARY	MURRAYS WELL SERVICE	RICK L. MURRAY
228961	BC	SHEARER RANCH							WELL	120	60	20060621	ROTARY	MURRAYS WELL SERVICE	RICK L. MURRAY
234316	BC								WELL	25	16	20070207	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL BRAY
238837	BC								WELL	100	39	20070815	ROTARY	H & L DRILLING INC	SHAWN TONEY
246200	BC	CASTLE MOUNTAIN ESTATES		5					WELL	100	58	20080718	ROTARY	H AND L DRILLING	SHAWN TONEY
247141	BC								WELL	800	22	20080904	ROTARY	KEVIN HAGGERTY DRILLING INC.	KEVIN HAGGERTY
250791	BC								WELL	92	45	20090612	ROTARY	VAN DYKEN DRILLING INC	BERNARD WESTRA
250850	BC								WELL	131	20	19570701			UNKNOWN
250853	BC								WELL	90	40	19801029	CABLE	H & L DRILLING INC	HAROLD REID
250861	BC								WELL	89	34	19800930	CABLE	H & L DRILLING INC	HAROLD REID
250862	BC								WELL	84	27	19800928	CABLE	H & L DRILLING INC	HAROLD REID
250864	BC								WELL	125	40	19761029	CABLE	H & L DRILLING INC	ED HILLMAN
250865	BC								WELL	36	16	19800209	CABLE	H & L DRILLING INC	HAROLD REID
250893	BC								WELL	89	54	19800922	CABLE TOOL	H & L DRILLING INC	HAROLD REID
251624	BC	SHEARER RANCH TRACTS II		4					BOREHOLE	140	58	20090603	ROTARY		SHAWN TONEY
254937	BC								WELL	113	41	20100205	ROTARY	H AND L DRILLING	SHAWN TONEY
260104	BC								SPRING	0	0				
261183	BC								WELL	220	31		ROTARY		
262473	BC								WELL	280	6	20110630	ROTARY	H AND L DRILLING	SHAWN TONEY
264319	BC	ELLINGTON MINOR		2					WELL	181	89	20111014	ROTARY	H & L DRILLING INC	SHAWN TONEY
272070	BC	CASTLE MOUNTAIN		11					WELL	100	55	20121114	ROTARY	H & L DRILLING INC	SHAWN TONEY
275546	BC								WELL	110	57	20131020	ROTARY	HAYES DRILLING	WILL HAYES
275761	BC	FOWLIE MINOR		A					WELL	293	150	20130501	ROTARY	H & L DRILLING INC	SHAWN TONEY
278411	BC	THE OLD MILL MINOR SUB							WELL	118	56	20140602	ROTARY	HAYES DRILLING	WILL HAYES
279353	BC								WELL	20	15	20140731	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
279355	BC								WELL	20	15	20140801	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
279356	BC								WELL	20	15	20140801	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
279357	BC								WELL	20	15	20140801	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
279358	BC								WELL	20	15	20140802	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
281432	BC								WELL	93	39	20141110	ROTARY	H & L DRILLING INC	SHAWN TONEY
283934	BC								WELL	40	0	20150730	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
283935	BC								WELL	20	15	20150730	HOLLOWSTEM AUGER	HAZ TECH DRILLING INC	PAUL E. BRAY
284259	BC								WELL	193	139	20150623	ROTARY	H & L DRILLING INC	SHAWN TONEY
285290	BC								WELL	158	95	20150831	ROTARY	A-10 DRILLING	MARK MILLER
285291	BC								WELL	108	39	20150901	ROTARY	A-10 DRILLING	MARK MILLER
289993	BC	WOODSON ADDITION		72-74					WELL	62	11	20160815	ROTARY	H & L DRILLING INC	SHAWN TONEY
293707	BC	BARTH MINOR		1B					WELL	85	43	20170331	ROTARY	H & L DRILLING INC	SHAWN TONEY
299539	BC		31	2					WELL	340	29	20180724	ROTARY	A-10 DRILLING	MARK MILLER
300369	BC		136	1-8				47179813103010000	WELL	12	0	19900101		BOLAND DRILLING	CHRISTOPHER BOLAND
300371	BC		136	1-8				471798131030000	WELL	12	0	20161001		BOLAND DRILLING	CHRISTOPHER BOLAND
300375	BC		136	1-8				47179813103010000	WELL	13	0	20161001		BOLAND DRILLING	CHRISTOPHER BOLAND
300376	BC		136	1-8				47179813103010000	WELL	7	0	19900101		BOLAND DRILLING	CHRISTOPHER BOLAND
300377	BC		136	1-8				47179813103010000	WELL	12	0	20030101		BOLAND DRILLING	CHRISTOPHER BOLAND
301355	BC								WELL	80	32	19930414	FORWARD ROTARY	JOE JOHNSON DRILLING	JOE L. JOHNSON
305887	BC	WSS ORIGINAL TOWNSITE AMEND	61	5					WELL	244	40	20200117	ROTARY	H & L DRILLING INC	SHAWN TONEY
317387	BC								WELL	155	70	20210916	ROTARY	H & L DRILLING INC	SHAWN TONEY
317692	BC	CASTLE VALLEY MEADOWS		6					WELL	163	43	20210929	ROTARY	H & L DRILLING INC	SHAWN TONEY

GWICID	DRILLER_LI	DRILLER_00	DRILLER_FI	VERIFIED_T	ABANDONED_	DATE_ABAND	STATUS	FLOWING	DEPTH_WATE	AQUIFER	PRIORITY	WELL_USE	WELLUSE_PR	CALC_LOC	VER_LOC	NETWORK	FIELD_VISI	SWL_MEAS	SAMPLES
213250	WWC	447					NEW WELL		159		0		0	YES	YES		0	0	0
213456	WWC	253					NEW WELL		118		0		0	YES	YES		0	0	0
228960	WWC	351					NEW WELL		200		0		0	YES	YES		0	0	0
228961	WWC	351					NEW WELL		60		0		0	YES	YES		0	0	0
234316	MWC	344	MW-6				NEW WELL		10		0		0	YES	YES		0	0	0
238837	WWC	447					NEW WELL		60		0		0	YES	YES		0	0	0
246200	WWC	447					NEW WELL		80		0		0	YES	YES		0	0	0
247141	WWC	353					NEW WELL		0		0		0	YES	YES		0	0	0
250791	WWC	380					NEW WELL		92		0		0	NO	YES		0	0	0
250850		0					NEW WELL		131		0		0	YES	YES		0	0	0
250853	WWC	334					NEW WELL		90		0		0	YES	YES		0	0	0
250861	WWC	334					NEW WELL		89		0		0	YES	YES		0	0	0
250862	WWC	334					NEW WELL		84		0		0	YES	YES		0	0	0
250864	WWC	258					NEW WELL		125		0		0	YES	YES		0	0	0
250865	WWC	334					NEW WELL		36		0		0	YES	YES		0	0	0
250893	WWC	334					NEW WELL		89		0		0	YES	YES		0	0	0
251624	WWC	447					NEW WELL		140		0		0	YES	YES		0	0	0
254937	WWC	447					NEW WELL		93		0		0	YES	YES		0	0	0
260104		0							0		0		0	NO	YES		4	0	6
261183		0					NEW WELL		49		0		0	YES	YES		0	0	2
262473	WWC	447					NEW WELL		180		0		0	YES	YES		0	0	0
264319	WWC	447					NEW WELL		141		0		0	YES	YES		0	0	0
272070	WWC	447					NEW WELL		100		0		0	YES	YES		0	0	0
275546	WWC	361					NEW WELL		101		0		0	NO	YES		0	0	0
275761	WWC	447					NEW WELL		233		0		0	YES	YES		0	0	0
278411	WWC	361					NEW WELL		78		0		0	NO	YES		0	0	0
279353	MWC	435					NEW WELL		10		0		0	NO	YES		0	0	0
279355	MWC	435					NEW WELL		5		0		0	NO	YES		0	0	0
279356	MWC	435					NEW WELL		5		0		0	NO	YES		0	0	0
279357	MWC	435					NEW WELL		5		0		0	NO	YES		0	0	0
279358	MWC	435					NEW WELL		5		0		0	NO	YES		0	0	0
281432	WWC	447					NEW WELL		53		0		0	YES	YES		0	0	0
283934	MWC	435					NEW WELL		15		0		0	NO	YES		0	0	0
283935	MWC	435					NEW WELL		5		0		0	NO	YES		0	0	0
284259	WWC	447					NEW WELL		153		0		0	YES	YES		0	0	0
285290	WWC	611					NEW WELL		118		0		0	YES	YES		0	0	0
285291	WWC	611					NEW WELL		88		0		0	YES	YES		0	0	0
289993	WWC	447					NEW WELL		42		0		0	YES	YES		0	0	0
293707	WWC	447					NEW WELL		65		0		0	YES	YES		0	0	0
299539	WWC	611					NEW WELL		280		0		0	YES	YES		0	0	0
300369	WWC	667			YES	20181102	ABANDONED		7		0		0	YES	YES		0	0	0
300371	WWC	667			YES	20181102	ABANDONED		7		0		0	YES	YES		0	0	0
300375	WWC	667			YES	20181102	ABANDONED		8		0		0	YES	YES		0	0	0
300376	WWC	667			YES	20181102	ABANDONED		2		0		0	YES	YES		0	0	0
300377	WWC	667			YES	20181102	ABANDONED		7		0		0	YES	YES		0	0	0
301355	WWC	154					NEW WELL		65		0		0	YES	YES		0	0	0
305887	WWC	447					NEW WELL		164		0		0	YES	YES		0	0	0
317387	WWC	447					NEW WELL		95		0		0	YES	YES		0	0	0
317692	WWC	447					NEW WELL		113		0		0	YES	YES		0	0	0

GWICID	REPORT_LIN	ALL_WATER_	YIELD_GPM	PUMPING_WA	DNRC_WATER
213250	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=213250&reqby=M&	DOMESTIC	23.00 (AIR)		
213456	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=213456&reqby=M&	DOMESTIC	30.00 (AIR)	112.00 (AIR)	
228960	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=228960&reqby=M&	DOMESTIC	10.00 (AIR)		
228961	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=228961&reqby=M&	DOMESTIC	20.00 (AIR)		30027391
234316	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=234316&reqby=M&	MONITORING			
238837	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=238837&reqby=M&	DOMESTIC	60.00 (AIR)		
246200	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=246200&reqby=M&	DOMESTIC, STOCKWATER	35.00 (AIR)		30043734
247141	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=247141&reqby=M&	OTHER	70.00 (AIR)		
250791	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250791&reqby=M&	DOMESTIC	30.00 (AIR)		
250850	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250850&reqby=M&	FIRE PROTECTION, INDUSTRIAL			
250853	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250853&reqby=M&	DOMESTIC	47.00 (BAILER)	50.00 (BAILER)	
250861	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250861&reqby=M&	DOMESTIC	45.00 (BAILER)	50.00 (BAILER)	
250862	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250862&reqby=M&	DOMESTIC	40.00 (BAILER)	68.00 (BAILER)	
250864	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250864&reqby=M&	DOMESTIC	20.00 (BAILER)	100.00 (BAILER)	30119568
250865	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250865&reqby=M&	DOMESTIC	50.00 (BAILER)	20.00 (BAILER)	
250893	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=250893&reqby=M&	UNKNOWN	35.00 (BAILER)		
251624	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=251624&reqby=M&	DOMESTIC	50.00 (AIR)		
254937	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=254937&reqby=M&	DOMESTIC, STOCKWATER	60.00 (AIR)		
260104	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=260104&reqby=M&				
261183	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=261183&reqby=M&				
262473	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=262473&reqby=M&	PUBLIC WATER SUPPLY	430.00 (PUMP)		
264319	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=264319&reqby=M&	DOMESTIC	21.00 (AIR)		30062782
272070	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=272070&reqby=M&	DOMESTIC	35.00 (AIR)		
275546	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=275546&reqby=M&	DOMESTIC	50.00 (AIR)		30067748
275761	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=275761&reqby=M&	DOMESTIC	5.00 (AIR)		
278411	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=278411&reqby=M&	DOMESTIC	50.00 (AIR)		
279353	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=279353&reqby=M&	MONITORING			
279355	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=279355&reqby=M&	MONITORING			
279356	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=279356&reqby=M&	MONITORING			
279357	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=279357&reqby=M&	MONITORING			
279358	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=279358&reqby=M&	MONITORING			
281432	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=281432&reqby=M&	IRRIGATION	32.00 (AIR)		
283934	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=283934&reqby=M&	MONITORING			
283935	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=283935&reqby=M&	MONITORING			
284259	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=284259&reqby=M&	DOMESTIC	10.00 (AIR)		
285290	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=285290&reqby=M&	STOCKWATER	35.00 (AIR)		30108148
285291	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=285291&reqby=M&	DOMESTIC	30.00 (AIR)		30105074
289993	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=289993&reqby=M&	IRRIGATION	50.00 (AIR)		
293707	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=293707&reqby=M&	DOMESTIC	50.00 (AIR)		30112597
299539	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=299539&reqby=M&	IRRIGATION	40.00 (AIR)		
300369	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=300369&reqby=M&	MONITORING			
300371	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=300371&reqby=M&	MONITORING			
300375	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=300375&reqby=M&	MONITORING			
300376	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=300376&reqby=M&	MONITORING			
300377	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=300377&reqby=M&	MONITORING			
301355	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=301355&reqby=M&	DOMESTIC	20.00 (AIR)		
305887	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=305887&reqby=M&	DOMESTIC	12.00 (AIR)		
317387	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=317387&reqby=M&	DOMESTIC	50.00 (AIR)		
317692	http://mbmggwic.mtech.edu/sqlserver/v11/reports/SiteSummary.asp?gwicid=317692&reqby=M&	DOMESTIC	45.00 (AIR)		

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (6/30/2009 1:26:12 PM)

Site Name: CITY OF WHITE SULPHUR SPRINGS
GWIC Id: 172711
DNRC Water Right: 61342

Section 1: Well Owner(s)

1) CITY OF WHITE SULPHUR SPRINGS (MAIL)
102 8TH AVE NE
WHITE SULPHUR SPRINGS MT 59645 [04/21/1999]

Section 2: Location

Township	Range	Section	Quarter Sections
09N	07E	7	SW¼ SE¼ SE¼

County	Geocode
MEAGHER	

Latitude	Longitude	Geomethod	Datum
46.54985488145	-110.888469034	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, April 21, 1999

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	30	14.75
30	201	12.25

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	201	10.75	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
145	195	10		3/16 X 1	HOLTE PERFORATOR SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	35	NEAT CEMENT	

Section 7: Well Test Data

Total Depth: 201
Static Water Level: 22
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
1000 gpm pump rate with _ feet of drawdown after 10 hours of pumping.
Time of recovery 0.03 hours.
Recovery water level 22 feet.
Pumping water level 58 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	3	TOPSOIL
3	11	DRY SANDY CLAY
11	28	MOIST SANDY CLAY
28	31	MUDSTONE BROWN 2 GPM
31	55	HARDER BROWN SILTSTONE 20 GPM
55	75	BROWN SILTSTONE W/INTERMITTENT LAYER OF A HARD GREEN BROWN SILTSTONE 40 GPM
75	201	FRACTURED SILTSTONE

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	BILL MAXWELL
Company:	BUSH DRILLING
License No:	WWC-597
Date Completed:	4/21/1999

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (4/11/2011 5:17:58 PM)

Site Name: CITY OF WHITE SULPHUR SPRINGS
GWIC Id: 260672

Section 1: Well Owner(s)

1) CITY OF WHITE SULPHUR SPRINGS (MAIL)
N/A
WHITE SULPHUR SPRINGS MT 59645 [06/23/1986]

Section 2: Location

Township	Range	Section	Quarter Sections
09N	07E	7	SW¼ SE¼ SE¼

County	Geocode
MEAGHER	

Latitude	Longitude	Geomethod	Datum
45.5499	-110.8898	NAV-GPS	NAD27

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Monday, June 23, 1986

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	30	18
0	200	14

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	30	16				CASING (TYPE UNKNOWN)
0	90	10				STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
90	200	10		.10	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	0	BENTONITE	
0	88	CEMENT	

Section 7: Well Test Data

Total Depth: 200
Static Water Level: 19
Water Temperature:

Pump Test *

Depth pump set for test 42 feet.
200 gpm pump rate with _ feet of drawdown after 24 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	19	FINE SAND
19	200	FRACTURED SILTSTONE

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company:
License No: -
Date Completed: 6/23/1986

Appendix G

Surface Water Data

Water Quality Use Class

Legend

Water Quality Use Class

Use Classification

- A-1
- A-C
- B-1
- B-2
- B-3
- C-1
- C-2
- C-3
- I
- Non-State Jurisdiction

Montana Tribal Nations (Non-state Jurisdiction)

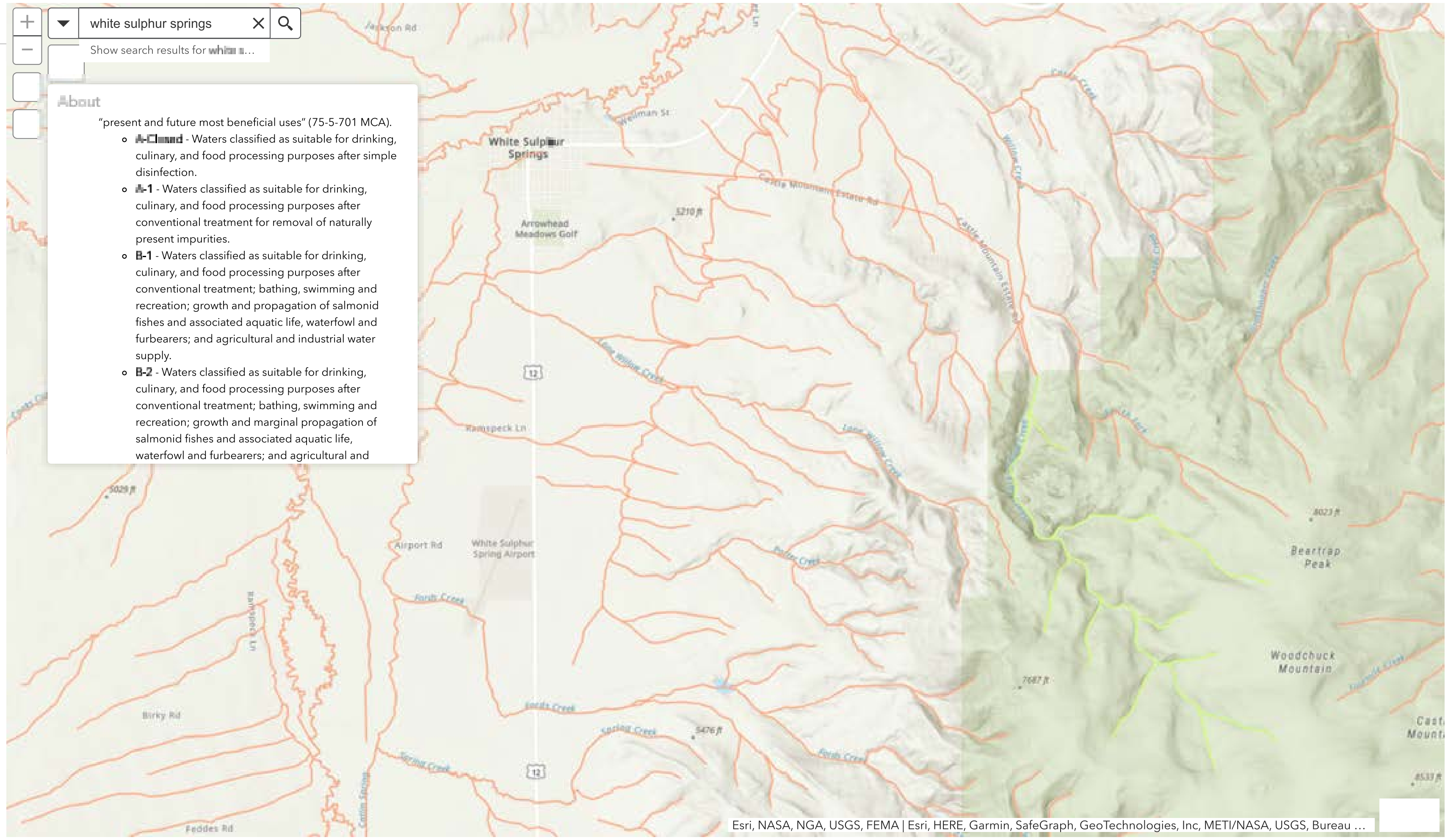
white sulphur springs

Show search results for white s...

About

"present and future most beneficial uses" (75-5-701 MCA).

- **A-Closed** - Waters classified as suitable for drinking, culinary, and food processing purposes after simple disinfection.
- **A-1** - Waters classified as suitable for drinking, culinary, and food processing purposes after conventional treatment for removal of naturally present impurities.
- **B-1** - Waters classified as suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.
- **B-2** - Waters classified as suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and



1mi

-110.741 46.566 Degrees

Assessment Record Summary

Reporting Cycle: 2020 **Assessment Record:** MT41J002_011 **Status:** Unassigned

WATER INFORMATION	**Status:** Unassigned

Reporting Cycle: 2020

Assessment Unit: MT41J002_011

Name: North Fork Smith River

Location Description: NORTH FORK SMITH RIVER, Lake Sutherlin to mouth (Smith River), T9N R6E S21

Water Type:	Size (Miles/Acres)	Use Class:
RIVER	23 MILES	B-1

Trophic Status:

Trophic Trend:

1 - Hydrologic Unit Code: 10030103

2 - HUC Name: Smith

3 - Watershed: Upper Missouri

4 - Basin: Upper Missouri

5 - TMDL Planning Area: Smith

6 - Ecoregion: Northwestern Great Plains

7 - County: Meagher County

8 - LAT/LONG AU Upstream: Start: 46.621622 / -110.746814

9 - LAT/LONG AU Downstream: End: 46.528624 / -110.977853

Water Quality Category: 5 - Waters where one or more applicable beneficial uses have been assessed as being impaired or threatened, and a TMDL is required to address the factors causing the impairment or threat.

Beneficial Use Support Information

Use Name	Fully Supporting	Not Fully Supporting	Threatened	Insufficient Information	Not Assessed
Aquatic Life	X				
Agricultural					X
Drinking Water	X				
Primary Contact Recreation		X			

Assessment Information

Use Name	Assessment Type	Assessment Confidence
NA		

Use Name	Assessment Methods
NA	

Impairment Information

Use Name	Probable Causes	Probable Sources	TMDL Completed
Primary Contact Recreation	Chlorophyll-a	Source Unknown	N
	Escherichia coli (E. Coli)	Source Unknown	N
	Nitrogen, Total	Source Unknown	N
	Phosphorus, Total	Source Unknown	N

Use Name	Observed Effects
NA	

Delisting / Category Changes

Cause	Reason for Change	Change Date	Comments
Chlorophyll-a	Not caused by a pollutant (4C)	01/25/2008	The pollutant/non-pollutant effect designation was changed from pollutant to non-pollutant.
Fecal Coliform	Data and/or information lacking to determine WQ status; original basis for listing was incorrect	11/08/2011	Fecal Coliform has changed to E. Coli due to updated standards.

Appendix H

Floodplain Map

FEMA (//www.fema.gov/)

FEMA Flood Map Service Center: Search By Address

Enter an address, place, or coordinates:

White Sulphur Springs, Montana

Search

Whether you are in a high risk zone or not, you may need flood insurance (https://www.fema.gov/national-flood-insurance-program) because most homeowners insurance doesn't cover flood damage. If you live in an area with low or moderate flood risk, you are 5 times more likely to experience flood than a fire in your home over the next 30 years. For many, a National Flood Insurance Program's flood insurance policy could cost less than $400 per year. Call your insurance agent today and protect what you've built.

Learn more about steps you can take (https://www.fema.gov/what-mitigation) to reduce flood risk damage.

Search Results—Products for **WHITE SULPHUR SPRINGS, CITY OF**

Show ALL Products » (https://msc.fema.gov/portal/availabilitySearch?addcommunity=300047&communityName=WHITE SULPHUR SPRINGS, CITY OF#sear

The flood map for the selected area is number **300047C**, effective on **04/15/1986**

MAP IMAGE

(https://msc.fema.gov/portal/viewProduct?productID=300047C)

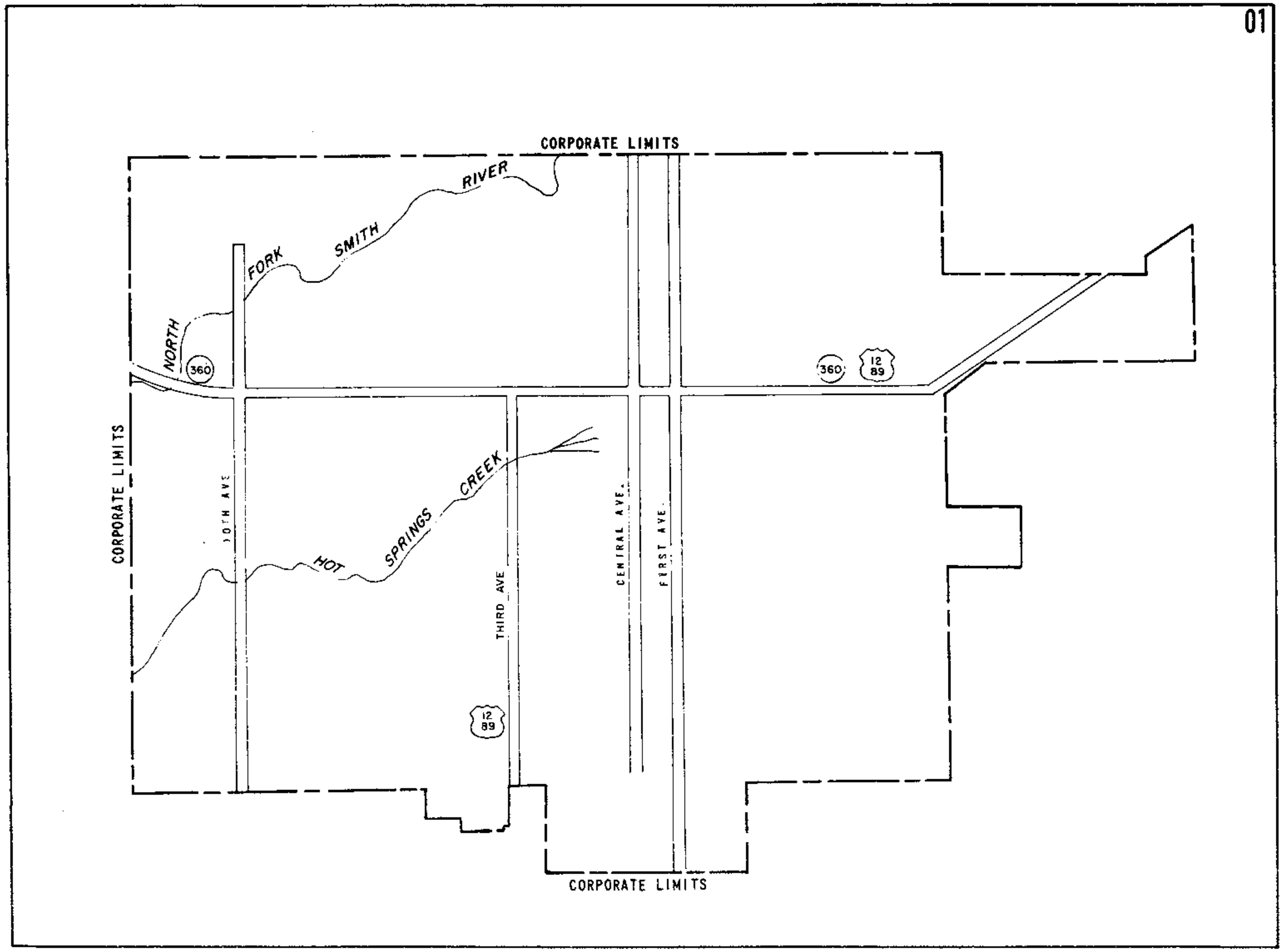
(https://msc.fema.gov/portal/downloadProduct?productTypeID=FINAL_PRODUCT&productSubTypeID=FIRM_PANEL&productID=300047C)

Changes to this FIRM

Revisions (0)
Amendments (0)
Revalidations (0)

You can choose a new flood map or move the location pin by selecting a different location on the locator map below or by entering a new location in the search field above. It may take a minute or more during peak hours to generate a dynamic FIRMette.

Share This Page.



KEY TO MAP

Zone Designations

ZONE C
ZONE A
ZONE C

Elevation Reference Mark — RM7 x

Zone D Boundary ————

River Mile — •M1.5

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
C	Areas of minimal flooding.
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.

NOTES TO USER

INITIAL IDENTIFICATION:

MAY 24, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:

JANUARY 16, 1976

FEBRUARY 16, 1982

FLOOD INSURANCE RATE MAP EFFECTIVE:

APRIL 15, 1986

FLOOD INSURANCE RATE MAP REVISIONS:

NONE

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

FEDERAL EMERGENCY MANAGEMENT AGENCY

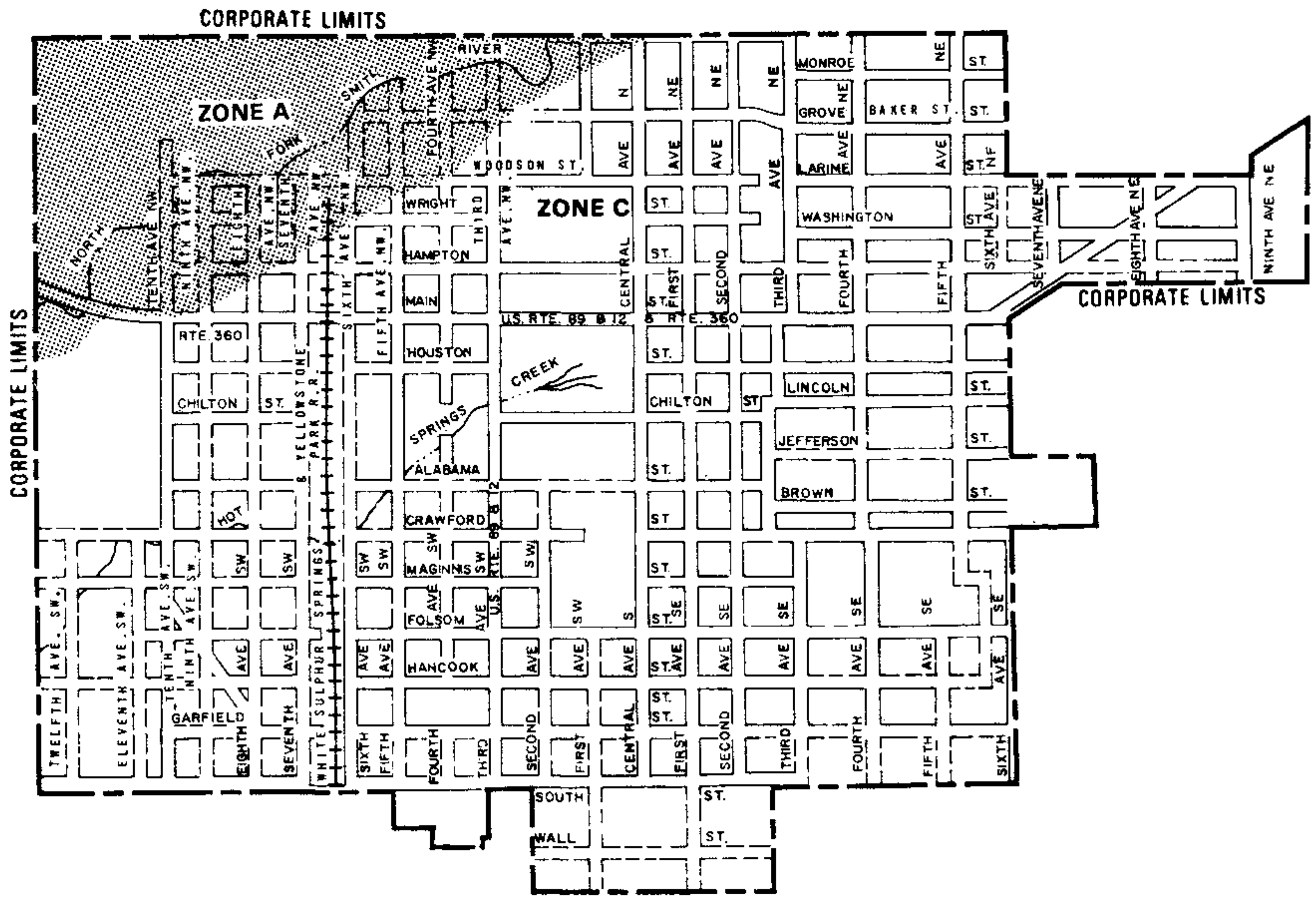
FLOOD INSURANCE RATE MAP

PANEL(S) 01

MAP INDEX

CITY OF WHITE SULPHUR SPRINGS, MT
(MEAGHER CO.)

COMMUNITY NO. 300047 C



FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WHITE SULPHUR SPRINGS, MT
(MEAGHER CO.)

APPROXIMATE SCALE

800 0 800 1600 2400 FEET

FLOOD INSURANCE RATE MAP

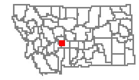
EFFECTIVE DATE:
APRIL 15, 1986

01

Appendix I

Natural Heritage Program Wetland and Riparian Map

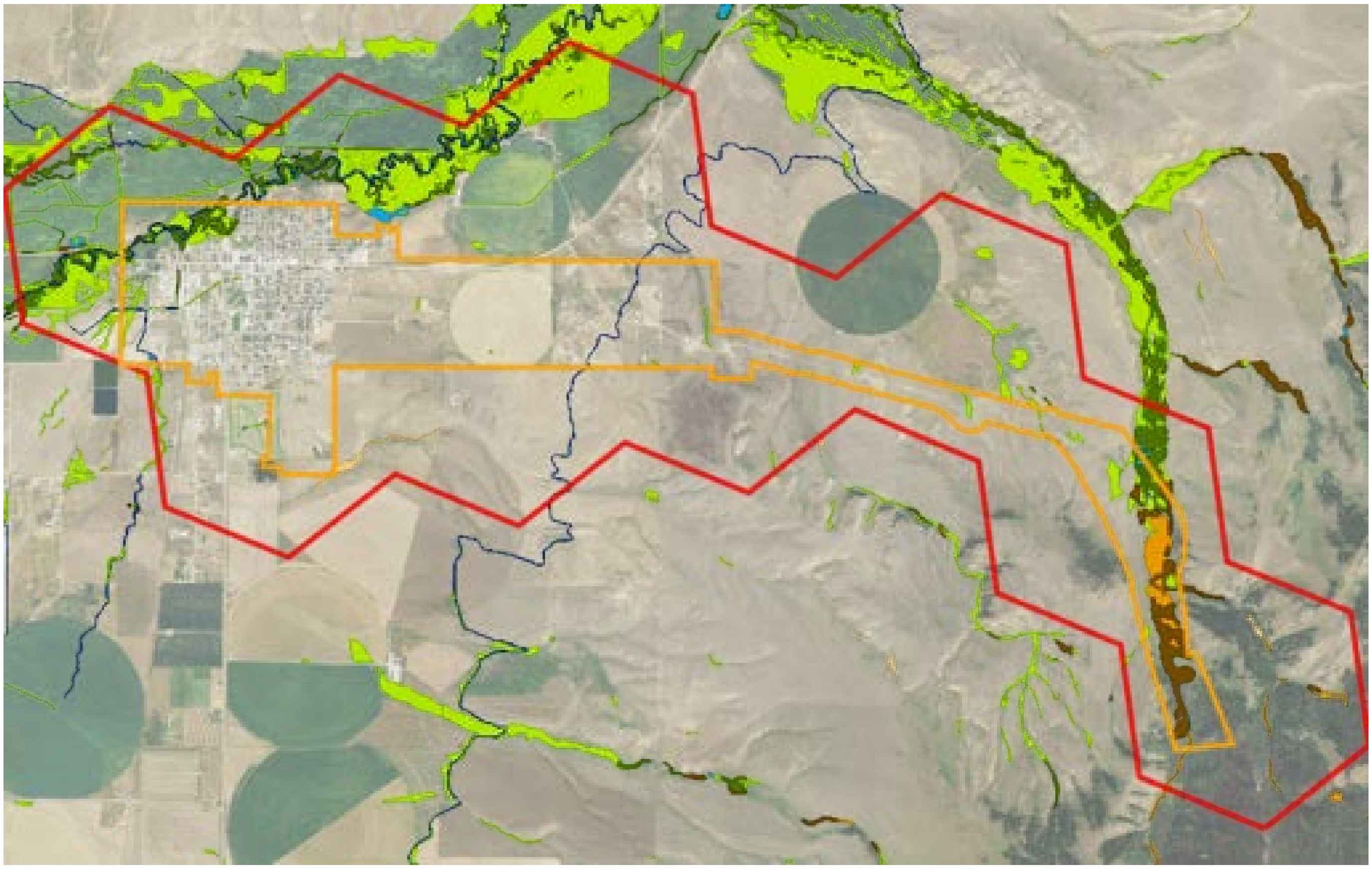
A program of the **Montana State Library's Natural Resource Information System**



Latitude	Longitude
46.51014	-110.79556
46.56431	-110.92652

Wetland and Riparian

Summarized by: *(Custom Area of Interest)*



Wetland and Riparian Mapping

Explain

P - Palustrine

AB - Aquatic Bed

P - Palustrine, AB - Aquatic Bed
Wetlands with vegetation growing on or below the water surface for most of the growing season.

F - Semipermanently Flooded	11 Acres	
(no modifier)	**<1 Acres**	**PABF**
b - Beaver	**3 Acres**	**PABFb**
h - Diked/Impounded	**1 Acres**	**PABFh**
x - Excavated	**7 Acres**	**PABFx**

EM - Emergent

P - Palustrine, EM - Emergent
Wetlands with erect, rooted herbaceous vegetation present during most of the growing season.

A - Temporarily Flooded	295 Acres	
(no modifier)	**270 Acres**	**PEMA**
x - Excavated	**25 Acres**	**PEMAx**

C - Seasonally Flooded	29 Acres	
(no modifier)	**16 Acres**	**PEMC**
f - Farmed	**11 Acres**	**PEMCf**
x - Excavated	**2 Acres**	**PEMCx**

F - Semipermanently Flooded	<1 Acres	
(no modifier)	**<1 Acres**	**PEMF**
x - Excavated	**<1 Acres**	**PEMFx**

SS - Scrub-Shrub

P - Palustrine, SS - Scrub-Shrub
Wetlands dominated by woody vegetation less than 6 meters (20 feet) tall. Woody vegetation includes tree saplings and trees that are stunted due to environmental conditions.

A - Temporarily Flooded	77 Acres	
(no modifier)	**71 Acres**	**PSSA**
x - Excavated	**6 Acres**	**PSSAx**

C - Seasonally Flooded	45 Acres	
(no modifier)	**43 Acres**	**PSSC**
x - Excavated	**2 Acres**	**PSSCx**

R - Riverine (Rivers)

3 - Upper Perennial

UB - Unconsolidated Bottom

R - Riverine (Rivers), 3 - Upper Perennial, UB - Unconsolidated Bottom
Stream channels where the substrate is at least 25% mud, silt or other fine particles.

F - Semipermanently Flooded	1 Acres	
(no modifier)	**1 Acres**	**R3UBF**

G - Intermittently Exposed 1 Acres

(no modifier) **1 Acres** **R3UBG**

H - Permanently Flooded 14 Acres

(no modifier) **14 Acres** **R3UBH**

4 - Intermittent

SB - Stream Bed

R - Riverine (Rivers), 4 - Intermittent, SB - Stream Bed
Active channel that contains periodic water flow.

C - Seasonally Flooded 9 Acres

x - Excavated **9 Acres** **R4SBCx**

Rp - Riparian

1 - Lotic

SS - Scrub-Shrub

(no modifier) **29 Acres** **Rp1SS**

Rp - Riparian, 1 - Lotic, SS - Scrub-Shrub
This type of riparian area is dominated by woody vegetation that is less than 6 meters (20 feet) tall. Woody vegetation includes tree saplings and trees that are stunted due to environmental conditions.

FO - Forested

(no modifier) **51 Acres** **Rp1FO**

Rp - Riparian, 1 - Lotic, FO - Forested
This riparian class has woody vegetation that is greater than 6 meters (20 feet) tall.

EM - Emergent

(no modifier) **7 Acres** **Rp1EM**

Rp - Riparian, 1 - Lotic, EM - Emergent
Riparian areas that have erect, rooted herbaceous vegetation during most of the growing season.

2 - Lentic

FO - Forested

(no modifier) **1 Acres** **Rp2FO**

Rp - Riparian, 2 - Lentic, FO - Forested
This riparian class has woody vegetation that is greater than 6 meters (20 feet) tall.

Introduction to Wetland and Riparian

Within the report area you have requested, wetland and riparian mapping is summarized by acres of each classification present. Summaries are only provided for modern MTNHP wetland and riparian mapping and not for outdated (NWI Legacy) or incomplete (NWI Scalable) mapping efforts; described here. MTNHP has made all three of these datasets and associated metadata available for separate download on the Montana Wetland and Riparian Framework web page.

Wetland and Riparian mapping is one of 15 Montana Spatial Data Infrastructure framework layers considered vital for making statewide maps of Montana and understanding its geography. The wetland and riparian framework layer consists of spatial data representing the extent, type, and approximate location of wetlands, riparian areas, and deep water habitats in Montana.

Wetland and riparian mapping is completed through photointerpretation of 1-m resolution color infrared aerial imagery acquired from 2005 or later. A coding convention using letters and numbers is assigned to each mapped wetland. These letters and numbers describe the broad landscape context of the wetland, its vegetation type, its water regime, and the kind of alterations that may have occurred. Ancillary data layers such as topographic maps, digital elevation models, soils data, and other aerial imagery sources are also used to improve mapping accuracy. Wetland mapping follows the federal Wetland Mapping Standard and classifies wetlands according to the Cowardin classification system of the National Wetlands Inventory (NWI) (Cowardin et al. 1979, FGDC Wetlands Subcommittee 2013). Federal, State, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands differently than the NWI. Similar coding, based on U.S. Fish and Wildlife Service conventions, is applied to riparian areas (U.S. Fish and Wildlife Service 2009). These are mapped areas where vegetation composition and growth is influenced by nearby water bodies, but where soils, plant communities, and hydrology do not display true wetland characteristics. **These data are intended for use at a scale of 1:12,000 or smaller. Mapped wetland and riparian areas do not represent precise boundaries and digital wetland data cannot substitute for an on-site determination of jurisdictional wetlands.**

See a detailed overview, with examples, of both wetland and riparian classification systems and associated codes

Literature Cited

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79/31. Washington, D.C. 103pp.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C.

U.S. Fish and Wildlife Services. 2009. A system for mapping riparian areas in the western United States. Division of Habitat and Resource Conservation, Branch of Resource and Mapping Support, Arlington, Virginia.

Appendix J

Census and Income Data

ceic-mtdoc.opendata.arcgis.com/datasets/mtdoc::place-census-1980/explore?location=46.547840%2C-110.906330%2C15.26

CENSUS & ECONOMIC INFORMATION CENTER - GIS RESOURCES

Sign In

Place - Census 1980

Private Member

Montana Department of Commerce

Summary

1980 Census State, County, Tract, Block Numbering Area and Place.

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Info Updated

December 14, 2016
Data Updated

June 26, 2014
Published Date

139 Records
View data table

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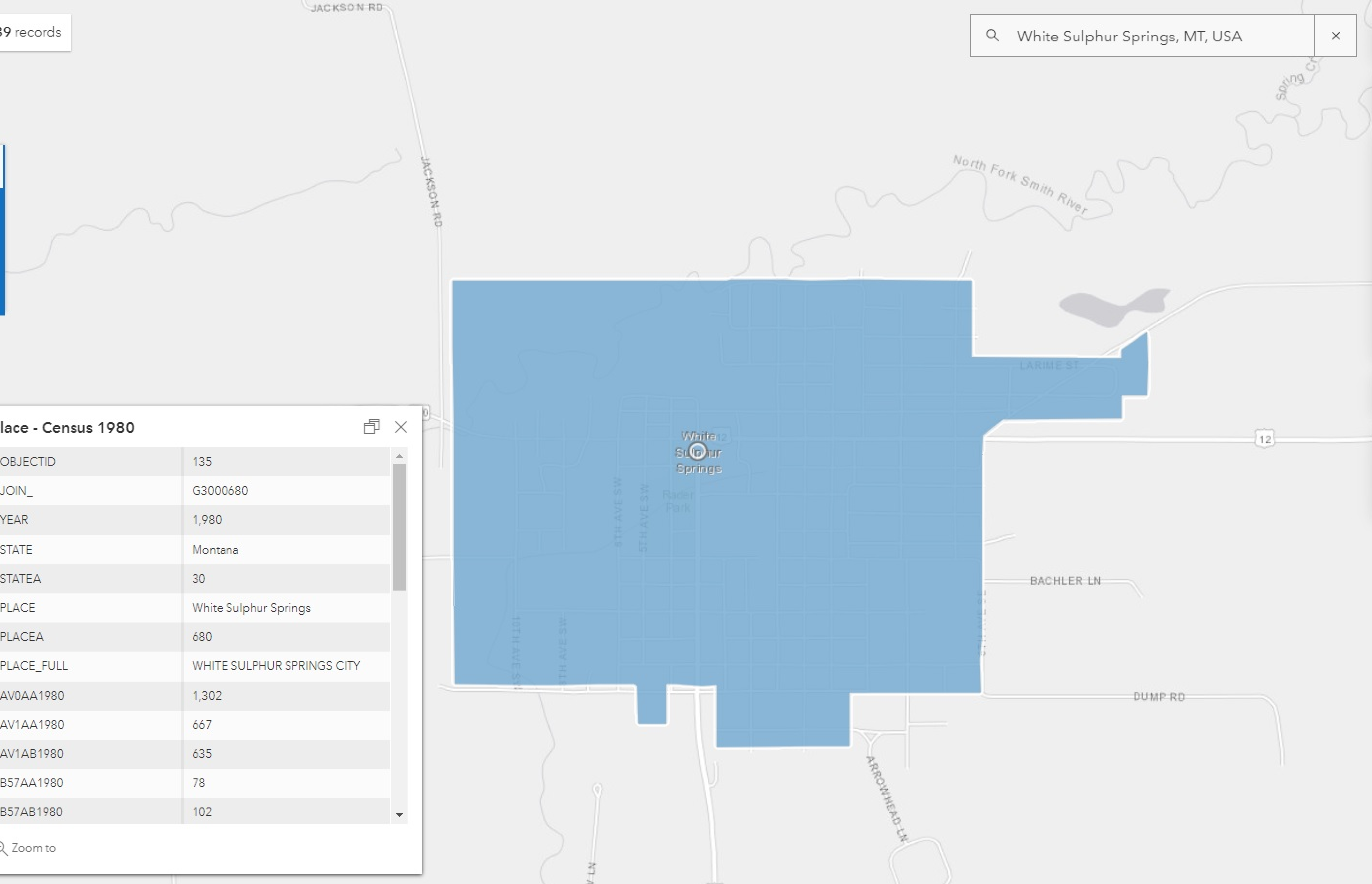
139 records

White Sulphur Springs, MT, USA



Place - Census 1980

OBJECTID	135
JOIN_	G3000680
YEAR	1,980
STATE	Montana
STATEA	30
PLACE	White Sulphur Springs
PLACEA	680
PLACE_FULL	WHITE SULPHUR SPRINGS CITY
AV0AA1980	1,302
AV1AA1980	667
AV1AB1980	635
B57AA1980	78
B57AB1980	102

Zoom to

ceic-mtdoc.opendata.arcgis.com/datasets/mtdoc::county-census-1980/explore?location=47.000557%2C-109.967392%2C7.74

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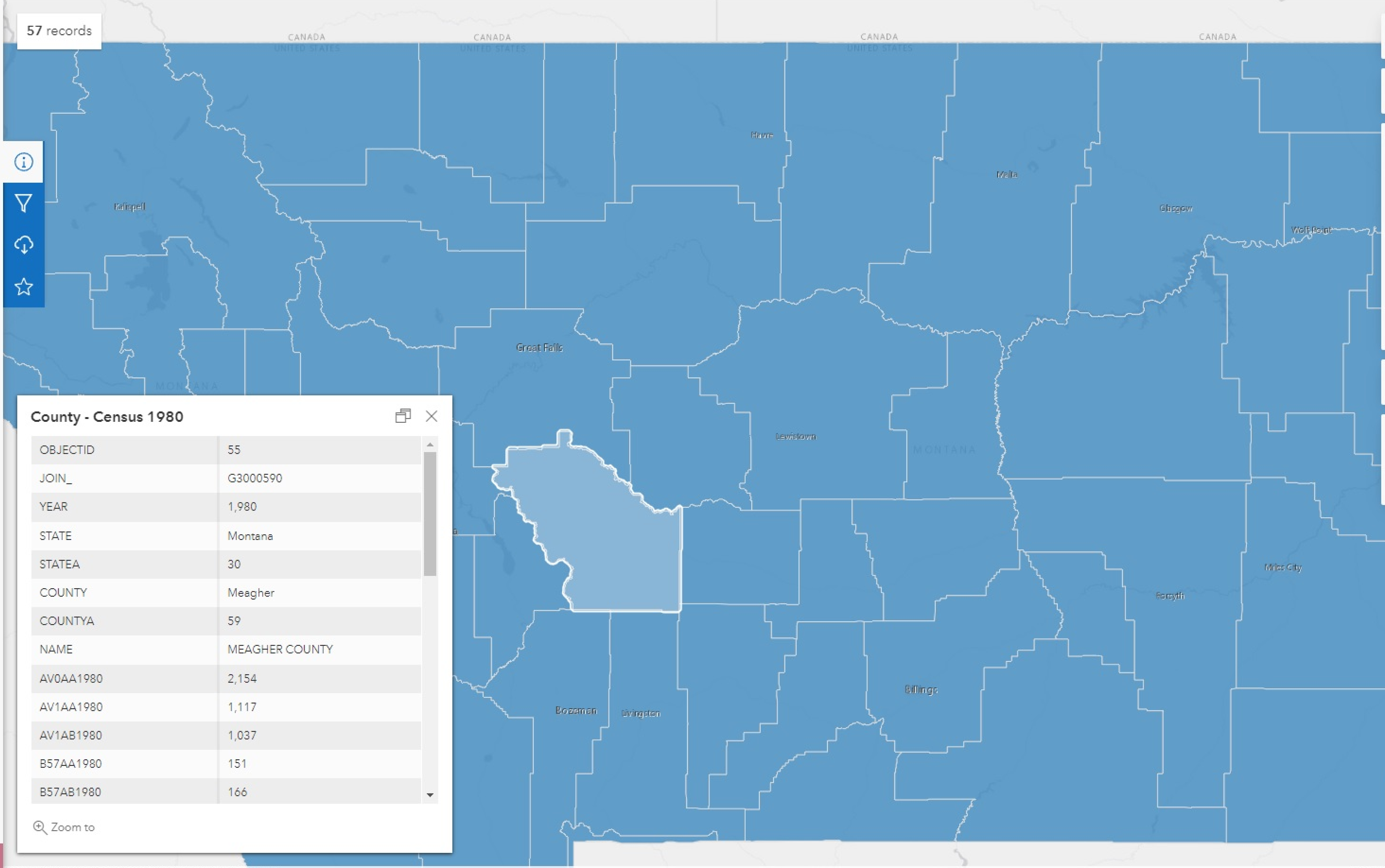

County - Census 1980

OBJECTID	55
JOIN_	G3000590
YEAR	1,980
STATE	Montana
STATEA	30
COUNTY	Meagher
COUNTYA	59
NAME	MEAGHER COUNTY
AV0AA1980	2,154
AV1AA1980	1,117
AV1AB1980	1,037
B57AA1980	151
B57AB1980	166

Zoom to

Esri, HERE, Garmin, USGS, EPA, NPS | Esri, HERE, NPS

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ceic-mtdoc.opendata.arcgis.com/datasets/mtdoc::place-census-1990/explore?filters=eyJBVjBBQTE5OTAiOlsxOSw4MTE1MV19&location=46.547840%2C-110.906330%2C15.26

CENSUS & ECONOMIC INFORMATION CENTER - GIS RESOURCES

Sign In

Filters

Place - Census 1990

Filters | Styling

Filter as map moves

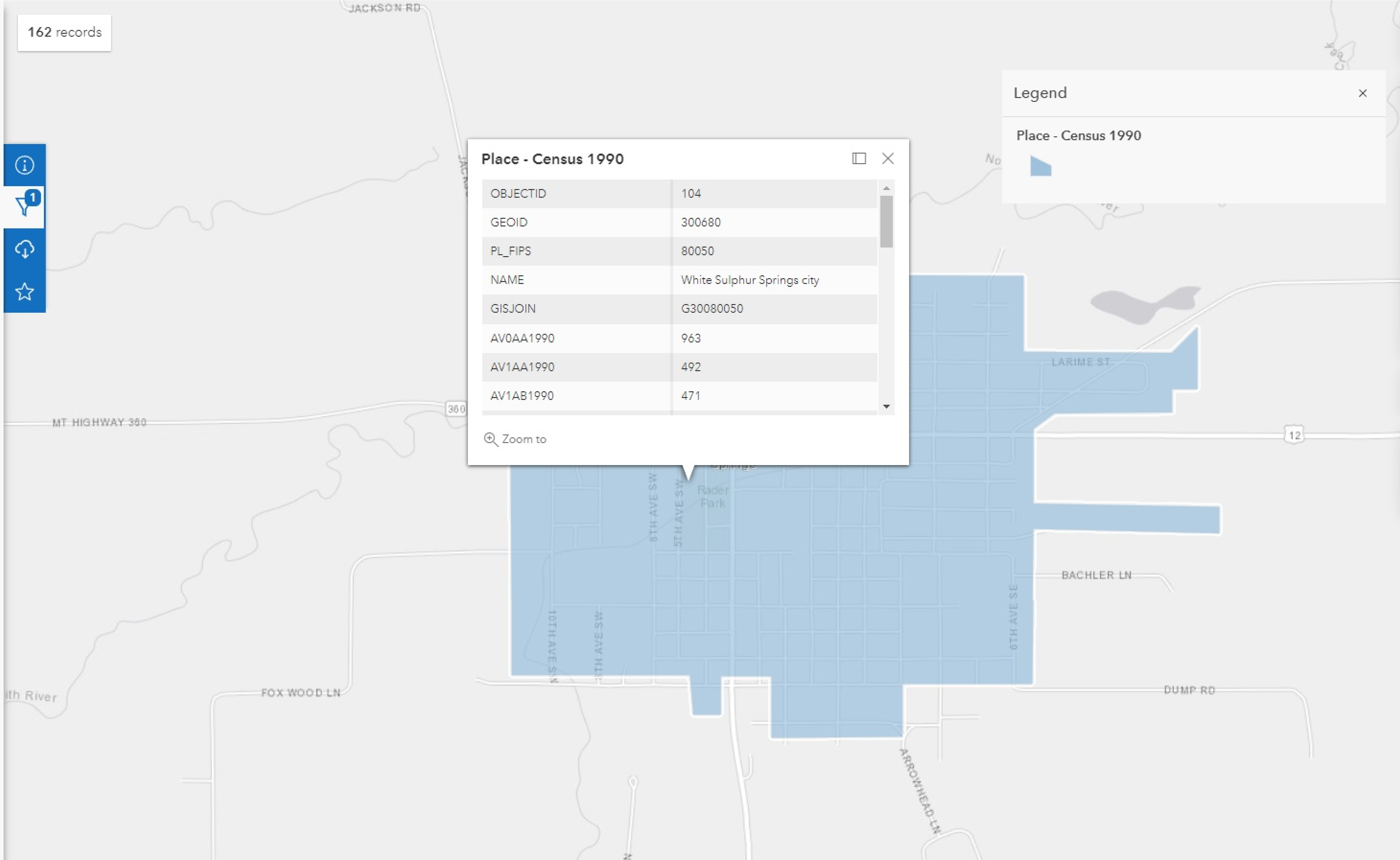
Total Population

19 — 81,151

Select attribute filters (31)

- [ ] GEOID — 162 values
- [ ] PL_FIPS — 162 values
- [ ] Name — 162 values
- [ ] GISJOIN — 162 values
- [x] Total Population — 19 to 81,151
- [ ] Male — 12 to 38,718

162 records



Place - Census 1990

OBJECTID	104
GEOID	300680
PL_FIPS	80050
NAME	White Sulphur Springs city
GISJOIN	G30080050
AV0AA1990	963
AV1AA1990	492
AV1AB1990	471

Zoom to

Legend

Place - Census 1990

CENSUS & ECONOMIC INFORMATION CENTER - GIS RESOURCES

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County - Census 1990

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1990 Census State, County, Tract, Block Group, Block and Place.

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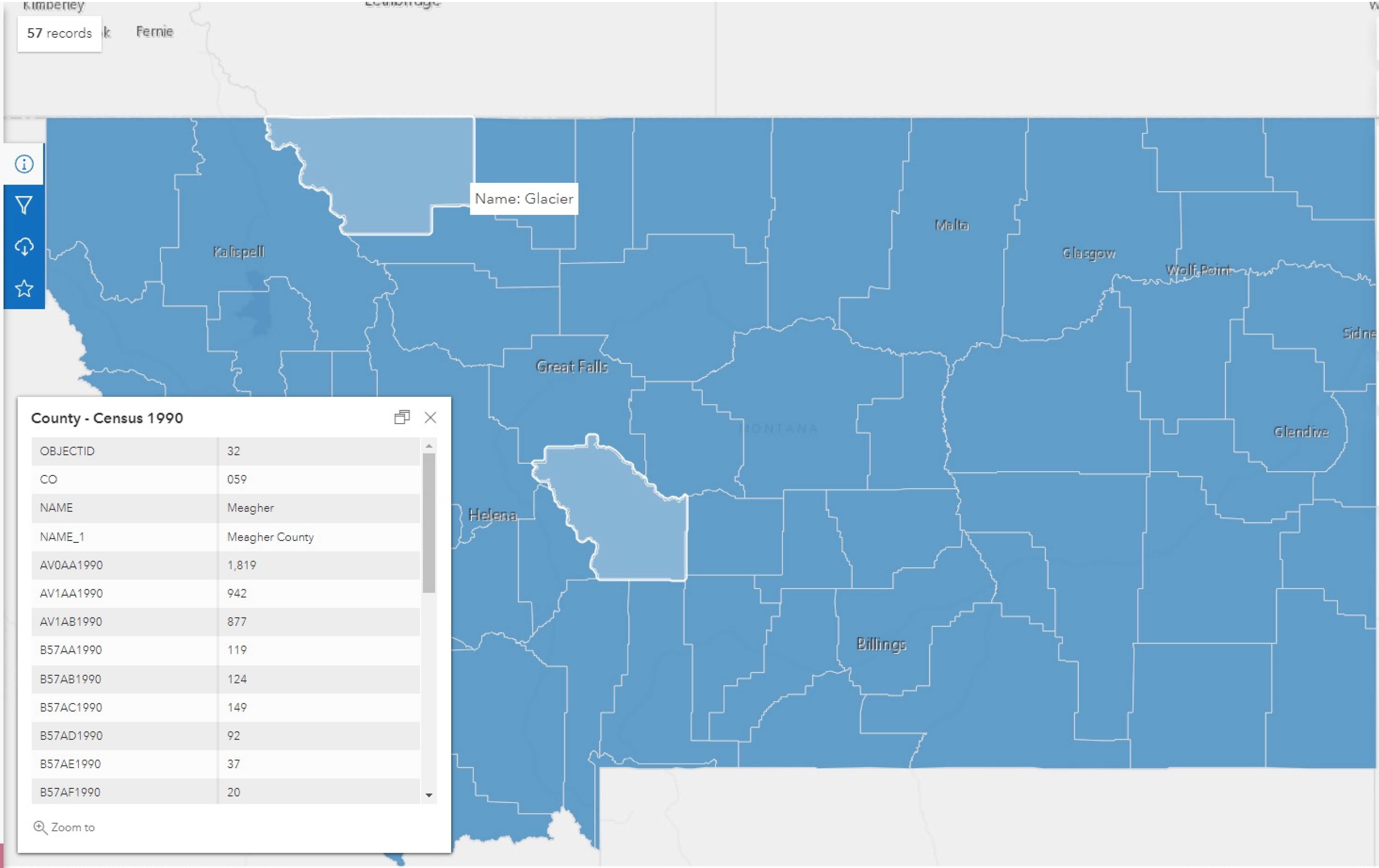

County - Census 1990

OBJECTID	32
CO	059
NAME	Meagher
NAME_1	Meagher County
AV0AA1990	1,819
AV1AA1990	942
AV1AB1990	877
B57AA1990	119
B57AB1990	124
B57AC1990	149
B57AD1990	92
B57AE1990	37
B57AF1990	20

Zoom to

ceic-mtdoc.opendata.arcgis.com/datasets/mtdoc::place-census-2000/explore?location=46.547840%2C-110.906330%2C15.26

CENSUS & ECONOMIC INFORMATION CENTER - GIS RESOURCES

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Place - Census 2000

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2000 Census State, Reservation, County, Tract, Block Group, Block and Place

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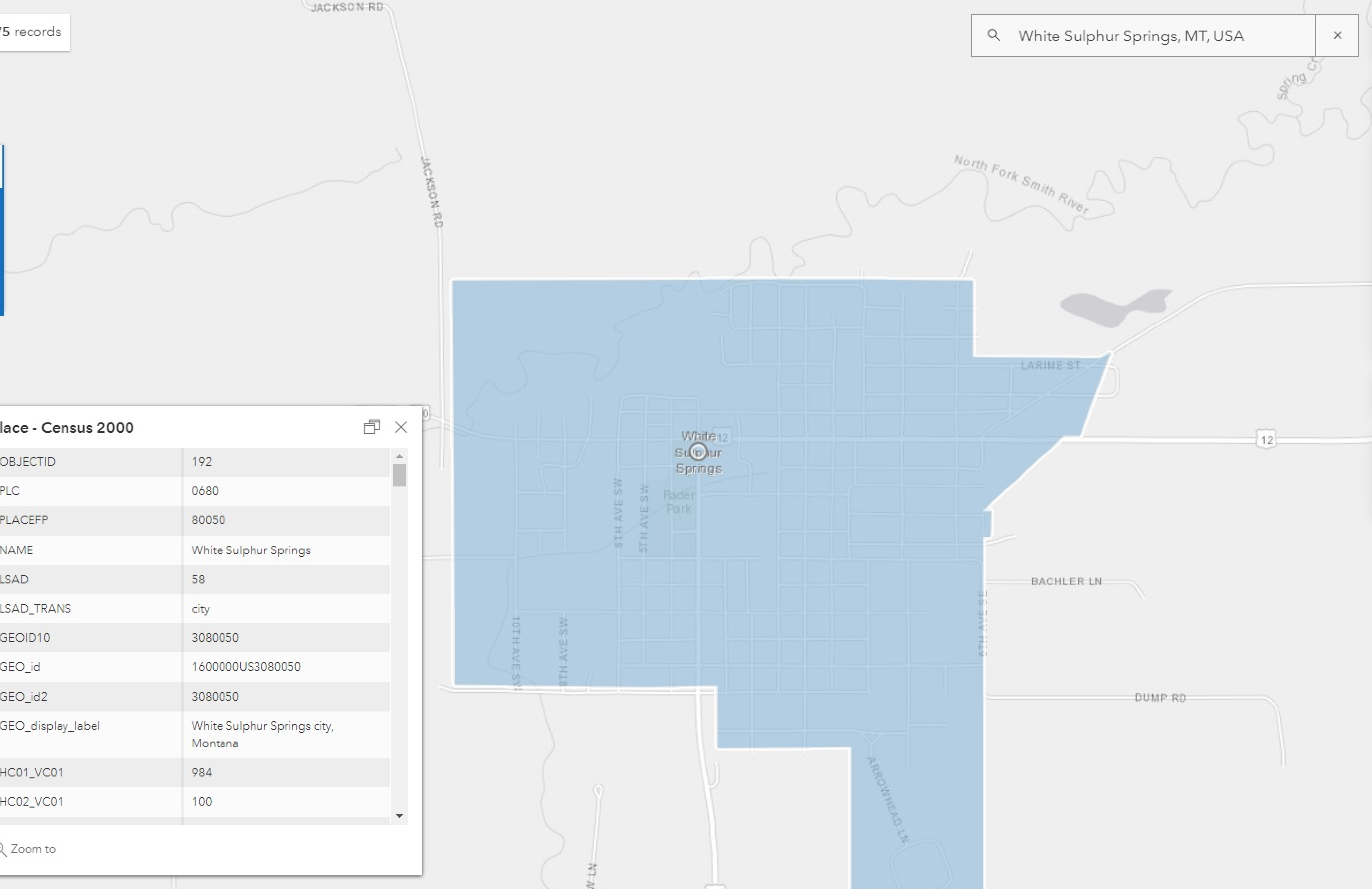
White Sulphur Springs, MT, USA



Place - Census 2000

OBJECTID	192
PLC	0680
PLACEFP	80050
NAME	White Sulphur Springs
LSAD	58
LSAD_TRANS	city
GEOID10	3080050
GEO_id	1600000US3080050
GEO_id2	3080050
GEO_display_label	White Sulphur Springs city, Montana
HC01_VC01	984
HC02_VC01	100

Zoom to

ceic-mtdoc.opendata.arcgis.com/datasets/mtdoc::county-census-2000/explore?location=46.999243%2C-109.967392%2C7.72

CENSUS & ECONOMIC INFORMATION CENTER - GIS RESOURCES

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County - Census 2000

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Montana Department of Commerce

Summary

2000 Census State, Reservation, County, Tract, Block Group, Block and Place

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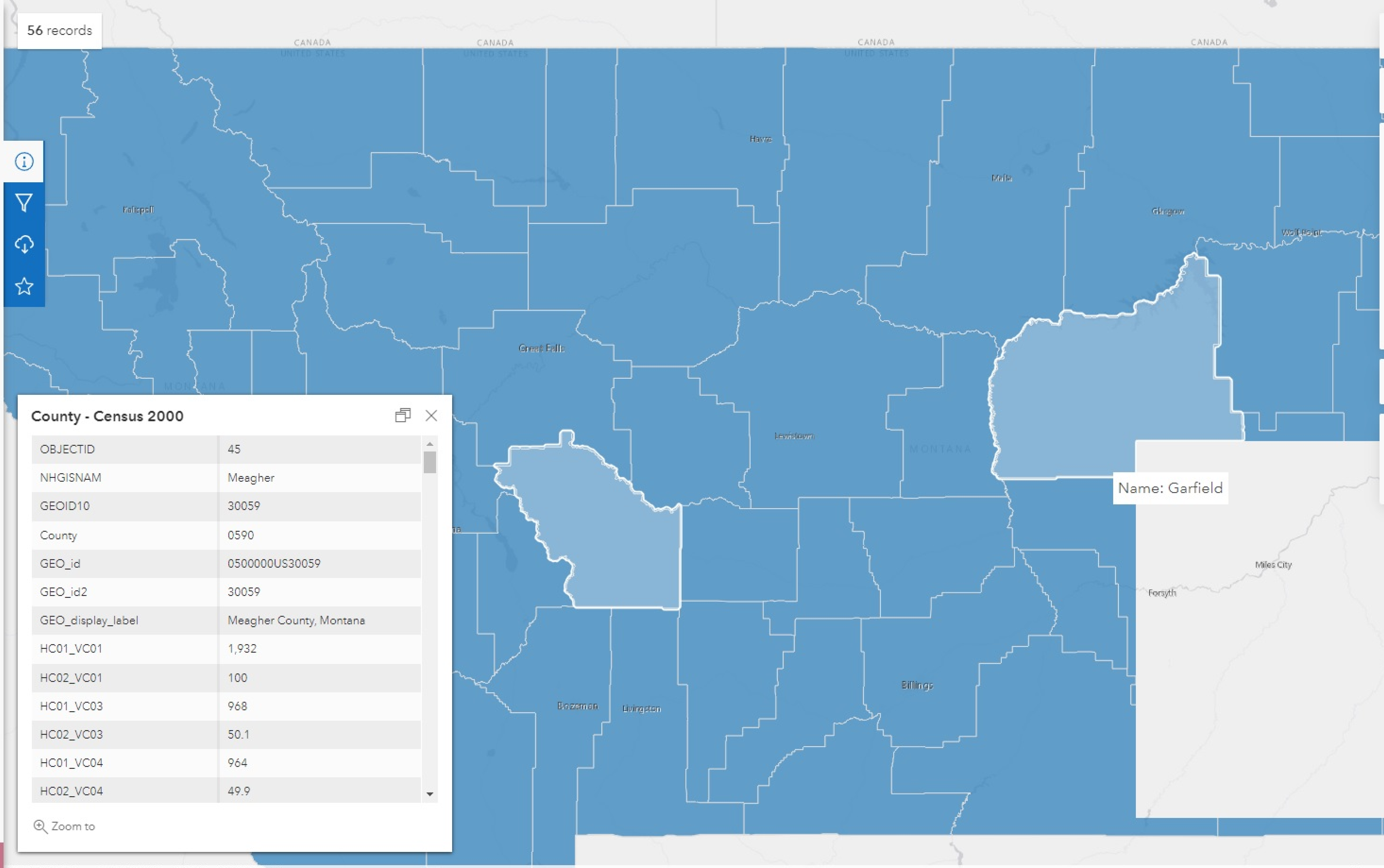

County - Census 2000

OBJECTID	45
NHGISNAM	Meagher
GEOID10	30059
County	0590
GEO_id	0500000US30059
GEO_id2	30059
GEO_display_label	Meagher County, Montana
HC01_VC01	1,932
HC02_VC01	100
HC01_VC03	968
HC02_VC03	50.1
HC01_VC04	964
HC02_VC04	49.9

Zoom to

Esri, HERE, Garmin, USGS, EPA, NPS | Esri, HERE, NPS

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Census 2010TIGER Place MT

Private Member

Montana Department of Commerce

Summary

2010 Census State, Reservation, County, Tract, Block Group, Block and Place

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Info Updated

December 14, 2016
Data Updated

June 18, 2012
Published Date

364 Records
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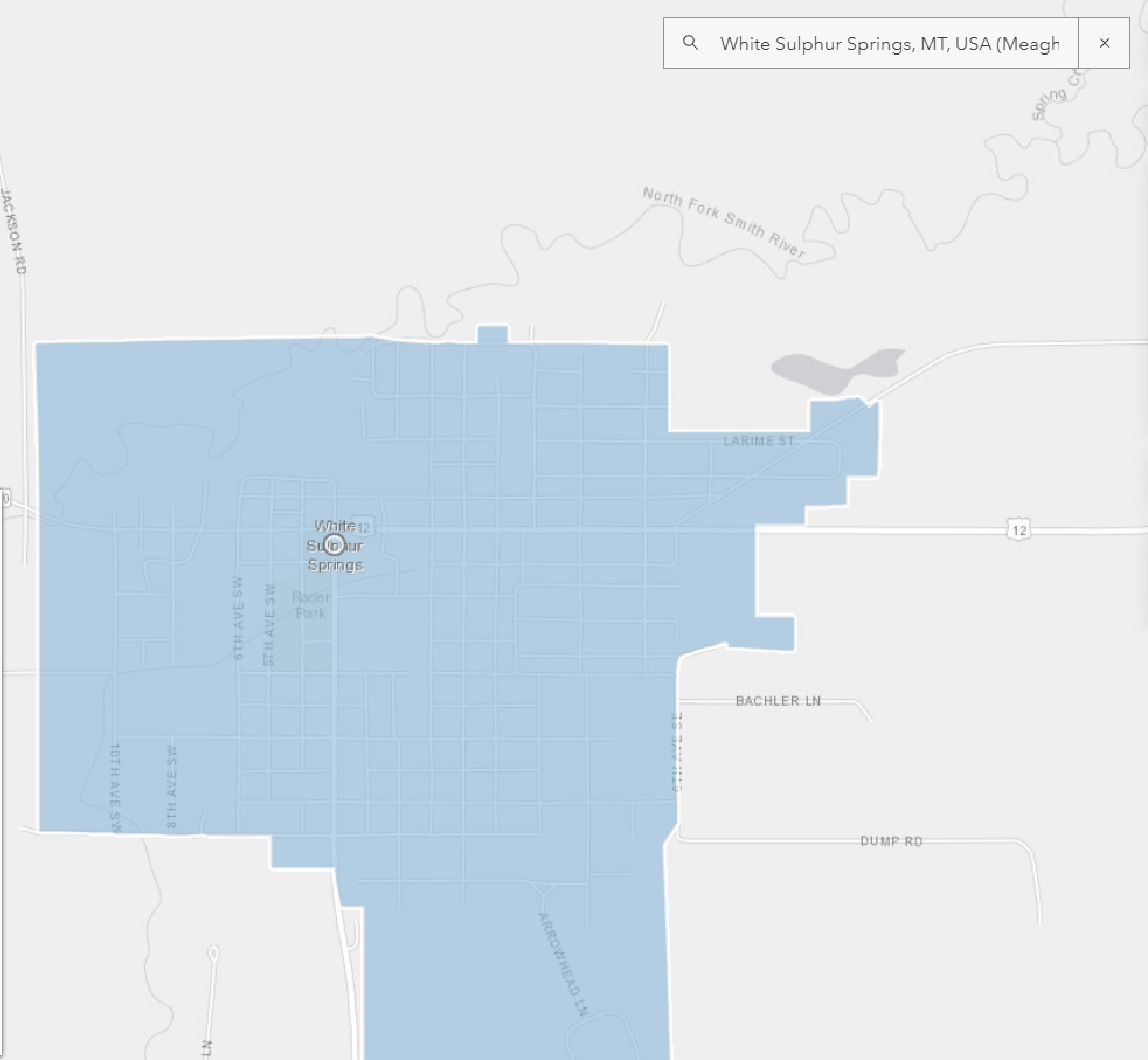
364 records

White Sulphur Springs, MT, USA (Meagh



Census_2010TIGER_Place_MT

PCICBSA10	N
PCINECTA10	N
MTFCC10	G4110
FUNCSTAT10	A
ALAND10	2,606,159
AWATER10	0
INTPTLAT10	+46.5452553
INTPTLON10	-110.9037489
PopTotal	939
OneRace	923
White	913
Black	1
AIAN	3

Zoom to

CENSUS & ECONOMIC INFORMATION CENTER - GIS RESOURCES

Sign In

County

Private Member

Montana Department of Commerce

Summary

2010 Census State, Reservation, County, Tract, Block Group, Block and Place

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December 29, 2020
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March 4, 2020
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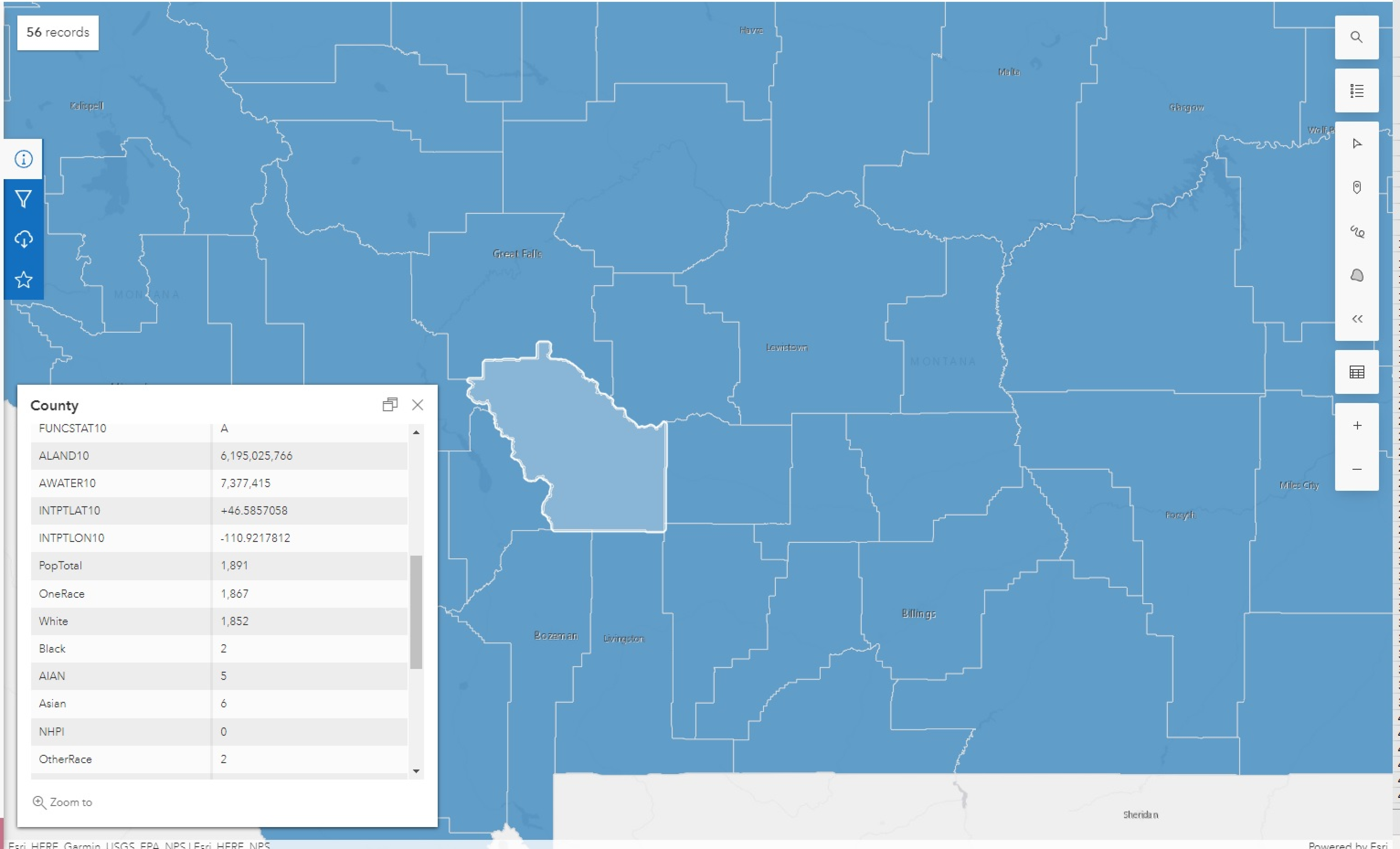

County

FUNCSTAT10	A
ALAND10	6,195,025,766
AWATER10	7,377,415
INTPTLAT10	+46.5857058
INTPTLON10	-110.9217812
PopTotal	1,891
OneRace	1,867
White	1,852
Black	2
AIAN	5
Asian	6
NHPI	0
OtherRace	2

Zoom to

Esri, HERE, Garmin, USGS, EPA, NPS | Esri, HERE, NPS

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mtdoc.maps.arcgis.com/apps/MapSeries/index.html?appid=a8cf34a878db4256b2a5587a19314fc1

2020 Census Population and Housing Units by Place

Population Change | Population Density | American Indian | 18 and Over | Hispanic Origin | Housing Units

Population change from 2010 to 2020

Click a place on the map for detailed information.

A place may be a consolidated city/county, incorporated city, incorporated town or a census designated place.

Source: 2020 Census Redistricting summary files released by the U.S. Census Bureau in August 2021. Click here to download data compiled for Montana.

Place

Percentage population change from 2010 to 2020

> 10

0

< -10

Absolute population change from 2010 to 2020

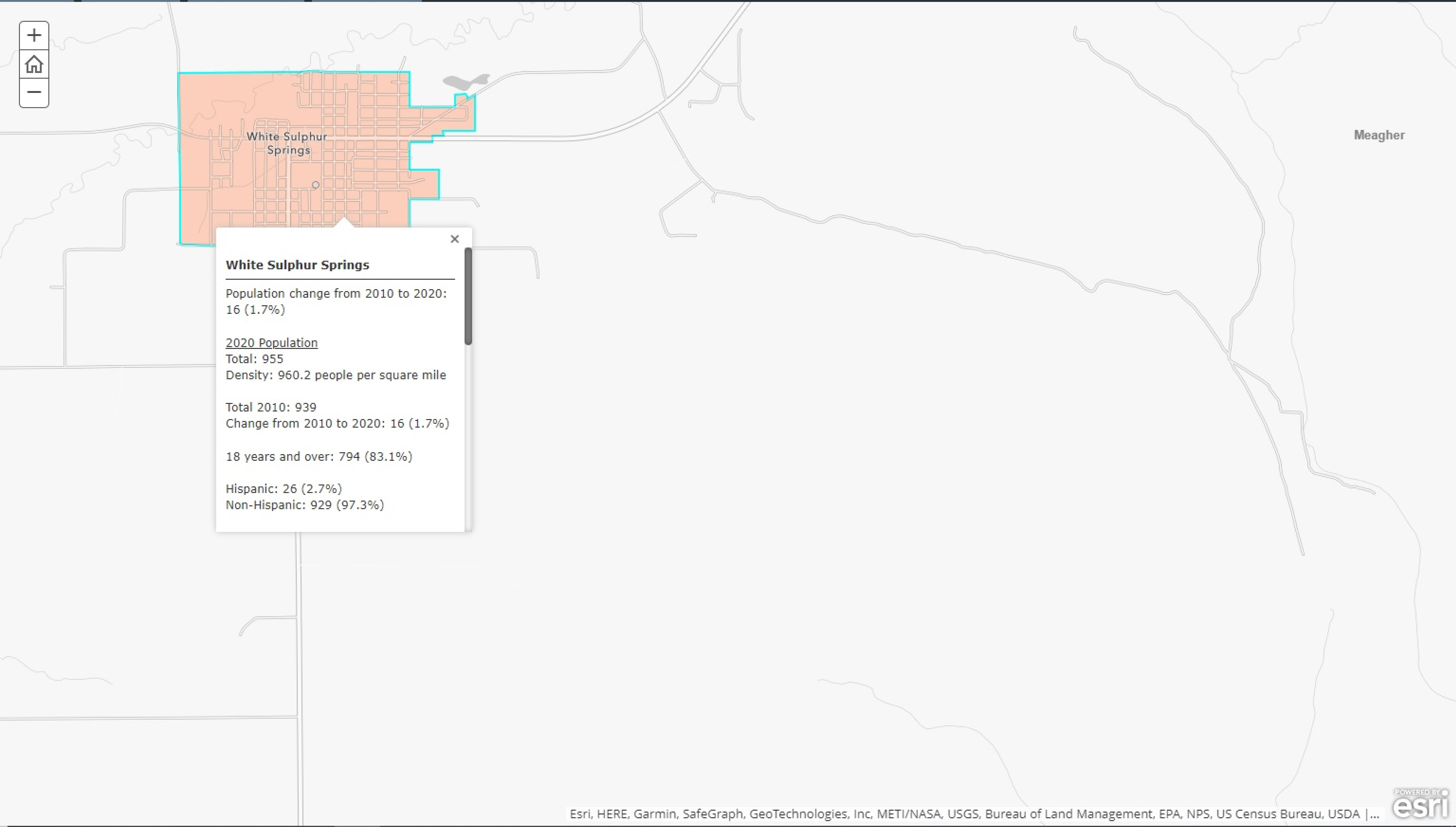
> 12,000

9,000

6,000

3,000

< 100



White Sulphur Springs

Population change from 2010 to 2020: 16 (1.7%)

2020 Population
Total: 955
Density: 960.2 people per square mile

Total 2010: 939
Change from 2010 to 2020: 16 (1.7%)

18 years and over: 794 (83.1%)

Hispanic: 26 (2.7%)
Non-Hispanic: 929 (97.3%)

10:31 AM

mtdoc.maps.arcgis.com/apps/MapSeries/index.html?appid=776b167aa4224fed862fa55ee5bce22f

2020 Census Population and Housing by Montana State, County and Tract

Population Density | Population Change | 18 and Over | Hispanic Origin | American Indian | Housing Units

2020 population density

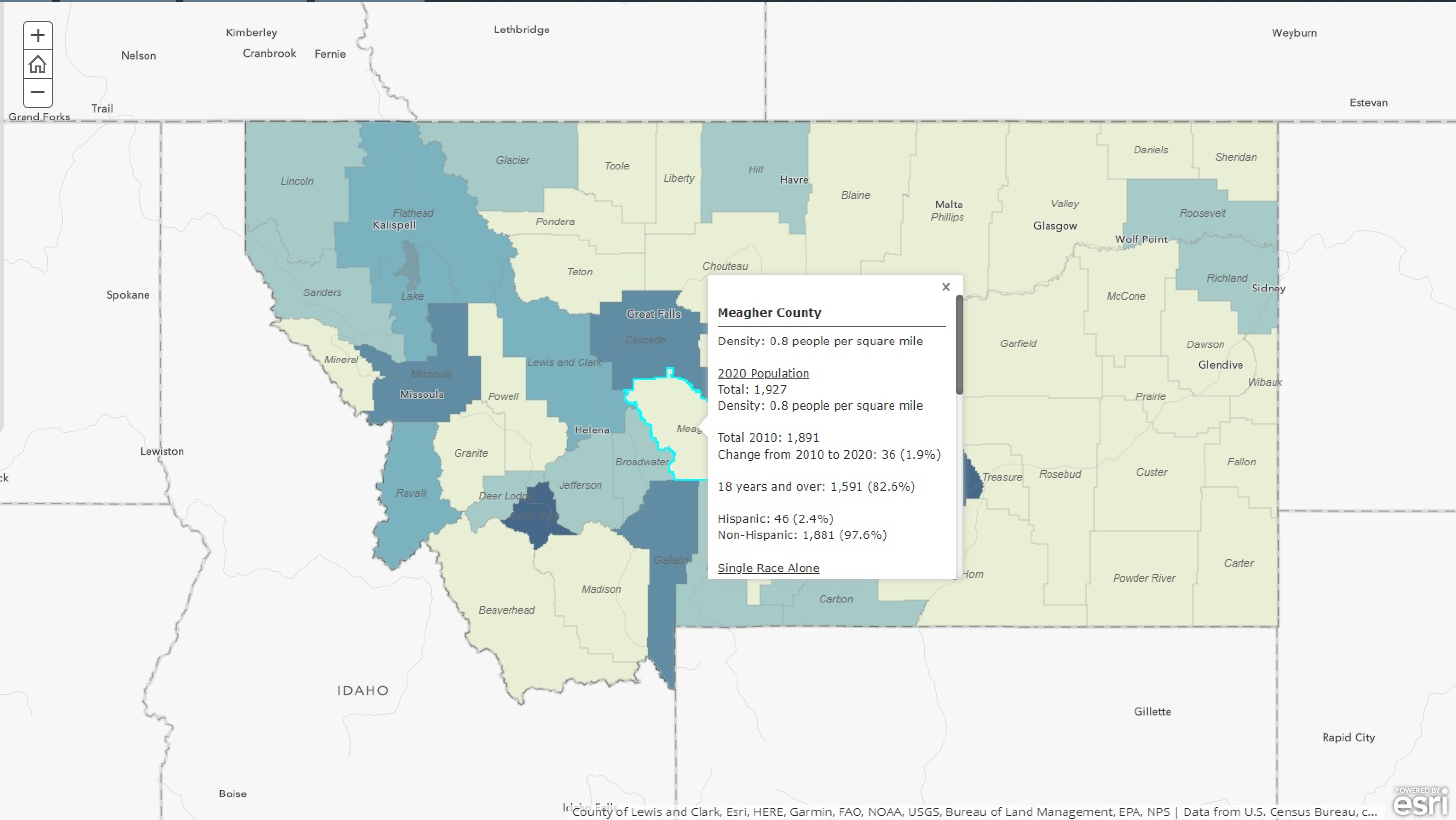
Zoom out for state, zoom in for census tracts and click an area on the map for detailed information.

Source: 2020 Census Redistricting summary files released by the U.S. Census Bureau in August 2021. Click here to download data compiled for Montana.

County

Population per square mile

- > 48 To 63
- > 30 To 48
- > 15 To 30
- > 4 To 15
- 0 To 4



Income and Poverty Trend
American Community Survey (ACS) 5-Year Data Profile

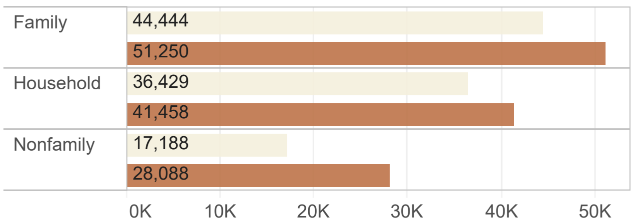
2019

Select Geography Level
Place

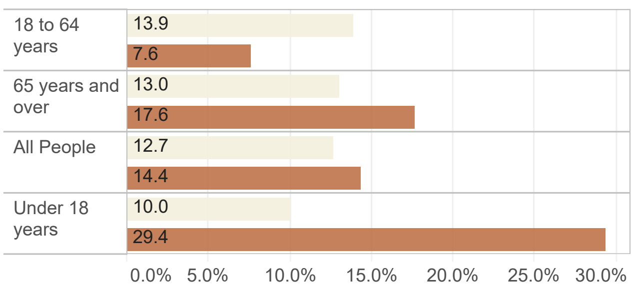
Select Geography Name
White Sulphur Springs

2014
2019

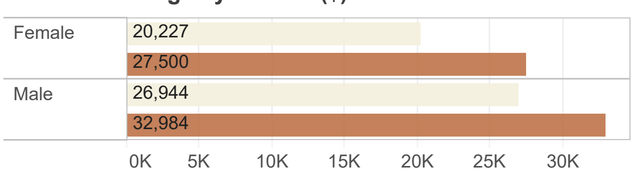
Median Income ($)



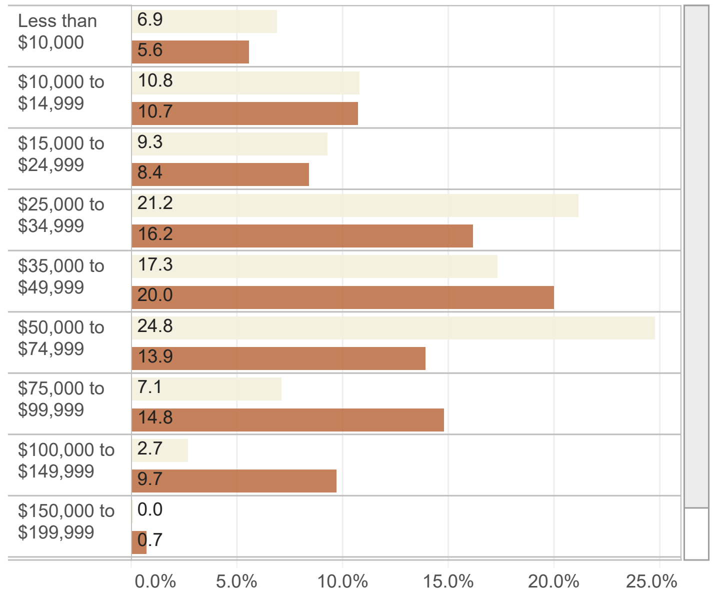
People Below Poverty Level (%)



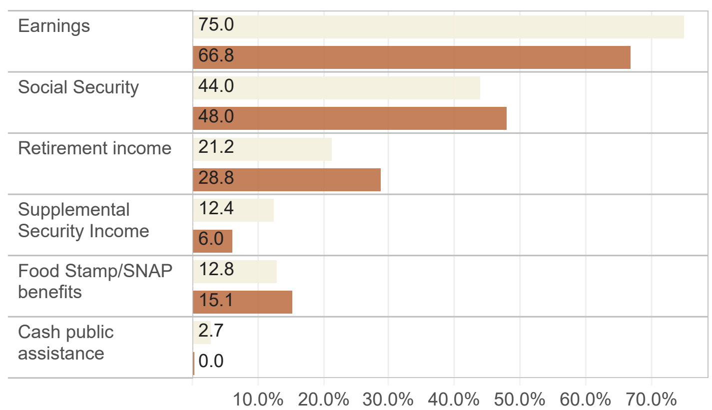
Median Earnings by Gender ($)



Households by Income Class (%)



Household Income by Source (%)



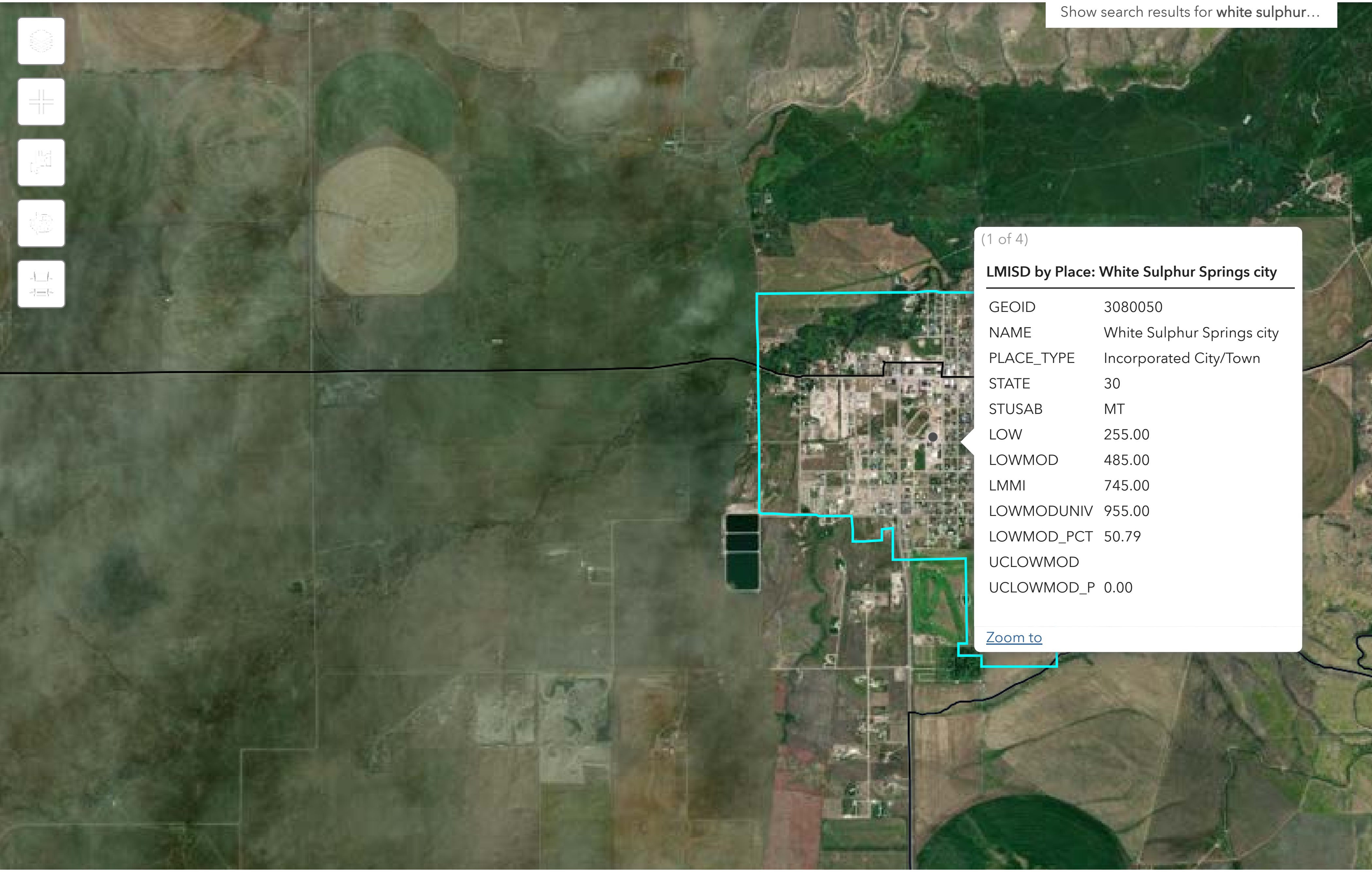
Data Source: American Community Survey 5-year Data Profile, U.S. Census Bureau.
American Community Survey (ACS) 5-year estimates are derived from surveys conducted over a 5 year period. The information on this page compares the most recent ACS 5-year estimate to most recent non-overlapping ACS 5-year estimate.

Low- and Moderate-Income Area Data, based on 2011-2015 ACS

with Web AppE

white sulphur springs, montana

Show search results for **white sulphur...**



(1 of 4)

LMISD by Place: White Sulphur Springs city

GEOID	3080050
NAME	White Sulphur Springs city
PLACE_TYPE	Incorporated City/Town
STATE	30
STUSAB	MT
LOW	255.00
LOWMOD	485.00
LMMI	745.00
LOWMODUNIV	955.00
LOWMOD_PCT	50.79
UCLOWMOD	
UCLOWMOD_P	0.00

Zoom to

0.4mi

-110.862 46.566 Degrees

Appendix K

Public Outreach Information

AFFIDAVIT OF PUBLICATION

STATE OF MONTANA)
) ss.
County of Meagher)

Laura Phillips, being duly sworn, deposes and says: That she is Assistant Editor of the **MEAGHER COUNTY NEWS**, a newspaper of general circulation printed and published in White Sulphur Springs, Meagher County, Montana, and that the notice hereunto annexed: **City of White Sulphur Springs, Notice of Public Hearing,** has been correctly published in the regular and entire issue of every number of said paper for two consecutive weeks, beginning on the **9th** day of **March, 2023,** ending on the **16th** day of **March, 2023.**

Laura Phillips

Subscribed and sworn to before me this
24 Day of March, A. D. 2023

Gretchen Rader

Notary Public for the State of Montana

GRETCHEN RADER
NOTARIAL
SEAL
STATE OF MONTANA

GRETCHEN RADER
NOTARY PUBLIC for the
State of Montana
Residing at White Sulphur Springs, Montana
My Commission Expires
June 15, 2026

NOTICE OF PUBLIC HEARING

The City of White Sulphur Springs will hold a public hearing on Tuesday, March 21, 2023. The public hearing will begin at 5:30 p.m. at the City Hall at 105 West Hampton in White Sulphur Springs. The City has scheduled a hearing to obtain public comments regarding the proposed improvements to the City of White Sulphur Springs' water system. With assistance from Great West Engineering, the City is preparing a water preliminary engineering report (PER) update. It may apply for funding from the Montana Department of Commerce, Montana Department of Natural Resources and Conservation, USDA Rural Development, or the Department of Environmental Quality's Drinking Water State Revolving Fund Program.

At the public hearing, White Sulphur Springs and Great West Engineering representatives will explain the project's purpose, the project area, the scope of work, the budget, possible funding sources, and any costs that may result for local citizens because of the project. Great West Engineering will also present its assessment of the project's environmental impact. A copy of the PER is available at City Hall. During the public hearing, residents may ask questions and express their opinions regarding the project and its potential impact on the City of White Sulphur Springs residents.

Residents can submit comments and questions about the project at any time at wss@itstriangle.com or P.O. Box 442, White Sulphur Springs, MT 59645. You may also contact Great West Engineering's Project Manager, Jessica Salo, PE, at (406) 422-1288 or jsalo@greatwesteng.com.

See What's *Possible.*

www.greatwesteng.com

City of White Sulphur Springs

Water System Improvements Preliminary Engineering Report – Public Meeting

March 21, 2022

Jessica Salo, PE

1

WHY ARE WE HERE

- Identified water system needs
- Discuss Preliminary Engineering Report (PER)
  - **Discuss Environmental Assessment (EA)**
  - **Public comment**

2

PRELIMINARY ENGINEERING REPORT

» **Evaluate Existing Conditions**
Problem Definition
Alternative Solutions

» **Establish Estimated Costs**
Cost Estimates
Funding Scenarios

» **Solicit Public Comment**
Public Hearing

» **Required by Funding Agencies**
Technical Analysis
Environmental Assessment
Grant Applications

GreatWest

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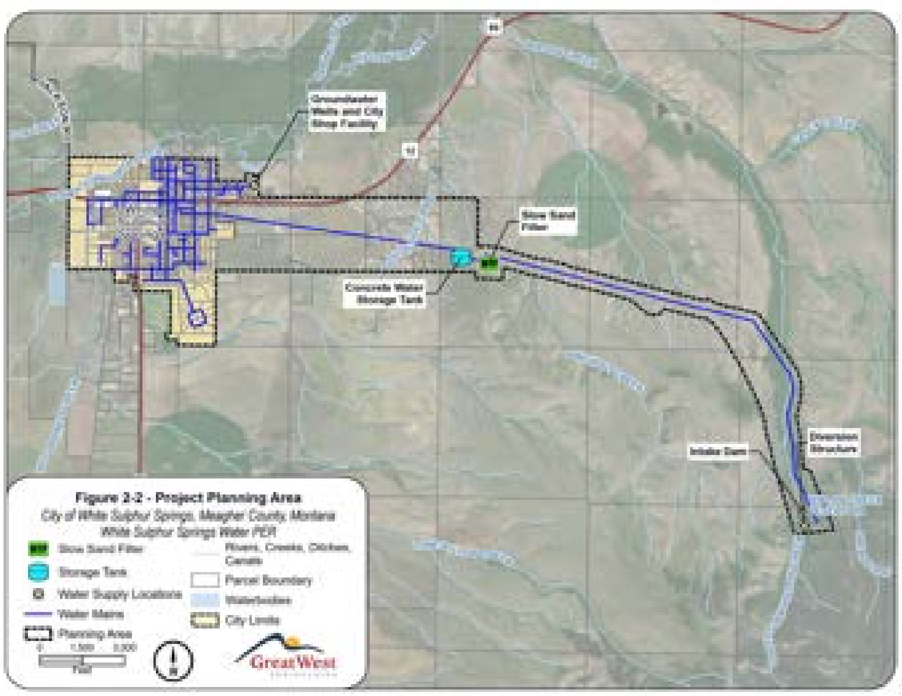
PLANNING AREA



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POPULATION

Current Population

- 2020 Census population is 955

2045 Design Population Estimate

- 1% annual growth projection
- 1,225 estimated design year population

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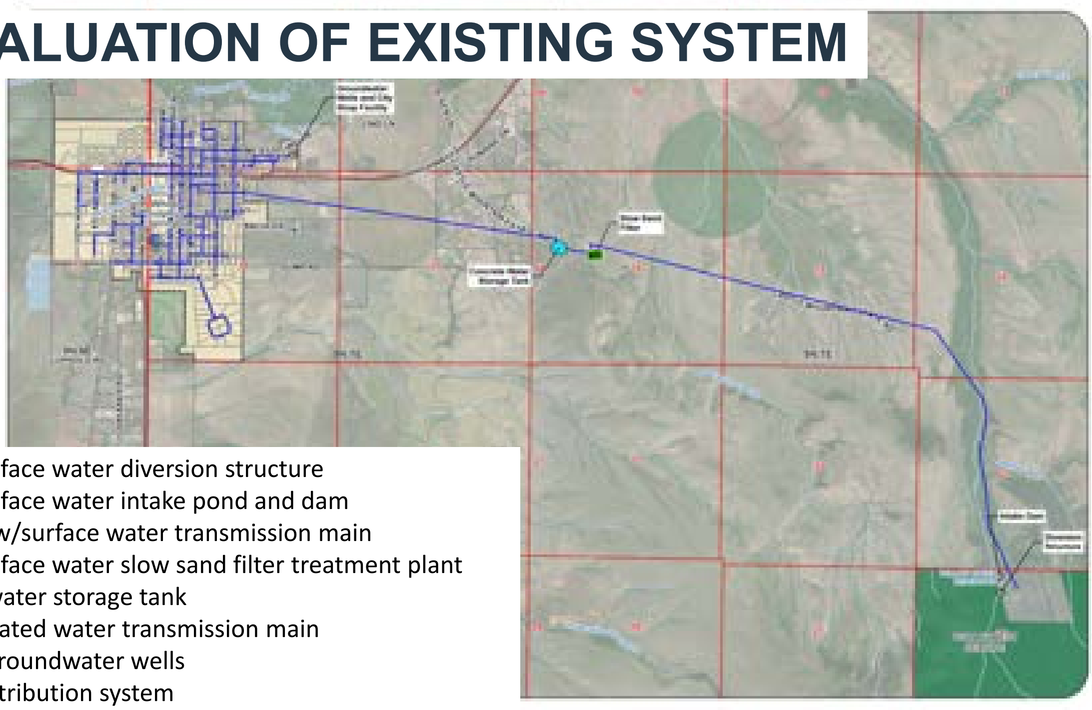
EVALUATION OF EXISTING SYSTEM



- Surface water diversion structure
- Surface water intake pond and dam
- Raw/surface water transmission main
- Surface water slow sand filter treatment plant
- 1 water storage tank
- Treated water transmission main
- 2 groundwater wells
- Distribution system

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WATER USE EVALUATION

- Water use can be evaluated two ways:
  1. Based on source data
  2. Based on metered data
- Source Data

  Average Day Use = 242,537 gallons per day
  Average Gallons per Capita Per Day = 254 gpcd
- Meter Data

  Average Day Use = 120,487 gallons per day
  Average Gallons per Capita Per Day = 126 gpcd
- Unaccounted for Water

  122,000 gallons per day or 50% of the water pumped into the system is lost
  Anything over 15% is considered excessive
  30% of the water system is old cast iron, steel, or ductile iron

Water Loss Evaluation

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WATER USE EVALUATION

Water Demands (based on current source data)

Year	Estimated Population	Average Day Use (gpd)	Maximum Day Use (gpd)	Annual Acre-Feet
2020	955	242,537	727,610	272
2045	1,225	311,037	933,110	348

Water Demands (with assumed reduced leakage)

Year	Estimated Population	Average Day Use (gpd)	Maximum Day Use (gpd)	Annual Acre-Feet
2020	955	143,250	429,750	160
2045	1,225	183,708	551,125	206

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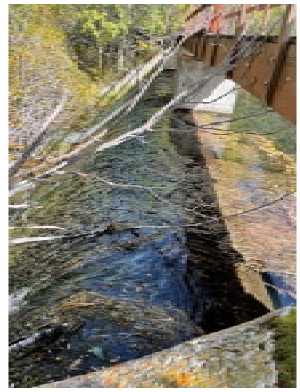
WATER SUPPLY



- Surface water source is the South Fork of Willow Creek
- Diversion structure and dam provide water to a 6-inch PVC transmission main that flows by gravity to the slow sand filter building
- After treatment water flows to the storage tank where it is chlorinated before entering the distribution system

- Groundwater supply source are two groundwater wells located close together at the City shop facility
- Wells are pumps directly in the distribution system, feeding the user demands and filling the storage tank
- No treatment other than disinfection with chlorine

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WATER SUPPLY – DIVERSION STRUCTURE

- Diversion structure on the South Fork of Willow Creek
- Diverts flow to the water system
- 1940s construction
- Two concrete channels, one for the diverted flow and one for the mainstream flow
- A bar screen and slide gate on the diversion channel. The slide gate is used to isolate the City's water system from Willow Creek.

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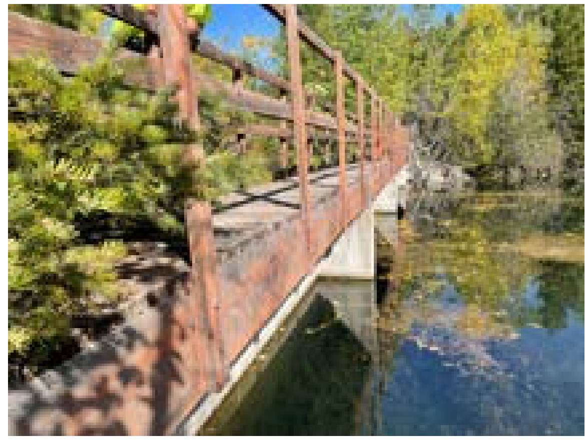
WATER SUPPLY – INTAKE POND AND DAM

Intake pond and dam on Willow Creek Reservoir:

- Concrete dam with spillway, flushing valve, and wooden catwalk.
- Flushing valve is used to drain the pond and flush sediment
- Staff must walk on catwalk to operate valve
- Dam structure is 1940s era
- Engineered sand filter with perforated pipes was added in the 1990s underneath the pond
- Pipes collect water, manifold together, and supply water to the transmission main.



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WATER SUPPLY – GROUNDWATER WELLS

Groundwater Wells

- City uses groundwater when Willow Creek source is not in use or as a supplement source to Willow Creek
- Well house at City shop yard

Well Name	GWIC ID	Well Completion Date	Total Depth (ft.)	Static Water Level (ft.)	Test Pumping Rate (gpm)(1)	Actual Pumping Rate (gpm)(2)
Well #1	260672	1986	200	19	200	350
Well #2	172711	1999	201	22	1,000	534

(1)Based on original well logs
(2)Based on operator knowledge

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WATER SUPPLY ASSESSMENT

- The diversion structure is in good condition
- Concrete dam is in good condition but the catwalk is deteriorated
- Flushing valve is not functional
- Pond is filled with silt, aquatic plants and deadfall
- Buildup of sediment is affecting quality of water
- Willow Creek source has not been used reliably for the past two to three years
- Transmission main from intake to the treatment plant was last upgraded in the 1980s and there are no known issues.
- Access to diversion/intake is difficult
- Coordination with Forest Service is important to manage deadfall
- Groundwater well meters not in the correct place to meter both wells
- City needs both water sources in order to meet demands
- Water quantity could become an issue within the planning period if no improvements are made or if leakage is not reduced.
- Finished water quality is good and the City routinely meets drinking water standards.

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WATER TREATMENT

- A slow sand filtration facility treats the water diverted from Willow Creek
- Constructed in 2004
- Includes four filter compartments
- Current practice includes raking the sand after spring runoff
- Plant can treat around 120 to 140 gpm when the turbidity is 0.6 NTU or lower
- Finished water is collected at the bottom of the filters via an underdrain system before going to the storage tank
- System is 100% gravity
- Groundwater wells are disinfected with gaseous chorine

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TREATMENT ASSESSMENT

- Facility is relatively new and in excellent condition
- The City's slow sand filters are not performing at the level that slow sand filters are typically designed to operate
- Should be able to treat water with a turbidity of 10-20 NTU
- Causes may be due to clays and algae in the water, wrong size of filter sand, ineffective cleaning procedures, or a combination of these factors.
- Another issue is there is no way to measure raw turbidity when the plant is not in use, making it difficult to know when the plant can be put into service
- No issues with groundwater disinfection system.

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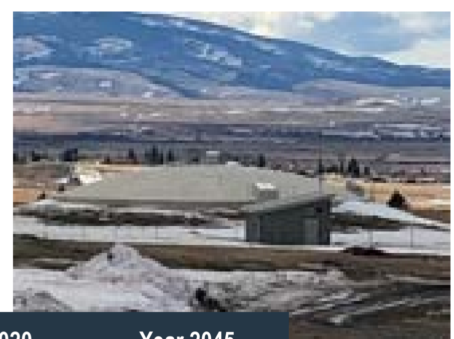
STORAGE



A 560,000-gallon storage tank was constructed in 2012 and is located approximately 2 miles southeast of the City.

- Partially buried prestressed concrete storage tank
- 80-foot diameter, 15 feet high.
- Good condition

Storage Need	Year 2020 Demand (gallons)	Year 2045 Demand (gallons)
Operational (average daily demand)	243,000	311,000
Emergency	0	0
Fire Suppression (2,500 gpm for 2 hours)	300,000	300,000
Total Required	**543,000**	**611,000**
Storage Surplus (+) or Deficit (-)[1]	**+17,000**	**-51,000**

[1]Based on existing storage capacity of 560,000 gallons.

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STORAGE ASSESSMENT

- Storage capacity is adequate for existing demands but starts to fall short when looking at projected demands
  - If leakage can be reduced, storage volume will be adequate
- Tank was recently constructed in 2012
- In excellent condition
- Buried concrete tanks can have high design life on the order of 100 years
- No improvements to storage needed at this time.

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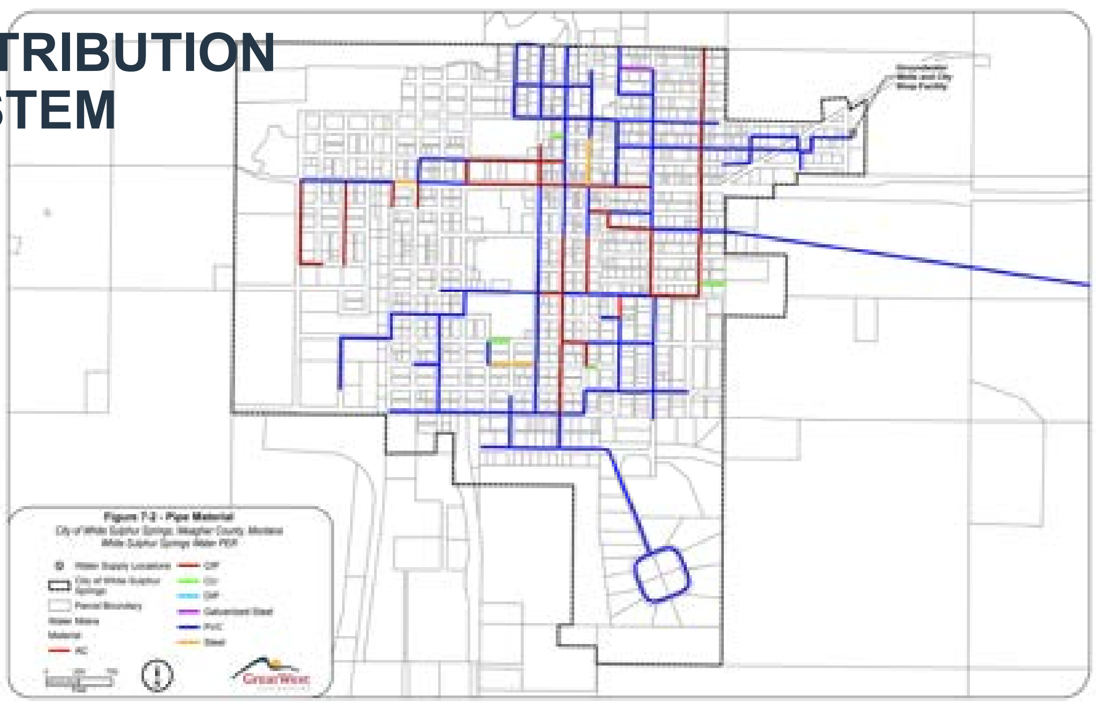
DISTRIBUTION SYSTEM



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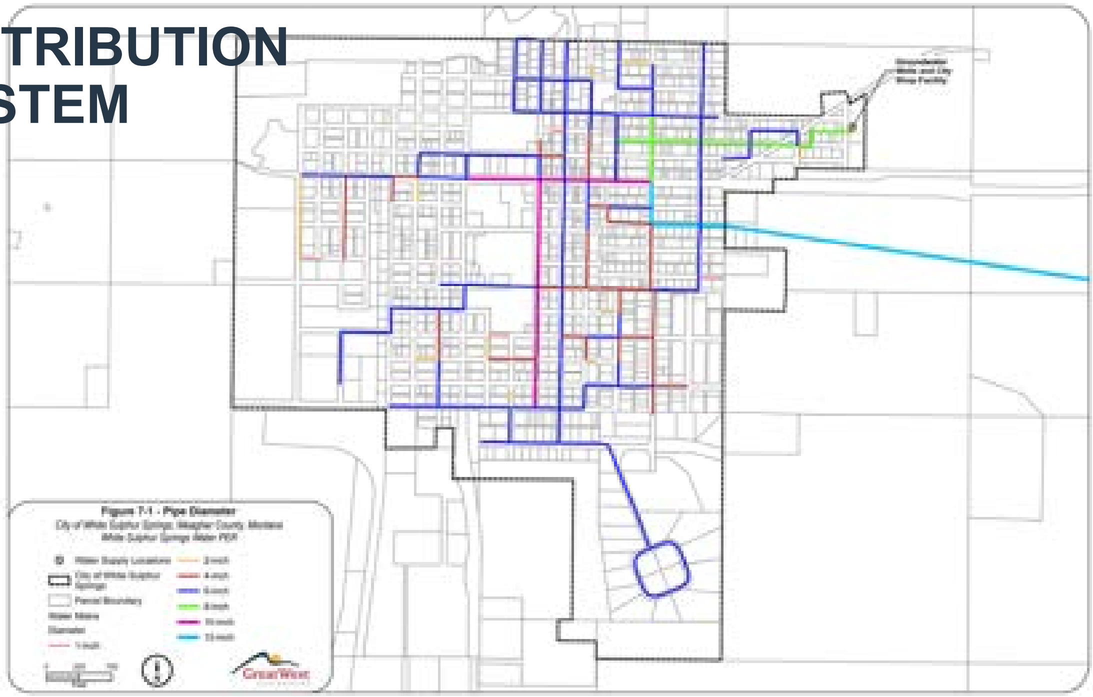
DISTRIBUTION SYSTEM



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TRANSMISSION MAIN

Line was originally constructed in the 1940s as steel.

A portion was replaced in 1986 with PVC and another portion in 2010 with PVC.

There is a remaining portion of the main that is still 1946 steel and is believed to be the biggest source of leakage in the system.

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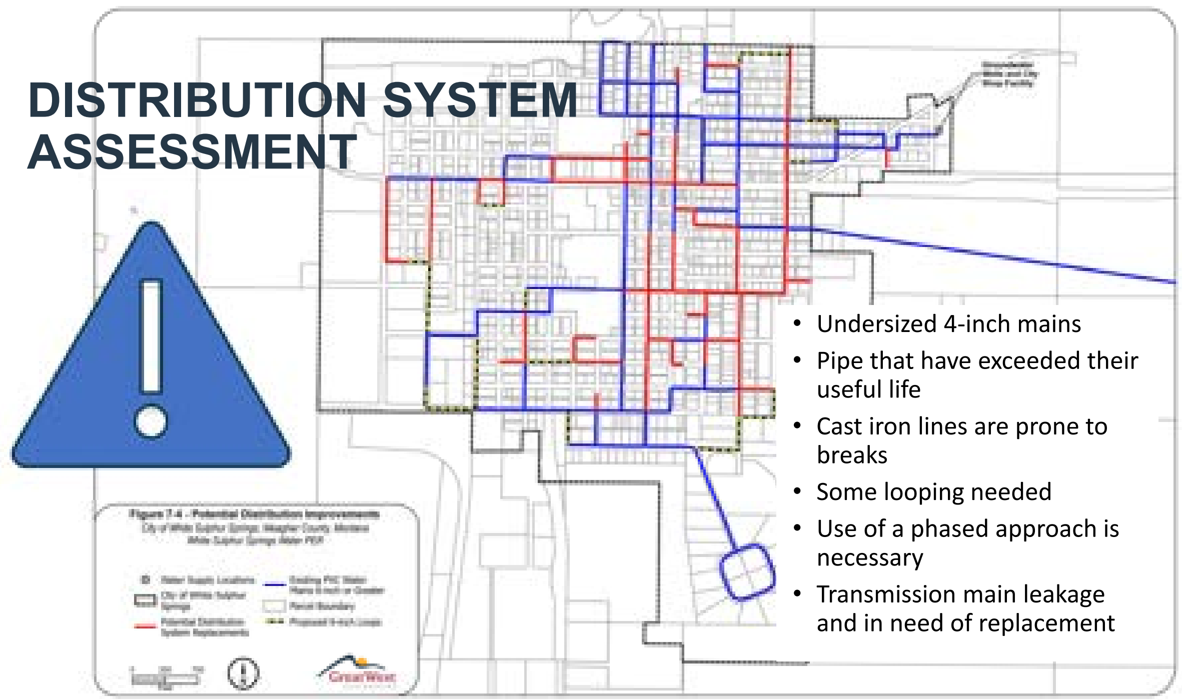
DISTRIBUTION SYSTEM ASSESSMENT



- Undersized 4-inch mains
- Pipe that have exceeded their useful life
- Cast iron lines are prone to breaks
- Some looping needed
- Use of a phased approach is necessary
- Transmission main leakage and in need of replacement

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ALTERNATIVES ANALYSIS

Supply Alternatives
Alt. S-1: No Action
Alt. S-2: Investigate Pond Intake
Alt. S-3: Pond Improvements
Alt. S-4: Pond Turbidity Meter
Alt. S-5: Well House Plumbing Modifications
Alt. S-6: Well Rehabilitation Project
Alt. S-7: Purchase Backup Pump/Motor

Treatment Alternatives
Alt. T-1: No Action
Alt. T-2: Reduce Algae and Turbidity Loads on WTP (See Alternative S3)
Alt. T-3: Relace Filter Media
Alt. T-4a:Implement Scraping Technique
Alt. T-4b:Imprlement Harrowing Technique
Alt. T-5: Install Combined Filter Effluent Turbidimeter
Alt. T-6: Install Two New Slow Sand Filters

Storage Alternatives
No Alternatives for Storage

Distribution System Alternatives
Alt. D-1: No Action
Alt. D-2: Replace 12-inch Transmission Main
Alt. D-3: Water Main Distribution Replacements
Alt. D-4: Water Main Looping

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PREFERRED ALTERNATIVE

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
OPINION OF PROBABLE COST City of White Sulphur Springs, Montana Alternative D2: Replace 12-inch Transmission Main					
1	12-inch PVC Water Main	4,000	LF	$ 125.00	$ 500,000
2	12-inch Gate Valve	5	EA	$ 8,000.00	$ 40,000
3	12-inch Fittings	5	EA	$ 4,500.00	$ 22,500
4	HDPE Bore for Canal Crossing	150	LF	$ 250.00	$ 37,500
5	Gravel Surface Restoration	4,000	LF	$ 25.00	$ 100,000
6	Seed and Fertilize	1	LS	$ 8,000.00	$ 8,000
	Direct Construction Subtotal				**$ 708,000**
	Mobilization	10%			$ 71,000
	Traffic Control	1%			$ 7,000
	Construction Subtotal				**$ 786,000**
	2024 Construction Cost [2]	8.0%			$ 849,000
	Contingency	20%			$ 170,000
	Permitting				$ 5,000
	Land Acquisition				$ 2,500
	Geotechnical Investigation				$ 10,000
	Engineering Design	10%			$ 101,900
	Engineering Construction	10%			$ 101,900
	Grant Admin, Legal, & Administrative				$ 85,000
	TOTAL [3]				**$ 1,325,300**

Construction Cost = $1.3 Million

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FUNDING SCENARIOS

ITEM	SCENARIO #3 ARPA MAG, SRF Loan (20-yrs, 2.5%) w/ SRF Forgiveness	SCENARIO #4 ARPA MAG, DNRC, MCEP, SRF Loan (30-yrs, 2.5%) w/ SRF Forgiveness
FUNDING OPTIONS FOR WHITE SULPHUR SPRINGS - Based on 622 EDUs WATER SYSTEM IMPROVEMENTS		
Alternative D2: Replace 12-inch Transmission Main	$1,325,300	$1,325,300
Rounded Total	**$1,325,300**	**$1,325,300**
ARPA MAG (City & County Combined)	$306,708	$306,708
CDBG Grant		
DNRC Grant		$125,000
MCEP Grant		$500,000
RD Grant or SRF Loan Forgiveness	$750,000	$295,194
RD or SRF Loan	$268,592	$98,398
Total Project Funds	**$1,325,300**	**$1,325,300**
SRF Bond Reserve (1/2 year payment)	$8,608	$2,352
RD - Interim Interest (loans > $500,000, check rate w/ RD Staff)		
Total Loan Amount	**$277,200**	**$100,750**
Annual Loan Payment	$17,770	$4,820
Total Loan Payments Over Life of Loan	$355,400	$144,600
Total Interest Paid Over Life of Loan	**$78,200**	**$43,850**
Annual Loan Coverage	$1,777	$482
TOTAL ANNUAL CAPITAL DEBT SERVICE COST	**$19,547**	**$5,302**
User Capital Cost/Month (1)	***$2.62***	***$0.71***
Current Annual O&M(2)	$250,000	$250,000
Current Annual Debt Service(3)	$132,058	$132,058
Additional O&M Due To Project	$0	$0
TOTAL ANNUAL O&M COSTS	**$382,058**	**$382,058**
User O&M Cost/Month (1)	***$51.22***	***$51.22***
USER COST/MONTH(1)	**$53.84**	**$51.93**
Existing Average User Cost/Month/EDU	$48.86	$48.86
COST/MONTH INCREASE/EDU	**$4.98**	**$3.07**
Existing Other System Cost/Month	$42.00	$42.00
Total Proposed Water & Sewer Cost/Month	$95.84	$93.93
Combined Systems Target Rate(4)	$79.46	$79.46
PERCENT OF COMBINED TARGET RATE	**120.6%**	**118.2%**

(1)Based on 622 EDUs

(2)Based on brief analysis of last three years actual expenditures - subject to change after more thorough analysis.

(3)Based on highest calculated coverage calculation - SRF Debt Service Schedule on Current Drinking Water Loans

(4)https://comdev.mt.gov/Resources/Target-Rate

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ENVIRONMENTAL ASSESSMENT

Factors Considered:
- Land Cover
- Land Management
- Soils and Farmland Classification
- Biological Resources
- Water Resources
- Floodplains
- Wetlands
- Cultural and Historical Resources
- Socio-economic and Environmental Justice Issues
- Hazardous Materials

Public document analyzing complexity and seriousness of environmental issues

Local, State, and Federal agencies were contacted

Public comment accepted

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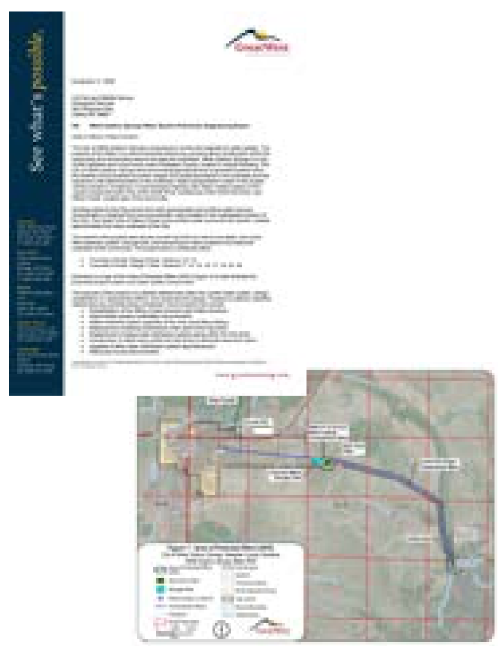
ENVIRONMENTAL ASSESSMENT

Comments received from:

- US Fish and Wildlife Service
- Montana Historical Society
  - Diversion/Intake may need to be recorded prior to rehabilitation
- Montana Land Reliance
- DNRC Water Resources
- Meagher County
- Helena-Lewis & Clark National Forest
- Montana Fish, Wildlife and Parks
  - Westslope Cutthroat Trout considerations

Decision:

- No significant impacts have been identified.



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WHERE DO WE GO FROM HERE

Finalize PER/Prepare SRF Application	March/April 2023
Finalize Funding/Contract for Design	May/June 2023
Easement Negotiations/Design	July 2023
Bidding	January 2024
Construction	Spring 2025

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See What's *Possible.*

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QUESTIONS

Water/Wastewater ▪ Transportation ▪ Grant Services ▪ Solid Waste ▪ Structural ▪ Bridges ▪ Natural Resources ▪ Planning

BILLINGS
6780 Trade Center Avenue
Billings, MT 59101
Phone (406) 652-5000

BOISE
3050 N. Lakeharbor Lane,
Suite 201
Boise, ID 83703
Phone (208) 576-6646

GREAT FALLS
702 2nd Street South #2
Great Falls, MT 59405
Phone (406) 952-1109

HELENA
2501 Belt View Drive
Helena, MT 59604
Phone (406) 449-8627
Fax (406) 449-8631

SPOKANE
9221 N. Division St.,
Suite F
Spokane, WA 99218
Phone (509) 413-1430

GreatWest ENGINEERING

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City of White Sulphur Springs

The Public Hearing of the City Council was held on March 21, 2023 at 5:30 pm followed afterwards with the Regular Session. Mayor Rick Nelson called the meeting to order with the following members present:

Ron Coleman
Pattie Berg
Rick Ellison

March 21, 2023 @ 5:30 pm

PUBLIC HEARING
A. City's Water Preliminary Engineering Report (PER) Update.
Discussion:
White Sulphur Springs and Great West Engineering representatives will explain the project's purpose, the project area, the scope of work, the budget, possible funding sources, and any costs that may result for local citizens because of the project. Great West Engineering will also present its assessment of the project's environmental impact. Also funding options, including the Montana Department of Commerce, Montana Department of Natural Resources and Conservation, USDA Rural Development, or the Department of Environmental Quality's Drinking Water State Revolving Fund Program.
Public Comment.

Jessica Salo discussed the City's Water System Improvements Preliminary Engineering Report (PER). A PER is a required component of funding applications when a community applies for state funding to assist with infrastructure improvement projects. The PER includes an evaluation of existing conditions, identifies problems or deficiencies, develops potential alternatives to address the issues, estimates costs, and ultimately provides a preferred project and associated funding scenario. Public involvement is also conducted as part of the process. The PER provides the technical analysis and justification for the proposed project. Environmental implications are also evaluated.

The 2020 Census population is 955.
The 2045 Design Population Estimate:
1% annual growth projection
1,225 estimated design year population

Evaluation of Existing System
surface water diversion structure
surface water intake pond and dam
raw/surface water transmission main
surface water slow sand filter treatment plant
1 water storage tank
treated water transmission main
2 groundwater wells
distribution system

Water Use can be evaluated two ways, based on source date and metered data. The source data was 242,537 gallons per day and the meter data was 120,487 gallons per day. The unaccounted water was 122,000 gallons per day or 50% of the water pumped into the system is lost (anything over 15% is considered excessive). 30% of the City's Water System is old cast iron, steel, or ductile iron.

Water Supply:

surface water source is the South Fork of Willow Creek
diversion structure and dam provide water to a 6-inch
pvc transmission main that flows by gravity to the slow sand filter building
after treatment water flows to the storage tank where it is chlorinated before entering the distribution system
groundwater supply source are two groundwater wells located close together at the City shop facility
wells are pumps directly in the distribution system, feeding the user demands and filling the storage tank
no treatment other than disinfection with chlorine

Water Supply – Diversion Structure:

diversion structure on the South Fork of Willow Creek
diverts flow to the water system
1940s construction
two concrete channels, one for the diverted flow and one for the mainstream flow
a bar screen and slide gate on the diversion channel.
the slide gate is used to isolate the City's water system from Willow Creek.

Water Supply – Intake Pond and Dam:

intake pond and dam on willow Creek Reservoir
concrete dam with spillway, flushing valve, and wooden catwalk.
flushing valve is used to drain the pond and flush sediment
staff must walk on catwalk to operate valve
dam structure is 1940s era
engineered sand filter with perforated pipes was added in the 1990s underneath the pond
pipes collect water, manifold together, and supply water to the transmission main

Water Supply – Groundwater Wells: Well #1 (1986) and Well #2 (1999)

City uses groundwater when Willow Creek source is not in use or as a supplement source to Willow Creek
well house at City Shop Yard

Water Supply Assessment:

the diversion structure is in good condition
concrete dam is in good condition but the catwalk is deteriorated
flushing valve is not functional
pond is filled with silt, aquatic plants and deadfall
buildup of sediment is affecting quality of water
Willow Creek source has not been used reliably for the past two to three years
transmission main from intake to the treatment plant was last upgraded in the 1980s and there are no known issues.
access to diversion/intake is difficult
coordination with Forest Service is important to manage deadfall
groundwater well meters not in the correct place to meter both wells
City needs both water sources in order to meet demands
water quantity could become an issue within the planning period if no improvements are made or if leakage is not reduced.
finished water quality is good and the City routinely meets drinking water standards.

Water Treatment:

a slow sand filtration facility treats the water diverted from Willow Creek
constructed in 2004
includes four filter compartments
current practice includes rakinq the sand after spring runoff
plant can treat around 120 to 140 gpm when the turbidity is 0.6 NTU or lower
finished water is collected at the bottom of the filters via an underdrain svstem before going to the storage tank
system is 100% gravity
groundwater wells are disinfected with gaseous chlorine

Treatment Assessment:

facility is relatively new and in excellent condition
the City's slow sand filters are not performing at the level that slow sand filters are typically designed to operate
should be able to treat water with a turbidity of 10-20 NTU
causes may be due to clays and algae in the water, wrong size of filter sand, ineffective cleaning procedures, or a combination of these factors.
another issue is there is no way to measure raw turbidity when the plant is not in use, making it difficult to know when the plant can be put into service
no issues with groundwater disinfection system.

Storage:

a 560,000 gallon storage tank was constructed in 2012 and is located approximately 2 miles SE of the City.
partially buried prestressed concrete storage tank
80-foot diameter,15 feet high
good condition

Storage Assessment

storage capacity is adequate for existing demands but starts to fall short when looking at projected demands
if leakage can be reduced, storage volume will be adequate
tank was recently constructed in 2012
in excellent condition
buried concrete tanks can have high design life on the order of 100 years
no improvements to storage needed at this time

Transmission Main

line was originally constructed in the 1940s as steel
a portion was replaced in 1986 with PVC and another portion in 2010 with PVC
there is a remaining portion of the main that is still 1946 steel and is believed to be the biggest source of leakage in the system

Distribution System Assessment

undersized 4-inch mains (should be at least 6-inch water mains to provide adequate fire flow protection and serving fire hydrants)
pipe that have exceeded their useful life
cast iron lines are prone to breaks
some looping needed
use of a phased approach is necessary
transmission main leakage and in need of replacement

Alternative Analysis

Supply Alternatives

Alt. S-1: No Action
Alt. S-2: Investigate Pond Intake
Alt. S-3: Pond Improvements
Alt. S-4: Pond Turbidity Meter
Alt. S-5: Well House Plumbing Modifications
Alt. S-6: Well Rehabilitation Project
Alt. S-7: Purchase Backup Pump/Motor

Treatment Alternatives

Alt. T-1: No Action
Alt. T-2: Reduce Algae and Turbidity Loads on WTP (see alternative S3)
Alt. T-3: Replace Filter Media
Alt. T-4a: Implement Scaping Technique
Alt. T-4b: Implement Harrowing Technique
Alt. T-5: Install Combined Filter Effluent Turbidimeter
Alt. T-6: Install Two New Slow Sand Filters

Storage Alternatives
No Alternatives for Storage

Distribution System Alternatives
Alt. D-1: No Action
Alt. D-2: Replace 12-inch Transmission Main
Alt. D-3: Water Main Distribution Replacements
Alt. D-4: Water Main Looping

The Mayor, City Attorney, and Council discussed the Alternatives and Funding Scenarios. The 12-inch transmission line from the storage tank to the City limits has evolved over the years and sections have been replaced. The line was originally constructed in the 1940s as steel. A portion was replaced in 1988 with PVC and another portion in 2010 with PVC. There is a remaining portion of the main that is still 1946 steel and is believed to be the biggest source of leakage in the system. This line would be replaced by a 12-inch Transmission Main and realigned the main along the Castle Mountain Estate Road and along property lines in the adjoining subdivision. Easement negotiations will be required for the realignment. The Council discussed that the City would rebuild the torn up road and it would likely be left in much better condition that it is now. The Council discussed putting hydrants along the road to help with fire suppression.

If the City wanted to get started with the project before July 2025 the SRF Loan Program was the way to go, because the City really can't afford to wait on starting the project due to all of the leaks (122,000 treated water gallons per day) with the last replacement of water transmission main last section. The City currently qualifies as a disadvantaged community with the current Median Household Income (MHI) data that is being used. The MHI has gone up and when those new numbers go into effect, the City won't have the disadvantaged community status anymore. Disadvantaged community status is eligible for the 75% SRF forgiveness. A positive for going with Scenario #3 is that the City would not have to wait 2 years until DNRC/MCEP funding is available. SRF loans are relatively easy to obtain and could have the project ready to bid potentially by early next year.

The Mayor, City Attorney, Great West Engineering – Jessica Salo, and Council discussed the PER and they were in agreement that the preferred alternative would be:

OPINION OF PROBABLE COST City of White Sulphur Springs, Montana Alternative D2: Replace 12-inch Transmission Main					
#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	12-inch PVC Water Main	[illegible]	LF	$ [illegible]	$ [illegible]
2	12-inch Gate Valve	[illegible]	EA	$ [illegible]	$ [illegible]
3	12-inch Fittings	[illegible]	EA	$ [illegible]	$ [illegible]
4	[illegible]	[illegible]	LF	$ [illegible]	$ [illegible]
5	[illegible]	[illegible]	LF	$ [illegible]	$ [illegible]
6	[illegible]	[illegible]	[illegible]	$ [illegible]	$ [illegible]
	Direct Construction Subtotal				$ [illegible]
	Mobilization	[illegible]			$ [illegible]
	Traffic Control	[illegible]			$ [illegible]
	Construction Subtotal				$ [illegible]
	[illegible] Construction Cost [1]	[illegible]			$ [illegible]
	Contingency	20%			$ [illegible]
	Permitting				$ [illegible]
	Land Acquisition				$ [illegible]
	Geotechnical Investigation				$ [illegible]
	Engineering Design	10%			$ [illegible]
	Engineering Construction	10%			$ [illegible]
	Grant Admin, Legal & Administrative				$ [illegible]
	TOTAL [1]				$ 1,325,300

With the Funding Scenario of: **Scenario #3**

FUNDING OPTIONS FOR WHITE SULPHUR SPRINGS - Based on 622 EDUs WATER SYSTEM IMPROVEMENTS		
ITEM	SCENARIO #3 ARPA MAG, SRF Loan (20-yrs, 2.5%) w/ SRF Forgiveness	SCENARIO #4 ARPA MAG, DNRC, MCEP, SRF Loan (30 yrs, 2.5%) w/ SRF Forgiveness
Alternative D2: Replace 12-inch Transmission Main	$1,325,300	$1,325,300
Rounded Total	**$1,325,300**	**$1,325,300**
ARPA MAG (City & County Combined)	$306,708	$306,708
CDBG Grant		
DNRC Grant		$125,000
MCEP Grant		$500,000
RD Grant or SRF Loan Forgiveness	$750,000	$296,194
RD or SRF Loan	[illegible]	$98,398
Total Project Funds	**$1,325,300**	**$1,325,300**
SRF Bond Reserve (1/2 year payment)	$8,608	$2,352
RD - Interim interest (loans > $500,000 - check rate w/ RD Staff)		
Total Loan Amount	$277,200	$100,750
Annual Loan Payment	$17,770	$4,820
Total Loan Payments Over Life of Loan	$355,400	$144,600
Total Interest Paid Over Life of Loan	$78,200	$43,850
Annual Loan Coverage	$1,777	$482
TOTAL ANNUAL CAPITAL DEBT SERVICE COST	$19,547	$5,302
User Capital Cost/Month (1)	*$2.62*	*$0.71*
Current Annual O&M (2)	$250,000	$250,000
Current Annual Debt Service (3)	$132,058	$132,058
Additional O&M Due To Project	$0	$0
TOTAL ANNUAL O&M COSTS	$382,058	$382,058
User O&M Cost/Month (1)	*$51.22*	*$51.22*
USER COST/MONTH (1)	**$53.84**	**$51.93**
Existing Average User Cost/Month/EDU	$48.86	$48.86
COST/MONTH INCREASE/EDU	**$4.98**	**$3.07**
Existing Other System Cost/Month	$42.00	$42.00
Total Proposed Water & Sewer Cost/Month	$95.84	$93.93
Combined Systems Target Rate (4)	$79.46	$79.46
PERCENT OF COMBINED TARGET RATE	**120.6%**	**118.2%**

(1) Based on 622 EDUs
(2) Based on brief analysis of last three years actual expenditures - subject to change after more thorough analysis
(3) Based on highest calculated coverage calculation - SRF Debt Service Schedule on Current Drinking Water Loans
(4) [illegible] Target Rate

The Environmental Assessment comments received from:

US Fish & Wildlife Service
Montana Historical Society (*diversion/intake may need to be recorded prior to rehabilitation*)
Montana Land Reliance
DNRC Water Sources
Meagher County
Helena-Lewis & Clark National Forest
Montana Fish, Wildlife and Parks (*Westslope Cutthroat Trout considerations*)

The Environmental Assessment decision was that no significant impacts have been identified.

The next steps would be to:
Finalize the PER and Prepare the SRF Application - March/April 2023
Finalize Funding and Contract for Design - May/June 2023
Easement Negotiations and Design - July 2023
Bidding - January 2024
Construction - Spring 2025

Motion/Vote to Close Public Hearing and Adjourn to Regular Business Meeting.
March 21, 2023 @ 6:15 pm

The Mayor asked if there was a motion to close the Public Hearing. Ron Coleman motioned to close the Public Hearing. Pattie Berg seconded the motion. Ron Coleman, Pattie Berg, and Rick Ellison all said Aye. Motion carried and passed.

A. Call Regular Meeting to Order

B. Roll Call

C. Pledge of Allegiance to Flag

D. Public Comment:

Public comment will be accepted on public matters not listed on this agenda and are within the jurisdiction of the City Council and having a significant interest to the public. During a regular session, there will be time after each agenda item for comment about that item.

1. Step up to the podium and state your name and address for the record.
2. Please limit your comments to THREE (3) minutes.

E. Unfinished Business - Items for Discussion and/or Action

1. **Phase 4 Water Transmission Project: Action on PER and Proposed Project with Funding – Jessica Salo/Craig Erickson from Great West and Council**

Discussion and/or Action
Continue discussion from Public Hearing and March 6, 2023 meeting as to Adopting PER and Proposed Phase 4 Project, together with decisions as to Funding, considering: 1) all regular system operation and maintenance expenses, 2) fund a reasonable system repair & replacement reserve account, and 3) cover 110% of all principal and interest payments due on outstanding bonds at our present rate structure; and whether our present categories adequately reflect equivalencies between dwellings and businesses and their corresponding impact on the system or require alteration.
Accept Public Comment
Motion to Adopt proposed PER together with Proposed Phase 4 Water Transmission Project, and funding alternative, OR Motion to continue discussion.

The Mayor asked if there was a motion to approve the presentation and move forward with the proposed alternative. Ron Coleman motioned to proceed with the PER as presented and proceed with the Distribution System - Alternative D2 (replace 12 - inch Transmission Main). Pattie Berg seconded the motion. Ron Coleman, Pattie Berg, and Rick Ellison all said Aye. Motion carried and passed.

2. Montana Department of Transportation – Ted Jones – Request a permanent through traffic street closure of 5th Ave SW between the streets of SW Hancock St and SW Garfield St.

Discussion and/or Action

Continued discussion regarding need for street closure requested by Montana Department of Transportation (MDT) as to their property located between SW Hancock and SW Garfield which straddles 5th Ave SW and their plans for development of this property.

Accept Public Comment

Possible Motion: Move to grant street closure (2 gates) and bring matter back for formal Resolution; or Move to continue matter for further discussion.

The City Attorney, Susan Wordal, said that the first place to begin is with the Petition to Abandon. Susan Wordal, Montana Department of Transportation, Ted Jones, and DOT Attorney, Bart LaMont have been working together to get the necessary documents for the discontinuance of 5th Avenue SW between Hancock and Garfield. The Mayor, City Attorney, Department of Transportation discussed the Petition to Abandon a Portion, Notice of Hearing on Abandonment Petition, Private Access and Utility Easement with Reversion Clause to public Use and Deed Restriction, and the Utility Easement. Susan Wordal said that there are two easements. One is a general agreement about access into the abandoned street for purposes of any City utility work. The City wants to maintain that easement for water/sewer/etc., which requires we be able to access the area under certain situations. The second one is a reversion document which allows for the abandoned street and the easement to revert back to the City in the event the MDOT should decide to shift their operation out of that location and sell the street after MDOT and its successors in interest leave that site, it will be much less of a challenge if we retain a reversionary interest.

MT DOT said that they would like to start and demolish the current building shop in May and build a new shop that sets a little farther back and is closer to the street. MT DOT will be presenting the Council with the formal petition documents in April.

3. Freedom Days LLC - Labor Day Rodeo Street Closure/Alcohol Waiver

Discussion and/or Action

Continued from March 6th: Presentation as to Freedom Day's Rodeo event and the street closure/alcohol waiver request for the 4th of September.

Accept Public Comment

Possible Motion: Move to approve Freedom Day's Rodeo's Open Container Waiver for September 3rd

The Mayor said that Freedom Days LLC is not here, so this will be at the next meeting in April.

F. Comments/Discussion

1. Future Business

2. Mayor's Comments—Rick Nelson

The Mayor, Marc Pryor, and Heather Harrington met with the County Commissioners at 3:30 pm to talk about the Spay & Neuter Clinic happening June 17th, and they have agreed to contribute up to $1,500, the cost of the clinic will be about $2,350 for two vet teams. Local Motels have donated rooms, and others have donated beverages. The Spay & Neuter Clinic will be on the next agenda for the Council's approval of paying the same amount part of costs. The Mayor said that he also reminded the Commissioners that it was the County's turn to host the Clean Up Day. This will also be on the next agenda to coordinate with the County and come up with a date for Clean Up Day. May 2-4 in Bozeman will be the Montana Municipal Institute for Elected Officials, Clerks, Treasurers, & Finance Officers. The Mayor said that Ron Coleman and himself will be attending. Pattie Berg will look at the draft agenda and her calendar and let the office know if she will be attending or not. Assistant Clerk, Heather Harrington, will be attending the Institute this year. Clerk-Treasurer, Michelle Stidham, will not be attending the Institute this time due to the Audit that is scheduled for May1-4 this year. The Mayor said that he will only be gone one of the days but would be there for the rest of Audit. The City Attorney, Susan Wordal, will be attending the Tillotson Service Program for Municipal Attorneys in Bozeman May 3-5, presented by Montana League of Cities and Towns and MMIA.

3. Council Comments/Discussion

a. President of the Council—Ron Coleman

Nothing. Hopefully Spring will be coming soon.

b. Council Member—Lee Blanchard

Not in attendance.

c. Council Member—Pattie Berg

Working with Great West Engineering on the Parks. Waiting on the electricity Rotary Shelter Building for the quote. The Mayor said that the quote was forwarded onto Jen Frazer and the quote came in at $2,500 plus up to 10% just in case needed.

Still would like to see Rocky Vinton's paperwork. The Mayor said that Rocky Vinton has it on his desk at the City Shop, but he is gone at Rural Water training in Great Falls this week. City Clerk-Treasurer registered and will be attending the Great Falls, Rural Water on March 22nd for the WASACT Funding Workshop 8:00-12:30 via live streaming.

d. Council Member—Rick Ellison

Via Zoom. Nothing to report, but it has been snowing and raining where he is at on his vacation.

G. Council Review of Financials

Received a copy Budget Expenditure/Revenue February 2023

H. Claims Signing/Motion to Approve the Bills

Will be included at the April 3rd meeting.

I. Motion/Vote to Adjourn the Meeting

The Mayor asked the Council if there is a motion to adjourn the meeting. Pattie Berg motioned to adjourn the meeting. Ron Coleman seconded the motion. All said Aye. Meeting adjourned at 6:35 pm.

Michelle Stidham

Michelle Stidham–Clerk-Treasurer

Mayor – Rick Nelson

Appendix L

MDEQ Sanitary Survey

January 17, 2023

City of White Sulphur Springs
Attn: Michelle Stidham
PO Box 442
White Sulphur Springs, MT 59645

Re: Sanitary Survey Inspection for the city of White Sulphur Springs (PWSID: MT0000360).

Dear system owners,
I would like to thank Jacob Gregory, Daryl Mesecher and staff for assisting my colleague, Josh Seekins and me during the sanitary survey inspection of the city of White Sulphur Springs. As a community public water supply system, your facility is required to have a sanitary survey inspection every three years. These regular inspections offer us an opportunity to look for sanitary deficiencies that have the potential to cause contamination in the water system, as well as pointing out operation and maintenance concerns. Below are a few comments relating to the sanitary survey conducted on November 29, 2022.

White Sulphur Springs is in Meagher County near the junction of Highway 12 and Highway 89. The town, located near the Smith River Canyon, was named after the white deposits that were formed by the hot springs that are in the city park. The town supports the local agricultural and recreation/tourism industries. The public water supply is classified as Community due to the nature of the population served.

<u>SOURCE(s):</u> WL003 (Well 1), WL004 (Well 2) – IN002 – Intake Willow Creek
The White Sulphur Springs wells are completed in deep fractured siltstone. Source water recharge to the White Sulphur Springs wells mostly likely results from water percolating into more permeable zones of area limestone or fractured bedrock along area faults. Based on this information, the siltstone aquifer that supplies water to the White Sulphur Springs PWS wells has a low sensitivity to potential contaminant sources. The wells are equipped with submersible pumps and are controlled by the levels of the storage tank.

(WL003) Well 1 1986 was rotary drilled in June of 1986 to a total depth of 200 ft. The well is cased the entire depth with steel casing and developed with a screen from 90 ft. to 200 ft. The casing was grouted to a depth of 88 ft. with cement. According to the well log static water level at the time of completion was 19 ft. The well log for the 1986 well is on record in the Groundwater Information Center database (GWIC) 260672.

(WL004) Well 2 1998 was rotary drilled in April of 1999 to a total depth of 201 ft. The well is cased the entire depth with steel casing and developed with perforations from 145 ft to 195 ft. The casing was grouted to a depth of 35 ft. with cement. According to the well log static water level at the time of completion was 22 ft. The well log can be found in GWIC with number 172711.

(IN002) Intake Willow Creek consists of a concrete dam with earthen sides in the channel of Willow Creek that was the original sand filter for the water supply. Previous reports indicate that approximately 314,000 gallons of water are held behind the dam allowing infiltration into collection pipes that gather water underneath the historic sand filter. It is unknown what exists for collection piping, but the operator stated a valve at the site controls the water to the approximately three mile pipeline to the sand filter treatment plant and storage tank. Recharge to

Willow Creek appears to be from precipitation entering directly into the creek or from runoff that eventually flows into the creek.

<u>TREATMENT:</u> TP002 & TP003

The public water supply uses ground water from well 1 (WL003) and well 2 (WL004) as the source for the community. The wells share a common header pipe with treatment plant **TP003** providing disinfection with gaseous chlorine.

The treatment plant (**TP002**) for Willow Creek SWTP consists of a sand filter. The treatment is shut down when turbidities exceed the slow sand filter capability of removal. The treatment plant was not used in 2022 for this reason.

Water is collected through piping submerged in the historic sand filter located behind the historic dam on Willow Creek. Willow Creek is a tributary of the Smith River that flows north from Castle Mountains south and east of White Sulphur Springs. Collected water flows through a transmission main of 6" or 8" piping to the treatment plant sand filter. Water enters the building in ductile iron pipe where the flow is split if desired and a perforated PVC header distributes the water across one or two sand filter chambers that interconnect with another two chambers allowing for isolation of chambers if needed. Finished water is then collected off the bottom of the sand filters via the underdrain system and four collection pipes, two per side where water then enters a concrete surge tank. The sand filter is desired due to its location providing pressure to the storage tank and system by elevation instead of pumping, and its operation is maximized under allowable turbidity requirements. Records, operation, maintenance, and overall management of the facility are well accomplished.

- Recommendations: The system needs to have a second portable chlorine analyzer for treatment and distribution operators. Disinfection requirement is to verify chlorine disinfection in the distribution system and verify on line monitoring equipment every 5 days.

<u>DISTRIBUTION:</u> DS001

Distribution system pressures are adequately maintained. Piping consists of the typical mixture of dissimilar pipe types including Ductile Iron, Cast Iron, and PVC. No AC pipe is known to exist, and all repairs are completed with C 900 PVC. It was noted that the operators are sorting through records for as-built drawings of the system; they have started a hydrant flushing program and are concerned with operating the system in compliance and with the best management practices. Water pressure in the distribution system is maintained by gravity flow.

<u>STORAGE:</u> ST002

ST002 storage reservoir rides the distribution system on a transmission main to town; it is approximately 2 miles to town. The site is secured with fencing and gates.

<u>PUMPS, PUMP FACILITIES and CONTROLS:</u>

The variable frequency drive (VFD) submersible pumps from the wells are controlled by levels of the storage tank. The VFD submersible pumps moderate distribution pressure during events that require the storage reservoir ST002 to be taken offline.

<u>MONITORING, REPORTING and DATA VERIFICATION:</u>

Monitoring and reporting were reviewed, and the system has 2 outstanding violations at the time of this inspection. VOC and arsenic samples need to be taken from TP002/EP502 as soon as possible to return those violations to compliance. The sand filter was not in operation at this time and reporting for surface water compliance was briefly discussed. The proper disinfection residuals were being monitored and reported regarding the wells and distribution system in use at the time of this inspection. Monitoring and reporting for the surface water treatment plant will be reviewed by the surface water treatment rule manager upon monthly submittal and discussed as needed.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION:

The operators demonstrated extensive knowledge of the system and cooperated with this inspection. Maintenance and management of the existing equipment is proactively accomplished, and the operators conduct daily inspections of the tank, sources, and distribution system.

Montana DEQ PWS is committed to offering technical, managerial, and financial capacity assistance to all public water supplies across the state. Michael Kropp (406-755-8971) is the new Capacity Development Coordinator for the state, and he will be working with technical assistance providers RATES, MAP, MRWS, and other DEQ staff to meet the demand for facility-based training opportunities. DEQ Operator Certification is working with Mr. Kropp to provide operators an opportunity to earn CECs for completing facility-based capacity development training with one of the approved trainers. Please contact Mr. Kropp or one of the other approved trainers for additional information.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:

This PWS and its operators are following DEQ’s operator certification requirements.

SIGNIFICANT DEFICIENCIES

No significant deficiencies were observed during this inspection. However, recommendations should be promptly addressed.

No changes have been made to Safe Drinking Water Information System (SDWIS) during this inspection.

Thank you very much for your time and for your dedication to protecting public health through proper management of your public water system. If you have any questions about this report or public water supply regulations, please give me a call at 406-444-5881.

Sincerely,

Gerard Gernand
Surface Water Treatment Inspector
Public Water and Subdivision bureau
Phone: 406-444-5881
Email: ggernand@mt.gov

White Sulphur Springs, PWS ID:MT0000360

Well Site for Wells 1 and 2


11/29/2022

11/29/2022

11/29/2022



WALLACE & TIERNAN
CAUTION
CHAIN CYLINDERS
05/09/2019


05/09/2019


05/09/2019





11/29/2022


CHLORINE
11/29/2022


11/29/2022


NOTICE

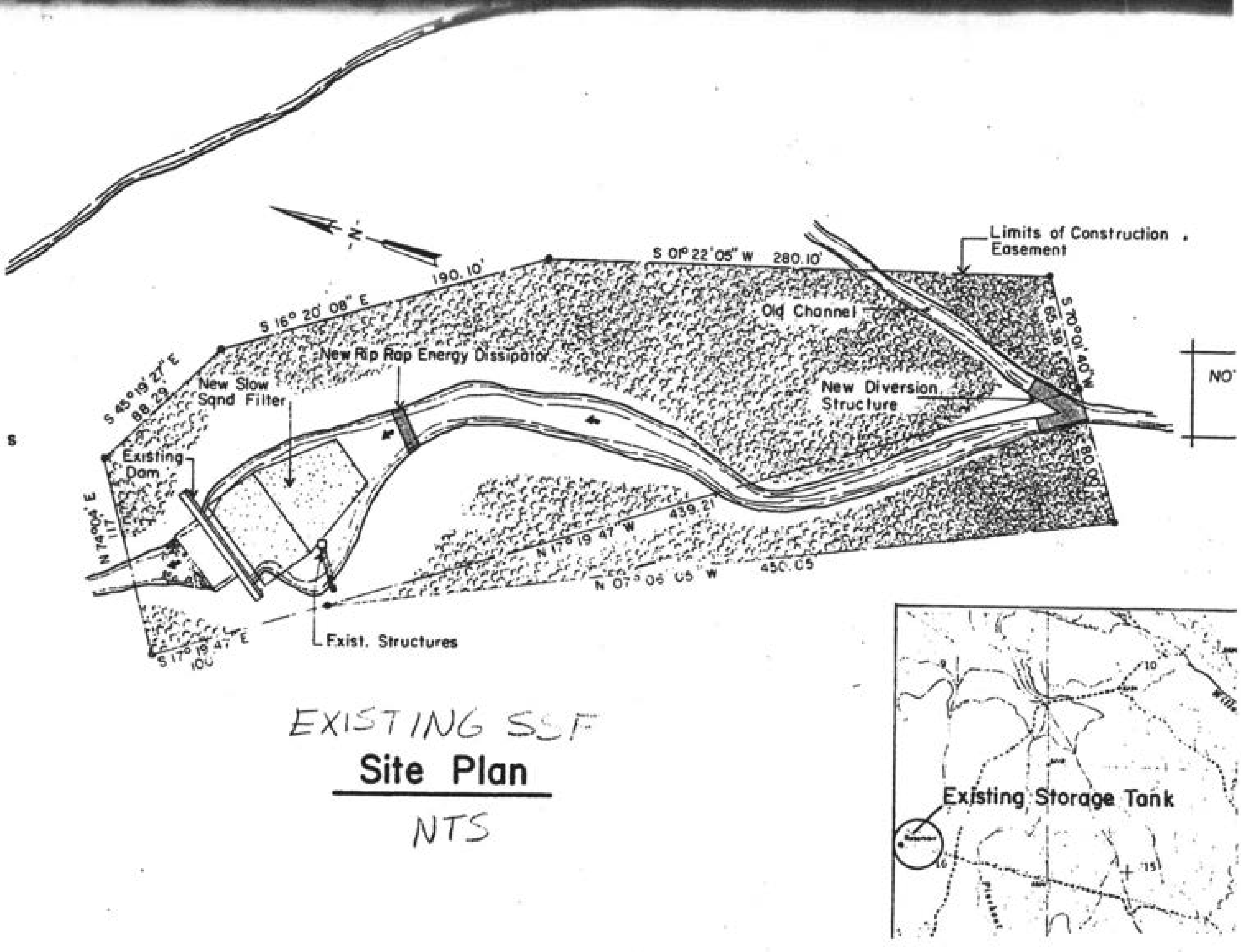

Able Wright, Inc.


11/29/2022


Breathing Apparatus

Appendix M

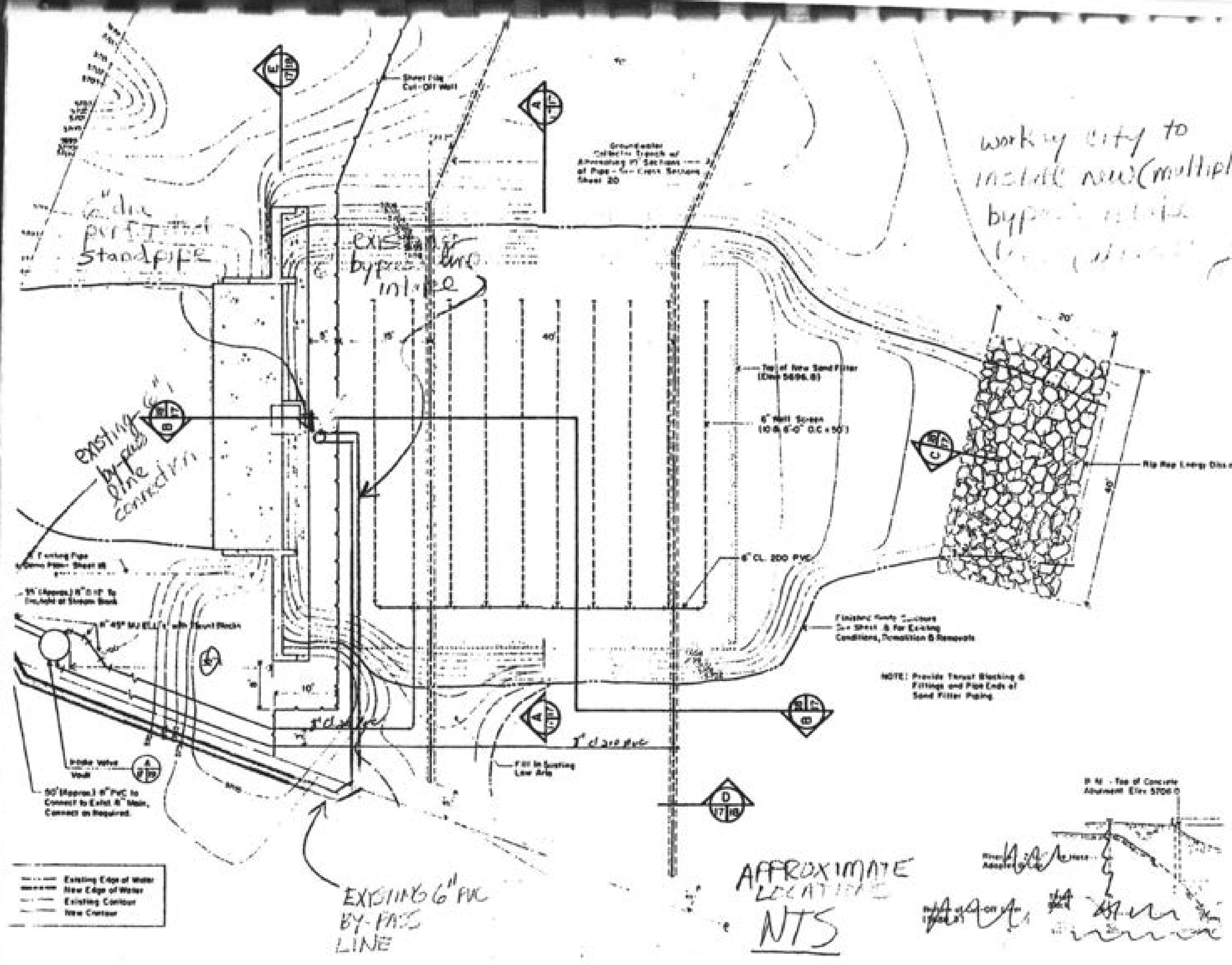
Willow Creek Reservoir Sand Filter Schematics



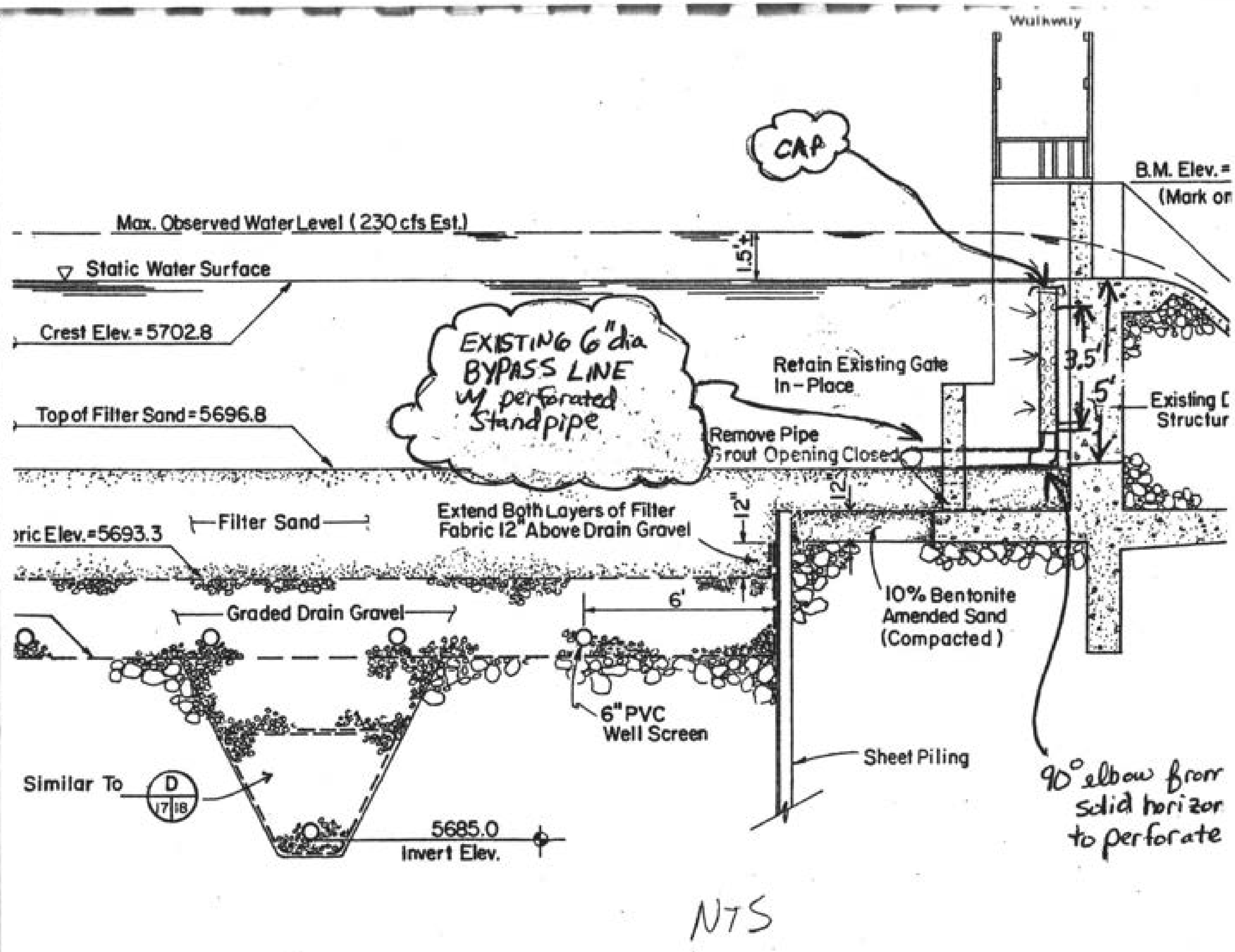
EXISTING SSF

Site Plan

NTS



Sheet Pile Cut-Off Wall
Groundwater Collector Trench w/ Alternating 10' Sections of Pipe - See Cross Sections Sheet 20
work w/ city to install new (multiple bypass
6" dia perforated standpipe
existing bypass line intake
15'
40'
20'
Top of New Sand Filter
6" Well Screen
existing bypass line connection
Rip Rap Energy Dissip.
6" CL. 200 PVC
Finished Grade Contours See Sheet 8 for Existing Conditions, Demolition & Removals
NOTE: Provide Thrust Blocking & Fittings and Pipe Ends of Sand Filter Piping.
10'
Intake Valve Vault
50' (Approx.) 8" PVC to Connect to Exist. 8" Main. Connect as Required.
Fill In Existing Low Area
D
Existing Edge of Water
New Edge of Water
Existing Contour
New Contour
EXISTING 6" PVC BY-PASS LINE
APPROXIMATE LOCATIONS
NTS



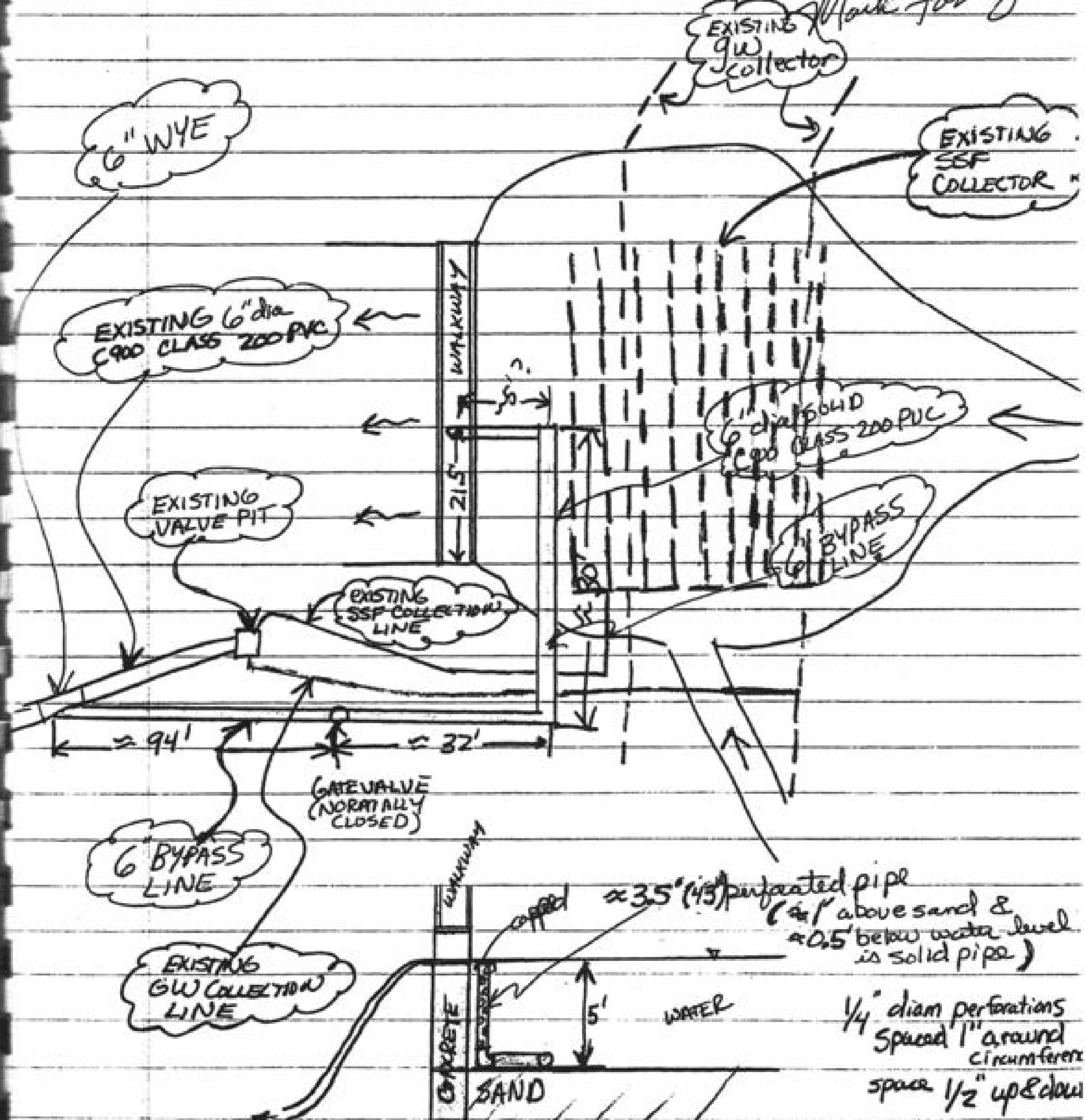
Walkway
CAP
B.M. Elev. =
(Mark or
Max. Observed Water Level (230 cfs Est.)
1.5'±
Static Water Surface
Crest Elev. = 5702.8
EXISTING 6" dia BYPASS LINE w/ perforated Standpipe
Retain Existing Gate In-Place
3.5'
.5'
Existing D Structur
Top of Filter Sand = 5696.8
Remove Pipe Grout Opening Closed
12"
12"
Extend Both Layers of Filter Fabric 12" Above Drain Gravel
Filter Sand
bric Elev. = 5693.3
10% Bentonite Amended Sand (Compacted)
6'
Graded Drain Gravel
6" PVC Well Screen
Sheet Piling
Similar To
D
17 18
5685.0
Invert Elev.
90° elbow from solid horizon to perforate
NTS

Sketch

7/1/02

SITE VISIT @ Willow Creek Reservoir
in White Sulphur Springs

Mark Fosting



Appendix N

Source and Metered Water Data

		Gallons PD	
1-26-19	12.04	165,000	2319.3
1-27-19		114,000	2328.8
1-28-19	12.49	213,000	2335.9
1-29-19	13.04	282,000	2345.3
1-30-19	12.37	201,000	2352.0
1-31-19	11.56	198,000	2358.6
2-1-19	13.12	282,000	2368.0
2-2-19	12.06	225,000	2375.5
2-3-19	12.95	261,000	2384.2
2-4-19	11.57	168,000	2389.8
2-5-19	13.09	321,000	2400.5
2-6	11.27	183,000	2406.6
2-7-19	13.80	306,000	2416.8
2-8-19	11.08	171,000	2422.5
2-9-19	11.78	318,000	2433.1
2-10-19	13.30	306,000	2443.3
2-11-19	13.18	195,000	2449.8
2-12-19	11.01	159,000	2455.1
2-13-19	13.87	303,000	2465.2
2-14-19	11.57	150,000	2470.2
2-15-19	12.25	222,000	2477.6
2-16-19	13.07	234,000	2485.4
2-17-18	11.42	144,000	2490.2
2-18-19	13.12	288,000	2499.8
2-19-19	13.15	189,000	2506.1
2-20-19	11.55	156,000	2511.3

U

		Gallon PD	
1-21-19	13.48	270,000	2520.3
1-22-19	12.43	177,000	2526.2
2-23-19	11.65	198,000	2532.8
2-24-19	13.62	270,000	2541.8
2-25-19	11.79	156,000	2547.0
2-26-19	13.16	279,000	2556.3
2-27-19	12.98	177,000	2562.2
2-28-19	11.35	156,000	2567.4
3-1-19	13.46	282,000	2576.5
3-2-19	12.29	180,000	2582.8
3-3-19	11.92	210,000	2589.5
3-4-19	13.10	261,000	2598.5
3-5-19	11.01	162,000	2603.9
3-6-19	13.50	315,000	2614.4
3-7-19	11.85	153,000	2619.5
3-8-19	12.70	252,000	2627.9
3-9-19	12.23	225,000	2635.4
3-10-19	11.83	207,000	2642.3
3-11-19	14.56	267,000	2651.2
3-12-19	7.42	12,000	2651.6
3-13-19	11.45	354,000	2663.4
3-14-19	13.44	312,000	2673.8
3-15-19	12.15	156,000	2679
3-16-19	12.57	321,000	2689.7
3-17-19	11.43	150,000	2694.7
3-18	12.05	222,000	2702.1
3-19	12.96	252,000	2710.5

		Gallons PD		
3-20-19	11.38	159,000	2715.8	
3-21-19	13.22	273,000	2724.9	
3-22-19	12.25	189,000	2731.2	
3-23-19	12.35	234,000	2739.0	
3-24-19	12.58	231,000	2746.7	
3-25-19	11.70	159,000	2752.0	
3-26-19	13.86	312,000	2762.4	
3-27-19	12.32	150,000	2767.4	
3-28-19	12.16	219,000	2774.7	
3-29-19	12.72	237,000	2782.6	
3-30-19	11.39	156,000	2787.8	
3-31-19	13.68	324,000	~~27~~ 2798.6	
4-1-19	11.57	159,000	2803.9	
4-2-19	13.70	306,000	2814.1	
4-3-19	11.68	165,000	2819.6	
4-4-19	12.20	222,000	2827.0	
4-5-19	12.75	243,000	2835.1	
4-6-19	11.19	168,000	2840.7	
4-7-19	13.64	300,000	2850.7	
4-8-19	11.27	159,000	2856.0	
4-9-19	11.45	240,000	2864.0	
4-10-19	12.70	198,000	2870.6	
4-11-19	12.25	165,000	2876.1	
4-12-19	12.46	231,000	2883.8	
4-13-19	~~13.~~ 9.21	84,000	2886.6	
4-14-19	10.19	321,000	2897.3	
4-15-19	14.80	504,000	2914.1	Scada Did not UPDaTe

		Gallons PD		
4-16-19	12.63	111,000	2917.8	
4-17-19	14.97	429,000	2932.1	Scada Did not UPDATE
4-18-19	12.83	99,000	2935.4	
4-19-19	12.80	183,000	2941.5	
4-20-19	13.12	174,000	2947.3	
4-21-19	12.90	213,000	2954.4	
4-22-19	13.04	180,000	2960.4	
4-23-19	13.38	189,000	2966.7	
4-24-19	13.81	195,000	2973.2	
4-25-19	13.69	162,000	2978.6	
4-26-19	12.18	144,000	2983.4	
4-27-19	13.66	288,000	2993.0	
4-28-19	12.44	93,000	2996.1	
4-29-19	12.63	195,000	3002.6	
~~4-30-19~~	~~12.55~~	~~189,000~~	~~3002~~	
4-30-19	12.80	189,000	3008.9	
5-1-19	12.94	189,000	3015.2	
5-2-19	13.18	183,000	3021.3	
5-3-19	13.13	192,000	3027.7	
5-4-19	13.48	192,000	3034.1	
5-5-19	13.52	192,000	3040.5	
5-6-19	13.11	195,000	3047.0	
5-7-19	13.35	189,000	3053.3	
5-8-19	13.46	189,000	3059.6	
5-9-19	13.19	189,000	3065.9	
5-10-19	13.39	189,000	3072.2	

		Gallons PD	
5-11-19	13.53	189,000	3078.5
5-12-19	13.12	183,000	3085
5-13-19	12.83	201,000	3091.7
5-14-19	12.31	195,000	3098.2
5-15-19	12.19	186,000	3104.7
5-16-19	12.03	207,000	3111.6
5-17-19	11.99	198,000	3118.2
5-18-19	13.25	297,000	3128.1
5-19-19	13.63	195,000	3134.6
5-20-19	12.34	93,000	3137.7
5-21-19	12.54	195,000	3144.2
5-22-19	12.60	186,000	3150.4
5-23-19	12.68	192,000	3156.8
5-24-19	12.3[illegible]	195,000	3163.3
5-25-19	12.95	252,000	3171.7
5-26-19	13.81	270,000	3180.7
5-27-19	11.62	132,000	3185.1
5-28-19	13.19	243,000	3193.2
5-29-19	11.92	156,000	3198.4
5-30-19	12.50	228,000	3206.0
5-31-19	13.11	255,000	3214.5
6-1-19	12.33	180,000	3220.5
6-2-19	12.17	282,000	3229.9
6-3-19	13.47	309,000	3240.2
6-4-19	12.86	231,000	3247.9

Total For This Page
7,554,000

6-5-19	12.24	282,000	3257.3
6-6-19	12.22		3268.1
6-7-19	11.89		3276.6
6-8-19	12.48		3285.2
6-9-19	13.90		3294.5
6-10-19	13.17		3302.3
6-11-19	12.26		3309.9
6-12-19	12.14		3319.2
6-13-19	12.31		3330.4
6-14-19	12.68		3342.1
6-15-19	13.29		3356.1
6-16-19	12.61		3363.7
6-17-19	12.85		3375.4
6-18-19	12.97		3387.5
6-19-19	12.28		3397.7
6-20-19	12.47		3408.9
6-21-19	12.34		3418.1
6-22-19	13.79		3431
6-23-19	12.74		3438.8
6-24-19	11.77		3445.7
6-25-19	11.95		3454
6-26-19	11.73		3464.5
6-27-19	12.62		3476.4
6-28-19	13.73		3488.2
6-29-19	13.69		3501.4
6-30-19	12.81		3509.1

Total usage This Page
7,947,000

7-1-19	13.93	3520.1
7-2-19	11.49	3528.0
7-3-19	13.38	3543.1
7-4-19	13.27	3552.3
7-5-19	12.89	3561.5
7-6-19	13.64	3572.7
7-7-19	12.96	3581.0
7-8-19	12.26	3588.8
7-9-19	~~[illegible]~~ 11.74	3597.2
7-10-19	11.71	3606.7
7-11-19	11.80	3616.7
7-12	12.76	3629.8
7-13	13.41	3640.7
7-14	13.84	3651.2
7-15	12.59	3658.2
~~7-16~~	~~12.56~~ 11.64	~~3658.3~~ 3666.0
7-17	12.30	3677.9
7-18	13.02	3686.8
7-19	11.14	3695.2
7-20	13.02	3710.3
7-21	12.85	3720.5
7-22	11.43	3730.4
7-23	11.61	3743.0
7-24	13.00	3760.1
7-25	11.47	3768.8
7-26	11.92	3785.0

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9159000

7-27	12.13	3800
7-28	12.58	3815.2
7-29	11.79	3827.0
7-30	11.94	3841.7
7-31	11.65	3854.2
		3869
8-1-19	11.58	3884.0
8-2-19	12.15	
8-3-19	13.78	3900.2
8-4-19	13.08	3911.8
8-5-19	11.87	3922.5
8-6-19	11.54	3935.3
8-7-19	11.58	3950.2
8-8-19	11.47	3962.7
8-9-19	11.58	3976.8
8-10-19	13.41	3991.2
8-11-19	13.47	4000.0
8-12-19	12.05	4007.3
8-13-19	11.88	4016.4
8-14-19	12.36	4027
8-15-19	12.08	4038.7
8-16-19	12.79	4051.2
8-17-19	13.53	4062.5
8-18-19	11.58	4068.4
8-19-19	12.13	4081.3
8-20-19	11.86	4091.7
8-21-19	12.05	4105.3

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7947000

8-22-19	11.69	4115.2
8-23-19	11.64	4126.3
8-24-19	12.67	4138.2
8-25-19	12.69	4148.6
8-26-19	12.14	4156.1
8-27-19	14.97	4179
8-28-19	12.16	4187.4
8-29-19	11.38	4198.7
8-30-19	12.68	4213.5
8-31-19	13.35	4225.3
9-1-19	13.02	4236.4
9-2-19	12.28	4246.4
9-3-19	11.57	4256.3
9-4-19	11.77	4271.0
9-5-19	11.81	4281.3
9-6-19	12.40	4296.5
9-7-19	11.72	4304.6
9-8-19	11.87	4314.5
9-9-19	12.93	4324.0
9-10-19	12.79	4333.6
9-11-19	13.07	4343.2
9-12-19	13.72	4353.1
9-13-19	13.67	4362
9-14-19	12.63	4370.2
9-15-19	13.09	4380.1

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2214000

9-16-19	11.87	4386.3
9-17-19	11.51	4391.4
9-18-19	11.64	4395.6
9-19-19	12.18	4399.3
9-20-19	12.37	4403.7
9-21-19	11.79	4405.9
9-22-19	11.65	4409.1
9-23-19	14.01	4414.8
9-24-19	11.77	4414.8
9-25-19	12.92	4418.2
9-26-19	11.80	4418.8
9-27-19	14.97	4427.6
9-28-19	13.85	4427.6
9-29-19	12.90	4427.6
9-30-19	12.15	4427.6
10-1-19	14.97	4438.2
10-2-19	14.14	4438.2
10-3-19	13.95	4438.2
10-4-19	13.86	4441.3
10-5-19	12.87	4441.3
10-6-19	11.84	4441.3
10-7-19	13.70	4444.5
10-8-19	13.28	4444.5
10-9-19	12.99	4448.2
10-10-19	11.79	4452.3
10-11-19	13.33	4460.1

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432,3000

10-12-19	12.23	108,000	4464.1
10-13-19	13.74	218,700	4472.2
10-14-19	12.29	105,300	4476.1
10-15-19	11.66	108,000	4480.1
10-16-19	13.23	213,300	4488.0
10-17-19	12.04	108,000	4492.0
10-18-19	13.74	202,500	4499.5
10-19-19	12.20	113,400	4503.7
10-20-19	12.59	159,300	4509.6
10-21-19	13.23		4515.7
10-22-19	12.55		4519.7
10-23	12.54		4525.4
10-24	13.07		4531.5
10-25	11.74		4535.3
10-26	13.16		4543.1
10-27	11.64		4547
10-28	13.57		4554.1
10-29	12.73		4555.3
10-30	11.79		4559.6
10-31	13.48		4567.4
11-1	11.54		4571.4
11-2	9.13		4575.5
11-3	11.72		4583.6
11-4	13.40		4591.5
11-5	11.62		4596.2
11-6	12.72		4603.9
11-7	11.57		4608.2

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179.4000
$

11-8	13.30	4616.0
11-9	11.63	4620.1
11-10	13.32	4628.0
11-11	13.21	4634.9
11-12	13.66	4640.2
11-13	12.34	4644.1
11-14	13.17	4651.0
11-15	12.51	4656.0
11-16	12.70	4662.2
11-17	12.71	4668
11-18	11.67	4672.4
11-19	14.12	4675.5
11-20	14.14	4675.5
11-21	14.11	4675.6
11-22	14.07	4675.6
11-23	13.98	4675.6
11-24	14.01	4675.6
11-25	13.72	4675.6
11-26	13.64	4675.6
11-27	13.61	4675.6
11-28	13.42	4675.6
11-29	13.38	4675.6
11-30	13.04	4675.6
12-1	12.85	4675.6
12-2	12.61	4675.6
12-3	12.73	4675.6
12-4	12.82	4675.8

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Gallons Sand Filter online

12-5-19	12.87	4675.8
12-6-19	12.69	4675.8
12-7-19	12.60	4675.8
12-8-19	12.7	4675.8
12-9-19	12.30	4675.8
12-10-19	12.38	4675.8
12-11-19	12.43	4675.8
12-12-19	12.53	4675.8
12-13-19	12.57	4675.8
12-14-19	12.62	4675.8
12-15-19	12.61	4675.8
12-16	12.36	4675.8
12-17	12.49	4675.8
12-18	12.46	4675.8
12-19	12.46	4675.8
12-20	12.50	4675.8
12-21	12.59	4675.8
12-22	12.52	4675.8
12-23	12.41	4675.8
12-24-19	12.41	4675.9
12-25-19	12.43	4675.9
12-26	12.50	4675.9
12-27	12.16	4675.8
12-28	11.68	4675.8
12-29	13.60	4675.8
12-30	13.39	4678.7
12-31	13.01	4678.7
		4678.7

Jan 2020

		well 1	well 2
1-1-2020	12.70	$	4678.7
1-2-2020	12.22		4678.7
1-3-20	12.15		4678.7
1-4	12.19		4678.7
1-5	11.79		4678.7
1-6	14.08		4681.5
1-7	14.16		4681.5
1-8	14.25		4681.5
1-9-20	13.85	37699.6	4685.4
1-10-20	13.66		4685.4
1-11-20	13.58		4685.4
1-12-20	13.48		4685.4
1-13-20	13.27		4685.4
1-14-20	13.29		4685.4
1-15-20	13.36		4685.4
1-16-20	13.25		4685.4
1-17-20	13.30		4685.4
1-18-20	13.38		4685.4
1-19-20	13.07		4685.4
1-20-20	12.97		4685.4
1-21-20	12.91		4685.4
1-22-20	12.95		4685.4
1-23-20	12.85		4685.4
1-24-20	12.90		4685.4
1-25-20	12.93		4685.4
1-26-20	12.52		4685.4
1-27-20	12.37		4685.4
1-2[illegible]-20	12.33		4685.4
1-2[illegible]-20	12.34		4685.4
1-30-20	12.11		4685.4
1-31-20	12.07		4685.4
2-1-20	11.97		4685.4
2-2-20	14.02		4688.2
2-3-20	13.74		4688.2
2-4-20	13.55		4688.2
2-5-20	13.71		4688.2
2-6-20	13.90		4688.2
2-7-20	13.86		4688.2
2-8-20	13.90		4688.2
2-9-20	13.74		4688.2
2-10-20	13.11		4688.2
2-11-20	12.95		4688.2
2-12-20	12.88		4688.2
2-13-20	13.02		4688.2
2-14	13.20		4688.2
2-15	13.48		4688.2
2-16	13.53		4688.2
2-17	13.54		4688.2
2-18-20	13.73		4688.2
2-19-20	13.93		4688.2
2-20-20	14.10		4688.2
2-21-20	14.27		4688.2
2-22-20	14.19		4688.2
2-23-20	13.92		4688.2

2-24	13.41	4688.2
2-25	13.19	4688.2
2-26	12.93	4688.2
2-27	12.84	4688.2
2-28	12.89	4688.2
2-29	12.96	4688.2
3-1-20	12.76	4688.2
3-2-20	12.80	4688.2
3-3-20	12.93	4688.2
3-4-20	13.17	4688.2
3-5-20	13.12	4688.2
3-6-20	13.16	4688.2
3-7-20	13.29	4688.2
3-8-20	13.26	4688.2
3-9-20	13.24	4688.2
3-10-20	13.37	4688.2
3-11-20	13.50	4688.2
3-12-20	13.53	4688.2
3-13-20	13.65	4688.2
3-14-20	13.77	4688.2
3-15-20	13.71	4688.2
3-16-20	13.52	4688.2
3-17-20	13.57	4688.2
3-18-20	13.48	4688.2
3-19-20	13.25	4688.2
3-20-20	13.[illegible]	4688.2

3-21-20	13.08	4688.2
3-22-20	12.95	4688.2
3-23-20	12.96	4688.2
3-24-20	12.82	4688.2
3-25-20	12.64	4688.2
3-26-20	12.53	4688.2
3-27-20	12.58	4688.2
3-28-20	12.70	4688.2
3-29-20	12.74	4688.2
3-30-20	13.09	4688.2
3-31-20	13.29	4688.2
4-1-20	13.51	4688.2
4-2-20	13.80	4688.2
4-3-20	13.91	4688.2
4-4-20	14.09	4688.2
4-5-20	14.19	4688.2
4-6-20	14.51	4688.2
4-7-20	14.42	4688.2
4-8-20	14.73	4688.2
4-9-20	1[illegible].56	4688.2
4-10-20	14.97	4688.2
4-11-20	14.58	4688.2
4-12-20	13.40	4688.2
4-13-20	12.43	4691.8
4-14-20	13.86	4698.5
4-15-20	12.02	4701.5
4-16-20	12.29	4716.5

4-17	10.97	4717.6
4-18	13.89	4726.7
4-19	12.41	4729.8
4-20	12.89	4736.1
4-21	13.80	4742.4
4-22	12.36	4745.6
4-23	12.78	4751.8
4-24	13.66	4758.0
4-25	13.31	4763.6
4-26	12.19	4768.0
4-27	13.06	4774.1
4-28	13.77	4780.1
4-29	12.24	4783.6
4-30	12.95	4790.2
5-1	13.11	4796.4
5-2	13.93	4802.3
5-3	12.06	4806.4
5-4	12.32	4812.8
5-5	13.26	4819
5-6	13.52	4825.3
5-7	12.88	4830.0
5-8	12.61	4834.9
5-9	13.11	4841.1
5-10	13.78	4847.7
5-11	12.31	4851.4
5-12	12.57	4857.2
5-13	13.27	4863.5
5-14-20	13.53	4869.3
5-15-20	12.19	4873.2
5-16-20	13.45	4880.2
5-17-20	11.87	4884.2
5-18	13.76	4892.6
5-19	11.89	4896.8
5-20	13.88	4905.1
5-21	12.42	4909.1
5-22	12.35	4914.6
5-23	12.22	4921.2
5-24	13.87	4929.3
5-25	13.35	4933.2
5-26	12.21	4939.1
5-27	12.15	4947.0
5-28	12.40	4955.8
5-29	12.93	4964.7
5-30	12.76	4974.0
5-31	12.29	4983.7
6-1-20	12.98	4994.3
6-2-20	13.46	5005.2
6-3-20	13.02	5015.5
6-4-20	12.95	5025.6
6-5-20	12.32	5036.2
6-6-20	11.97	5048.5
6-7-20	12.10	5057.8
6-8-20	13.79	5067.9

6-9-20	11.72	5072.3
6-10-20	12.18	5083.1
6-11-20	12.81	5092.3
6-12-20	12.62	5103.7
6-13-20	13.03	5114.7
6-14-20	12.84	5125.5
6-15-20	13.62	5136.1
6-16-2	12.67	5143.4
6-17-20	12.57	5157.3
6-18-20	13.61	5160.4
6-19-20	13.88	5170.2
6-20	12.43	5177.4
6-21	11.78	5185.5
6-22	13.16	5195.7
6-23	13.57	5205.7
6-24	13.92	5216.8
6-25	13.62	5227.0
6-26	13.80	5237.3
6-27	13.89	5248.7
6-28	13.88	5257.3
6-29	12.10	5262.9
6-30	13.46	5272.3
7-1	13.32	5280.1
7-2	11.63	5285.9
7-3	12.27	5295.3
7-4	13.18	5305.5

7-5-20	13.70	5315.0
7-6-20	13.02	5323.4
7-7-20	12.37	5332.5
7-8-20	11.55	5341.3
7-9-20	12.90	5352.2
7-10-20	12.56	5364.0
7-11-20	13.03	5373.6
7-12-20	9.56	5378.5
7-13-20	12.62	5394
7-14-20	11.68	5403
7-15-20	12.44	5417
7-16-20	13.01	5429.6
7-17-20	12.16	5442.0
7-18-20	12.03	5453.6
7-19-20	12.45	5465.2
7-20-20	13.09	5478.7
7-21-20	13.03	5492.2
7-22	13.25	5506.7
7-23	13.26	5520.2
7-24	13.73	5532.1
7-25	13.63	5545.7
7-26	12.90	5558.2
7-27	13.10	5573.3
7-28	11.74	5585.8
7-29	13.19	5601.4
7-30	13.15	5615.3
7-31	13.39	5631.1

8-1-20	13.78	5644.7
8-2-20	13.83	5667.1
8-3	12.48	5673.3
8-4	12.75	5688.0
8-5	13.67	5704.4
8-6	13.57	5717.3
8-7	13.58	5733.4
8-8	12.78	5743.5
8-9	13.57	5760.8
8-10	12.02	5772.2
8-11	13.50	5787.7
8-12	13.89	5802.5
8-13	13.14	5816.2
8-14	13.58	5828.1
8-15	13.14	5843.3
8-16	13.66	5857.1
8-17	12.42	5870.1
8-18	12.36	5886.3
8-19	13.85	5903.5
8-20	13.80	5915.2
8-21	13.81	5930.7
8-22	13.95	5945.4
8-23	11.68	5954.5
8-24	13.59	5970.3
8-25	13.91	5984.1
8-26	13.67	5995.3
8-27	13.26	6005.6

8-28	13.00	6017.0
8-29	12.48	6026.4
8-30	13.05	6041.6
8-31	13.85	6050.7
9-1	13.95	6061.4
9-2	13.62	6071.8
9-3	13.14	6081.6
9-4	13.59	6095.3
9-5	13.08	6106.1
9-6	11.79	6116.2
9-7	12.44	6129.3
9-8	12.79	6139.8
9-9	13.74	6152.2
9-10	14.97	6165.5
9-11	12.26	6171.3
9-12	12.57	6180.6
9-13	13.90	6189.4
9-14	13.86	6198.8
9-15		6204.5
9-16	13.91	6215.2
9-17	12.18	6221.1
9-18	11.86	6228.8
9-19	12.36	6239.0
9-20	13.33	6244.8
9-21	12.09	6249.9
9-22	13.35	6258.1

9-23	12.22	6263.7
9-24	12.88	6270.8
9-25	12.83	6277.2
9-26	12.50	6283.4
9-27	12.61	6289.3
9-28	12.64	6295.7
9-29	13.20	6302.6
9-30	12.55	6308.0
10-1	12.60	6314.2
10-2	12.65	6320.3
10-3	11.51	6324.5
10-4	12.64	6332.6
10-5	13.90	6341.3
10-6	12.55	6345.2
10-7	12.74	6351.5
10-8	12.65	6357.5
10-9	13.19	6364.1
10-10	12.20	6369.6
10-11	11.57	6373.5
10-12	13.07	6381.4
10-13	11.71	6385.4
10-14	13.73	6393.1
10-15	12.99	6397.2
10-16	12.12	6401.2
10-17	12.74	
10-18	12.96	6402.3
10-19	11.99	6412.4
		6416.9

10-20	11.78	6421.4
10-21	13.27	6428.5
10-22	12.20	6432.2
10-23	12.59	6437.9
10-24	13.20	6443.8
10-25	11.77	6447.9
10-26	13.49	6455.2
10-27	12.77	6459.7
10-28	11.72	6463.8
10-29	13.74	6471.4
10-30	12.94	6475.4
10-31	11.97	6479.4
11-01	13.06	6485.9
11-02	13.01	6491.2
11-03	11.61	6495.1
11-04	13.85	6502.2
11-05	12.51	6506.3
11-06	11.81	6511.3
11-07	13.12	6519.5
11-8	11.60	6522.5
11-09	11.28	6528.6
11-10	14.97	6552.1
11-11	13.52	6555.6
11-12	13.28	6560.8
11-13	12.02	6564.9
11-14	14.97	6583
11-15	12.15	6585

1-8-21	12.76	6894.4
1-9-21	12.62	6900.2
1-10-21	12.49	6906.5
1-11-21	13.08	6912.0
1-12-21	11.49	6916.0
1-13-21	13.27	6924.2
1-14-21	13.78	6929.7
1-15-21	12.52	6933.6
1-16-21	11.83	6938.2
1-17-21	13.33	6945.6
1-18-21	12.06	6949.6
1-19-21	13.40	6957.8
1-20-21	12.45	6961.7
1-21-21	12.25	6967.0
1-22-21	13.64	6973.5
1-23-21	11.94	6977.5
1-24-21	13.04	6985.6
1-25-21	12.34	6989.6
1-26-21	12.50	6995.3
1-27-21	12.68	7001.6
1-28-21	11.80	7006.3
1-29-21	13.30	7013.7
1-30-21	12.84	7019.3
1-31-21	13.39	7026.0
02-01-21	12.25	7029.9
02-02-21	12.07	7034.9

2-3-21	13.57	7041.3
2-4-21	12.02	7045.9
2-5-21	13.20	7052.7
2-6-21	13.11	7057.2
2-7-21	11.73	7062.3
2-8-21	13.38	7070.1
2-9-21	11.94	7074.2
2-10-21	13.50	7081.5
2-11-21	12.68	7086.2
2-12-21	12.68	7092.3
2-13	12.33	7095.4
2-14	11.54	710[illegible].6
2-15	13.04	7110.7
2-16	11.55	7115.7
2-17-21	12.94	7123.2
2-18-21	11.94	7127.2
2-19-21	13.60	7135.3
2-20	12.06	7140.6
2-21	11.92	7145.2
2-22-21	13.73	7157.0
2-23-21	11.67	7161.9
2-24-21	12.14	7070.5
2-25-21	13.09	7179.3
2-26-21	12.93	7186.5
2-27-21	11.85	7192.8
2-28-21	13.25	7201.5

3-1-21	7.42	7202.3
03-02-21	11.58	7214.5
3-03-21	12.88	7222.9
03-04-21	1377	7231.0
03-05-21	11.57	7236.3
3-6-21	12.58	7245.0
3-7-21	13.77	7253.3
03-08-21	11.86	7259.2
03-09-21	12.46	7267.3
03-10-21	13.48	7275.9
03-11-21	12.09	7281.6
3-12-21	12.42	7289.2
3-13	13.46	7297.0
3-14	13.54	7307.1
03-15-21	12.10	7311.4
03-16-21	12.86	7320.2
03-17-21	12.47	7327.7
3-1[illegible]	12.35	7334.9
03-19-21	13.07	7343.8
03-20-21	13.49	7351.8
03-21-21	12.08	7357.2
03-22-21	12.64	7366.1
03-23-21	13.79	7374.9
03-24-21	11.77	7379.4
03-25-21	12.44	7388.1
3-26-21	13.98	7396.8
3-27-21	12.31	7403.5

3-28-21	11.71	7410.3
3-29-21	13.32	7419.2
03-30-21	12.45	7425.4
03-31-21	12.12	7432.5
04-01-21	13.02	7441.2
04-2-21	12.74	7449.9
4-3-21	12.63	7457.3
4-4-21	12.58	7463.4
04-05-21	13.23	7472.5
04-06-21	11.82	7477.7
4-7	12.36	7485.8
04-08-21	12.90	7493.7
04-09-21	13.69	7502.2
4-10	13.16	7510.3
4-11	12.35	7516.0
04-12-21	13.63	7524.9
04-13-21	11.93	7530.2
04-14-21	12.41	7538.1
04-15-21	13.35	7546.8
04-16-21	13.27	7554.7
04-17-21	12.43	7560.5
04-18-21	12.69	7569.5
04-19-21	13.79	7578.6
04-20-21	11.99	7584.1
04-21-21	12.52	7591.8
04-22-21	13.33	7600.6

04-23-21	12.43	7606.8
04-24-21	13.16	7617.1
4-25	12.00	7622.8
04-26-21	12.99	7630.1
04-27-21	11.93	7636.3
04-28-21	12.97	7644.9
04-29-21	13.43	7653.1
04-30-21	11.61	7658.5
5-1-21	12.32	7665.4
5-2-21	12.28	7676.3
05-03-21	12.44	7683.8
05-04-21	11.58	7690.5
05-05-21	12.58	7699.3
05-06-21	13.15	7708.3
05-07-21	13.07	7716.2
5-8-21	12.18	7725.9
5-9-21	12.73	7731.5
05-10-21	13.74	7740.1
05-11-21	11.66	7745.4
05-12-21	12.38	7754.2
5-13	13.06	7763.0
05-14-21	13.05	7770.7
05-15-21	11.52	7777.3
05-16-21	12.33	7787.2
05-17-21	12.67	7797.5
05-18-21	12.61	7807.1
~~05-[illegible]~~		

05-19-21	13.42	7816.8
05-20-21	12.77	7823.4
05-21-21	12.24	7829.5
5-22	13.33	7838.1
5-23	13.16	7846.9
05-24-21	12.90	7850.8
05-25-21	12.18	7856.3
5-26-21	12.32	7863.5
5-27-	13.73	7871.7
5-28	11.82	7877.2
5-29	11.61	7886.0
5-30	11.82	7895.4
5-31	12.28	7905.3
6-1-21	12.15	7916.3
06-02-21	12.65	7927.0
06-03-21	11.62	7938.2
06-04-21	11.79	7951.7
6-5-21	12.60	7964.0
6-6-21	12.34	7976.4
6-7-21	13.10	7990.8
6-8-21	13.37	8003.9
6-9-21	13.28	8017.0
06-10-21	13.50	8030.5
06-11-21	13.61	8045.0
06-12-21	13.87	8059.8
06-13-21	12.99	8074.7

6-14-21	13.66	8092.0
6-15-21	13.30	8109.5
6-16-21	12.13	8124.6
6-17-21	13.78	8143.5
6-18-21	12.28	8160.0
6-19-21	13.99	8178.2
6-20-21	12.54	8191.2
06-21-21	13.62	8203.4
06-22-21	12.78	8215.4
06-23-21	13.47	8231.6
06-24-21	12.82	8245.7
6-25-21	13.61	8263.0
6-26-21	11.76	8277.3
6-27-21	13.49	8293.0
06-28-21	11.70	8306.7
06-29-21	13.33	8326.0
06-30-21	13.46	8344.4
07-1-21	14.29	8362.6
7-2-21	13.75	8382.2
7-3-21	13.92	8399.1
7-4-21	14.24	8419.9
7-5-21	11.83	8432.4
7-6-21	13.41	8450.0
7-7-21	12.68	8467.8
7-8-21	13.05	8483.2
7-9-21	12.88	8501.3
7-10-21	13.97	8519.9

07-11-21	11.78	8536.1
7-12-21	12.77	8552.2
07-13-21	13.99	8571.5
07-14-21	12.93	8583.5
07-15-21	13.87	8598.9
07-16-21	12.15	8613.9
7-17-21	14.29	8632.3
7-18-21	12.24	8654.1
7-19-21	13.30	8669.3
7-20-21	13.47	8688.4
7-21-21	12.98	8705.0
7-22-21	13.98	8723.9
7-23-21	13.22	8740.7
7-24-21	12.43	8755.5
7-25-21	12.96	8770.0
7-26-21	13.49	8785.8
7-27-21	12.63	8800.1
07-28-21	12.37	8817.9
07-29-21	12.67	8832.5
07-30-21	12.29	8847.8
07-31-21	14.26	8862.1
08-01-21	14.00	8876.9
08-02-21	13.50	8889.9
8-3-21	13.76	8902.8
8-4-21	14.13	8915.0
8-5-21	13.70	8926.0

8-6-21	14.03		8940.2
8-7-21	14.01		8952.4
8-8-21	12.86		8965.3
8-9-21	8.53		8970.2
8-10-21	14.11		8988.6
8-11-21	13.85		9000.1
8-12-21	13.91		9012.8
8-13-21	13.31		9024.9
8-14-21	13.87		9038.5
8-15	12.71		9051.1
8-16	14.34		9065.2
8-17	14.00		9078.3
8-18	13.79		9090.3
8-19	13.64		9100.4
8-20-21	12.46	*Changed Chlorine	9110.1
8-21-21	14.31		9122.7
8-22-21	14.69		9132.0
8-23-21	14.24		9141.9
8-24-21	13.39		9151.5
8-25-21	13.86		9162.3
8-26-21	13.27		9173.0
8-27-21	12.96		9184.2
8-28-21	12.3		9193.7
8-29-21	13.30		9206.3
8-30-21	12.97		9216.6
9-31-21	13.14		9227.1

30 × 8 = 240

240 × 6 = 1440

9-1-21	14.06	9240.3
9-2-21	14.06	9252.2
9-3-21	13.09	9263.2
9-4-21	12.61	9273.9
9-5-21	12.55	9286.1
9-6-21	12.67	9299.1
9-7-21	13.66	9312.1
9-8-21	14.18	9326.6
9-9-21	13.05	9337.1
9-10-21	12.71	9349.0
9-11-21	14.97	9362.6
9-12-21	14.93	9374.6
9-13-21	14.96	9386.1
9-14-21	14.35	9396.3
9-15 Pump #1	11.53	
9-16	14.96	
9-17	14.97	
9-18	14.96	
9-19	14.96	
9-20	14.98	
9-21	14.96	
9-22-21	14.96	
9-23-21	14.96	
9-24-21	14.96	
9-27-21	14.96	
9-28-21	14.96	

9-29-21	14.97		Well #1 Manual
9-30-21	14.97		Well #1 manual
10-01-21	11.29	Well # 2 back on line	Well #1 OFF @ 8 PM 9/30/21
10-02-21	12.85		9403.2
10-03-21	12.33		9411.0
10-4-21	12.61		9418.8
10-5-21	12.73		9426.4
10-6-21	12.42		9432.7
10-7-21	12.99		9442.2
10-8-21	13.06		9448.1
10-9-21	13.19		9455.1
10-10-21	13.02		9462.1
10-11-21	13.27		9469.1
10-12-21	13.32		9475.9
10-13-21	13.85		9482.6
10-14-21	14.04		9489.4
10-15-21	13.60		9495.1
10-16-21	13.01		9501.2
10-17-21	12.52		9507.5
10-18-21	13.11		9514.2
10-19-21	13.16		9521.0
10-20-21	13.29		9527.7
10-21-21	14.73		9535.7
10-22-21	14.97		1548.1
10-23-21	13.86		9554.3
10-24-21	13.12		9560.1
10-25-21	12.95		9565.8

10-26-21	14.29		9574.1
10-27-21	~~[illegible]~~ 11.98	update Reset	9577.7
~~[illegible]~~	~~[illegible]~~		
10-28-21	13.02		9586.1
10-29-21	13.20		9592.3
10-30-21	12.71		9599.6
10-31-21	13.03		9606.4
11-01-21	13.46		9613.3
11-2-21	13.88		9620.0
11-03-21	14.25		9626.8
11-04-21	14.44		9633.9
11-05-21	12.99		9638.4
11-6-21	12.31		9644.5
11-7-21	12.69		9651.5
11-8-21	12.83		9658.5
11-9-21	13.06		9665.2
11-10-21	13.28		9672.9
11-11-21	13.22		9678.7
11-12-21	13.54		9685.3
11-13-21	12.73		9692.2
11-14-21	13.30		9699.0
11-15-21	13.45		9705.8
11-16-21	13.43		9712.7
11-17-21	13.37		9719.4
11-18-21	13.60		9726.2
11-19-21	13.98		9733.0

11-20-21	13.26		9739.7
11-21-21	14.33		9746.5
11-22-21	12.69		9750.0
11-23-21	13.28		9756.5
11-24-21	13.83		9763.1
11-25	13.92		9768.9
11-26	12.64		9773.1
11-27	12.78		9779.7
11-28	13.27		978.3
11-29	13.97		9792.9
11-30	13.38		9798.1
12-01	12.76		9802.9
12-02	13.43		9809.4
12-03	13.92		9815.8
12-04	14.23		9822.5
12-05	12.60		9825.8
12-06	13.26		9832.6
12-07	13.47		9839.1
12-08	13.67		9844.2
12-9	12.68		9849.1
12-10	13.33		9855.7
12-11	13.35		9862.1
12-12	14.36		9868.3
12-13	12.47		9872.3
12-14	13.28		9878.9
12-15	11.30		9882.4
12-16	10.46	Reset update SKATA	9887.4

12-17-21	12.35	9894.3
12-18-21	12.68	9900.1
12-19-21	13.78	9908.4
12-20-21	13.47	9915.1
12-21-21	13.86	9921.7
12-22-21	14.06	9927.9
12-23	12.80	9931.0
12-24	13.17	9938.5
12-25	13.24	9945.1
12-26	13.91	9951.7
12-27	12.54	9955.4
-28	12.69	9961.9
12-29	13.10	9968.5
12-30	13.88	9975.1
12-31	13.89	9981.2
		9988.3
1-1-22	14.23	9995.2
1-2-22	14.37	9998.7
1-3-22	13.01	9998.7
1-4-22	13.42	10005.3
1-5-22	14.03	10012.0
1-6-22	14.12	10018.3
1-7-22	12.41	10022.2
1-8-22	12.58	10028.9
1-9-22	13.38	10035.5
1-10-22	13.48	10042.2

1-11-22	13.77	10047.3
1-12-22	12.34	10052.5
1-13-22	12.83	10059.1
1-14-22	13.15	10063.7
1-15-22	13.32	10072.3
1-16-22	13.64	10078.9
1-17-22	13.75	10085.7
1-18-22	12.50	10095.4
1-19-22		
1-20-22	12.94	102.9
1-21-22	13.36	10108.5
1-22-22	13.38	10115.0
1-23-22	14.16	10121.7
1-24-22	12.37	10125.2
1-25-22	13.17	10131.8
1-26-22	13.59	144.3
1-27-22	14.11	
1-28-22	12.88	149.7
1-29-22	12.97	156.2
1-30-22	12.76	161.8
1-31-22	13.37	10168.4
		10175.1
2-01-22	14.19	175.1
2-02-22	12.64	179.1
02-03-22	12.69	185.3
02-04-22	13.25	191.9
02-05-22	13.24	198.5

02-06-22	14.05	205.1
02-07-22	14.12	211.3
2-8-22	12.31	215.4
02-09-22	13.65	218.4
2-10-22	12.35	218.4
2-11-22	13.37	221.2
2-12-22	14.24	223.8
2-13-22	13.45	223.8
2-14-22	12.69	223.8
2-15-22	14.17	226.4
2-16-22	13.41	226.5
2-17-22	12.79	226.5
2-18-22	14.29	229.3
2-19-22	13.36	229.1
2-20-22	12.54	229.1
2-21-22	13.81	231.7
2-22-22	14.27	10234.4
2-23-22	13.34	10234.4
2-24-22	12.41	10234.4
2-25-22	13.64	10237.1
2-26-22	12.70	10237.1
2-27-22	13.54	10239.8
2-28-22	14.19	242.3
3-1-22	13.24	242.3

3-2-22	12.42	242.3
3-3-22	13.98	10245.0
3-4-22	13.24	245.0
3-5-22	12.60	245.4
3-6-22	13.55	247.6
3-7-22	12.99	247.6
3-8-22	12.51	247.6
3-9-22	14.28	250.2
3-10-22	13.52	250.2
3-11-22	12.91	250.2
3-12-22	12.33	250.3
3-13-22	13.91	252.9
3-14-22	13.03	252.9
3-15-22	14.24	255.6
3-16-22	13.19	255.6
3-17-22	13.51	257.1
3-18-22	13.45	258.3
3-19-22	12.71	258.3
3-20-22	14.14	260.9
3-21-22	13.32	260.9
3-22-22	12.70	260.9
3-23-22	14.35	263.5
3-24-22	13.60	263.5
3-25-22	12.94	263.5
3-26-22	14.18	266.1
3-27-22	13.34	266.1
3-28-22	12.71	266.1

3-29-22	14.37	268.7
3-30-22	12.83	268.7
3-31-22	13.32	275.2
4-1-22	14.02	281.7
4-2-22	14.43	288.4
4-3-22	13.12	293.2
4-4-22	12.73	298.3
4-5-22	14.11	306.4
4-6-22	13.36	311.4
4-7-22	12.68	316.5
4-8-22	12.62	322.4
4-9-22	12.73	328.6
4-10-22	12.56	334.9
4-11-22	12.81	341.1
4-12-22	13.08	347.1
4-13-22	13.38	353.4
4-14-22	13.17	359.1
4-15-22	13.13	365.1
4-16-22	12.95	371.1
4-17-22	12.70	377.2
4-18-22	13.47	382.1
4-19-22	13.70	389.1
4-20-22	13.51	395.0
4-21-22	13.16	400.9
4-22-22	13.40	406.8
4-23-22	13.07	412.8
4-24-22	12.76	418.9

4-25-22	13.20	425.0
4-26-22	13.22	431.0
4-27-22	13.14	436.9
4-28-22	13.23	443.0
4-29-22	13.27	448.1
4-30-22	12.65	453.7
5-1-22	12.71	461.2
5-2-22	13.15	467.2
5-3-22	13.15	473.4
5-4-22	12.59	479.0
5-5-22	12.96	485.1
5-6-22	13.03	491.2
5-7-22	13.00	497.2
5-8-22	12.91	503.4
5-9-22	12.87	509.6
5-10-22	13.02	515.7
5-11-22	12.69	521.3
5-12-22	12.76	527.2
5-13-22	12.70	533.3
5-14-22	13.55	541.7
5-15-22	14.14	549.1
5-16-22	12.51	552.2
5-17-22	12.67	559.6
5-18-22	12.57	566.2
5-19-22	12.92	573.1
5-20-22	12.51	578.6
5-21-22	12.54	584.8

5-22-22	13.62	593.1
5-23-22	12.86	598.4
5-24-22	14.30	607.4
5-25-22	14.37	613.8
5-26-22	13.35	620.2
5-27-22	12.61	627.4
5-28-22	13.18	632.7
5-29-22	12.99	644.4
5-30-22	12.98	651.2
5-31-22	13.38	659.6
		667.5
6-1-22	13.59	674.3
6-2-22	12.97	680.2
6-3-22	14.21	685.1
6-4-22	13.15	691.8
6-5-22	12.97	699.4
6-6-22	14.21	708.4
6-7-22	13.52	714.9
6-8-22	12.68	722.6
6-9-22	14.41	733.0
6-10-22	13.21	740.5
6-11-22	13.76	750.4
6-12-22	8.00	757.3
6-13-22	14.35	766.3
6-14-22	13.40	773.4
6-15-22	12.59	780.3
6-16-22	14.34	791.2

	Level	Usage
6-17-22	12.95	799.0
6-18-22	13.53	809.9
6-19-22	12.55	819.7
6-20-22	14.28	10 830.4
6-21-22	13.02	837.4
6-22-22	11.77	844.6
6-23-22	12.89	857.7
6-24-22	13.63	867.9
6-25-22	12.31	878.3
6-26-22	13.80	887.9
6-27-22	13.58	898.4
6-28-22	12.73	909.0
6-29-22	13.35	920.3
6-30-22	13.61	932.0
7-1-22	14.35	945.5
~~7-2~~-22	13.24	957.3
7-3	12.57	969.6
7-4	14.02	980.3
7-5	13.32	988.1
well 1		
7-5-22		37707.0
7-6-22	11.92	37726
7-8-22	8.87	988.1
7-9-22	8.38	

7-10-22	8.40	988.1	
7-11-22	8.54	37849	
7-12-22	8.56	37873.6	
7-13-22	12.78	37897.7	
7-14-22	13.24	992	well 2
7-15-22	14.25	11005.2	
7-16-22	13.22	11015.6	
		11027.9	
7-19-22	12.79	11051.7	
7-20	13.48	11062.8	
7-21-	13.88	11075.7	
7/22-	13.11	11088.5	
7-23	12.95	" 102.6	
7-24	13.77	117.2	
7-25	14.25	128.5	
7-26	12.57	11138.3	
7-27	14.28	154.2	
7-28	12.57	166.3	
7-29	12.90	1826	
7-30-22	14.10	196.9	
7-31-22	12.51	209.7	
8-1-22	14.40	11227.3	
8-2-22	12.72	238.6	
8-4-22	12.56	265.4	
8-5-22	13.20	280.1	
	13.76	293.5	

8-7-22	12.57	302.9
8-8-22	13.85	317.3
8-9-22	12.92	328.0
8-10-22	13.93	342.3
8-11-22	13.77	356.7
8-12-22	14.36	368.1
8-13-22	14.23	382.3
8-14-22	13.19	391.9
8-15-22	5.27	393.2
8-16-22	13.26	416.1
8-17-22	13.99	430.2
8-18-22	13.26	443.5
8-19-22	14.31	456.8
8-20	12.98	467.9
8-21	13.83	482.4
8-22	12.92	494.0
8-23	12.90	505.5
8-24	14.34	517.3
8-25	8.58	529.6
8-26	14.96	531.7
8-27	9.25	
8-28	11.68	
8-29	9.31	
8-30	14.96	37970
8-31	14.97	37985
9-1	14.97	38001

9-2-22	14.59	
9-3-22	14.97	
9-4-22	14.97	
9-5-22	14.96	
9-6-22	14.96	
9-7-22	14.27	~~1525.7~~
9-8-22	14.97	38106.9
9-9-22	13.30	541.3
9-10-22	13.00	550.4
9-11-22	12.57	562.9
9-12-22	11.16	575.5
9-13-22	12.62	583.4
9-14-22	13.97	595.2
9-15-22	12.69	602.6
9-16-22	13.91	612.6
9-17-22	13.60	620.2
9-18-22	12.93	627.5
9-19-22	13.77	638.6
9-20-22	13.32	645.1
9-21-22	12.53	651.8
9-22-22	12.67	657.1
9-23-22	13.68	667.0
9-24-22	12.54	671.3
9-25-22	13.86	680.4
9-26-22	13.56	687.7
9-27-22	12.80	693.8
9-28	12.95	699.8

9-29-22	12.73	706.5
9-30-22	12.80	712.2
10-01-22	12.88	718.1
10-02-22	12.73	724.0
10-3-22	12.63	730.0
10-4-22	13.05	735.8
10-5-22	13.03	741.5

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
1/26/2019	12.04	165,000.00	2,319.30	--	--		--	--	
1/27/2019		114,000.00	2,328.80	9.50	285,000				285,000
1/28/2019	12.49	213,000.00	2,335.90	7.10	213,000				213,000
1/29/2019	13.04	282,000.00	2,345.30	9.40	282,000				282,000
1/30/2019	12.37	201,000.00	2,352.00	6.70	201,000				201,000
1/31/2019	11.56	198,000.00	2,358.60	6.60	198,000				198,000
2/1/2019	13.12	282,000.00	2,368.00	9.40	282,000				282,000
2/2/2019	12.06	225,000.00	2,375.50	7.50	225,000				225,000
2/3/2019	12.95	261,000.00	2,384.20	8.70	261,000				261,000
2/4/2019	11.57	168,000.00	2,389.80	5.60	168,000				168,000
2/5/2019	13.09	321,000.00	2,400.50	10.70	321,000				321,000
2/6/2019	11.27	183,000.00	2,406.60	6.10	183,000				183,000
2/7/2019	13.80	306,000.00	2,416.80	10.20	306,000				306,000
2/8/2019	11.08	171,000.00	2,422.50	5.70	171,000				171,000
2/9/2019	11.78	318,000.00	2,433.10	10.60	318,000				318,000
2/10/2019	13.30	306,000.00	2,443.30	10.20	306,000				306,000
2/11/2019	13.18	195,000.00	2,449.80	6.50	195,000				195,000
2/12/2019	11.01	159,000.00	2,455.10	5.30	159,000				159,000
2/13/2019	13.87	303,000.00	2,465.20	10.10	303,000				303,000
2/14/2019	11.57	150,000.00	2,470.20	5.00	150,000				150,000
2/15/2019	12.25	222,000.00	2,477.60	7.40	222,000				222,000
2/16/2019	13.07	234,000.00	2,485.40	7.80	234,000				234,000
2/17/2019	11.42	144,000.00	2,490.20	4.80	144,000				144,000
2/18/2019	13.12	288,000.00	2,499.80	9.60	288,000				288,000
2/19/2019	13.15	189,000.00	2,506.10	6.30	189,000				189,000
2/20/2019	11.55	156,000.00	2,511.30	5.20	156,000				156,000
2/21/2019	13.48	270,000.00	2,520.30	9.00	270,000				270,000
2/22/2019	12.43	177,000.00	2,526.20	5.90	177,000				177,000
2/23/2019	11.65	198,000.00	2,532.80	6.60	198,000				198,000
2/24/2019	13.62	270,000.00	2,541.80	9.00	270,000				270,000
2/25/2019	11.79	156,000.00	2,547.00	5.20	156,000				156,000
2/26/2019	13.16	279,000.00	2,556.30	9.30	279,000				279,000
2/27/2019	12.98	177,000.00	2,562.20	5.90	177,000				177,000
2/28/2019	11.35	156,000.00	2,567.40	5.20	156,000				156,000
3/1/2019	13.46	282,000.00	2,576.80	9.40	282,000				282,000
3/2/2019	12.29	180,000.00	2,582.80	6.00	180,000				180,000
3/3/2019	11.92	210,000.00	2,589.80	7.00	210,000				210,000
3/4/2019	13.10	261,000.00	2,598.50	8.70	261,000				261,000
3/5/2019	11.01	162,000.00	2,603.90	5.40	162,000				162,000
3/6/2019	13.50	315,000.00	2,614.40	10.50	315,000				315,000
3/7/2019	11.85	153,000.00	2,619.50	5.10	153,000				153,000
3/8/2019	12.70	252,000.00	2,627.90	8.40	252,000				252,000
3/9/2019	12.23	225,000.00	2,635.40	7.50	225,000				225,000
3/10/2019	11.83	207,000.00	2,642.30	6.90	207,000				207,000
3/11/2019	14.56	267,000.00	2,651.20	8.90	267,000				267,000
3/12/2019	7.42	12,000.00	2,651.60	0.40	12,000				12,000
3/13/2019	11.45	354,000.00	2,663.40	11.80	354,000				354,000
3/14/2019	13.44	312,000.00	2,673.80	10.40	312,000				312,000
3/15/2019	12.15	156,000.00	2,679.00	5.20	156,000				156,000
3/16/2019	12.87	321,000.00	2,689.70	10.70	321,000				321,000
3/17/2019	11.43	150,000.00	2,694.70	5.00	150,000				150,000
3/18/2019	12.05	222,000.00	2,702.10	7.40	222,000				222,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
3/19/2019	12.96	252,000.00	2,710.50	8.40	252,000				252,000
3/20/2019	11.38	159,000.00	2,715.80	5.30	159,000				159,000
3/21/2019	13.22	273,000.00	2,724.90	9.10	273,000				273,000
3/22/2019	12.25	189,000.00	2,731.20	6.30	189,000				189,000
3/23/2019	12.35	234,000.00	2,739.00	7.80	234,000				234,000
3/24/2019	12.58	231,000.00	2,746.70	7.70	231,000				231,000
3/25/2019	11.70	159,000.00	2,752.00	5.30	159,000				159,000
3/26/2019	13.86	312,000.00	2,762.40	10.40	312,000				312,000
3/27/2019	12.32	150,000.00	2,767.40	5.00	150,000				150,000
3/28/2019	12.16	219,000.00	2,774.70	7.30	219,000				219,000
3/29/2019	12.72	237,000.00	2,782.60	7.90	237,000				237,000
3/30/2019	11.39	156,000.00	2,787.80	5.20	156,000				156,000
3/31/2019	13.68	324,000.00	2,798.60	10.80	324,000				324,000
4/1/2019	11.57	159,000.00	2,803.90	5.30	159,000				159,000
4/2/2019	13.70	306,000.00	2,814.10	10.20	306,000				306,000
4/3/2019	11.68	165,000.00	2,819.60	5.50	165,000				165,000
4/4/2019	12.20	222,000.00	2,827.00	7.40	222,000				222,000
4/5/2019	12.75	243,000.00	2,835.10	8.10	243,000				243,000
4/6/2019	11.19	168,000.00	2,840.70	5.60	168,000				168,000
4/7/2019	13.64	300,000.00	2,850.70	10.00	300,000				300,000
4/8/2019	11.27	159,000.00	2,856.00	5.30	159,000				159,000
4/9/2019	11.45	240,000.00	2,864.00	8.00	240,000				240,000
4/10/2019	12.70	198,000.00	2,870.60	6.60	198,000				198,000
4/11/2019	12.25	165,000.00	2,876.10	5.50	165,000				165,000
4/12/2019	12.46	231,000.00	2,883.80	7.70	231,000				231,000
4/13/2019	8.21	84,000.00	2,886.60	2.80	84,000				84,000
4/14/2019	10.19	321,000.00	2,897.30	10.70	321,000				321,000
4/15/2019	14.80	504,000.00	2,914.10	16.80	504,000				504,000
4/16/2019	12.63	111,000.00	2,917.80	3.70	111,000				111,000
4/17/2019	14.97	429,000.00	2,932.10	14.30	429,000				429,000
4/18/2019	12.83	99,000.00	2,935.40	3.30	99,000				99,000
4/19/2019	12.80	183,000.00	2,941.50	6.10	183,000				183,000
4/20/2019	13.12	174,000.00	2,947.30	5.80	174,000				174,000
4/21/2019	12.90	213,000.00	2,954.40	7.10	213,000				213,000
4/22/2019	13.04	180,000.00	2,960.40	6.00	180,000				180,000
4/23/2019	13.38	189,000.00	2,966.70	6.30	189,000				189,000
4/24/2019	13.81	195,000.00	2,973.20	6.50	195,000				195,000
4/25/2019	13.69	162,000.00	2,978.60	5.40	162,000				162,000
4/26/2019	12.18	144,000.00	2,983.40	4.80	144,000				144,000
4/27/2019	13.66	288,000.00	2,993.00	9.60	288,000				288,000
4/28/2019	12.44	93,000.00	2,996.10	3.10	93,000				93,000
4/29/2019	12.63	195,000.00	3,002.60	6.50	195,000				195,000
4/30/2019	12.80	189,000.00	3,008.90	6.30	189,000				189,000
5/1/2019	12.94	189,000.00	3,015.20	6.30	189,000				189,000
5/2/2019	13.18	183,000.00	3,021.30	6.10	183,000				183,000
5/3/2019	13.13	192,000.00	3,027.70	6.40	192,000				192,000
5/4/2019	13.48	192,000.00	3,034.10	6.40	192,000				192,000
5/5/2019	13.52	192,000.00	3,040.50	6.40	192,000				192,000
5/6/2019	13.11	195,000.00	3,047.00	6.50	195,000				195,000
5/7/2019	13.35	189,000.00	3,053.30	6.30	189,000				189,000
5/8/2019	13.40	189,000.00	3,059.60	6.30	189,000				189,000
5/9/2019	13.19	189,000.00	3,065.90	6.30	189,000				189,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2 Pump Run Time (Hours)	Well #2 Difference (Hours)	Well #2 Gal/Day (Calculated)	Well #1 Pump Run Time (Hours)	Well #1 Difference (Hours)	Well #1 Gal/Day (Calculated)	Total Gal/Day
5/10/2019	13.39	189,000.00	3,072.20	6.30	189,000				189,000
5/11/2019	13.53	189,000.00	3,078.50	6.30	189,000				189,000
5/12/2019	13.12	183,000.00	3,085.00	6.50	195,000				195,000
5/13/2019	12.83	201,000.00	3,091.70	6.70	201,000				201,000
5/14/2019	12.31	195,000.00	3,098.20	6.50	195,000				195,000
5/15/2019	12.19	186,000.00	3,104.70	6.50	195,000				195,000
5/16/2019	12.03	207,000.00	3,111.60	6.90	207,000				207,000
5/17/2019	11.99	198,000.00	3,118.20	6.60	198,000				198,000
5/18/2019	13.25	297,000.00	3,128.10	9.90	297,000				297,000
5/19/2019	13.63	195,000.00	3,134.60	6.50	195,000				195,000
5/20/2019	12.34	93,000.00	3,137.70	3.10	93,000				93,000
5/21/2019	12.54	195,000.00	3,144.20	6.50	195,000				195,000
5/22/2019	12.60	186,000.00	3,150.40	6.20	186,000				186,000
5/23/2019	12.68	192,000.00	3,156.80	6.40	192,000				192,000
5/24/2019	12.30	195,000.00	3,163.30	6.50	195,000				195,000
5/25/2019	12.95	252,000.00	3,171.70	8.40	252,000				252,000
5/26/2019	13.81	270,000.00	3,180.70	9.00	270,000				270,000
5/27/2019	11.62	132,000.00	3,185.10	4.40	132,000				132,000
5/28/2019	13.19	243,000.00	3,193.20	8.10	243,000				243,000
5/29/2019	11.92	156,000.00	3,198.40	5.20	156,000				156,000
5/30/2019	12.50	228,000.00	3,206.00	7.60	228,000				228,000
5/31/2019	13.11	255,000.00	3,214.50	8.50	255,000				255,000
6/1/2019	12.33	180,000.00	3,220.50	6.00	180,000				180,000
6/2/2019	12.17	282,000.00	3,229.90	9.40	282,000				282,000
6/3/2019	13.47	309,000.00	3,240.20	10.30	309,000				309,000
6/4/2019	12.86	231,000.00	3,247.90	7.70	231,000				231,000
6/5/2019	12.24	282,000.00	3,257.30	9.40	282,000				282,000
6/6/2019	12.22		3,268.10	10.80	324,000				324,000
6/7/2019	11.89		3,276.60	8.50	255,000				255,000
6/8/2019	12.48		3,285.20	8.60	258,000				258,000
6/9/2019	13.90		3,294.50	9.30	279,000				279,000
6/10/2019	13.17		3,302.30	7.80	234,000				234,000
6/11/2019	12.26		3,309.90	7.60	228,000				228,000
6/12/2019	12.14		3,319.20	9.30	279,000				279,000
6/13/2019	12.31		3,330.40	11.20	336,000				336,000
6/14/2019	12.68		3,342.10	11.70	351,000				351,000
6/15/2019	13.29		3,356.10	14.00	420,000				420,000
6/16/2019	12.61		3,363.70	7.60	228,000				228,000
6/17/2019	12.85		3,375.40	11.70	351,000				351,000
6/18/2019	12.97		3,387.50	12.10	363,000				363,000
6/19/2019	12.28		3,397.70	10.20	306,000				306,000
6/20/2019	12.47		3,408.90	11.20	336,000				336,000
6/21/2019	12.34		3,418.10	9.20	276,000				276,000
6/22/2019	13.79		3,431.00	12.90	387,000				387,000
6/23/2019	12.74		3,438.80	7.80	234,000				234,000
6/24/2019	11.77		3,445.70	6.90	207,000				207,000
6/25/2019	11.95		3,454.00	8.30	249,000				249,000
6/26/2019	11.73		3,464.50	10.50	315,000				315,000
6/27/2019	12.62		3,476.40	11.90	357,000				357,000
6/28/2019	13.73		3,488.20	11.80	354,000				354,000
6/29/2019	13.69		3,501.40	13.20	396,000				396,000
6/30/2019	12.81		3,509.10	7.70	231,000				231,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
7/1/2019	13.93		3,520.10	11.00	330,000				330,000
7/2/2019	11.49		3,528.00	7.90	237,000				237,000
7/3/2019	13.38		3,543.10	15.10	453,000				453,000
7/4/2019	13.27		3,552.30	9.20	276,000				276,000
7/5/2019	12.89		3,561.50	9.20	276,000				276,000
7/6/2019	13.64		3,572.70	11.20	336,000				336,000
7/7/2019	12.96		3,581.00	8.30	249,000				249,000
7/8/2019	12.26		3,588.80	7.80	234,000				234,000
7/9/2019	11.74		3,597.20	8.40	252,000				252,000
7/10/2019	11.71		3,606.70	9.50	285,000				285,000
7/11/2019	11.80		3,616.70	10.00	300,000				300,000
7/12/2019	12.76		3,629.80	13.10	393,000				393,000
7/13/2019	13.41		3,640.70	10.90	327,000				327,000
7/14/2019	13.84		3,651.20	10.50	315,000				315,000
7/15/2019	12.59		3,658.20	7.00	210,000				210,000
7/16/2019	11.64		3,666.00	7.80	234,000				234,000
7/17/2019	12.30		3,677.90	11.90	357,000				357,000
7/18/2019	13.02		3,686.80	8.90	267,000				267,000
7/19/2019	11.14		3,695.20	8.40	252,000				252,000
7/20/2019	13.02		3,710.30	15.10	453,000				453,000
7/21/2019	12.85		3,720.50	10.20	306,000				306,000
7/22/2019	11.43		3,730.40	9.90	297,000				297,000
7/23/2019	11.61		3,743.00	12.60	378,000				378,000
7/24/2019	13.00		3,760.10	17.10	513,000				513,000
7/25/2019	11.47		3,768.80	8.70	261,000				261,000
7/26/2019	11.92		3,785.00	16.20	486,000				486,000
7/27/2019	12.13		3,800.00	15.00	450,000				450,000
7/28/2019	12.58		3,815.20	15.20	456,000				456,000
7/29/2019	11.79		3,827.00	11.80	354,000				354,000
7/30/2019	11.94		3,841.70	14.70	441,000				441,000
7/31/2019	11.65		3,854.20	12.50	375,000				375,000
8/1/2019	11.58		3,869.00	14.80	444,000				444,000
8/2/2019	12.15		3,884.00	15.00	450,000				450,000
8/3/2019	13.78		3,900.20	16.20	486,000				486,000
8/4/2019	13.08		3,911.80	11.60	348,000				348,000
8/5/2019	11.87		3,922.50	10.70	321,000				321,000
8/6/2019	11.54		3,935.30	12.80	384,000				384,000
8/7/2019	11.58		3,950.20	14.90	447,000				447,000
8/8/2019	11.47		3,962.70	12.50	375,000				375,000
8/9/2019	11.58		3,976.80	14.10	423,000				423,000
8/10/2019	13.41		3,991.20	14.40	432,000				432,000
8/11/2019	13.47		4,000.00	8.80	264,000				264,000
8/12/2019	12.05		4,007.30	7.30	219,000				219,000
8/13/2019	11.88		4,016.40	9.10	273,000				273,000
8/14/2019	12.36		4,027.00	10.60	318,000				318,000
8/15/2019	12.08		4,038.70	11.70	351,000				351,000
8/16/2019	12.79		4,051.20	12.50	375,000				375,000
8/17/2019	13.53		4,062.50	11.30	339,000				339,000
8/18/2019	11.58		4,068.40	5.90	177,000				177,000
8/19/2019	12.13		4,081.30	12.90	387,000				387,000
8/20/2019	11.86		4,091.70	10.40	312,000				312,000
8/21/2019	12.05		4,105.30	13.60	408,000				408,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
8/22/2019	11.69		4,115.20	9.90	297,000				297,000
8/23/2019	11.64		4,126.30	11.10	333,000				333,000
8/24/2019	12.67		4,138.20	11.90	357,000				357,000
8/25/2019	12.69		4,148.60	10.40	312,000				312,000
8/26/2019	12.14		4,156.10	7.50	225,000				225,000
8/27/2019	14.97		4,179.00	22.90	687,000				687,000
8/28/2019	12.16		4,187.40	8.40	252,000				252,000
8/29/2019	11.38		4,198.30	10.90	327,000				327,000
8/30/2019	12.68		4,213.50	15.20	456,000				456,000
8/31/2019	13.35		4,225.30	11.80	354,000				354,000
9/1/2019	13.02		4,236.40	11.10	333,000				333,000
9/2/2019	12.28		4,246.40	10.00	300,000				300,000
9/3/2019	11.51		4,256.30	9.90	297,000				297,000
9/4/2019	11.77		4,271.00	14.70	441,000				441,000
9/5/2019	11.81		4,281.30	10.30	309,000				309,000
9/6/2019	12.40		4,296.50	15.20	456,000				456,000
9/7/2019	11.72		4,304.60	8.10	243,000				243,000
9/8/2019	11.87		4,314.50	9.90	297,000				297,000
9/9/2019	12.93		4,324.00	9.50	285,000				285,000
9/10/2019	12.78		4,333.60	9.60	288,000				288,000
9/11/2019	13.07		4,343.20	9.60	288,000				288,000
9/12/2019	13.72		4,353.10	9.90	297,000				297,000
9/13/2019	13.67		4,362.00	8.90	267,000				267,000
9/14/2019	12.63		4,370.20	8.20	246,000				246,000
9/15/2019	13.09		4,380.10	9.90	297,000				297,000
9/16/2019	11.87		4,386.30	6.20	186,000				186,000
9/17/2019	11.51		4,391.40	5.10	153,000				153,000
9/18/2019	11.64		4,395.60	4.20	126,000				126,000
9/19/2019	12.18		4,399.30	3.70	111,000				111,000
9/20/2019	12.37		4,403.70	4.40	132,000				132,000
9/21/2019	11.79		4,405.90	2.20	66,000				66,000
9/22/2019	11.65		4,409.10	3.20	96,000				96,000
9/23/2019	14.01		4,414.80	5.70	171,000				171,000
9/24/2019	11.77		4,414.80	0.00	0				0
9/25/2019	12.92		4,418.20	3.40	102,000				102,000
9/26/2019	11.80		4,418.80	0.60	18,000				18,000
9/27/2019	14.97		4,427.60	8.80	264,000				264,000
9/28/2019	13.85		4,427.60	0.00	0				0
9/29/2019	12.90		4,427.60	0.00	0				0
9/30/2019	12.18		4,427.60	0.00	0				0
10/1/2019	14.97		4,438.20	10.60	318,000				318,000
10/2/2019	14.14		4,438.20	0.00	0				0
10/3/2019	13.95		4,438.20	0.00	0				0
10/4/2019	13.86		4,441.30	3.10	93,000				93,000
10/5/2019	12.87		4,441.30	0.00	0				0
10/6/2019	11.84		4,441.30	0.00	0				0
10/7/2019	13.70		4,444.50	3.20	96,000				96,000
10/8/2019	13.28		4,444.50	0.00	0				0
10/9/2019	12.99		4,448.20	3.70	111,000				111,000
10/10/2019	11.79		4,452.30	4.10	123,000				123,000
10/11/2019	13.33		4,460.10	7.80	234,000				234,000
10/12/2019	12.23	108,000.00	4,464.10	4.00	120,000				120,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
10/13/2019	13.74	218,700.00	4,472.20	8.10	243,000				243,000
10/14/2019	12.29	105,300.00	4,476.10	3.90	117,000				117,000
10/15/2019	11.10	108,000.00	4,480.10	4.00	120,000				120,000
10/16/2019	13.23	213,300.00	4,488.00	7.90	237,000				237,000
10/17/2019	12.04	108,000.00	4,492.00	4.00	120,000				120,000
10/18/2019	13.74	202,500.00	4,499.50	7.50	225,000				225,000
10/19/2019	12.20	113,400.00	4,503.70	4.20	126,000				126,000
10/20/2019	12.59	159,300.00	4,509.60	5.90	177,000				177,000
10/21/2019	13.23		4,515.70	6.10	183,000				183,000
10/22/2019	12.55		4,519.70	4.00	120,000				120,000
10/23/2019	12.54		4,525.40	5.70	171,000				171,000
10/24/2019	13.07		4,531.50	6.10	183,000				183,000
10/25/2019	11.74		4,535.30	3.80	114,000				114,000
10/26/2019	13.16		4,543.10	7.80	234,000				234,000
10/27/2019	11.64		4,547.00	3.90	117,000				117,000
10/28/2019	13.57		4,554.10	7.10	213,000				213,000
10/29/2019	12.73		4,555.30	1.20	36,000				36,000
10/30/2019	11.79		4,559.60	4.30	129,000				129,000
10/31/2019	13.48		4,567.40	7.80	234,000				234,000
11/1/2019	11.54		4,571.40	4.00	120,000				120,000
11/2/2019	9.13		4,575.50	4.10	123,000				123,000
11/3/2019	11.72		4,583.60	8.10	243,000				243,000
11/4/2019	13.40		4,591.50	7.90	237,000				237,000
11/5/2019	11.62		4,596.20	4.70	141,000				141,000
11/6/2019	12.72		4,603.90	7.70	231,000				231,000
11/7/2019	11.57		4,608.20	4.30	129,000				129,000
11/8/2019	13.30		4,616.00	7.80	234,000				234,000
11/9/2019	11.63		4,620.10	4.10	123,000				123,000
11/10/2019	13.32		4,628.00	7.90	237,000				237,000
11/11/2019	13.21		4,634.90	6.90	207,000				207,000
11/12/2019	13.66		4,640.20	5.30	159,000				159,000
11/13/2019	12.34		4,644.10	3.90	117,000				117,000
11/14/2019	13.17		4,651.00	6.90	207,000				207,000
11/15/2019	12.51		4,656.00	5.00	150,000				150,000
11/16/2019	12.70		4,662.20	6.20	186,000				186,000
11/17/2019	12.71		4,668.00	5.80	174,000				174,000
11/18/2019	11.67		4,672.40	4.40	132,000				132,000
11/19/2019	14.12		4,675.50	3.10	93,000				93,000
11/20/2019	14.14		4,675.50	0.00	0				0
11/21/2019	14.11		4,675.60	0.10	3,000				3,000
11/22/2019	14.07		4,675.60	0.00	0				0
11/23/2019	13.98		4,675.60	0.00	0				0
11/24/2019	14.01		4,675.60	0.00	0				0
11/25/2019	13.72		4,675.60	0.00	0				0
11/26/2019	13.64		4,675.60	0.00	0				0
11/27/2019	13.61		4,675.60	0.00	0				0
11/28/2019	13.42		4,675.60	0.00	0				0
11/29/2019	13.38		4,675.60	0.00	0				0
11/30/2019	13.04		4,675.60	0.00	0				0
12/1/2019	12.85		4,675.60	0.00	0				0
12/2/2019	12.61		4,675.60	0.00	0				0
12/3/2019	12.73		4,675.60	0.00	0				0

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
12/4/2019	12.82		4,675.80	0.20	6,000				6,000
12/5/2019	12.87		4,675.80	0.00	0				0
12/6/2019	12.69		4,675.80	0.00	0				0
12/7/2019	12.60		4,675.80	0.00	0				0
12/8/2019	12.70		4,675.80	0.00	0				0
12/9/2019	12.30		4,675.80	0.00	0				0
12/10/2019	12.38		4,675.80	0.00	0				0
12/11/2019	12.43		4,675.80	0.00	0				0
12/12/2019	12.53		4,675.80	0.00	0				0
12/13/2019	12.57		4,675.80	0.00	0				0
12/14/2019	12.62		4,675.80	0.00	0				0
12/15/2019	12.61		4,675.80	0.00	0				0
12/16/2019	12.36		4,675.80	0.00	0				0
12/17/2019	12.49		4,675.80	0.00	0				0
12/18/2019	12.46		4,675.80	0.00	0				0
12/19/2019	12.46		4,675.80	0.00	0				0
12/20/2019	12.50		4,675.80	0.00	0				0
12/21/2019	12.59		4,675.80	0.00	0				0
12/22/2019	12.52		4,675.80	0.00	0				0
12/23/2019	12.41		4,675.80	0.00	0				0
12/24/2019	12.41		4,675.80	0.00	0				0
12/25/2019	12.43		4,675.80	0.00	0				0
12/26/2019	12.50		4,675.80	0.00	0				0
12/27/2019	12.16		4,675.80	0.00	0				0
12/28/2019	11.68		4,675.80	0.00	0				0
12/29/2019	13.60		4,678.70	2.90	87,000				87,000
12/30/2019	13.39		4,678.70	0.00	0				0
12/31/2019	13.01		4,678.70	0.00	0				0
1/1/2020	12.70		4,678.70	0.00	0				0
1/2/2020	12.22		4,678.70	0.00	0				0
1/3/2020	12.15		4,678.70	0.00	0				0
1/4/2020	12.19		4,678.70	0.00	0				0
1/5/2020	11.79		4,678.70	0.00	0				0
1/6/2020	14.08		4,681.50	2.80	84,000				84,000
1/7/2020	14.16		4,681.50	0.00	0				0
1/8/2020	14.25		4,681.50	0.00	0				0
1/9/2020	13.85		4,685.40	3.90	117,000	37,699.60			117,000
1/10/2020	13.66		4,685.40	0.00	0	37,699.60	0.00	0	0
1/11/2020	13.58		4,685.40	0.00	0	37,699.60	0.00	0	0
1/12/2020	13.48		4,685.40	0.00	0	37,699.60	0.00	0	0
1/13/2020	13.27		4,685.40	0.00	0	37,699.60	0.00	0	0
1/14/2020	13.29		4,685.40	0.00	0	37,699.60	0.00	0	0
1/15/2020	13.36		4,685.40	0.00	0	37,699.60	0.00	0	0
1/16/2020	13.25		4,685.40	0.00	0	37,699.60	0.00	0	0
1/17/2020	13.30		4,685.40	0.00	0	37,699.60	0.00	0	0
1/18/2020	13.38		4,685.40	0.00	0	37,699.60	0.00	0	0
1/19/2020	13.07		4,685.40	0.00	0	37,699.60	0.00	0	0
1/20/2020	12.97		4,685.40	0.00	0	37,699.60	0.00	0	0
1/21/2020	12.91		4,685.40	0.00	0	37,699.60	0.00	0	0
1/22/2020	12.95		4,685.40	0.00	0	37,699.60	0.00	0	0
1/23/2020	12.85		4,685.40	0.00	0	37,699.60	0.00	0	0
1/24/2020	12.90		4,685.40	0.00	0	37,699.60	0.00	0	0

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
1/25/2020	12.93		4,685.40	0.00	0	37,699.60	0.00	0	0
1/26/2020	12.52		4,685.40	0.00	0	37,699.60	0.00	0	0
1/27/2020	12.37		4,685.40	0.00	0	37,699.60	0.00	0	0
1/28/2020	12.33		4,685.40	0.00	0	37,699.60	0.00	0	0
1/29/2020	12.34		4,685.40	0.00	0	37,699.60	0.00	0	0
1/30/2020	12.11		4,685.40	0.00	0	37,699.60	0.00	0	0
1/31/2020	12.07		4,685.40	0.00	0	37,699.60	0.00	0	0
2/1/2020	11.97		4,685.40	0.00	0	37,699.60	0.00	0	0
2/2/2020	14.02		4,688.20	2.80	84,000	37,699.60	0.00	0	84,000
2/3/2020	13.74		4,688.20	0.00	0	37,699.60	0.00	0	0
2/4/2020	13.55		4,688.20	0.00	0	37,699.60	0.00	0	0
2/5/2020	13.71		4,688.20	0.00	0	37,699.60	0.00	0	0
2/6/2020	13.90		4,688.20	0.00	0	37,699.60	0.00	0	0
2/7/2020	13.86		4,688.20	0.00	0	37,699.60	0.00	0	0
2/8/2020	13.90		4,688.20	0.00	0	37,699.60	0.00	0	0
2/9/2020	13.74		4,688.20	0.00	0	37,699.60	0.00	0	0
2/10/2020	13.11		4,688.20	0.00	0	37,699.60	0.00	0	0
2/11/2020	12.95		4,688.20	0.00	0	37,699.60	0.00	0	0
2/12/2020	12.88		4,688.20	0.00	0	37,699.60	0.00	0	0
2/13/2020	13.02		4,688.20	0.00	0	37,699.60	0.00	0	0
2/14/2020	13.20		4,688.20	0.00	0	37,699.60	0.00	0	0
2/15/2020	13.48		4,688.20	0.00	0	37,699.60	0.00	0	0
2/16/2020	13.53		4,688.20	0.00	0	37,699.60	0.00	0	0
2/17/2020	13.54		4,688.20	0.00	0	37,699.60	0.00	0	0
2/18/2020	13.73		4,688.20	0.00	0	37,699.60	0.00	0	0
2/19/2020	13.93		4,688.20	0.00	0	37,699.60	0.00	0	0
2/20/2020	14.10		4,688.20	0.00	0	37,699.60	0.00	0	0
2/21/2020	14.27		4,688.20	0.00	0	37,699.60	0.00	0	0
2/22/2020	14.19		4,688.20	0.00	0	37,699.60	0.00	0	0
2/23/2020	13.52		4,688.20	0.00	0	37,699.60	0.00	0	0
2/24/2020	13.41		4,688.20	0.00	0	37,699.60	0.00	0	0
2/25/2020	13.19		4,688.20	0.00	0	37,699.60	0.00	0	0
2/26/2020	12.93		4,688.20	0.00	0	37,699.60	0.00	0	0
2/27/2020	12.84		4,688.20	0.00	0	37,699.60	0.00	0	0
2/28/2020	12.89		4,688.20	0.00	0	37,699.60	0.00	0	0
2/29/2020	12.96		4,688.20	0.00	0	37,699.60	0.00	0	0
3/1/2020	12.76		4,688.20	0.00	0	37,699.60	0.00	0	0
3/2/2020	12.80		4,688.20	0.00	0	37,699.60	0.00	0	0
3/3/2020	12.93		4,688.20	0.00	0	37,699.60	0.00	0	0
3/4/2020	13.17		4,688.20	0.00	0	37,699.60	0.00	0	0
3/5/2020	13.12		4,688.20	0.00	0	37,699.60	0.00	0	0
3/6/2020	13.16		4,688.20	0.00	0	37,699.60	0.00	0	0
3/7/2020	13.29		4,688.20	0.00	0	37,699.60	0.00	0	0
3/8/2020	13.26		4,688.20	0.00	0	37,699.60	0.00	0	0
3/9/2020	13.24		4,688.20	0.00	0	37,699.60	0.00	0	0
3/10/2020	13.37		4,688.20	0.00	0	37,699.60	0.00	0	0
3/11/2020	13.50		4,688.20	0.00	0	37,699.60	0.00	0	0
3/12/2020	13.53		4,688.20	0.00	0	37,699.60	0.00	0	0
3/13/2020	13.65		4,688.20	0.00	0	37,699.60	0.00	0	0
3/14/2020	13.77		4,688.20	0.00	0	37,699.60	0.00	0	0
3/15/2020	13.71		4,688.20	0.00	0	37,699.60	0.00	0	0
3/16/2020	13.52		4,688.20	0.00	0	37,699.60	0.00	0	0

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
3/17/2020	13.57		4,688.20	0.00	0	37,699.60	0.00	0	0
3/18/2020	13.48		4,688.20	0.00	0	37,699.60	0.00	0	0
3/19/2020	13.29		4,688.20	0.00	0	37,699.60	0.00	0	0
3/20/2020	13.17		4,688.20	0.00	0	37,699.60	0.00	0	0
3/21/2020	13.08		4,688.20	0.00	0	37,699.60	0.00	0	0
3/22/2020	12.95		4,688.20	0.00	0	37,699.60	0.00	0	0
3/23/2020	12.96		4,688.20	0.00	0	37,699.60	0.00	0	0
3/24/2020	12.82		4,688.20	0.00	0	37,699.60	0.00	0	0
3/25/2020	12.64		4,688.20	0.00	0	37,699.60	0.00	0	0
3/26/2020	12.53		4,688.20	0.00	0	37,699.60	0.00	0	0
3/27/2020	12.58		4,688.20	0.00	0	37,699.60	0.00	0	0
3/28/2020	12.70		4,688.20	0.00	0	37,699.60	0.00	0	0
3/29/2020	12.74		4,688.20	0.00	0	37,699.60	0.00	0	0
3/30/2020	13.09		4,688.20	0.00	0	37,699.60	0.00	0	0
3/31/2020	13.29		4,688.20	0.00	0	37,699.60	0.00	0	0
4/1/2020	13.51		4,688.20	0.00	0	37,699.60	0.00	0	0
4/2/2020	13.80		4,688.20	0.00	0	37,699.60	0.00	0	0
4/3/2020	13.91		4,688.20	0.00	0	37,699.60	0.00	0	0
4/4/2020	14.09		4,688.20	0.00	0	37,699.60	0.00	0	0
4/5/2020	14.19		4,688.20	0.00	0	37,699.60	0.00	0	0
4/6/2020	14.51		4,688.20	0.00	0	37,699.60	0.00	0	0
4/7/2020	14.42		4,688.20	0.00	0	37,699.60	0.00	0	0
4/8/2020	14.73		4,688.20	0.00	0	37,699.60	0.00	0	0
4/9/2020	14.86		4,688.20	0.00	0	37,699.60	0.00	0	0
4/10/2020	14.97		4,688.20	0.00	0	37,699.60	0.00	0	0
4/11/2020	14.58		4,688.20	0.00	0	37,699.60	0.00	0	0
4/12/2020	13.40		4,688.20	0.00	0	37,699.60	0.00	0	0
4/13/2020	12.43		4,691.80	3.60	108,000	37,699.60	0.00	0	108,000
4/14/2020	13.86		4,698.50	6.70	201,000	37,699.60	0.00	0	201,000
4/15/2020	12.02		4,701.50	3.00	90,000	37,699.60	0.00	0	90,000
4/16/2020	12.29		4,716.50	15.00	450,000	37,699.60	0.00	0	450,000
4/17/2020	10.97		4,717.60	1.10	33,000	37,699.60	0.00	0	33,000
4/18/2020	13.85		4,726.70	9.10	273,000	37,699.60	0.00	0	273,000
4/19/2020	12.41		4,729.80	3.10	93,000	37,699.60	0.00	0	93,000
4/20/2020	12.89		4,736.10	6.30	189,000	37,699.60	0.00	0	189,000
4/21/2020	13.80		4,742.40	6.30	189,000	37,699.60	0.00	0	189,000
4/22/2020	12.36		4,745.60	3.20	96,000	37,699.60	0.00	0	96,000
4/23/2020	12.78		4,751.80	6.20	186,000	37,699.60	0.00	0	186,000
4/24/2020	13.66		4,758.00	6.20	186,000	37,699.60	0.00	0	186,000
4/25/2020	13.31		4,763.60	5.60	168,000	37,699.60	0.00	0	168,000
4/26/2020	12.19		4,768.00	4.40	132,000	37,699.60	0.00	0	132,000
4/27/2020	13.06		4,774.10	6.10	183,000	37,699.60	0.00	0	183,000
4/28/2020	13.77		4,780.10	6.00	180,000	37,699.60	0.00	0	180,000
4/29/2020	12.24		4,783.60	3.50	105,000	37,699.60	0.00	0	105,000
4/30/2020	12.95		4,790.20	6.60	198,000	37,699.60	0.00	0	198,000
5/1/2020	13.11		4,796.40	6.20	186,000	37,699.60	0.00	0	186,000
5/2/2020	13.93		4,802.30	5.90	177,000	37,699.60	0.00	0	177,000
5/3/2020	12.06		4,806.40	4.10	123,000	37,699.60	0.00	0	123,000
5/4/2020	12.32		4,812.80	6.40	192,000	37,699.60	0.00	0	192,000
5/5/2020	13.26		4,819.00	6.20	186,000	37,699.60	0.00	0	186,000
5/6/2020	13.52		4,825.30	6.30	189,000	37,699.60	0.00	0	189,000
5/7/2020	12.88		4,830.00	4.70	141,000	37,699.60	0.00	0	141,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
5/8/2020	12.61		4,834.90	4.90	147,000	37,699.60	0.00	0	147,000
5/9/2020	13.11		4,841.10	6.20	186,000	37,699.60	0.00	0	186,000
5/10/2020	13.78		4,847.70	6.60	198,000	37,699.60	0.00	0	198,000
5/11/2020	12.31		4,851.40	3.70	111,000	37,699.60	0.00	0	111,000
5/12/2020	12.57		4,857.20	5.80	174,000	37,699.60	0.00	0	174,000
5/13/2020	13.27		4,863.50	6.30	189,000	37,699.60	0.00	0	189,000
5/14/2020	13.53		4,869.30	5.80	174,000	37,699.60	0.00	0	174,000
5/15/2020	12.19		4,873.20	3.90	117,000	37,699.60	0.00	0	117,000
5/16/2020	13.45		4,880.20	7.00	210,000	37,699.60	0.00	0	210,000
5/17/2020	11.87		4,884.20	4.00	120,000	37,699.60	0.00	0	120,000
5/18/2020	13.76		4,892.60	8.40	252,000	37,699.60	0.00	0	252,000
5/19/2020	11.89		4,896.80	4.20	126,000	37,699.60	0.00	0	126,000
5/20/2020	13.88		4,905.10	8.30	249,000	37,699.60	0.00	0	249,000
5/21/2020	12.42		4,909.10	4.00	120,000	37,699.60	0.00	0	120,000
5/22/2020	12.35		4,914.60	5.50	165,000	37,699.60	0.00	0	165,000
5/23/2020	12.22		4,921.20	6.60	198,000	37,699.60	0.00	0	198,000
5/24/2020	13.87		4,929.30	8.10	243,000	37,699.60	0.00	0	243,000
5/25/2020	13.35		4,933.20	3.90	117,000	37,699.60	0.00	0	117,000
5/26/2020	12.21		4,939.10	5.90	177,000	37,699.60	0.00	0	177,000
5/27/2020	12.15		4,947.00	7.90	237,000	37,699.60	0.00	0	237,000
5/28/2020	12.40		4,955.80	8.80	264,000	37,699.60	0.00	0	264,000
5/29/2020	12.93		4,964.70	8.90	267,000	37,699.60	0.00	0	267,000
5/30/2020	12.76		4,974.00	9.30	279,000	37,699.60	0.00	0	279,000
5/31/2020	12.29		4,983.70	9.70	291,000	37,699.60	0.00	0	291,000
6/1/2020	12.98		4,994.30	10.60	318,000	37,699.60	0.00	0	318,000
6/2/2020	13.46		5,005.20	10.90	327,000	37,699.60	0.00	0	327,000
6/3/2020	13.02		5,015.50	10.30	309,000	37,699.60	0.00	0	309,000
6/4/2020	12.95		5,025.60	10.10	303,000	37,699.60	0.00	0	303,000
6/5/2020	12.32		5,036.20	10.60	318,000	37,699.60	0.00	0	318,000
6/6/2020	11.97		5,048.50	12.30	369,000	37,699.60	0.00	0	369,000
6/7/2020	12.10		5,057.80	9.30	279,000	37,699.60	0.00	0	279,000
6/8/2020	13.79		5,067.90	10.10	303,000	37,699.60	0.00	0	303,000
6/9/2020	11.72		5,072.30	4.40	132,000	37,699.60	0.00	0	132,000
6/10/2020	12.18		5,083.10	10.80	324,000	37,699.60	0.00	0	324,000
6/11/2020	12.81		5,092.30	9.20	276,000	37,699.60	0.00	0	276,000
6/12/2020	12.62		5,103.70	11.40	342,000	37,699.60	0.00	0	342,000
6/13/2020	13.03		5,114.70	11.00	330,000	37,699.60	0.00	0	330,000
6/14/2020	12.84		5,125.50	10.80	324,000	37,699.60	0.00	0	324,000
6/15/2020	13.62		5,136.10	10.60	318,000	37,699.60	0.00	0	318,000
6/16/2020	12.67		5,143.40	7.30	219,000	37,699.60	0.00	0	219,000
6/17/2020	12.57		5,151.30	7.90	237,000	37,699.60	0.00	0	237,000
6/18/2020	13.61		5,160.40	9.10	273,000	37,699.60	0.00	0	273,000
6/19/2020	13.88		5,170.20	9.80	294,000	37,699.60	0.00	0	294,000
6/20/2020	12.43		5,177.40	7.20	216,000	37,699.60	0.00	0	216,000
6/21/2020	11.78		5,185.50	8.10	243,000	37,699.60	0.00	0	243,000
6/22/2020	13.16		5,195.70	10.20	306,000	37,699.60	0.00	0	306,000
6/23/2020	13.57		5,205.70	10.00	300,000	37,699.60	0.00	0	300,000
6/24/2020	13.92		5,216.80	11.10	333,000	37,699.60	0.00	0	333,000
6/25/2020	13.62		5,227.00	10.20	306,000	37,699.60	0.00	0	306,000
6/26/2020	13.80		5,237.30	10.30	309,000	37,699.60	0.00	0	309,000
6/27/2020	13.89		5,248.70	11.40	342,000	37,699.60	0.00	0	342,000
6/28/2020	13.88		5,257.30	8.60	258,000	37,699.60	0.00	0	258,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2 Pump Run Time (Hours)	Well #2 Difference (Hours)	Well #2 Gal/Day (Calculated)	Well #1 Pump Run Time (Hours)	Well #1 Difference (Hours)	Well #1 Gal/Day (Calculated)	Total Gal/Day
6/29/2020	12.10		5,262.90	5.60	168,000	37,699.60	0.00	0	168,000
6/30/2020	13.46		5,272.30	9.40	282,000	37,699.60	0.00	0	282,000
7/1/2020	13.32		5,280.10	7.80	234,000	37,699.60	0.00	0	234,000
7/2/2020	11.63		5,285.90	5.80	174,000	37,699.60	0.00	0	174,000
7/3/2020	12.27		5,295.30	9.40	282,000	37,699.60	0.00	0	282,000
7/4/2020	13.18		5,305.50	10.20	306,000	37,699.60	0.00	0	306,000
7/5/2020	13.70		5,315.00	9.50	285,000	37,699.60	0.00	0	285,000
7/6/2020	13.02		5,323.40	8.40	252,000	37,699.60	0.00	0	252,000
7/7/2020	12.37		5,332.50	9.10	273,000	37,699.60	0.00	0	273,000
7/8/2020	11.55		5,341.30	8.80	264,000	37,699.60	0.00	0	264,000
7/9/2020	12.90		5,352.20	10.90	327,000	37,699.60	0.00	0	327,000
7/10/2020	12.56		5,364.00	11.80	354,000	37,699.60	0.00	0	354,000
7/11/2020	13.03		5,373.60	9.60	288,000	37,699.60	0.00	0	288,000
7/12/2020	9.56		5,378.50	4.90	147,000	37,699.60	0.00	0	147,000
7/13/2020	12.62		5,394.00	15.50	465,000	37,699.60	0.00	0	465,000
7/14/2020	11.68		5,403.00	9.00	270,000	37,699.60	0.00	0	270,000
7/15/2020	12.44		5,417.00	14.00	420,000	37,699.60	0.00	0	420,000
7/16/2020	13.01		5,429.60	12.60	378,000	37,699.60	0.00	0	378,000
7/17/2020	12.16		5,442.00	12.40	372,000	37,699.60	0.00	0	372,000
7/18/2020	12.03		5,453.60	11.60	348,000	37,699.60	0.00	0	348,000
7/19/2020	12.45		5,465.20	11.60	348,000	37,699.60	0.00	0	348,000
7/20/2020	13.09		5,478.70	13.50	405,000	37,699.60	0.00	0	405,000
7/21/2020	13.03		5,492.20	13.50	405,000	37,699.60	0.00	0	405,000
7/22/2020	13.25		5,506.70	14.50	435,000	37,699.60	0.00	0	435,000
7/23/2020	13.26		5,520.20	13.50	405,000	37,699.60	0.00	0	405,000
7/24/2020	13.73		5,532.10	11.90	357,000	37,699.60	0.00	0	357,000
7/25/2020	13.63		5,545.70	13.60	408,000	37,699.60	0.00	0	408,000
7/26/2020	12.90		5,558.20	12.50	375,000	37,699.60	0.00	0	375,000
7/27/2020	13.10		5,573.30	15.10	453,000	37,699.60	0.00	0	453,000
7/28/2020	11.74		5,585.80	12.50	375,000	37,699.60	0.00	0	375,000
7/29/2020	13.19		5,601.40	15.60	468,000	37,699.60	0.00	0	468,000
7/30/2020	13.15		5,615.30	13.90	417,000	37,699.60	0.00	0	417,000
7/31/2020	13.35		5,631.10	15.80	474,000	37,699.60	0.00	0	474,000
8/1/2020	13.78		5,644.70	13.60	408,000	37,699.60	0.00	0	408,000
8/2/2020	13.63		5,667.10	22.40	672,000	37,699.60	0.00	0	672,000
8/3/2020	12.48		5,673.30	6.20	186,000	37,699.60	0.00	0	186,000
8/4/2020	12.75		5,688.00	14.70	441,000	37,699.60	0.00	0	441,000
8/5/2020	13.67		5,704.40	16.40	492,000	37,699.60	0.00	0	492,000
8/6/2020	13.59		5,717.30	12.90	387,000	37,699.60	0.00	0	387,000
8/7/2020	13.58		5,733.40	16.10	483,000	37,699.60	0.00	0	483,000
8/8/2020	12.78		5,743.50	10.10	303,000	37,699.60	0.00	0	303,000
8/9/2020	13.57		5,760.80	17.30	519,000	37,699.60	0.00	0	519,000
8/10/2020	12.02		5,772.20	11.40	342,000	37,699.60	0.00	0	342,000
8/11/2020	13.50		5,787.70	15.50	465,000	37,699.60	0.00	0	465,000
8/12/2020	13.89		5,802.50	14.80	444,000	37,699.60	0.00	0	444,000
8/13/2020	13.14		5,816.20	13.70	411,000	37,699.60	0.00	0	411,000
8/14/2020	13.58		5,828.10	11.90	357,000	37,699.60	0.00	0	357,000
8/15/2020	13.14		5,843.30	15.20	456,000	37,699.60	0.00	0	456,000
8/16/2020	13.66		5,857.10	13.80	414,000	37,699.60	0.00	0	414,000
8/17/2020	12.42		5,870.10	13.00	390,000	37,699.60	0.00	0	390,000
8/18/2020	12.36		5,886.30	16.20	486,000	37,699.60	0.00	0	486,000
8/19/2020	13.85		5,903.50	17.20	516,000	37,699.60	0.00	0	516,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
8/20/2020	13.80		5,915.20	11.70	351,000	37,699.60	0.00	0	351,000
8/21/2020	13.81		5,930.70	15.50	465,000	37,699.60	0.00	0	465,000
8/22/2020	13.95		5,945.40	14.70	441,000	37,699.60	0.00	0	441,000
8/23/2020	11.68		5,954.50	9.10	273,000	37,699.60	0.00	0	273,000
8/24/2020	13.59		5,970.30	15.80	474,000	37,699.60	0.00	0	474,000
8/25/2020	13.91		5,984.10	13.80	414,000	37,699.60	0.00	0	414,000
8/26/2020	13.67		5,995.30	11.20	336,000	37,699.60	0.00	0	336,000
8/27/2020	13.26		6,005.60	10.30	309,000	37,699.60	0.00	0	309,000
8/28/2020	13.00		6,017.00	11.40	342,000	37,699.60	0.00	0	342,000
8/29/2020	12.48		6,026.40	9.40	282,000	37,699.60	0.00	0	282,000
8/30/2020	13.05		6,041.60	15.20	456,000	37,699.60	0.00	0	456,000
8/31/2020	13.85		6,050.70	9.10	273,000	37,699.60	0.00	0	273,000
9/1/2020	13.95		6,061.40	10.70	321,000	37,699.60	0.00	0	321,000
9/2/2020	13.62		6,071.80	10.40	312,000	37,699.60	0.00	0	312,000
9/3/2020	13.14		6,081.60	9.80	294,000	37,699.60	0.00	0	294,000
9/4/2020	13.59		6,095.30	13.70	411,000	37,699.60	0.00	0	411,000
9/5/2020	13.08		6,106.10	10.80	324,000	37,699.60	0.00	0	324,000
9/6/2020	11.79		6,116.20	10.10	303,000	37,699.60	0.00	0	303,000
9/7/2020	12.44		6,129.30	13.10	393,000	37,699.60	0.00	0	393,000
9/8/2020	12.79		6,139.80	10.50	315,000	37,699.60	0.00	0	315,000
9/9/2020	13.74		6,152.20	12.40	372,000	37,699.60	0.00	0	372,000
9/10/2020	14.97		6,165.50	13.30	399,000	37,699.60	0.00	0	399,000
9/11/2020	12.26		6,171.30	5.80	174,000	37,699.60	0.00	0	174,000
9/12/2020	12.57		6,180.60	9.30	279,000	37,699.60	0.00	0	279,000
9/13/2020	13.90		6,189.40	8.80	264,000	37,699.60	0.00	0	264,000
9/14/2020	13.86		6,198.80	9.40	282,000	37,699.60	0.00	0	282,000
9/15/2020			6,204.50	5.70	171,000	37,699.60	0.00	0	171,000
9/16/2020	13.91		6,215.20	10.70	321,000	37,699.60	0.00	0	321,000
9/17/2020	12.18		6,221.10	5.90	177,000	37,699.60	0.00	0	177,000
9/18/2020	11.86		6,228.80	7.70	231,000	37,699.60	0.00	0	231,000
9/19/2020	12.36		6,239.00	10.20	306,000	37,699.60	0.00	0	306,000
9/20/2020	13.33		6,244.80	5.80	174,000	37,699.60	0.00	0	174,000
9/21/2020	12.09		6,249.90	5.10	153,000	37,699.60	0.00	0	153,000
9/22/2020	13.35		6,258.10	8.20	246,000	37,699.60	0.00	0	246,000
9/23/2020	12.22		6,263.70	5.60	168,000	37,699.60	0.00	0	168,000
9/24/2020	12.88		6,270.80	7.10	213,000	37,699.60	0.00	0	213,000
9/25/2020	12.83		6,277.20	6.40	192,000	37,699.60	0.00	0	192,000
9/26/2020	12.50		6,283.40	6.20	186,000	37,699.60	0.00	0	186,000
9/27/2020	12.61		6,289.30	5.90	177,000	37,699.60	0.00	0	177,000
9/28/2020	12.64		6,295.70	6.40	192,000	37,699.60	0.00	0	192,000
9/29/2020	13.20		6,302.50	6.80	204,000	37,699.60	0.00	0	204,000
9/30/2020	12.55		6,308.00	5.50	165,000	37,699.60	0.00	0	165,000
10/1/2020	12.60		6,314.20	6.20	186,000	37,699.60	0.00	0	186,000
10/2/2020	12.65		6,320.30	6.10	183,000	37,699.60	0.00	0	183,000
10/3/2020	11.51		6,324.50	4.20	126,000	37,699.60	0.00	0	126,000
10/4/2020	12.64		6,332.60	8.10	243,000	37,699.60	0.00	0	243,000
10/5/2020	13.90		6,341.30	8.70	261,000	37,699.60	0.00	0	261,000
10/6/2020	12.55		6,345.20	3.90	117,000	37,699.60	0.00	0	117,000
10/7/2020	12.74		6,351.50	6.30	189,000	37,699.60	0.00	0	189,000
10/8/2020	12.65		6,357.50	6.00	180,000	37,699.60	0.00	0	180,000
10/9/2020	13.19		6,364.10	6.60	198,000	37,699.60	0.00	0	198,000
10/10/2020	12.20		6,369.50	5.40	162,000	37,699.60	0.00	0	162,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
10/11/2020	11.57		6,373.50	4.00	120,000	37,699.60	0.00	0	120,000
10/12/2020	13.07		6,381.40	7.90	237,000	37,699.60	0.00	0	237,000
10/13/2020	11.71		6,385.40	4.00	120,000	37,699.60	0.00	0	120,000
10/14/2020	13.73		6,393.10	7.70	231,000	37,699.60	0.00	0	231,000
10/15/2020	12.99		6,397.20	4.10	123,000	37,699.60	0.00	0	123,000
10/16/2020	12.12		6,401.20	4.00	120,000	37,699.60	0.00	0	120,000
10/17/2020	12.74		6,402.20	1.00	30,000	37,699.60	0.00	0	30,000
10/18/2020	12.96		6,412.40	10.20	306,000	37,699.60	0.00	0	306,000
10/19/2020	11.99		6,416.90	4.50	135,000	37,699.60	0.00	0	135,000
10/20/2020	11.78		6,421.40	4.50	135,000	37,699.60	0.00	0	135,000
10/21/2020	13.27		6,428.50	7.10	213,000	37,699.60	0.00	0	213,000
10/22/2020	12.20		6,432.20	3.70	111,000	37,699.60	0.00	0	111,000
10/23/2020	12.59		6,437.90	5.70	171,000	37,699.60	0.00	0	171,000
10/24/2020	13.20		6,443.80	5.90	177,000	37,699.60	0.00	0	177,000
10/25/2020	11.77		6,447.90	4.10	123,000	37,699.60	0.00	0	123,000
10/26/2020	13.49		6,455.20	7.30	219,000	37,699.60	0.00	0	219,000
10/27/2020	12.77		6,459.70	4.50	135,000	37,699.60	0.00	0	135,000
10/28/2020	11.72		6,463.80	4.10	123,000	37,699.60	0.00	0	123,000
10/29/2020	13.74		6,471.40	7.60	228,000	37,699.60	0.00	0	228,000
10/30/2020	12.94		6,475.40	4.00	120,000	37,699.60	0.00	0	120,000
10/31/2020	11.97		6,479.40	4.00	120,000	37,699.60	0.00	0	120,000
11/1/2020	13.06		6,485.90	6.50	195,000	37,699.60	0.00	0	195,000
11/2/2020	13.01		6,491.20	5.30	159,000	37,699.60	0.00	0	159,000
11/3/2020	11.61		6,495.10	3.90	117,000	37,699.60	0.00	0	117,000
11/4/2020	13.85		6,502.20	7.10	213,000	37,699.60	0.00	0	213,000
11/5/2020	12.51		6,506.30	4.10	123,000	37,699.60	0.00	0	123,000
11/6/2020	11.81		6,511.30	5.00	150,000	37,699.60	0.00	0	150,000
11/7/2020	13.12		6,518.50	7.20	216,000	37,699.60	0.00	0	216,000
11/8/2020	11.60		6,522.50	4.00	120,000	37,699.60	0.00	0	120,000
11/9/2020	11.28		6,528.60	6.10	183,000	37,699.60	0.00	0	183,000
11/10/2020	14.97		6,552.10	23.50	705,000	37,699.60	0.00	0	705,000
11/11/2020	13.52		6,553.60	1.50	45,000	37,699.60	0.00	0	45,000
11/12/2020	13.28		6,560.80	7.20	216,000	37,699.60	0.00	0	216,000
11/13/2020	12.02		6,564.40	3.60	108,000	37,699.60	0.00	0	108,000
11/14/2020	14.97		6,583.00	18.60	558,000	37,699.60	0.00	0	558,000
11/15/2020	12.15		6,585.00	2.00	60,000	37,699.60	0.00	0	60,000
11/16/2020				-6,585.00	-197,550,000	37,699.60	0.00	0	-197,550,000
11/17/2020				0.00	0	37,699.60	0.00	0	0
11/18/2020				0.00	0	37,699.60	0.00	0	0
11/19/2020				0.00	0	37,699.60	0.00	0	0
11/20/2020				0.00	0	37,699.60	0.00	0	0
11/21/2020				0.00	0	37,699.60	0.00	0	0
11/22/2020				0.00	0	37,699.60	0.00	0	0
11/23/2020				0.00	0	37,699.60	0.00	0	0
11/24/2020				0.00	0	37,699.60	0.00	0	0
11/25/2020				0.00	0	37,699.60	0.00	0	0
11/26/2020				0.00	0	37,699.60	0.00	0	0
11/27/2020				0.00	0	37,699.60	0.00	0	0
11/28/2020				0.00	0	37,699.60	0.00	0	0
11/29/2020				0.00	0	37,699.60	0.00	0	0
11/30/2020				0.00	0	37,699.60	0.00	0	0
12/1/2020				0.00	0	37,699.60	0.00	0	0

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
12/2/2020				0.00	0	37,699.60	0.00	0	0
12/3/2020				0.00	0	37,699.60	0.00	0	0
12/4/2020				0.00	0	37,699.60	0.00	0	0
12/5/2020				0.00	0	37,699.60	0.00	0	0
12/6/2020				0.00	0	37,699.60	0.00	0	0
12/7/2020				0.00	0	37,699.60	0.00	0	0
12/8/2020				0.00	0	37,699.60	0.00	0	0
12/9/2020				0.00	0	37,699.60	0.00	0	0
12/10/2020				0.00	0	37,699.60	0.00	0	0
12/11/2020				0.00	0	37,699.60	0.00	0	0
12/12/2020				0.00	0	37,699.60	0.00	0	0
12/13/2020				0.00	0	37,699.60	0.00	0	0
12/14/2020				0.00	0	37,699.60	0.00	0	0
12/15/2020				0.00	0	37,699.60	0.00	0	0
12/16/2020				0.00	0	37,699.60	0.00	0	0
12/17/2020				0.00	0	37,699.60	0.00	0	0
12/18/2020				0.00	0	37,699.60	0.00	0	0
12/19/2020				0.00	0	37,699.60	0.00	0	0
12/20/2020				0.00	0	37,699.60	0.00	0	0
12/21/2020				0.00	0	37,699.60	0.00	0	0
12/22/2020				0.00	0	37,699.60	0.00	0	0
12/23/2020				0.00	0	37,699.60	0.00	0	0
12/24/2020				0.00	0	37,699.60	0.00	0	0
12/25/2020				0.00	0	37,699.60	0.00	0	0
12/26/2020				0.00	0	37,699.60	0.00	0	0
12/27/2020				0.00	0	37,699.60	0.00	0	0
12/28/2020				0.00	0	37,699.60	0.00	0	0
12/29/2020				0.00	0	37,699.60	0.00	0	0
12/30/2020				0.00	0	37,699.60	0.00	0	0
12/31/2020				0.00	0	37,699.60	0.00	0	0
1/1/2021				0.00	0	37,699.60	0.00	0	0
1/2/2021				0.00	0	37,699.60	0.00	0	0
1/3/2021				0.00	0	37,699.60	0.00	0	0
1/4/2021				0.00	0	37,699.60	0.00	0	0
1/5/2021				0.00	0	37,699.60	0.00	0	0
1/6/2021				0.00	0	37,699.60	0.00	0	0
1/7/2021				0.00	0	37,699.60	0.00	0	0
1/8/2021	12.76		6,894.40	6,894.40	206,832,000	37,699.60	0.00	0	206,832,000
1/9/2021	12.62		6,900.20	5.80	174,000	37,699.60	0.00	0	174,000
1/10/2021	12.49		6,906.50	6.30	189,000	37,699.60	0.00	0	189,000
1/11/2021	13.08		6,912.00	5.50	165,000	37,699.60	0.00	0	165,000
1/12/2021	11.99		6,916.00	4.00	120,000	37,699.60	0.00	0	120,000
1/13/2021	13.87		6,924.20	8.20	246,000	37,699.60	0.00	0	246,000
1/14/2021	13.78		6,929.70	5.50	165,000	37,699.60	0.00	0	165,000
1/15/2021	12.52		6,933.60	3.90	117,000	37,699.60	0.00	0	117,000
1/16/2021	11.83		6,938.20	4.60	138,000	37,699.60	0.00	0	138,000
1/17/2021	13.33		6,945.60	7.40	222,000	37,699.60	0.00	0	222,000
1/18/2021	12.06		6,949.60	4.00	120,000	37,699.60	0.00	0	120,000
1/19/2021	13.90		6,957.80	8.20	246,000	37,699.60	0.00	0	246,000
1/20/2021	12.45		6,961.70	3.90	117,000	37,699.60	0.00	0	117,000
1/21/2021	12.25		6,967.00	5.30	159,000	37,699.60	0.00	0	159,000
1/22/2021	13.64		6,973.50	6.50	195,000	37,699.60	0.00	0	195,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2 Pump Run Time (Hours)	Well #2 Difference (Hours)	Well #2 Gal/Day (Calculated)	Well #1 Pump Run Time (Hours)	Well #1 Difference (Hours)	Well #1 Gal/Day (Calculated)	Total Gal/Day
1/23/2021	11.94		6,977.50	4.00	120,000	37,699.60	0.00	0	120,000
1/24/2021	13.04		6,985.60	8.10	243,000	37,699.60	0.00	0	243,000
1/25/2021	12.34		6,989.60	4.00	120,000	37,699.60	0.00	0	120,000
1/26/2021	12.50		6,995.30	5.70	171,000	37,699.60	0.00	0	171,000
1/27/2021	12.68		7,001.60	6.30	189,000	37,699.60	0.00	0	189,000
1/28/2021	11.80		7,006.30	4.70	141,000	37,699.60	0.00	0	141,000
1/29/2021	13.30		7,013.70	7.40	222,000	37,699.60	0.00	0	222,000
1/30/2021	12.34		7,019.30	5.60	168,000	37,699.60	0.00	0	168,000
1/31/2021	13.39		7,026.00	6.70	201,000	37,699.60	0.00	0	201,000
2/1/2021	12.25		7,029.90	3.90	117,000	37,699.60	0.00	0	117,000
2/2/2021	12.07		7,034.90	5.00	150,000	37,699.60	0.00	0	150,000
2/3/2021	13.57		7,041.30	6.40	192,000	37,699.60	0.00	0	192,000
2/4/2021	12.02		7,045.90	4.60	138,000	37,699.60	0.00	0	138,000
2/5/2021	13.20		7,052.70	6.80	204,000	37,699.60	0.00	0	204,000
2/6/2021	13.11		7,057.20	4.50	135,000	37,699.60	0.00	0	135,000
2/7/2021	11.73		7,062.30	5.10	153,000	37,699.60	0.00	0	153,000
2/8/2021	13.38		7,070.10	7.80	234,000	37,699.60	0.00	0	234,000
2/9/2021	11.94		7,074.20	4.10	123,000	37,699.60	0.00	0	123,000
2/10/2021	13.50		7,081.50	7.30	219,000	37,699.60	0.00	0	219,000
2/11/2021	12.68		7,086.20	4.70	141,000	37,699.60	0.00	0	141,000
2/12/2021	12.68		7,092.30	6.10	183,000	37,699.60	0.00	0	183,000
2/13/2021	12.33		7,098.40	6.10	183,000	37,699.60	0.00	0	183,000
2/14/2021	11.54		7,102.60	4.20	126,000	37,699.60	0.00	0	126,000
2/15/2021	13.04		7,110.70	8.10	243,000	37,699.60	0.00	0	243,000
2/16/2021	11.55		7,115.30	4.60	138,000	37,699.60	0.00	0	138,000
2/17/2021	12.94		7,123.20	7.90	237,000	37,699.60	0.00	0	237,000
2/18/2021	11.94		7,127.20	4.00	120,000	37,699.60	0.00	0	120,000
2/19/2021	13.60		7,135.30	8.10	243,000	37,699.60	0.00	0	243,000
2/20/2021	12.06		7,140.60	5.30	159,000	37,699.60	0.00	0	159,000
2/21/2021	11.92		7,148.20	7.60	228,000	37,699.60	0.00	0	228,000
2/22/2021	13.73		7,157.00	8.80	264,000	37,699.60	0.00	0	264,000
2/23/2021	11.67		7,161.90	4.90	147,000	37,699.60	0.00	0	147,000
2/24/2021	12.14		7,170.50	8.60	258,000	37,699.60	0.00	0	258,000
2/25/2021	13.09		7,179.30	8.80	264,000	37,699.60	0.00	0	264,000
2/26/2021	12.93		7,186.50	7.20	216,000	37,699.60	0.00	0	216,000
2/27/2021	11.85		7,192.80	6.30	189,000	37,699.60	0.00	0	189,000
2/28/2021	13.25		7,201.50	8.70	261,000	37,699.60	0.00	0	261,000
3/1/2021	7.42		7,202.30	0.80	24,000	37,699.60	0.00	0	24,000
3/2/2021	11.58		7,214.50	12.20	366,000	37,699.60	0.00	0	366,000
3/3/2021	12.88		7,222.90	8.40	252,000	37,699.60	0.00	0	252,000
3/4/2021	13.77		7,231.00	8.10	243,000	37,699.60	0.00	0	243,000
3/5/2021	11.57		7,236.30	5.30	159,000	37,699.60	0.00	0	159,000
3/6/2021	12.58		7,245.00	8.70	261,000	37,699.60	0.00	0	261,000
3/7/2021	13.77		7,253.30	8.30	249,000	37,699.60	0.00	0	249,000
3/8/2021	11.86		7,259.20	5.90	177,000	37,699.60	0.00	0	177,000
3/9/2021	12.46		7,267.30	8.10	243,000	37,699.60	0.00	0	243,000
3/10/2021	13.48		7,275.90	8.60	258,000	37,699.60	0.00	0	258,000
3/11/2021	12.09		7,281.60	5.70	171,000	37,699.60	0.00	0	171,000
3/12/2021	12.42		7,289.20	7.60	228,000	37,699.60	0.00	0	228,000
3/13/2021	13.46		7,297.00	7.80	234,000	37,699.60	0.00	0	234,000
3/14/2021	13.54		7,302.10	5.10	153,000	37,699.60	0.00	0	153,000
3/15/2021	12.10		7,311.40	9.30	279,000	37,699.60	0.00	0	279,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
3/16/2021	12.86		7,320.20	8.80	264,000	37,699.60	0.00	0	264,000
3/17/2021	12.47		7,327.70	7.50	225,000	37,699.60	0.00	0	225,000
3/18/2021	12.25		7,334.90	7.20	216,000	37,699.60	0.00	0	216,000
3/19/2021	13.07		7,343.80	8.90	267,000	37,699.60	0.00	0	267,000
3/20/2021	13.49		7,351.80	8.00	240,000	37,699.60	0.00	0	240,000
3/21/2021	12.08		7,357.20	5.40	162,000	37,699.60	0.00	0	162,000
3/22/2021	12.64		7,366.10	8.90	267,000	37,699.60	0.00	0	267,000
3/23/2021	13.79		7,374.90	8.80	264,000	37,699.60	0.00	0	264,000
3/24/2021	11.77		7,379.90	5.00	150,000	37,699.60	0.00	0	150,000
3/25/2021	12.44		7,388.10	8.20	246,000	37,699.60	0.00	0	246,000
3/26/2021	13.98		7,396.80	8.70	261,000	37,699.60	0.00	0	261,000
3/27/2021	12.81		7,403.80	7.00	210,000	37,699.60	0.00	0	210,000
3/28/2021	11.71		7,410.30	6.50	195,000	37,699.60	0.00	0	195,000
3/29/2021	13.32		7,419.20	8.90	267,000	37,699.60	0.00	0	267,000
3/30/2021	12.45		7,425.40	6.20	186,000	37,699.60	0.00	0	186,000
3/31/2021	12.12		7,432.50	7.10	213,000	37,699.60	0.00	0	213,000
4/1/2021	13.02		7,441.20	8.70	261,000	37,699.60	0.00	0	261,000
4/2/2021	12.74		7,449.90	8.70	261,000	37,699.60	0.00	0	261,000
4/3/2021	12.63		7,457.30	7.40	222,000	37,699.60	0.00	0	222,000
4/4/2021	12.58		7,463.40	6.10	183,000	37,699.60	0.00	0	183,000
4/5/2021	13.83		7,472.50	9.10	273,000	37,699.60	0.00	0	273,000
4/6/2021	11.82		7,477.70	5.20	156,000	37,699.60	0.00	0	156,000
4/7/2021	12.36		7,485.80	8.10	243,000	37,699.60	0.00	0	243,000
4/8/2021	12.90		7,493.70	7.90	237,000	37,699.60	0.00	0	237,000
4/9/2021	13.69		7,502.20	8.50	255,000	37,699.60	0.00	0	255,000
4/10/2021	13.16		7,510.30	8.10	243,000	37,699.60	0.00	0	243,000
4/11/2021	12.35		7,516.00	5.70	171,000	37,699.60	0.00	0	171,000
4/12/2021	13.63		7,524.90	8.90	267,000	37,699.60	0.00	0	267,000
4/13/2021	11.93		7,530.20	5.30	159,000	37,699.60	0.00	0	159,000
4/14/2021	12.41		7,538.10	7.90	237,000	37,699.60	0.00	0	237,000
4/15/2021	13.35		7,546.80	8.70	261,000	37,699.60	0.00	0	261,000
4/16/2021	13.27		7,554.70	7.90	237,000	37,699.60	0.00	0	237,000
4/17/2021	12.43		7,568.50	13.80	414,000	37,699.60	0.00	0	414,000
4/18/2021	12.69		7,569.50	1.00	30,000	37,699.60	0.00	0	30,000
4/19/2021	13.79		7,578.60	9.10	273,000	37,699.60	0.00	0	273,000
4/20/2021	11.99		7,584.10	5.50	165,000	37,699.60	0.00	0	165,000
4/21/2021	12.52		7,591.80	7.70	231,000	37,699.60	0.00	0	231,000
4/22/2021	13.33		7,600.60	8.80	264,000	37,699.60	0.00	0	264,000
4/23/2021	12.43		7,606.80	6.20	186,000	37,699.60	0.00	0	186,000
4/24/2021	13.16		7,617.10	10.30	309,000	37,699.60	0.00	0	309,000
4/25/2021	12.00		7,622.80	5.70	171,000	37,699.60	0.00	0	171,000
4/26/2021	12.99		7,630.10	7.30	219,000	37,699.60	0.00	0	219,000
4/27/2021	11.93		7,636.30	6.20	186,000	37,699.60	0.00	0	186,000
4/28/2021	12.97		7,644.90	8.60	258,000	37,699.60	0.00	0	258,000
4/29/2021	13.43		7,653.10	8.20	246,000	37,699.60	0.00	0	246,000
4/30/2021	11.61		7,658.50	5.40	162,000	37,699.60	0.00	0	162,000
5/1/2021	12.32		7,665.40	6.90	207,000	37,699.60	0.00	0	207,000
5/2/2021	12.28		7,676.30	10.90	327,000	37,699.60	0.00	0	327,000
5/3/2021	12.94		7,683.80	7.50	225,000	37,699.60	0.00	0	225,000
5/4/2021	11.58		7,690.50	6.70	201,000	37,699.60	0.00	0	201,000
5/5/2021	12.58		7,699.30	8.80	264,000	37,699.60	0.00	0	264,000
5/6/2021	13.15		7,708.30	9.00	270,000	37,699.60	0.00	0	270,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
5/7/2021	13.07		7,716.20	7.90	237,000	37,699.60	0.00	0	237,000
5/8/2021	12.68		7,725.90	9.70	291,000	37,699.60	0.00	0	291,000
5/9/2021	12.73		7,731.50	5.60	168,000	37,699.60	0.00	0	168,000
5/10/2021	13.74		7,740.10	8.60	258,000	37,699.60	0.00	0	258,000
5/11/2021	11.66		7,745.40	5.30	159,000	37,699.60	0.00	0	159,000
5/12/2021	12.38		7,754.20	8.80	264,000	37,699.60	0.00	0	264,000
5/13/2021	13.06		7,763.00	8.80	264,000	37,699.60	0.00	0	264,000
5/14/2021	13.05		7,770.70	7.70	231,000	37,699.60	0.00	0	231,000
5/15/2021	11.52		7,777.30	6.60	198,000	37,699.60	0.00	0	198,000
5/16/2021	12.33		7,787.20	9.90	297,000	37,699.60	0.00	0	297,000
5/17/2021	12.67		7,797.50	10.30	309,000	37,699.60	0.00	0	309,000
5/18/2021	12.61		7,807.10	9.60	288,000	37,699.60	0.00	0	288,000
5/19/2021	13.42		7,816.80	9.70	291,000	37,699.60	0.00	0	291,000
5/20/2021	12.77		7,823.40	6.60	198,000	37,699.60	0.00	0	198,000
5/21/2021	12.24		7,829.50	6.10	183,000	37,699.60	0.00	0	183,000
5/22/2021	13.33		7,838.10	8.60	258,000	37,699.60	0.00	0	258,000
5/23/2021	13.16		7,846.90	8.80	264,000	37,699.60	0.00	0	264,000
5/24/2021	12.90		7,850.80	3.90	117,000	37,699.60	0.00	0	117,000
5/25/2021	12.18		7,856.30	5.50	165,000	37,699.60	0.00	0	165,000
5/26/2021	12.32		7,863.50	7.20	216,000	37,699.60	0.00	0	216,000
5/27/2021	13.73		7,876.70	13.20	396,000	37,699.60	0.00	0	396,000
5/28/2021	11.82		7,877.20	0.50	15,000	37,699.60	0.00	0	15,000
5/29/2021	11.61		7,886.00	8.80	264,000	37,699.60	0.00	0	264,000
5/30/2021	11.82		7,895.40	9.40	282,000	37,699.60	0.00	0	282,000
5/31/2021	12.28		7,905.30	9.90	297,000	37,699.60	0.00	0	297,000
6/1/2021	12.15		7,916.30	11.00	330,000	37,699.60	0.00	0	330,000
6/2/2021	12.05		7,927.00	10.70	321,000	37,699.60	0.00	0	321,000
6/3/2021	11.62		7,938.20	11.20	336,000	37,699.60	0.00	0	336,000
6/4/2021	11.79		7,951.70	13.50	405,000	37,699.60	0.00	0	405,000
6/5/2021	12.60		7,964.00	12.30	369,000	37,699.60	0.00	0	369,000
6/6/2021	12.34		7,976.40	12.40	372,000	37,699.60	0.00	0	372,000
6/7/2021	13.10		7,990.80	14.40	432,000	37,699.60	0.00	0	432,000
6/8/2021	13.37		8,003.90	13.10	393,000	37,699.60	0.00	0	393,000
6/9/2021	13.28		8,017.00	13.10	393,000	37,699.60	0.00	0	393,000
6/10/2021	13.50		8,030.50	13.50	405,000	37,699.60	0.00	0	405,000
6/11/2021	13.61		8,045.00	14.50	435,000	37,699.60	0.00	0	435,000
6/12/2021	13.87		8,059.80	14.80	444,000	37,699.60	0.00	0	444,000
6/13/2021	12.99		8,074.70	14.90	447,000	37,699.60	0.00	0	447,000
6/14/2021	13.66		8,092.00	17.30	519,000	37,699.60	0.00	0	519,000
6/15/2021	13.30		8,109.50	17.50	525,000	37,699.60	0.00	0	525,000
6/16/2021	12.13		8,124.60	15.10	453,000	37,699.60	0.00	0	453,000
6/17/2021	13.78		8,143.50	18.90	567,000	37,699.60	0.00	0	567,000
6/18/2021	12.28		8,160.00	16.50	495,000	37,699.60	0.00	0	495,000
6/19/2021	13.99		8,178.20	18.20	546,000	37,699.60	0.00	0	546,000
6/20/2021	12.54		8,191.20	13.00	390,000	37,699.60	0.00	0	390,000
6/21/2021	13.62		8,203.40	12.20	366,000	37,699.60	0.00	0	366,000
6/22/2021	12.78		8,215.40	12.00	360,000	37,699.60	0.00	0	360,000
6/23/2021	13.47		8,231.60	16.20	486,000	37,699.60	0.00	0	486,000
6/24/2021	12.82		8,245.70	14.10	423,000	37,699.60	0.00	0	423,000
6/25/2021	13.61		8,263.00	17.30	519,000	37,699.60	0.00	0	519,000
6/26/2021	11.76		8,277.30	14.30	429,000	37,699.60	0.00	0	429,000
6/27/2021	13.49		8,293.00	15.70	471,000	37,699.60	0.00	0	471,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
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6/28/2021	11.70		8,306.70	13.70	411,000	37,699.60	0.00	0	411,000
6/29/2021	13.33		8,326.00	19.30	579,000	37,699.60	0.00	0	579,000
6/30/2021	13.46		8,344.40	18.40	552,000	37,699.60	0.00	0	552,000
7/1/2021	14.29		8,362.60	18.20	546,000	37,699.60	0.00	0	546,000
7/2/2021	13.75		8,382.20	19.60	588,000	37,699.60	0.00	0	588,000
7/3/2021	13.92		8,399.10	16.90	507,000	37,699.60	0.00	0	507,000
7/4/2021	14.24		8,419.90	20.80	624,000	37,699.60	0.00	0	624,000
7/5/2021	11.83		8,432.40	12.50	375,000	37,699.60	0.00	0	375,000
7/6/2021	13.41		8,450.00	17.60	528,000	37,699.60	0.00	0	528,000
7/7/2021	12.68		8,467.80	17.80	534,000	37,699.60	0.00	0	534,000
7/8/2021	13.05		8,483.20	15.40	462,000	37,699.60	0.00	0	462,000
7/9/2021	12.88		8,501.30	18.10	543,000	37,699.60	0.00	0	543,000
7/10/2021	13.97		8,519.90	18.60	558,000	37,699.60	0.00	0	558,000
7/11/2021	11.78		8,536.10	16.20	486,000	37,699.60	0.00	0	486,000
7/12/2021	12.77		8,552.20	16.10	483,000	37,699.60	0.00	0	483,000
7/13/2021	13.99		8,571.50	19.30	579,000	37,699.60	0.00	0	579,000
7/14/2021	12.93		8,583.50	12.00	360,000	37,699.60	0.00	0	360,000
7/15/2021	13.87		8,598.90	15.40	462,000	37,699.60	0.00	0	462,000
7/16/2021	12.15		8,613.90	15.00	450,000	37,699.60	0.00	0	450,000
7/17/2021	14.29		8,637.30	23.40	702,000	37,699.60	0.00	0	702,000
7/18/2021	12.74		8,654.10	16.80	504,000	37,699.60	0.00	0	504,000
7/19/2021	13.30		8,669.30	15.20	456,000	37,699.60	0.00	0	456,000
7/20/2021	13.47		8,688.40	19.10	573,000	37,699.60	0.00	0	573,000
7/21/2021	12.98		8,705.00	16.60	498,000	37,699.60	0.00	0	498,000
7/22/2021	13.98		8,723.90	18.90	567,000	37,699.60	0.00	0	567,000
7/23/2021	13.22		8,740.70	16.80	504,000	37,699.60	0.00	0	504,000
7/24/2021	12.43		8,755.50	14.80	444,000	37,699.60	0.00	0	444,000
7/25/2021	12.96		8,770.00	14.50	435,000	37,699.60	0.00	0	435,000
7/26/2021	13.49		8,785.00	15.00	450,000	37,699.60	0.00	0	450,000
7/27/2021	12.63		8,800.10	15.10	453,000	37,699.60	0.00	0	453,000
7/28/2021	12.37		8,817.90	17.80	534,000	37,699.60	0.00	0	534,000
7/29/2021	12.67		8,832.50	14.60	438,000	37,699.60	0.00	0	438,000
7/30/2021	12.29		8,847.80	15.30	459,000	37,699.60	0.00	0	459,000
7/31/2021	14.26		8,862.10	14.30	429,000	37,699.60	0.00	0	429,000
8/1/2021	14.00		8,876.30	14.20	426,000	37,699.60	0.00	0	426,000
8/2/2021	13.50		8,889.90	13.60	408,000	37,699.60	0.00	0	408,000
8/3/2021	13.76		8,902.80	12.90	387,000	37,699.60	0.00	0	387,000
8/4/2021	14.13		8,915.00	12.20	366,000	37,699.60	0.00	0	366,000
8/5/2021	13.70		8,926.00	11.00	330,000	37,699.60	0.00	0	330,000
8/6/2021	14.03		8,940.20	14.20	426,000	37,699.60	0.00	0	426,000
8/7/2021	14.01		8,952.40	12.20	366,000	37,699.60	0.00	0	366,000
8/8/2021	12.86		8,965.30	12.90	387,000	37,699.60	0.00	0	387,000
8/9/2021	8.53		8,970.20	4.90	147,000	37,699.60	0.00	0	147,000
8/10/2021	14.11		8,988.60	18.40	552,000	37,699.60	0.00	0	552,000
8/11/2021	13.85		9,000.10	11.50	345,000	37,699.60	0.00	0	345,000
8/12/2021	13.91		9,012.80	12.70	381,000	37,699.60	0.00	0	381,000
8/13/2021	13.31		9,024.90	12.10	363,000	37,699.60	0.00	0	363,000
8/14/2021	13.87		9,038.50	13.60	408,000	37,699.60	0.00	0	408,000
8/15/2021	12.71		9,051.10	12.60	378,000	37,699.60	0.00	0	378,000
8/16/2021	14.34		9,065.20	14.10	423,000	37,699.60	0.00	0	423,000
8/17/2021	14.00		9,078.30	13.10	393,000	37,699.60	0.00	0	393,000
8/18/2021	13.79		9,090.30	12.00	360,000	37,699.60	0.00	0	360,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
8/19/2021	13.64		9,100.40	10.10	303,000	37,699.60	0.00	0	303,000
8/20/2021	12.46		9,110.10	9.70	291,000	37,699.60	0.00	0	291,000
8/21/2021	14.31		9,122.70	12.60	378,000	37,699.60	0.00	0	378,000
8/22/2021	14.69		9,132.00	9.30	279,000	37,699.60	0.00	0	279,000
8/23/2021	14.24		9,141.90	9.90	297,000	37,699.60	0.00	0	297,000
8/24/2021	13.39		9,151.50	9.60	288,000	37,699.60	0.00	0	288,000
8/25/2021	13.86		9,162.30	10.80	324,000	37,699.60	0.00	0	324,000
8/26/2021	13.27		9,173.00	10.70	321,000	37,699.60	0.00	0	321,000
8/27/2021	12.96		9,184.20	11.20	336,000	37,699.60	0.00	0	336,000
8/28/2021	12.30		9,193.70	9.50	285,000	37,699.60	0.00	0	285,000
8/29/2021	13.30		9,206.30	12.60	378,000	37,699.60	0.00	0	378,000
8/30/2021	12.97		9,216.60	10.30	309,000	37,699.60	0.00	0	309,000
8/31/2021	13.14		9,227.10	10.50	315,000	37,699.60	0.00	0	315,000
9/1/2021	14.06		9,240.30	13.20	396,000	37,699.60	0.00	0	396,000
9/2/2021	14.06		9,252.20	11.90	357,000	37,699.60	0.00	0	357,000
9/3/2021	13.09		9,263.20	11.00	330,000	37,699.60	0.00	0	330,000
9/4/2021	12.61		9,273.90	10.70	321,000	37,699.60	0.00	0	321,000
9/5/2021	12.55		9,286.10	12.20	366,000	37,699.60	0.00	0	366,000
9/6/2021	12.67		9,299.10	13.00	390,000	37,699.60	0.00	0	390,000
9/7/2021	13.66		9,317.20	18.10	543,000	37,699.60	0.00	0	543,000
9/8/2021	14.18		9,326.60	9.40	282,000	37,699.60	0.00	0	282,000
9/9/2021	13.05		9,337.10	10.50	315,000	37,699.60	0.00	0	315,000
9/10/2021	12.71		9,349.00	11.90	357,000	37,699.60	0.00	0	357,000
9/11/2021	14.97		9,362.60	13.60	408,000	37,699.60	0.00	0	408,000
9/12/2021	14.93		9,374.60	12.00	360,000	37,699.60	0.00	0	360,000
9/13/2021	14.96		9,386.10	11.50	345,000	37,699.60	0.00	0	345,000
9/14/2021	14.35		9,396.30	10.20	306,000	37,699.60	0.00	0	306,000
9/15/2021	11.53		9,396.30	0.00	0	37,699.60	0.00	0	0
9/16/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/17/2021	14.97		9,396.30	0.00	0	37,699.60	0.00	0	0
9/18/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/19/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/20/2021	14.98		9,396.30	0.00	0	37,699.60	0.00	0	0
9/21/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/22/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/23/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/24/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/25/2021			9,396.30	0.00	0	37,699.60	0.00	0	0
9/26/2021			9,396.30	0.00	0	37,699.60	0.00	0	0
9/27/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/28/2021	14.96		9,396.30	0.00	0	37,699.60	0.00	0	0
9/29/2021	14.97		9,396.30	0.00	0	37,699.60	0.00	0	0
9/30/2021	14.97		9,396.30	0.00	0	37,699.60	0.00	0	0
10/1/2021	11.89		9,396.30	0.00	0	37,699.60	0.00	0	0
10/2/2021	12.85		9,403.20	6.90	207,000	37,699.60	0.00	0	207,000
10/3/2021	12.33		9,411.00	7.80	234,000	37,699.60	0.00	0	234,000
10/4/2021	12.61		9,418.80	7.80	234,000	37,699.60	0.00	0	234,000
10/5/2021	12.73		9,426.40	7.60	228,000	37,699.60	0.00	0	228,000
10/6/2021	12.42		9,432.70	6.30	189,000	37,699.60	0.00	0	189,000
10/7/2021	12.99		9,442.20	9.50	285,000	37,699.60	0.00	0	285,000
10/8/2021	13.06		9,448.10	5.90	177,000	37,699.60	0.00	0	177,000
10/9/2021	13.19		9,455.10	7.00	210,000	37,699.60	0.00	0	210,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2 Pump Run Time (Hours)	Well #2 Difference (Hours)	Well #2 Gal/Day (Calculated)	Well #1 Pump Run Time (Hours)	Well #1 Difference (Hours)	Well #1 Gal/Day (Calculated)	Total Gal/Day
10/10/2021	13.02		9,462.10	7.00	210,000	37,699.60	0.00	0	210,000
10/11/2021	13.27		9,469.10	7.00	210,000	37,699.60	0.00	0	210,000
10/12/2021	13.32		9,475.90	6.80	204,000	37,699.60	0.00	0	204,000
10/13/2021	13.85		9,482.60	6.70	201,000	37,699.60	0.00	0	201,000
10/14/2021	14.04		9,489.40	6.80	204,000	37,699.60	0.00	0	204,000
10/15/2021	13.60		9,495.10	5.70	171,000	37,699.60	0.00	0	171,000
10/16/2021	13.01		9,501.20	6.10	183,000	37,699.60	0.00	0	183,000
10/17/2021	12.52		9,507.50	6.30	189,000	37,699.60	0.00	0	189,000
10/18/2021	13.11		9,514.20	6.70	201,000	37,699.60	0.00	0	201,000
10/19/2021	13.16		9,521.00	6.80	204,000	37,699.60	0.00	0	204,000
10/20/2021	13.29		9,527.70	6.70	201,000	37,699.60	0.00	0	201,000
10/21/2021	14.73		9,535.70	8.00	240,000	37,699.60	0.00	0	240,000
10/22/2021	14.97		9,548.10	12.40	372,000	37,699.60	0.00	0	372,000
10/23/2021	13.86		9,554.30	6.20	186,000	37,699.60	0.00	0	186,000
10/24/2021	13.12		9,560.10	5.80	174,000	37,699.60	0.00	0	174,000
10/25/2021	12.95		9,565.80	5.70	171,000	37,699.60	0.00	0	171,000
10/26/2021	14.29		9,574.10	8.30	249,000	37,699.60	0.00	0	249,000
10/27/2021	11.98		9,577.70	3.60	108,000	37,699.60	0.00	0	108,000
10/28/2021	13.02		9,586.10	8.40	252,000	37,699.60	0.00	0	252,000
10/29/2021	13.20		9,592.30	6.20	186,000	37,699.60	0.00	0	186,000
10/30/2021	12.71		9,599.60	7.30	219,000	37,699.60	0.00	0	219,000
10/31/2021	13.03		9,606.40	6.80	204,000	37,699.60	0.00	0	204,000
11/1/2021	13.46		9,613.30	6.90	207,000	37,699.60	0.00	0	207,000
11/2/2021	13.88		9,620.00	6.70	201,000	37,699.60	0.00	0	201,000
11/3/2021	14.25		9,626.80	6.80	204,000	37,699.60	0.00	0	204,000
11/4/2021	14.44		9,633.90	7.10	213,000	37,699.60	0.00	0	213,000
11/5/2021	12.99		9,638.40	4.50	135,000	37,699.60	0.00	0	135,000
11/6/2021	12.31		9,644.50	6.10	183,000	37,699.60	0.00	0	183,000
11/7/2021	12.69		9,651.50	7.00	210,000	37,699.60	0.00	0	210,000
11/8/2021	12.83		9,658.50	7.00	210,000	37,699.60	0.00	0	210,000
11/9/2021	13.06		9,665.20	6.70	201,000	37,699.60	0.00	0	201,000
11/10/2021	13.28		9,672.90	7.70	231,000	37,699.60	0.00	0	231,000
11/11/2021	13.22		9,678.70	5.80	174,000	37,699.60	0.00	0	174,000
11/12/2021	13.54		9,685.30	6.60	198,000	37,699.60	0.00	0	198,000
11/13/2021	12.73		9,692.20	6.90	207,000	37,699.60	0.00	0	207,000
11/14/2021	13.30		9,699.00	6.80	204,000	37,699.60	0.00	0	204,000
11/15/2021	13.45		9,705.80	6.80	204,000	37,699.60	0.00	0	204,000
11/16/2021	13.43		9,712.70	6.90	207,000	37,699.60	0.00	0	207,000
11/17/2021	13.37		9,719.40	6.70	201,000	37,699.60	0.00	0	201,000
11/18/2021	13.60		9,726.20	6.80	204,000	37,699.60	0.00	0	204,000
11/19/2021	13.98		9,733.00	6.80	204,000	37,699.60	0.00	0	204,000
11/20/2021	13.26		9,739.70	6.70	201,000	37,699.60	0.00	0	201,000
11/21/2021	14.33		9,746.50	6.80	204,000	37,699.60	0.00	0	204,000
11/22/2021	12.69		9,750.00	3.50	105,000	37,699.60	0.00	0	105,000
11/23/2021	13.28		9,756.50	6.50	195,000	37,699.60	0.00	0	195,000
11/24/2021	13.83		9,763.10	6.60	198,000	37,699.60	0.00	0	198,000
11/25/2021	13.92		9,768.90	5.80	174,000	37,699.60	0.00	0	174,000
11/26/2021	12.64		9,773.10	4.20	126,000	37,699.60	0.00	0	126,000
11/27/2021	12.78		9,779.70	6.60	198,000	37,699.60	0.00	0	198,000
11/28/2021	13.27		9,786.30	6.60	198,000	37,699.60	0.00	0	198,000
11/29/2021	13.97		9,792.90	6.60	198,000	37,699.60	0.00	0	198,000
11/30/2021	13.38		9,798.10	5.20	156,000	37,699.60	0.00	0	156,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2 Pump Run Time (Hours)	Well #2 Difference (Hours)	Well #2 Gal/Day (Calculated)	Well #1 Pump Run Time (Hours)	Well #1 Difference (Hours)	Well #1 Gal/Day (Calculated)	Total Gal/Day
12/1/2021	12.76		9,802.90	4.80	144,000	37,699.60	0.00	0	144,000
12/2/2021	13.43		9,809.40	6.50	195,000	37,699.60	0.00	0	195,000
12/3/2021	13.92		9,815.80	6.40	192,000	37,699.60	0.00	0	192,000
12/4/2021	14.23		9,822.50	6.70	201,000	37,699.60	0.00	0	201,000
12/5/2021	12.60		9,825.80	3.30	99,000	37,699.60	0.00	0	99,000
12/6/2021	13.26		9,832.60	6.80	204,000	37,699.60	0.00	0	204,000
12/7/2021	13.47		9,839.10	6.50	195,000	37,699.60	0.00	0	195,000
12/8/2021	13.67		9,844.20	5.10	153,000	37,699.60	0.00	0	153,000
12/9/2021	12.68		9,849.10	4.90	147,000	37,699.60	0.00	0	147,000
12/10/2021	13.33		9,855.70	6.60	198,000	37,699.60	0.00	0	198,000
12/11/2021	13.35		9,862.10	6.40	192,000	37,699.60	0.00	0	192,000
12/12/2021	14.36		9,868.30	6.20	186,000	37,699.60	0.00	0	186,000
12/13/2021	12.47		9,872.30	4.00	120,000	37,699.60	0.00	0	120,000
12/14/2021	13.28		9,878.90	6.60	198,000	37,699.60	0.00	0	198,000
12/15/2021	11.30		9,882.40	3.50	105,000	37,699.60	0.00	0	105,000
12/16/2021	10.46		9,889.40	7.00	210,000	37,699.60	0.00	0	210,000
12/17/2021	12.35		9,894.30	4.90	147,000	37,699.60	0.00	0	147,000
12/18/2021	12.68		9,900.10	5.80	174,000	37,699.60	0.00	0	174,000
12/19/2021	13.76		9,908.40	8.30	249,000	37,699.60	0.00	0	249,000
12/20/2021	13.47		9,915.10	6.70	201,000	37,699.60	0.00	0	201,000
12/21/2021	13.86		9,921.70	6.60	198,000	37,699.60	0.00	0	198,000
12/22/2021	14.06		9,927.90	6.20	186,000	37,699.60	0.00	0	186,000
12/23/2021	12.80		9,931.00	3.10	93,000	37,699.60	0.00	0	93,000
12/24/2021	13.17		9,938.50	7.50	225,000	37,699.60	0.00	0	225,000
12/25/2021	13.24		9,945.10	6.60	198,000	37,699.60	0.00	0	198,000
12/26/2021	13.91		9,951.70	6.60	198,000	37,699.60	0.00	0	198,000
12/27/2021	12.54		9,955.40	3.70	111,000	37,699.60	0.00	0	111,000
12/28/2021	12.69		9,961.90	6.50	195,000	37,699.60	0.00	0	195,000
12/29/2021	13.10		9,968.50	6.60	198,000	37,699.60	0.00	0	198,000
12/30/2021	13.88		9,975.10	6.60	198,000	37,699.60	0.00	0	198,000
12/31/2021	13.89		9,981.20	6.10	183,000	37,699.60	0.00	0	183,000
1/1/2022	14.23		9,988.30	7.10	213,000	37,699.60	0.00	0	213,000
1/2/2022	14.37		9,995.20	6.90	207,000	37,699.60	0.00	0	207,000
1/3/2022	13.01		9,998.70	3.50	105,000	37,699.60	0.00	0	105,000
1/4/2022	13.42		10,005.30	6.60	198,000	37,699.60	0.00	0	198,000
1/5/2022	14.03		10,012.00	6.70	201,000	37,699.60	0.00	0	201,000
1/6/2022	14.12		10,018.30	6.30	189,000	37,699.60	0.00	0	189,000
1/7/2022	12.41		10,022.20	3.90	117,000	37,699.60	0.00	0	117,000
1/8/2022	12.58		10,028.90	6.70	201,000	37,699.60	0.00	0	201,000
1/9/2022	13.38		10,035.50	6.60	198,000	37,699.60	0.00	0	198,000
1/10/2022	13.48		10,042.20	6.70	201,000	37,699.60	0.00	0	201,000
1/11/2022	13.77		10,047.30	5.10	153,000	37,699.60	0.00	0	153,000
1/12/2022	12.34		10,052.50	5.20	156,000	37,699.60	0.00	0	156,000
1/13/2022	12.83		10,059.10	6.60	198,000	37,699.60	0.00	0	198,000
1/14/2022	13.15		10,063.70	4.60	138,000	37,699.60	0.00	0	138,000
1/15/2022	13.32		10,072.30	8.60	258,000	37,699.60	0.00	0	258,000
1/16/2022	13.64		10,078.90	6.60	198,000	37,699.60	0.00	0	198,000
1/17/2022	13.75		10,085.70	6.80	204,000	37,699.60	0.00	0	204,000
1/18/2022	12.50		10,095.40	9.70	291,000	37,699.60	0.00	0	291,000
1/19/2022			10,095.40	0.00	0	37,699.60	0.00	0	0
1/20/2022	12.94		10,102.90	7.50	225,000	37,699.60	0.00	0	225,000
1/21/2022	13.56		10,108.50	5.60	168,000	37,699.60	0.00	0	168,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
1/22/2022	13.38		10,115.00	6.50	195,000	37,699.60	0.00	0	195,000
1/23/2022	14.16		10,121.70	6.70	201,000	37,699.60	0.00	0	201,000
1/24/2022	12.37		10,125.20	3.50	105,000	37,699.60	0.00	0	105,000
1/25/2022	13.17		10,131.80	6.60	198,000	37,699.60	0.00	0	198,000
1/26/2022	13.59		10,144.30	12.50	375,000	37,699.60	0.00	0	375,000
1/27/2022	14.11		10,144.30	0.00	0	37,699.60	0.00	0	0
1/28/2022	12.88		10,149.70	5.40	162,000	37,699.60	0.00	0	162,000
1/29/2022	12.97		10,156.20	6.50	195,000	37,699.60	0.00	0	195,000
1/30/2022	12.76		10,161.80	5.60	168,000	37,699.60	0.00	0	168,000
1/31/2022	13.37		10,168.40	6.60	198,000	37,699.60	0.00	0	198,000
2/1/2022	14.19		10,175.10	6.70	201,000	37,699.60	0.00	0	201,000
2/2/2022	12.64		10,179.10	4.00	120,000	37,699.60	0.00	0	120,000
2/3/2022	12.69		10,185.30	6.20	186,000	37,699.60	0.00	0	186,000
2/4/2022	13.25		10,191.90	6.60	198,000	37,699.60	0.00	0	198,000
2/5/2022	13.24		10,198.50	6.60	198,000	37,699.60	0.00	0	198,000
2/6/2022	14.05		10,205.10	6.60	198,000	37,699.60	0.00	0	198,000
2/7/2022	14.12		10,211.30	6.20	186,000	37,699.60	0.00	0	186,000
2/8/2022	12.31		10,215.40	4.10	123,000	37,699.60	0.00	0	123,000
2/9/2022	13.65		10,218.40	3.00	90,000	37,699.60	0.00	0	90,000
2/10/2022	12.35		10,218.40	0.00	0	37,699.60	0.00	0	0
2/11/2022	13.37		10,221.20	2.80	84,000	37,699.60	0.00	0	84,000
2/12/2022	14.24		10,223.80	2.60	78,000	37,699.60	0.00	0	78,000
2/13/2022	13.45		10,223.80	0.00	0	37,699.60	0.00	0	0
2/14/2022	12.69		10,223.80	0.00	0	37,699.60	0.00	0	0
2/15/2022	14.17		10,226.40	2.60	78,000	37,699.60	0.00	0	78,000
2/16/2022	13.41		10,226.50	0.10	3,000	37,699.60	0.00	0	3,000
2/17/2022	12.79		10,226.50	0.00	0	37,699.60	0.00	0	0
2/18/2022	14.29		10,229.30	2.80	84,000	37,699.60	0.00	0	84,000
2/19/2022	13.36		10,229.70	0.40	12,000	37,699.60	0.00	0	12,000
2/20/2022	12.54		10,229.70	0.00	0	37,699.60	0.00	0	0
2/21/2022	13.81		10,231.70	2.00	60,000	37,699.60	0.00	0	60,000
2/22/2022	14.27		10,234.40	2.70	81,000	37,699.60	0.00	0	81,000
2/23/2022	13.34		10,234.40	0.00	0	37,699.60	0.00	0	0
2/24/2022	12.41		10,234.40	0.00	0	37,699.60	0.00	0	0
2/25/2022	13.64		10,237.10	2.70	81,000	37,699.60	0.00	0	81,000
2/26/2022	12.70		10,237.10	0.00	0	37,699.60	0.00	0	0
2/27/2022	13.54		10,239.80	2.70	81,000	37,699.60	0.00	0	81,000
2/28/2022	14.19		10,242.30	2.50	75,000	37,699.60	0.00	0	75,000
3/1/2022	13.24		10,242.30	0.00	0	37,699.60	0.00	0	0
3/2/2022	12.42		10,242.30	0.00	0	37,699.60	0.00	0	0
3/3/2022	13.98		10,245.00	2.70	81,000	37,699.60	0.00	0	81,000
3/4/2022	13.24		10,245.00	0.00	0	37,699.60	0.00	0	0
3/5/2022	12.60		10,245.40	0.40	12,000	37,699.60	0.00	0	12,000
3/6/2022	13.55		10,247.60	2.20	66,000	37,699.60	0.00	0	66,000
3/7/2022	12.99		10,247.60	0.00	0	37,699.60	0.00	0	0
3/8/2022	12.51		10,247.60	0.00	0	37,699.60	0.00	0	0
3/9/2022	14.28		10,250.20	2.60	78,000	37,699.60	0.00	0	78,000
3/10/2022	13.52		10,250.20	0.00	0	37,699.60	0.00	0	0
3/11/2022	12.91		10,250.20	0.00	0	37,699.60	0.00	0	0
3/12/2022	12.33		10,250.30	0.10	3,000	37,699.60	0.00	0	3,000
3/13/2022	13.91		10,252.90	2.60	78,000	37,699.60	0.00	0	78,000
3/14/2022	13.03		10,252.90	0.00	0	37,699.60	0.00	0	0

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
3/15/2022	14.24		10,255.60	2.70	81,000	37,699.60	0.00	0	81,000
3/16/2022	13.19		10,255.60	0.00	0	37,699.60	0.00	0	0
3/17/2022	13.51		10,257.10	1.50	45,000	37,699.60	0.00	0	45,000
3/18/2022	13.45		10,258.30	1.20	36,000	37,699.60	0.00	0	36,000
3/19/2022	12.71		10,258.30	0.00	0	37,699.60	0.00	0	0
3/20/2022	14.14		10,260.90	2.60	78,000	37,699.60	0.00	0	78,000
3/21/2022	13.32		10,260.90	0.00	0	37,699.60	0.00	0	0
3/22/2022	12.70		10,260.90	0.00	0	37,699.60	0.00	0	0
3/23/2022	14.35		10,263.50	2.60	78,000	37,699.60	0.00	0	78,000
3/24/2022	13.60		10,263.50	0.00	0	37,699.60	0.00	0	0
3/25/2022	12.94		10,263.50	0.00	0	37,699.60	0.00	0	0
3/26/2022	14.18		10,266.10	2.60	78,000	37,699.60	0.00	0	78,000
3/27/2022	13.34		10,266.10	0.00	0	37,699.60	0.00	0	0
3/28/2022	12.71		10,266.10	0.00	0	37,699.60	0.00	0	0
3/29/2022	14.37		10,268.70	2.60	78,000	37,699.60	0.00	0	78,000
3/30/2022	12.83		10,268.70	0.00	0	37,699.60	0.00	0	0
3/31/2022	13.32		10,275.20	6.50	195,000	37,699.60	0.00	0	195,000
4/1/2022	14.02		10,281.70	6.50	195,000	37,699.60	0.00	0	195,000
4/2/2022	14.43		10,288.40	6.70	201,000	37,699.60	0.00	0	201,000
4/3/2022	13.12		10,293.20	4.80	144,000	37,699.60	0.00	0	144,000
4/4/2022	12.73		10,298.30	5.10	153,000	37,699.60	0.00	0	153,000
4/5/2022	14.11		10,306.40	8.10	243,000	37,699.60	0.00	0	243,000
4/6/2022	13.36		10,311.40	5.00	150,000	37,699.60	0.00	0	150,000
4/7/2022	12.68		10,316.50	5.10	153,000	37,699.60	0.00	0	153,000
4/8/2022	12.62		10,322.40	5.90	177,000	37,699.60	0.00	0	177,000
4/9/2022	12.73		10,328.60	6.20	186,000	37,699.60	0.00	0	186,000
4/10/2022	12.56		10,334.90	6.30	189,000	37,699.60	0.00	0	189,000
4/11/2022	12.81		10,341.10	6.20	186,000	37,699.60	0.00	0	186,000
4/12/2022	13.08		10,347.10	6.00	180,000	37,699.60	0.00	0	180,000
4/13/2022	13.38		10,353.40	6.30	189,000	37,699.60	0.00	0	189,000
4/14/2022	13.17		10,359.10	5.70	171,000	37,699.60	0.00	0	171,000
4/15/2022	13.13		10,365.10	6.00	180,000	37,699.60	0.00	0	180,000
4/16/2022	12.95		10,371.10	6.00	180,000	37,699.60	0.00	0	180,000
4/17/2022	12.70		10,377.20	6.10	183,000	37,699.60	0.00	0	183,000
4/18/2022	13.47		10,382.10	4.90	147,000	37,699.60	0.00	0	147,000
4/19/2022	13.70		10,389.10	7.00	210,000	37,699.60	0.00	0	210,000
4/20/2022	13.51		10,395.00	5.90	177,000	37,699.60	0.00	0	177,000
4/21/2022	13.16		10,400.90	5.90	177,000	37,699.60	0.00	0	177,000
4/22/2022	13.40		10,406.80	5.90	177,000	37,699.60	0.00	0	177,000
4/23/2022	13.07		10,412.80	6.00	180,000	37,699.60	0.00	0	180,000
4/24/2022	12.76		10,418.90	6.10	183,000	37,699.60	0.00	0	183,000
4/25/2022	13.20		10,425.00	6.10	183,000	37,699.60	0.00	0	183,000
4/26/2022	13.22		10,431.00	6.00	180,000	37,699.60	0.00	0	180,000
4/27/2022	13.14		10,436.90	5.90	177,000	37,699.60	0.00	0	177,000
4/28/2022	13.23		10,443.00	6.10	183,000	37,699.60	0.00	0	183,000
4/29/2022	13.27		10,448.10	5.10	153,000	37,699.60	0.00	0	153,000
4/30/2022	12.65		10,455.50	7.40	222,000	37,699.60	0.00	0	222,000
5/1/2022	12.71		10,461.20	5.70	171,000	37,699.60	0.00	0	171,000
5/2/2022	13.15		10,467.20	6.00	180,000	37,699.60	0.00	0	180,000
5/3/2022	13.15		10,473.40	6.20	186,000	37,699.60	0.00	0	186,000
5/4/2022	12.59		10,479.00	5.60	168,000	37,699.60	0.00	0	168,000
5/5/2022	12.96		10,485.10	6.10	183,000	37,699.60	0.00	0	183,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
5/6/2022	13.03		10,491.20	6.10	183,000	37,699.60	0.00	0	183,000
5/7/2022	13.00		10,497.20	6.00	180,000	37,699.60	0.00	0	180,000
5/8/2022	12.91		10,503.40	6.20	186,000	37,699.60	0.00	0	186,000
5/9/2022	12.87		10,509.60	6.20	186,000	37,699.60	0.00	0	186,000
5/10/2022	13.02		10,515.70	6.10	183,000	37,699.60	0.00	0	183,000
5/11/2022	12.69		10,521.30	5.60	168,000	37,699.60	0.00	0	168,000
5/12/2022	12.76		10,527.20	5.90	177,000	37,699.60	0.00	0	177,000
5/13/2022	12.70		10,533.30	6.10	183,000	37,699.60	0.00	0	183,000
5/14/2022	13.55		10,541.70	8.40	252,000	37,699.60	0.00	0	252,000
5/15/2022	14.14		10,549.10	7.40	222,000	37,699.60	0.00	0	222,000
5/16/2022	12.51		10,552.20	3.10	93,000	37,699.60	0.00	0	93,000
5/17/2022	12.67		10,559.60	7.40	222,000	37,699.60	0.00	0	222,000
5/18/2022	12.57		10,566.20	6.60	198,000	37,699.60	0.00	0	198,000
5/19/2022	12.92		10,573.10	6.90	207,000	37,699.60	0.00	0	207,000
5/20/2022	12.51		10,578.60	5.50	165,000	37,699.60	0.00	0	165,000
5/21/2022	12.54		10,584.80	6.20	186,000	37,699.60	0.00	0	186,000
5/22/2022	13.62		10,593.10	8.30	249,000	37,699.60	0.00	0	249,000
5/23/2022	12.86		10,598.40	5.30	159,000	37,699.60	0.00	0	159,000
5/24/2022	14.30		10,607.40	9.00	270,000	37,699.60	0.00	0	270,000
5/25/2022	14.37		10,613.80	6.40	192,000	37,699.60	0.00	0	192,000
5/26/2022	13.35		10,620.20	6.40	192,000	37,699.60	0.00	0	192,000
5/27/2022	12.61		10,627.40	7.20	216,000	37,699.60	0.00	0	216,000
5/28/2022	13.18		10,637.70	10.30	309,000	37,699.60	0.00	0	309,000
5/29/2022	12.99		10,644.40	6.70	201,000	37,699.60	0.00	0	201,000
5/30/2022	12.98		10,651.20	6.80	204,000	37,699.60	0.00	0	204,000
5/31/2022	13.38		10,659.60	8.40	252,000	37,699.60	0.00	0	252,000
6/1/2022	13.59		10,674.30	14.70	441,000	37,699.60	0.00	0	441,000
6/2/2022	12.97		10,680.20	5.90	177,000	37,699.60	0.00	0	177,000
6/3/2022	14.21		10,685.10	4.90	147,000	37,699.60	0.00	0	147,000
6/4/2022	13.15		10,691.80	6.70	201,000	37,699.60	0.00	0	201,000
6/5/2022	12.97		10,699.40	7.60	228,000	37,699.60	0.00	0	228,000
6/6/2022	14.21		10,708.40	9.00	270,000	37,699.60	0.00	0	270,000
6/7/2022	13.52		10,714.90	6.50	195,000	37,699.60	0.00	0	195,000
6/8/2022	12.68		10,722.60	7.70	231,000	37,699.60	0.00	0	231,000
6/9/2022	14.41		10,733.00	10.40	312,000	37,699.60	0.00	0	312,000
6/10/2022	13.21		10,740.50	7.50	225,000	37,699.60	0.00	0	225,000
6/11/2022	13.76		10,750.40	9.90	297,000	37,699.60	0.00	0	297,000
6/12/2022	8.00		10,751.30	0.90	27,000	37,699.60	0.00	0	27,000
6/13/2022	14.35		10,766.30	15.00	450,000	37,699.60	0.00	0	450,000
6/14/2022	13.40		10,773.40	7.10	213,000	37,699.60	0.00	0	213,000
6/15/2022	12.57		10,780.30	6.90	207,000	37,699.60	0.00	0	207,000
6/16/2022	14.34		10,791.20	10.90	327,000	37,699.60	0.00	0	327,000
6/17/2022	12.95		10,799.00	7.80	234,000	37,699.60	0.00	0	234,000
6/18/2022	13.53		10,809.00	10.00	300,000	37,699.60	0.00	0	300,000
6/19/2022	12.55		10,819.70	10.70	321,000	37,699.60	0.00	0	321,000
6/20/2022	14.28		10,830.40	10.70	321,000	37,699.60	0.00	0	321,000
6/21/2022	13.02		10,837.40	7.00	210,000	37,699.60	0.00	0	210,000
6/22/2022	11.77		10,844.60	7.20	216,000	37,699.60	0.00	0	216,000
6/23/2022	12.89		10,857.70	13.10	393,000	37,699.60	0.00	0	393,000
6/24/2022	13.63		10,867.90	10.20	306,000	37,699.60	0.00	0	306,000
6/25/2022	13.31		10,878.30	10.40	312,000	37,699.60	0.00	0	312,000
6/26/2022	13.80		10,887.90	9.60	288,000	37,699.60	0.00	0	288,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2 Pump Run Time (Hours)	Well #2 Difference (Hours)	Well #2 Gal/Day (Calculated)	Well #1 Pump Run Time (Hours)	Well #1 Difference (Hours)	Well #1 Gal/Day (Calculated)	Total Gal/Day
6/27/2022	13.58		10,898.40	10.50	315,000	37,699.60	0.00	0	315,000
6/28/2022	12.73		10,909.00	10.60	318,000	37,699.60	0.00	0	318,000
6/29/2022	13.35		10,920.30	11.30	339,000	37,699.60	0.00	0	339,000
6/30/2022	13.61		10,932.00	11.70	351,000	37,699.60	0.00	0	351,000
7/1/2022	14.35		10,945.50	13.50	405,000	37,699.60	0.00	0	405,000
7/2/2022	13.24		10,957.30	11.80	354,000	37,699.60	0.00	0	354,000
7/3/2022	12.57		10,969.60	12.30	369,000	37,699.60	0.00	0	369,000
7/4/2022	14.02		10,980.30	10.70	321,000	37,699.60	0.00	0	321,000
7/5/2022	13.32		10,988.10	7.80	234,000	37,707.00	7.40	155,400	389,400
7/5/2022			10,988.10	0.00	0	37,726.00	19.00	399,000	399,000
7/6/2022	11.92		10,988.10	0.00	0	37,726.00	0.00	0	0
7/7/2022			10,988.10	0.00	0	37,726.00	0.00	0	0
7/8/2022	8.87		10,988.10	0.00	0	37,726.00	0.00	0	0
7/9/2022	8.38		10,988.10	0.00	0	37,726.00	0.00	0	0
7/10/2022	8.40		10,988.10	0.00	0	37,726.00	0.00	0	0
7/11/2022	8.54		10,988.10	0.00	0	37,849.00	123.00	2,583,000	2,583,000
7/12/2022	8.56		10,988.10	0.00	0	37,873.60	24.60	516,600	516,600
7/13/2022	12.78		10,988.10	0.00	0	37,897.70	24.10	506,100	506,100
7/14/2022	13.24		10,992.00	3.90	117,000	37,897.70	0.00	0	117,000
7/15/2022	14.25		11,005.20	13.20	396,000	37,897.70	0.00	0	396,000
7/16/2022	13.22		11,015.60	10.40	312,000	37,897.70	0.00	0	312,000
7/17/2022			11,015.60	0.00	0	37,897.70	0.00	0	0
7/18/2022			11,027.90	12.30	369,000	37,897.70	0.00	0	369,000
7/19/2022	12.79		11,051.70	23.80	714,000	37,897.70	0.00	0	714,000
7/20/2022	13.48		11,062.85	11.15	334,500	37,897.70	0.00	0	334,500
7/21/2022	13.88		11,075.70	12.85	385,500	37,897.70	0.00	0	385,500
7/22/2022	13.11		11,088.70	13.00	390,000	37,897.70	0.00	0	390,000
7/23/2022	12.95		11,102.60	13.90	417,000	37,897.70	0.00	0	417,000
7/24/2022	13.77		11,117.20	14.60	438,000	37,897.70	0.00	0	438,000
7/25/2022	14.25		11,128.50	11.30	339,000	37,897.70	0.00	0	339,000
7/26/2022	12.57		11,138.30	9.80	294,000	37,897.70	0.00	0	294,000
7/27/2022	14.28		11,154.20	15.90	477,000	37,897.70	0.00	0	477,000
7/28/2022	12.57		11,166.30	12.10	363,000	37,897.70	0.00	0	363,000
7/29/2022	12.90		11,182.60	16.30	489,000	37,897.70	0.00	0	489,000
7/30/2022	14.10		11,196.90	14.30	429,000	37,897.70	0.00	0	429,000
7/31/2022	12.51		11,209.70	12.80	384,000	37,897.70	0.00	0	384,000
8/1/2022	14.40		11,227.30	17.60	528,000	37,897.70	0.00	0	528,000
8/2/2022	12.72		11,238.60	11.30	339,000	37,897.70	0.00	0	339,000
8/3/2022			11,238.60	0.00	0	37,897.70	0.00	0	0
8/4/2022	12.56		11,265.40	26.80	804,000	37,897.70	0.00	0	804,000
8/5/2022	13.20		11,280.10	14.70	441,000	37,897.70	0.00	0	441,000
8/6/2022	13.76		11,293.50	13.40	402,000	37,897.70	0.00	0	402,000
8/7/2022	12.57		11,302.90	9.40	282,000	37,897.70	0.00	0	282,000
8/8/2022	13.85		11,317.30	14.40	432,000	37,897.70	0.00	0	432,000
8/9/2022	12.92		11,328.00	10.70	321,000	37,897.70	0.00	0	321,000
8/10/2022	13.93		11,342.30	14.30	429,000	37,897.70	0.00	0	429,000
8/11/2022	13.77		11,356.70	14.40	432,000	37,897.70	0.00	0	432,000
8/12/2022	14.36		11,368.10	11.40	342,000	37,897.70	0.00	0	342,000
8/13/2022	14.23		11,382.30	14.20	426,000	37,897.70	0.00	0	426,000
8/14/2022	13.19		11,391.90	9.60	288,000	37,897.70	0.00	0	288,000
8/15/2022	13.27		11,393.20	1.30	39,000	37,897.70	0.00	0	39,000
8/16/2022	13.26		11,416.10	22.90	687,000	37,897.70	0.00	0	687,000

White Sulphur Springs Groundwater Well Pump Run Time Data

Date	Tank Level	Gal/Day (Operator's Notes)	Well #2			Well #1			Total Gal/Day
			Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	Pump Run Time (Hours)	Difference (Hours)	Gal/Day (Calculated)	
8/17/2022	13.99		11,430.20	14.10	423,000	37,897.70	0.00	0	423,000
8/18/2022	13.26		11,443.50	13.30	399,000	37,897.70	0.00	0	399,000
8/19/2022	14.31		11,456.80	13.30	399,000	37,897.70	0.00	0	399,000
8/20/2022	12.98		11,467.90	11.10	333,000	37,897.70	0.00	0	333,000
8/21/2022	13.83		11,482.40	14.50	435,000	37,897.70	0.00	0	435,000
8/22/2022	12.92		11,494.00	11.60	348,000	37,897.70	0.00	0	348,000
8/23/2022	12.90		11,505.50	11.50	345,000	37,897.70	0.00	0	345,000
8/24/2022	14.34		11,517.30	11.80	354,000	37,897.70	0.00	0	354,000
8/25/2022	8.58		11,529.60	12.30	369,000	37,897.70	0.00	0	369,000
8/26/2022	14.96		11,531.70	2.10	63,000	37,897.70	0.00	0	63,000
8/27/2022	9.25		11,531.70	0.00	0	37,897.70	0.00	0	0
8/28/2022	11.68		11,531.70	0.00	0	37,897.70	0.00	0	0
8/29/2022	9.31		11,531.70	0.00	0	37,897.70	0.00	0	0
8/30/2022	14.96		11,531.70	0.00	0	37,970.00	72.30	1,518,300	1,518,300
8/31/2022	14.97		11,531.70	0.00	0	37,985.00	15.00	315,000	315,000
9/1/2022	14.97		11,531.70	0.00	0	38,001.00	16.00	336,000	336,000
9/2/2022	14.59		11,531.70	0.00	0	38,001.00	0.00	0	0
9/3/2022	14.97		11,531.70	0.00	0	38,001.00	0.00	0	0
9/4/2022	14.97		11,531.70	0.00	0	38,001.00	0.00	0	0
9/5/2022	14.96		11,531.70	0.00	0	38,001.00	0.00	0	0
9/6/2022	14.96		11,531.70	0.00	0	38,001.00	0.00	0	0
9/7/2022	14.27		11,531.70	0.00	0	38,001.00	0.00	0	0
9/8/2022	14.97		11,531.70	0.00	0	38,106.90	105.90	2,223,900	2,223,900
9/9/2022	13.30		11,541.30	9.60	288,000	38,106.90	0.00	0	288,000
9/10/2022	13.00		11,550.40	9.10	273,000	38,106.90	0.00	0	273,000
9/11/2022	12.57		11,562.90	12.50	375,000	38,106.90	0.00	0	375,000
9/12/2022	11.16		11,575.50	12.60	378,000	38,106.90	0.00	0	378,000
9/13/2022	12.62		11,583.40	7.90	237,000	38,106.90	0.00	0	237,000
9/14/2022	13.97		11,595.20	11.80	354,000	38,106.90	0.00	0	354,000
9/15/2022	12.69		11,602.60	7.40	222,000	38,106.90	0.00	0	222,000
9/16/2022	13.91		11,612.60	10.00	300,000	38,106.90	0.00	0	300,000
9/17/2022	13.60		11,620.20	7.60	228,000	38,106.90	0.00	0	228,000
9/18/2022	12.93		11,627.50	7.30	219,000	38,106.90	0.00	0	219,000
9/19/2022	13.97		11,638.60	11.10	333,000	38,106.90	0.00	0	333,000
9/20/2022	13.32		11,645.10	6.50	195,000	38,106.90	0.00	0	195,000
9/21/2022	12.53		11,651.80	6.70	201,000	38,106.90	0.00	0	201,000
9/22/2022	12.67		11,657.10	5.30	159,000	38,106.90	0.00	0	159,000
9/23/2022	13.68		11,667.00	9.90	297,000	38,106.90	0.00	0	297,000
9/24/2022	12.54		11,671.30	4.30	129,000	38,106.90	0.00	0	129,000
9/25/2022	13.86		11,680.40	9.10	273,000	38,106.90	0.00	0	273,000
9/26/2022	13.56		11,687.70	7.30	219,000	38,106.90	0.00	0	219,000
9/27/2022	12.80		11,693.80	6.10	183,000	38,106.90	0.00	0	183,000
9/28/2022	12.95		11,699.80	6.00	180,000	38,106.90	0.00	0	180,000
9/29/2022	12.73		11,706.50	6.70	201,000	38,106.90	0.00	0	201,000
9/30/2022	12.80		11,712.20	5.70	171,000	38,106.90	0.00	0	171,000
10/1/2022	12.88		11,718.10	5.90	177,000	38,106.90	0.00	0	177,000
10/2/2022	12.73		11,724.00	5.90	177,000	38,106.90	0.00	0	177,000
10/3/2022	12.63		11,730.00	6.00	180,000	38,106.90	0.00	0	180,000
10/4/2022	13.05		11,735.80	5.80	174,000	38,106.90	0.00	0	174,000
10/5/2022	13.03		11,741.50	5.70	171,000	38,106.90	0.00	0	171,000

usertype	avg_accts_per_month	jan_2019	feb_2019	mar_2019	apr_2019	may_2019	jun_2019	jul_2019	aug_2019	sep_2019	oct_2019	nov_2019	dec_2019	total
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Usage Summary From Billing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Routes: All	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billing Usage Period: From JAN-2019 to DEC-2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER USAGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-CHURCH	1	181	560	451	396	367	366	280	304	341	376	481	340	4443
C-FINANCE-BANKING	1	3100	3100	3400	3300	4300	82800	105900	93000	93200	3100	2900	2600	400700
C-GOVERNMENT-COUNTY	2	1250	1790	1870	1460	1270	7740	11510	13640	14600	1680	1050	1660	59520
C-RETAIL-GENERAL MERCHANDISE	1	640	850	690	630	7630	23350	27720	37220	27240	830	540	510	127850
COMMERCIAL	13	152404	190045	128665	132578	127818	196848	216129	233018	202386	184982	223375	164435	2152683
R-MOBIL HOME	1	5610	4660	4740	4940	4990	5510	5150	6350	3680	3850	3830	4040	57350
RESIDENTIAL	474	1463364	1430283	1297916	1357301	1531193	3266591	3493295	5145460	3324033	1909116	1411446	1757525	27387523
RESIDENTIAL RENTALS	10	29653	25639	23513	20412	18224	28592	18642	37493	38311	19469	84382	17918	362248
Subtotal for WATER USAGE	503	1656202	1656927	1461245	1521017	1695792	3611797	3878626	5566485	3703791	2123403	1728004	1949028	30552317
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	503	1656202	1656927	1461245	1521017	1695792	3611797	3878626	5566485	3703791	2123403	1728004	1949028	30552317

usertype	avg_accts	jan_2020	feb_2020	mar_2020	apr_2020	may_2020	jun_2020	jul_2020	aug_2020	sep_2020	oct_2020	nov_2020	dec_2020	total
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Usage Summary From Billing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Routes: All	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billing Usage Period: From JAN-2020 to DEC-2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER BASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal for WATER BASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER USAGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-CHURCH	1	495	451	269	35	100	252	406	377	208	388	434	344	3759
C-FINANCE-BANKING	1	3300	2400	2300	2000	2700	108700	158500	159200	134600	2300	2400	2900	581300
C-GOVERNMENT-COUNTY	2	1180	1430	1340	890	1020	9290	22620	25180	21430	9570	1450	1080	96480
C-RETAIL-GENERAL MERCHANDISE	1	520	650	400	100	4980	41820	62630	84880	62650	11960	480	570	271640
COMMERCIAL	12	165862	97019	76842	49618	67005	119848	229316	259301	200442	180525	188875	135443	1770096
R-MOBIL HOME	1	5710	3690	3530	2340	1640	2540	2860	6180	2910	2360	2620	2890	39270
RESIDENTIAL	483	1506898	11483842	1270730	1000562	1364514	3078073	3623736	7335601	4737748	2285218	1625805	1454723	40767450
RESIDENTIAL RENTALS	8	23280	19217	20262	18816	27701	45812	46190	63965	31123	29454	25375	18214	369409
Subtotal for WATER USAGE	509	1707245	11608699	1375673	1074361	1469660	3406335	4146258	7934684	5191111	2521775	1847439	1616164	43899404
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	509	1707245	11608699	1375673	1074361	1469660	3406335	4146258	7934684	5191111	2521775	1847439	1616164	43899404

usertype	avg_accts	jan_2021	feb_2021	mar_2021	apr_2021	may_2021	jun_2021	jul_2021	aug_2021	sep_2021	oct_2021	nov_2021	dec_2021	total
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Usage Summary From Billing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Routes: All	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billing Usage Period: From JAN-2021 to DEC-2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER BASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal for WATER BASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER USAGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-CHURCH	1	474	728	440	520	1040	897	5123	734	449	690	1415	1128	13638
C-FINANCE-BANKING	1	2500	5900	1600	2600	2100	91200	144600	107900	44436	1613	1720	1318	407487
C-GOVERNMENT-COUNTY	2	2410	2150	1140	1760	3300	4160	4400	37500	18198	8732	2211	1913	87874
C-RETAIL-EAT & DRINK	1	0	0	0	0	0	0	916	989	968	1031	401	322	4627
C-RETAIL-GENERAL MERCHANDISE	1	530	660	500	810	14150	59970	88640	86040	46360	16130	7800	650	322240
COMMERCIAL	11	88909	116699	92621	134150	115680	190425	243691	482082	241230	185665	1171257	163983	3226392
R-MOBIL HOME	1	3300	4650	2960	8680	7660	7690	11650	5260	6460	6090	4530	800	69730
RESIDENTIAL	504	1486340	1612864	1126243	1587804	1723898	3654821	7778491	6772408	4005355	2743256	8380313	11592698	52464491
RESIDENTIAL RENTALS	8	18892	19282	15663	18748	17208	74625	82364	47636	34880	35182	20036	23032	407548
Subtotal for WATER USAGE	530	1603355	1762933	1241167	1755072	1885036	4083788	8359875	7540549	4398336	2998389	9589683	11785844	57004027
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	530	1603355	1762933	1241167	1755072	1885036	4083788	8359875	7540549	4398336	2998389	9589683	11785844	57004027

usertype	avg_accts	jan_2022	feb_2022	mar_2022	apr_2022	may_2022	jun_2022	jul_2022	aug_2022	sep_2022	oct_2022	nov_2022	dec_2022	total
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Usage Summary From Billing	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Routes: All	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billing Usage Period: From JAN-2022 to DEC-2022	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER BASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal for WATER BASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WATER USAGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-CHURCH	1	1107	599	688	211	321	469	411	454	257	257	705	538	6017
C-FINANCE-BANKING	1	1476	1875	1761	1566	1545	112236	140394	153870	137172	137172	0	0	689067
C-GOVERNMENT-COUNTY	2	1869	1796	3226	1761	2367	11418	20082	24951	23040	23040	0	53	113603
C-RETAIL-EAT & DRINK	1	63	24	8	286	670	621	831	960	2	2	2503	0	5970
C-RETAIL-GENERAL MERCHANDISE	1	500	660	688	567	9861	25056	75642	147335	82698	82698	0	0	425705
COMMERCIAL	12	98494	246820	202449	177426	174723	299458	278728	304029	398064	398064	124160	135253	2837668
RESIDENTIAL	472	1609429	1578758	1625657	1544418	1614697	2272575	4056074	6866566	5483034	5041916	1263121	1244154	34200399
RESIDENTIAL RENTALS	9	32359	23705	21517	23268	24821	27742	42550	73813	40401	40547	7571	12382	370676
Subtotal for WATER USAGE	499	1745297	1854237	1855994	1749503	1829005	2749575	4614712	7571978	6164668	5723696	1398060	1392380	38649105
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1585	5116897	5429883	5402170	5103345	5311129	6204977	7926552	10852608	9430648	8954546	4130240	4135744	77998739

Appendix O

Water Rights

STATE OF MONTANA
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
1424 9TH AVENUE P.O.BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41J 61342-00 PROVISIONAL PERMIT
Version: 2 -- CHANGE AUTHORIZATION
Version Status: ACTIVE

Owners: WHITE SULPHUR SPRINGS, CITY OF
PO BOX 442
WHITE SULPHUR SPRINGS, MT 59645

Priority Date: DECEMBER 20, 1985 at 11:49 A.M.

Enforceable Priority Date: DECEMBER 20, 1985 at 11:49 A.M.

Purpose (use): MUNICIPAL

Maximum Flow Rate: 500.00 GPM

Maximum Volume: 806.50 AC-FT

Source Name: GROUNDWATER

Source Type: GROUNDWATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		SWSESE	7	9N	7E	MEAGHER

Period of Diversion: JANUARY 1 TO DECEMBER 31
Diversion Means: WELL
Well Depth: 200.00 FEET
Static Water Level: 19.00 FEET
Casing Diameter: 10.00 INCHES

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
2		SWSESE	7	9N	7E	MEAGHER

Period of Diversion: JANUARY 1 TO DECEMBER 31
Diversion Means: WELL
Well Depth: 201.00 FEET
Static Water Level: 22.00 FEET
Casing Diameter: 14.75 INCHES

Purpose (Use): MUNICIPAL
Volume: 806.50 AC-FT
Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			S2	7	9N	7E	MEAGHER
2			NW	18	9N	7E	MEAGHER
3			SE	12	9N	6E	MEAGHER
4			NE	13	9N	6E	MEAGHER

Remarks:

Remarks:

GROUNDWATER WASTE & CONTAMINATION

THIS RIGHT IS SUBJECT TO SECTION 85-2-505, MCA, REQUIRING ALL WELLS BE CONSTRUCTED SO THEY WILL NOT ALLOW WATER TO BE WASTED OR CONTAMINATE OTHER WATER SUPPLIES OR SOURCES, AND ALL FLOWING WELLS SHALL BE CAPPED OR EQUIPPED SO THE FLOW OF THE WATER MAY BE STOPPED WHEN NOT BEING PUT TO BENEFICIAL USE.

GROUNDWATER WELL - ACCESS PORT

THE FINAL COMPLETION OF THE WELL(S) MUST INCLUDE AN ACCESS PORT OF AT LEAST .50 INCH SO THE STATIC LEVEL OF THE WELL MAY BE ACCURATELY MEASURED.

WATER MEASUREMENT-INLINE FLOW METER REQUIRED

THE APPROPRIATOR SHALL INSTALL A DEPARTMENT APPROVED IN-LINE FLOW METER AT A POINT IN THE DELIVERY LINE APPROVED BY THE DEPARTMENT. WATER MUST NOT BE DIVERTED UNTIL THE REQUIRED MEASURING DEVICE IS IN PLACE AND OPERATING. ON A FORM PROVIDED BY THE DEPARTMENT, THE APPROPRIATOR SHALL KEEP A WRITTEN YEARLY RECORD OF THE FLOW RATE AND VOLUME OF ALL WATER DIVERTED, INCLUDING THE PERIOD OF TIME. RECORDS SHALL BE SUBMITTED BY NOVEMBER 30 OF EACH YEAR AND UPON REQUEST AT OTHER TIMES DURING THE YEAR. FAILURE TO SUBMIT REPORTS MAY BE CAUSE FOR REVOCATION OF A PERMIT OR CHANGE. THE RECORDS MUST BE SENT TO THE WATER RESOURCES REGIONAL OFFICE. THE APPROPRIATOR SHALL MAINTAIN THE MEASURING DEVICE SO IT ALWAYS OPERATES PROPERLY AND MEASURES FLOW RATE AND VOLUME ACCURATELY.

STATE OF MONTANA

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

1424 9TH AVENUE P.O.BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41J 193193-00 STATEMENT OF CLAIM

Version: 2 -- POST DECREE

Version Status: ACTIVE

Owners: WHITE SULPHUR SPRINGS, CITY OF
PO BOX 442
WHITE SULPHUR SPRINGS, MT 59645

Priority Date: DECEMBER 31, 1872

Enforceable Priority Date: DECEMBER 31, 1872

Type of Historical Right: DECREED

Purpose (use): MUNICIPAL

Maximum Flow Rate: 112.20 GPM

Maximum Volume: 181.00 AC-FT

Source Name: WILLOW CREEK, SOUTH FORK

Source Type: SURFACE WATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		NENENW	26	9N	7E	MEAGHER

Period of Diversion: JANUARY 1 TO DECEMBER 31

Diversion Means: HEADGATE

Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			S2S2	7	9N	7E	MEAGHER
2			S2SE	12	9N	7E	MEAGHER
3			NE	13	9N	7E	MEAGHER
4			N2NESE	13	9N	7E	MEAGHER
5			SWNWNE	18	9N	7E	MEAGHER
6			NW	18	9N	7E	MEAGHER
7			N2NWSW	18	9N	7E	MEAGHER

Remarks:

THE FOLLOWING ELEMENTS WERE AMENDED BY THE CLAIMANT ON 03/23/1989: PRIORITY DATE AND PLACE OF USE.

WHENEVER THE WATER RIGHTS FOLLOWING THIS STATEMENT ARE COMBINED TO SUPPLY WATER FOR THE CLAIMED PURPOSE, EACH IS LIMITED TO THE HISTORICAL FLOW RATE AND PLACE OF USE OF THAT INDIVIDUAL RIGHT. THE SUM TOTAL VOLUME OF THESE WATER RIGHTS SHALL NOT EXCEED THE AMOUNT PUT TO HISTORICAL AND BENEFICIAL USE. 193193-00, 193194-00, 193195-00.

STATE OF MONTANA
DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
1424 9TH AVENUE P.O.BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41J 193194-00 STATEMENT OF CLAIM
Version: 2 -- POST DECREE
Version Status: ACTIVE

Owners: WHITE SULPHUR SPRINGS, CITY OF
PO BOX 442
WHITE SULPHUR SPRINGS, MT 59645

Priority Date: JUNE 30, 1878

Enforceable Priority Date: JUNE 30, 1878

Type of Historical Right: USE

Purpose (use): MUNICIPAL

Maximum Flow Rate: 1.42 CFS

Maximum Volume: 476.00 AC-FT

Source Name: WILLOW CREEK, SOUTH FORK

Source Type: SURFACE WATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		NENENW	26	9N	7E	MEAGHER

Period of Diversion: JANUARY 1 TO DECEMBER 31
Diversion Means: HEADGATE

Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			S2S2	7	9N	7E	MEAGHER
2			S2SE	12	9N	7E	MEAGHER
3			NE	13	9N	7E	MEAGHER
4			N2NESE	13	9N	7E	MEAGHER
5			SWNWNE	18	9N	7E	MEAGHER
6			NW	18	9N	7E	MEAGHER
7			N2NWSW	18	9N	7E	MEAGHER

Remarks:

THE FOLLOWING ELEMENTS WERE AMENDED BY THE CLAIMANT ON 3/23/1989: PLACE OF USE, PRIORITY DATE AND FLOW RATE.

WHENEVER THE WATER RIGHTS FOLLOWING THIS STATEMENT ARE COMBINED TO SUPPLY WATER FOR THE CLAIMED PURPOSE, EACH IS LIMITED TO THE HISTORICAL FLOW RATE AND PLACE OF USE OF THAT INDIVIDUAL RIGHT. THE SUM TOTAL VOLUME OF THESE WATER RIGHTS SHALL NOT EXCEED THE AMOUNT PUT TO HISTORICAL AND BENEFICIAL USE. 193193-00, 193194-00, 193195-00.

STATE OF MONTANA

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

1424 9TH AVENUE P.O.BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41J 193195-00 STATEMENT OF CLAIM

Version: 2 -- POST DECREE

Version Status: ACTIVE

Owners: WHITE SULPHUR SPRINGS, CITY OF
PO BOX 442
WHITE SULPHUR SPRINGS, MT 59645

Priority Date: SEPTEMBER 22, 1898

Enforceable Priority Date: SEPTEMBER 22, 1898

Type of Historical Right: FILED

Purpose (use): MUNICIPAL

Maximum Flow Rate: 0.33 CFS

Maximum Volume: 194.00 AC-FT

Source Name: WILLOW CREEK, SOUTH FORK

Source Type: SURFACE WATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		NENENW	26	9N	7E	MEAGHER

Period of Diversion: JANUARY 1 TO DECEMBER 31

Diversion Means: HEADGATE

Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			S2S2	7	9N	7E	MEAGHER
2			S2SE	12	9N	7E	MEAGHER
3			NE	13	9N	7E	MEAGHER
4			N2NESE	13	9N	7E	MEAGHER
5			SWNWNE	18	9N	7E	MEAGHER
6			NW	18	9N	7E	MEAGHER
7			N2NWSW	18	9N	7E	MEAGHER

Remarks:

THE PLACE OF USE WAS AMENDED BY THE CLAIMANT ON 03/23/1989.

WHENEVER THE WATER RIGHTS FOLLOWING THIS STATEMENT ARE COMBINED TO SUPPLY WATER FOR THE CLAIMED PURPOSE, EACH IS LIMITED TO THE HISTORICAL FLOW RATE AND PLACE OF USE OF THAT INDIVIDUAL RIGHT. THE SUM TOTAL VOLUME OF THESE WATER RIGHTS SHALL NOT EXCEED THE AMOUNT PUT TO HISTORICAL AND BENEFICIAL USE. 193193-00, 193194-00, 193195-00.

Appendix P

Water Quality

DEQ MONTANA

Montana Department of Environmental Quality

Drinking Water: Public Water Supply Bureau

Public Water Supply Monitoring Schedule

Guidance Document PDF CLICK HERE

Video Tutorial on Printing CLICK HERE

PWS Bureau Contacts CLICK HERE

Search by Water System Name or PWS ID#
MT0000360 WHITE SULPHUR SPRINGS CITY OF

Last Data Refresh:
7/8/2023 11:38:08 AM

Public Water Supply ID#:	MT0000360	Water System Name:	WHITE SULPHUR SPRINGS CITY OF
Principle County Served:	MEAGHER	Primary Water Source:	SW
Number of Connections:	600	Classification Type:	COMMUNITY
Population Served:	1,000	Operating Period:	01/01-12/31

COMPLIANCE SCHEDULES

Schedule Type	Schedule Activity	Due Date	Schedule Status
CONSUMER CONFIDENCE REPORT	SUBMIT ACCEPTABLE CERTIFICATION	09/30/2023	Paperwork due in 84 days
	SUBMIT ACCEPTABLE CCR	06/30/2023	Paperwork Overdue

SYSTEM SUMMARY REPORTING REQUIREMENTS: FANLs

PWS Facility Name	Sample Point Labels	Analyte Name	Control Level	Sample Frequency	Reporting Frequency	DEQ FANL CODE
DISTRIBUTION SYSTEM	DS001 SP001	**CHLORINE**	4 MG/L MAX	Monthly	Quarterly	MRDL
			.001 MG/L MIN	1 Daily	Monthly	DSRD
			.060 MG/L	See Chem	See Chem	

		HAA5	.060 MG/L MAX	See Chem Schedule	See Chem Schedule	DBP2
		TTHM	.080 MG/L MAX	See Chem Schedule	See Chem Schedule	DBP2
TP FOR WILLOW CREEK SWTP	TP002 EP502	CHLORINE	.2 MG/L MIN	1 Daily	Monthly	EPRD
		TURBIDITY	1 NTU 95P	Contact Rule MGR	Contact Rule MGR	95PT
			5 NTU MAX	Contact Rule MGR	Contact Rule MGR	MAXT

*Monthly MRDL chlorine residual must be taken and reported at the same time and place as each coliform sample collected.

TOTAL COLIFORM BACTERIOLOGICAL SCHEDULES

Analyte Group Name	Sample Point Label	Sample Point Name	Sample Count Required	Sample Frequency	Seasonal Collection	Monitoring Period	Monitoring Period Name	Monitoring Period Satisfied?	Schedule Status
COLIFORM (TCR)	DS001 SP001	SP FOR DS	2	MONTHLY	01/01-12/31	08-01-2023 to 08-31-2023	AUG23	No	Future Schedule: 24 days to CP
						07-01-2023 to 07-31-2023	JUL23	No	Open Schedule: 23 days left in CP
						06-01-2023 to 06-30-2023	JUN23	Yes	Closed Schedule: Samp taken on 06-26-2023

Chemical Schedules Status Filter

Chemical Schedules can be filtered by schedule status. Click the drop-down arrow and select which schedules you want to display.

All

CHEMICAL SCHEDULES

Facility/Sample Point Name	Sample Point Label	Analyte Group Name	Sample Count Required	Sample Frequency	Monitoring Period	Collection Period	Monitoring Period Satisfied	Schedule Status
					01-01-2024 to 12-31-2024	08-01-2024 to 08-31-2024	NO	Future Schedule: 390 days to CP

DISTRIBUTION SYSTEM: 2ND WK AUG- 205 10TH ST	DS001 DBPHA5	**HAA5 (HAA5)**	1	1 YEAR	01-01-2023 to 12-31-2023	08-01-2023 to 08-31-2023	NO	Open Schedule: 24 days to CP
					01-01-2022 to 12-31-2022	08-01-2022 to 08-31-2022	YES	Closed Schedule: Sample taken on 09-06-2022
DISTRIBUTION SYSTEM: 2ND WK AUG- GARDEN SHOP	DS001 D BPTHM	**TTHM (TTHM)**	1	1 YEAR	01-01-2024 to 12-31-2024	08-01-2024 to 08-31-2024	NO	Future Schedule: 390 days to CP
					01-01-2023 to 12-31-2023	08-01-2023 to 08-31-2023	NO	Open Schedule: 24 days to CP
					01-01-2022 to 12-31-2022	08-01-2022 to 08-31-2022	YES	Closed Schedule: Sample taken on 09-06-2022
DISTRIBUTION SYSTEM: SP FOR DS	DS001 SP001	**ASBESTOS (ASBE)**	1	9 YEARS	01-01-2029 to 12-31-2037	01-01-2029 to 12-31-2037	NO	Future Schedule: 2004 days to CP
					01-01-2020 to 12-31-2028	01-01-2020 to 12-31-2028	NO	Open Schedule: 2003 days left in CP
		LEAD COPPER ONLY (PBCU)	10	3 YEARS	01-01-2024 to 12-31-2026	06-01-2026 to 09-30-2026	NO	Future Schedule: 1059 days to CP
					01-01-2021 to 12-31-2023	06-01-2023 to 09-30-2023	NO	Open Schedule: 84 days left in CP
					01-01-2018 to 12-31-2020	06-01-2020 to 09-30-2020	YES	Closed Schedule: Sample taken on 09-30-2020
		ARSENIC (ARSE)	1	3 YEARS	01-01-2026 to 12-31-2028	01-01-2026 to 12-31-2028	NO	Future Schedule: 908 days to CP
					01-01-2023 to 12-31-2025	01-01-2023 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2020 to 12-31-2022	01-01-2020 to 12-31-2022	YES	Closed Schedule: Sample taken on 12-12-2022
		NITRATE NITRITE (NITR)	1	1 YEAR	01-01-2024 to 12-31-2024	01-01-2024 to 12-31-2024	NO	Future Schedule: 177 days to CP
					01-01-2023 to 12-31-2023	01-01-2023 to 12-31-2023	NO	Open Schedule: 176 days left in CP
					01-01-2022 to 12-31-2022	01-01-2022 to 12-31-2022	YES	Closed Schedule: Sample taken on 12-12-2022
		P2-5 INOR			01-01-2026 to 12-31-2028	01-01-2026 to 12-31-2028	NO	Future Schedule: 908 days to CP
					01-01-2023 to	01-01-2023 to		Open Schedule:

TP FOR WELLS 1 & 2: EP FOR WELLS 1 & 2	TP003 EP503	GANICS (IN O1)	1	3 YEARS	01-01-2023 to 12-31-2025	01-01-2023 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2020 to 12-31-2022	01-01-2020 to 12-31-2022	YES	Closed Schedule: Sample taken on 12-12-2022
		RAD GROSS ALPHA (GRAL)	1	9 YEARS	01-01-2026 to 12-31-2034	01-01-2026 to 12-31-2034	NO	Future Schedule: 908 days to CP
					01-01-2017 to 12-31-2025	01-01-2017 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2008 to 12-31-2016	01-01-2008 to 12-31-2016	YES	Closed Schedule: Sample taken on 12-20-2010
		RADIUMS COMBINED (COMB)	1	9 YEARS	01-01-2026 to 12-31-2034	01-01-2026 to 12-31-2034	NO	Future Schedule: 908 days to CP
					01-01-2017 to 12-31-2025	01-01-2017 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2008 to 12-31-2016	01-01-2008 to 12-31-2016	YES	Closed Schedule: Sample taken on 12-05-2016
		SOC REGUL ATED (SOC)	1	3 YEARS	01-01-2026 to 12-31-2028	01-01-2026 to 12-31-2028	NO	Future Schedule: 908 days to CP
					01-01-2023 to 12-31-2025	01-01-2023 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2020 to 12-31-2022	01-01-2020 to 12-31-2022	YES	Closed Schedule: Sample taken on 12-12-2022
		STATE WIDE WAIVERS (SWW)	1	9 YEARS	01-01-2029 to 12-31-2037	01-01-2029 to 12-31-2037	NO	Future Schedule: 2004 days to CP
					01-01-2020 to 12-31-2028	01-01-2020 to 12-31-2028	NO	Partial Sample taken on 12-12-2022
		VOC (VOC1)	1	3 YEARS	01-01-2026 to 12-31-2028	01-01-2026 to 12-31-2028	NO	Future Schedule: 908 days to CP
					01-01-2023 to 12-31-2025	01-01-2023 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2020 to 12-31-2022	01-01-2020 to 12-31-2022	YES	Closed Schedule: Sample taken on 12-12-2022
		ARSENIC (ARSE)	1	1 YEAR	01-01-2024 to 12-31-2024	01-01-2024 to 12-31-2024	NO	Future Schedule: 177 days to CP
					01-01-2023 to 12-31-2023	01-01-2023 to 12-31-2023	NO	Open Schedule: 176 days left in CP

TP FOR WILLOW CREEK SWTP: EP FOR IN TP	TP002 EP502				01-01-2019 to 12-31-2019	01-01-2019 to 12-31-2019	YES	Closed Schedule: Sample taken on 12-03-2019
		NITRATE NITRITE (NITR)	1	QUARTERLY	10-01-2023 to 12-31-2023	10-01-2023 to 12-31-2023	NO	Future Schedule: 85 days to CP
					07-01-2023 to 09-30-2023	07-01-2023 to 09-30-2023	NO	Open Schedule: 84 days left in CP
					04-01-2023 to 06-30-2023	04-01-2023 to 06-30-2023	NO	Missed Sample
					01-01-2022 to 03-31-2022	01-01-2022 to 03-31-2022	YES	Closed Schedule: Sample taken on 02-14-2022
		RAD GROSS ALPHA (GRAL)	1	9 YEARS	01-01-2026 to 12-31-2034	01-01-2026 to 12-31-2034	NO	Future Schedule: 908 days to CP
					01-01-2017 to 12-31-2025	01-01-2017 to 12-31-2025	NO	Open Schedule: 907 days left in CP
		RADIUMS COMBINED (COMB)	1	9 YEARS	01-01-2026 to 12-31-2034	01-01-2026 to 12-31-2034	NO	Future Schedule: 908 days to CP
					01-01-2017 to 12-31-2025	01-01-2017 to 12-31-2025	NO	Open Schedule: 907 days left in CP
		SOC REGUL ATED (SOC)	1	3 YEARS	01-01-2026 to 12-31-2028	01-01-2026 to 12-31-2028	NO	Future Schedule: 908 days to CP
					01-01-2023 to 12-31-2025	01-01-2023 to 12-31-2025	NO	Open Schedule: 907 days left in CP
					01-01-2017 to 12-31-2019	01-01-2017 to 12-31-2019	YES	Closed Schedule: Sample taken on 12-03-2019
		VOC (VOC1)	1	1 YEAR	01-01-2024 to 12-31-2024	01-01-2024 to 12-31-2024	NO	Future Schedule: 177 days to CP
					01-01-2023 to 12-31-2023	01-01-2023 to 12-31-2023	NO	Open Schedule: 176 days left in CP
					01-01-2019 to 12-31-2019	01-01-2019 to 12-31-2019	YES	Closed Schedule: Sample taken on 12-03-2019

If needed, scroll down

*Asbestos - required to monitor during the first three-year compliance period of each nine-year compliance cycle.

*All waivers (including Dioxin) must monitor in the first 3-year period of the new monitoring cycle. The State-wide Waiver includes the following analytes endothall, diquat, glyphosate, ethylene dibromide (EDB), dibromochloropropane (DBCP), cyanide and PCBs.

Drinking Water Branch

Coliform/Microbial Sample Results

Return Links

[Water System Search]

[County Map]

[Glossary]

Principal County Served	Water System No.	Water System Name	Type	Lab Sample No.	Collection Date & Time	Presence/ Absence Indicator	Analyte Code	Analyte Name	Monitoring Period Begin Date	Monitoring Period End Date	Print
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	RT	64766	03-20-2023	P	3100	COLIFORM (TCR)	03-01-2023	03-31-2023	
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	RT	53689	04-10-2018 14:15:00	P	3100	COLIFORM (TCR)	04-01-2018	04-30-2018	
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	RT	53690	04-10-2018 14:30:00	P	3100	COLIFORM (TCR)	04-01-2018	04-30-2018	

Total Number of Records Displayed = 3

Drinking Water Branch

Lead and Copper Sample Summary Results

Return Links

Water System Search

County Map

Glossary

Principal County Served	Water System No.	Water System Name	Monitoring Period Begin Date	Monitoring Period End Date	Number of Samples	Measure (mg/l)	Analyte
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2018	12-31-2020	10	.168	Copper
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2018	12-31-2020	10	.209	Copper
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2018	12-31-2020	0	null	Copper
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2018	12-31-2020	10	0	Lead
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2018	12-31-2020	10	.001	Lead
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2018	12-31-2020	0	null	Lead
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2015	12-31-2017	10	.082	Copper
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2015	12-31-2017	10	.102	Copper
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2015	12-31-2017	0	null	Copper
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2015	12-31-2017	10	.002	Lead
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2015	12-31-2017	10	.004	Lead
MEAGHER	MT0000360	WHITE SULPHUR SPRINGS CITY OF	01-01-2015	12-31-2017	0	null	Lead

Total Number of Records Displayed = 12

Drinking Water Branch

Violations

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000360	**Federal Type :**	C
Water System Name :	WHITE SULPHUR SPRINGS CITY OF	**State Type :**	C
Principal County Served :	MEAGHER	**Primary Source :**	SW
Status :	A	**Activity Date :**	02-14-2000

****Please note**: some of these violations may have been resolved and/or returned to compliance. Please click on the violation to view more information on its compliance status.**

Group Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Group Code	Analyte Group Name	Water System Facility State Asgn ID	Water System Facility Name
2023-16341	V	03	MONITORING, ROUTINE MAJOR	SOC	CDS SOC REGULATED	TP002	TP FOR WILLOW CREEK SWTP
2022-15909	V	27	MONITORING, ROUTINE (DBP), MAJOR	HAA5	CDS HAA5	DS001	DISTRIBUTION SYSTEM
2021-15762	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP002	TP FOR WILLOW CREEK SWTP
2021-15746	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	TP002	TP FOR WILLOW CREEK SWTP
2021-15745	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2020-15678	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP002	TP FOR WILLOW CREEK SWTP
2020-15519	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP002	TP FOR WILLOW CREEK SWTP
2019-15451	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2019-15449	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	TP002	TP FOR WILLOW CREEK SWTP
2016-14408	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP002	TP FOR WILLOW CREEK SWTP
2014-13417	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2011-11403	V	03	MONITORING, ROUTINE MAJOR	SOC1	CDS SOC	CH001	COMMON HEADER FOR WELLS 1 & 2
2011-11404	V	03	MONITORING, ROUTINE MAJOR	SOC1	CDS SOC	TP002	TP FOR WILLOW CREEK SWTP
2011-11244	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	CH001	COMMON HEADER FOR WELLS 1 & 2

2011-11312	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	TP002	TP FOR WILLOW CREEK SWTP
2011-11183	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2009-10388	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	TP002	TP FOR WILLOW CREEK SWTP
2009-10310	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2009-10320	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	TP002	TP FOR WILLOW CREEK SWTP
2009-10319	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	CH001	COMMON HEADER FOR WELLS 1 & 2
2009-10056	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2009-10057	V	27	MONITORING, ROUTINE (DBP), MINOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2007-9298	V	27	MONITORING, ROUTINE (DBP), MINOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2007-9295	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2007-9296	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2007-9297	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2006-8788	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2006-8798	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2006-8697	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	TP002	TP FOR WILLOW CREEK SWTP
2006-8330	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2006-8326	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	CH001	COMMON HEADER FOR WELLS 1 & 2
2006-8325	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	TP002	TP FOR WILLOW CREEK SWTP
2005-7030	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	CH001	COMMON HEADER FOR WELLS 1 & 2
2005-6919	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2005-6421	V	27	MONITORING, ROUTINE (DBP), MAJOR	CDBP	CDS DISINFECTANT BPS	DS001	DISTRIBUTION SYSTEM
2003-3061	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	TP002	TP FOR WILLOW CREEK SWTP
2002-2262	V	03	MONITORING, ROUTINE MAJOR	ARSE	CDS ARSENIC	TP002	TP FOR WILLOW CREEK SWTP
2002-1602	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	TP002	TP FOR WILLOW CREEK SWTP

Total Number of Records Displayed = 38

Individual Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Code	Analyte Name	Water System Facility State Asgn ID	Water System Facility Name
2021-4123362	V	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	null	null
2021-4123337	V	66	LEAD CONSUMER NOTICE (LCR)	5000	LEAD & COPPER RULE	null	null
2014-4123309	V	41	RES DISINFECT CONCENTRATION (SWTR)	0999	CHLORINE	TP002	TP FOR WILLOW CREEK SWTP
2011-4123221	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2010-4123114	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0999	CHLORINE	DS001	DISTRIBUTION SYSTEM
2009-4123112	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0999	CHLORINE	DS001	DISTRIBUTION SYSTEM
2009-4121909	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0999	CHLORINE	TP002	TP FOR WILLOW CREEK SWTP
2009-4117609	V	44	MONTHLY COMB FLTR EFFLUENT (IESWTR/LT1)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2007-4116107	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2006-4122006	V	41	SINGLE COMB. FILTER EFFLUENT (SWTR)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4122206	V	41	RES DISINFECT CONCENTRATION (SWTR)	0999	CHLORINE	TP002	TP FOR WILLOW CREEK SWTP
2006-4114506	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4114406	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4114306	V	43	SINGLE COMB FLTR EFFLUENT (IESWTR/LT1)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4114106	V	43	SINGLE COMB FLTR EFFLUENT (IESWTR/LT1)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4114206	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4113906	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4113806	V	43	SINGLE COMB FLTR EFFLUENT (IESWTR/LT1)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4122106	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4113506	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP

2006-4113406	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4108406	V	43	SINGLE COMB FLTR EFFLUENT (IESWTR/LT1)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2006-4108306	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2005-4108105	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2005-4107905	V	43	SINGLE COMB FLTR EFFLUENT (IESWTR/LT1)	0300	IESWTR	TP002	TP FOR WILLOW CREEK SWTP
2005-4105505	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0999	CHLORINE	TP003	TP FOR WELLS 1 & 2
2005-4104805	V	52	FOLLOW-UP OR ROUTINE TAP M/R (LCR)	5000	LEAD & COPPER RULE	null	null
2004-4104704	V	36	MONITORING, RTN/RPT MAJOR (SWTR-FILTER)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4103504	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4103204	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4103304	V	36	MONITORING, RTN/RPT MINOR (SWTR-FILTER)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4103604	V	36	MONITORING, RTN/RPT MINOR (SWTR-FILTER)	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4101804	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4101404	V	41	MONTHLY COMB. FILTER EFFLUENT (SWTR	0100	TURBIDITY	TP002	TP FOR WILLOW CREEK SWTP
2004-4099004	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2000-4092700	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-200	V	21	MCL (TCR), ACUTE	3100	COLIFORM (TCR)	null	null
2000-4068300	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-4060300	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-204000	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-137000	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-121900	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-104300	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1999-1626399	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
2000-18600	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null

2000-3500	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1999-1306099	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1999-1065999	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1999-1047099	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1998-456498	V	26	MONITORING (TCR), REPEAT MINOR	3100	COLIFORM (TCR)	null	null
1998-371398	V	24	MONITORING (TCR), ROUTINE MINOR	3100	COLIFORM (TCR)	null	null
1998-244798	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1998-230598	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1998-191098	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1998-152098	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1997-1098497	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1997-1075997	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1997-760197	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1996-1452896	V	03	MONITORING, ROUTINE MAJOR	1024	CYANIDE	null	null
1996-1453196	V	03	MONITORING, ROUTINE MAJOR	1025	FLUORIDE	null	null
1996-1453396	V	03	MONITORING, ROUTINE MAJOR	1035	MERCURY	null	null
1996-1452796	V	03	MONITORING, ROUTINE MAJOR	1036	NICKEL	null	null
1996-1452596	V	03	MONITORING, ROUTINE MAJOR	1040	NITRATE	null	null
1996-1453096	V	03	MONITORING, ROUTINE MAJOR	1074	ANTIMONY, TOTAL	null	null
1996-1453496	V	03	MONITORING, ROUTINE MAJOR	1020	CHROMIUM	null	null
1996-1453596	V	03	MONITORING, ROUTINE MAJOR	1015	CADMIUM	null	null
1996-1453696	V	03	MONITORING, ROUTINE MAJOR	1010	BARIUM	null	null
1996-1453796	V	03	MONITORING, ROUTINE MAJOR	1005	ARSENIC	null	null
1996-1452696	V	03	MONITORING, ROUTINE MAJOR	1085	THALLIUM, TOTAL	null	null

1996-1452996	V	03	MONITORING, ROUTINE MAJOR	1075	BERYLLIUM, TOTAL	null	null
1996-1453296	V	03	MONITORING, ROUTINE MAJOR	1045	SELENIUM	null	null
1995-977395	V	03	MONITORING, ROUTINE MAJOR	1040	NITRATE	null	null
1995-396395	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1995-387395	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1995-226495	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1995-224995	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1995-228495	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1995-56995	V	41	RES DISINFECT CONCENTRATION (SWTR)	0200	SWTR	null	null
1988-388	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1988-288	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1988-188	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1987-387	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1987-287	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1987-187	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1986-186	V	02	MCL, AVERAGE	0100	TURBIDITY	null	null
1984-184	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1981-50081	V	02	MCL, AVERAGE	3000	COLIFORM (PRE-TCR)	null	null
1981-1381	V	03	MONITORING, ROUTINE MAJOR	0100	TURBIDITY	null	null
1981-1281	V	03	MONITORING, ROUTINE MAJOR	0100	TURBIDITY	null	null
1980-33980	V	02	MCL, AVERAGE	3000	COLIFORM (PRE-TCR)	null	null
1980-11880	V	02	MCL, AVERAGE	0100	TURBIDITY	null	null
1980-11780	V	02	MCL, AVERAGE	0100	TURBIDITY	null	null

Total Number of Records Displayed = 92

IMPORTANT INFORMATION

Annual Drinking Water Quality Report

MT0000360 WHITE SULPHUR SPRINGS CITY OF

Annual Water Quality Report for the period of January 1 to December 31, 2020

This report is intended to provide you with important information about your drinking water and the efforts made by the water system to provide safe drinking water.

WHITE SULPHUR SPRINGS CITY OF is Surface Water

For more information regarding this report contact:

Name ____

Phone ____

Este informe contiene información muy importante sobre el agua que usted bebe. Tradúzcalo ó hable con alguien que lo entienda bien.

Sources of Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. The source water assessment report for your water system provides additional information on your source water's susceptibility to contamination. To access this report please go to: https://deq.mt.gov/water/Programs/dw-sourcewater

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPAs Safe Drinking Water Hotline at (800) 426-4791.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

- Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population.

Information about Source Water Assessments

SWA = Source Water Assessment

Source Water Name	Type of Water	Report Status	Location
INTAKE WILLOW CREEK	SW	________	____
WELL 1 1986 8TH AVE GWIC 260672	GW	________	102 8TH AVE NE JUST INSIDE CITY YARD
WELL 2 1998 8TH AVE GWIC 172711	GW	________	102 8TH AVE NE JUST INSIDE CITY YARD

Lead and Copper

Definitions:
Action Level Goal (ALG): The level of a contaminant in drinking water below which there is no known or expected risk to health. ALGs allow for a margin of safety.
Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Lead and Copper	Date Sampled	MCLG	Action Level (AL)	90th Percentile	# Sites Over AL	Units	Violation	Likely Source of Contamination
Copper	2020	1.3	1.3	0.168	0	ppm	N	Erosion of natural deposits; Leaching from wood preservatives; Corrosion of household plumbing systems.

Water Quality Test Results

Definitions:	The following tables contain scientific terms and measures, some of which may require explanation.
Avg:	Regulatory compliance with some MCLs are based on running annual average of monthly samples.
Level 1 Assessment:	A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.
Level 2 Assessment:	A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an E. coli MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions.
Maximum Contaminant Level or MCL:	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
Maximum Contaminant Level Goal or MCLG:	The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
Maximum residual disinfectant level or MRDL:	The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum residual disinfectant level goal or MRDLG:	The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
mrem:	millirems per year (a measure of radiation absorbed by the body)
na:	not applicable.
ppb:	micrograms per liter or parts per billion - or one ounce in 7,350,000 gallons of water.
ppm:	milligrams per liter or parts per million - or one ounce in 7,350 gallons of water.

Treatment Technique or TT:	A required process intended to reduce the level of a contaminant in drinking water.

Regulated Contaminants

Disinfectants and Disinfection By-Products	Collection Date	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likely Source of Contamination
Chlorine	2020	0.2	0.2 - 0.2	MRDLG = 4	MRDL = 4	ppm	N	Water additive used to control microbes.
Haloacetic Acids (HAA5)	2020	1	1 - 1	No goal for the total	60	ppb	N	By-product of drinking water disinfection.
Total Trihalomethanes (TTHM)	2020	10	5.6 - 5.6	No goal for the total	80	ppb	N	By-product of drinking water disinfection.

Inorganic Contaminants	Collection Date	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likely Source of Contamination
Arsenic	12/03/2019	4	0 - 4	0	10	ppb	N	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.
Barium	12/03/2019	0.08	0.08 - 0.08	2	2	ppm	N	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Fluoride	12/03/2019	0.2	0.2 - 0.2	4	4.0	ppm	N	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.

Violations Table

1,1,1-Trichloroethane

Some people who drink water containing 1,1,1-trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

1,1,2-Trichloroethane

Some people who drink water containing 1,1,2-trichloroethane well in excess of the MCL over many years could have problems with their liver, kidneys, or immune systems.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

1,1-Dichloroethylene

Some people who drink water containing 1,1-dichloroethylene in excess of the MCL over many years could experience problems with their liver.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

1,2,4-Trichlorobenzene

Some people who drink water containing 1,2,4-trichlorobenzene well in excess of the MCL over many years could experience changes in their adrenal glands.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

1,2-Dichloroethane			
Some people who drink water containing 1,2-dichloroethane in excess of the MCL over many years may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

1,2-Dichloropropane			
Some people who drink water containing 1,2-dichloropropane in excess of the MCL over many years may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Arsenic			
Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Benzene			
Some people who drink water containing benzene in excess of the MCL over many years could experience anemia or a decrease in blood platelets, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Carbon Tetrachloride			
Some people who drink water containing carbon tetrachloride in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Chlorobenzene			
Some people who drink water containing chlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Dichloromethane			
Some people who drink water containing dichloromethane in excess of the MCL over many years could have liver problems and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Ethylbenzene			
Some people who drink water containing ethylbenzene well in excess of the MCL over many years could experience problems with their liver or kidneys.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Lead and Copper Rule

The Lead and Copper Rule protects public health by minimizing lead and copper levels in drinking water, primarily by reducing water corrosivity. Lead and copper enter drinking water mainly from corrosion of lead and copper containing plumbing materials.

Violation Type	Violation Begin	Violation End	Violation Explanation
LEAD CONSUMER NOTICE (LCR)	12/30/2020	01/19/2021	We failed to provide the results of lead tap water monitoring to the consumers at the location water was tested. These were supposed to be provided no later than 30 days after learning the results.

Nitrate and nitrite [measured as Nitrogen]

Infants below the age of six months who drink water containing nitrate and nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	03/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.
MONITORING, ROUTINE MAJOR	04/01/2020	06/30/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Styrene

Some people who drink water containing styrene well in excess of the MCL over many years could have problems with their liver, kidneys, or circulatory system.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Tetrachloroethylene

Some people who drink water containing tetrachloroethylene in excess of the MCL over many years could have problems with their liver, and may have an increased risk of getting cancer.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Toluene			
Some people who drink water containing toluene well in excess of the MCL over many years could have problems with their nervous system, kidneys, or liver.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Trichloroethylene			
Some people who drink water containing trichloroethylene in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Vinyl Chloride			
Some people who drink water containing vinyl chloride in excess of the MCL over many years may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Xylenes			
Some people who drink water containing xylenes in excess of the MCL over many years could experience damage to their nervous system.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

cis-1,2-Dichloroethylene			
Some people who drink water containing cis-1,2-dichloroethylene in excess of the MCL over many years could experience problems with their liver.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

o-Dichlorobenzene			
Some people who drink water containing o-dichlorobenzene well in excess of the MCL over many years could experience problems with their liver, kidneys, or circulatory systems.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

p-Dichlorobenzene			
Some people who drink water containing p-dichlorobenzene in excess of the MCL over many years could experience anemia, damage to their liver, kidneys, or spleen, or changes in their blood.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

trans-1,2-Dicholoroethylene			
Some people who drink water containing trans-1,2-dichloroethylene well in excess of the MCL over many years could experience problems with their liver.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2020	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

IMPORTANT INFORMATION

The following pages comprise the Annual Consumer Confidence Report (CCR) for your water system.

To download the CCR into your word processing program, follow these steps. Remember you must have the document set up in Landscape Orientation.

* Choose Select All from the edit drop down MENU. (It will highlight all the information)
* Choose Edit from the Menu, select Copy from the edit dropdown Menu.
* Open your word processing program.
* Choose Edit from the MENU, select Paste from the edit dropdown MENU and the information will transfer.
* Choose Edit from the Menu.

In order to meet all the requirements of the CCR, you must include the following additional information if it pertains to your water system.

* The report must include the telephone number of the owner, operator, or designee of the community water system as a source of additional information concerning the report.

* If your water system had any violations during the current CCR Calendar year, you are required to include an explanation of the corrective action taken by the water system.

* The report must include information about opportunities for public participation in decisions that may affect the quality of the water (e.g., time and place of regularly scheduled board meetings).

* If your water system purchases water from another source, you are required to include the current CCR year's Regulated Contaminants Detected table from your source water supply.

* If your water system had any violations during the current CCR Calendar year, you are required to include an explanation of the corrective action taken by the water system.

* If your water system is going to use the CCR to deliver a Public Notification, you must include the full notice and return a copy of the CCR and Public Notice with the public Notice. This is in addition to the copy and certification form required by the CCR Rule.

* The information about likely sources of contamination provided in the CCR is generic. Specific information regarding contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator.

* If a community water system distributes water to its customers from multiple hydraulically independent distribution systems fed by different raw water sources, the table should contain a separate column for each service area, and the report should identify each separate distribution system. Alternatively, systems may produce separate reports tailored to include data for each service area.

* Detections of unregulated contaminants for which monitoring is required are not included in the CCR and must be added. When added, the information must

include the average and range at which the contaminant was detected.

* If a water system has performed any monitoring for Cryptosporidium, including monitoring performed to satisfy the requirements of the Information Collection Rule [ICR] (141.143), which indicates that Cryptosporidium may be present in the source water or the finished water, the report must include: (a) a summary of the results of the monitoring; and (b) an explanation of the significance of the results.

* If a water system has performed any monitoring for radon which indicate that radon may be present in the finished water, the report must include: (a) The results of the monitoring; and (b) An explanation of the significance of the results.

* If a water system has performed additional monitoring which indicates the presence of other contaminants in the finished water, EPA strongly encourages systems to report any results which may indicate a health concern. To determine if results may indicate a health concern, EPA recommends that systems find out if EPA has proposed an NPDWR or issued a health advisory for that contaminant by calling the Safe Drinking Water Hotline (800-426-4791). EPA considers detects above a proposed MCL or health advisory level to indicate possible health concerns. For such contaminants, EPA recommends that the report include: (a) the results of the monitoring; and (b) an explanation of the significance of the results noting the existence of a health advisory or a proposed regulation.

* If you are a groundwater system that receives notice from a state of a significant deficiency, you must inform your customers in your CCR report of any significant deficiencies that are not corrected by December 31 of the year covered by it. The CC must include the following information:

- The nature of the significant deficiency and the date it was identified by the state.

- If the significant deficiency was not corrected by the end of the calendar year, include information regarding the State-approved plan and schedule for correction, including interim measures, progress to date, and any interim measures completed.

- If the significant deficiency was corrected by the end of the calendar year, include information regarding how the deficiency was corrected and the date it was corrected.

Annual Drinking Water Quality Report

MT0000360 WHITE SULPHUR SPRINGS CITY OF

Annual Water Quality Report for the period of January 1 to December 31, 2021

This report is intended to provide you with important information about your drinking water and the efforts made by the water system to provide safe drinking water.

WHITE SULPHUR SPRINGS CITY OF is Surface Water

For more information regarding this report contact:

Name ____

Phone ____

Este informe contiene información muy importante sobre el agua que usted bebe. Tradúzcalo ó hable con alguien que lo entienda bien.

Sources of Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. The source water assessment report for your water system provides additional information on your source water's susceptibility to contamination. To access this report please go to: https://deq.mt.gov/water/Programs/dw-sourcewater

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPAs Safe Drinking Water Hotline at (800) 426-4791.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

- Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population.

Contaminants may be found in drinking water that may cause taste, color, or odor problems. These types of problems are not necessarily causes for health concerns. For more information on taste, odor, or color of drinking water, please contact the system's business office.

Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. We are responsible for providing high quality drinking water, but we cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Source Water Information

SWA = Source Water Assessment

Source Water Name	Type of Water	Report Status	Location
INTAKE WILLOW CREEK	SW		
WELL 1 1986 8TH AVE GWIC 260672	GW		102 8TH AVE NE JUST INSIDE CITY YARD
WELL 2 1998 8TH AVE GWIC 172711	GW		102 8TH AVE NE JUST INSIDE CITY YARD

Lead and Copper

Definitions:
Action Level Goal (ALG): The level of a contaminant in drinking water below which there is no known or expected risk to health. ALGs allow for a margin of safety.
Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Lead and Copper	Date Sampled	MCLG	Action Level (AL)	90th Percentile	# Sites Over AL	Units	Violation	Likely Source of Contamination
Copper	09/30/2020	1.3	1.3	0.168	0	ppm	N	Erosion of natural deposits; Leaching from wood preservatives; Corrosion of household plumbing systems.

Water Quality Test Results

Definitions:	The following tables contain scientific terms and measures, some of which may require explanation.
Avg:	Regulatory compliance with some MCLs are based on running annual average of monthly samples.
Level 1 Assessment:	A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.
Level 2 Assessment:	A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an E. coli MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions.
Maximum Contaminant Level or MCL:	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
Maximum Contaminant Level Goal or MCLG:	The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
Maximum residual disinfectant level or MRDL:	The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum residual disinfectant level goal or MRDLG:	The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
mrem:	millirems per year (a measure of radiation absorbed by the body)
na:	not applicable.
ppb:	micrograms per liter or parts per billion - or one ounce in 7,350,000 gallons of water.
ppm:	milligrams per liter or parts per million - or one ounce in 7,350 gallons of water.

Treatment Technique or TT:	A required process intended to reduce the level of a contaminant in drinking water.

Regulated Contaminants

Disinfectants and Disinfection By-Products	Collection Date	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likely Source of Contamination
Chlorine	2021	0.2	0.2 - 0.2	MRDLG = 4	MRDL = 4	ppm	N	Water additive used to control microbes.
Haloacetic Acids (HAA5)	08/25/2020	1	1 - 1	No goal for the total	60	ppb	N	By-product of drinking water disinfection.
Total Trihalomethanes (TTHM)	08/25/2020	5.6	5.6 - 5.6	No goal for the total	80	ppb	N	By-product of drinking water disinfection.
Inorganic Contaminants	**Collection Date**	**Highest Level Detected**	**Range of Levels Detected**	**MCLG**	**MCL**	**Units**	**Violation**	**Likely Source of Contamination**
Arsenic	12/03/2019	4	0 - 4	0	10	ppb	N	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.
Barium	12/03/2019	0.08	0.08 - 0.08	2	2	ppm	N	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Fluoride	12/03/2019	0.2	0.2 - 0.2	4	4.0	ppm	N	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate [measured as Nitrogen]	2021	1	1 - 1.02	10	10	ppm	N	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Turbidity

	Limit (Treatment Technique)	Level Detected	Violation	Likely Source of Contamination
Highest single measurement	5.0 NTU	0 NTU	N	Soil runoff.
Lowest monthly % meeting limit	1.0 NTU	100%	N	Soil runoff.

Information Statement: Turbidity is a measurement of the cloudiness of the water caused by suspended particles. We monitor it because it is a good indicator of water quality and the effectiveness of our filtration

Violations Table

Haloacetic Acids (HAA5)			
Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE (DBP), MAJOR	09/01/2020	08/31/2021	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Lead and Copper Rule			
The Lead and Copper Rule protects public health by minimizing lead and copper levels in drinking water, primarily by reducing water corrosivity. Lead and copper enter drinking water mainly from corrosion of lead and copper containing plumbing materials.			
Violation Type	Violation Begin	Violation End	Violation Explanation
LEAD CONSUMER NOTICE (LCR)	12/30/2020	01/19/2021	We failed to provide the results of lead tap water monitoring to the consumers at the location water was tested. These were supposed to be provided no later than 30 days after learning the results.

Revised Total Coliform Rule (RTCR)			
The Revised Total Coliform Rule (RTCR) seeks to prevent waterborne diseases caused by E. coli. E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Human pathogens in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a greater health risk for infants, young children, the			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE, MAJOR (RTCR)	10/01/2021	10/31/2021	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

IMPORTANT INFORMATION

The following pages comprise the Annual Consumer Confidence Report (CCR) for your water system.

To download the CCR into your word processing program, follow these steps. Remember you must have the document set up in Landscape Orientation.

* Choose Select All from the edit drop down MENU. (It will highlight all the information)
* Choose Edit from the Menu, select Copy from the edit dropdown Menu.
* Open your word processing program.
* Choose Edit from the MENU, select Paste from the edit dropdown MENU and the information will transfer.
* Choose Edit from the Menu.

In order to meet all the requirements of the CCR, you must include the following additional information if it pertains to your water system.

* The report must include the telephone number of the owner, operator, or designee of the community water system as a source of additional information concerning the report.

* If your water system had any violations during the current CCR Calendar year, you are required to include an explanation of the corrective action taken by the water system.

* The report must include information about opportunities for public participation in decisions that may affect the quality of the water (e.g., time and place of regularly scheduled board meetings).

* If your water system purchases water from another source, you are required to include the current CCR year's Regulated Contaminants Detected table from your source water supply.

* If your water system had any violations during the current CCR Calendar year, you are required to include an explanation of the corrective action taken by the water system.

* If your water system is going to use the CCR to deliver a Public Notification, you must include the full notice and return a copy of the CCR and Public Notice with the public Notice. This is in addition to the copy and certification form required by the CCR Rule.

* The information about likely sources of contamination provided in the CCR is generic. Specific information regarding contaminants may be available in sanitary surveys and source water assessments and should be used when available to the operator.

* If a community water system distributes water to its customers from multiple hydraulically independent distribution systems fed by different raw water sources, the table should contain a separate column for each service area, and the report should identify each separate distribution system. Alternatively, systems may produce separate reports tailored to include data for each service area.

* Detections of unregulated contaminants for which monitoring is required are not included in the CCR and must be added. When added, the information must

include the average and range at which the contaminant was detected.

* If a water system has performed any monitoring for Cryptosporidium, including monitoring performed to satisfy the requirements of the Information Collection Rule [ICR] (141.143), which indicates that Cryptosporidium may be present in the source water or the finished water, the report must include: (a) a summary of the results of the monitoring; and (b) an explanation of the significance of the results.

* If a water system has performed any monitoring for radon which indicate that radon may be present in the finished water, the report must include: (a) The results of the monitoring; and (b) An explanation of the significance of the results.

* If a water system has performed additional monitoring which indicates the presence of other contaminants in the finished water, EPA strongly encourages systems to report any results which may indicate a health concern. To determine if results may indicate a health concern, EPA recommends that systems find out if EPA has proposed an NPDWR or issued a health advisory for that contaminant by calling the Safe Drinking Water Hotline (800-426-4791). EPA considers detects above a proposed MCL or health advisory level to indicate possible health concerns. For such contaminants, EPA recommends that the report include: (a) the results of the monitoring; and (b) an explanation of the significance of the results noting the existence of a health advisory or a proposed regulation.

* If you are a groundwater system that receives notice from a state of a significant deficiency, you must inform your customers in your CCR report of any significant deficiencies that are not corrected by December 31 of the year covered by it. The CC must include the following information:

- The nature of the significant deficiency and the date it was identified by the state.

- If the significant deficiency was not corrected by the end of the calendar year, include information regarding the State-approved plan and schedule for correction, including interim measures, progress to date, and any interim measures completed.

- If the significant deficiency was corrected by the end of the calendar year, include information regarding how the deficiency was corrected and the date it was corrected.

Annual Drinking Water Quality Report

MT0000360 WHITE SULPHUR SPRINGS CITY OF

Annual Water Quality Report for the period of January 1 to December 31, 2022

This report is intended to provide you with important information about your drinking water and the efforts made by the water system to provide safe drinking water.

WHITE SULPHUR SPRINGS CITY OF is Surface Water

For more information regarding this report contact:

Name ____

Phone ____

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Sources of Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. The source water assessment report for your water system provides additional information on your source water's susceptibility to contamination. To access this report please go to: https://deq.mt.gov/water/Programs/dw-sourcewater

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- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

- Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

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Source Water Information

SWA = Source Water Assessment

Source Water Name	Type of Water	Report Status	Location
INTAKE WILLOW CREEK	SW	________	____
WELL 1 1986 8TH AVE GWIC 260672	GW	________	102 8TH AVE NE JUST INSIDE CITY YARD
WELL 2 1998 8TH AVE GWIC 172711	GW	________	102 8TH AVE NE JUST INSIDE CITY YARD

Lead and Copper

Definitions:
Action Level Goal (ALG): The level of a contaminant in drinking water below which there is no known or expected risk to health. ALGs allow for a margin of safety.
Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Lead and Copper	Date Sampled	MCLG	Action Level (AL)	90th Percentile	# Sites Over AL	Units	Violation	Likely Source of Contamination
Copper	09/30/2020	1.3	1.3	0.168	0	ppm	N	Erosion of natural deposits; Leaching from wood preservatives; Corrosion of household plumbing systems.

Water Quality Test Results

Definitions:	The following tables contain scientific terms and measures, some of which may require explanation.
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Level 2 Assessment:	A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an E. coli MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions.
Maximum Contaminant Level or MCL:	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
Maximum Contaminant Level Goal or MCLG:	The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
Maximum residual disinfectant level or MRDL:	The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum residual disinfectant level goal or MRDLG:	The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
mrem:	millirems per year (a measure of radiation absorbed by the body)
na:	not applicable.
ppb:	micrograms per liter or parts per billion - or one ounce in 7,350,000 gallons of water.
ppm:	milligrams per liter or parts per million - or one ounce in 7,350 gallons of water.

Treatment Technique or TT:	A required process intended to reduce the level of a contaminant in drinking water.

Regulated Contaminants

Disinfectants and Disinfection By-Products	Collection Date	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likely Source of Contamination
Chlorine	2022	0.2	0.2 - 0.2	MRDLG = 4	MRDL = 4	ppm	N	Water additive used to control microbes.
Haloacetic Acids (HAA5)	2022	1	1.1 - 1.1	No goal for the total	60	ppb	N	By-product of drinking water disinfection.
Total Trihalomethanes (TTHM)	2022	11	0 - 11	No goal for the total	80	ppb	N	By-product of drinking water disinfection.
Inorganic Contaminants	Collection Date	Highest Level Detected	Range of Levels Detected	MCLG	MCL	Units	Violation	Likely Source of Contamination
Arsenic	2022	4	4 - 4	0	10	ppb	N	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.
Barium	2022	0.08	0.08 - 0.08	2	2	ppm	N	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Fluoride	2022	0.3	0.3 - 0.3	4	4.0	ppm	N	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate [measured as Nitrogen]	2022	1	0 - 0.99	10	10	ppm	N	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Turbidity

	Limit (Treatment Technique)	Level Detected	Violation	Likely Source of Contamination
Highest single measurement	5.0 NTU	0.98 NTU	N	Soil runoff.
Lowest monthly % meeting limit	1.0 NTU	100%	N	Soil runoff.

Information Statement: Turbidity is a measurement of the cloudiness of the water caused by suspended particles. We monitor it because it is a good indicator of water quality and the effectiveness of our filtration

Violations Table

2,4,5-TP (Silvex)			
Some people who drink water containing silvex in excess of the MCL over many years could experience liver problems.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

2,4-D			
Some people who drink water containing the weed killer 2,4-D well in excess of the MCL over many years could experience problems with their kidneys, liver, or adrenal glands.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Alachlor			
Some people who drink water containing alachlor in excess of the MCL over many years could have problems with their eyes, liver, kidneys, or spleen, or experience anemia, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Atrazine			
Some people who drink water containing atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Benzo(a)pyrene			
Some people who drink water containing benzo(a)pyrene in excess of the MCL over many years may experience reproductive difficulties and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Carbofuran			
Some people who drink water containing carbofuran in excess of the MCL over many years could experience problems with their blood, or nervous or reproductive systems.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Chlordane			
Some people who drink water containing chlordane in excess of the MCL over many years could experience problems with their liver or nervous system, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Dalapon			
Some people who drink water containing dalapon well in excess of the MCL over many years could experience minor kidney changes.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Di (2-ethylhexyl) adipate

Some people who drink water containing di (2-ethylhexyl) adipate well in excess of the MCL over many years could experience general toxic effects or reproductive difficulties.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Di (2-ethylhexyl) phthalate

Some people who drink water containing di (2-ethylhexyl) phthalate in excess of the MCL over many years may have problems with their liver, or experience reproductive difficulties, and may have an increased risk of getting cancer.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Dinoseb

Some people who drink water containing dinoseb well in excess of the MCL over many years could experience reproductive difficulties.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Endrin

Some people who drink water containing endrin in excess of the MCL over many years could experience liver problems.

Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Heptachlor			
Some people who drink water containing heptachlor in excess of the MCL over many years could experience liver damage and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Heptachlor epoxide			
Some people who drink water containing heptachlor epoxide in excess of the MCL over many years could experience liver damage, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Hexachlorobenzene			
Some people who drink water containing hexachlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys, or adverse reproductive effects, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Hexachlorocyclopentadiene			
Some people who drink water containing hexachlorocyclopentadiene well in excess of the MCL over many years could experience problems with their kidneys or stomach.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Lindane			
Some people who drink water containing lindane in excess of the MCL over many years could experience problems with their kidneys or liver.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Methoxychlor			
Some people who drink water containing methoxychlor in excess of the MCL over many years could experience reproductive difficulties.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Oxamyl [Vydate]			
Some people who drink water containing oxamyl in excess of the MCL over many years could experience slight nervous system effects.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Pentachlorophenol			
Some people who drink water containing pentachlorophenol in excess of the MCL over many years could experience problems with their liver or kidneys, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Violations Table

Picloram			
Some people who drink water containing picloram in excess of the MCL over many years could experience problems with their liver.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Simazine			
Some people who drink water containing simazine in excess of the MCL over many years could experience problems with their blood.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Toxaphene			
Some people who drink water containing toxaphene in excess of the MCL over many years could have problems with their kidneys, liver, or thyroid, and may have an increased risk of getting cancer.			
Violation Type	Violation Begin	Violation End	Violation Explanation
MONITORING, ROUTINE MAJOR	01/01/2020	12/31/2022	We failed to test our drinking water for the contaminant and period indicated. Because of this failure, we cannot be sure of the quality of our drinking water during the period indicated.

Appendix Q

Source Water Delineation and Assessment Report, Source Water Protection Plan

White Sulphur Springs
Public Water System

PWSID # MT0000360

SOURCE WATER DELINEATION AND ASSESSMENT REPORT

Date of Report: 12/09/02

Contact Person:

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White Sulphur Springs, MT 59645

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Final Document

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INTRODUCTION

Carolyn DeMartino, a Water Quality Specialist with the Montana Department of Environmental Quality, completed the White Sulphur Springs (PWSID# 00360) Source Water Delineation and Assessment Report (SWDAR).

Purpose

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for the completion of the delineation and assessment for the White Sulphur Springs Public Water Supply System (PWSS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 (P.L. 104-182).

The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is "delineation and assessment". Delineation is a process of mapping source water protection areas, which contribute water used for drinking. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported, and then determining the relative potential for contamination of drinking water by these sources. The primary purpose of this source water delineation and assessment report is to provide information that helps White Sulphur Springs complete a source water protection plan to protect its drinking water source.

Limitations

This report was prepared to assess threats to the White Sulphur Springs public water supply, and is based on published information and information obtained from local residents familiar with the community. The terms "drinking water supply" or "drinking water source" refer specifically to the source of the White Sulphur public water supply and not any other public or private water supply. Also, not every potential or existing source of groundwater or surface water contamination in the White Sulphur Springs area has been identified. Only potential sources of contamination in areas that contribute water to its drinking water source are considered.

The term "contaminant" is used in this report to refer to constituents for which maximum concentration levels (MCLs) have been specified under the national primary drinking water standards, and to certain constituents that do not have MCLs but are considered to be significant health threats.

CHAPTER 1
BACKGROUND

The Community

White Sulphur Springs is located in Meagher County in southwestern Montana (Figure 1). The town, located near the Smith River Canyon, was named after the white deposits that were formed by the hot springs that are located in the city park. According to the Census Bureau the population of Meagher County in 2000 was 1,932 of which 984 people live in White Sulphur Springs. White Sulphur Springs' economy is based primarily upon agriculture. Other area businesses include gas stations, a post and pole company, trucking company, hospital, and other service related businesses.

The major transportation routes in the White Sulphur Springs area include US Route 89 and U.S. Route 12.

White Sulphur Springs is served by a municipal sanitary sewer system. The facultative sewage treatment lagoons are located on the southwest side of town (Figure 2). The receiving water for the treated wastewater discharge is Lone Willow Creek.

Geographic Setting

White Sulphur Springs is located in the Smith River Valley of southwestern Montana in Section 7 and 17, Township 9 Nouth, Range 7 East (Figure 1). Climate in the White Sulphur Springs area is considered semi-arid. Average daily high and low temperatures in White Sulphur Springs are 80.5° F and 47.5° F in August and July, respectively, and 32.2° F and 11.4° F in January. Annual precipitation averages 13.41 inches. Rainfall occurs year round with May and June being the wettest months. The annual average snowfall of 36.2 inches is received in the White Sulphur Springs area mainly September to April (Western Regional Climate Center, Monthly Climate Summary 12/1/1978 to 12/31/2001).

Major streams in the White Sulphur Springs vicinity include the Smith River, Lone Willow Creek, and Willow Creek. Irrigation canals are also in the White Sulphur Springs vicinity. South Side Canal is located approximately one mile east of White Sulphur Springs.

In addition to the springs located within the City of White Sulphur Springs park, Hanson Spring is located to the northwest, Trinity Springs to the northeast, Carlin Springs and Rankin Springs to the south of White Sulphur Springs.

The three mountain ranges that surround White Sulphur Springs include the Little Belt Mountains to the northeast, the Castle Mountains to the southeast, and the Big Belt Mountains to the southwest. The headwaters for Willow Creek, the White Sulphur Springs PWS surface water source, are located in the Castle Mountains.

General description of the Source Water

The City of White Sulphur Springs obtains its water from both groundwater and surface water sources. Groundwater is obtained from two 200-foot wells (Figure 2) completed in fractured siltstone (Figure 3). Well logs are located in Appendix A. Surface water is obtained from a slow sand filter/ infiltration gallery system located in Willow Creek. The slow sand filter and infiltration gallery are located approximately five miles southeast of town (Figure 4).

The Public Water Supply

The White Sulphur Springs PWS provides water to approximately 1,000 residents through 520 active service connections. Each service connection is metered. The water supply system consists of a 200-foot well (Well #1-WL003) that was drilled in 1986 and a slow sand filter/ infiltration gallery system (IN002) located in Willow Creek. A newer well (Well #2-WL004), drilled in 1998, functions only as a back-up well if the need arises (DEQ, 1999 Sanitary Survey). Three buildings at the PWS system include the chlorination room and well house, located at the well head; a chlorinate analyzer building, located on the transmission main from the storage tank; and a chlorination and valve building at the storage tank.

A 60 horse power submersible pump with a peak flow of 800 gallons per minute (gpm) is located in well 1 at about 180 feet below ground surface. Groundwater is pumped directly into the distribution system, and during periods of low use excess pressure in the distribution system lifts water to a 450,000 –gallon concrete storage tank located approximately two miles east of White Sulphur Springs. The water from the tank is then gravity fed back to the distribution system as demand increases. The storage tank is connected to the distribution system with approximately two miles of 12-inch steel transmission main. The steel transmission line is scheduled to be replaced with 12-inch PVC pipe.

The slow sand filter system, located approximately five miles from town consists of a concrete dam with earthen sides and approximately 4.5 feet of masonry sand as the filter media with collectors below. An infiltration gallery is used in conjunction with the slow sand filter to help collect water. Water from Willow Creek and trenches is collected through perforated pipe wrapped in filter paper. The dam creates a pond, holding approximately 314,160 gallons of water, above the slow sand filter when Willow Creek is diverted into the slow sand filter (DEQ, 1999 Sanitary Survey). Water from the slow sand filter is gravity fed into the storage tank through approximately three miles of 6-inch PVC pipe. Because the slow sand filter requires the use of supplemental pumping to drain and it is difficult to clean, filtered water frequently has a higher turbidity than water in the creek before filtration. Future improvements are planned for the White Sulphur Springs slow sand filter system located in Willow Creek.

Groundwater from the wells and surface water from Willow Creek are treated with gas chlorine that is injected at the well house and at the storage tank.

The daily average demand for groundwater well #1 is approximately 300,000 gallons per day (gpd), and about 150,000 gpd for the slow sand filter. The production from the Willow Creek system limited by water rights during irrigation season as the irrigation water rights have priority. During irrigation season withdrawal from Willow Creek is limited to approximately 112 gpm.

Water Quality

White Sulphur Springs water quality is routinely monitored for compliance with drinking water standards. Bacteriological monitoring is conducted monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules. Nitrate plus nitrite as nitrogen in Willow Creek over the past five years has ranged from 0 to 0.11 milligrams per liter (mg/L). Monitoring results for nitrate plus nitrite as nitrogen in groundwater within the past five years indicate the range of detections is from 0.11 mg/L to 0.81 mg/L. These detections remain well below the maximum contaminant level of 10 mg/L (DEQ SDWIS database). Within the past five years there have been coliform bacteria detections in water utilized by the White Sulphur Springs PWS. Within the past five years turbidity exceedances have also been detected and have prompted the initiation of future improvements to be considered on the slow sand filter.

Willow Creek is located in the Smith River sub-basin of the Upper Missouri River Watershed. The U.S. Geological Survey hydrologic unit code for Willow Creek is 10030103. The Willow Creek drainage to the White Sulphur Springs intake is classified as A-1 water meaning, waters are to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities. This stream segment is not listed on the 303D List of Impaired Streams.

A nearby stream gage is not available in the vicinity of the White Sulphur Springs PWS. No further ambient water quality data is available for this segment of Willow Creek.

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to the White Sulphur Springs PWS wells, is identified in this chapter. Management areas identified within the source water protection area for wells 1 and 2 include the control zone, inventory region, and recharge region. For the purposes of this report, the recharge region is included within the watershed region for the Willow Creek surface water intake. The control zone is an area at least 100-foot radius around the well. The management goal of the control zone, also known as the exclusion zone, is to protect against the direct introduction of contaminants into the wells or in the immediate area surrounding each well. The inventory region (Figure 5) represents the zone of contribution to the wells. The management goal of the inventory region is to focus on pollution prevention activities at potential contaminant sources where it is likely that contaminated water would flow into the wells within a relatively short time. The recharge region represents the entire portion of the aquifer that contributes water to the White Sulphur Springs wells. Management within the recharge region should focus on maintaining and improving the quality of groundwater that could reach the wells over longer timeframes or with increase usage.

Management areas identified within the source water protection area for the White Sulphur Springs surface water intake include the spill response region (Figure 6) and the watershed region (Figure 7). The spill response region represents the area of surface water upstream of the White Sulphur Springs PWS in which contaminants could be drawn into the intake in a relatively short period of time. The watershed region represents the entire region that is upstream of, and contributes water to the White Sulphur Springs PWS.

Hydrogeologic Conditions

Tertiary basin fill sediments underlie the City of White Sulphur Springs. White Sulphur Springs PWS wells 1 and 2 are completed in deep fractured siltstone and appear to be confined (Appendix A). Regional groundwater flow in the White Sulphur Springs vicinity is to the west with a relatively flat gradient (Maxim, July 1997).

Several thrust faults are located nearby and north and east of White Sulphur Springs. Water flowing from the hot springs for which the City of White Sulphur Springs is named, is the result of deep water circulation along the Willow Creek Thrust Fault, in high permeability zones of the Mississipian Mission Canyon Limestone or the Pre-Cambrian Newland Limestone beneath the thrust fault zone, or both (D. Smith 1983). The water temperature is approximately 115 ° F. The sulfur odor given off by the springs is caused by hydrogen sulfide gas escaping to the atmosphere (Groff, 1965). The springs are used for the pools and baths in a local spa hotel and for the heating system at a local bank (Grove and Dunn, 1980).

The surface water intake for the White Sulphur Springs PWS is located in Willow Creek. The headwaters for Willow Creek are located in the Castle Mountains, which are located southeast of White Sulphur Springs. The Castle Mountains were formed approximately 50 million years ago when movement of area faults occurred and the magma that formed these granite mountains moved upward along the faults (Alt and Hyndman, 1986). As the granite mountains weather, castle-like turrets are formed thus giving rise to their name.

Sedimentary rocks ranging in age from Precambrian to Cretaceous that cover a large part of the White Sulphur Springs vicinity were uplifted during the formation of the Castle Mountains and another igneous extrusion composed of diorite. The Castle Mountains and diorite extrusions produced numerous fractures in the overlying layers.

Recharge to the White Sulphur Springs wells mostly likely results from water percolating into more permeable zones of area limestones or fractured bedrock along area faults. Recharge to Willow Creek appears to be from precipitation entering directly into the creek or from runoff that eventually flows into the creek.

Table 1 below is used to determine source water/ aquifer sensitivity.

Table 1. Source Water Sensitivity Criteria (DEQ, 1999)

Source Water Sensitivity
High Source Water Sensitivity **Surface water and GWUDISW** Unconsolidated Alluvium (unconfined) Fluvial-Glacial Gravel Terrace and Pediment Gravel Shallow Fractured or Carbonate Bedrock
Moderate Source Water Sensitivity Semi-consolidated Valley Fill sediments Unconsolidated Alluvium (semi-confined)
Low Source Water Sensitivity Consolidated Sandstone Bedrock **Deep Fractured or Carbonate Bedrock** Semi-consolidated Valley Fill Sediments (confined)

The White Sulphur Springs wells are completed in deep fractured siltstone. Based on this information the siltstone aquifer that supplies water to the White Sulphur Springs PWS wells has a low sensitivity to potential contaminant sources (Table 1).

Water obtained via the slow sand filter/ infiltration galley intake system in Willow Creek is classified as having a high sensitivity to potential contaminant sources. Because the groundwater and surface water are blended in the storage tank, the overall sensitivity of the White Sulphur Springs PWS to potential contaminant sources is moderate.

<u>Conceptual Model and Assumptions</u>

Tertiary basin fill sediments underlie the City of White Sulphur Springs. Areas nearby and to the north and east of White Sulphur Springs were highly faulted. Hot springs located in the city park are the result of deep water circulation along the Willow Creek Thrust Fault, in high permeability zones of the Mississipian Mission Canyon Limestone or the Pre-Cambrian Newland Limestone beneath the thrust fault zone, or both (Smith 1983). White Sulphur Springs PWS wells 1 and 2 are completed in deep fractured siltstone and appear to be confined. Regional groundwater flow in the White Sulphur Springs vicinity is to the west with a relatively flat gradient (Maxim, July 1997). Recharge to the wells is potentially from water percolating into more permeable limestones or fractured bedrock along area faults.

Surface water is also utilized by the White Sulphur Springs PWS. The water is obtained via a slow sand filter/ infiltration gallery system in Willow Creek. Contaminants, if spilled directly into Willow Creek upstream or in the immediate vicinity of the White Sulphur Springs intake, could potentially reach the intake before the water operator could close it. Over a longer time-frame, contaminants that accumulate throughout the watershed could be flushed into Willow Creek during periods of spring high flow runoff.

<u>Well Information</u>

Data for the White Sulphur Springs wells is summarized in Table 2.
Table 2 Well information for the White Sulphur Springs PWS.

Information	Well #1	Well #2
PWS Source Code	WL003	WL004
Well Location (T, R, Sec)	T. 9 N., R. 7 E., Sec. 07 SW¼ SE¼SE¼ (DDC)	T. 9 N., R. 7 E., Sec. 07 SW¼ SE¼SE¼ (DDC)
Latitude/ Longitude	46.5498/110.8899	46.5482/ 110.8883
MBMG #	NA	172711
Water Right #	NA	C061342-00
Date Well was Completed	06/23/86	04/21/1999
Total Depth	200	201
Perforated Interval	90' - 200'	145' – 195'
Static Water Level	19	22
Pumping Water Level	42	58
Drawdown	23	36
Test Pumping Rate	NA	NA
Specific Capacity	35	28

Well 1 is used mainly along with water obtained via the Willow Creek surface water intake to supply White Sulphur Springs with drinking water. Well 2 is used as a backup well as needed depending on water demand.

<u>Surface Water Intake Information</u>

The slow sand filter system, located approximately five miles southeast of town in Willow Creek, consists of a concrete dam with earthen sides and approximately 4.5 feet of masony sand as the filter media with collectors below. An infiltration gallery is used in conjunction with the slow sand filter to help collect water. Water from Willow Creek and trenches is collected through perforated pipe wrapped in filter paper. The dam creates a pond, holding approximately 314,160 gallons of water, above the slow sand filter when Willow Creek is diverted into the slow sand filter (DEQ, 1999 Sanitary Survey). Because the slow sand filter requires the use of supplemental pumping to drain and it is difficult to clean, filtered water has a higher turbidity than water in the creek before filtration. Future improvements are planned for the White Sulphur Springs slow sand filter system located in Willow Creek.

Methods and Criteria

DEQ's Source Water Protection Program specifies methods and criteria used to delineate subregions of the source water protection area for the White Sulphur Springs PWS. Because the White Sulphur Springs PWS obtains water from both groundwater wells and a surface water intake, a control zone, and inventory region have been delineated for the wells. A spill response region has been identified for the Willow Creek surface water intake. A combined recharge/ watershed region has been delineated for both the wells and surface water intake

Delineation Results

Because wells 1 and 2 are only about 20-feet apart, a one hundred-foot radius control zone was delineated around both of the wells. A 1000-foot fixed radius inventory region was also delineated around both of the wells.

The spill response region for the Willow Creek intake extends ½-mile downstream and ten miles upstream (or at the watershed boundary) from the intake and, includes ½-mile wide buffers adjacent to all shorelines.

The delineation of the recharge/watershed region for the White Sulphur Springs PWS wells and surface water intake is based on hydrogeological mapping.

Limiting Factors

Delineation for the wells is based on a 1000-foot fixed radius inventory region. Uncertainty exists concerning the vertical and lateral extent of potential confining layers. Also, the total amount of recharge to the system from area streams and nearby irrigation canals is unknown and can vary seasonally.

CHAPTER 3
INVENTORY

Inventory of potential contaminant sources was conducted within the White Sulphur Springs PWS well control zones, inventory region, and recharge region. Inventory of potential contaminant sources was also conducted within the spill response region and watershed region of the PWS intake on Willow Creek. Potential sources of all primary drinking water contaminants and Cryptosporidium were identified, however, only significant potential contaminant sources were selected for the detailed inventory. Significant potential contaminants in the White Sulphur Springs inventory region and spill response region include nitrate, pathogens, fuels, solvents, agricultural chemicals, and metals.

The potential contaminant source inventory for White Sulphur Springs focuses on all activities in the control zone, certain sites or land use activities in the inventory region, and general land uses and large facilities in the recharge region. In the spill response region potential contaminant sources that have the potential to impact the intake are identified. General land uses and large facilities within the watershed region are identified.

Inventory Method

Available databases were initially searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. The following steps were followed:

Step 1: Urban and agricultural land uses were identified using the United States Geological Survey National Landcover Dataset 2000.

Step 2: EPA's Envirofacts System was queried to identify EPA regulated facilities. This system accesses the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), Permit Compliance System (PCS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility is a significant potential contaminant source.

Step 3: DEQ databases were queried to identify Underground Storage Tanks (UST), hazardous waste contaminated sites, landfills, and abandoned mines.

Step 4: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by SIC code.

Step 5: Major road and rail transportation routes were identified.

Step 6. All significant potential contaminant sources were identified in the inventory region and land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the recharge region.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

1) Large quantity hazardous waste generators
2) Landfills
3) Hazardous waste contaminated sites
4) Underground storage tanks
5) Major roads or rail transportation routes
6) Cultivated cropland
7) Animal feeding operations
8) Wastewater lagoons or spray irrigation
9) Septic systems
10) Sewered residential areas
11) Storm sewer outflows
12) Floor drains, sumps, or dry wells
13) Abandoned or active mines

Inventory Results/Control Zone

White Sulphur Springs Wells 1 and 2 are located on the northeast side of town. The City controls the land within the 100-foot control zone (Personal Communication, December 2002, Rick Cottingham, DEQ Drinking Water Section).

Inventory Results/Inventory Region

Land cover within the inventory region for the White Sulphur Springs PWS is predominantly grassland at 44% and residential land at 40% (Figure 8). Additional land use types and their percentages are also identified on Figure 8. Septic system density in the inventory region is low. The municipal sewer system covers approximately 40% of the inventory region (Figure 9).

Significant potential contaminant sources in the inventory region are listed in Table 3 and indicated on Figure 10. A list of the additional potential contaminant sources within White Sulphur Springs is contained in Appendix B.

Table 3. Significant Potential Contaminant Sources in the White Sulphur Springs PWS Inventory Region

Significant Potential Contaminant Sources	Figure/ Map ID	Contaminants	Hazard
Municipal Sewer System	Figure 10 #1	Nitrates and pathogens	Main line breaks and contents leaching into groundwater
US Highway 12 & 89	Figure 10 #2	VOCs, SOCs, nitrates, pathogens	Accidental spills with migration of contaminants to groundwater
Septic Systems	Figure 9	Nitrates and pathogens	Effluent leaching into area groundwater
Pasture Hay Land	Figure 8	Nitrates and pathogens	Agricultural chemicals leaching into groundwater
Class V Injection Wells	Uknown	VOCs, SOCs, metals	Infiltration of contaminated water into groundwater

Municipal sewer system - Municipal sewer lines underlay approximately 40% of the inventory region. A sewer main break could allow nitrates and pathogens to enter area groundwater.

Transportation routes - Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along US Highways 12 and 89.

Septic systems – Septic system malfunctions could cause nitrates and pathogens to leach into area groundwater.

Agricultural land - Nitrates and pathogens found in fertilizers and manure applied to pasture/hay land could potentially leach into area groundwater.

Class V Injection wells – Locations have not been determined to date for this type of discharge. However, if any are located in the inventory region they could allow infiltration of contaminated water into area groundwater.

Inventory Results/Surface Water Intake Spill Response Region

Land cover within the Willow Creek Spill Response Region includes 92% forests, 7% grassland, and 1% bare rock and decidous trees (Figure 11). Septic density within the spill response region is low.

A past producing mine, the Ringling Mine, appears to be located upgradient of the Willow Creek intake. While no confined animal feeding operations have been identified, cattle from area ranches graze in the vicinity of Willow Creek.

Inventory Results/ Watershed-Recharge Region

Land cover in the White Sulphur Springs watershed/recharge consists predominantly of 48% grasslands and 40% forests (Figure 12). Additional land use types and percentages are also identified on Figure 12. Residential land covered less than one percent of land area and was not broken out in the pie chart.

Septic density in the watershed region is low. The only significant potential contaminant sources identified in the watershed region in addition to those mentioned in the inventory region and spill response region are scattered mines (Figure 13).

Inventory Limitations

The potential contaminant inventory was conducted using various databases to acquire readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information, however, should ensure that the major threats to the White Sulphur Springs PWS wells and surface water intake in Willow Creek have been identified.

Inventory Update

To make this SWDAR a useful document in the years to come, the owners, managers, or the certified water system operator(s) for the White Sulphur Springs PWS should update the inventory for their records every year. Changes in land uses or potential contaminant sources should be noted and additions made as needed. The complete inventory should be submitted to DEQ at least every 5 years to ensure that this report stays current in the public record.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case White Sulphur Springs.

The goal of Source Water Management is to protect the sources of the White Sulphur Springs PWS water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the Inventory Region for the wells and in the spill response region for the intake, and 3) ensuring that land use activities in the Recharge/ Watershed Regions pose minimal threat to the source water. Management priorities in the Inventory Region for the wells and Spill Response Region for the intake are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the White Sulphur Springs PWS to reduce susceptibility are recommended.

Susceptibility is determined by considering the hazard ranking for each potential contaminant source and the existence of barriers that may decrease the likelihood that contaminated water will flow to the White Sulphur Springs wells and surface water intake (Table 4).

Table 4. Relative susceptibility to specific contaminant sources as determined by hazard and the presence of barriers.

	High Hazard	Moderate Hazard	Low Hazard
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Proximity or density of significant potential contaminant sources and nature of contaminants determines hazard (Table 5).

Table 5. Hazard of potential contaminant sources associated with proximity to a PWS well or intake or density within a PWS inventory or spill response region.

Type of Contaminant Source		High Hazard	Moderate Hazard	Low Hazard
SURFACE WATE	Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
	Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source

Table 5. Hazard of potential contaminant sources associated with proximity to a PWS well or intake or density within a PWS inventory or spill response region.

Type of Contaminant Source		High Hazard	Moderate Hazard	Low Hazard
R		pipelines		water
WELLS	Point Sources of All Contaminants (Unconfined)	Within 1-year TOT	1 to 3 years TOT	Over 3 years TOT
	Point Sources of All Contaminants (Confined)	PWS well is not sealed through the confining layer	Well(s) in the inventory region other than the PWS well are not sealed through the confining layer	All wells in the inventory region are sealed through the confining layer
ALL	Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
	Municipal Sanitary Sewer (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
	Cropped Agricultural Land (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Susceptibility rankings are presented individually for each significant potential contaminant source and each associated contaminant in Table 5 and in text following the table. Management recommendations that indicate how significant potential contaminant sources could be better managed to prevent impacts to the White Sulphur Springs wells and surface water intake are also provided in Table 5.

Table 5. Susceptibility assessment for significant potential contaminant sources in the White Sulphur Springs Inventory and Spill Response Regions

Potential Contaminant Sources	Potential Contaminants	Hazard	Hazard Ranking	Barriers	Susceptibility	Management Recommendation
Inventory Region						
Municipal Sewer (40%)	Nitrates and pathogens	Main breaks and contaminated water mixing with groundwater	Moderate	Well intake depth, upward groundwater gradient	Very Low	Periodic inspection and upgrades of older sewer mains
US Highway 12 & 89	VOCs, SOCs, nitrates	Accidental spills	Low	Well intake depth, upward groundwater gradient	Very Low	Spill Response Plan
Septic Systems	Nitrates and pathogens	Effluent leaching into groundwater	Low	Well intake depth, upward groundwater gradient	Very Low	Proper maintenance
Pasture Hay Land	Nitrates and pathogens	Spills, over application, surface runoff leaching into groundwater	Low	Well intake depth, upward groundwater gradient	Very Low	Use Best Management Practices
Stormwater Discharges	VOCs, SOCs, metals	Infiltration into	Unknown at this time	Not available	Unknown at this time	Work with EPA to identify locations and

Table 5. Susceptibility assessment for significant potential contaminant sources in the White Sulphur Springs Inventory and Spill Response Regions

Potential Contaminant Sources	Potential Contaminants	Hazard	Hazard Ranking	Barriers	Susceptibility	Management Recommendation
Inventory Region						
Class V Injection Wells		groundwater				appropriate response
Spill Response Region						
Mines Ringling Mine	VOCs, SOCs, nitrates, metals	Leaching into area surface water	High	Dilution	High	Revegetation, tailings management

Municipal Sewer – Hazard is ranked moderate because the municipal sewer system underlies approximately 40% of the inventory region. The susceptibility of the wells is ranked low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

U.S. Highway 12 and 89 – Hazard is ranked low for these transportation routes. The overall susceptibility is very low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

Septic Systems – Hazard is ranked low based on the low density of septic systems in the inventory region. The susceptibility of the wells is ranked low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

Pasture Hay Land – Hazard is ranked low because this agricultural land occupies only 6 percent of the inventory region. The susceptibility of the wells is ranked low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

Storm Water Discharges (Class V Injection Wells) – Hazard has not been ranked because the location and quantity of Class V Injection Wells in White Sulphur Springs is unknown. The have been identified in this report because if present, they have the potential to discharge into area groundwater. The susceptibility is also unknown at this time.

Mines (Ringling Mine) – Hazard is ranked high in the Willow Creek Spill Response region. The past producing Ringling Mine appears to be upgradient of the Willow Creek intake. The overall susceptibility is high based on dilution.

Management Recommendations

The White Sulphur Springs PWS Source Water Delineation and Assessment Report was prepared to assist the City of White Sulphur Springs. The report provides information concerning the wells and Willow Creek intake that supply water to White Sulphur Springs, identifies the source water protection areas and within each of these protection areas identifies the significant potential contaminants that may impact the source of water to White Sulphur Springs. Also provided in the table are recommendations regarding how the potential contaminant could be better managed to prevent impacts in the vicinity of the White Sulphur Springs wells and surface water intake. If these management recommendations are implemented, they may be considered additional barriers that will reduce the susceptibility of White Sulphur Springs' wells and intake to specific sources and contaminants.

Management recommendations fall into the following categories:

Sewer maintanence and leak detection. Early leak detection and scheduled replacement of older sewer lines will reduce the susceptibility of Great Falls intake to contamination from sanitary wastes.

Sewer extension. Annexation and extension of sewers is the only way to reduce contamination from existing unsewered developments.

Agricultural Best Management Practices. BMPs that address application and mixing of fertilizers and pesticides are a viable alternative to prohibition of their use. BMPs are voluntary but their implementation can be encouraged through education and technical assistance. BMPs may also be utilized to minimize surface runoff and soil erosion on cultivated fields

Stormwater Management. Stormwater planning should address source and drainage control. Source control can be accomplished through educational programs focusing on residential and commercial chemical use, disposal, and recycling. Drainage control and pollutant removal can be accomplished through the use of vegetated retention basins at outfall locations.

Education. Educational workshops provided to the general public by the city, county, or state promote safe handling and proper storage, transport, use, and disposal of hazardous materials. Ongoing training provided to designated emergency personnel would promote the efficiency and effectiveness of emergency responses to hazardous material spills. Educational workshops provided to rural homeowners will promote the proper maintenance and replacement of residential septic systems. Educational materials covering these topics are available to the public and can be obtained from the US EPA and the State of Montana.

Emergency Response Plan. This is a management recommendation that White Sulphur Springs itself could develop and implement. Coordination with county and state emergency response personnel would greatly benefit the plan. The plan should identify the procedures the water operators and other emergency personnel should follow in the event that there is an imminent threat that contaminants would reach the PWS wells or intake. The emergency response plan should be updated annually to reflect changes in emergency contacts, phone numbers, and resources available within the city and county to respond to an emergency situation, such as a hazardous material spill.

Chapter 5
MONITORING WAIVERS

Monitoring Waiver Requirements

The 1986 Amendments to the Safe Drinking Water Act require that community and non-community PWSs sample drinking water sources for the presence of volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The US EPA has authorized states to issue monitoring waivers for the organic chemicals to systems that have completed an approved waiver application and review process. All PWSs in the State of Montana are eligible for consideration of monitoring waivers for several organic chemicals. The chemicals diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), and polychlorinated biphenyls are excluded from monitoring requirements by statewide waivers. Following are descriptions of the different types of waivers. Monitoring waiver recommendations for White Sulphur Springs follows these descriptions.

Use Waivers

A Use Waiver can be allowed if through a vulnerability assessment, it is determined that specific organic chemicals were not used, manufactured, or stored in the area of a water source (or source area). If certain organic chemicals have been used, or if the use is unknown, the system would be determined to be vulnerable to organic chemical contamination and ineligible for a Use Waiver for those particular contaminants.

Susceptibility Waivers

If a Use Waiver is not granted, a system may still be eligible for a Susceptibility Waiver, if through a vulnerability assessment it is demonstrated that the water source would not be susceptible to contamination. Susceptibility is based on prior analytical or vulnerability assessment results, environmental persistence, and transport of the contaminants, natural protection of the source, wellhead protection program efforts, and the level of susceptibility indicators (such as nitrate and coliform bacteria). The vulnerability assessment of a surface water source must consider the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the surface water intake. PWSs developed in unconfined aquifers should use a minimum fixed radius of 1.0 miles as an area of investigation for the use of organic chemicals. Vulnerability assessment of spring water sources should use a minimum fixed radius of 1.0 miles as an area of investigation for the use of organic chemicals. Shallow groundwater sources under the direct influence of surface water (GWUDISW) should use the same area of investigation as surface water systems; that is, the watershed area above the source, or a minimum fixed radius of 1.5 miles upgradient of the point of diversion. The purpose of the vulnerability assessment procedures outlined in this section is to determine which of the organic chemical contaminants are in the area of investigation.

Given the wide range of landforms, land uses, and the diversity of groundwater and surface water sources across the state, additional information is often required during the review of a waiver application. Additional information may include will logs, pump test data, or water quality monitoring data from surrounding public water systems; delineation of zones of influence and contribution to a well; Time-of-Travel or attenuation studies; vulnerability mapping; and the use of computerized groundwater flow and transport models. Review of an organic chemical monitoring waiver application will be conducted by DEQ's PWS Section and DEQ's Source Water Protection Program. Other state agencies may be asked for assistance.

Susceptibility Waiver for Confined Aquifers

Confined groundwater is isolated from overlying material by relatively impermeable geologic formations. A confined aquifer is subject to pressures higher than atmospheric pressure that would exist at the top of the aquifer if the aquifer were not geologically confined. A well that is drilled through the impervious layer into a confined aquifer will enable the water to rise in the borehole to a level that is proportional to the water pressure (hydrostatic head) that exists at the top of a confined aquifer.

The susceptibility of a confined aquifer relates to the probability of an introduced contaminant to travel from the source of contamination to the aquifer. Susceptibility of an aquifer to contamination will be influenced by the hydrogeologic characteristics of the soil, vadose zone (the unsaturated geologic materials between the ground surface and the aquifer), and confining layers. Important hydrogeologic controls include the thickness of the soil, the depth of the aquifer, the permeability of the soil and vadose zones, the thickness and uniformity of low permeability and confining layers between the surface and the aquifer, and hydrostatic head of the aquifer. These factors will control how readily a contaminant will infiltrate and percolate toward the groundwater.

The Susceptibility waiver has the objective of assessing the potential of contaminants reaching the groundwater used by the PWS. A groundwater source that appears to be confined from surface infiltration in the immediate area of the wellhead may eventually be affected by contaminated groundwater flow from elsewhere in the recharge area. Contaminants could also enter the confined aquifer through improper well construction or abandonment where the well provides a hydraulic connection from the surface to the confined aquifer. The extent of confinement of an aquifer is critical to limiting susceptibility to organic chemical contamination. Regional conditions that define the confinement of a groundwater source must be demonstrated by the PWS in order to be considered for a confined aquifer susceptibility waiver. Confinement of an aquifer can be demonstrated by pump test data (storage coefficient), geologic mapping, and well logs. Site specific information is required to sufficiently represent the recharge area of the aquifer and the zone of contribution to the PWS well. The following information should be provided:

- Abandoned wells in the region (zone of contribution to the well),
- Other wells in the region (zone of contribution to the well),
- Nitrate/Coliform bacteria analytical history of the PWS well,
- Organic chemical analytical history of the PWS well,

Susceptibility Waiver for Unconfined Aquifers

Unconfined aquifers are the most common source of usable groundwater. Unconfined aquifers differ from confined aquifers in that the groundwater is not regionally contained within relatively impervious geologic strata. As a result, the upper groundwater surface or water table in an unconfined aquifer is not under pressure that produces hydrostatic head common to confined aquifers.

Unconfined aquifers are usually locally recharged from surface water or precipitation. In general, groundwater flow gradients in unconfined aquifers reflect surface topography, and the residence time of water in the aquifer is comparatively shorter than for water in confined aquifers. Similar water chemistry often exists between unconfined groundwater and area surface water, and physical parameters and dissolved constituents can be an indicator of the hydraulic connection between groundwater and surface water. Consequently, unconfined aquifers can be susceptible to contamination by organic chemicals migrating from the ground surface to groundwater.

The objective of the susceptibility waiver application is to assess the potential of organic chemical migration from the surface to the unconfined aquifer. The general procedures make use of a combination of site specific information pertaining to the location and construction of the source development, monitoring history of the source, geologic characteristics of the unsaturated soil and vadose zones, and chemical characteristics of the organic chemicals pertaining to their mobility and persistence in the environment. The zone of contribution of the unconfined groundwater source must be defined and plotted. This should describe the groundwater flow directions, gradients, and a 3-year time-of-travel. All surface bodies within a 1,000 feet of the PWS well(s) must be plotted. Analytical monitoring history of the PWS well and those nearby should be provided as well.

Waiver Recommendation

Currently, White Sulphur Springs has a Phase II inorganic monitoring waiver for the common header for wells 1& 2. A Phase II and Phase V inorganic monitoring waiver is also in effect for the surface water intake. Based on past monitoring results and the susceptibility assessment for the wells and the surface water intake, White Sulphur Springs may be eligible for additional monitoring waivers. For further monitoring waiver consideration, the White Sulphur Springs PWS should submit a letter to DEQ requesting additional monitoring waivers. The PWS also needs to provide additional information to DEQ regarding chemical use within the inventory and spill response regions.

REFERENCES

Cottingham, Rick, December 2002, Montana Department of Environmental Quality, Public Drinking Water Section.

Freeze, R. Allan and Cherry, John A., 1979, Groundwater.

Groff, S.L., 1965, Reconnaissance Ground-Water and Geological Studies, Western Meagher County, Montana, Montana Bureau of Mines and Geology, Special Publication 35, Ground-Water Report 3.

Grove, Michael and Dunn, Darrel E., 1980, Geothermal Heating System For the First National Bank of White Sulphur Springs, Montana.

Montana: A Visitors Guide at Montana.ms

Montana Bureau of Mines and Geology, Groundwater Information Center.

Montana Department of Environmental Quality Public Water Supply Program Safe Drinking Water Information System (SDWIS).

Montana Department of Environmental Quality Underground Storage Tank Program web-site.

Montana Department of Environmental Quality, 2000, "303(d) List, Montana List of Waterbodies In Need of Maximum Daily Load Development".

Montana Department of Natural Resources and Conservation Water Rights Bureau.

Ross, Clyde P., Andrews, David A., and Witkind, Irving J., 1955, Geologic Map of Montana, Montana Bureau of Mines and Geology.

United States Census Bureau, 2000.

United States Environmental Protection Agency "Envirofacts Data Warehouse and Applications".

United States Environmental Protection Agency "Know Your Watershed".

United States Geological Survey. 2000. National Landcover Dataset, Montana. 30 meter electronic digital landcover dataset interpreted from satellite imagery.

Western Regional Climate Center wrcc@dri.edu, Montana Climate Summaries.White Sulphur Springs 2, Montana (Station 248930).

GLOSSARY*

Acute Health Effect. A negative health effect in which symptoms develop rapidly.

Alkalinity. The capacity of water to neutralize acids.

Aquifer. A water-bearing layer of rock or sediment that will yield water in usable quantity to a well or spring.

Barrier. A physical feature or management plan that reduces the likelihood of contamination of a water source from a potential contaminant source

Best Management Practices (BMPs). Methods for various activities that have been determined to be the most effective, practical means of preventing or reducing non-point source pollution.

Biennial Reporting System (BRS). An EPA database that contains information on hazardous waste sites. The data can be accessed through the EPA Envirofacts website.

Chronic Health Effect. A negative health effect in which symptoms develop over an extended period of time.

Class V Injection Well. Any pit or conduit into the subsurface for disposal of waste waters. The receiving unit for an injection well typically represents the aquifer, or water-bearing interval.

Coliform Bacteria. A general type of bacteria found in the intestinal tracts of animals and humans, and also in soils, vegetation and water. Their presence in water is used as an indicator of pollution and possible contamination by pathogens.

Community. A town, neighborhood or area where people live and prosper.

Comprehensive Environmental Cleanup and Responsibility Act (CECRA). Passed in 1989 by the Montana State Legislature, CECRA provides the mechanism and responsibility to clean up hazardous waste sites in Montana.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Enacted in 1980. CERCLA provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA was given power to seek out those parties responsible for any release and assure their cooperation in the cleanup.

Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS). A database that provides information about specific sites through the EPA Envirofacts website.

Confined Animal Feeding Operation (CAFO). Any agricultural operation that feeds animals within specific areas, not on rangeland. Certain CAFOs require permits for operation.

Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static water level in a well in a confined aquifer is at an elevation that is equal to or higher than the base of the overlying confining unit.

Confining Unit. A geologic formation present above a confined aquifer that inhibits the flow of water and maintains the pressure of the ground water in the aquifer. The physical properties of a confining unit may range from a five-foot thick clay layer to shale that is hundreds of feet thick.

Delineation. The process of determining and mapping source water protection areas.

Glacial. Of or relating to the presence and activities of ice or glaciers. Also, pertaining to distinctive features and materials produced by or derived from glaciers.

Geographic Information Systems (GIS). A computerized database management and mapping system that allows for analysis and presentation of geographic data.

Hardness. Characteristic of water caused by presence of various calcium and magnesium salts. Hard water may interfere with some industrial processes and prevent soap from lathering.

Hazard. A relative measure of the potential of a contaminant from a facility or associated with a land use to reach the water source for a public water supply. The location, quantity and toxicity of significant potential contaminant sources determine hazard.

Hydraulic Conductivity. A constant number or coefficient of proportionality that describes the rate water can move through an aquifer material.

Hydrology. The study of water and how it flows in the ground and on the surface.

Hydrogeology. The study of geologic formations and how they effect ground water flow systems.

Inventory Region. A source water management area for ground water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified three year ground water travel time.

Lacustrine. Pertaining to, produced by, or formed in a lake or lakes.

Large Capacity Septic System. Defined by Underground Injection Control regulations as an on-site septic system serving 20 or more persons.

Leaking Underground Storage Tank (LUST). A release from an UST and/or associated piping into the subsurface.

Maximum Contaminant Level (MCL). Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water supply. Set by EPA under authority of the Safe Drinking Water Act to establish concentrations of contaminants in drinking water that are protective of human health.

Montana Bureau of Mines and Geology – Ground Water Information Center (MBMG/GWIC). The database of information on all wells drilled in Montana, including stratigraphic data and well construction data, when available.

Montana Pollutant Discharge Elimination System (MPDES). A permitting system that utilizes a database to track entities that discharge wastewater of any type into waters of the State of Montana.

National Pollutant Discharge Elimination System (NPDES). A national permitting system that utilizes a database to track entities that discharge wastewater into waters of the United States.

Nitrate. An important plant nutrient and type of inorganic fertilizer that can be a potential contaminant in water at high concentrations. In water the major sources of nitrates are wastewater treatment effluent, septic tanks, feed lots and fertilizers.

Nonpoint-Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from city streets. Nonpoint sources of pollution, such as the use of herbicides, can concentrate low levels of these chemicals into surface and/or ground waters at increased levels that may exceed MCLs.

Pathogens. A microorganism typically found in the intestinal tracts of mammals, capable of producing disease.

Phase II (and IIb) Rules. EPA updated or created legal limits on 38 contaminants. The rules became effective July 30, 1992 and January 1, 1993. Some of these contaminants are frequently-applied agricultural chemicals such as nitrate and others are industrial solvents.

Phase V Rule. EPA set standards for 23 contaminants in addition to those addressed by the Phase II Rules. The Phase V Rule became effective January 17, 1994. Some of these contaminants include inorganic chemicals such as cyanide and other Phase V contaminants are pesticides that enter water supplies through run-off from fields where farmers have applied them or by leaching through the soil into ground water. Six are probable cancer-causing agents. Others can cause liver and kidney damage, or problems of the nervous system and brain.

Point Source. A stationary location or a fixed facility from which pollutants are discharged. This includes any single identifiable source of pollution, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fracture, container, rolling stock (tanker truck), or vessel or other floating craft, from which pollutants are or may be discharged.

Pollutant. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource (e.g. groundwater used for drinking water).

Permit Compliance System (PCS). An EPA database that provides information on the status of required permits for specific activities for specific facilities. The data can be accessed through the EPA Envirofacts website.

Public Water System (PWS). A system that provides water for human consumption through at least 15 service connections or regularly serves 25 individuals.

Pumping Water Level. Water level elevation in a well when the pump is operating.

Recharge Region. An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers. As a source water management region, the term generally describes the entire area that could contribute water to an aquifer used by a public water supply. Includes areas that could contribute water over long time periods or under different water usage patterns.

Resource Conservation and Recovery Act (RCRA). Enacted by Congress in 1976. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Resource Conservation and Recovery Information System (RCRIS). Is a database that provides information about specific sites through the EPA Envirofacts website.

Secondary Maximum Contaminant Levels (SMCL). The maximum concentration of a substance in water that is recommended to be delivered to users of a public water supply based on aesthetic qualities. SMCLs are non-enforceable guidelines for public water supplies, set by EPA under authority of the Safe Drinking Water Act. Compounds with SMCLs may occur naturally in certain areas, limiting the ability of the public water supply to treat for them.

Section Seven Tracking System (SSTS). SSTS is an automated system EPA uses to track pesticide producing establishments and the amount of pesticides they produce.

Source Water. Any surface water, spring, or ground water source that provides water to a public water supply.

Source Water Delineation and Assessment Report (SWDAR). A report for a public water supply that delineates source water protection areas, provides an inventory of potential contaminant sources within the delineated areas, and evaluates the relative susceptibility of the source water to contamination from the potential contaminant sources under “worst-case” conditions.

Source Water Protection Areas. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply. For ground water sources, the area within a fixed radius or three-year travel time from a well, and the land area where the aquifer is recharged.

Spill Response Region. A source water management area for surface water systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified four-hour water travel time in a stream or river.

Standard Industrial Classification (SIC) Code. A method of grouping industries with similar products or services and assigning codes to these groups.

Static Water Level (SWL). Water level elevation in a well when the pump is not operating.

Susceptibility (of a PWS). The relative potential for a PWS to draw water contaminated at concentrations that would pose concern. Susceptibility is evaluated at the point immediately preceding treatment or, if no treatment is provided, at the entry point to the distribution system.

Synthetic Organic Compounds (SOC). Man made organic chemical compounds (e.g. herbicides and pesticides).

Total Dissolved Solids (TDS). The dissolved solids collected after a sample of a known volume of water is passed through a very fine mesh filter.

Total Maximum Daily Load (TMDL). The total pollutant load to a surface water body from point, nonpoint, and natural sources. The TMDL program was established by section 303(d) of the Clean Water Act to help states implement water quality standards.

Toxicity. The quality or degree of being poisonous or harmful to plants, animals, or humans.

Toxicity Characteristic Leachate Procedure. A test designed to determine whether a waste is hazardous or requires treatment to become less hazardous.

Toxic Release Inventory (TRI). An EPA database that compiles information about permitted industrial releases of chemicals to air and water. Information about specific sites can be obtained through the EPA Envirofacts website.

Transmissivity. A number that describes the ability of an aquifer to transmit water. The transmissivity is determined by multiplying the hydraulic conductivity time the aquifer thickness.

Turbidity. The cloudy appearance of water caused by the presence of suspended matter.

Unconfined Aquifer. An aquifer containing water that is not under pressure. The water table is the top surface of an unconfined aquifer.

Underground Storage Tanks (UST). A tank located at least partially underground and designed to hold gasoline or other petroleum products or chemicals, and the associated plumbing system.

Volatile Organic Compounds (VOC). Chemicals such as petroleum hydrocarbons and solvents or other organic chemicals that evaporate readily to the atmosphere.

Watershed. The region drained by, or contributing water to, a stream, lake, or other water body of water.

* With the exception of the definitions for Lacustrine, Phase II and Phase V Rules, and Standard Industrial Classification Code, definitions were adapted from EPA's Term References System (formerly known as Glossary of Selected Terms and Abbreviations) which can be found at:
http://www.epa.gov/trs/index.htm

The definitions of glacial and lacustrine were taken from the Glossary of Geology by Robert L. Bates and Julia A. Jackson.

The definitions for Phase II and Phase V Rules were adapted from:
http://www.epa.gov/OGWDW/source/therule.html#PhaseII
http://www.epa.gov/OGWDW/source/therule.html#PhaseV

The definition for Standard Industrial Classification Code was adapted from:
EPA/Office of Enforcement and Compliance Assurance: Guide to Environmental Issues: Glossary of Terms & Acronyms *Term Detail*

APPENDICES

APPENDIX A

WELL LOGS

WELL LOG REPORT   Well #1 WL003

State law requires that this form be filed by the water well driller within 60 days after completion of the well

1. WELL OWNER
Name: City of White Sulphur Springs

2. CURRENT MAILING ADDRESS

3. WELL LOCATION
County
Township 09 N/S   Range 07 E/W
SW ¼ SE ¼ SE ¼   Section 7
Lot   Block
Subdivision

4. PROPOSED USE   Domestic ☐   Stock ☐   Irrigation ☐
Other ☐ specify

5. DRILLING METHOD   ___ cable, ___ bored, X forward rotary, ___ reverse rotary, ___ jetted, ___ other (specify)

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations and/or Screen X 100 Slot: Size	From (feet)	To (feet)
18"	365 16"	0	30	SS40	90	200
14"	365 10"	0	90	10" PS		

Was casing left open end? ___ Yes X No
Was a packer or seal used? X Yes ___ No
If so, what material: BENTONITE
Was the well gravel packed? X Yes ___ No
Was the well grouted? X Yes ___ No
To what depth? 88'
Material used in grouting: CEMENT
Well head completion: Pitless adapter ___ Yes ___ No
Top of casing 12 in. or greater above grade X Yes ___ No

7. WHAT IS THE TEMPERATURE OF THE WATER?
45 Degrees Fahrenheit
☐ Measured   ☒ Estimated

8. WATER LEVEL
Static water level 19 feet below land surface
If flowing; closed-in pressure ___ psi ___ gpm
Controlled by: ___ valve, ___ reducer, ___ other, (specify)

9. WELL TEST DATA   X pump ___ bailer ___ other, (specify)
Pumping water level below land surface:
42 ft. after 24 hrs. pumping 700 gpm
___ ft. after ___ hrs. pumping ___ gpm

10. WAS WELL PLUGGED OR ABANDONED? ___ Yes ___ No
If yes, how?

11. DATE COMPLETED 6-27-86

12. WELL LOG

Depth (ft.) From	To	Formation
0	19	Fine Sand
19	200	Fractured Silt Stone

(use separate sheet if necessary)

13. DRILLER'S CERTIFICATION
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

Date
Firm Name
Address
Signature   License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION DNRC
32 SOUTH EWING   HELENA, MONTANA 59620   444-6610

Montana Bureau of Mines and Geology
Ground-water Information Center Site Report
CITY OF WHITE SULPHUR SPRINGS

Plot this site on a topographic map

Location Information

GWIC Id:	172711	Source of Data:	LOG
Location (TRS):	09N 07E 07 DDC	Latitude (dd):	46.5482
County (MT):	MEAGHER	Longitude (dd):	-110.8883
DNRC Water Right:	C061342-00	Geomethod:	TRS-TWN
PWS Id:		Datum:	1927
Block:	Not Reported	Addition:	Not Reported
Lot:	Not Reported	Type of Site:	WELL
Certificate of Survey:	Not Reported		

Well Construction and Performance Data (measurements are reported below land surface)

Total Depth (ft):	201.00	How Drilled:	ROTARY
Static Water Level (ft):	22.00	Driller's Name:	BUSH
Pumping Water Level (ft):	58.00	Driller License:	WWC597
Yield (gpm):	1000.00	Completion Date:	Apr 21, 1999
Test Type:	PUMP	Special Conditions:	None Reported
Test Duration:	10.00	Is Well Flowing?:	No
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):	22.00	Geology/Aquifer:	Not Reported
Recovery Time (hrs):	.03	Well/Water Use:	Not Reported

Hole Diameter Information

No hole diameter records were found.

Casing Information

From (ft)	To (ft)	Dia (in)	Description
0.0	201.0	10.0	STEEL

Annular Seal Information

From (ft)	To (ft)	Description
0.0	35.0	NEAT CEMENT

Completion Information

From (ft)	To (ft)	Dia (in)	Description
145.0	195.0	10.0	3/16X1 AIR MECHANICAL

Lithology Information

From (ft)	To (ft)	Description
0.0	3.0	TOPSOIL
3.0	11.0	DRY SANDY CLAY
11.0	28.0	MOIST SANDY CLAY
28.0	31.0	MUDSTONE BROWN 2 GPM
31.0	55.0	HARDER BROWN SILTSTONE 20 GPM
55.0	75.0	BROWN SILTSTONE W/INTERMITTENT LAYER OF A HARD GREEN BROWN SILTSTONE 40 GPM
75.0	201.0	FRACTURED SILTSTONE

APPENDIX B

Potential Contaminant Sources In The
White Sulphur Springs Inventory Region

APPENDIX C

Concurrence Letter

SOURCE WATER PROTECTION PLAN

City White Sulphur Springs

Public Water Supply

PWSID # MT0000360

Certified Operator

Rocky Vinton

P.O. Box 442

White Sulphur Springs, MT

(406) 547-3788

Kristi Kline, Montana Rural Water Systems

December 2015

TABLE OF CONTENTS

Executive Summary

This Source Water Protection Plan (SWP) was completed by Kristi Kline, Source Water Protection Specialist, Montana Rural Water for the City of White Sulphur Springs, PWS ID # MT 0000360. The City of White Sulphur Springs Public Water System (PWS) is located in Meagher County. Contact for the City of White Sulphur Springs PWS is Rocky Vinton, Water Superintendent, P.O. Box 442, White Sulphur Springs, MT, 59645, (406) 547-3788. The SWP was built upon the Source Water Delineation and Assessment Report (SWDAR) for White Sulphur Springs which was authored by Carolyn DeMartino, Water Quality Specialist, MT DEQ SWP program and completed in 2002.

The Montana Source Water Protection Program is a practical and cost-effective approach to protecting public drinking water supplies from contamination. A major component of the Montana Source Water Protection Program is termed delineation and assessment. The emphasis of the delineation and assessment report is identifying significant potential contaminant threats to public drinking water sources, assessing susceptibility to those threats in order to provide the basis needed to develop a source water protection plan for the City of White Sulphur Springs.

Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water, called source water protection areas, are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. Assessment involves identifying locations or regions in source water protection areas where contaminants may be generated, stored, or transported and then determining the potential for contamination of drinking water by these sources.

Planning meetings were held throughout 2015 to review the 2002 SWDAR and discuss updates, new management ideas and emergency response planning for the City of White Sulphur Springs PWS.

Planning members included:

City of White Sulphur Springs

JulianTheriault, Mayor
George Kirkwood, Council member
Rocky Vinton, Water Superintendent
Daryl Mesecher, Wastewater Superintendent

Montana Rural Water Systems, Inc.

Kristi Kline, Source Water Protection Specialist

Source Water Protection planning focuses on the water supply sources for a public water system. The City of White Sulphur Springs obtains their supply from two sources, an infiltration gallery on Willow Creek and two groundwater wells. This report looks at the potential impacts that could occur to these two sources of water supply. It also identifies management activities that the city can implement to protect the source waters.

This project was completed as a group effort among a planning committee that included staff with the City of White Sulphur Springs, Lewis and Clark National Forest White Sulphur Springs Ranger District, Meagher County Sanitarian, and Montana Rural Water Systems, Inc. The 2002 SWDAR was used as a technical basis for this planning process. On-site tours and several planning meeting were held to update and refine information, inventories, potential susceptibilities and maps for the City of White Sulphur Springs public water supply system.

Potential future economic additions to Meagher County include the Tartania and Black Butte copper mining proposal that is to be located at the head of Sheep Creek north of White Sulphur Springs and the Gordon Butte Hydro Pumped Storage Facility project located near Martinsdale. Both of these projects could bring an increase of jobs to the area with the potential of an increase in population for the City of White Sulphur Springs. Both projects will continue to be reviewed by state agencies in 2016.

Source Water Assessment

A 2002 Source Water Delineation and Assessment Report (SWDAR) was completed for the City of White Sulphur Springs by Carolyn DeMartino, Montana (MT) Department of Environmental Quality Source Water Protection Program. City of White Sulphur Springs' Public Water System staff at that time provided comment and review. The 2002 SWDAR can be reviewed at the White Sulphur Springs City Hall or at http://deq.mt.gov/wqinfo/swp/

The SWDAR is predominantly a technical document that provides the technical basis for this Source Water Protection Plan. During the planning process to develop the 2015 SWP plan, the White Sulphur Spring's Mayor, Council members and PWS staff along with Kristi Kline, Montana Rural Water SWP Specialist, reviewed current information, inventories and improvements added to the PWS since the 2002 SWDAR was written. Those updates are highlighted in **bold** in the 2015 SWP plan. 2002 SWDAR information includes:

- General information on the community of White Sulphur Springs, economy, population served, public water and wastewater services;
- Delineation and mapping of the source water protection area including updated maps and evaluation of hydrology and hydrogeology;
- Inventory of potential contaminant sources that could impact the water sources
- A susceptibility assessment to identify potential contaminant sources that are considered particularly significant with respect to the White Sulphur Springs' water supplies.

Updates for the City of White Sulphur Springs PWS are addressed as follows.

SOURCE WATER ASSESSMENT (Updated December 2015)

The Community

In 2015, the City of White Sulphur Springs serves 951 residents through 593 service connections. Each service connection is metered.
Agriculture remains the primary economic base for White Sulphur Springs' economy. Potential future economic additions to Meagher County include the Tartania and Black Butte copper mining proposal that is to be located at the head of Sheep Creek north of White Sulphur Springs and the Gordon Butte Hydro Pumped Storage Facility project located near Martinsdale. Both of these projects could bring an increase of jobs to the area with the potential of an increase in population for the City of White Sulphur Springs. Both projects will continue to be reviewed by state agencies in 2016.

Geographic Setting

White Sulphur Springs is located in the Smith River Valley of southwestern Montana in Section 7 and 17, Township 9 North, Range 7 East (Figure 1). Climate in the White Sulphur Springs area is considered semi-arid. Average daily high and low temperatures in White Sulphur Springs are 80.5° F and 47.5° F in August and July, respectively, and 32.2° F and 11.4° F in January. Annual precipitation averages 13.41 inches. Rainfall occurs year round with May and June being the wettest months. The annual average snowfall of 36.2 inches is received in the White Sulphur Springs area mainly September to April (Western Regional Climate Center, Monthly Climate Summary 12/1/1978 to 12/31/2001).
Major streams in the White Sulphur Springs vicinity include the Smith River, Lone Willow Creek, and Willow Creek. Irrigation canals are also in the White Sulphur Springs vicinity. South Side Canal is located approximately one mile east of White Sulphur Springs.
In addition to the springs located within the City of White Sulphur Springs Park, Hanson Springs is located to the northwest, Trinity Springs to the northeast, Carlin Springs and Rankin Springs to the south of White Sulphur Springs.
The three mountain ranges that surround White Sulphur Springs include the Little Belt Mountains to the northeast, the Castle Mountains to the southeast, and the Big Belt Mountains to the southwest. The headwaters for Willow Creek, the White Sulphur Springs PWS surface water source, are located in the Castle Mountains.

Source Water

The City of White Sulphur Springs obtains its water from both groundwater and surface water sources. Groundwater is obtained from two 200-foot wells (Figure 2) completed in fractured siltstone (Figure 3). Well logs are located in Appendix A. Surface water is obtained from a slow sand filter/ infiltration gallery system located in Willow Creek. The slow sand filter and infiltration gallery are located approximately five miles southeast of town (Figure 4).

The Public Water Supply
Add new additions to Sand Filter system/Year completed

The water supply system consists of a 200-foot well (Well #1-WL003) that was drilled in 1986, a slow sand filter/ infiltration gallery system (IN002) located in Willow Creek, and a newer well (Well #2-WL004), drilled in 1998, **Well #1** functions only as a back-up well if the need arises (**Rocky Vinton communication, 2015**). Three buildings at the PWS system include the chlorination room and well house, located at the well head; and a chlorination and valve building at the storage tank.
A 60 horse power submersible pump with a peak flow of **500** gallons per minute (gpm) is located in **Well #1 and Well #2** at about 180 feet below ground surface. Groundwater is pumped directly into the distribution system, and during periods of low use excess pressure in the distribution system lifts water to a **560,000** –gallon concrete storage tank located approximately two miles east of White Sulphur Springs. Larger tank was installed in 2011/12 for fire protection and future growth.
The water from the tank is then gravity fed back to the distribution system as demand increases. The storage tank is connected to the distribution system with approximately two miles of **10-inch** steel transmission main. The steel transmission line is scheduled to be replaced with 12-inch PVC pipe.
An infiltration gallery is used in conjunction with the slow sand filter to help collect water. The dam creates a pond, holding approximately 314,160 gallons of water, above the slow sand filter when Willow Creek is diverted into the slow sand filter (DEQ, 1999 Sanitary Survey).

A new sand filter building was completed in 2004 and is located 2 miles from town. New additions included a 4-cell sand filter system that allows for a future 2-cell expansion. A tornado event in 2012 destroyed much of the sand filter building roof and walls. Repairs were made and the system was back on line in 2013.
Replacement of 3,000 feet of 12" PVC transmission line in 2010 extended ½ mile from town through privately owned land.

Currently, water from Willow Creek is gravity fed into the updated sand filter system. Rain events that produce heavy run-off may contribute to higher turbidity levels on the Willow Creek source. Turbidity meters are installed that enable the PWS staff to monitor any changes in turbidity levels for this source. If levels reach above 1, the Willow Creek source is turned off and the PWS will use 100% of the groundwater sources until the turbidity levels are reduced on Willow Creek. Maintenance on the sand filter system is completed during this time.

Groundwater from the wells and surface water from Willow Creek are treated with gas chlorine that is injected at the well house and at the storage tank.
The daily average demand for groundwater **Well #2** is approximately 300,000 gallons per day (gpd), and about 150,000 gpd for the slow sand filter. The production from the Willow Creek system is limited during the irrigation season (April - September). During the irrigation season withdrawal from Willow Creek is limited to approximately 112 gpm.

<u>Water Quality</u>

White Sulphur Springs' water quality is routinely monitored for compliance with drinking water standards. Bacteriological monitoring is conducted monthly. Compliance with other drinking water standards is based on additional sampling on a variety of schedules. The PWS has maintained compliance with all SDWA regulations in the last five years.

Willow Creek is located in the Smith River sub-basin of the Upper Missouri River Watershed. The U.S. Geological Survey hydrologic unit code for Willow Creek is 10030103. The Willow Creek drainage to the White Sulphur Springs intake is classified as A-1 water meaning, waters are to be maintained suitable for drinking, culinary and food processing purposes after conventional treatment for removal of naturally present impurities.

CHAPTER 2
DELINEATION

The source water protection area, the land area that contributes water to the White Sulphur Springs PWS wells, is identified in this chapter. Management areas identified within the source water protection area for wells 1 and 2 include the control zone, inventory region, and recharge region. For the purposes of this report, the recharge region is included within the watershed region for the Willow Creek surface water intake. The control zone is an area at least 100-foot radius around the well. The management goal of the control zone, also known as the exclusion zone, is to protect against the direct introduction of contaminants into the wells or in the immediate area surrounding each well. The inventory region (Figure 5) represents the zone of contribution to the wells. The management goal of the inventory region is to focus on pollution prevention activities at potential contaminant sources where it is likely that contaminated water would flow into the wells within a relatively short time. The recharge region represents the entire portion of the aquifer that contributes water to the White Sulphur Springs wells. Management within the recharge region should focus on maintaining and improving the quality of groundwater that could reach the wells over longer timeframes or with increase usage.

Management areas identified within the source water protection area for the White Sulphur Springs surface water intake include the spill response region (Figure 6) and the watershed region (Figure 7). The spill response region represents the area of surface water upstream of the White Sulphur Springs PWS in which contaminants could be drawn into the intake in a relatively short period of time. The watershed region represents the entire region that is upstream of, and contributes water to the White Sulphur Springs PWS.

<u>Hydrogeologic Conditions</u>

Tertiary basin fill sediments underlie the City of White Sulphur Springs. White Sulphur Springs PWS wells 1 and 2 are completed in deep fractured siltstone and appear to be confined (Appendix A). Regional groundwater flow in the White Sulphur Springs vicinity is to the west with a relatively flat gradient (Maxim, July 1997).

Several thrust faults are located nearby and north and east of White Sulphur Springs. Water flowing from the hot springs for which the City of White Sulphur Springs is named, is the result of deep water circulation along the Willow Creek Thrust Fault, in high permeability zones of the Mississippian Mission Canyon Limestone or the Pre-Cambrian Newland Limestone beneath the thrust fault zone, or both (D. Smith 1983). The water temperature is approximately 115 ° F. The sulfur odor given off by the springs is caused by hydrogen sulfide gas escaping to the atmosphere (Groff, 1965). The springs are used for the pools and baths in a local spa hotel and for the heating system at a local bank (Grove and Dunn, 1980).

The surface water intake for the White Sulphur Springs PWS is located in Willow Creek. The headwaters for Willow Creek are located in the Castle Mountains, which are located southeast of White Sulphur Springs. The Castle Mountains were formed approximately 50 million years ago when movement of area faults occurred and the magma that formed these granite mountains moved upward along the faults (Alt and Hyndman, 1986). As the granite mountains weather, castle-like turrets are formed thus giving rise to their name.

Sedimentary rocks ranging in age from Precambrian to Cretaceous that cover a large part of the White Sulphur Springs vicinity were uplifted during the formation of the Castle Mountains and another igneous extrusion composed of diorite. The Castle Mountains and diorite extrusions produced numerous fractures in the overlying layers. Recharge to the White Sulphur Springs wells mostly likely results from water percolating into more permeable zones of area limestones or fractured bedrock along area faults. Recharge to Willow Creek appears to be from precipitation entering directly into the creek or from runoff that eventually flows into the creek.

Table 1 below is used to determine source water/ aquifer sensitivity.

Table 1. Source Water Sensitivity Criteria (DEQ, 1999)

Source Water Sensitivity
High Source Water Sensitivity **Surface water and GWUDISW** Unconsolidated Alluvium (unconfined) Fluvial-Glacial Gravel Terrace and Pediment Gravel Shallow Fractured or Carbonate Bedrock
Moderate Source Water Sensitivity Semi-consolidated Valley Fill sediments Unconsolidated Alluvium (semi-confined)
Low Source Water Sensitivity Consolidated Sandstone Bedrock **Deep Fractured or Carbonate Bedrock** Semi-consolidated Valley Fill Sediments (confined)

The White Sulphur Springs wells are completed in deep fractured siltstone. Based on this information the siltstone aquifer that supplies water to the White Sulphur Springs PWS wells has a low sensitivity to potential contaminant sources (Table 1).

Water obtained via the slow sand filter/ infiltration galley intake system in Willow Creek is classified as having a high sensitivity to potential contaminant sources. Because the groundwater and surface water are blended in the storage tank, the overall sensitivity of the White Sulphur Springs PWS to potential contaminant sources is moderate.

<u>Conceptual Model and Assumptions</u>

Tertiary basin fill sediments underlie the City of White Sulphur Springs. Areas nearby and to the north and east of White Sulphur Springs were highly faulted. Hot springs located in the city park are the result of deep water circulation along the Willow Creek Thrust Fault, in high permeability zones of the Mississippian Mission Canyon Limestone or the Pre-Cambrian Newland Limestone beneath the thrust fault zone, or both (Smith 1983). White Sulphur Springs PWS wells 1 and 2 are completed in deep fractured siltstone and appear to be confined. Regional groundwater flow in the White Sulphur Springs vicinity is to the west with a relatively flat gradient (Maxim, July 1997). Recharge to the wells is potentially from water percolating into more permeable limestones or fractured bedrock along area faults.

Surface water is also utilized by the White Sulphur Springs PWS. The water is obtained via a slow sand filter/ infiltration gallery system in Willow Creek. Contaminants, if spilled directly into Willow Creek upstream or in the immediate vicinity of the White Sulphur Springs intake, could potentially reach the intake before the water operator could close it. Over a longer time-frame, contaminants that accumulate throughout the watershed could be flushed into Willow Creek during periods of spring high flow runoff.

Well Information

Data for the White Sulphur Springs wells is summarized in Table 2.

Table 2 Well information for the White Sulphur Springs PWS.

Information	Well #1	Well #2
PWS Source Code	WL003	WL004
Well Location (T, R, Sec)	T. 9 N., R. 7 E., Sec. 07 SW¼ SE¼SE¼ (DDC)	T. 9 N., R. 7 E., Sec. 07 SW¼ SE¼SE¼ (DDC)
Latitude/ Longitude	46.5498/110.8899	46.5482/ 110.8883
MBMG #	260672	172711
Water Right #	NA	C061342-00
Date Well was Completed	06/23/86	04/21/1999
Total Depth	200	201
Perforated Interval	90' - 200'	145' – 195'
Static Water Level	19	22
Pumping Water Level	42	58
Drawdown	23	36
Test Pumping Rate	NA	NA
Specific Capacity	35	28

Currently, Well #2 is used primarily along with water obtained via the Willow Creek surface water intake to supply White Sulphur Springs with drinking water. Well #1 is used as a backup well as needed depending on water demand.

Surface Water Intake Information

The slow sand filter system, located approximately five miles southeast of town in Willow Creek, consists of a concrete dam with earthen sides and approximately 4.5 feet of masonry sand as the filter media with collectors below. An infiltration gallery is used in conjunction with the slow sand filter to help collect water. The dam creates a pond, holding approximately 314,160 gallons of water, above the slow sand filter when Willow Creek is diverted into the slow sand filter (DEQ, 1999 Sanitary Survey). Because the slow sand filter requires the use of supplemental pumping to drain and it is difficult to clean, filtered water has a higher turbidity than water in the creek before filtration ?

Methods and Criteria

DEQ's Source Water Protection Program specifies methods and criteria used to delineate sub regions of the source water protection area for the White Sulphur Springs PWS. Because the White Sulphur Springs PWS obtains water from both groundwater wells and a surface water intake, a control zone, and inventory region have been delineated for the wells. A spill response region has been identified for the Willow Creek surface water intake. A combined recharge/ watershed region has been delineated for both the wells and surface water intake

Delineation Results

Because wells 1 and 2 are only about **20**-feet apart, a one hundred-foot radius control zone was delineated around both of the wells. A 1000-foot fixed radius inventory region was also delineated around both of the wells.

The spill response region for the Willow Creek intake extends ½-mile downstream and ten miles upstream (or at the watershed boundary) from the intake and, includes ½-mile wide buffers adjacent to all shorelines.

The delineation of the recharge/watershed region for the White Sulphur Springs PWS wells and surface water intake is based on hydrogeological mapping.

CHAPTER 3
INVENTORY

Inventory of potential contaminant sources was conducted within the White Sulphur Springs PWS well control zones, inventory region, and recharge region. Inventory of potential contaminant sources was also conducted within the spill response region and watershed region of the PWS intake on Willow Creek. Potential sources of all primary drinking water contaminants and Cryptosporidium were identified; however, only significant potential contaminant sources were selected for the detailed inventory. Significant potential contaminants in the White Sulphur Springs' inventory region and spill response region include nitrate, pathogens, fuels, solvents, agricultural chemicals, and metals.

The potential contaminant source inventory for White Sulphur Springs focuses on all activities in the control zone, certain sites or land use activities in the inventory region, and general land uses and large facilities in the recharge region. In the spill response region potential contaminant sources that have the potential to impact the intake are identified. General land uses and large facilities within the watershed region are identified.

Inventory Method

Available databases were initially searched to identify businesses and land uses that are potential sources of regulated contaminants in the inventory region. The following steps were followed:

Step 1: Urban and agricultural land uses were identified using the United States Geological Survey National Landcover Dataset 2000.

Step 2: EPA's Envirofacts System was queried to identify EPA regulated facilities. This system accesses the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory (TRI), Permit Compliance System (PCS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility is a significant potential contaminant source.

Step 3: DEQ databases were queried to identify Underground Storage Tanks (UST); hazardous waste contaminated sites, landfills, and abandoned mines.

Step 4: A business phone directory was consulted to identify businesses that generate, use, or store chemicals in the inventory region. Equipment manufacturing and/or repair facilities, printing or photographic shops, dry cleaners, farm chemical suppliers, and wholesale fuel suppliers were targeted by SIC code.

Step 5: Major road and rail transportation routes were identified.

Step 6. All significant potential contaminant sources were identified in the inventory region and land uses and facilities that generate, store, or use large quantities of hazardous materials were identified within the recharge region.

Potential contaminant sources are designated as significant if they fall into one of the following categories:

-Large quantity hazardous waste generators
-Landfills
-Hazardous waste contaminated sites
-Underground storage tanks
-Major roads or rail transportation routes
-Cultivated cropland
-Animal feeding operations
-Wastewater lagoons or spray irrigation
-Septic systems
-Sewered residential areas
-Storm sewer outflows
-Floor drains, sumps, or dry wells
-Abandoned or active mines

Inventory Results/Control Zone

White Sulphur Springs Wells 1 and 2 are located on the northeast side of town. The City controls the land within the 100-foot control zone (Personal Communication, December 2002, Rick Cottingham, DEQ Drinking Water Section).

Inventory Results/Inventory Region

Land cover within the inventory region for the White Sulphur Springs PWS is predominantly grassland at 44% and residential land at 40% (Figure 8). Additional land use types and their percentages are also identified on Figure 8. Septic system density in the inventory region is low. The municipal sewer system covers approximately 40% of the inventory region (Figure 9).

Significant potential contaminant sources in the inventory region are listed in Table 3 and indicated on Figure 10.

Table 3. Significant Potential Contaminant Sources in the White Sulphur Springs PWS Inventory Region

Significant Potential Contaminant Sources	Figure/ Map ID	Contaminants	Hazard
Municipal Sewer System	Figure 10 #1	Nitrates and pathogens	Main line breaks and contents leaching into groundwater
US Highway 12 & 89	Figure 10 #2	VOCs, SOCs, nitrates, pathogens	Accidental spills with migration of contaminants to groundwater
Septic Systems	Figure 9	Nitrates and pathogens	Effluent leaching into area groundwater
Pasture Hay Land	Figure 8	Nitrates and pathogens	Agricultural chemicals leaching into groundwater
Class V Injection Wells	Unknown	VOCs, SOCs, metals	Infiltration of contaminated water into groundwater

Municipal sewer system - Municipal sewer lines underlay approximately 40% of the inventory region. A sewer main break could allow nitrates and pathogens to enter area groundwater.

Transportation routes - Spills of fertilizers, pesticides, volatile organic compounds (VOCs), and synthetic organic compounds (SOCs) could occur along US Highways 12 and 89.

Septic systems – Septic system malfunctions could cause nitrates and pathogens to leach into area groundwater.

Agricultural land - Nitrates and pathogens found in fertilizers and manure applied to pasture/hay land could potentially leach into area groundwater.

Class V Injection wells – Locations have not been determined to date for this type of discharge. However, if any are located in the inventory region they could allow infiltration of contaminated water into area groundwater.
(No Injection wells are located within the area – communication from Rocky Vinton, 2015)

Inventory Results/Surface Water Intake Spill Response Region

Land cover within the Willow Creek Spill Response Region includes 92% forests, 7% grassland, and 1% bare rock and deciduous trees (Figure 11). Septic density within the spill response region is low.

A past producing mine, the Ringling Mine, appears to be located upgradient of the Willow Creek intake. While no confined animal feeding operations have been identified, cattle from area ranches graze in the vicinity of Willow Creek.

Inventory Results/ Watershed-Recharge Region

Land cover in the White Sulphur Springs watershed/recharge consists predominantly of 48% grasslands and 40% forests (Figure 12). Additional land use types and percentages are also identified on Figure 12. Residential land covered less than one percent of land area and was not broken out in the pie chart.

Septic density in the watershed region is low. The only significant potential contaminant sources identified in the watershed region in addition to those mentioned in the inventory region and spill response region are scattered mines (Figure 13).

Inventory Limitations

The potential contaminant inventory was conducted using various databases to acquire readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The use of multiple sources of information, however, should ensure that the major threats to the White Sulphur Springs PWS wells and surface water intake in Willow Creek have been identified.

CHAPTER 4
SUSCEPTIBILITY ASSESSMENT

Susceptibility is the potential for a public water supply to draw water contaminated by inventoried sources at concentrations that would pose concern. Susceptibility is assessed in order to prioritize potential pollutant sources for management actions by local entities, in this case White Sulphur Springs.

The goal of Source Water Management is to protect the sources of the White Sulphur Springs PWS water by 1) controlling activities in the control zone, 2) managing significant potential contaminant sources in the Inventory Region for the wells and in the spill response region for the intake, and 3) ensuring that land use activities in the Recharge/ Watershed Regions pose minimal threat to the source water. Management priorities in the Inventory Region for the wells and Spill Response Region for the intake are determined by ranking the significant potential contaminant sources identified in the previous chapter according to susceptibility. Alternative management approaches that could be pursued by the White Sulphur Springs PWS to reduce susceptibility are recommended.

Susceptibility is determined by considering the hazard ranking for each potential contaminant source and the existence of barriers that may decrease the likelihood that contaminated water will flow to the White Sulphur Springs' wells and surface water intake (Table 4).

Table 4. Relative susceptibility to specific contaminant sources as determined by hazard and the presence of barriers.

	High Hazard	Moderate Hazard	Low Hazard
No Barriers	Very High Susceptibility	High Susceptibility	Moderate Susceptibility
One Barrier	High Susceptibility	Moderate Susceptibility	Low Susceptibility
Multiple Barriers	Moderate Susceptibility	Low Susceptibility	Very Low Susceptibility

Proximity or density of significant potential contaminant sources and nature of contaminants determines hazard (Table 5).

Table 5. Hazard of potential contaminant sources associated with proximity to a PWS well or intake or density within a PWS inventory or spill response region.

Type of Contaminant Source		High Hazard	Moderate Hazard	Low Hazard
SURFACE WATER	Point Sources of Nitrate or Microbes	Potential for direct discharge to source water	Potential for discharge to groundwater hydraulically connected to source water	Potential contaminant sources in the watershed region
SURFACE WATER	Point Sources of VOCs, SOCs, or Metals	Potential for direct discharge of large quantities from roads, rails, or pipelines	Potential for direct discharge of small quantities to source water	Potential for discharge to groundwater hydraulically connected to source water
WELLS	Point Sources of All Contaminants (Unconfined)	Within 1-year TOT	1 to 3 years TOT	Over 3 years TOT
WELLS	Point Sources of All Contaminants (Confined)	PWS well is not sealed through the confining layer	Well(s) in the inventory region other than the PWS well are not sealed through the confining layer	All wells in the inventory region are sealed through the confining layer
ALL	Septic Systems	More than 300 per sq. mi.	50 – 300 per sq. mi.	Less than 50 per sq. mi.
ALL	Municipal Sanitary Sewer (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region
ALL	Cropped Agricultural Land (% land use)	More than 50 percent of region	20 to 50 percent of region	Less than 20 percent of region

Susceptibility rankings are presented individually for each significant potential contaminant source and each associated contaminant in Table 6 and in text following the table. Management recommendations that indicate how significant potential contaminant sources could be better managed to prevent impacts to the White Sulphur Springs' wells and surface water intake are also provided in Table 6.

Table 6. Susceptibility assessment for significant potential contaminant sources in the White Sulphur Springs Inventory and Spill Response Regions

Potential Contaminant Sources	Potential Contaminants	Hazard	Hazard Ranking	Barriers	Susceptibility	Management Recommendation
Inventory Region						
Municipal Sewer (40%)	Nitrates and pathogens	Main breaks, contaminated water mixing with ground Water	Moderate	Well intake depth, upward groundwater gradient	Very Low	Periodic inspection and upgrades of older sewer mains
US Highway 12 & 89	VOCs, SOCs, nitrates	Accidental spills	Low	Well intake depth, upward groundwater gradient	Very Low	Spill Response Plan
Septic Systems	Nitrates and pathogens	Effluent leaching into ground Water	Low	Well intake depth, upward groundwater gradient	Very Low	Proper maintenance
Pasture Hay Land	Nitrates and pathogens	Spills, over application surface runoff leaching into ground Water	Low	Well intake depth, upward groundwater gradient	Very Low	Use Best Management Practices
Stormwater Discharges Class V Injection Wells	VOCs, SOCs, metals	Infiltration into ground Water	Unknown at this time	Not available	**No know injection wells in the area**	Work with EPA to identify locations and appropriate response
Spill Response Region						
Mines Ringling Mine	VOCs, SOCs, nitrates, metals	Leaching into area surface water	High	Dilution	**Moderate**	Revegetation tailings management

Municipal Sewer – Hazard is ranked moderate because the municipal sewer system underlies approximately 40% of the inventory region. The susceptibility of the wells is ranked low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

U.S. Highway 12 and 89 – Hazard is ranked low for these transportation routes. The overall susceptibility is very low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

Septic Systems – Hazard is ranked low based on the low density of septic systems in the inventory region. The susceptibility of the wells is ranked low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

Pasture Hay Land – Hazard is ranked low because this agricultural land occupies only 6 percent of the inventory region. The susceptibility of the wells is ranked low based on the depth of the well intakes and there appears to be an upward groundwater flow gradient.

Storm Water Discharges (Class V Injection Wells) – Hazard has not been ranked because the location and quantity of Class V Injection Wells in White Sulphur Springs is unknown. They have been identified in this report because if present, they have the potential to discharge into area groundwater. The susceptibility is also unknown at this time. **No injections wells identified in the area (Rocky Vinton communication, 2015)**

Mines (Ringling Mine) – Hazard is ranked high in the Willow Creek Spill Response region. The past producing Ringling Mine appears to be upgradient of the Willow Creek intake. The overall susceptibility is high based on dilution. **2015 update: Mine is currently off line and not in operation – Communication with Rocky Vinton, 2015. Mine will be monitored for activity and communicated.**

MANAGEMENT PLANNING

The goal of the Source Water Protection Plan is to protect the two sources of the White Sulphur Springs PWS by:

1) Keeping potentially polluting materials and activities out of the *Control Zones*, and
2) Manage the *Inventory Region* for the wells and *Spill Response Region* for the intake to ensure that susceptibility to land use activities and potential contaminant sources is the lowest possible.

Planning meetings and site visits were conducted in 2015 by the SWP planning team. Updates and corrections were made to the 2002 Source Water Delineation and Assessment report (SWDAR). Future management ideas for the contaminant sources identified in the 2002 SWDAR were discussed and plans are detailed in this chapter.

The SWP planning team members included:

City of White Sulphur Springs (WSS)
JulianTheriault, Mayor
George Kirkwood, Council member
Rocky Vinton, Water Superintendent
Daryl Mesecher, Wastewater Superintendent

Montana Rural Water Systems
Kristi Kline, Source Water Protection Specialist

The City of White Sulphur Springs is a rural community that is surrounded by three mountain ranges that include the Little Belt Mountains to the northeast, the Castle Mountains to the southeast, and the Big Belt Mountains to the southwest. The headwaters for Willow Creek, the White Sulphur Springs PWS surface water source, are located in the Castle Mountains. Surface waters are identified as having high source water sensitivity (Table 1, DEQ). The PWS groundwater sources are completed in confined deep fractured siltstones that underlie the City. This siltstone aquifer provides a low sensitivity to potential contaminant sources (Table 1, DEQ).

Management protection for this SWP Plan will focus on the main PWS supply, the Willow Creek surface water supply and the two PWS wells that currently serve as supplemental sources. Both sources have an important collaboration element that will be fundamental to a successful source water protection program. As, source water protection is an ongoing effort, extending for the life of the water sources, an active participation and communication effort by the City of White Sulphur Springs' Council

members and Public Works staff in this collaboration are important roles to be continued in the future.
The City of White Sulphur Springs maintains a small PWS work force of operators who are cross-trained and certified in water and wastewater treatment operations. This cross training enables a communication and knowledge of all utility operations for the City of White Sulphur Springs that is very beneficial in the collaboration of services for all water users.

Collaborations

Lewis and Clark US National Forest (USNF), White Sulphur Springs (WSS) Ranger District

A portion of the Willow Creek Municipal Watershed, a primary source of water for the City of White Sulphur Springs, is located in the western portion of the Castle Mountains within this USNF. The City of White Sulphur Springs owns the water rights that date back to the late 1800's for the South Fork of Willow Creek. The Willow Creek intake is located on USNF land. The While Sulphur Springs Ranger District office manages this region and is located in White Sulphur Springs which allows an opportunity to work closely together on SWP management plans and any other future plans. Maintaining a working collaboration with this staff will be imperative to the success of the 2015 SWP plan.
The daily average demand for groundwater well #2 is approximately 300,000 gallons per day (gpd), and about 150,000 gpd for the slow sand filter. The production from the Willow Creek system limited during irrigation season as the irrigation water rights have priority. During irrigation season withdrawal from Willow Creek is limited to approximately 112 gpm.

Private Landowners

Private property borders the access to the PWS Willow Creek intake, located in the western portion of the Castle Mountains. The City of White Sulphur Springs PWS staff has maintained a working cooperation with past and current landowners for access through their land to the entrance of the USNF land and the PWS intake. Maintaining a cooperative communication with the current landowners will be an important portion of the 2015 SWP plan.

Control Zone Management

The PWS Wells #1 and #2 are 20-feet apart from each other and located on land controlled by the City of White Sulphur Springs. Future activities or construction projects within this area will include protective barriers managed by the WSS Public Works Department staff.

Future Action plans:

- Replace existing line between Well #1 and Well #2

Inventory Region/Spill Response Region Management

PWS Wells #1 and #2

Susceptibility of groundwater sources is very low due to the depth of the PWS wells and existing groundwater gradient. To maintain a barrier of protection that ensures a low susceptibility for these wells, the PWS staff should continue to inspect, maintain and plan for future replacement of municipal sewer lines within this region. In addition, coordination of spill response action plans with the Meagher County Disaster and Emergency Response staff will provide barriers to any spills that may occur on US Highway 12 and 89 within this region.

Management planning will include these outreach projects:

- Presentation of 2015 SWP plan by City of White Sulphur Springs PWS staff to Meagher County LEPC
    - Assisted by Montana Rural Water Source Water Protection Specialist

- Future planning by City of White Sulphur Springs Council will include source water protection management planning in developing future construction plans for the public water system

Willow Creek Intake

Meetings were held with the White Sulphur Springs PWS staff and USFS Ranger and District staff to discuss several SWP management planning ideas. The Spill Response Zone around the Willow Creek intake is identified as roadless and somewhat remote. Some trails exist within the area but are very rugged and private land surrounds the entrance to this area and is fenced and locked. In recent years, the White Sulphur Springs PWS staff has encountered road access problems near the Willow Creek PWS intake due to downed trees on forest land. SWP planning discussions with the USFS Ranger District staff resulted in a site inspection with the WSS PWS staff and a road clearing project was collaborated and completed in October 2015. Future planning will include a PWS Operation and Maintenance plan for the PWS intake to communicate with the USFS District Ranger staff. This O&M plan will convey access needs for monitoring, sampling and maintenance needs for the Willow Creek. This communication will allow the Ranger District staff to include future management review of access for the area.

In 2015, The WSS Ranger District began a project scoping proposal to implement the Castle Mountains Restoration project. This project contains a suite of forest treatments focused on maintaining, restoring and improving the resiliency of forests and grasslands in the Castle Mountains on the White Sulphur Springs and Musselshell Ranger Districts. Reducing wildfire hazards, implementing mechanical and hand vegetation treatments including some prescribed fire, weed control and enhancing and restoring quaking aspen and white bark pine stands are some of the proposed action plans.

This project is a great opportunity for the City of White Sulphur Springs' Council and PWS staff to communicate the importance of the Willow Creek PWS source water and participate in any future planning efforts for the area. The City of White Sulphur Springs PWS staff continues to monitor the water quality for Safe Drinking Water Act (SDWA) regulations. Additional monitoring by the PWS staff will be added and reviewed to note any changes in the current quality of the water. New information will be communicated with the WSS Ranger District staff that may further assist in future restoration planning efforts.

The Ringling Mine is currently inactive at the time of this writing. This is an old mining claim that has changed hands over the years. Current information of activities will be investigated. Contacts with Lewis and Clark USFS and MT DEQ staff will be identified to communicate with any updates on activities of this mine.

- Lewis and Clark USFS-Judith Basin Ranger District (406) 566-4000
- MT DEQ SWP program staff – (406) 444- 4806

Future concerns

At the time of this writing, a copper mining proposal to be located at the head of Sheep Creek north of White Sulphur Springs and the Gordon Butte Hydro Pumped Storage Facility project located near Martinsdale, are currently under review by state agencies. Communication of maintaining protective barriers for the WSS PWS sources is an important management tool. As a prospective economic benefit to both the City of White Sulphur Springs Council and Meagher County, a cooperative effort of planning will ensure that protective barriers for the City of White Sulphur Springs' source waters are included.

***Management planning*:**

- WSS PWS staff to develop an O&M plan for the Willow Creek intake to share with USFS Ranger District for future management of the access roads
    - Include Duties and equipment needed

- WSS Council and PWS staff continue cooperative communication with private landowners to access Willow Creek on USFS land
    - "Neighborhood watch"
    - Current WSS PWS staff and vehicle information

- WSS Council and PWS support the USFS Castle Mountains Restoration project
    - Participate and communicate protection of the Willow Creek PWS source with future restoration project treatments
        - Monitor and review of Willow Creek water quality data

- Identify contacts with Lewis and Clark USFS and MT DEQ staff to communicate with any updates on activities of the Ringling Mine.
    - Lewis and Clark USFS-Judith Basin Ranger District (406) 566-4000
    - MT DEQ SWP program staff – (406) 444- 4806

- The City of White Sulphur Springs Council will communicate source water protection management planning in developing future planning within The City of White Sulphur Springs and Meagher County

EMERGENCY RESPONSE PLANNING

The City of White Sulphur Springs Mayor, Council members and Public Water System (PWS) staff evaluated the current emergency response plan (ERP) and developed an updated ERP addressing drinking water emergencies for this SWP plan. The team evaluated the principal threats to the source water, designated a PWS emergency coordinator, and developed potential responses in the event that a problem arises. Another important aspect of this plan is an estimate of the equipment and materials that would be needed in the event of an emergency, a description of how a short-term replacement water supply would be handled, and a description of the funding available to deal with an emergency response.

The evaluation team included:

City of White Sulphur Springs

Julian Theriault, Mayor	George Kirkwood, Council member
Rocky Vinton, Water Superintendent	Daryl Mesecher, Wastewater Superintendent

Montana Rural Water Systems,
Kristi Kline, Source Water Protection Specialist

This Source Water Protection emergency response planning chapter includes coordinating communication efforts with the City of White Sulphur Springs staff, customers and Meagher County.
This chapter will also address:

-Equipment and material resources	-Replacement water supply
-Emergency funding availability	-Future water source supply

This collaboration and the following items listed are also important for the implementation of this emergency response plan:

ACTION ITEMS

- **City of White Sulphur Springs Council and PWS staff** will coordinate with **Meagher County DES and Public Health Emergency Preparedness Coordinators** on emergency planning exercises, Local Emergency Planning Committee (LEPC) activities and any funding opportunities for emergency equipment resources important to the City of White Sulphur Springs ERP.

City of White Sulphur Springs Council and PWS staff will coordinate with **Lewis and Clark National Forest-White Sulphur Springs Ranger District staff** on road maintenance and fire fighting response plans in Willow Creek Municipal Watershed.

City of White Sulphur Springs Council will continue to budget for PWS utility repairs and contingency funding yearly.

- **City of White Sulphur Springs Council and PWS staff** will develop Standard Operating Procedures (SOPs) to evaluate emergency thresholds for ERP planning and water conservation programs that could be implemented during water restriction events
  -assistance from Montana Rural Water System staff

Identification of possible disruption threats

The principal threats to the PWS have been identified as chemical spills, storm and wildfire events in the Control Zone of Willow Creek. Secondary threats are earthquakes

Designation of an emergency coordinator

The ***emergency coordinator*** for the *City of White Sulphur Springs PWS* is the **Water Superintendent** and the ***backup emergency coordinator*** is the *City of White Sulphur Springs* **Wastewater Superintendent**. The City of White Sulphur Springs office number is **(406) 547-3911**. Please refer to Emergency Contacts table at the end of this chapter for all contact phone numbers.

The emergency coordinator is familiar with the county and state DES procedures and is responsible for contacting the appropriate officials should a spill or other threat to the source water occur.
The **Meagher County Sheriff/Dispatch** contact number is:
- 24-hour phone number - **(406) 547-3397 or 911**

The State of Montana DES 24 hour phone number is **(406) 324-4777, request the Duty Officer**.

Equipment and material resources

The principal identified threats to the intake and springs are *chemical spills, storm or wildfire events*. Resources that may be needed to respond to these are listed below. Should additional resources be needed the City of White Sulphur Springs will contract with an emergency response firm properly trained and equipped. A list of possible contractors is maintained and updated by the DEQ Enforcement Division (406) 444-0379.

Available resources

City of White Sulphur Springs
- Various equipment and spare parts
- Remote SCADA for operation of water treatment facilities
- City of White Sulphur Springs Volunteer Fire Department

Other Resources – Mayor of White Sulphur Springs will coordinate with County staff
Meagher County
Various equipment
Coordination with Meagher County Emergency Response staff

Lewis and Clark National Forest –White Sulphur Springs Ranger District
Various equipment
Staff assistance
Area resources – Harlowton, Townsend and Helena
Municipality and business resources

- Montana Rural Water Systems, Inc. – staff available for on-site assistance

In the event of a catastrophic loss of water, the City of White Sulphur Springs would consult all resources available

Procedures to shut down the intake and wells

The PWS intake on Willow Creek and two wells can be turned off and isolated from the water supply system. Under ideal conditions the system can operate without the supply sources by using water in the PWS storage tank for approximately 1-2 days. Shut down operations can be performed by the White Sulphur Springs PWS certified operators.

Coordination Procedures

The *City of White Sulphur Springs SWP Plan* has been made available to the **Meagher County Disaster and Public Health Emergency Coordinators**. Additionally, reportable spills will be handled as per the mandated reporting requirements as follows:

X Meagher County Sheriff/Dispatch 24/7– **(406) 547-3397**
MT DES - **(406) 324-4777** - to report spills/emergencies

Procedures to communicate with water users

The White Sulphur Springs PWS Emergency Coordinator will communicate with the **White Sulphur Springs Mayor and City Council** about the emergency situation. A statement would be prepared and approved by all council members to be distributed to the White Sulphur Springs water users. *The Mayor is the designated Public Information Officer (PIO) for the City of White Sulphur Springs.*

Further communication efforts will be coordinated with these additional contacts depending on the incident:
Meagher County Sheriff/Dispatch
(406) 547-3397 (Sheriff/Dispatch) or 911
White Sulphur Springs Volunteer Fire Department
Meagher County Disaster and Public Health Emergency Coordinators
MT DEQ Public Water Supply Section and/or MT DES

Phone calls to water users – by Town of White Sulphur Springs' staff and/or designated volunteers

- White Sulphur Springs High School – **(406) 547-3351**
- White Sulphur Springs Grade School – **(406) 547-3751**
- Mountainview Medical Center – **(406) 547-3321**
- Area business as needed

Door to Door Notification – by White Sulphur Springs' PWS staff and/or designated volunteers
In person
Bullhorn to broadcast information

Postings – by White Sulphur Springs' PWS staff and/or designated volunteers

- White Sulphur Springs City Hall
- White Sulphur Springs US Post Office
- Meagher County Courthouse

Media – In coordination with City of White Sulphur Springs PIO (Mayor) and Meagher County DES and Emergency and Communication Coordinators as needed

Reverse 911
Websites:
City of White Sulphur Springs
Meagher County
Social Media
Facebook

Source of emergency water

The short-term plan for emergency water will be coordinated with Meagher County Public Health Emergency Coordinator. Possible resources are listed below:

Bottled water supplies

City of White Sulphur Springs Council and PWS staff will coordinate with **Meagher County Public Emergency Coordinator** for bottled water supplies and delivery

Distribution Center – depending on incident
White Sulphur Springs City Hall
Meagher County Rodeo Arena
Meagher County Ambulance Barn

Certified water hauler list can be obtained from MT DEQ Operator Certification Office at **(406) 444-3434**.

Plans and specifications for any new water source will require MT DEQ-Public Water Supply Section review and approval prior to construction. The City of White Sulphur Springs would consult their current engineering firm for any new design projects.

Disinfection and resumption of water service

The storage tank and distribution system can be disinfected for bacteriological contamination as per the City of White Sulphur Springs standard disinfection and tank cleaning procedures under the direction of the certified operator. Normal water service resumption will occur after sample results indicate the supply is safe as approved by DEQ-Public Water Supply Section and the City of White Sulphur Springs certified operator.

Outreach methods of communication of resumption of service to the public may include:
Phone calls to water users
Area Postings
Various media announcements/newsletters/press releases/ social media

Funds

The City Council of White Sulphur Springs has budgeted contingency funding for public utilities repairs. In addition, the City Council is aware of all state and federal funding available through state and federal grants and loans and would apply for available funds for any emergencies.

ACTION ITEM:

-**City of White Sulphur Springs Council** will continue to budget for PWS utility repairs and contingency funding yearly.

Long-term or Alternate Water Sources

The City of White Sulphur Springs' public water system is currently meeting the summer and winter demands for usage. A low growth of 1% has prevailed over the last few years for White Sulphur Springs and Meagher County.
Meagher County is currently updating the 2014 Growth Policy and is reviewing two new economic projects for the area. A copper mining proposal to be located at the head of Sheep Creek north of White Sulphur Springs and the Gordon Butte Hydro Pumped Storage Facility project located near Martinsdale, would both bring an increase in jobs and population to the County and most likely White Sulphur Springs. Growth plans to anticipate potential changes and accommodate this growth will be reviewed. Coordination between Meagher County and the City of White Sulphur Springs is contained within the current growth plan with the goal of ensuring long term benefits for the City and the County. Water and Wastewater infrastructure needs will be examined with this update.

City of White Sulphur Springs SWP

Emergency Contacts and Phone Numbers

CONTACT NAME	TITLE	PHONE	RESPONSIBILITY
Rocky Vinton Emergency PWS Coordinator	Water Superintendent	**(406) 521-0209** Cell # **(406) 547-3788** City Shop	Operation and management of City of White Sulphur Springs Public Water System
Daryl Mesecher Backup Emergency PWS Coordinator	Wastewater Superintendent/ Backup PWS Operator	**(406) 224-3429** Cell #	Operation and management of White Sulphur Springs Wastewater facility and backup PWS Operator
Meagher County Sheriff	Meagher County Dispatch-24/7	**(406) 547-3397** or **911**	Emergency response coordination for Meagher County
Montana DES - 24 hr/7 – Spill Hotline - Duty officer		**(406) 324-4777**	All reportable spills.
MT DEQ Public Water Supply MT DEQ Duty Officer		(406)444-4400 (406)431-0014	Responds to any event that will pollute surface or ground waters.

REFERENCES

Cottingham, Rick, December 2002, Montana Department of Environmental Quality, Public Drinking Water Section.

Freeze, R. Allan and Cherry, John A., 1979, Groundwater.

Groff, S.L., 1965, Reconnaissance Ground-Water and Geological Studies, Western Meagher County, Montana, Montana Bureau of Mines and Geology, Special Publication 35, Ground-Water Report 3.

Grove, Michael and Dunn, Darrel E., 1980, Geothermal Heating System For the First National Bank of White Sulphur Springs, Montana.

Montana: A Visitors Guide at Montana.ms

Montana Bureau of Mines and Geology, Groundwater Information Center.

Montana Department of Environmental Quality (DEQ) Public Water Supply Program Safe Drinking Water Information System (SDWIS).

Montana DEQ, 2002. City of White Sulphur Springs Source Water Delineation and Assessment Report, Carolyn DeMartino, Source Water Protection Section.

Montana Department of Environmental Quality Underground Storage Tank Program web-site.

Montana Department of Environmental Quality, 2000, "303(d) List, Montana List of Waterbodies In Need of Maximum Daily Load Development".

Montana Department of Natural Resources and Conservation Water Rights Bureau.

Ross, Clyde P., Andrews, David A., and Witkind, Irving J., 1955, Geologic Map of Montana, Montana Bureau of Mines and Geology.

United States Census Bureau, 2000, and 2010

United States Environmental Protection Agency "Envirofacts Data Warehouse and Applications".

United States Environmental Protection Agency "Know Your Watershed".

United States Geological Survey. 2000. National Landcover Dataset, Montana. 30 meter electronic digital landcover dataset interpreted from satellite imagery.

Western Regional Climate Center wrcc@dri.edu, Montana Climate Summaries.White Sulphur Springs 2, Montana (Station 248930).

APPENDIX A

WELL LOGS

Well #2-WL004 – GWIC # **172711 – Primary well**

Well #1-WL003 – GWIC # **260672 – Backup well**

Site Name: CITY OF WHITE SULPHUR SPRINGS
GWIC Id: 172711
DNRC Water Right: C061342-00

Well #2 – WL004

Section 1: Well Owner(s)
1) CITY OF WHITE SULPHUR SPRINGS (MAIL)
102 8TH AVE NE
WHITE SULPHUR SPRINGS MT 59645 [04/21/1999]

Section 2: Location

Township	Range	Section	Quarter Sections
09N	07E	7	SW¼ SE¼ SE¼

County	Geocode
MEAGHER	

Latitude	Longitude	Geomethod	Datum
46.54985488145	110.888469034	TRS-SEC	NAD83

Ground Surface Altitude	Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Wednesday, April 21, 1999

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	30	14.75
30	201	12.25

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	201	10.75	0.25		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
145	195	10			3/16X1 AIR MECHANICAL

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	35	NEAT CEMENT	

Section 7: Well Test Data

Total Depth: 201
Static Water Level: 22
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
1000 gpm pump rate with _ feet of drawdown after 10 hours of pumping.
Time of recovery 0.03 hours.
Recovery water level 22 feet.
Pumping water level 58 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	3	TOPSOIL
3	11	DRY SANDY CLAY
11	28	MOIST SANDY CLAY
28	31	MUDSTONE BROWN 2 GPM
31	55	HARDER BROWN SILTSTONE 20 GPM
55	75	BROWN SILTSTONE W/INTERMITTENT LAYER OF A HARD GREEN BROWN SILTSTONE 40 GPM
75	201	FRACTURED SILTSTONE

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: BILL MAXWELL
Company: BUSH DRILLING
License No: WWC-597
Date Completed: 4/21/1999

Site Name: CITY OF WHITE SULPHUR SPRINGS
GWIC Id: 260672

WELL #1 – WL003

Section 1: Well Owner(s)
1) CITY OF WHITE SULPHUR SPRINGS (MAIL)
N/A
WHITE SULPHUR SPRINGS MT 59645 [06/23/1986]

Section 2: Location

Township	Range	Section	Quarter Sections
09N	07E	7	SW¼ SE¼ SE¼

County	Geocode
MEAGHER	

Latitude	Longitude	Geomethod	Datum
45.5499	110.8898	NAV-GPS	NAD27

Ground Surface Altitude	Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Monday, June 23, 1986

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	30	18
0	200	14

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	30	16				CASING (TYPE UNKNOWN)
0	90	10				STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
90	200	10		10	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	0	BENTONITE	
0	88	CEMENT	

Section 7: Well Test Data

Total Depth: 200
Static Water Level: 19
Water Temperature:

Pump Test *

Depth pump set for test 42 feet.
200 gpm pump rate with _ feet of drawdown after 24 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	19	FINE SAND
19	200	FRACTURED SILTSTONE

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company:
License No:-
Date Completed: 6/23/1986

Site Name: CITY OF WHITE SULPHUR SPRINGS
GWIC Id: 127777
DNRC Water Right: C080786-00

TEST WELL

Section 1: Well Owner(s)
1) CITY OF WHITE SULPHUR SPRINGS (MAIL)
N/A
WHITE SULPHUR SPRINGS MT 59645 [10/08/1991]

Section 2: Location

Township	Range	Section	Quarter Sections
09N	07E	17	NW¼ NW¼ SW¼

County	Geocode
MEAGHER	

Latitude	Longitude	Geomethod	Datum
46.540826	110.8833	TRS-SEC	NAD83

Ground Surface Altitude	Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Tuesday, October 08, 1991

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	219	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1.5	18.5	6				STEEL
9	219	4				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
199	219	4			2X.20 FACTORY

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	18.5	BENTONITE	

Section 7: Well Test Data

Total Depth: 219
Static Water Level: 110
Water Temperature:

Air Test *

5 gpm with drill stem set at _ feet for 1 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 209 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	11	CLAY
11	13	GRAVEL
13	219	CLAY

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

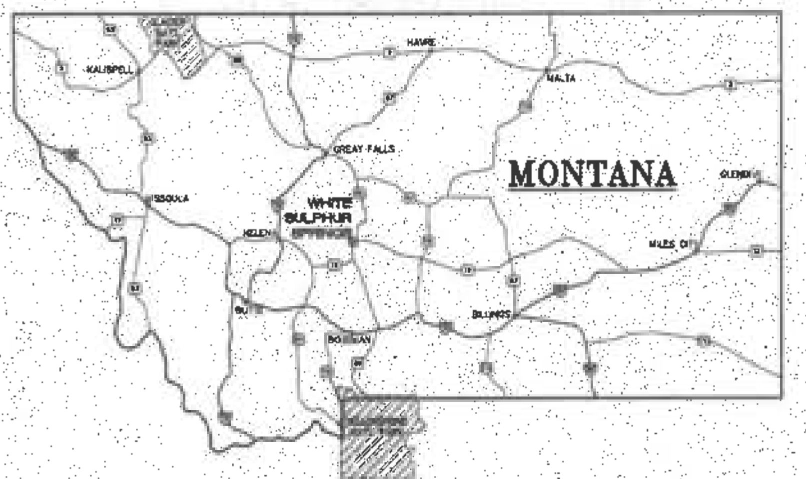
Name: SHAWN TONEY
Company: H & L DRILLING INC
License No: WWC-447
Date Completed: 10/8/1991

Appendix R

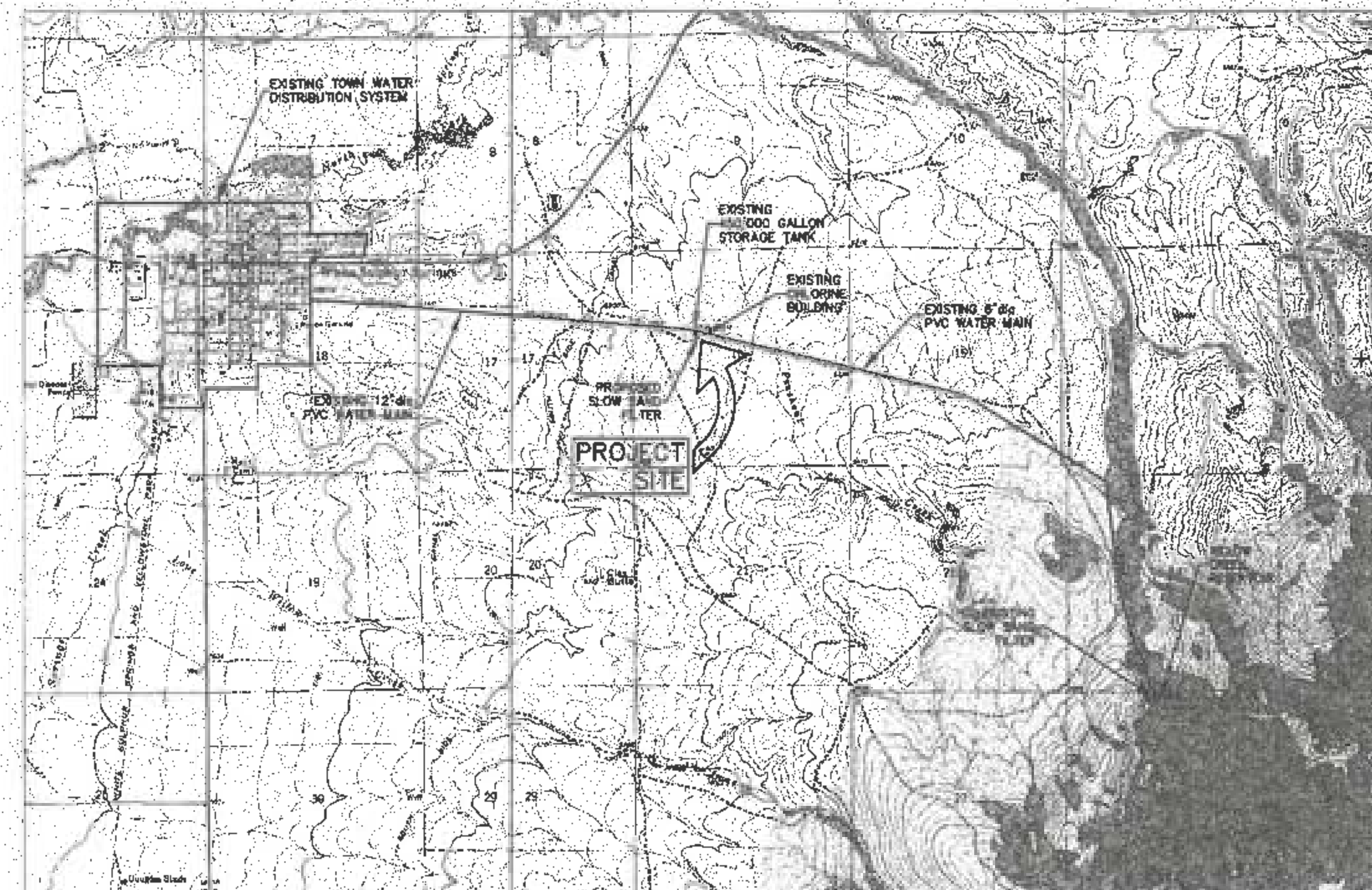
Slow Sand Filter Construction Plans

CONSTRUCTION PLANS

FOR WHITE SULPHUR SPRINGS
WATER TREATMENT SYSTEM IMPROVEMENTS



VICINITY MAP
SCALE: NTS



AREA MAP
SCALE: 1"=2000'

SHEET INDEX

PROTECTION OF ADJACENT IMPROVEMENTS / BENCH MARKS:
RETAIN AND PROTECT ALL ADJACENT IMPROVEMENTS INCLUDING TREES, SHRUBS, FENCES, ETC. RESTORE MATERIAL STORAGE SITES IN KIND. ENGINEER WILL PROVIDE CLEARING LIMITS STAKES AS NECESSARY DURING CONSTRUCTION. CONTRACTOR SHALL PROTECT TEMPORARY AND PERMANENT BENCH MARKS PROVIDED BY ENGINEER.
CONTRACTOR SHALL MAINTAIN EXISTING WATER TREATMENT AND SUPPLY OPERATIONS DURING CONSTRUCTION OF NEW SLOW SAND FILTER. CONTRACTOR SHALL MAKE ARRANGEMENTS WITH CITY PERSONNEL AND ENGINEER PRIOR TO CONNECTION TO EXISTING WATER MAINS.

EXPLORATORY EXCAVATION:
EXPLORATORY EXCAVATION WILL BE PAID AT HOURLY RATES AND ONLY WHEN DIRECTED BY THE ENGINEER. EXPLORATORY EXCAVATION AT ALL LOCATIONS SHALL BE COMPLETED PRIOR TO BEGINNING CONSTRUCTION AND BEFORE ORDERING SPECIALTY MATERIALS AND EQUIPMENT.

UNDERGROUND/OVERHEAD UTILITIES:
CONTRACTOR SHALL BE RESPONSIBLE TO CONTACT EXISTING UTILITY COMPANIES AND COORDINATE WITH SUCH PRIOR TO BEGINNING CONSTRUCTION. EXISTING UTILITIES SHOWN ON THE PLANS ARE SHOWN AT THEIR APPROXIMATE LOCATION AND TO THE BEST KNOWLEDGE OF THE ENGINEER. CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT ALL EXISTING UTILITIES HAVE BEEN PROPERLY LOCATED BY THEIR RESPECTIVE OWNERS.

ONE CALL UTILITY LOCATE 1-800-424-5555

CONTRACTOR SHALL MAKE ARRANGEMENTS WITH UTILITY COMPANY TO PROTECT, SUPPORT AND/OR RELOCATE ALL EXISTING UTILITIES, UTILITY BOXES OR UTILITY POLES AS NECESSARY DURING CONSTRUCTION.

ROAD SECTION REPLACEMENT:
THE CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE ALL EXISTING GRAVEL AND PAVED STREETS OR SURFACES TO THEIR PRE CONSTRUCTION CONDITION. THE CONTRACTOR SHALL REPLACE EXISTING GRAVEL AND PAVED SURFACES WITH LIKE KIND MATERIAL OF EQUAL DEPTH.

AS-CONSTRUCTED OCTOBER, 2004

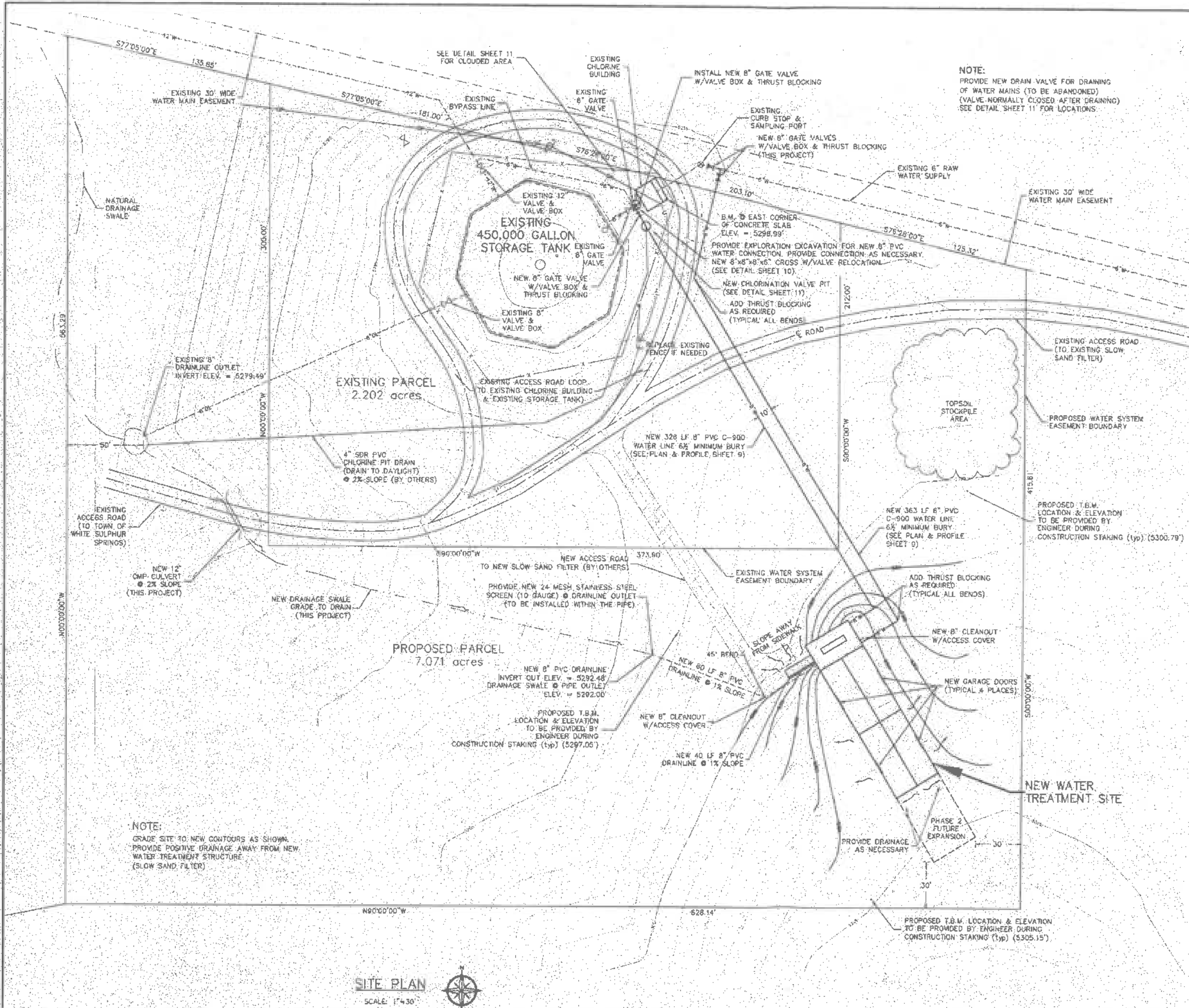
MONTANA MARK A. FASTING No. 12071-PE PROFESSIONAL ENGINEER

DRAWN BY: KWO
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: JUNE 6, 2002

GASTON ENGINEERING
SURVEYING & SOILS TESTING
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING
P.O. BOX 301, BOZEMAN, MONTANA 59771

SLOW SAND FILTER
VICINITY AND AREA MAPS
WHITE SULPHUR SPRINGS, MONTANA

DRAWING No: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET 1 of 11



NOTE:
PROVIDE NEW DRAIN VALVE FOR DRAINING OF WATER MAINS (TO BE ABANDONED) (VALVE NORMALLY CLOSED AFTER DRAINING) SEE DETAIL SHEET 11 FOR LOCATIONS.

CONTRACTOR/SUPPLIER NOTE

ALL RIMS, INVERTS, PIPE LENGTHS AND PIPE GRADES ARE CALCULATED TO THE CENTER OF THE CONNECTION. CONTRACTOR AND SUPPLIER SHALL MAKE THE NECESSARY ADJUSTMENTS.

LEGEND

- CONTOUR LINES
- PROPERTY LINES
- EASEMENTS
- CENTER LINE OF RIGHT OF WAY
- EXISTING WATER LINE
- EXISTING WATER VALVE
- EXISTING YARD HYDRANT ASSEMBLY
- EXISTING DRAIN LINE
- EXISTING CULVERT
- EXISTING OVERHEAD UTILITY LINE
- EXISTING UNDERGROUND TELEPHONE LINE
- PROPOSED WATER LINE
- PROPOSED WATER VALVE
- PROPOSED FIRE HYDRANT ASSEMBLY
- PROPOSED WATER SERVICE
- PROPOSED ALIGNMENT W/STATIONING
- PROPOSED EDGE OF NEW ASPHALT ROAD
- PROPOSED CULVERT
- FENCE
- SWALE
- UTILITY POLE
- PHONE PEDESTAL
- DRAINAGE FLOW DIRECTION
- PROPOSED SIDEWALK
- T.B.M. TEMPORARY BENCH MARK

TOP OF FLOOR ELEV. = 5297.00'
TOP OF SAND FILTER WALL ELEV. = 5307.00'
START OF FILL MATERIAL BACKSLOPE @ 5305.00'

NOTE:
GRADE SITE TO NEW CONTOURS AS SHOWN. PROVIDE POSITIVE DRAINAGE AWAY FROM NEW WATER TREATMENT STRUCTURE (SLOW SAND FILTER)

SITE PLAN
SCALE: 1"=30'

AS-CONSTRUCTED OCTOBER, 2004

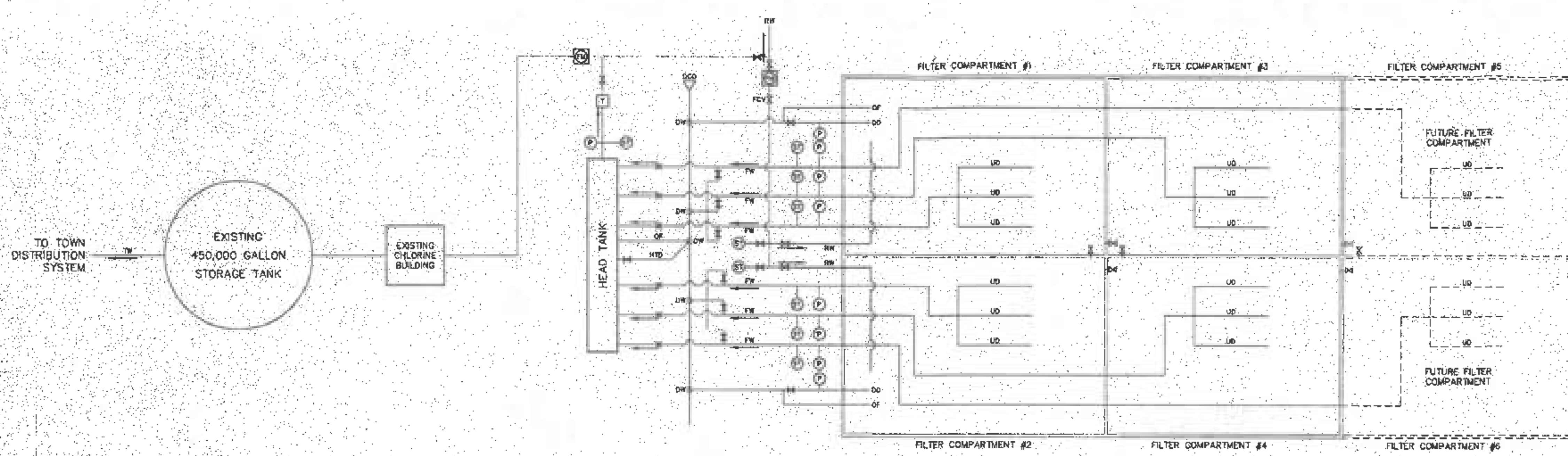
MONTANA MARK A. FASTING No. 12071 PE

DRAWN BY: KWO
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: AUG. 20, 2002

GASTON ENGINEERING SURVEYING & SOILS TESTING
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING
P.O. BOX 691, BOZEMAN, MONTANA 59771
(406) 586-0588 FAX: (406) 586-0589

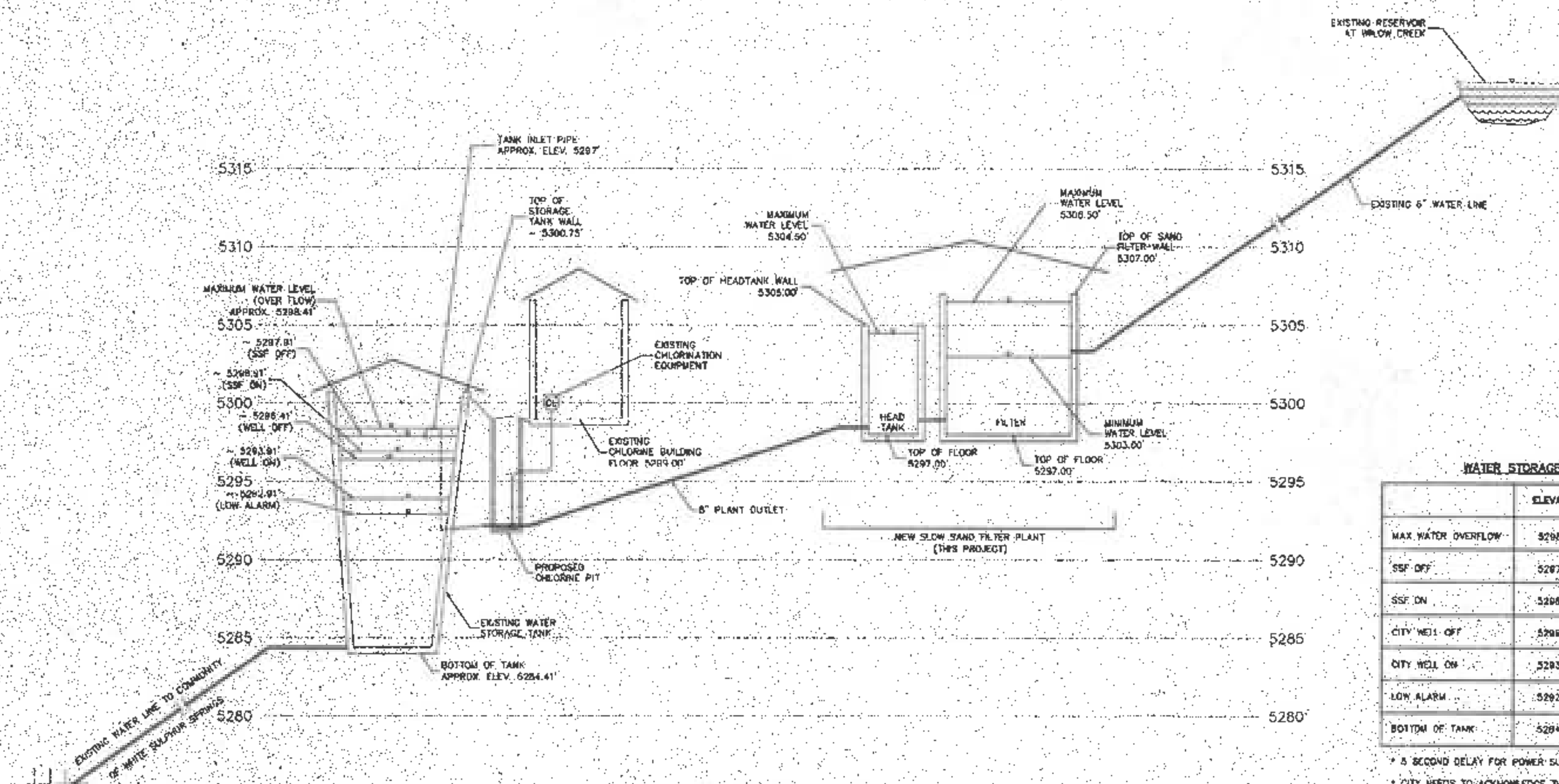
SLOW SAND FILTER
SITE PLAN
WHITE SULPHUR SPRINGS, MONTANA

DRAWING No: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET: 2 of 11



PROCESS DIAGRAM

SCALE: NTS



HYDRAULIC PROFILE

SCALE: NTS

WATER STORAGE TANK SETTINGS

	ELEVATION	WATER DEPTH	WATER LEVEL DIFFERENCE
MAX WATER OVERFLOW	5298.41'	14.0'	0.5'
SSF OFF	5297.91'	13.5'	1.0'
SSF ON	5296.91'	12.5'	0.5'
CITY WELL OFF	5296.41'	12.0'	2.5'
CITY WELL ON	5293.91'	9.5'	1.0'
LOW ALARM	5292.91'	8.5'	8.5'
BOTTOM OF TANK	5284.41'	0'	

* 5 SECOND DELAY FOR POWER SURGE HAS BEEN APPLIED
* CITY NEEDS TO ACKNOWLEDGE THE ALARM

LEGEND

BP	BY PASS
DD	DRAW DOWN
DCO	DRAIN CLEANOUT
DW	DRAIN TO WASTE
FCV	FLOW CONTROL VALVE
FW	FILTERED WATER
HTD	HEAD TANK DRAIN
OF	OVER FLOW
RW	RAW WATER
TW	TREATED WATER
UD	UNDER DRAIN
X	BUTTERFLY VALVE (THROTTLING)
	GATE VALVE (NORMALLY CLOSED)
	GATE VALVE (NORMALLY OPEN)
FM	FLOW METER
SV	SOLENOID VALVE (POWER OFF CLOSED)
T	TURBIDITY METER
P	PIEZOMETER
ST	SAMPLE TAP
CH	CHEMICAL PUMP

AS-CONSTRUCTED OCTOBER, 2004

MARK A. FASTING No. 12071-PE

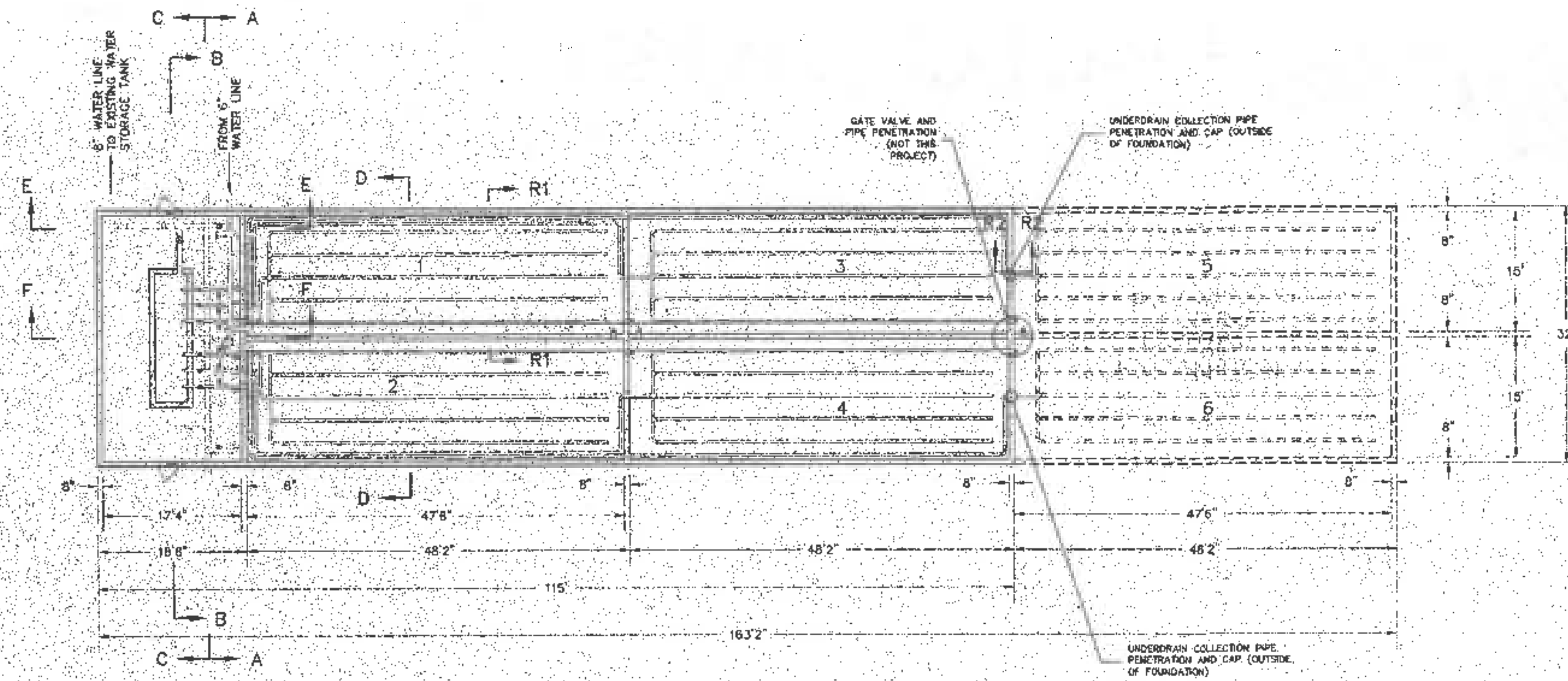
DRAWN BY: KNO
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: AUG 20, 2002

GASTON ENGINEERING
SURVEYING & SOILS TESTING
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING
P.O. BOX 861, BOZEMAN, MONTANA 59771
(406) 586-0590 FAX (406) 586-0589

SLOW SAND FILTER

PROCESS DIAGRAM AND HYDRAULIC PROFILE
WHITE SULPHUR SPRINGS, MONTANA

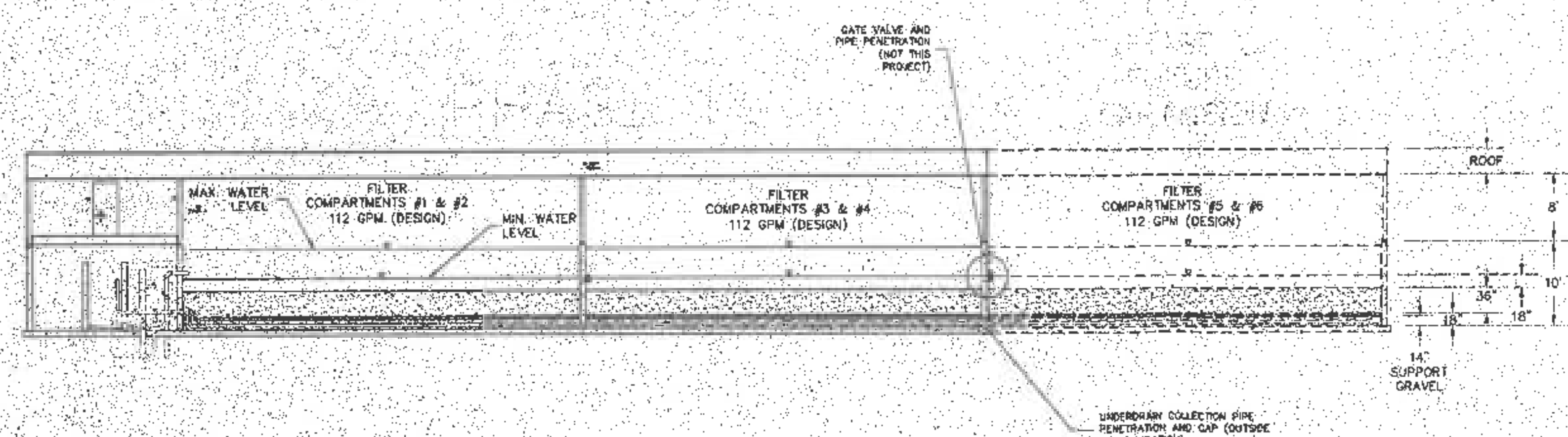
DRAWING No: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET: 3 of 11



PLAN VIEW

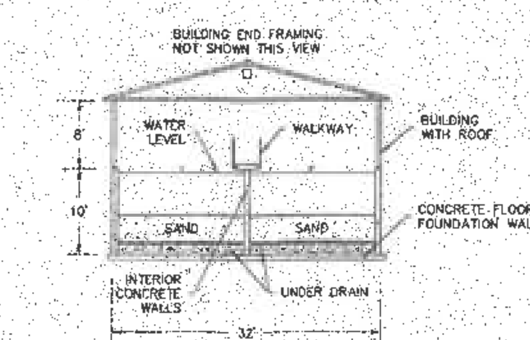
SCALE: 1"=10'

NOTE:
FOR SECTION VIEWS SEE SHEETS 6 & 7 OF 9



SIDE VIEW

SCALE: 1"=10'



TYPICAL SECTION
END VIEW

SCALE: 1"=10'

AS-CONSTRUCTED OCTOBER, 2004

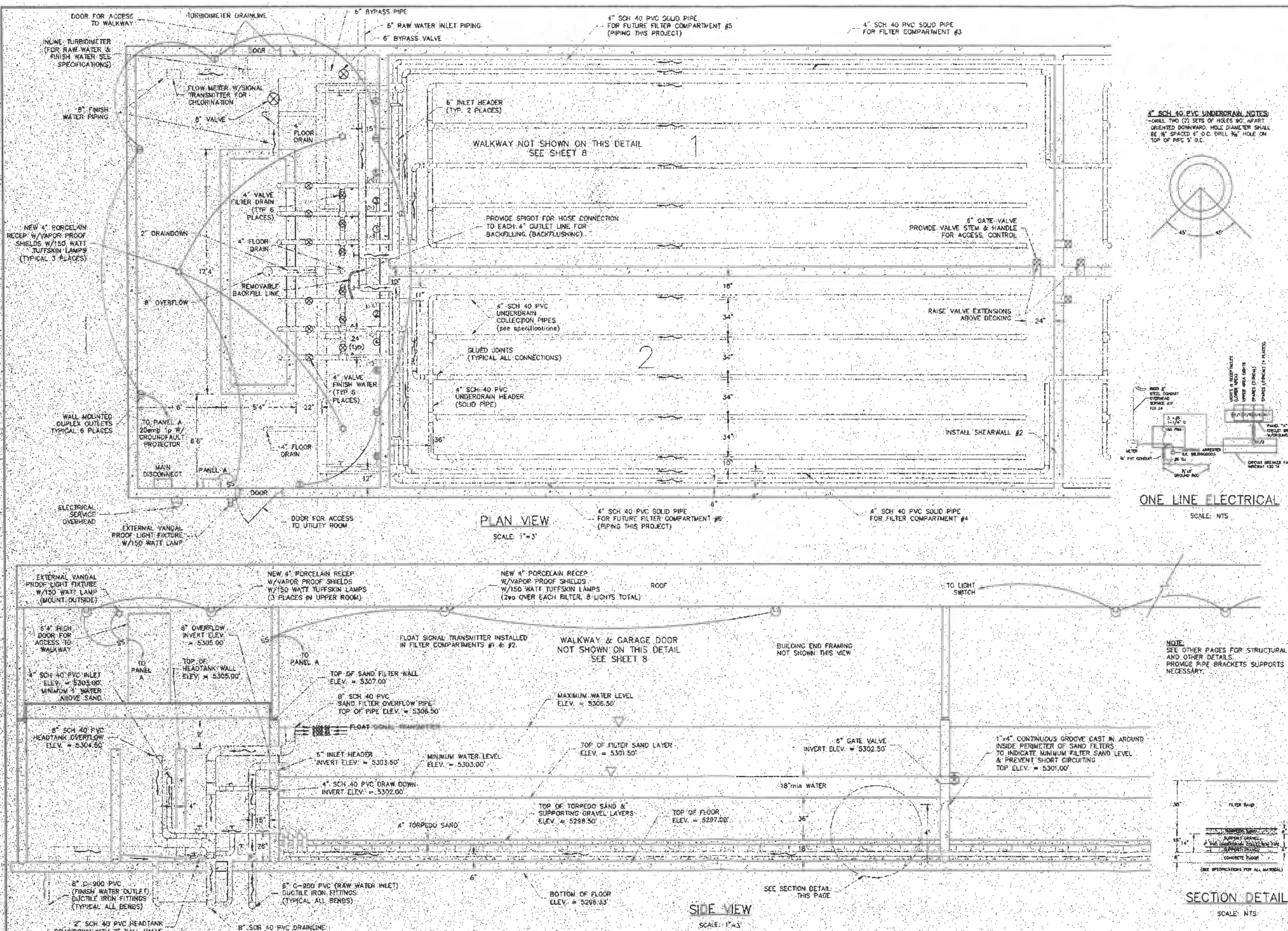
MARK A. FASTING No. 12071 PE

DRAWN BY: MRO
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: JUNE 6, 2002

GASTON ENGINEERING
SURVEYING & SOILS TESTING

SLOW SAND FILTER
FILTER PLAN & PROFILE / FILTER DIMENSIONS
WHITE SULPHUR SPRINGS, MONTANA

PROJECT No. 00-504
SHEET 4 of 11



AS-CONSTRUCTED OCTOBER 2004

SLOW SAND FILTER

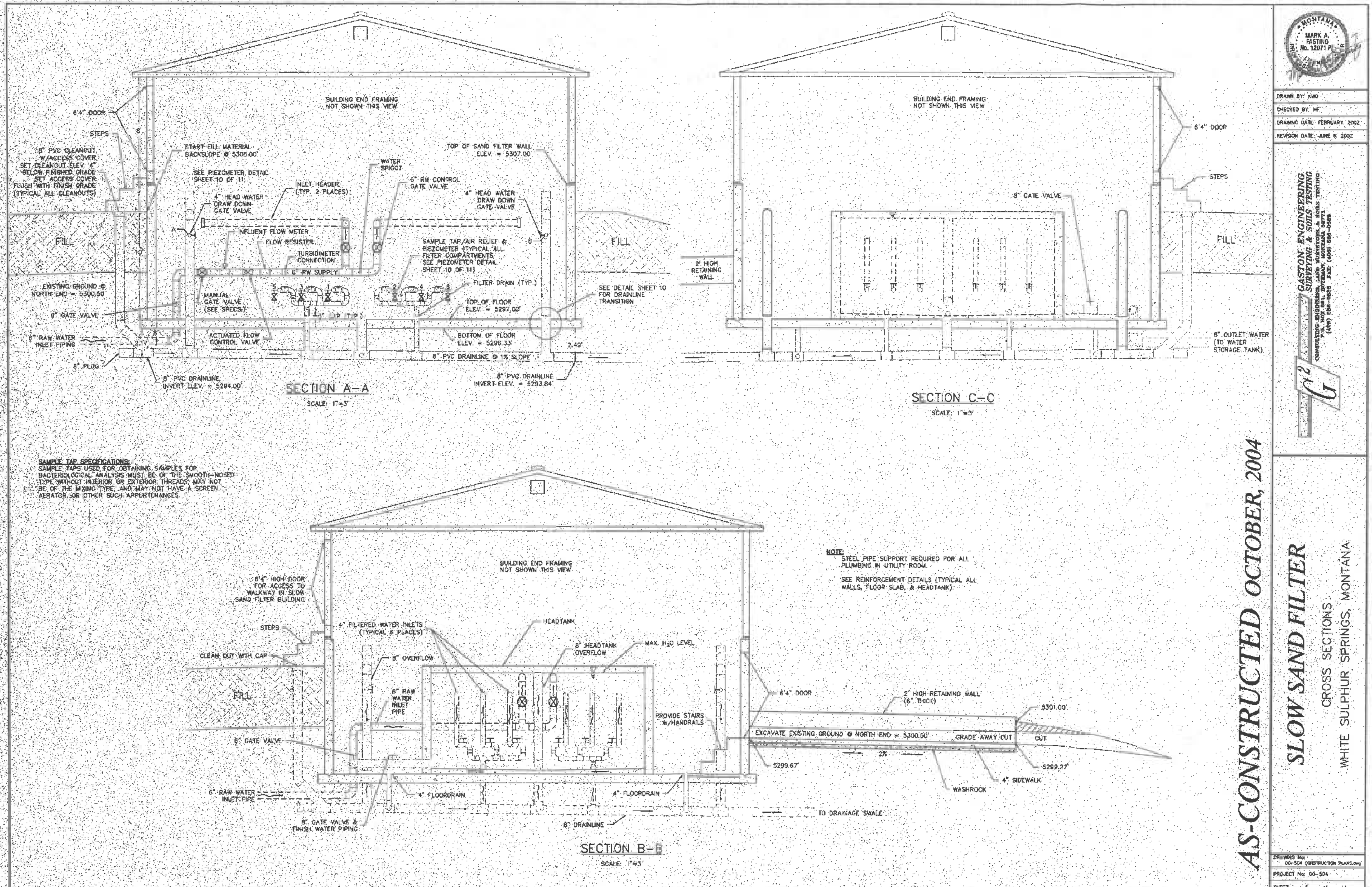
FILTER PLAN & PROFILE DETAILS & ELECTRICAL
WHITE SULPHUR SPRINGS, MONTANA

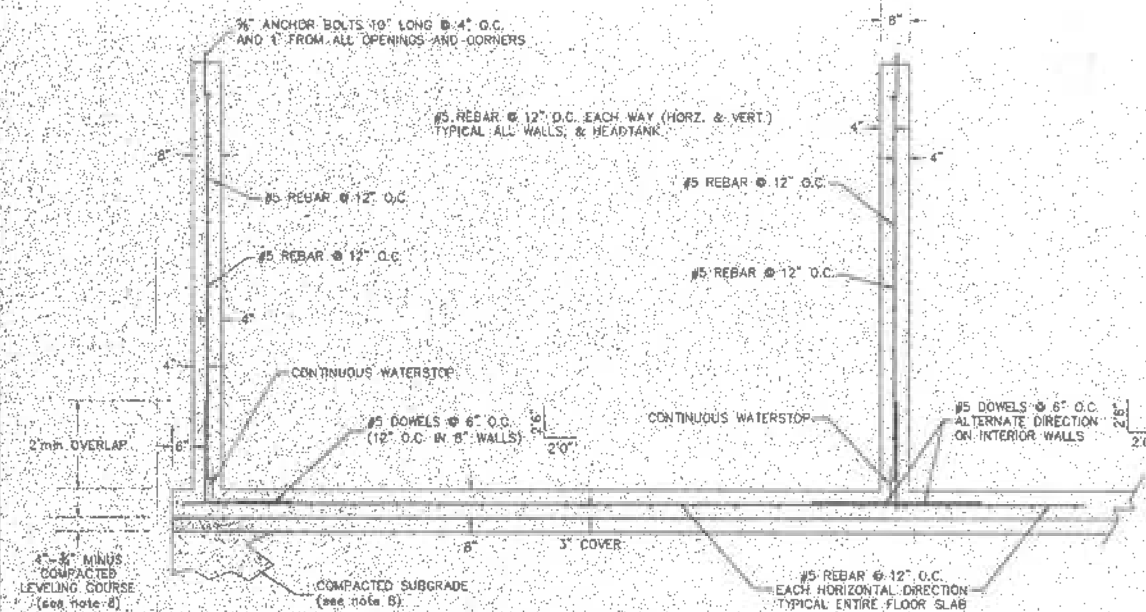
GASTON ENGINEERING
SURVEYING & SOILS TESTING

MONTANA MARK A. FASTING No. 12071 PE

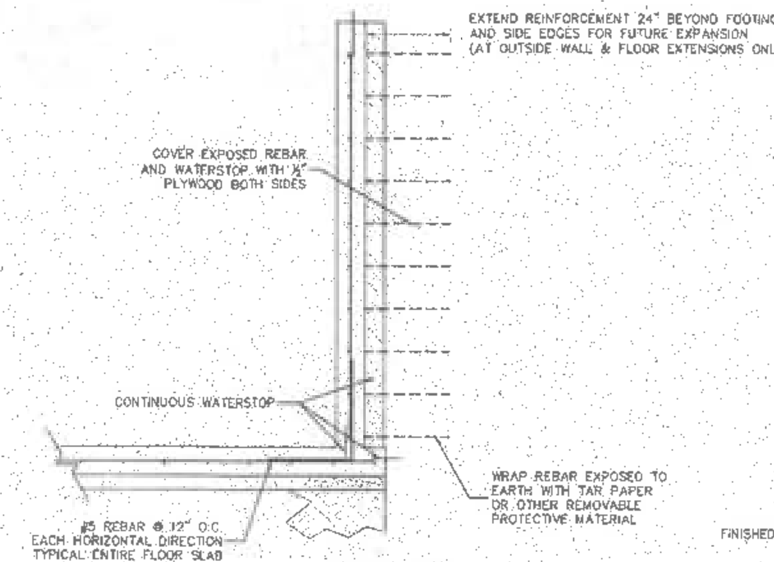
DRAWN BY: KWO
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: JULY 11, 2002

DRAWING No: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET: 5 of 11

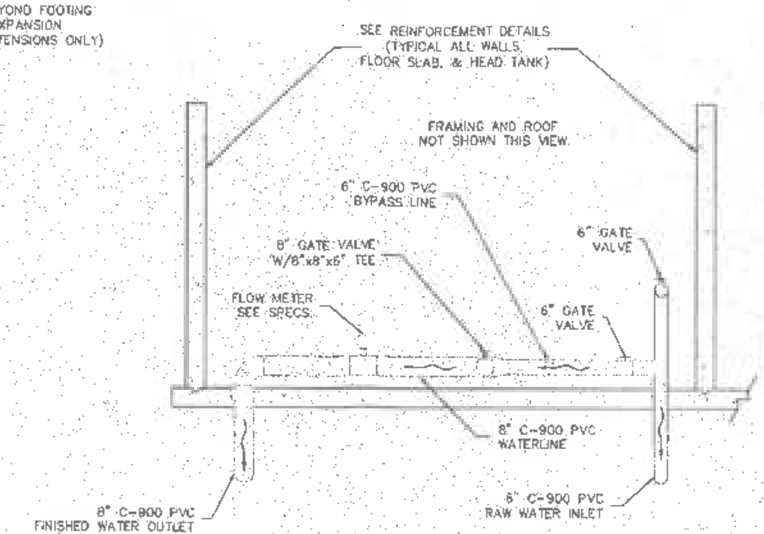

SECTION A-A
SCALE: 1"=3'
BUILDING END FRAMING NOT SHOWN THIS VIEW
6'4" DOOR
STEPS
8" PVC CLEANOUT, W/ACCESS COVER. SET CLEANOUT ELEV. 4" BELOW FINISHED GRADE. SET ACCESS COVER FLUSH WITH FINISH GRADE (TYPICAL ALL CLEANOUTS)
START FILL MATERIAL BACKSLOPE @ 5305.00'
SEE PIEZOMETER DETAIL SHEET 10 OF 11
4" HEAD WATER DRAW DOWN GATE VALVE
INLET HEADER (TYP. 2 PLACES)
WATER SPIGOT
6" RW CONTROL GATE VALVE
TOP OF SAND FILTER WALL ELEV. = 5307.00'
INFLUENT FLOW METER
FLOW RESISTER
TURBIDIMETER CONNECTION
6" RW SUPPLY
SAMPLE TAP/AIR RELIEF & PIEZOMETER (TYPICAL ALL FILTER COMPARTMENTS. SEE PIEZOMETER DETAIL SHEET 10 OF 11)
FILTER DRAIN (TYP.)
EXISTING GROUND @ NORTH END = 5300.50'
MANUAL GATE VALVE (SEE SPECS)
TOP OF FLOOR ELEV. = 5297.00'
SEE DETAIL SHEET 10 FOR DRAINLINE TRANSITION
6" GATE VALVE
6" RAW WATER INLET PIPING
ACTUATED FLOW CONTROL VALVE
BOTTOM OF FLOOR ELEV. = 5296.33'
8" PVC DRAINLINE @ 1% SLOPE
8" PLUG
8" PVC DRAINLINE INVERT ELEV. = 5294.00'
8" PVC DRAINLINE INVERT ELEV. = 5293.84'
FILL
SECTION C-C
SCALE: 1"=3'
BUILDING END FRAMING NOT SHOWN THIS VIEW
6'4" DOOR
STEPS
8" GATE VALVE
2' HIGH RETAINING WALL
6" OUTLET WATER (TO WATER STORAGE TANK)
FILL
SAMPLE TAP SPECIFICATIONS:
SAMPLE TAPS USED FOR OBTAINING SAMPLES FOR BACTERIOLOGICAL ANALYSIS MUST BE OF THE SMOOTH-NOSED TYPE WITHOUT INTERIOR OR EXTERIOR THREADS; MAY NOT BE OF THE MIXING TYPE, AND MAY NOT HAVE A SCREEN, AERATOR, OR OTHER SUCH APPURTENANCES.
SECTION B-B
SCALE: 1"=3'
BUILDING END FRAMING NOT SHOWN THIS VIEW
6'4" HIGH DOOR FOR ACCESS TO WALKWAY IN SLOW SAND FILTER BUILDING
4" FILTERED WATER INLETS (TYPICAL 6 PLACES)
HEADTANK
8" HEADTANK OVERFLOW
MAX. H2O LEVEL
STEPS
CLEAN OUT WITH CAP
8" OVERFLOW
6" RAW WATER INLET PIPE
FILL
6'4" DOOR
2' HIGH RETAINING WALL (6" THICK)
5301.00'
PROVIDE STAIRS W/HANDRAILS
EXCAVATE EXISTING GROUND @ NORTH END = 5300.50'
GRADE AWAY
CUT
2%
5299.67'
5299.27'
WASHROCK
4" SIDEWALK
6" GATE VALVE
6" RAW WATER INLET PIPE
4" FLOORDRAIN
4" FLOORDRAIN
TO DRAINAGE SWALE
8" DRAINLINE
8" GATE VALVE & FINISH WATER PIPING
NOTE:
STEEL PIPE SUPPORT REQUIRED FOR ALL PLUMBING IN UTILITY ROOM.
SEE REINFORCEMENT DETAILS (TYPICAL ALL WALLS, FLOOR SLAB, & HEADTANK).
AS-CONSTRUCTED OCTOBER, 2004
MONTANA
MARK A. FASTING
No. 12071 PE
DRAWN BY: KWO
CHECKED BY: MF
DRAWING DATE: FEBRUARY 2002
REVISION DATE: JUNE 6, 2002
GASTON ENGINEERING SURVEYING & SOILS TESTING
SLOW SAND FILTER
CROSS SECTIONS
WHITE SULPHUR SPRINGS, MONTANA
PROJECT No: 00-504
SHEET 6 of 11



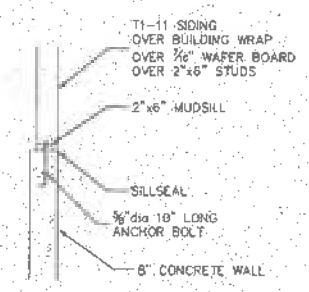
SECTION R1–R1
REINFORCEMENT DETAIL
SCALE: 1"=2'



SECTION R2–R2
REINFORCEMENT DETAIL
SCALE: 1"=2'



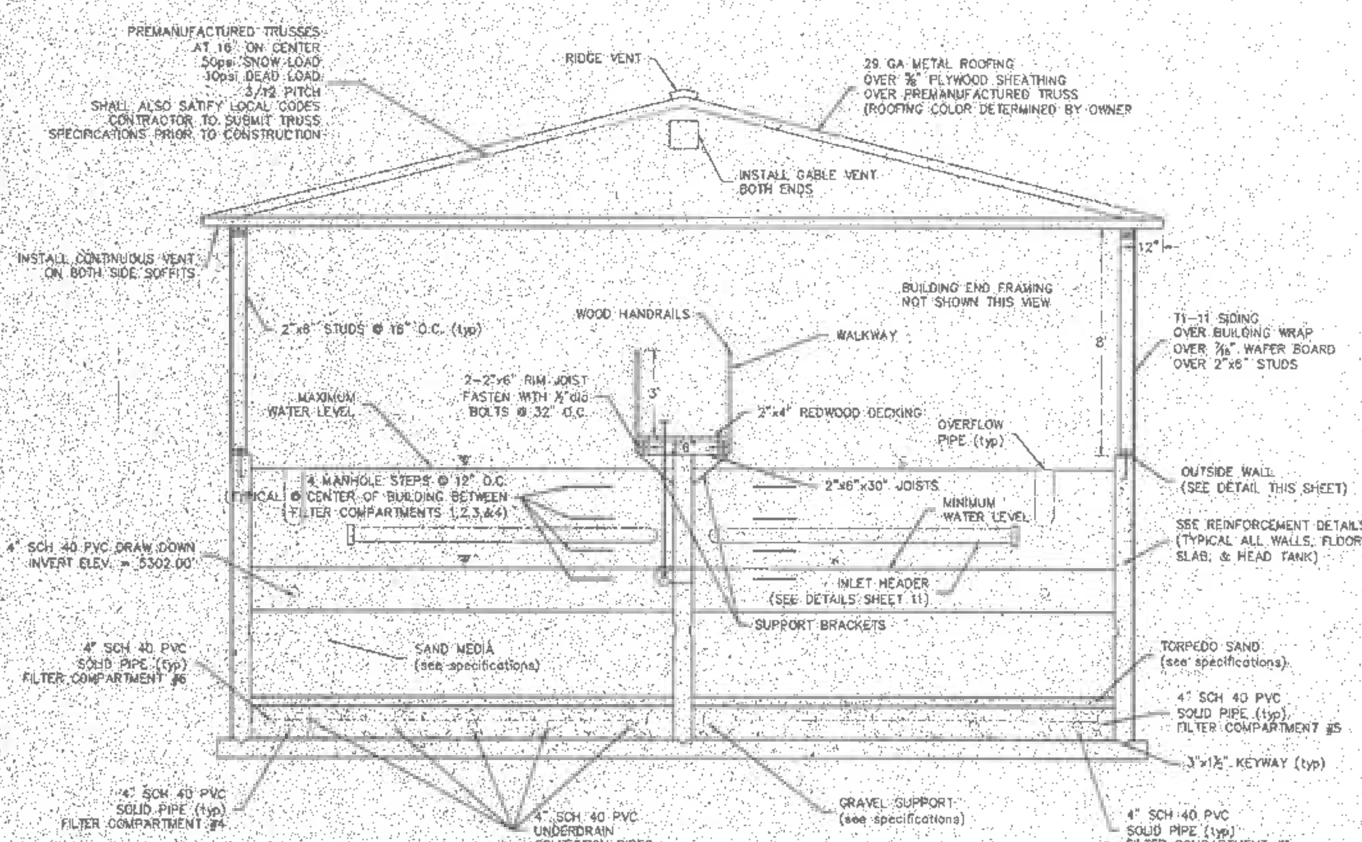
SECTION E–E
SCALE: 1"=3'



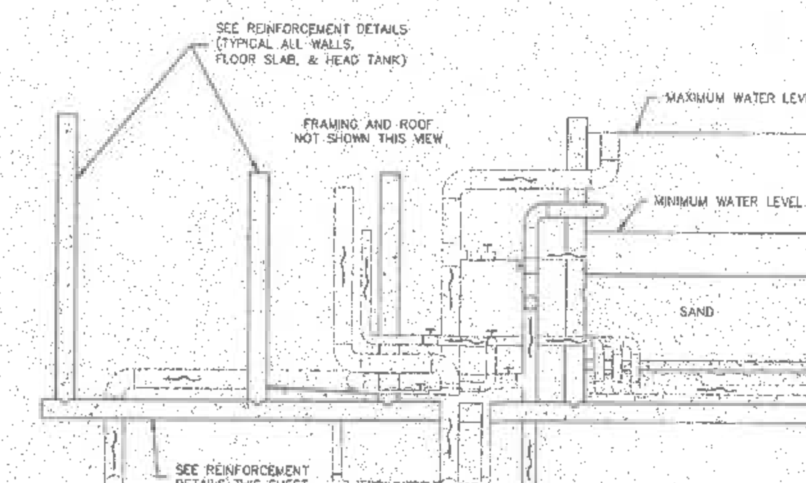
OUTSIDE WALL DETAIL
SCALE: NTS

GENERAL NOTES:

1. CONCRETE FOR THE FLOOR AND FOOTINGS SHALL BE 4000 PSI WITH 4% ENTRAINED AIR. SLUMP SHALL NOT EXCEED 6". CONCRETE SHALL BE CONSOLIDATED BY RODDING OR VIBRATING.
2. REINFORCING STEEL SHALL BE GRADE 60 MEETING ASTM A615 SPECIFICATIONS.
3. REINFORCEMENT OVERLAP SHALL BE AT LEAST 24" FOR #5 BARS OR SMALLER.
4. ALL SNAP TIE HOLES SHALL BE PLUGGED WITH NON-SHRINK GROUT AND FINISHED SMOOTH.
5. ALL WORK SHALL BE GUARANTEED FOR A PERIOD OF NO LESS THAN ONE YEAR FROM THE DATE OF ACCEPTANCE OF INSTALLATION.
6. ALL CONSTRUCTION SHALL CONFORM TO MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS.
7. ALL CONCRETE CURING COMPOUNDS USED IN CONSTRUCTION MUST BE LISTED ON THE E.P.A. APPROVED LIST FOR USE WITH POTABLE WATER VESSELS.
8. LEVELING COURSE AND SUBGRADE TO BE MECHANICALLY COMPACTED TO 95% MODIFIED PROCTOR MAXIMUM DENSITY.
9. NO TREATED LUMBER SHALL BE USED IN THE FILTER AREA OF THIS STRUCTURE. (USE REDWOOD OR OTHER MATERIAL APPROVED BY ENGINEER)



SECTION D–D
SCALE: 1"=3'



SECTION F–F
SCALE: 1"=3'

AS-CONSTRUCTED OCTOBER, 2004

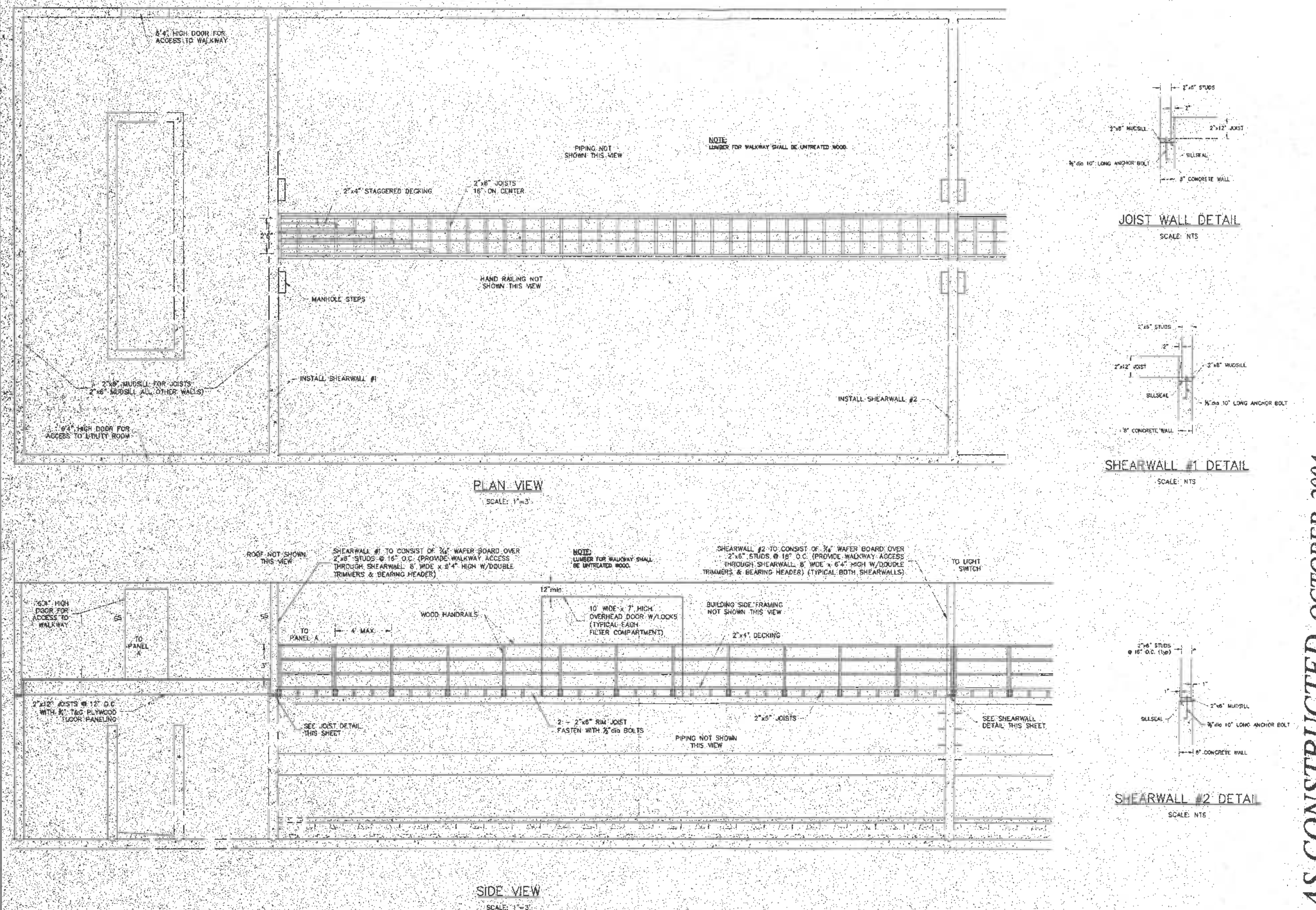
MONTANA MARK A. FASTING No. 12071 PE PROFESSIONAL ENGINEER

DRAWN BY:	KWO
CHECKED BY:	MF
DRAWING DATE:	FEBRUARY, 2002
REVISION DATE:	JUNE 6, 2002

GASTON ENGINEERING
SURVEYING & SOILS TESTING
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING
P.O. BOX 861, BOZEMAN, MONTANA 59771
(406) 586-0588 FAX (406) 586-0589

SLOW SAND FILTER
REINFORCEMENT DETAILS / STRUCTURE PLAN
WHITE SULPHUR SPRINGS, MONTANA

DRAWING No:	00-504 CONSTRUCTION PLANS.dwg
PROJECT No:	00-504
SHEET:	7 of 11



AS-CONSTRUCTED OCTOBER, 2004

MARK A. FASTING No. 12071 PE MONTANA

DRAWN BY: KMJ
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: JUNE 5, 2002

GASTON ENGINEERING SURVEYING & SOILS TESTING

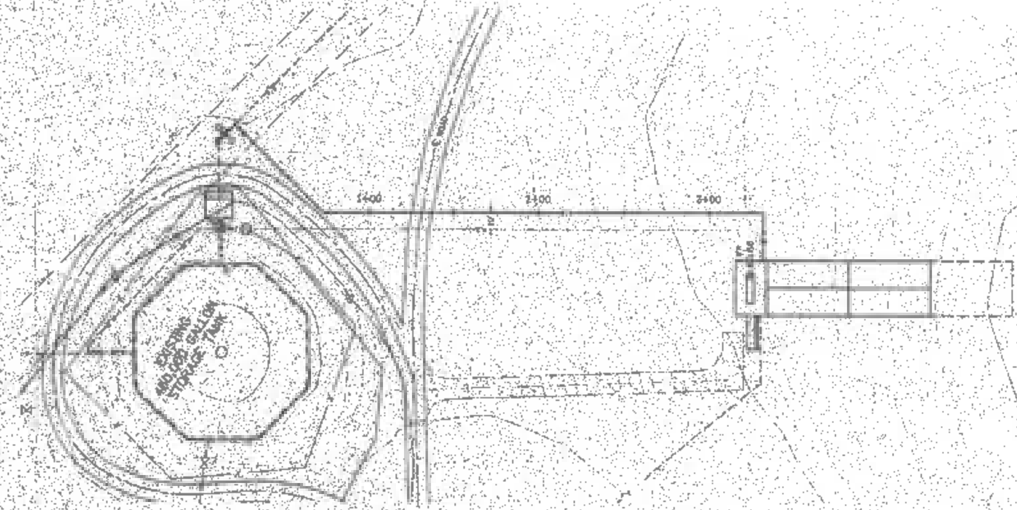
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING

SLOW SAND FILTER

WALKWAY DETAILS

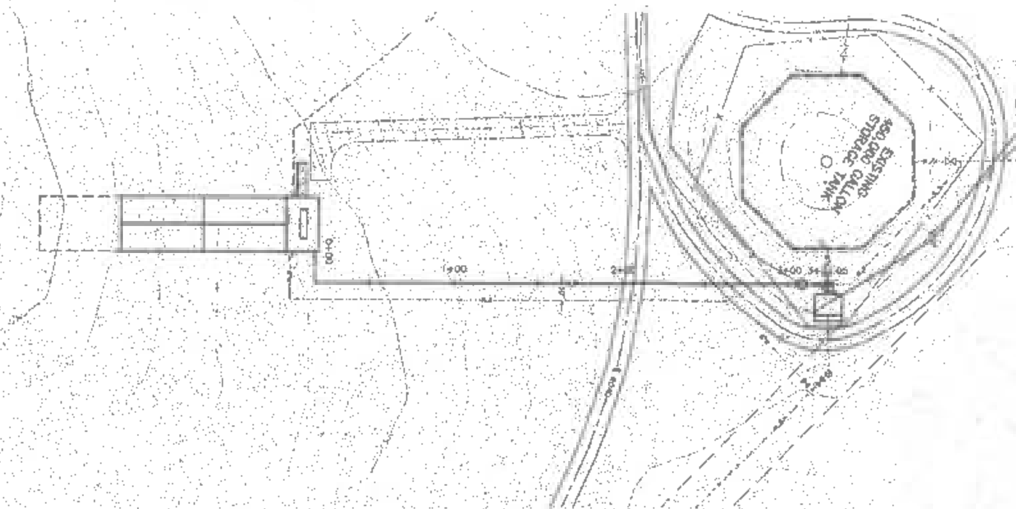
WHITE SULPHUR SPRINGS, MONTANA

DRAWING No: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET: 8 of 11



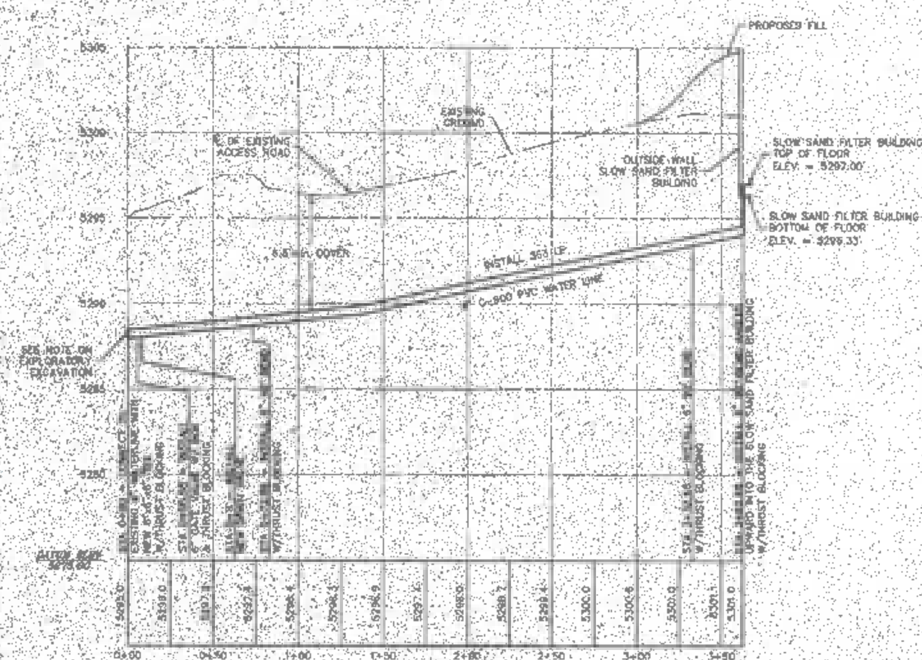
6" WATERLINE PLAN VIEW

SCALE: 1"=50'



8" WATERLINE PLAN VIEW

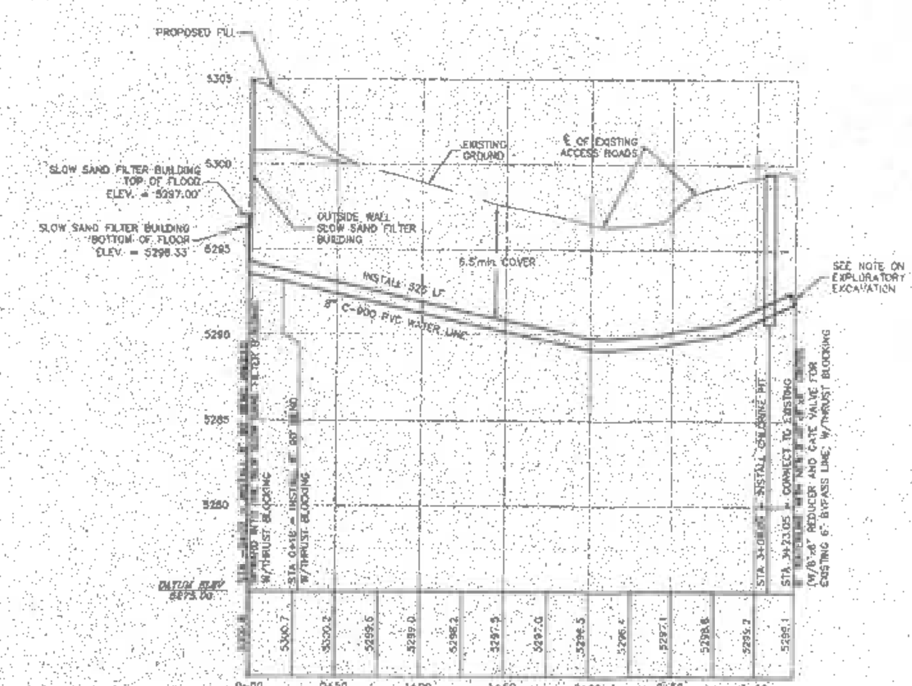
SCALE: 1"=50'



6" WATERLINE PROFILE VIEW

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=5'

NOTE:
EXISTING WATER MAIN AS-BUILTS BY CASHE & ASSOCIATES, INC INDICATES 6.5' BURY. PRIOR TO ANY WATER LINE INSTALLATION CONTRACTOR SHALL PROVIDE EXPLORATORY EXCAVATION TO VERIFY EXISTING WATER MAIN DEPTH AT CONNECTION POINTS.



8" WATERLINE PROFILE VIEW

HORZ. SCALE: 1"=50'
VERT. SCALE: 1"=5'

AS-CONSTRUCTED OCTOBER, 2004

MARK A. FASTING No. 12071 PE

DRAWN BY: KWO
CHECKED BY: MF
DRAWING DATE: MAY, 2002
REVISION DATE: JULY 19, 2002

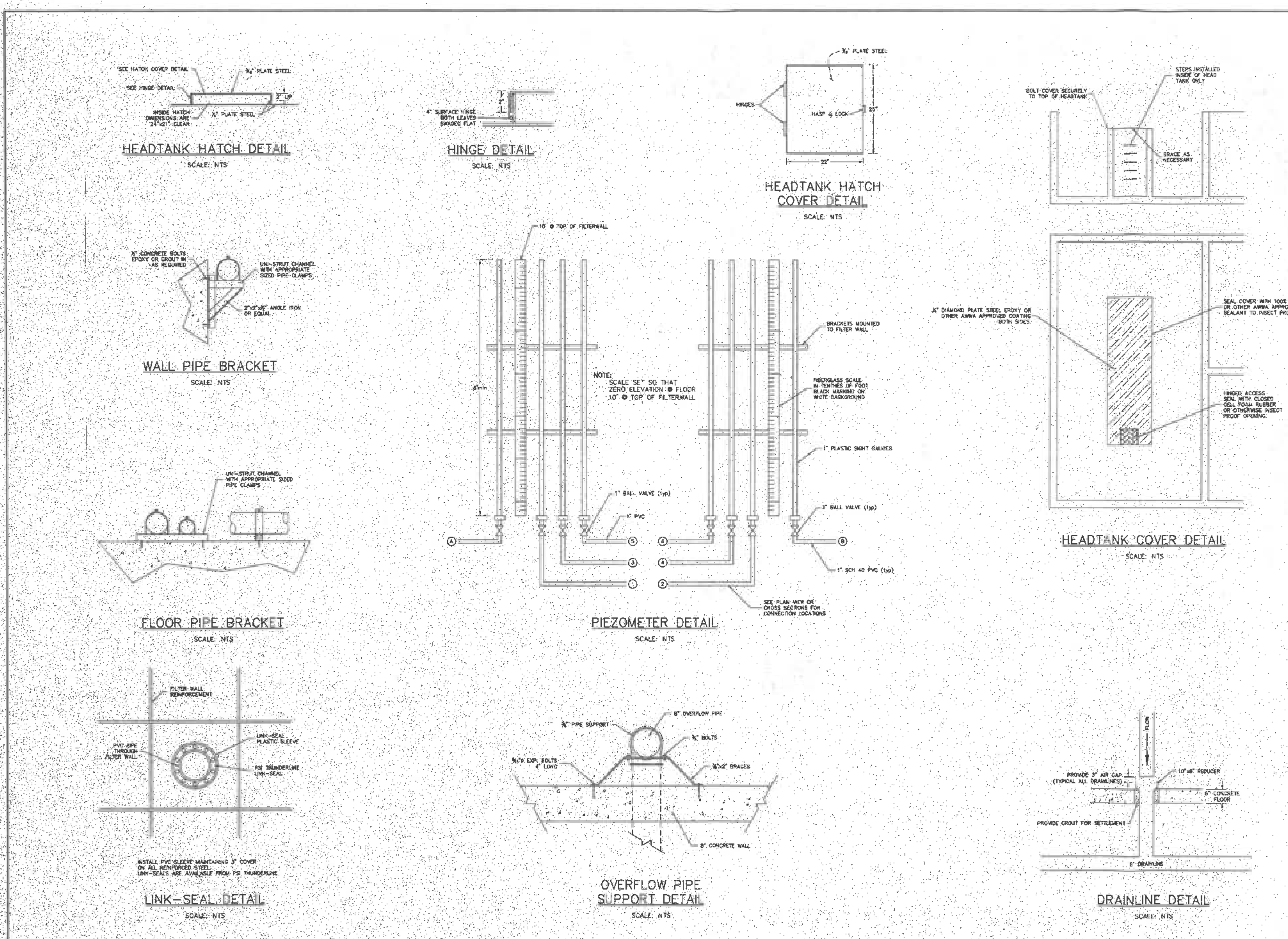
GASTON ENGINEERING
SURVEYING & SOILS TESTING
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING
P.O. BOX 861, BOZEMAN, MONTANA 59771
(406) 586-0588 FAX (406) 586-0589

SLOW SAND FILTER

6" AND 8" WATERLINE PROFILES

WHITE SULPHUR SPRINGS, MONTANA

DRAWING No.: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET: 9 of 11



AS-CONSTRUCTED OCTOBER, 2004

DRAWN BY: KWD
CHECKED BY: MJF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: JUNE 6, 2002

GASTON ENGINEERING SURVEYING & SOILS TESTING

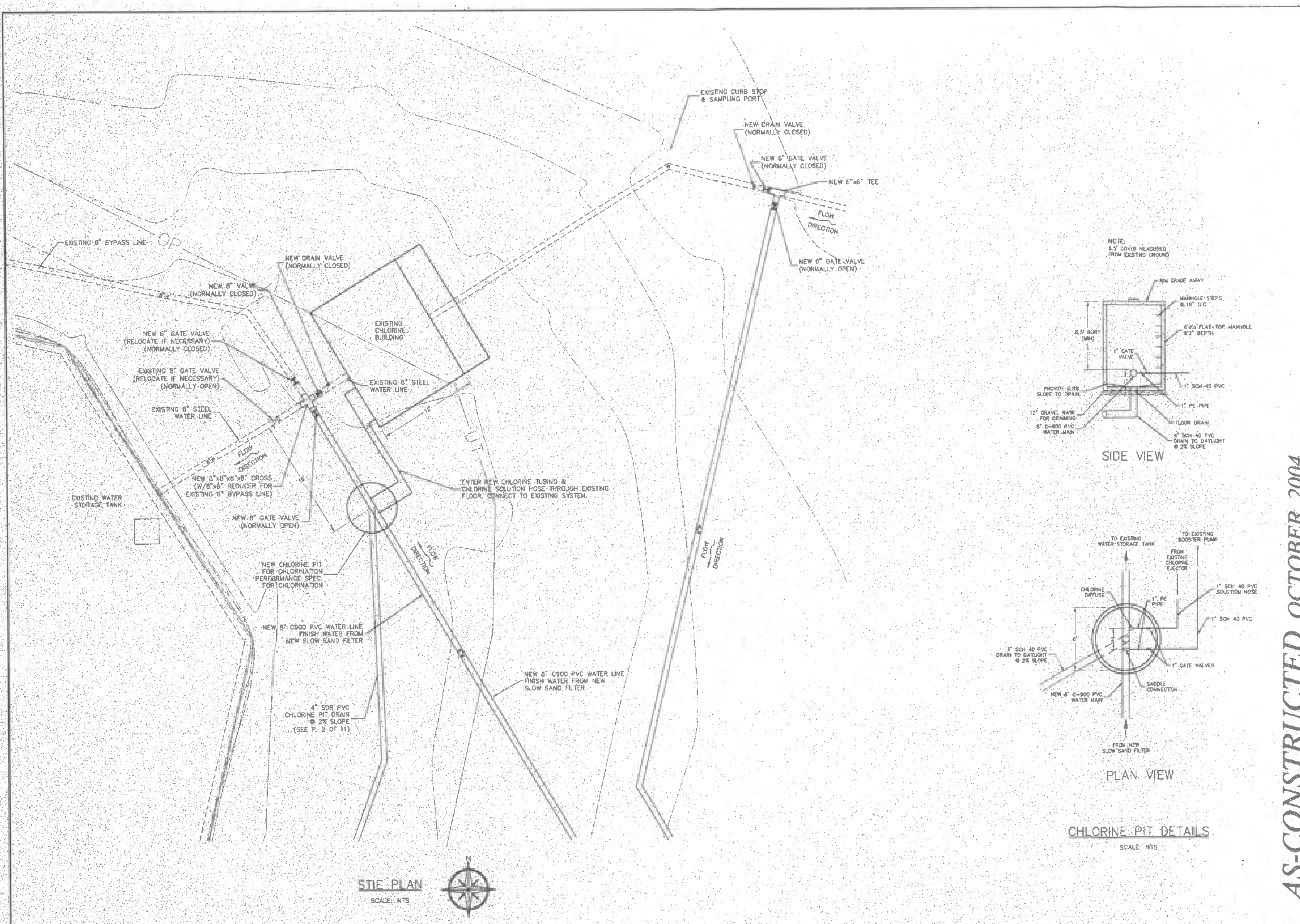
MARK A. FASTING No. 1207 PE

SLOW SAND FILTER

DETAILS

WHITE SULPHUR SPRINGS, MONTANA

PROJECT No: 00-504
SHEET: 10 of 11



MONTANA MARK A. FASTING No. 12071 PE LICENSED PROFESSIONAL ENGINEER

DRAWN BY: KWO
CHECKED BY: MF
DRAWING DATE: FEBRUARY, 2002
REVISION DATE: AUG. 20, 2002

GASTON ENGINEERING SURVEYING & SOILS TESTING
CONSULTING ENGINEERS, LAND SURVEYORS & SOILS TESTING
P.O. BOX 861, BOZEMAN, MONTANA 59771
(406) 586-0588 FAX (406) 586-0589

AS-CONSTRUCTED OCTOBER, 2004

SLOW SAND FILTER

DETAILS

WHITE SULPHUR SPRINGS, MONTANA

DRAWING No: 00-504 CONSTRUCTION PLANS.dwg
PROJECT No: 00-504
SHEET: 11 of 11

Appendix S

DEQ Surface Water Treatment Rule Reports

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form by 10th of Following Month to:

SWTR Manager, Public Water Supply PO BOX 200901 Helena, MT 59620-0901

Month: March Year: 2020 PWSID# MT0000360

System: White Sulphur Springs Water Source: **Surface Water**

Prepared by: Clyde Vinton Date: 4/6/2020

Spreadsheet to determine disinfection inactivation ratio based upon the formula:
CT required = 0.3 x pH^2.69 x c^0.15 x (log reduction) x 0.933^(temp-5)

Total Log Reduction Required =	3.0	Giardia
Log Reduction Allowed for Treatment =	2.0	Giardia
Log Reduction Required for Disinfection =	1.0	Giardia
Enter Baffling Factor =	0.2	
Minimum Volume (Gallons) =	276,000.00	

DAY	CL_2 (mg/L)	Peak (GPM)	Vol Min (gal)	Vol Eff (gal)	T10 (min)	CT calc	pH	Temp (Cels)	CT req'd	I.R.
1	0.23	115.0	276000.0	55200.0	480.0	110.4	6.89	3.4	48.3	2.3
2	0.22	115.0	276000.0	55200.0	480.0	105.6	6.87	3.2	48.3	2.2
3	0.21	114.0	276000.0	55200.0	484.2	101.7	6.93	3.3	48.8	2.1
4	0.23	114.0	276000.0	55200.0	484.2	111.4	6.91	3.3	49.1	2.3
5	0.22	114.0	276000.0	55200.0	484.2	106.5	6.86	3.2	48.1	2.2
6	0.22	114.0	276000.0	55200.0	484.2	106.5	6.84	3.3	47.4	2.2
7	0.22	115.0	276000.0	55200.0	480.0	105.6	6.87	3.3	48.0	2.2
8	0.21	114.0	276000.0	55200.0	484.2	101.7	6.82	3.3	46.7	2.2
9	0.21	114.0	276000.0	55200.0	484.2	101.7	6.86	3.0	48.5	2.1
10	0.19	114.0	276000.0	55200.0	484.2	92.0	6.86	3.3	46.8	2.0
11	0.20	115.0	276000.0	55200.0	480.0	96.0	6.82	3.0	47.4	2.0
12	0.19	114.0	276000.0	55200.0	484.2	92.0	6.91	3.0	48.7	1.9
13	0.19	115.0	276000.0	55200.0	480.0	91.2	6.98	3.0	50.0	1.8
14	0.17	114.0	276000.0	55200.0	484.2	82.3	6.97	2.7	50.0	1.6
15	0.16	115.0	276000.0	55200.0	480.0	76.8	6.98	2.9	49.1	1.6
16	0.16	114.0	276000.0	55200.0	484.2	77.5	7.04	3.0	49.9	1.6
17	0.12	115.0	276000.0	55200.0	480.0	57.6	7.01	2.8	47.9	1.2
18	0.23	115.0	276000.0	55200.0	480.0	110.4	7.02	2.9	52.6	2.1
19	0.29	115.0	276000.0	55200.0	480.0	139.2	6.88	2.9	51.6	2.7
20	0.48	115.0	276000.0	55200.0	480.0	230.4	6.85	2.9	55.0	4.2
21	0.56	115.0	276000.0	55200.0	480.0	268.8	6.87	2.9	56.8	4.7
22	0.62	115.0	276000.0	55200.0	480.0	297.6	7.01	3.0	60.4	4.9
23	0.62	115.0	276000.0	55200.0	480.0	297.6	6.59	3.1	50.8	5.9
24	0.65	115.0	276000.0	55200.0	480.0	312.0	6.47	3.0	49.0	6.4
25	0.64	115.0	276000.0	55200.0	480.0	307.2	6.46	3.1	48.4	6.3
26	0.45	115.0	276000.0	55200.0	480.0	216.0	6.46	3.4	45.0	4.8
27	0.43	115.0	276000.0	55200.0	480.0	206.4	6.51	3.3	45.9	4.5
28	0.33	115.0	276000.0	55200.0	480.0	158.4	6.42	3.1	43.1	3.7
29	0.29	115.0	276000.0	55200.0	480.0	139.2	6.57	3.2	44.7	3.1
30	0.27	115.0	276000.0	55200.0	480.0	129.6	6.85	3.2	49.4	2.6
31	0.26	115.0	276000.0	55200.0	480.0	124.8	6.88	3.4	49.1	2.5

Month: March Year: 2020

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form to Public Water Supply Section, PWSS Bureau, 1520 E. Sixth Avenue
P.O. Box 200901, Helena, MT 59620-0901 – by the 10th of the Following Month

Log Inactivation Ratio ≥ 1.0

Name of Water System: White Sulphur Springs

Prepared by: Clyde Vinion

PWSID: MT0000360

Filtration Type: Slow Sand

MCL= 1.0 MAX= 5.0 NTU

Check Type of NTU Measurements Used
☐ In-Line ☐ Bench-Top

Notes: DAY	Operating Time Hrs/Day	Raw Water GPD	Raw Water pH	Raw Water NTU	Coagulant (None) PPM	Polymer (None) PPM	Max. NTU Finish Water Ntu	Number of Turbidity: Turbidity Meas. 2 (B)	Meas. ≤ Specified Limit 3 (A)	Meas. > Max Limit Limit 4	Distribution: No. of Sites where Disinfectant Residual was: Measured. 5 (D)	Record Chlorine Residual Value (C) (mg/L)	Not detected No HPC 6	Disinfectant Concentration Meas. At POE During Peak Hourly Flow 7 (mg/L)	Peak Hourly Flow 8 (GPM)	From Data Entry Form Baffling Factor (s): Minimum Operating Volume 9a (gal)	Minimum Operating Volume 9b (gal)	Individual or Combined Values: Effective Volume 10 (gal)	Contact Time $T*T_{10}$ 11 (min)	CT calc = (CxT) 12	Finished Water pH 13	Finished Water Temp 14 (°C)	Individual or Combined I.R. 16
1	24.0			0.43			0.31	6			1	0.43		0.2	115	276000		55200	480.0	110.4	6.89	3.4	2.3
2	24.0			0.42			0.30	6			1	0.35		0.2	115	276000		55200	480.0	105.6	6.87	3.2	2.2
3	24.0			0.41			0.30	6			1	0.15		0.2	114	276000		55200	484.2	101.7	6.93	3.3	2.1
4	24.0			0.41			0.30	6			1	0.31		0.2	114	276000		55200	484.2	111.4	6.91	3.3	2.3
5	24.0			0.65			0.31	6			1	0.30		0.2	114	276000		55200	484.2	106.5	6.86	3.2	2.2
6	24.0			0.66			0.30	6			1	0.09		0.2	114	276000		55200	484.2	106.5	6.84	3.3	2.2
7	24.0			1.02			0.31	6			1	0.17		0.2	115	276000		55200	480.0	105.6	6.87	3.3	2.2
8	24.0			1.32			0.44	6			1	0.11		0.2	114	276000		55200	484.2	101.7	6.82	3.3	2.2
9	24.0			1.16			0.59	6			1	0.06		0.2	114	276000		55200	484.2	101.7	6.86	3.0	2.1
10	24.0			0.98			0.58	6			1	0.23		0.2	114	276000		55200	484.2	92.0	6.86	3.3	2.0
11	24.0			1.01			0.53	6			1	0.17		0.2	115	276000		55200	480.0	96.0	6.82	3.0	2.0
12	24.0			1.13			0.47	6			1	0.06		0.2	114	276000		55200	484.2	92.0	6.91	3.0	1.9
13	24.0			1.15			0.44	6			1	0.17		0.2	115	276000		55200	480.0	91.2	6.98	3.0	1.8
14	24.0			1.16			0.41	6			1	0.20		0.2	114	276000		55200	484.2	82.3	6.97	2.7	1.6
15	24.0			1.15			0.38	6			1	0.27		0.2	116	276000		55200	480.0	76.8	6.98	2.9	1.6
16	24.0			1.14			0.35	6			1	0.14		0.2	114	276000		55200	484.2	77.5	7.04	3.0	1.6
17	24.0			1.13			0.34	6			1	0.22		0.1	115	276000		55200	480.0	57.6	7.01	2.8	1.2
18	24.0			1.12			0.33	6			1	0.12		0.2	116	276000		55200	480.0	110.4	7.02	2.9	2.1
19	24.0			0.75			0.32	6			1	0.33		0.3	115	276000		55200	480.0	139.2	6.86	2.9	2.7
20	24.0			0.90			0.32	6			1	0.21		0.5	115	276000		55200	480.0	230.4	6.85	2.9	4.2
21	24.0			0.98			0.32	6			1	0.36		0.6	115	276000		55200	480.0	268.8	6.87	2.9	4.7
22	24.0			1.00			0.30	6			1	0.34		0.6	115	276000		55200	480.0	297.6	7.01	3.0	4.9
23	24.0			1.10			0.30	6			1	0.07		0.6	115	276000		55200	480.0	297.6	6.59	3.1	5.9
24	24.0			1.12			0.30	6			1	0.74		0.7	115	276000		55200	480.0	312.0	6.47	3.0	6.4
25	24.0			1.12			0.30	6			1	0.93		0.6	115	276000		55200	480.0	307.2	6.46	3.1	6.3
26	24.0			1.10			0.29	6			1	0.50		0.5	115	276000		55200	480.0	216.0	6.46	3.4	4.8
27	24.0			1.13			0.29	6			1	0.46		0.4	115	276000		55200	480.0	206.4	6.51	3.3	4.6
28	24.0			1.13			0.29	6			1	0.51		0.3	115	276000		55200	480.0	158.4	6.42	3.1	3.7
29	24.0			1.13			0.29	6			1	0.43		0.3	115	276000		55200	480.0	139.2	6.57	3.2	3.1
30	24.0			1.07			0.28	6			1	0.41		0.3	115	276000		55200	480.0	129.6	6.85	3.2	2.8
31	24.0			1.05			0.29	6			1	0.05		0.3	115	276000		55200	480.0	124.8	6.88	3.4	2.5
Total		MGD				Max NTU=	0.590	186			31	12										Lowest I.R. =	1.2

The % of turbidity measurements meeting the specified limits = B/A x 100 = ______ V = D/C x 100 = ______

Record the date and turbidity value for any measurements exceeding maximum allowed.
If none, enter "None"

		Turbidity, NTU

Date: ______
By Whom: ______

Checked against:
☐ Bench-Top Turbidimeter ☐ Primary Turbidity Standard

Date: ______
By Whom: ______
Last Calibration Date: ______

Form F-8 (10-2008)

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form by 10th of Following Month to:

SWTR Manager, Public Water Supply PO BOX 200901 Helena, MT 59620-0901

Month: April Year: 2020 PWSID# MT0000360

System: White Sulphur Springs Water Source: Surface Water

Prepared by: Clyde Vinton Date: 5/5/2020

Spreadsheet to determine disinfection inactivation ratio based upon the formula:
CT required = 0.3 x pH^2.69 x c^0.15 x (log reduction) x 0.933^(temp-5)

Total Log Reduction Required =	3.0	Giardia
Log Reduction Allowed for Treatment =	2.0	Giardia
Log Reduction Required for Disinfection =	1.0	Giardia
Enter Baffling Factor =	0.2	
Minimum Volume (Gallons) =	276,000.00	

DAY	CL_2 (mg/L)	Peak (GPM)	Vol Min (gal)	Vol Eff (gal)	T10 (min)	CT calc	pH	Temp (Cels)	CT req'd	I.R.
1	0.21	116.0	276000.0	55200.0	475.9	99.9	6.90	2.9	49.6	2.0
2	0.22	115.0	276000.0	55200.0	480.0	105.6	7.05	3.0	52.5	2.0
3	0.19	114.0	276000.0	55200.0	484.2	92.0	6.93	2.9	49.4	1.9
4	0.15	115.0	276000.0	55200.0	480.0	72.0	6.94	2.8	48.2	1.5
5	0.19	115.0	276000.0	55200.0	480.0	91.2	6.99	3.0	50.2	1.8
6	0.22	114.0	276000.0	55200.0	484.2	106.5	6.92	3.0	50.0	2.1
7	0.24	115.0	276000.0	55200.0	480.0	115.2	6.79	3.0	48.1	2.4
8	0.25	115.0	276000.0	55200.0	480.0	120.0	7.33	3.0	59.5	2.0
9	0.20	115.0	276000.0	55200.0	480.0	96.0	6.86	2.8	48.8	2.0
10	0.23	115.0	276000.0	55200.0	480.0	110.4	6.85	3.2	48.3	2.3
11	0.30	102.0	276000.0	55200.0	541.2	162.4	6.87	3.0	51.3	3.2
12	0.27	102.0	276000.0	55200.0	541.2	146.1	6.84		61.5	2.4
13			276000.0							
14			276000.0							
15			276000.0							
16			276000.0							
17			276000.0							
18			276000.0							
19			276000.0							
20			276000.0							
21			276000.0							
22			276000.0							
23			276000.0							
24			276000.0							
25			276000.0							
26			276000.0							
27			276000.0							
28			276000.0							
29			276000.0							
30			276000.0							
31			276000.0							

Month: April Year: 2020

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form to Public Water Supply Section, PWSS Bureau, 1520 E. Sixth Avenue
P.O. Box 200901, Helena, MT 59620-0901 – by the 10th of the Following Month

Log Inactivation Ratio ≥	1.0

Name of Water System: White Sulphur Springs

Filtration Type: Slow Sand MCL= 1.0 MAX= 5.0 NTU

Prepared by: Clyde Vinton PWSID: MT 0000360

Check Type of NTU Measurements Used ☐ In-Line ☐ Bench-Top

Notes: DAY	Operating Time Hrs/Day	Raw Water GPD	Raw Water pH	Raw Water NTU	Coagulant (None) PPM	Polymer (None) PPM	Max. NTU Finish Water Ntu	Number of Turbidity: Turbidity Meas. 2 (B)	Meas. ≤ Specified Limit 3 (A)	Meas. > Max Limit Limit 4	Distribution: No. of Sites where Disinfectant Residual was: Measured 5 (D)	Record Chlorine Residual Value (C) (mg/L)	Not detected No HPC 6	Disinfectant Concentration Meas. At POE During Peak Hourly Flow 7 (mg/L)	Peak Hourly Flow 8 (GPM)	From Data Entry Form Baffling Factor (s): Minimum Operating Volume 9a (gal)	Minimum Operating Volume 9b (gal)	Individual or Combined Values: Effective Volume 10 (gal)	Contact Time $T=T_{10}$ 11 (min)	CT calc = (CxT) 12	Finished Water pH 13	Finished Water Temp 14 (°C)	Individual or Combined I.R. 15
1	24.0			1.00			0.35	6			1	0.09		0.2	116	276000		55200	475.9	99.9	6.90	2.9	2.0
2	24.0			1.01			0.36	6			1	0.15		0.2	115	276000		55200	480.0	105.6	7.05	3.0	2.0
3	24.0			0.99			0.37	6			1	0.10		0.2	114	276000		55200	484.2	92.0	6.93	2.9	1.9
4	24.0			0.98			0.33	6			1	0.37		0.2	115	276000		55200	480.0	72.0	6.94	2.8	1.5
5	24.0			0.93			0.36	6			1	0.39		0.2	115	276000		55200	480.0	91.2	6.99	3.0	1.8
6	24.0			0.91			0.36	6			1	0.41		0.2	114	276000		55200	484.2	106.5	6.92	3.0	2.1
7	24.0			0.89			0.40	6			1	0.07		0.2	115	276000		55200	480.0	115.2	6.79	3.0	2.4
8	24.0			0.87			.48	6			1	0.31		0.3	115	276000		55200	480.0	120.0	7.33	3.0	2.0
9	24.0			0.86			0.49	6			1	0.04		0.2	115	276000		55200	480.0	96.0	6.86	2.8	2.0
10	24.0			0.86			0.61	6			1	0.13		0.2	115	276000		55200	480.0	110.4	6.85	3.2	2.3
11	24.0			0.87			0.67	6			1	0.22		0.3	102	276000		55200	541.2	162.4	6.87	3.0	3.2
12	24.0			0.86			0.87	6			1	0.18		0.3	102	276000		55200	541.2	146.1	6.84		2.4
13											1	0.22				276000		55200					
14											1	0.25				276000		55200					
15											1	0.30				276000		55200					
16											1	0.25				276000		55200					
17											1	0.19				276000		55200					
18											1	0.13				276000		55200					
19											1	0.09				276000		55200					
20											1	0.13				276000		55200					
21											1	0.18				276000		55200					
22											1	0.24				276000		55200					
23											1	0.04				276000		55200					
24											1	0.28				276000		55200					
25											1	0.25				276000		55200					
26											1	0.23				276000		55200					
27											1	0.05				276000		55200					
28											1	0.07				276000		55200					
29											1	0.06				276000		55200					
30											1	0.18				276000		55200					
31																276000		55200					
Total		MGD				Max NTU=	0.870	72			30	17										Lowest I.R. =	1.5

The % of turbidity measurements meeting the specified limits = B/A x 100 = ______ V = D/C x 100 = ______

Record the date and turbidity value for any measurements exceeding maximum allowed:
If none, enter "None"

	Turbidity, NTU

Date: ______
By Whom: ______

Checked against:
☐ Bench-Top Turbidimeter ☐ Primary Turbidity Standard

Date: ______
By Whom: ______
Last Calibration Date: ______

Form F-5 (10-2008)

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form by 10th of Following Month to:

SWTR Manager, Public Water Supply PO BOX 200901 Helena, MT 59620-0901

Month: Feb Year: 2022 PWSID # MT0000360

System: White Sulphur Springs Water Source: **Surface Water**

Prepared by: Clyde Vinton Date: 3/9/2022

Spreadsheet to determine disinfection inactivation ratio based upon the formula:
CT required = 0.3 x pH^2.69 x c^0.15 x (log reduction) x 0.933^(temp-5)

RECEIVED
MAR 10 2022
MT DEQ PUBLIC WATER

Total Log Reduction Required =	3.0	Giardia
Log Reduction Allowed for Treatment =	2.0	Giardia
Log Reduction Required for Disinfection =	1.0	Giardia
Enter Baffling Factor =	0.2	
Minimum Volume (Gallons) =	276,000.00	

DAY	CL_2 (mg/L)	Peak (GPM)	Vol Min (gal)	Vol Eff (gal)	T10 (min)	CT calc	pH	Temp (Cels)	CT req'd	I.R.
1			276000.0							
2			276000.0							
3			276000.0							
4			276000.0							
5			276000.0							
6			276000.0							
7			276000.0							
8	0.28	77.0	276000.0	55200.0	716.9	200.7	7.06	6.6	42.6	4.7
9	0.51	77.0	276000.0	55200.0	716.9	365.6	7.07	6.4	47.4	7.7
10	0.48	100.0	276000.0	55200.0	552.0	265.0	7.10	6.4	47.5	5.6
11	0.45	100.0	276000.0	55200.0	552.0	248.4	7.06	5.9	48.0	5.2
12	0.42	112.0	276000.0	55200.0	492.9	207.0	7.07	6.0	47.4	4.4
13	0.15	113.0	276000.0	55200.0	488.5	73.3	7.11	6.7	39.3	1.9
14	0.15	114.0	276000.0	55200.0	484.2	72.6	7.01	5.4	41.3	1.8
15	0.14	113.0	276000.0	55200.0	488.5	68.4	7.08	4.9	43.5	1.6
16	0.13	113.0	276000.0	55200.0	488.5	63.5	7.12	4.9	43.7	1.5
17	0.13	113.0	276000.0	55200.0	488.5	63.5	7.26	5.1	45.4	1.4
18	0.13	113.0	276000.0	55200.0	488.5	63.5	7.22	4.8	45.7	1.4
19	0.12	113.0	276000.0	55200.0	488.5	58.6	7.25	5.1	44.7	1.3
20	0.12	113.0	276000.0	55200.0	488.5	58.6	7.21	5.0	44.3	1.3
21	0.11	113.0	276000.0	55200.0	488.5	53.7	7.23	4.8	44.7	1.2
22	0.13	114.0	276000.0	55200.0	484.2	62.9	7.19	4.2	47.1	1.3
23	0.14	113.0	276000.0	55200.0	488.5	68.4	7.26	4.4	48.2	1.4
24	0.15	114.0	276000.0	55200.0	484.2	72.6	7.28	4.7	48.1	1.5
25	0.15	114.0	276000.0	55200.0	484.2	72.6	7.11	4.2	46.7	1.6
26	0.16	114.0	276000.0	55200.0	484.2	77.5	7.16	4.4	47.4	1.6
27	0.15	114.0	276000.0	55200.0	484.2	72.6	7.06	4.3	45.5	1.6
28	0.13	113.0	276000.0	55200.0	488.5	63.5	7.22	4.4	47.0	1.4
29			276000.0							
30			276000.0							
31			276000.0							

Month: Feb Year: 2022

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form to Public Water Supply Section, PWSS Bureau, 1520 E. Sixth Avenue
P.O. Box 200901, Helena, MT 59620-0901 – by the 10th of the Following Month

Log Inactivation Ratio ≥	1.0

Name of Water System: White Sulphur Springs Prepared by: Clyde Vinton PWSID: MT0000360

Check Type of NTU Measurements Used: ☒ In-Line ☐ Bench-Top

Filtration Type: Slow Sand MCL= 1.0 MAX= 5.0 NTU Distribution

Notes: DAY	Operating Time	Raw Water			Click on cell below to select Coagulant: None	Polymer: None	Max. NTU Finish Water	Number of Turbidity: Turbidity Meas. 2. (B)	Meas. ≤ Specified Limit 3. (A)	Meas. > Max Limit Limit 4	No. of Sites where Disinfectant Residual was: Measured, Record Chlorine Residual Value 5. (D)	(C)	Not detected No HPC 6	Disinfectant Concentration Meas. At POE During Peak Hourly Flow 7	Peak Hourly Flow 8	From Data Entry Form Baffling Factor (s): Minimum Operating Volume 9a	Minimum Operating Volume 9b	Individual or Combined Values: Effective Volume 10	Contact Time $T=T_{10}$ 11	CT calc = (CxT) 12	Finished Water pH 13	Finished Water Temp 14	Individual or Combined I.R. 16
DAY	Hrs/Day	GPD	pH	NTU	PPM	PPM	Ntu					(mg/L)		(mg/L)	(GPM)	(gal)	(gal)	(gal)	(min)			(°C)	
1											1	0.20				276000		55200					
2											1	0.10				276000		55200					
3											1	0.13				276000		55200					
4											1	0.24				276000		55200					
5											1	0.16				276000		55200					
6											1	0.23				276000		55200					
7											1	0.14				276000		55200					
8	24.0			0.53			0.43	6			1	0.12		0.3	77	276000		55200	716.9	200.7	7.08	6.6	4.7
9	24.0			0.53			0.43	6			1	0.10		0.5	77	276000		55200	716.9	365.6	7.07	6.4	7.7
10	24.0			0.53			0.43	6			1	0.04		0.5	100	276000		55200	552.0	265.0	7.10	6.4	5.6
11	24.0			0.53			0.42	6			1	0.05		0.5	100	276000		55200	552.0	248.4	7.08	5.9	5.2
12	24.0			0.53			0.40	6			1	0.22		0.4	112	276000		55200	492.9	207.0	7.07	6.0	4.4
13	24.0			0.53			0.41	6			1	0.14		0.2	113	276000		55200	488.5	73.3	7.11	6.7	1.9
14	24.0			0.54			0.40	6			1	0.46		0.2	114	276000		55200	484.2	72.6	7.01	5.4	1.8
15	24.0			0.54			0.39	6			1	0.23		0.1	113	276000		55200	488.5	68.4	7.08	4.9	1.6
16	24.0			0.53			0.38	6			1	0.22		0.1	113	276000		55200	488.5	63.5	7.12	4.9	1.5
17	24.0			0.52			0.37	6			1	0.11		0.1	113	276000		55200	488.5	63.5	7.26	5.1	1.4
18	24.0			0.54			0.36	6			1	0.24		0.1	113	276000		55200	488.5	63.5	7.22	4.8	1.4
19	24.0			0.54			0.36	6			1	0.07		0.1	113	276000		55200	488.5	58.6	7.25	5.1	1.3
20	24.0			0.54			0.36	6			1	0.20		0.1	113	276000		55200	488.5	58.6	7.21	5.0	1.3
21	24.0			0.53			0.35	6			1	0.11		0.1	113	276000		55200	488.5	53.7	7.23	4.8	1.2
22	24.0			0.54			0.32	6			1	0.10		0.1	114	276000		55200	484.2	62.9	7.19	4.2	1.3
23	24.0			0.54			0.31	6			1	0.25		0.1	113	276000		55200	488.5	68.4	7.26	4.4	1.4
24	24.0			0.54			0.32	6			1	0.18		0.2	114	276000		55200	484.2	72.6	7.28	4.7	1.5
25	24.0			0.54			0.34	6			1	0.32		0.2	114	276000		55200	484.2	72.6	7.11	4.2	1.6
26	24.0			0.54			0.34	6			1	0.07		0.2	114	276000		55200	484.2	77.5	7.16	4.4	1.6
27	24.0			0.54			0.33	6			1	0.19		0.2	114	276000		55200	484.2	72.6	7.06	4.3	1.6
28	24.0			0.54			0.33	6			1	0.14		0.1	113	276000		55200	488.5	63.5	7.22	4.4	1.4
29																276000		55200					
30																276000		55200					
31																276000		55200					
Total			MGD			Max NTU=	0.430	126			28	17										Lowest I.R. =	1.2

The % of turbidity measurements meeting the specified limits = B/A x 100 = ______ V = D/C x 100 = ______

Date: ______ By Whom: ______

Date: ______ By Whom: ______ Last Calibration Date: ______

Record the date and turbidity value for any measurements exceeding maximum allowed:
If none, enter "None"

	Turbidity, NTU

Checked against:
☐ Bench-Top Turbidimeter ☐ Primary Turbidity Standard

Form F-8 (10-2008)

3-8-22
willow creek online

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STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form by 10th of Following Month to:

SWTR Manager, Public Water Supply PO BOX 200901 Helena, MT 59620-0901

Month: March Year: 2022 PWSID # MT0000360

System: White Sulphur Springs Water Source: **Surface Water**

Prepared by: Clyde Vinton Date: 4/8/2022

Spreadsheet to determine disinfection inactivation ratio based upon the formula:

CT required = 0.3 x pH^2.69 x c^0.15 x (log reduction) x 0.933^(temp-5)

Total Log Reduction Required =	3.0	Giardia
Log Reduction Allowed for Treatment =	2.0	Giardia
Log Reduction Required for Disinfection =	1.0	Giardia
Enter Baffling Factor =	0.2	
Minimum Volume (Gallons) =	276,000.00	

DAY	CL_2 (mg/L)	Peak (GPM)	Vol Min (gal)	Vol Eff (gal)	T10 (min)	CT calc	pH	Temp (Cels)	CT req'd	I.R.
1	0.23	113.0	276000.0	55200.0	488.5	112.4	7.19	5.0	48.5	2.3
2	0.21	113.0	276000.0	55200.0	488.5	102.6	7.64	4.6	57.9	1.8
3	0.20	118.0	276000.0	55200.0	467.8	93.6	7.16	3.9	50.7	1.8
4	0.29	119.0	276000.0	55200.0	463.9	134.5	7.16	4.2	52.5	2.6
5	0.21	118.0	276000.0	55200.0	467.8	98.2	7.18	4.7	48.7	2.0
6	0.24	118.0	276000.0	55200.0	467.8	112.3	7.17	4.9	48.8	2.3
7	0.29	119.0	276000.0	55200.0	463.9	134.5	7.16	4.5	51.4	2.6
8	0.29	118.0	276000.0	55200.0	467.8	135.7	7.14	4.2	52.1	2.6
9	0.29	118.0	276000.0	55200.0	467.8	135.7	7.10	3.5	53.9	2.5
10	0.20	118.0	276000.0	55200.0	467.8	93.6	7.16	3.6	51.8	1.8
11	0.20	118.0	276000.0	55200.0	467.8	93.6	7.27	4.2	51.7	1.8
12	0.21	118.0	276000.0	55200.0	467.8	98.2	7.21	3.9	52.1	1.9
13	0.19	118.0	276000.0	55200.0	467.8	88.9	7.22	3.7	52.2	1.7
14	0.18	119.0	276000.0	55200.0	463.9	83.5	7.09	3.8	49.0	1.7
15	0.17	118.0	276000.0	55200.0	467.8	79.5	6.96	3.8	46.2	1.7
16	0.17	118.0	276000.0	55200.0	467.8	79.5	7.17	4.1	49.0	1.6
17	0.24	119.0	276000.0	55200.0	463.9	111.3	7.13	3.7	52.3	2.1
18	0.26	119.0	276000.0	55200.0	463.9	120.6	7.09	3.8	51.7	2.3
19	0.26	118.0	276000.0	55200.0	467.8	121.6	7.16	3.9	52.7	2.3
20	0.26	119.0	276000.0	55200.0	463.9	120.6	6.93	3.6	49.3	2.4
21	0.25	119.0	276000.0	55200.0	463.9	116.0	7.21	3.8	53.8	2.2
22	0.23	119.0	276000.0	55200.0	463.9	106.7	7.13	3.9	51.2	2.1
23	0.19	119.0	276000.0	55200.0	463.9	88.1	7.18	4.1	50.0	1.8
24	0.26	119.0	276000.0	55200.0	463.9	120.6	7.20	4.0	53.2	2.3
25	0.28	119.0	276000.0	55200.0	463.9	129.9	7.19	4.2	52.8	2.5
26	0.27	119.0	276000.0	55200.0	463.9	125.2	7.22	4.5	52.0	2.4
27	0.27	119.0	276000.0	55200.0	463.9	125.2	7.14	4.8	49.5	2.5
28	0.24	119.0	276000.0	55200.0	463.9	111.3	7.16	4.5	50.0	2.2
29	0.25	119.0	276000.0	55200.0	463.9	116.0	7.30	4.0	54.9	2.1
30	0.25	119.0	276000.0	55200.0	463.9	116.0	7.24	4.1	53.3	2.2
31	0.25	130.0	276000.0	55200.0	424.6	106.2	6.88	4.5	45.2	2.3

STATE OF MONTANA: DEPARTMENT OF ENVIRONMENTAL QUALITY

Return Completed Form to Public Water Supply Section, PWSS Bureau, 1520 E. Sixth Avenue
P.O. Box 200901, Helena, MT 59620-0901 -- by the 10th of the Following Month

Month: March Year: 2022

Log Inactivation Ratio ≥ 1.0

Name of Water System: White Sulphur Springs Prepared by: Clyde Vinton PWSID: ______

Check Type of NTU Measurements Used: ☐ In-Line ☐ Bench-Top

Filtration Type: Slow Sand MCL= 1.0 MAX= 5.0 NTU Distribution

Notes: DAY	Operating Time Hrs/Day	Raw Water GPD	Raw Water pH	Raw Water NTU	Coagulant (None) PPM	Polymer (None) PPM	Max. NTU Finish Water Ntu	Number of Turbidity: Turbidity Meas. 2 (B)	Meas. ≤ Specified Limit 3 (A)	Meas. > Max Limit 4	No. of Sites where Disinfectant Residual was: Measured 5 (D)	Record Chlorine Residual Value (C) (mg/L)	Not detected No HPC 6	Disinfectant Concentration Meas. At POE During Peak Hourly Flow 7 (mg/L)	Peak Hourly Flow 8 (GPM)	From Data Entry Form Baffling Factor (s): Minimum Operating Volume 9a (gal)	Minimum Operating Volume 9b (gal)	Individual or Combined Values: Effective Volume 10 (gal)	Contact Time $T=T_{10}$ 11 (min)	CT calc = (CxT) 12	Finished Water pH 13	Finished Water Temp 14 (°C)	Individual or Combined I.R. 15
1	24.0			0.54			0.30	6			1	0.21		0.2	113	276000		55200	488.5	112.4	7.19	5.0	2.3
2	24.0			0.55			0.35	6			1	0.06		0.2	113	276000		55200	488.5	102.6	7.64	4.6	1.8
3	24.0			0.55			0.40	6			1	0.22		0.2	118	276000		55200	467.8	93.6	7.16	3.9	1.8
4	24.0			0.55			0.48	6			1	0.11		0.3	119	276000		55200	463.9	134.5	7.16	4.2	2.6
5	24.0			0.55			0.48	6			1	0.20		0.2	118	276000		55200	467.8	98.2	7.18	4.7	2.0
6	24.0			0.55			0.40	6			1	0.24		0.2	118	276000		55200	467.8	112.3	7.17	4.9	2.3
7	24.0			0.55			0.32	6			1	0.11		0.3	119	276000		55200	463.9	134.5	7.16	4.5	2.6
8	24.0			0.55			0.28	6			1	0.31		0.3	118	276000		55200	467.8	135.7	7.14	4.2	2.6
9	24.0			0.55			0.24	6			1	0.24		0.3	118	276000		55200	467.8	135.7	7.10	3.5	2.5
10	24.0			0.55			0.26	6			1	0.17		0.2	118	276000		55200	467.8	93.6	7.16	3.6	1.8
11	24.0			0.55			0.19	6			1	0.12		0.2	118	276000		55200	467.8	93.6	7.27	4.2	1.8
12	24.0			0.55			0.25	6			1	0.10		0.2	118	276000		55200	467.8	98.2	7.21	3.9	1.9
13	24.0			0.55			0.26	6			1	0.12		0.2	118	276000		55200	467.8	88.9	7.22	3.7	1.7
14	24.0			0.55			0.25	6			1	0.09		0.2	119	276000		55200	463.9	83.5	7.09	3.8	1.7
15	24.0			0.55			0.25	6			1	0.13		0.2	118	276000		55200	467.8	79.5	6.96	3.8	1.7
16	24.0			0.55			0.25	6			1	0.04		0.2	118	276000		55200	467.8	79.5	7.17	4.1	1.6
17	24.0			0.55			0.25	6			1	0.21		0.2	119	276000		55200	463.9	111.3	7.13	3.7	2.1
18	24.0			0.55			0.24	6			1	0.22		0.3	119	276000		55200	463.9	120.6	7.09	3.8	2.3
19	24.0			0.55			0.24	6			1	0.20		0.3	118	276000		55200	467.8	121.6	7.16	3.9	2.3
20	24.0			0.55			0.25	6			1	0.26		0.3	119	276000		55200	463.9	120.6	6.93	3.6	2.4
21	24.0			0.55			0.26	6			1	0.21		0.3	119	276000		55200	463.9	116.0	7.21	3.8	2.2
22	24.0			0.55			0.25	6			1	0.25		0.2	119	276000		55200	463.9	106.7	7.13	3.9	2.1
23	24.0			0.55			0.26	6			1	0.20		0.2	119	276000		55200	463.9	88.1	7.18	4.1	1.8
24	24.0			0.54			0.33	6			1	0.18		0.3	119	276000		55200	463.9	120.6	7.20	4.0	2.3
25	24.0			0.54			0.46	6			1	0.19		0.3	119	276000		55200	463.9	129.9	7.19	4.2	2.5
26	24.0			0.54			0.49	6			1	0.25		0.3	119	276000		55200	463.9	125.2	7.22	4.5	2.4
27	24.0			0.54			0.57	6			1	0.12		0.3	119	276000		55200	463.9	125.2	7.14	4.8	2.5
28	24.0			0.54			0.69	6			1	0.05		0.2	119	276000		55200	463.9	111.3	7.16	4.5	2.2
29	24.0			0.54			0.82	6			1	0.12		0.3	119	276000		55200	463.9	116.0	7.30	4.0	2.1
30	24.0			0.59			0.97	6			1	0.25		0.3	119	276000		55200	463.9	116.0	7.24	4.1	2.2
31	24.0			0.59			0.98	6			1	0.18		0.3	130	276000		55200	424.6	106.2	6.88	4.5	2.3
Total		MGD				Max NTU=	0.980	186			31	16										Lowest I.R. =	1.6

The % of turbidity measurements meeting the specified limits = B/A x 100 = ______ V = D/C x 100 = ______

Record the date and turbidity value for any measurements exceeding maximum allowed.
If none, enter "None"

	Turbidity, NTU

Date: ______
By Whom: ______

Date: ______
By Whom: ______
Last Calibration Date: ______

Checked against:
☐ Bench-Top Turbidimeter ☐ Primary Turbidity Standard

Form F-5 (10-2006)

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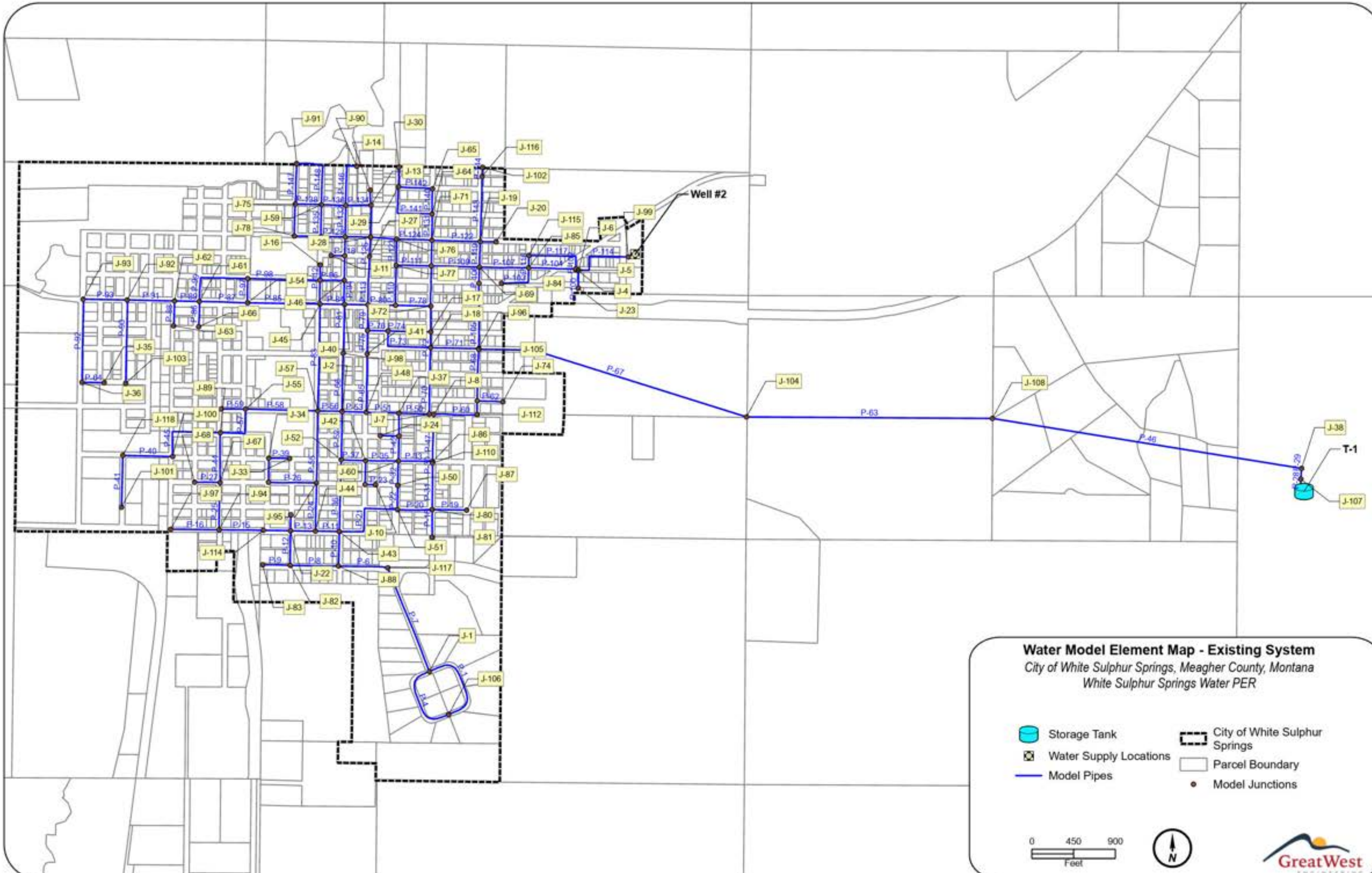
Appendix T

Hydraulic Water Model Reports


Water Model Element Map - Existing System
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Storage Tank
Water Supply Locations
Model Pipes
City of White Sulphur Springs
Parcel Boundary
Model Junctions
0
450
900
Feet
N
GreatWest
Well #2
T-1
P-67
P-63
P-46
J-104
J-108
J-38
J-107
J-105
J-1
J-106

Existing System Peak Hour

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-1	940	J-1	J-106	6.0	PVC	145.0	1	0.01	0.000	Open
P-4	855	J-106	J-1	6.0	PVC	145.0	1	0.01	0.000	Open
P-6	532	J-88	J-117	6.0	PVC	145.0	6	0.07	0.000	Open
P-7	1,204	J-117	J-1	6.0	PVC	145.0	5	0.06	0.000	Open
P-8	518	J-88	J-82	6.0	PVC	145.0	0	0.00	0.000	Open
P-9	299	J-82	J-83	6.0	PVC	145.0	2	0.02	0.000	Open
P-10	372	J-88	J-43	6.0	PVC	145.0	15	0.17	0.000	Open
P-11	257	J-43	J-44	6.0	PVC	145.0	34	0.38	0.000	Open
P-12	374	J-22	J-82	6.0	PVC	145.0	7	0.08	0.000	Open
P-13	268	J-44	J-22	6.0	PVC	145.0	37	0.42	0.000	Open
P-14	294	J-22	J-114	6.0	PVC	145.0	21	0.23	0.000	Open
P-15	476	J-114	J-94	6.0	PVC	145.0	20	0.22	0.000	Open
P-16	521	J-94	J-97	6.0	PVC	145.0	3	0.04	0.000	Open
P-17	172	J-21	J-22	2.0	PVC	145.0	5	0.53	0.001	Open
P-18	298	J-80	J-81	4.0	PVC	145.0	3	0.08	0.000	Open
P-19	371	J-80	J-87	4.0	PVC	145.0	3	0.08	0.000	Open
P-20	374	J-51	J-80	6.0	PVC	145.0	4	0.05	0.000	Open
P-21	870	J-43	J-51	6.0	PVC	145.0	12	0.14	0.000	Open
P-22	261	J-50	J-51	6.0	PVC	145.0	0	0.00	0.000	Open
P-23	114	J-9	J-10	2.0	CU	145.0	5	0.53	0.001	Open
P-24	519	J-95	J-44	10.0	PVC	145.0	74	0.30	0.000	Open
P-25	511	J-94	J-67	6.0	PVC	145.0	7	0.08	0.000	Open
P-26	517	J-95	J-47	4.0	Steel	80.0	11	0.29	0.000	Open
P-27	275	J-67	J-68	2.0	PVC	145.0	5	0.53	0.001	Open
P-28	173	T-1	J-107	12.0	PVC	145.0	672	1.91	0.001	Open
P-29	115	J-107	J-38	12.0	PVC	145.0	672	1.91	0.001	Open
P-30	17	J-86	J-110	4.0	PVC	145.0	13	0.34	0.000	Open
P-31	499	J-110	J-80	4.0	PVC	145.0	8	0.21	0.000	Open
P-32	263	J-50	J-60	4.0	PVC	145.0	4	0.10	0.000	Open
P-33	368	J-60	J-86	4.0	PVC	145.0	9	0.23	0.000	Open
P-34	257	J-42	J-9	4.0	CIP	45.0	9	0.24	0.001	Open
P-35	355	J-42	J-60	6.0	PVC	145.0	11	0.13	0.000	Open
P-36	774	J-52	J-43	6.0	CIP	45.0	3	0.03	0.000	Open
P-37	261	J-52	J-42	4.0	CIP	45.0	3	0.08	0.000	Open
P-38	260	J-34	J-47	2.0	PVC	145.0	5	0.53	0.001	Open
P-39	225	J-33	J-34	1.0	CU	145.0	2	0.85	0.004	Open
P-40	538	J-100	J-118	6.0	PVC	145.0	5	0.06	0.000	Open

Existing System Peak Hour

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-41	559	J-118	J-101	6.0	PVC	145.0	3	0.04	0.000	Open
P-42	270	J-60	J-25	6.0	PVC	145.0	11	0.12	0.000	Open
P-43	202	J-24	J-25	2.0	PVC	145.0	5	0.53	0.001	Open
P-44	537	J-89	J-67	4.0	PVC	145.0	3	0.09	0.000	Open
P-45	785	J-100	J-89	6.0	PVC	145.0	13	0.14	0.000	Open
P-46	3,376	J-38	J-108	12.0	Steel	100.0	672	1.91	0.002	Open
P-47	511	J-8	J-86	4.0	PVC	145.0	27	0.68	0.001	Open
P-48	50	J-7	J-8	6.0	CIP	45.0	16	0.19	0.000	Open
P-49	246	J-37	J-25	4.0	AC	120.0	20	0.51	0.000	Open
P-50	327	J-37	J-7	4.0	PVC	145.0	26	0.68	0.001	Open
P-51	352	J-48	J-37	4.0	PVC	145.0	5	0.13	0.000	Open
P-52	520	J-3	J-52	6.0	CIP	45.0	14	0.16	0.000	Open
P-53	260	J-3	J-48	4.0	PVC	145.0	1	0.03	0.000	Open
P-54	3	J-2	J-3	6.0	CIP	45.0	16	0.18	0.000	Open
P-55	777	J-57	J-95	10.0	PVC	145.0	96	0.39	0.000	Open
P-56	263	J-57	J-2	4.0	CIP	45.0	2	0.05	0.000	Open
P-57	530	J-89	J-55	6.0	PVC	145.0	24	0.28	0.000	Open
P-58	779	J-57	J-55	6.0	PVC	145.0	37	0.42	0.000	Open
P-59	262	J-55	J-56	6.0	PVC	145.0	6	0.07	0.000	Open
P-60	471	J-8	J-112	6.0	CIP	45.0	52	0.59	0.002	Open
P-61	148	J-112	J-73	6.0	CIP	45.0	61	0.69	0.003	Open
P-62	278	J-73	J-74	1.0	CU	145.0	4	1.71	0.015	Open
P-63	2,651	J-108	J-104	12.0	PVC	145.0	672	1.91	0.001	Open
P-64	238	J-35	J-36	1.0	CIP	45.0	2	0.85	0.035	Open
P-65	631	J-41	J-48	4.0	CIP	45.0	11	0.29	0.001	Open
P-66	627	J-98	J-2	6.0	CIP	45.0	22	0.25	0.000	Open
P-67	2,996	J-104	J-105	12.0	PVC	145.0	672	1.91	0.001	Open
P-68	555	J-73	J-105	6.0	CIP	45.0	72	0.82	0.004	Open
P-69	9	J-105	J-96	6.0	CIP	45.0	593	6.72	0.201	Open
P-70	717	J-18	J-7	4.0	CIP	45.0	17	0.45	0.002	Open
P-71	519	J-18	J-96	12.0	PVC	145.0	549	1.56	0.001	Open
P-72	171	J-17	J-18	12.0	PVC	145.0	513	1.45	0.001	Open
P-73	628	J-32	J-18	4.0	CIP	45.0	5	0.13	0.000	Open
P-74	461	J-32	J-17	6.0	PVC	145.0	27	0.31	0.000	Open
P-75	252	J-31	J-41	6.0	PVC	145.0	25	0.28	0.000	Open
P-76	221	J-31	J-32	4.0	CIP	45.0	25	0.64	0.004	Open
P-77	277	J-72	J-17	12.0	PVC	145.0	481	1.36	0.001	Open

Existing System Peak Hour

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-78	380	J-72	J-79	10.0	CIP	80.0	252	1.03	0.001	Open
P-79	278	J-39	J-31	6.0	PVC	145.0	7	0.08	0.000	Open
P-80	298	J-79	J-39	10.0	CIP	80.0	255	1.04	0.001	Open
P-81	527	J-40	J-98	6.0	PVC	145.0	39	0.44	0.000	Open
P-82	252	J-39	J-40	10.0	CIP	80.0	232	0.95	0.001	Open
P-83	1,153	J-45	J-57	10.0	PVC	145.0	137	0.56	0.000	Open
P-84	264	J-40	J-45	10.0	CIP	80.0	212	0.87	0.001	Open
P-85	781	J-45	J-54	10.0	PVC	145.0	62	0.25	0.000	Open
P-86	273	J-61	J-66	2.0	CIP	45.0	5	0.53	0.007	Open
P-87	519	J-54	J-61	6.0	PVC	145.0	42	0.48	0.000	Open
P-88	269	J-62	J-63	4.0	CIP	45.0	4	0.11	0.000	Open
P-89	268	J-61	J-62	4.0	Steel	80.0	41	1.04	0.003	Open
P-90	899	J-92	J-103	4.0	CIP	45.0	1	0.03	0.000	Open
P-91	511	J-62	J-92	6.0	PVC	145.0	29	0.33	0.000	Open
P-92	898	J-93	J-36	2.0	CIP	45.0	6	0.64	0.009	Open
P-93	475	J-92	J-93	6.0	PVC	145.0	16	0.18	0.000	Open
P-94	260	J-40	J-46	6.0	PVC	145.0	28	0.32	0.000	Open
P-95	258	J-45	J-15	6.0	CIP	45.0	5	0.06	0.000	Open
P-96	262	J-46	J-15	4.0	CIP	45.0	11	0.29	0.001	Open
P-97	262	J-53	J-54	6.0	CIP	45.0	16	0.19	0.000	Open
P-98	779	J-15	J-53	6.0	CIP	45.0	10	0.12	0.000	Open
P-99	766	J-61	J-53	6.0	PVC	145.0	16	0.18	0.000	Open
P-100	193	J-6	J-23	2.0	PVC	145.0	2	0.21	0.000	Open
P-101	30	J-5	J-6	8.0	PVC	145.0	15	0.09	0.000	Open
P-102	13	J-4	J-5	6.0	PVC	145.0	16	0.18	0.000	Open
P-103	447	J-84	J-85	6.0	PVC	145.0	9	0.11	0.000	Open
P-104	508	J-85	J-4	8.0	PVC	145.0	17	0.11	0.000	Open
P-105	703	J-96	J-113	6.0	CIP	45.0	38	0.43	0.001	Open
P-106	175	J-113	J-69	6.0	CIP	45.0	31	0.36	0.001	Open
P-107	531	J-69	J-85	8.0	PVC	145.0	43	0.27	0.000	Open
P-108	434	J-72	J-70	8.0	PVC	145.0	219	1.40	0.001	Open
P-109	518	J-70	J-69	8.0	PVC	145.0	32	0.21	0.000	Open
P-110	430	J-79	J-77	6.0	PVC	145.0	10	0.11	0.000	Open
P-111	378	J-77	J-70	8.0	PVC	145.0	82	0.53	0.000	Open
P-112	164	J-15	J-16	4.0	CIP	45.0	3	0.08	0.000	Open
P-113	521	J-39	J-27	4.0	Steel	80.0	5	0.12	0.000	Open
P-114	683	J-6	J-99	8.0	PVC	145.0	8	0.05	0.000	Open

Existing System Peak Hour

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-115	265	J-46	J-12	6.0	PVC	145.0	47	0.53	0.000	Open
P-116	133	J-85	J-115	6.0	PVC	145.0	12	0.14	0.000	Open
P-117	644	J-115	J-4	6.0	PVC	145.0	4	0.05	0.000	Open
P-118	146	J-11	J-12	1.0	CU	145.0	2	0.85	0.004	Open
P-119	275	J-69	J-19	6.0	CIP	45.0	13	0.15	0.000	Open
P-120	172	J-19	J-20	6.0	PVC	145.0	4	0.05	0.000	Open
P-121	276	J-70	J-71	8.0	PVC	145.0	97	0.62	0.000	Open
P-122	521	J-71	J-19	6.0	PVC	145.0	12	0.13	0.000	Open
P-123	284	J-77	J-76	6.0	PVC	145.0	65	0.73	0.000	Open
P-124	379	J-76	J-71	6.0	PVC	145.0	55	0.63	0.000	Open
P-125	209	J-27	J-28	6.0	PVC	145.0	3	0.04	0.000	Open
P-126	283	J-28	J-76	6.0	PVC	145.0	111	1.26	0.001	Open
P-127	204	J-12	J-26	6.0	PVC	145.0	52	0.59	0.000	Open
P-128	273	J-28	J-26	6.0	PVC	145.0	61	0.69	0.000	Open
P-129	261	J-26	J-49	6.0	PVC	145.0	13	0.15	0.000	Open
P-130	287	J-49	J-78	6.0	PVC	145.0	6	0.07	0.000	Open
P-131	284	J-71	J-64	6.0	PVC	145.0	22	0.25	0.000	Open
P-132	340	J-26	J-58	6.0	PVC	145.0	8	0.09	0.000	Open
P-133	346	J-28	J-13	6.0	PVC	145.0	41	0.47	0.000	Open
P-134	273	J-58	J-13	6.0	PVC	145.0	35	0.40	0.000	Open
P-135	345	J-49	J-59	6.0	PVC	145.0	2	0.03	0.000	Open
P-136	263	J-58	J-59	6.0	PVC	145.0	16	0.19	0.000	Open
P-137	344	J-78	J-75	6.0	PVC	145.0	2	0.02	0.000	Open
P-138	282	J-59	J-75	6.0	PVC	145.0	6	0.07	0.000	Open
P-139	162	J-13	J-14	2.0	PVC	145.0	2	0.21	0.000	Open
P-140	272	J-64	J-65	6.0	PVC	145.0	6	0.07	0.000	Open
P-141	661	J-64	J-29	6.0	PVC	145.0	10	0.11	0.000	Open
P-142	368	J-29	J-65	2.0	Galvanized Steel	120.0	1	0.06	0.000	Open
P-143	702	J-19	J-116	6.0	CIP	45.0	10	0.12	0.000	Open
P-144	100	J-116	J-102	6.0	CIP	45.0	2	0.02	0.000	Open
P-145	214	J-29	J-30	6.0	PVC	145.0	4	0.05	0.000	Open
P-146	533	J-58	J-90	6.0	PVC	145.0	5	0.06	0.000	Open
P-147	438	J-75	J-91	6.0	PVC	145.0	1	0.01	0.000	Open
P-148	708	J-59	J-91	6.0	PVC	145.0	4	0.05	0.000	Open

Junction Table - Time: 0.00 hours

Existing System Peak Hour

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,090.55	<None>	<Collection: 1 item>	3	5,260.41	73
J-2	5,074.99	<None>	<Collection: 1 item>	4	5,260.54	80
J-3	5,074.98	<None>	<Collection: 1 item>	3	5,260.54	80
J-4	5,088.83	<None>	<Collection: 1 item>	5	5,261.53	75
J-5	5,088.97	<None>	<Collection: 1 item>	1	5,261.53	75
J-6	5,088.48	<None>	<Collection: 1 item>	4	5,261.53	75
J-7	5,118.08	<None>	<Collection: 1 item>	7	5,260.70	62
J-8	5,120.11	<None>	<Collection: 1 item>	9	5,260.71	61
J-9	5,091.56	<None>	<Collection: 1 item>	4	5,260.24	73
J-10	5,097.08	<None>	<Collection: 1 item>	5	5,260.15	71
J-11	5,048.08	<None>	<Collection: 1 item>	2	5,260.38	92
J-12	5,058.45	<None>	<Collection: 1 item>	3	5,260.97	88
J-13	5,107.71	<None>	<Collection: 1 item>	4	5,261.06	66
J-14	5,091.23	<None>	<Collection: 1 item>	2	5,261.04	73
J-15	5,039.74	<None>	<Collection: 1 item>	3	5,260.67	96
J-16	5,041.86	<None>	<Collection: 1 item>	3	5,260.65	95
J-17	5,088.75	<None>	<Collection: 1 item>	4	5,262.11	75
J-18	5,096.97	<None>	<Collection: 1 item>	14	5,262.21	71
J-19	5,087.49	<None>	<Collection: 1 item>	10	5,261.51	75
J-20	5,087.59	<None>	<Collection: 1 item>	4	5,261.51	75
J-21	5,064.77	<None>	<Collection: 1 item>	5	5,260.29	85
J-22	5,061.85	<None>	<Collection: 1 item>	4	5,260.42	86
J-23	5,090.66	<None>	<Collection: 1 item>	2	5,261.51	74
J-24	5,099.33	<None>	<Collection: 1 item>	5	5,260.27	70
J-25	5,107.11	<None>	<Collection: 1 item>	4	5,260.42	66
J-26	5,067.27	<None>	<Collection: 1 item>	4	5,261.03	84
J-27	5,069.96	<None>	<Collection: 1 item>	8	5,261.12	83
J-28	5,087.30	<None>	<Collection: 1 item>	5	5,261.12	75
J-29	5,097.72	<None>	<Collection: 1 item>	6	5,261.50	71
J-30	5,095.31	<None>	<Collection: 1 item>	4	5,261.50	72
J-31	5,050.18	<None>	<Collection: 1 item>	7	5,261.15	91
J-32	5,061.81	<None>	<Collection: 1 item>	7	5,262.08	87
J-33	5,058.61	<None>	<Collection: 1 item>	2	5,259.19	87
J-34	5,049.85	<None>	<Collection: 1 item>	3	5,260.11	91
J-35	5,010.67	<None>	<Collection: 1 item>	2	5,242.79	100
J-36	5,009.18	<None>	<Collection: 1 item>	4	5,251.25	105
J-37	5,106.14	<None>	<Collection: 1 item>	11	5,260.53	67

Existing System Peak Hour

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-38	5,263.66	Tank Node	<Collection: 0 items>	0	5,276.71	6
J-39	5,048.66	<None>	<Collection: 1 item>	10	5,261.15	92
J-40	5,041.60	<None>	<Collection: 1 item>	9	5,260.90	95
J-41	5,056.26	<None>	<Collection: 1 item>	14	5,261.14	89
J-42	5,092.61	<None>	<Collection: 1 item>	5	5,260.41	73
J-43	5,078.04	<None>	<Collection: 1 item>	9	5,260.43	79
J-44	5,070.00	<None>	<Collection: 1 item>	3	5,260.46	82
J-45	5,037.84	<None>	<Collection: 1 item>	8	5,260.67	96
J-46	5,042.76	<None>	<Collection: 1 item>	7	5,260.92	94
J-47	5,051.79	<None>	<Collection: 1 item>	6	5,260.30	90
J-48	5,088.63	<None>	<Collection: 1 item>	5	5,260.54	74
J-49	5,042.46	<None>	<Collection: 1 item>	4	5,261.02	95
J-50	5,106.21	<None>	<Collection: 1 item>	4	5,260.41	67
J-51	5,097.31	<None>	<Collection: 1 item>	7	5,260.41	71
J-52	5,081.27	<None>	<Collection: 1 item>	8	5,260.43	78
J-53	5,029.00	<None>	<Collection: 1 item>	10	5,260.58	100
J-54	5,027.73	<None>	<Collection: 1 item>	3	5,260.65	101
J-55	5,038.43	<None>	<Collection: 1 item>	6	5,260.42	96
J-56	5,029.39	<None>	<Collection: 1 item>	6	5,260.42	100
J-57	5,066.97	<None>	<Collection: 1 item>	6	5,260.53	84
J-58	5,068.85	<None>	<Collection: 1 item>	5	5,261.03	83
J-59	5,041.81	<None>	<Collection: 1 item>	8	5,261.02	95
J-60	5,106.38	<None>	<Collection: 1 item>	4	5,260.42	67
J-61	5,024.18	<None>	<Collection: 1 item>	13	5,260.56	102
J-62	5,021.41	<None>	<Collection: 1 item>	7	5,259.62	103
J-63	5,020.41	<None>	<Collection: 1 item>	4	5,259.58	103
J-64	5,108.06	<None>	<Collection: 1 item>	6	5,261.50	66
J-65	5,121.04	<None>	<Collection: 1 item>	5	5,261.50	61
J-66	5,023.71	<None>	<Collection: 1 item>	5	5,258.75	102
J-67	5,032.50	<None>	<Collection: 1 item>	5	5,260.38	99
J-68	5,025.43	<None>	<Collection: 1 item>	5	5,260.17	102
J-69	5,078.56	<None>	<Collection: 1 item>	7	5,261.56	79
J-70	5,073.98	<None>	<Collection: 1 item>	7	5,261.57	81
J-71	5,091.91	<None>	<Collection: 1 item>	8	5,261.52	73
J-72	5,066.97	<None>	<Collection: 1 item>	9	5,261.96	84
J-73	5,131.56	<None>	<Collection: 1 item>	7	5,262.20	57
J-74	5,137.70	<None>	<Collection: 1 item>	4	5,258.13	52

Existing System Peak Hour

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-75	5,034.40	<None>	<Collection: 1 item>	7	5,261.02	98
J-76	5,101.86	<None>	<Collection: 1 item>	9	5,261.41	69
J-77	5,075.31	<None>	<Collection: 1 item>	8	5,261.52	81
J-78	5,036.50	<None>	<Collection: 1 item>	4	5,261.02	97
J-79	5,057.50	<None>	<Collection: 1 item>	7	5,261.51	88
J-80	5,100.76	<None>	<Collection: 1 item>	6	5,260.41	69
J-81	5,087.54	<None>	<Collection: 1 item>	3	5,260.41	75
J-82	5,056.67	<None>	<Collection: 1 item>	5	5,260.42	88
J-83	5,045.80	<None>	<Collection: 1 item>	2	5,260.42	93
J-84	5,081.01	<None>	<Collection: 1 item>	9	5,261.53	78
J-85	5,082.50	<None>	<Collection: 1 item>	4	5,261.54	77
J-86	5,119.55	<None>	<Collection: 1 item>	4	5,260.44	61
J-87	5,111.43	<None>	<Collection: 1 item>	3	5,260.41	64
J-88	5,063.58	<None>	<Collection: 1 item>	8	5,260.42	85
J-89	5,030.14	<None>	<Collection: 1 item>	8	5,260.39	100
J-90	5,056.93	<None>	<Collection: 1 item>	5	5,261.03	88
J-91	5,027.47	<None>	<Collection: 1 item>	5	5,261.02	101
J-92	5,015.59	<None>	<Collection: 1 item>	13	5,259.58	106
J-93	5,012.00	<None>	<Collection: 1 item>	9	5,259.57	107
J-94	5,031.81	<None>	<Collection: 1 item>	9	5,260.39	99
J-95	5,071.86	<None>	<Collection: 1 item>	10	5,260.48	82
J-96	5,110.08	<None>	<Collection: 1 item>	6	5,262.57	66
J-97	5,018.60	<None>	<Collection: 1 item>	3	5,260.39	105
J-98	5,042.61	<None>	<Collection: 1 item>	17	5,260.82	94
J-99	5,069.96	<None>	<Collection: 1 item>	8	5,261.53	83
J-100	5,018.92	<None>	<Collection: 1 item>	7	5,260.38	104
J-101	5,008.54	<None>	<Collection: 1 item>	3	5,260.37	109
J-102	5,119.06	<None>	<Collection: 1 item>	2	5,261.43	62
J-103	5,012.39	<None>	<Collection: 1 item>	1	5,259.57	107
J-104	5,141.69	<None>	<Collection: 0 items>	0	5,267.42	54
J-105	5,110.65	<None>	<Collection: 1 item>	7	5,264.45	67
J-106	5,093.82	<None>	<Collection: 1 item>	2	5,260.41	72
J-107	5,266.76	Tank Node	<Collection: 0 items>	0	5,276.83	4
J-108	5,130.43	<None>	<Collection: 0 items>	0	5,270.05	60
J-110	5,119.47	<None>	<Collection: 1 item>	5	5,260.44	61
J-112	5,132.34	<None>	<Collection: 1 item>	8	5,261.76	56
J-113	5,080.08	<None>	<Collection: 1 item>	6	5,261.71	79

Existing System Peak Hour

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-114	5,050.04	<None>	<Collection: 1 item>	1	5,260.41	91
J-115	5,082.63	<None>	<Collection: 1 item>	8	5,261.53	77
J-116	5,121.37	<None>	<Collection: 1 item>	8	5,261.43	61
J-117	5,067.58	<None>	<Collection: 1 item>	1	5,260.41	83
J-118	5,018.00	<None>	<Collection: 1 item>	2	5,260.37	105

Tank Table - Time: 0.00 hours

Label	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)	Elevation (ft)	Diameter (ft)	Volume Full (Calculated) (MG)	Percent Full (%)
T-1	5,267.00	5,267.00	5,277.00	5,282.00	672	5,277.00	5,271.27	80.00	0.56	66.7

2045 Peak Hour w/ no Improvements

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-1	940	J-1	J-106	6.0	PVC	145.0	1	0.02	0.000	Open
P-4	855	J-106	J-1	6.0	PVC	145.0	1	0.01	0.000	Open
P-6	532	J-88	J-117	6.0	PVC	145.0	8	0.09	0.000	Open
P-7	1,204	J-117	J-1	6.0	PVC	145.0	7	0.08	0.000	Open
P-8	518	J-88	J-82	6.0	PVC	145.0	0	0.00	0.000	Open
P-9	299	J-82	J-83	6.0	PVC	145.0	3	0.03	0.000	Open
P-10	372	J-88	J-43	6.0	PVC	145.0	19	0.22	0.000	Open
P-11	257	J-43	J-44	6.0	PVC	145.0	43	0.49	0.000	Open
P-12	374	J-22	J-82	6.0	PVC	145.0	9	0.10	0.000	Open
P-13	268	J-44	J-22	6.0	PVC	145.0	48	0.54	0.000	Open
P-14	294	J-22	J-114	6.0	PVC	145.0	26	0.30	0.000	Open
P-15	476	J-114	J-94	6.0	PVC	145.0	25	0.28	0.000	Open
P-16	521	J-94	J-97	6.0	PVC	145.0	4	0.05	0.000	Open
P-17	172	J-21	J-22	2.0	PVC	145.0	7	0.69	0.001	Open
P-18	298	J-80	J-81	4.0	PVC	145.0	4	0.10	0.000	Open
P-19	371	J-80	J-87	4.0	PVC	145.0	4	0.10	0.000	Open
P-20	374	J-51	J-80	6.0	PVC	145.0	6	0.06	0.000	Open
P-21	870	J-43	J-51	6.0	PVC	145.0	15	0.17	0.000	Open
P-22	261	J-50	J-51	6.0	PVC	145.0	0	0.00	0.000	Open
P-23	114	J-9	J-10	2.0	CU	145.0	7	0.69	0.001	Open
P-24	519	J-95	J-44	10.0	PVC	145.0	95	0.39	0.000	Open
P-25	511	J-94	J-67	6.0	PVC	145.0	9	0.10	0.000	Open
P-26	517	J-95	J-47	4.0	Steel	80.0	15	0.38	0.001	Open
P-27	275	J-67	J-68	2.0	PVC	145.0	7	0.69	0.001	Open
P-28	173	T-1	J-107	12.0	PVC	145.0	864	2.45	0.002	Open
P-29	115	J-107	J-38	12.0	PVC	145.0	864	2.45	0.002	Open
P-30	17	J-86	J-110	4.0	PVC	145.0	17	0.44	0.000	Open
P-31	499	J-110	J-80	4.0	PVC	145.0	10	0.27	0.000	Open
P-32	263	J-50	J-60	4.0	PVC	145.0	5	0.13	0.000	Open
P-33	368	J-60	J-86	4.0	PVC	145.0	12	0.30	0.000	Open
P-34	257	J-42	J-9	4.0	CIP	45.0	12	0.31	0.001	Open
P-35	355	J-42	J-60	6.0	PVC	145.0	15	0.17	0.000	Open
P-36	774	J-52	J-43	6.0	CIP	45.0	3	0.04	0.000	Open
P-37	261	J-52	J-42	4.0	CIP	45.0	4	0.10	0.000	Open
P-38	260	J-34	J-47	2.0	PVC	145.0	7	0.69	0.001	Open
P-39	225	J-33	J-34	1.0	CU	145.0	3	1.10	0.006	Open
P-40	538	J-100	J-118	6.0	PVC	145.0	7	0.08	0.000	Open

2045 Peak Hour w/ no Improvements
Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-41	559	J-118	J-101	6.0	PVC	145.0	4	0.05	0.000	Open
P-42	270	J-60	J-25	6.0	PVC	145.0	14	0.15	0.000	Open
P-43	202	J-24	J-25	2.0	PVC	145.0	7	0.69	0.001	Open
P-44	537	J-89	J-67	4.0	PVC	145.0	4	0.11	0.000	Open
P-45	785	J-100	J-89	6.0	PVC	145.0	16	0.18	0.000	Open
P-46	3,376	J-38	J-108	12.0	Steel	100.0	864	2.45	0.003	Open
P-47	511	J-8	J-86	4.0	PVC	145.0	34	0.87	0.001	Open
P-48	50	J-7	J-8	6.0	CIP	45.0	21	0.24	0.000	Open
P-49	246	J-37	J-25	4.0	AC	120.0	26	0.65	0.001	Open
P-50	327	J-37	J-7	4.0	PVC	145.0	34	0.87	0.001	Open
P-51	352	J-48	J-37	4.0	PVC	145.0	6	0.16	0.000	Open
P-52	520	J-3	J-52	6.0	CIP	45.0	18	0.21	0.000	Open
P-53	260	J-3	J-48	4.0	PVC	145.0	2	0.04	0.000	Open
P-54	3	J-2	J-3	6.0	CIP	45.0	21	0.23	0.000	Open
P-55	777	J-57	J-95	10.0	PVC	145.0	123	0.50	0.000	Open
P-56	263	J-57	J-2	4.0	CIP	45.0	2	0.06	0.000	Open
P-57	530	J-89	J-55	6.0	PVC	145.0	31	0.35	0.000	Open
P-58	779	J-57	J-55	6.0	PVC	145.0	47	0.54	0.000	Open
P-59	262	J-55	J-56	6.0	PVC	145.0	8	0.09	0.000	Open
P-60	471	J-8	J-112	6.0	CIP	45.0	67	0.76	0.004	Open
P-61	148	J-112	J-73	6.0	CIP	45.0	78	0.88	0.005	Open
P-62	278	J-73	J-74	1.0	CU	145.0	5	2.19	0.023	Open
P-63	2,651	J-108	J-104	12.0	PVC	145.0	864	2.45	0.002	Open
P-64	238	J-35	J-36	1.0	CIP	45.0	3	1.10	0.056	Open
P-65	631	J-41	J-48	4.0	CIP	45.0	15	0.37	0.002	Open
P-66	627	J-98	J-2	6.0	CIP	45.0	28	0.32	0.001	Open
P-67	2,996	J-104	J-105	12.0	PVC	145.0	864	2.45	0.002	Open
P-68	555	J-73	J-105	6.0	CIP	45.0	93	1.05	0.006	Open
P-69	9	J-105	J-96	6.0	CIP	45.0	762	8.65	0.320	Open
P-70	717	J-18	J-7	4.0	CIP	45.0	22	0.57	0.003	Open
P-71	519	J-18	J-96	12.0	PVC	145.0	706	2.00	0.001	Open
P-72	171	J-17	J-18	12.0	PVC	145.0	659	1.87	0.001	Open
P-73	628	J-32	J-18	4.0	CIP	45.0	7	0.17	0.000	Open
P-74	461	J-32	J-17	6.0	PVC	145.0	35	0.40	0.000	Open
P-75	252	J-31	J-41	6.0	PVC	145.0	32	0.36	0.000	Open
P-76	221	J-31	J-32	4.0	CIP	45.0	32	0.83	0.007	Open
P-77	277	J-72	J-17	12.0	PVC	145.0	619	1.75	0.001	Open

2045 Peak Hour w/ no Improvements

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-78	380	J-72	J-79	10.0	CIP	80.0	325	1.33	0.002	Open
P-79	278	J-39	J-31	6.0	PVC	145.0	9	0.10	0.000	Open
P-80	298	J-79	J-39	10.0	CIP	80.0	327	1.34	0.002	Open
P-81	527	J-40	J-98	6.0	PVC	145.0	50	0.57	0.000	Open
P-82	252	J-39	J-40	10.0	CIP	80.0	299	1.22	0.002	Open
P-83	1,153	J-45	J-57	10.0	PVC	145.0	176	0.72	0.000	Open
P-84	264	J-40	J-45	10.0	CIP	80.0	273	1.11	0.001	Open
P-85	781	J-45	J-54	10.0	PVC	145.0	80	0.32	0.000	Open
P-86	273	J-61	J-66	2.0	CIP	45.0	7	0.69	0.011	Open
P-87	519	J-54	J-61	6.0	PVC	145.0	54	0.62	0.000	Open
P-88	269	J-62	J-63	4.0	CIP	45.0	5	0.14	0.000	Open
P-89	268	J-61	J-62	4.0	Steel	80.0	52	1.34	0.006	Open
P-90	899	J-92	J-103	4.0	CIP	45.0	1	0.03	0.000	Open
P-91	511	J-62	J-92	6.0	PVC	145.0	38	0.43	0.000	Open
P-92	898	J-93	J-36	2.0	CIP	45.0	8	0.82	0.015	Open
P-93	475	J-92	J-93	6.0	PVC	145.0	20	0.23	0.000	Open
P-94	260	J-40	J-46	6.0	PVC	145.0	36	0.41	0.000	Open
P-95	258	J-45	J-15	6.0	CIP	45.0	6	0.07	0.000	Open
P-96	262	J-46	J-15	4.0	CIP	45.0	15	0.38	0.002	Open
P-97	262	J-53	J-54	6.0	CIP	45.0	21	0.24	0.000	Open
P-98	779	J-15	J-53	6.0	CIP	45.0	13	0.15	0.000	Open
P-99	766	J-61	J-53	6.0	PVC	145.0	21	0.23	0.000	Open
P-100	193	J-6	J-23	2.0	PVC	145.0	3	0.27	0.000	Open
P-101	30	J-5	J-6	8.0	PVC	145.0	19	0.12	0.000	Open
P-102	13	J-4	J-5	6.0	PVC	145.0	20	0.23	0.000	Open
P-103	447	J-84	J-85	6.0	PVC	145.0	12	0.14	0.000	Open
P-104	508	J-85	J-4	8.0	PVC	145.0	22	0.14	0.000	Open
P-105	703	J-96	J-113	6.0	CIP	45.0	48	0.55	0.002	Open
P-106	175	J-113	J-69	6.0	CIP	45.0	40	0.46	0.001	Open
P-107	531	J-69	J-85	8.0	PVC	145.0	55	0.35	0.000	Open
P-108	434	J-72	J-70	8.0	PVC	145.0	282	1.80	0.001	Open
P-109	518	J-70	J-69	8.0	PVC	145.0	41	0.26	0.000	Open
P-110	430	J-79	J-77	6.0	PVC	145.0	12	0.14	0.000	Open
P-111	378	J-77	J-70	8.0	PVC	145.0	106	0.68	0.000	Open
P-112	164	J-15	J-16	4.0	CIP	45.0	4	0.10	0.000	Open
P-113	521	J-39	J-27	4.0	Steel	80.0	6	0.16	0.000	Open
P-114	683	J-6	J-99	8.0	PVC	145.0	11	0.07	0.000	Open

2045 Peak Hour w/ no Improvements

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-115	265	J-46	J-12	6.0	PVC	145.0	60	0.68	0.000	Open
P-116	133	J-85	J-115	6.0	PVC	145.0	16	0.18	0.000	Open
P-117	644	J-115	J-4	6.0	PVC	145.0	5	0.06	0.000	Open
P-118	146	J-11	J-12	1.0	CU	145.0	3	1.10	0.006	Open
P-119	275	J-69	J-19	6.0	CIP	45.0	17	0.20	0.000	Open
P-120	172	J-19	J-20	6.0	PVC	145.0	5	0.06	0.000	Open
P-121	276	J-70	J-71	8.0	PVC	145.0	125	0.80	0.000	Open
P-122	521	J-71	J-19	6.0	PVC	145.0	15	0.17	0.000	Open
P-123	284	J-77	J-76	6.0	PVC	145.0	83	0.94	0.001	Open
P-124	379	J-76	J-71	6.0	PVC	145.0	71	0.81	0.000	Open
P-125	209	J-27	J-28	6.0	PVC	145.0	4	0.05	0.000	Open
P-126	283	J-28	J-76	6.0	PVC	145.0	142	1.61	0.002	Open
P-127	204	J-12	J-26	6.0	PVC	145.0	67	0.76	0.000	Open
P-128	273	J-28	J-26	6.0	PVC	145.0	78	0.89	0.001	Open
P-129	261	J-26	J-49	6.0	PVC	145.0	16	0.19	0.000	Open
P-130	287	J-49	J-78	6.0	PVC	145.0	8	0.09	0.000	Open
P-131	284	J-71	J-64	6.0	PVC	145.0	28	0.32	0.000	Open
P-132	340	J-26	J-58	6.0	PVC	145.0	10	0.12	0.000	Open
P-133	346	J-28	J-13	6.0	PVC	145.0	53	0.60	0.000	Open
P-134	273	J-58	J-13	6.0	PVC	145.0	45	0.51	0.000	Open
P-135	345	J-49	J-59	6.0	PVC	145.0	3	0.03	0.000	Open
P-136	263	J-58	J-59	6.0	PVC	145.0	21	0.24	0.000	Open
P-137	344	J-78	J-75	6.0	PVC	145.0	3	0.03	0.000	Open
P-138	282	J-59	J-75	6.0	PVC	145.0	8	0.09	0.000	Open
P-139	162	J-13	J-14	2.0	PVC	145.0	3	0.27	0.000	Open
P-140	272	J-64	J-65	6.0	PVC	145.0	8	0.09	0.000	Open
P-141	661	J-64	J-29	6.0	PVC	145.0	12	0.14	0.000	Open
P-142	368	J-29	J-65	2.0	Galvanized Steel	120.0	1	0.10	0.000	Open
P-143	702	J-19	J-116	6.0	CIP	45.0	13	0.15	0.000	Open
P-144	100	J-116	J-102	6.0	CIP	45.0	3	0.03	0.000	Open
P-145	214	J-29	J-30	6.0	PVC	145.0	5	0.06	0.000	Open
P-146	533	J-58	J-90	6.0	PVC	145.0	7	0.08	0.000	Open
P-147	438	J-75	J-91	6.0	PVC	145.0	2	0.02	0.000	Open
P-148	708	J-59	J-91	6.0	PVC	145.0	5	0.06	0.000	Open

Junction Table - Time: 0.00 hours

2045 Peak Hour w/ no Improvements

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,090.55	<None>	<Collection: 1 item>	4	5,250.58	69
J-2	5,074.99	<None>	<Collection: 1 item>	5	5,250.78	76
J-3	5,074.98	<None>	<Collection: 1 item>	4	5,250.78	76
J-4	5,088.83	<None>	<Collection: 1 item>	7	5,252.36	71
J-5	5,088.97	<None>	<Collection: 1 item>	1	5,252.36	71
J-6	5,088.48	<None>	<Collection: 1 item>	5	5,252.36	71
J-7	5,118.08	<None>	<Collection: 1 item>	9	5,251.04	58
J-8	5,120.11	<None>	<Collection: 1 item>	12	5,251.06	57
J-9	5,091.56	<None>	<Collection: 1 item>	5	5,250.30	69
J-10	5,097.08	<None>	<Collection: 1 item>	7	5,250.17	66
J-11	5,048.08	<None>	<Collection: 1 item>	3	5,250.53	88
J-12	5,058.45	<None>	<Collection: 1 item>	4	5,251.48	84
J-13	5,107.71	<None>	<Collection: 1 item>	5	5,251.62	62
J-14	5,091.23	<None>	<Collection: 1 item>	3	5,251.58	69
J-15	5,039.74	<None>	<Collection: 1 item>	4	5,250.98	91
J-16	5,041.86	<None>	<Collection: 1 item>	4	5,250.96	90
J-17	5,088.75	<None>	<Collection: 1 item>	5	5,253.29	71
J-18	5,096.97	<None>	<Collection: 1 item>	17	5,253.45	68
J-19	5,087.49	<None>	<Collection: 1 item>	13	5,252.33	71
J-20	5,087.59	<None>	<Collection: 1 item>	5	5,252.33	71
J-21	5,064.77	<None>	<Collection: 1 item>	7	5,250.38	80
J-22	5,061.85	<None>	<Collection: 1 item>	5	5,250.59	82
J-23	5,090.66	<None>	<Collection: 1 item>	3	5,252.32	70
J-24	5,099.33	<None>	<Collection: 1 item>	7	5,250.35	65
J-25	5,107.11	<None>	<Collection: 1 item>	5	5,250.59	62
J-26	5,067.27	<None>	<Collection: 1 item>	5	5,251.56	80
J-27	5,069.96	<None>	<Collection: 1 item>	11	5,251.71	79
J-28	5,087.30	<None>	<Collection: 1 item>	7	5,251.71	71
J-29	5,097.72	<None>	<Collection: 1 item>	8	5,252.31	67
J-30	5,095.31	<None>	<Collection: 1 item>	5	5,252.31	68
J-31	5,050.18	<None>	<Collection: 1 item>	9	5,251.76	87
J-32	5,061.81	<None>	<Collection: 1 item>	9	5,253.23	83
J-33	5,058.61	<None>	<Collection: 1 item>	3	5,248.64	82
J-34	5,049.85	<None>	<Collection: 1 item>	4	5,250.09	87
J-35	5,010.67	<None>	<Collection: 1 item>	3	5,222.52	92
J-36	5,009.18	<None>	<Collection: 1 item>	5	5,235.98	98
J-37	5,106.14	<None>	<Collection: 1 item>	15	5,250.76	63

2045 Peak Hour w/ no Improvements

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-38	5,263.66	Tank Node	<Collection: 0 items>	0	5,276.54	6
J-39	5,048.66	<None>	<Collection: 1 item>	13	5,251.76	88
J-40	5,041.60	<None>	<Collection: 1 item>	12	5,251.36	91
J-41	5,056.26	<None>	<Collection: 1 item>	17	5,251.73	85
J-42	5,092.61	<None>	<Collection: 1 item>	7	5,250.58	68
J-43	5,078.04	<None>	<Collection: 1 item>	12	5,250.60	75
J-44	5,070.00	<None>	<Collection: 1 item>	4	5,250.65	78
J-45	5,037.84	<None>	<Collection: 1 item>	11	5,251.00	92
J-46	5,042.76	<None>	<Collection: 1 item>	9	5,251.39	90
J-47	5,051.79	<None>	<Collection: 1 item>	8	5,250.41	86
J-48	5,088.63	<None>	<Collection: 1 item>	7	5,250.78	70
J-49	5,042.46	<None>	<Collection: 1 item>	5	5,251.55	90
J-50	5,106.21	<None>	<Collection: 1 item>	5	5,250.58	62
J-51	5,097.31	<None>	<Collection: 1 item>	9	5,250.58	66
J-52	5,081.27	<None>	<Collection: 1 item>	11	5,250.61	73
J-53	5,029.00	<None>	<Collection: 1 item>	13	5,250.85	96
J-54	5,027.73	<None>	<Collection: 1 item>	4	5,250.96	97
J-55	5,038.43	<None>	<Collection: 1 item>	8	5,250.60	92
J-56	5,029.39	<None>	<Collection: 1 item>	8	5,250.59	96
J-57	5,066.97	<None>	<Collection: 1 item>	8	5,250.76	80
J-58	5,068.85	<None>	<Collection: 1 item>	7	5,251.56	79
J-59	5,041.81	<None>	<Collection: 1 item>	11	5,251.55	91
J-60	5,106.38	<None>	<Collection: 1 item>	5	5,250.59	62
J-61	5,024.18	<None>	<Collection: 1 item>	16	5,250.82	98
J-62	5,021.41	<None>	<Collection: 1 item>	9	5,249.32	99
J-63	5,020.41	<None>	<Collection: 1 item>	5	5,249.26	99
J-64	5,108.06	<None>	<Collection: 1 item>	8	5,252.32	62
J-65	5,121.04	<None>	<Collection: 1 item>	7	5,252.32	57
J-66	5,023.71	<None>	<Collection: 1 item>	7	5,247.94	97
J-67	5,032.50	<None>	<Collection: 1 item>	7	5,250.53	94
J-68	5,025.43	<None>	<Collection: 1 item>	7	5,250.20	97
J-69	5,078.56	<None>	<Collection: 1 item>	9	5,252.41	75
J-70	5,073.98	<None>	<Collection: 1 item>	9	5,252.43	77
J-71	5,091.91	<None>	<Collection: 1 item>	11	5,252.34	69
J-72	5,066.97	<None>	<Collection: 1 item>	12	5,253.05	81
J-73	5,131.56	<None>	<Collection: 1 item>	9	5,253.43	53
J-74	5,137.70	<None>	<Collection: 1 item>	5	5,246.95	47

2045 Peak Hour w/ no Improvements

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-75	5,034.40	<None>	<Collection: 1 item>	9	5,251.55	94
J-76	5,101.86	<None>	<Collection: 1 item>	12	5,252.17	65
J-77	5,075.31	<None>	<Collection: 1 item>	11	5,252.34	77
J-78	5,036.50	<None>	<Collection: 1 item>	5	5,251.55	93
J-79	5,057.50	<None>	<Collection: 1 item>	9	5,252.33	84
J-80	5,100.76	<None>	<Collection: 1 item>	8	5,250.58	65
J-81	5,087.54	<None>	<Collection: 1 item>	4	5,250.57	71
J-82	5,056.67	<None>	<Collection: 1 item>	7	5,250.59	84
J-83	5,045.80	<None>	<Collection: 1 item>	3	5,250.59	89
J-84	5,081.01	<None>	<Collection: 1 item>	12	5,252.36	74
J-85	5,082.50	<None>	<Collection: 1 item>	5	5,252.37	73
J-86	5,119.55	<None>	<Collection: 1 item>	5	5,250.63	57
J-87	5,111.43	<None>	<Collection: 1 item>	4	5,250.57	60
J-88	5,063.58	<None>	<Collection: 1 item>	11	5,250.59	81
J-89	5,030.14	<None>	<Collection: 1 item>	11	5,250.54	95
J-90	5,056.93	<None>	<Collection: 1 item>	7	5,251.56	84
J-91	5,027.47	<None>	<Collection: 1 item>	7	5,251.55	97
J-92	5,015.59	<None>	<Collection: 1 item>	16	5,249.25	101
J-93	5,012.00	<None>	<Collection: 1 item>	12	5,249.23	103
J-94	5,031.81	<None>	<Collection: 1 item>	12	5,250.54	95
J-95	5,071.86	<None>	<Collection: 1 item>	13	5,250.68	77
J-96	5,110.08	<None>	<Collection: 1 item>	8	5,254.01	62
J-97	5,018.60	<None>	<Collection: 1 item>	4	5,250.54	100
J-98	5,042.61	<None>	<Collection: 1 item>	21	5,251.23	90
J-99	5,069.96	<None>	<Collection: 1 item>	11	5,252.36	79
J-100	5,018.92	<None>	<Collection: 1 item>	9	5,250.52	100
J-101	5,008.54	<None>	<Collection: 1 item>	4	5,250.52	105
J-102	5,119.06	<None>	<Collection: 1 item>	3	5,252.20	58
J-103	5,012.39	<None>	<Collection: 1 item>	1	5,249.24	102
J-104	5,141.69	<None>	<Collection: 0 items>	0	5,261.75	52
J-105	5,110.65	<None>	<Collection: 1 item>	9	5,257.01	63
J-106	5,093.82	<None>	<Collection: 1 item>	3	5,250.58	68
J-107	5,266.76	Tank Node	<Collection: 0 items>	0	5,276.73	4
J-108	5,130.43	<None>	<Collection: 0 items>	0	5,265.93	59
J-110	5,119.47	<None>	<Collection: 1 item>	7	5,250.62	57
J-112	5,132.34	<None>	<Collection: 1 item>	11	5,252.73	52
J-113	5,080.08	<None>	<Collection: 1 item>	8	5,252.65	75

2045 Peak Hour w/ no Improvements

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-114	5,050.04	<None>	<Collection: 1 item>	1	5,250.57	87
J-115	5,082.63	<None>	<Collection: 1 item>	11	5,252.37	73
J-116	5,121.37	<None>	<Collection: 1 item>	11	5,252.20	57
J-117	5,067.58	<None>	<Collection: 1 item>	1	5,250.58	79
J-118	5,018.00	<None>	<Collection: 1 item>	3	5,250.52	101

Tank Table - Time: 0.00 hours

Label	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)	Elevation (ft)	Diameter (ft)	Volume Full (Calculated) (MG)	Percent Full (%)
T-1	5,267.00	5,267.00	5,277.00	5,282.00	864	5,277.00	5,271.27	80.00	0.56	66.7

Existing System Fire Flow Availability
Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-1	19	895	21	20	J-106	4	J-107
J-2	3	1,492	20	21	J-3	4	J-107
J-3	3	1,494	20	20	J-2	4	J-107
J-4	22	1,841	24	20	J-74	4	J-107
J-5	22	1,841	23	20	J-74	4	J-107
J-6	22	1,841	23	20	J-74	4	J-107
J-7	3	1,172	20	23	J-8	4	J-107
J-8	3	1,170	20	24	J-7	4	J-107
J-9	18	315	23	20	J-10	4	J-107
J-10	3	198	20	55	J-9	4	J-107
J-11	13	44	22	59	J-104	4	J-107
J-12	7	1,801	38	20	J-74	4	J-107
J-13	3	1,666	20	26	J-74	4	J-107
J-14	15	227	20	58	J-104	4	J-107
J-15	20	1,556	21	20	J-16	4	J-107
J-16	3	484	20	55	J-74	4	J-107
J-17	5	1,852	38	20	J-74	4	J-107
J-18	4	1,855	35	20	J-74	4	J-107
J-19	5	1,513	35	20	J-116	4	J-107
J-20	4	1,513	25	20	J-116	4	J-107
J-21	3	239	20	58	J-74	4	J-107
J-22	5	1,653	34	20	J-110	4	J-107
J-23	3	211	20	58	J-104	4	J-107
J-24	3	192	20	58	J-74	4	J-107
J-25	3	1,266	20	23	J-24	4	J-107
J-26	5	1,793	36	20	J-13	4	J-107
J-27	37	1,812	23	20	J-74	4	J-107
J-28	5	1,802	28	20	J-13	4	J-107
J-29	3	1,240	20	21	J-30	4	J-107
J-30	3	1,164	20	26	J-29	4	J-107
J-31	5	1,798	37	20	J-74	4	J-107
J-32	20	1,850	25	20	J-74	4	J-107
J-33	13	32	21	59	J-104	4	J-107
J-34	17	175	24	20	J-33	4	J-107
J-35	12	9	21	59	J-104	4	J-107

Existing System Fire Flow Availability

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-36	15	31	25	22	J-35	4	J-107
J-37	3	1,274	20	28	J-7	4	J-107
J-38	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
J-39	7	1,794	52	20	J-74	4	J-107
J-40	22	1,774	54	20	J-74	4	J-107
J-41	3	1,771	20	21	J-74	4	J-107
J-42	5	1,249	22	20	J-10	4	J-107
J-43	5	1,604	33	20	J-110	4	J-107
J-44	5	1,654	37	20	J-110	4	J-107
J-45	5	1,754	53	20	J-86	4	J-107
J-46	7	1,789	47	20	J-74	4	J-107
J-47	18	447	23	20	J-33	4	J-107
J-48	3	1,301	20	33	J-74	4	J-107
J-49	5	1,779	40	20	J-13	4	J-107
J-50	3	1,327	20	24	J-87	4	J-107
J-51	5	1,366	25	20	J-87	4	J-107
J-52	3	1,178	20	38	J-74	4	J-107
J-53	22	1,755	30	20	J-74	4	J-107
J-54	5	1,755	53	20	J-86	4	J-107
J-55	3	1,689	20	20	J-110	4	J-107
J-56	3	1,552	20	27	J-110	4	J-107
J-57	5	1,696	40	20	J-110	4	J-107
J-58	5	1,747	34	20	J-13	4	J-107
J-59	5	1,771	40	20	J-13	4	J-107
J-60	3	1,318	20	21	J-25	4	J-107
J-61	6	1,755	37	20	J-74	4	J-107
J-62	3	663	20	20	J-35	4	J-107
J-63	3	342	20	57	J-74	4	J-107
J-64	3	1,480	26	20	J-65	4	J-107
J-65	3	1,290	20	36	J-64	4	J-107
J-66	14	63	21	58	J-104	4	J-107
J-67	3	1,557	20	23	J-68	4	J-107
J-68	3	208	20	58	J-74	4	J-107
J-69	23	1,841	38	20	J-74	4	J-107
J-70	23	1,839	43	20	J-74	4	J-107

Existing System Fire Flow Availability

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-71	5	1,837	33	20	J-65	4	J-107
J-72	21	1,848	48	20	J-74	4	J-107
J-73	5	828	24	20	J-74	4	J-107
J-74	12	19	22	59	J-104	4	J-107
J-75	5	1,774	39	20	J-13	4	J-107
J-76	5	1,828	27	20	J-74	4	J-107
J-77	5	1,834	41	20	J-74	4	J-107
J-78	5	1,776	36	20	J-13	4	J-107
J-79	5	1,820	50	20	J-74	4	J-107
J-80	5	1,245	25	20	J-87	4	J-107
J-81	3	805	20	47	J-74	4	J-107
J-82	5	1,644	31	20	J-110	4	J-107
J-83	3	1,599	20	22	J-110	4	J-107
J-84	3	1,543	20	31	J-74	4	J-107
J-85	6	1,841	30	20	J-74	4	J-107
J-86	3	1,138	20	21	J-110	4	J-107
J-87	3	674	20	50	J-74	4	J-107
J-88	5	1,582	33	20	J-106	4	J-107
J-89	3	1,593	20	25	J-110	4	J-107
J-90	3	1,534	20	30	J-74	4	J-107
J-91	5	1,772	34	20	J-13	4	J-107
J-92	19	638	22	20	J-35	4	J-107
J-93	5	617	24	20	J-35	4	J-107
J-94	20	1,665	20	20	J-110	4	J-107
J-95	5	1,670	37	20	J-110	4	J-107
J-96	21	1,868	30	20	J-74	4	J-107
J-97	3	1,429	20	31	J-74	4	J-107
J-98	5	1,763	28	20	J-74	4	J-107
J-99	22	1,841	23	20	J-74	4	J-107
J-100	3	1,281	20	20	J-118	4	J-107
J-101	3	1,052	20	32	J-118	4	J-107
J-102	3	451	20	24	J-116	4	J-107
J-103	3	207	20	58	J-104	4	J-107
J-104	3	2,235	20	20	J-74	4	J-107
J-105	19	1,943	33	20	J-74	4	J-107

Existing System Fire Flow Availability

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-106	3	854	20	26	J-1	4	J-107
J-107	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
J-108	21	2,659	25	20	J-104	3	J-107
J-110	3	1,123	20	22	J-86	4	J-107
J-112	3	857	20	24	J-74	4	J-107
J-113	2	1,429	20	35	J-74	4	J-107
J-114	5	1,660	27	20	J-110	4	J-107
J-115	22	1,841	24	20	J-74	4	J-107
J-116	3	475	20	21	J-102	4	J-107
J-117	5	1,239	31	20	J-106	4	J-107
J-118	3	1,138	20	24	J-101	4	J-107

2045 Fire Flow Availability w/ no Improvements

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-1	5	860	21	20	J-106	4	J-107
J-2	3	1,418	20	21	J-3	4	J-107
J-3	3	1,419	20	20	J-2	4	J-107
J-4	15	1,677	27	20	J-74	4	J-107
J-5	15	1,677	27	20	J-74	4	J-107
J-6	15	1,677	27	20	J-74	4	J-107
J-7	3	1,105	20	23	J-8	4	J-107
J-8	3	1,102	20	24	J-7	4	J-107
J-9	18	307	23	20	J-10	4	J-107
J-10	3	193	20	54	J-9	4	J-107
J-11	13	43	22	58	J-74	4	J-107
J-12	6	1,638	41	20	J-74	4	J-107
J-13	4	1,561	20	23	J-74	4	J-107
J-14	3	224	20	56	J-74	4	J-107
J-15	5	1,492	21	20	J-16	4	J-107
J-16	3	475	20	52	J-74	4	J-107
J-17	6	1,689	39	20	J-74	4	J-107
J-18	6	1,692	36	20	J-74	4	J-107
J-19	6	1,417	35	20	J-116	4	J-107
J-20	5	1,417	26	20	J-116	4	J-107
J-21	3	235	20	56	J-74	4	J-107
J-22	6	1,526	36	20	J-110	4	J-107
J-23	3	208	20	56	J-74	4	J-107
J-24	3	188	20	56	J-74	4	J-107
J-25	3	1,192	20	23	J-24	4	J-107
J-26	8	1,646	37	20	J-74	4	J-107
J-27	6	1,650	28	20	J-74	4	J-107
J-28	8	1,650	30	20	J-74	4	J-107
J-29	3	1,184	20	21	J-30	4	J-107
J-30	3	1,114	20	26	J-29	4	J-107
J-31	6	1,636	40	20	J-74	4	J-107
J-32	6	1,686	30	20	J-74	4	J-107
J-33	13	32	21	58	J-74	4	J-107
J-34	17	172	25	20	J-33	4	J-107
J-35	12	8	26	58	J-74	4	J-107

2045 Fire Flow Availability w/ no Improvements

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-36	15	29	26	22	J-35	4	J-107
J-37	3	1,201	20	27	J-7	4	J-107
J-38	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
J-39	8	1,633	53	20	J-74	4	J-107
J-40	8	1,615	55	20	J-74	4	J-107
J-41	6	1,635	24	20	J-74	4	J-107
J-42	5	1,182	22	20	J-10	4	J-107
J-43	6	1,482	34	20	J-110	4	J-107
J-44	6	1,526	38	20	J-110	4	J-107
J-45	9	1,596	55	20	J-74	4	J-107
J-46	8	1,627	50	20	J-74	4	J-107
J-47	18	436	24	20	J-33	4	J-107
J-48	3	1,237	20	30	J-74	4	J-107
J-49	8	1,646	42	20	J-74	4	J-107
J-50	3	1,248	20	23	J-110	4	J-107
J-51	5	1,279	26	20	J-87	4	J-107
J-52	3	1,125	20	34	J-74	4	J-107
J-53	8	1,597	35	20	J-74	4	J-107
J-54	9	1,596	55	20	J-74	4	J-107
J-55	6	1,560	24	20	J-110	4	J-107
J-56	3	1,487	20	23	J-74	4	J-107
J-57	6	1,564	40	20	J-110	4	J-107
J-58	6	1,632	34	20	J-13	4	J-107
J-59	8	1,647	42	20	J-74	4	J-107
J-60	3	1,239	20	21	J-25	4	J-107
J-61	8	1,596	41	20	J-74	4	J-107
J-62	5	633	22	20	J-35	4	J-107
J-63	3	335	20	55	J-74	4	J-107
J-64	5	1,389	26	20	J-65	4	J-107
J-65	3	1,218	20	35	J-64	4	J-107
J-66	14	62	21	57	J-74	4	J-107
J-67	3	1,490	20	23	J-110	4	J-107
J-68	3	205	20	56	J-74	4	J-107
J-69	5	1,676	39	20	J-74	4	J-107
J-70	6	1,675	44	20	J-74	4	J-107

2045 Fire Flow Availability w/ no Improvements

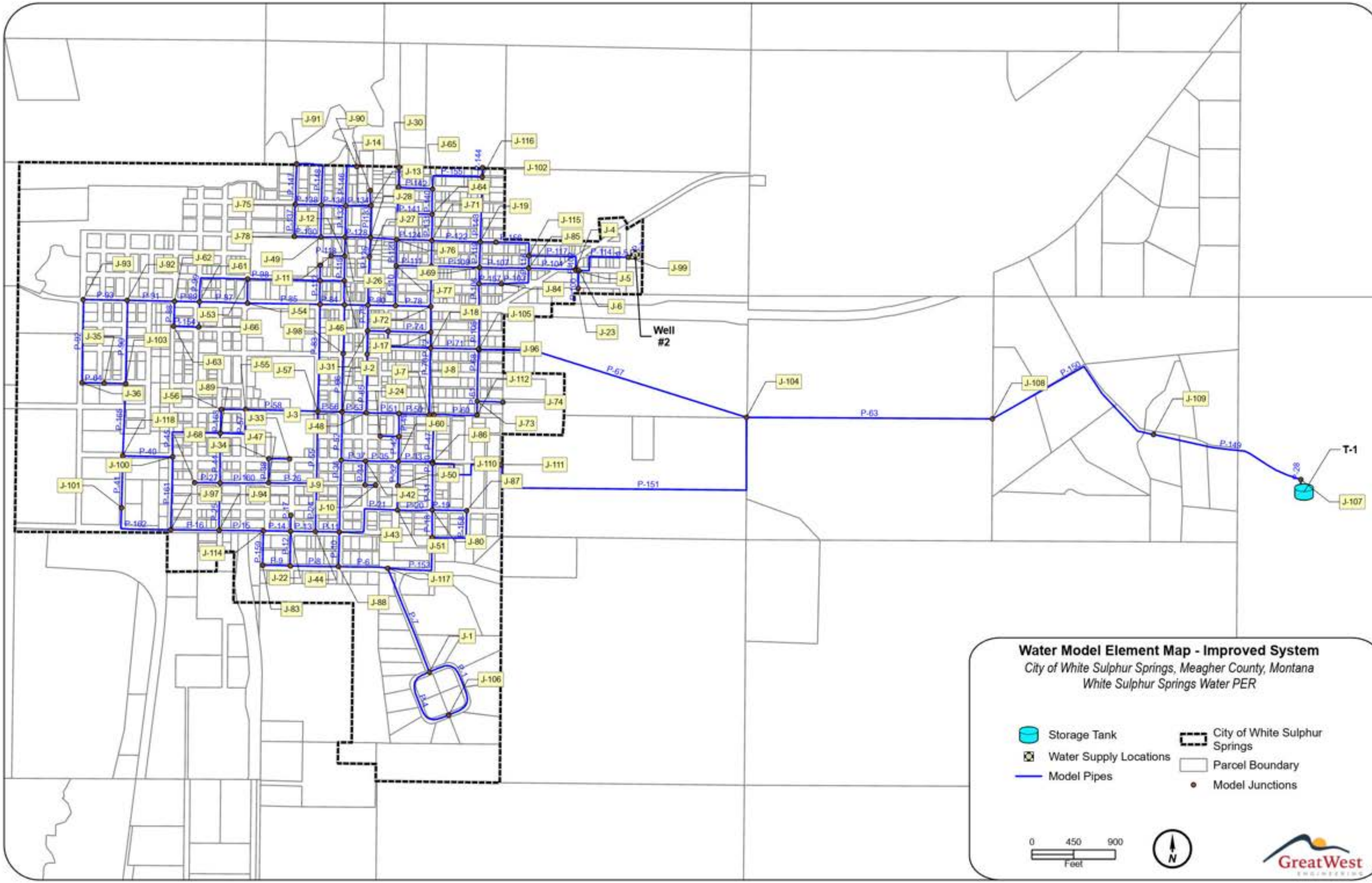
Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-71	8	1,673	34	20	J-74	4	J-107
J-72	6	1,685	48	20	J-74	4	J-107
J-73	5	781	24	20	J-74	4	J-107
J-74	12	18	22	58	J-104	4	J-107
J-75	8	1,646	41	20	J-74	4	J-107
J-76	6	1,664	28	20	J-74	4	J-107
J-77	6	1,670	42	20	J-74	4	J-107
J-78	8	1,646	39	20	J-74	4	J-107
J-79	6	1,658	51	20	J-74	4	J-107
J-80	5	1,171	25	20	J-87	4	J-107
J-81	3	776	20	44	J-74	4	J-107
J-82	6	1,517	33	20	J-110	4	J-107
J-83	6	1,517	21	20	J-110	4	J-107
J-84	12	1,473	20	28	J-74	4	J-107
J-85	15	1,677	33	20	J-74	4	J-107
J-86	3	1,071	20	20	J-110	4	J-107
J-87	3	648	20	48	J-74	4	J-107
J-88	6	1,485	33	20	J-106	4	J-107
J-89	3	1,524	20	22	J-110	4	J-107
J-90	3	1,469	20	27	J-74	4	J-107
J-91	8	1,647	37	20	J-74	4	J-107
J-92	5	608	25	20	J-35	4	J-107
J-93	5	588	26	20	J-35	4	J-107
J-94	6	1,537	25	20	J-110	4	J-107
J-95	6	1,540	37	20	J-110	4	J-107
J-96	6	1,705	31	20	J-74	4	J-107
J-97	3	1,376	20	27	J-74	4	J-107
J-98	6	1,604	33	20	J-74	4	J-107
J-99	12	1,677	29	20	J-74	4	J-107
J-100	3	1,236	20	20	J-118	4	J-107
J-101	3	1,022	20	31	J-118	4	J-107
J-102	3	438	20	24	J-116	4	J-107
J-103	3	204	20	56	J-74	4	J-107
J-104	6	2,079	20	20	J-74	4	J-107
J-105	6	1,779	34	20	J-74	4	J-107

2045 Fire Flow Availability w/ no Improvements

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-106	3	821	20	26	J-1	4	J-107
J-107	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
J-108	6	2,497	25	20	J-74	3	J-107
J-110	3	1,057	20	22	J-86	4	J-107
J-112	3	817	20	23	J-74	4	J-107
J-113	3	1,369	20	31	J-74	4	J-107
J-114	6	1,531	30	20	J-110	4	J-107
J-115	15	1,677	28	20	J-74	4	J-107
J-116	3	461	20	21	J-102	4	J-107
J-117	5	1,176	31	20	J-106	4	J-107
J-118	3	1,101	20	24	J-101	4	J-107


Water Model Element Map - Improved System
City of White Sulphur Springs, Meagher County, Montana
White Sulphur Springs Water PER
Storage Tank
Water Supply Locations
Model Pipes
City of White Sulphur Springs
Parcel Boundary
Model Junctions
0 450 900
Feet
N
GreatWest
Well #2
T-1
P-63
P-67
P-151
P-150
P-149
J-104
J-108
J-109
J-107
J-96
J-87
J-111
J-106
J-1
P-7

2045 Peak Hour w/ Improvements and Reduced Leakage

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-1	940	J-1	J-106	6.0	PVC	145.0	1	0.02	0.000	Open
P-4	855	J-106	J-1	6.0	PVC	145.0	0	0.00	0.000	Open
P-6	532	J-88	J-117	6.0	PVC	145.0	25	0.28	0.000	Open
P-7	1,204	J-117	J-1	6.0	PVC	145.0	4	0.05	0.000	Open
P-8	518	J-88	J-82	6.0	PVC	145.0	22	0.25	0.000	Open
P-9	299	J-82	J-83	6.0	PVC	145.0	11	0.12	0.000	Open
P-10	372	J-88	J-43	6.0	PVC	145.0	4	0.04	0.000	Open
P-11	257	J-43	J-44	6.0	PVC	145.0	31	0.35	0.000	Open
P-12	374	J-22	J-82	6.0	PVC	145.0	7	0.08	0.000	Open
P-13	268	J-44	J-22	6.0	PVC	145.0	12	0.14	0.000	Open
P-14	294	J-22	J-114	6.0	PVC	145.0	12	0.14	0.000	Open
P-15	476	J-114	J-94	6.0	PVC	145.0	21	0.23	0.000	Open
P-16	521	J-94	J-97	6.0	PVC	145.0	12	0.13	0.000	Open
P-17	172	J-21	J-22	6.0	PVC	145.0	4	0.05	0.000	Open
P-18	298	J-80	J-81	6.0	PVC	145.0	22	0.25	0.000	Open
P-19	371	J-80	J-87	6.0	PVC	145.0	13	0.14	0.000	Open
P-20	374	J-51	J-80	6.0	PVC	145.0	29	0.32	0.000	Open
P-21	870	J-43	J-51	6.0	PVC	145.0	32	0.36	0.000	Open
P-22	261	J-50	J-51	6.0	PVC	145.0	9	0.10	0.000	Open
P-23	114	J-9	J-10	6.0	PVC	145.0	4	0.05	0.000	Open
P-24	519	J-95	J-44	10.0	PVC	145.0	17	0.07	0.000	Open
P-25	511	J-94	J-67	6.0	PVC	145.0	2	0.02	0.000	Open
P-26	517	J-95	J-47	6.0	PVC	145.0	20	0.23	0.000	Open
P-27	275	J-67	J-68	6.0	PVC	145.0	4	0.05	0.000	Open
P-28	173	T-1	J-107	12.0	PVC	145.0	512	1.45	0.001	Open
P-30	17	J-86	J-110	6.0	PVC	145.0	140	1.59	0.002	Open
P-31	499	J-110	J-80	6.0	PVC	145.0	68	0.77	0.000	Open
P-32	263	J-50	J-60	6.0	PVC	145.0	12	0.14	0.000	Open
P-33	368	J-60	J-86	6.0	PVC	145.0	79	0.90	0.001	Open
P-34	257	J-42	J-9	6.0	PVC	145.0	7	0.08	0.000	Open
P-35	355	J-42	J-60	6.0	PVC	145.0	43	0.48	0.000	Open
P-36	774	J-52	J-43	6.0	PVC	145.0	10	0.11	0.000	Open
P-37	261	J-52	J-42	6.0	PVC	145.0	31	0.36	0.000	Open
P-38	260	J-34	J-47	6.0	PVC	145.0	4	0.05	0.000	Open
P-39	225	J-33	J-34	6.0	PVC	145.0	2	0.02	0.000	Open
P-40	538	J-100	J-118	6.0	PVC	145.0	7	0.07	0.000	Open
P-41	559	J-118	J-101	6.0	PVC	145.0	3	0.04	0.000	Open

2045 Peak Hour w/ Improvements and Reduced Leakage

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-42	270	J-60	J-25	6.0	PVC	145.0	21	0.24	0.000	Open
P-43	202	J-24	J-25	6.0	PVC	145.0	4	0.05	0.000	Open
P-44	537	J-89	J-67	6.0	PVC	145.0	5	0.06	0.000	Open
P-45	785	J-100	J-89	6.0	PVC	145.0	9	0.10	0.000	Open
P-47	511	J-8	J-86	6.0	PVC	145.0	58	0.66	0.000	Open
P-48	50	J-7	J-8	6.0	PVC	145.0	63	0.72	0.000	Open
P-49	246	J-37	J-25	6.0	PVC	145.0	14	0.15	0.000	Open
P-50	327	J-37	J-7	6.0	PVC	145.0	36	0.41	0.000	Open
P-51	352	J-48	J-37	6.0	PVC	145.0	41	0.47	0.000	Open
P-52	520	J-3	J-52	6.0	PVC	145.0	15	0.17	0.000	Open
P-53	260	J-3	J-48	6.0	PVC	145.0	31	0.36	0.000	Open
P-54	3	J-2	J-3	6.0	PVC	145.0	44	0.50	0.000	Open
P-55	777	J-57	J-95	10.0	PVC	145.0	11	0.05	0.000	Open
P-56	263	J-57	J-2	6.0	PVC	145.0	28	0.32	0.000	Open
P-57	530	J-89	J-55	6.0	PVC	145.0	6	0.07	0.000	Open
P-58	779	J-57	J-55	6.0	PVC	145.0	19	0.22	0.000	Open
P-59	262	J-55	J-56	6.0	PVC	145.0	8	0.09	0.000	Open
P-60	471	J-8	J-112	6.0	PVC	145.0	13	0.14	0.000	Open
P-61	148	J-112	J-73	6.0	PVC	145.0	19	0.22	0.000	Open
P-62	278	J-73	J-74	6.0	PVC	145.0	3	0.04	0.000	Open
P-63	2,651	J-108	J-104	12.0	PVC	145.0	512	1.45	0.001	Open
P-64	238	J-35	J-36	6.0	PVC	145.0	5	0.05	0.000	Open
P-65	631	J-41	J-48	6.0	PVC	145.0	6	0.07	0.000	Open
P-66	627	J-98	J-2	6.0	PVC	145.0	13	0.15	0.000	Open
P-67	2,996	J-104	J-105	12.0	PVC	145.0	300	0.85	0.000	Open
P-68	555	J-73	J-105	6.0	PVC	145.0	28	0.32	0.000	Open
P-69	9	J-105	J-96	6.0	PVC	145.0	267	3.03	0.005	Open
P-70	717	J-18	J-7	6.0	PVC	145.0	21	0.24	0.000	Open
P-71	519	J-18	J-96	12.0	PVC	145.0	217	0.61	0.000	Open
P-72	171	J-17	J-18	12.0	PVC	145.0	204	0.58	0.000	Open
P-73	628	J-32	J-18	6.0	PVC	145.0	24	0.27	0.000	Open
P-74	461	J-32	J-17	6.0	PVC	145.0	19	0.22	0.000	Open
P-75	252	J-31	J-41	6.0	PVC	145.0	4	0.05	0.000	Open
P-76	221	J-31	J-32	6.0	PVC	145.0	38	0.43	0.000	Open
P-77	277	J-72	J-17	12.0	PVC	145.0	181	0.51	0.000	Open
P-78	380	J-72	J-79	10.0	PVC	145.0	109	0.44	0.000	Open
P-79	278	J-39	J-31	6.0	PVC	145.0	28	0.32	0.000	Open

2045 Peak Hour w/ Improvements and Reduced Leakage

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-80	298	J-79	J-39	10.0	PVC	145.0	87	0.36	0.000	Open
P-81	527	J-40	J-98	6.0	PVC	145.0	0	0.00	0.000	Open
P-82	252	J-39	J-40	10.0	PVC	145.0	89	0.36	0.000	Open
P-83	1,153	J-45	J-57	10.0	PVC	145.0	8	0.03	0.000	Open
P-84	264	J-40	J-45	10.0	PVC	145.0	62	0.25	0.000	Open
P-85	781	J-45	J-54	10.0	PVC	145.0	36	0.15	0.000	Open
P-86	273	J-61	J-66	6.0	PVC	145.0	12	0.13	0.000	Open
P-87	519	J-54	J-61	6.0	PVC	145.0	21	0.24	0.000	Open
P-88	269	J-62	J-63	6.0	PVC	145.0	4	0.05	0.000	Open
P-89	268	J-61	J-62	6.0	PVC	145.0	15	0.17	0.000	Open
P-90	899	J-92	J-103	6.0	PVC	145.0	1	0.01	0.000	Open
P-91	511	J-62	J-92	6.0	PVC	145.0	14	0.16	0.000	Open
P-92	898	J-93	J-36	6.0	PVC	145.0	2	0.02	0.000	Open
P-93	475	J-92	J-93	6.0	PVC	145.0	6	0.06	0.000	Open
P-94	260	J-40	J-46	6.0	PVC	145.0	20	0.23	0.000	Open
P-95	258	J-45	J-15	6.0	PVC	145.0	12	0.13	0.000	Open
P-96	262	J-46	J-15	6.0	PVC	145.0	3	0.04	0.000	Open
P-97	262	J-53	J-54	6.0	PVC	145.0	13	0.15	0.000	Open
P-98	779	J-15	J-53	6.0	PVC	145.0	10	0.11	0.000	Open
P-99	766	J-61	J-53	6.0	PVC	145.0	15	0.17	0.000	Open
P-100	193	J-6	J-23	6.0	PVC	145.0	2	0.02	0.000	Open
P-101	30	J-5	J-6	8.0	PVC	145.0	11	0.07	0.000	Open
P-102	13	J-4	J-5	6.0	PVC	145.0	12	0.14	0.000	Open
P-103	447	J-84	J-85	6.0	PVC	145.0	11	0.12	0.000	Open
P-104	508	J-85	J-4	8.0	PVC	145.0	13	0.09	0.000	Open
P-105	703	J-96	J-113	6.0	PVC	145.0	46	0.52	0.000	Open
P-106	175	J-113	J-69	6.0	PVC	145.0	23	0.26	0.000	Open
P-107	531	J-69	J-85	8.0	PVC	145.0	17	0.11	0.000	Open
P-108	434	J-72	J-70	8.0	PVC	145.0	66	0.42	0.000	Open
P-109	518	J-70	J-69	8.0	PVC	145.0	14	0.09	0.000	Open
P-110	430	J-79	J-77	6.0	PVC	145.0	16	0.18	0.000	Open
P-111	378	J-77	J-70	8.0	PVC	145.0	11	0.07	0.000	Open
P-112	164	J-15	J-16	6.0	PVC	145.0	2	0.03	0.000	Open
P-113	521	J-39	J-27	6.0	PVC	145.0	18	0.21	0.000	Open
P-114	683	J-6	J-99	8.0	PVC	145.0	6	0.04	0.000	Open
P-115	265	J-46	J-12	6.0	PVC	145.0	11	0.13	0.000	Open
P-116	133	J-85	J-115	6.0	PVC	145.0	11	0.13	0.000	Open

2045 Peak Hour w/ Improvements and Reduced Leakage

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-117	644	J-115	J-4	6.0	PVC	145.0	3	0.03	0.000	Open
P-118	146	J-11	J-12	6.0	PVC	145.0	2	0.02	0.000	Open
P-119	275	J-69	J-19	6.0	PVC	145.0	15	0.17	0.000	Open
P-120	172	J-19	J-20	6.0	PVC	145.0	1	0.01	0.000	Open
P-121	276	J-70	J-71	8.0	PVC	145.0	35	0.23	0.000	Open
P-122	521	J-71	J-19	6.0	PVC	145.0	4	0.04	0.000	Open
P-123	284	J-77	J-76	6.0	PVC	145.0	20	0.22	0.000	Open
P-124	379	J-76	J-71	6.0	PVC	145.0	10	0.12	0.000	Open
P-125	209	J-27	J-28	6.0	PVC	145.0	12	0.14	0.000	Open
P-126	283	J-28	J-76	6.0	PVC	145.0	23	0.26	0.000	Open
P-127	204	J-12	J-26	6.0	PVC	145.0	7	0.08	0.000	Open
P-128	273	J-28	J-26	6.0	PVC	145.0	17	0.19	0.000	Open
P-129	261	J-26	J-49	6.0	PVC	145.0	13	0.14	0.000	Open
P-130	287	J-49	J-78	6.0	PVC	145.0	6	0.06	0.000	Open
P-131	284	J-71	J-64	6.0	PVC	145.0	15	0.17	0.000	Open
P-132	340	J-26	J-58	6.0	PVC	145.0	8	0.09	0.000	Open
P-133	346	J-28	J-13	6.0	PVC	145.0	14	0.16	0.000	Open
P-134	273	J-58	J-13	6.0	PVC	145.0	10	0.11	0.000	Open
P-135	345	J-49	J-59	6.0	PVC	145.0	4	0.04	0.000	Open
P-136	263	J-58	J-59	6.0	PVC	145.0	10	0.11	0.000	Open
P-137	344	J-78	J-75	6.0	PVC	145.0	2	0.03	0.000	Open
P-138	282	J-59	J-75	6.0	PVC	145.0	4	0.05	0.000	Open
P-139	162	J-13	J-14	6.0	PVC	145.0	2	0.02	0.000	Open
P-140	272	J-64	J-65	6.0	PVC	145.0	6	0.07	0.000	Open
P-141	661	J-64	J-29	6.0	PVC	145.0	5	0.05	0.000	Open
P-142	368	J-29	J-65	6.0	PVC	145.0	3	0.04	0.000	Open
P-143	702	J-19	J-116	6.0	PVC	145.0	9	0.11	0.000	Open
P-144	100	J-116	J-102	6.0	PVC	145.0	2	0.02	0.000	Open
P-145	214	J-29	J-30	6.0	PVC	145.0	3	0.04	0.000	Open
P-146	533	J-58	J-90	6.0	PVC	145.0	4	0.05	0.000	Open
P-147	438	J-75	J-91	6.0	PVC	145.0	1	0.01	0.000	Open
P-148	708	J-59	J-91	6.0	PVC	145.0	3	0.03	0.000	Open
P-149	1,683	J-107	J-109	12.0	PVC	145.0	512	1.45	0.001	Open
P-150	2,220	J-109	J-108	12.0	PVC	145.0	512	1.45	0.001	Open
P-151	3,683	J-104	J-111	12.0	PVC	145.0	212	0.60	0.000	Open
P-152	966	J-111	J-110	12.0	PVC	145.0	212	0.60	0.000	Open
P-153	827	J-117	J-81	6.0	PVC	145.0	29	0.33	0.000	Open

2045 Peak Hour w/ Improvements and Reduced Leakage

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Status (Initial)
P-154	270	J-63	J-66	6.0	PVC	145.0	8	0.09	0.000	Open
P-155	670	J-65	J-116	6.0	PVC	145.0	1	0.02	0.000	Open
P-156	493	J-20	J-115	6.0	PVC	145.0	2	0.03	0.000	Open
P-157	243	J-84	J-113	6.0	PVC	145.0	18	0.20	0.000	Open
P-158	661	J-81	J-87	6.0	PVC	145.0	10	0.12	0.000	Open
P-159	373	J-83	J-114	6.0	PVC	145.0	9	0.10	0.000	Open
P-160	522	J-67	J-47	6.0	PVC	145.0	11	0.13	0.000	Open
P-161	785	J-100	J-97	6.0	PVC	145.0	3	0.04	0.000	Open
P-162	763	J-101	J-97	6.0	PVC	145.0	6	0.07	0.000	Open
P-163	256	J-56	J-89	6.0	PVC	145.0	3	0.04	0.000	Open
P-164	233	J-35	J-103	6.0	PVC	145.0	6	0.07	0.000	Open
P-165	779	J-103	J-118	6.0	PVC	145.0	8	0.09	0.000	Open

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,090.55	<None>	<Collection: 1 item>	2	5,272.13	79
J-2	5,074.99	<None>	<Collection: 1 item>	3	5,272.09	85
J-3	5,074.98	<None>	<Collection: 1 item>	2	5,272.10	85
J-4	5,088.83	<None>	<Collection: 1 item>	4	5,272.09	79
J-5	5,088.97	<None>	<Collection: 1 item>	1	5,272.09	79
J-6	5,088.48	<None>	<Collection: 1 item>	3	5,272.09	79
J-7	5,118.08	<None>	<Collection: 1 item>	6	5,272.22	67
J-8	5,120.11	<None>	<Collection: 1 item>	7	5,272.24	66
J-9	5,091.56	<None>	<Collection: 1 item>	3	5,272.13	78
J-10	5,097.08	<None>	<Collection: 1 item>	4	5,272.13	76
J-11	5,048.08	<None>	<Collection: 1 item>	2	5,272.07	97
J-12	5,058.45	<None>	<Collection: 1 item>	2	5,272.07	92
J-13	5,107.71	<None>	<Collection: 1 item>	3	5,272.07	71
J-14	5,091.23	<None>	<Collection: 1 item>	2	5,272.07	78
J-15	5,039.74	<None>	<Collection: 1 item>	2	5,272.07	101
J-16	5,041.86	<None>	<Collection: 1 item>	2	5,272.07	100
J-17	5,088.75	<None>	<Collection: 1 item>	3	5,272.17	79
J-18	5,096.97	<None>	<Collection: 1 item>	10	5,272.19	76
J-19	5,087.49	<None>	<Collection: 1 item>	8	5,272.09	80

2045 Peak Hour w/ Improvements and Reduced Leakage
Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-20	5,087.59	<None>	<Collection: 1 item>	3	5,272.09	80
J-21	5,064.77	<None>	<Collection: 1 item>	4	5,272.07	90
J-22	5,061.85	<None>	<Collection: 1 item>	3	5,272.07	91
J-23	5,090.66	<None>	<Collection: 1 item>	2	5,272.09	78
J-24	5,099.33	<None>	<Collection: 1 item>	4	5,272.18	75
J-25	5,107.11	<None>	<Collection: 1 item>	3	5,272.18	71
J-26	5,067.27	<None>	<Collection: 1 item>	3	5,272.07	89
J-27	5,069.96	<None>	<Collection: 1 item>	6	5,272.08	87
J-28	5,087.30	<None>	<Collection: 1 item>	4	5,272.07	80
J-29	5,097.72	<None>	<Collection: 1 item>	5	5,272.08	75
J-30	5,095.31	<None>	<Collection: 1 item>	3	5,272.08	76
J-31	5,050.18	<None>	<Collection: 1 item>	6	5,272.12	96
J-32	5,061.81	<None>	<Collection: 1 item>	6	5,272.15	91
J-33	5,058.61	<None>	<Collection: 1 item>	2	5,272.05	92
J-34	5,049.85	<None>	<Collection: 1 item>	2	5,272.05	96
J-35	5,010.67	<None>	<Collection: 1 item>	2	5,272.02	113
J-36	5,009.18	<None>	<Collection: 1 item>	3	5,272.02	114
J-37	5,106.14	<None>	<Collection: 1 item>	9	5,272.18	72
J-39	5,048.66	<None>	<Collection: 1 item>	8	5,272.10	97
J-40	5,041.60	<None>	<Collection: 1 item>	7	5,272.08	100
J-41	5,056.26	<None>	<Collection: 1 item>	10	5,272.12	93
J-42	5,092.61	<None>	<Collection: 1 item>	4	5,272.13	78
J-43	5,078.04	<None>	<Collection: 1 item>	7	5,272.10	84
J-44	5,070.00	<None>	<Collection: 1 item>	2	5,272.07	87
J-45	5,037.84	<None>	<Collection: 1 item>	6	5,272.07	101
J-46	5,042.76	<None>	<Collection: 1 item>	6	5,272.07	99
J-47	5,051.79	<None>	<Collection: 1 item>	5	5,272.05	95
J-48	5,088.63	<None>	<Collection: 1 item>	4	5,272.12	79
J-49	5,042.46	<None>	<Collection: 1 item>	3	5,272.06	99
J-50	5,106.21	<None>	<Collection: 1 item>	3	5,272.19	72
J-51	5,097.31	<None>	<Collection: 1 item>	6	5,272.19	76
J-52	5,081.27	<None>	<Collection: 1 item>	6	5,272.11	83
J-53	5,029.00	<None>	<Collection: 1 item>	8	5,272.06	105
J-54	5,027.73	<None>	<Collection: 1 item>	2	5,272.07	106
J-55	5,038.43	<None>	<Collection: 1 item>	5	5,272.04	101
J-56	5,029.39	<None>	<Collection: 1 item>	5	5,272.04	105
J-57	5,066.97	<None>	<Collection: 1 item>	5	5,272.07	89

2045 Peak Hour w/ Improvements and Reduced Leakage
Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-58	5,068.85	<None>	<Collection: 1 item>	4	5,272.06	88
J-59	5,041.81	<None>	<Collection: 1 item>	6	5,272.06	100
J-60	5,106.38	<None>	<Collection: 1 item>	3	5,272.20	72
J-61	5,024.18	<None>	<Collection: 1 item>	10	5,272.04	107
J-62	5,021.41	<None>	<Collection: 1 item>	6	5,272.03	108
J-63	5,020.41	<None>	<Collection: 1 item>	3	5,272.03	109
J-64	5,108.06	<None>	<Collection: 1 item>	5	5,272.09	71
J-65	5,121.04	<None>	<Collection: 1 item>	4	5,272.08	65
J-66	5,023.71	<None>	<Collection: 1 item>	4	5,272.04	107
J-67	5,032.50	<None>	<Collection: 1 item>	4	5,272.04	104
J-68	5,025.43	<None>	<Collection: 1 item>	4	5,272.04	107
J-69	5,078.56	<None>	<Collection: 1 item>	6	5,272.10	84
J-70	5,073.98	<None>	<Collection: 1 item>	6	5,272.10	86
J-71	5,091.91	<None>	<Collection: 1 item>	6	5,272.09	78
J-72	5,066.97	<None>	<Collection: 1 item>	7	5,272.14	89
J-73	5,131.56	<None>	<Collection: 1 item>	6	5,272.26	61
J-74	5,137.70	<None>	<Collection: 1 item>	3	5,272.25	58
J-75	5,034.40	<None>	<Collection: 1 item>	6	5,272.06	103
J-76	5,101.86	<None>	<Collection: 1 item>	7	5,272.09	74
J-77	5,075.31	<None>	<Collection: 1 item>	6	5,272.10	85
J-78	5,036.50	<None>	<Collection: 1 item>	3	5,272.06	102
J-79	5,057.50	<None>	<Collection: 1 item>	6	5,272.11	93
J-80	5,100.76	<None>	<Collection: 1 item>	5	5,272.22	74
J-81	5,087.54	<None>	<Collection: 1 item>	2	5,272.21	80
J-82	5,056.67	<None>	<Collection: 1 item>	4	5,272.07	93
J-83	5,045.80	<None>	<Collection: 1 item>	2	5,272.07	98
J-84	5,081.01	<None>	<Collection: 1 item>	7	5,272.10	83
J-85	5,082.50	<None>	<Collection: 1 item>	3	5,272.10	82
J-86	5,119.55	<None>	<Collection: 1 item>	3	5,272.40	66
J-87	5,111.43	<None>	<Collection: 1 item>	2	5,272.21	70
J-88	5,063.58	<None>	<Collection: 1 item>	6	5,272.10	90
J-89	5,030.14	<None>	<Collection: 1 item>	6	5,272.04	105
J-90	5,056.93	<None>	<Collection: 1 item>	4	5,272.06	93
J-91	5,027.47	<None>	<Collection: 1 item>	4	5,272.06	106
J-92	5,015.59	<None>	<Collection: 1 item>	10	5,272.02	111
J-93	5,012.00	<None>	<Collection: 1 item>	7	5,272.02	112
J-94	5,031.81	<None>	<Collection: 1 item>	7	5,272.04	104

2045 Peak Hour w/ Improvements and Reduced Leakage

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-95	5,071.86	<None>	<Collection: 1 item>	8	5,272.07	87
J-96	5,110.08	<None>	<Collection: 1 item>	5	5,272.25	70
J-97	5,018.60	<None>	<Collection: 1 item>	2	5,272.03	110
J-98	5,042.61	<None>	<Collection: 1 item>	13	5,272.08	99
J-99	5,069.96	<None>	<Collection: 1 item>	6	5,272.09	87
J-100	5,018.92	<None>	<Collection: 1 item>	6	5,272.03	110
J-101	5,008.54	<None>	<Collection: 1 item>	2	5,272.03	114
J-102	5,119.06	<None>	<Collection: 1 item>	2	5,272.09	66
J-103	5,012.39	<None>	<Collection: 1 item>	1	5,272.02	112
J-104	5,141.69	<None>	<Collection: 0 items>	0	5,272.97	57
J-105	5,110.65	<None>	<Collection: 1 item>	6	5,272.30	70
J-106	5,093.82	<None>	<Collection: 1 item>	2	5,272.13	77
J-107	5,266.76	Tank Node	<Collection: 0 items>	0	5,276.90	4
J-108	5,130.43	<None>	<Collection: 0 items>	0	5,274.56	62
J-109	5,186.44	<None>	<Collection: 0 items>	0	5,275.89	39
J-110	5,119.47	<None>	<Collection: 1 item>	4	5,272.43	66
J-111	5,136.22	<None>	<Collection: 0 items>	0	5,272.54	59
J-112	5,132.34	<None>	<Collection: 1 item>	6	5,272.25	61
J-113	5,080.08	<None>	<Collection: 1 item>	5	5,272.11	83
J-114	5,050.04	<None>	<Collection: 1 item>	1	5,272.06	96
J-115	5,082.63	<None>	<Collection: 1 item>	6	5,272.09	82
J-116	5,121.37	<None>	<Collection: 1 item>	6	5,272.09	65
J-117	5,067.58	<None>	<Collection: 1 item>	1	5,272.13	88
J-118	5,018.00	<None>	<Collection: 1 item>	2	5,272.03	110

Tank Table - Time: 0.00 hours

Label	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)	Elevation (ft)	Diameter (ft)	Volume Full (Calculated) (MG)	Percent Full (%)
T-1	5,267.00	5,267.00	5,277.00	5,282.00	512	5,277.00	5,271.27	80.00	0.56	66.7

2045 Fire Flow w/ Improvements and Reduced Leakage

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-1	4	1,166	21	20	J-106	4	J-107
J-2	6	2,682	38	20	J-74	4	J-107
J-3	6	2,682	38	20	J-74	4	J-107
J-4	6	2,670	22	20	J-74	4	J-107
J-5	6	2,660	21	20	J-23	4	J-107
J-6	6	2,642	21	20	J-23	4	J-107
J-7	6	2,579	23	20	J-74	4	J-107
J-8	6	2,549	23	20	J-74	4	J-107
J-9	5	1,958	22	20	J-10	4	J-107
J-10	3	1,793	20	31	J-9	4	J-107
J-11	4	2,572	20	23	J-74	4	J-107
J-12	6	2,674	33	20	J-74	4	J-107
J-13	4	2,295	20	27	J-14	4	J-107
J-14	3	2,074	20	29	J-13	4	J-107
J-15	6	2,677	49	20	J-74	4	J-107
J-16	6	2,677	22	20	J-74	4	J-107
J-17	6	2,670	39	20	J-74	4	J-107
J-18	6	2,669	36	20	J-74	4	J-107
J-19	6	2,588	32	20	J-116	4	J-107
J-20	6	2,633	21	20	J-116	4	J-107
J-21	3	2,399	20	28	J-74	4	J-107
J-22	6	2,687	32	20	J-74	4	J-107
J-23	4	2,152	20	33	J-109	4	J-107
J-24	3	2,095	20	33	J-109	4	J-107
J-25	4	2,577	20	23	J-74	4	J-107
J-26	6	2,615	34	20	J-13	4	J-107
J-27	6	2,674	28	20	J-74	4	J-107
J-28	6	2,654	28	20	J-13	4	J-107
J-29	4	2,063	20	21	J-30	4	J-107
J-30	3	1,762	20	34	J-65	4	J-107
J-31	6	2,673	47	20	J-74	4	J-107
J-32	6	2,671	42	20	J-74	4	J-107
J-33	3	1,809	20	35	J-109	4	J-107
J-34	5	2,089	24	20	J-33	4	J-107
J-35	3	2,396	20	24	J-36	4	J-107

2045 Fire Flow w/ Improvements and Reduced Leakage

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-36	3	2,301	20	30	J-74	4	J-107
J-37	6	2,657	23	20	J-74	4	J-107
J-39	4	2,674	55	20	J-74	4	J-107
J-40	4	2,676	57	20	J-74	4	J-107
J-41	6	2,673	32	20	J-74	4	J-107
J-42	6	2,573	22	20	J-10	4	J-107
J-43	6	2,691	33	20	J-74	4	J-107
J-44	6	2,686	38	20	J-74	4	J-107
J-45	4	2,678	58	20	J-74	4	J-107
J-46	6	2,676	49	20	J-74	4	J-107
J-47	6	2,643	23	20	J-33	4	J-107
J-48	6	2,676	29	20	J-74	4	J-107
J-49	6	2,578	32	20	J-13	4	J-107
J-50	4	2,530	20	25	J-74	4	J-107
J-51	4	2,685	20	20	J-74	4	J-107
J-52	6	2,689	27	20	J-74	4	J-107
J-53	6	2,678	47	20	J-74	4	J-107
J-54	4	2,678	56	20	J-74	4	J-107
J-55	6	2,682	29	20	J-74	4	J-107
J-56	6	2,682	26	20	J-74	4	J-107
J-57	6	2,681	43	20	J-74	4	J-107
J-58	6	2,495	31	20	J-13	4	J-107
J-59	6	2,557	33	20	J-13	4	J-107
J-60	6	2,691	24	20	J-74	4	J-107
J-61	6	2,679	41	20	J-74	4	J-107
J-62	6	2,679	34	20	J-74	4	J-107
J-63	5	2,679	25	20	J-74	4	J-107
J-64	6	2,182	24	20	J-65	4	J-107
J-65	4	2,055	20	29	J-116	4	J-107
J-66	6	2,679	25	20	J-74	4	J-107
J-67	6	2,683	37	20	J-74	4	J-107
J-68	3	2,350	20	29	J-74	4	J-107
J-69	8	2,670	37	20	J-74	4	J-107
J-70	6	2,671	43	20	J-74	4	J-107
J-71	6	2,660	32	20	J-65	4	J-107

2045 Fire Flow w/ Improvements and Reduced Leakage

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-72	5	2,671	48	20	J-74	4	J-107
J-73	6	2,030	23	20	J-74	4	J-107
J-74	3	1,547	20	36	J-109	4	J-107
J-75	6	2,564	27	20	J-13	4	J-107
J-76	6	2,672	24	20	J-74	4	J-107
J-77	6	2,672	39	20	J-74	4	J-107
J-78	6	2,570	22	20	J-13	4	J-107
J-79	4	2,673	51	20	J-74	4	J-107
J-80	6	2,536	24	20	J-87	4	J-107
J-81	6	2,484	24	20	J-87	4	J-107
J-82	6	2,689	30	20	J-74	4	J-107
J-83	6	2,688	25	20	J-74	4	J-107
J-84	6	2,670	21	20	J-74	4	J-107
J-85	8	2,670	32	20	J-74	4	J-107
J-86	6	2,679	24	20	J-111	4	J-107
J-87	3	2,128	20	33	J-109	4	J-107
J-88	6	2,692	30	20	J-74	4	J-107
J-89	6	2,682	36	20	J-74	4	J-107
J-90	3	1,828	20	35	J-109	4	J-107
J-91	3	2,480	20	23	J-13	4	J-107
J-92	3	2,613	20	22	J-74	4	J-107
J-93	3	2,293	20	31	J-74	4	J-107
J-94	6	2,683	38	20	J-74	4	J-107
J-95	6	2,684	39	20	J-74	4	J-107
J-96	6	2,668	31	20	J-74	4	J-107
J-97	6	2,682	30	20	J-74	4	J-107
J-98	6	2,678	31	20	J-74	4	J-107
J-99	4	2,490	20	25	J-74	4	J-107
J-100	6	2,682	30	20	J-74	4	J-107
J-101	3	2,566	20	23	J-74	4	J-107
J-102	3	1,796	20	27	J-116	4	J-107
J-103	3	2,573	20	23	J-35	4	J-107
J-104	4	2,841	20	22	J-74	3	J-107
J-105	6	2,668	31	20	J-74	4	J-107
J-106	3	1,084	20	29	J-1	4	J-107

2045 Fire Flow w/ Improvements and Reduced Leakage

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
J-107	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)	(N/A)
J-108	2	3,500	29	23	J-109	3	J-107
J-109	2	3,500	23	43	J-104	3	J-107
J-110	6	2,666	25	20	J-111	4	J-107
J-111	4	2,629	20	24	J-74	4	J-107
J-112	4	2,091	20	21	J-74	4	J-107
J-113	6	2,669	32	20	J-74	4	J-107
J-114	6	2,686	33	20	J-74	4	J-107
J-115	6	2,670	27	20	J-74	4	J-107
J-116	4	1,945	20	21	J-102	4	J-107
J-117	6	2,238	31	20	J-106	4	J-107
J-118	5	2,681	25	20	J-74	4	J-107

Appendix U

Financial Information

5210 Water Fund

Account		Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES						
331010	CDBG/Home	1,504.64	1,504.64	0.00	-1,504.64	** %
	Account Group Total:	**1,504.64**	**1,504.64**	**0.00**	**-1,504.64**	**** %**
340000 Charges for Services						
343021	Metered Water Sales	0.00	180,853.47	195,000.00	14,146.53	93 %
343026	Water Installation Charges	0.00	4,500.00	1,000.00	-3,500.00	450 %
343027	Miscellaneous (meter, or turn on/off)	0.00	11,194.64	8,000.00	-3,194.64	140 %
343046	Miscellaneous Revenues	0.00	-31.44	0.00	31.44	** %
	Account Group Total:	**0.00**	**196,516.67**	**204,000.00**	**7,483.33**	**96 %**
370000 Investment and Royalty Earnings						
371010	Investment Earnings	0.00	3,327.70	50.00	-3,277.70	*** %
	Account Group Total:	**0.00**	**3,327.70**	**50.00**	**-3,277.70**	***** %**
	Fund Total:	**1,504.64**	**201,349.01**	**204,050.00**	**2,700.99**	**99 %**

5220 Water Line Replacement

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
340000 Charges for Services					
343022 Unmetered Water Sales - Water Line	0.00	34,874.66	34,000.00	-874.66	103 %
Account Group Total:	**0.00**	**34,874.66**	**34,000.00**	**-874.66**	**103 %**
370000 Investment and Royalty Earnings					
371010 Investment Earnings	0.00	4,675.25	0.00	-4,675.25	** %
Account Group Total:	**0.00**	**4,675.25**	**0.00**	**-4,675.25**	**** %**
Fund Total:	**0.00**	**39,549.91**	**34,000.00**	**-5,549.91**	**116 %**

5223 Water Tank Project

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES					
335051 Water Tank Debt	0.00	0.00	146,000.00	146,000.00	0 %
Account Group Total:	**0.00**	**0.00**	**146,000.00**	**146,000.00**	**0 %**
360000 Miscellaneous Revenue					
363021 Bond Principal Assessments	0.00	171,534.94	0.00	-171,534.94	** %
Account Group Total:	**0.00**	**171,534.94**	**0.00**	**-171,534.94**	**** %**
Fund Total:	**0.00**	**171,534.94**	**146,000.00**	**-25,534.94**	**117 %**
Grand Total:	**1,504.64**	**412,433.86**	**384,050.00**	**-28,383.86**	**107 %**

5210 Water Fund

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES					
336020 On-behalf state revenue	890.77	890.77	0.00	-890.77	** %
Account Group Total:	**890.77**	**890.77**	**0.00**	**-890.77**	**** %**
340000 Charges for Services					
343021 Metered Water Sales	0.00	163,836.81	179,000.00	15,163.19	92 %
343022 Unmetered Water Sales - Water Line	0.00	162.00	4,000.00	3,838.00	4 %
343025 Water Permits	0.00	80.00	9,000.00	8,920.00	1 %
343026 Water Installation Charges	0.00	2,215.50	3,000.00	784.50	74 %
343027 Miscellaneous (meter, or turn on/off)	0.00	9,342.27	8,000.00	-1,342.27	117 %
Account Group Total:	**0.00**	**175,636.58**	**203,000.00**	**27,363.42**	**87 %**
370000 Investment and Royalty Earnings					
371010 Investment Earnings	0.00	2,542.25	2,900.00	357.75	88 %
Account Group Total:	**0.00**	**2,542.25**	**2,900.00**	**357.75**	**88 %**
Fund Total:	**890.77**	**179,069.60**	**205,900.00**	**26,830.40**	**87 %**

5220 Water Line Replacement

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
340000 Charges for Services					
343022 Unmetered Water Sales - Water Line	0.00	34,831.45	34,000.00	-831.45	102 %
Account Group Total:	**0.00**	**34,831.45**	**34,000.00**	**-831.45**	**102 %**
370000 Investment and Royalty Earnings					
371010 Investment Earnings	0.00	2,726.18	3,800.00	1,073.82	72 %
Account Group Total:	**0.00**	**2,726.18**	**3,800.00**	**1,073.82**	**72 %**
Fund Total:	**0.00**	**37,557.63**	**37,800.00**	**242.37**	**99 %**

5221 Water Trans. Main

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES					
331026 SRF Loan "B" - Water Line Main Transmission -	0.00	0.00	100,000.00	100,000.00	0 %
331027 SRF Loan "A" Forgiveness-Water Main Line	0.00	0.00	100,000.00	100,000.00	0 %
334120 TSEP	0.00	0.00	200,000.00	200,000.00	0 %
Account Group Total:	**0.00**	**0.00**	**400,000.00**	**400,000.00**	**0 %**
380000 Other Financing Sources					
383000 Interfund Operating Transfer	0.00	0.00	100,000.00	100,000.00	0 %
Account Group Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**0 %**
Fund Total:	**0.00**	**0.00**	**500,000.00**	**500,000.00**	**0 %**

5223 Water Tank Project

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
360000 Miscellaneous Revenue					
363021 Bond Principal Assessments	0.00	170,621.76	168,000.00	-2,621.76	102 %
Account Group Total:	**0.00**	**170,621.76**	**168,000.00**	**-2,621.76**	**102 %**
Fund Total:	**0.00**	**170,621.76**	**168,000.00**	**-2,621.76**	**102 %**
Grand Total:	**890.77**	**387,248.99**	**911,700.00**	**524,451.01**	**42 %**

5210 Water Fund

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES					
336020 On-behalf state revenue	2,483.00	2,483.00	0.00	-2,483.00	** %
Account Group Total:	**2,483.00**	**2,483.00**	**0.00**	**-2,483.00**	**** %**
340000 Charges for Services					
343021 Metered Water Sales	0.00	186,952.06	160,000.00	-26,952.06	117 %
343022 Unmetered Water Sales - Water Line	0.00	887.79	100.00	-787.79	888 %
343025 Water Permits	0.00	0.00	60.00	60.00	0 %
343026 Water Installation Charges	0.00	5,461.64	2,500.00	-2,961.64	218 %
343027 Miscellaneous (meter, or turn on/off)	0.00	3,833.65	8,000.00	4,166.35	48 %
Account Group Total:	**0.00**	**197,135.14**	**170,660.00**	**-26,475.14**	**116 %**
370000 Investment and Royalty Earnings					
371010 Investment Earnings	0.00	1,243.03	1,150.00	-93.03	108 %
Account Group Total:	**0.00**	**1,243.03**	**1,150.00**	**-93.03**	**108 %**
Fund Total:	**2,483.00**	**200,861.17**	**171,810.00**	**-29,051.17**	**117 %**

5220 Water Line Replacement

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
340000 Charges for Services					
343022 Unmetered Water Sales - Water Line	0.00	35,250.21	34,000.00	-1,250.21	104 %
Account Group Total:	**0.00**	**35,250.21**	**34,000.00**	**-1,250.21**	**104 %**
370000 Investment and Royalty Earnings					
371010 Investment Earnings	0.00	87.88	1,000.00	912.12	9 %
Account Group Total:	**0.00**	**87.88**	**1,000.00**	**912.12**	**9 %**
Fund Total:	**0.00**	**35,338.09**	**35,000.00**	**-338.09**	**101 %**

5221 Water Trans. Main

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES					
331026 SRF Loan "B" - Water Line Main Transmission -	0.00	0.00	100,000.00	100,000.00	0 %
331027 SRF Loan "A" Forgiveness-Water Main Line	0.00	0.00	100,000.00	100,000.00	0 %
334120 TSEP	0.00	0.00	200,000.00	200,000.00	0 %
Account Group Total:	**0.00**	**0.00**	**400,000.00**	**400,000.00**	**0 %**
380000 Other Financing Sources					
383000 Interfund Operating Transfer	0.00	0.00	100,000.00	100,000.00	0 %
Account Group Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**0 %**
Fund Total:	**0.00**	**0.00**	**500,000.00**	**500,000.00**	**0 %**

5223 Water Tank Project

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
360000 Miscellaneous Revenue					
363021 Bond Principal Assessments	0.00	171,066.39	168,000.00	-3,066.39	102 %
Account Group Total:	**0.00**	**171,066.39**	**168,000.00**	**-3,066.39**	**102 %**
Fund Total:	**0.00**	**171,066.39**	**168,000.00**	**-3,066.39**	**102 %**
Grand Total:	**2,483.00**	**407,265.65**	**874,810.00**	**467,544.35**	**47 %**

For the Accounting Period: 6 / 22

5210 Water Fund

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
340000 Charges for Services					
343021 Metered Water Sales	16,154.24	209,708.66	165,000.00	-44,708.66	127 %
343022 Unmetered Water Sales - Water Line	21.06	280.72	100.00	-180.72	281 %
343025 Water Permits	0.00	0.00	60.00	60.00	0 %
343026 Water Installation Charges	48.42	3,581.01	3,500.00	-81.01	102 %
343027 Miscellaneous (meter, or turn on/off)	1,850.10	9,342.40	8,000.00	-1,342.40	117 %
Account Group Total:	18,073.82	222,912.79	176,660.00	-46,252.79	126 %
370000 Investment and Royalty Earnings					
371010 Investment Earnings	179.63	1,391.44	1,150.00	-241.44	121 %
Account Group Total:	179.63	1,391.44	1,150.00	-241.44	121 %
Fund Total:	18,253.45	224,304.23	177,810.00	-46,494.23	126 %

5220 Water Line Replacement

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
340000 Charges for Services					
343022 Unmetered Water Sales - Water Line	3,000.19	35,883.14	34,000.00	-1,883.14	106 %
Account Group Total:	3,000.19	35,883.14	34,000.00	-1,883.14	106 %
370000 Investment and Royalty Earnings					
371010 Investment Earnings	146.39	266.18	50.00	-216.18	532 %
Account Group Total:	146.39	266.18	50.00	-216.18	532 %
380000 Other Financing Sources					
381000 Proceeds of General Long-Term Debt	0.00	0.00	100,000.00	100,000.00	0 %
Account Group Total:	0.00	0.00	100,000.00	100,000.00	0 %
Fund Total:	3,146.58	36,149.32	134,050.00	97,900.68	27 %

5221 Water Trans. Main

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
330000 INTERGOVERNMENTAL REVENUES					
331031 SRF Loan "B" - Water Line Main Transmission -	0.00	45,097.00	254,000.00	208,903.00	18 %
331032 SRF Loan "A" Forgiveness-Water Main Line	0.00	43,446.00	254,000.00	210,554.00	17 %
334120 TSEP	33,006.53	33,006.53	200,000.00	166,993.47	17 %
Account Group Total:	33,006.53	121,549.53	708,000.00	586,450.47	17 %
380000 Other Financing Sources					
383000 Interfund Operating Transfer	0.00	0.00	100,000.00	100,000.00	0 %
Account Group Total:	0.00	0.00	100,000.00	100,000.00	0 %
Fund Total:	33,006.53	121,549.53	808,000.00	686,450.47	15 %

5223 Water Tank Project

Account	Received Current Month	Received YTD	Estimated Revenue	Revenue To Be Received	% Received
360000 Miscellaneous Revenue					
363021 Bond Principal Assessments	14,321.38	171,821.52	168,000.00	-3,821.52	102 %
Account Group Total:	14,321.38	171,821.52	168,000.00	-3,821.52	102 %
Fund Total:	14,321.38	171,821.52	168,000.00	-3,821.52	102 %
Grand Total:	68,727.94	553,824.60	1,287,860.00	734,035.40	43 %

For the Accounting Period: 13 / 19

5210 Water Fund

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430500 Water Utilities						
110 Salaries-Clerk~Treasurer	0.00	15,251.05	19,000.00	19,000.00	3,748.95	80 %
111 Salaries-Public Works Director	0.00	22,928.83	21,000.00	21,000.00	-1,928.83	109 %
112 Salaries-Extra Help	0.00	30,889.76	36,000.00	36,000.00	5,110.24	86 %
140 Employer Contributions	0.00	8,419.88	12,000.00	12,000.00	3,580.12	70 %
190 payroll expense	18,120.46	18,120.46	0.00	0.00	-18,120.46	%
210 Office Supplies & Materials	0.00	5,272.29	6,000.00	6,000.00	727.71	88 %
221 Chemicals	0.00	0.00	2,500.00	2,500.00	2,500.00	%
230 Repair & Maintenance Supplies	0.00	53,602.90	45,000.00	45,000.00	-8,602.90	119 %
231 Gas, diesel, oil, tires	0.00	0.00	5,000.00	5,000.00	5,000.00	%
238 Repair Parts for Water or	0.00	26,940.72	60,000.00	60,000.00	33,059.28	45 %
310 Communication & Transportation	0.00	4,044.38	12,000.00	12,000.00	7,955.62	34 %
330 Publicity, Subscriptions &	0.00	977.73	1,000.00	1,000.00	22.27	98 %
335 Memberships and Registration	0.00	1,562.50	3,000.00	3,000.00	1,437.50	52 %
341 Power	0.00	53,940.90	60,000.00	60,000.00	6,059.10	90 %
345 Telephone	0.00	0.00	1,000.00	1,000.00	1,000.00	%
350 Professional Services	0.00	0.00	22,000.00	22,000.00	22,000.00	%
351 Consumer Fee	0.00	1,200.00	2,000.00	2,000.00	800.00	60 %
352 Easement and Decreed Water	0.00	245.00	500.00	500.00	255.00	49 %
354 Engineering	0.00	34,293.49	60,000.00	60,000.00	25,706.51	57 %
356 Water Testing	0.00	1,802.78	5,000.00	5,000.00	3,197.22	36 %
360 Repair & Maintenance Services	0.00	14,720.42	40,000.00	40,000.00	25,279.58	37 %
370 Travel	0.00	1,221.53	4,000.00	4,000.00	2,778.47	31 %
390 Other Purchased Services	0.00	63.00	0.00	0.00	-63.00	%
450 Sand - Gravel	0.00	154.35	0.00	0.00	-154.35	%
620 Interest	0.00	0.00	60.00	60.00	60.00	%
830 Deprec-Closed to Retained	91,920.40	91,920.40	0.00	0.00	-91,920.40	%
940 Machinery & Equipment	-11,800.00	0.00	40,000.00	40,000.00	40,000.00	%
Account Total:	**98,240.86**	**387,572.37**	**457,060.00**	**457,060.00**	**69,487.63**	**85 %**
Account Group Total:	**98,240.86**	**387,572.37**	**457,060.00**	**457,060.00**	**69,487.63**	**85 %**
Fund Total:	**98,240.86**	**387,572.37**	**457,060.00**	**457,060.00**	**69,487.63**	**85 %**

5220 Water Line Replacement

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430505 Waterline Replacement Fund- Unmetered Water Sales						
238 Repair Parts for Water or	0.00	0.00	120,000.00	120,000.00	120,000.00	%
354 Engineering	0.00	0.00	80,000.00	80,000.00	80,000.00	%
390 Other Purchased Services	0.00	0.00	29,318.00	29,318.00	29,318.00	%
Account Total:	**0.00**	**0.00**	**229,318.00**	**229,318.00**	**229,318.00**	%
Account Group Total:	**0.00**	**0.00**	**229,318.00**	**229,318.00**	**229,318.00**	%
Fund Total:	**0.00**	**0.00**	**229,318.00**	**229,318.00**	**229,318.00**	%

5223 Water Tank Project

Account Object		Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
490000 Debt Service							
490000 Debt Service							
610 Principal		-67,000.00	0.00	341,624.00	341,624.00	341,624.00	%
620 Interest		0.00	23,610.00	112,588.00	112,588.00	88,978.00	21 %
630 Paying Agent Fees (Bank		0.00	10,975.00	72,584.00	72,584.00	61,609.00	15 %
	Account Total:	**-67,000.00**	**34,585.00**	**526,796.00**	**526,796.00**	**492,211.00**	**7 %**
	Account Group Total:	**-67,000.00**	**34,585.00**	**526,796.00**	**526,796.00**	**492,211.00**	**7 %**
	Fund Total:	**-67,000.00**	**34,585.00**	**526,796.00**	**526,796.00**	**492,211.00**	**7 %**
	Grand Total:	**31,240.86**	0.00 422,157.37	1,213,174.00	1,213,174.00	791,016.63	35 %

For the Accounting Period: 13 / 20

5210 Water Fund

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430000 Public Works						
195 Pension expense	-4,045.00	-4,045.00	0.00	0.00	4,045.00	%
Account Total:	**-4,045.00**	**-4,045.00**	**0.00**	**0.00**	**4,045.00**	**%**
430500 Water Utilities						
110 Salaries-Clerk~Treasurer	-30,973.71	-14,725.05	19,000.00	19,000.00	33,725.05	-78 %
111 Salaries-Public Works Director	0.00	18,659.30	23,000.00	23,000.00	4,340.70	81 %
112 Salaries-Extra Help	0.00	45,190.15	37,500.00	37,500.00	-7,690.15	121 %
140 Employer Contributions	0.00	9,351.05	12,000.00	12,000.00	2,648.95	78 %
210 Office Supplies & Materials	0.00	6,007.16	6,500.00	6,500.00	492.84	92 %
221 Chemicals	0.00	0.00	2,500.00	2,500.00	2,500.00	%
230 Repair & Maintenance Supplies	0.00	1,710.38	47,500.00	47,500.00	45,789.62	4 %
231 Gas, diesel, oil, tires	0.00	0.00	5,000.00	5,000.00	5,000.00	%
238 Repair Parts for Water or	0.00	21,575.81	62,000.00	62,000.00	40,424.19	35 %
310 Communication & Transportation	0.00	3,769.64	10,000.00	10,000.00	6,230.36	38 %
330 Publicity, Subscriptions &	0.00	247.50	1,000.00	1,000.00	752.50	25 %
335 Memberships and Registration	0.00	1,235.94	3,000.00	3,000.00	1,764.06	41 %
341 Power	0.00	46,068.90	60,000.00	60,000.00	13,931.10	77 %
350 Professional Services	0.00	0.00	22,000.00	22,000.00	22,000.00	%
351 Consumer Fee	0.00	1,200.00	2,000.00	2,000.00	800.00	60 %
352 Easement and Decreed Water	0.00	245.00	500.00	500.00	255.00	49 %
354 Engineering	-4,081.90	548.86	60,000.00	60,000.00	59,451.14	1 %
356 Water Testing	0.00	3,297.21	5,000.00	5,000.00	1,702.79	66 %
360 Repair & Maintenance Services	0.00	8,193.41	40,000.00	40,000.00	31,806.59	20 %
370 Travel	0.00	2,207.51	4,000.00	4,000.00	1,792.49	55 %
380 Training Services	0.00	500.00	2,000.00	2,000.00	1,500.00	25 %
390 Other Purchased Services	0.00	161.00	0.00	0.00	-161.00	%
830 Deprec-Closed to Retained	92,275.88	92,275.88	0.00	0.00	-92,275.88	%
940 Machinery & Equipment	-2,225.00	0.00	40,000.00	40,000.00	40,000.00	%
Account Total:	**54,995.27**	**247,719.65**	**464,500.00**	**464,500.00**	**216,780.35**	**53 %**
Account Group Total:	**50,950.27**	**243,674.65**	**464,500.00**	**464,500.00**	**220,825.35**	**52 %**
Fund Total:	**50,950.27**	**243,674.65**	**464,500.00**	**464,500.00**	**220,825.35**	**52 %**

5220 Water Line Replacement

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430500 Water Utilities						
354 Engineering	0.00	24,860.08	0.00	0.00	-24,860.08	%
Account Total:	**0.00**	**24,860.08**	**0.00**	**0.00**	**-24,860.08**	**%**
Account Group Total:	**0.00**	**24,860.08**	**0.00**	**0.00**	**-24,860.08**	**%**
520000 Other Financing Uses						
521000 Interfund Operating Transfers Out						
390 Other Purchased Services	0.00	0.00	100,000.00	100,000.00	100,000.00	%
Account Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**100,000.00**	**%**
Account Group Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**100,000.00**	**%**
Fund Total:	**0.00**	**24,860.08**	**100,000.00**	**100,000.00**	**75,139.92**	**25 %**

5221 Water Trans. Main

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430551 Water Transmission Main Project 19-10						
354 Engineering	-24,860.08	-24,860.08	400,000.00	400,000.00	424,860.08	-6 %
Account Total:	**-24,860.08**	**-24,860.08**	**400,000.00**	**400,000.00**	**424,860.08**	**-6 %**
Account Group Total:	**-24,860.08**	**-24,860.08**	**400,000.00**	**400,000.00**	**424,860.08**	**-6 %**
Fund Total:	**-24,860.08**	**-24,860.08**	**400,000.00**	**400,000.00**	**424,860.08**	**-6 %**

5223 Water Tank Project

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
490000 Debt Service						
490000 Debt Service						
610 Principal	-70,000.00	0.00	66,000.00	66,000.00	66,000.00	%
620 Interest	0.00	22,250.00	24,000.00	24,000.00	1,750.00	93 %
630 Paying Agent Fees (Bank	0.00	10,335.00	12,000.00	12,000.00	1,665.00	86 %
Account Total:	**-70,000.00**	**32,585.00**	**102,000.00**	**102,000.00**	**69,415.00**	**32 %**
Account Group Total:	**-70,000.00**	**32,585.00**	**102,000.00**	**102,000.00**	**69,415.00**	**32 %**
Fund Total:	**-70,000.00**	**32,585.00**	**102,000.00**	**102,000.00**	**69,415.00**	**32 %**
Grand Total:	**-43,909.81**	0.00 276,259.65	1,066,500.00	1,066,500.00	790,240.35	26 %

5210 Water Fund

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430500 Water Utilities						
110 Salaries-Clerk~Treasurer	10,342.20	28,030.03	19,000.00	19,000.00	-9,030.03	148 %
111 Salaries-Public Works Director	0.00	19,116.52	23,000.00	23,000.00	3,883.48	83 %
112 Salaries-Extra Help	0.00	62,108.74	53,000.00	53,000.00	-9,108.74	117 %
140 Employer Contributions	0.00	10,773.24	12,000.00	12,000.00	1,226.76	90 %
210 Office Supplies & Materials	0.00	6,547.64	6,500.00	6,500.00	-47.64	101 %
221 Chemicals	0.00	0.00	1,000.00	1,000.00	1,000.00	%
230 Repair & Maintenance Supplies	0.00	12,342.11	40,000.00	40,000.00	27,657.89	31 %
231 Gas, diesel, oil, tires	0.00	562.64	5,000.00	5,000.00	4,437.36	11 %
238 Repair Parts for Water or	0.00	64,730.75	40,000.00	40,000.00	-24,730.75	162 %
310 Communication & Transportation	0.00	2,896.80	5,000.00	5,000.00	2,103.20	58 %
320 Printing, Duplicating, Typing	0.00	75.00	0.00	0.00	-75.00	%
330 Publicity, Subscriptions &	0.00	314.50	1,000.00	1,000.00	685.50	31 %
335 Memberships and Registration	0.00	650.00	2,000.00	2,000.00	1,350.00	33 %
341 Power	0.00	42,266.57	55,000.00	55,000.00	12,733.43	77 %
351 Consumer Fee	0.00	1,200.00	1,200.00	1,200.00	0.00	100 %
352 Easement and Decreed Water	0.00	245.00	500.00	500.00	255.00	49 %
354 Engineering	0.00	500.00	40,000.00	40,000.00	39,500.00	1 %
356 Water Testing	0.00	1,074.00	5,000.00	5,000.00	3,926.00	21 %
360 Repair & Maintenance Services	0.00	19,440.57	30,000.00	30,000.00	10,559.43	65 %
370 Travel	0.00	659.29	3,000.00	3,000.00	2,340.71	22 %
380 Training Services	0.00	0.00	1,000.00	1,000.00	1,000.00	%
390 Other Purchased Services	0.00	284.00	200.00	200.00	-84.00	142 %
410 Concrete	0.00	791.00	0.00	0.00	-791.00	%
450 Sand - Gravel	0.00	75.04	5,000.00	5,000.00	4,924.96	2 %
830 Deprec-Closed to Retained	93,673.35	93,673.35	93,000.00	93,000.00	-673.35	101 %
940 Machinery & Equipment	-18,088.32	0.00	40,000.00	40,000.00	40,000.00	%
Account Total:	**85,927.23**	**368,356.79**	**481,400.00**	**481,400.00**	**113,043.21**	**77 %**
Account Group Total:	**85,927.23**	**368,356.79**	**481,400.00**	**481,400.00**	**113,043.21**	**77 %**
Fund Total:	**85,927.23**	**368,356.79**	**481,400.00**	**481,400.00**	**113,043.21**	**77 %**

5220 Water Line Replacement

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
520000 Other Financing Uses						
521000 Interfund Operating Transfers Out						
390 Other Purchased Services	0.00	0.00	100,000.00	100,000.00	100,000.00	%
Account Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**100,000.00**	%
Account Group Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**100,000.00**	%
Fund Total:	**0.00**	**0.00**	**100,000.00**	**100,000.00**	**100,000.00**	%

5221 Water Trans. Main

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430551 Water Transmission Main Project 19-10						
354 Engineering	0.00	864.83	400,000.00	400,000.00	399,135.17	%
Account Total:	**0.00**	**864.83**	**400,000.00**	**400,000.00**	**399,135.17**	**%**
Account Group Total:	**0.00**	**864.83**	**400,000.00**	**400,000.00**	**399,135.17**	**%**
Fund Total:	**0.00**	**864.83**	**400,000.00**	**400,000.00**	**399,135.17**	**%**

5223 Water Tank Project

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
490000 Debt Service						
490000 Debt Service						
610 Principal	-73,000.00	0.00	73,000.00	73,000.00	73,000.00	%
620 Interest	0.00	20,840.00	20,840.00	20,840.00	0.00	100 %
630 Paying Agent Fees (Bank	0.00	9,670.00	9,670.00	9,670.00	0.00	100 %
Account Total:	**-73,000.00**	**30,510.00**	**103,510.00**	**103,510.00**	**73,000.00**	**29 %**
Account Group Total:	**-73,000.00**	**30,510.00**	**103,510.00**	**103,510.00**	**73,000.00**	**29 %**
Fund Total:	**-73,000.00**	**30,510.00**	**103,510.00**	**103,510.00**	**73,000.00**	**29 %**
Grand Total:	**12,927.23**	0.00				
		399,731.62	1,084,910.00	1,084,910.00	685,178.38	37 %

5210 Water Fund

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430500 Water Utilities						
110 Salaries-Clerk~Treasurer	738.11	8,557.01	10,000.00	10,000.00	1,442.99	86 %
111 Salaries-Public Works Director	651.90	10,760.45	12,000.00	12,000.00	1,239.55	90 %
112 Salaries-Extra Help	2,096.89	33,328.02	32,000.00	32,000.00	-1,328.02	104 %
140 Employer Contributions	303.35	8,010.78	11,000.00	11,000.00	2,989.22	73 %
210 Office Supplies & Materials	811.46	5,720.99	6,500.00	6,500.00	779.01	88 %
221 Chemicals	0.00	0.00	1,000.00	1,000.00	1,000.00	%
230 Repair & Maintenance Supplies	2,596.08	17,899.59	40,000.00	40,000.00	22,100.41	45 %
231 Gas, diesel, oil, tires	0.00	604.70	5,000.00	5,000.00	4,395.30	12 %
238 Repair Parts for Water or	0.00	26,575.56	40,000.00	40,000.00	13,424.44	66 %
310 Communication & Transportation	597.02	3,354.95	5,000.00	5,000.00	1,645.05	67 %
330 Publicity, Subscriptions &	88.75	196.75	1,000.00	1,000.00	803.25	20 %
335 Memberships and Registration	0.00	664.99	2,000.00	2,000.00	1,335.01	33 %
341 Power	3,612.56	44,613.52	55,000.00	55,000.00	10,386.48	81 %
351 Consumer Fee	0.00	1,200.00	1,200.00	1,200.00	0.00	100 %
352 Easement and Decreed Water	0.00	245.00	500.00	500.00	255.00	49 %
354 Engineering	1,375.00	6,181.80	20,000.00	20,000.00	13,818.20	31 %
356 Water Testing	171.00	1,080.49	5,000.00	5,000.00	3,919.51	22 %
360 Repair & Maintenance Services	228.06	28,210.21	30,000.00	30,000.00	1,789.79	94 %
370 Travel	0.00	1,664.36	3,000.00	3,000.00	1,335.64	55 %
380 Training Services	0.00	60.00	1,000.00	1,000.00	940.00	6 %
390 Other Purchased Services	0.00	99.00	200.00	200.00	101.00	50 %
450 Sand - Gravel	0.00	0.00	5,000.00	5,000.00	5,000.00	%
830 Deprec-Closed to Retained	0.00	0.00	94,000.00	94,000.00	94,000.00	%
940 Machinery & Equipment	0.00	16,577.10	40,000.00	40,000.00	23,422.90	41 %
Account Total:	13,270.18	215,605.27	420,400.00	420,400.00	204,794.73	51 %
430526 Water System PER Update						
354 Engineering	0.00	6,093.33	0.00	0.00	-6,093.33	%
Account Total:	0.00	6,093.33	0.00	0.00	-6,093.33	%
Account Group Total:	13,270.18	221,698.60	420,400.00	420,400.00	198,701.40	53 %
Fund Total:	13,270.18	221,698.60	420,400.00	420,400.00	198,701.40	53 %

5220 Water Line Replacement

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
520000 Other Financing Uses						
521000 Interfund Operating Transfers Out						
390 Other Purchased Services	0.00	0.00	100,000.00	100,000.00	100,000.00	%
Account Total:	0.00	0.00	100,000.00	100,000.00	100,000.00	%
Account Group Total:	0.00	0.00	100,000.00	100,000.00	100,000.00	%
Fund Total:	0.00	0.00	100,000.00	100,000.00	100,000.00	%

5221 Water Trans. Main

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
430000 Public Works						
430551 Water Transmission Main Project 19-10						
354 Engineering	12,213.20	110,228.23	708,000.00	708,000.00	597,771.77	16 %
360 Repair & Maintenance Services	0.00	120.00	0.00	0.00	-120.00	%
Account Total:	12,213.20	110,348.23	708,000.00	708,000.00	597,651.77	16 %
Account Group Total:	12,213.20	110,348.23	708,000.00	708,000.00	597,651.77	16 %
490000 Debt Service						
490000 Debt Service						
610 Principal	5,000.00	5,000.00	0.00	0.00	-5,000.00	%
620 Interest	227.99	227.99	0.00	0.00	-227.99	%
630 Paying Agent Fees (Bank	57.00	57.00	0.00	0.00	-57.00	%
Account Total:	5,284.99	5,284.99	0.00	0.00	-5,284.99	%
Account Group Total:	5,284.99	5,284.99	0.00	0.00	-5,284.99	%
Fund Total:	17,498.19	115,633.22	708,000.00	708,000.00	592,366.78	16 %

5223 Water Tank Project

Account Object	Committed Current Month	Committed YTD	Original Appropriation	Current Appropriation	Available Appropriation	% Commit
490000 Debt Service						
490000 Debt Service						
610 Principal	37,000.00	75,000.00	75,000.00	75,000.00	0.00	100 %
620 Interest	9,490.00	19,360.00	19,360.00	19,360.00	0.00	100 %
630 Paying Agent Fees (Bank	4,400.00	8,977.50	8,978.00	8,978.00	0.50	100 %
Account Total:	50,890.00	103,337.50	103,338.00	103,338.00	0.50	100 %
Account Group Total:	50,890.00	103,337.50	103,338.00	103,338.00	0.50	100 %
Fund Total:	50,890.00	103,337.50	103,338.00	103,338.00	0.50	100 %
Grand Total:	81,658.37					
		0.00				
		440,669.32	1,331,738.00	1,331,738.00	891,068.68	33 %

WRF-13270
364720
9999FB9D7

STATE OF MONTANA
GENERAL OBLIGATION BONDS
DRINKING WATER
(REVOLVING FUND PROGRAM)

Final Schedule B

BORROWER:	White Sulphur Springs	FINAL LOAN PAYMENT:	7/1/2032
PROJECT NAME:	Waterline Replacements	TOTAL # PAYMENTS:	40
LOAN COMMITMENT:	$1,573,000	PROJECT NUMBER:	WRF-13270
FINAL AMOUNT:	$1,267,375	DATE OFFUNDING:	09/13/12
INTEREST RATE:	3.00%		

PAYMENT DUE	ADM EXPENSE SURCHARGE	LOAN LOSS SURCHARGE	INTEREST PAYMENT	PRINCIPAL PAYMENT	O/S LOAN BALANCE	TOTAL AMOUNT OF PAYMENT
01/01/13	1,394.46	464.82	3,718.55	29,000.00	1,087,311.00	$34,577.83
07/01/13	4,380.15	1,460.05	11,680.41	29,000.00	1,161,275.00	$46,520.62
01/01/14	4,392.37	1,464.12	11,712.97	30,000.00	1,177,532.00	$47,569.46
07/01/14	4,417.74	1,472.58	11,780.64	30,000.00	1,149,375.00	$47,670.97
01/01/15	4,310.16	1,436.72	11,493.75	24,375.00	1,125,000.00	$41,615.63
07/01/15	4,218.75	1,406.25	11,250.00	25,000.00	1,100,000.00	$41,875.00
01/01/16	4,125.00	1,375.00	11,000.00	25,000.00	1,075,000.00	$41,500.00
07/01/16	4,031.25	1,343.75	10,750.00	25,000.00	1,050,000.00	$41,125.00
01/01/17	3,937.50	1,312.50	10,500.00	26,000.00	1,024,000.00	$41,750.00
07/01/17	3,840.00	1,280.00	10,240.00	26,000.00	998,000.00	$41,360.00
01/01/18	3,742.50	1,247.50	9,980.00	27,000.00	971,000.00	$41,970.00
07/01/18	3,641.25	1,213.75	9,710.00	27,000.00	944,000.00	$41,565.00
01/01/19	3,540.00	1,180.00	9,440.00	27,000.00	917,000.00	$41,160.00
07/01/19	3,438.75	1,146.25	9,170.00	28,000.00	889,000.00	$41,755.00
01/01/20	3,333.75	1,111.25	8,890.00	28,000.00	861,000.00	$41,335.00
07/01/20	3,228.75	1,076.25	8,610.00	29,000.00	832,000.00	$41,915.00
01/01/21	3,120.00	1,040.00	8,320.00	29,000.00	803,000.00	$41,480.00
07/01/21	3,011.25	1,003.75	8,030.00	30,000.00	773,000.00	$42,045.00
01/01/22	2,898.75	966.25	7,730.00	30,000.00	743,000.00	$41,595.00
07/01/22	2,786.25	928.75	7,430.00	30,000.00	713,000.00	$41,145.00
01/01/23	2,673.75	891.25	7,130.00	31,000.00	682,000.00	$41,695.00
07/01/23	2,557.50	852.50	6,820.00	31,000.00	651,000.00	$41,230.00
01/01/24	2,441.25	813.75	6,510.00	32,000.00	619,000.00	$41,765.00
07/01/24	2,321.25	773.75	6,190.00	32,000.00	587,000.00	$41,285.00
01/01/25	2,201.25	733.75	5,870.00	33,000.00	554,000.00	$41,805.00
07/01/25	2,077.50	692.50	5,540.00	33,000.00	521,000.00	$41,310.00
01/01/26	1,953.75	651.25	5,210.00	34,000.00	487,000.00	$41,815.00
07/01/26	1,826.25	608.75	4,870.00	34,000.00	453,000.00	$41,305.00
01/01/27	1,698.75	566.25	4,530.00	35,000.00	418,000.00	$41,795.00
07/01/27	1,567.50	522.50	4,180.00	35,000.00	383,000.00	$41,270.00
01/01/28	1,436.25	478.75	3,830.00	36,000.00	347,000.00	$41,745.00
07/01/28	1,301.25	433.75	3,470.00	36,000.00	311,000.00	$41,205.00
01/01/29	1,166.25	388.75	3,110.00	37,000.00	274,000.00	$41,665.00
07/01/29	1,027.50	342.50	2,740.00	37,000.00	237,000.00	$41,110.00
01/01/30	888.75	296.25	2,370.00	38,000.00	199,000.00	$41,555.00
07/01/30	746.25	248.75	1,990.00	39,000.00	160,000.00	$41,985.00
01/01/31	600.00	200.00	1,600.00	39,000.00	121,000.00	$41,400.00
07/01/31	453.75	151.25	1,210.00	40,000.00	81,000.00	$41,815.00
01/01/32	303.75	101.25	810.00	40,000.00	41,000.00	$41,215.00
07/01/32	153.75	51.25	410.00	41,000.00	0.00	$41,615.00
	101,184.87	33,728.29	269,826.33	1,267,375.00		1,672,114.49

WRF-14303 364751sb 9999FK9E5

STATE OF MONTANA
GENERAL OBLIGATION BONDS
DRINKING WATER
(REVOLVING FUND PROGRAM)

BORROWER: City of White Sulphur Springs
PROJECT NAME: Sand Filter Building
LOAN COMMITMENT: $105,264.00
INTEREST RATE: 3.00%

FINAL LOAN PAYMENT: 7/1/2033
TOTAL # OF LOAN PAYMENTS: 40
PROJECT NUMBER: WRF-14303
DATE OF LOAN FUNDING: 10/16/2013

PAYMENT DUE	ADM EXPENSE SURCHARGE	LOAN LOSS SURCHARGE	INTEREST PAYMENT	PRINCIPAL PAYMENT	DRAW DOWNS	O/S LOAN BALANCE	TOTAL PAYMENT
07/01/14	386.25	128.75	1,030.00	2,000.00		101,000.00	$3,545.00
01/01/15	378.75	126.25	1,010.00	2,000.00		99,000.00	$3,515.00
07/01/15	371.25	123.75	990.00	2,000.00		97,000.00	$3,485.00
01/01/16	363.75	121.25	970.00	2,000.00		95,000.00	$3,455.00
07/01/16	356.25	118.75	950.00	2,000.00		93,000.00	$3,425.00
01/01/17	348.75	116.25	930.00	2,000.00		91,000.00	$3,395.00
07/01/17	341.25	113.75	910.00	2,000.00		89,000.00	$3,365.00
01/01/18	333.75	111.25	890.00	2,000.00		87,000.00	$3,335.00
07/01/18	326.25	108.75	870.00	2,000.00		85,000.00	$3,305.00
01/01/19	318.75	106.25	850.00	2,000.00		83,000.00	$3,275.00
07/01/19	311.25	103.75	830.00	2,000.00		81,000.00	$3,245.00
01/01/20	303.75	101.25	810.00	3,000.00		78,000.00	$4,215.00
07/01/20	292.50	97.50	780.00	2,000.00		76,000.00	$3,170.00
01/01/21	285.00	95.00	760.00	3,000.00		73,000.00	$4,140.00
07/01/21	273.75	91.25	730.00	2,000.00		71,000.00	$3,095.00
01/01/22	266.25	88.75	710.00	3,000.00		68,000.00	$4,065.00
07/01/22	255.00	85.00	680.00	2,000.00		66,000.00	$3,020.00
01/01/23	247.50	82.50	660.00	3,000.00		63,000.00	$3,990.00
07/01/23	236.25	78.75	630.00	2,000.00		61,000.00	$2,945.00
01/01/24	228.75	76.25	610.00	3,000.00		58,000.00	$3,915.00
07/01/24	217.50	72.50	580.00	2,000.00		56,000.00	$2,870.00
01/01/25	210.00	70.00	560.00	3,000.00		53,000.00	$3,840.00
07/01/25	198.75	66.25	530.00	3,000.00		50,000.00	$3,795.00
01/01/26	187.50	62.50	500.00	3,000.00		47,000.00	$3,750.00
07/01/26	176.25	58.75	470.00	3,000.00		44,000.00	$3,705.00
01/01/27	165.00	55.00	440.00	3,000.00		41,000.00	$3,660.00
07/01/27	153.75	51.25	410.00	3,000.00		38,000.00	$3,615.00
01/01/28	142.50	47.50	380.00	3,000.00		35,000.00	$3,570.00
07/01/28	131.25	43.75	350.00	3,000.00		32,000.00	$3,525.00
01/01/29	120.00	40.00	320.00	3,000.00		29,000.00	$3,480.00
07/01/29	108.75	36.25	290.00	3,000.00		26,000.00	$3,435.00
01/01/30	97.50	32.50	260.00	3,000.00		23,000.00	$3,390.00
07/01/30	86.25	28.75	230.00	3,000.00		20,000.00	$3,345.00
01/01/31	75.00	25.00	200.00	3,000.00		17,000.00	$3,300.00
07/01/31	63.75	21.25	170.00	3,000.00		14,000.00	$3,255.00
01/01/32	52.50	17.50	140.00	3,000.00		11,000.00	$3,210.00
07/01/32	41.25	13.75	110.00	3,000.00		8,000.00	$3,165.00
01/01/33	30.00	10.00	80.00	4,000.00		4,000.00	$4,120.00
07/01/33	15.00	5.00	40.00	4,000.00		0.00	$4,060.00
	8,661.98	2,887.33	23,098.60	105,264.00			139,911.90

WRF-15334 364782 9999FS9Z1

Release of fds 6-6-16

199,664

STATE OF MONTANA
GENERAL OBLIGATION BONDS
DRINKING WATER
(REVOLVING FUND PROGRAM)

Final Schedule B

BORROWER: White Sulphur Springs
PROJECT NAME: Water Main
LOAN COMMITMENT: $233,500.00
INTEREST RATE: 2.50%

FINAL LOAN PAYMENT: 1/1/2035
TOTAL # OF LOAN PAYMENTS: 40
PROJECT NUMBER: WRF-15334
DATE OF LOAN FUNDING: 12/11/2014

PAYMENT DUE	ADM EXPENSE SURCHARGE	LOAN LOSS SURCHARGE	INTEREST PAYMENT	PRINCIPAL PAYMENT	O/S LOAN BALANCE	TOTAL PAYMENT
				Starting Balance:	18,726.00	
07/01/15	65.40	65.40	523.24	4,500.00	174,834.00	$5,154.05
01/01/16	241.67	241.67	1,933.38	5,000.00	190,164.00	$7,416.72
07/01/16	237.71	237.71	1,901.64	5,000.00	185,164.00	$7,377.06
01/01/17	231.46	231.46	1,851.64	5,164.00	180,000.00	$7,478.55
07/01/17	225.00	225.00	1,800.00	4,000.00	176,000.00	$6,250.00
01/01/18	220.00	220.00	1,760.00	4,000.00	172,000.00	$6,200.00
07/01/18	215.00	215.00	1,720.00	4,000.00	168,000.00	$6,150.00
01/01/19	210.00	210.00	1,680.00	4,000.00	164,000.00	$6,100.00
07/01/19	205.00	205.00	1,640.00	4,000.00	160,000.00	$6,050.00
01/01/20	200.00	200.00	1,600.00	4,000.00	156,000.00	$6,000.00
07/01/20	195.00	195.00	1,560.00	4,000.00	152,000.00	$5,950.00
01/01/21	190.00	190.00	1,520.00	4,000.00	148,000.00	$5,900.00
07/01/21	185.00	185.00	1,480.00	5,000.00	143,000.00	$6,850.00
01/01/22	178.75	178.75	1,430.00	5,000.00	138,000.00	$6,787.50
07/01/22	172.50	172.50	1,380.00	5,000.00	133,000.00	$6,725.00
01/01/23	166.25	166.25	1,330.00	5,000.00	128,000.00	$6,662.50
07/01/23	160.00	160.00	1,280.00	5,000.00	123,000.00	$6,600.00
01/01/24	153.75	153.75	1,230.00	5,000.00	118,000.00	$6,537.50
07/01/24	147.50	147.50	1,180.00	5,000.00	113,000.00	$6,475.00
01/01/25	141.25	141.25	1,130.00	5,000.00	108,000.00	$6,412.50
07/01/25	135.00	135.00	1,080.00	5,000.00	103,000.00	$6,350.00
01/01/26	128.75	128.75	1,030.00	5,000.00	98,000.00	$6,287.50
07/01/26	122.50	122.50	980.00	5,000.00	93,000.00	$6,225.00
01/01/27	116.25	116.25	930.00	5,000.00	88,000.00	$6,162.50
07/01/27	110.00	110.00	880.00	5,000.00	83,000.00	$6,100.00
01/01/28	103.75	103.75	830.00	5,000.00	78,000.00	$6,037.50
07/01/28	97.50	97.50	780.00	5,000.00	73,000.00	$5,975.00
01/01/29	91.25	91.25	730.00	5,000.00	68,000.00	$5,912.50
07/01/29	85.00	85.00	680.00	5,000.00	63,000.00	$5,850.00
01/01/30	78.75	78.75	630.00	5,000.00	58,000.00	$5,787.50
07/01/30	72.50	72.50	580.00	5,000.00	53,000.00	$5,725.00
01/01/31	66.25	66.25	530.00	5,000.00	48,000.00	$5,662.50
07/01/31	60.00	60.00	480.00	6,000.00	42,000.00	$6,600.00
01/01/32	52.50	52.50	420.00	6,000.00	36,000.00	$6,525.00
07/01/32	45.00	45.00	360.00	6,000.00	30,000.00	$6,450.00
01/01/33	37.50	37.50	300.00	6,000.00	24,000.00	$6,375.00
07/01/33	30.00	30.00	240.00	6,000.00	18,000.00	$6,300.00
01/01/34	22.50	22.50	180.00	6,000.00	12,000.00	$6,225.00
07/01/34	15.00	15.00	120.00	6,000.00	6,000.00	$6,150.00
01/01/35	7.50	7.50	60.00	6,000.00	0.00	$6,075.00
	5,218.74	5,218.74	41,749.90	199,664.00		251,851.38

WRF-22506 364953 9999JVBC8

Final Schedule B
as of

STATE OF MONTANA
GENERAL OBLIGATION BONDS
DRINKING WATER
(REVOLVING FUND PROGRAM)

BORROWER: White Sulphur
PROJECT NAME: Water Line Replacement
LOAN COMMITMENT: $267,000.00
LOAN AMOUNT: $251,607.00
INTEREST RATE: 2.50%

FINAL LOAN PAYMENT: 1/1/2042
TOTAL # OF LOAN PAYMENTS: 40
PROJECT NUMBER: WRF-22506
DATE OF LOAN FUNDING: 3/30/2022

PAYMENT DUE	INTEREST RATE	# DAYS DUE	ADM EXPENSE SURCHARGE	LOAN LOSS SURCHARGE	INTEREST PAYMENT	PRINCIPAL PAYMENT	O/S LOAN BALANCE	TOTAL PAYMENT
						Beginning Balance:	45,097.00	
07/01/22	2.500%	91	28.50	28.50	227.99	5,000.00	40,097.00	$5,284.99
01/01/23	2.500%	180	125.91	125.91	1,007.31	5,000.00	144,238.00	$6,259.14
07/01/23	2.500%	180	299.30	299.30	2,394.43	5,607.00	236,000.00	$8,600.04
01/01/24	2.500%	180	295.00	295.00	2,360.00	5,000.00	231,000.00	$7,950.00
07/01/24	2.500%	180	288.75	288.75	2,310.00	5,000.00	226,000.00	$7,887.50
01/01/25	2.500%	180	282.50	282.50	2,260.00	5,000.00	221,000.00	$7,825.00
07/01/25	2.500%	180	276.25	276.25	2,210.00	5,000.00	216,000.00	$7,762.50
01/01/26	2.500%	180	270.00	270.00	2,160.00	5,000.00	211,000.00	$7,700.00
07/01/26	2.500%	180	263.75	263.75	2,110.00	6,000.00	205,000.00	$8,637.50
01/01/27	2.500%	180	256.25	256.25	2,050.00	6,000.00	199,000.00	$8,562.50
07/01/27	2.500%	180	248.75	248.75	1,990.00	6,000.00	193,000.00	$8,487.50
01/01/28	2.500%	180	241.25	241.25	1,930.00	6,000.00	187,000.00	$8,412.50
07/01/28	2.500%	180	233.75	233.75	1,870.00	6,000.00	181,000.00	$8,337.50
01/01/29	2.500%	180	226.25	226.25	1,810.00	6,000.00	175,000.00	$8,262.50
07/01/29	2.500%	180	218.75	218.75	1,750.00	6,000.00	169,000.00	$8,187.50
01/01/30	2.500%	180	211.25	211.25	1,690.00	6,000.00	163,000.00	$8,112.50
07/01/30	2.500%	180	203.75	203.75	1,630.00	6,000.00	157,000.00	$8,037.50
01/01/31	2.500%	180	196.25	196.25	1,570.00	6,000.00	151,000.00	$7,962.50
07/01/31	2.500%	180	188.75	188.75	1,510.00	6,000.00	145,000.00	$7,887.50
01/01/32	2.500%	180	181.25	181.25	1,450.00	6,000.00	139,000.00	$7,812.50
07/01/32	2.500%	180	173.75	173.75	1,390.00	6,000.00	133,000.00	$7,737.50
01/01/33	2.500%	180	166.25	166.25	1,330.00	7,000.00	126,000.00	$8,662.50
07/01/33	2.500%	180	157.50	157.50	1,260.00	7,000.00	119,000.00	$8,575.00
01/01/34	2.500%	180	148.75	148.75	1,190.00	7,000.00	112,000.00	$8,487.50
07/01/34	2.500%	180	140.00	140.00	1,120.00	7,000.00	105,000.00	$8,400.00
01/01/35	2.500%	180	131.25	131.25	1,050.00	7,000.00	98,000.00	$8,312.50
07/01/35	2.500%	180	122.50	122.50	980.00	7,000.00	91,000.00	$8,225.00
01/01/36	2.500%	180	113.75	113.75	910.00	7,000.00	84,000.00	$8,137.50
07/01/36	2.500%	180	105.00	105.00	840.00	7,000.00	77,000.00	$8,050.00
01/01/37	2.500%	180	96.25	96.25	770.00	7,000.00	70,000.00	$7,962.50
07/01/37	2.500%	180	87.50	87.50	700.00	7,000.00	63,000.00	$7,875.00
01/01/38	2.500%	180	78.75	78.75	630.00	7,000.00	56,000.00	$7,787.50
07/01/38	2.500%	180	70.00	70.00	560.00	7,000.00	49,000.00	$7,700.00
01/01/39	2.500%	180	61.25	61.25	490.00	7,000.00	42,000.00	$7,612.50
07/01/39	2.500%	180	52.50	52.50	420.00	7,000.00	35,000.00	$7,525.00
01/01/40	2.500%	180	43.75	43.75	350.00	7,000.00	28,000.00	$7,437.50
07/01/40	2.500%	180	35.00	35.00	280.00	7,000.00	21,000.00	$7,350.00
01/01/41	2.500%	180	26.25	26.25	210.00	7,000.00	14,000.00	$7,262.50
07/01/41	2.500%	180	17.50	17.50	140.00	7,000.00	7,000.00	$7,175.00
01/01/42	2.500%	180	8.75	8.75	70.00	7,000.00	0.00	$7,087.50
			6,372.47	6,372.47	50,979.73	251,607.00		315,331.66

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

GREG GIANFORTE, GOVERNOR
1539 ELEVENTH AVENUE

STATE OF MONTANA

DIRECTOR'S OFFICE: (406) 444-2074
FAX: (406) 444-2684
PO BOX 201601
HELENA, MONTANA 59620-1601

MEMORANDUM

To: Richard Nelson, Mayor
City of White Sulphur Springs

From: Anna Miller
Department of Natural Resources and Conservation

Subject: White Sulphur Springs WRF Loan $534,000

Date: March 7, 2022

I have reviewed the FY 2021 actuals for the City's water system. The water fees will be pledged to the debt of the water system. There are three loans outstanding. The City is looking at borrowing additional funds for a total of $534,000 of which there will be a B Loan of $267,000 at 2.5% for a term of 20 years and an A Loan of $267,000 which will be forgiven once all program requirements are met.

Coverage Calculation

The average highest years debt service is $121,133 in FY 2026.
Coverage is $121,133 x 110% = $133,246.

Calculation using FY21 Actual Revenue and Expenses

Water System Actual Revenue FY21	$387,018
Water System Actual Expenses FY21	<$224,344>
Total Net Revenues	$162,674

Net Revenues	$ 215,121
Coverage Needed	<$ 133,246>
Coverage is made by	$ 81,875

The coverage for the loan is in place. I have attached the FY21 actuals for White Sulphur Springs.

I have made adjustments for the installation of meters in FY21 that should be capitalized. There is a copy of the estimated payment schedule. I will adjust the payment schedules once we have a closing date.

Please call if you have questions. My number is 406-444-6689.

cc: Rob Ashton – DEQ w/
Cid Sivils – DNRC w/
Bob Murdo – JM&G w/
Nathan Bilyeu – JM&G w/
Michelle Stidham – White Sulphur Springs w/
Terry Threlkeld – Innovative Eng w/
White Sulphur Springs A Loan WRF $267,000 file w/
White Sulphur Springs B Loan WRF $267,000 file w/

White Sulphur Springs Drinking Water Loans

	WRF-13270 3.00% $1,267,375	WRF-14303 3% $105,264	WRF-15334 2.5% $199,664	WRF-22502 2.5% $267,000	WRF Total
2023	82,840	7,010	13,388	14,962	118,200
2024	82,995	6,860	13,138	17,363	120,355
2025	83,090	6,710	12,888	16,088	118,775
2026	**83,125**	**7,545**	**12,638**	**17,825**	**121,133**
2027	83,100	7,365	12,388	17,525	120,378
2028	83,015	7,185	12,138	17,225	119,563
2029	82,870	7,005	11,888	16,925	118,688
2030	82,665	6,825	11,638	17,625	118,753
2031	83,385	6,645	11,388	16,300	117,718
2032	83,030	6,465	13,125	17,000	119,620
2033	41,615	7,285	12,825	17,663	79,388
2034		4,060	12,525	17,313	33,898
2035			12,225	16,963	29,188
2036				16,613	16,613
2037				16,263	16,263
2038				17,900	17,900
2039				17,500	17,500
2040				17,100	17,100
2041				16,700	16,700
2042				16,300	16,300
Total	871,730	80,960	162,188	$339,150	$1,454,027

Coverage Calculation: 121,133 x 110% = 133,246

Completed By: Terry Threlkeld, PE/Updated by DNRC

City of White Sulphur Springs

12/16/2021

Administrative/Finance Costs	Source: TSEP	Source: WRF-22502 $267,000 Loan 2.5% for 20	Source: WRF-22501 $267,000 Loan Forgiveness	Source:	Total:
Personnel Costs	$ 2,500	$ -	$ -		$ 2,500
Office Costs	$ 1,500	$ -	$ -		$ 1,500
Professional Services	$ 2,500	$ -	$ -		$ 2,500
Legal Costs	$ 3,548	$ -	$ 3,549		$ 7,097
Audit Fees	$ 2,500	$ 2,500	$ -		$ 5,000
Travel & Training	$ 750	$ -	$ -		$ 750
Debt Service Reserve		$ 8,913	$ -		$ 8,913
Bond Counsel & Related costs	$ 4,500	$ 6,800	$ 700		$ 12,000
ADMIN/FINANCE COSTS:	$ 17,798	$ 18,213	$ 4,249	$ -	$ 40,260
					$ -
Soil & Geotechnical					$ -
Basic Engineering	$ 17,500	$ 6,250	$ 6,250		$ 30,000
Engineering - Field	$ 10,000	$ 500	$ 14,500		$ 25,000
Engineering Additional Svc	$ -	$ -			$ -
Construction	$ 142,202	$ 219,247	$ 219,247		$ 580,696
Contingency	$ 12,500	$ 22,790	$ 22,754		$ 58,044
ACTIVITY COSTS	$ 182,202	$ 248,787	$ 262,751	$ -	$ 693,740
TOTAL PROJECT COSTS	$ 200,000	$ 267,000	$ 267,000	$ -	$ 734,000

08/17/21
14:55:16

CITY OF WHITE SULPHUR SPRINGS
Revenue Budget Report -- MultiYear Actuals
For the Year: 2021 - 2022

Report ID: B250

5210 Water Fund

Account	Actuals 17-18	Actuals 18-19	Actuals 19-20	Actuals 20-21	Current Budget 20-21	% Rec. 20-21	Prelim. Budget 21-22	Budget Change 21-22	Final Budget 21-22	% Old Budget 21-22
330000 INTERGOVERNMENTAL REVENUES										
331010 CDBG/Home		1,505			0	0%			0	0%
336020 On-behalf state revenue	1,098		891		0	0%			0	0%
Group:	1,098	1,505	891		0	0%	0	0	0	0%
340000 Charges for Services										
343021 Metered Water Sales	195,479	180,853	163,837	186,952	160,000	117%	160,000		160,000	100%
343022 Unmetered Water Sales -			162	888	100	888%	100		100	100%
343025 Water Permits			80		60	0%	60		60	100%
343026 Water Installation	1,000	4,500	2,216	5,462	2,500	218%	2,500		2,500	100%
343027 Miscellaneous (meter, or	4,873	11,195	9,342	3,834	8,000	48%	8,000		8,000	100%
343046 Miscellaneous Revenues	18	-31			0	0%			0	0%
Group:	201,370	196,517	175,637	197,136	170,660	116%	170,660	0	170,660	100%
370000 Investment and Royalty Earnings										
371010 Investment Earnings	106	3,328	2,542	1,243	1,150	108%	1,150		1,150	100%
Group:	106	3,328	2,542	1,243	1,150	108%	1,150	0	1,150	100%
Fund:	202,574	201,350	179,070	198,379	171,810	115%	171,810	0	171,810	100%

186,952
34,000 Unmetered
171,066 Bond Assessment
(5,000) Users Not Paying
387,018

CITY OF WHITE SULPHUR SPRINGS
Revenue Budget Report -- MultiYear Actuals
For the Year: 2021 - 2022

5220 Water Line Replacement

Account	Actuals 17-18	Actuals 18-19	Actuals 19-20	Actuals 20-21	Current Budget 20-21	% Rec. 20-21	Prelim. Budget 21-22	Budget Change 21-22	Final Budget 21-22	% Old Budget 21-22
340000 Charges for Services										
343022 Unmetered Water Sales -	36,012	34,875	34,831	35,250	34,000	104%	34,000		34,000	100%
Group:	36,012	34,875	34,831	35,250	34,000	104%	34,000	0	34,000	100%
370000 Investment and Royalty Earnings										
371010 Investment Earnings		4,675	2,726	88	1,000	9%	50		50	5%
Group:		4,675	2,726	88	1,000	9%	50	0	50	5%
Fund:	36,012	39,550	37,557	35,338	35,000	101%	34,050	0	34,050	97%

CITY OF WHITE SULPHUR SPRINGS
Revenue Budget Report -- MultiYear Actuals
For the Year: 2021 - 2022

5223 Water Tank Project

Account	Actuals 17-18	Actuals 18-19	Actuals 19-20	Actuals 20-21	Current Budget 20-21	% Rec. 20-21	Prelim. Budget 21-22	Budget Change 21-22	Final Budget 21-22	% Old Budget 21-22
360000 Miscellaneous Revenue										
363020 Bond Principal and	70,950				0	0%			0	0%
363021 Bond Principal	99,811	171,535	170,622	171,066	168,000	102%	168,000		168,000	100%
Group:	170,761	171,535	170,622	171,066	168,000	102%	168,000	0	168,000	100%
Fund:	170,761	171,535	170,622	171,066	168,000	102%	168,000	0	168,000	100%
Grand Total:	409,347	412,435	387,249	404,783	874,810		873,860	0	873,860	

08/17/21
14:56:10

CITY OF WHITE SULPHUR SPRINGS
Expenditure Budget Report -- MultiYear Actuals
For the Year: 2021 - 2022

Report ID: B240

5210 Water Fund

Account Object	Actuals 17-18	Actuals 18-19	Actuals 19-20	Actuals 20-21	Current Budget 20-21	% Exp. 20-21	Prelim. Budget 21-22	Budget Changes 21-22	Final Budget 21-22	% Old Budget 21-22
430000 Public Works										
195 Pension expense			-4,045		0	0%			0	0%
Account:			-4,045		0	***%	0	0	0	0%
430500 Water Utilities										
100 Personal Services	-1,460				0	0%			0	0%
110 Salaries-Clerk-Treasurer	14,710	15,251	-14,725	17,688	19,000	93%	19,000		19,000	100%
111 Salaries-Public Works Dir	30,604	22,929	18,659	19,117	23,000	83%	23,000		23,000	100%
112 Salaries-Extra Help	25,612	30,890	45,190	62,109	53,000	117%	53,000		53,000	100%
140 Employer Contributions	8,129	8,420	9,351	10,773	12,000	90%	12,000		12,000	100%
190 payroll expense		18,120			0	0%			0	0%
195 Pension expense	7,280				0	0%			0	0%
210 Office Supplies & Materia	4,578	5,272	6,007	6,548	6,500	101%	6,500		6,500	100%
221 Chemicals	100				1,000	0%	1,000		1,000	100%
230 Repair & Maintenance Supp	31,708	53,603	1,710	12,342	40,000	31%	40,000		40,000	100%
231 Gas, diesel, oil, tires				563	5,000	11%	5,000		5,000	100%
238 Repair Parts for Water or		26,941	21,576	64,731	40,000	162%	40,000		40,000	100%
310 Communication & Transport	2,746	4,044	3,770	2,897	5,000	58%	5,000		5,000	100%
320 Printing, Duplicating, Ty				75	0	***%			0	0%
330 Publicity, Subscriptions	90	978	248	315	1,000	32%	1,000		1,000	100%
335 Memberships and Registrat	1,013	1,563	1,236	650	2,000	33%	2,000		2,000	100%
341 Power	52,324	53,941	46,069	42,267	55,000	77%	55,000		55,000	100%
351 Consumer Fee	1,200	1,200	1,200	1,200	1,200	100%	1,200		1,200	100%
352 Easement and Decreed Wate	241	245	245	245	500	49%	500		500	100%
354 Engineering	8,470	34,293	549	500	40,000	1%	40,000		40,000	100%
356 Water Testing	2,264	1,803	3,297	1,074	5,000	21%	5,000		5,000	100%

08/17/21
14:56:10

CITY OF WHITE SULPHUR SPRINGS
Expenditure Budget Report -- MultiYear Actuals
For the Year: 2021 - 2022

Report ID: B240

5210 Water Fund

Account Object	Actuals 17-18	Actuals 18-19	Actuals 19-20	Actuals 20-21	Current Budget 20-21	% Exp. 20-21	Prelim. Budget 21-22	Budget Changes 21-22	Final Budget 21-22	% Old Budget 21-22
360 Repair & Maintenance Serv	9,875	14,720	8,193	19,441	30,000	65%	30,000		30,000	100%
370 Travel	2,509	1,222	2,208	659	3,000	22%	3,000		3,000	100%
380 Training Services			500		1,000	0%	1,000		1,000	100%
390 Other Purchased Services	154	63	161	284	200	142%	200		200	100%
410 Concrete				791	0	***%			0	0%
450 Sand - Gravel		154		75	5,000	2%	5,000		5,000	100%
830 Deprec-Closed to Retained	90,924	91,920	92,276		93,000	0%	93,000		93,000	100%
940 Machinery & Equipment				(18,088)	40,000	45%	40,000		40,000	100%
Account:	293,071	387,572	247,720	282,432	481,400	59%	481,400	0	481,400	100%
Fund:	293,071	387,572	243,675	282,432	481,400	59%	481,400	0	481,400	100%

%

(18,088)
(40,000)

224,344

Appendix V

Water Rates and Account Information

Utility Rates for White Sulphur Springs

Gallons Used	Water Rate	Sewer Rate Parts, totaling to the Sewer Rate						Sewer Rate	Utility Total
		Base	Resrv	Debt 1	Bond 1	Debt 2	Bond 2		
1000	$44.67	$15.43	$4.00	$3.48	$0.35	$16.37	$1.64	$41.26	$85.93
1500	$45.57	$15.43	$4.00	$3.76	$0.38	$17.65	$1.77	$42.98	$88.55
2000	$46.47	$15.43	$4.00	$4.03	$0.40	$18.94	$1.89	$44.69	$91.16
2300	$47.01	$15.43	$4.00	$4.19	$0.42	$19.71	$1.97	$45.72	$92.73
3000	$48.27	$15.43	$4.00	$4.58	$0.46	$21.51	$2.15	$48.12	$96.39
4000	$50.07	$15.43	$4.00	$5.12	$0.51	$24.08	$2.41	$51.55	$101.62
5000	$51.87	$15.43	$4.00	$5.67	$0.57	$26.65	$2.67	$54.98	$106.85
6000	$53.67	$15.43	$4.00	$6.22	$0.62	$29.22	$2.92	$58.41	$112.08
7000	$55.47	$15.43	$4.00	$6.76	$0.68	$31.79	$3.18	$61.84	$117.31
8000	$57.27	$15.43	$4.00	$7.31	$0.73	$34.36	$3.44	$65.27	$122.54
9000	$59.07	$15.43	$4.00	$7.86	$0.79	$36.93	$3.69	$68.70	$127.77
10000	$60.87	$15.43	$4.00	$8.40	$0.84	$39.50	$3.95	$72.13	$133.00
20000	$78.87	$15.43	$4.00	$13.87	$1.39	$65.21	$6.52	$106.42	$185.29
30000	$96.87	$15.43	$4.00	$19.34	$1.93	$90.92	$9.09	$140.72	$237.59
40000	$114.87	$15.43	$4.00	$24.81	$2.48	$116.63	$11.66	$175.01	$289.88
50000	$132.87	$15.43	$4.00	$30.28	$3.03	$142.33	$14.23	$209.31	$342.18
60000	$150.87	$15.43	$4.00	$35.75	$3.58	$168.04	$16.80	$243.60	$394.47
70000	$168.87	$15.43	$4.00	$41.22	$4.12	$193.75	$19.37	$277.89	$446.76
80000	$186.87	$15.43	$4.00	$46.69	$4.67	$219.45	$21.95	$312.19	$499.06
90000	$204.87	$15.43	$4.00	$52.16	$5.22	$245.16	$24.52	$346.48	$551.35
100000	$222.87	$15.43	$4.00	$57.63	$5.76	$270.87	$27.09	$380.78	$603.65

Gallons Used -- Number of gallons of water used per month, measured by the water meter.
Water Rate -- Amount charged for the water used during the month.
Base -- Sewer base rate, based on the amount needed for operation and maintenance costs.
Reserve -- Amount set aside to cover future needs or emergencies.
Debt 1 -- Amount of loan #1 for the sewer charged based on system useage.
Bond 1 -- Amount to cover the bond on loan #1, also based on system usage.
Debt 2 -- Amount of loan #2 for the sewer charged based on system useage.
Bond 2 -- Amount to cover the bond on loan #2, also based on system usage.
Sewer Rate -- Total sewer rate, including the Base, Reserve, Debt 1, Debt 2, Bond 1, Bond 2.
Utility Total -- Utility bill for the month, which is a total of the water rate and sewer rate.

UNDERSTANDING YOUR WATER BILL

SEWER BOND 1	Amount to cover the bond on Sewer Lagoon Phase Project # 1 Loan based on system usage.
SEWER DEBT 2	Amount of loan #2 for the sewer charged based on system usage.
SEWER BOND 2	Amount to cover the bond on Sewer Lagoon Phase Project #2 based on system usage.
WATER BASE	Water base rate based on the amount needed for operation and maintenance costs.
WATER USAGE	Water gallons used water rate.
WATER LINE REPL	Water Line Replacement Reserve set aside to cover future needs or emergencies.
WATER TANK DEBT	Amount of Water Tank loan.
SEWER BASE	Sewer base rate based on the amount needed for operation and maintenance cost.
SEWER RSRV FUND	Sewer Reserve set aside to cover future needs or emergencies.
SEWER DEBT 1	Amount of Sewer Lagoon Phase Project #1 for the sewer charged based on system usage.

Your bill is determined on the amount of water you use each month. If you see a very noticeable increase, check your toilet to see if it's shutting off when it should or check for plumbing leaks.

WSS CITY WATER DEPARTMENT

SERVICES: WATER BASE WATER USAGE WATER LINE REPL WATER TANK DEBT SEWER BASE SEWER RSRV FUND SEWER DEBT 1 SEWE
BOND 2 LATE FEE LIEN FEE METER OR ON/OFF MISCELLANEOUS NSF CHARGES OVERPAYMENT

METER SIZES: ALL

Service / Meter Size	Usage in Actual Units Usage	Charges	Number
LATE FEE			
.75	0	1530.00	51
1	0	60.00	2
2	0	60.00	2
Subtotal for Service LATE FEE :		**1650.00**	**55**
SEWER BASE			
.75	0	9172.39	568
1	0	123.44	8
1.5	0	138.87	2
2	0	200.59	12
3	0	15.43	1
4	0	15.43	1
Subtotal for Service SEWER BASE :		**9666.15**	**592**
SEWER BOND 1			
.75	0	223.81	525
1	0	15.23	6
1.5	0	1.65	2
2	0	13.27	12
3	0	0.35	1
4	0	0.70	1
Subtotal for Service SEWER BOND 1 :		**255.01**	**547**
SEWER BOND 2			
.75	0	1048.69	525
1	0	71.54	6
1.5	0	7.76	2
2	0	62.37	12
3	0	1.64	1
4	0	3.31	1
Subtotal for Service SEWER BOND 2 :		**1195.31**	**547**
SEWER DEBT 1			
.75	1084758	2231.47	525
1	246100	152.21	6
1.5	19436	16.49	2
2	173287	132.62	12
3	0	3.48	1
4	7490	7.03	1
Subtotal for Service SEWER DEBT 1 :	**1531071**	**2543.30**	**547**
SEWER DEBT 2			
.75	1084758	10477.90	525
1	246100	715.37	6
1.5	19436	77.55	2
2	173287	623.51	12
3	0	16.37	1
4	7490	33.05	1
Subtotal for Service SEWER DEBT 2 :	**1531071**	**11943.75**	**547**
SEWER RSRV FUND			
.75	0	2212.00	525
1	0	24.00	6
1.5	0	36.00	2
2	0	52.00	12
3	0	4.00	1

Service Meter Size	Usage in Actual Units Usage	Charges	Number
4	0	4.00	1
Subtotal for Service SEWER RSRV FUND:		**2332.00**	**547**
WATER BASE			
.75	0	9111.22	546
1	0	112.00	7
1.5	0	144.00	2
2	0	208.00	12
3	0	16.00	1
4	0	16.00	1
Subtotal for Service WATER BASE :		**9607.22**	**569**
WATER LINE REPL			
.75	0	2852.26	547
1	0	35.00	7
1.5	0	45.00	2
2	0	65.00	12
3	0	5.00	1
4	0	5.00	1
Subtotal for Service WATER LINE REPL:		**3007.26**	**570**
WATER TANK DEBT			
.75	0	13613.01	596
1	0	196.83	9
1.5	0	218.70	3
2	0	306.18	13
3	0	21.87	1
4	0	21.87	1
Subtotal for Service WATER TANK DEBT:		**14378.46**	**623**
WATER USAGE			
.75	1151304	2072.49	385
1	246100	442.99	6
1.5	19436	34.99	2
2	173287	311.91	8
4	7490	13.48	1
Subtotal for Service WATER USAGE :	**1597617**	**2875.86**	**402**
Grand Total :	**4659759**	**59454.32**	**5546**

Appendix W

Target Rate and Income Information

RESOURCES

- Consolidated Plan
- Past Programs
- Census and Target Rate
- Income and Rent Limits

TARGET RATE CALCULATION RESOURCE

The Community Development Division (CDD) has updated the U.S. Census Bureau's American Communities Survey (ACS) data set 2015-2019 for the calculation of local government target rates. The Montana Coal Endowment Program (MCEP) and Community Development Block Grant (CDBG) programs use ACS information as the base data set to calculate applicant target rates for community infrastructure systems.

These calculated rates, along with other demographic information, are components of the review and analysis of applications submitted to the programs for funding requests. Applications to be submitted in 2021 or later for MCEP or CDBG programs must use the 2015-2019 ACS data for the calculation of target rates for an applicant.

Low and moderate income (LMI) data is subject to change due to information released by the U.S Department of Housing and Urban Development (HUD).

Search below for 2015-2019 American Communities Survey data used to calculate target rates when applying to the **Montana Coal Endowment Program** and **Community Development Block Group Grant Program.**

Step 1a:
Select a geography type
City

OR

Step 1b:
Select a county or counties
(All)

Step 2:
Select a geography
White Sulphur Springs city

MONTANA
DEPARTMENT OF COMMERCE

Selected Geography	**White Sulphur Springs city**
Associated County	*Meagher County*
Population	1,012
Total Households	431
Median Household Income	$41,458
Low & Moderate Income Percent	50.8%
Percent Poverty	14.4%

Target Rates

Water & Wastewater	$79.46
Water Only	$48.37
Wastewater Only	$31.09
Solid Waste Only	$10.36

Place

White Sulphur Springs city, Montana

White Sulphur Springs city, Montana is a city, town, place equivalent, and township located in Montana.

// United States / Montana / White Sulphur Springs city, Montana

Display Sources

Populations and People
Total Population
955
P1 | 2020 Decennial Census

Income and Poverty
Median Household Income
$51,352
S1901 | 2021 American Community Survey 5-Year Estimates

Education
Bachelor's Degree or Higher
21.7%
S1501 | 2021 American Community Survey 5-Year Estimates

Employment
Employment Rate
55.3%
DP03 | 2021 American Community Survey 5-Year Estimates

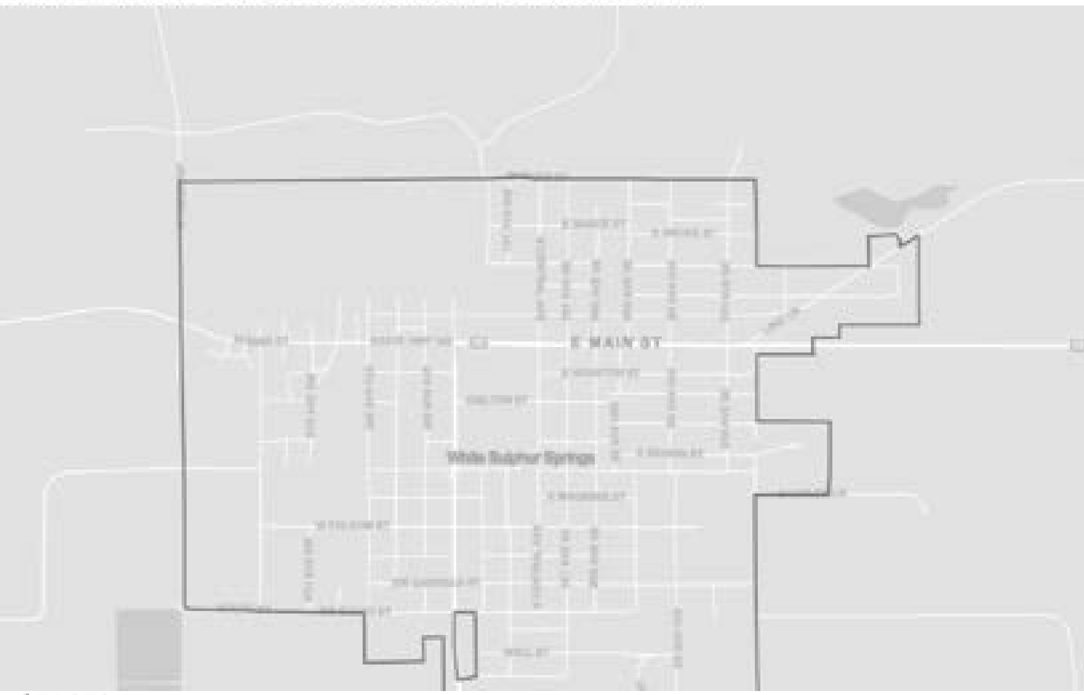
Housing
Total Housing Units
595
H1 | 2020 Decennial Census

Health
Without Health Care Coverage
5.9%
S2701 | 2021 American Community Survey 5-Year Estimates

Families and Living Arrangements
Total Households
469
DP02 | 2021 American Community Survey 5-Year Estimates

Race and Ethnicity
Hispanic or Latino (of any race)
26
P9 | 2020 Decennial Census

White Sulphur Springs city, Montana Reference Map



$51,352 ± $7,982
Median Household Income in White Sulphur Springs city, Montana

$67,631 ± $1,496
Median Household Income in Montana

S1901 | 2021 American Community Survey 5-Year Estimates

Median Income by Types of Families
in White Sulphur Springs city, Montana

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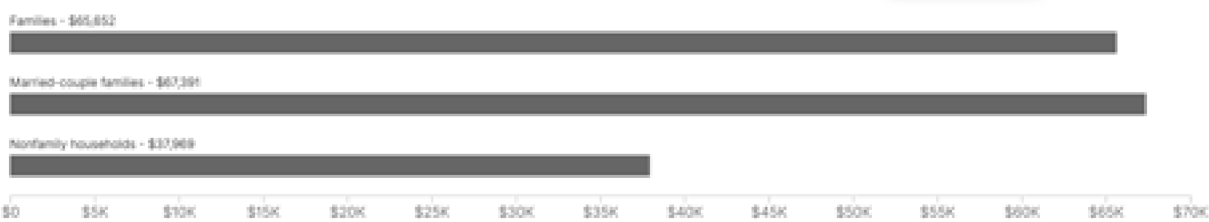

Income and Poverty

S1901 | 2021 American Community Survey 5-Year Estimates

Income and Earnings

Poverty

8.5% ± 6.3%
Poverty, All people in White Sulphur Springs city, Montana