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IN COLLABORATION WITH:

AE2S

Gallatin Canyon Water
Preliminary Engineering Report (Draft)
Client: Gallatin Canyon County Water Sewer District
08/30/2025

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TECHNICAL ACRONYMS

BGS	**Below Ground Surface**
BSCWSD	**Big Sky County Water and Sewer District**
CECs	**Contaminants of Emerging Concerns**
CFS	**Cubic Feet Per Second**
CFU	**Colony Forming Units**
DEQ	**Montana Department of Environmental Quality**
GCCSWD	**Gallatin Canyon County Sewer and Water District**
Gpm	**Gallons Per Minute**
GWIC	**Groundwater Information Center**
MBR	**Membrane Bioreactor**
MBMG	**Montana Bureau of Mines and Geology**
MGD	**Million Gallons Per Day**
MPDES	**Montana Pollutant Elimination System**
NRCS	**Natural Resources Conservation Service**
RIBs	**Rapid Infiltration Beds**
SBR	**Sequencing Batch Reactor**
TDS	**Total Dissolved Solids**
TMDL	**Total Maximum Daily Load**
TN	**Nitrate+Nitrite and Total Nitrogen**
TP	**Total Phosphorous**
USGS	**United States Geologic Services**
WMA	**Wildlife Management Area**
WRRF	**Water Resource Recovery Facility**
WWTP	**Wastewater Treatment Plant**

EXECUTIVE SUMMARY

The Canyon Area is an unincorporated area of Gallatin County, located along the Highway 191 corridor, generally from just north of the Highway 64 intersection south to Ophir School. Similar to many resort towns, the Canyon Area grew rapidly and somewhat haphazardly as a gateway into and providing support to the core of Big Sky. Although the Canyon Area is located within the Big Sky Resort Area District (BSRAD), until recently, it has remained on the periphery in terms of receiving the benefits of BSRAD assistance towards addressing its infrastructure deficiencies.

The Gallatin Canyon County Water and Sewer District (GCCWSD) is a new utility district, formed in 2020, and created by petition of landowners within the Canyon Area. The GCCWSD is led by a five-member volunteer board but currently has no employees, no assets, and no customers. However, the GCCWSD and its board have been working since its inception to plan, design and ultimately construct a new central sanitary sewer system to provide sewer collection, treatment and disposal for the Canyon Area, as it seeks to do its part to achieve relevant community goals. In the case of a central sewer system, the GCCWSD will improve the health of the local aquifer and Gallatin River by reducing nutrient loading to both, as well as improve health risks to those in the Canyon Area associated with potable well contamination from the large spread of septic systems throughout the area. The provision of a central GCCWSD sewer system also promotes development of affordable housing. These efforts have progressed to a current 60% design of the sewer system along with entering an alternative project delivery method to contract with a Construction Manager that will assist in completing design of the overall sewer project with construction beginning as early as 2027.

This Preliminary Engineering Report (PER) continues with the purpose of the GCCWSD, as defined below, to present planning and preliminary engineering required to address water infrastructure improvements in the GCCWSD and its projected future extent. This report was prepared in accordance with the PER requirements of the *Uniform Application for Montana Public Facility Projects* at the request of the GCCWSD Board of Directors.

PURPOSE AND NEED

The purpose of the GCCWSD, as stated in its bylaws, is to “collect information and data, and to analyze the same, in order to determine what wastewater treatment system is best adapted to provide wastewater collection and treatment to not only the present District, but other properties in the canyon area that may elect to joint the District, and to gather information an analyses for water and water distribution systems” and “to finance, construct, operate and maintain such systems.” Continuing on the recent momentum of the GCCWSD sewer design, this PER analyzes the feasibility and alternatives for a new GCCWSD-owned and maintained central water system to serve the District, progressing the GCCWSD toward achieving its stated purpose and developing solutions that promote pathways to achieve those relevant community goals outlined in Section 1. The current state of water systems within the Canyon Area has led to sparse distribution of wells diverting water from different aquifers, with most systems being unmetered, unregulated with no requirements for continued monitoring and testing, meaning there’s no incentive or requirement to properly maintain these systems or promote protection and conservation of the source aquifers, and most systems don’t have sustainable means to do so. Improvement action is needed to better manage and sustainably use what is one of our most valuable resources and continuing the purpose that started the GCCWSD. In the case of a central water system, a GCCWSD system will promote protection, conservation and sustainability of water resources, provide improved infrastructure along with sustainable operations and maintenance of infrastructure, and promote development of affordable housing for the area’s residents and work force.

EXISTING INFRASTRUCTURE OVERVIEW

While there are surface water sources within the Planning Area and the neighboring Big Sky County Water and Sewer District (BSCWSD) public water system (PWS), these source alternatives were deemed infeasible in favor of utilizing groundwater as this PER's preferred system source. Several aquifers supply water to the many wells in the GCCWSD Planning Area. According to available GWIC and geology data, most of the wells in the valley floor draw from the alluvial aquifer or sand and gravel, with some of the deeper wells drawing from the Kootenai or Madison formation, and generally, the area's aquifers are of high quality. There are 94 wells withing the Planning Area, 62 of which are potable water wells, and 14 of these wells are PWS wells.

This PER's preferred storage alternative for a GCCWSD central water system is to utilize ground-level storage tanks that both provide the necessary storage to meet all design requirements as well as provide adequate operating pressures due to their relative elevations. There are two bolted-steel ground-level tanks within the Planning Area that have storage capacities and elevations suitable to be used in the GCCWSD PWS. The Lazy J tank has a 530,000-gallon capacity, and the Ramshorn tank has a 340,000-gallon capacity, and both tanks are generally in good condition with likely half of their design life (~20 years) remaining. These two PWS's also have distribution main piping that can be used and expanded from to serve the GCCWSD PWS. These distribution systems are approximately 20 years old and are anticipated to have 30+ years of design life remaining.

PREFERRED ALTERNATIVE

A central, GCCWSD-owned and operated public water system is both technically feasible and financially attainable; however, a strategic funding approach will be necessary to minimize the financial burden associated with the initial construction and commissioning of the new central system, relying heavily on securing as much grant money as possible.

After analyzing the feasible alternatives based on their respective LCCA and non-monetary factors prescribed in the *Uniform Application for Montana Public Facility Project,* the proposed project would utilize existing Lazy J public system infrastructure and expand as a single combined system throughout the Planning Area, in phases as demand dictates. This will require acquisition of key Lazy J PWS infrastructure, consisting of its two existing production wells and one ground-level tank along with its reusable water mains. For this PER's proposed project, it is assumed that the proposed source aquifer's quality would remain consistent, and therefore, no treatment will be required. The Phase 1 project will focus on serving the service areas having current and/or near-term expansion plans, which are also the same areas with the highest concentration of annexation requests (SA's 4-8). For system estimated "build-out" demands, two additional wells would be required, so it is recommended to proceed with the Phase 1 project to complete these new wells into the same source aquifer as the existing two Lazy J wells with matching pumping capacities, which will equate to four total water supply wells to perfect the estimated water rights allocation and meet required design criteria.

In addition to its existing wells, Lazy J's existing 530,000-gallon ground-level tank would be used to serve the Phase 1 project area and continue to serve the GCCWSD's service areas until phased system expansions and/or system demands require a new tank be constructed to provide adequate storage to meet design volume requirements. This PER estimates a "build-out" demand storage capacity of approximately 766,000-gallons will be needed, and this can be accomplished with a new 655,000-gallon bolted steel ground-level tank operating in parallel with the existing 530,000-gallon tank, with both at approximately 2/3 full capacity. Though DEQ does not require tank/storage redundancy, this tandem operation will provide the system with reliable means to meet the design criteria to be able to isolate a tank from the distribution system and drained for cleaning or maintenance without

necessitating loss of pressure in the distribution system. Distribution mains will be connected to the existing Lazy J distribution system and extended to service areas as they annex into the GCCWSD. The Phase 1 project will extend the core distribution network from Buck's T-4 to the Quarry PUD (on the west side of HWY 191) and loop across to Service Area 4 (on the east side of HWY 191) as described and depicted in Section 6. Once this Phase 1 core infrastructure is completed and operating, future phases can be added by extending new water mains as modeled, though the system modeling should be updated as infrastructure is designed and completed.

The estimated cost of the overall project as a whole, including construction and non-construction costs, is approximately $18,194,030; however, this PER's immediate recommendation is to plan, design, and construct the Phase 1 project with a total estimated cost of approximately $14,229,000. Due to consistent annual cost escalation and uncertainties with the current economic climate, this Phase 1 estimated cost includes building in the necessary production and storage capacities estimated for the "build-out" conditions of the entire Planning Area while limiting the distribution network extension to the Phase 1 boundary that would serve Service Areas 4 – 8.

It's anticipated that the water rate structure would follow an increasing block type or tiered structure in which the price per unit of water increases as metered consumption increases, which will encourage water conservation. In the absence of a current rate structure, this PER used a simple uniform rate approach to estimate conceptual rates based on the overall annual expenditures estimated for the water service and the annual estimated water consumption demand and estimated number of services for the Phase 1 project. This method results in an estimated total monthly water bill of $81.00 for a typical average monthly residential use as described in Section 6.

KEY VARIABLES

The success of a new GCCWSD central water system hinges on three interlinked key variables: water rights, public buy-in, and cost. The first and most critical component for success of this proposed project is to complete a successful water rights change application to secure both the annual volume and flow rate diversions from the groundwater source needed to serve the estimated demands of the GCCWSD central water system. Without first securing the adequate water rights necessary to provide the source water meeting demands of the consolidated GCCWSD system, this project will not be feasible. A successful change of use application for water rights is anticipated to take 1-3 years. Therefore, it is recommended that the Board begin discussions as soon as possible with the appropriate water right owners identified herein, and upon successful good faith negotiations, begin steps to secure those water rights via a change of use application with the DNRC.

As with any start-up system, the initial scale of capital required to provide core infrastructure is significant, especially for a system with a relatively small customer base. However, once the core infrastructure is in place and paid for, the financial requirements necessary to fund the long-term operations and maintenance as well as debt service and capital improvements and replacements reserves becomes sustainable with reasonable target user rates. Therefore, it's recommended that the Board concurrently begin campaigning to build public support and develop an appropriate funding strategy to target maximum grant funding, which will be the ultimate tool toward getting customer rates to acceptable levels for construction and commissioning of the recommended Phase 1 project, and which will also be the ultimate variable driver of public support.

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1.0 PROJECT PLANNING

The GCCWSD was created in December 2020 as a result of a collaboration initiative led by the Gallatin River Task Force. This initiative also included the Big Sky County Water and Sewer District (BSCWSD), Big Sky Resort Area District (BSRAD), and Gallatin County and was organized to determine feasible strategies toward achieving the relevant common goals of the regional Big Sky community, stated as 1) Promote the development of affordable housing, 2) Improve and maintain infrastructure, and 3) Protect and enhance our water resources. The GCCWSD's stated purpose is generally to collect and analyze data to determine feasibility of providing water and wastewater service, including collection and treatment of wastewater along with production and distribution of water, and to ultimately finance, construct, own and maintain the infrastructure necessary to provide such service if determined feasible.

The Canyon Area is an unincorporated area of Gallatin County, located along the corridor leading to Big Sky, MT. The Canyon Area generally refers to the Highway 191 corridor and those properties fronting and/or accessing the highway. This area has developed rapidly over the past 50 years without the benefit of a central water and wastewater system that would allow more efficient land use as well as more effective management of water resources. Current development within the Canyon area is a sprawling mix of commercial, light industrial, and residential areas with relatively low density. As the Canyon Area grows along with the regional Big Sky area, it will continue in a sprawl of low-density developments if not provided with improved, consolidated water and wastewater systems. This manner of growth will continue to promote development of exorbitant homes and investment properties for non-residents, which is in direct conflict with the vision and strategies of the overall Big Sky community, most notably to promote the development of affordable housing for those who live and work here and call Montana their home, as well as to protect and enhance the water resources that Montanans rely heavily on.

The desire to create a county utility district to provide wastewater and potentially water service to the Canyon Area dates back to at least 2008. Previous engineering reports and feasibility studies have been conducted with focus on a centralized wastewater collection and treatment system. These previous studies ultimately led to the creation of the District that exists today and defined the Planning Area boundary for the District. The District's wastewater system has advanced to a 30% design level and is currently in the process of valuating options for final feasibility before moving forward to final design with an anticipated first phase construction beginning in 2026. Due to document and file sizes, these previous studies and design documents are not included with this PER but are available upon request.

As an initial step to evaluating a water system to support the District, the District Board submitted a American Rescue Plan Act (ARPA) grant application to Gallatin County. The application was successful, and the District received a $25,000 grant for completing a water system PER. The remainder of the funds for this PER are provided by the Big Sky Resort Area District (BSRAD). In June 2023, the District Board solicited engineering firms to complete the PER, and subsequently WGM Group, Inc. was selected and contracted to complete this work.

This PER evaluates the existing water infrastructure in the District's Planning Area near Big Sky, Gallatin County, Montana (See **Figure 1**), documenting the needs for water supply improvements and analyzing alternatives for improved water supply to provide a recommendation for a more sustainable system toward achieving community goals. This PER has been prepared by WGM Group, with support from AE2S, in accordance with the current Uniform Application for Montana Public Facility Projects, as required by the following grant and loan programs: DNRC-RRGL, Treasure State Endowment Program (TSEP), State Revolving Fund (SRF), and Rural Development (RD).

1.1 LOCATION

This PER is focused on the canyon area adjacent to Big Sky in Gallatin County, Montana. This area is just east of the Big Sky County Water and Sewer District (BSCWSD) and is included in the Big Sky Resort Area District (BSRAD). Existing development consists of a sprawling mix of commercial-industrial areas (primarily in the immediate vicinity of Highway 191), residential areas with relatively low density, and a few undeveloped parcels. The area is rapidly growing.

The current GCCSWD includes approximately 301 acres of land spanning properties from the intersection of Highway 191 and Lone Mountain Trail to just north of Ophir School (see **Figure 2**). Properties are expected to continue to annex into the District. This PER will evaluate present conditions and water supply options for the entire conceptual expanded "GCCWSD Planning Area." This includes the current GCCWSD as well as existing development immediately north of the Highway 191-Lone Mountain Trail intersection, and properties south to the Big Sky School District elementary and high schools. These are the areas previously identified as likely to eventually annex into the GCCWSD during the sewer project planning process. While the entire area will be evaluated, the area actually recommended to be served by the proposed project may be smaller. The water service and sewer service areas within the GCCWD can differ so long as water rights requirements are met.

The GCCWSD Planning Area is divided into several 'Service Areas.' Service areas are used as a planning tool to organize existing and future demand estimates, design capacity development, and aid in communicating potential for incremental implementation. A subset of the service areas used in the GCCWSD sewer planning process will continue to be used in this water planning process – the same naming conventions will be used. These areas are delineated based on a range of factors including zoning, existing land use, and potential for increased density.

The GCCWSD Planning Area encompasses approximately 780 acres of land in Township 06 South, Range 04 East and Township 07 South, 04 East. The north end of the planning area is at roughly 45.264714, -111.252378. The approximate ground surface elevation ranges from roughly 6,000 to 6,200 feet with the general valley gradient sloping from south to north.

Figure 1 shows the location of the GCCWSD Planning Area. Refer to **Figure 2** for a more detailed depiction of the planning boundaries.

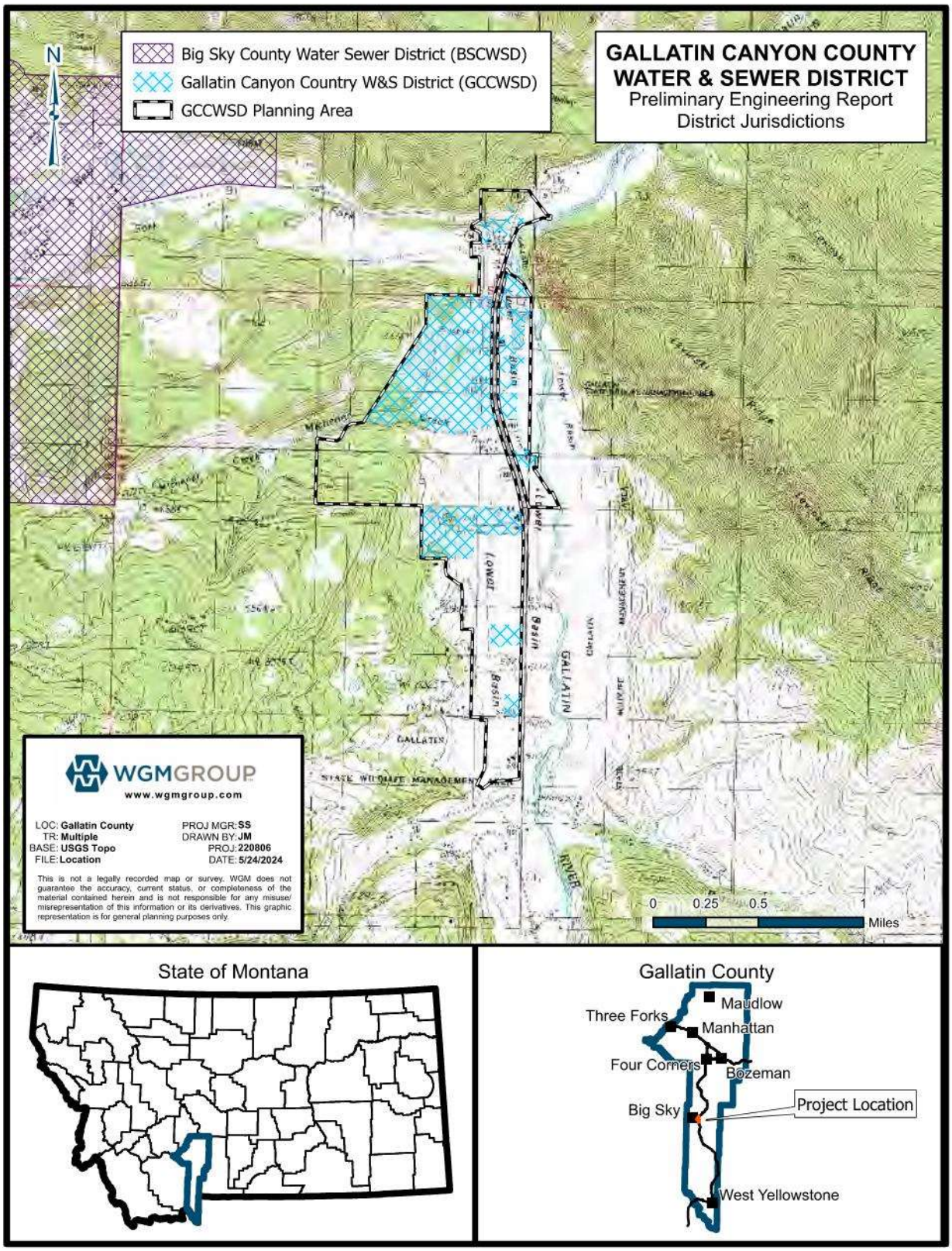


FIGURE 1. PROJECT LOCATION

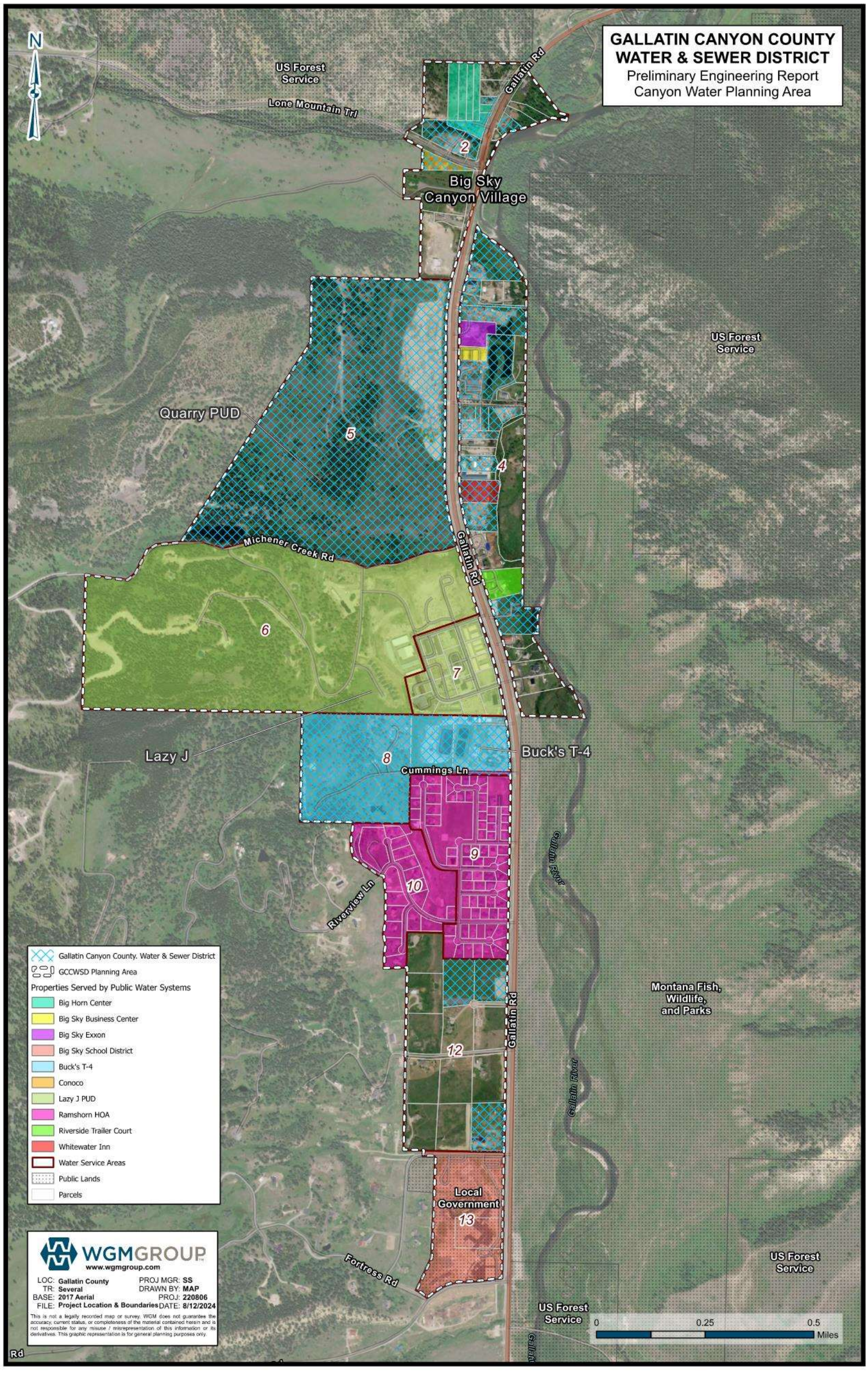


FIGURE 2 – DETAILED GCCWSD BOUNDARIES & SERVICE AREAS

1.2 ENVIRONMENTAL RESOURCES PRESENT

The study area for this proposed project is part of the Gallatin River Watershed. The valley slope is generally about 0.75 percent, or 0.75 feet per 100 ft.

SOILS, GEOLOGY, AND AQUIFERS

In general, the geology and bedrock layers in the Big Sky area include alluvium of modern channels and floodplains (Qual), colluvium (Qc), the Madison Group (Mm), Quadrant Sandstone (PMqa), the Morrison Formation (JTmd), the Kootenai Formation (Kk), Thermopolis Shale (Kmdt), Muddy Sandstone (Kmdt – same as Thermopolis), Mowry Shale (Km), Frontier Formation (Kf), and Cody Formation (Kco) (Baldwin 1996). Baldwin (1997) determined that potential aquifers exist in all of the bedrock units due to extensive fracturing, with yields ranging on average from 1 to 30 gallons per minute (gpm). More specifically, the Madison formation and aquifer produces extremely high yields to not only groundwater wells in the area, but to springs as well. Made up of karstified limestone, the formation contains interconnected solution channels and large voids. Geologic faults and structures in the formation provide high water yield potential through secondary flow pathways (Baldwin 1997). The groundwater in the area generally follows the slope of the topography toward the Gallatin River and is a part of the larger Gallatin Watershed. The canyon's alluvial aquifer and the adjacent Gallatin River are hydraulically connected, with most data indicating that the river is gaining.

See **Figure 3** for a surface overview and **Figure 4** from the Lazy J's PWS-6 Report for an approximate cross section.

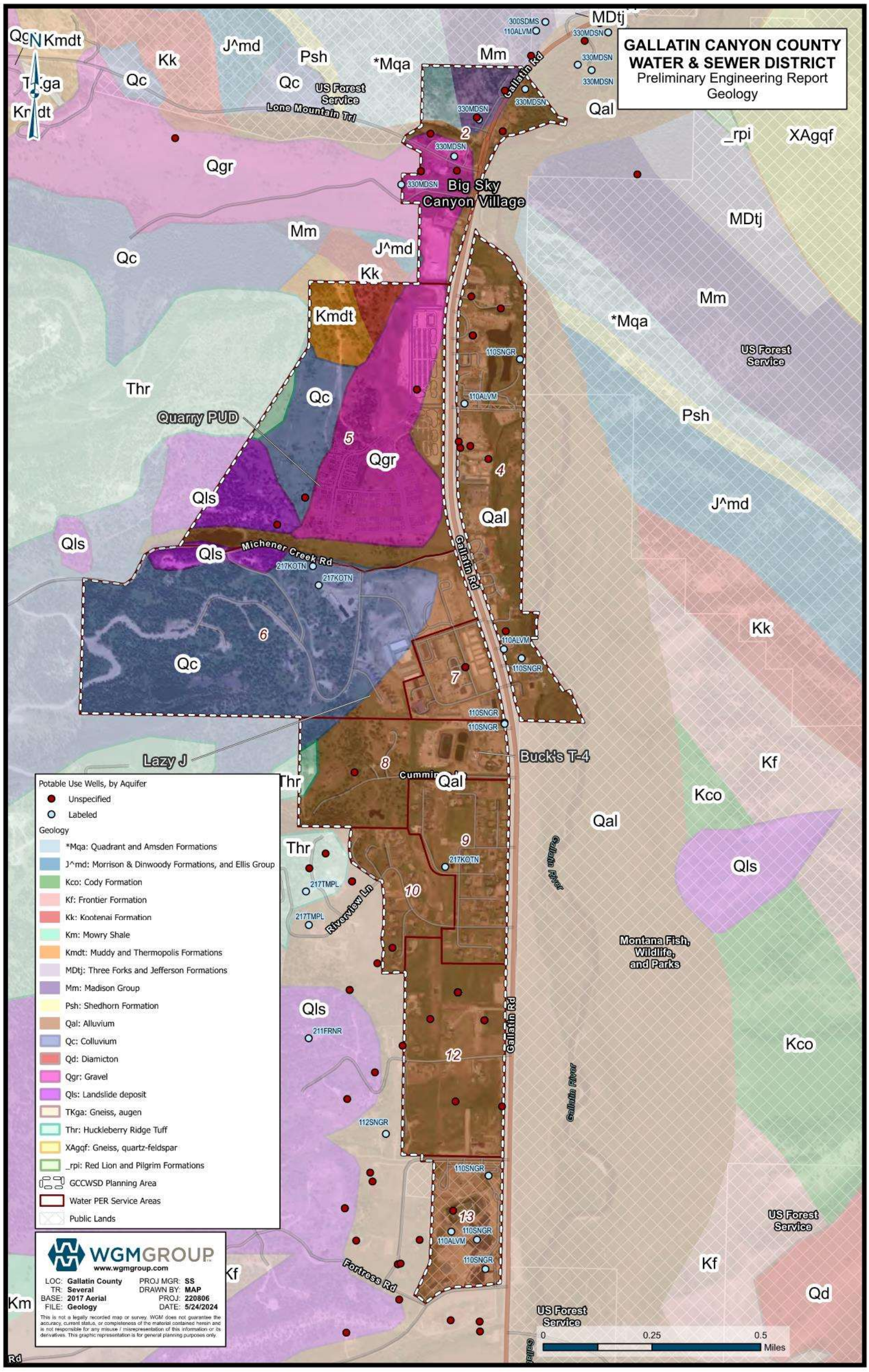


FIGURE 3. AREA GEOLOGIC MAP – SURFACE OVERVIEW

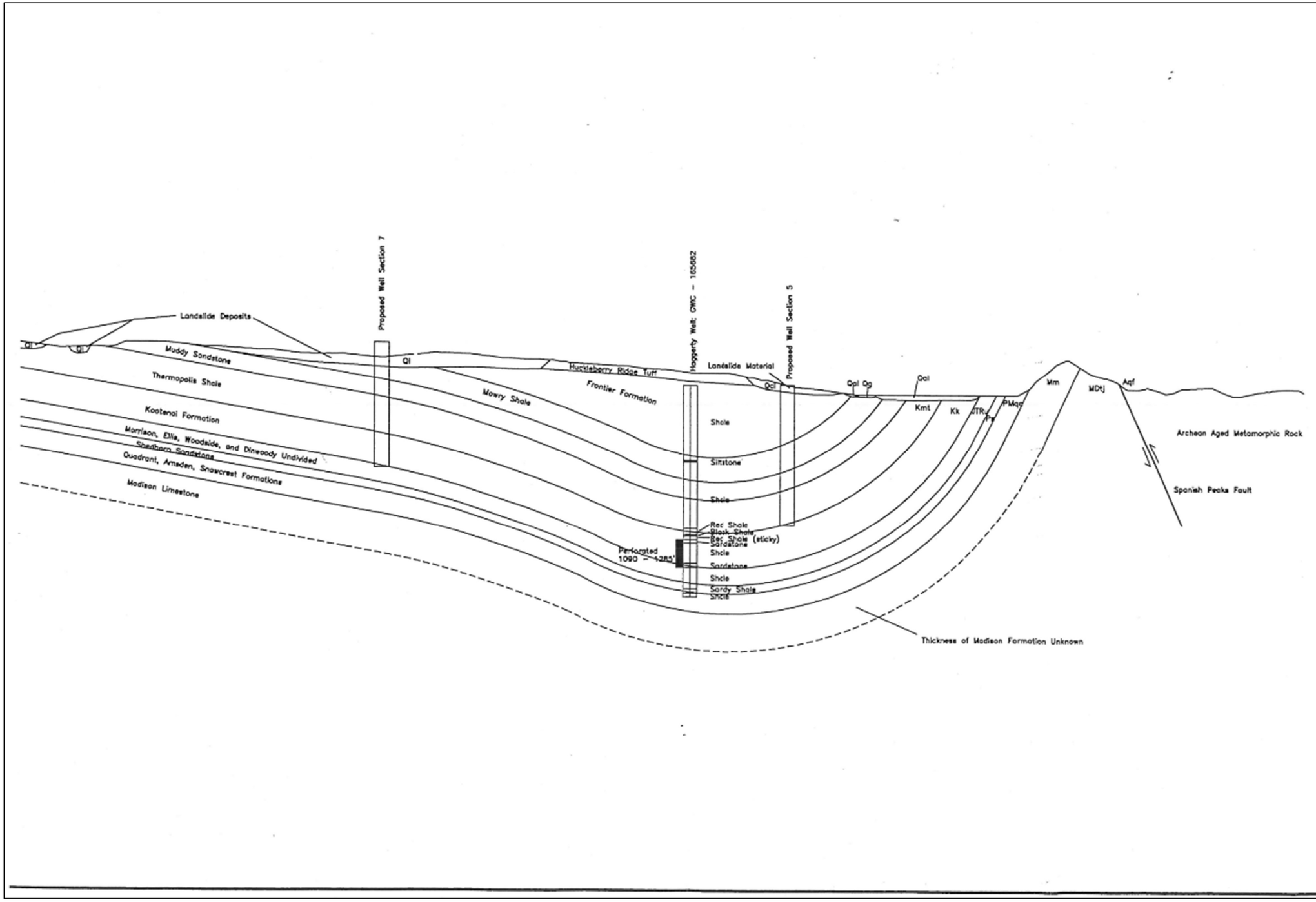


FIGURE 4: APPROXIMATE GEOLOGICAL CROSS-SECTION

A Modflow model of the shallow alluvial aquifer has been prepared by MBMG and can be found at https://mbmg.mtech.edu/pdf-open-files/mbmg772.pd. This would help inform design or any future water system.

The soils in the area are primarily loam and cobbly loam (Preliminary Engineering Report for Canyon Area Wastewater Treatment and Disposal (Dowl HKM, 2008)). Overview maps of regional geology and soils may be found in **Appendix A.**

All water supplies for human use in the area come from groundwater. Increasing water conservation and efficiency have been identified as community goals to protect aquifer levels and baseflow in the Gallatin River for human use and environmental health. Rapid development and climate change are increasing pressure on this water availability.

THE GALLATIN RIVER

The Gallatin River is a blue-ribbon designated river with nearly 3,000 trout per mile and is under consideration for Wild and Scenic Designation. It is an integral part of the local economy and culture. A algae-based TMDL for the reach is currently being developed and is expected to take effect in 2028 or 2029. Septic systems in the canyon were previously identified as a significant source of nitrogen to the river and contributor to the algae issues. River sensitivity is greatest in late summer when base flow is low and water temperatures are elevated, increasing the risk of algae blooms and reduced dissolved oxygen, creating less favorable conditions for fish and other aquatic species. The canyon's alluvial aquifer and the adjacent Gallatin River are hydraulically connected, with most data indicating that the river is gaining. Water use practices in the community can affect water quality and quantity in the adjacent stretch of the Gallatin River.

FLOODPLAINS

The relevant floodplain areas are along the Gallatin River, west of Highway 191S, and the West Fork. Most development is well outside of the 100-year regulatory floodplain (Zone A). However, some existing potable wells are within the floodplain and some distribution lines of a centralized PWS may need to be located within these zones to serve existing buildings. This will be taken into consideration during design development. The full Floodplain Exhibit is included in **Appendix A**.

WETLANDS

There are wetland areas along the Gallatin River and the West Fork. Most of the project can easily avoid wetland disturbance, but further evaluation will be needed to see if distribution lines can entirely avoid being sited through wetlands and still serve existing buildings. Care will be taken to ensure minimal to no wetland disturbance during project implementation. A Wetland Exhibit is included in **Appendix A**.

WILDLIFE

Several endangered and threatened species have ranges overlapping the project area. These include the threatened grizzly bear, Canada Lynx, and potentially threatened Whitebark Pine. This includes minimal area designated as critical habitat for the Canada Lynx. Protected migratory birds in the area include Bald Eagle, Cassin's Finch, Golden Eagle, Rufous Hummingbird, and Olive-sided Flycatcher. The Gallatin River is also a blue-ribbon trout fishing river, with valuable cold water fish habitat. The GCCWSD Planning Area is not in an executive order area for sage grouse habitat.

1.2.1 AGENCY NOTIFICATION

A project summary, location map, and overview map were prepared for this project and are being sent to various agencies for comment on this project. Letters have been sent to DEQ, the Montana Department of Fish, Wildlife & Parks (FWP), the Department of Natural Resources and Conservation (DNRC), the State Historic Preservation Office – Montana Historical Society (SHPO), Montana Department of Transportation (MDT), the U.S. Army Corps of Engineers (USACE), the U.S. Fish and Wildlife Service (USFWS), the United States Department of Agriculture (USDA), United States Forest Service (USFS), the Gallatin Conservation District (GCD), Gallatin Local Water Quality District (GLWQD), and the Gallatin City-County Health Department (GCCHD), and Big Sky Fire Department (BSFD). Agency correspondence that has already been received is included in **Appendix B**. This will be updated if and when more correspondence is received.

1.2.2 ENVIRONMENTAL CHECKLIST

The draft Environmental Checklist is included in **Appendix C,** which also contains a draft environmental assessment for the ongoing Canyon Sewer Project. Many of the project environmental considerations and impacts would be the same.

1.3 WATER RIGHTS VIABILITY ASSESSMENT

The Canyon Area is situated within two basin closures, presenting a hurdle to new and continued development because the DNRC may not process or grant applications for new permits to appropriate surface water within the Gallatin Basin until the Water Court issues Final Decrees for the Upper Missouri Basin and all incorporated subbasins.

WGM Group prepared a 2024 *Water Rights Viability Assessment for Centralized Supply* Technical Memorandum, attached as **Appendix D** of this report. Because no avenue exists to secure a new surface water permit within the Gallatin Drainage, the *Viability Assessment* is structured to provide a strategy for the potential consolidation of numerous existing groundwater sources in support of the Preliminary Engineering Report (PER) for District-wide water supply. It summarizes the existing private water rights in addition to unfiled groundwater wells located within the Canyon Area and attempts to quantify the potential volume of supply, which may be legally available (through Change Authorization & Permitting processes) for assimilation and re-distribution under a centralized water supply network owned and operated by the GCCWSD.

Table 1 of the technical memorandum (reproduced below) includes a combined listing of all existing water rights and uses that fall within the GCCWSD water supply project planning boundary. The cumulative total characterizes the Canyon Area's water supply volumes and flow rates at full current Abstract value according to the claimed maximums allowable by statutes and administrative rules. The tabulated hypothetical totals are not necessarily indicative of the water, which might be justifiably available for centralized District service.

Water Right Type	Combined Maximum Annual Volume [ac-ft]	Combined Maximum Flow Rate [gpm]
Permits	241.8	477
Groundwater Certificates	207.3	968
Existing Uses*	Up to 250	Up to 815
Suppositional Cumulative Total	**699.1**	**2260**

*Includes both Unquantified Certificates and Unfiled Exempt Wells. Flow rates up to 35 gpm per well and individual volumes up to 10ac-ft per year statutorily possible per combined appropriation. Subject to past beneficial use.

No avenue currently exists to secure a new permit for a surface water right within the Gallatin Drainage, While the DNRC will consider an application for a new groundwater permit, any new consumptive use of water would have to be offset by retiring existing water rights within the Gallatin Drainage. Furthermore, any new or changed groundwater right application must provide sufficient evidence that downstream users of surface water and groundwater are not adversely affected by the proposal.

Based on the findings of the *Viability Assessmen*t, WGM considers the aggregate volume of legally available well water as the limiting factor for development density. *Table 2* of the *Viability Assessment* Memo (reproduced below) summarizes a listing of the cumulative potential of all current water rights (and future Certificates) within the Canyon Area, which WGM believes are viable for consideration under the proposed GCCWSD water supply project. Please refer to *Section 3.3*, of the technical memo for an explanation of the methodologies employed to estimate the *Aggregated Annual Volume Available* for GCCWSD build-out.

Water Right Type	Aggregated Annual Volume Available [ac-ft]	Daily Average Domestic Equivalent [gpd]
Permits & Appurtenants	239.4	--
Large Certificates > 3 ac-ft	75.7	--
Small Certificates < 3 ac-ft	33.5	--
Unquantified Certificates	9.8	--
Unfiled Exempt Wells	21.0	--
Convertible Cumulative Total**	**379.3**	**339,000**

**Provisional valuation according to present day consumptive use patterns and simplifying assumptions. Total includes current irrigation.

Lazy J Utility, Ramshorn HOA, and Boyne (Buck's T-4) own a significant portion of the potentially useable water right volumes. It is important to recognize that not all righstholders will transfer their water rights ownership to the District. Additionally, some portion of the estimated Convertible Cumulative Total summarized in *Table 2* must be reserved for future irrigation, large-volume business use, and other probable consumptions (including any required mitigation). These types of uses exist today and are likely to continue to exist to some degree after future development. Therefore, options and alternatives for development within this Water PER must be guided by an understanding of the legal availability of GCCWSD's water sources.

1.4 POPULATION TRENDS

The GCCWSD Planning Area is a rapidly growing community with a mix of commercial, industrial and residential population. Detailed population data for the GCCWSD Planning Area is not available since it included in the larger Big Sky CDP (See **Figure 5**). The CDP grew 89% from 2000-2010 and 56% between the last two censuses with a 2020 population of 3,591. The area continues to grow rapidly. According to US Census data, Gallatin County population growth has slowed, with Bozeman area's peak of 3.8 % growth in 2016 dropping to 1.2% growth in 2023 – Big Sky area growth is not expected to track that trend closely.

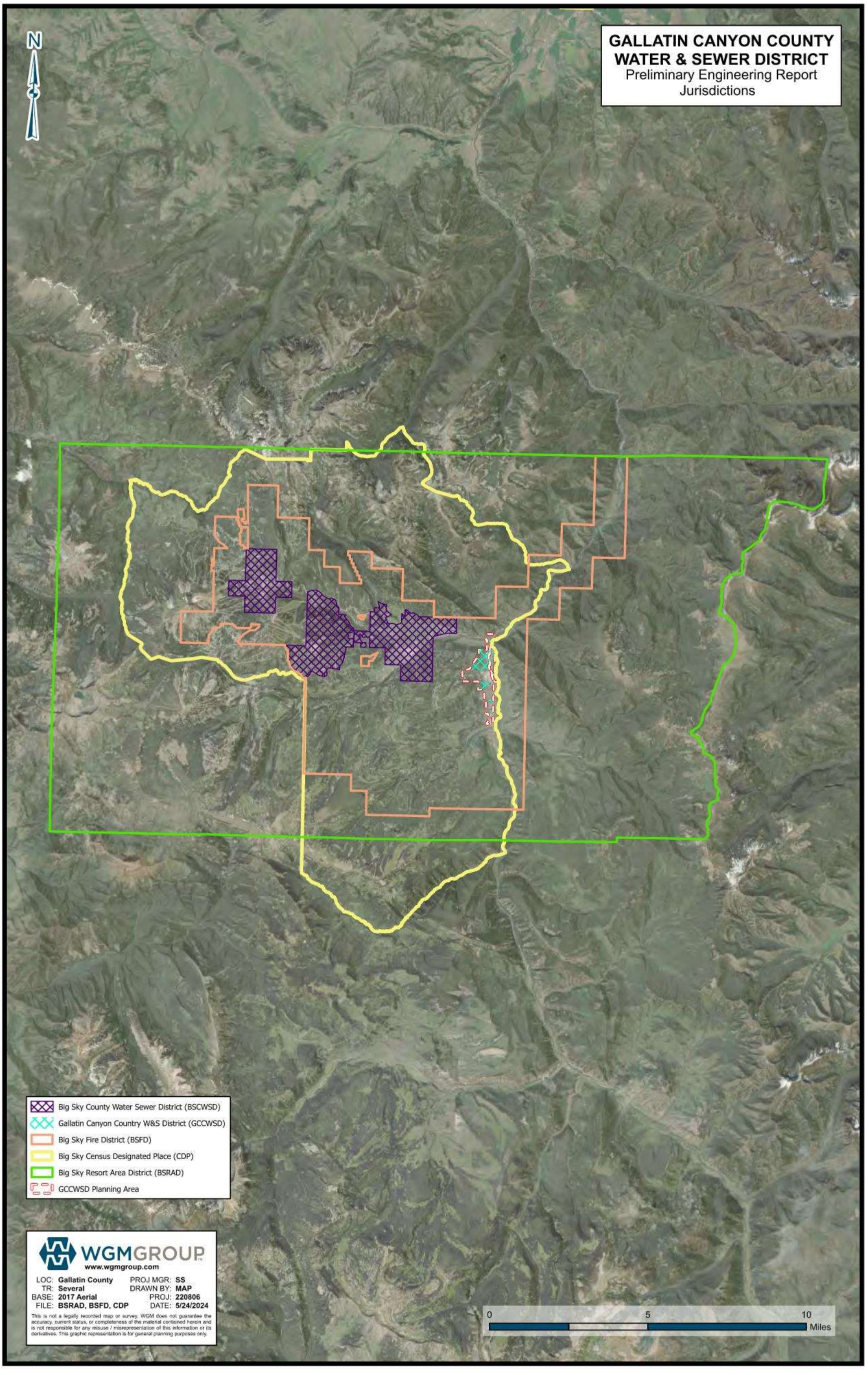


FIGURE 5. AREA JURISDICTIONS AND BIG SKY CDP

Several large developments are already planned. For example, the Quarry PUD in service area 5 plans to add 300 residential units and 30 commercial units. 24 of the residential units are set aside as deed-restricted affordable housing. Lazy J (service areas 6 and 7) plans to add 50 townhomes and 10 commercial units and Buck's T-4 in service area 8 plans to add a 100 person dormitory and 100 residential units. This will greatly increase the population of the GCCWSD Planning Area. These areas, along with service area 4 along the river have the most growth potential.

According to a Visit Big Sky estimate, 292,000 tourists visit Big Sky annually. About 87% stay overnight. Currently, about 86% of Big Sky's guests come in the winter, 39% in the summer, 20% in the spring and 13% in the fall (percentage overlaps occur from those who visit multiple seasons). This leads to a highly seasonal population and water demand. It is unknown how much of this is focused in the GCCWSD Planning Area. According to the 2019 "WRRF Conceptual Design Report and Effluent Reuse and Discharge Study" conducted by AE2s for the BSCWSD, year-round tourism in the Big Sky area is expected to continue to increase due to efforts to attract more year-round summer visitors with mountain biking and other events (concerts, rodeo, etc). This will cause more vacation properties to be occupied year-round, increasing the strain on local infrastructure.

With the GCCWSD formation and progress towards a centralized sewer, denser, more cohesively planned development will become possible. In addition to reducing the environmental, health, and administrative burdens of individual septic use, centralized wastewater infrastructure lends to more efficient land use which will improve current community challenges associated with rapid development. These include development of more affordable/workforce housing, commuter traffic congestion, and natural resource conservation. Centralized water and associated decommissioning of private potable wells would likely further this trend.

It is likely that the development in the Gallatin Canyon will be a hybrid of resort-area type development (hotels, restaurants) and residential-type development, and heavily tourist-based, making actual population estimates difficult at this time. Anticipated trends in water demand are discussed in Section 3.3.

There is no official income survey data, but the income of the canyon is generally lower than that of the rest of Big Sky. The median household income (MHI) for the GCCWSD Planning Area would be lower than the official $94,176 shown in the census for the Big Sky Census Designated Place (CDP).

1.5 COMMUNITY ENGAGEMENT

As previously discussed the GCCWSD was born out of a collaborative initiative led by the Gallatin River Task Force and including the BSCWSD, BSRAD and Gallatin County to determine feasible strategies toward achieving common goals of the regional Big Sky community. This community, in 2020, voted for an additional 1% Resort Tax for Infrastructure to provide partial funding for design and construction of the GCCWSD's sewer system, which is currently pushing towards final design. The next logical step for the GCCWSD is to investigate the need and feasibility to provide, operate, and maintain a central public water system, which will bolster the GCCWSD's contribution towards achieving these common goals, particularly the promotion of affordable housing, improving and maintaining infrastructure, and protecting and enhancing water resources. Though most regional and immediate community members understand the role a GCCWSD's centralized water and sewer systems play in advancing towards these goals, likely the biggest hurdle to achieving full "buy-in" from the Planning Area's residents and business owners will be achieving reasonable user rates for these systems. This PER analyzes and recommends alternatives for a new central water system to be used as a GCCWSD planning document to be used for system planning and design as well as community engagement and education and for seeking project funding.

The GCCWSD holds public meetings roughly monthly and frequently discusses this Water PER effort. Project information, as well as meeting minutes and other educational materials are publicly available on the GCCWSD's website, GallatinCanyonWSD.org.

A special GCCWSD Board meeting was held the evening of May 30th 2024 with a focus on this Water PER process. Meeting minutes can be found at https://www.gallatincanyonwsd.com/2024-meetings. Motivation for evaluating water in the GCCWSD, the PER process, and the alternatives being evaluated were discussed. Public input was solicited. Six members of the public attended and asked clarifying questions throughout the meeting. These were not the same people who regularly show up to GCCWSD board meetings. There were no strong comments for or against a centralized water system. Most attendees said they showed up to hear what the GCCWSD board is planning. MSU Extension's "Well Educated" water quality test kits were available at the meeting – one attendee took a kit to sample their well.

A final public meeting will be held upon completing the final draft report for further board and public review and discussion. Coming out of this final public meeting, the PER will be finalized, incorporating relevant discussion and comments from the meeting. The Board will then vote to adopt the final PER as an official planning document, and to educate the public on the importance of an updated water system in the canyon area and associated costs, including funding and user costs. Future public meetings and outreach events also will be conducted as the project is implemented.

2.0 EXISTING FACILITIES

There is no existing centralized water system in the GCCWSD Planning Area. Many property owners rely on individual wells and septic systems; there are ten public water supplies (PWS) owned by private entities.

2.1 LOCATION MAP

WGM Group previously compiled an inventory of wells in the area as part of the 2022 "Canyon Septic Inventory & Collection Prioritization Study" (see **Appendix F**). This data was based on MBMG's available GWIC and "Groundwater Investigation Program (GWIP) for the Upper Gallatin" well data. It is important to note that location data from GWIC is notoriously inaccurate, so spatial representation of these wells and associated values are estimates only; GWIP locations are verified. Many properties with structures on them have no wells in the GWIC dataset and are not served by a PWS - it is unknown how many of these are served by neighboring wells through shared connections and how many actually have a well that does not show. Many wells in GWIC are shown at the same location which is unlikely. Several updates to the inventory were made during this PER process based on additional resources, including all PWS well locations.

Potable wells represent the wells in the GWIC database that include "Domestic", "Public Water Supply" or "Commercial" in their use description; wells marked "Unknown" or with no use description were assumed to be potable. If the use description includes Test, Monitoring, Unused, Industrial, Stock, Irrigation, or Fire Protection, but not Domestic or Commercial, the well was not considered potable. This indicates there are 94 wells total in the planning area, 62 of which are for potable use. Roughly a quarter of these are located in Service Area 4. 30 of the potable wells are less than 50 feet deep and 6 are less than 25 feet deep and are especially vulnerable to surface contamination. 14 of these are Public Water Supply (PWS) wells associated with ten PWSs. Note that the PWS well locations indicated by GWIC were updated according to system drawings where needed. There are many other wells outside of the GCCWSD Planning Area, some of which draw from the same aquifers.

An overview of the existing wells and the layouts of the largest PWSs are provided on **Figure 6**. More detailed layouts, as well as schematics and photographs, of the existing PWSs are included in the most recent Sanitary Surveys, which are included in **Appendix G.**

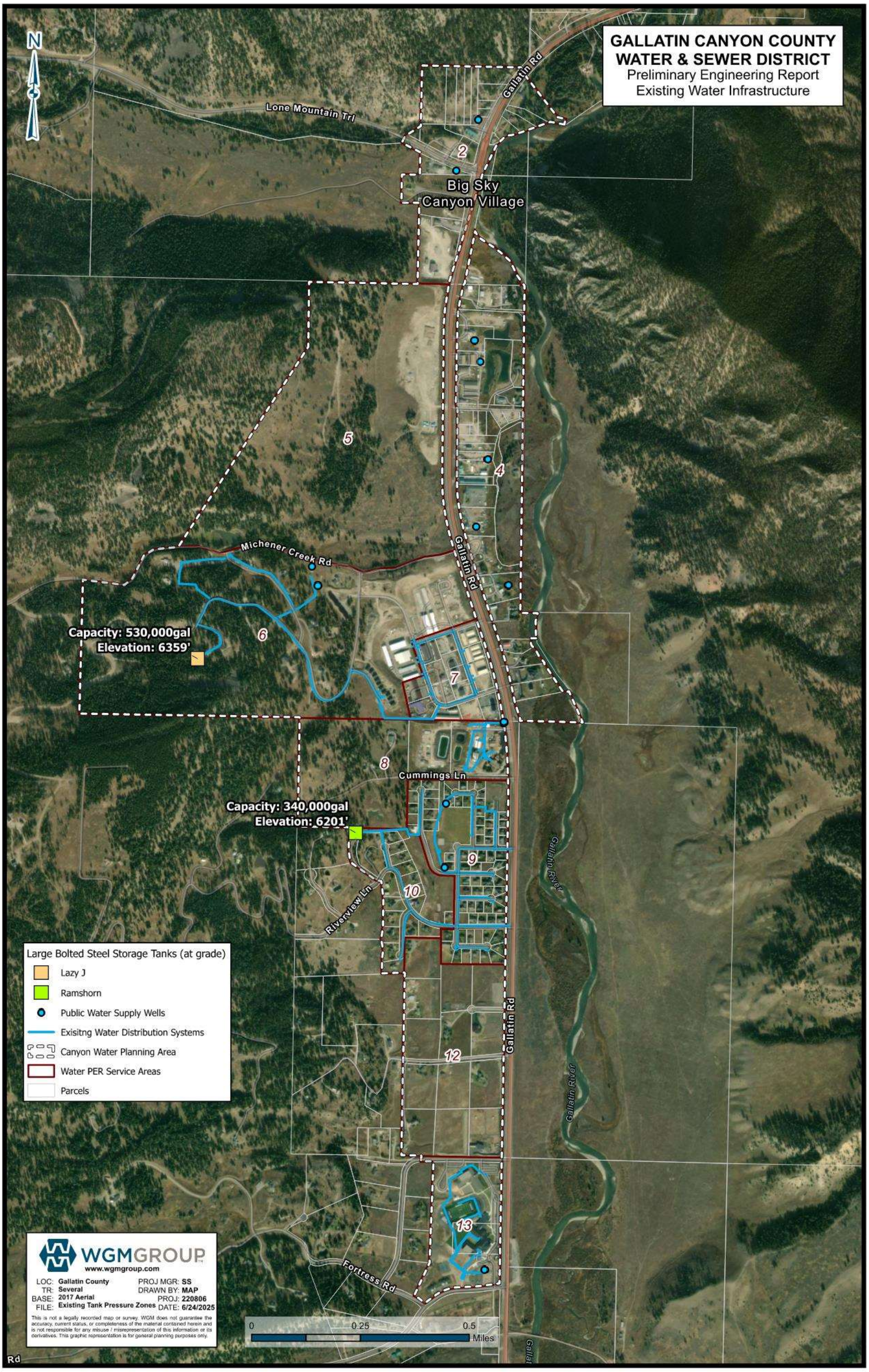


FIGURE 6 – EXISTING WATER INFRASTRUCTURE

TABLE 1: EXISTING WELL SUMMARY

SERVICE AREA	# OF WELLS	# POTABLE WELLS	NUMBER OF POTABLE WELLS LESS THAN 50' DEEP	NUMBER OF SHALLOW POTABLE WELLS LESS THAN 25' DEEP	# OF PUBLIC WATER SUPPLY WELLS	# DOMESTIC WELLS	# IRRIGATION WELLS	# FIRE FLOW WELLS	# MONITORING WELLS	# UNUSED
2	13	10	7	1	2	7	0	0	2	0
4	24	18	11	2	4	12	2	1	2	2
5	8	5	4	0	0	5	0	0	3	0
6	7	2	0	0	2	2	0	0	5	0
7	4	2	1	1	0	0	0	0	2	0
8	7	4	1	0	3	3	2	0	0	1
9	7	1	0	0	2	0	2	0	3	1
10	3	1	0	0	0	1	0	0	0	2
12	15	14	2	0	0	12	0	0	0	0
13	6	5	3	0	1	1	0	0	1	0
TOTAL	**94**	**62**	**29**	**4**	**14**	**43**	**6**	**1**	**18**	**6**

Note that many wells fall under several categories.

2.2 HISTORY

The GCCWSD was formed in December 2020, with the intention of pursuing a new solution to wastewater management in the District and eventually evaluating water supply needs. The District was created by petition of all the landowners within its boundaries and is expected to grow significantly to cover the entire GCCWSD Planning Area. An additional 25 properties joined the GCCWSD in May 2024 and others have indicated that they plan to annex before the completion of the GCCWSD Sewer Project. Properties can continue to annex into the GCCWSD after the completion of the sewer project and any future water project. As the GCCWSD expands, so will its public and environmental health benefits and affordability.

Water service in the area currently consists of numerous private wells and several small privately-owned public systems supplying businesses and small clusters of residences. The Riverside Trailer Court and Buck's T-4's PWS were started in the 1970s. The other PWS were developed in the 1990s and 2000s. The GCCWSD owns no water infrastructure. Sewer service in the Canyon Area currently consists of numerous septic systems and several larger "public" wastewater systems servicing individual development areas. These systems generate low quality effluent compared to most centralized treatment options, and the discharge results in elevated nutrient loading to the Gallatin River and the aquifer that supplies drinking water for most of the canyon, posing a public health risk, as documented in the 2022 Septic Inventory (**Appendix F**). As illustrated in **Figure 7** below, many potable wells are downgradient of septic systems, many of which are nearing the end of their expected useful life. Many of these wells are shallow, drawing from the same aquifer that the septic systems discharge to.

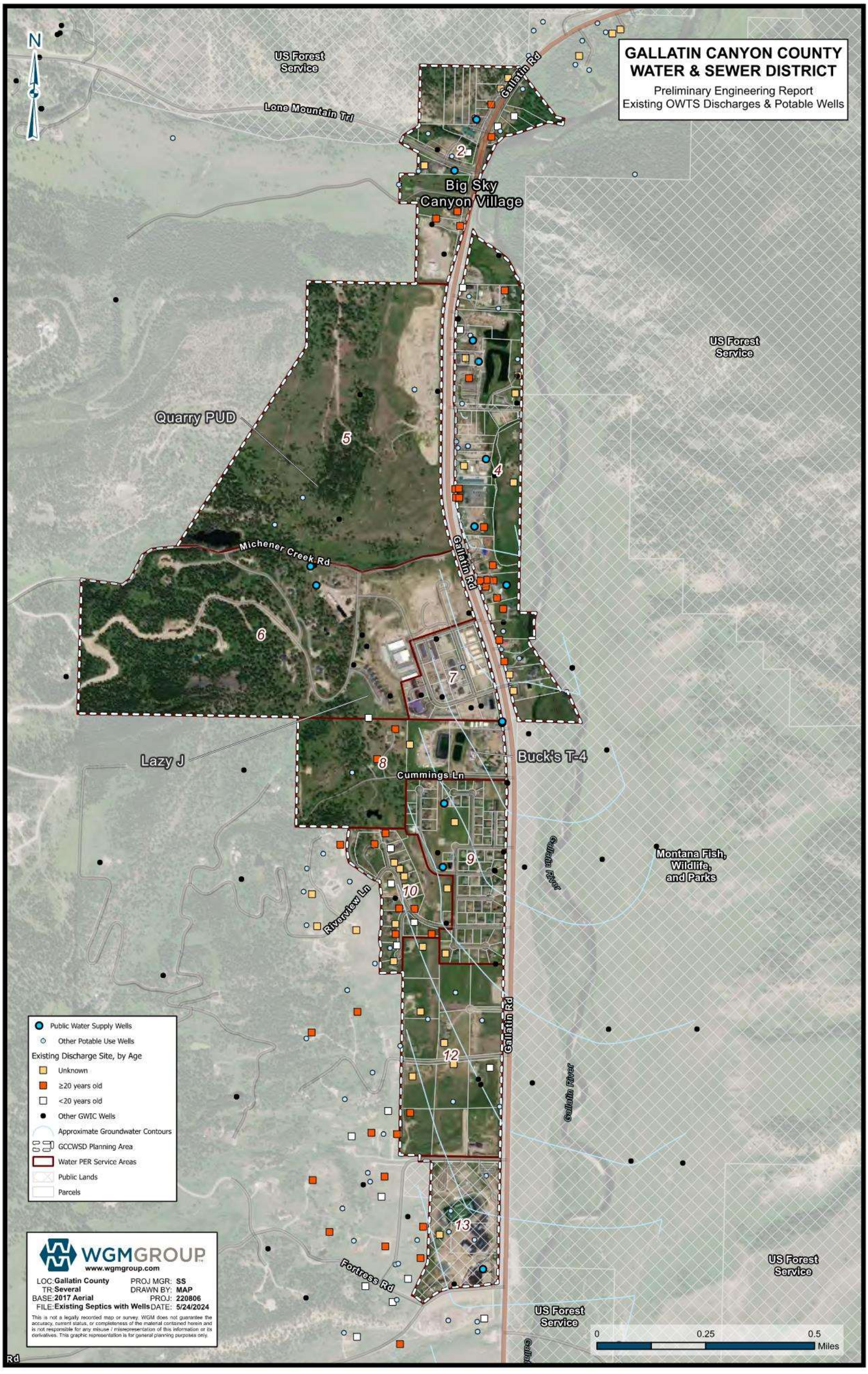


FIGURE 7 – SPATIAL RELATION OF EXISTING WELLS AND SEPTIC SYSTEMS

A centralized sewer project is currently in the design and permitting phase. Phase 1 construction is expected to be completed in 2026. This project is expected to eventually decommission all of the existing septic and public wastewater systems within the GCCWSD Planning Area. The new central sewer will collect wastewater from the GCCWSD Planning Area and convey it up to the BSCWSD Water Resource Reclamation Facility (WRRF). Effluent, treated to class A-1 (Montana's highest quality effluent standard), will be discharged back to the aquifer in several locations. An overview of the Canyon Sewer Project can be seen in **Figure 8**. This will resolve much of the wastewater-related contamination in the aquifer and associated health risk.

However, as seen in **Figure 9**, there will still be onsite wastewater treatment systems in the area on properties that choose not to annex in the GCCWSD and connect to sewer that could still present a contamination risk. There is also no cohesive fire control water supply or plan for the Canyon which may pose a public safety risk. Additionally, some community members have expressed interest in the development density, water rights, and managerial efficiencies and water conservation implications that can come from a centralized water system as opposed to private wells.

Evaluating GCCWSD water now may help inform final sewer design, to ensure both systems are compatible. It also may help clarify the value and practicality of using treated sewer effluent for non-potable water demands. Therefore, the GCCWSD commissioned this PER to further evaluate water conditions and needs for the area and, if needed, potential options to better serve the water needs of its community.

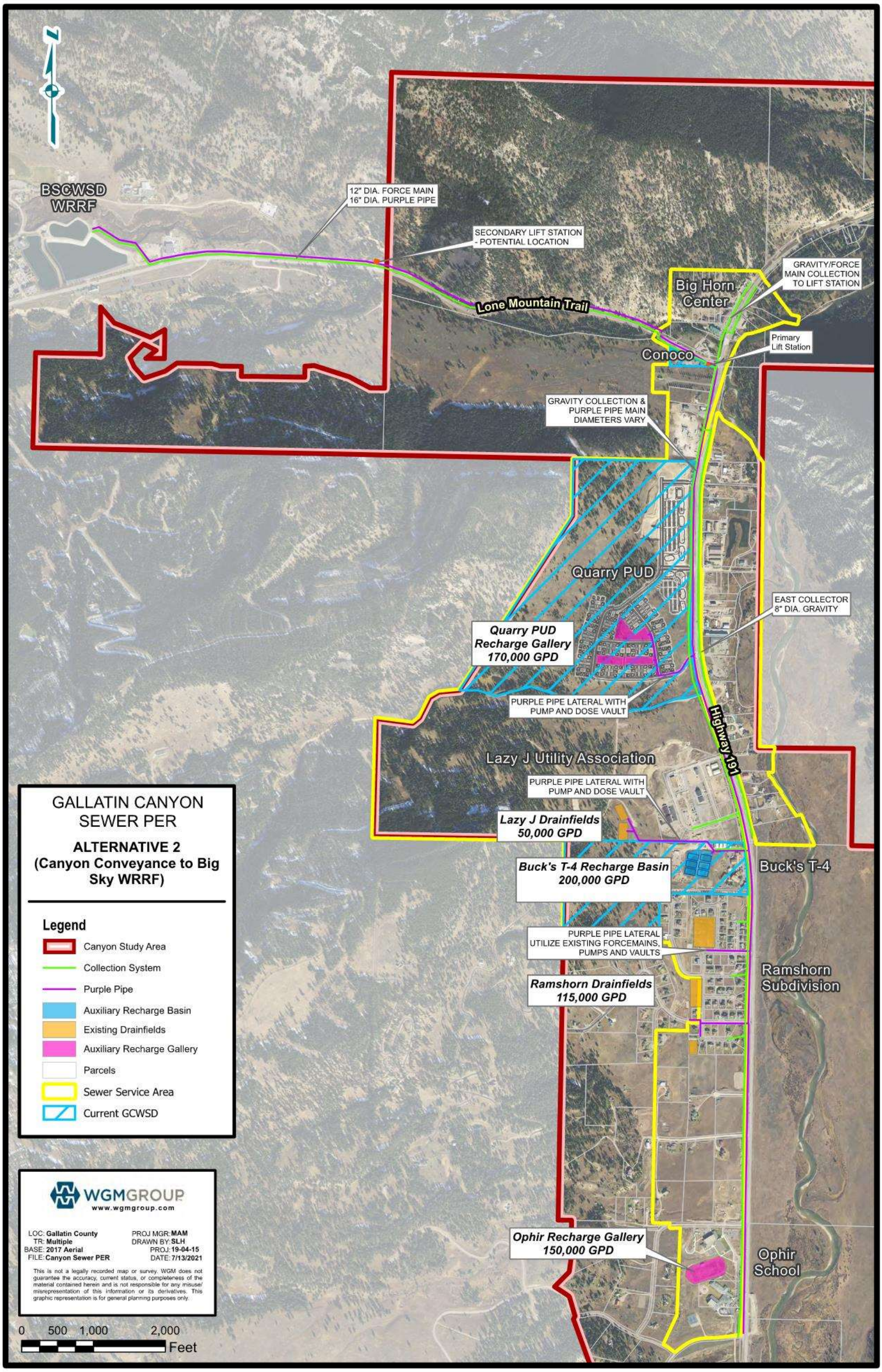


FIGURE 8: CURRENT PROPOSED CANYON SEWER PROJECT

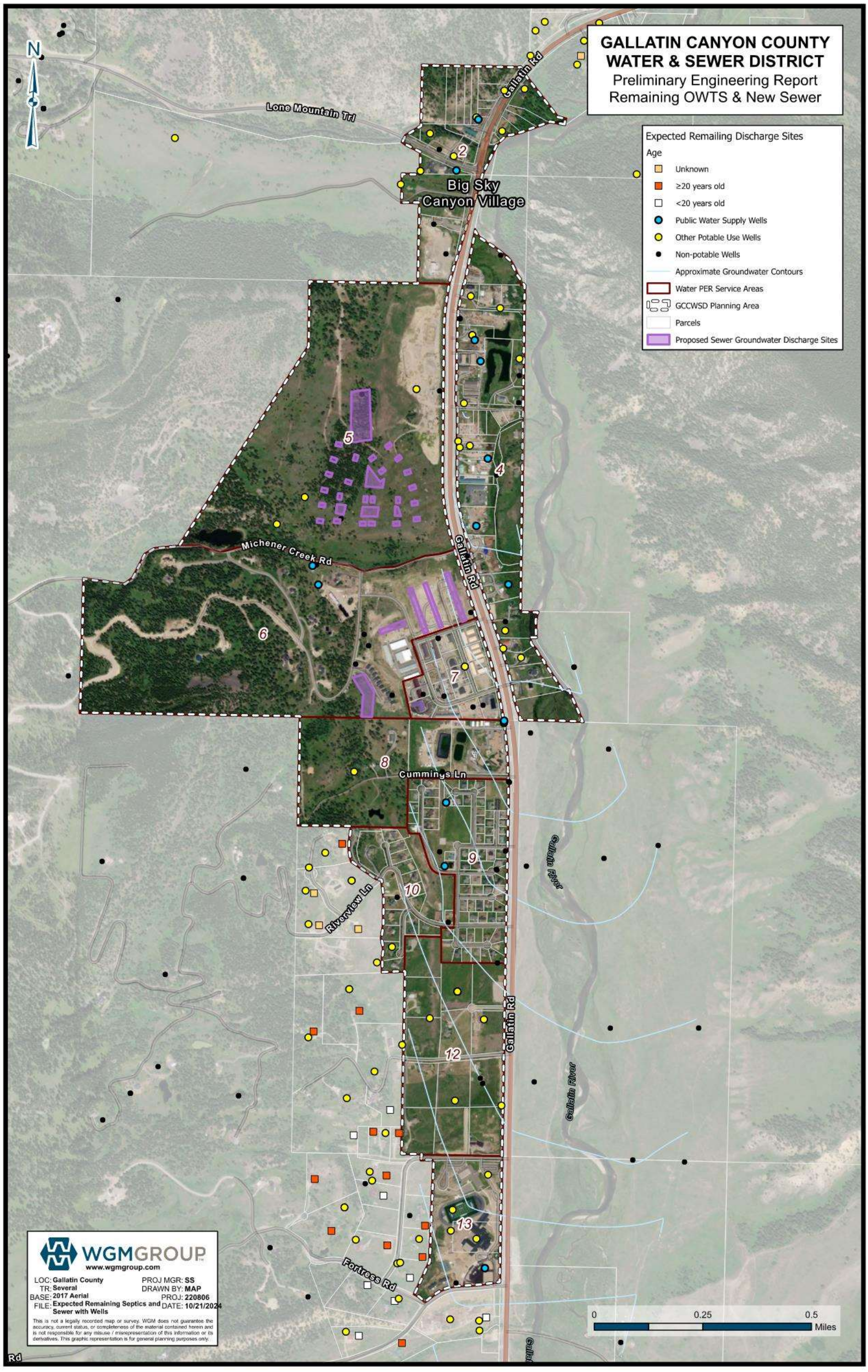


FIGURE 9: EXPECTED REMAINING SEPTIC SYSTEMS, GCCWSD SEWER DISCHARGE AREAS, AND EXISTING WELLS

A review of Drinking Water Watch indicated very few water quality violations in the past decade at these systems. However, there are many managerial violations for improper or missed samples and public notifications. Additionally, sanitary surveys indicate that backflow prevention and basic maintenance such as replacing damaged sanitary seals on well caps and changing filters could be improved at many of the systems.

2.3 CONDITION OF EXISTING FACILITIES

2.3.1 AQUIFER WATER QUALITY

Several aquifers supply water to the many wells in the GCCWSD Planning Area. According to available GWIC and geology data, most of the wells in the valley floor draw from the alluvial aquifer or sand and gravel. Some of the deeper wells to the west, including Lazy J and Ramshorn's wells, draw from the Kootenai formation. Many of the wells in service area 2 draw from the Madison formation. See the previous Figures in Section 1.2 for a surface overview and an approximate cross section from the Lazy J's PWS-6 Report.

Generally, the area's aquifers are of high quality. GWIP data indicates that most of the alluvial aquifer West of the Gallatin River is considered Class 1 groundwater with a conductivity of less than 1000 uS/cm. A few wells towards the north of the planning area have higher conductivities, assumed to be a result of upgradient OWTSs. The lack of recent water quality violations from the PWSs also indicates decent aquifer quality. However, most of the PWSs with shallow wells treat their water with chlorine-based disinfection and, in some cases, cartridge filtration. The Ramshorn PWS, which draws from deep in the Kootenai formation aquifer has experienced nuisance levels of hydrogen sulfide. They evaluated ozone treatment but did not implement. A Ramshorn resident who attended the first Water PER public meeting indicated that most homes use a point of use treatment device and that the system's water is naturally quite soft. Lazy J, which likely draws from the same aquifer, has not noted any water quality concerns.

Since 2018, MBMG has been working on "Groundwater Investigation Program (GWIP) for the Upper Gallatin." The project extents are similar to the Canyon Study Area extents. The project, nominated by the Gallatin River Task Force, is supported by the Gallatin Canyon/Big Sky Zoning Committee, Gallatin Planning Commission, and Big Sky Water and Sewer District. Project results will be used to evaluate potential changes in zoning, location of new wells and septic systems, and to make informed management decisions regarding new public water supplies and sewer systems. Data collection for this project is complete but data analysis and the final report are still in progress. The base data used here was collected by MBMG staff, properly verified and of high quality. Locations have been verified by survey or navigational grade GPS and are presumed to be accurate. This data is significantly more reliable than the general GWIC dataset. The water quality data used for this project is all from 2020 and 2021.

The MBMG water quality data indicates a clear problem of elevated nitrogen concentrations in many parts of the Canyon Study Area. One well (GWIC# 133410) has a mean TN level of 6.19 mg/L and has documented a TN concentration of 28 mg/L. Nitrogen concentrations on the east side of the Gallatin River where there is little to no wastewater input is low (<2 mgTN/L), as expected. This supports the assumption that elevated nitrogen concentrations in the west half of the aquifer are linked to wastewater effluent.

Exceedance of the EPA's MCL of 10mg nitrate/L as N was not observed. Although most water sources in the Canyon are private and therefore not regulated by these thresholds, these are important thresholds to track. Nitrate data indicates concentrations elevated above background in some areas,

but no sustained exceedances of health advisory thresholds. However, TN data indicates elevated nitrogen concentrations at more sites. Three sites have mean TN concentrations above 5mg/L and two have maximum TN concentrations above 10mg/L.

5mg/L nitrate is the advisory threshold that indicates elevated levels and requires reporting in a consumer confidence report for Montana Public Water Supplies. GWIC# 133410 had a maximum nitrate concentration of 5.84mg/L, with a mean just below the threshold at 4.71mg/L. The fact that average concentrations across 13 samples are elevated as well, indicates that the problem is not a random high spike in concentration.

Figure 10 below shows potable well locations, and nitrate concentrations in the aquifer.
It is important to note that ten separate monitoring wells each had one sampling event where TN concentration was more than 1mg/L higher than nitrate + nitrite concentration (GWIC# 246433 had two occurrences). These sites can be seen in **Figure 11**, labeled with their corresponding GCWIC ID. Small differences between measured TN and nitrate + nitrite can be attributed to differences in analysis sensitivity and reporting limits. However, a difference of more than 1mg/L likely indicates presence of Kjeldahl Nitrogen. Total Kjeldahl Nitrogen (TKN) can be calculated as TN minus nitrate + nitrite. In an aquifer such as this, the vast majority of N should be in the form of nitrate. A TKN of 1mg/L or more indicates that poorly treated wastewater likely makes up a significant portion of the water sampled. There should be further investigation at these sites to confirm what is happening.

The site with a max TN of 28mg/L (GWIC# 133410 in Service Area 4) had a calculated TKN of 23.6 when sampled 6.20.22. This well is only 14 feet deep, so it is especially susceptible to OWTS influence. However, some of the other wells with elevated TKN are deeper. The nearby 31-foot deep GWIC# 133571 also experienced elevated calculated TKN in August 2021, but not in December 2021. This is also a private potable well, representing a serious health concern.

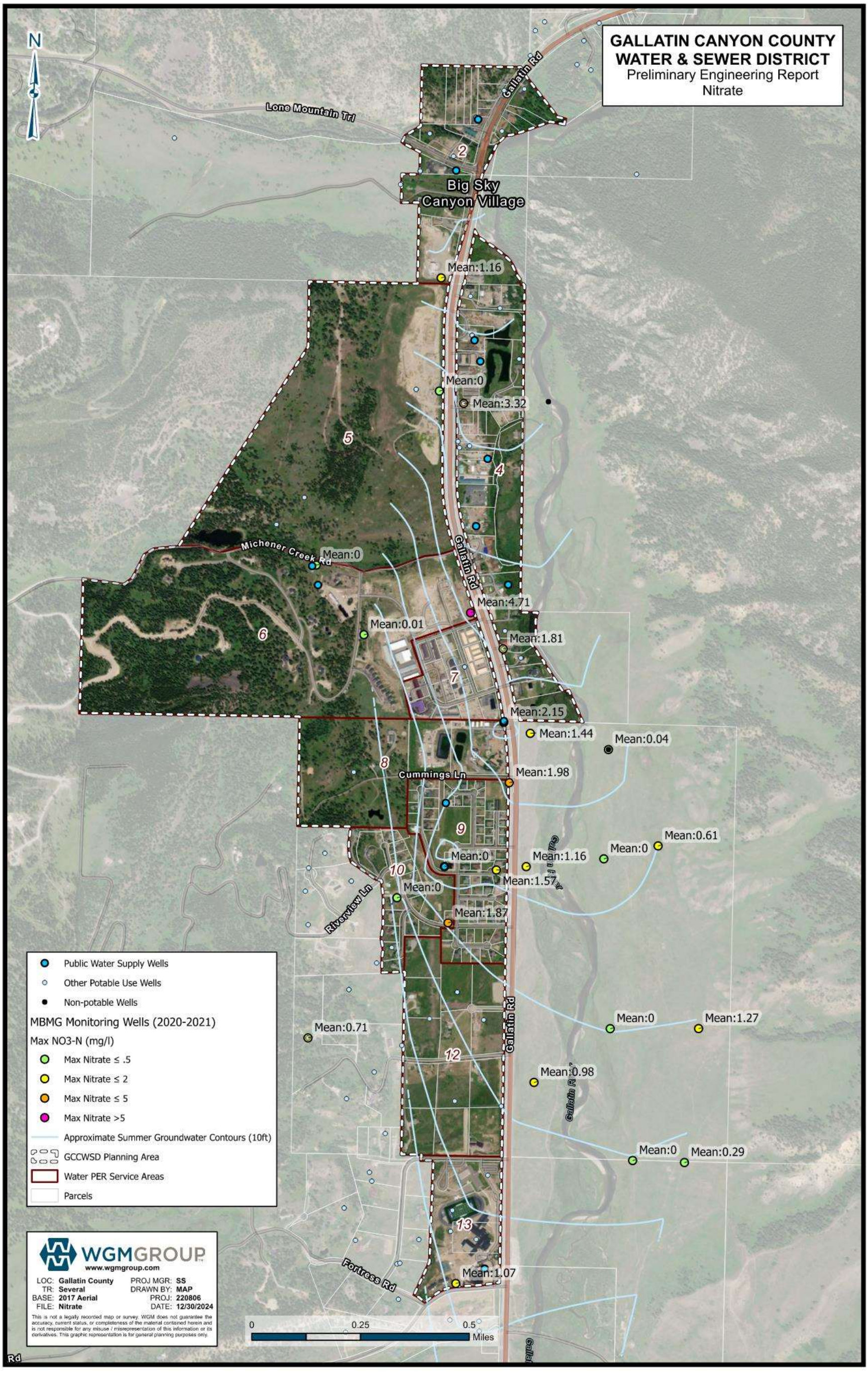


FIGURE 10: NITRATE CONCENTRATION IN WELLS

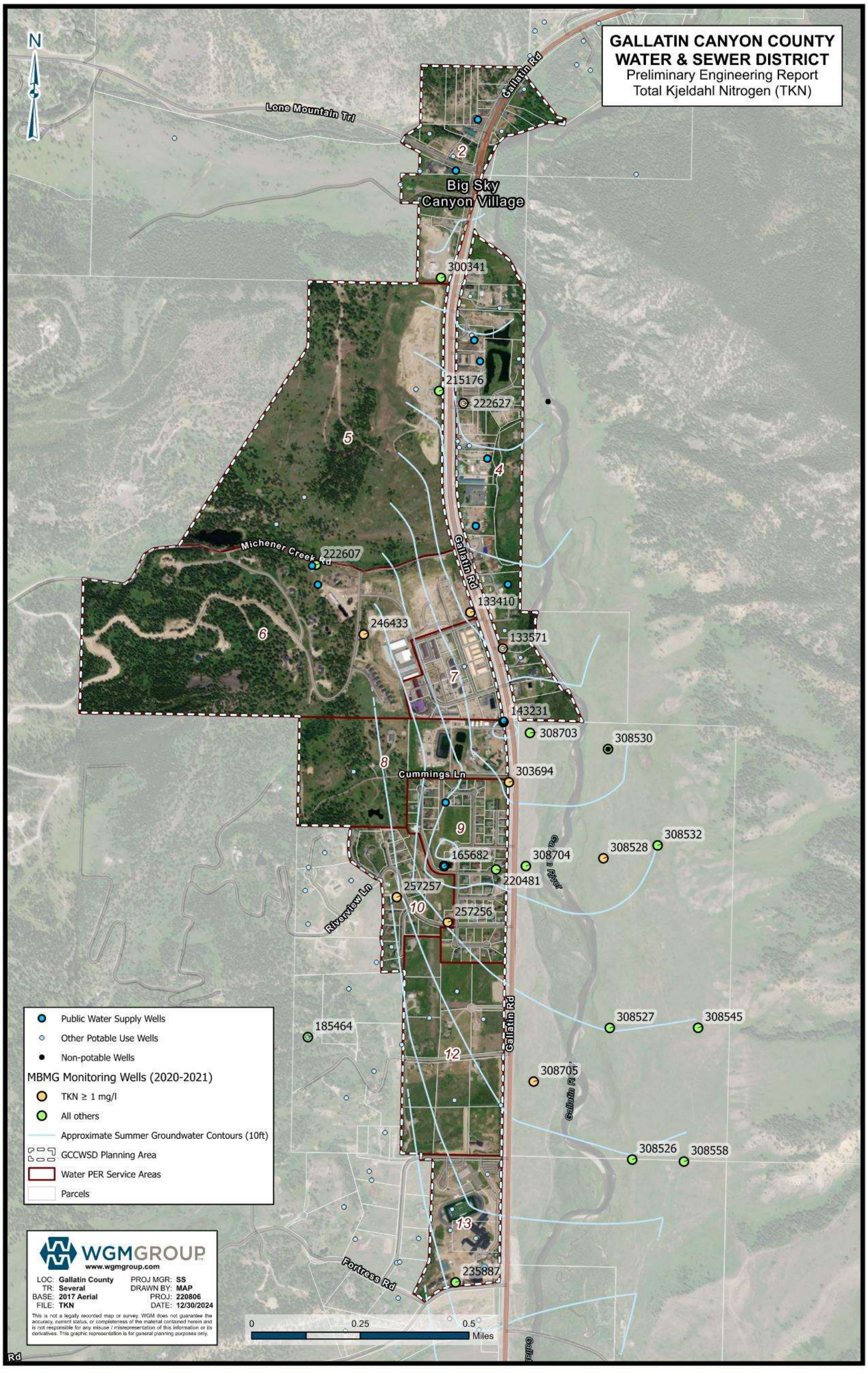


FIGURE 11: TKN CONCENTRATION IN WELLS

The ongoing Canyon Sewer Project should significantly improve wastewater-related contamination of the shallow aquifer, and associated health risks. The expected remaining septic systems and proposed new GCCWSD discharge areas can be seen in the previous **Figure 9**. It is unknown how long it will take before the entire expected sewer area is annexed and connected to sewer service. As OWTS are removed, it will likely take a few months to years for nitrate and associated contaminant levels to leave the aquifer.

In addition to the hazard of increasingly dense OWTSs, several non-wastewater-related potential anthropogenic aquifer contamination sources in the GCCWSD Planning Area were identified. The shallow aquifer, which a majority of existing wells in the area draw from is more vulnerable to these than the deeper aquifers. According to the “Discovering DEQ’s Data,” there are seven underground gas or diesel storage tanks within the project area, located at the Exxon and Conoco. These regulated storage tanks appear to be near and upgradient of the gas station PWSs. According to DEQ GIS data, there have been several petroleum releases, one of which is unresolved. These are near, and likely up gradient of the Big Sky Exxon PWS wells. Two opencut gravel mines are located in the north end of the planning area. At least one of these is expected to be retired by 2026, while a timeline for closing or retiring the other is uncertain. Flooding from the adjacent creeks and rivers also presents a potential hazard to the aquifer and wells, a couple of which are within the floodplain. Highways 191 and 64 are also considered hazards in the area’s PWS’s SWDARs; vehicles can leak or spill fuels and other hazardous materials that can leach into the aquifers. Additionally, each well is a direct pathway into the aquifers. Without proper maintenance and backflow prevention, these can be pathways for pathogen or chemical contamination. See **Figure 12** for spatial context of these potential hazards.

The GWIP data includes a wealth of water quality data in addition to the nitrogen data discussed above. As the proposed project progresses and supply wells are explored, data from the monitoring wells in the relevant aquifer can be used to provide additional information.

A brief review of some of the available parameters was conducted as part of this PER. Most wells showed moderately hard to hard water. pH, as well as arsenic and fluoride concentrations were generally within safe ranges. Three GWIP wells had measurable lead, exceeding the MCLG of non-detect, but not the MCL.

GWIP data indicates widespread presence of low levels of uranium in the canyon. Radium was detected at Ramshorn’s supply well (deep aquifer) in 2004 and 2005, but not in subsequent sampling. Radium, as well as Gross Alpha, was also detected at the three shallow aquifer wells that were tested by WGM Group in 2024, with a max value of combined radium of 3.09 +/- 1.201 pC/L. All of these carcinogenic radionuclide concentrations were below the MCLs but exceed the MCLGs of 0.

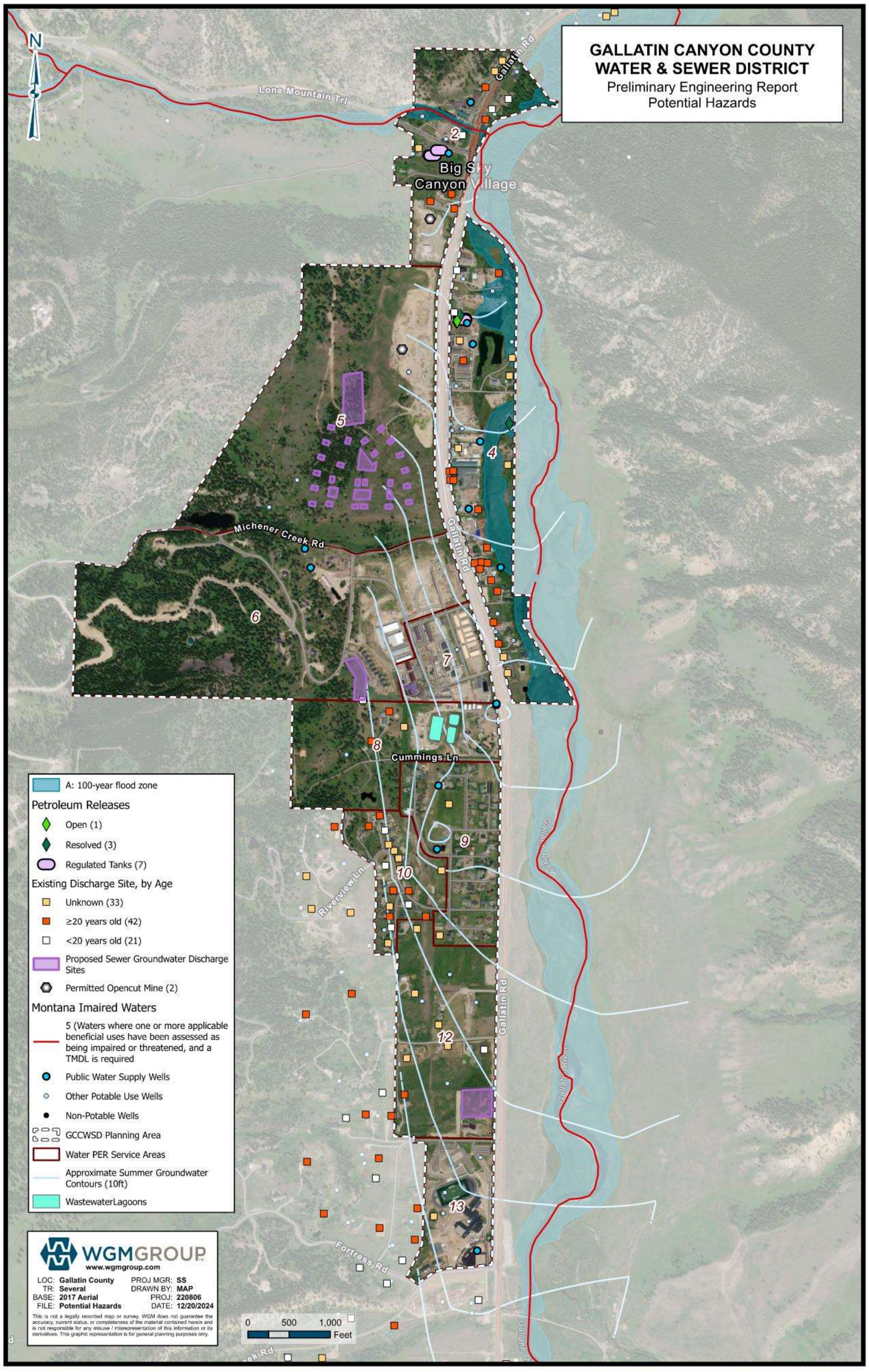


FIGURE 12: POTENTIAL CONTAMINATION SOURCES

2.3.2 PRIVATE WELLS

GWIC indicates that there are about 80 private wells in the GCCWSD Planning Area, 62 of which are potable. Since there is no regulation (once built) of private wells, little is known about the condition of those in the GCCWSD Planning Area.

Operations and maintenance of private wells is solely the responsibility of the owner. Private wells, and any associated treatment devices are often improperly maintained, and it is rare for private wells to be tested for water quality, as recommended by public health professionals. Assuming wells and septic systems were built around the same time, then the median well age would be roughly 21, with some as old as 52. The projected useful life of a well is 25-35 years so many of these wells may need extensive maintenance or replacement in the near future. The cost of updating or replacing wells or replacing well pumps (typically needed every 10-15 years) can be a significant burden for private well owners.

Figure 13 shows wells depths, based on GWIC data. Generally, Service Area 4, near the Gallatin River has shallower wells (as shallow as 18 feet) and wells in the foothills towards the west side of the GCCWSD Planning Area are deeper, with some well over 1,000 feet deep. Three private wells in the planning area are less than 25 feet deep and would not meet current design standards of public wells protecting from surface contamination. Additionally, two potable private wells in Service Area 4 are located within the 100-year floodplain, also not meeting current standards. In general, shallow wells tend to be more susceptible to contamination from human activities, such as pathogens and nitrates from septic systems and VOCs from leaking storage tanks, while deeper wells tend to be more affected by contaminants with geologic origins. Seasonal high groundwater in the valley bottom has been observed to be quite shallow, as little as 4 feet below ground surface in some monitoring wells. To protect from surface pathogens, public wells in unconfined aquifers are required to disinfect if seasonally high groundwater is less than 25 feet deep. While not held to the same standard, many private wells are likely drawing this potentially contaminated water without treatment or regular monitoring and are vulnerable to risk.

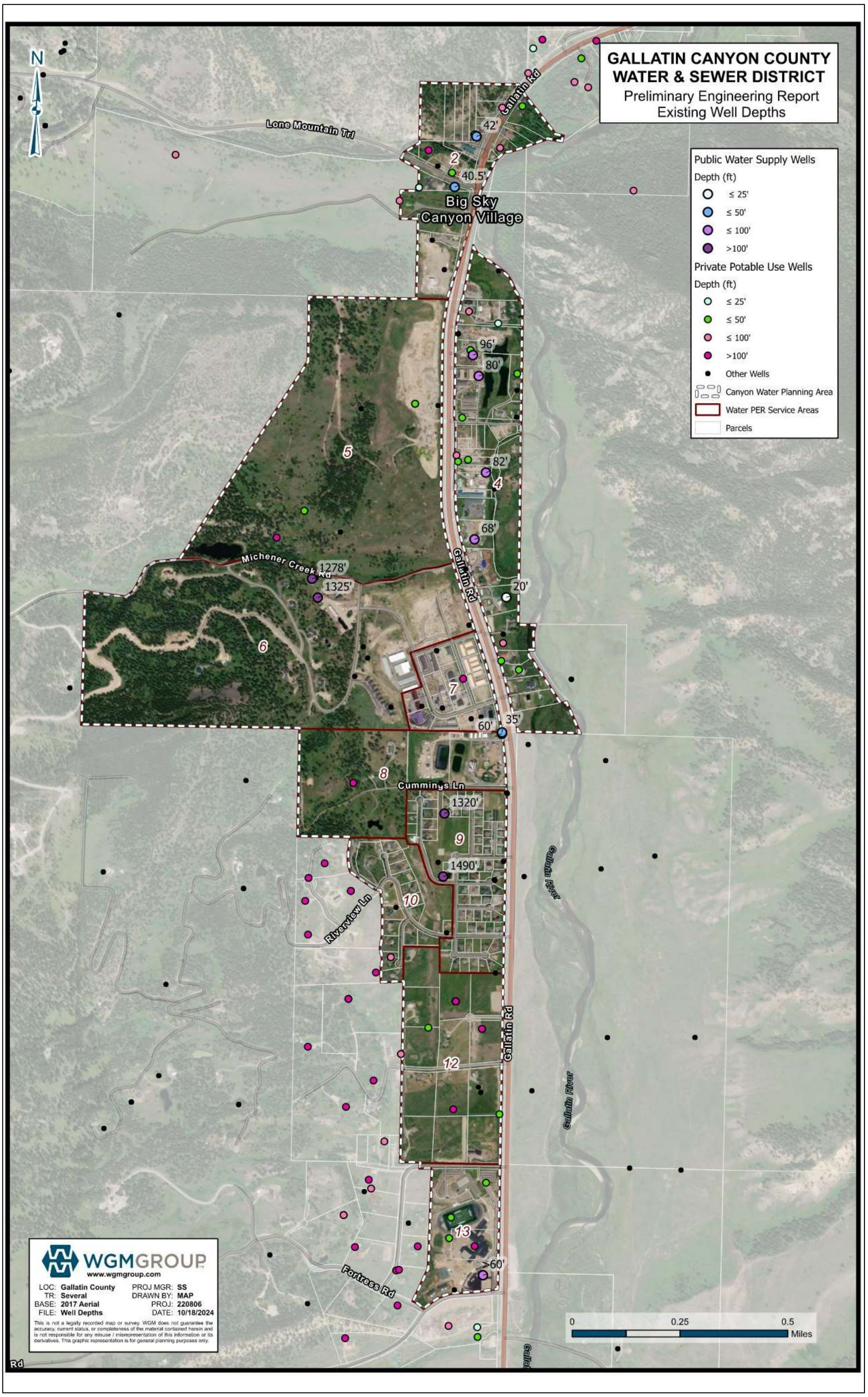


FIGURE 13: WELL DEPTHS

2.3.3 PUBLIC WATER SUPPLIES (PWS)

A public water system (PWS) provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year. A public water system may be publicly or privately owned. EPA has defined three types of public water systems:

Community Water System (CWS): A public water system that supplies water to the same population year-round.

Non-Transient Non-Community Water System (NTNCWS): A public water system that regularly supplies water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.

Transient Non-Community Water System (TNCWS): A public water system that provides water in a place such as a gas station or campground where people do not remain for long periods of time.

There are 10 existing PWSs in the GCCWSD Planning Area, as seen in **Figure 6** above. The most recent sanitary surveys (SS) were collected and reviewed for each, as well as the available Source Water Delineation and Assessment Reports (SWDAR), Drinking Water Watch Violation Summaries, water rights documentation and design reports, where available. The Sanitary Surveys and Violation Summaries for the largest systems can be found in **Appendix G** – refer to these for more detailed system descriptions, system photos, and maps. Copies of the other references are available upon request. Information from these reports and conversations with system owners and operators is summarized below.

Generally, PWSs are better managed than private wells, as there are required sampling and periodic inspections. Community PWSs are required to have certified operators and more regular and extensive water quality monitoring which should improve conditions compared to non-community PWSs.

Overview

A summary of this information can be found in **Table 2** below. Between the 10 PWSs, there is a total of 14 wells. The Riverside Trailer Court PWS and Buck's T-4 are the oldest, built in 1971 and 1974 respectively. The rest of the PWSs were built in the 1990s and 2000s. All of the PWSs with wells less than 100' deep, except the Big Horn Center, chlorinate their water and a few use cartridge filters. The two systems with deeper wells, Lazy J and Ramshorn, do not treat. A review of Drinking Water Watch indicated very few water quality violations in the past decade at these systems. However, there are many managerial violations for improper or missed samples and public notifications. Additionally, sanitary surveys indicate that backflow prevention and basic maintenance such as replacing damaged sanitary seals on well caps and changing filters could be improved at many of the systems. Available records indicate that the Riverside Trailer Court's well is a 20-foot deep hand dug well that is barely outside of the 100-year floodplain and untreated. This does not meet current standards for a PWS and presents a significant health risk. One of the Buck's T-4 PWS wells has a lead packer, contrary to current standards. Their wells are also shallow and closely downgradient of the Buck's T-4 lagoon wastewater system.

Lazy J and Ramshorn are the only properties protected with gravity-fed fire hydrants. Some of the other properties likely don't meet current fire flow standards. Even those with adequate supply are reliant on infrequently used pumps, a potential point of failure.

Some, but not all, of the PWS operators in the GCCWSD Planning Area have procured a provisional permit through the DNRC, which is necessary to allow for combined water appropriations exceeding 10 ac-ft per year. Supply rates for these systems range from 35 to 180 gpm.

Most water systems only have one or a few connections, with little capacity of note for GCCWSD scale planning. Lazy J and Ramshorn and, to a lesser extent, Buck's T-4 and the schools, have large enough systems that components are potentially reusable. Unless a centralized water system is built first, the Quarry PUD property plans to build their own distribution system and tie into the Lazy J PWS. Based on the Quarry's planned buildout date of 2025, this will most likely be built by the time a GCCWSD PWS is established. The Trailer Court and Ramshorn are currently the only Community PWSs. Lazy J will have to become one once they start serving the Quarry Property. The Riverside Trailer Court has a distribution system to each of the trailers, but this property has recently been purchased and will likely be redeveloped so this system is not further evaluated for reuse at this time.

The Canyon Sewer Project will generally improve water quality in the shallow aquifer from which most PWS's draw. However, the septic systems upgradient of the School's PWS wells are not expected to be abandoned as part of the Canyon Sewer project. Additionally, the shallow PWSs in Service Area 4 and Buck's T-4 will likely be downgradient of the new GCCWSD sewer's discharge sites.

TABLE 2: EXISTING PUBLIC WATER SYSTEMS OVERVIEW

NAME	BIG HORN CENTER	CONOCO	LAZY J WATER SYSTEM	BUCK'S T-4	RAMSHORN	BIG SKY EXXON HIDEAWAY LLC	BIG SKY BUSINESS CENTER	WHITEWATER INN	RIVERSIDE/ GEORGE NORMAN TRAILER COURT	SCHOOLS
Service Area	2	2	6&7	8	9	4	4	4	4	13
PWS ID	MT0003963	MT0001832	MT0004432	MT0001292	MT0004035	MT0003839	MT0003949	MT0004079	MT0000105	MT0001281
Class	Transient Non-community	Transient non-community	Non-Transient Non-Community	Non-Transient Non-community	Community	Transient Non-Community	Transient Non-Community	Transient Non-Community	Community	Non-Transient Non-Community
Number of Wells	1	1	2	2	2	1	1	1	1 (dug)	1
Well Depth (ft)	42	40.5	1,278; 1,325	35; 60	1,490; 1,320	96	80	68	20	unknown: >60'
Source Age	1996	2000	2005; 2006	1974	1994; 2009	2007	1992	1997	1971	2008
Treatment	None	Calcium Hypochlorite; cartridge filter; ion-exchange water softener	Chlorination installed, but not operational	Full-time Sodium Hypochlorite disinfection; ion-exchange softening	None	Particulate cartridge filter; ion-exchange water softening; full-time disinfection with Sodium Hypochlorite	"cartridge filter"	Full-time Sodium Hypochlorite disinfection	Point of use RO (to meet lead and copper rule requirements)	None
Storage Capacity	0	0	530,000 gal above ground	2x10,000 gal buried tanks	340,000 gal above ground	0	0	0		6,000 gal tank
Distribution has Dead-ends?	NA	NA	Yes	No	Yes	NA	NA	NA	unknown	unknown
Unresolved Deficiencies noted in Last SS	Well needs protection from vehicles	Pressure relief valve needed.	WL001 needs to be abandoned. Splash pad recommended at Storage Tank.	Well 1 not grouted - has lead packer	Wiring conduit in need of repairs. Well 2 has black water and requires flushing before use.	Reduced pressure zone installed incorrectly	Filter needs more regular maintenance	Test/certify RPZ device annually	Full-time UV disinfection recommended because it is a shallow dug well.	No backup operator

NAME	BIG HORN CENTER	CONOCO	LAZY J WATER SYSTEM	BUCK'S T-4	RAMSHORN	BIG SKY EXXON HIDEAWAY LLC	BIG SKY BUSINESS CENTER	WHITEWATER INN	RIVERSIDE/ GEORGE NORMAN TRAILER COURT	SCHOOLS
Fire Protection	Unknown	Unknown	Fire hyrdants attached to PWS	Unknown	~24 fire hydrants attached to PWS	Unknown	Unknown	Unknown	Unknown	WL003 now serves fire suppression tanks, separate from PWS
Has emergency power Source?	Unknown	Unknown	Unknown	No	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Has Lead fixtures?	None noted	None noted	None noted	Lead packer in Well 1	None noted	None noted	None noted	None noted	Likely. RO installed "to meet Lead and Copper Rule Requirements"	None noted

Additional summaries of the larger systems can be seen below.

EXISTING LARGE SOURCES AND WATER RIGHTS

Ramshorn and Lazy J's PWS wells are deep, and consistently meet water quality standards without treatment for more than the last decade. These wells have strong potential for reuse in a future centralized system. The Buck's T-4 wells draw from the shallow alluvial aquifer and are downgradient of the property's current wastewater holding ponds. Additionally, with a lead packer, Well 1 North does not meet current PWS standards. Highway 191 runs through the 100' isolation zone of both Buck's T-4 PWS wells contrary to current standards. The GCCWSD's Sewer main may also pass through this zone, in the highways right of way.

The Ramshorn PWS has had issues with hydrogen sulfide from their well water causing odor problems. They evaluated ozone treatment but did not implement. A resident indicated most homes use point of use filters to address this. Note that Ramshorn's Well 2 is rarely used and requires flushing prior to use due to black particulates and hydrogen sulfide odors. Well 1 also has hydrogen sulfide, but to a lesser degree. A 2012 Well 2 Evalutation Report by Western Groundwater Services, LLC recommended that Ramshorn form a County Water and Seewer District to help make upgrades more affordable.

TABLE 3: EXISTING LARGE SOURCES

System	LAZY J		BUCK'S T-4		RAMSHORN		SCHOOLS
PWS ID	MT0004432		MT0001292		MT0004035		MT0001281
Service Area	6&7		8		9		13
Design Capacity	113,149 GPD		unknown		84,960 GPD		unknown
Water Rights Capacity (AF/Year) / GPD equivalent	135 / 120,520		100 / 89,274		98 / 87,488		15.5 / 13,837
Treatment	Chlorination installed, but not operational		Full-time Sodium Hypochlorite disinfection; ion-exchange softening		None		None
Well Name	Well 1	Well 2	Well 1 North	Well 2 South	Well 1	Well 2	Well 3
Well ID	WL002	WL003	WL002	WL003	WL002	WL003	WL004
GWIC ID	223891	227731	104527	143231	165682	257253	248254
Depth (ft)	1,278	1,325	35	60	1490	1320	Unknown, >60'
Date	2005	2006	1974	1993	1994	2009	2008
Pumps	50 HP Submersible	50 HP Submersible	2 HP submersible	1.5 HP Franklin Submersible	30 HP Franklin Submersible	30 HP Franklin Submersible	Unknown
Notes:	artesian with 153 -180psi	artesian with 160 - 180psi	lead packer installed, but not grouted. Highway in 100' well isolation zone.	- Highway in 100' well isolation zone.	artesian with 10psi. Some hydrogen sulfide odor.	Rarely used. Water is black prior to flushing. Strong Hydrogen Sulfide odor.	GWIC 168031 separated from PWS for fire supply in 2022

EXISTING LARGE STORAGE

The existing PWSs have a total of 896,000 gallons of storage with the vast majority coming from the Lazy J and Ramshorn systems. These tanks could potentially be reused in a future centralized system, with minor upgrades. The Lazy J storage tank is high enough to provide sufficient pressure throughout the GCCWSD Planning Area, and the Ramshorn tank could serve a smaller area. These potentials are analyzed in Section 4.

TABLE 4: EXISTING LARGE STORAGE

NAME	SERVICE AREA	PWS ID	STORAGE CAPACITY (GAL)	STORAGE TYPE	STORAGE AGE
LAZY J WATER SYSTEM	6&7	MT000 4432	530,000	Bolted, coated steel storage tank at grade	~2005
BUCK'S T-4	8	MT000 1292	20,000	2x10,000 gal buried tanks	2021
RAMSHORN	9	MT000 4035	340,000	Bolted steel storage tank at grade	~2003
SCHOOLS	13	MT000 1281	6,000	Buried tank	2022

Note that there is additional storage capacity in the area from existing fire control systems that are not currently connected to PWSs; details on these systems are not available at this time.

According to the EPA, storage tanks can last 30-60 years. Any tank proposed for reuse should be evaluated to determine any improvements needed and expected remaining useful life. The most recent Sanitary Survey for the Lazy J system recommended that a splash pad be added below the overflow outlet to prevent erosion.

EXISTING LARGE DISTRIBUTION SYSTEMS

TABLE 5: EXISTING LARGE DISTRIBUTION SYSTEMS

NAME	SERVICE AREA	PWS ID	DISTRIBUTION DESCRIPTION	AGE OF OLDEST PIPE
LAZY J WATER SYSTEM	6&7	MT0004432	Distribution consists of Eight-inch PVC C900 mains that are partially looped. Commercial lots were planned to have 1-inch service connections and residential service connections were planned to have 1.5-inch service connections. Four-inch C900 PVC fire service connections were also planned. All active non-fire service connections are metered. It is suspected there is some pressure reducing equipment somewhere in distribution but plan records do not indicate any pressure reducing stations. No irrigation systems were reported.	2005
BUCK'S T-4	8	MT0001292	Consists of copper, iron, black poly and PVC pipes in the treatment building, 4” PVC pipe from treatment building to storage facilities and 6” PVC mains to distribute finished water. The in-ground irrigation system and jacuzzi system have backflow preventers installed. All water is metered.	1974
RAMSHORN	9	MT0004035	Consists of varying sizes of PVC piping, mostly 8”.. The distribution system is partially looped with the dead-end sections flushed annually or more frequently as needed. The fire hydrants (approximately 24) located throughout the distribution system are flushed by the system operator.	1994
SCHOOLS	13	MT0001281	Two systems were merged into one in 2022. Fire supply has been separated from the PWS.	2008

According to the EPA, water main typical useful lives are about 35-40 years and service lines 30-50 years. Much of Buck’s T-4 and Ramshorn’s distribution systems will likely need replacements or extensive maintenance in the near future.

2.3.4 FIRE PROTECTION

The GCCWSD Planning Area is in the Big Sky Fire District (BSFD). There is no centralized water supply for fire protection. However, the larger subdivisions and businesses manage their own water supplies.

Both the Ramshorn and Lazy J PWSs have large, elevated storage tanks and fire hydrants throughout their system to provide fire supply. The school recently separated one of their wells from the PWS to provide fire protection supply; storage is provided by an underground tank and supply is reliant on a pump. Most of the other larger systems likely rely on a similar set up but tied to the main potable well.

According to a conversation with BSFD staff, several developments do not meet current fire protection standards. Even the systems that do meet code would greatly benefit from the addition of elevated storage-provided fire flows. This removes the reliance on pumps and can greatly increase the duration of fire flow availability. Regular placement of fire hydrants, connected to elevated storage can improve response time, removing the need to fill the water truck for supply. The BSFD is expected to support a centralized water system that provides fire flows.

According to the BSFD Strategic Community Risk Reduction Plan, there were two vegetation fires and one structural fire in the GCCWSD Planning Area in 2020-2022.

An overview of existing fire protection infrastructure, based on publicly available BSFD data can be seen in **Figure 14** below.

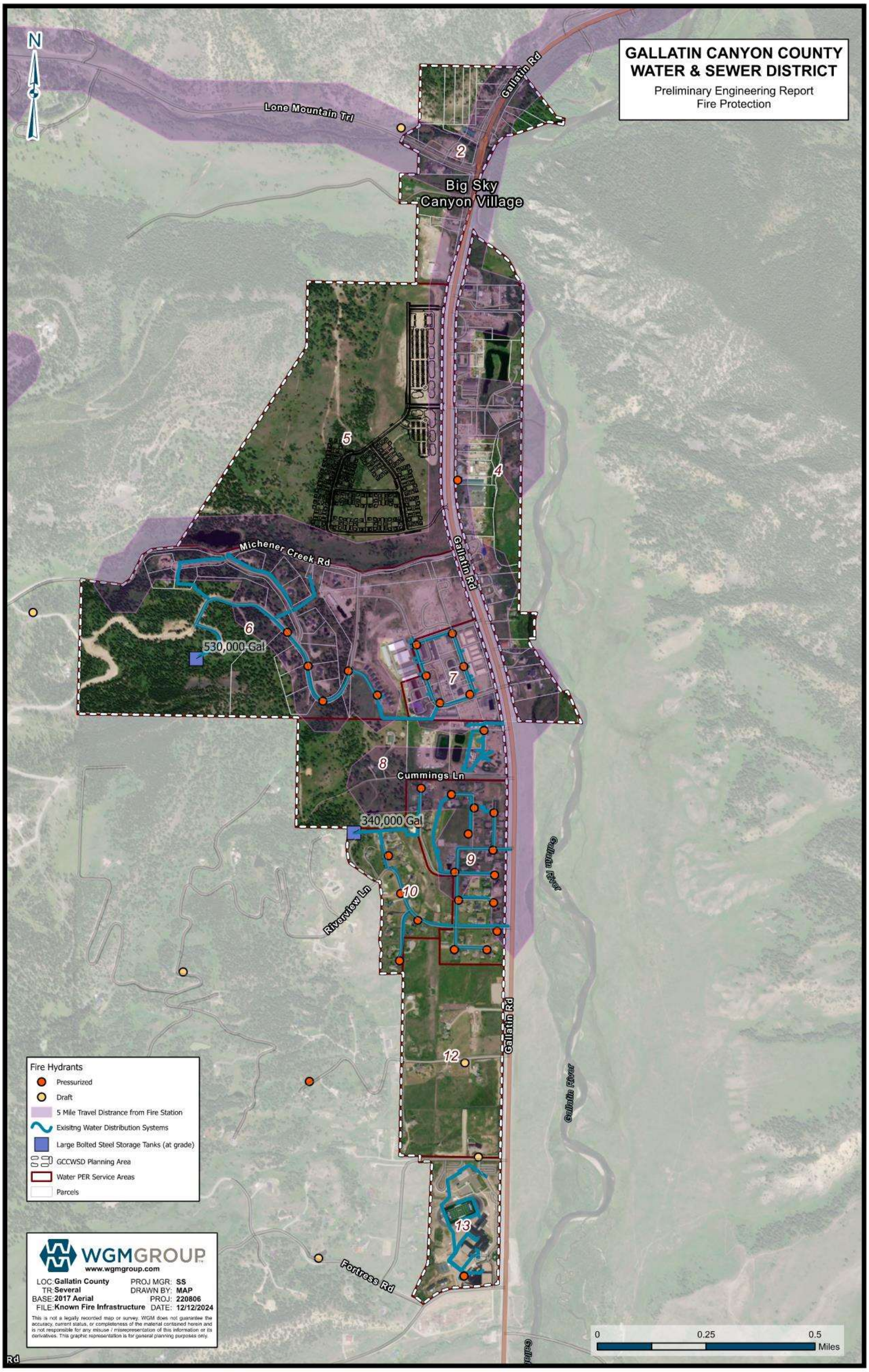


FIGURE 14: EXISTING FIRE PROTECTION INFRASTRUCTURE

2.4 FINANCIAL STATUS

The GCCWSD currently owns no infrastructure and has no regular income. BRSARD has contributed annual operating funds for the GCCWSD's first several years. All of other funding to date has been sewer project-specific grants. BSRAD has provided $200,000 reimbursement-based funds for fiscal year 2025 to cover District administration and some water and sewer project related work.

The sewer project is anticipated to be completed in 2027. Once the sewer is operational, the GCCWSD will begin to collect connection fees and monthly user rates to cover project and operation and maintenance (O&M) costs and pay off their WPC SRF loan. Sewer rates and connection fees have not yet been finalized. Water and wastewater funds must be kept separate.

This PER is funded by an ARPA grant of $25,000 from Gallatin County via the U.S. Department of Treasury. The remainder will be covered by the GCCWSD fiscal year 2024 operations budget, provided by BSRAD.

In 2020, Big Sky community voters approved a 1% resort tax earmarked specifically for infrastructure projects, in addition the general 3% resort tax. These provide a long-term funding mechanism to support continued project implementation and operation.

There are no official income survey data, but the income of the canyon is generally lower than that of the rest of Big Sky. The median household income (MHI) for the Sewer Service Area would be lower than the official $94,176 shown in the 2020 census for the Big Sky Census Designated Place.

Significant private development in the canyon is planned. A centralized water project would allow for private capital that would otherwise be used for the proliferation of more private and small public water systems, to be applied towards a better-quality and better-managed public system that can also serve the existing residents and larger community goals.

Lazy J Utility District customers already pay user rates for water and sewer services. Ramshorn residents pay HOA monthly dues which includes standard rate fees for operation and maintenance of their water and sewer systems. Disclosure of actual rates from these systems has not yet been obtained but are an important reference point for gauging acceptable rates for a GCCWSD water system. As of a 2015 planning document, the Ramshorn HOA had a fund of $230,000 for water system improvements and added $5,000 to the fund annually.

2.5 WATER/ENERGY/WASTE AUDITS

The GCCWSD owns no water system for which to perform efficiency audits. No formal audits of the existing private systems in the area were identified. Lazy J is the only PWS with metered connections. All considered solutions will be evaluated with respect to energy efficiency, waste management, and reducing consumptive water use. In any centralized proposed project, all connections would be metered.

3.0 NEED FOR PROJECT

The lack of central water system infrastructure and management results in project needs ranging from immediate human health and safety risks to general community benefits such as reduced sprawl, and water conservation. Specific project needs include:

- Reducing human health risk that has been identified in the area (WGM, 2022) associated with the intermingling of wells and septics and other sources of contamination.
- Improve reliability of water supply in face of inconsistent management, aging infrastructure, and a changing climate.
- Provide a cohesive fire control water supply and/or plan for the Canyon to improve public safety
- Provide opportunity for increased development density to support community needs for increased housing availability and affordability.
- Expanded District user base and services for improved operational economics (i.e. economy of scale).
- Facilitate re-development of underutilized land area to improve community/county/state tax base.
- Improve water conservation.
- Allow for private funds that would otherwise be used for the proliferation of more private and small public water systems, to be applied towards a better-quality and better-managed public system that can also serve the existing residents and larger community goals.

3.1 HEALTH, SANITATION, AND SECURITY

The GCCWSD Planning Area needs improvements to existing water infrastructure and management to help protect public and environmental health and safety. The following sections discuss community needs surrounding water conservation, aquifer and drinking water quality, fire protection, and water supply reliability. All of these issues will be exacerbated by the expected rapid growth and changing climate, if a centralized water system is not implemented.

3.1.1 ENVIRONMENTAL HEALTH

WATER CONSERVATION

The Gallatin River and canyon aquifer are hydraulically connected, and most data indicates that the reach adjacent to the study area is gaining. Reducing extraction of water from the aquifer should lead to more water in the Gallatin River, improving climate change and drought resiliency in the region.

Water conservation was identified as a community priority during the Big Sky Sustainable Water Solutions Forum's planning process. Currently, there are little to no water conservation efforts or incentives in the canyon. Currently, the few systems where customers are charged for water use charge a flat rate regardless of amount used.

Sewering much of the canyon area, and the associated decommissioning of septic systems removes a current major restriction on both development and the number of wells in the GCCWSD Planning Area – this could lead to the proliferation of new wells. A metered centralized water system, coupled with abandoning many of the existing private wells, would greatly reduce the number of wells drawing from the area's aquifers and provide a mechanism to control, to some degree, water consumption.

A GCCWSD PWS would have tools be able to encourage less water use. These include, but are not limited to, rate structures, ordinances, rebates, leak detection, and education. These could be used as long-term strategies or just temporarily in times of drought.

Encouraging the reuse of treated effluent from the GCCWSD Sewer for non-potable water needs, such as irrigation, is another way the GCCWSD plans to help water conservation efforts.

The scale of these benefits are unknown at this time.

3.1.2 PUBLIC HEALTH, SANITATION, & SAFETY

AQUIFER AND DRINKING WATER QUALITY

As detailed in section 2.3.1, there are a number of current and potential threats to drinking water quality in the GCCWSD Planning Area.

The MBMG water quality data indicates a clear problem of elevated nitrogen concentrations in many parts of the Canyon Study Area. The observed low nitrogen concentrations on the east side of the Gallatin River, where there is little to no wastewater input, supports the long-standing assumption that elevated nitrogen concentrations in the west half of the aquifer are linked to wastewater effluent.

There are numerous potable wells downgradient of septic systems in the aquifer. These are at risk of exposure to elevated nitrate concentrations and other wastewater associated contaminants. Nitrate MCL exceedances have not been observed, however, nearly one third of the monitoring wells appear to have experienced elevated calculated TKN levels at some point between 2020-2021. In this aquifer, that indicates a high likelihood of exposure to poorly treated and/or diluted wastewater. Only one monitored well showed repeat elevated calculated TKN.

Additionally, the ArcNLET preliminary model, discussed in the Septic Inventory Report (Appendix X), indicates that many potable wells are likely within the 200-day travel plumes of onsite wastewater systems and potentially exposed to microbial contamination. The current model of non-point source pollution via OWTS does not provide an adequate tool to protect groundwater quality, which ultimately impacts public health. With the expected rapid growth in the area, these health risks will increase significantly if development continues without addressing the wastewater-related issues. Decommissioning these many OWTS and connecting them to a properly designed and managed central sewer will help improve public health

The GCCWSD's Canyon Sewer Project is designed to achieve net nutrient reduction compared to existing conditions, including the projected growth in the Canyon and disposal of some BSCWSD generated effluent. The effluent will be much higher quality and much more reliably managed as a few point sources under a groundwater discharge permit. Any irrigation with reuse water will be applied at a rate that minimizes interaction with groundwater. The risks of wastewater pathogens being transmitted through the aquifer will also be much lower as the effluent will be disinfected. However, some risk will remain from the septic systems that remain beyond the sewer's boundary and from the new discharge sites. The sewer main will likely cross through the 100' isolation zone of Buck's T-4 PWS wells requiring mitigation. While the shallow aquifer overall will be cleaner, some shallow wells downgradient from the new discharge sites may receive more contaminants of emerging concern (CECs) than they do now. The risk of pathogen exposure would significantly be reduced, except in the case of treatment failures at the WRRF; however, discharge of lower than A-1 quality water is unlikely even in the case of treatment failures due to several months of residence time in BSCWSD storage ponds. The Canyon Sewer Project will likely be phased. It is unknown how long it will take before the entire expected sewer

area is annexed and connected to sewer service, reducing the current health risks. As OWTS are removed, it will likely take a few months to years for nitrate and associated contaminant levels to leave the aquifer.

In addition to the hazard of increasingly dense OWTSs, several non-wastewater-related potential anthropogenic aquifer contamination sources in the GCCWSD Planning Area were identified in section 2.3. As the area continues to develop rapidly, the health hazard of these sources will expand. The likelihood of these leading to issues will further increase if the current trend of proliferation of wells continues.

Geologic-sourced contaminants such as lead and radionuclides are also known to be present in the areas water. The available data points for these parameters indicate they are below the MCL, but above MCLG. Without the regular monitoring required of PWSs, the amount of these and other contaminants in the private wells is unknown.

One of Buck's T-4's PWS wells has a lead packer and both of their PWS wells have Highway 191 within its 100' isolation zone, and the Trailer Court's PWS wells is shallow without disinfection, contrary to current health-based design standards. Several private wells would also be in violation of current codes, if held to the same standards as PWSs, based on depths, known shallow groundwater, isolation zones, and floodplain locations.

While few water quality-based violations were noted, there were quite a few for missed samples and notifications. The available Sanitary Surveys for the PWSs in the area also indicate significant room for improved operations. Issues with improper backflow prevention, sanitary seals, filter care, vent screening, filter maintenance and more were noted.
Private wells and non-community PWS do not require oversight by licensed operators. Community PWSs are required to have certified operators and more regular and extensive water quality monitoring. Several of the community systems don't have a qualified backup operator. Proper maintenance, monitoring, and operations are vital for ensuring a safe and reliable supply of water.

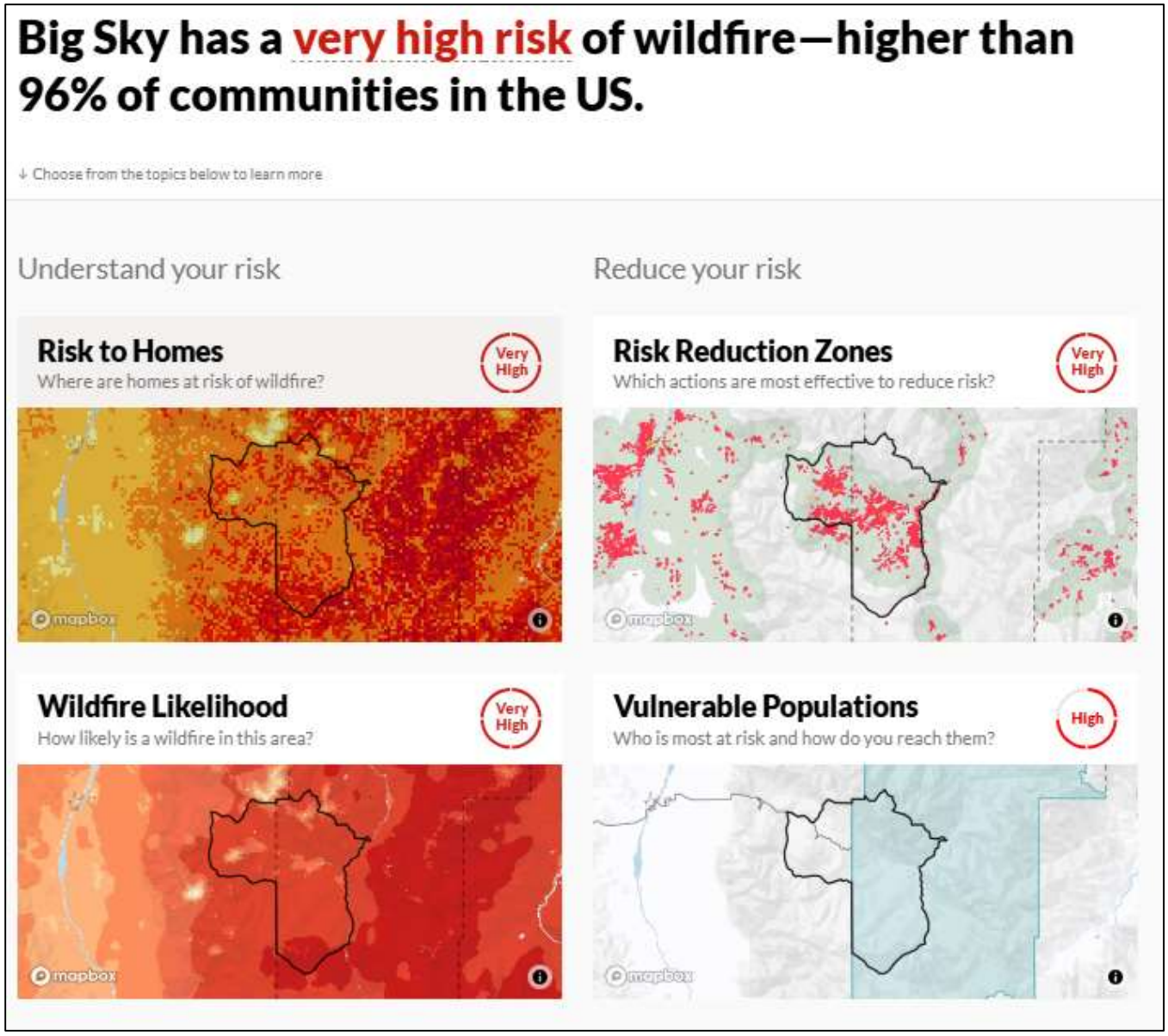
See Section 2.3 for additional details on human health hazards.

FIRE PROTECTION

The GCCWSD Planning Area is in the Big Sky Fire District (BSFD), however the GCCWSD Planning Area south of Ramshorn is outside of the recommended 5 mile distance from a fire station. There is no centralized water supply for fire protection. However, the larger subdivisions and businesses manage their own water supplies.

According to a conversation with BSFD staff, several developments in the area do not meet current fire protection standards. Several systems that do meet code would greatly benefit from the addition of elevated storage-provided fire flows through a centrally managed system. This removes the reliance on rarely-used pumps and can greatly increase the duration of fire flow availability. Regular placement of fire hydrants, connected to elevated storage can also improve response time, removing the need to fill the water truck for supply. The BSFD did not specify any special requirements for a new system – state and county design standards should be followed.

USDA Forest Service data shows that the GCCWSD Planning Area is all Wildland Urban Interface (WUI) or Intermix (places where communities meet or intermingle with wildfire hazard and flammable vegetation). As detailed in the figure below, the Big Sky community as a whole has a very high risk of wildfire.



Source: U.S. Department of Agriculture, Forest Service (2024), Wildfire Risk to Communities, retrieved from https://wildfirerisk.org/explore/overview/30/30031%7C30057/3000006325/

According to the BSFD Strategic Community Risk Reduction Plan, “wildfire occurrences continue to trend upwards in the area, state, and nation. As Big Sky continues to add housing density, the risk of catastrophic WUI fire continues to increase." Climate change is expected to exacerbate this trend. The hazard of fire in the GCC WSD Planning Area is exacerbated by the fact that Highway 191 is the only major evacuation route for the community.

While not legally required, having a centralized water system providing sufficient flows for fire protection throughout the served area would significantly increase the safety of the GCCWSD community.

In addition to improved safety, provision of improved fire protection water supply and increased proximity to fire hydrants is anticipated to both increase property value and help improve the availability and affordability of property insurance. As in much of the western United States, Big Sky property

owners are starting to see much of the primary insurance market stop writing policies in the area and/or significantly increase premiums in order to mitigate risk.

3.1.3 SECURITY

HUMAN ERROR AND MALICIOUS INTENT

Intentionally or not, it is easy for individuals to contaminate drinking water systems and the aquifers they draw from. Many impacts are local and would only impact the individual well user. However, if contamination is introduced to a well, there is potential to contaminate the aquifer and subsequently other wells. The available sanitary surveys indicated several instances of improperly sealed hatches, monitoring ports, and well caps, as well as missing screens on vents, With a centralized PWS, well caps and other entry points are much more likely to be fully secure, backflow preventors are more likely to be properly maintained, and contamination is likely be identified and addressed sooner.

The more wells, the more open pathways that can allow contamination to reach the aquifer and affect public and environmental health. As mentioned above, removal of most septic systems in the area could lead to denser development and the proliferation of new wells. A centralized solution would limit new wells and likely result in the proper abandonment of some existing wells.

Not all of the PWSs have wells and other above ground structures that are adequately protected from being hit by vehicles, leaving them vulnerable to damage. Many of the private wells likely face this same issue.

While centralized systems are more likely to be targeted for attack than individual systems, this is highly unlikely in such a small community. In addition, a properly designed and operated centralized system is quite secure, with the regular oversight of a certified operator as well as with locks at all entrances to critical infrastructure, intrusion alarms, fencing, signage, closed-circuit television monitoring, and more frequent water quality monitoring.

Things are generally less likely to go seriously wrong with larger PWSs. However, larger systems have the potential to impact many more people when something does go wrong.

BACKUP ELECTRICITY AND WATER SOURCE

Currently, much of the canyon community is vulnerable to loss of water service, which could cause public health and economic problems.

The GCCWSD Planning Area is served by NorthWestern Energy. None of the sanitary surveys reviewed indicated that the existing PWSs owned a backup generator. Most private well owners don't keep generators. This leaves the community vulnerable to periods of no water supply and, if water pressure is not maintained, contamination from backflow. A centralized PWS for a larger area such as this would be able to own and maintain a backup generator and or sufficient storage capacity to maintain water service and pressure through most power outages.

Additionally, community PWSs must have multiple sources and storage capable of providing the maximum day demand with the largest producing well out of service. This significantly reduces the risk of water outages compared to private and non-community PWSs and makes them much more resilient to drought, infrastructure damage, contamination, and large fluctuations in demand.

Consistent and reliable supply of sufficient amounts of clean water is vital for human health and safety as well as for the local economy.

FLOOD, DROUGHT AND CLIMATE CHANGE RESILIENCY

According to the 2021 Great Yellowstone Climate Assessment, the area has warmed on average by 2.3 degrees Fahrenheit since 1950 and is expected to warm as much as 10-11 degrees Fahrenheit by the end of the century. It is also projected that existing trends will continue; a greater portion of precipitation will fall as rain instead of snow and that snowmelt and runoff will occur earlier in spring, likely increasing flood risk and adding to ground and river water shortages in summer. This in turn will lead to increased fire potential, as discussed above.

The Gallatin River will be affected by these changes. Lower summer baseflows and higher air temperatures will work to increase water temperature likely exacerbate the existing algae bloom issues and stress the trout and other species that rely on cool water. Damage to the river can quickly ripple out to the larger ecosystem and the outdoor recreation-driven local economy. Since the alluvial aquifer and the Gallatin River stretch in the GCCWSD Planning Area are hydraulicly connected, shallow well use impacts the river. Irrigation is assumed to be the largest user of groundwater in the GCCWSD Planning Area

Many of the private potable wells are shallow – the shallowest, in service area 4, is 18 feet deep. These are vulnerable to dropping water tables during times of drought and have less expertise and resources available to be able to adapt than larger public systems. Deeper wells drawing from the aquifers below the shallow alluvial aquifer are less vulnerable to drought.

GWIC shows that two private wells in Service Area 4 are currently located within the current 100-year floodplain, contrary to current standards. The Trailer Park's 20ft deep PWS well is just barely beyond this boundary. These are vulnerable to significant contamination and structural damage from floods – this risk is expected to increase due to climate change.

3.2 AGING INFRASTRUCTURE

According to the EPA, the expected useful life of a well is 25-35 years. AWWA's EUL Project spreadsheet, indicates that, with repeated rehabilitation, supply wells can last 60-75 years. The Riverside Trailer Court PWS and Buck's T-4 are the oldest public systems in the area, built in 1971 and 1974 respectively. With no evidence of rehabilitation, the wells for both of these systems are beyond the expected useful age and do not meet current PWS standards. One of Buck's T-4 wells has a lead packer and is within 100 feet of the Highway 191, the trailer court's 20 foot deep well is hand dug and has only under-sink treatment, and a couple private wells are built within the Gallatin River's 100-year floodplain. The Trailer Court's 2001 SS says that the point of use treatment was added for Lead and Copper Rule compliance – this likely means there is lead piping and appurtenances or documented copper contamination within the system. The rest of the PWSs were built in the 1990s and 2000s as seen in **Table 3** (Section 2.3), and approaching the end of their expected useful lives without rehabilitation.

Age data is sparse, but the median well age in the GCCWSD Planning Area is estimated to be roughly 21, with some wells more than 50 years old. Many of these wells may need extensive maintenance or replacement in the near future. The cost of updating or replacing wells or replacing well pumps (typically needed every 10-15 years) can be thousands of dollars and a significant burden for private well owners and small PWSs.

According to the EPA, storage tanks typically last 30-60 years. AWWA's EUL Project spreadsheet indicates that at-grade bolted steel tanks lifespan may be closer to 30-50 years and a buried tank lasts, on average, 30 years. Buck's T-4 and the schools replaced their underground storage tanks in the last

few years and Ramshorn and Lazy J's above ground storage systems are about 21 and 19 years old respectively. The other PWSs likely don't have significant storage beyond hydropneumatic tanks.

According to the EPA, water main expected useful lives are about 35-40 years and service lines 30-50 years. Much of Buck's T-4, the Trailer Court, and Ramshorn's distribution systems will likely need replacements or significant maintenance in the near future. While most of the other systems don't have extensive distribution systems, many of their service lines are within the end of useful life range.

Maintenance, replacement, and current conditions of other shorter-lived assets is unknown at this time.

Aging infrastructure increases the risk of system contamination, water waste and property damage through leaks, loss of service, and urgent large expenses. Private and small public systems are often slower to catch and fix infrastructure issues than larger community PWSs that maintain a metering network and a certified operator.

Any existing infrastructure proposed for reuse should be evaluated to determine any improvements needed, associated costs, and expected remaining useful life.

3.3 REASONABLE GROWTH

Current infrastructure is inadequate to serve the anticipated growth in the GCCWSD Planning Area. Public planning and coordination of water infrastructure development will help improve sustainable service to the existing community as well as the growing population.

PROJECTED GROWTH

As discussed in Section 1.4, the GCCWSD Planning Area is expected to experience significant infill growth in coming years. This growth is anticipated to consist of a mix of resort-area type development (hotels, restaurants) and residential-type development, and occupancy of the area's "build-out" conditions is anticipated to be heavily influenced by seasonal tourism fluctuations.

The Planning Area contains some vacant parcels, as well as some properties that could be further developed with higher density if offsite central water and sewer systems were available to serve those properties. Central system infrastructure can be extended and expanded in phases, but the core infrastructure has to be sized based on build-out, or fully occupied conditions of the area(s) being served by the infrastructure. Sizing of this infrastructure is based on use demands of the product, in this case water, and water demands are primarily projected based on population to be served. Therefore, population projections and resulting water demand of the overall District are discussed together in this Section and require estimates based on restrictions currently in place. Those restrictions limiting the developed land use within the GCCWSD and its resulting water demands are primarily the limiting planning boundary, the land uses allowed within, as governed by the Gallatin Canyon/Big Sky Zoning Regulations, currently approved development plans, as well as the water rights available for beneficial use (discussed in Section 1.3).

All parcels within the GCCWSD Planning Area are currently zoned for specific land uses and development intensity or density. As mentioned above, the existing zoning enforces some level of water demand restrictions as the zoning regulations restrict the type and number of units that can be developed on the properties. Current land use zoning within the GCCWSD Planning Area consists of residential, commercial, commercial/industrial mixed use, and community facilities which is intended to provide for public or semi-public community facilities. **Table 6** below provides a summary of the zoning distribution within the GCCWSD Planning Area. For reference, a zoning map is provided in **Figure 15**

below, and the zoning regulations can be viewed at the following link (https://gallatincomt.virtualtownhall.net/sites/g/files/vyhlif606/f/pages/bs_09_14.pdf).

TABLE 6: GCCWSD PLANNING AREA ZONING

ZONED USE	ACRES	PERCENT OF GCCWSD PLANNING AREA
Commercial & Industrial Mixed Use	217	28.7
Community Commercial	35	4.6
Community Facilities	39	5.1
Residential Cluster Single Family 1	160	21.2
Residential Cluster Single Family 5	260	34.4
Residential Single Family 11,000	38	5.0
Residential Single Family 7,500	7	1.0
TOTAL	**755**	

Determination of the system's Average Daily Demand (ADD) is a required design criteria and is further detailed and used in Section 4 to analyze system alternatives. In the absence of population data and/or trends specific to the GCCWSD Planning Area, the estimated ADD is used here in this Section as a metric to estimate the area's growth and to determine if the growth estimates are reasonable compared to the available data for the general Big Sky community area.

ADD can often be estimated by reviewing water billing data to determine typical average daily uses for residences as well as varying types of commercial and industrial establishments. In the absence of billing records, typical published use rates can be used, though they can tend to be overly conservative. The neighboring Big Sky County Water and Sewer District (BSCWSD) has years of water service billing data and serves a similar, but larger, community type as the GCCWSD. Therefore, the BSCWSD metered data was requested from 2019 to 2023 for use in estimating these water demand parameters.

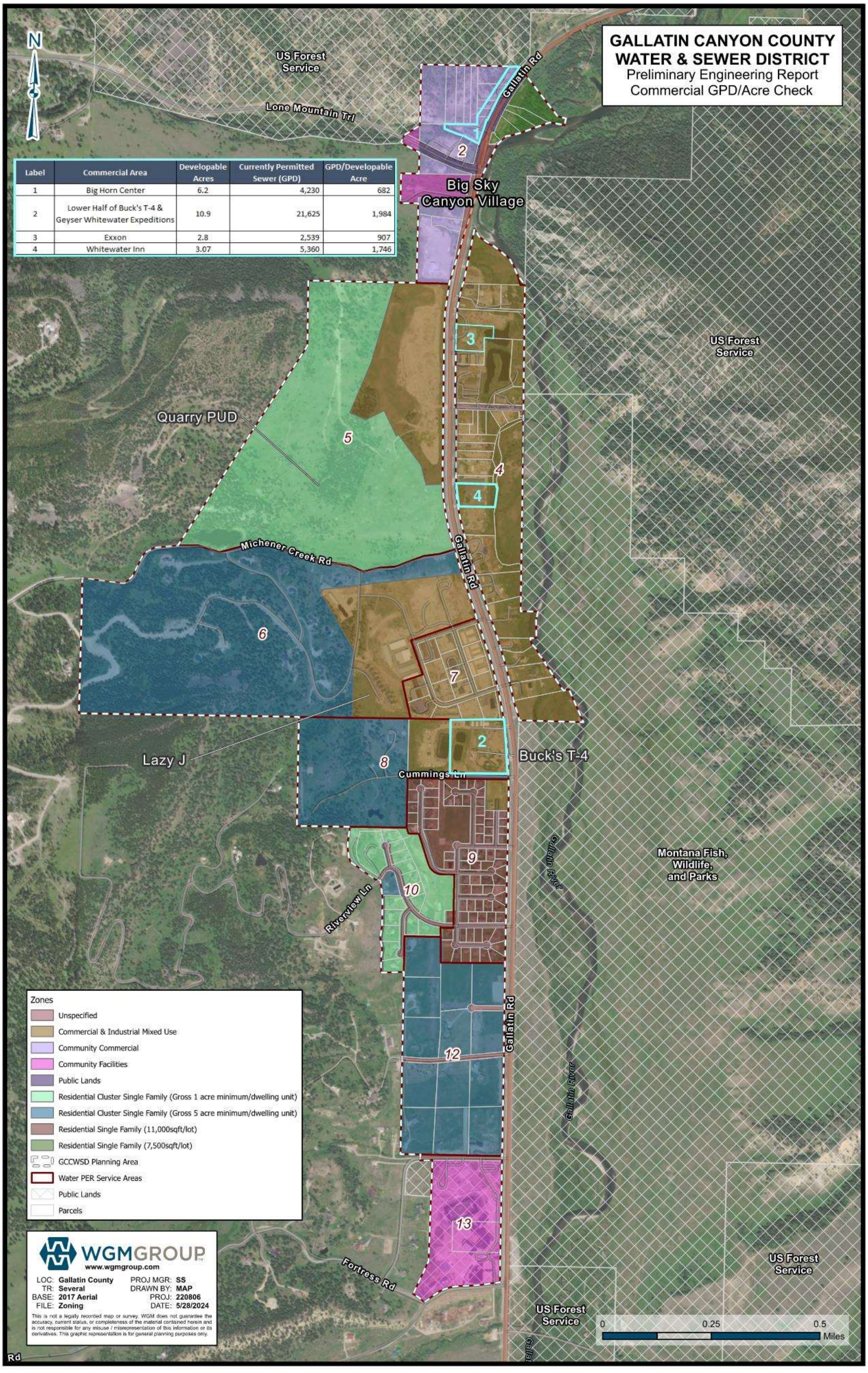
Water service metered data was obtained; however, the available data does not readily translate to per capita usage. The BSCWSD currently has 2,197 residential water services and 333 non-residential services; however, efforts required to determine number of bedrooms of each residential unit as well as the family size of each unit's owner are outside of the scope of this PER. Additionally, many residential units in the BSCWSD are used as short-term rentals, and occupancy of these residential units varies significantly depending on the season. This is evident when comparing the BSCWSD's estimates for Single Family Equivalents (SFE), which is calculated as the average demand across all metered residential units, vs. typical published per capita water demand numbers. For example, in the BSCWSD Source Capacity Plan 2022 Update, their SFE calculations ranged from 114 gpd/SFE to 127 gpd/SFE for average day demand. This is considerably different than what would be projected for residential if the majority of the BSCWSD residential units were permanent residents.

Published estimates of per capita water demands are wide ranging and highly dependent on percentage of domestic demand vs. commercial and industrial demands within a respective system or service area, and it also varies by geographic region, size of population, as well as socioeconomic status. Many water and wastewater design textbooks publish per capita water demand from 40 to 130 gpd with those averages ranging from 50 to 60 gpd for domestic use, while the American Water Works Association (AWWA) and the Environmental Protection Agency (EPA) estimate the average per capita water demand for households is 74 gpd and 100 gpd, respectively. For this PER, a per capita domestic

water demand of 100 gpd is used for determining ADD flows for residential areas within the GCCWSD Planning Area and equating that to 250 gpd per residential unit, which is generally consistent with Montana's Department of Natural Resources and Conservation (DNRC) and DEQ recommendations.

Approximately 38% of the overall GCCWSD Planning Area consists of non-residential properties, which are zoned as a mix of commercial, industrial, and community facilities. Water use demands for commercial and industrial purposes are highly variable. Many water and wastewater design textbooks publish ranges from 1,000 to 7,640 gallons per day per acre; however, these ranges are generally established from relatively large municipal water systems. It is not anticipated that any commercial or industrial operation would develop within the Planning Area that would be a high water user relying on high volumes or flowrates of water for processing or manufacturing. If such a facility was proposed, they'd likely have to seek development of their own private source for specific process needs. To compare these published demand ranges with available data from a few varying commercial properties within the Planning Area, existing permitted wastewater demands were attained for a portion of the Lazy J commercial area, the Whitewater Inn, the Exxon gas station, and a portion of the Buck's T-4 commercial area to determine their usage per unit of ground area. **Figure 15** depicts these properties on the Zoning Map with their permitted wastewater demand, extrapolated water demands (wastewater demand divided by .8) and their equated demand per acre.

As shown, the water usage rates per land area for these existing commercial properties range from 682 – 1,984 gpd/acre, far below the previously mentioned published rates. Additionally, the City of Bozeman's design standards were consulted for comparison, as they provide wastewater usage rates by land area designation which can be converted to approximate water demands. These rates range from 960 – 2,400 gpd/acre for varying commercial and industrial land uses. This range converts to an approximate average of 1,780 gpd/acre, assuming 75% of consumed water is used indoors and becomes wastewater; however, Bozeman's water and sewer systems are much larger and serve a much denser population and denser land usage. Considering all these data points for water demands, a rate of 1,765 gpd/acre was used to apply to existing non-residential zoned areas within the Canyon's Planning Area, where specific development plans were not available. Areas within floodplains or that are quite steep were deemed undevelopable and excluded from this application rate to project demands of the non-residential areas.



Label	Commercial Area	Developable Acres	Currently Permitted Sewer (GPD)	GPD/Developable Acre
1	Big Horn Center	6.2	4,230	682
2	Lower Half of Buck's T-4 & Geyser Whitewater Expeditions	10.9	21,625	1,984
3	Exxon	2.8	2,539	907
4	Whitewater Inn	3.07	5,360	1,746

FIGURE 15: ZONING AND COMMERCIAL FLOW RATES

As part of the GCCWSD Sewer Project, existing wastewater usage was estimated based on permitted septic system flow rates of existing developed properties from Gallatin City-County Health Department records, DEQ permits, and aerial imagery. This information was then used to extrapolate water demand estimates for these same existing developed properties as a basis for comparing build-out conditions of the Planning Area and the resulting growth rate percentage from this comparison.

For projecting the Planning Area's build-out conditions, the areas having the greatest potential for new and/or re-development are primarily limited to Service Areas 4 through 8. All other areas within the SSA are mostly developed in accordance with their current zoning, primarily low density residential, which limits uncertainties with future development of any remaining vacant lots in those areas. Therefore, future "build-out" flows for these areas can be estimated with a higher level of confidence.

Input was obtained from owners of the Quarry PUD, Lazy J, and Buck's T-4 properties as to their current development expansion plans, and this data was used to inform the build-out water demand estimates for those properties (Service Areas 5-8). **Table 7** below summarizes the existing and build-out water demands estimated for this PER using methods described above and broken out by respective Service Areas, and tables included in **Appendix E** provide more data detailing these summarized flow estimates. Note that some development expansion plans provided by those property owners mentioned above may exceed purely zoning-based capacities; however, in these cases, the larger values were used in the estimates provided in **Table 7** below.

Estimating the system's water demand based on the Planning Area boundary and current zoning restrictions along with available expansion plans for properties in the Planning Area yields a projected total build-out ADD of approximately 365,000 GPD, which generally aligns with previous estimate methods utilized to generate the GCCWSD sewer PER and the current sewer system design, and this is feasible given the assessment of existing water rights. This projected buildout flow estimate is about 3.5 times larger than estimated existing flows; however, this is in large part due to the Quarry PUD being undeveloped with zero flows and a rather dense planned development. Given the recent population trends in the area and the rapid growth projected, this is a reasonable estimate.

TABLE 7 GALLATIN CANYON AREA WASTEWATER USE ESTIMATES AND PROJECTIONS

POTENTIAL SUB-DISTRICTS	SERVICE AREA	ZONING	CURRENT # OF PARCELS	ESTIMATED EXISTING AVERAGE DAY WATER DEMAND (WASTEWATER FLOWS FROM SEPTIC INVENTORY REPORT DIVIDED BY .8) (GPD)	ESTIMATED AVERAGE DAY WATER FLOWS AT FULL BUILDOUT (GPD)
North District	Service Area 2 – Bighorn Center Area	Community Commercial and Community Facilities and Residential Single Family (7,500 sqft/lot)	25	12,749	24,000
	Service Area 4 – River Front Properties	Commercial & Industrial Mixed	42	17,904	70,000
	Service Area 5 – Quarry PUD	Residential Cluster Single Family (Gross 1 acre minimum/dwelling unit) and Commercial & Industrial	1	-	123,008
	Service Area 6 & 7 – Lazy J Utility	Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit) and Commercial & Industrial Mixed	20	12,500	50,100
	Service Area 8 – Bucks T-4	Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit) and Commercial & Industrial Mixed	4	22,125	54,000
South District	Service Area 9 – Ramshorn Subdivision (Lower)	Residential Single Family (11,000sqft/lot) and Commercial & Industrial Mixed	77	21,625	21,625
	Service Area 10 – Ramshorn Subdivision (Upper)	Residential Cluster Single Family (Gross 1 acre minimum/dwelling unit) and Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit)	22	7,375	4,250
	Service Area 12 - Low Density Residential Area	Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit)	13	3,188	3,250
	Service Area 13 – Schools	Community Facilities	2	6,906	15,132
TOTAL			**206**	**104,371**	**365,365**

According to BSCWSD's 2022 Source Capacity Plan, BSCWSD's water SFE allocations had an annual growth rate of 3.9% from 2015-2021, with growth as high as 4.7% in their Meadow Village area (the area most similar to the GCCWSD Planning Area). That report assumes the same growth rate for their 20-year planning period. The Canyon Planning Area is expected to grow at a roughly similar rate as Big Sky proper. Available development plans provided by the larger property owners indicate a potentially higher rate in the Canyon. The full build-out growth projections shown in the table above are roughly equivalent to 4.3% growth over 30 years. However, based on available development plans, the majority of this growth is anticipated to occur in the first 10 years.

ADEQUACY OF EXISTING WATER INFRASTRUCTURE CAPACITY TO SERVE EXPECTED GROWTH

The current infrastructure is insufficient to meet projected demand in coming years, particularly storage and source infrastructure, as well as some pipeline sizes related to their ability to provide adequate pressures throughout a central system for all demand requirements. Some growth could be accommodated with minimal new infrastructure; the Quarry PUD, for example, has already secured use of Lazy J's water supply and storage. However, the rapid planned development in the area, discussed above and an estimated roughly 3.5 times as much water demand will necessitate significant new water supply infrastructure. Reuse of components of existing infrastructure is possible and will be evaluated in the Alternatives Analysis section. For example, the Lazy J PWS's existing 530,000 gallon tank is elevated enough to provide adequate pressure for the entire GCCWSD Planning area and several wells are potentially suitable for reuse. A GCCWSD centralized water project would allow for private capital that would otherwise be used for the proliferation of more private and small public water systems, to be applied towards a better-quality and better-managed public system that can also serve the existing residents and larger community goals.

Continuing proliferation of private and small public water systems is managerially, regulatorily, land-use, and, likely, financially inefficient. A centralized PWS run by a water and sewer district would provide a mechanism for long term funding, maintenance, and management of water supply that doesn't exist with the current decentralized model. Additionally, the increased density of development in a WUI increases both the likelihood and hazard of fire and need for improved water supply for fire protection. The community is interested in being proactive in upgrading their water management and protecting public and environmental health and allowing for more cohesive community planning and growth. The GCCWSD aims to encourage more affordable and worker housing by enabling this denser development.

FUNDING BASE AND PHASING

The District and it's Outreach and Annexation subcommittee are working to encourage expansion of the District and subsequently the central sewer and potential future water service. In 2024, 29 properties annexed into the GCCSWD. With expansion and a growing customer base, economies of scale will help improve system cost efficiency and affordability and impact of the benefits of the project.

Strategic project phasing will be key to initial project feasibility and implementation. The logical phasing strategy will focus on the service areas with the most near term or immediate need and plans for expansion, as well as the area(s) with the most underutilized land area. This phasing strategy should also focus an initial project phase that would take advantage of as much existing public water system infrastructure as possible that can be acquired and immediately repurposed in a new central water system. Service Areas 4 – 8 meet all of these criteria, and much of the existing larger public system infrastructure with potential for reuse is located in Service Areas 6 – 8. Additionally, these service areas contain the highest concentration of non-residential zoned properties, much of which, with central water and sewer systems, have the most potential for redevelopment and expansion which in turn can

increase BSRAD tax revenues within the Planning Area and helps justify BSRAD funding assistance towards the project. Utilizing existing infrastructure within these areas will minimize a first phase project cost, and these service areas present the biggest “bang for the buck” in terms resulting growth potential and growth rate. After a core water system, infrastructure, and customer base is established with a successful first phase, the GCCWSD system can expand to the north and south with water main extensions, as dictated by annexation interest from adjacent property owners. The GCCWSD will be qualified for grant and loan funding to aid in system expansion. Additionally, the GCCWSD would set up a budget and rate structure to fund a reserve account specifically for use in capital improvement of existing infrastructure and expansions.

4.0 ALTERNATIVES CONSIDERED

This section identifies alternatives to meet the needs and improve the deficiencies defined in the previous sections. The alternatives focus on components of a PWS, including individual infrastructure categories such as source, storage, and distribution. The alternatives considered for this PER are listed below followed by individual analysis:

1. Alternative 1 – No Action
2. Alternative 2 – Source: Surface Water
3. Alternative 3 – Source: Metered Connection to Existing BSCWSD Public Water System
4. Alternative 4 – Source: Groundwater Using Existing PWS Wells
5. Alternative 5 – Source: Groundwater Using New PWS Well Field
6. Alternative 6 - Treatment
7. Alternative 7 – Storage: Hydropneumatic Tanks
8. Alternative 8 - Storage: New Elevated Storage Tank
9. Alternative 9 – Storage: Existing Ground-Level Storage Tank
10. Alternative 10 – Storage: New Ground-Level Storage Tank
11. Alternative 11 – Distribution System: Single Combined System
12. Alternative 12 – Distribution System: Two Separate North/South Systems

The design criteria that generally govern the overall water system are defined below followed by more specific presentations of each alternative in conformance with *Uniform PER For Montana Public Facility Projects*.

4.1 WATER SYSTEM DESIGN CRITERIA

4.1.1 REGULATORY REQUIREMENTS

Creating a new water system to serve the GCCWSD, whether a single central system or separate clustered systems, would meet the definition of a public Community Water System. As defined by the Federal Safe Drinking Water Act (SDWA), a public water system provides piped water for human consumption to 15 or more connections or at least 25 individuals each day for at least 60 days, and a community PWS supplies water to the same population year-round. The SDWA requires the EPA to set National Primary Drinking Water Regulations (NPDWR) for contaminants that may cause adverse public health effects. The NPDWR are administered by the state through the Montana Department of Environmental Quality (MDEQ). All public water systems must test their water sources to ensure compliance with these regulations. In addition, public water systems in Montana must comply with the requirements of the current edition of *Montana Department of Environmental Quality Circular 1 – Standards for Water Works* (MDEQ Circular 1). MDEQ Circular 1 sets basic or minimum design criteria for water systems.

4.1.2 WATER DEMANDS

Water demand within the District will drive required design sizing of the public system facilities, such as storage reservoirs, water source production infrastructure, as well as transmission and distribution piping.

Sizing components of public water systems requires an understanding of the water demands placed on the system by its users. In general, the population of users, as well as the variability of user types, connected to and withdrawing from the system determines the water demand, whether residents or people working for and/or doing business with those businesses in the District and served by its system. In order to properly size infrastructure required for water supply and production, storage, and distribution, the following design water demand values must be known or estimated: Average Daily Demand (ADD), Maximum Day Demand (MDD), and Peak Instantaneous Demand (PID). These demand values are defined in MDEQ Circular 1 as follows:

Average Day Demand (ADD): Annual water consumption divided by 365 days in a year. Average Day Demand normally includes the following components for design of new systems. Domestic Demand: Volume of water required by the average household for drinking, cooking, laundry, bathing, and sanitation.

Commercial/Industrial: Volume of water required by users other than residential, such as restaurants, offices, institutions, and shops.

Irrigation Demand: Volume of water used to irrigate lawns and gardens. The total seasonal demand over 180 days is averaged for the entire year.

Average Day Demand from actual used records for existing systems that provide fire protection may also include some fire demands that have occurred. However, separate fire demand must always be added to the components listed below for new systems or to the actual average use for existing systems when designing for fire storage:

Maximum Day Demand (MDD): The highest volume of water consumed on any day in a year, often determined by applying a peaking factor to the ADD.

Peak Instantaneous Demand (PID): The highest flow rate on the hydrographic curve. Expressed as a volume per unit of time. Calculated from a Fixture Unit analysis per the UPC, AWWA Fixture Value Method, or by applying a peaking factor to the Average Day Demand in gallons per minute, or other means acceptable to MDEQ.

ADD values will be based on the flow projection presented in Section 3.3 of this PER.

Though the BSCWSD metered data did not directly translate to average per capita domestic use, the data is useful for determining the basis of design for the MDD peaking factor. The monthly total system production was obtained from BSCWSD for the years 2019 – 2023. The winter season is generally the peak tourism season for the Big Sky area, and while metered water use does show high water demand during the winter months, the maximum month for water production during these five years occurred in July or August. This is typical for the region, as irrigation demand is generally at its highest during these months. Comparing the maximum month demand of each year to that year's average monthly demand gives an MDD factor ranging from 1.33 to 1.99 over those 5 years, which is consistent with typical published MDD peaking factors ranging from 1.2 to 2.0. Therefore, a peaking factor of 2.0 is used as the Canyon District's basis of design for MDD. Typical published peaking factor values for PID range from 2.0 to 3.0, and those values typically fall along the higher side of the range for smaller user populations. The obtained metered production data again doesn't directly translate to a PID factor;

however, the data was used as a "gut check" for these peaking factor ranges. Comparing the highest recorded month for these 5 years (July 2021) to the average of each individual month for each of the 5 years results in factors ranging from 1.27 to 3.34. It should be noted that these are not instantaneous rate and time comparisons, and the highest factor is a result of the 5-year max month vs. the average of the lowest recorded month for the same 5-year period; however, these results give confidence in selection of the basis of design peaking factors for the Canyon Planning Area. Therefore, the higher peaking factor of 3.0 from typical published ranges is used as the basis of design for PID. **Tables 8** and **9** in the following section summarizes the ADD, MDD, and PID developed and used as the basis of design for this PER's water system design alternatives. Supporting calculations are provided in **Appendix E**.

FIRE FLOW DEMANDS

Public water systems that will provide fire protection in addition to their domestic service are required to provide adequate flows and pressures during fire flow demands. Gallatin County's Subdivision Regulations require a fire protection plan for new subdivision developments which require review and approval by the Fire Protection Authority Having Jurisdiction (FPAHJ). In this case, the entire Canyon District falls within the Big Sky Fire District's (BSFD) boundary.

The preferred fire protection plan defined in the County's regulations is to provide 1,000 gpm for a 2-hour duration with a minimum 20 psi residual pressure maintained in the system, though there are allowed reductions in flow rate requirements and flow durations which affects storage requirements. Additionally, the Canyon District is located within a defined Wildland/Urban Interface and/or Intermix area, which requires an additional 500 gpm to the base fire flow requirement. Montana has currently adopted the 2021 version of the International Fire Code (IFC) as the state's Uniform Fire Code. The IFC recommends a minimum fire flow of 1,000 gpm for a 1-hour duration for one- and two-family dwelling units, having a building area less than 3,600 square feet. The IFC further recommends fire flows ranging from 1,500 gpm for a two-hour duration to 8,000 gpm for a four-hour duration, depending on construction type, materials, and structure size. The IFC also recommends allowed fire flow reductions up to 75%, to a minimum of 1,000 gpm, if automatic building sprinklers are provided. For this PER, the BSFD was contacted to determine their preferences for fire flow requirements with a new regional water system. While they expressed general support for a central water system, they didn't propose specific design criteria. Therefore, the above-described County preferred plan equaling 1,500 gpm for a 2-hour duration will be assumed appropriate for this PER and planning.

TABLE 8: FULL BUILDOUT DESIGN FLOW RATES

AREA	AVERAGE DAILY DEMAND (GPD)	AVERAGE DAILY DEMAND (GPM)	MAXIMUM DAILY DEMAND (GPM)	PEAK INSTANTANEOUS DEMAND (GPM)	2-HOUR FIRE FLOW REQUIREMENT (GPM)
North District (SA 2, 4-8)	321,108	223	446	669	1,500
South District (SA 9-13)	44,257	31	61	92	1,500
Entire GCCWSD Planning Area	365,365	254	507	761	1,500

The amount of development that will occur between the writing of this report and construction of the proposed project is unknown, though much of the development in the north district is anticipated to occur in the next 10 years. Any system built would need to be able to support initial flows as well as the full-

buildout design flows or be able to be expanded. The values below present a conservatively low initial flow scenario based on estimated existing water demands. These low-end flow calculations will need to be updated during final design.

TABLE 9: FLOW RATES TO SERVE EXISTING DEVELOPMENT

AREA	AVERAGE DAILY DEMAND (GPD)	AVERAGE DAILY DEMAND (GPM)	MAXIMUM DAILY DEMAND (GPM)	PEAK INSTANTANEOUS DEMAND (GPM)	2-HOUR FIRE FLOW REQUIREMENT (GPM)
North District (SA 2, 4-8)	65,278	36	73	109	1,500
South District (SA 9-13)	39,094	22	43	65	1,500
Entire GCCWSD Planning Area	104,371	58	116	174	1,500

WATER RIGHTS

Any GCCWSD water system would have to secure sufficient water rights.

As discussed in section 1.3 and Appendix D, existing groundwater rights could potentially be retired and combined into a GCCWSD right. Preliminary analysis has estimated the potentially usable water rights capacities for GCCWSD use, summarized below. The design flow rates and values should be less than these water rights-based constraints.

TABLE 10: POTENTIAL WATER RIGHT VOLUME AND RATES ESTIMATED TO BE JUSTIFIABLY AVAILABLE FOR GCCWSD SUPPLY*

Aggregated Annual Volume Available [ac-ft]	Daily Average Equivalent [GPD]	Combined Maximum Flow Rate [GPM]**
379.3	339,000	520

*Provisional valuation according to present day consumptive use patterns and simplifying assumptions. Total includes current irrigation.
** The maximum flow rate estimate is especially conservative, drawing from just the 6 largest water rights.

The scale of future development and infrastructure centralization will be largely dependent on the number of existing water rights that can be assimilated as part of a single, mass change application, which aligns the elements of Storage and Use across a common District Service Area as the proposed Place of Use (POU). Similarly, to maximize design flexibility, WGM proposes to specify the water delivery network as the common Point of Diversion (POD) for each changed water right, rather than listing discrete wellhead locations. Phased engineering and construction for the central water system may be practicable under a single change application via a DNRC authorized Completion Date 'window'.

The following section defines the previously listed alternatives explored with this PER, applies these flow demand criteria, and provides data to be used in selection of a viable alternative.

4.2 NO ACTION ALTERNATIVE

As described in previous sections, water production and supply within the District is currently provided by numerous private wells and several small, privately owned public water wells and their respective distribution systems. While the wells supplying the existing public systems require regular monitoring and testing, the remaining private wells are not required to be metered, regulated, monitored, or tested.

Nearly half of these existing potable wells are shallower than 50', with a few shallower than 25'. Many of these wells are located near the Gallatin River floodplain, are downgradient of existing septic systems and even underground fuel storage tanks. All of these factors mean many of the District's wells are at least highly susceptible to source contamination, hindering sustainability as it relates to public health and safety.

Additionally, current rulings governing appropriation of water rights from "exempt" wells, dictate that any new subdivision will be considered a combined appropriation, and the entire subdivision would be limited to a maximum of 10 acre-feet per year of water withdrawal. DNRC's Water Calculation Guide, which is used to determine feasible housing density for development's relying on exempt well water rights, stipulates a 1 acre-foot/year of water volume for a single household as well as 2.5 acre-feet/acre for lawn/landscaping irrigation. Therefore, even if a new residential development was proposed that would not include or require irrigation, the entire development would likely be limited to 10 new homes, regardless of the development land size. This type of low-density development may be preferable to wealthy individuals or families, but it will continue to drive up the cost of housing, whether to own or to rent, pushing affordability of housing further out of reach for the local resident workforce.

Exempt wells also contribute to inefficient and potentially unsustainable use of Montana's groundwater resource, at least as it relates to the ability to manage and plan around how it's impacted by continued population and development growth as the number of exempt wells expand every year. The DNRC has been working with Montana's Ground Water Information Center (GWIC) and the public to inventory the state's wells, especially as they relate to permitted water rights. In a report updated October 26, 2023, their Stakeholder Working Group has documented 212,293 exempt wells used for various applications; however, not all existing wells are compliant and were not filed with completion. Though these exempt wells have mandated limits on withdrawal flow rates and annual volumes, once the wells are completed, they're not metered and never regulated again. Therefore, owners of existing and new wells, once they're completed and properly filed or not, have free reign to withdraw as much water as the constructed well will produce. As southwestern Montana grows and the climate continues to change, continuation of this type of groundwater use and management has the propensity to lead to unanticipated water shortages.

Therefore, the no action alternative would perpetuate current growth patterns, lead to continued sporadic spreads of unchecked water systems, likely constructed as a lower capital priority compared to other development and growth needs, and continue the inefficient and potentially unsustainable use of one of our most valuable resources. This no action alternative is also in direct conflict with goals of the regional Big Sky community. ***Therefore, no further analysis is provided for this alternative.***

Because improvement action is needed to better manage and sustainably use the area groundwater and how its use directly affects the health and safety of area residents and patrons and affordability for the region's resident workforce, all viable options would meet the definition of a PWS. In order to properly serve a PWS's users, the system must have an adequate and sustainable water source, providing both the quantity required of the system as well as the quality required by the Federal and State laws governing public systems. Additionally, the system must provide adequate storage and distribution networks to meet the system's daily user demands, including provisions to meet fire flow requirements within the area served. The following sections evaluate those PWS components separately.

4.3 SOURCE ALTERNATIVE: SURFACE WATER

4.3.1 DESCRIPTION

Surface waters include streams, natural lakes, and artificial reservoirs. Surface water, in theory, could be used as the District's water source, as there are two perennial streams that cross through or near the District with adequate annual mean flowrates, the West Fork Gallatin River and Beaver Creek, each of which are tributaries of the Gallatin River, and the Gallatin River itself is located along the District's eastern boundary. These surface waters are highlighted in **Figure 16**.

4.3.2 DESIGN CRITERIA

Surface water quantity must:

- Be adequate to meet/exceed design MDD during extreme droughts;
- Provide reasonable surplus for anticipated growth;
- Be adequate to compensate for all losses such as silting, evaporation, seepage, etc.;
- Be adequate to provide ample water for other legal users of the source.

Surface water quality must ultimately meet microbiological, physical, chemical and radiological contaminant levels set by the NPDWR and be studied to determine resiliency to ongoing impacts from:

- Future uses of impoundments or reservoirs;
- Degree of control over the watershed by the owner;
- Degree of hazard to the supply from agricultural, domestic, industrial, or recreational activities in the watershed, which may generate toxic or harmful substances detrimental to the water quality or treatment processes;
- Waste discharges and all activities that could impact water supply;
- Source contaminant fluctuations and effects on treatment processes.

Surface waters require treatment operations and processes designed to:

- Consider worst conditions that may exist during the life of the treatment facility;
- Ensure compliance with ARM 17.38.2, which sets maximum contaminant levels for the microbiological, physical, chemical, and radiological constituents of the finished water;
- Provide minimum treatment to include filtration preceded by appropriate pretreatment as well as disinfection.

Use of surface water sources must include intake structures to divert/pump raw water to off-stream storage facilities, sized for severe drought conditions, prior to treatment, as well as storage facilities sized to satisfy MDD plus fire flow demands.

Utilizing one of these surface water sources would require constructing a diversion to feed a constructed reservoir to provide operational and emergency/buffer storage requirements ahead of a new water treatment plant. At a minimum, surface water sources require filtration preceded by pretreatment and disinfection of the finished water. Therefore, both mechanical and chemical treatment of the water would be required.

Further complicating this alternative's feasibility is the requirement to obtain the rights to divert and use the appropriate flowrate and volume needed to meet the demands of a new GCCWSD water system. There are no known residents or property owners within the GCCWSD Planning Area that hold existing water rights to either of these surface waters defined above. Additionally, as explained in the water

rights technical memorandum (**Appendix D**), no avenue currently exists to secure a new permit for a surface water right within the Gallatin Drainage.

Due to the initial costs necessary to develop surface water sources, as well as the ongoing O&M costs associated with treatment requirements, surface waters typically aren't financially feasible for small communities or towns and are generally more practical for larger cities. Given the relatively small size of the GCCWSD and its water demand, the surface water source alternative is deemed to be financially infeasible. Additionally, due to the requirements to obtain necessary land area, environmental permits, water rights, as well as the need to have some degree of control of the watershed of the respective surface water, this alternative to utilize a surface water as a water source is also deemed to be practically infeasible. ***Therefore, no further analysis is provided for this alternative.***

4.3.3 MAP

The following **Figure 16** provides a map depicting the above-described surface waters.

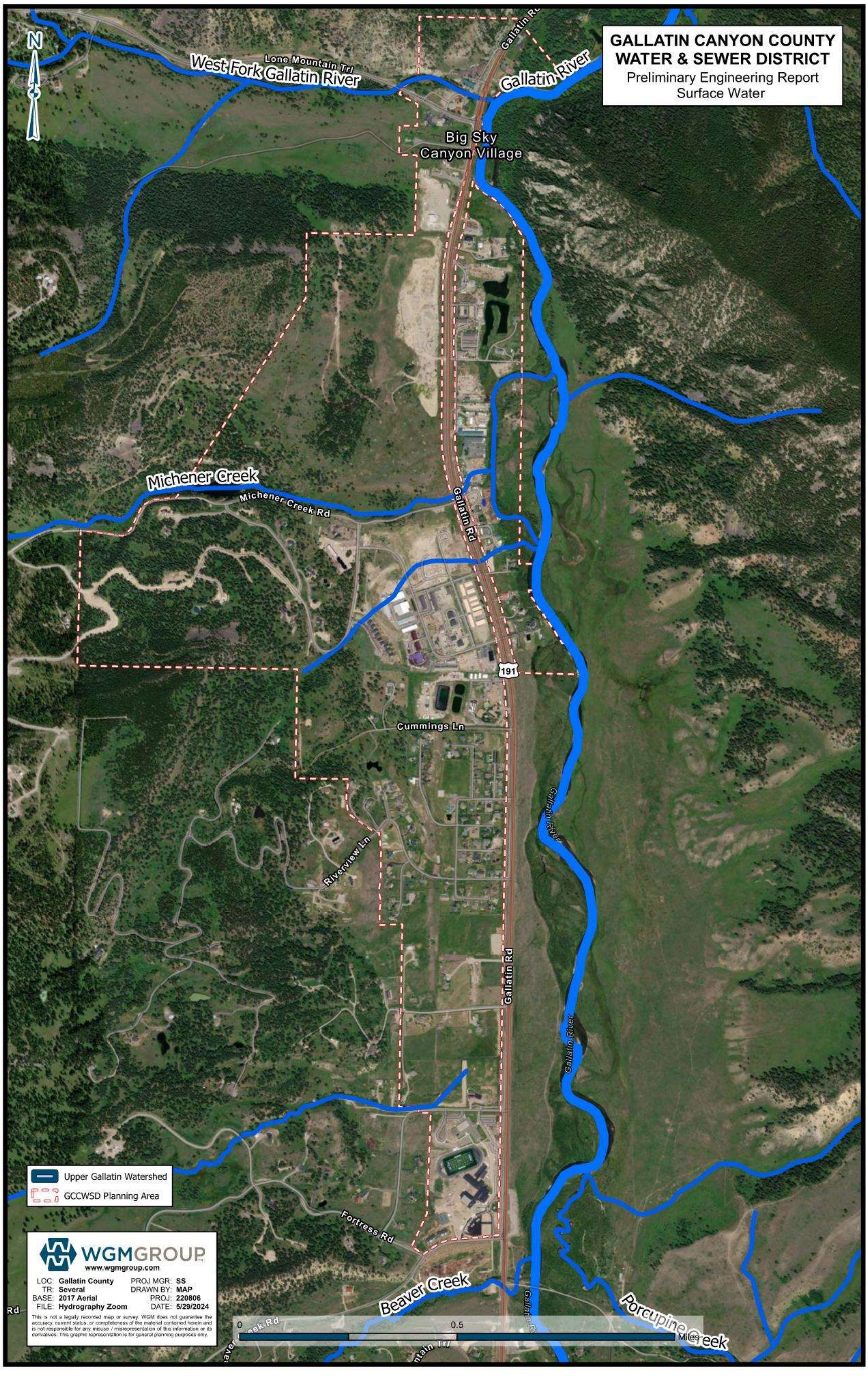


FIGURE 16: SURFACE WATER ALTERNATIVE MAP

4.4 SOURCE ALTERNATIVE: METERED CONNECTION TO EXISTING BSCWSD SYSTEM

4.4.1 DESCRIPTION

The Big Sky County Water and Sewer District (BSCWSD) owns and operates an existing public water system that supplies water to approximately 2,197 residential customers and 333 non-residential customers. The alternative to utilize the existing BSCWSD system as the source water for the GCCWSD District would require extension of a new water transmission main from HWY 191 to connect to an existing BSCWSD main near Town Center, as shown in **Figure 17**, as well as an operations agreement between the Districts. The length of new transmission main required to make the connection would be approximately 16,000 feet and would require a mix of occupancy permits from both MDT and the USFS as well as private land easements for encroachments onto private properties.

This extension and connection would require a master meter installed near the HWY 191 intersection ahead of the first GCCWSD service to monitor the District's consumption and for billing purposes, as the BSCWSD would bill the GCCWSD directly as a single customer. This source connection and use would also require an operations agreement between the two Districts to establish usage rates, delineate O&M responsibilities as well as to establish initial capital responsibilities for the new transmission main and capacity purchase to cover BSCWSD's immediate or future storage increase as that District continues to grow.

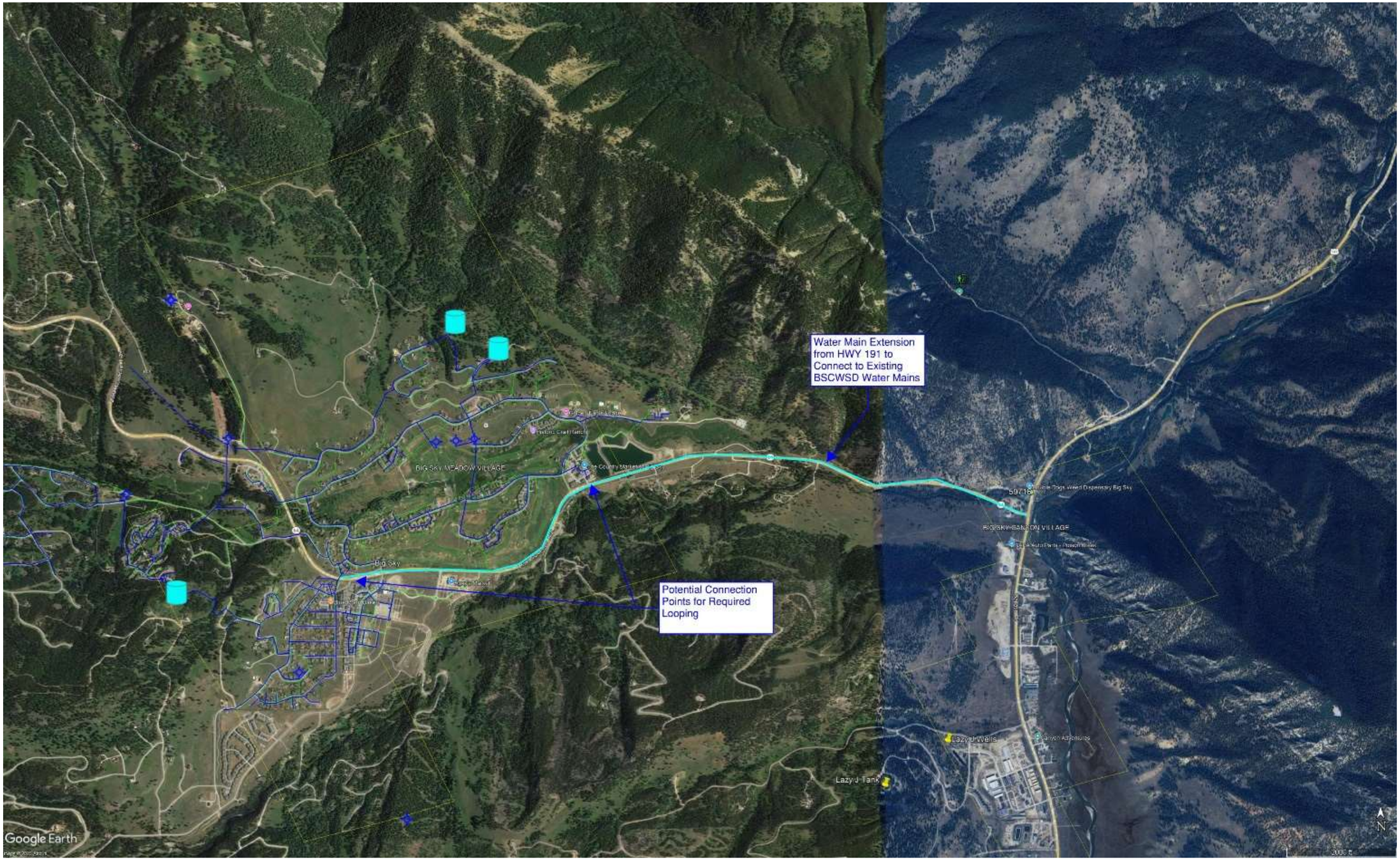


FIGURE 17: METERED CONNECTION TO BSCWSD ALTERNATIVE MAP

4.4.2 DESIGN CRITERIA

The BSCWSD system is an existing, permitted public water system, so its system components are in compliance with DEQ requirements. Therefore, the design criteria specific to this alternative's addition or expansion to the system are associated with storage volumes, flow demands and maintaining allowable system pressures within the extended distribution system.

Storage facilities must supplement source capacity to satisfy all system demands occurring on the maximum day plus fire flow demands where fire protection is provided by the system. Minimum storage requirements are as follows:

- Minimum allowable storage must be equal to the ADD plus fire flow demand.
- Fire flow demand must satisfy the governing fire protection agency recommendation, which is the BSFD.
- Systems with multiple pressure zones require those zones to be analyzed separately to ensure sufficient storage is provided for each zone, to satisfy the above requirements.
- Excessive Storage capacity should be avoided to prevent water quality deterioration and potential freezing problems.

In addition to the storage design criteria above, the system must provide:

- Minimum normal working pressure of 35 psi for all normal system demands except fire flows, which includes PID demands.
- Minimum pressure of 20 psi under all conditions of flow which includes fire flows and main flushing operations.
- Maximum normal working pressure should range from 60 to 80 psi.

Although this alternative is possible and existing production and storage infrastructure exists, the required approximately 16,000 linear feet extension of a new transmission main to connect and transmit water to the Canyon area would likely have a minimum $2 Million scale capital construction cost. Additionally, that's more than three miles of pipeline with no user connections and thus no beneficial user cost share across this length, and the same scale capital could provide a new storage tank locally with the District. Adding complications to this alternative is the narrow public corridor, with varying slope stabilities, in which the water main would have to be laid as well as navigating property occupancy requirements of both MDT and USFS and DEQ's horizontal offset requirements in relation to sewer mains.

Due to the high cost of extension requirements with no direct user connection benefits, costs that could be directly allocated within the District for localized infrastructure to boost and/or supplement production and storage needs, this alternative is deemed to be an ill-advised solution, financially, given the same investment could be used to improve or expand infrastructure that already exists in the GCCWSD.

Additionally, the available corridor in which to install transmission infrastructure is at least physically impractical, if not infeasible, due to both Federal and State regulations associated with right-of-way occupancy, potentially unstable slopes along the corridor as well as the proximity to the West Fork of the Gallatin River. Finally, while the BSCWSD does have water rights that could potentially be used to add the GCCWSD, those water rights are actively managed and planned and some already committed for immediate and future ongoing development and system expansion in the Big Sky area. Also, the potential of Canyon area water right owners donating and/or selling their existing rights to Big Sky is far less likely than consolidating them into an existing local system. ***Therefore, no further analysis is provided for this alternative.***

4.5 SOURCE ALTERNATIVE: GROUNDWATER USING EXISTING PWS WELLS

4.5.1 DESCRIPTION

Groundwater is, as it sounds, water obtained from below ground. For water production systems, groundwater is generally obtained by drilling wells and pumping water from the wells either into storage tanks or directly into the water distribution system. Groundwater is the most widely used source of water for potable water use in Montana, as it requires less infrastructure, less power, less if any treatment, less operation and maintenance than surface water sources, and is generally a simpler design, making it ideal for Montana's smaller communities.

As discussed in Section 2.3 above, there are several existing permitted, public water wells already in the GCCWSD, some of which have significant water right diversion rates and annual volumes, respective to the water demand basis of design for the GCCWSD. As summarized in Section 1.3 and more detailed in the Water Rights Viability Assessment included in **Appendix D**, there is potential to consolidate existing water rights within the GCCWSD and apply those combined capacities toward a central public water system with a single mass change application. The ability to acquire, combine, and allocate those water rights to a new central water system owned and operated by the GCCWSD will ultimately be the critical exercise in determining viability of a new central water supply system and the extents of areas within the GCCWSD that the system can successfully service. The water rights assessment performed with this PER estimates potential for a justifiable combined aggregated annual volume of 379.3 acre-feet which translates to 339,000 gpd with a combined maximum flow rate of 520 GPM. Additional flow rate could likely be justified if needed. The mass change application would align the elements of Storage and Use across a common District Service Area as the proposed Place of Use (POU). Similarly, to maximize design flexibility, WGM proposes to specify the water delivery network as the common Point of Diversion (POD) for each changed water right, rather than listing discrete wellhead locations. Note that phased engineering and construction for the central water system may be practicable under a single change application via a DNRC authorized Completion Date 'window'.

Although there are approximately 94 total wells within the Planning Area, only 14 of those existing wells are public system supply wells and not all of those meet current PWS well standards. In theory these wells could be manifolded together to pressurize a new water system and/or fill storage tank(s); however, these existing PWS wells are spread out all over the Planning Area, draw from different aquifers at different depths and have varying ranges of susceptibility to existing or future sources of contamination, and all have different pumps designed for vastly different operating conditions, all conditions which would create extensive complications in managing, operating and maintaining system infrastructure. Therefore, a more strategic use of existing wells would include targeting existing wells with the highest permitted withdrawal/pumping rates and a proven higher yield aquifer source, with closer proximity to each other and to existing potential storage facilities, with water quality history consistently meeting permit requirements, and in locations with the best source protection against existing and potential future contamination sources. This strategy narrows our focus to the two Lazy J Utility PWS wells and the two Ramshorn HOA PWS wells, which are centrally located within the Planning Area. Both systems have ground storage tanks, analyzed in the following sections.

Existing Lazy J Wells

Available records indicate that Lazy J has two wells with generally mirrored construction which draw from the same aquifer source. The primary well has a rated pump capacity of 180+ gpm, while the secondary well has a rated pump capacity of 33 gpm. Records show these wells meet all community

PWS supply well standards and are suitable for reuse. Both wells draw from the deep Thermopolis Formation sandstone aquifer and are strongly artesian. Closed-in pressure has been observed as high as 180 psi in both wells and the storage tank can be filled without pumping when demand is low. Pump tests and geological review indicate that this deep aquifer is not hydraulically connected to the alluvial aquifer, Michener Creek, or the Gallatin River.

These wells generally produce high quality water that meets all MCLs consistently without treatment. A hypochlorite chlorination system is installed but not used. This could be repurposed for the new system, if needed.

Well 1 water is very soft, with a hardness of about 2mg/L. Sodium is relatively high, measured at 265 mg/L and the time of well completion. The EPA recommends that drinking water sodium concentrations not exceed 20 mg/L for people on a very low sodium diet (500 mg/day) or 30 to 60 mg/L to avoid adverse effects on taste. No taste complaints have been made by the systems existing users. System users should be notified. Customers concerned with sodium intake may benefit from the use of POU treatment of their drinking water. The water also has a high sodium absorption ratio (SAR) of 82.4 that may cause issues if used for irrigation on soils with lower permeability and high organic matter. Separate water quality is not available for Well 2; however, given the close proximity of the two wells and their draw from the same source aquifer, it is reasonable to assume the water quality of both wells is generally similar.

Existing Ramshorn Wells

Available records indicate that Ramshorn has two wells with differing well construction which draw from the same source aquifer in the Kootenai Formation (below the Thermopolis Shale that Lazy J wells draw from). Both wells have pumps rated at approximately 125 gpm and records indicate compliance with all MCLs. Ramshorn PW's Well 2 is operated as a backup and rarely used. It requires flushing prior to use due to black particulates and strong hydrogen sulfide odor. This was evaluated in the 2012 Well 2 Evaluation Report by Western Groundwater Services, LLC. Even after flushing, objectionable odors of hydrogen sulfide remain. This is likely primarily from the source lithology. Corrosion of the well casing may also be a contributing factor. Western Groundwater Service's evaluation was not optimistic about rehabilitating this well. It did indicate that, if the well is used regularly, blended with Well 1 water, and allowed to off-gas, it would likely be palatable.

Ramshorn's Well 1 has much less hydrogen sulfide odor than Well 2 and no visible discoloration. Water quality testing conducted in 2012 indicated a high sodium level of 264 mg/L, consistent with Lazy J's and a specific conductance of 1020 uS/cm (class II groundwater). Well 1 showed significant presence of common non-pathogenic anaerobic bacteria, that over time could cause plugging issues in the well or aesthetic concerns for consumers. This was not identified in Well 2.

TABLE 11: EXISTING PWS WELLS PROPOSED FOR REUSE

WELL NAME	LAZY J WELL 1	LAZY J WELL 2	RAMSHORN WELL 1	RAMSHORN WELL 2
GWIC ID	223891	227731	165682	257253
DEPTH (FT)	1,278	1,325	1490	1,320
YEAR BUILT	2005	2006	1994	2009
EXISTING PUMPS	50 HP Submersible	50 HP Submersible	30 HP Franklin Submersible	30HP Franklin Submersible
ARTESIAN CLOSED – IN PRESSURE	153 – 180 psi	160 – 180 psi	10 psi	NA
ARTESIAN FLOW RATE	Unknown	14 GPM	Unknown	NA
PUMP TEST FLOW RATE	181 GPM	Unknown	120 GPM	120 GPM

Additional information on well construction and underlying lithology can be found in the well logs in **Appendix H** and in the corresponding PWS design reports detailing well development (available on request).

4.5.2 DESIGN CRITERIA

Design criteria for groundwater sources are mainly centered on quantity, quality, well location and long-term protection of those locations. These criteria are more specifically defined below:

- Depending on system storage provisions, the source capacity must equal the design MDD or PID.
- A minimum of two sources (wells) must be provided, and the design flow (MDD or PID) must be provided with the largest well/pump out of service to ensure system redundancy in the case a well is offline or down for service/maintenance.
- All new, modified, or reconditioned groundwater source must be sampled and tested to ensure water quality compliance with Maximum Contaminant Levels (MCL), established in the NPDWR, respective to microbiological, physical, chemical, and radiological constituents of the water source. The Administrative Rules of Montana (ARM) Title 17, Chapter 38, Subchapter 2 governs this process and limitations.
- Treatment requirements are determined on a case-by-case basis based on history and source. Existing PWS wells are regularly monitored to ensure continued compliance with water quality requirements, and if any regulated water constituents/contaminants are found to exceed their respective MCL, then a full-time treatment operation or process will have to be added to treat or mitigate those contaminant levels.
- Wells must be located so as to provide protection from potential sources of contamination from both the surface and subsurface sources. A 100’ radius isolation zone prohibiting sewer lines, septic tanks, holding tanks, and any structure used to convey or retain industrial, storm, or sanitary waste from being placed within this zone must be established. This isolation zone also includes state and federal highway rights-of-way. Wells also must meet setback distances to sewage lagoons established in ARM 17.30.1702 and must not be in a groundwater mixing zone as defined in ARM 17.30.517.
- Well location must be approved based on a Source Water Protection Assessment conforming with Section 1.1.7.2 of DEQ Circular 1, which includes providing a PWS-5 evaluation for “Groundwater Under the Direct Influence of Surface Water” and a PWS-6 to determine “Source Water Protection Delineation”.

For this alternative, suitable existing well infrastructure exists, meeting PWS requirements and design criteria, which can be re-purposed for a new District system. For simplicity, consistency, and understanding of long-term system operations, a single groundwater source aquifer is preferred, and all wells will have similar pumping capacities to satisfy pumping redundancy requirements. Two or more wells will be required for each PWS. This alternative takes advantage of using existing, in place well infrastructure, as well as the ability to upgrade well pump capacity within existing wells, both of which are viable alternatives to advance in conjunction with the subsequent system component alternatives. Additionally, depending on existing wells selected and the selection of existing storage facilities (discussed in following component alternatives), a new transmission main may be required to manifold wells and connect to those storage facilities. Cost estimates for this alternative are limited to upgrading existing well(s) and new transmission main extension.

4.5.3 MAP

Figures 18 and 19 provide maps highlighting existing wells identified within the GCCWSD Planning Area along with depths of existing wells. For the purposes of this report, the existing Public Water Supply (PWS) wells are of most importance, as most have already satisfied the required design criteria and are monitored, as required, to track water quality.

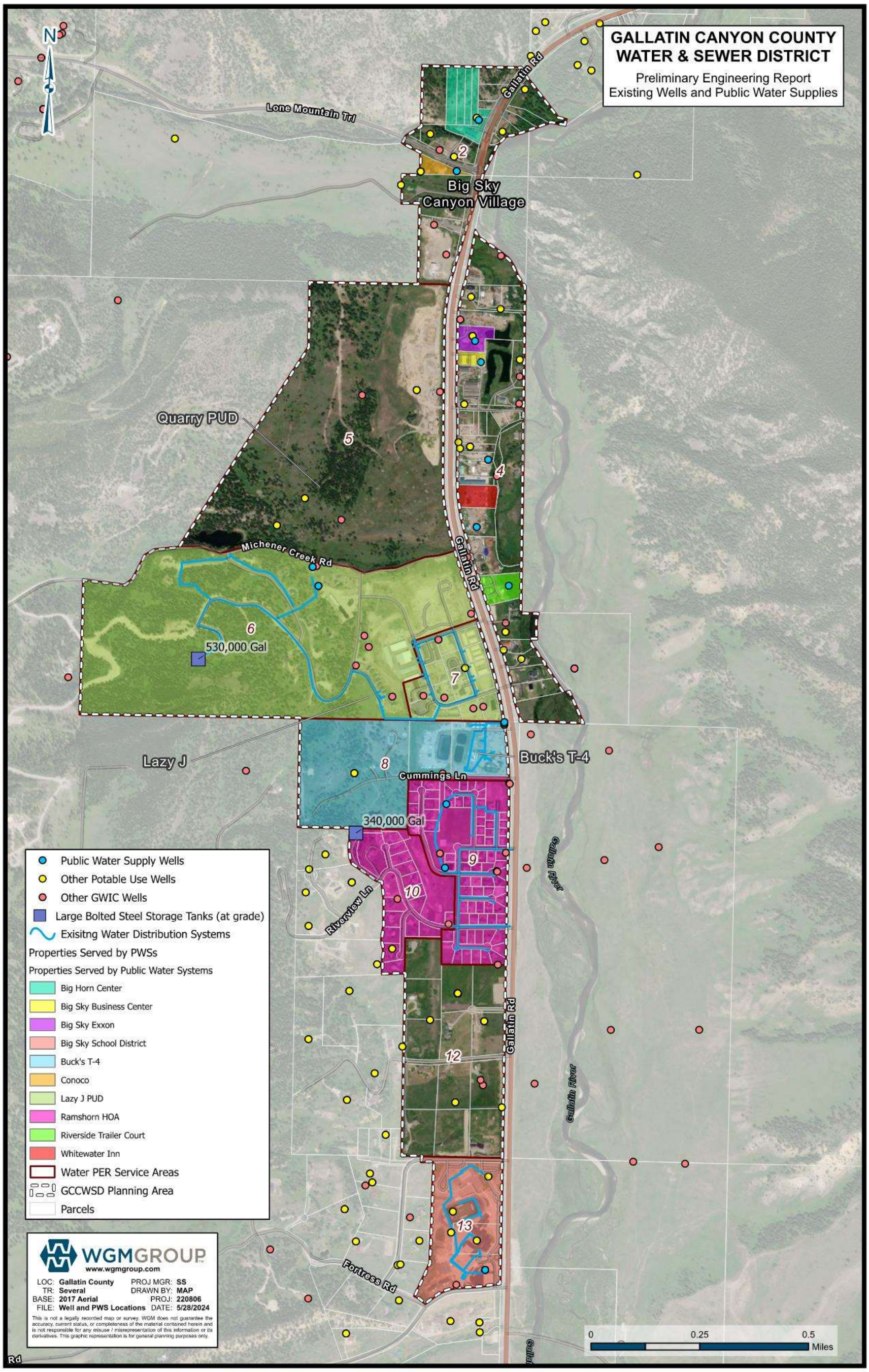


FIGURE 18: EXISTING PWS WELLS & INFRASTRUCTURE

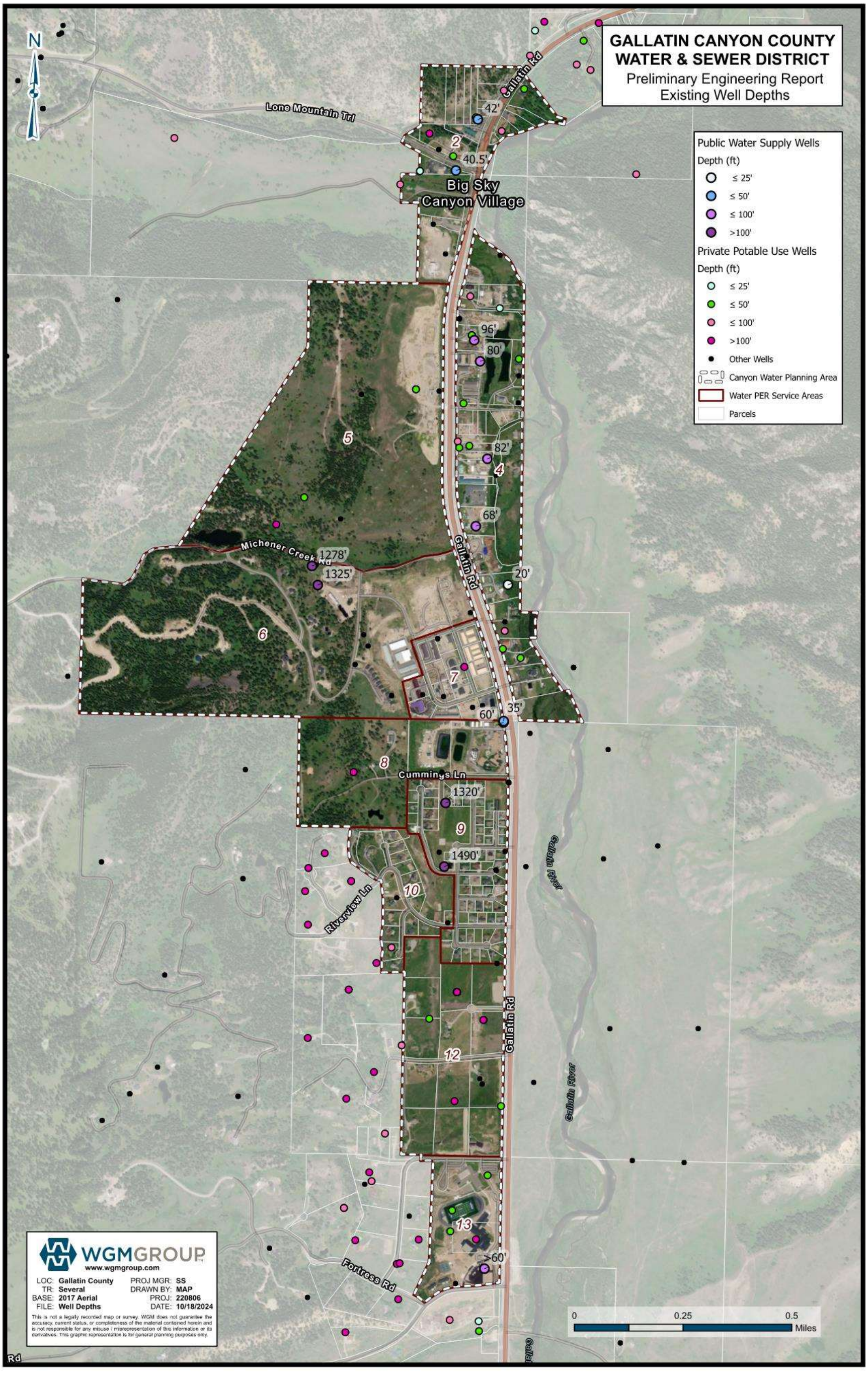


FIGURE 19: EXISTING WELL DEPTHS

4.5.4 ENVIRONMENTAL IMPACTS

Use of existing, operating infrastructure will essentially have zero environmental impacts, as the localized areas containing the infrastructure are already developed and maintained. In particular, this alternative focuses on existing source wells already serving larger, multi-unit developments, which themselves have the highest permitted diversion flowrates associated with their existing water rights. The strategic existing wells to use with this alternative are those serving the Lazy J and Ramshorn developments which are located well outside any area floodplains and wetlands and are not hydraulically connected to the alluvial aquifer or surface water. Extension of a new transmission main to connect selected wells to storage facilities would be constructed within existing developed areas and generally follow existing roadways, outside of any environmentally sensitive areas, so no adverse environmental impacts are anticipated for construction of this main extension. Other important land resources, potential endangered species, historical and archaeological properties are assessed in the Uniform Environmental Checklist provided in **Appendix C**, but no known such resources exist in the immediate vicinity of existing wells proposed for use.

4.5.5 LAND REQUIREMENTS

Existing PWS wells proposed for use for this PER's new central water system are located on existing lots owned by subdivision Owners Associations (OA) or development parent companies. This project is unique in that the intent is to create a new public water and sewer district-owned PWS that consolidates and repurposes existing infrastructure to support a single utility instead of multiple, dispersed public and private systems serving individual properties or development with multiple owners. Specific to using existing wells with this alternative, this will at least require occupancy and access easements, if not, sectioned off utility lots encompassing the well locations. Main extensions would be mostly routed along existing roadways with existing easements and/or right-of-way. A portion of transmission main extension, if required, would run outside of these existing roadways, so these areas would require new utility easements from respective property owners.

4.5.6 POTENTIAL CONSTRUCTION PROBLEMS

The Ramshorn well #2 is not readily accessible for constructed upgrades and servicing. Additionally, as discussed above, this well consistently produces hydrogen sulfide smells and varying levels of discoloration due to high particulates and as such is only used in the case that well #1 has to be taken offline for maintenance. A well evaluation conducted in 2012 did not recommend, at that time, to modify or construct a new well due to uncertainties of improved quality and risks of rendering the existing well unusable. Therefore, this Ramshorn well #2 is not considered viable. There is inherent uncertainty with modifying any existing well and with constructing any new wells, as you never know what will be encountered as you drill down into the earth. Additionally, there is inherent uncertainty with upgrading existing wells to pump at higher rates than they've historically operated. These existing wells have successfully operated at their design and tested pumping rates for many years; however, attempts to increase these pumping rates would have unknown results on the aquifer capacity and conditions both local to these wells and surrounding wells and thus would have to be re-tested for any increase pumping rates.

Though not a construction item, securing sufficient water rights will likely be the largest hurdle for securing a water source. From a water rights feasibility view, there is not a significant difference between using existing wells or constructing new well infrastructure. Another potential hurdle for this alternative would be transferring ownership and operations of this system infrastructure and access permissions from the current owners. Lazy J Utilities has expressed interest in connection to a new GCCWSD water system and is considered a viable option for transfer of ownership and operations. Some Ramshorn Subdivision residents have expressed interest in the idea of connecting to a new

GCCWSD water system; however, getting approval from the OA will ultimately come down to affordability for those residents.

Since construction associated with this alternative is generally limited to working within existing wells to upgrade pumping capacities, no other significant construction problems are anticipated.

4.5.7 SUSTAINABILITY CONSIDERATIONS

Water and Energy Efficiency

While the wells are quite deep, they are strongly artesian, generating positive pressure from the aquifer which reduces required pressure head output for the pump which decreases horsepower requirements, which ultimately reduces operational energy demands. Depending on storage capacity utilized to meet total system demands, MDD plus fire flow demand, pump and source capacity requirements can get exceedingly large when systems depend primarily on pumps to meet these system demands instead of storage. In contrast, utilizing multiple smaller well pumps in conjunction with adequate storage to meet system demands, reduces pump horsepower and associated energy requirements, reduces pump run times, and reduces stress on the source aquifer that may arise with higher pumping rates. In this case, relying on a few 180 gpm wells/pumps with storage versus well/pump capacities between 700 – 2,000 gpm with minimal or no storage will result in much better energy efficiency and source resiliency. A source water meter will be used in conjunction with user meters to help detect water leaks and improve water efficiency.

Green Infrastructure

There will be minimal new impermeable groundcover associated with this alternative as well as minimal, if any, impacts to existing terrain or historical drainage patterns, so little to no impact to stormwater is expected.

Other

Wells in the deep aquifer should be less vulnerable to drought and contamination from anthropogenic sources than the existing shallow water supply wells. Additionally, utilizing one source aquifer will greatly simplify long term monitoring and management of water quality. Utilizing pumps generally in close proximity to each other, their well control house(s) and storage facilities will greatly simplify system operations, as well as utilizing wells with the same pumps and flow rates. Also, consolidating to a single Utility District owner will enhance sustainability and resiliency of the water source and system infrastructure. It will provide more consistent operation and maintenance for the Planning Area as a whole. Additionally, economies of scale associated with an expanded user base will play into long term maintenance, infrastructure upgrades and replacements of aging infrastructure necessary to maintain compliance with permits as governing regulations become increasingly more stringent and financially cumbersome for smaller systems. County Water and Sewer Districts are eligible for state and federal funding programs as well as planning grants that some of the existing PWS's can't access.

4.5.8 COST ESTIMATES

Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualize OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I**.

TABLE 12: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
UPGRADE EXISTING LAZY J WELLS	$157,290.00	$86,000.00	$53,952.50	**$243,290.00**
UPGRADE EXISTING RAMSHORNWELLS	$349,180.00	$190,000.00	$54,830.00	**$539,180.00**
RAMSHORN TO LAZY J TRANSMISSION (REQ'D WITH SINGLE SYSTEM)	$631,725.00	$721,500.00	$6,900.00	**$1,353,225.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

This alternative is technically feasible and will be evaluated further in Section 5.

4.6 SOURCE ALTERNATIVE: GROUNDWATER USING NEW PWS WELLS

4.6.1 DESCRIPTION

This alternative includes construction of new wells to either supplement and/or take the place of existing wells. In the absence of a hydrogeological assessment report which would be important, or at least beneficial toward selecting a completely new site for a new well field, the general proximity of the existing Lazy J Utility wells is the anticipated location of any new well(s) for this PER. As discussed in the preceding existing wells alternative, the two Lazy J wells have produced reliable capacity and water quality from their deep aquifer source for approximately 18 years.

Given the relatively dense residential nature of the Ramshorn Subdivision and the fact that its open/park space is significantly occupied by existing wastewater discharge drainfields and one of its wells is already considered to be not readily accessible for servicing and maintenance, the Ramshorn area is not considered for potential location of a new well. Additionally, their Well 2 experiences at least aesthetic quality issues from high particulates and hydrogen sulfide smell, and a previous assessment report indicated uncertainty of water quality improvements from modifying the well and/or constructing a new well in the same general vicinity and same aquifer.

Depending on the selection of a single combined distribution system or two separate systems split to serve the approximate northern and southern halves of the Planning Area, evaluated in latter alternatives, at least a total of two wells and potentially up to four wells will be required. It is recommended to conduct a hydrogeologic study for the central region of the Planning Area, prior to drilling a new well, to aid in well siting and determining aquifer location and depths predicted to provide the best water quantity and quality. For the purposes of the PER, it is assumed that any new well(s) would be located in the general vicinity of the existing Lazy J wells and storage tank and drilled into the same aquifer, given their history of providing reliable production quantity and a history of water quality reliably meeting regulated MCL's without treatment.

As previously discussed, the ability to acquire, combine and allocate those water rights to a new central water system owned and operated by the GCCWSD will ultimately be the critical exercise in

determining viability of a new central water supply system and the extents of areas that the system can successfully service. The water rights assessment conducted with this PER demonstrates confidence in justifying a change of water rights to the new District for an approximate average of 339,000 gpd at a rate of 520 gpm with some potential path for a higher volume and flowrate. This maximum flow rate would be sufficient to serve the Planning Area based on calculated flow demand projections provided in Section 4.1 above and will determine how a new system will balance production capacity between direct pumped capacity and storage capacity to meet overall system demand requirements. This average daily water right volume is approximately 92% of the total daily volume calculated for the Planning Area. The water right assessment identifies a total combined maximum annual volume of water rights of 699.1 acre-feet, or 624,074 gallons; however, these would include unqualified certificates and unified exempt wells. So while it's not likely that the GCCWSD could acquire this max total, there may be enough additional volume of existing rights that could meet the total average daily demand calculated for the Planning Area. With this in mind, this PER utilizes the calculated water demand for the alternative analysis for required system infrastructure, recognizing that ultimately the total water rights approved with a change application will determine the District's service area boundary derived from the groundwater quantity allowed.

Given the Planning Area's calculated demands, a combination of existing and new wells will be required for source production. Additionally, given required pumped flow rates, the water supply mains from each well will manifold together and require upsizing to 6" diameter mains to replace the 4" diameter mains that exist to avoid excessive pipe velocities. In conjunction with an upgrade in these main sizes, a new well control/process building would be desired to house above grade piping galleries to accommodate required system controls as well as the potential addition of filtering treatment equipment. The existing well control building could remain operational to provide any near term or future equipment and/or chemical storage. The existing building's through piping could be retrofitted to operate in tandem with the new building and piping to provide side-stream/blending operations and full-stream treatment train operations.

4.6.2 DESIGN CRITERIA

Design criteria for this alternative are the same as those presented above for existing wells. New PWS wells require DEQ review and approval of well design plans, specifications, and a design report stamped by a Professional Engineer. Design documents must include a new PWS-5 and PWS-6 evaluation for the well(s) to ensure proper source protection. All wells must be constructed by a licensed water well contractor in accordance with MCA 37.43 and ARM 36.21., and upon completion the following information is required prior to final approval and use of the well(s):

- Water quality sample results demonstrating compliance with DEQ-1, 3.2.2.1 (microbiological quality) and DEQ-1, 3.2.2.2 (physical and chemical quality).
- An executed copy of the recorded well isolation zone protection document.
- Aquifer pump testing results and completed well log including analysis of the well production capacity vs. required demand capacity.

4.6.3 MAP

Figure 20 below highlights potential region for new well development within the Lazy J subdivision, and **Figure 21** shows a conceptual arrangement of a new well discharge manifold and a new control building connected in parallel to the existing building for flexible production and process operations to adapt to changes in aquifer conditions and regulatory requirement.

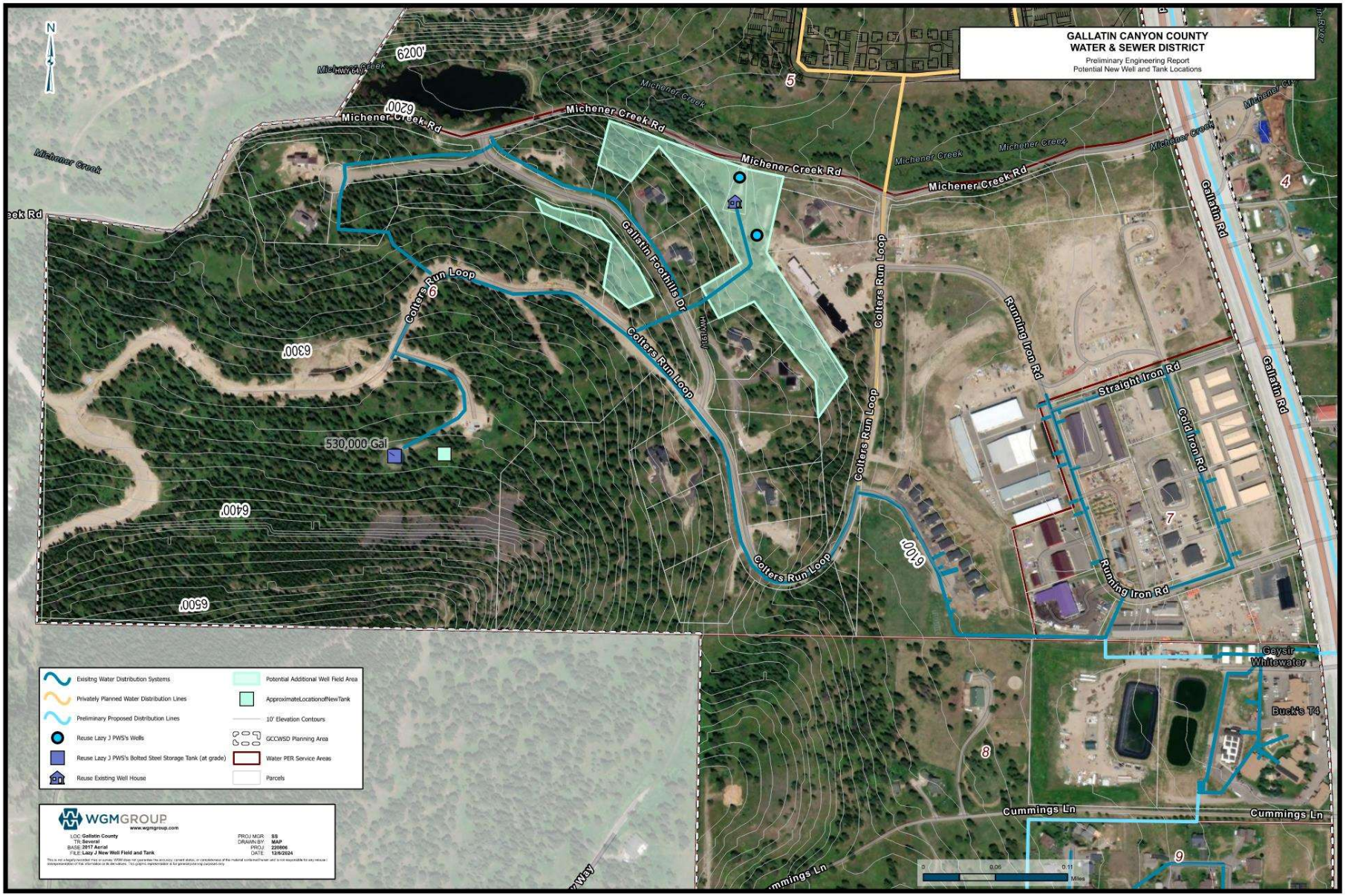


FIGURE 20: NEW WELL FIELD REGION



FIGURE 21: NEW WELL MANIFOLD CONNECTION ARRANGEMENT

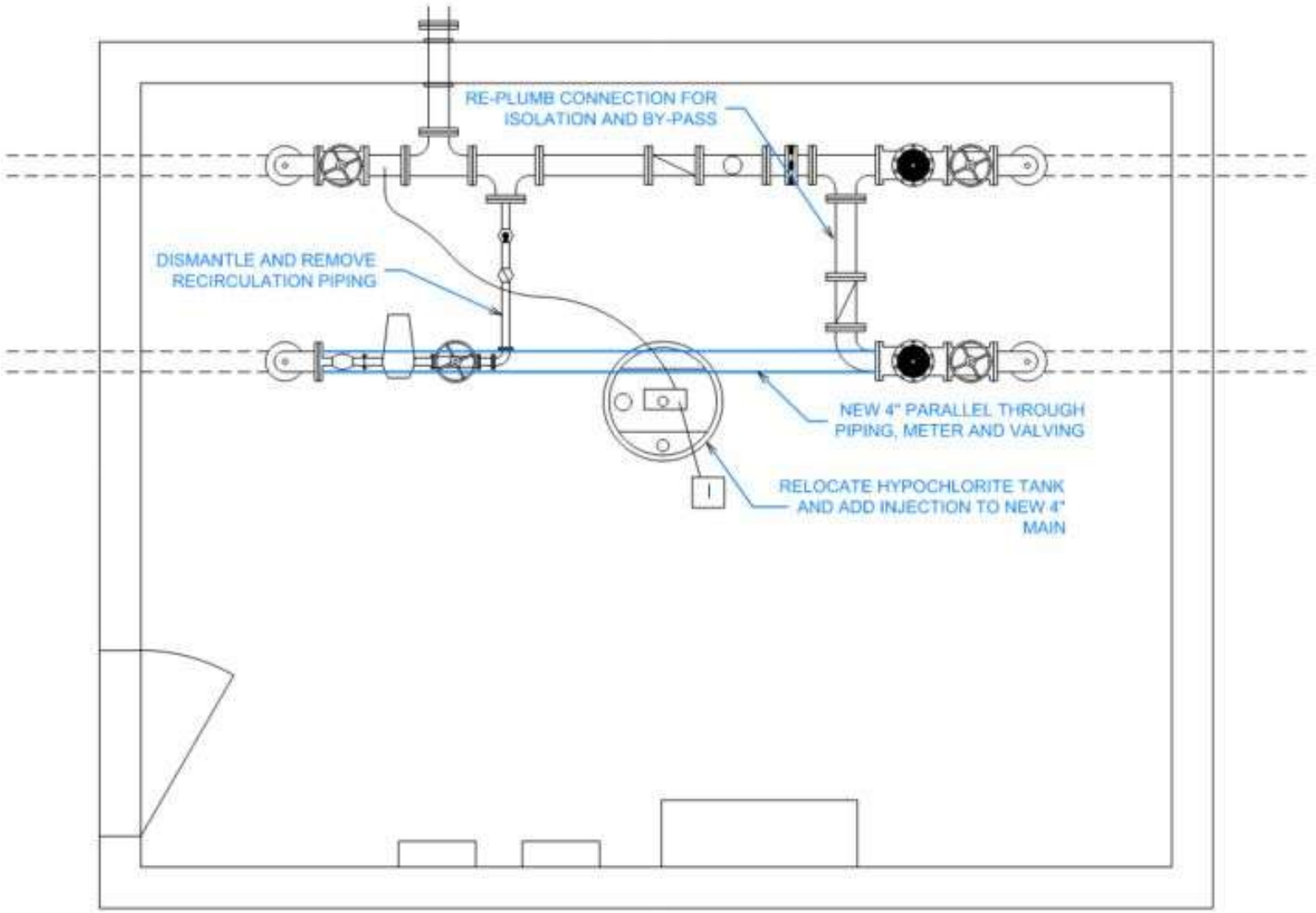


FIGURE 22: EXISTING WELL CONTROL BUILDING MODIFICATIONS

4.6.4 ENVIRONMENTAL IMPACTS

New wells and a well control house will have a relatively small footprint and likely be constructed in or adjacent to developed land in close proximity to existing system infrastructure, so long-term land impacts will be negligible. PWS well location and construction requirements, in addition to water rights control of aquifer use, mitigate aquifer contamination potential and stress from overdrafting. Standard system operation and maintenance practices, in conjunction with regulatory monitoring required for public systems, ensure controlled use of the aquifer, and recurring quality checks ensure user safety.

New wells and control house infrastructure will be located well outside any area floodplains and wetlands. Extension of a new transmission main to connect selected wells to storage facilities would be constructed within existing developed areas and generally follow existing roadways, outside of any environmentally sensitive areas, so no adverse environmental impacts are anticipated for construction of this main extension. Other important land resources, potential endangered species, historical and archaeological properties are assessed in the Uniform Environmental Checklist provided in **Appendix C**, but no known such resources exist in the immediate vicinity of existing wells proposed for use.

Proper construction measures would be taken to minimize the temporary impacts, such as noise, dust, and control of erosion and sediment runoff associated with construction activities.

4.6.5 LAND REQUIREMENTS

A 100’ foot diameter well isolation zone, secured with a deed notice or easement will be required for each well. Easements and/or creation of separate utility lots will be required for the land occupied by system wells and control house. Additionally, easements for linear piping infrastructure connecting wells, buildings and storage facilities extending outside of any non-public access routes would also be needed.

4.6.6 POTENTIAL CONSTRUCTION PROBLEMS

As previously discussed, securing and transferring sufficient water rights will likely be the largest hurdle in developing a new central water supply. From a water rights feasibility view, there is not a significant difference between using existing or new well infrastructure.

The underlaying geology is complex and there are inherent uncertainties in developing any new PWS well in the regional aquifers. The primary challenge anticipated for source development is locating and producing water requiring no treatment, as treatment increases initial capital costs as well as long term operation and maintenance costs.

The target deep aquifer water quality point sources have no contaminants requiring treatment; however, there are secondary inorganic mineral concentrations that could warrant specific treatment for aesthetic reasons depending on demands of the public served. PWS wells in the area with the highest water right diversion rates and annual volumes are drilled to depths over 1,000’ and are artesian. It is likely that new wells would have similar depths. Drilling deeper wells into rock formations requires special drilling equipment which can decrease the qualified pool of area contractors. If the artesian flows are not properly managed during drilling, erosion from uncontained runoff can become an issue. Sealing and completion of well casing infrastructure can also be more challenging on artesian wells.

4.6.7 SUSTAINABILITY CONSIDERATIONS

Sustainability considerations for new wells accessing a groundwater source are largely the same as those presented above for existing wells.

Water and Energy Efficiency

The deep aquifer being used by the two larger public systems withing the Planning Area are artesian, reducing pumping horsepower and resulting energy demands. Utilizing adequate storage to buffer peak demands lends to less pumping horsepower requirements and energy demands. Locating wells as close as possible to storage infrastructure reduces friction head and resulting horsepower requirements and energy demands. Additionally, utilizing multiple, smaller flow rate wells/pumps to serve the system demand flow requirements is much more efficient than one well/pump sized to meet the system's peaking demands, as individual wells can start and operate alone and in parallel to meet demands fluctuating between peak and off-peak hours. Larger wells/pumps sized for full peak capacity turn on at full speed, with larger energy draws, for low period demands and peak demands alike which can lead to excessive pump cycling. Final design of the selected project will incorporate analysis of using onsite solar for appropriate energy demands as well as appropriate building design and/or materials to promote a more energy efficient and sustainable structure for the well/control house building, which will be provided by LEED professional(s).

Water quality in the local deep aquifer source is anticipated to be good, relative to regulated chemical, physical, and radiological constituent MCL's and to not require treatment; however, it is uncertain in new wells until they're drilled and sampled. If treatment is required, that would increase energy demands, chemical use, and, potentially, water produced versus water reject from varying treatment processes.

Green Infrastructure
There will be minimal new impermeable groundcover associated with this alternative as well as minimal, if any, impacts to existing terrain or historical drainage patterns, so little to no impact to stormwater is expected.

Other
Wells in the deep aquifer should be less vulnerable to drought and contamination from anthropogenic sources than the existing shallow water supply wells. Additionally, utilizing one source aquifer will greatly simplify long term monitoring and management of water quality. Utilizing pumps generally in close proximity to each other, their well control house(s) and storage facilities will greatly simplify system operations, as well as utilizing wells with the same pumps and flow rates. Also, consolidating to a single Utility District owner will enhance sustainability and resiliency of the water source and system infrastructure, as it will provide more consistent operation and maintenance for the Planning Area as a whole, and economies of scale associated with an expanded user base will play into long term maintenance, infrastructure upgrades and replacements of aging infrastructure necessary to maintain compliance with permits as governing regulations become increasingly more stringent and financially cumbersome for smaller systems. Utility Districts are eligible for state and federal funding programs as well as planning grants. The central water system will include standby generator(s) with automatic transfer switch to maintain system operation during power outages and other potential emergencies resulting in loss of power, which along with consistent maintenance increases system resiliency.

4.6.8 COST ESTIMATES

Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualize OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I**.

TABLE 13: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
ADDITION OF NEW WELLS – LAZY J WELLFIELD	$1,179,610.00	$1,044,000.00	$54,597.50	**$2,223,610.00**
NEW WELL/PUMP CONTROL HOUSE	$752,900.00	$665,000.00	$18,000.00	**$1,417,900.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

This alternative is technically feasible and will be evaluated further in Section 5.

4.7 TREATMENT ALTERNATIVE

4.7.1 DESCRIPTION

For this PER, the source aquifer for a District central water supply system is assumed to be consistent with Lazy J's Thermopolis Formation sandstone source aquifer. The two largest existing PWS's, Lazy J and Ramshorn, both utilize this generally same source aquifer. Lazy J has been utilizing this source aquifer for approximately 20 years, and its permit required source water quality monitoring has never yielded results meeting regulatory requirements for treatment. Most all other existing PWS wells in the Planning Area draw from a shallow aquifer source, potentially under the influence or connected to surface waters, which have a far greater potential of contamination, especially given the high density of septic drainfields throughout the Planning Area.

As discussed in Section 4.5 above, this source aquifer has the potential for high sodium content. Recapping some regulatory requirements discussed in Section 4.1 above, the EPA sets NPDWR for contaminants that may cause adverse health effects, and these regulations are administered in Montana by the MDEQ. Additionally, the EPA sets National Secondary Drinking Water Standards (NSDWS), which set non-mandatory water quality standards for 15 contaminants with secondary maximum contaminant levels (SMCL) established as guidelines for public water systems to consider as they manage aesthetics of their drinking water for characteristics such as taste, color, and odor. However, these contaminants are not considered to present a risk to human health, and as such, presence and SMCL's of these contaminants are not regulated or enforced.

Well testing data acquired from 2005 showed a sodium concentration of 265 mg/L. This testing data also showed a total dissolved solids (TDS) concentration of 722 mg/L and a pH of 9.1. Sodium is not on the EPA's NPDWR or NSDWS list of drinking water contaminants and does not require monitoring or treatment. TDS and pH are on the EPA's NSDWS list with SMCL's of 500 mg/L and 6.5 - 8.5, respectively. While these concentrations for TDS and pH exceed the SMCL for these constituents, monitoring for them is voluntary and treatment is not required. New samples of the proposed source water were collected as part of this PER, on January 8th, 2025, and the results are provided in **Table 14** below.

TABLE 14: LAZY J COMMON HEADER WATER QUALITY

Date Received: 01/08/2025

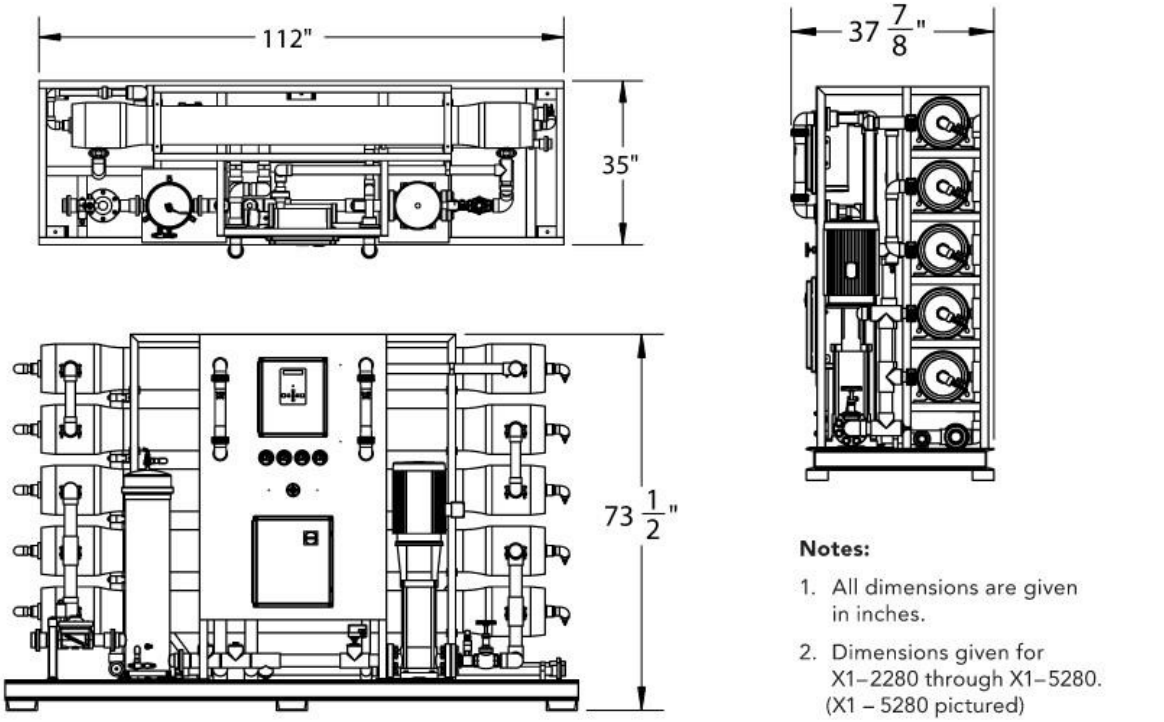
Analyte	Result	Units	RL	Qual	MCL	Method	Analysis Date/By
Inorganic							
Alkalinity, Total as CaCO3	293	mg/L	10.00			SM 2320 B	01/09/25 18:14/DJA
Calcium	1.79	mg/L	0.20			ASTM D6919-09	01/10/25 04:13/FAF
Chloride	1.19	mg/L	0.25		250	EPA 300.1	01/09/25 16:59/FAF
Conductivity	976	uS/cm	0.10			SM 2510 B	01/10/25 14:09/DJA
Corrosivity Index	0.104	mg/L	-10.00	CR 0		Calculation	01/23/25 10:39/DJA
Hardness	ND	mg/L	10.00	H-0		SM 2340 C	01/15/25 11:12/DJA
Iron, Total	0.03	mg/L	0.02			HACH 8008	01/09/25 17:27/HKO
Lithium	0.0900	mg/L	0.02			ASTM D6919-09	01/10/25 04:13/FAF
Magnesium	0.419	mg/L	0.05			ASTM D6919-09	01/10/25 04:13/FAF
pH	9.35	S.U.	0.10			SM 4500-H+B	01/10/25 14:09/DJA
Phosphate as P	ND	mg/L	0.05			EPA 300.1	01/09/25 16:59/FAF
Potassium	0.743	mg/L	0.35			ASTM D6919-09	01/10/25 04:13/FAF
Sodium Adsorption Ratio (SAR)	45.0		0.05			Calculation	01/23/25 10:41/DJA
Sodium	256	mg/L	0.20			ASTM D6919-09	01/10/25 04:13/FAF
Sulfate	154	mg/L	0.07		250	EPA 300.1	01/09/25 17:19/FAF
Total Dissolved Solids	632	mg/L	1.00			SM 2540 C	01/22/25 16:14/HKO
Metals							
Manganese	1.59	ug/L	0.50		300	EPA 200.8	01/10/25 00:11/DJA

These most recent results show pH, TDS, conductivity, sodium and SAR remain relatively high, which can cause undesirable effects; however, treatment is not required for these constituents. Since there is very little hardness, the high pH is unlikely to cause scaling. However, if disinfection becomes required, this pH level could necessitate the use of extra disinfectant dosing, likely chlorine, to maintain residual requirements throughout the system. Additionally, these constituents could cause unpleasant tastes. The system's owner and operations manager says they have not received complaints about the water's taste. Education and outreach about the higher sodium concentrations would be useful for those, if any, with health conditions requiring low-sodium diets.

While treatment of surface water sources typically occurs in large, open-air basins to coagulate, settle out and filter dissolved solids before being pumped into storage tanks and/or directly into the piping system, treatment of groundwater sources is done inline within the pressurized piping system. Current technology for reliable and effective removal of sodium and most all dissolved solids within groundwater systems is limited to reverse osmosis treatment operations. This treatment can be done for the entire system by using skid-mounted, pre-plumbed package systems, as depicted below, which are connected to above grade piping in the control building. Alternatively, this treatment can be accomplished, as desired by the end user/customer, by installing "point of use" (POU) units that can be installed under the sink. This POU treatment alternative could be used by any concerned customers.



FIGURE 23: REVERSE OSMOSIS SKID MOUNTED PACAKGE SYSTEM



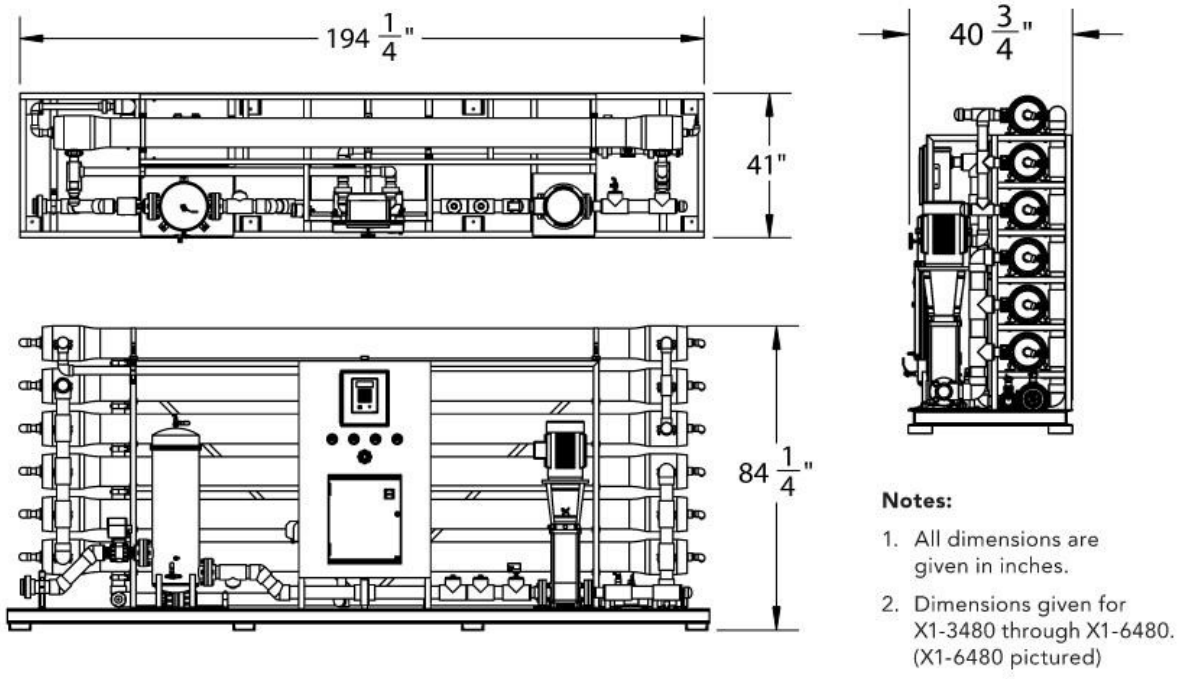


FIGURE 24: REVERSE OSMOSIS SKID LAYOUT

RO treatment cannot selectively target contaminants/constituents of concern, but rather it strips most all dissolved solids from the water, including minerals that are or can be beneficial for consumption or beneficial for the quality and stability of the water. The treated water recovered and discharged to the system from RO treatment operations, referred to as the permeate, usually has a decreased, more acidic pH and is usually very aggressive, as it will effectively try to pull ions and minerals from materials in contact with the water (pipes, tanks, etc.) to reach a more natural, equilibrium state, making it corrosive to any metal parts of the water system. Therefore, a central, whole system treatment would require treating a side stream with the permeate blended back with non-treated water, or it can include post-treatment processes to inject certain minerals or utilize mineral contact filters to remineralize the water to help raise the pH and reduce its corrosiveness. The reject water separated through the RO process, referred to as concentrate, has to be disposed of to a sanitary sewer system for treatment, as that water can contain harmful substances that can impact the environment and human health if released untreated. Additionally, with RO treatment, the typical recovery rate of permeate, or useable product water, is typically between 50% and 90% depending on the system's application, quality of feed water, and system design. In other words, for this range of recovery rates, for every 10 gallons produced of feed water, only 5 to 9 gallons of supply water would be produced. The RO system researched for this PER for a central supply treatment has a published recovery rate of 75%. When considering the limited availability of water rights, utilizing this type of RO treatment operation would effectively reduce the achievable service area of the District.

4.7.2 DESIGN CRITERIA

Treatment of groundwater sources is determined on a case-by-case basis, depending on the water quality testing results of the source water, to ensure compliance with ARM Title 17, Chapter 38, Subchapter 2. This State law establishes how Montana administers and complies with the Federal SDWA "to assure the safety of public water supplies with respect to bacteriological, chemical, and radiological quality and to promote the efficient operation of public water supply systems through control tests, laboratory analyses, operating records, and reports."

RO treatment is a membrane technology allowed by the MDEQ and is used with many small groundwater systems throughout the state. Section 4.3.8 of DEQ-1 establishes the considerations and design requirements for RO systems, and these designs are required to be reviewed and approved by MDEQ to ensure conformance with the approved system design.

4.7.3 MAP

Figure 25 shows additional improvements necessary to incorporate central RO treatment including additional building expansion to accommodate the skid equipment and process piping as well as the sanitary sewer extension for the reject waste stream created by RO treatment.

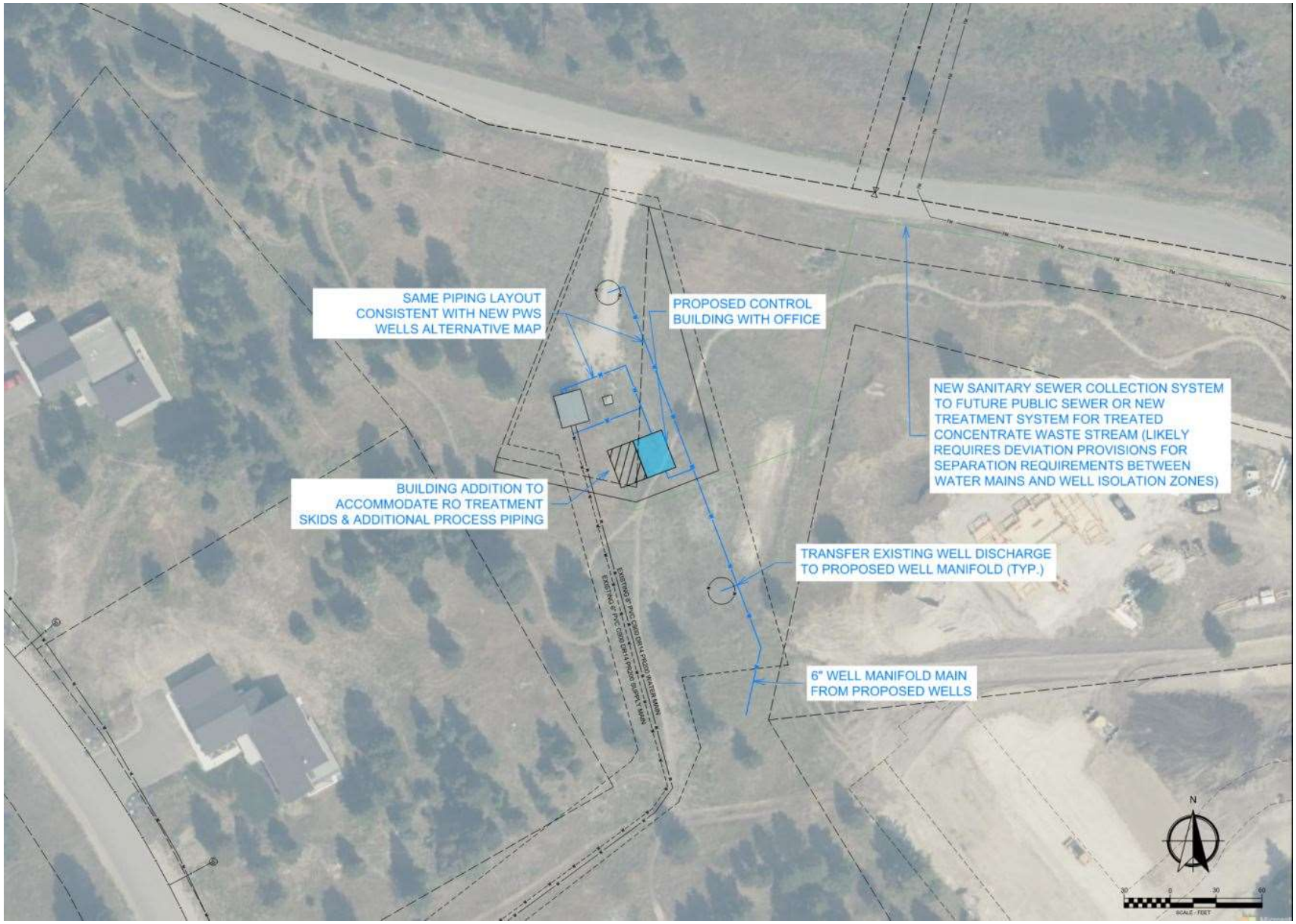


FIGURE 25: ADDITIONAL DESIGN IMPROVEMENTS FOR RO TREATMENT

4.7.4 ENVIRONMENTAL IMPACTS

RO source treatment infrastructure has a relatively small footprint and would be housed within the new well pump control building which would be located outside of any environmentally sensitive areas. However, utilizing RO treatment strips minerals, dissolved solids as well as many bacteria and viruses within the source water which creates a reject waste stream of water highly concentrated with those removed contaminants, appropriately termed concentrate. This concentrate then has to be treated. Current treatment options for RO concentrate are limited and can require multistep treatment trains for varying contaminants. DEQ-1 currently dictates acceptable methods to discharge to a municipal sewer system, to waste treatment facilities, or to evaporation ponds. These methods require agreed acceptance from the owner of such sewer systems or facilities, and evaporation ponds result in solid waste that would have to be disposed of at a landfill willing to accept it.

The GCCWSD is an emerging water and sewer district that is currently designing its sewer system with the intent to pump its wastewater to the BSCWSD WRRF for treatment; therefore, the BSCWSD would have to agree to accept this waste stream. The BSCWSD is currently working on a program to reduce the use of water softeners by its customers due to the relatively high concentrations of salts produced in the wastewater of those using softening systems, which is generally the primary contaminant driving this treatment alternative. In the absence of a public sewer collection and treatment system available for disposal, this concentrate waste stream would have to be treated onsite and then disposed through infiltration galleries, similar to septic system discharges, which could potentially add undesirable contaminants to wells downgradient of this system. Additionally, both the RO treatment and the required treatment of its concentrate generates a higher energy demand of the water system.

4.7.5 LAND REQUIREMENTS

Land requirements of the RO treatment infrastructure itself are minimal. The skid mounted equipment would be located within the new proposed well pump control building and plumbed into the building's above grade piping. The building's footprint would need to expand by approximately 456 square feet. Upon completion of the District's new sewer collection system, a sewer main could be extended to the location proposed for a new well field and control building within established road rights-of-way and easements for discharge of the RO waste stream. However, if this waste stream had to be treated onsite, due to the absence of a central sewer system or rejection by the BSCWSD to accept this waste stream, the drainfields and/or ponds required for treatment and disposal would require several acres of land, with the extents determined by the ultimate District service area and water demand.

4.7.6 POTENTIAL CONSTRUCTION PROBLEMS

There are no real construction problems associated with the RO treatment infrastructure itself. However, disposal of its concentrate waste stream does pose potential construction problems. If provided a central public sewer collection system, a gravity sewer main would have to be extended approximately 0.8 miles (4,300 feet) solely for collection of this waste. If no public sewer system is provided and this waste stream has to be treated onsite, several acres of land would have to be obtained to construct drainfields and/or lined ponds in "hilly" terrain, likely requiring mass grading within open and/or park spaces otherwise set aside for the benefit of area residents.

4.7.7 SUSTAINABILITY CONSIDERATIONS

Incorporating central RO treatment into a new District public water system wouldn't fit with the general intent of sustainable practices. Treatment would not be required from a regulatory standpoint, as the proposed source aquifer isn't currently treated, and the water does not exceed any contaminant concentrations regulated for monitoring and treatment by the state and the EPA. RO treatment would create more energy demand by the system, while reducing the efficiency of water production and create a new product that requires subsequent treatment.

Water and Energy Efficiency
As discussed above, a central RO system for the District's treatment of groundwater would, at best, produce 75% of consumable water for its customers, while wasting the remaining 25% to be further treated. This would effectively reduce water efficiency and conservation of the proposed central production system as well as waste a quarter of the water rights volume that would otherwise be available for beneficial use. Utilizing RO treatment would also increase energy demand associated operation and maintenance of the RO system as well as for treating the resulting concentrate waste stream, likely at least doubling the energy requirements for the production system versus not treating.

Green Infrastructure
A central RO treatment system would add nominal new impermeable groundcover as well as minimal, if any, impacts to existing terrain or historical drainage patterns, so little to no impact to stormwater would be anticipated for the RO treatment infrastructure itself. However, again if its concentrate waste stream were to require onsite treatment, ground clearing and mass grading required to construct drainfields and/or treatment ponds would require mitigation efforts to manage runoff volumes, flowrates, and routes of concentrated flows associated with clearing and altering the local landscape.

Other
As alluded to at the beginning of this section, central RO treatment wouldn't necessarily align with the intent of sustainable practices. RO treatment inherently produces an additional waste stream that requires treatment, reduces the useable water produced, and requires much more energy than not treating. Though the RO treatment is not overly complex for an operator, it does increase operation and maintenance attention by the operator to ensure optimal conditions are achieved. The membranes would generally require backwashing and cleaning in place quarterly, and if properly maintained, the membranes would have to be replaced every 5 – 7 years. Discarded membranes are usually made from some variation of plastic(s) which can be recycled; however, if these membranes are discarded as trash, they'd add plastic to the landfill and take 20 – 30 years or longer to decompose.

RO treatment could be beneficial to those potential customers with health conditions requiring low-sodium diets. Full-system treatment is typically more effective than point-of-use treatment due to professional operation and maintenance. Though disinfection would not be required with the current conditions of the proposed source aquifer, implementing RO treatment could trigger the additional requirement for disinfection, likely using chlorine, certainly if post-treatment conditioning of the source water was introduced to remineralize the water. Having a residual disinfectant such as chlorine in the storage and distribution system would provide protection against potential microbial contamination, though again, the source water quality does not currently require it.

4.7.8 COST ESTIMATES
Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualize OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I**.

TABLE 15: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
CENTRAL REVERSE OSMOSIS (RO) TREATMENT	$1,156,880.00	$612,900.00	$21,700.00	**$2,223,610.00**
HOUSEHOLD POINT OF USE (POU) RO TREATMENT (Based on Providing to +/- 116 Existing Residences)	$348,000.00	$0.00	$0.00	**$348,000.00**
NO TREATMENT	$0.00	$0.00	$0.00	**$0.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

4.8 STORAGE ALTERNATIVE: HYDROPNEUMATIC TANKS

4.8.1 DESCRIPTION

Hydropneumatic storage tanks can be used for small water systems as a means to pressurize the distribution system. These tanks are filled by production pumps/wells and store the water under pressure by injecting pressurized air. These tanks are typically small volume tanks, relative to daily water demand requirements, and generally serve to maintain system pressure during off-peak hours when little demand is occurring. These systems usually rely on constantly running pumps to maintain system pressures during hours when some variable constant system demand is occurring.

Hydropneumatic tanks are much less expensive than ground storage tanks and elevated tanks, primarily because they are drastically smaller. However, there is a trade off with this cost and the size and cost of pumping facilities. When hydropneumatic storage tanks are used as the only storage facility, DEQ requires the total developed groundwater capacity to equal or exceed peak instantaneous demand. DEQ also limits the use of hydropneumatic storage tanks to systems with less than 50 living units. Use of these tanks for a central GCCWSD system would require many wells, pumps, and tanks spread out over the entire service area with each well and tank isolated to small discreet distribution systems. While this is possible, the operations and maintenance of such a system would be somewhat complex, all wells would require peak demand pumping rates, source water quality would be highly variable, and control of that quality could potentially impose limitations on adjacent land uses due to well isolation zones. A goal of a new central GCCWSD system is also to provide fire flows for the Planning Area, and DEQ prohibits use of hydropneumatic tanks as a means of system storage for systems providing fire flows.

This tank alternative cannot meet the needs of the GCCWSD's proposed scale of centralization and fire protection. ***Therefore, this alternative is dismissed and will not be evaluated further.***

4.9 STORAGE ALTERNATIVE: ELEVATED STORAGE TANK

4.9.1 DESCRIPTION

Another storage alternative is the use of elevated storage tank(s) which are constructed to support the storage vessels high above grade at an elevation that will utilize the natural gravitational force of the stored water to pressurize the water distribution system. For consideration, one pound per square inch (psi) of water pressure is achieved for every 2.31 feet of water height. Without considering residual pressure to overcome frictional losses, as well as varying topographical elevations, as water flows throughout a water system's piping network, to maintain a pressure range between 60 psi and 80 psi, an elevated tank would have to be constructed at elevations between 139 feet and 185 feet above grade. For areas where significant topographic relief is not available, as in flatter geographical areas or larger valleys, an elevated reservoir/tank is advantageous in providing required large storage volumes as high as 150 to 200+ feet to pressurize the water system without the aid of large constant run pumps.

In order to elevate these large reservoir tanks and support the extreme load of the water, significant structural towers and foundations are required, design to support the weight, of course, but also to withstand area wind loads, seismic conditions, and soil stability. For this reason, elevated storage tanks are significantly more expensive than ground-level storage tanks of the same capacity and are generally not used when nearby high areas, such as hills or mountains, exist to support ground-level tanks at appropriate elevations to meet system pressures.

Elevated reservoirs are constructed of steel and coated to inhibit corrosion. As such, these reservoirs must be inspected and painted routinely to ensure their long-term operation. Additionally, regular inspections include analyzing structural integrity of the structure itself and the foundation. Given the height of elevated tanks and more sophisticated structure, regular inspections as well as tank maintenance require specialty contractors and technicians to perform the work. Also, the height of the tank limits accessibility for typical utility staff to perform any "in-house" routine inspections. Therefore, inspections and maintenance activities associated with elevated tanks can have significantly high costs, due to the risk and specialization, relative to other storage facilities.

There is significant topographic relief in the planning area, with potential areas already identified that are currently used for ground-level storage tanks with room for additional tanks, if determined necessary. Elevations of these existing tanks are such that they can provide sufficient system pressures throughout the Planning Area, as analyzed in the following distribution alternatives. Therefore, elevated tanks would be unnecessarily complicated, potentially dangerous and certainly with more risks, and would be more expensive to build and maintain. Additionally, they would be more visible than other alternatives and likely not accepted by the public for aesthetic reasons. ***Therefore, elevated storage tanks are not evaluated further for system storage solutions.***

4.10 STORAGE ALTERNATIVE: EXISTING GROUND-LEVEL STORAGE TANK(S)

4.10.1 DESCRIPTION

Another option to provide storage capacity meeting system demand requirements is to utilize tanks constructed directly on the ground on prepared foundation slabs, as opposed to supporting them high in the air like the previous alternative. Ground tanks can be pumped from to pressurize water systems with high-capacity pumps, as opposed to elevated tanks, when available grade elevations are not sufficient to provide gravity pressure from the tank elevation. For the District's Planning Area, there are sufficiently high elevations on the mountain front along the western boundary to provide more than adequate gravity pressure to the entire Planning Area.

As discussed in the previous groundwater source alternatives, there are two existing relatively large private PWS's within the District Planning Area serving the Ramshorn and Lazy J developments. Both of these systems utilize their own high-capacity ground-level tank to provide storage capacity and gravity pressure for their individual water systems. The tanks of both systems are bolted steel tanks with applied protective coatings. The Lazy J tank has a capacity of 530,000 gallons with a surveyed bottom of tank elevation of 6359.2, while the Ramshorn tank has a capacity of 340,000 gallons with a surveyed bottom of tank elevation of 6201.7, which is 157.5 (68.2 psi) below the Lazy J tank. **Figure 28** depicts ground contour ranges that equate to static pressure zones between 60 psi and 80 psi for each existing tank elevation. As illustrated in this figure, the elevation of the existing Lazy J storage tank would provide more than sufficient pressure throughout the GCCWSD Planning Area and would likely require strategic location of pressure reducing valves to avoid excessive pressures, where static pressures exceed 100 psi. The elevation of the existing Ramshorn tank could potentially provide adequate system pressures; however, the southern quarter of the Planning Area will likely approach the lower limits of minimum operating pressure allowance (35 psi). Alternatives for the distribution system(s) are analyzed in Section 4.12 and 4.13, which includes modeling existing tank elevations and system demands to determine if the existing Ramshorn tank could be utilized to adequately serve the southern extents of the Planning Area.

According to the EPA, storage tanks can generally last 30-60 years, but achievable lifespans are heavily dependent on the tank's type and inspection and maintenance operations. Manufacturers of bolted steel tanks estimate a lifespan of up to 40 years when properly maintained. Existing information indicates that the tanks are in good condition and have lots of useful life left despite being at the early end of this lifefspan range. However, this was not verified with a physical inspection as part of this PER. Any tank proposed for reuse should be evaluated to determine any improvements needed and expected remaining useful life before design progresses.

According to the system's 2020 sanitary survey, Lazy J's storage tank is located southwest of the pump house approximately one mile via Colters Run Loop. This facility consists of a Superior Tank Company bolted steel, coated, on-grade tank. Plan drawings show a 6-inch bottom inlet and an 8-inch bottom outlet. There is an 8-inch overflow. The overflow pipe is 1 pipe diameter (8-inchs) above grade and screened. There is no splash pad; the area beneath overflow is gravel and sloped minimally away from the tank. The most recent Sanitary Survey for the Lazy J system recommended that a splash pad or channel be added below the overflow outlet to prevent erosion. A properly constructed channel could also allow for the required 3 pipe diameters (24-inchs) above the ground level to be achieved. At least one broken weld on a handrail was observed at the last sanitary survey and may still need repair.

According to the 2024 sanitary survey, Ramshorn's storage tank is located uphill of the homes, about 980 ft west of the pump control building. This facility consists of a single on-grade, bolted steel, 340,000-gallon tank. It was reported to have separate fill and distribution pipes. The overflow termination was reported to be on private property below the tank so was not observed the day of inspection. The vent riser has six bolt holes filled with sealant in 2014. Two of those holes were not filled leaving openings into the tank – this has since been fixed. The tank vent was screened. The telemetry wiring conduit at the base of the tank was broken leaving the critical wiring exposed for potential damage. The tank hatch did not have any seal but was padlocked. The caged ladder did have a locked anti-climb gate.

AWWA recommends inspecting and cleaning this type of tank every 3-5 years.

Table 16: Existing Storage Tanks Proposed for Reuse

NAME	SERVICE AREA	PWS ID	STORAGE CAPACITY (GAL)	STORAGE TYPE	TANK AGE	BASE ELEVATION
LAZY J WATER SYSTEM	6&7	MT0004432	530,000	Bolted, coated steel storage tank at grade	~2005	6359.20'
RAMSHORN	9	MT0004035	340,000	Bolted, coated steel storage tank at grade	~2003	6201.70'



FIGURE 26: LAZY J'S EXISTING STORAGE TANK (PHOTO CREDIT: KIRK YODER, DEQ)

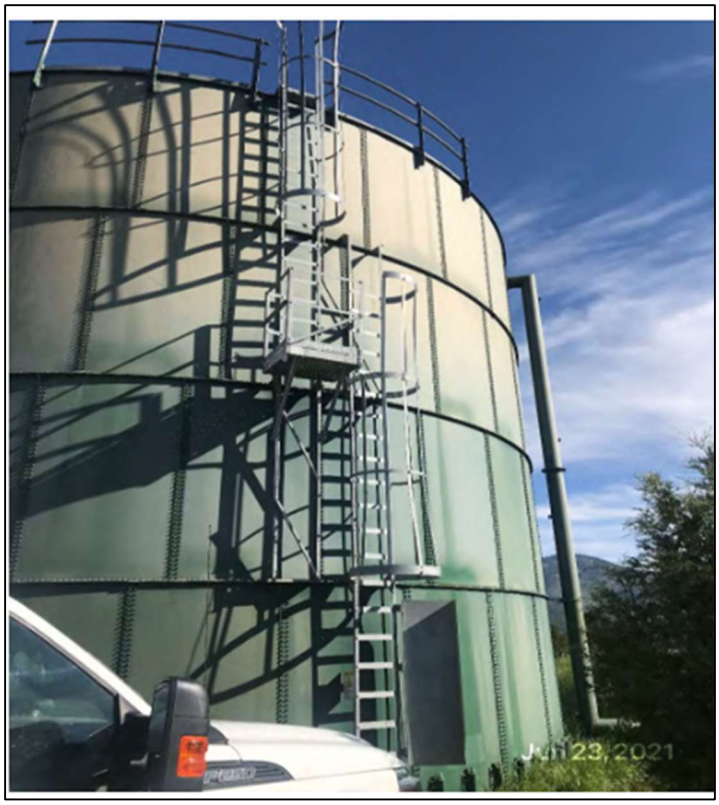


FIGURE 27: RAMSHORN'S EXISTING STORAGE TANK (PHOTO CREDIT: JODI STONER GRANBERG, DEQ)

4.10.2 DESIGN CRITERIA

Finished water storage tanks must incorporate materials and designs to provide structure stability and durability as well as to protect the quality of the stored water, while also providing adequate means for inspections, draining and maintenance operations. Tanks must meet the requirements of MDEQ Circular 1, Section 7 and must follow current AWWA Standards. The existing PWS tanks have met and remain in compliance with these standards, so design criteria presented in this PER are focused on capacity requirements and ability to adequately pressurize the system.

Tank sizing is more dependent on balancing an owner's risk tolerance for emergency reserves with adequate water turnover to avoid water quality issues associated with water age and stagnation as well as freezing. Emergency reserves can include considerations such as catastrophic main breaks, mechanical breakdowns affecting supply, tank shutdown for service/maintenance, etc. Therefore, there's no singular consensus method for sizing a water system's tank capacity; however, MDEQ-1 dictates that the minimum allowable storage must be equal to the average day demand plus fire flow demand volumes. This minimum capacity allowance is not adequate when a system's source capacity (wells) cannot meet or exceed peak system demands, which is the case for demand estimates for a new District system. Therefore, the storage capacity for this system must be sufficient to supplement source capacity to satisfy all system demands occurring on the maximum day plus fire flow demand.

Typically, storage tanks are sized to contain individually calculated capacities classified as operating storage, emergency/standby storage, equalization storage, fire storage, and dead storage. Operating storage is generally the volume provided between pump on and off levels, supplying water to the system when pumps are off, and this storage generally serves to minimize the number of pump starts during normal operations. Emergency/standby storage is used to provide water to the system during

other unusual or emergency conditions and for this system, covers one day's ADD volume. Equalizing storage is used when source pump capacity is less than peak system demands (PID) to provide buffer during peak demand hours. Fire storage is the required volume to meet requirements of local codes and/or FAHJ. For the new District system, this must be the volume to supply 1,500 gpm for 2 hours, or 180,000 gallons. Dead storage is the bottom tank volume that is maintained and not drawn out to limit the low-pressure elevation as well as to protect the tank slab and foundation from freezing. **Table 17** below tabulates these supply volumes for the separate vs. combined service area scenarios explored in the distribution system alternatives for comparison to volumes of the existing tanks. A minimum storage volume (per DEQ-2) is presented as well as tank volumes based on a proposed diameter of 65.36 ft.

TABLE 17: MINIMUM STORAGE CAPACITIES AT FULL BUILD OUT

	TANK SIZING	NORTH DISTRICT (SA 2, 4-8)	SOUTH DISTRICT (SA 9-13)	ENTIRE GCCWSD PLANNING AREA
Minimum Storage Volume	Emergency/Standby - ADD Volume (Gal)	321,108	44,257	365,365
	Fire Storage - 1500 gpm for 2 hours (Gal)	180,000	180,000	180,000
Potential Tank Configuration	Operating Storage (Gal)	25,100	5,000	25,100
	Equalization Storage (Gal)	35,274	5,000	57,403
	Dead Storage (Gal)	112,950	46,000	112,950
	Top of Tank - Freeboard (Gal)	25,100	10,200	25,100
	Total Tank Volume (Gal)	**699,532**	**290,457**	**765,918**
	Tank Turnover Based on System ADD (Days)	**2.18**	**6.56**	**2.10**

TABLE 18: MINIMUM STORAGE CAPACITIES TO SERVE EXISTING DEMANDS

	TANK SIZING	NORTH DISTRICT (SA 2, 4-8)	SOUTH DISTRICT (SA 9-13)	ENTIRE GCCWSD PLANNING AREA
Minimum Storage Volume	Emergency/Standby - ADD Volume (Gal)	52,222	31,275	83,497
	Fire Storage - 1500 gpm for 2 hours (Gal)	180000	180000	180000
Potential Tank Configuration	Operating Storage (Gal)	-	0	0
	Equalization Storage (Gal)	-	0	0
	Dead Storage (Gal)	112,950.00	46,000.00	112,950.00
	Top of Tank - Freeboard (Gal)	25,100.00	10,200.00	25,100.00
	Total Tank Volume (Gal)	**370,272**	**267,475**	**401,547**
	Tank Turnover Based on System ADD (Days)	7.09	8.55	4.81

Note that potential pump capacity exceeds PID and MDD of current estimated demands so additional operating and equalization storage would not be required to operate under current conditions.

Other critical design criteria driving tank size and proper operation are defined below.

- The maximum variation between high and low levels in storage structures providing pressure to a distribution system should not exceed 30 feet.
- The minimum working pressure in the distribution system should be 35 psi and the normal working pressure should be approximately 60 to 80 psi).
- When static pressures exceed 100 psi, pressure reducing devices must be provided on mains or as part of the meter setting on individual service lines in the distribution system.
- Storage structures that provide pressure directly to the distribution system must be designed so they can be isolated from the distribution system and drained for cleaning or maintenance without necessitating loss of pressure in the distribution system. The drain must discharge to the ground surface with no direct connection to a sewer or storm drain.
- Adequate controls must be provided to maintain levels in distribution system storage structures. Level indicating devices should be provided at a central location.
- Pumps should be controlled from tank levels with the signal transmitted by telemetering equipment when any appreciable head loss occurs in the distribution system between the source and the storage structure.
- Altitude valves or equivalent controls may be required for second and subsequent structures on the system.
- Overflow and low-level warnings or alarms should be located at places in the community where they will be under responsible surveillance 24 hours a day.
- Excessive storage capacity should be avoided to prevent water quality deterioration and potential freezing problems. Though this “excessive” qualifier is somewhat subjective and not defined, the most widely used design texts recommend water turnover rates occurring every 2 to 3 days with a maximum of 5 days for complete turnover. **Tables 17 and 18** above indicate that this will need to be addressed in an initial system using separate north and south storage and distribution systems due to combined operational storage requirements vs. current demands. Shorter turnover durations are more beneficial for water quality maintenance and freeze mitigation.

4.10.3 MAP

Figure 28 illustrates the locations of the existing Lazy J and Ramshorn storage tanks as well as delineated zones derived from their respective elevations that meet static system pressure for normal operating conditions.

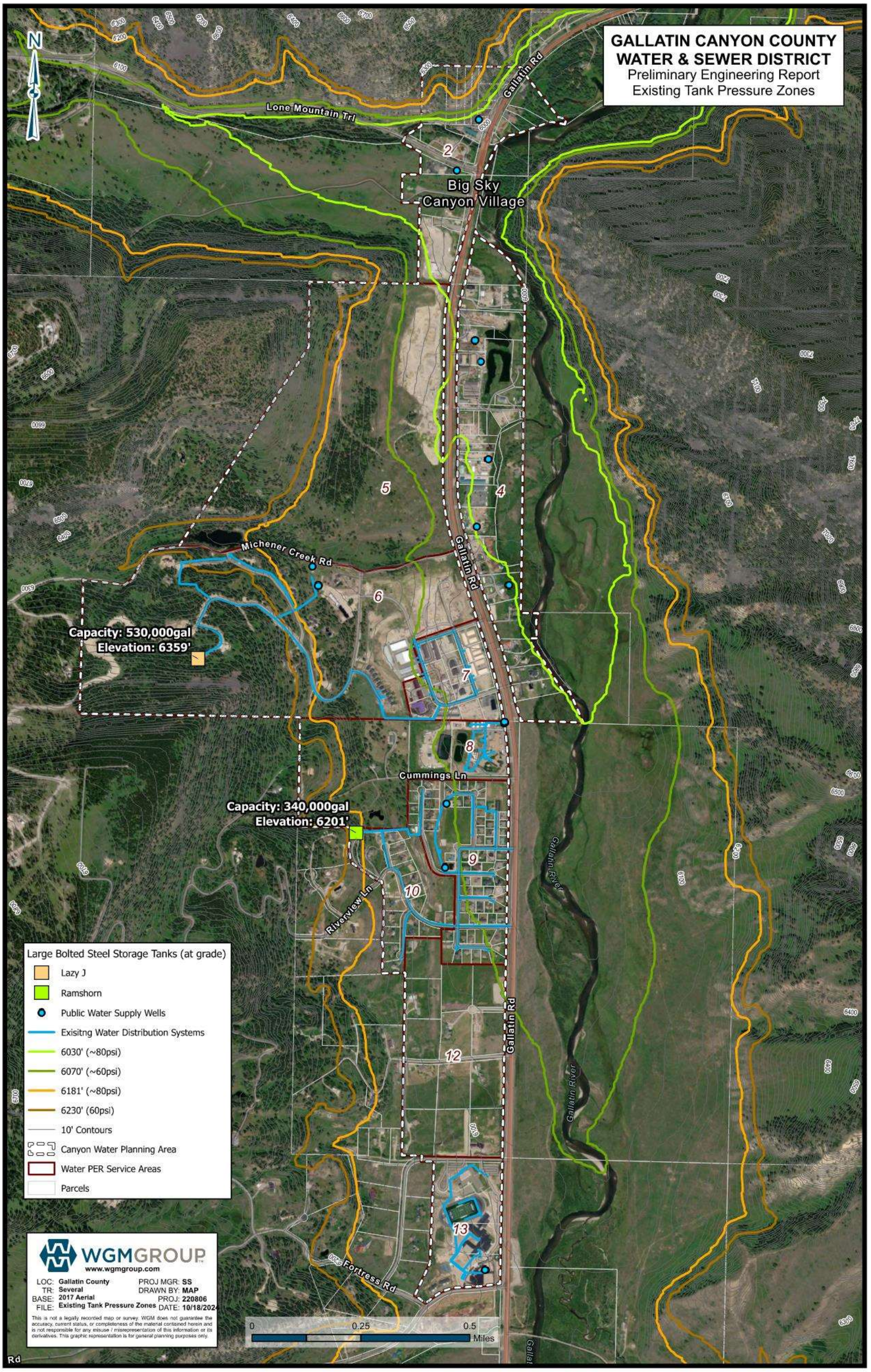


FIGURE 28: EXISTING TANK AND PRESSURE ZONES

4.10.4 ENVIRONMENTAL IMPACTS
Use of existing operating infrastructure will minimize environmental impacts, as the localized areas containing the infrastructure are already developed and maintained.

4.10.5 LAND REQUIREMENTS
Existing PWS wells proposed for use for this PER's new central water system are located on existing lots owned by Ramshorn's Owners Association (OA) and the Lazy J Utility District Utilities Association. Specific to using existing storage tanks with this alternative, which are also located on platted "open space" lots owned by the respective OA's, this will at least require transfer of ownership of the infrastructure plus occupancy and access easements and may require creation of utility lots divided off from current parcels to encompass the tank structures.

4.10.6 POTENTIAL CONSTRUCTION PROBLEMS
The main hurdle for this alternative would be securing ownership of this infrastructure as well as change of grantee for occupancy and access easements from the current infrastructure and affected property owners. Preliminary conversations and expressed interest support the feasibility of these acquisitions.

While the combined volume of the existing Lazy J and Ramshorn tanks would be adequate to meet design volume criteria for the District, there is no good way to operate these tanks in parallel operation to serve a single combined District system due to their significant elevation differences. Therefore, utilizing the existing Ramshorn tank would require splitting a District system into two separate systems (North and South systems).

Existing tanks proposed for reuse will be inspected during project design to determine appropriate maintenance and/or restoration work that should be completed prior to commissioning for use in the new District system. Based on the most recent sanitary survey performed by DEQ, no significant problems are anticipated with repurposing the existing Lazy J storage tank for use with the new District system.

4.10.7 SUSTAINABILITY CONSIDERATIONS
Water and Energy Efficiency
The existing Lazy J tank is located at an elevation suitable to pressurize the entire proposed District system via gravity, mitigating excessive energy demands associated with constant pumped pressure systems.

Green Infrastructure
There will be minimal new impermeable groundcover associated with this alternative as well as minimal, if any, impacts to existing terrain or historical drainage patterns, so little to no impact to stormwater is expected.

Other
Providing proper effective storage will enhance water supply resiliency and provide provision for fire protection to the entire service area. Using storage to supplement source (pumped) capacity lessens groundwater pumped withdrawal rates and pumping durations, which in turn lessens local and regional impacts to the source aquifer and its hydrogeology. Also, consolidating to a single Utility District owner will enhance sustainability and resiliency of the water source and system infrastructure. It will provide more consistent operation and maintenance for the Planning Area as a whole. Additionally, economies of scale associated with an expanded user base will play into long term maintenance, infrastructure upgrades and replacements of aging infrastructure necessary to maintain compliance with permits as governing regulations become increasingly more stringent and financially cumbersome for smaller

systems. County Water and Sewer Districts are eligible for state and federal funding programs as well as planning grants that some of the existing PWS's can't access.

4.10.8 COST ESTIMATES

Both existing ground-level storage tanks are approximately halfway through their design life; however, both tanks are still serviceable for the majority, if not all, of this PER's planning period. Therefore, cost estimates for continued use of these tanks focus on installing tank mixers which will mitigate water degradation associated with stored water aging as well as water freezing.

Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualize OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I**.

TABLE 19: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
EXISTING LAZY J BOLTED STEEL GROUND TANK	$54,000.00	$28,000.00	$31,475.00	**$82,000.00**
EXISTING LAZY J BOLTED STEEL GROUND TANK	$54,000.00	$28,000.00	$23,100.00	**$82,000.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

4.11 STORAGE ALTERNATIVE: NEW GROUND-LEVEL STORAGE TANK(S)

4.11.1 DESCRIPTION

Given the storage criteria and estimated design volumes in the section above, there is potential to utilize one or both existing tanks, at least in the short term, depending on the use of a single combined distribution system or two separate North and South systems. However, additional volume will be required for the combined system and North system alternatives as future development occurs within the Planning Area. Additionally, due to design criteria requiring the ability to isolate storage structures that pressurize distribution systems to be drained for maintenance without pressure disruptions to the system, this system will require parallel tanks to satisfy this requirement. Therefore, at least one new tank will be required. Given the alternative anaylsis above for storage structures, any new tank would consist of a ground level tank.

The vast majority of water distribution storage tanks today are constructed of steel or reinforced concrete. Within these two categories of construction, a myriad of choices are available to meet the storage requirements of a water system. The structure may take a variety of shapes and sizes depending on the system needs and the site of construction, but for this PER and cost estimating new tanks are assumed to have similar diameter dimensions as the existing tanks.

Steel ground-level tanks are either bolted together or welded and are erected on a pre-prepared concrete foundation. All steel structures are protected from corrosion by application of protective coatings. Bolted steel tanks usually consist of fabricated panels with factory applied coatings typically consisting of powder coating or fluidized glass coatings, while welded tanks have coatings applied at the site, due to erection and welding requirements, and those coatings typically consist of sprayed epoxy paints.

Concrete reservoirs can be cast-in-place using various methods or constructed of precast panels, which are generally cast at the site and erected, fastened and sealed in place. Concrete tanks do not require special coating when used for potable water storage, reducing long term maintenance costs associated with patching and full re-application of coatings.

Tank manufacturers for bolted steel, welded steel, and concrete tanks were consulted to obtain construction estimates for these three tank types with a target total volume of 766,000 gallons, which is the estimated volume for one combined District system. Though DEQ does not require redundant tanks, a strategy to meet the design criteria to be able to isolate the system's tank from the distribution system to be drained for cleaning or maintenance without necessitating loss of pressure in the distribution system must be considered. In order to meet this requirement, the strategy for this PER level design estimates that two new 655,000-gallon tanks could be utilized, for projected system build out capacity, by operating the tanks at approximately 2/3 capacity during normal operations and maxing out the useful volume of a single tank during such time as a tank requires isolation for draining and maintenance. This would be done by requiring draining and maintenance to occur during warmer months so the dead storage can be minimized along with reduced operational storage and top of tank freeboard volumes. Tank cost estimates from manufacturers were broken out to a cost per tank volume for consideration of final design sizing fluctuations to aid in alternative selection. Though these per volume unit costs do not provide a direct linear interpolation across all sizing variations, they do provide a "rule of thumb" scale for the different tank options for future planning purposes and for consideration of smaller tanks to serve a separate South District system.

4.11.2 DESIGN CRITERIA

The design criteria for this alternative are the same as the previous alternative for use of existing tanks. Tank plans and specifications require review and approval by MDEQ to ensure compliance with all applicable design and material standards, so design criteria presented in this PER are focused on capacity requirements and ability to adequately pressurize the system. For this PER, new tanks would be sized as described above and would be located in the same general vicinity as the existing Lazy J tank.

4.11.3 MAP

Figure 29 depicts the location of a new proposed tank to be placed in the same general vicinity and elevation as the existing Lazy J tank, and **Figure 30** shows a schematic concept for connection between tanks for parallel operation.

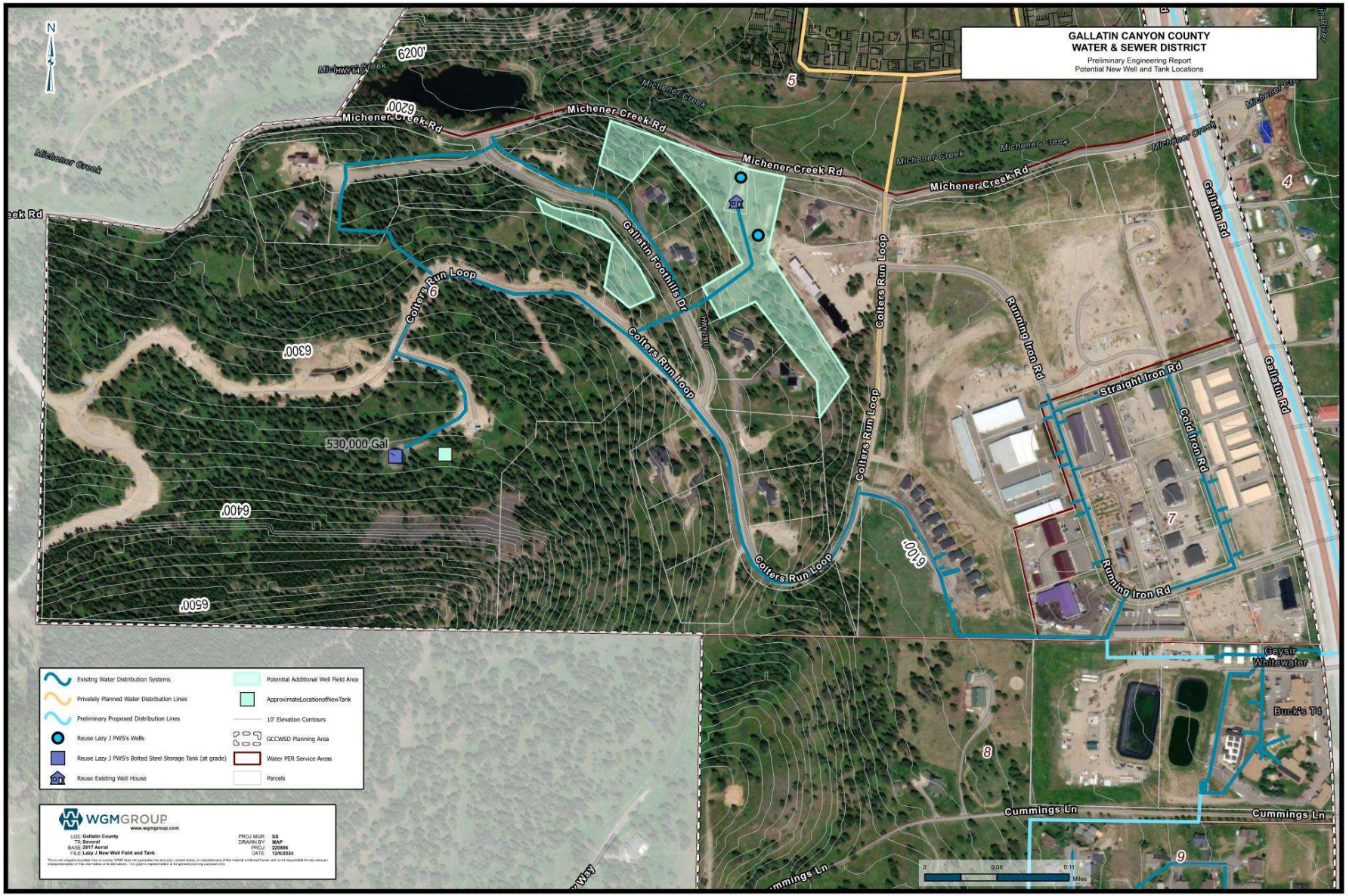


FIGURE 29: NEW GROUND STORAGE TANK LOCATION



FIGURE 30: PARALLEL ARRANGEMENT OF GROUND STORAGE TANKS

4.11.4 ENVIRONMENTAL IMPACTS

A new tank(s) constructed in the same vicinity as the existing Lazy J tank would utilize land area already lightly developed for the existing tanks which has an existing, maintained gravel access road. A new tank would require some tree removal and grading to construct a level concrete foundation. Additionally, the existing 6" transmission supply main and the 8" discharge/distribution main are sufficient for use with the new District system. Overall, construction would consist of a relatively small footprint (+/- 0.25 acres) to construct the tank as well as to complete required short runs of water main extensions, with a control valve box, to connect the two tanks allowing parallel operation. This would be less land disturbance than that needed to construct a new home, which is the other ongoing land use in the immediate area. Temporary and permanent land disturbance associated with construction would be graded to maintain historic drainage patterns and be revegetated with native grasses to return to pre-construction conditions.

All construction and permanent structures would be located well outside of any area floodplains and wetlands. Other important land resources, potential endangered species, historical and archaeological properties are assessed in the Uniform Environmental Checklist provided in **Appendix C,** but no known such resources exist in the immediate vicinity of the existing Lazy J tank.

Proper construction measures would be taken to minimize the temporary impacts, such as noise, dust, and control of erosion and sediment runoff associated with construction activities.

4.11.5 LAND REQUIREMENTS

Occupancy and access easements would be required for any infrastructure not already provided with easement. Creation of utility lots will be required for the land occupied by the tanks and valve vaults.

4.11.6 POTENTIAL CONSTRUCTION PROBLEMS

The consistent theme of likely largest project hurdles is securing the land to be occupied by system structures, transferring ownership of existing infrastructure to be repurposed for the GCCWSD system as well as acquiring or transferring easement entitlements for occupancy, access and maintenance. Since a new tank would be located in the same area as an existing tank, there are no anticipated problems with underlying soil structural support, and an adequate access road exists. Heavy equipment will be required for earthwork associated with both excavation and grading to remove and move rock expected to be encountered, but this is typical for most construction in this region.

There may be some aesthetic requirements necessitating painting the tank to blend into the landscape and not be an "eyesore"; therefore, it is assumed a new tank would be painted green to match the existing tank. No other significant construction problems are anticipated.

4.11.7 SUSTAINABILITY CONSIDERATIONS

Water and Energy Efficiency

The proposed tank site would provide sufficient gravity pressure for the entire proposed system, reducing required pumping rates, pump horsepower and duration of pumping, which reduces energy demand and strain on the supply aquifer. Proposed tank sizing shows system water turnover occurring at just over two days based on ADD estimates, which is on the lower end of recommended turnover rates, which is more favorable for maintaining water quality and reducing freezing potential.

Green Infrastructure

There will be minimal new impermeable groundcover associated with this alternative, as well as minimal impacts to existing terrain or historical drainage patterns, so little impact to stormwater management is expected.

Other
This large storage will provide improved water supply resiliency and fire protection to the entire Planning Area. Also, consolidating to a single Utility District owner will enhance sustainability and resiliency of the water source and system infrastructure, as it will provide more consistent operation and maintenance for the Planning Area as a whole, and economies of scale associated with an expanded user base will play into long term maintenance, infrastructure upgrades and replacements of aging infrastructure necessary to maintain compliance with permits as governing regulations become increasingly more stringent and financially cumbersome for smaller systems. Utility Districts are eligible for state and federal funding programs as well as planning grants.

4.11.8 COST ESTIMATES

Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualize OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I.**

TABLE 20: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
NEW BOLTED STEEL GROUND TANK	$1,238,590.00	$934,300.00	$21,225.00	**$2,172,890.00**
NEW WELDED STEEL GROUND TANK	$1,820,590.00	$1,051,300.00	$51,189.00	**$2,871,890.00**
NEW PRESTRESSED CONCRETE GROUND TANK	$2,023,590.00	$1,091,300.00	$32,380.00	**$3,114,890.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

4.12 SYSTEM DISTRIBUTION ALTERNATIVE - SINGLE COMBINED SYSTEM

4.12.1 DESCRIPTION

The water distribution network consists of the system of pipes, isolation and control valves, booster pumps if necessary, fire hydrants, and meters that distribute water from the system's source and/or storage infrastructure to the system's customers. As discussed in above alternatives, there are two existing relatively large PWS's within the District Planning Area, Lazy J and Ramshorn. Along with their production wells and ground storage tanks, these two developments have their own distribution networks, each meeting DEQ design criteria for public water systems. Additionally, the Buck's T-4 development sits directly between and adjacent to these two systems and is itself a public water system meeting DEQ design criteria. These three PWS's are generally located in the center of the Planning Area, so their existing distribution networks can be expanded out, extending north and south to serve the northern and southern extents of the Planning Area and everything in between. The existing public water distribution systems within the Planning Area are included again below in **Figure 31** for reference.

Given the infrastructure in place with these existing systems, there are two strategic alternatives to acquire and repurpose these systems to provide a central District owned and operated water system to serve the entire Planning Area. This alternative explores connecting the Lazy J and Ramshorn systems together, through Buck's T-4 and expanding out as a single combined system to the extents of the Planning Area. This single combined distribution system scenario is depicted conceptually in the following **Figure 32**.

AE2S was contracted to model the distribution system alternatives to assess system pressures and available fire flows given the estimated water demands developed in Section 4.1 of this PER in conjunction with existing public system distribution networks and proposed network extension concepts. A Technical Memorandum (TM) was prepared by AE2S to report results of the distribution alternatives. This TM is included in **Appendix J** and shows a single combined distribution system operating from gravity pressure applied by the Lazy J ground-level tank can operate in conformance with design criteria for system flows and pressures. Given the elevation of the Lazy J tank relative to the extents of the Planning Area, excessive static pressures well over 100 psi would be experienced throughout much of the combined system without the use of a strategically located pressure reducing valve (PRV). The TM includes modeling exhibits presenting pipe sizing and looping needs necessary to provide required flows and pressures as well as the proper location of a PRV to limit excessive pressures.

4.12.2 DESIGN CRITERIA

Water transmission and distribution systems must meet the requirements of MDEQ Circular 1, Section 8 and must conform to the latest standards issued by the AWWA and ANSI/NSF, where such standards exist. This Circular Section states the following general system design requirements. "Transmission mains and water distribution systems must be designed to maintain treated water quality. Special consideration should be given to distribution main sizing, providing for design of multidirectional flow, adequate valving for distribution system control, and provisions for adequate flushing. Systems should be designed to maximize turnover and to minimize residence times while delivering acceptable pressures and flows."

This Circular Section expands on system design criteria governing pipe and joint materials, system pressures and flows, limitations of dead-end mains, spacing of valves and hydrants, provision for air

relief, installation of mains, separation and protection from sources of contamination such as proximity to sewer and storm systems, surface waters, and cross connections. The Circular also requires each service connection to be individually metered, which promotes water conservation, allows for improved leak detection, and provides an accurate method of billing based on usage by each connected service.

Most of these design criteria are incorporated with more detailed design progression, beyond the scope of typical PER's, and with project specifications governing the work, materials, and conditions of project construction. The critical design criteria for this PER is the system's ability to maintain required minimum operating pressures as well as required area fire flows. MDEQ Circular 1 dictates a minimum normal operating pressure of 35 psi and a minimum pressure of 20 psi under all conditions of flow (e.g. fire flows), and fire flows must be in accordance with the recommendations of the FPAHJ (Big Sky Fire District) or the current fire code adopted by the State of Montana. It also states normal working pressures should be approximately 60 to 80 psi and pressure reducing devices must be used when static pressures exceed 100 psi.

4.12.3 MAP

Existing PWS infrastructure is shown in **Figure 31** followed by a single central system scenario shown in **Figure 32**, expanding new infrastructure from and through the existing infrastructure.

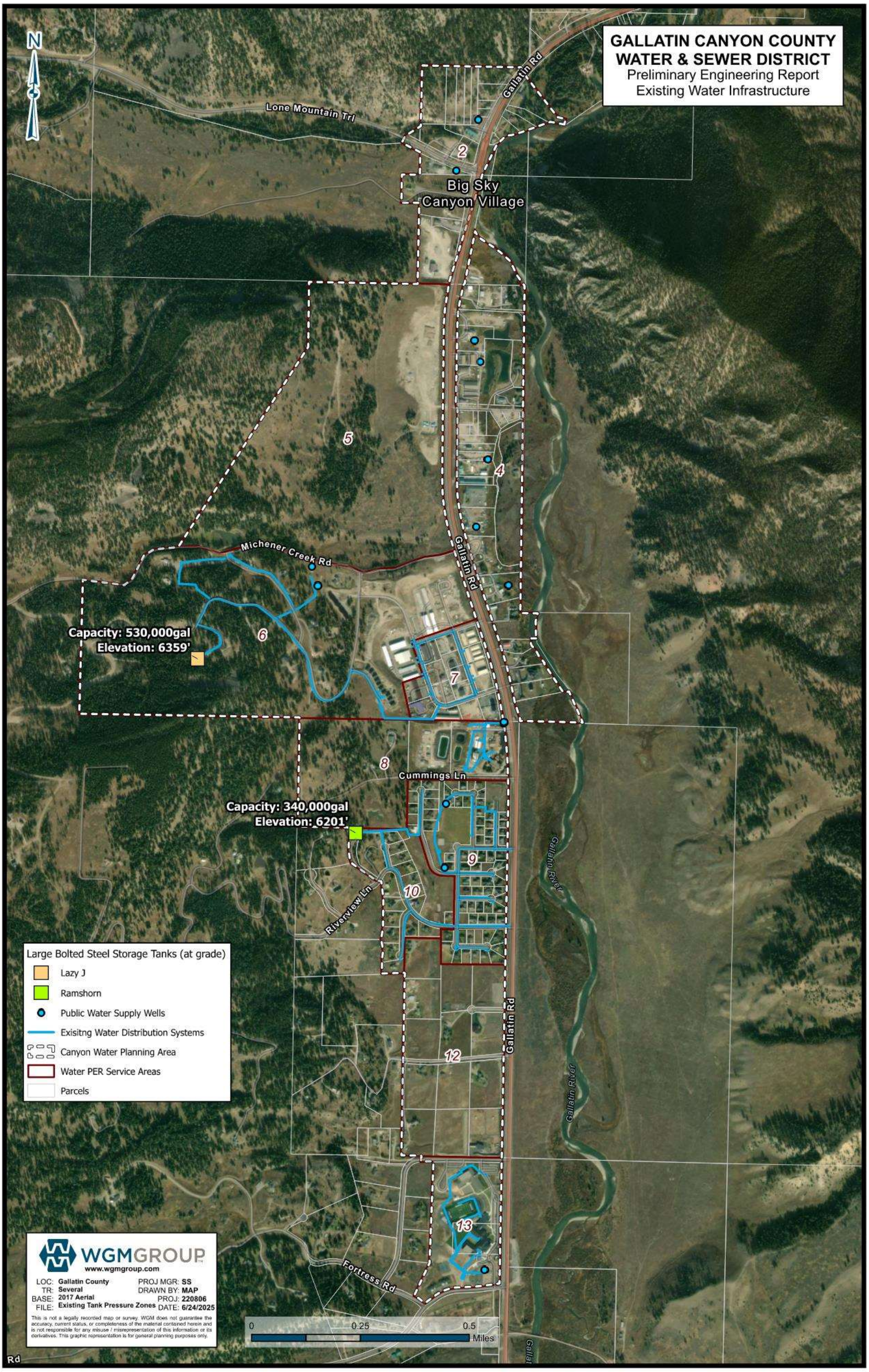


FIGURE 31: LAYOUT OF EXISTING PWS SYSTEMS



FIGURE 32: CONCEPTUAL SINGLE DISTRIBUTION SYSTEM LAYOUT

4.12.4 ENVIRONMENTAL IMPACTS

Use of existing operating infrastructure will minimize environmental impacts, as the localized areas containing the infrastructure are already developed and maintained. Installation of distribution network extensions would mostly occur in or along existing established roadway corridors with some extensions routed along boundaries of existing developed lots. All proposed extensions would occur well outside of any area floodplains. There are a couple small “pocket” wetland areas adjacent to Michener Creek and along the Quarry PUD frontage; however, these areas are located along and within US 191 R/W and appear to be due, at least in part, to constructed and/or obstructed storm drainage pathways. Therefore, any impacts would be minimal and temporary in nature and would be revegetated to pre-construction conditions upon construction completion.

Other important land resources, potential endangered species, historical and archaeological properties are assessed in the Uniform Environmental Checklist provided in **Appendix C,** but no known such resources exist in the immediate vicinity of proposed distribution network extensions. Proper construction measures would be taken to minimize the temporary impacts, such as noise, dust, and control of erosion and sediment runoff associated with construction activities.

4.12.5 LAND REQUIREMENTS

Removal and replacement of existing water mains to upsize flow capacity would occur within existing rights-of-way and/or easements. Proposed new water main extensions would be routed within existing rights-of-way as much as possible; however, there will be need for new utility easements generally requiring a 30’ easement width centered along those pipelines routed outside of existing rights-of-way. Land requirements for easements associated with this alternative are not anticipated to be obstructive to this project alternative.

4.12.6 POTENTIAL CONSTRUCTION PROBLEMS

Removal and replacement of water mains for increased capacity may require temporary water systems to be installed during construction to maintain required water service along reaches of those mains being replaced. These temporary systems are typically placed at grade and thus would have to occur during non-winter months but are not typically a hinderance to construction.

As mentioned in the section above, some new utility easements will be required for water main extensions made outside of existing rights-of-way or easements, but new easements are not anticipated to be an obstructive need.

There are areas of high groundwater in the northern third of the Planning Area, especially along the HWY 191 corridor and along the east side Service Area 4. Some areas may require trench dewatering to provide stable pipeline installations, but other than added costs, trench dewatering is not an extraordinary construction practice. There are other existing utilities (e.g. power, gas, communications, etc.) along rights-of-way in which much of the new water distribution system would be constructed, so coordination with those utility owners will be required to accurately locate those existing facilities and avoid or resolve location conflicts as necessary to adequately accommodate all utilities. Additionally, a central sewer system has been previously studied for the District and is currently nearing final design. This new sewer system will place sanitary sewer collection and treated reuse transmission facilities within most of the HWY 191 R/W. DEQ requires water mains installed parallel with sewer mains to be horizontally separated by 10’ minimum, with some limited deviation allowances for areas where this separation is impossible or impractical. Maintaining this minimum separation requirement will be a challenge along some alignments of the new water system and some deviations will be needed, but no

significant problems are anticipated that would prohibit water main extensions throughout the entire Planning Area.

4.12.7 SUSTAINABILITY CONSIDERATIONS

Water and Energy Efficiency

Improved water and energy efficiency will be a natural result of implementing a central water system to serve the entire Canyon Planning Area as discussed in previous infrastructure alternatives above. This is primarily the result of significantly decreasing the number of aquifer diversions, providing adequate storage that reduces the starts and run times of pumping, as well as sustainable operation, maintenance, metering and monitoring all system components, with State oversight, ensuring better protection and transparency of the area's water supply and quality.

Specific to distribution system piping, new gasketed pipe meeting DEQ design requirements is much less prone to leakage with proper installation. Water metering included with the distribution system allows owners to track system leakage, and the cost of water production and supply along with public system regulations forces system owners to monitor and maintain system leakage to a minimum. Additionally, the proposed single system includes installation of a PRV on the upsized 10" transmission main from the Lazy J tank prior to the main point of distribution which will reduce downgradient system pressures to more acceptable high-end pressures and reduce leakage potential throughout the system. In areas where static water pressures reach or exceed 100 psi, primarily in the northern quarter of the Planning Area, individual PRV's will be placed on customer services which will decrease potential of leakage in service lines and throughout customer plumbing as well as reduce flowrates and volume usage at those customers' points of use.

Green Infrastructure

There would be no new impermeable groundcover associated with this alternative. Additionally, there would be minimal impacts to existing terrain or historical drainage patterns associated with this alternative, as construction area disturbances would be returned to preconstruction conditions, so little to no impact to stormwater management would be expected.

Other

A single combined distribution system for the Canyon Planning Area would take advantage of existing water system infrastructure compliant with State regulations for public systems and would extend from a historically consistent source with storage located to sufficiently serve the entire Planning Area. Providing distribution from a singular source and using a singular gravity pressure storage elevation would simplify long term operations and maintenance as well as any trouble shooting exercises that may arise.

Consistent with other alternatives presented in this PER, consolidating to a single Utility District and expanding the distribution system throughout the Planning Area would extend fire protection throughout this developed portion of the Canyon. This would also enhance sustainability and resiliency of the water source and system infrastructure, as it will provide more consistent operation and maintenance for the Planning Area as a whole, and economies of scale associated with an expanded user base will play into long term maintenance, infrastructure upgrades and replacements of aging infrastructure necessary to maintain compliance with permits as governing regulations become increasingly more stringent and financially cumbersome for smaller systems. Utility Districts are eligible for state and federal funding programs as well as planning grants.

4.12.8 COST ESTIMATES

Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualize OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I.**

TABLE 21: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
SINGLE COMBINED DISTRIBUTION – W/ SOUTH MAIN LOOP	$8,395,880.00	$4,308,500.00	$78,487.00	**$12,704,380.00**
SINGLE COMBINED DISTRIBUTION – W/ 12" EXTENTION & NO LOOP	$7,941,840.00	$4,112,500.00	$75,187.00	**$12,054,340.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

4.13 SYSTEM DISTRIBUTION ALTERNATIVE - TWO SEPARATE NORTH/SOUTH SYSTEMS

4.13.1 DESCRIPTION

As discussed in the previous distribution alternative, there are two existing relatively large PWS's within the District Planning Area, Lazy J and Ramshorn, which both have their own production wells, ground storage tanks, and distribution networks. The second strategic alternative to utilize this existing infrastructure to serve the entire Planning Area is to provide two separate, north and south systems. For this alternative, the Lazy J system would be extended from its central location to the northern extents of the Planning Area and would tie into the existing Buck's T-4 system to create a separate north system serving the northern "half" of the proposed District. Similarly, the Ramshorn system would be extended from its general central location to the southern extents of the Planning Area to serve the southern "half" of the proposed District.

For context, the strategy of this demarcation of the two separate systems is primarily due to consideration of phasing, as Lazy J and Buck's T-4 have ongoing plans for their own development expansions, and the Quarry property is beginning construction of its subdivision this Summer 2025 and will be provided water from connection and extension of Lazy J's water system. Additionally, the northern "half" of the proposed District contains the most properties that have already annexed into the District and has the most likelihood for new and/or re-development, especially Service Area 4. As discussed in the previous single system alternative and illustrated in AE2S's TM in **Appendix J**, Lazy J's system can be acquired and re-purposed to serve the entire Planning Area as well as a separated northern system. If and/or when Ramshorn and the remaining southern half properties down to and

including the school, the Ramshorn system can be acquired and extended to serve the separate southern system. These separate north/south systems are depicted conceptually in the following **Figure 33**.

Again, the AE2S TM shows a north distribution system operating from gravity pressure applied by the Lazy J ground-level tank and a south distribution system operating from gravity pressure applied by the Ramshorn ground-level tank can both operate individually to comply with the required design criteria for system flows and pressures. The north system would again require a PRV to limit areas with static pressures exceeding 100 psi, while the south system can operate sufficiently without the need for an additional PRV. The TM includes modeling exhibits presenting pipe sizing and looping needs necessary for the two separate systems to provide required flows and pressures.

4.13.2 DESIGN CRITERIA

The design criteria for this alternative are the same as the previous alternative for one combined distribution system. Water system extension plans and specifications require review and approval by MDEQ to ensure compliance with all applicable design and material standards, so design criteria presented in this PER for distribution system alternatives are focused on system ability to provide required pressures and flows.

4.13.3 MAP

The following **Figure 33** shows the conceptual separate north/south systems, split between Buck's T-4 and the Ramshorn subdivision.



FIGURE 33: CONCEPTUAL NORTH & SOUTH DISTRIBUTION SYSTEM LAYOUT

4.13.4 ENVIRONMENTAL IMPACTS

There would be no additional or different environmental impacts for this separate system distribution alternative than those discussed with the above single combined system alternative. Generally, both alternatives would have the same network of piping extensions. The primary difference between these two distribution alternatives, other than operating off of separate tanks, is the single combined system alternative would include an extension made across the Buck's T-4 property to connect the north system to the south system, while this alternative's separate systems would omit this extension and connections.

4.13.5 LAND REQUIREMENTS

Land requirements for this distribution alternative are largely the same as the previous single system alternative with the exception of requiring one less easement acquisition with the omission of connecting the two systems through the Buck's T-4 property.

4.13.6 POTENTIAL CONSTRUCTION PROBLEMS

Potential construction problems associated with this alternative are the same as those discussed in the above single combined system alternative.

4.13.7 SUSTAINABILITY CONSIDERATIONS

Water and Energy Efficiency

Water and energy efficiency considerations for this alternative would be no different than those discussed with the above single combined system alternative.

Green Infrastructure

There would be no new impermeable groundcover associated with this alternative. Additionally, there would be minimal impacts to existing terrain or historical drainage patterns associated with this alternative, as construction area disturbances would be returned to preconstruction conditions, so little to no impact to stormwater management would be expected.

Other

As discussed in the previous single combined system alternative and consistent with other component alternatives presented in this PER, consolidating to a single Utility District and expanding the distribution system throughout the Planning Area would extend fire protection throughout this developed portion of the Canyon and would also enhance sustainability and resiliency of the water source and system infrastructure.

The previous single combined distribution system alternative does describe simplified long-term operations and maintenance as well as any trouble shooting exercises that may arise as a consideration for this singular system. However, having two separate systems wouldn't necessarily add complexity to the operations, maintenance, trouble shooting, etc. Ignoring other system components, the distribution pipe networks would generally be the same for both alternatives, and the overall length of system piping would not be substantially different.

This separate system may have an advantage with a phasing strategy. Because the northern "half" (from Buck's T-4 to the northern boundary) currently has more interest, more growth potential, and more properties already annexed into the District, the northern system can be established on its own as a first phase and extend as customer growth and demand dictates. Commissioning the southern system will then be primarily dependent first on agreement and annexation of the Ramshorn

subdivision and then the need and/or interest from the Big Sky School District to serve the Ophir School. If system investments are made to extend water service to the school, District ordinances will need to be coordinated with Gallatin County Planning & Community Development to require annexation and connection of those properties within the Planning Area that have main extensions crossing and/or adjacent to those properties.

4.13.8 COST ESTIMATES

Cost estimates for this alternative are summarized in the table below and broken out between construction, non-construction, and annualized OM&R costs in accordance with the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* guidance document. The detailed cost estimates for this alternative are provided in **Appendix I**.

TABLE 22: ALTERNATIVE COST ESTIMATE

PROJECT ALTERNATIVE	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	OM&R COSTS	TOTAL PROJECT COSTS (NOT INCLUDING OM&R*)
TWO SEPARATE DISTRIBUTION SYSTEMS – W/ SOUTH MAIN LOOP	$8,177,432.00	$3,969,000.00	$77,150.00	**$12,146,432.00**
TWO SEPARATE DISTRIBUTION SYSTEMS – W/ 12" EXTENTION & NO LOOP	$7,782,592.00	$3,797,000.00	$73,850.00	**$11,579,592.00**

*OM&R costs are not included in the total project alternative costs summarized in this table in order to show the estimated initial improvement costs associated with design and construction of the project alternative. OM&R costs are incorporated in the Life Cycle Cost Analysis provided in the following Section.

5.0 SELECTION OF AN ALTERNATIVE

In the previous section, several alternatives were considered for components and infrastructure required for a complete PWS. These alternatives were analyzed based on their design criteria, environmental impacts, land requirements, potential construction problems, sustainability, and cost estimates. Those alternatives determined to be technically, practically, or otherwise infeasible were dismissed in the previous section and not analyzed further. All remaining feasible alternatives are analyzed further in this section based on a life cycle cost present worth analysis and non-monetary factors to compare cost effectiveness and aid in alternative selections and project recommendations. The table below summarizes the current status of all alternatives analyzed in the above Section 4.

TABLE 23: COMPONENT SCREENING SUMMARY

PROJECT ALTERNATIVE	INITIAL SCREENING FINDINGS
1 – NO ACTION	Dismissed
2 – SOURCE: SURFACE WATER	Dismissed
3 – SOURCE: METERED CONNECTION TO EXISTING BSCWSD PWS	Dismissed
4 – SOURCE: GROUNDWATE USING EXISTING PWS WELLS	Feasible
5 – SOURCE: GROUNDWATE USING NEW PWS WELL FIELD	Feasible
6 - TREATMENT	Feasible
7 – STORAGE: HYDROPNEUMATIC TANKS	Dismissed
8 – STORAGE: NEW ELEVATED STORAGE TANK	Dismissed
9 – STORAGE: EXISTING GROUND-LEVEL STORAGE TANK	Feasible
10 – STORAGE: NEW GROUND-LEVEL STORAGE TANK	Feasible
11 – DISTRIBUTION SYSTEM: SINGLE COMBINED SYSTEM	Feasible
12 – DISTRIBUTION SYSTEM: TWO SEPARATE NORTH/SOUTH SYSTEMS	Feasible

5.1 LIFE CYCLE COST ANALYSIS

Guidelines for Life Cycle Cost Analysis (LCCA) provided in the *Uniform Preliminary Engineering Report For Montana Public Facility Projects* were utilized for this Section's analysis. To compare the LCCA of each feasible alternative, the estimated Operations, Maintenance and Replacements (OM&R) costs and salvage values were converted to present day dollars. These estimates were then combined with the total capital costs of each feasible alternative, which includes both the construction and non-construction costs calculated in the previous Section, to provide the net present values for evaluation.

To convert costs/values to present day dollars, a 20-year planning period was selected for this PER, as a 20-year period is more consistent with long range municipal planning as well as most municipal financing terms. Additionally, a real discount rate of 2.20%, as published in Appendix C of OMB Circular A-94 was used to calculate these conversions. OM&R estimated costs were converted to present day dollars using a uniform series present worth calculation, while salvage values were estimated at the end of the planning period by applying straight line depreciation over the anticipated design life expectancy of the asset(s) and then converted using a single payment present worth calculation. For the purposes of this PER, salvage values represent any remaining life/value of the asset(s) at the end of the planning period, so those short-lived assets having a design life equal to the planning period (20 years) are reported to have a $0.00 salvage value. It is recognized that there is still some actual value of the asset, at least such as scrap value; however, any such value is considered negligible relative to the system infrastructure as a whole. Additionally, the cost to disassemble, remove and haul off assets to be recycled or repurposed may potentially be more than the value of the specific asset material itself. LCCA results for each feasible alternative are presented in **Table 24** below. The detailed LCCA calculations are provided in **Appendix K**.

TABLE 24: COMPONENT LCCA SUMMARY

ALTERNATIVE DESCRIPTION	CAPITAL COST (C)	OM&R UNIFORM SERIES PRESENT WORTH USPW (OM&R)	SALVAGE VALUE SINGLE PAYMENT PRESENT WORTH SPPW (S)	NET PRESENT VALUE (NPV)
NPV – SOURCE ALTERNATIVES – EXISTING WELLS				
UPGRADE EXIST LAZY J WELLS	$243,290.00	$884,447.08	$0.00	$1,127,737.08
UPGRADE EXIST RAMSHORN WELLS	$539,180.00	$898,832.00	$0.00	$1,438,012.00
RAMSHORN - LAZY J TRANSM. MAIN (REQ'D W/ BOTH WELLFIELDS & ONE SYSTEM)	$1,353,225.00	$113,112.18	$196,464.39	$1,269,872.79
NPV – SOURCE ALTERNATIVES – NEW WELLS				
ADDITION OF NEW WELLS – LAZY J WELLFIELD	$2,223,610.00	$895,020.61	$0.00	$3,118,630.61
NEW WELL/PUMP CONTROL HOUSE	$1,417,900.00	$295,075.25	$256,995.62	$1,455,979.64
NPV – STORAGE ALTERNATIVES – EXISTING TANKS				
EXIST LAZY J TANK (BOLTED STEEL 530K GAL)	$82,000.00	$515,971.86	$0.00	$597,971.86
EXIST RAMSHORN TANK (BOLTED STEEL 340K GAL)	$82,000.00	$378,679.91	$0.00	$460,679.91
NPV – STORAGE ALTERNATIVES – NEW GROUND TANKS (655,000 GAL)				
NEW BOLTED STEEL TANK	$2,172,890.00	$347,942.90	$229,402.59	$2,291,430.31
NEW WELDED STEEL	$2,871,890.00	$839,143.02	$464,125.92	$3,246,907.10
NEW PRESTRESSED CONCRETE	$3,114,890.00	$530,807.59	$580,074.71	$3,065,622.88
NPV – TREATMENT ALTERNATIVES				
CENTRAL RO TREATMENT	$1,769,780.00	$355,729.61	$194,134.78	$1,931,374.83
HOME POU TREATMENT	$348,000	$0.00	$0.00	$348,000.00
NO TREATMENT	$0.00	$0.00	$0.00	$0.00
NPV – DISTRIBUTION ALTERNATIVES - SINGLE COMBINED SYSTEM				
SINGLE SYSTEM – W/ SOUTH MAIN LOOPING	$12,704,380.00	$1,286,642.85	$1,197,209.75	$12,793,813.10
SINGLE SYSTEM – W/ 12" MAIN EXTENSION IN LIEU OF LOOPING	$12,054,340.00	$1,232,545.72	$1,077,180.10	$12,209,705.62
NPV – DISTRIBUTION ALTERNATIVES - TWO SEPARATE SYSTEMS				
TWO SYSTEMS – W/ SOUTH MAIN LOOPING	$12,146,432.00	$1,264,725.32	$1,134,931.31	$12,276,226.00
TWO SYSTEMS – W/ 12" MAIN EXTENSION IN LIEU OF LOOPING	$11,579,592.00	$1,210,628.19	$1,014,901.66	$11,775,318.52

The table above provides the LCCA for the itemized feasible system component alternatives. **Table 25** below shows the minimum and maximum LCCA estimates for the overall combined alternatives required to operate as complete systems.

TABLE 25: COMPLETE SYSTEM LCCA SUMMARY

COMBINED WATER SYSTEM ALTERNATIVES	NET PRESENT VALUE (NPV)
SINGLE COMBINED SYSTEM ALTERNATIVES	
Exist. Lazy J & Ramshorn Wells; Exist. & New Lazy J Tanks; No New Well/Pump House; No Treatment; South Distribution W/ 12" Extension in Lieu of Looping	$18,934,729.67
Exist. & New Lazy J Wells; Exist. & New Lazy J Tanks; New Well/Pump House; Central RO Treatment; South Distribution W/ 8" & 10" Looping	$23,316,937.44
TWO SEPARATE SYSTEMS ALTERNATIVES	
Exist. & New Lazy J Wells + Exist. Ramshorn Wells; Exist. & New Lazy J Tanks + Exist. Ramshorn Tank; No New Well/Pump House; No Treatment; South Distribution W/ 12" Extension in Lieu of Looping	$20,809,780.30
Exist. & New Lazy J Wells + Exist. Ramshorn Wells; Exist. & New Lazy J Tanks + Exist. Ramshorn Tank; New Well/Pump House; Central RO Treatment; South Distribution W/ 8" & 10" Looping	$24,698,042.25

5.2 NON-MONETARY FACTORS

The minimum and maximum LCCA costs of the combined whole system alternatives presented above are not significantly different, and the range between these minimum and maximum costs for either single or two separate systems are similar at around $4 Million. Therefore, it is also critical to consider non-monetary factors in analyzing and recommending the proposed project to pursue. These non-monetary factors are considered below for each of these system components.

5.2.1 WATER SOURCE – WELLS

Both the Lazy J and Ramshorn existing wells can be used as a water source for a GCCWSD public water system, and the use of both existing system wells will generally have the same requirements and would have no adverse environmental impacts. For use in a single combined PWS using existing Ramshorn and Lazy J wells, both Ramshorn wells would need to be upgraded with higher capacity pumps to meet demand requirements, while only one Lazy J well would require upgrading, and the combination of all four existing wells would satisfy public system source redundancy requirements. In this scenario, no addition of new wells would be required; however, approximately 4,600 linear feet of new transmission main would be required to connect existing Ramshorn wells to Lazy J storage facilities which would add nearly a mile of additional pipe inventory to be maintained and would require additional easements from private properties. As a final option for this single system scenario, the system could be served by Lazy J wells only; however, this would require the addition of new wells along with the upgrade of one existing Lazy J well to meet the demand and system redundancy requirements. There is ample space in the immediate vicinity of existing Lazy J well and storage facilities as well as ample separation from any potential sources of contamination which is not the case with the Ramshorn system.

For use in two separate, north and south systems, the two existing Ramshorn wells could potentially operate at their current capacity without upgrades or the need for an additional redundant well to serve the south system. However, it would still be recommended to upgrade the capacities of these wells to

"perfect" the water rights allocations required for the project. To serve the north system, the two existing Lazy J wells would be used with one existing well requiring capacity upgrade, and the addition of one new well would be required to meet the demand and redundancy requirements of the north system. Again, for this scenario, ample spatial and source protection requirements are available for new wells in the Lazy J system but likely not in the Ramshorn system.

The alternative of existing and new wells with the biggest risks associated with sustainability, reliability, as well as potential community objections lies with the Ramshorn subdivision. First, though some Ramshorn residents have expressed interest in a central GCCWSD water system, the OA would have to vote, with some level of majority, to do this. A central GCCWSD sanitary sewer system is currently being designed that would include collection and treatment of Ramshorn sewer, but the OA has not "bought in" to their participation and annexation at this time. Additionally, as previously discussed, a 2012 evaluation of Ramshorn's Well 2 by Western Groundwater Services, LLC expressed concern with Well 2's hydrogen sulfide odor and coloration from black particulates and the ability to rehabilitate the well. This well is rarely used and, if used, has to be flushed prior to use. Both of Ramshorn's wells draw from the same aquifer and are less than 200' apart, so this same water quality issue is a potential long-term concern for their Well1. Additionally, due to the relatively high density of this subdivision and the location and proximity of the large community sewer drainfields, the ability to locate new additional or replacement wells within this area may not be reliable or at least not sustainable long-term.

5.2.2 WATER STORAGE – GROUND LEVEL TANKS

Prestressed concrete, welded steel, and bolted steel tanks were analyzed, and all three types would have the same functionality, and all have design life expectancies well beyond the 20-year planning period (EPA estimates up to 75 years and 50 years for concrete and steel tanks, respectively). Therefore, the bolted steel tank type was solely selected on their LCCA basis. Both the Lazy J and Ramshorn existing ground-level tanks can be used as water storage facilities for a GCCWSD public water system, and the use of both existing system tanks will generally have the same requirements and would have no adverse environmental impacts. Additionally, both existing system tanks could be utilized today to operate a GCCWSD public water system given their capacities relative to current water demand estimates for the Planning Area.

The existing Ramshorn ground-level tank, at a capacity of 340,000 gallons and an elevation of approximately 6201' MSL, could operate a separate south system to provide required flows and pressures under current condition demands and estimated "build-out" demands. However, due to this tank's size and elevation, it could not adequately operate the delineated north system, even at current condition demands. Therefore, the existing Ramshorn tank is only feasible for use with the alternative of two separate systems. Then there's still the condition of potential community objections, and the Ramshorn OA would have to vote in the affirmative to annex into the GCCWSD and allow acquisition of its existing infrastructure.

The existing Lazy J ground-level tank, at a capacity of 530,000 gallons and an elevation of approximately 6359' MSL, could operate a single system providing required flows and pressures throughout the entire Planning Area under current condition demands. To properly serve the entire Planning Area's estimated "build-out" demands, a new ground-level tank would be required to operate in parallel with the existing tank and would need to be installed at the same elevation as the existing tank. As previously discussed and depicted conceptually on a map, there is ample room for an additional tank in close proximity of the existing Lazy J tank. The scenario of two parallel tanks would also create an easy and reliable means of adhering to the design requirement allowing tanks to be isolated from the distribution system and drained for cleaning or maintenance without creating loss of

operating pressures in the distribution system. Additionally, Lazy J has expressed interest in joining the GCCWSD and is already extending their water system to the north to serve the water demands of the adjacent Quarry development which is currently under construction.

Given the elevation of the existing Lazy J tank, a pressure reducing valve will be required to limit excessive pressures throughout the northern portion of the Planning Area; however, this would be required with either a single combined or two separate system alternative.

5.2.3 TREATMENT – REVERSE OSMOSIS

With the level of data acquisition and preliminary design efforts typical for this PER, it is reasonable to estimate that treatment would not be required for a new central GCCWSD water system, as the source aquifers of both the Lazy J and Ramshorn systems have not exceeded any regulated MCL's since their inception. That said, there is evidence of relatively high sodium concentrations in the source aquifers of both systems. Additionally, new water samples were collected at Lazy J's wells on January 8, 2025, and testing results showed that sodium, TDS, pH, and SAR remain relatively high; however, treatment is still not required under current NPDWR and NSDWS regulations. Whether treating or not, as a public community system the GCCWSD would be required to deliver an annual drinking water quality report to its customers.

As previously discussed, current technology for removal of sodium as well as most dissolved solids within groundwater systems is limited to RO treatment. However, RO treatment has its drawbacks. It produces a reject wastewater that has to be treated, so for central treatment, either a new wastewater treatment facility would have to be constructed near the RO system, or the wastewater would have to be collected and treated by a public sewer system capable of treating. Central RO treatment would reduce water efficiency and conservation and potentially waste a quarter of the water rights volume obtained by the GCCWSD. It would also potentially double the energy demands of the water production system. A central RO system may also require post-treatment processes to inject certain minerals or utilize mineral contact filters to remineralize the water to help raise the pH and reduce its corrosiveness. These post-treatment processes may then trigger the requirement to provide full time disinfection treatment as well. Central RO would require increased operator time to ensure optimal conditions are met. Additionally, RO filters, if not recycled when replaced, would add plastic to local landfills.

The other option to provide some level of RO treatment is to provide POU RO treatment systems that can be installed at appropriate locations on individual water systems of private residences or businesses if desired by those customers. Either way, outreach and education to the potential GCCWSD customers of the higher sodium concentrations is advised to determine the level of public concern and gauge interest and scale of POU systems that may be desired throughout the GCCWSD service area. Depending on the number of POU systems desired by the customers, the GCCWSD could purchase the units and provide them to the customers, and those customers would then own the units and be responsible for their operation and maintenance. POU devices are often less effective than central treatment due to potential for improper operation and maintenance. These units can also be rented from at least one local vendor at approximately $60 per month, which includes vendor maintenance services.

5.2.4 DISTRIBUTION – SINGLE VS. TWO SEPARATE SYSTEMS

As previously discussed in Section 4 and shown in the AE2S TM (**Appendix J**), both single and two separate system alternatives can provide reliable flows and pressures throughout the Planning Area, and both alternatives would generally have the same requirements and would have no adverse

environmental impacts. There is not a significant difference in the lengths of main piping between the two alternatives, and both alternatives would require a single PRV station to limit excessive pressures in the northern region of the Planning Area.

The only distribution infrastructure difference between a single or two separate distribution system alternative is an additional approximately 1,337 linear feet of main required to extend from the existing Lazy J system to the existing Ramshorn system for the combined single system alternative. Aside from this extension, there are two options for distribution piping in the southern extents of the Planning Area, between Ramshorn and Ophir School. This distribution requires either a looped extension and connection with a 10” and 8” main or a single extension and connection with a larger 12” main. The looped option would result in nearly double the pipe length between Ramshorn and the school. It would also require additional permitting with MDT to occupy their right of way along US 191. With the current sewer design underway for the GCCWSD, this option would place a 3rd parallel pipe along the west side of US 191 requiring a minimum 10’ separation between mains. This would equate to an occupancy width exceeding 22’ which would likely prove difficult to maintain and permit within MDT right of way and thus would likely require additional easements outside of the R/W.

6.0 PROPOSED PROJECT

After analyzing the feasible alternatives based on their respective LCCA and those non-monetary factors prescribed in the *Uniform Application for Montana Public Facility Project,* the proposed project would utilize existing Lazy J public system infrastructure and expand as a single combined system throughout the Planning Area as demand dictates. For this PER's proposed project, it is assumed that the proposed source aquifer's quality would remain consistent, and therefore, no treatment will be required.

The first and most critical component for success of this proposed project is to complete a successful water rights change application to secure both the annual volume and flow rate diversions from the groundwater source needed to serve the estimated demands of the GCCWSD central water system. The proposed system would be implemented and developed in phases as shown in **Figure 34** and described in the following breakout of system components.

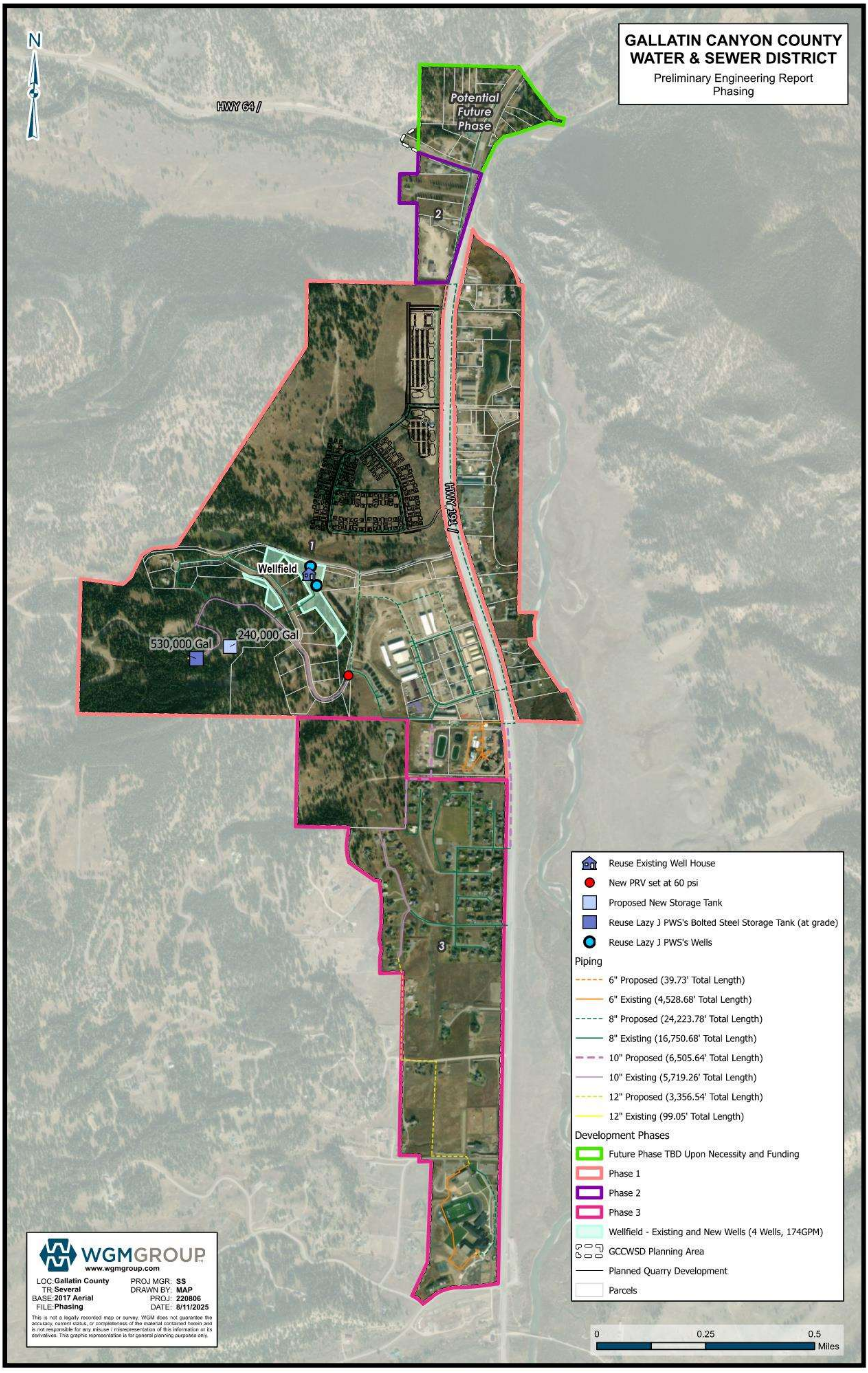


FIGURE 34 – PROPOSED GCCCWSD WATER PROJECT PHASING

6.1 PRELIMINARY PROJECT DESIGN

6.1.1 WATER SUPPLY

Upon securing adequate water rights, the existing Lazy J water system infrastructure would be acquired by the GCCWSD, consisting of the two existing production wells and one ground-level tank along with its reuseable water mains. Phase 1 initial commissioning would utilize the current two Lazy J wells, with one well requiring upgrading its pumping capacity. These two existing wells could potentially serve the entire Planning Area in its current developed state; however, the Phase 1 project will focus on serving the service areas having current and/or near-term expansion plans, which are also the same areas with the highest concentration of annexation requests (SA's 4-8). For system estimated "build-out" demands, two additional wells would be required, so it is recommended to proceed with the Phase 1 project to complete these new wells into the same source aquifer as the existing 2 Lazy J wells with matching pumping capacities. This equates to four total water supply wells to perfect the estimated water rights allocation and meet required design criteria. As previously discussed, this PER estimates a combined maximum water rights flow rate of 520 GPM, which will be achieved with three wells having equal flow rates of approximately 174 GPM. Providing a total of four wells meets the design criteria requirement to meet the design flow (MDD for this system's storage provision) with the largest well out of service to ensure system redundancy in the case a well is offline or down for service/maintenance.

6.1.2 TREATMENT

The proposed project would not include central RO or other physical or chemical treatment of the source water, as it is currently not required with the proposed source aquifer water quality. However, the proposed project does include construction of a new well/control building to house new well control and telemetry equipment that will be designed to accommodate an easy expansion to house treatment equipment as needed in the future. Additionally, the GCCWSD will provide outreach and education to customers to advise them of the water's sodium content and determine the type of assistance, if any, can be provided to customers that would require a POU RO treatment unit. Depending on the scale of interest in POU units from customers, the GCCWSD can plan for an appropriate number of POU RO units to include in its capital improvements or short-lived assets reserve.

6.1.3 WATER STORAGE

Upon acquisition of the existing Lazy J infrastructure, its existing 530,000-gallon ground-level tank would be used to serve the Phase 1 project area and continue to serve the GCCWSD's service areas until phased system expansions and/or system demands require a new tank be constructed to provide adequate storage to meet design volume requirements. This PER estimates a "build-out" demand storage capacity of approximately 766,000-gallons will be needed, and this can be accomplished with a new 655,000-gallon bolted steel ground-level tank operating in parallel with the existing 530,000-gallon tank, with both at approximately 2/3 full capacity. Though DEQ does not require tank/storage redundancy, this tandem operation will provide the system with reliable means to meet the design criteria to be able to isolate a tank from the distribution system and drained for cleaning or maintenance without necessitating loss of pressure in the distribution system. This new tank, when needed, will be constructed in the same vicinity as the existing tank and at the appropriate elevation that syncs both tank water levels with the system's hydraulic grade line pressure, generally as shown in **Figure 35** below.



FIGURE 35 – PROPOSED DUAL GROUND-LEVEL STORAGE TANKS LAYOUT

6.1.4 PUMPING STATIONS

Pumping stations, other than the actual supply wells, will not be required for the proposed water system. The location and elevation of the existing and proposed ground-level tanks is sufficient to provide adequate operating pressures and fire flows throughout the Planning Area. There are approximately 8 vacant residential lots in close proximity of the existing and new tank that would require boost pumping if connected to the consolidated GCCWSD water system, given their elevations relative to that of the tanks. However, for this PER, it is assumed these lots would provide their own water via private wells since there's no indication of those lots being planned for connection to the existing Lazy J system. These lots are shown on **Figure 36** below relative to a minimum 20 psi pressure grade provided by the tanks' full elevation. These lots can be connected to the system in the future, if needed or at a combined request of all of these lot owners; however, their connection will require a booster station to boost the required pressures to those lots with the cost of the booster station levied on those lot owners. This booster station is not included in this PER's proposed project or its cost estimate.



FIGURE 36 – POTENTIAL LOTS REQUIRING BOOST PUMPING

6.1.5 SYSTEM DISTRIBUTION

Upon acquisition of the existing Lazy J infrastructure, distribution mains will be connected to the existing Lazy J distribution system and extended to service areas as they annex into the GCCWSD. The Phase 1 project will extend the core distribution network from Buck's T-4 to the Quarry PUD (on the west side of HWY 191) and loop across to Service Area 4 (on the east side of HWY 191) as delineated in **Figure 34** above. The Lazy J transmission main from the ground-level tank to the primary point of distribution will be removed and replaced with an upsized 10" main, and a new PRV station will be installed ahead of this primary point of distribution. Phase 2 can then connect with a short extension to the Conoco on the south side of HWY 64.

The Phase 3 extension to Ophir School will primarily be dependent on the school district annexing into the GCCWSD. As previously discussed in considerations for the distribution alternatives, this investment to extend the water system to serve Ophir School will require the residential properties from Ramshorn to the school to annex and connect as the main extensions are constructed across and/or adjacent to those properties. This Phase 3 connection will require extending a 10" and 12" "backbone" main from the Lazy J system, through Buck's T-4 and across Ramshorn all the way to Ophir School's existing pipe network. This will include removal and replacement of existing mains with an upsized 12" main across the western edge of Ramshorn and extending new 12" main to the school. Additionally, a portion of the school's existing pipe network will be removed and replaced with upsized 8" main.

The northern extents of the Planning Area, north of HWY 64/Lone Mountain Trail, will not be completed until such time as connection of this area becomes necessary due to regulatory requirements and/or any system failures within this area occur that would potentially prohibit occupancy of those properties without connection to the GCCWSD system. This is due to the excessive cost of this area's connection relative to the limited customer base available in this area. Because crossing HWY 64 and the West Fork Gallatin River requires trenchless methods including jack and bore (J&B) and/or horizontal directional drilling (HDD) of the main extension along with HDD service extensions across HWY 191 to connect the few homes on the east side of the highway, as well as the terrain and congestion of other existing utilities and structures, connection of this area is estimated to exceed $1 Million. Future connection of this area will require substantial financial assistance from grant funding sources and the Big Sky Resort Area District (BSRAD) tax authority in order to minimize the burden of this area's property owners and make it financially feasible. The overall GCCWSD central water system is depicted in **Figure 37** below and includes a summary list of the proposed infrastructure components.

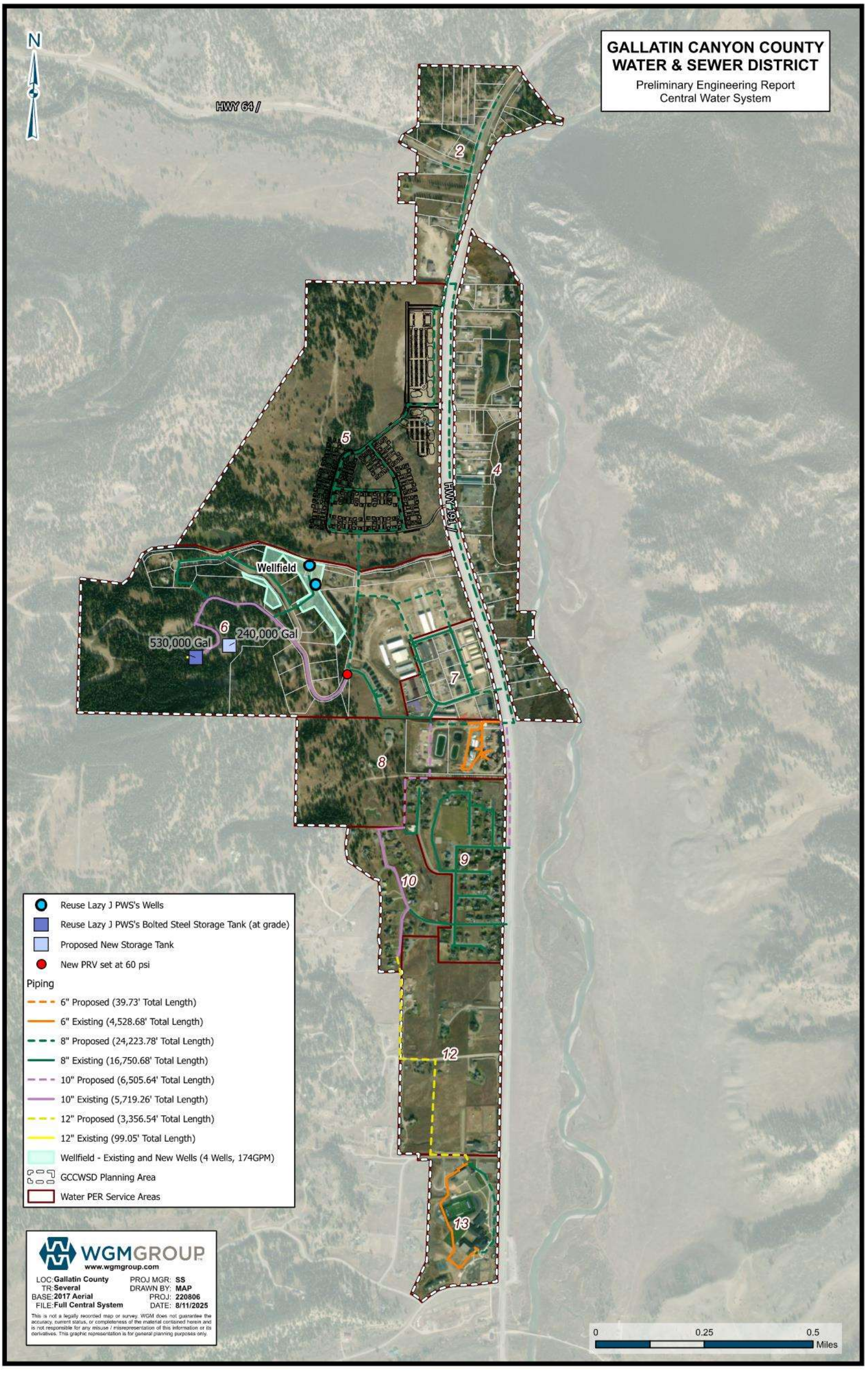


FIGURE 37 – PROPOSED GCCWSD CENTRAL WATER SYSTEM OVERVIEW

6.2 PROJECT SCHEDULE

Project implementation is dependent first on completing a successful water rights change application to secure adequate annual volumes and diversion flow rates needed to serve the proposed GCCWSD water system. The total water right volumes and diversion rates will also determine the extent of the total Planning Area can be served and thus will advise prioritization of project phasing. Therefore, this water rights change application effort will be prioritized for funding and scheduling, as this timeframe is anticipated to require 2 to 3 years for a final decision.

Upon securing these water rights, the project will be sequenced to advance through engineering design, permitting, funding, easement acquisition, bidding, and construction. A conceptual schedule is provided in **Figure 38** below based on anticipated alignment of anticipated timeframes for each step. Note that the GCCWSD is currently in the final design phase of the Canyon Sewer Project with construction of Phase 1 anticipated to begin in 2027 if adequate project funding is secured. This timing will align well with water system schedule, as a water rights decision should follow the heels of the sewer construction, and the sewer project will provide better insight into utility construction costs, any potential construction problems, disposition towards permitting and easements, as well as initial GCCWSD service area boundaries.

ID	Task Mode	Task Name	Start	Finish
1		**PROJECT PLANNING**	**Wed 3/20/24**	**Mon 5/1/28**
2		Preliminary Engineering Report	Wed 3/20/24	Fri 8/29/25
3		GCCWSD Board PER Approval as Planning Document	Mon 9/1/25	Wed 10/22/25
4		Funding Procurement - Water Rights Change	Mon 11/3/25	Tue 3/31/26
5		Water Rights Change Application	Wed 4/1/26	Fri 3/31/28
6		Funding Procurement - Water System Design	Mon 11/1/27	Fri 3/31/28
7		Water System Design Services Procurement	Wed 3/1/28	Mon 5/1/28
8		**PROJECT DESIGN**	**Mon 5/1/28**	**Thu 5/31/29**
9		Preliminary Water System Design & Permitting	Mon 5/1/28	Tue 10/31/28
10		Lazy J Water System Acquistiion	Wed 11/1/28	Thu 5/31/29
11		Final Water System Design & Permit	Wed 11/1/28	Mon 4/16/29
12		Land and Easement Acquisition	Wed 3/21/29	Fri 5/18/29
13		GCCWSD Board Approval to Proceed with Construction	Tue 3/20/29	Fri 5/25/29
14		**PROJECT CONSTRUCTION**	**Fri 5/25/29**	**Fri 11/29/30**
15		Construction Bidding and Award	Fri 5/25/29	Fri 6/22/29
16		Project Construction	Mon 6/25/29	Fri 8/30/30
17		Project Close Out and System Commissioning	Mon 9/2/30	Fri 11/29/30

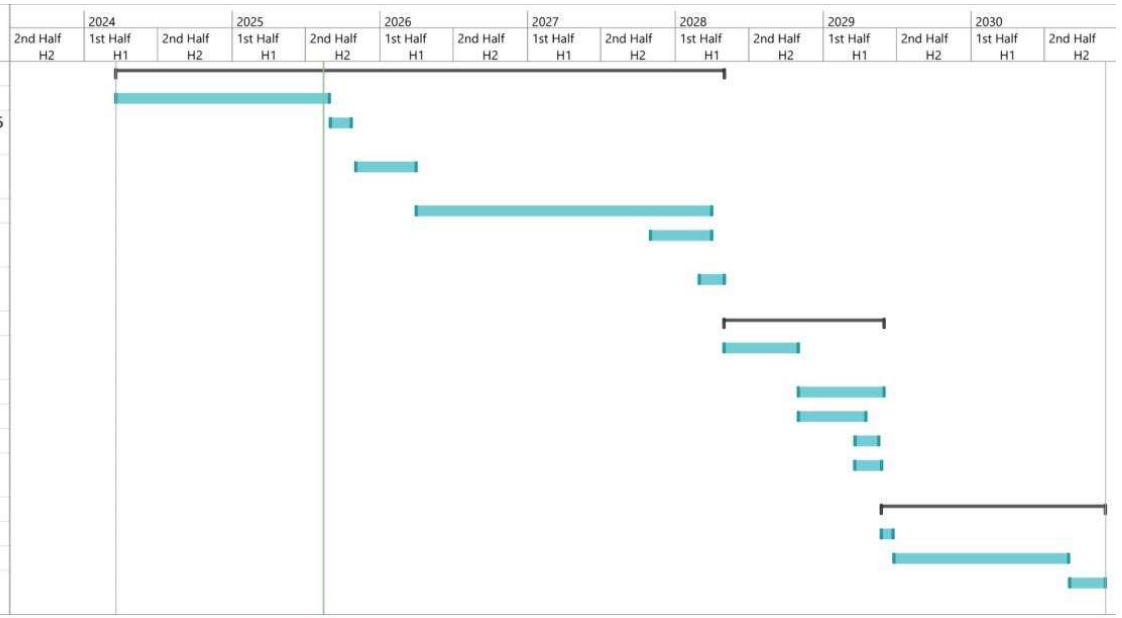


FIGURE 38 – CONCEPTUAL PROJECT SCHEDULE

6.3 PERMIT REQUIREMENTS

Again, first the successful water rights change application will be paramount to advancing the project beyond this PER level. Design and construction of public water infrastructure, including wells, tanks, water main piping and appurtenances, will require DEQ review and approval of plans, design report(s) and specifications along with record drawings of the "as-built" conditions upon completion. This DEQ review and approval will include PWS-5 and PWS-6 permitting to ensure source water protection for new wells.

Design advancement will include review of the construction corridor for cultural sites, wetlands and other water bodies to determine potential permitting and mitigation of impacts to these resources. These impacts and permitting requirements will likely be the same as those identified with the current design of the Gallatin Canyon Sewer Project, which would include the following permits: 310, 404, Section 10, 318 and County Floodplain permitting, all associated with pipeline crossings of Michener Creek and the West Fork Gallatin River. Any such impacts would be temporary and would not affect the cross section of these waterbodies, so no adverse impacts or permitting issues are anticipated.

Infrastructure to be constructed across or along HWY 191 and HWY 64 will require review and permitting through MDT to occupy their right-of-way. Preliminary review and discussions have been conducted with MDT for permitting of sewer infrastructure, and no occupancy permitting issues are anticipated with MDT. Easements from private landowners will need to be acquired for construction and maintenance of all pipelines and appurtenant facilities that cannot be maintained within existing public rights-of-way and easements. Additionally, a combination of easements and/or utility lots will need to be created for construction, maintenance and access to the wells, well control building, and the tanks. Any utility lot(s) will be owned by the GCCWSD.

Finally, a Storm Water Pollution Prevention Plan (SWPPP) will have to be designed and maintained to secure a Montana Pollutant Discharge Elimination System (MPDES) MTR100000 General Stormwater Permit for Construction Activity. This permit will be administered by DEQ and will require inspections, monitoring, and reporting throughout the duration of construction.

6.4 SUSTAINABILITY CONSIDERATIONS

The sustainability benefits generally common of a central District water system versus the current sporadic spread of wells drilled into different aquifers that go largely unchecked, unmetered, unmonitored, and are not regularly maintained are discussed in previous Sections 3 and 4 of this PER. These benefits span environmental and human health, provision for reliable fire protection, security, environmental and financial resiliency, etc. Sustainability considerations of interest, specific to the proposed project for this PER, are described below.

6.4.1 WATER AND ENERGY EFFICIENCY

Utilizing groundwater as the system's source water as opposed to surface water requires less infrastructure, less power, less treatment (in this case none), and is less operations and maintenance intensive. The physical and chemical characteristics of a developed groundwater source are more consistent and predictable than surface water sources, and groundwater is not susceptible to loss due to evaporation and transpiration, like surface waters, and are generally better protected from contamination.

The proposed project's use of multiple smaller wells/pumps in a highly artesian aquifer in conjunction with adequate storage to meet system demands, reduces pump horsepower and associated energy requirements, reduces pump run times, and reduces stress on the source aquifer that may arise if using wells/pumps with much higher pumping rates. In the case of the proposed project's selected alternatives, using three wells at approximately 180 gpm with storage versus well capacities demanding 700 – 2,000 gpm, with minimal or no storage, results in much better energy efficiency and source resiliency. Also, the project's use of ground-level storage tanks at an adequate elevation to meet system pressure requirements provides "passive" gravity pressure instead of constant run pumps to maintain pressure resulting in better energy efficiency of the overall system as well as provides more reliable fire protection supply.

Well production/pumping will be metered at the new control house, which will also include a SCADA system, providing consistent monitoring of operation status and tracking of total water volumes and flow rates produced from the wells. All customer connections to the system will also be equipped with regularly monitored and maintained water meters. The system production and consumption metering will provide operational means to monitor system losses and promote proactive maintenance. Additionally, as discussed in section 3.1.1, a metered GCCWSD PWS will have tools to encourage water conservation, which include but are not limited to, leak detection and repair programs, rate structures, ordinances, rebates, and customer education.

The advancement of the proposed project design will also analyze opportunities to incorporate renewable energy use, such as onsite solar arrays, to reduce the climate impact of the water system's energy consumption and potentially reduce operational costs over time. This could also add to operational resiliency as a redundant power supply. This will be evaluated further as design progresses to account for the most up-to-date technology and prices.

6.4.2 GREEN INFRASTRUCTURE

The proposed project will create a nominal increase of impervious surfaces, which would be limited to construction of a new well/pump control house as well as a new storage tank when demand requires. The project's proposed infrastructure improvements will require minimal grading or impacts to existing terrain, so historical drainage patterns will be maintained. Green stormwater best management practices (BMP's) will be designed and constructed with site design enveloping these structures to capture and treat the runoff reduction and treatment volumes as prescribed in the *Montana Post-Construction Storm Water BMP Design Guidance Manual*. Additionally, as discussed with the permit requirements, a SWPPP will be developed and implemented to minimize erosion and prevent sediment discharge associated with construction activities for the entire project area.

6.4.3 OTHER

The proposed project's use of existing and new wells in the deep aquifer should be less vulnerable to drought and contamination from anthropogenic sources than the existing shallow water supply wells. Additionally, utilizing one source aquifer will greatly simplify long term monitoring and management of water quality.

The proposed project makes use of existing infrastructure such as wells, tanks, and distribution networks and appurtenances with little, or no improvements or modifications needed for immediate system commissioning. Additionally, most of this existing infrastructure has at least half of its typical design life remaining, which is estimated to be equal to this PER's 20-year planning period.

The Quarry PUD, which adjoins Lazy J to the north, began construction in June, 2025 and is connecting to and extending from Lazy J's existing water system to provide water service to this development. The proposed project continues this proactive consolidation, connecting to and reusing existing infrastructure to expand service and available capacities to other unserved or underserved properties within the GCCWSD Planning Area. This will allow decommissioning of aged and/or failing infrastructure and minimize the sprawling well penetrations and groundwater diversions from varying hydrogeologic strata which will promote and allow better use and protection of the area's groundwater resource. Consolidating into a single Utility District owner will enhance sustainability and resiliency of the water source and system infrastructure, as it will provide more consistent monitoring, operation and maintenance for the Planning Area as a whole. Additionally, economies of scale associated with an expanded user base will play into long term maintenance, infrastructure upgrades and replacements of aging infrastructure necessary to maintain compliance with permits as governing regulations become increasingly more stringent and financially cumbersome for smaller systems. County Water and Sewer Districts are eligible for state and federal funding programs as well as planning grants that some of the existing PWS's can't access.

The location and capacities of existing infrastructure planned for acquisition and reuse for this project allows immediate system commissioning and service connections by simply extending from the existing Lazy J water mains, while also providing simple phasing strategies. Currently Service Areas 4-8 are the most active with new development and/or redevelopment and have the most expressed interest in annexing into the GCCWSD or have already been annexed. As mentioned above, the Quarry PUD (SA 5) is already extending water mains from Lazy J into and through its planned development. Buck's T-4 (SA 8) can be connected with a relatively short extension, as it adjoins Lazy J, and SA 4 can be connected with a looped extension along the east side of HWY 191. Future phases, presumed to be as shown in the previous **Figure 34**, can then be connected with extensions of distribution mains to the north and south as demand requires service connection and sufficient construction funding becomes available.

6.5 TOTAL PROJECT COST ESTIMATE

Table 26 provides a summary of the opinion of probable "total project" cost for the proposed water system, consisting of the combination of all selected component alternatives described above in this Section. Total project costs are defined as the sum of construction and non-construction costs. Non-construction costs include planning, design engineering, legal and other consulting services, land and rights-of-way, construction contingency, construction administration and observation services, and other costs associated with the project. These costs do not include administration or OM&R costs necessary for long-term management and operations of the GCCWSD system. Those costs are estimated in the following sections examining annual operating budget, annual O&M, debt repayments, and reserves.

The conceptual opinion of probable project cost was developed based upon previous project data, project specific equipment quotes, and RS Means cost estimating manuals. This cost opinion represents a Class 4 Estimate based upon the definitions of the Association for Advancement of Cost Engineering (AACE) International. This level of cost opinion is appropriate for planning level evaluations made with incomplete information. The cost opinion at this level of engineering is considered to have an accuracy range of +50/-30 percent. Actual costs will not be determined until a public bidding process has been completed. Escalation should be applied to the year of construction, but the ultimate schedule is unknown at this time.

TABLE 26: ENGINEER'S OPINION OF PROBABLE COST

PROPOSED PROJECT'S SYSTEM COMPONENT	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	TOTAL PROJECT COSTS
WATER SOURCE			
UPGRADE EXISTING LAZY J WELLS	$157,290.00	$86,000.00	$243,290.00
ADDITION OF NEW WELLS - LAZY J WELLFIELD	$1,179,610.00	$1,044,000.00	$2,223,610.00
NEW WELL/PUMP CONTROL HOUSE	$752,900.00	$665,000.00	$1,417,900.00
WATER STORAGE			
EXISTING LAZY J TANK IMPROVEMENTS (MIXING)	$54,000.00	$28,000.00	$82,000.00
NEW BOLTED STEEL GROUND TANK	$1,238,590.00	$934,300.00	$2,172,890.00
TREATMENT			
NO TREATMENT – N/A	$0.00	$0.00	$0.00
DISTRIBUTION SYSTEM			
SINGLE COMBINED DISTRIBUTION W/ 12" MAIN EXTENSION IN LIEU OF SOUTH LOOPING	$7,941,840.00	$4,112,500.00	$12,054,340.00
TOTALS	**$11,324,230.00**	**$6,869,800.00**	**$18,194,030.00**

While total project costs above represent the recommended project as a whole, the immediate project recommendation is to plan, design, and construct the Phase 1 project. Due to consistent annual cost escalation and uncertainties with the current economic climate, it is recommended that the Phase 1 project build in the necessary production and storage capacities estimated for the "build-out" conditions of the entire Planning Area but limit the distribution network extension to the Phase 1 boundary that would serve Service Areas 4 – 8. The Phase 1 Project Cost Estimate is provided in **Table 27** below, with the only change being the decrease in cost of the distribution system.

TABLE 27: ENGINEER'S PHASE 1 OPINION OF PROBABLE COST

PROPOSED PROJECT'S SYSTEM COMPONENT	CONSTRUCTION COSTS	NON-CONSTRUCTION COSTS	TOTAL PROJECT COSTS
WATER SOURCE			
UPGRADE EXISTING LAZY J WELLS	$157,290.00	$86,000.00	$243,290.00
ADDITION OF NEW WELLS - LAZY J WELLFIELD	$1,179,610.00	$1,044,000.00	$2,223,610.00
NEW WELL/PUMP CONTROL HOUSE	$752,900.00	$665,000.00	$1,417,900.00
WATER STORAGE			
EXISTING LAZY J TANK IMPROVEMENTS (MIXING)	$54,000.00	$28,000.00	$82,000.00
NEW BOLTED STEEL GROUND TANK	$1,238,590.00	$934,300.00	$2,172,890.00
TREATMENT			
NO TREATMENT – N/A	$0.00	$0.00	$0.00
DISTRIBUTION SYSTEM			
SINGLE COMBINED DISTRIBUTION W/ 12" MAIN EXTENSION IN LIEU OF SOUTH LOOPING	$5,576,400.00	2,513,000.00	$8,089,400.00
TOTALS	**$8,958,790.00**	**$5,270,300.00**	**$14,229,090.00**

6.6 ANNUAL OPERATING BUDGET

The GCCWSD is a new start-up water and sewer district and currently has no operating water or sewer infrastructure. A new sewer system for the GCCWSD is currently being designed and is tentatively planned for construction as early as 2027, depending on that project's funding. The GCCWSD does currently have an administrative operations budget to cover current costs associated with administration, grant management, legal, and professional consulting services provided by a BSRAD grant. It is estimated that by the time this recommended Phase 1 water project begins, the GCCWSD will have an operating sewer system and will be billing and collecting revenue for its sewer service that will include service fees to cover the administrative operations budget. However, billing and revenues for water and sewer enterprise funds must be maintained and tracked separately to ensure proper coverage of the costs for infrastructure, operations and maintenance of the respective system requirements. For this PER, it's estimated that the current GCCWSD annual operating budget will continue with similar costs and will be split evenly for the water and sewer systems, and these divided costs are itemized in **Table 27** below.

TABLE 28: GCCWSD ESTIMATED ANNUAL OPERATING BUDGET

GCCWSD Operations Budget Accounts	CURRENT FUNDING SOURCE	ACCOUNT INTNEDED USE	ACCOUNT BUDGET
CASH ACCOUNT	GCCWSD	Mics, non-grant funded needs	$25,000
ADMINISTRATIVE OPERATIONS	BSRAD	Annual operations, grant admin., District admin. & outreach, accounting, legal, insurance, etc.	$100,000
TOTAL ANNUAL OPERATING BUDGET			**$125,000.00**

6.6.1 INCOME

As discussed above, the GCCWSD is a start-up water and sewer district with no operating water or sewer infrastructure and thus no income associated with water and/or sewer service. The current administrative operations budget is primarily funded by BSRAD as a grant. The GCCWSD is currently working on a rate study for its sewer system, and this will ultimately inform the rate structure to be applied to the water system. The rate structure is anticipated to follow an increasing block type or tiered structure in which the price per unit of water increases as consumption increases, which will encourage water conservation. In the absence of a current rate structure, this PER will take a simple uniform rate approach to estimate conceptual rates based on the overall annual expenditures estimated for the water service and the annual estimated water consumption demand. These annual expenditures are the sum of the annual operating budget (tabulated above), annual O&M costs, annual debt service reserves, and short-lived asset reserves. These remaining expenditures are described in the following sections followed by an estimated user rate for comparison to prevailing target rates.

6.6.2 ANNUAL O&M COSTS

Annualized operation and maintenance costs were estimated for the system component alternatives in Section 4 with those totals provided for each feasible alternative. Itemized estimates for these O&M costs can be found in **Appendix I**. Those calculations include budget considerations for general labor and parts for component servicing and regular maintenance, energy requirements to power equipment, as well as sampling and testing, which are all specific to those individual infrastructure components. These costs were estimated with input from equipment manufacturer representatives and service contractors, and energy costs were estimated using a rate summary and calculation spreadsheet for "GS1 Secondary Demand" service provided by Northwestern Energy. Additionally, the previous O&M estimates included annualized replacement costs for respective system components for use in generating LCCA assessments. These replacement costs are removed and not included in this Section's compiled O&M costs but have been relocated to annual reserve budget costs discussed in the following Reserves Section.

For this Section's goal to assess the overall project's financial impact and feasibility, additional O&M budget items are considered, with the largest budget item being the cost for certified operators. The new water system will require certified operators to maintain system operations in compliance with Montana laws and regulations. With both water and sewer systems, the GCCWSD will need to employ or contract services of at least two operators with Class 1C wastewater operator and Class 2A/3C water system operator certifications. Additionally, budget items for one service vehicle, education and

licensing, as well as consumables (instruments, bulbs, fuses, personal protective gear, machine lubrications, etc.) are added to the annual O&M budget costs. Annual GCCWSD O&M costs are itemized in **Table 29** below, again with costs associated with operators assumed to be split evenly between water and sewer system budgets.

TABLE 29: ESTIMATED ANNUAL O&M COSTS

O&M Budget Line Item	ITEM BUDGET
SYSTEM OPERATIONS PERSONNEL	$125,000
OPERATIONS VEHICLE	$12,000
ENERGY/POWER	$39,000
CONSUMABLES	$9,000
REPAIRS & MAINTENANCE	$56,047.00
EDUCATION & LICENSING	$4,000
INSPECTIONS, SAMPLING & TESTING	$12,000
ANNUAL O&M TOTAL	**$257,047.00**

6.6.3 DEBT REPAYMENTS

The GCCWSD currently has no loans and no debt repayment responsibilities; however, in order to fund the proposed project, it's conservatively anticipated that half of the total project cost will be financed through Montana's Drinking Water State Revolving Fund (DWSRF) program and/or a combination of other public and private loan programs. The 2025 DWSRF interest rate is 2.5%, but this changes annually. This Section 6 focuses on estimating the total project cost along with annualized costs necessary to both operate the GCCWSD water system as well as fund future replacement and/or improvement projects. A funding strategy is presented in Section 7's Conclusions and Recommendations, which includes both loan and grant programs recommended.

6.6.4 RESERVES

It is critical for any water and sewer District to fund accounts to service its debt(s) as well as to replace or improve its infrastructure assets. As such, the GCCWSD is encouraged to establish separate accounts for these two reserves to track and manage these obligations. Reserves for debt service and an asset/capital improvement reserve associated with this PER's proposed project are described in the following sections.

DEBT SERVICE RESERVE

There are potentially several loan avenues that can be sought for public works project financing; however, the preferred project financing program from this PER is the Drinking Water SRF program managed by DEQ. While the DWSRF has possibilities for 30-year loan terms for disadvantaged communities, it is not anticipated that the GCCWSD would qualify for those terms and therefore would seek the DWSRF 20-year loan term. This program provides a fixed interest rate which is projected to be 2.5% and requires 110% coverage for the debt service.

As mentioned earlier and discussed more in Section 7, this PER estimates debt service assuming half of the total project cost will be financed with these DWSRF terms, while the remaining half is

anticipated to be covered by various grant programs as well as BSRAD Resort Tax grant funding. **Table 30** below shows the estimated debt service calculation for the proposed project.

TABLE 30: ESTIMATED ANNUAL DEBT SERVICE

DEBT SERVICE CALCULATION	
TOTAL PROJECT COST	$14,229,090.00
FINANCED PROJECT COST (½ TOTAL)	$7,114,545.00
LOAN TERMS	20-Years @ 2.5%
ANNUAL DEBT SERVICE	$451,461.61
ANNUAL DEBT SERVICE COVERAGE (110%)	**$496,607.77**

ASSET/CAPITAL IMPROVEMENTS RESERVE

It's recommended that the GCCWSD establish a reserve account to fund the replacement of short-lived assets. For the GCCWSD water, these short-lived assets primarily consist of the system's well pumps. Other assets, such as storage tanks and pipeline networks which have long lifespans relative to mechanical equipment, are typically funded with long-term capital financing. However, unless significant grant funds are acquired to replace those long-term facilities, the cost of that future financing will eventually be taken on, applied to the debt service reserve, and passed onto the user rates. Accounting for the "depreciation" costs of these longer-term assets isn't standard practice, but it is considered prudent for this PER to consider those costs now to understand those affects to user rates and track those rate impacts in comparison to target rates. **Table 31** below itemizes annualized replacement cost of these assets for a projected total of this reserve.

TABLE 31: ANNUALIZED ESTIMATES FOR CAPITAL REPLACEMENTS

Asset Items	ANNUALIZED RESERVE FUNDING
Public Water Supply Well Pumps (4)	$15,200
Ground-Level Storage Tanks (2)	$48,200
Distribution System	$57,400.00
ANNUAL ASSET RESERVE TOTAL	**$120,800.00**

6.6.5 EXISTING PWS ACQUISITION

As discussed in Section 6.1, the existing Lazy J PWS infrastructure will have to be acquired, as it contains the core existing infrastructure proposed for source water production and storage as well as the water main distribution system that would be extended from to serve the GCCWSD system. The prospect of this acquisition has been discussed with the Lazy J Utility Association which has expressed interest in a potential sale and annexation into the GCCWSD with the understanding that their existing infrastructure has value and an acquisition will require negotiations to determine amenable terms. This type of negotiation is beyond the scope of this PER, and financial data relating to the cost of the system's original construction has been obtained. However, a simplified approach to estimating the current value has been conducted to serve as a baseline to begin negotiations.

From available records obtained, the original system was constructed in 2005 and therefore is 20 years old as of the date of this PER. The two existing Lazy J wells and existing ground-level tank would be

critical to commissioning a new GCCWSD system. A portion of the existing transmission main from the tank to the primary Lazy J distribution system would require removal and replacement to upsize this main from an 8" to 10"; therefore, this pipeline infrastructure is not included in this proposed acquisition cost, and the remaining distribution only mains are omitted. However, two existing distribution main extensions are required to reach connection points to connect and expand a GCCWSD distribution system. The existing wells, tank, and distribution mains considered in this baseline valuation are highlighted in **Figure 39** below. In the absence of original construction costs, this PER has estimated the costs of that highlighted infrastructure using today's dollars and converted those costs back to 2005 using the same USPW method used for the LCCA calculations. This converted 2005 value was then depreciated using straight line depreciation over the 20 years this infrastructure has been in service. This method gives a current valuation of approximately $1,359,515 for a baseline to begin negotiations for acquisition.

Funding the cost of this acquisition presents another obstacle in getting rates to "pencil out" for the GCCWSD customers. The cost of this acquisition will be a one-time, fixed fee; however, this cost is not included in the calculation of conceptual water rates below. This PER recommends applying for BSRAD grant funds to pay for this acquisition and is discussed further in Section 7.

6.6.6 CONCEPTUAL WATER USER RATES

As prefaced in Section 6.6.1, a rate study is underway for the GCCWSD sewer system. The resultant rate structure from this study will likely evolve once the water system is running with metered connections, and it's anticipated this rate structure would follow an increasing block type or tiered structure in which the price per unit of water increases as consumption increases, which will encourage water conservation. In the absence of a current rate structure, this PER will take a simple uniform rate approach to estimate conceptual rates based on the overall annual expenditures estimated for the water service and the annual estimated water consumption demand and estimated number of services for the Phase 1 project.

For this PER, the annual operating budget for the water system is divided by the estimated total number of individual water services to establish a conceptual base rate that would apply to all services. The land use for the Phase 1 project area contains a large percentage of property zoned as Commercial & Industrial Mixed Use and is anticipated to develop and/or redevelop with this commercial/industrial consistent with this current zoning, making it challenging to estimate the number of individual services that will connect these properties. Based on future planning efforts from owners of Lazy J, Buck's T-4, and the Quarry PUD along with anticipated redevelopment of the Service Area 4 properties, a "build-out" total of 511 water services is estimated for the Phase 1 project. This results in a rounded-up monthly base charge of $21.00 per service to cover the estimated $125,000 annual operating budget. It should be noted that the future rate structure will likely include increasing base rates determined by service/meter size and/or use (e.g. residential, commercial, or industrial). This will allow a decreased proportion of the required base charge to be allocated to residential units by applying higher base charges to the higher water demand commercial/industrial users which are able to earn revenues from non-residents and tourism, making it more equitable for local residents.

The remaining annual budget items, including O&M, debt reserve and asset replacement/improvement reserve, will be covered by rates related to customer usage. Again, ultimately this will likely be an increasing type block rate, but for this PER, a simpler uniform rate is calculated by dividing the total annual budget by the Phase 1 project area's estimated annual average demand, in thousands of gallons. The proposed Phase 1 project area has an estimated "build-out" ADD of approximately 297,108 GPD, which equates to approximately 9,037 kgal (1,000's of gallons) per month. The annual budget obligation for the Phase 1 project is estimated to be $874,454.77 or approximately $73,000 per month. This results

in a required consumption rate of $8.00 per kgal. As discussed previously, the Phase 1 project area consists of a large percentage of commercial/industrial mixed-use properties, which on average, will have higher water consumption rates than typical residential customers. For this PER's estimation of average water demand for residential use, a factor of 250 gal/day per residential unit was used. This would equate to an approximate average of 7,500 gallons (7.5 kgal) per month of water consumption. Therefore, the typical monthly residential water bill for the Phase 1 project requirements would include a $21 base charge plus $60.00 for consumptive use for a total bill of $81.00.

There is currently no income survey data specific to the GCCWSD Planning Area boundaries. Without this canyon area-specific income survey or establishment of a separate Census Designated Place (CDP), the most recent Big Sky CDP MHI of $94,176 would be used by state funding agencies to determine target rates. While not required, having rates at or above target rates increases funding eligibility. The residential target rates are 1.4% of MHI for water alone or 2.3% of MHI for water and sewer rates together. This equates to $109.88/month for just water or $180.51/month for both water and sewer for residential users. This project's projected residential water bill is below the target rate in relation to the Big Sky CDP MHI, which increases its viability using this MHI metric.

The current rate study, when completed, will provide a recommended overall rate structure as well as the rates needed for sewer service. This study and rate structure will provide a better understanding of the combined system as a whole along with clearer expectations of the revenues needed to operate and sustain the combined central water and sewer District owned by the GCCWSD. Often the biggest challenge for a new start-up utility District is the scale of initial costs to construct infrastructure and resulting affordability of its services to its customers. Generally, user rates can "pencil out" to sustain the long-term operations and maintenance of a District water and sewer system, but the scale of start-up costs requires significant initial capital and/or financing capacity. Therefore, the success of commissioning the GCCWSD's proposed water system will ultimately come down to the scale of grant funds that can be secured to get the Phase 1 infrastructure installed. A proposed funding strategy is presented in the following Section which relies heavily on securing grant funding from BSRAD to gain as much project assistance as possible from non-residents and area tourism.

7.0 CONCLUSIONS AND RECOMMENDATIONS

A central, GCCWSD owned and operated public water system is both technically feasible and financially attainable; however, a strategic funding approach will be necessary to minimize the financial burden associated with the initial construction and commissioning of the new central system, relying heavily of securing as much grant money as possible. As with any start-up system, the initial scale of capital required to provide core infrastructure is significant, especially for a system with a relatively small customer base. However, once the core infrastructure is in place and paid for, the financial requirements necessary to fund the long-term operations and maintenance as well as debt service and capital improvements and replacements reserves becomes sustainable with reasonable target user rates.

The recommendation of this PER is that the GCCWSD Board begin by voting to approve this PER as its planning document. After this, it is recommended that the Board begin taking the necessary sequential steps to fund and construct the Phase 1 water system as described and delineated in Section 6. The critical first step of the GCCWSD water system is to secure adequate water rights volume and diversion rates to serve the system. Therefore, it is recommended that the Board begin discussions as soon as possible with those water right owners identified in the Water Rights Viability Assessment included in **Appendix D**, and upon successful good faith negotiations, begin steps to secure those water rights via a change of use application with the DNRC. A successful change of use application for water rights is anticipated to take as little as 1-2 years and as long as 3 years. Therefore, it's recommended that the Board concurrently begin some level of campaigning to build public support and develop an appropriate funding strategy to target maximum grant funding, which will be the ultimate tool toward getting customer rates to acceptable levels for construction and commissioning of the recommended Phase 1 project.

7.1 PUBLIC SUPPORT

TO BE COMPLETED FOR FINAL PER AFTER FINAL PUBLIC MEETING

7.2 FUNDING STRATEGY

TO BE COMPLETED FOR FINAL PER AFTER FINAL PUBLIC MEETING

7.3 IMPLEMENTATION

TO BE COMPLETED FOR FINAL PER AFTER FINAL PUBLIC MEETING

7.4 BENEFITS OF PROPOSED PROJECT

TO BE COMPLETED FOR FINAL PER AFTER FINAL PUBLIC MEETING

APPENDIX A

ENVIRONMENTAL RESOURCES EXHIBITS

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Soils

N

US Forest Service

US Forest Service

US Forest Service

Montana Fish, Wildlife, and Parks

US Forest Service

Quarry PUD

Lazy J

Buck's T-4

54-2D
2
64-2A
66-1A
87-2D
492F
178F
694F
5
482C
W
608B
4
494F
492E
6
492F
478G
380E
GP
7
64-2A
66-1A
482C
8
280B
679F
492E
9
10
79C
12
13
280B

NRCSSoils_Clip

Soil Description

- 178F: Copenhaver flaggy loam, 35 - 60% slopes
- 280B: Libeg cobbly loam, 0 - 4% slopes
- 380E: Libeg cobbly loam, 15 - 35% slopes, stony
- 478G: Tiban-Castner channery loams, 45 - 70% slopes
- 482C: Philipsburg-Libeg complex, 4 - 8% slopes
- 492E: Yellowmule-Ouselfal complex, 8 - 25% slopes
- 492F: Ouselfal-Yellowmule complex, 35 - 60% slopes
- 494F: Bangtail-Timberlin complex, moist, 35 - 60% slopes, stony
- 54-2D: Typic Argiborolls-Typic Ustochrepts-Rock outcrop complex, steep
- 608B: Beehive-Mooseflat complex, 0 - 4% slopes
- 64-2A: Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains
- 694F: Timberlin-Copenhaver complex, 35 - 60% slopes
- 66-1A: Cryaquolls and Cryaquents, flood plains
- 679F: Bangtail-Copenhaver complex, 35 - 60% slopes
- 79C: Bridger loam, 2 - 8% slopes
- 87-2D,Mollic Cryoboralfs-Typic Cryoboralfs complex, steep
- GP: Gravel pit
- W: Water
- GCCWSD Planning Area
- Water PER Service Areas
- Public Lands

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Soils**	DATE:	**5/24/2024**

This is not a legally recorded map or survey. WGM does not guarantee the accuracy, current status, or completeness of the material contained herein and is not responsible for any misuse / misrepresentation of this information or its derivatives. This graphic representation is for general planning purposes only.

0 0.25 0.5 Miles

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Geology

N

Big Sky Canyon Village

Gallatin Rd

Lone Mountain Trl

Michener Creek Rd

Quarry PUD

Lazy J

Buck's T-4

Riverview Ln

Fortress Rd

Gallatin River

Montana Fish, Wildlife, and Parks

US Forest Service

1 2 3 4 5 6 7 8 9 10 12 13

300SDMS 110ALVM 330MDSN 217KOTN 217TMPL 110SNGR 112SNGR 211FRNR

Potable Use Wells, by Aquifer
- Unspecified
- Labeled

Geology
- *Mqa: Quadrant and Amsden Formations
- J^md: Morrison & Dinwoody Formations, and Ellis Group
- Kco: Cody Formation
- Kf: Frontier Formation
- Kk: Kootenai Formation
- Km: Mowry Shale
- Kmdt: Muddy and Thermopolis Formations
- MDtj: Three Forks and Jefferson Formations
- Mm: Madison Group
- Psh: Shedhorn Formation
- Qal: Alluvium
- Qc: Colluvium
- Qd: Diamicton
- Qgr: Gravel
- Qls: Landslide deposit
- TKga: Gneiss, augen
- Thr: Huckleberry Ridge Tuff
- XAgqf: Gneiss, quartz-feldspar
- _rpi: Red Lion and Pilgrim Formations
- GCCWSD Planning Area
- Water PER Service Areas
- Public Lands

0 0.25 0.5 Miles

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Geology**	DATE:	**5/24/2024**

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GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Hydrography

N

Swan Creek
West Fork Gallatin River
South Fork West Fork Gallatin River
191
Buck Creek
Gallatin River
Taylor Fork Gallatin River
Taylor Creek
Tepee Creek
Sage Creek
Gallatin River

Upper Gallatin Watershed
GCCWSD Planning Area

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Hydrography**	DATE:	**5/24/2024**

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0 5 10 Miles

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Floodplains and Wetlands

N

US Forest Service

US Forest Service

US Forest Service

Montana Fish, Wildlife, and Parks

US Forest Service

Local Government

Quarry PUD

Lazy J

Buck's T-4

2

4

5

6

7

8

9

10

12

13

Michener Creek

Public Water Supply Wells
Other Potable Use Wells

Wetland & Riparian Areas
- Freshwater Emergent Wetland
- Freshwater Forested Wetland
- Freshwater Pond
- Freshwater Scrub-Shrub Wetland
- Riparian Emergent
- Riparian Forested
- Riparian Scrub-Shrub
- River
- A: 100-year flood zone
- Water PER Service Areas
- GCCWSD Planning Area
- Public Lands

0 0.25 0.5 Miles

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www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Floodplains & Wetlands**	DATE:	**5/24/2024**

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GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Zoning

N

US Forest Service

Lone Mountain Trl

Gallatin Rd

2

Big Sky Canyon Village

US Forest Service

Quarry PUD

5

4

Michener Creek Rd

Gallatin Rd

6

7

Lazy J

8

Cummings Ln

Buck's T-4

9

10

Riverview Ln

Gallatin RNer

Montana Fish, Wildlife, and Parks

12

Gallatin Rd

Gallatin River

13

Fortress Rd

US Forest Service

US Forest Service

Rd

Zones

- Unspecified
- Commercial & Industrial Mixed Use
- Community Commercial
- Community Facilities
- Public Lands
- Residential Cluster Single Family (Gross 1 acre minimum/dwelling unit)
- Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit)
- Residential Single Family (11,000sqft/lot)
- Residential Single Family (7,500sqft/lot)
- GCCWSD Planning Area
- Water PER Service Areas
- Public Lands
- Parcels

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Zoning**	DATE:	**5/28/2024**

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0 0.25 0.5 Miles

APPENDIX B

AGENCY CORRESPONDENCE

WGMGROUP
Community Values. Inspired Futures.

June 20, 2024

Department of Environmental Quality
Sent via e-mail: lenglish@mt.gov

Re: Gallatin County Water and Sewer District Preliminary Engineering Report – Agency Input

To whom it may concern,

The Gallatin Canyon County Water and Sewer District (GCCWSD) is currently preparing a preliminary engineering report (PER) for a new centralized public water production and supply system to provide potable water service to the District, recently formed in 2020. In compliance with the Uniform Environmental Checklist, this letter is being sent to request your input on the project, as related to any areas of concern or project requirements that may fall under your Agency's authority.

This project would advance the District's initiative toward achieving common goals of the regional Big Sky community; specifically to promote opportunities for affordable housing, improving and maintaining infrastructure, as well as protecting and enhancing water resources. This project would also bolster the District's effectiveness to reduce human health risk associated with the intermingling of potable drinking wells and septic systems. A centralized public sanitary sewer collection system is currently under design for the District, with potential initial phase construction in 2027.

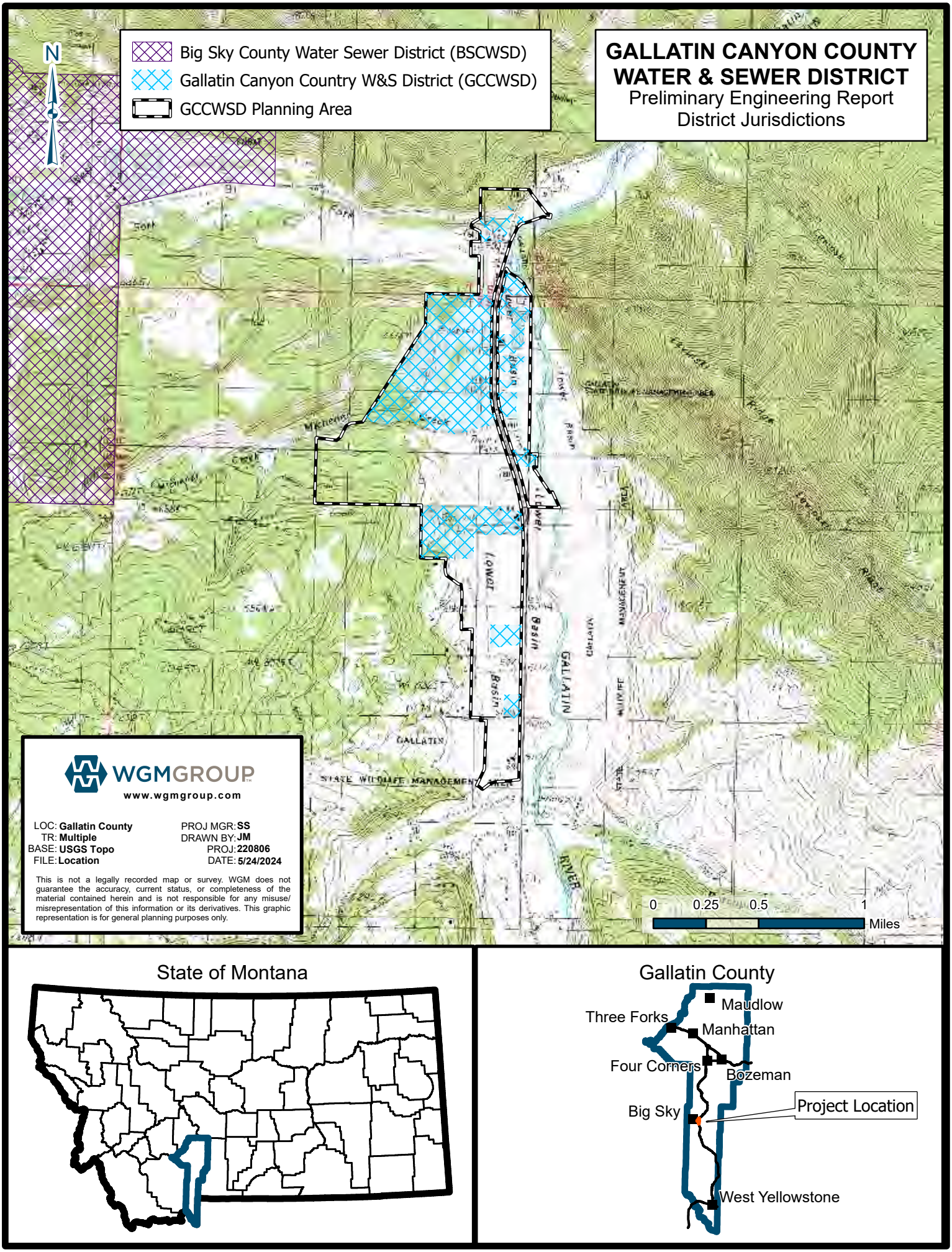
The project would utilize existing high-capacity public wells and storage facilities, generally located in the center of the District, and phase expansion of the existing water distribution network throughout the District as dictated by growth. Additionally, the project would seek to acquire and consolidate existing groundwater rights to meet the flowrates and volumes necessary to adequately serve the District.

A location map and project map are both enclosed for your reference. Additional information can be provided upon request. Please feel free to reach out with any questions or concerns. Your feedback is appreciated.

Sincerely,
WGM Group, Inc.

Shane Strong, PE
Senior Project Engineer

Encl.


Big Sky County Water Sewer District (BSCWSD)
Gallatin Canyon Country W&S District (GCCWSD)
GCCWSD Planning Area
N
GALLATIN CANYON COUNTY WATER & SEWER DISTRICT
Preliminary Engineering Report
District Jurisdictions
WGMGROUP
www.wgmgroup.com
LOC: Gallatin County
TR: Multiple
BASE: USGS Topo
FILE: Location
PROJ MGR: SS
DRAWN BY: JM
PROJ: 220806
DATE: 5/24/2024
This is not a legally recorded map or survey. WGM does not guarantee the accuracy, current status, or completeness of the material contained herein and is not responsible for any misuse/ misrepresentation of this information or its derivatives. This graphic representation is for general planning purposes only.
0
0.25
0.5
1
Miles
State of Montana
Gallatin County
Maudlow
Three Forks
Manhattan
Four Corners
Bozeman
Big Sky
Project Location
West Yellowstone

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Preliminary Central Water Distribution

N

HWY 64 / Lone Mountain Trl

Gallatin Rd

2

Big Sky
Canyon Village

5

4

HWY 191 / Gallatin Rd

Michener Creek Rd

6

530,000 Gal

7

8

Cummings Ln

9

10

Riverview Ln

Gallatin River

12

13

Fortress Rd

Gallatin Rd

Gallatin River

Preliminary Proposed Distribution System
Exisitng Water Distribution Systems
Reuse Lazy J PWS's Wells
Reuse Lazy J PWS's Bolted Steel Storage Tanks (at grade)
GCCWSD Planning Area
Water PER Service Areas
Planned Quarry Development
Parcels

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www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Central System Sketch**	DATE:	**6/14/2024**

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0 0.25 0.5 Miles

Rd

Brandy Sularz

Subject: FW: Gallatin County Water & Sewer District

From: Smitham, Jen <JSmitham@mt.gov>
Sent: Thursday, June 20, 2024 2:10 PM
To: WGM <WGM@wgmgroup.com>
Subject: Gallatin County Water & Sewer District

[EXTERNAL EMAIL] Only open attachments or click on links from senders you trust.

Hello,

We have received your request for comment. With no indication of a due date listed, July 22 has been set for a due date if comment is produced.
If there is any problem with this date, please let me know.

Thank you,

Jen Smitham |*R3*
Public comment Coordinator
Montana Fish, Wildlife & Parks
Office: (406) 495-3262 |



Montana FWP | Montana Outdoors Magazine



DEQ
Montana Department of Environmental Quality

July 15, 2024

Shane Strong, P.E.
WGM Group
109 East Main St., Suite B
Bozeman, MT 59715

Re: Request for Comments on the Gallatin County Water and Sewer District Centralized Public Water Production and Supply System

Dear Shane:

Thank you for the request for comments on the above proposed water system improvements project.

Since the Department of Environmental Quality (DEQ) will be reviewing environmental documents, the preliminary engineering report, and plans and specifications for the proposed project when they are submitted; those reviews will serve as DEQ's comments. The reviews will be performed by either the Public Water Supply Program, or if DEQ funding is also proposed, by the Drinking Water State Revolving Fund Program (SRF). Both of these programs are in DEQ's Engineering Bureau. Please keep in mind that other DEQ permits associated with construction of the project may be required.

If you have any questions regarding DEQ's participation, please contact Jackie Kuhl in the Public Water Supply Program at jackie.kuhl@mt.gov, or me at (406) 444-6824 or jake.goettle@mt.gov.

Sincerely,

Jake Goettle, P.E.
Drinking Water SRF Section Supervisor
DEQ- Engineering Bureau

Cc: Jackie Kuhl, PE, PWSP

July 3, 2024

Shane Strong, P.E.
WGM Group
109 East Main St., Suite B
Bozeman, MT 59715

Re: Request for Comments on the Gallatin County Water and Sewer District Centralized Public Water Production and Supply System

Dear Shane:

Thank you for the request for comments on the above proposed water system improvements project.

Since the Department of Environmental Quality (DEQ) will be reviewing environmental documents, the preliminary engineering report, and plans and specifications for the proposed project when they are submitted; those reviews will serve as DEQ's comments. The reviews will be performed by either the Public Water Supply Program, or if DEQ funding is also proposed, by the Drinking Water State Revolving Fund Program. Please also keep in mind that other DEQ permits associated with construction of the project may be required.

If you have any questions regarding DEQ's participation, please contact Jackie Kuhl in the Public Water Supply Program (Jackie.Kuhl@mt.gov), or me (406.444.6824 or Jake.Goettle@mt.gov).

Sincerely,

Jake Goettle, P.E.
Drinking Water SRF Section Supervisor
DEQ – Engineering Bureau

c. Jackie Kuhl, P.E., PWSP

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, OMAHA DISTRICT
MONTANA REGULATORY OFFICE
100 NEILL AVENUE
HELENA, MONTANA 59601-3329

June 27, 2024

SUBJECT: Gallatin Canyon County Water/Sewer - water system - Gallatin River (Gallatin County), File No. **NWO-2024-01054-MT**

Brandy Sularz
WGM Group
1111 E Broadway
Missoula, Montana 59802

Dear Ms. Sularz:

This letter is in response to correspondence we received requesting comments or permitting information regarding the above-referenced project. Specifically, the project involves a new centralized public water production and supply system. The project is located on or near Gallatin River, at Latitude 45.257°, Longitude -111.2563°, in Section 5, Township 7 S, Range 4 E , Gallatin County, Montana.

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, rechannelization, or any other modification of a navigable water of the United States,

[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).

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). Other 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-2024-01054-MT** 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

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.

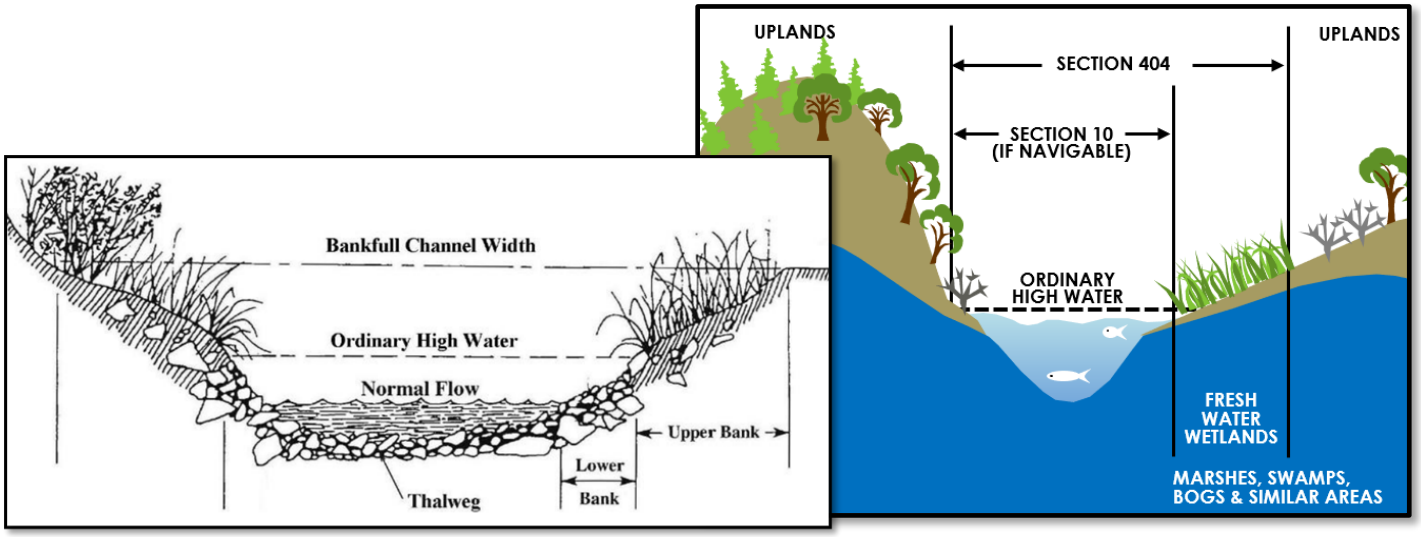
U.S. Army Corps of Engineers – Omaha District, Montana
Additional Information and Resources for Permitting

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. Other 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:

Commander (dpw)
13th Coast Guard District
915 2nd Avenue, Room 3510
Seattle, WA. 98174-1067
Attn: Waterways Management Branch
(206) 220-7282 | D13-SMB-D13-DPW@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: https://dnrc.mt.gov/Licenses-and-Permits/Stream-Permitting/

SHPO Project #:

File Search Request Form

Contact Name:	Greta Brom-Palkowski
Organization:	WGM Group Inc.
Address:	1111 East Broadway Street
City/State/Zip:	Missoula, MT 59802
Telephone:	406-728-4611
Email:	gbrompalkowski@wgmgroup.coom

MONTANA HISTORICAL SOCIETY
State Historic Preservation Office
225 North Roberts Street
PO Box 201201
Helena, MT 59620-1201

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

Project Name:	Gallatin Canyon County Water & Sewer District Central Water Distribution
Describe the proposed project:	The proposed project will install a centrailied water system with the Gallatin Canyon County Water & Sewer District. A file search request was previously submitted in 2021 for a corresponding project to make improvements to the sewer treatment infrastructure in the area (SHPO Project # 2021072101).

Land Use:	Private/Commercial/Highway ROW	**County:**	**Gallatin**
Agency Involved: (Private,FWP,BLM)	Private/County/Gallatin County Water & Sewer District	**Land Ownership:**	**Mixed Private/Public**

Project Area Location Information

Township(N/S)	Range (E/W)	Section(s)
6S	4E	32,33
7S	4E	4,5,8, 17

File Search Fee Structure

$35 / section

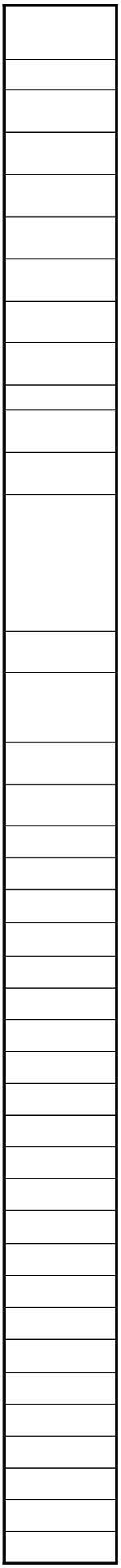
Please complete this form and attach a map showing the proposed project location. Feel free to attach additional project information if available.

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:	1
Total amount to be paid to SHPO:	**$35.00**



STATE HISTORIC PRESERVATION OFFICE Montana Cultural Resource Database

Township, Range, Section Report

Report Date:6/20/2024

Site #	Twp	Rng	Sec	Qs	Site Type 1	Site Type 2	Time Period	Owner	NR Status
24GA0318	6S	4E	32	SE	Precontact Lithic Material Concentration		Prehistoric Middle Period	No Data	Undetermined*
24GA0319	7S	4E	17		Precontact Lithic Material Concentration		No Data	No Data	Undetermined*
24GA0322	7S	4E	17		Precontact Lithic Material Concentration		No Data	No Data	Undetermined*
24GA0454	6S	4E	33	NW	Precontact Lithic Material Concentration		No Indication of Time	Forest Service	Undetermined*
24GA0637	6S	4E	32	SE	Historic Recreation/Tourism		1900-1909	Private	Ineligible
24GA0689	6S	4E	32	SE	Precontact Lithic Material Concentration		Prehistoric Late Period	Private	Undetermined*
24GA1001	6S	4E	32	SW	Precontact Lithic Material Concentration		No Data	Private	Undetermined*
24GA1072	7S	4E	17	NE	Precontact Lithic Material Concentration		No Indication of Time	USFWS	Ineligible
24GA1097	6S	4E	33	NE	Historic Mining		Historic More Than One Decade	State Owned	Undetermined*
24GA1130	6S	4E	32	SE	Precontact Lithic Material Concentration		Prehistoric More Than One Period	Private	Undetermined*
24GA1143	7S	4E	5		Precontact Lithic Material Concentration		Prehistoric More Than One Period	Private	Undetermined*
24GA1143	6S	4E	32		Precontact Lithic Material Concentration		Prehistoric More Than One Period	Private	Undetermined*
24GA2001	7S	4E	5	NE	Historic Mining		Historic Period	Private	Ineligible
24GA2002	7S	4E	5	NE	Historic Residence		Historic Period	Private	Ineligible
24GA2003	7S	4E	5	Comb	Historic Irrigation System		Historic Period	Private	Ineligible

Township:6 S Range:4 E Section: 32

LAHREN LARRY A.

1/1/0001 REPORT ON PRELIMINARY ARCHAEOLOGICAL INVESTIGATIONS IN THE WEST FORK OF THE GALLATIN CANYON

Report Document Number: GA 1 15189 Agency Document Number:

Township:6 S Range:4 E Section: 32

NAPTON L. KYLE

1/1/1966 CANYON AND VALLEY: PRELIMINARY ARCHAEOLOGICAL SURVEY IN THE GALLATIN AREA

Report Document Number: ZZ 6 15683 Agency Document Number: MA THESIS

Township:7 S Range:4 E Section: 17

NAPTON L. KYLE

1/1/1966 CANYON AND VALLEY: PRELIMINARY ARCHAEOLOGICAL SURVEY IN THE GALLATIN AREA

Report Document Number: ZZ 6 15683 Agency Document Number: MA THESIS

Township:6 S Range:4 E Section: 32

O ' BRIEN LYNN, ET AL.

1/1/1972 REPORT OF THE 1972 HIGHWAY ARCHAEOLOGICAL RECONNAISSANCE SURVEY

Report Document Number: ZZ 4 15940 Agency Document Number:

Township:7 S Range:4 E Section: 17

FERGUSON DAVID M.

8/18/1994 CLASS III CRI WITHIN GALLATIN WILDLIFE MANAGEMENT AREA

Report Document Number: GA 6 16132 Agency Document Number:

Township:7 S Range:4 E Section: 17

FERGUSON DAVID M.

11/15/1994 TESTING AT 24GA1072

Report Document Number: GA 6 16624 Agency Document Number:

Township:6 S Range:4 E Section: 32

AXLINE JON A., ET AL.

9/5/1996 BICYCLE/PEDESTRIANS TRAIL - BIG SKY

Report Document Number: GA 4 18421 Agency Document Number: STPE 16(27)

Township:7 S Range:4 E Section: 5

AXLINE JON A., ET AL.

9/5/1996 BICYCLE/PEDESTRIANS TRAIL - BIG SKY

Report Document Number: GA 4 18421 Agency Document Number: STPE 16(27)

Township:7 S Range:4 E Section: 8

AXLINE JON A., ET AL.

9/5/1996 BICYCLE/PEDESTRIANS TRAIL - BIG SKY

Report Document Number: GA 4 18421 Agency Document Number: STPE 16(27)

Township:7 S Range:4 E Section: 17

AXLINE JON A., ET AL.

9/5/1996 BICYCLE/PEDESTRIANS TRAIL - BIG SKY

Report Document Number: GA 4 18421 Agency Document Number: STPE 16(27)

Township:6 S Range:4 E Section: 32

ALLEN WALTER E.

3/1/2002 CULTURAL RESOURCE INVENTORY OF THE ANNUAL REPORT FOR GALLATIN NATIONAL FOREST, FY 2001

Report Document Number: ZZ 1 25268 Agency Document Number:

Township:6 S Range:4 E Section: 33

ALLEN WALTER E.

3/1/2002 CULTURAL RESOURCE INVENTORY OF THE ANNUAL REPORT FOR GALLATIN NATIONAL FOREST, FY 2001

Report Document Number: ZZ 1 25268 Agency Document Number:

Township:6 S Range:4 E Section: 32

ALLEN WALTER E. AND TOM BALLARD

3/7/2006 GALLATIN NATIONAL FOREST HERITAGE PROGRAM ANNUAL REPORT TO THE MONTANA STATE HISTORIC PRESERVATION OFFICE

Report Document Number: ZZ 1 29452 Agency Document Number:

Township:6 S Range:4 E Section: 33

ALLEN WALTER E. AND TOM BALLARD

3/7/2006 GALLATIN NATIONAL FOREST HERITAGE PROGRAM ANNUAL REPORT TO THE MONTANA STATE HISTORIC PRESERVATION OFFICE

Report Document Number: ZZ 1 29452 Agency Document Number:

Township:6 S Range:4 E Section: 33

ALLEN WALTER E. AND TOM BALLARD

2/27/2009 GALLATIN NATIONAL FOREST HERITAGE PROGRAM ANNUAL REPORT TO THE MONTANA STATE HISTORIC PRESERVATION 2008

Report Document Number: ZZ 1 30958 Agency Document Number:

Township:6 S Range:4 E Section: 33

ALLEN WALTER E.

11/2/2007 LEVINSKY ABANDONED MINE CLOSURE

Report Document Number: GA 1 34999 Agency Document Number: 2008-GA-6-01

Township:7 S Range:4 E Section: 5

TROENDLE KIMBERLY AND JENNIFER B. LEE

8/27/2020 A CLASS III CULTURAL RESOURCE INVENTORY FOR BIG SKY ROCK, LLC'S THE QUARRY PUD IN GALLATIN COUNTY, MONTANA.

Report Document Number: GA 6 40566 Agency Document Number:

Township:7 S Range:4 E Section: 5

MAURO NIKKI

12/10/2020 BIG SKY (MT-06203) TOWER SITE, GALLATIN COUNTY, MONTANA: CLASS III CULTURAL RESOURCES SURVEY.

Report Document Number: GA 6 40721 Agency Document Number: MT-06203

Township:6 S Range:4 E Section: 32

RUDOLPH JAMES L.

1/7/2013 JACK RABBIT-BIG SKY MEADOW VILLAGE 161 KV TRANSMISSION LINE UPGRADE PROJECT, GALLATIN COUNTY, MONTANA ARCHAEOLOGICAL SURVEY - DRAFT REPORT.

Report Document Number: GA 1 41633 Agency Document Number:

Township:6 S Range:4 E Section: 33

RUDOLPH JAMES L.

1/7/2013 JACK RABBIT-BIG SKY MEADOW VILLAGE 161 KV TRANSMISSION LINE UPGRADE PROJECT, GALLATIN COUNTY, MONTANA ARCHAEOLOGICAL SURVEY - DRAFT REPORT.

Report Document Number: GA 1 41633 Agency Document Number:

Brandy Sularz

Subject: FW: Gallatin Canyon County Water/Sewer - water system - Gallatin River (Gallatin County), File No. NWO-2024-01054-MT

Attachments: USACE.pdf; NWO-2024-01054-MT_RFC_Letter-&-Attachment.rtf_06_27_2024_20_18_27.pdf

From: Montana.Reg <Montana.Reg@usace.army.mil>
Sent: Thursday, June 27, 2024 2:34 PM
To: Brandy Sularz <bsularz@wgmgroup.com>
Cc: Montana.Reg <Montana.Reg@usace.army.mil>
Subject: Gallatin Canyon County Water/Sewer - water system - Gallatin River (Gallatin County), File No. NWO-2024-01054-MT

[EXTERNAL EMAIL] Only open attachments or click on links from senders you trust.

Brandy,

Please see the attached response to your request.

Please continue to send these requests to our team email at Montana.Reg@usace.army.mil (no need to send a hard copy). Our website (https://www.nwo.usace.army.mil/Missions/Regulatory-Program/Montana/) has information on the process for submitting requests digitally and additional options for sending large files.

Please note our physical address has changed. We are now at:

Montana Regulatory Program
U.S. Army Corps of Engineers
100 Neill Avenue
Helena, MT 59601-3329

Thank you,
Montana Regulatory Team
Montana.Reg@usace.army.mil
(406) 441-1375

****

2021 Nationwide Permits: Effective as of February 25, 2022, https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Nationwide-Permits/

Electronic Submission Requirements: https://www.nwo.usace.army.mil/Missions/Regulatory-Program/Montana/

Regulatory Customer Service Survey: 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/
****

Brandy Sularz

From: Mcclory, Adam - FS, ID <adam.mcclory@usda.gov>
Sent: Thursday, June 27, 2024 1:13 PM
To: Brandy Sularz
Cc: Shane Strong; Mcclory, Adam - FS, ID; Nicolli, Melissa - FS, MT
Subject: RE: [External Email]Gallatin County Water and Sewer District Preliminary Engineering Report – Agency Input

Follow Up Flag: Follow up
Flag Status: Flagged

[EXTERNAL EMAIL] Only open attachments or click on links from senders you trust.

Hi Brandy –

Thank you for sending along this letter requesting agency input. We are glad to be part of the discussion for this potential project that may formally request use of National Forest System (NFS) lands.

While it is helpful to see the boundaries of the BSCWSD and GCCWSD, as well as a bigger scale understanding of the GCCWSD boundary, there was not any additional information about the potential request for use of NFS lands. However, through Shane Strong, we had just recently been provided with some preliminary thoughts on possible use of NFS lands directly to the south of Highway 64.

We met on-site with Shane Strong as well as a representative of AE2S to discuss the project earlier this month. During the meeting, Melissa and I explained the requirement to ensure that all non-NFS options for the project were exhausted prior to requesting use of National Forest. Additionally, since the meeting, we have conducted some initial work to understand if the potential project would work given the requirements of our Forest Plan (which in sum, guides our decision making throughout the Custer Gallatin National Forest). We have forwarded these initial thoughts to Shane.

We will continue to analyze the potential project so that you can receive more formal input from us. Do you have a timeline by when you would like to get the information?

Thanks,
Adam

Adam McClory
Realty Specialist, Land Uses Program Manager
Custer Gallatin National Forest
c: 208-301-8224

adam.mcclory@usda.gov
10 East Babcock
Bozeman, MT 59715
www.fs.fed.us



Caring for the land and serving people

From: Brandy Sularz <bsularz@wgmgroup.com>
Sent: Thursday, June 20, 2024 9:59 AM
To: Mcclory, Adam - FS, ID <adam.mcclory@usda.gov>
Subject: [External Email]Gallatin County Water and Sewer District Preliminary Engineering Report – Agency Input

You don't often get email from bsularz@wgmgroup.com. Learn why this is important

[External Email]
If this message comes from an **unexpected sender** or references a **vague/unexpected topic;**
Use caution before clicking links or opening attachments.
Please send any concerns or suspicious messages to: Spam.Abuse@usda.gov

Hello,

The Gallatin Canyon County Water and Sewer District (GCCWSD) is currently preparing a preliminary engineering report (PER) for a new centralized public water production and supply system to provide potable water service to the District, recently formed in 2020. In compliance with the Uniform Environmental Checklist, this letter is being sent to request your input on the project, as related to any areas of concern or project requirements that may fall under your Agency's authority.

Please review the attached project letter and information and let us know if you have any concerns about the environmental resources present that may be potentially impacted or specific measures for mitigating those impacts.

Thank you.

Brandy Sularz
Proposal and Marketing Coordinator

M: 406-493-4073 O: 406-728-4611
1111 East Broadway
Missoula, Montana 59802
www.wgmgroup.com

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APPENDIX C

ENVIRONMENTAL CHECKLIST & DRAFT BASELINE EA FOR CANYON SEWER

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

Conservation and Resource Development Division
Environmental Checklist Instructions

Purpose of This Document:

All applicants must consider the potential environmental impacts of their projects. Consideration of these impacts on the location, design, or construction actions may help avoid expensive costs. A project will not be eligible for funding if it results in significant environmental degradation.

DNRC requires compliance with the Montana Environmental Policy Act (MEPA) per state law and associated DNRC Administrative Rules (ARM 36.2.523). MEPA requires state agencies to prepare a detailed statement on any project, program, or activity directly undertaken by the agency; a project or activity supported through a contract, grant, subsidy, loan, or other form of funding assistance from the agency; and a project or activity involving the issuance of a lease, permit, license, certificate, or other entitlement for use or permission by the agency (MCA Title 75, Chapter 1). Thus, all project applications will be subject to MEPA review.

What Does This Mean for Applicants?

- □ All applicants must complete the Environmental Checklist in its entirety and provide sufficient documentation on public participation.
- □ Public participation, or scoping, of the project must include stakeholder, landowner, and community engagement. These efforts can be in the form of documented public meetings (e.g., meeting minutes, pdf presentations) or letters of support.
    - The public meeting must be properly noticed (advertised) and the public must be provided with an opportunity at the meeting to comment on the project.
    - Minutes of the meeting should reflect what was discussed about the project, including all comments received from the public.
    - Letters of support must be included from any identified or interested stakeholders.
- □ Agency Comment Letters (see instructions below)
- □ Please submit these items with your application.
- □ Provide Affidavit of Publication or Meeting Minutes for the public comment period notice on the draft EA

How Will DNRC Use the Information Provided?

The information provided within the Environmental Checklist will be subject to a MEPA review by DNRC. If this review should result in an Environmental Assessment, please be aware that DNRC will draft the Environmental Assessment. The drafted Environmental Assessment decision will be posted for a public comment period of up to 30 days dependent on the level of environmental impact.

When the draft EA is posted, we require the project proponent to post the notice in either one local newspaper outlet in the legal advertising section or provide the notice during a publicly held meeting. The applicant must then provide the affidavit of publication if posted in the newspaper or meeting minutes if discussed in a public meeting. Please note this public comment period does not suffice for the public participation component mentioned above. The MEPA document will then require a final decision by DNRC before funds are awarded.

It is also important to note for projects with no environmental impacts, or those that do not lead directly to construction or any other sort of environmental degradation, will not be subject to an environmental assessment and the checklist/public participation does not need to be completed. Examples of these sorts of activities include, but are not limited to, development of a PER (professional engineering report), planning, and education/informational outreach. Please let us know if there are additional questions on what other projects may fall under this category.

Instructions:

Complete the Environmental Checklist on the following pages after the instructions below. DNRC retains the ultimate decision-making authority on all MEPA decisions. If DNRC determines this section to be incomplete, additional information will be required before consideration for funding.

Example			
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:* *Preferred Alternative Environmental Narrative:*

1. **Impact Code:** In the first column, identify the impact that the preferred alternative will have on each resource (e.g. 1. Soil Suitability, Topographic and/or Geologic Constraints) in the project area. Select from the following impact codes:
   - *No Impact*: No impact to the resource is anticipated or this is not applicable to this project.
   - *Beneficial*: Potentially beneficial impact to the resource.
   - *Adverse*: Potentially adverse impact to the resource.

   Please note that a resource may have more than one impact. Identify all possible impacts to the resource in the space provided. For example, the preferred alternative may have a short-term direct negative impact and a long-term direct and indirect positive impact on the resource. Check all boxes that apply and use the space provided in the final column "Explanation of Impact to Resource" to explain.

Example			
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:* *Preferred Alternative Environmental Narrative:*

2. **Impact Type:** In the second column, identify the type(s) of impact to the resource from the preferred alternative. (Impacts may be direct, indirect or cumulative).
    - *Direct impacts*: Occur at the same time and place as the proposed project.
    - *Indirect or secondary impacts*: Occur at a different location or later time than the proposed project.
    - *Cumulative impacts*: Collective impacts on the environment when considered in conjunction with other past, present, and future actions related to the proposed project. Cumulative impact analysis includes a review of all state and nonstate activities that have occurred, are occurring, or may occur that have impacted or may impact the same resource as the proposed project.

    Just as above, please note that a resource may have more than one impact. Identify all possible impacts to the resource in the space provided. For example, the preferred alternative may have a short-term direct negative impact and a long-term direct and indirect positive impact on the resource. Check all boxes that apply and use the space provided in the final column "Explanation of Impact to Resource" to explain.

Example			
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:* *Preferred Alternative Environmental Narrative:*

3. **Permits/Mitigation Required:** In the third column, please select if a permit and/or mitigation is required for the project (e.g., 310, USACE Section 404 Nationwide).
    - Please make sure to include which permits (if any) are required for the particular resource and what mitigation techniques will be used if impacts are to occur.

Example			
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: Click or tap here to enter text. Preferred Alternative Environmental Narrative: Click or tap here to enter text.

4. **Explanation of Impact to Resource:** In the final column, use the space provided on the Environmental Checklist to summarize the following information:
    - ***Current Conditions***
        - Describe the current environmental resources of the affected area including the impact of no action. Your description of the current natural resources will provide a baseline to compare all alternatives and their associated environmental impacts.
    - ***Preferred Alternative Environmental Narrative:***
        - Describe the impact of the preferred alternative or ***indicate why there is no impact*** from the project.
        - Identify any reasonable cumulative impacts that may result from implementing the preferred alternative. Cumulative impacts are the collective impacts on the environment when considered in conjunction with other past, present, and future actions related to the proposed project.
        - If a potentially adverse impact is identified for the preferred alternative, the applicant must provide the following:
            - An analysis of the severity, duration, extent, and frequency of the impact. Please specify and describe the following:
                - Severity: negligible, minor, or major.
                - Duration: short-term or long-term.
                - Extent: local, regional, or statewide.
                - Frequency: non-recurring or recurring.
            - An explanation of short- and/or long-term measures to mitigate the impact with a discussion on the effects of those mitigative measures on the proposed project.
        - Identify any required permits.

5. **Additional Information:** Underneath the table the following information must be provided:
    - Cultural Survey Acknowledgement
    - Sources of Information: Identify all sources consulted for the completion of the Environmental Checklist. Sources may include studies, plans, documents, or the persons, organizations, or agencies contacted for assistance.

Certain sections of this Environmental Checklist require specialized knowledge. Please contact the following agencies and attach comments provided by those agencies to your application. Below are contacts for certain sections that require additional review by other agencies:

- *Physical Environment,* ***Section #5*** **– Surface Water Quality** – Montana Department of Environmental Quality, (406) 444 - 3080.
- *Physical Environment,* ***Section #6*** **– Floodplains and Floodplain Management** – Contact the Local Floodplain Administrator for your County and/or Community

(http://dnrc.mt.gov/divisions/water/operations/floodplain-management/contacts/20210924FPAs2021.1.pdf) or visit the Department of Natural Resources Water Resources Division, (406) 444 – 0860, http://dnrc.mt.gov/divisions/water/operations/floodplain-management.

- *Physical Environment,* ***Section #7*** **– Wetlands** – U.S. Department of the Army Corps of Engineers, (406) 441 - 1375 or montana.reg@usace.army.mil.
- *Physical Environment,* ***Section #9*** **– Vegetation and Wildlife Species and Habitats** – Montana Fish, Wildlife and Parks, Wildlife Office (406) 444 - 2612 or find your Regional Office at https://fwp.mt.gov/aboutfwp/contact-us.
- *Physical Environment,* ***Section #10*** **– Unique, Endangered, Fragile or Limited Environmental Resources** – U.S. Fish and Wildlife Service for consultation on potential impacts to endangered or limited plants, fish, or other wildlife, (406) 449 - 5225.
- *Human Environment,* ***Section #4*** **– Historic Properties, Cultural or Archaeological Resources –** Montana State Historic Preservation Office (SHPO), (406) 444 - 7767 or dmurdo@mt.gov.

For assistance in preparing the Environmental Checklist, contact DNRC grant manager listed on grant application.

Environmental Checklist

Applicant Name: Gallatin Canyon County Water and Sewer District

Project Title: Gallatin Canyon Water PER

Environmental Checklist Prepared by: On: 12/28/2023

Greta Brom-Palkowski	WGM Group, Inc.
Name of Person 1	Organization
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Phone Number	Email
Name of Person 2	Organization
Phone Number	Email

Click or tap here to enter text.

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

Physical Environment			
Impact Code	**Impact Type**	**Permits/ Mitigation Required?**	**Explanation of Impact to Resource**
1. Soil Suitability, Topographic and/or Geologic Constraints (example: soil lump, steep slopes, subsidence, seismic activity)			
☒ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The soils in the area are primarily loam and cobbly loam. In general, the topography of the area slopes towards the Gallatin River. The geology and bedrock layers in the Big Sky area include alluvium of modern channels and floodplains (Qual), colluvium (Qc), the Madison Group (Mm),

			Quadrant Sandstone (PMqa), the Morrison Formation (JTmd), the Kootenai Formation (Kk), Thermopolis Shale (Kmdt), Muddy Sandstone (Kmdt – same as Thermopolis), Mowry Shale (Km), Frontier Formation (Kf), and Cody Formation (Kco) (Baldwin 1996).There are no identified topographical or geographical constraints in the proposed project's area of disturbance. See the attached Natural Resources Conservation Service (NRCS) Soil report and geology exhibit from the Preliminary Engineering Report (PER) developed for the project in **Appendix A**. Preferred Alternative Environmental Narrative: Soils will be disturbed during construction activities. Portions of the project area may experience high groundwater, especially east of Highway 191 and soils are anticipated to be inundated with water during this time. Construction will need to be scheduled around this time or dewatering employed. Central water infrastructure may need to be constructed in high groundwater. The proposed project is not anticipated to impact the overall soil suitability or topographic/geologic constraints in the project area.
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 Department of Environmental Quality (DEQ) "Discovering DEQ's Data," there are no known hazardous waste sites in the Canyon Water Planning Area. There are seven underground gas or diesel storage tanks within this area, located at two different facilities, Exxon and Conoco. There are power lines in the area. An exhibit of existing hazardous facilities from PER is located in **Appendix A**. Preferred Alternative Environmental Narrative: The proposed project will have no impact on any existing hazardous facilities. Likewise, existing hazardous facilities are not anticipated to impact project activities. The proposed project will not add any additional hazardous facilities.
3. Surrounding Air Quality (example: dust, odors, emissions)			
☐ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☒Mitigation ☐ NA	Current Conditions: According to the Environmental Protection Agency (EPA), the proposed project is not located in a nonattainment area for air quality. There are no known existing issues with surrounding air quality in the Canyon Water Planning Area; however, the area is classified as an open burning elevation restriction area. Burning restrictions may be in place from September 1 through November 30 depending on the elevation of a burn. Preferred Alternative Environmental Narrative: Minor short term impacts to air quality are anticipated during construction activities related to the use of heavy equipment. Impacts will be temporary, contained to the immediate project area, and non-recurring. The proposed project is not expected to impact the overall air quality of Gallatin County. As required by the contractors' Stormwater Pollution Prevention Plan (SPPP), contractors will use appropriate dust suppression measures to mitigate air quality impact from dust particulates.
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: Groundwater resources in the aquifers in the Canyon Water Planning Area originate from the Madison formation. Baldwin (1997) determined that potential aquifers exist in all of the bedrock units in the areas due to extensive fracturing, with yields ranging on average from 1 to 30 gallons per minute (gpm). More specifically, the Madison formation and aquifer produces extremely high yields to not only groundwater wells in the area, but to springs as well. Made up of karstified limestone, the formation contains interconnected solution channels and large voids. Geologic faults and structures in the formation provide high water yield potential through secondary flow pathways (Baldwin 1997). The Gallatin River and canyon aquifers are hydraulically connected. Currently, groundwater in the Canyon Water Planning Area generally follows the slope of the topography toward the Gallatin River and is a part of the larger Gallatin Watershed, flowing below several septic systems. All water supplies for human use in the area currently come from groundwater. Although many drinking water wells in the area that draw from aquifers are deep, review of Groundwater Information Center (GWIC) data in the area indicates that some drinking water wells are shallow and draw from the same aquifer that the septic systems discharge to, and therefore are more susceptible to septic nitrate contamination. Rapid development and climate change are also increasing pressure on water availability in the planning area. Preferred Alternative Environmental Narrative: The proposed project is anticipated to improve groundwater resources by consolidating existing privately owned infrastructure and installing a centralized water service which will increase water conservation, sustainability and efficiency. In addition, removing untreated, shallow potable wells is anticipated to reduce the public risk and exposure of potable water sources with potential contamination from wastewater effluent.
5. Surface Water/Water Quality, Quantity and Distribution (example: streams, lakes, storm runoff, irrigation systems, canals)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐Mitigation ☐ NA	Current Conditions: Surface waters in the proposed project area are part of the Gallatin River Watershed. Primary streams in the Canyon Water Planning Area are the Gallatin River and West Fork Gallatin River. Currently, the Gallatin River does not have a nutrient total maximum daily load (TMDL), however, it is estimated that wastewater from existing septic systems causes elevated nitrogen concentrations in the river, which has started to experience algal blooms. Three waterbodies in the West Fork Watershed are currently deemed as “impaired waterbodies” under the Clean Water Act’s 303(d) list and have TMDLs for Nitrate+Nitrite and Total Nitrogen (TN). These are the Middle Fork of the West Fork, the South Fork of the West Fork, and the West Fork of the Gallatin River. Preferred Alternative Environmental Narrative: No impacts to surface water during construction activities are anticipated. Construction equipment will not access waterways within the high-water mark or enter any wetland areas. The proposed centralized water source will be required to meet DEQ and

			EPA standards for public water systems and is not anticipated to adversely impact surface water or water quality. The proposed project is anticipated to beneficially impact surface water by consolidating existing privately owned infrastructure and installing a centralized water service which will increase water conservation and efficiency by reducing the number of wells drawing from the area's aquifers, allowing more groundwater inflow to the surface. This may help make the Gallatin River and its tributaries more resilient to the temperature and precipitation variability of climate change and drought.
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: There are Zone A regulatory floodplains along the Gallatin River, east of Hwy 191, and along the West Fork Gallatin River. A floodplain exhibit from the PER is included in **Appendix A.** Preferred Alternative Environmental Narrative: The majority of project activities will take place outside of the Zone A 100-year floodplain. Water lines will be designed outside of floodplains to the maximum extent possible, however, a small portion of the new centralized water system may need to be located within this zone to service existing buildings. Appropriate floodplain permits will be obtained before project activities begin. None of the work will result in a floodplain encroachment and it will not impact flood patterns or floodplain storage volumes in the Zone AE regulatory floodway. No long-term adverse impacts to floodplains are anticipated as a result of project activities and the proposed project will not result in an increase to the Base Flood Elevation.
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: According to Montana Natural Heritage Program (MTNHP), and US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) wetland and riparian mapping, there are wetlands located adjacent to the Gallatin River, the West Fork Gallatin River, Beaver Creek, Michener Creek, and Porcupine Creek, as well as isolated pothole wetlands elsewhere in the Canyon Water Planning Area. A wetland and riparian exhibit from the PER is included in **Appendix A**. Preferred Alternative Environmental Narrative: The majority of construction activities associated with the proposed project will be located outside of wetland areas and in highway right-of-way areas near Hwy 191 and Hwy 64 or within previously disturbed private properties. New water lines will be designed outside of wetlands to the maximum extent possible. If impacts to wetlands cannot be avoided, wetlands will be delineated, and appropriate permits will be obtained prior to beginning project activities. As the regulatory authority, the U.S. Army Corps of Engineers (USACE) will make final jurisdictional determinations and mitigation requirements for impacts to wetlands. Overall, the proposed project is anticipated to benefit wetlands by providing more groundwater inflow and improving water quality.

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 majority of the project areas have been previously developed. There are agricultural lands located within one mile of the project area. Grazing, cropland, and forestry production exists on private and USFS lands within the Canyon Water Planning Area. No soils identified as prime or important farmland exist with the proposed project area. A soil map from the PER and NRCS soil report with farmland classification are included in **Appendix A**. Preferred Alternative Environmental Narrative: The proposed project may result in temporary impacts to agricultural lands on private parcels during construction activities. Any impacts are anticipated to be short-term and temporary. Disturbed areas will be seeded with desired species as soon as is practicable following project activities. The proposed project is not anticipated to impact any important farm ground or forest lands. No agricultural lands will be converted to non-agricultural use as a result of project activities.
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: There are various habitats for plant, wildlife, and fish species within the Canyon Water Planning Area, primarily on USFS, Montana Fish, Wildlife and Parks, (FWP) and other public lands. Conifer forests, deciduous forests, and sagebrush are the most common ecosystems that may provide habitat for vegetation and wildlife. There is habitat for aquatic resources, including fish, in wetland and riparian systems including in the Gallatin River, West Fork Gallatin River and other small tributary streams. MTNHP data indicates that over 450 species occurrences have been documented in the Canyon Water Planning Area. The most common species present include the following: Beaver (*Castor canadensis*), American robin (*Turdus migratorius*), black-billed magpie (*Pica hudsonia*), common raven (*Corvus corax*), hoary false-alyssum (*Berteroa incana*), Canada thistle (*Cirsium arvense*), and Common Hound's-tongue (*Cynoglossum officinale*). Westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), a Montana species of concern, is present in the Gallatin River and in the West Fork Gallatin River. The proposed project's extent of disturbance is generally comprised of developed or soon-to-be-developed commercial and residential properties that may provide some habitat to biological resources but is presumed to be of lesser quality than that of native ecosystems. Preferred Alternative Environmental Narrative: The proposed project will temporarily impact vegetation and wildlife resources present within the limits of disturbance for installation of centralized water system infrastructure. Wildlife species adjacent to project areas may also be temporarily disturbed by noise and dust associated with project activities. Disturbed areas will be seeded with desired vegetation following project activities and habitat is anticipated to

			return to a pre-project state. The project will not convert any native ecosystems or undisturbed wildlife or aquatic habitat to developed land. The project is anticipated to indirectly benefit fish and aquatic life and their habitats by allowing more groundwater inflow to the surface of the Gallatin River and West Fork Gallatin River.
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: A list of endangered species that could potentially be impacted by project activities was generated from the USFWS Information for Planning and Consultation (IPaC) tool. The following federally listed species have potential to occur in or near the project site: threatened grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*) and Canada lynx critical habitat, whitebark pine (*Pinus albicaulis*), North American wolverine (Gulo gulo *luscus*), and candidate, monarch butterfly (*Danaus plexippus*). In addition, Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. There is no suitable habitat for any of these species present within the extent of disturbance for the proposed project. The closest occurrence of a grizzly bear documented by MTNHP is approximately two miles away in 2002. The Canyon Water Planning Area encompasses both continuous home range and potential transitory movement for the species and overlaps the Yellowstone recovery zone. A population of approximately 700 bears occur within this recovery zone and 512 observations have been documented in this zone. There have been no Canada lynx occurrences within the project area. The closest occurrence occurred in 2008, approximately one mile from the project sites and was noted as an unlikely site for a lynx. There is very little preferred habitat for lynx in the Canyon Water Planning Area. The Gallatin Mountain Range is designated lynx Critical Habitat. A total of one observation has been documented in this area. There are no documented occurrences of whitebark pine in the Canyon Study Area. There are several occurrences documented within one mile of the project area. It is presumed that there is a preferred habitat for the species on public lands in the Madison and Gallatin Mountain Ranges within the Canyon Water Planning Area. A total of 136 wolverine observations have been documented by MTNHP in the Madison and Gallatin Mountain Ranges. A wolverine track was reported approximately two miles from the Canyon Water Planning Area in 2000; however, there is no preferred habitat for species in the project area. There are no documented Monarch butterfly occurrences near the Canyon Water Planning Area. The closest species occurrence is from 2007, approximately sixteen miles away. There are many occurrences of bald eagles and one documented nest site in the Canyon Water Planning Area. The nest site is on the east side of the

			Gallatin River and approximately 1,000 feet from the project's extent of disturbance. There are two occurrences of golden eagles and no nest sites documented within two miles of the project area. Preferred Alternative Environmental Narrative: The proposed project is not anticipated to directly impact any unique, endangered or limited environmental resources. All project activities will take place within areas that have previously been developed near Highway corridors and private and commercial properties that have a high degree of existing disturbance and human activity. Project activities will occur during daylight hours and will not impact the unlikely occurrence of a transient endangered resource moving through the area at night. Conservation measures will be employed to manage potential bear attractants and mitigate conflicts with grizzly bears. No land that is currently used by unique, endangered or limited environmental resources will be converted as a result of project activities. The project may indirectly beneficially impact endangered species using the Gallatin River and West Fork Gallatin River by increasing groundwater conservation and efficiency and thus improving inflow to surface waters.
11. Unique Natural Features (example: geologic features)			
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The Gallatin River is rated as a blue-ribbon trout fishing river. It is also eligible for classification as a Wild and Scenic River due to its unique recreational, scenic and heritage features. Preferred Alternative Environmental Narrative: The proposed project will not change the character of the Gallatin River corridor. New infrastructure will be consistent with existing use in the area. The proposed project may beneficially impact on the unique natural features of the Gallatin River by increasing groundwater conservation and efficiency and thus recharging aquifers and improving inflow to surface waters.
12. Access to, and Quality of, Recreational and Wilderness Activities, Public Lands and Waterways, and Public Open Space			
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: There are many existing recreational access areas and public open space areas within the Canyon Water Planning Area. Approximately 2,040 acres of public land are present. In addition, the Gallatin River is an important recreational resource for fishing, rafting, kayaking, hiking and more. Preferred Alternative Environmental Narrative: Recreational users at sites near the project area may be temporarily impacted by noise and dust associated with construction activities. The proposed project will not result in long-term impacts to access or quality of recreational and wilderness activities or public lands. Reduction of anthropogenic impacts by increasing groundwater conservation and efficiency and thus recharging aquifers and improving inflow to surface waters may have a beneficial impact on public lands and waterways.
Human Environment			
Impact Code	**Impact Type**	**Permits/ Mitigation Required?**	**Resource**

1. Visual Quality – Coherence, Diversity, Compatibility of Use and Scale, Aesthetics			
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The current visual quality in the Canyon Water Planning Area is typical of a rural highway and river corridor. Visuals include the Gallatin River and Madison and Gallatin Mountain Ranges mixed with agriculture and residential and commercial developments. Development in the area has increased in recent years altering natural landscapes, especially along the Hwy 191 and 46 corridors. Nearly all components of existing water infrastructure are underground and do not contribute to visual quality. All existing deficiencies in visual quality are related to development and would be considered minor in scale. Preferred Alternative Environmental Narrative: Minor temporary impacts to the visual quality and aesthetics to the project area will occur during construction. The duration will be short-term, the extent will be local to the construction areas, and the frequency will be non-recurring since it is solely associated with the construction phase. The proposed project is not anticipated to impact the overall visual quality of the Canyon Water Planning Area. Nearly all components of the centralized water system will be underground or at existing well sites.
2. Nuisances (example: glare, fumes)			
☒ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: The proposed project is located along a highway corridor with residential and light commercial areas where nuisances are rare, and the level of tolerance is low. Typical existing nuisances include traffic noise, occasional diesel fumes, and occasional construction noise. Preferred Alternative Environmental Narrative: The proposed project will not result in any permanent nuisances at any of the sites. All new project components are passive and do not produce any noise, odors, or unsightly appearance. Minor adverse impacts may occur during construction, when there may be temporary nuisances such as diesel odors and construction noise. These impacts will be mitigated by limitations to construction hours, designated staging areas, and weekday-only work. Adverse impacts due to construction will be short-term, local, and non-recurring.
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: The Canyon Water Planning Area includes portions of Hwy 191 and 64 corridors. These areas have typical noise associated with street activity and highway traffic. There are no airports, railroads, or other major sources of noise in the area. Preferred Alternative Environmental Narrative: A short-term, minor increase in noise is expected during construction due to equipment. Mitigation measures during the short-term construction period will include enforced phasing/staging/timing to limit disruption to residences and resident-based businesses, and to keep construction hours between 8am and 6pm during the work week (Monday through Friday). Impacts are expected to be short-term, local, and non-recurring. No long-term effects are anticipated.

4. Historic Properties, Cultural, and Archaeological Resources***(Please see end of Environmental Checklist for details if Cultural Survey has not been performed per SHPO Section 106)*			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The Montana State Historic Preservation Office (SHPO) was consulted in June 2024 for cultural resources present in the Canyon Water Planning Area. There have been a few previously conducted cultural resource inventories done in the area and a few previously recorded sites within the search locales (Sections 32, 33, T6S R4E, Sections 4,5,8,17 T7S R4E). None of the sites are within the proposed project area. The proposed project is located in an area that has largely been previously disturbed by human activity. SHPO determined that ground disturbances that will be kept to previously existing right-of-way will not impact cultural or historic properties and did not recommend a cultural resource inventory. However, if any part of the project will be located within previously undisturbed ground or will impact a structure over fifty years of age, SHPO recommends that a cultural resource inventory be conducted in order to determine whether or not sites exist and if they will be impacted. **Appendix A.** Preferred Alternative Environmental Narrative: The area of disturbance for the proposed project will largely be located entirely within previously developed areas and existing right-of-way. No impacts to cultural resources are anticipated. If any cultural objects are discovered while working, work will stop immediately, and the SHPO will be contacted for further investigation.
5. Changes in Demographic (Population) Characteristics (example: quantity, distribution, density)			
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: U.S. Census Bureau data indicates that the population of Gallatin County has increased rapidly since 2010. Actual detailed population data for the Canyon Water Planning Area is not available because it is located within the larger Big Sky Census Designated Place (CDP). The CDP grew 56% between the last two censuses with a 2020 population of 3,591. The Person Equivalent (PE) methodology was used to estimate a population of approximately 1,000 people for the smaller Canyon Water Planning Area. Population density in the area is relatively low, though development has increased rapidly in recent years. In addition, according to a Visit Big Sky estimate, an additional 292,000 tourists visit Big Sky annually and about 87% stay overnight. Currently, about 86% of Big Sky's guests come in the winter, 39% in the summer, 20% in the spring and 13% in the fall (percentage overlaps occur from those who visit multiple seasons). It is unknown how much of this is focused in the Canyon Water Planning Area. Preferred Alternative Environmental Narrative: The proposed design of the central water system will be scaled to meet changes in demographic characteristics over the next 20 years. A central water system is anticipated to promote infill and redevelopment of underutilized land parcels as population densities in the Canyon Water Planning Area increase. Project activities may have a beneficial impact on demographics by providing the infrastructure needed for additional affordable workforce housing. The proposed project is not anticipated to

			lead to changes in demographic characteristics in the area at rates higher than are currently being experienced.
6. General Housing Conditions – Quality, Quantity, Affordability			
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: According to U.S. census data, the median value of owner-occupied housing units in Gallatin County is $526,700, the median gross rent is $1,582, and the median household income is $83,064. The area is currently experiencing a shortage of homes, rental properties, and affordable housing options. Preferred Alternative Environmental Narrative: The proposed project may have indirect beneficial impacts to housing conditions in the area by providing a central water distribution system that will encourage infill and help facilitate the development of affordable workforce housing units. The quality of workforce housing options will be improved with improved infrastructure and central water systems. Improving water infrastructure is not anticipated to increase property values on existing properties at rates higher than are currently being experienced.
7. Businesses or Residents (example: loss of, displacement, or relocation)			
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Currently, most commercial and residential developments are along Highways 191 and 64. Businesses include gas stations, restaurants, service-providing businesses, and hotels and other businesses catering to tourism in the area. Preferred Alternative Environmental Narrative: There are no anticipated long-term or permanent impacts to businesses or residents as a result of the project. Construction may create minor disruptions to normal traffic due to. Once infrastructure improvements are finished, all traffic patterns will be returned back to their original condition and full regular access will be regained. No loss of visitorship to commercial areas is anticipated and no restrictions to residential access will occur. Mitigation measures such as timing, phasing, and other work restrictions will limit or avoid the construction impacts. The impacts are expected to be minor, short-term non-recurring, and local. The proposed project is not anticipated to lead to the loss, displacement or relocation of any businesses or residents in the Canyon Water Planning Area. The project may have indirect benefits to businesses or residents by providing a reliable centralized water system, allowing outdated well systems to be properly abandoned.
8. Public Health and Safety			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Currently, some drinking water wells in the Canyon Water Planning Area are shallow and draw from the same aquifer that septic systems discharge to and are therefore more susceptible to septic nitrate and pathogen contamination. One well in the area had an average nitrate level of 8.43mg/l in 2020 and has reached levels as high as 28.8mg/l. This indicates health risks are emerging in drinking water sources. Additionally, each well is a direct pathway into aquifers in the canyon area. Without proper

			maintenance and backflow prevention, these can be pathways for pathogen or chemical contamination. Continued use of outdated and aging well and septic systems increases the chance of elevated nitrate levels in drinking water and exposure to pathogens which may result in negative human health effects, including interference with the blood's ability to deliver oxygen to the body and diseases such as gastroenteritis, hepatitis, and dysentery. Non-harmful algal blooms have also occurred in the Gallatin River in recent summers. Preferred Alternative Environmental Narrative: The proposed project is anticipated to have beneficial impacts to public health and safety. Decommissioning aging and inefficient well systems and replacing them with a water system designed to current standards and managed by the Gallatin Canyon County Water and Sewer District (GCCWSD) will provide a safe and sustainable potable water supply and help reduce exposure to nitrates and pathogens in the aquifer and the associated health risks.
9. Local Employment – Quantity or Distribution of Employment, Economic Impact			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: According to the U.S. Census, the Gallatin County economy employs 73,488 with the largest industries being: educational services and healthcare and social assistance; professional, scientific, and management, and administrative and waste management services; construction; and arts, entertainment, recreation, and accommodation and food services. Preferred Alternative Environmental Narrative: The proposed project may have a short-term beneficial impact on the local economy by hiring a workforce to complete construction at the site. In addition to initial construction-related jobs, at least one new full-time-equivalent job will be created for operations and management of the system. The proposed project is also anticipated to improve water quality conditions in the Gallatin River, which is a large driver of the local tourism economy and linked directly to local employment.
10. Income Patterns – Economic Impact			
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: According to the U.S. Census, the median household income in Gallatin County is $ $83,064. Preferred Alternative Environmental Narrative: The proposed project may have a short-term beneficial impact on income patterns by hiring workforce to complete construction at the site. The project is not anticipated to impact the overall income patterns of the area.
11. Local and State Tax Base and Revenues			
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: According to the Montana Department of Revenue, property taxes make up 97% of local taxes in the State. Property taxes in Gallatin County have risen based on 2023 reappraisal values. This increase is due to an increase in the real estate market across Gallatin County and Montana. In addition, the Big Sky Resort Area District collects a 3% annual resort tax on all luxury items and services sold in the Canyon Water Planning Area. In May 2020, the community voted for a 1% resort tax increase for infrastructure funding, which will provide a long-term funding mechanism for implementation and operation of the proposed project.

			Preferred Alternative Environmental Narrative: The proposed project will provide central water, allowing property owners to develop parcels to "best use and value" rather than being hindered by onsite well system limitations. This is anticipated to allow infill and increased commercial and tourism based business opportunities and throughout the Canyon corridor. This may have a beneficial impact on tax base and revenues in the area. It is anticipated that the Big Sky resort tax will continue to provide a long-term funding mechanism to support continued project implementation and operation and maintenance.
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)			
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Current community and Government services in the Canyon Water Planning Area include elementary, middle, and high schools, urgent care and medical center, fire department and search and rescue, performing arts center, several parks and extensive amounts of open space public land and recreational opportunities. Preferred Alternative Environmental Narrative: The proposed project will not change access to any services. Construction activities that might occur on roadways that could affect access by emergency services or school buses will be mitigated with alternative routes. The fire department will be beneficially impacted by implementation of a centralized water supply for fire protection.
13. Commercial and Industrial Facilities – Production and Activity, Growth or Decline			
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Development in the Canyon Water Planning Area is currently comprised of a mix of residential and commercial facilities. Commercial and industrial facilities include gas stations, restaurants, service-providing businesses, a gravel pit, agricultural facilities, and hotels and other businesses catering to tourism in the area. Preferred Alternative Environmental Narrative: The proposed project will not change any land use or zoning classification and is not anticipated to impact the production and activity, growth or decline of existing commercial or industrial facilities. Access to facilities will remain during construction and no loss of visitorship is expected. The project may have an indirect beneficial impact on the development of new facilities by creating a centralized water system than can accommodate commercial and industrial connections.
14. Social Structures and Mores (example: standards of social conduct/social conventions)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The proposed project site is located near a mixed income residential and commercial area with varying social norms and frameworks. The Big Sky town center and Gallatin County provide public infrastructure that is part of a larger system in place to service its citizens. Preferred Alternative Environmental Narrative: The project involves improvements to infrastructure that is part of a larger system that is in place to serve all citizens of the Canyon Water Planning Area. The project will not directly or indirectly impact the social structure.
15. Land Use Compatibility (example: growth, land use change, development activity, adjacent land uses and potential conflicts)			

☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Current land use in the Canyon Water Planning Area is mixed residential and commercial and the associated infrastructure (roads, sidewalks, parks, utilities, etc.). In addition, there are large parcels of undeveloped public lands. The state of Montana is experiencing a period of growth and related development activity. Existing individual well systems are contributing to inefficient land use (e.g. development sprawl). Preferred Alternative Environmental Narrative: The proposed project is expected to reduce development sprawl and promote infill and redevelopment of underutilized land parcels. Increasing housing density may help preserve open space and develop more affordable housing options. The project is not anticipated to increase development activity at higher rates than the region is currently experiencing or create conflicts with adjacent land uses.
16. Energy Resources – Consumption and Conservation			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Energy consumption in the Canyon Water Planning Area is consistent with normal residential and commercial levels. Preferred Alternative Environmental Narrative: The proposed project will require additional energy temporarily during construction activities and in the long-term to operate the water system. Increases in energy use would be analogous with other development activities in the area and will not be at a scale that would cause an adverse effect.
17. Solid Waste Management			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Waste management in the Canyon Water Planning Area is provided by Republic Services, L&S Site Services, and can be self- hauled to either the logan landfill or Bozeman convenience site. Recycling drop off locations are managed by the Gallatin Solid Waste Management District. Preferred Alternative Environmental Narrative: The proposed project will have no impact on solid waste management.
18. Wastewater Treatment – Sewage System			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Wastewater treatment and disposal in the Canyon Water Planning Area is currently a mix of seepage pits, septic tanks, drainfields, and potentially some other unknown disposal methods. Most are individual septic systems, but there are a few community-commercial scale wastewater systems. The earliest septic permit record available in the Study Area is from 1972. Aerial imagery indicates that there are likely unpermitted systems. In addition, there are several permitted larger shared and/or community systems within the Sewer Service Area. These include Lazy J (Level 2 treatment system with two drainfields), Buck's T-4 (lagoon system with land application of effluent for disposal), Ramshorn View Estates (three Level 2 treatment systems with associated drainfields), Ophir Elementary (septic system) and Lone Peak High School (septic system). Other large systems within the Study Area include the Big Horn Center (elevated sand mound and drainfield), Big Sky Exxon (recirculating trickling filters and drainfield), Gallatin Canyon Adventures (formerly the Big Sky Comfort Inn,

			Unknown), and the San Merino Drive lots (two septic tanks and drainfields). These are aging and, even as designed, do no not remove nutrients to the level desired by the community. One has exceeded permit levels several times in the past few years. Several unpermitted larger systems are also known to exist. These systems generate low quality effluent compared to most centralized treatment options, and the discharge results in elevated nutrient loading to the Gallatin River. The nutrient loading also directly effects human health and safety, as the discharge poses a risk of contaminating private wells throughout the developed canyon corridor. There are six properties in the Canyon Area currently on individual septic systems that have filed for a Petition for Annexation into the GCCWSD. <u>Preferred Alternative Environmental Narrative:</u> The proposed project is not anticipated to impact any wastewater treatment systems; however, it is being planned in conjunction with another project proposed by the GCCWSD that would upgrade current septic systems and small public wastewater systems to a centralized sewer system. Establishment of a central sewer system will provide improved and more reliable wastewater treatment and is anticipated to be implemented prior to the proposed project. Both projects are anticipated to result in beneficial impacts to the environmental and public health.
19. Storm Water – Surface Drainage			
☐ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☒ Permit ☐ Mitigation ☐ NA	<u>Current Conditions:</u> Currently, storm water surface drainage in the Canyon Water Planning Area is managed by existing storm water drainage collection lines and storm water treatment infrastructure in accordance with stormwater management regulations of Montana DEQ and Gallatin County. The Montana Department of Transportation manages storm water for Highways 191 and 46. <u>Preferred Alternative Environmental Narrative:</u> The proposed project will not result in an increase in impervious surfaces. The project has the potential to have a temporary minor adverse impact on surface water quality and storm runoff quality during construction due to limited introduction of sediment runoff from open excavations and exposed soils. The severity of this impact would be minor because construction Best Management Practices (BMP's) (both physical and tactical) will be implemented as required by the State and Gallatin County to mitigate introduction of sediment to runoff. The duration of the adverse impact to stormwater during construction is considered short-term. The extent of the adverse impact will be limited to the immediate project vicinity. The adverse impact is entirely associated with one-time construction activity; therefore, the frequency of the adverse impact will be non-recurring. Any potential long-term impacts to stormwater quality from construction activities will be mitigated by resurfacing temporarily exposed soils with native plant materials. The project's construction activities will require a stormwater permit for temporary erosion and sediment control and a Storm Water Pollution Prevention Plan (SWPPP) approval from the Montana DEQ. Both require aggressive implementation of construction BMP's to reduce erosion,

			sedimentation, and impacts to receiving waters from entrained sediment.
20. Community Water Supply			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☒ Permit ☐ Mitigation ☐ NA	Current Conditions: Currently, there is no centralized water supply in the GCCWSD Planning Area and water is obtained from numerous private wells and several small privately-owned public systems supplying businesses and residential subdivisions utilizing various aquifers as a water source. Multiple surface water sources such as springs and irrigation ditches are also utilized. GWIC data indicates that there are 289 wells in use in the Canyon Study Area ranging from 0 to 1,490 feet in depth and depth to water from 0 to 1,450 feet. Preferred Alternative Environmental Narrative: The proposed project is anticipated to have a beneficial impact on the community water supply by consolidating existing privately owned infrastructure and installing a centralized water service which will increase water conservation and efficiency by reducing the number of wells drawing from the area's aquifers. Existing high-capacity public wells and storage facilities, generally located in the center of the GCCWSD will be utilized, and phased expansion of the water distribution network throughout the Canyon Water Planning Area will be dictated by growth. Additionally, the project will seek to acquire and consolidate existing groundwater rights to meet the flowrates and volumes necessary to adequately serve the area. The project will also reduce the number of shallow drinking water wells that draw from the same aquifer that septic systems discharge to and reduce community susceptibility to septic nitrate and pathogen contamination. The project will be permitted by the Montana DEQ.
21. Fire Protection – Hazards			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The proposed project site is located near a mixed residential and commercial area with large areas of open space and public land immediately adjacent. Fire protection in developed areas is provided by the Big Sky Fire Department and wildland fire protection is provided by the Gallatin National Forest. There are existing water storage tanks and fire hydrants located at the Ramshorn and Lazy J public water supply locations. There are no known fire hazards currently located in residential and commercial zones. Wildland areas on public lands may contain existing fire hazards. Preferred Alternative Environmental Narrative: The proposed project will not create any new fire hazards or alter fire protection services. The project is not anticipated to impact fire protection or fire hazards. The project may have an indirect beneficial impact on fire protection services by creating a centralized water system that can accommodate additional connections and hydrants for fire suppression. The project may have a beneficial effect on wildfire resiliency by increasing groundwater infiltration and surface water flows withing the Gallatin River system.
22. Cultural Facilities, Cultural Uniqueness and Diversity			

☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The Canyon Water Planning Area is located within Gallatin County. According to the 2020 US census, the county is 94.3% white, 0.5% African American, 1.1% American Indian and Alaska Native, 1.8% Asian, 0.1% Native Hawaiian, 2.3% 2 or more races, and 4.6% Hispanic or Latino. Cultural facilities within the area include; performing arts center, museum, public library, art galleries, and theaters. Preferred Alternative Environmental Narrative: The proposed project will not change the population characteristics of the Canyon Water Planning Area or impact any existing cultural facilities. The project is not anticipated to impact the cultural uniqueness or diversity of the site or surrounding area.
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)			
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☐ NA	Current Conditions: Major transportation networks in the Canyon Water Planning Area include Highways 191 and 46. In addition, there are several other minor arterial roads providing access to local homes, businesses, and public lands. There are no railroads or airport runway clear zones located in the area. Preferred Alternative Environmental Narrative: The proposed project may impact traffic flow during construction of water mains. Traffic control, limitations to construction hours, designated staging areas, and weekday-only work will be used to minimize impacts. The duration will be short-term, the extent will be local to the construction areas, and the frequency will be non-recurring since it is solely associated with construction. The proposed project may indirectly beneficially impact commuter traffic by creating infill, and thus opportunities for affordable and/or workforce housing to reduce workforce commuting distances.
24. Consistency with Local Ordinances, Resolutions, or Plans (example: conformance with local comprehensive plans, zoning, or capital improvement plans.)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: There are existing Zoning Regulations for the Gallatin Canyon/Big Sky zoning district. Existing land use planning documents applicable to the Canyon Water Planning Area including the Gallatin River Task Force's 2018 Sustainable Watershed Stewardship Plan, the 2021 Gallatin County Growth Plan, and the 2011 Gallatin Canyon/Big Sky Capital Improvement Plan. Preferred Alternative Environmental Narrative: The proposed project conforms to existing ordinances and plans. The project may provide an indirect beneficial impact by supporting additional affordable housing, which is one of the goals of the Gallatin County Growth Policy.
25. Private Property Rights (example: a regulatory action or project activity that reduces, minimizes, or eliminates the use of private property.)			

☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The Canyon Water Planning Area is comprised of private properties and public lands. Private property rights in the area conform to the Administrative Rules of Montana (ARM) and Gallatin County regulations. Preferred Alternative Environmental Narrative: Following the connection of the central water system, properties will be encouraged to connect to the sewer voluntarily. The proposed project will not reduce, minimize, or eliminate the use of private property at the site. Private property rights are not anticipated to be impacted as a result of the project.
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?)			
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The proposed project site is not located on a site of known environmental degradation. See **Appendix B** for the EPA Environmental Justice Screen Report. Preferred Alternative Environmental Narrative: The proposed project will not adversely impact any environmental justice, environmental, or socioeconomic indicators. The project may indirectly benefit environmental justice populations by improving water quality in the Gallatin River and supporting opportunities for additional affordable housing in the area.
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 structures containing lead based paint or asbestos-lined pipes within the project construction limits. Preferred Alternative Environmental Narrative: The proposed project is not anticipated to impact existing structures containing lead-based paint or asbestos. If lead based paint or asbestos are discovered during construction the materials will be disposed of in compliance with Montana DEQ requirements.

Additional Information

****If no cultural survey has been performed, or is not expected to be needed, applicant must agree to the following statement:**

☒ I hereby agree that, to my knowledge, there are no cultural or paleontological materials in the proposed project site. If previously unknown cultural or paleontological materials are identified during project related activities, the DNRC grant manager will be notified, and all work will cease until a professional assessment of such resources can be made.

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.

A letter requesting comment was sent to the following Agencies on June 19, 2024:

Gallatin City-County Health Department
Gallatin Conservation District
Gallatin Local Water Quality District
Montana Department of Environmental Quality
Montana Department of Natural Resources
Montana Department of Transportation
Montana Fish, Wildlife, and Parks
Montana State Historic Preservation Office
US Army Corps of Engineers
US Forest Service

A public meeting for the project was held at the Big Sky County Water and Sewer District (BSCWSD) on May 30th, 2024. Public meetings will continue to be held by BSCWSD and GCCWSD as design and permitting for the project advance. In addition, project information, as well as meeting minutes and other educational materials are publicly available on the BSCWSD's website: https://bigskywatersewer.com/rfps-rfqs/ and GCCWSD's website: https://www.gallatincanyonwsd.com/.

Below is a list of resources utilized in the development of the Environmental Checklist:

DEQ data search tools: https://discover-mtdeq.hub.arcgis.com/

DNRC Floodplain Mapping Projects: https://dnrc.mt.gov/Water-Resources/Floodplains/Floodplain-Mapping-Projects

EPA Air Quality non-attainment areas: https://www.epa.gov/green-book

EPA ECHO https://echo.epa.gov/facilities/facility-search/results

EPA Environmental Justice and Socioeconomic: https://ejscreen.epa.gov/mapper/

EPA npdes Stormwater Program https://www.epa.gov/npdes/npdes-stormwater-program

Farmland Classification: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

FEMA National Flood Hazard Layer Viewer https://msc.fema.gov/nfhl

Gallatin County City-County Environmental Health Services Map: https://gis.gallatin.mt.gov/webmaps/?map=ehs&lat=45.21936&lon=-111.25023&scale=5824

Gallatin County Planning Documents and Zoning Regulations: https://gallatincomt.virtualtownhall.net/planning-community-development/pages/zoning-regulations

Gallatin River Task Force Watershed Stewardship Plan: https://gallatinrivertaskforce.org/watershed-stewardship-plan/

Gallatin Solid Waste Management District https://www.gallatinsolidwaste.org/trash

Groundwater Information Center (GWIC). Montana State Library. https://mslservices.mt.gov/

Montana Cadastral http://svc.mt.gov/msl/mtcadastral

Montana Natural Heritage Program. https://nris.mt.gov/reqapp/userMain.asp

Montana State Historic Preservation Office, Damon Murdo 406-444-7767: http://mhs.mt.gov/Shpo
Montana Tech Groundwater Information Center: https://mbmggwic.mtech.edu/

NRCS Web Soil Survey https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

National Wetland Inventory Mapper https://www.fws.gov/wetlands/data/mapper.html

Preliminary Engineering Reports: Preliminary Engineering Report for Canyon Area Wastewater Treatment and Disposal (Dowl HKM, 2008), Gallatin Canyon Sewer Preliminary Engineering Report (WGM Group, AE2S 2021)

United States Census Bureau, QuickFacts, Gallatin County, MT
https://data.census.gov/profile/Gallatin_County,_Montana?g=010XX00US

US Fish and Wildlife Service Information for Planning and Consultation System: https://ipac.ecosphere.fws.gov/

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/

Cadastral (for property ownership info): http://svc.mt.gov/msl/mtcadastral

Census Information, MT Dept. of Commerce: http://ceic.mt.gov

Conservation Districts, MT: http://macdnet.org/

Cultural Records

- Montana Historical Society: https://mhs.mt.gov/Shpo/CulturalRecords

DEQ data search tools: Montana DEQ's GIS Portal (mt.gov)

- Including Clean Water Act Info Center, Hazardous Waste Handlers, Petroleum Release Fund Claims, Unpermitted Releases, Underground Storage Tanks, Source Water Protection

EPA Enforcement and Compliance History Online http://echo.epa.gov/

Farmland Classification: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Fish (Also See Wildlife)

- Montana Fisheries Information System: Montana Fish, Wildlife & Parks GIS Data (arcgis.com)
- Aquatic Invasive Species: Montana FWP AIS Surveys Dashboard 2021 (arcgis.com)

Floodplain Maps, FEMA: https://msc.fema.gov/portal

Geographic Information, Natural Resources Information System: http://nris.mt.gov/gis

Geologic Information - MBMG - Publications - Download Geologic Maps (mtech.edu)

Maps of Montana for species observations, land cover, wetland and riparian areas, land management: Montana Natural Heritage Program (mtnhp.org); http://mtnhp.org/mapviewer/?t=6

Montana Department of Transportation: https://www.mdt.mt.gov/

- Environmental Manual: http://www.mdt.mt.gov/publications/docs/manuals/env/preface.pdf
- Environmental Manual - Chapter 29, Permits Required: https://www.mdt.mt.gov/publications/docs/manuals/env/Chapter%2029%20PERMITS%20REQUIRED.pdf

Montana Board of Oil and Gas Conservation Information System:

- http://bogc.dnrc.mt.gov/webApps/DataMiner/

Plants

- Plant database, USDA Natural Resources Conservation Service: http://plants.usda.gov/java
- Plant Species, MT Field Guide: http://fieldguide.mt.gov/default.aspx

- Plant Species of Concern: http://mtnhp.org/SpeciesOfConcern/Default.aspx?AorP=p
- Threatened, Endangered and Rare Plants, USDA: https://plants.usda.gov/home/raritySearch

Soils

- USDA Natural Resource Conservation Service database: https://websoilsurvey.nrcs.usda.gov/app/
- Montana soil and water conservation districts: http://swcdmi.org/

State Historic Preservation Office: http://mhs.mt.gov/Shpo

Tourism, UM – Institute of Tourism & Recreation Research: http://www.itrr.umt.edu

Tribal Resources:

- Blackfeet Tribal Environmental Permits: http://www.blackfeetenvironmental.com
- CSKT Natural Resources Department: http://nrd.csktribes.org/
- Montana Office of Indian Affairs: http://tribalnations.mt.gov/
- Tribal Historic Preservation Officer List: Search - NATHPO
- Tribal Directory Assessment Tool (TDAT): https://egis.hud.gov/tdat/

Vehicle Traffic Count (MDT): http://www.mdt.mt.gov/publications/datastats/traffic.shtml

Water

- Stream Record Extension Facilitator, USGS: USGS | National Water Dashboard
- Streamstats basin characteristics, USGS: http://water.usgs.gov/osw/streamstats/
- Water Resources Division, DNRC: http://dnrc.mt.gov/divisions/water ; ArcGIS Web Application (mt.gov)
- Water Rights Bureau, DNRC: http://dnrc.mt.gov/divisions/water/water-rights
- Water Right Query System, DNRC: DNRC Water Right Query System (mt.gov)
- Wetlands database, USFWS: http://www.fws.gov/wetlands/Data/mapper.html

Wild and Scenic Rivers: http://www.rivers.gov/montana.php

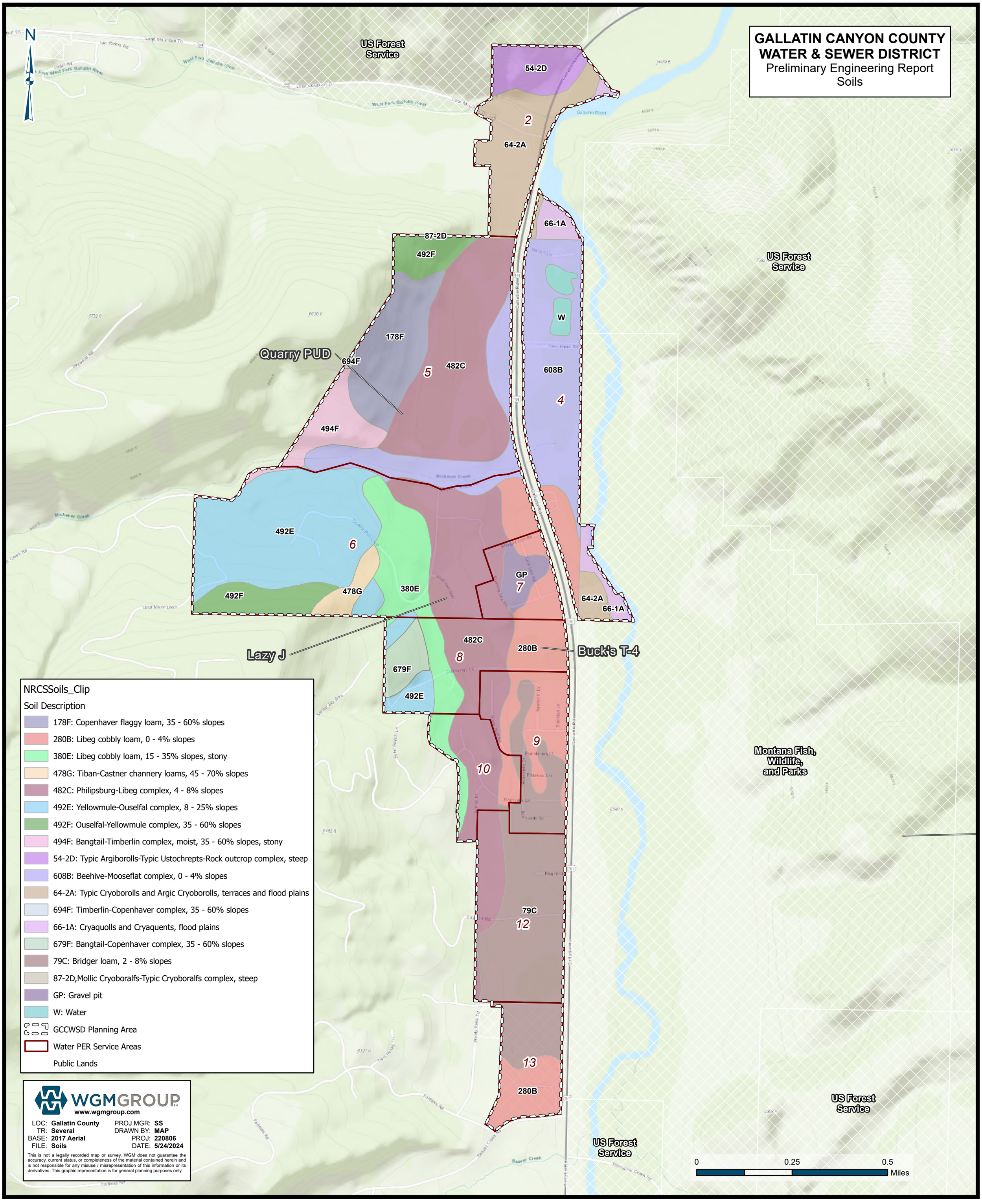
Wildlife

- Animal Species, MT Field Guide: http://fieldguide.mt.gov/default.aspx
- Animal Species of Concern: http://mtnhp.org/SpeciesOfConcern/Default.aspx?AorP=a
- Aquatic Invasive Species: Montana FWP AIS Surveys Dashboard 2021 (arcgis.com)
- Critical Habitat Mapper, USFWS: http://ecos.fws.gov/crithab/
- Crucial Areas Planning System/Habitat Assessment Tool: Habitat MT (HB 526) Funded Lands (arcgis.com)

- FWP Contact Map: http://fwp.mt.gov/gis/maps/contactUs/ (includes biologist responsibility areas)
- Maps and GIS Data, FWP: Montana Fish, Wildlife & Parks GIS Data (arcgis.com)
- Sage grouse management, FWP: Montana Fish, Wildlife & Parks GIS Data : Sage-grouse Habitat/Current Distribution (Montana) : Sage-grouse Habitat/Current Distribution (Montana) (arcgis.com)
- Sage grouse habitat conservation program, DNRC: http://sagegrouse.mt.gov/
- Sage grouse habitat map: https://sagegrouse.mt.gov/ProgramMap

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Soils



NRCSSoils_Clip

Soil Description

- 178F: Copenhaver flaggy loam, 35 - 60% slopes
- 280B: Libeg cobbly loam, 0 - 4% slopes
- 380E: Libeg cobbly loam, 15 - 35% slopes, stony
- 478G: Tiban-Castner channery loams, 45 - 70% slopes
- 482C: Philipsburg-Libeg complex, 4 - 8% slopes
- 492E: Yellowmule-Ouselfal complex, 8 - 25% slopes
- 492F: Ouselfal-Yellowmule complex, 35 - 60% slopes
- 494F: Bangtail-Timberlin complex, moist, 35 - 60% slopes, stony
- 54-2D: Typic Argiborolls-Typic Ustochrepts-Rock outcrop complex, steep
- 608B: Beehive-Mooseflat complex, 0 - 4% slopes
- 64-2A: Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains
- 694F: Timberlin-Copenhaver complex, 35 - 60% slopes
- 66-1A: Cryaquolls and Cryaquents, flood plains
- 679F: Bangtail-Copenhaver complex, 35 - 60% slopes
- 79C: Bridger loam, 2 - 8% slopes
- 87-2D,Mollic Cryoboralfs-Typic Cryoboralfs complex, steep
- GP: Gravel pit
- W: Water
- GCCWSD Planning Area
- Water PER Service Areas
- Public Lands

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Soils**	DATE:	**5/24/2024**

This is not a legally recorded map or survey. WGM does not guarantee the accuracy, current status, or completeness of the material contained herein and is not responsible for any misuse / misrepresentation of this information or its derivatives. This graphic representation is for general planning purposes only.

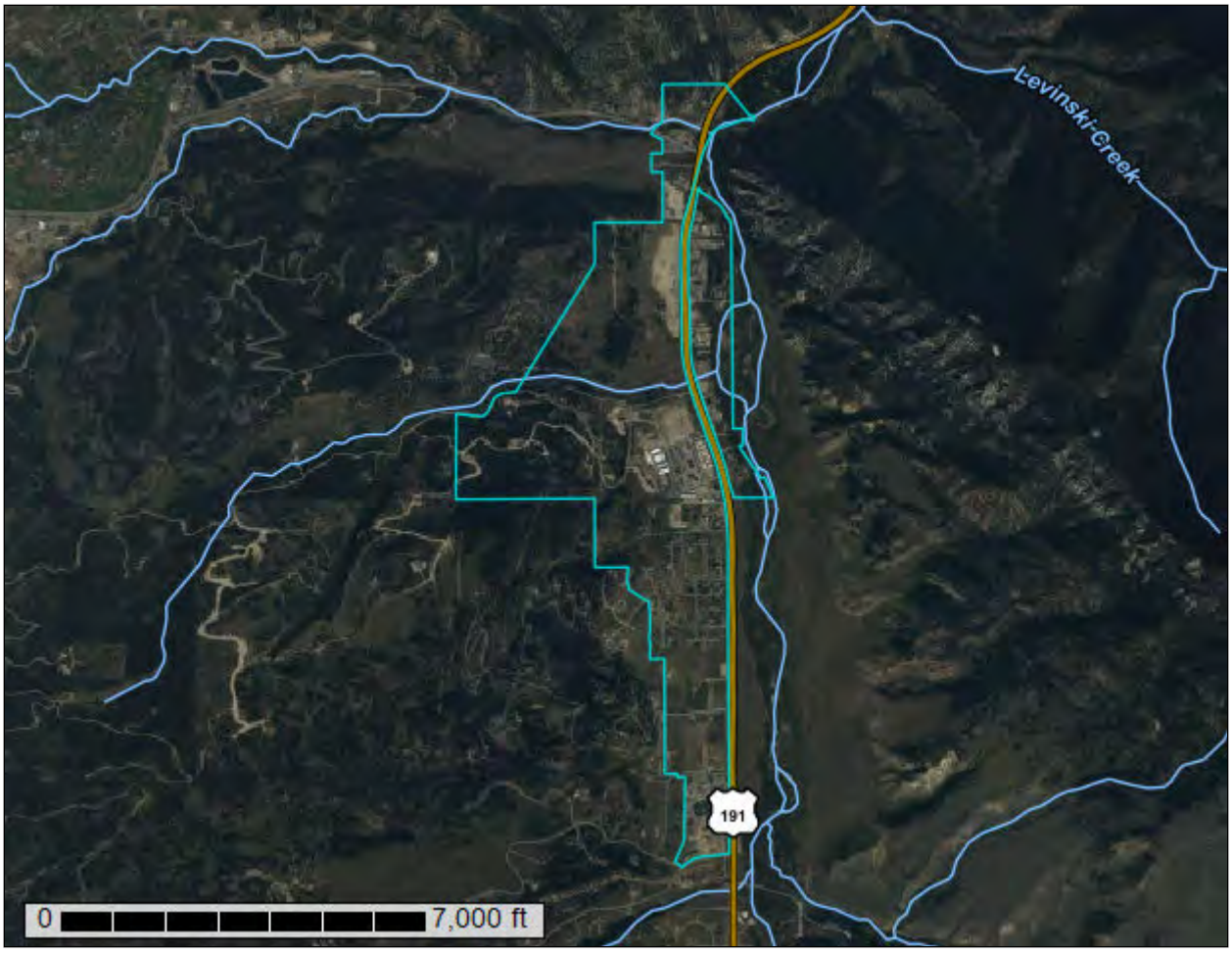
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Gallatin County Area, Montana, and Gallatin National Forest Area, Montana



June 19, 2024

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.

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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.

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

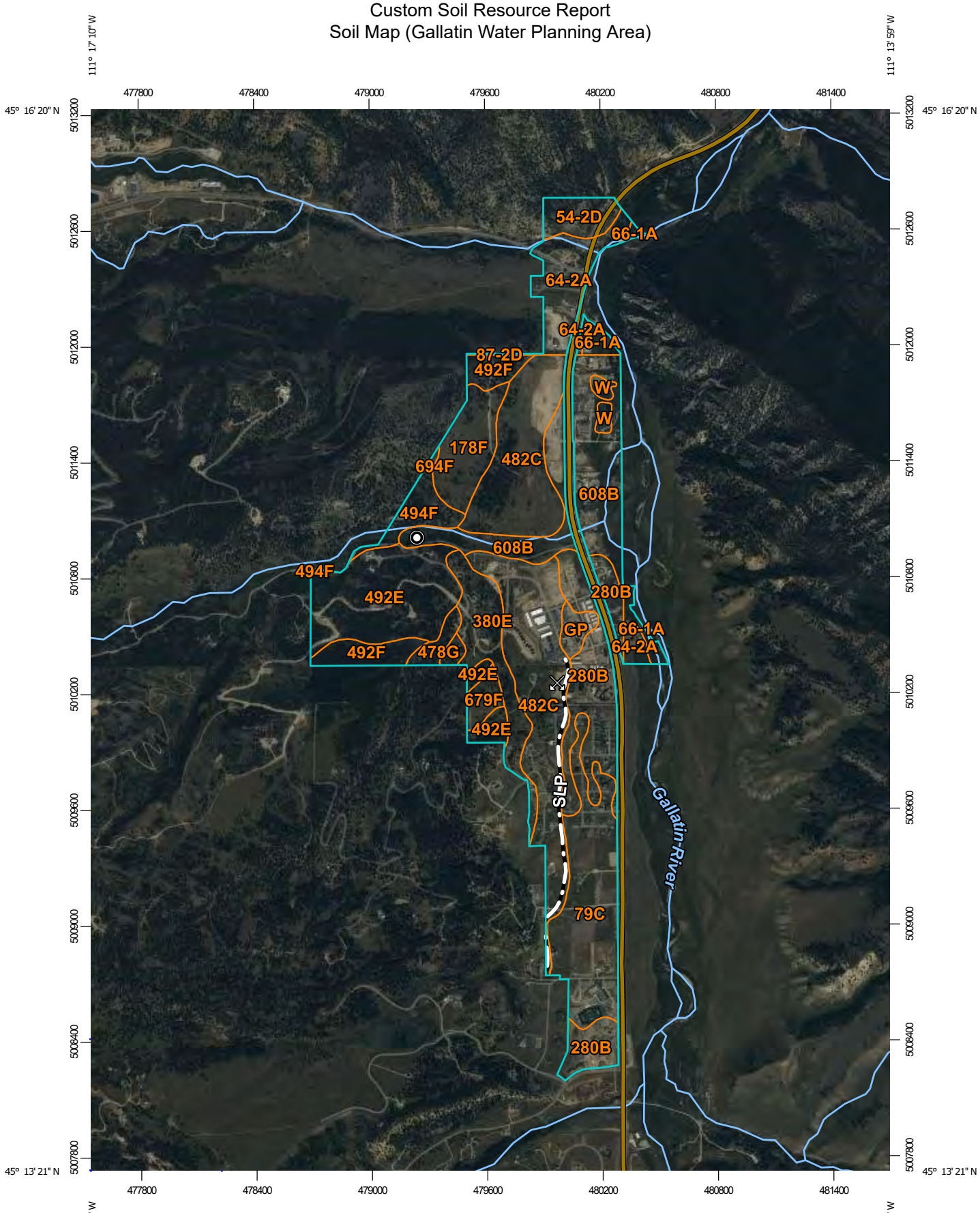
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map (Gallatin Water Planning Area)



Map Scale: 1:26,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

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: Gallatin County Area, Montana
Survey Area Data: Version 27, Aug 25, 2023

Soil Survey Area: Gallatin National Forest Area, Montana
Survey Area Data: Version 13, Aug 25, 2023

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 18, 2022—Aug 29, 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 (Gallatin Water Planning Area)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
79C	Bridger loam, 2 to 8 percent slopes	90.3	11.6%
178F	Copenhaver flaggy loam, 35 to 60 percent slopes	36.4	4.7%
280B	Libeg cobbly loam, 0 to 4 percent slopes	83.7	10.7%
380E	Libeg cobbly loam, 15 to 35 percent slopes, stony	43.6	5.6%
478G	Tiban-Castner channery loams, 45 to 70 percent slopes	7.8	1.0%
482C	Philipsburg-Libeg complex, 4 to 8 percent slopes	182.1	23.3%
492E	Yellowmule-Ouselfal complex, 8 to 25 percent slopes	95.4	12.2%
492F	Ouselfal-Yellowmule complex, 35 to 60 percent slopes	27.2	3.5%
494F	Bangtail-Timberlin complex, moist, 35 to 60 percent slopes, stony	18.5	2.4%
608B	Beehive-Mooseflat complex, 0 to 4 percent slopes	92.9	11.9%
679F	Bangtail-Copenhaver complex, 35 to 60 percent slopes	9.6	1.2%
694F	Timberlin-Copenhaver complex, 35 to 60 percent slopes	0.6	0.1%
GP	Gravel pit	8.6	1.1%
W	Water	5.7	0.7%
Subtotals for Soil Survey Area		**702.4**	**90.0%**
Totals for Area of Interest		**780.2**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
54-2D	Typic Argiborolls-Typic Ustochrepts-Rock outcrop complex, steep	18.3	2.4%
64-2A	Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains	45.9	5.9%
66-1A	Cryaquolls and Cryaquents, flood plains	13.0	1.7%
87-2D	Mollic Cryoboralfs-Typic Cryoboralfs complex, steep	0.6	0.1%
Subtotals for Soil Survey Area		**77.8**	**10.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Totals for Area of Interest		**780.2**	**100.0%**

Map Unit Descriptions (Gallatin Water Planning Area)

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.

Gallatin County Area, Montana

79C—Bridger loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 571m
Elevation: 5,450 to 6,200 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Bridger

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium colluvium

Typical profile

A - 0 to 8 inches: loam
Bt - 8 to 28 inches: gravelly clay loam
Bk - 28 to 60 inches: cobbly 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: 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 8.1 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Minor Components

Libeg

Percent of map unit: 5 percent
Landform: Alluvial fans, stream terraces
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Bridger, warm

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Bridger, clay loam

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

178F—Copenhaver flaggy loam, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 56ly
Elevation: 5,050 to 7,100 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Copenhaver

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: flaggy loam
Bt - 7 to 15 inches: very flaggy sandy clay loam
R - 15 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 35 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): 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
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

Minor Components

Rubbleland

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

Rock outcrop

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

Copenhaver

Percent of map unit: 5 percent
Landform: Hills
Ecological site: R043BP812MT - Shallow Shrubland Group
Hydric soil rating: No

280B—Libeg cobbly loam, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 56nx
Elevation: 5,600 to 6,550 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 36 to 45 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Libeg

Setting

Landform: Outwash plains
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 7 inches: cobbly loam
Bt - 7 to 60 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 0 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
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R043BP818MT - Upland Grassland Group
Hydric soil rating: No

Minor Components

Philipsburg

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Libeg

Percent of map unit: 5 percent
Landform: Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Adel

Percent of map unit: 5 percent
Landform: Drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

380E—Libeg cobbly loam, 15 to 35 percent slopes, stony

Map Unit Setting

National map unit symbol: 56r7
Elevation: 5,200 to 7,300 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Libeg

Setting

Landform: Alluvial fans, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy colluvium derived from sandstone

Typical profile

A - 0 to 10 inches: cobbly loam
Bt - 10 to 23 inches: very stony clay loam
BC - 23 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 15 to 35 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
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Minor Components

Adel

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP818MT - Upland Grassland Group
Hydric soil rating: No

Libeg

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Libeg, stony

Percent of map unit: 5 percent
Landform: Alluvial fans, stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

478G—Tiban-Castner channery loams, 45 to 70 percent slopes

Map Unit Setting

National map unit symbol: 56tr
Elevation: 4,300 to 6,700 feet
Mean annual precipitation: 17 to 22 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 65 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Tiban and similar soils: 55 percent
Castner and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tiban

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from argillite

Typical profile

Oi - 0 to 4 inches: slightly decomposed plant material
A - 4 to 16 inches: channery loam
Bw - 16 to 29 inches: very channery loam
Bk - 29 to 60 inches: extremely channery loam

Properties and qualities

Slope: 45 to 70 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: 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 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Description of Castner

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from argillite

Typical profile

A1 - 0 to 6 inches: channery loam
A2 - 6 to 10 inches: very channery sandy loam
Bk - 10 to 16 inches: very channery sandy loam
R - 16 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 45 to 70 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): Moderately high to high (0.57 to 5.95 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: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R043BP812MT - Shallow Shrubland Group
Hydric soil rating: No

Minor Components

Timberlin
Percent of map unit: 8 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Tiban, lesser slopes
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

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

482C—Philipsburg-Libeg complex, 4 to 8 percent slopes

Map Unit Setting
National map unit symbol: 56tx
Elevation: 5,750 to 6,800 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 45 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition
Philipsburg and similar soils: 50 percent
Libeg and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Philipsburg

Setting
Landform: Stream terraces
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 15 inches: loam
Bt - 15 to 28 inches: gravelly clay loam
Bk - 28 to 60 inches: gravelly clay 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 (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: 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 9.1 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 Libeg

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 7 inches: cobbly loam
Bt - 7 to 60 inches: very gravelly sandy clay 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
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R044BP819MT - Upland Sagebrush Shrubland
Hydric soil rating: No

Minor Components

Libeg, stony

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Adel

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Philipsburg

Percent of map unit: 5 percent
Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

492E—Yellowmule-Ouselfal complex, 8 to 25 percent slopes

Map Unit Setting

National map unit symbol: 56v2
Elevation: 6,400 to 7,900 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 32 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Yellowmule and similar soils: 50 percent
Ouselfal and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yellowmule

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
E - 1 to 11 inches: loam
Bt - 11 to 31 inches: clay loam
Cr - 31 to 41 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 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 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: F043BP909MT - Upland Cold Woodland Group
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Description of Ouselfal

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
E1 - 2 to 7 inches: very flaggy sandy loam
E2 - 7 to 19 inches: very channery sandy loam
Bt - 19 to 25 inches: extremely gravelly clay loam
Cr - 25 to 40 inches: weathered bedrock
R - 40 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 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): 6e
Hydrologic Soil Group: C

Ecological site: F043BP909MT - Upland Cold Woodland Group
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Minor Components

Cowood
Percent of map unit: 8 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Yellowmule, very channery loam
Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Rock outcrop
Percent of map unit: 1 percent
Hydric soil rating: No

Rubbleland
Percent of map unit: 1 percent
Hydric soil rating: Unranked

492F—Ouselfal-Yellowmule complex, 35 to 60 percent slopes

Map Unit Setting
National map unit symbol: 56v3
Elevation: 6,400 to 8,000 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 32 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition
Ouselfal and similar soils: 50 percent
Yellowmule and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ouselfal

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
E1 - 2 to 7 inches: very flaggy sandy loam
E2 - 7 to 19 inches: very channery sandy loam
Bt - 19 to 25 inches: extremely gravelly clay loam
Cr - 25 to 40 inches: weathered bedrock
R - 40 to 44 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 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: F043BP909MT - Upland Cold Woodland Group
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Description of Yellowmule

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
E - 1 to 11 inches: loam
Bt - 11 to 31 inches: clay loam
Cr - 31 to 41 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 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 5.2 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/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Minor Components

Cowood

Percent of map unit: 10 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/twinflower (PK660), subalpine fir/blue huckleberry (PK720), subalpine fir/grouse whortleberry (PK730)
Hydric soil rating: No

Rubbleland

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

Rock outcrop

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

494F—Bangtail-Timberlin complex, moist, 35 to 60 percent slopes, stony

Map Unit Setting

National map unit symbol: 56v6
Elevation: 5,000 to 7,100 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Bangtail and similar soils: 45 percent
Timberlin and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bangtail

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: gravelly loam
Bt - 9 to 23 inches: clay loam
C - 23 to 37 inches: clay loam
Cr - 37 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
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
Available water supply, 0 to 60 inches: Moderate (about 6.7 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 (PK260), Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Description of Timberlin

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: flaggy loam
Bt1 - 6 to 11 inches: very flaggy clay loam
Bt2 - 11 to 25 inches: very flaggy clay loam
Cr - 25 to 30 inches: weathered bedrock
R - 30 to 34 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
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
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/ninebark (PK260), Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Minor Components

Yellowmule

Percent of map unit: 8 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: subalpine fir/blue huckleberry (PK720)
Hydric soil rating: No

Cowood

Percent of map unit: 5 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Rock outcrop

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

608B—Beehive-Mooseflat complex, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 56xz
Elevation: 5,300 to 6,650 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Beehive and similar soils: 60 percent
Mooseflat and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beehive

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: gravelly sandy loam
C1 - 5 to 28 inches: extremely gravelly loamy coarse sand
C2 - 28 to 60 inches: extremely cobbly loamy coarse 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 (0.57 to 5.95 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: Occasional
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): 6s
Hydrologic Soil Group: B
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: spruce/common horsetail (PK410)
Hydric soil rating: No

Description of Mooseflat

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

Oe - 0 to 2 inches: mucky peat
A - 2 to 12 inches: loam
Bg - 12 to 24 inches: silty clay loam
2Cg - 24 to 60 inches: very gravelly loamy coarse sand

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 to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: R043BP801MT - Bottomland Group
Hydric soil rating: Yes

Minor Components

Beehive

Percent of map unit: 8 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: spruce/common horsetail (PK410)
Hydric soil rating: No

Water

Percent of map unit: 2 percent

679F—Bangtail-Copenhaver complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 56z5
Elevation: 5,300 to 8,000 feet
Mean annual precipitation: 15 to 24 inches
Mean annual air temperature: 34 to 43 degrees F
Frost-free period: 65 to 100 days
Farmland classification: Not prime farmland

Map Unit Composition

Bangtail and similar soils: 70 percent
Copenhaver and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bangtail

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey residuum weathered from sandstone and shale

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 23 inches: clay loam
C - 23 to 37 inches: clay loam
Cr - 37 to 59 inches: bedrock

Properties and qualities

Slope: 35 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): 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
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R043BP818MT - Upland Grassland Group
Hydric soil rating: No

Description of Copenhaver

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: flaggy loam
Bt - 7 to 15 inches: very flaggy sandy clay loam
R - 15 to 59 inches: bedrock

Properties and qualities

Slope: 35 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): 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
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
Hydric soil rating: No

Minor Components

Redchief, stony

Percent of map unit: 6 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R043BP820MT - Upland Shrubland Group
Hydric soil rating: No

Rock outcrop

Percent of map unit: 4 percent
Hydric soil rating: Unranked

694F—Timberlin-Copenhaver complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 56zg
Elevation: 5,000 to 7,900 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 34 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Timberlin and similar soils: 65 percent
Copenhaver and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Timberlin

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 6 inches: loam
Bt1 - 6 to 11 inches: very flaggy clay loam
Bt2 - 11 to 25 inches: very flaggy clay loam
Cr - 25 to 30 inches: weathered bedrock
R - 30 to 34 inches: unweathered bedrock

Properties and qualities

Slope: 35 to 60 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock

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
Available water supply, 0 to 60 inches: Very low (about 2.7 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 (PK260), Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Description of Copenhaver

Setting

Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy residuum weathered from sandstone and shale

Typical profile

A - 0 to 7 inches: flaggy loam
Bt - 7 to 15 inches: very flaggy sandy clay loam
R - 15 to 19 inches: unweathered bedrock

Properties and qualities

Slope: 35 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): 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
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), Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

Minor Components

Bangtail

Percent of map unit: 7 percent
Landform: Mountains
Down-slope shape: Linear
Across-slope shape: Linear

Other vegetative classification: Douglas-fir/ninebark (PK260), Douglas-fir/snowberry (PK310), Douglas-fir/pinegrass (PK320)
Hydric soil rating: No

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

GP—Gravel pit

Map Unit Composition
Pits, gravel: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits, Gravel

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

W—Water

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Gallatin National Forest Area, Montana

54-2D—Typic Argiborolls-Typic Ustochrepts-Rock outcrop complex, steep

Map Unit Setting

National map unit symbol: 58ks
Elevation: 6,500 to 7,500 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 70 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Typic argiborolls and similar soils: 55 percent
Typic ustochrepts and similar soils: 20 percent
Rock outcrop: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Typic Argiborolls

Setting

Landform: Mountain slopes
Parent material: Loamy colluvium derived from sandstone and shale

Typical profile

H1 - 0 to 8 inches: silt loam

Properties and qualities

Slope: 45 to 70 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
Available water supply, 0 to 60 inches: Very low (about 1.3 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/snowberry (PK310)
Hydric soil rating: No

Description of Typic Ustochrepts

Setting

Landform: Mountain slopes
Parent material: Loamy colluvium derived from sandstone and shale

Properties and qualities

Slope: 45 to 70 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: 20 percent

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/snowberry (PK310)

Description of Rock Outcrop

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Douglas-fir/snowberry (PK310)

64-2A—Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains

Map Unit Setting

National map unit symbol: 58l3
Elevation: 6,500 to 8,000 feet
Mean annual precipitation: 20 to 40 inches
Mean annual air temperature: 36 to 43 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Argic cryoborolls and similar soils: 51 percent
Typic cryoborolls and similar soils: 49 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Argic Cryoborolls

Setting

Landform: Terraces, flood plains
Parent material: Loamy outwash

Typical profile

A - 0 to 10 inches: loam
Bt - 10 to 40 inches: very gravelly sandy clay loam
C - 40 to 60 inches: very cobbly sandy loam

Properties and qualities

Slope: 0 to 10 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
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)
Hydric soil rating: No

Description of Typic Cryoborolls

Setting

Landform: Terraces, flood plains
Parent material: Loamy outwash

Typical profile

A - 0 to 7 inches: sandy loam
Bw - 7 to 22 inches: very gravelly loam
C - 22 to 60 inches: very cobbly loamy sand

Properties and qualities

Slope: 0 to 10 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
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: F043BP910MT - Upland Cool Woodland Group
Other vegetative classification: Douglas-fir/Idaho fescue (PK220)
Hydric soil rating: No

66-1A—Cryaquolls and Cryaquents, flood plains

Map Unit Setting

National map unit symbol: 58l5
Elevation: 6,600 to 8,600 feet
Mean annual precipitation: 20 to 50 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 30 to 60 days
Farmland classification: Not prime farmland

Map Unit Composition

Cryaquolls and similar soils: 51 percent
Cryaquents and similar soils: 49 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cryaquolls

Setting

Landform: Flood plains

Properties and qualities

Slope: 0 to 10 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 0 to 30 inches
Frequency of flooding: Frequent
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Hydrologic Soil Group: B/D
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: deschampsia caespitosa/carex spp. h.t. (MS0501)
Hydric soil rating: Yes

Description of Cryaquents

Setting

Landform: Flood plains

Properties and qualities

Slope: 0 to 10 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: Rare

Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: R043BP801MT - Bottomland Group
Other vegetative classification: deschampsia caespitosa/carex spp. h.t. (MS0501)
Hydric soil rating: Yes

87-2D—Mollic Cryoboralfs-Typic Cryoboralfs complex, steep

Map Unit Setting

National map unit symbol: 58m5
Elevation: 6,500 to 8,000 feet
Mean annual precipitation: 20 to 35 inches
Mean annual air temperature: 36 to 39 degrees F
Frost-free period: 50 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Mollic cryoboralfs and similar soils: 50 percent
Typic cryoboralfs and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mollic Cryoboralfs

Setting

Landform: Scarp slopes, dip slopes

Typical profile

E1 - 0 to 15 inches: very gravelly loam

Properties and qualities

Slope: 45 to 70 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
Available water supply, 0 to 60 inches: Very low (about 1.3 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/heartleaf arnica (PK780)

Description of Typic Cryoboralfs

Setting

Landform: Scarp slopes, dip slopes

Typical profile

E1 - 0 to 7 inches: gravelly loam
Bt1 - 7 to 17 inches: cobbly loam
Bt2 - 17 to 48 inches: very stony loam
C - 48 to 60 inches: extremely stony loam

Properties and qualities

Slope: 45 to 70 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
Available water supply, 0 to 60 inches: Low (about 5.5 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/heartleaf arnica (PK780)

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Other vegetative classification: subalpine fir/blue huckleberry (PK720), subalpine fir/heartleaf arnica (PK780)

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.

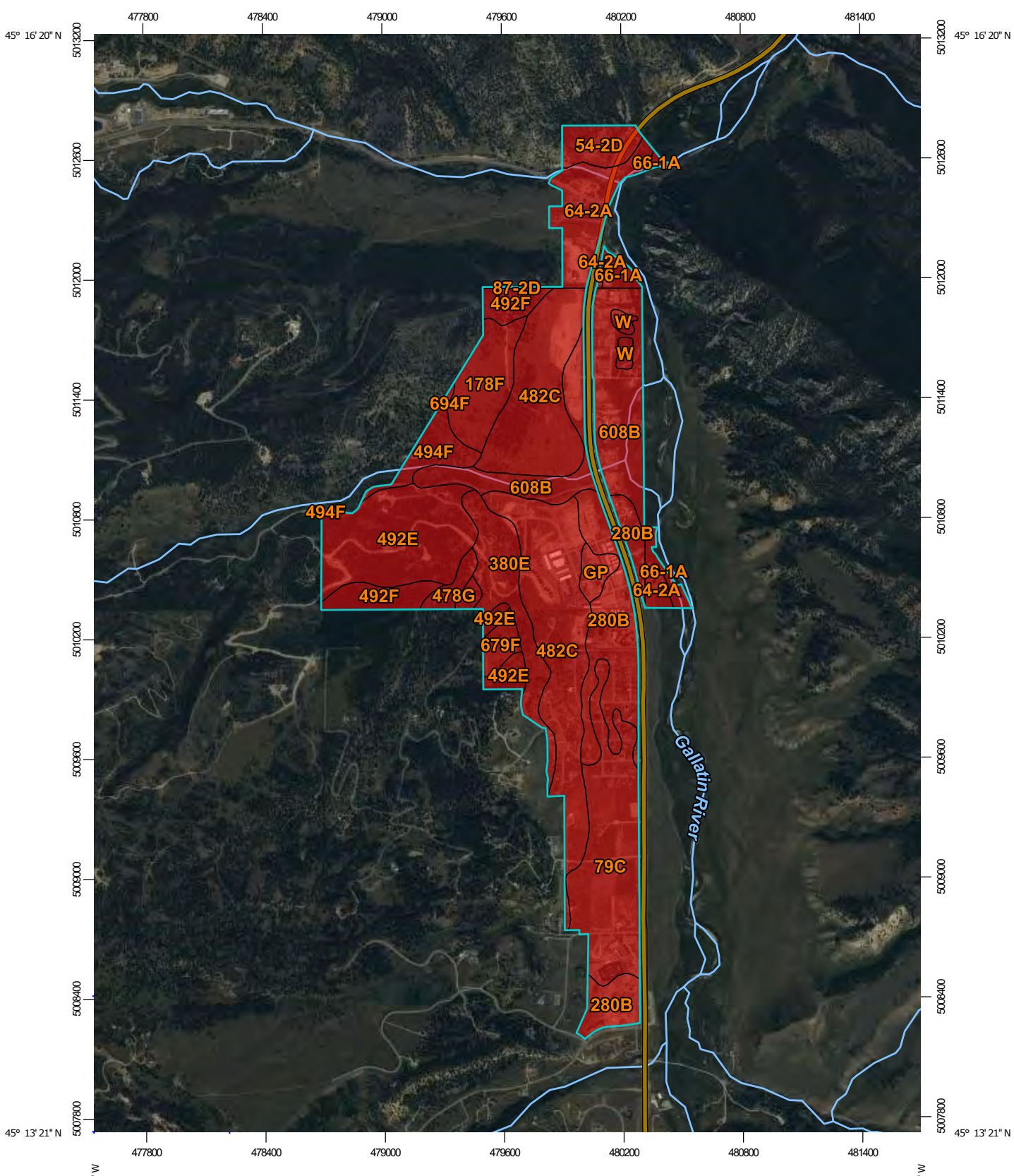
Land Classifications

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 (Gallatin Water Planning Area)

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 (Gallatin Water Planning Area)



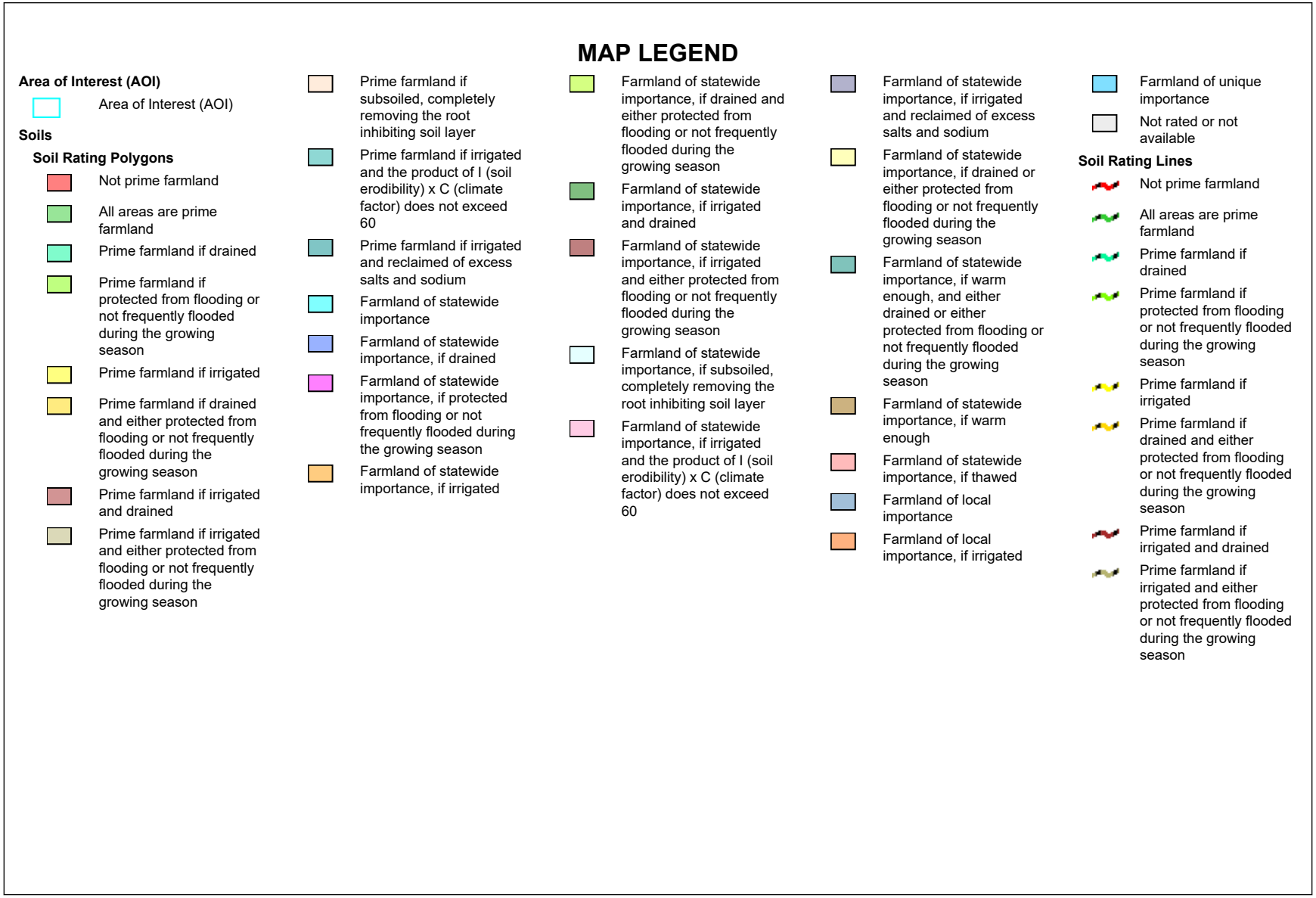
Map Scale: 1:26,800 if printed on A portrait (8.5" x 11") sheet.

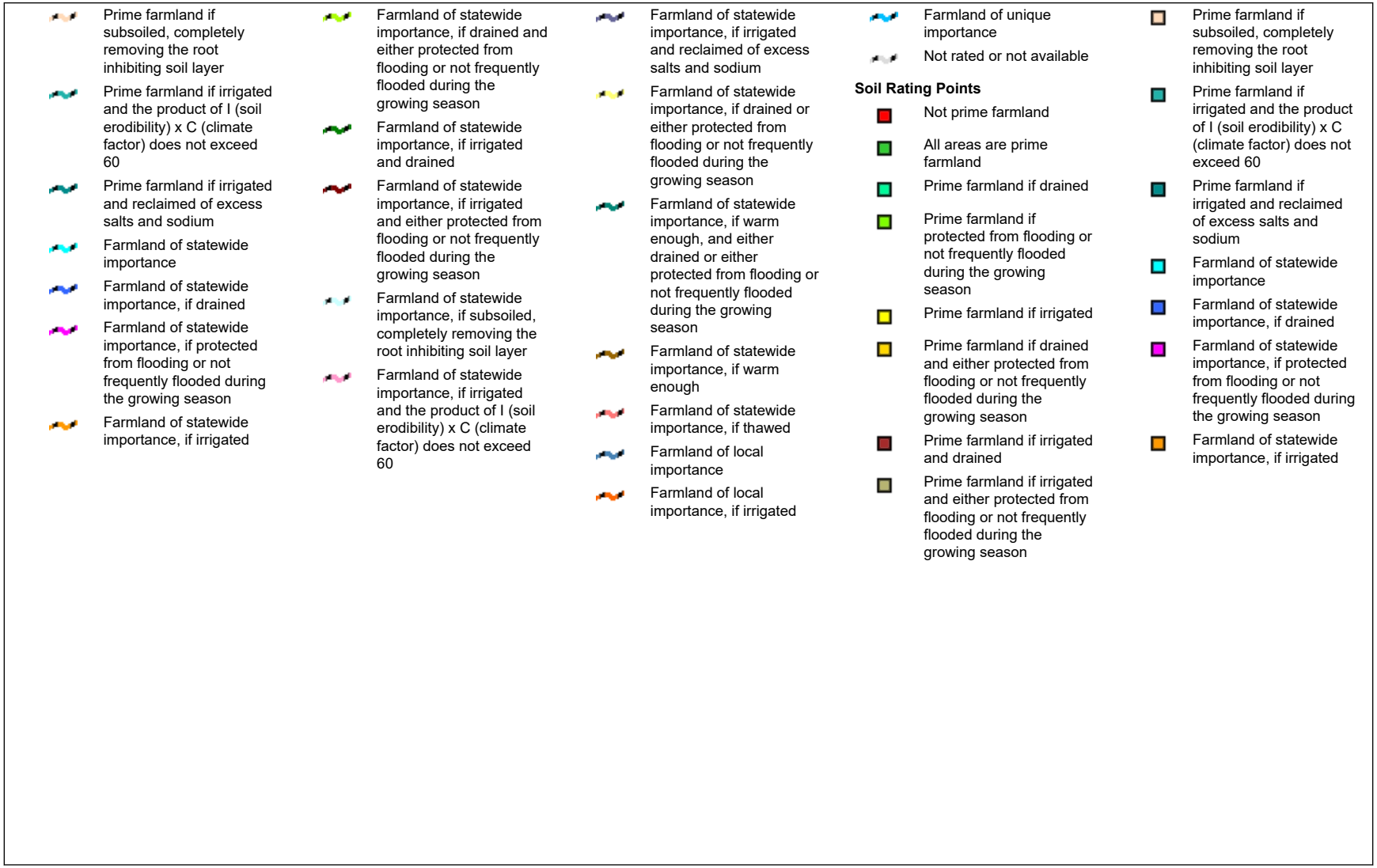
N

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

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: Gallatin County Area, Montana
Survey Area Data: Version 27, Aug 25, 2023

Soil Survey Area: Gallatin National Forest Area, Montana
Survey Area Data: Version 13, Aug 25, 2023

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 18, 2022—Aug 29, 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 (Gallatin Water Planning Area)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
79C	Bridger loam, 2 to 8 percent slopes	Not prime farmland	90.3	11.6%
178F	Copenhaver flaggy loam, 35 to 60 percent slopes	Not prime farmland	36.4	4.7%
280B	Libeg cobbly loam, 0 to 4 percent slopes	Not prime farmland	83.7	10.7%
380E	Libeg cobbly loam, 15 to 35 percent slopes, stony	Not prime farmland	43.6	5.6%
478G	Tiban-Castner channery loams, 45 to 70 percent slopes	Not prime farmland	7.8	1.0%
482C	Philipsburg-Libeg complex, 4 to 8 percent slopes	Not prime farmland	182.1	23.3%
492E	Yellowmule-Ouselfal complex, 8 to 25 percent slopes	Not prime farmland	95.4	12.2%
492F	Ouselfal-Yellowmule complex, 35 to 60 percent slopes	Not prime farmland	27.2	3.5%
494F	Bangtail-Timberlin complex, moist, 35 to 60 percent slopes, stony	Not prime farmland	18.5	2.4%
608B	Beehive-Mooseflat complex, 0 to 4 percent slopes	Not prime farmland	92.9	11.9%
679F	Bangtail-Copenhaver complex, 35 to 60 percent slopes	Not prime farmland	9.6	1.2%
694F	Timberlin-Copenhaver complex, 35 to 60 percent slopes	Not prime farmland	0.6	0.1%
GP	Gravel pit	Not prime farmland	8.6	1.1%
W	Water	Not prime farmland	5.7	0.7%
Subtotals for Soil Survey Area			**702.4**	**90.0%**
Totals for Area of Interest			**780.2**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
54-2D	Typic Argiborolls-Typic Ustochrepts-Rock outcrop complex, steep	Not prime farmland	18.3	2.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
64-2A	Typic Cryoborolls and Argic Cryoborolls, terraces and flood plains	Not prime farmland	45.9	5.9%
66-1A	Cryaquolls and Cryaquents, flood plains	Not prime farmland	13.0	1.7%
87-2D	Mollic Cryoboralfs-Typic Cryoboralfs complex, steep	Not prime farmland	0.6	0.1%
Subtotals for Soil Survey Area			**77.8**	**10.0%**
Totals for Area of Interest			**780.2**	**100.0%**

Rating Options—Farmland Classification (Gallatin Water Planning Area)

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

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Geology

N

Big Sky Canyon Village

Gallatin Rd

Lone Mountain Trl

Michener Creek Rd

Quarry PUD

Lazy J

Buck's T-4

Riverview Ln

Fortress Rd

Gallatin River

US Forest Service

Montana Fish, Wildlife, and Parks

2 4 5 6 7 8 9 10 12 13

300SDMS 110ALVM 330MDSN 217KOTN 217TMPL 110SNGR 211FRNR 112SNGR

Potable Use Wells, by Aquifer
- Unspecified
- Labeled

Geology
- *Mqa: Quadrant and Amsden Formations
- J^md: Morrison & Dinwoody Formations, and Ellis Group
- Kco: Cody Formation
- Kf: Frontier Formation
- Kk: Kootenai Formation
- Km: Mowry Shale
- Kmdt: Muddy and Thermopolis Formations
- MDtj: Three Forks and Jefferson Formations
- Mm: Madison Group
- Psh: Shedhorn Formation
- Qal: Alluvium
- Qc: Colluvium
- Qd: Diamicton
- Qgr: Gravel
- Qls: Landslide deposit
- TKga: Gneiss, augen
- Thr: Huckleberry Ridge Tuff
- XAgqf: Gneiss, quartz-feldspar
- _rpi: Red Lion and Pilgrim Formations
- GCCWSD Planning Area
- Water PER Service Areas
- Public Lands

0 0.25 0.5 Miles

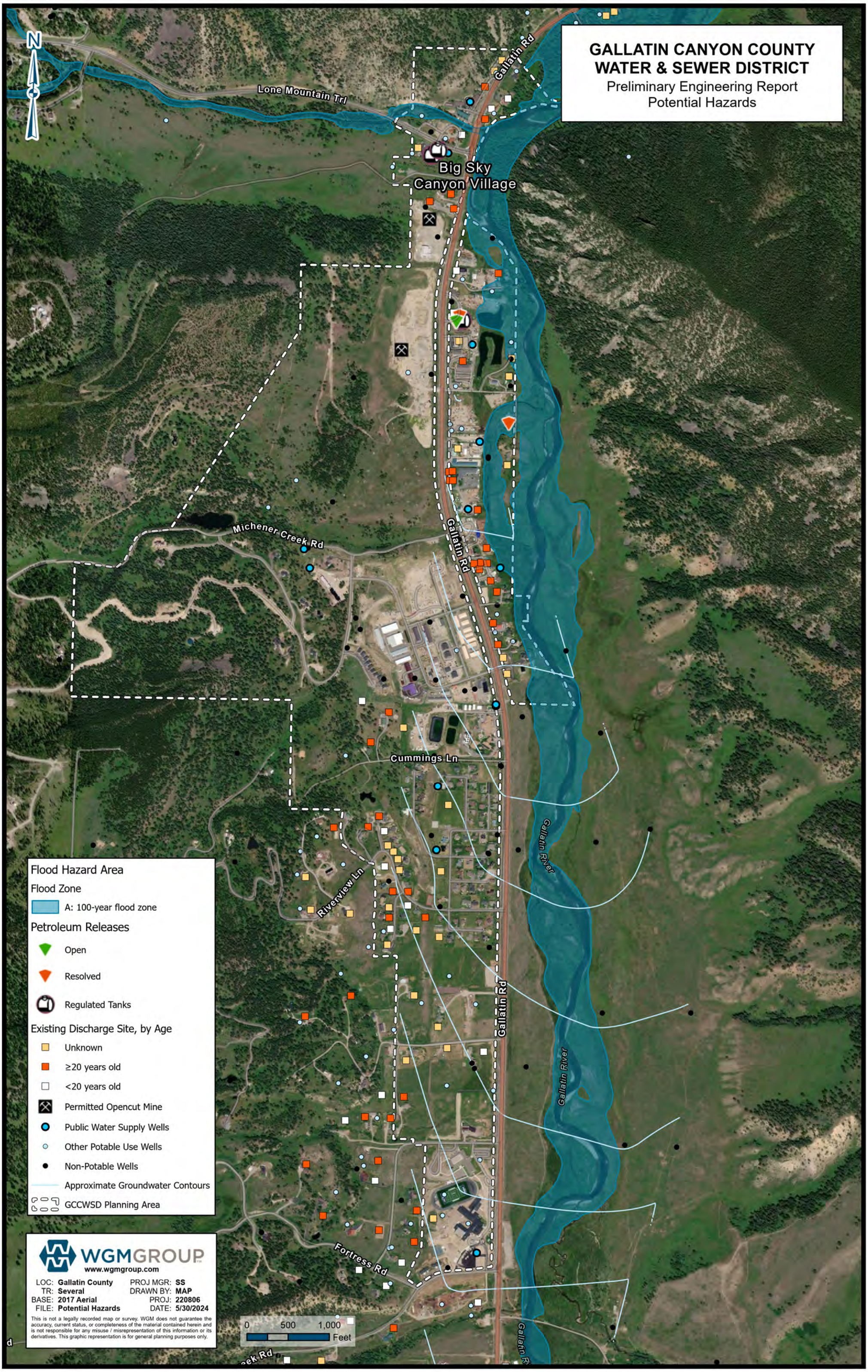
WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Geology**	DATE:	**5/24/2024**

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GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Potential Hazards



Flood Hazard Area

Flood Zone

- A: 100-year flood zone

Petroleum Releases

- Open
- Resolved
- Regulated Tanks

Existing Discharge Site, by Age

- Unknown
- ≥20 years old
- <20 years old
- Permitted Opencut Mine
- Public Water Supply Wells
- Other Potable Use Wells
- Non-Potable Wells
- Approximate Groundwater Contours
- GCCWSD Planning Area

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Potential Hazards**	DATE:	**5/30/2024**

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GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Floodplains and Wetlands

N

US Forest Service

US Forest Service

US Forest Service

Montana Fish, Wildlife, and Parks

US Forest Service

Local Government

Quarry PUD

Lazy J

Buck's T-4

2

4

5

6

7

8

9

10

12

13

Michener Creek

0 0.25 0.5 Miles

- Public Water Supply Wells
- Other Potable Use Wells

Wetland & Riparian Areas

- Freshwater Emergent Wetland
- Freshwater Forested Wetland
- Freshwater Pond
- Freshwater Scrub-Shrub Wetland
- Riparian Emergent
- Riparian Forested
- Riparian Scrub-Shrub
- River
- A: 100-year flood zone
- Water PER Service Areas
- GCCWSD Planning Area
- Public Lands

WGMGROUP
www.wgmgroup.com

LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Floodplains & Wetlands**	DATE:	**5/24/2024**

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Greta Brom-Palkowski

From: Murdo, Damon <dmurdo@mt.gov>
Sent: Thursday, June 20, 2024 4:21 PM
To: Greta Brom-Palkowski
Subject: RE: File Search Request GCCWSD Preliminary Central Water Distribution Project
Attachments: 20240619008.pdf; Reports.pdf; Sites.pdf

[EXTERNAL EMAIL] Only open attachments or click on links from senders you trust.

June 20, 2024

Greta Brom-Palkowski
WGM Group Inc.
1111 East Broadway Street
Missoula MT 59802

MONTANA HISTORICAL SOCIETY
State Historic Preservation Office

RE: GALLATIN CANYON COUNTY WATER & SEWER DISTRICT PER, BIG SKY. SHPO Project #: 20240619008

Dear Greta:

I have conducted a cultural resource file search for the above-cited project located in Sections 32, 33, T6S R4E, and Sections 4, 5, 8, 17, T7S R4E. According to our records there have been a few 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 on 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.

As long as ground disturbance will be kept to previously existing Right-of-ways and there will be no disturbance or alteration to structures over fifty years of age, we feel that there will be no cultural or historic properties affected by this undertaking. We, therefore, feel that a recommendation for a cultural resource inventory is unwarranted at this time. However, if any part of the project will be located within previously undisturbed ground, we would recommend that a cultural resource inventory be conducted in order to determine whether or not sites exist and if they will be impacted.

For all future file searches or consultations with the MT SHPO please use the new Montana Cultural Resource Database to upload your projects. We will no longer be accepting paper copies, or emails for consultation. You can find instructions for how to upload your documents on our website. https://mhs.mt.gov/Shpo/docs/download/crd-submitting-db2.pdf

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/2024

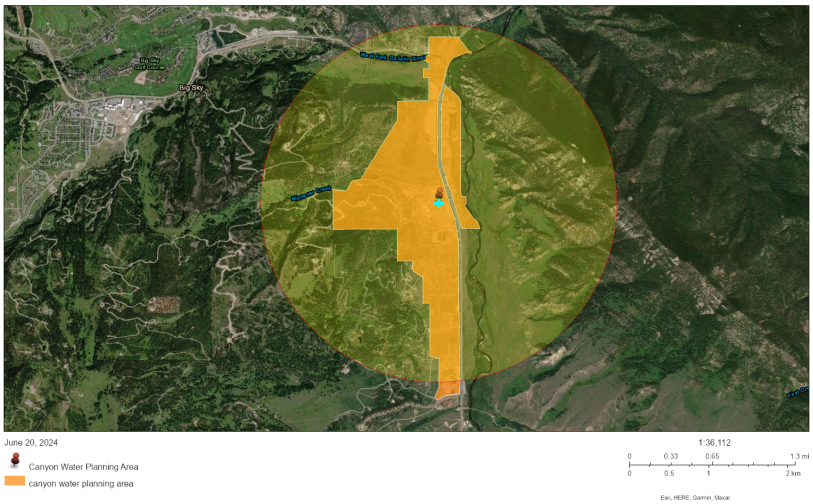
EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Big Sky, MT

1.4 miles Ring Centered at 45.249212,-111.254497
Population: 158
Area in square miles: 6.15

A3 Landscape



COMMUNITY INFORMATION

Low income: 24 percent	People of color: 6 percent	Less than high school education: 1 percent	Limited English households: 0 percent
Unemployment: 1 percent	Persons with disabilities: 2 percent	Male: 47 percent	Female: 53 percent
81 years Average life expectancy	$44,982 Per capita income	Number of households: 37	Owner occupied: 71 percent

BREAKDOWN BY RACE

White: 94%	Black: 0%	American Indian: 1%	Asian: 1%
Hawaiian/Pacific Islander: 0%	Other race: 0%	Two or more races: 4%	Hispanic: 1%

BREAKDOWN BY AGE

From Ages 1 to 4	5%
From Ages 1 to 18	22%
From Ages 18 and up	78%
From Ages 65 and up	9%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	0%
Speak Other Indo-European Languages	0%
Speak Asian-Pacific Island Languages	0%
Speak Other Languages	0%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2017 -2021. Life expectancy data comes from the Centers for Disease Control.

LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
No language data available.	

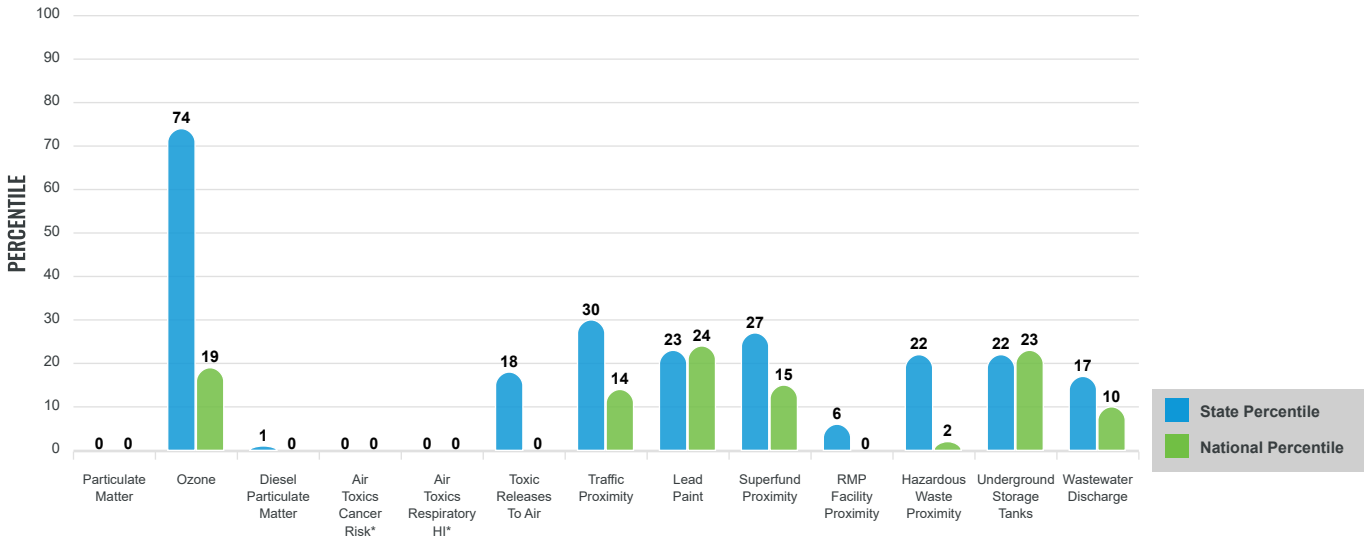
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

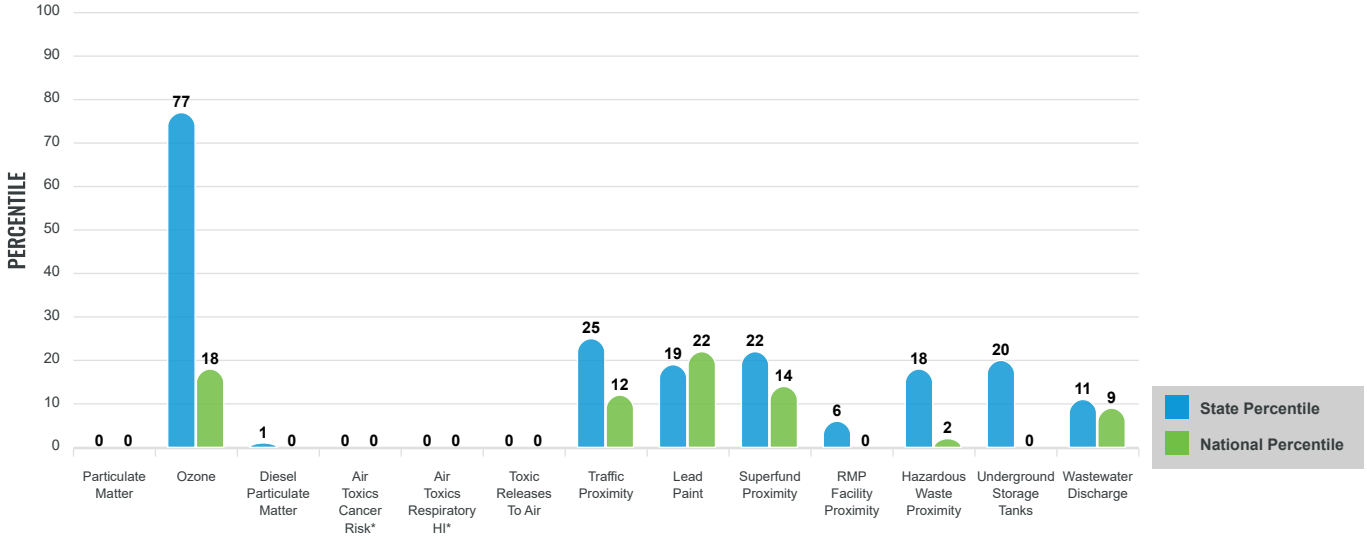
EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low-income, percent linguistically isolated, percent less than high school education, percent unemployed, and low life expectancy with a single environmental indicator.

SUPPLEMENTAL INDEXES FOR THE SELECTED LOCATION



These percentiles provide perspective on how the selected block group or buffer area compares to the entire state or nation.

Report for 1.4 miles Ring Centered at 45.249212,-111.254497

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
POLLUTION AND SOURCES					
Particulate Matter (µg/m^3)	2.71	5.24	0	8.08	0
Ozone (ppb)	57.8	54.5	99	61.6	22
Diesel Particulate Matter (µg/m^3)	0.00974	0.086	1	0.261	0
Air Toxics Cancer Risk* (lifetime risk per million)	9	15	0	25	0
Air Toxics Respiratory HI*	0.09	0.18	0	0.31	0
Toxic Releases to Air	0	590	18	4,600	1
Traffic Proximity (daily traffic count/distance to road)	6.8	67	30	210	13
Lead Paint (% Pre-1960 Housing)	0.061	0.3	20	0.3	28
Superfund Proximity (site count/km distance)	0.02	0.15	29	0.13	18
RMP Facility Proximity (facility count/km distance)	0.0083	0.22	6	0.43	0
Hazardous Waste Proximity (facility count/km distance)	0.022	0.65	23	1.9	2
Underground Storage Tanks (count/km^2)	0.076	5.1	35	3.9	27
Wastewater Discharge (toxicity-weighted concentration/m distance)	4.1E-06	1.7	24	22	13
SOCIOECONOMIC INDICATORS					
Demographic Index	15%	23%	29	35%	22
Supplemental Demographic Index	9%	12%	22	14%	26
People of Color	6%	15%	34	39%	16
Low Income	24%	32%	36	31%	45
Unemployment Rate	1%	4%	34	6%	26
Limited English Speaking Households	0%	0%	0	5%	0
Less Than High School Education	1%	6%	19	12%	14
Under Age 5	5%	5%	57	6%	54
Over Age 64	9%	20%	10	17%	21
Low Life Expectancy	17%	19%	20	20%	22

*Diesel particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 0
Hazardous Waste, Treatment, Storage, and Disposal Facilities 0
Water Dischargers 27
Air Pollution 0
Brownfields 0
Toxic Release Inventory 0

Other community features within defined area:

Schools 3
Hospitals 0
Places of Worship 1

Other environmental data:

Air Non-attainment ..... No
Impaired Waters ..... Yes

Selected location contains American Indian Reservation Lands* ..... No
Selected location contains a "Justice40 (CEJST)" disadvantaged community ..... No
Selected location contains an EPA IRA disadvantaged community ..... Yes

Report for 1.4 miles Ring Centered at 45.249212,-111.254497

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	17%	19%	20	20%	22
Heart Disease	3.8	6.5	6	6.1	9
Asthma	8.7	10.4	1	10	17
Cancer	5.1	6.9	11	6.1	27
Persons with Disabilities	2.5%	14.4%	0	13.4%	1

CLIMATE INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	19%	15%	74	12%	84
Wildfire Risk	12%	44%	40	14%	82

CRITICAL SERVICE GAPS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	1%	16%	0	14%	12
Lack of Health Insurance	4%	9%	14	9%	29
Housing Burden	No	N/A	N/A	N/A	N/A
Transportation Access	No	N/A	N/A	N/A	N/A
Food Desert	No	N/A	N/A	N/A	N/A

Report for 1.4 miles Ring Centered at 45.249212,-111.254497

WGMGROUP

DRAFT Baseline Environmental Report
Gallatin Canyon County Water and Sewer District
WGM Project Number: 220724
02.21.2024

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DRAFT REPORT DATE:

02.21.2024

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WGM File Path: W:\Projects\220724\90 Environmental & Water Resources\08 Baseline Env Assessment\2024-02-21 Draft GCCWSD Baseline Environmental Report .docx

ABBREVIATIONS & ACRONYMS

ARM	Administrative Rules of Montana
BSCWSD	Big Sky County Water & Sewer District
EA	Environmental Assessment
GCCWSD	Gallatin Canyon County Water and Sewer District
GPM	Gallons Per Minute
GWIC	Groundwater Information Center
IPaC	Information for Planning and Consultation
MEPA	Montana Environmental Protection Act
MBR	Membrane Bioreactor
MBMG	Montana Bureau of Mines and Geology
MDT	Montana Department of Transportation
DEQ	Montana Department of Environmental Quality
MTFWP	Montana Fish, Wildlife, and Parks
MTNHP	Montana Natural Heritage Program
MGD	Million Gallons Per Day
PE	Person Equivalent
PER	Preliminary Engineering Report
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TN	Nitrate+Nitrite and Total Nitrogen
TP	Total Phosphorous
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geologic Services
WMA	Wildlife Management Area
WRRF	Water Resource Recovery Facility

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EXECUTIVE SUMMARY

This baseline Environmental Assessment (EA) presents potential environmental impacts associated with proposed sewer infrastructure improvements in the Gallatin Canyon County Water and Sewer District (GCCWSD). This EA was prepared for the Montana Department of Environmental Quality (DEQ) in conjunction with the development of a Montana Environmental Protection Act (MEPA) Environmental Checklist. This report incorporates findings of previous reports, including the Canyon Area Feasibility Study (FS), the Gallatin Canyon Sewer Preliminary Engineering Report (PER), and Gallatin Canyon Sewer Project Phase I Environmental Assessment Overview (WGM, 2020; WGM, 2021; WGM, 2022). These documents served to select a Preferred Alternative for the proposed project and each contained an assessment of potential environmental impacts.

This baseline EA provides an evaluation of the current environmental resources in the affected environment based on advances in the design of the proposed project and analyzes the potential environmental impacts to those resources for the Preferred Alternative. Short and long-term measures to minimize and mitigate impacts are also identified.

This EA contains an evaluation for the project as currently designed. It is anticipated that the document will be revised as design progresses and to include updates on items such as agency and/or permitting requirements, funding sources, and public comments.

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1.0 PURPOSE & NEED FOR ACTION

1.1 INTRODUCTION & BACKGROUND

The Canyon Area (or Canyon Study Area) is located along the Gallatin River and US Highway 191 near Big Sky, Montana. It is an unincorporated community with a large tourism-based transient population. This development corridor consists of a sprawling mix of commercial-industrial areas, residential areas with relatively low density, and open space. The area is developing rapidly with an objective to facilitate increased density and offer more affordable and/or workforce housing opportunities. Sewer service in the Canyon Area currently consists of numerous septic systems and a number of larger, "public" onsite wastewater systems servicing individual development areas. These systems generate low quality effluent compared to most centralized treatment options, and the discharges result in elevated nutrient loading to the Gallatin River. The nutrient loading also directly affects human health and safety, as the discharge poses a risk of contaminating private wells throughout the developed canyon corridor. The Canyon Area exists within the larger Project Area, which includes the Big Sky County Water Sewer District Boundary (BSCWSD) and general surrounding area (refer to **Appendix A** for the Project Area Map).

In 2019, the Gallatin River Task Force and Big Sky Resort Area District (BSRAD) commissioned a FS to evaluate alternatives to provide central collection and treatment in the Canyon Area to reduce septic related impacts to the Gallatin River (WGM, 2020). The FS was completed in May 2020 and the Gallatin Canyon County Water and Sewer District (GCCWSD; the District) was formed in December 2020 with the intention of pursuing a new solution to wastewater management within the District. The District was created by a petition of all the landowners within its boundaries. The current GCCWSD includes approximately 235 acres of land spanning from the intersection of Highway 191 and Highway 64 (also known as Lone Mountain Trail) south to Buck's T-4 lodge. Central collection is proposed beyond the limits of the current GCCWSD to allow future collection of areas with existing septic systems and community and/or commercial scale wastewater treatment systems. This conceptual expanded Sewer Service Area is 680 acres and includes the current GCCWSD, existing development immediately north of the Highway 191- Highway 64 intersection, and all properties south to the Big Sky School District elementary and high school.

For the purposes of this baseline Environmental Assessment (EA), potential impacts are analyzed within and beyond the Sewer Service Area, encompassing the entire Canyon Study Area to allow for the future expansion of a centralized wastewater treatment system as development in the area continues. The larger Project Area is referenced as needed to incorporate elements of the BSCWSD that are relevant to the Canyon Study Area. Implementation of an improved wastewater collection and treatment system in the Canyon Study Area will be completed in phases. Location maps and planning boundaries from the 2021 WGM PER are included in **Appendix A**.

1.2 PROPOSED ACTION

The GCCWSD is proposing a new sewer collection system for the Canyon Area with high quality treatment provided by the existing upgraded Big Sky Water Resource Recovery Facility (WRRF) and effluent disposal through reuse and aquifer recharge. Approximately five miles of sewer collection main is proposed along Highway 191 and throughout the existing Canyon Area development corridor. Wastewater will be conveyed largely by gravity to the Canyon Area Lift Station. This will be constructed southwest of the intersection of Highway 64 and Highway 191 for conveyance of wastewater west along Highway 64 to the Big Sky WRRF. This lift station and forcemain will pump Canyon Area wastewater west along Highway 64 to the Big Sky WRRF for treatment at the soon-to-be upgraded and expanded Membrane Bioreactor (MBR) facility. This facility will produce an effluent

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compliant with Montana DEQ Class A-1 standards for reuse, Montana's highest designated wastewater effluent quality standards (i.e., concentrations of total nitrogen (TN) of less than 5 milligrams per liter (mg/L) and concentrations of total Phosphorus (TP) of less than 2 mg/L).

Treated GCCWSD effluent and a portion of the BSCWSD's effluent would be conveyed by gravity back to the Canyon Area for disposal via groundwater infiltration or for irrigation. The GCCWSD will be responsible for installation, operation, and maintenance of the sewer collection system as well as the disposal of all its effluent flow and a portion of that generated by the BSCWSD.

1.3 PURPOSE & NEED

The proposed project will provide safe and reliable wastewater management for the Gallatin Canyon community. The 'purpose and need' for the proposed project is three-fold:

1) to protect the Canyon Study Area's groundwater (drinking water source) quality;
2) to mitigate existing and future nutrient loading to the Gallatin River and the West Fork Gallatin River (West Fork); and
3) to establish improved long-term wastewater management enabling continued area growth while mitigating the risk of future area water quality impacts as the Canyon Study Area further develops.

Providing a centralized sewer system that treats wastewater to meet Class A-1 water reuse effluent quality standards while progressively retiring existing septic systems will protect public and environmental health. The project also provides the base infrastructure to accelerate progress towards several community goals:

- Protecting the long-term health of the Gallatin River watershed.
- Construct more workforce housing.
- Increase water conservation opportunities.
- Improve BSCWSD wastewater disposal capacity and redundancy/safety.
- Reduce the potential for nutrient loading to the impaired West Fork watershed.

1.4 PUBLIC INVOLVEMENT

Public involvement and outreach regarding the proposed project have been ongoing since 2019. The BSCWSD and GCCWSD, Gallatin River Task Force, and the Resort Tax Advisory Board regularly hold public meetings. The proposed project has been the subject of several scoping meetings hosted by these entities beginning during the Canyon Area FS development in fall of 2019. The GCCWSD and BSCWSD have information about the proposed project, meeting notes, and upcoming meeting schedules on their website. The Canyon Area and the community has shown general support for central wastewater management by voting for a 1% resort tax increase for infrastructure funding, $12 million of which is committed for this project. As part of the July 2021 ARPA application for this project, letters of support for the proposed project were submitted by Gallatin County, Madison County, Gallatin Watershed Council, Gallatin Conservation District, Gallatin River Task Force, as well as several Canyon property owners including the Big Sky School District. Both GCCWSD and BSCWSD will continue to keep updated information about the proposed project on their websites and future public meetings will be conducted as final design of the proposed project progresses.

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2.0 ALTERNATIVES

Several components of a wastewater solution were evaluated during the development of the PER (WGM, 2021). Alternatives were evaluated based on various factors including life-cycle cost, technical and logistical feasibility, operations and maintenance complexity, public health and safety, environmental impacts, and public acceptance. Two alternatives exploring maintaining existing systems were eliminated from further analysis due to the associated continuing degradation of groundwater quality. Three sanitary sewer collection methods were eliminated from further analysis due to excessive operations and maintenance costs and unviable treatment options. Four treatment methods were eliminated because of being too land intensive, offering inadequate treatment performance, and not being located with the GCCWSD jurisdiction. Six disposal methods were eliminated due to being land intensive, technically unfeasible, creating unnecessary operations and maintenance costs, and/or generating public objection or permitting issues.

Following the initial component screening, a no action alternative was removed from further consideration due to water quality issues related to existing septic systems that present health and safety risks for residents of the area. Three action alternatives with viable systems components for treatment, collection, and disposal were brought forth for final analysis. All three alternatives included construction of the Canyon Study Area sewer collection system. Each action alternative was evaluated and ranked within a decision matrix to select the optimal solution. Alternative two in the PER was selected as the preferred alternative based on the life cycle cost of the project, ease of operations and maintenance for the facilities, high-quality level of effluent being discharged, minimized environmental impacts, and greater public acceptance. The details of each alternative and the evaluation of alternatives is presented in the PER (WGM, 2021). A summary of the preferred alternative follows.

2.1 PREFERRED ALTERNATIVE SUMMARY

A completely new sanitary sewer collection system is proposed to collect the raw sewage generated in the Canyon Study Area and convey it to a centralized treatment location, the Big Sky WRRF. Existing septic and community treatment systems would be abandoned and properly de-commissioned after the proposed project is completed and operational. The Canyon Study Area generally slopes downward from south to north, so most of the wastewater will be collected and conveyed by gravity to the Canyon Area Lift Station.

The collection system south of the Highway 64 intersection consists of gravity sewer lines. Based on the peak hour design flows, a system of 8-inch, 10-inch, and 12-inch diameter pipes is anticipated to be adequate to convey wastewater flows without surcharging the collection system. The gravity-only wastewater collection system main would primarily parallel US 191, from Beaver Creek Road (just south of Lone Peak High School) to Highway 64. A small sewer collection system would be extended approximately 0.2 miles north of Highway 64.

At least one lift station will be constructed to convey wastewater from the Canyon Area to the Treatment Facility, and a second midway lift station may be necessary due to the elevation gradient and resulting hydraulic pressure required to lift the wastewater from the Canyon Area to the Treatment Facility. The primary Lift Station will be located adjacent to the intersection of Highway 64 and Highway 191. The second Lift Station, if necessary, will be located along Highway 64 approximately halfway between the primary lift station and the Big Sky WRRF. The precise locations will depend on site availability and accommodations involving private property owners, the United States Forest Service (USFS), and MDT. If there is no reasonable alternative to placing the

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infrastructure on National Forest System lands, a NEPA analysis will be completed and a Special Use Permit will be obtained from the USFS.

The lift stations will pump the raw sewage from the Highway 64/191 intersection to the Big Sky WRRF, approximately 1.8 miles (9,300 ft). The forcemain is anticipated to be an 8-inch diameter main to convey the estimated 727 gallons per minute (gpm) peak hour flow to the WRRF. If more capacity is required, additional wet well capacity at the lift station could be provided to allow for a reduction in the peaking factor.

These two lift stations and the forcemain would bring Canyon Study Area wastewater to the Big Sky WRRF for treatment at the BSCWSD's soon-to-be upgraded and expanded MBR facility. The BSCWSD WRRF treatment upgrade is part of another project that is already underway and scheduled for completion in 2023.

Wastewater at Big Sky WRFF will be screened, de-gritted, and then treated through a series of anaerobic/anoxic/aerobic zones to maximize biological nutrient removal. Biosolids will be aerobically digested, dewatered, and composted with sawdust and coarse green waste. The activated sludge will then be filtered by ultrafiltration membranes and UV disinfected. This facility will produce an effluent compliant with DEQ Class A-1 standards for reuse.

Treated GCCWSD effluent and a portion of BSCWSD's effluent will flow by gravity back to the Canyon Area via a pipe sharing a similar alignment to the wastewater force main. This pipeline will convey DEQ Class A-1 quality effluent from the WRRF west down Hwy 64 to the intersection of Hwy 64 and US 191, then south through the Canyon Area for reuse and/or disposal. Locations for reuse and/or disposal via groundwater discharge (Rapid Infiltration Beds, subsurface drainfields, or shallow injection wells) will ideally be dispersed throughout the Canyon Area, including as far south as the Big Sky School District.

The distance that a pipeline could convey the effluent without additional pumping depends on pressure losses, which will be driven by velocities in the pipeline: larger diameter pipe will result in less head loss and longer conveyance up the Canyon. A 12-inch main could convey about 2.5 million gallons a day as far south as the south end of the Quarry PUD. A 16-inch main could convey as much as 3 million gallons a day of effluent as far south as the southern end of the Ramshorn View Estates subdivision. Conveyance of effluent for reuse or discharge further south than Ramshorn may require a booster pump station. It is likely that some groundwater disposal and irrigation reuse will be located at Big Sky School District, so this booster station will be included in the conceptual design.

A 16-inch reuse pipeline, from the Big Sky WRRF to the south end of Ramshorn View Estates would be approximately 3.6 miles (19,000 ft) in length. The distance along Hwy 64 is approximately 9,300 ft, and the length from the intersection with 191 to the south end of Ramshorn View Estates is approximately 9,700 ft.

The reuse main conveying the DEQ Class A-1 quality effluent from the treatment facility is planned to extend along the entire service area corridor to facilitate disposal through multiple groundwater infiltration galleries and/or shallow injection wells. Irrigation and snowmaking are also being considered as potential supplemental disposal methods, with less emphasis on snowmaking due to economic limitations. Groundwater discharge feasibility was assessed in the Draft Discharge Feasibility Report (WGM Group, 2023). This document was written in preparation for a Preliminary Groundwater Discharge Design Report and to support coordination for groundwater and/or surface water discharge permit(s). Five preliminary discharge sites have been identified. Three of the sites contain existing drainfields, and all sites have space for increased disposal capacity with the

implementation of new infrastructure. Phase 1 of the sewer project is assumed to require a minimum disposal capacity of 0.2 million gallons per day (MGD). It is anticipated that at full build out the Canyon Study Area may send up to 0.30 MGD of wastewater to the BSCWSD WRRF for treatment and receive 0.5 MGD of treated effluent for disposal. Existing disposal areas and potential discharge areas are depicted in **Appendix A**.

Preliminary disposal site details from north to south in the Canyon Area are as follows:

1. Quarry PUD – Multiple drainfields are anticipated to be constructed as part of the ongoing planned unit development (PUD) project. Disposal capacity estimates (100,000 – 200,000 gpd) reflect planned drainfield locations along with potential for additional drainfields and/or shallow injection wells.

2. Lazy J Utility – The existing drainfield is permitted for 20,000 gpd of Level II effluent quality wastewater. Disposal capacity estimates for this site are anticipated to be hydraulically limited due to a restricting clay soil layer, so 20,000 gpd is the current capacity threshold even with considerations of utilizing the existing drainfield and a new drainfield installed in the dedicated replacement area. This specific area may not be economical to pursue further. However, some subsurface disposal on Lazy J property may be required due to the property users' water rights.

3. Buck's T-4 – There are no existing drainfields on the property. Disposal capacity estimates (50,000 gpd) assume that the existing lagoon footprint will be replaced with new infiltration infrastructure (rapid infiltration basins) if economical.

4. Ramshorn Subdivision – The subdivision has three drainfield areas and a discharge permit for 14,800 gpd of Level II effluent quality wastewater. Approximately 30,000 gpd of disposal is estimated if the existing drainfield infrastructure is used 'as is.' Significant increased capacity (180,000 gpd) is anticipated to be feasible if the existing drainfields are utilized along with installation of new drainfield laterals in the dedicated replacement areas.

5. FWP Treatment Wetland – An approximately 40-acre area of land owned by Montana Fish, Wildlife and Parks (FWP) was identified based on review of relevant hydrogeologic conditions and distance from drinking water wells. The scale of available land area provides an opportunity for increased nutrient removal via engineered treatment wetlands. The proposed design would result in excess of 500,000 gpd of disposal capacity and treated effluent polishing to remove an additional 40 percent to 50 percent nitrogen reduction during summer months.

Construction of forcemain and effluent pipelines is anticipated to occur largely within existing MDT Right-of-Way (ROW) along Highway 191. Proper easements will be obtained for any work located outside of MDT ROW. Requirements for the spacing between the raw wastewater and treated effluent pipes will be permitted by DEQ and determined during final design. Installation will require trenching along Highways 191 and 64, and borings under Highway 64, Highway 191, at numerous local and access roads, and along the West Fork. Two boring locations have been selected along Highway 191. One is near Straight Iron Road and a second is approximately 0.25 miles south of the intersection of Highways 191 and 64. These sites would employ the jack and bore method. Additional boring sites are predicted to utilize directional drilling. One boring site across the West Fork is anticipated to be located between Highway 191 and the pedestrian bridge crossing the river. Additional sites will be determined during final design.

Preliminary alignment of the lift stations, forcemain, reuse pipeline, public ROW locations, known boring locations, and potential disposal sites are depicted in the preliminary plan sets in **Appendix B**.

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3.0 AFFECTED ENVIRONMENT

3.1 PROJECT AREA

The Project Area includes the entire Canyon Study Area as defined above, as well as the general surrounding area and BSCWS boundary (refer to Project Area Map in **Appendix A**). Future development within the Project Area is expected and accounted for in the design. The Canyon Study Area is approximately 4,500 acres in size. The majority of this total land area is not planned for future development (predominately associated with Gallatin National Forest land and, to a lesser extent, "open space" zoning designations, and undevelopable floodplain-riparian areas). Existing development consists of a sprawling mix of commercial-industrial areas (primarily in the immediate vicinity of Highway 191), residential areas with relatively low density, and a few undeveloped parcels. The Project and Canyon Study Areas are depicted in **Appendix A.**

3.2 POPULATION & FLOW PREDICTIONS

The U.S. Census Bureau data indicates that the population of Gallatin County has increased from 118,960 in 2010 to 124,857 in 2022. Actual flow rate and detailed population data are not currently available for the Canyon Study Area. The 2021 WGM PER utilized Person Equivalent (PE) methodology to estimate flow rates based on the available population data. Calculations indicated that flows and population are expected to grow to nearly 2.7 times the current level in the Sewer Service Area and the entire Canyon Study Area over the next 20 years. A projected population was estimated at 3,050 and a design flow of 305,000 gpd is assumed for the entire Canyon Study Area. Detailed population and flow estimate calculation information can be found in the PER (WGM, 2021).

3.3 NATURAL FEATURES

The Canyon Study Area is within the Gallatin and Madison Mountain Ranges, within the Middle Rockies Mid-Elevation Sedimentary Mountains and Gneissic-Schistose Forested Mountain Ecoregions, at an approximate elevation range from 6,000 to 6,200 feet above mean sea level (msl) and valley slope of approximately 0.75 percent. Climax vegetation includes subalpine fir and Douglas-fir forests and major land uses include logging, recreation, and some grazing (Woods 2002). According to the Montana Natural Heritage Program (MTNHP) land cover database, land use in the proposed Canyon Study Area is made up primarily of forest and woodland systems, human land use, shrubland, steppe and savanna systems, and wetland and riparian systems.

The Project Area is within the Missouri River Region, Missouri Headwaters Subregion, and Gallatin River Watershed. The Gallatin River flows from south to north and Highway 191 parallels the river closely through the Canyon Area. There are several wetland and riparian areas adjacent to the river on the east side of Highway 191. The West Fork flows from west to east and meets the main stem Gallatin River near the junction of Highways 191 and 64. The West Fork is currently considered an impaired waterbody by DEQ and has a total maximum daily load (TMDL) defining the maximum amount of pollution the river can receive from Nitrate plus Nitrite and TN. Hydrography and Wetland and riparian maps from the PER are included in **Appendix A.**

In general, the geology and bedrock layers in the Project Area include alluvium of modern channels and floodplains (Qual), colluvium (Qc), the Madison Group (Mm), Quadrant Sandstone (PMqa), the Morrison Formation (JTmd), the Kootenai Formation (Kk), Thermopolis Shale (Kmdt), Muddy Sandstone (Kmdt – same as Thermopolis), Mowry Shale (Km), Frontier Formation (Kf), and Cody Formation (Kco) (Baldwin 1996). Baldwin (1997) determined that potential aquifers exist in all of the bedrock units due to extensive fracturing, with yields ranging on average from one to 30 gpm. More

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specifically, the Madison formation and aquifer produces extremely high yields to not only groundwater wells in the area, but to springs as well. Made up of karstified limestone, the formation contains interconnected solution channels and large voids. The groundwater in the area generally follows the slope of the topography toward the Gallatin River and is a part of the larger Gallatin Watershed. Natural Resources Conservation Service (NRCS) soils data indicates that soils in the area are primarily loam and cobbly loam. Overview maps of regional geology and soils from the 2021 WGM PER are found in **Appendix A.**

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4.0 ENVIRONMENTAL EFFECTS

Potential direct and indirect environmental effects to the physical and human environment from the proposed project were analyzed using the MEPA Environmental Checklist. Environmental Checklists were previously completed for the PER and Gallatin Canyon Sewer Project Phase 1 EA Overview.

The proposed project will not result in significant adverse environmental impacts and no significant cumulative effects are anticipated. Potential significant effects were minimized or mitigated utilizing project design standards, enforceable controls, and/or conditions imposed by regulatory agencies. All facilities will be designed and constructed in accordance with sound engineering practices and will comply with all relevant regulations and permit requirements of Federal, State, and local agencies. Best Management Practices (BMPs) will be implemented during construction activities to minimize temporary impacts to the maximum extent possible.

The proposed project is anticipated to provide long term benefits to the Project Area, including conserving Gallatin River aquifer water by reducing well sourced irrigation; recharging the aquifer with very high-quality treated effluent; reducing nutrient loading in the West Fork; and progressively removing septic systems to reduce human health risks associated with septic sourced pathogens that currently contaminate drinking water wells.

4.1 ENVIRONMENTAL CHECKLIST

PHYSICAL ENVIRONMENT		
Impact Code	**Impact Type**	**Explanation of Impact to Resource**
1. Soil Suitability, Topographic and/or Geologic Constraints (example: soil lump, steep slopes, subsidence, seismic activity)		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: The soils in the Canyon Study Area (Area) are primarily loam and cobbly loam. In general, the geology and bedrock layers in the Big Sky area include alluvium of modern channels and floodplains (Qual), colluvium (Qc), the Madison Group (Mm), Quadrant Sandstone (PMqa), the Morrison Formation (JTmd), the Kootenai Formation (Kk), Thermopolis Shale (Kmdt), Muddy Sandstone (Kmdt – same as Thermopolis), Mowry Shale (Km), Frontier Formation (Kf), and Cody Formation (Kco) (Baldwin 1996).There are no identified topographical or geographical constraints in the proposed project's area of disturbance. See the attached NRCS Soils and geology exhibits in **Appendix A**. Preferred Alternative Environmental Narrative: Topography is conducive to gravity collection for most of the system. Soils will be disturbed during construction activities. All proposed project activities are anticipated to occur within an existing or obtained residential or commercial ROW in areas that have previously been developed. Portions of the Area may experience high groundwater, especially east of Highway 191 and soils are anticipated to be inundated with water during this time. Construction will need to be scheduled around this time or dewatering employed. Sewer mains and appurtenances may need to be constructed to be installed in high groundwater. The proposed project is not anticipated to impact the overall soil suitability or topographic/geologic constraints in the Area.

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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	Current Conditions: According to the DEQ's "Discovering DEQ's Data," there are no known hazardous waste sites in the Area. There are seven underground gas or diesel storage tanks within this area, located at two different facilities, Exxon and Conoco. There are power lines in the area. An exhibit of existing facilities is located in **Appendix A**. Preferred Alternative Environmental Narrative: The proposed project will not impact any of the existing storage tanks or power lines in the Area. Care will be taken during design and construction to avoid interference with these hazardous facilities. The proposed project will not add any additional hazardous facilities.
3. Surrounding Air Quality (example: dust, odors, emissions)		
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	Current Conditions: According to the Environmental Protection Agency (EPA), the proposed project is not located in a nonattainment area for air quality. There are no known existing issues with surrounding air quality in the Area. Preferred Alternative Environmental Narrative: Construction activities in the proposed project area may cause temporary direct impacts to air quality from dust and emissions from construction vehicles. Dust abatement on high traffic dirt/gravel roads will be managed with watering during construction to minimize impacts. The duration will be short-term, the extent will be local to the construction areas, and the frequency will be non-recurring since it is solely associated with the construction phase. Additionally, effluent disposal is generally proposed to be subsurface and due to the high quality of the effluent, odor and emissions will be limited to none. Removing odors emitted from existing septic systems is anticipated to have a beneficial impact on surrounding air quality. No significant or long-term effects will occur.
4. Groundwater Resources and Aquifers (example: quantity, quality, distribution, depth to groundwater, sole source aquifers)		
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Groundwater resources in the aquifers in the Area originate from the Madison formation. Baldwin (1997) determined that potential aquifers exist in all of the bedrock units in the areas due to extensive fracturing, with yields ranging on average from 1 to 30 gallons per minute (gpm). More specifically, the Madison formation and aquifer produces extremely high yields to not only groundwater wells in the area, but to springs as well. Made up of karstified limestone, the formation contains interconnected solution channels and large voids. Geologic faults and structures in the formation provide high water yield potential through secondary flow pathways (Baldwin 1997). Currently, groundwater in the Area generally follows the slope of the topography toward the Gallatin River and is a part of the larger Gallatin Watershed, flowing below several septic systems. Although many drinking water wells in the area that draw from aquifers are deep, review of Groundwater Information Center (GWIC) data in the area indicates that some drinking water wells are shallow and draw from the same aquifer that the

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		septic systems discharge to, and therefore are more susceptible to septic nitrate contamination. Preferred Alternative Environmental Narrative: The preferred alternative is anticipated to benefit groundwater resources in the proposed project area. With the extension of central sewer, homes in the area can connect to County utility district managed sewer and abandon their drainfields. This will result in improved quality of the canyon aquifer as discharges of partially treated septic system effluent containing nitrates, microorganisms, and other contaminants to groundwater will be reduced. Additionally, high-quality, highly treated effluent will be discharged to the canyon aquifer through groundwater infiltration which will help replenish the aquifer. Discharge permitting will be required through DEQ. In the West Fork Watershed, the Big Sky County Water and Sewer District (BSCWSD) currently discharges 100% of its effluent via irrigation. Moving some of this effluent out of the watershed will reduce the potential for nutrients to contribute loading to the West Fork aquifer and reduce the need for land application practices that results in 100% "consumptive use" of treated effluent.
5. Surface Water/Water Quality, Quantity and Distribution (example: streams, lakes, storm runoff, irrigation systems, canals)		
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Surface waters in the proposed project area are part of the Gallatin River Watershed. Primary streams in the Area are the Gallatin River and West Fork Gallatin River. Currently, the Gallatin River does not have a nutrient TMDL, however, it is estimated that wastewater from existing septic systems causes nitrate load to roughly double in the river, which has started to experience algal blooms. Three waterbodies in the West Fork Watershed are currently deemed as "impaired waterbodies" under the Clean Water Act's 303(d) list and have TMDLs for Nitrate+Nitrite and Total Nitrogen (TN). These are the Middle Fork of the West Fork, the South Fork of the West Fork, and the West Fork of the Gallatin River. Existing discharge areas are depicted in **Appendix A**. Preferred Alternative Environmental Narrative: The preferred alternative is anticipated to benefit surface water and water quality in the Area by removing septic systems contributing to nitrate loads and providing total net nutrient reduction in the watershed. No impacts to surface water during construction activities are anticipated. The installation of drilled pipeline crossings under the West Fork River is not anticipated to increase turbidity or otherwise impact the river or water quality. Construction equipment will not access waterways within the high-water mark or enter any wetland areas. Drilling fluid utilized during directional drilling will be contained in an area outside of the high-water mark. If bore pits are utilized for drilling, they will be located outside of the high-water mark and outside of any wetlands in the area. High-quality, highly treated effluent that is discharged to the canyon aquifer is anticipated to help make the Gallatin River more resilient to the temperature and precipitation variability of climate change and drought by providing more groundwater inflow to the river, specifically targeting recharge during seasonal low flow time periods. The overall impact to surface water and groundwater is anticipated to be beneficial. Specific information on anticipated impacts to surface water, including projected

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		nitrogen levels, is provided in Section 4.2, below.
6. Floodplains and Floodplain Management (Identify any floodplains within one mile of the boundary of the project.)		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: There are Zone A floodplains along the Gallatin River, east of Hwy 191, and along the West Fork Gallatin River. A floodplain exhibit is included in **Appendix A**. Preferred Alternative Environmental Narrative: The majority of project activities will take place outside of the Zone A 100-year floodplain. Collection lines will be designed outside of floodplains to the maximum extent possible, however, collection lines may need to be located within this zone to service existing buildings. Appropriate floodplain permits will be obtained before project activities begin. No long-term adverse impacts to floodplains are anticipated as a result of project activities and the proposed project will not result in an increase to the Base Flood Elevation.
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	Current Conditions: There are wetlands located adjacent to the Gallatin River, the West Fork Gallatin River, Beaver Creek, Michener Creek, and Porcupine Creek, as well as isolated pothole wetlands elsewhere in the Area. A wetland and riparian exhibit is included in **Appendix A**. Preferred Alternative Environmental Narrative: The majority of construction activities associated with the proposed project will be located outside of wetland areas and in an MDT or Gallatin County ROW near Hwy 191 and Hwy 64. New sewer lines will be designed outside of wetlands to the maximum extent possible. If impacts to wetlands cannot be avoided, wetlands will be delineated, and appropriate permits will be obtained prior to beginning project activities. As the regulatory authority, the U.S. Army Corps of Engineers (USACE) will make final jurisdictional determinations and mitigation requirements for impacts to wetlands. Overall, the proposed project is anticipated to benefit wetlands by providing more groundwater inflow and improving water quality by reducing nitrogen loading.
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	Current Conditions: There are agricultural lands located within one mile of the project area. Grazing, cropland, and forestry production exists on private and USFS lands within the Area. No soils identified as prime or important farmland exist with the proposed project area. A soil map and NRCS soil report are included in **Appendix A.** Preferred Alternative Environmental Narrative: The Preferred Alternative may result in temporary impacts to agricultural lands during construction activities. Impacts are anticipated to be short-term and temporary. Disturbed areas will be seeded with desired species as soon as is practicable following project activities. The proposed project will not

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		impact any prime or important farmland, or production at any grazing, forestry, agricultural lands. All new infrastructure is anticipated to be constructed within ROWs and on previously developed properties.
9. Vegetation and Wildlife Species and Habitats, Including Fish (example: terrestrial, avian and aquatic life and habitats)		
☒ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: There are various habitats for plant, wildlife, and fish species within the Area, primarily on USFS, MTFWP and other public lands. Conifer forests, deciduous forests, and sagebrush are the most common ecosystems that may provide habitat for vegetation and wildlife. There is habitat for aquatic resources, including fish, in wetland and riparian systems including in the Gallatin River, West Fork Gallatin River and other small tributary streams. MTNHP data indicates that over 3,000 species occurrences have been documented in the Area. The most common species present include the following: Beaver (*Castor canadensis*), American robin (*Turdus migratorius*), black-billed magpie (*Pica hudsonia*), common raven (*Corvus corax*), hoary false-alyssum (*Berteroa incana*), Canada thistle (*Cirsium arvense*), and Common Hound's-tongue (*Cynoglossum officinale*). Westslope cutthroat trout, a Montana species of concern, is present in the Gallatin River and in the West Fork Gallatin River. The proposed project's extent of disturbance is generally comprised of developed or soon-to-be-developed commercial and residential properties that may provide some habitat to biological resources but is presumed to be of lesser quality than that of native ecosystems. Preferred Alternative Environmental Narrative: The proposed project will temporarily impact biological resources present within the limits of disturbance for installation of sewer mains, lift station and forcemain. Wildlife species adjacent to project areas may also be temporarily disturbed by noise and dust associated with project activities. Disturbed areas will be seeded with desired vegetation following project activities and habitat is anticipated to return to a pre-project state. The project will not convert any native ecosystems or undisturbed wildlife or aquatic habitat to developed land. The project is anticipated to indirectly benefit fish and aquatic life and their habitats by reducing the nitrate loads to the Gallatin River and West Fork Gallatin River and increasing base flows through recharge.
10. Unique, Endangered, Fragile, or Limited Environmental Resources, Including Endangered Species (example: plants, fish or wildlife)		
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: A list of endangered and threatened species with habitat ranges overlapping the project area was generated using the USFWS Information for Planning and Consultation (IPaC) system. Species with the potential to occur in the proposed project vicinity include the threatened grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*) and Canada lynx critical habitat, whitebark pine (*Pinus albicaulis*), threatened North American wolverine (*Gulo gulo luscus*), and candidate, monarch butterfly (*Danaus plexippus*). Bald eagle *(Haliaeetus leucocephalus)* and golden eagle *(Aquila chrysaetos)* are also present in the area and protected under The Bald and Golden Eagle Protection Act of 1940.

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		The closest occurrence of a grizzly bear documented by MTNHP was approximately two miles away in 2002. The Area encompasses both continuous home range and potential transitory movement for the species and overlaps the Yellowstone recovery zone. A population of approximately 700 bears occur within this recovery zone and 512 observations have been documented in this zone. There have been no Canada lynx occurrences within the project area. The closest occurrence occurred in 2008, approximately one mile from the project sites and was noted as an unlikely site for a lynx. There is very little preferred habitat for lynx in the Area. The Gallatin Mountain Range is designated lynx Critical Habitat. A total of one observation has been documented in this area. There are no documented occurrences of whitebark pine in the Area. There are several occurrences documented within one mile of the project area. It is presumed that there is a preferred habitat for the species on public lands in the Madison and Gallatin Mountain Ranges within the Area. A total of 136 wolverine observations have been documented by MTNHP in the Madison and Gallatin Mountain Ranges. A wolverine track was reported approximately two miles from the Area in 2000. There is no preferred habitat for wolverine in the Area. There are no documented Monarch butterfly occurrences near the Area. The closest species occurrence is from 2007, approximately 16 miles away. There are many occurrences of bald eagles and one documented nest site in the Area. The nest site is on the east side of the Gallatin River and approximately 1,000 feet from the project's extent of disturbance. There are two occurrences of golden eagles and no nest sites documented in the Area. <u>Preferred Alternative Environmental Narrative:</u> The proposed project is not anticipated to impact any endangered, threatened, fragile, or limited environmental resources or habitats. All project activities will take place within areas that have previously been developed near Highways 191 and 64 that have a high degree of existing disturbance and human activity. The project is located within, or immediately adjacent to, existing transportation networks and MDT ROWs, and there is no suitable habitat for endangered resources within project limits. Project activities will occur during daylight hours and will not impact the unlikely occurrence of a transient endangered resource moving through the area at night. Conservation measures will be employed to manage potential bear attractants and mitigate conflicts with grizzly bears. No habitat for unique or endangered species will be converted to developed land as a result of project activities. Long-term indirect benefits to threatened and endangered species are anticipated due to the improved quality of surface water and groundwater.
11. Unique Natural Features (example: geologic features)		
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	<u>Current Conditions:</u> The Gallatin River is rated as a blue-ribbon trout fishing river. It is also eligible for classification as a Wild and Scenic River due to its unique recreational, scenic and heritage features.

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		Preferred Alternative Environmental Narrative: The proposed project is anticipated to have a beneficial impact on the unique natural features of the Gallatin River by reducing nutrient loading to the river and recharging aquifers in the Area through groundwater infiltration.
12. Access to, and Quality of, Recreational and Wilderness Activities, Public Lands and Waterways, and Public Open Space		
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: There are many existing access areas and public open space areas within the Area. Approximately 2,040 acres of public land are present. In addition, the Gallatin River is an important recreational resource for fishing, rafting, kayaking, hiking and more. Preferred Alternative Environmental Narrative: The proposed project will not impact access to, or quality of, recreational and wilderness activities or public lands. Reduction of anthropogenic nutrient loading to ground and surface waters in the area is anticipated to have a beneficial impact on public lands and waterways.

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	Current Conditions: Visual quality in the Area is typical of a rural highway and river corridor. Visuals include the Gallatin River and Madison and Gallatin Mountain Ranges mixed with agriculture and residential and commercial developments. Development in the area has increased in recent years altering natural landscapes, especially along the Hwy 191 and 46 corridors. Nearly all components of existing water and sewer structures are underground and do not contribute to visual quality. Preferred Alternative Environmental Narrative: Minor temporary impacts to the visual quality and aesthetics will occur during project construction due to construction equipment. Impacts will be mitigated by limitations to construction hours, designated staging areas, and weekday-only work. The duration will be short-term, the extent will be local to the construction areas, and the frequency will be non-recurring since it is solely associated with the construction phase. The proposed project is not anticipated to impact the overall visual quality of the Area. Nearly all components of the sewer will be underground or in existing wastewater management sites. The lift station pump house will be designed to not cause undo visual disturbance.
2. Nuisances (example: glare, fumes)		
☒ No Impact ☐ Beneficial ☒ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	Current Conditions: The proposed project is located along a highway corridor with residential and light commercial areas where nuisances are rare, and the level of tolerance is low. Typical existing nuisances include traffic noise, occasional diesel fumes, and occasional construction noise. Current wastewater facilities may emit odors. Preferred Alternative Environmental Narrative: The proposed project may result in minor adverse impacts during

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		construction, when there may be temporary nuisances such as diesel odors, construction noise, and equipment noise. These impacts will be mitigated by limitations to construction hours, designated staging areas, and weekday-only work. Adverse impacts due to construction will be short-term, local, and non-recurring. The preferred alternative will not result in any permanent nuisances. All new proposed project components are passive and do not produce any noise, odors, or unsightly appearance. New conveyance facilities will be designed to eliminate stagnant locations where wastewater may accumulate, and odors may form. Disposal of higher quality effluent versus conventional septic systems will also help reduce odors and is anticipated to have a beneficial impact on nuisances associated with fumes.
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	Current Conditions: The Area includes portions of Hwy 191 and 64 corridors. These areas have typical noise associated with street activity and highway traffic. There are no airports, railroads, or other major sources of noise in the area. Preferred Alternative Environmental Narrative: The proposed project is anticipated to result in short-term increases in noise sources during the construction phase associated with operating gas and diesel-powered equipment, grading and excavation, materials placement, etc. These impacts will be mitigated by limitations to construction hours, designated staging areas, and weekday-only work. Impacts due to construction will be short-term, local, and non-recurring. No long-term effects are anticipated.
4. Historic Properties, Cultural, and Archaeological Resources ***(Please see end of Environmental Checklist for details if Cultural Survey has not been performed per SHPO Section 106)***		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: The Montana State Historic Preservation Office (SHPO) was contacted in July 2021 for information on existing cultural resources in the area. SHPO determined that there was a low likelihood that cultural resources would be impacted by the project and did not recommend a cultural resources inventory. SHPO correspondence is included in **Appendix A.** Preferred Alternative Environmental Narrative: The area of disturbance for the proposed project will be located entirely within previously developed areas and existing ROWs. No impacts to cultural resources are anticipated. If any cultural objects are discovered while working, work will stop immediately, and the SHPO will be contacted for further investigation.
5. Changes in Demographic (Population) Characteristics (example: quantity, distribution, density)		
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: U.S. Census Bureau data indicates that the population of Gallatin County has increased rapidly since 2010. Actual detailed population data for the Area is not available. The 2021 Preliminary Engineering Report (PER) utilized the Person Equivalent (PE) methodology to estimate population. Calculations using existing sewer loads indicated that the population was approximately 1,000 people. Population density in the area is relatively low, though development has increased rapidly in recent years. The Big Sky region suffers from lack of workforce housing and the Canyon Area

		development model of individual wells and septic systems currently results in inefficient land use (e.g., development sprawl). Preferred Alternative Environmental Narrative: The population in the Area is projected to grow to nearly 2.7 times the current level in the next 20 years. Development within the current Gallatin Canyon County Water and Sewer District (GCCWSD) is projected to grow to 5.4 times present levels during the same period. The proposed design of sewer systems was scaled to meet changes in demographic characteristics over the next 20 years. The 2021 PER assumed a 5% population growth rate for the area and the projected population was estimated at 3,050. A central wastewater management system is anticipated to promote infill and redevelopment of underutilized land parcels as population densities in the Area increase. Project activities may have a beneficial impact on demographics by providing the infrastructure needed for affordable workforce housing. The proposed project is not anticipated to lead to changes in demographic characteristics in the area at rates higher than are currently being experienced.
6. General Housing Conditions – Quality, Quantity, Affordability		
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: According to U.S. census data, the median value of owner-occupied housing units in Gallatin County is $435,400 and the median household income is $76,208. The area is currently experiencing a shortage of homes, rental properties, and affordable housing options. Preferred Alternative Environmental Narrative: The proposed project may have indirect beneficial impacts to housing conditions in the area by providing a central sewer system that will encourage infill and help facilitate the development of affordable workforce housing units. The quality of workforce housing options will be improved with improved infrastructure and central sewer systems.
7. Businesses or Residents (example: loss of, displacement, or relocation)		

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☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Currently, most commercial and residential developments are along Highways 191 and 64. Businesses include gas stations, restaurants, service-providing businesses, and hotels and other businesses catering to tourism in the area. Preferred Alternative Environmental Narrative: The proposed project may create minor direct impacts to normal traffic patterns during construction activities due to traffic control and detours. Once infrastructure improvements are finished, all traffic patterns will return to their original condition and full regular access will be regained. No decrease in visitation to the commercial areas is anticipated and no restrictions to residential access will occur because these potential impacts will be minimized by the design and construction logistics of the project. Mitigation measures such as timing, phasing, and other work restrictions will limit or avoid the construction impacts. The impacts are expected to be minor, short-term non-recurring, and local. The proposed project is not anticipated to lead to the loss, displacement or relocation of any businesses or residents in the Area. The project may have an indirect benefit on business or residents by providing a reliable centralized sewer system, allowing outdated and leaking septic systems to be properly abandoned.

8. Public Health and Safety		
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Currently, some drinking water wells in the Area are shallow and draw from the same aquifer that the septic systems discharge to and are therefore more susceptible to septic nitrate and pathogen contamination. One well in the area had an average nitrate level of 8.43mg/l in 2020 and has reached levels as high as 28.8mg/l. This indicates current health risks are already emerging in drinking water sources. Continued use of outdated and aging septic systems increases the chance of system failures that lead to surfacing of wastewater. Contact with surfaced septage is an acute health risk that exposes people, often children, to pathogens that cause diseases such as gastroenteritis, hepatitis, and dysentery. In addition, non-harmful algal blooms have occurred in the Gallatin River in recent summers. Preferred Alternative Environmental Narrative: The proposed project is anticipated to have beneficial impacts to public health and safety. Decommissioning aging inconsistently maintained onsite wastewater systems and replacing them with a centralized sewer system designed to current standards will help reduce nitrate loading to the aquifer and the associated health risks. The risk of microbial contamination in drinking water wells from wastewater will be much reduced as well. The project is also anticipated to lead to nutrient reductions in the Gallatin River, providing indirect beneficial impacts to recreational users of surface waters.
9. Local Employment – Quantity or Distribution of Employment, Economic Impact		

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☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: According to the U.S. Census, the economy of Gallatin County employs 53,115 people with the biggest industries being retail trade, accommodation and food services, and healthcare. Preferred Alternative Environmental Narrative: The proposed project will have no adverse impact on local employment and income patterns. The project may encourage additional worker housing and affordable housing, which may allow more local employees to live in the area rather than commute. The Proposed Project will have a short-term (<2-year) benefit to local employment, as it will hire workforce to complete construction of infrastructure improvements. In addition to initial construction-related jobs, at least one new full-time-equivalent job will be created for operations and management of the system.
10. Income Patterns – Economic Impact		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: According to U.S. census data, the median household income of Gallatin County is $76,208. Preferred Alternative Environmental Narrative: The proposed project is not anticipated to impact income patterns. It is anticipated that anyone hired to complete the proposed project would be paid comparable wages to similar work in the area.

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11. Local and State Tax Base and Revenues		
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: According to the state's Revenue Department, property taxes make up 97% of local taxes in Montana. In addition, the Big Sky Resort Area District collects a 4% annual resort tax on all luxury items and services sold in the Area. In May 2020, the community voted for a 1% resort tax increase for infrastructure funding, $12 million of which is committed for this project. Preferred Alternative Environmental Narrative: The proposed project will provide central sewer, allowing property owners to develop parcels to "best economic use" rather than being hindered by onsite sewer limitations. This is anticipated to allow infill and increased commercial and tourism based business opportunities and through the developed Canyon corridor. This may have a beneficial impact on tax base and revenues in the area. It is anticipated that the Big Sky resort tax will continue to provide a long-term funding mechanism to support continued project implementation and operation and maintenance.
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)		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: Current community and Government services in the Area include elementary, middle, and high schools, urgent care and medical center, fire department and search and rescue, performing arts center, several parks and extensive amounts of open space public land and recreational opportunities. Preferred Alternative Environmental Narrative: The proposed project is not anticipated to impact any community and government services and facilities. Construction activities that might occur on roadways that could affect access by emergency services or school buses will be mitigated with alternative routes.
13. Commercial and Industrial Facilities – Production and Activity, Growth or Decline		
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Development in the Area is currently comprised of a mix of residential and commercial facilities. Commercial and industrial facilities include gas stations, restaurants, service-providing businesses, a gravel pit, agricultural facilities, and hotels and other businesses catering to tourism in the area. Preferred Alternative Environmental Narrative: The proposed project will not change any land use or zoning classification and is not anticipated to impact the production and activity, growth or decline of existing commercial or industrial facilities. The project may have an indirect beneficial impact on the development of new facilities by creating a centralized sewer system than can accommodate commercial and industrial connections.

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14. Social Structures and Mores (example: standards of social conduct/social conventions)		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: The Area is comprised of varying social norms and frameworks. Preferred Alternative Environmental Narrative: The proposed project will not impact social structures and mores.
15. Land Use Compatibility (example: growth, land use change, development activity, adjacent land uses and potential conflicts)		
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Current land use in the Area is mixed residential and commercial and the associated infrastructure (roads, sidewalks, parks, utilities, etc.). In addition, there are large parcels of undeveloped public lands. The state of Montana is experiencing a period of growth and related development activity. Existing individual wells and septic systems are contributing to inefficient land use (e.g. development sprawl). Preferred Alternative Environmental Narrative: The proposed project is expected to reduce development sprawl and enable more affordable employee housing. Additionally, central sewer is anticipated to promote infill and redevelopment of underutilized land parcels. Increasing housing density may help preserve open space. The project is not anticipated to increase development activity at higher rates than the region is currently experiencing or create conflicts with adjacent land uses.
16. Energy Resources – Consumption and Conservation		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: Energy consumption in the Area is consistent with normal residential and commercial levels. Preferred Alternative Environmental Narrative: The proposed project will require additional energy temporarily during construction activities and in the long-term to operate the sewer. The largest new energy use would be the lift stations up to the BSCWSD's Wastewater Resource Reclamation Facility (WRRF). Increases in energy use would be analogous with other development activities in the area and will not be at a scale that would cause an adverse effect. The proposed project may result in less energy consumption
17. Solid Waste Management		
☒ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	Current Conditions: Current solid waste management in septic systems is pumped and taken to regulated disposal sites for proper treatment of waste. Preferred Alternative Environmental Narrative: As sewer mains are constructed and properties connected, there will be an additional biosolid load experienced at the BSCWSD WRRF. Currently these biosolids are dried, composted, and beneficially reused. This process will continue in the future and therefore will not have an impact on solids waste facilities. Increased quantities of grit and screenings will be generated, which will be disposed of at the existing sanitary landfill - the projected quantities are insignificant compared with other solid waste streams. No adverse impacts to solid waste management are anticipated as a result of the project.

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18. Wastewater Treatment – Sewage System		
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: According to Gallatin County data, there are approximately 150 existing septic systems in the Area. Converting existing sewer loads to a population equivalent (PE) results in a population served of approximately 1,000 people in the general Area. Wastewater treatment and disposal in the Sewer Service Area currently is a mix of seepage pits, septic tanks, drainfields, and potentially some other unknown disposal methods. Most are individual septic systems, but there are a few community-commercial scale wastewater systems. Almost all facilities within the Area are served by individual wells located onsite. The earliest septic permit record available in the Study Area is from 1972. Aerial imagery indicates that there are likely unpermitted systems. In addition, there are several permitted larger shared and/or community systems within the Sewer Service Area. These include Lazy J (Level 2 treatment system with two drainfields), Buck's T-4 (lagoon system with land application of effluent for disposal), Ramshorn View Estates (three Level 2 treatment systems with associated drainfields), Ophir Elementary (septic system) and Lone Peak High School (septic system). Other large systems within the Study Area include the Big Horn Center (elevated sand mound and drainfield), Big Sky Exxon (recirculating trickling filters and drainfield), Gallatin Canyon Adventures (formerly the Big Sky Comfort Inn, Unknown), and the San Merino Drive lots (two septic tanks and drainfields). These are aging and, even as designed, do not remove nutrients to the level desired by the community. One has exceeded permit levels several times in the past few years. Several unpermitted larger systems are also known to exist. These systems generate low quality effluent compared to most centralized treatment options, and the discharge results in elevated nutrient loading to the Gallatin River. The nutrient loading also directly affects human health and safety, as the discharge poses a risk of contaminating private wells throughout the developed canyon corridor. There are sixteen properties in the Gallatin Study Area currently on individual septic systems that have filed for a Petition for Annexation into the GCCWSD. Proposed annexation locations are depicted in **Appendix A**. Preferred Alternative Environmental Narrative: The proposed project will result in current septic systems and small public wastewater systems being properly abandoned and replaced with connections to a centralized sewer. Annexation into the GCCWSD is anticipated to occur in several rounds prior to construction of the system. The central sewer will provide much better and more reliable wastewater treatment - which is anticipated to have a beneficial impact on the environmental and public health.

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19. Storm Water – Surface Drainage		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: Currently, storm water surface drainage in the Area is managed by existing storm water drainage collection lines and storm water treatment infrastructure in accordance with stormwater management regulations of Montana DEQ and Gallatin County. MDT manages storm water for Highways 191 and 46. Preferred Alternative Environmental Narrative: The proposed project will create impervious surface at the two new lift station locations. By utilizing the existing water treatment plant and groundwater infiltration areas, new impervious areas have been minimized to the maximum extent possible, and the proposed project will not result in a significant increase in surface drainage. Green stormwater design will be incorporated into the design of the lift stations to minimize negative impacts through stormwater quality and quantity. A Stormwater Pollution Prevention Plan (SWPPP) will be developed and "storm water during construction discharge permit" will be required to ensure temporary storm water pollution during construction activities is mitigated.
20. Community Water Supply		
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☐ Cumulative	Current Conditions: Currently, there is no community water supply in the Area and water is obtained from multiple surface water sources such as springs, irrigation ditches, and private domestic wells utilizing various aquifers as a water source. GWIC data indicates that there are 289 wells in use in the Area ranging from 0 to 1,490 feet in depth and depth to water from 0 to 1,450 feet. Preferred Alternative Environmental Narrative: Following the implementation of a central sewer system, A1 effluent will be discharged to the shallow aquifer that is used as a water supply for a portion of private wells (many are drilled into deeper aquifers). Relative to existing conditions, human health risks associated with potable water supply will be reduced. Approval of a DEQ groundwater discharge permit will require further evaluation and documentation of adequate protection of human health and the environment. A PER for the Area water system will be developed in early 2024. The proposed project is anticipated to have a beneficial impact on the water supply of the Area
21. Fire Protection – Hazards		
☒ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: The Area is within a mixed residential and commercial zone that has no known existing fire hazards. Wildland areas on public lands may contain existing fire hazards. Fire protection is provided by the Big Sky Fire Department and Gallatin National Forest. Preferred Alternative Environmental Narrative: The proposed project will not create or affect fire hazards, nor will it impact fire protection services. The project may have a beneficial effect on wildfire resiliency by increasing groundwater infiltration.

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22. Cultural Facilities, Cultural Uniqueness and Diversity		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: The Area is located within Gallatin County. According to the 2020 US census, the county is 94.3% white, 0.5% African American, 1.1% American Indian and Alaska Native, 1.8% Asian, 0.1% Native Hawaiian, 2.3% 2 or more races, and 4.6% Hispanic or Latino. Cultural facilities within the area include; performing arts center, museum, public library, art galleries, and theaters. Preferred Alternative Environmental Narrative: The proposed project will not change the population characteristics of the Area or any impact any cultural facilities. The project is not anticipated to impact cultural facilities, cultural uniqueness, or diversity.
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)		
☐ No Impact ☒ Beneficial ☒ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	Current Conditions: Major transportation networks in the Area include highways 191 and 46. In addition, there are several other minor arterial roads providing access to local homes, businesses, and public lands. There are no railroads or airport runway clear zones located in the area. Preferred Alternative Environmental Narrative: The proposed project may impact automobile traffic during construction of sewer mains. Traffic control, limitations to construction hours, designated staging areas, and weekday-only work will be used to minimize impacts. The duration will be short-term, the extent will be local to the construction areas, and the frequency will be non-recurring since it is solely associated with construction. The proposed project may indirectly beneficially impact commuter traffic by creating additional affordable and/or workforce housing.
24. Consistency with Local Ordinances, Resolutions, or Plans (example: conformance with local comprehensive plans, zoning, or capital improvement plans.)		
☒ No Impact ☒ Beneficial ☐ Adverse+	☐ Direct ☒ Indirect ☐ Cumulative	Current Conditions: There are existing Zoning Regulations for the Gallatin Canyon/Big Sky zoning district. Existing land use planning documents applicable to the Area including the Gallatin River Task Force's 2018 Sustainable Watershed Stewardship Plan, the 2021 Gallatin County Growth Plan, and the 2011 Gallatin Canyon/Big Sky Capital Improvement Plan. Preferred Alternative Environmental Narrative: The proposed project conforms to existing ordinances and plans. The project may provide an indirect beneficial impact by creating affordable housing, which is one of the goals of the Gallatin County Growth Policy.

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25. Private Property Rights (example: a regulatory action or project activity that reduces, minimizes, or eliminates the use of private property.)		
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	Current Conditions: The Area is comprised of private properties and public lands. Private property rights in the area conform to the Administrative Rules of Montana (ARM) and Gallatin County regulations. Preferred Alternative Environmental Narrative: Following the connection of the central sewer line, properties will be encouraged to connect to the sewer voluntarily. Some may be forced to connect to adjacent sewer lines upon failure of their onsite wastewater treatment systems per ARM 17.36.914 and 17.36.328. The proposed project will not result in reducing, minimizing, or eliminating the use of private property.

4.2 SURFACE WATER IMPACTS AND NET-NUTRIENT REDUCTION

BACKGROUND

WGM Group has performed several previous desktop analyses to investigate the scale of existing water quality impacts to the Gallatin River and potential to maintain "net-nutrient reduction" across the projected 20-year growth period (WGM, 2020; WGM, 2021; WGM, 2022). A primary objective of the Canyon sewer project is to provide enhanced wastewater management (collection, treatment, and disposal) such that even with expanded growth and expanded disposal capacity for BSCWSD, nutrient loading to the Gallatin River will be reduced, especially during the nutrient sensitive period from July 1st through September 30th. The ability to achieve net-nutrient reduction is primarily driven by the Class A-1 quality effluent treatment to be provided by the upgraded BSCWSD WRRF which substantially reduces the nitrogen and phosphorous loads while also creating a range of potential discharge options. The BSCWSD also has notable storage capacity that allows for timing of discharge in which to manage loading to the Gallatin River when it is most sensitive (i.e. late-summer base flow).

A preliminary Gallatin Canyon Onsite Wastewater Treatment System (OWTS) Inventory was conducted as part of the 2020 FS effort. The database included approximately 62 permitted systems totaling 92,968 gallons per day (gpd) design flow in the Canyon Study Area. "Ground truthing" was conducted via 2017 aerial imagery, review of as-built drawings and permits, and site observations to identify systems and associated design flows not accurately reflected within the database. The resulting estimated total design capacity of existing systems in the Canyon Study Area was calculated to be 115,000 gpd. This initial OWTS inventory was used to estimate current and expected future nitrogen loading from each Service Area and as an input for ArcNLET analysis. This inventory also served as the basis for growth projections and preliminary sewer design in the 2021 PER. Since then, additional permits have been uploaded to the Gallatin City County Health Department's (GCCHD) online database and supplemental analyses performed to estimate nutrient fate and transport. The updated estimated existing nitrogen load to the Gallatin River is estimated at 5,850 lbs N/year, approximately 25 percent larger than the value presented in the FS (WGM, 2022).

Without the GCCWSD sewer system, urban sprawl and increased OWTS nutrient loading will continue in the Canyon area. **Figure 1** below from the 2021 PER shows projected septic plumes that are likely to impact surface waters if the Canyon continues to develop without central wastewater management infrastructure.

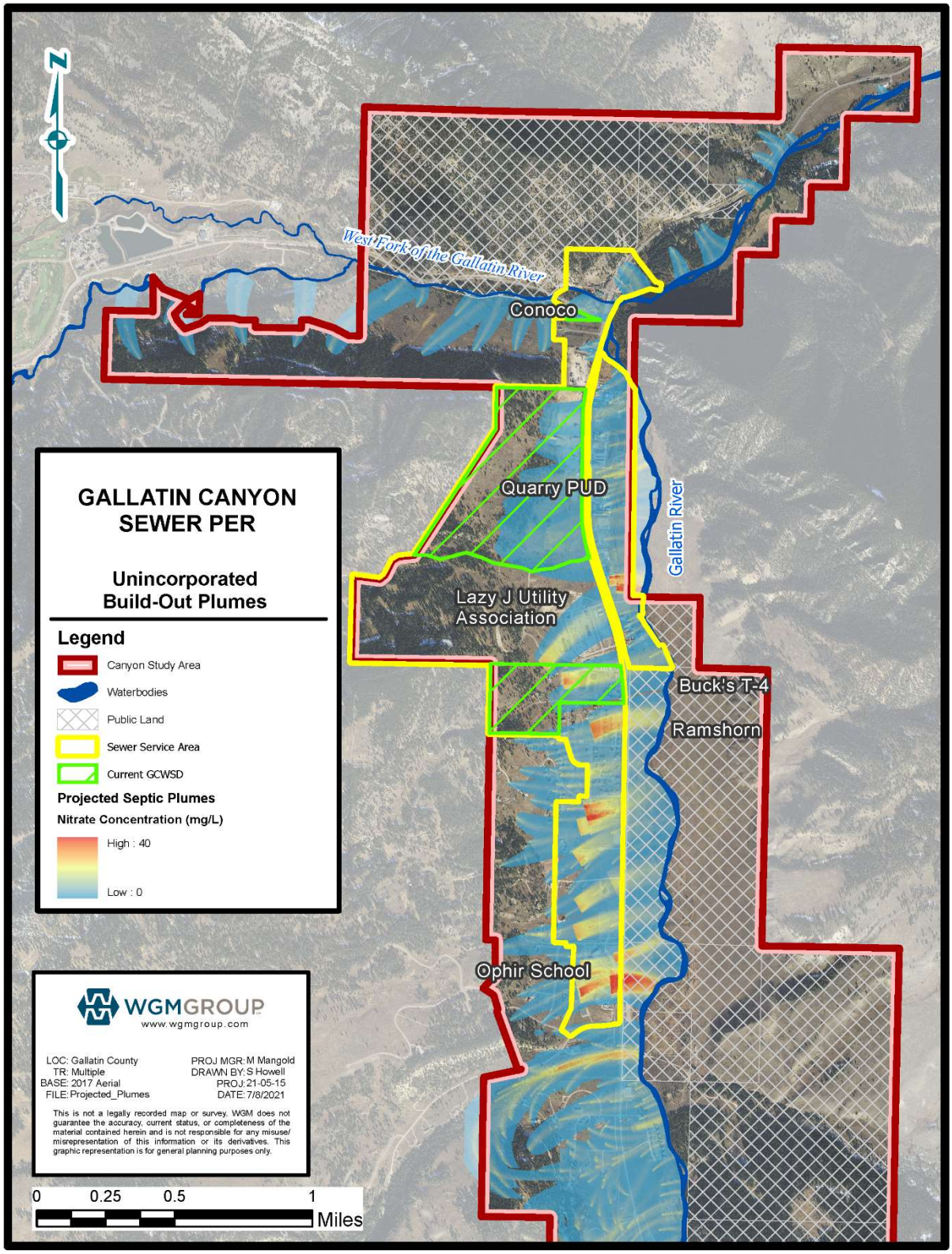


FIGURE 1: SEPTIC SYSTEM BASED BUILD-OUT MODELING (PER, WGM, 2021)

As the Canyon area continues to see increased development, the ratio of nitrogen load per person will increase proportionally on the same existing trend, unless better treatment and central sewer is implemented. Currently, a single person in the Canyon utilizing onsite septic is estimated to discharge 3.2 pounds per year of Total Nitrogen, assuming 100 gallons per day per capita wastewater generation, at an average discharge TN concentration of 10.5 mg/L. The average discharge TN concentration is approximated based on a variety of different conventional and Level 2 OWTSs of various ages and efficiencies that exist in the area. In contrast, a new central sewer system is anticipated to provide discharge TN concentrations of approximately five mg/L or less, which is at least a 50 percent reduction in TN. **Figure 2** below displays a bar graph of sewer service area projections comparing the total potential nitrogen load with central sewer to the total potential nitrogen load without central sewer based on the projected 20-year population served.

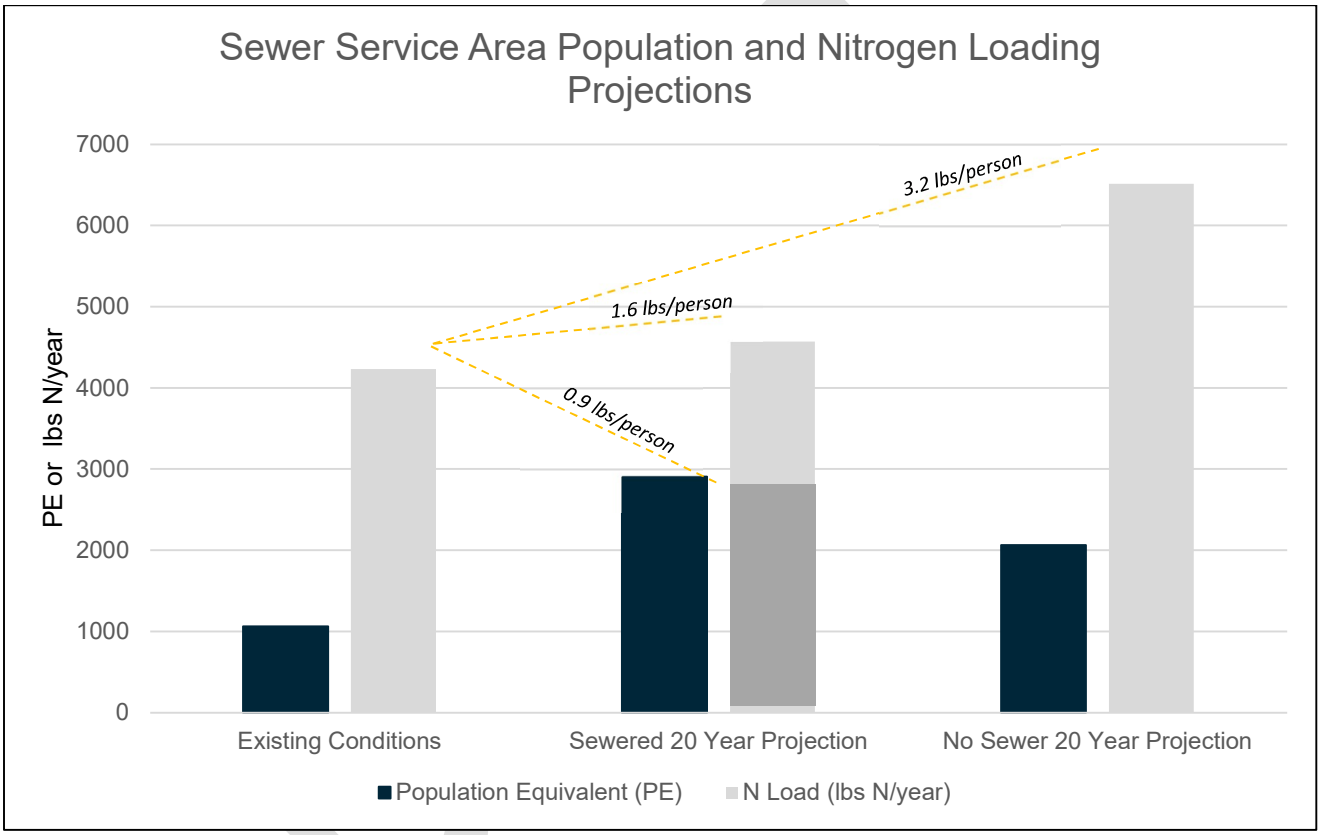


FIGURE 2: SEWER SERVICE AREA POPULATION AND NITROGEN LOAD PROJECTIONS

If the increased TN loading without central sewer continues in the Canyon, surface water impacts during the most sensitive time period of late summer base flow conditions are anticipated to be even more significant, **Figure 3**.

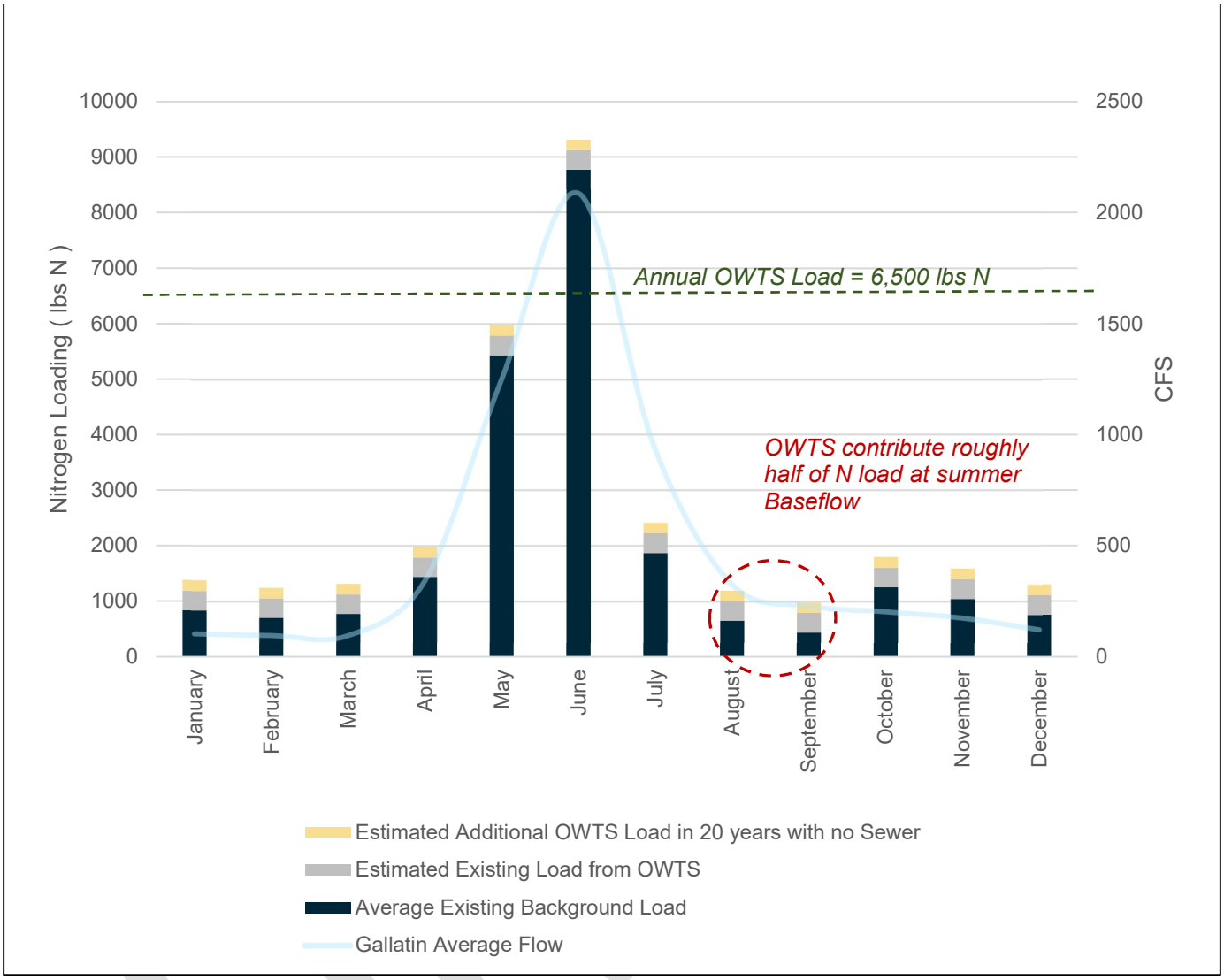


FIGURE 3: SEPTIC SYSTEM BASED BUILD-OUT LOAD PROJECTION TO GALLATIN RIVER

CENTRAL WASTEWATER MANAGEMENT

Central wastewater management provides a number of benefits and a range of opportunities to reduce nutrient related impacts to the Gallatin River. Coupling the benefits of enhanced treatment and the ability to implement a range of discharge and reuse, the GCCWSD is targeting a 25 percent net-nutrient reduction relative to present-day conditions. Timing of discharge is anticipated to target peak flow conditions to further mitigate water quality impacts during late summer months. Irrigation reuse is anticipated to be implemented as a water conservation measure while also providing notable nutrient uptake benefits. Additionally, the GCCWSD is evaluating the potential to utilize treatment wetlands to facilitate additional nutrient polishing to improve effluent quality from the assumed five mg/L average to less than three mg/L during summer months. **Figure 4** illustrates conceptual loading to the Gallatin River assuming all of the above measures are implemented to mitigate existing septic load impacts coupled with comprehensive wastewater management for projected future growth.

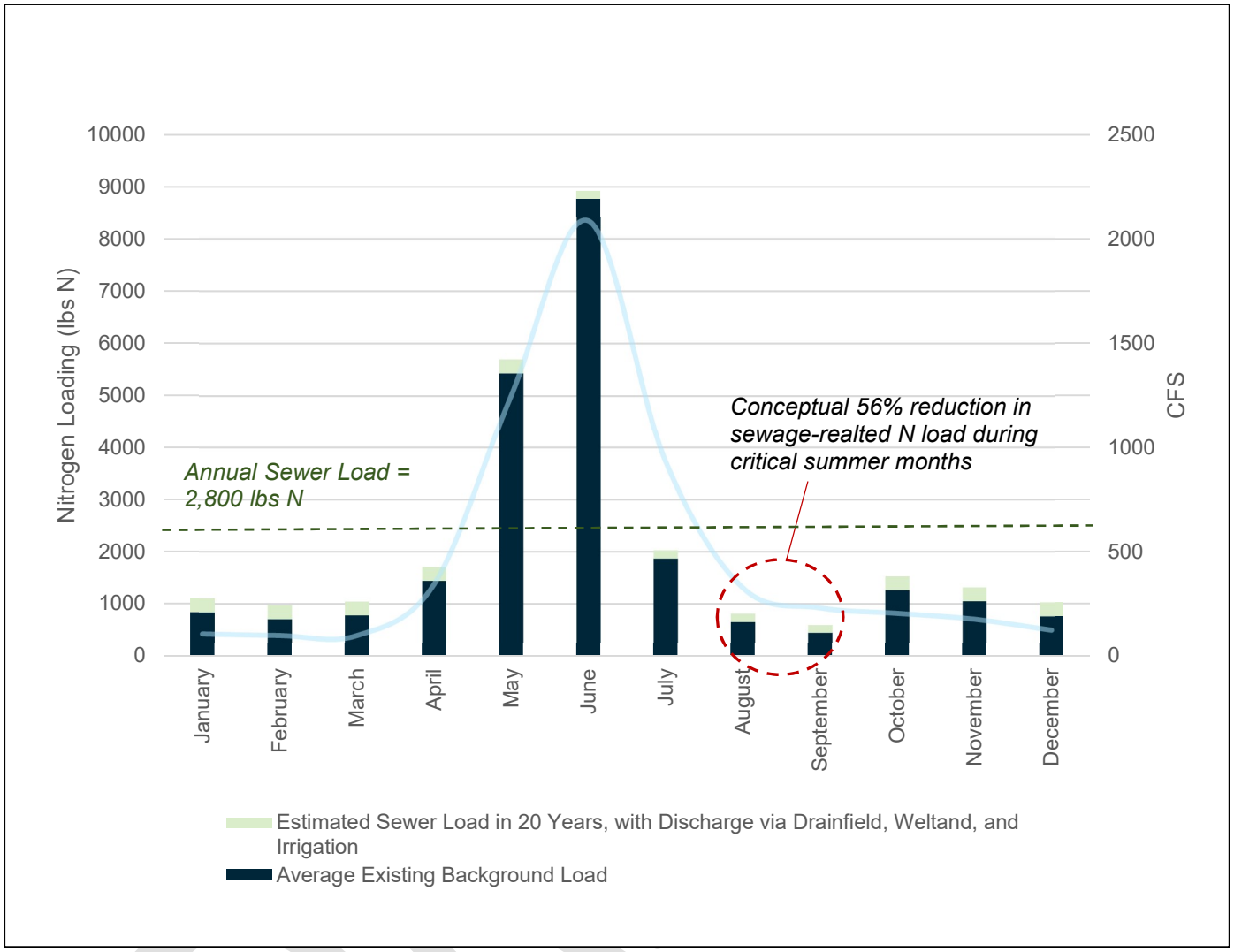


FIGURE 4: CENTRAL WASTEWATER BASED BUILD-OUT LOAD PROJECTION TO GALLATIN RIVER

Nitrogen load estimates presented in the above net-nutrient reduction analysis are considered approximate only. Actual loading is dependent on a range of factors that are difficult to quantify including but not limited to: occupancy rates, septic age, system operating condition (good, moderate, failing), and subsurface denitrification processes. Refined analyses are planned to be performed as the GCCWSD collects additional field data to support planned discharge methods and characterization of existing systems planned to be connected to proposed collection system.

5.0 CONSULTATION & COORDINATION

5.1 PERSONS, GROUPS, & AGENCIES CONSULTED

Agency outreach was conducted as a part of the PER. A summary of the agencies contacted in regard to the proposed project and any response received follows. Agencies will be contacted for comment again in Spring 2024 and provided with updated project design information.

No response was received from the following agencies:

- Gallatin Local Water Quality District
- Gallatin City-County Health Department
- Gallatin Conservation District
- Montana DEQ
- Montana Department of Fish, Wildlife and Parks
- Montana Department of Natural Resources and Conservation

Summary of Responses received:

- US Fish and Wildlife Service – Provided a list of threatened and endangered species that may occur in the proposed project area or be affected by the project.

- Montana State Historic Preservation Office: Conducted a file search request for Sections 31, 32,33, T6S R4E, and Sections 5, 8, T7S R4E. Provided a list of sites and previously completed cultural resource inventories completed in the area. Indicated that as long as the collection systems and piping be kept within previously disturbed ground and ROW's there is a low likelihood cultural properties will be impacted and did not recommend that a cultural resource inventory be completed.

- Montana Department of Transportation (MDT): MDT Butte District Utility Agent provided comment citing a need for a maintenance agreement between GCCWSD, Gallatin County, and MDT and provided information about steep slopes located on the north side of Highway 64 near the West Fork bridge. MDT also indicated a need to consider future MDT projects and existing trail infrastructure in the area.

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REFERENCES

Environmental Protection Agency. Air Quality Non-Attainment Areas. https://www.epa.gov/green-book. Accessed August 2023.

Environmental Protection Agency. Environmental Justice Screen. https://www.ejscreen.epa.gov/mapper/index/html. Accessed August 2023.

Federal Emergency Management Agency. Flood Maps. https://msc.fema.gov/flood-maps. Accessed August 2023.

Gallatin County City-County Environmental Health Services Map. https://gis.gallatin.mt.gov/webmaps. Accessed 8/10/2023.

Gallatin County Planning Documents and Zoning Regulations. https://gallatincomt.virtualtownhall.net/planning-community-development/pages/zoning-regulations. Accessed August 2023.

Gallatin River Task Force Big Sky Sustainable Watershed Plan. https://gallatinrivertaskforce.org/watershed-stewardship-plan/ Accessed August 2023.

Gallatin River Task Force 2019 Upper Gallatin River Watershed Monitoring Report. https://gallatinrivertaskforce.org/wpcontent/uploads/2020/07/2019_grtf_waterquality_report_FINAL_small. Accessed February 2024.

Montana Bureau of Mines and Geology. Geologic Maps. http://www.mbmg.mtech.edu/Information/StoryMaps/GeologicMaps.asp#gsc.tab=0. Accessed August 2023.

Montana Department of Environmental Quality Data Hub. https://discover-mtdeq.hub.arcgis.com/. Accessed August-September 2023.

Montana Department of Environmental Quality. 2010. The West Fork Gallatin River Watershed Total Maximum Daily Loads (TMDLs) and Framework Watershed Water Quality Improvement Plan. Helena, MT. https://deq.mt.gov/files/water/wqpb/CWAIC/TMDL/M05-TMDL-01a.pdf. Accessed February 2024.

Montana Fish, Wildlife, and Parks FISHMT Survey & Inventory Information. https://myfwp.mt.gov/fishMT/reports/surveyreport. Accessed August 2023.

Montana Groundwater Information Center. https://mbmggwic.mtech.edu/. Accessed 8/24/2023.

Montana Natural Heritage Program MapViewer. Accessed for: Species Point Occurrences, Environmental Summary Report, Land Cover Data, Wetlands and Riparian Mapping. https://mtnhp.org/mapviewer. Accessed August-September 2023.

Montana State Historic Preservation Office. http://mhs.mt.gov/Shpo. Accessed 9/1/2023.

DRAFT

Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey and Farmland Classification. https://websoilsurvey.sc.egov.usda.gov/. Accessed August 2023.

National Wild and Scenic Rivers System. https://rivers.gov/montana. Accessed 8/3/2023.

U.S. Census Bureau QuickFacts Gallatin County, Montana https://www.census.gov/quickfacts/fact/table/US,gallatincountymontana/LND110210 Accessed 8/7/2023.

U.S. Fish and Wildlife Service. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. http://www.fws.gov/wetlands/. Accessed August-September 2023.

U.S. Fish and Wildlife Service. Information for Planning and Consultation website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. https://ipac.ecosphere.fws.gov. Accessed 8/1/2023.

WGM Group, Inc. and AE2S. 2020. Canyon Area Feasibility Study. Bozeman, Montana.

WGM Group, Inc. 2020. Canyon Area Feasibility Study. Technical Memorandum No. 5: Disposal Alternatives Analysis. Bozeman, MT

WGM Group, Inc. 2022. Canyon Septic Inventory & Collection Prioritization Study, Upper Gallatin Restoration. Bozeman, MT

WGM Group, Inc. and AE2S. 2021. Gallatin Canyon Sewer Preliminary Engineering Report. Bozeman, Montana.

WGM Group, Inc. 2022. Gallatin Canyon Sewer Project Phase 1 Environmental Assessment Overview. Bozeman, Montana.

WGM Group, Inc. 2023. Draft Discharge Feasibility Report Gallatin County Water and Sewer District. Bozeman, Montana.

WGM Group, Inc. 2020. Upper Gallatin Nutrient Assessment & Reduction Plan. Technical Memorandum: Preliminary Estimate of Nutrient Loading and Potential Mitigation Projects. Bozeman, MT

Woods, Alan J., Omernik, James, M., Nesser, John A., Shelden, J., Comstock, J.A., Azevedo, Sandra H., 2002, Ecoregions of Montana, 2nd edition (color poster with map, descriptive text, summary tables, and photographs). Map scale 1:1,500,000

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APPENDIX D

WATER RIGHTS VIABILITY ASSESSMENT MEMO

WGMGROUP
Community Values. Inspired Futures.

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DRAFT MEMORANDUM

DATE: October 1, 2024

TO: Shane Strong & Mace Mangold, WGM Infrastructure Team

FROM: Susan Anderson & Cole Peebles, WGM Water Rights Team

RE: Water Rights Viability Assessment for Centralized Supply
Gallatin Canyon County Water & Sewer District (GCCWSD)

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1. PROJECT BACKGROUND

1.1 SETTING

The Canyon Area is generally situated west of the Gallatin River and immediately south (and north) of the intersection of Highway 191 with Lone Mountain Trail (Hwy 61). Located roughly three miles southeast of the Big Sky Meadow Village, this unincorporated community is comprised of a mix of commercial-industrial uses, the Big Sky School District, and several rapidly developing residential areas, all servicing the Greater Big Sky Area. Refer to *Figure 1* on page 3, herein.

1.2 THE GALLATIN WATERSHED

Named after former Treasury Secretary Albert Gallatin[1], the Gallatin River contributes flows as the southern fork of the Missouri River. The Gallatin Headwaters originate within Yellowstone National Park and the Gallatin Watershed collects runoff from nearly 1.2 million acres across southwest Montana[2]. The Gallatin River supplies critical irrigation waters, is an important fishery, and provides a variety of recreational opportunities to local Montanans and visiting tourists. The Gallatin River also forms the eastern boundary of the Canyon Area.

Growing concerns over water quality issues have heightened oversight on the Gallatin River by State and Federal agencies tasked with safeguarding environmental and stream health. Through the Water Use Act of 1973, the State of Montana has broad authority to limit (or close) river basins and groundwater aquifers to certain types of water appropriations because of water availability problems, water contamination problems, and the charge to protect existing water rights.

The Canyon Area is situated within two basin closure areas. The Gallatin River was shut off to new appropriations of surface water as part of the 1993 Legislative Closure of the Upper Missouri River Basin. The temporarily restricted reach is comprised of the drainage area of the Missouri River (and all of its tributaries) above the Morony Dam, which was constructed across the Missouri northeast of Great Falls, Montana. Additionally, the US Bureau of Land Management (BLM) Compact Closure of the Upper Missouri National Wild & Scenic River was enacted in 1997. This closure area includes the Upper Missouri River Basin and its additional tributaries above McNulty Bottoms, which is near the Highway 191 bridge crossing.

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[1] Three Forks Chamber of Commerce, “Lewis & Clark and the Three Forks of the Missouri,” Life in Three Forks, May 9, 2024, https://threeforksmontana.com/life-in-three-forks/history/
[2] Gallatin Watershed Council, “About Our Watershed,” Our Watershed, May 9, 2024, https://www.gallatinwatershedcouncil.org/about-gallatin-watershed

These closures present a hurdle to new and continued development within the Canyon Area because the Montana Department of Natural Resources and Conservation (DNRC) may not process or grant applications for new permits to appropriate surface water within the Gallatin Basin until the Water Court issues Final Decrees for the Upper Missouri Basin and all incorporated subbasins.

Following are the only exceptions where the DNRC may consider granting new appropriations for the GCCWSD Canyon Area as part of the Gallatin Basin:

- Applications to appropriate groundwater (incorporating appropriate mitigation),
- Applications for non-consumptive uses,
- Applications for limited domestic, municipal, or stock use (including exempt wells),
- Applications to store water during high spring flows (protecting senior right holders),
- Temporary emergency appropriations.

1.3 GCCWSD: PLANNING FOR A SUSTAINABLE FUTURE

In recent decades, the Greater Big Sky and Gallatin Valley Areas have experienced significant population growth. Closure of the Gallatin Basin to new water appropriations has presented municipal water supply and wastewater treatment challenges, which are at odds with the continued development essential to sustain growing population trends.

In 2021, community leaders concerned with wastewater management in the Canyon Area were successful in petitioning the formation of the Gallatin Canyon County Water & Sewer District (GCCWSD). The current GCCSWD Boundary includes approximately 235 acres of land spanning from the intersection of Highway 191 and Lone Mountain Trail to just north of Ophir School. Additional properties are expected to annex into the GCCWSD, with an anticipated future extent defined as the GCCWSD Planning Area. As demonstrated by *Figure 1* on the following page, the GCCWSD Planning Area incorporates more than 200 residential parcels, over 80 commercial-industrial properties, and encompasses nearly 780 acres. Currently, numerous individual private water supply wells and decentralized public water supply and wastewater treatment systems provide service to the businesses and landowners within the GCCWSD. As such, the GCCWSD has concentrated its resources to identify alternatives to aid in the implementation of a more efficient centralized water distribution and wastewater collection and treatment systems. Consolidated water and wastewater systems would allow for more impactful land use and promote the conservation of natural resources during future buildout.

Because no avenue currently exists to secure a new permit for a surface water right within the Gallatin Drainage, this Viability Assessment focuses on the possibility of creating a public water system utilizing wells (and groundwater rights) as the means of supply. While the DNRC will consider an application for a new groundwater permit, any new consumptive use of water would have to be offset by retiring existing water rights within the Gallatin Drainage. Furthermore, any new or changed groundwater right application must provide sufficient evidence that downstream users of surface water and groundwater will not be not adversely affected by the proposal.

Building upon recommendations from the *2020 Canyon Area Feasibility Study*, this *Water Rights Viability Assessment* is structured to provide a strategy for the potential consolidation of numerous existing groundwater sources in support of the Preliminary Engineering Report (PER) for District-wide water supply. It summarizes the existing private water rights as well as unfiled groundwater wells located within the Canyon Planning Area and attempts to quantify the potential volume of supply, which may be legally available (through Change Authorization & Permitting processes) for assimilation and re-distribution under a centralized water supply network owned and operated by the GCCWSD.

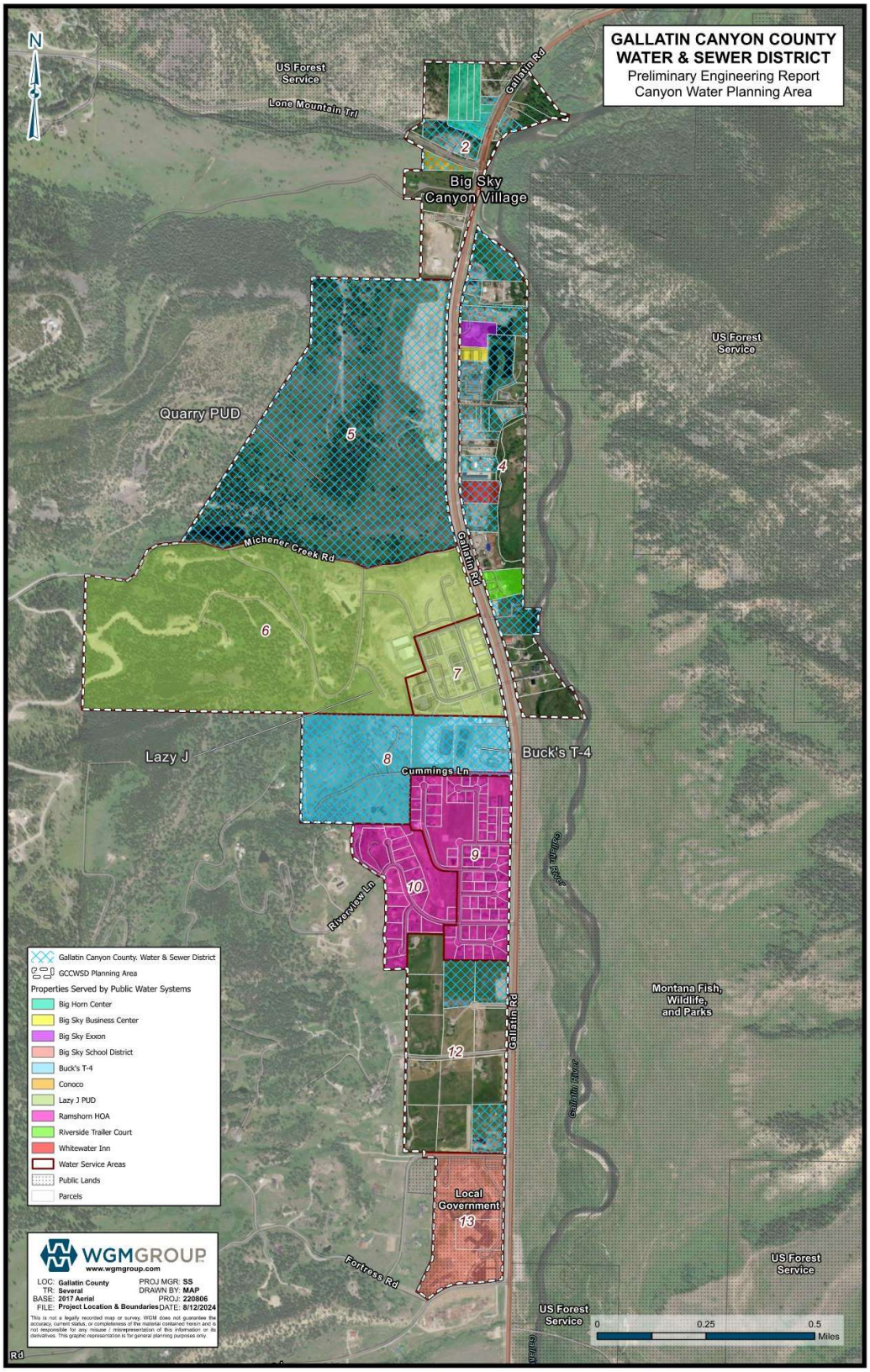


FIGURE 1: GCCWSD PLANNING AREA

2. WATER RIGHTS IN MONTANA

2.1 OVERVIEW

The State of Montana owns the surface, underground, flood, and atmospheric waters within its boundaries. While individual Montanans cannot 'own' water, they can possess a legal right to use water within the framework of the State's statutes and administrative rules. A water right is a possessory interest, which protects the holder's beneficial use of water from junior (or unrecorded) claims, illegal uses, or from others who exceed their rights.

Montana's water rights are guided by the Prior Appropriation Doctrine, which dictates 'first in time is first in right.' Simply put, the first person to beneficially use water from a source establishes the first right, the second water user establishes the next right to remaining water, and so on. The doctrine grants water rights in chronological order, which gives the earliest claims to a particular source the highest priority. During periods of water shortage, junior right holders with more recent claims may see their water diversions reduced or cut off.

Montana's water rights are generally grouped into two categories.

1. *Existing Historical Water Rights:* Water rights established prior to July 1, 1973 are considered 'historical' water rights and are under the jurisdiction of the Montana Water Court.
2. *New Appropriations:* With a few specific exceptions, the only way to establish a new (post-1973) water right is to apply for a permit (or certificate). These 'new' water rights are regulated by the DNRC's Water Resources Division.

Since the early 1980s, the Montana Water Court has been adjudicating historical water rights, and the process is not yet complete. Adjudication is the legal procedure that confirms the priority and amount of water that each right holder can use from a particular water source. The Water Court divided Montana into 85 drainage basins and has been reviewing and settling the pre-1973 water rights in each basin over time. This technical report focuses on Water Court Basin 41H, the Upper Missouri Division, specifically the Gallatin River.

The DNRC's regulatory oversight of new water rights, which are authorized after 1973, is often referred to as the New Appropriations Program. Prior to 1973, water rights were recorded (with relative inconsistency) in county courthouses across the state. To aid in the administration of Montana's water, the Water Use Act charged the DNRC with the creation of a central records repository for Montana's water rights. To facilitate public access, the Department created the Water Rights Query System (WRQS), which is an internet-based access portal intended to provide information about all the individual water right files within the State's central database. WGM relied on water right summary information provided via the WRQS database as the foundation for this Viability Assessment for Centralized Supply.

2.2 WATER RIGHT ELEMENTS

A Montana Water Right is summarized by a General Water Right Abstract (hereinafter Abstract) document, which attributes a set of defining 'elements,' to a water right, be it based on a Statement of Claim, Record of Use, Permit, or Certificate. Common water right Abstract elements include: Source, Priority Date, Purpose, Point of Diversion (POD), Place of Use (POU), Period of Diversion, Flow Rate, and Volume. Water right holders are required to operate within the confines of these specified elements.

To protect the senior water right holders from harm, users seeking to establish new or additional water developments must typically obtain approval through the DNRC's water right permitting process. Existing water rights can be modified by submitting an Application for Change of Appropriation Water Right (Form 606). Prior approval through the DNRC is required before enacting changes to any of the following elements of an existing water right:

1. Point of Diversion;
2. Place of Use;
3. Purpose of Use; or
4. Place of Storage.

A water right holder generally cannot change the Source, Quantity, Period of Diversion, or Priority Date of an existing water right.

2.3 BASIN DECREE STATUS IN THE GALLATIN

In October 2018, the Montana Water Court issued a Reexamination Preliminary Decree for the Gallatin Basin (41H), meaning that the Court is reviewing rights included within the original 1985 Temporary Preliminary Decree. Because the 41H Temporary Decree was issued prior to 1992, its historical claims were evaluated under the old DNRC Verification Procedures rather than the DNRC's current Claims Examination Process, which is now the statewide standard. Basin 41H is close to being fully adjudicated (approximately 95% complete) under the Reexamination Preliminary Decree. Next, prior to the order of a comprehensive Final Decree, the Water Court will issue an Interlocutory Preliminary Decree for the Gallatin. The Interlocutory Phase will include all late, implied, split, and exempt claims that were not incorporated during the reexamination process. The Court is projecting that a Basin Summary Report will be available in April of 2025. However, no official timeline has been established for the Interlocutory Preliminary or Final Decrees in the Gallatin.

Issuance of the forthcoming Interlocutory Preliminary Decree will trigger filing and objection deadlines involving only a few of the historical (pre-1973) wells within the District Planning Area. However, Groundwater Certificates (including flow rate and volume elements) can be secured in the period leading up to Final Decree. These water right Certificates could be applied toward the GCCWSD's centralized services development concept. The process to file on these potential groundwater rights is described in further detail in *Section 3.2*.

The adjudication process is seminal in that once a water claim is decreed by the Water Court according to recognized legal and examination standards, it becomes a water right, regardless of the underlying claim's origin or filing method. Similarly, once the DNRC issues a permit (including notice of completion) or certificate, the right is valid pursuant to the elements summarized on the water right Abstract. As such, a right will not be subject to further scrutiny by the Water Court or the DNRC, unless it incorporates a substantiative clerical error/omission, or, alternatively, if the right holder proposes a change to the elements of the right as listed on the decreed/authorized Abstract.

2.4 STANDARD OF PROOF & QUALITY OF WATER RIGHTS

In Montana, a preponderance of evidence is the standard of proof used to determine if a claim to; an application for; or an objection to a water right is more likely to be true than not. Additionally, a Statement of Claim is considered *prima facie* evidence of a historical (pre-1973) water right. Therefore, absent evidence to the contrary, a properly filed historical claim provided sufficient evidence for the State to have accepted an appropriator's right as true at its face value.

Legal objections along with DNRC examination remarks and analyses—which are parts of the adjudication and new appropriations processes—can compel a claimant/applicant to provide additional proof to support a claim or application.

The adjudication, permit application, and certification processes have successfully winnowed out many exaggerated, falsified, unfounded, and misfiled claims and water right elements. However, owing to the sheer scale of the adjudication and new appropriations processes, it is unrealistic to assume that all inaccuracies, ambiguities, and typographical errors have been completely eliminated—even for decreed basins. As such, the element maximums for the beneficial uses summarized on the numerous Abstracts for groundwater rights within the GCCWSD Planning Area cannot necessarily be assumed at their 'face' values for this Viability Assessment.

Before presenting a summation of the existing and potential water rights within the proposed GCCWSD central water supply system, it is important to be aware of certain aspects of the existing water right record keeping and water right authorization processes, which may diminish the stated extent of the beneficial uses. Following are some examples of potential issues that may affect the existing rights considered as available within GCCWSD portfolio:

- The information summarized on each Abstract may not necessarily reflect the amount of Volume or Flow Rate that would be authorized under a Change Application due to increased scrutiny by the DNRC.
- Water right records may contain scrivener errata that can, for example, obscure the true Place of Use, ownership, or Volume amounts.
- Records may indicate conflicting information, such as inaccurate/transposed legal land descriptions, multiple parties filing on the same well, or filed flow records that can only corroborate a consumed volume lower than what was authorized in a Groundwater Certificate.
- Water right records might lack evidence of a well log, perfection, or a well-described Place of Use.
- Certain water right records have not been updated/transferred to the current owner, adding a level of uncertainty as to whether the water rights (or wells) may have been abandoned or changed to alternate purposes or locations.

In consideration of the types of water right issues described above, this Viability Assessment makes certain assumptions and inferences to apply conservative estimation techniques aimed at ascertaining a 'true' estimate of the potential aggerate groundwater volume that might be legally available in the Canyon Area. Assessment criteria, limitations, and assumptions are discussed in greater detail within *Section 3.*

2.5 WATER RIGHT PERMITTING AND CHANGE PROCESSES

Protecting right holders' ability to enjoy their use of Montana's water is of paramount importance. Those seeking a change in existing right (or a new appropriation) must sufficiently demonstrate that the proposed application beneficially uses the state's water while not adversely affecting other right holders. As such, permitting/changing a single water right can be a lengthy and involved process with anticipated timelines ranging from six months up to one or more years depending upon the complexity of the application. Change of Water Right Application timeliness and efficacy will also be impacted by the number of claim elements proposed for modification. While not identical, the processes to acquire permits for—and changes to—water rights follow similar tracks. Following is a simplified sequence of steps for an applicant pursuing a Change Authorization for an existing right:

- Submit a Request for Preapplication Meeting form with DNRC.
- Attend the Preapplication meeting.
    - Collaborate with DNRC staff during the Preapplication Meeting to answer relevant questions within the Preapplication Meeting Change Form (Form 606P).
    - Finalize the Preapplication form and submit initial filing fee.
- Await DNRC's technical analysis, OR:
    - Prepare and submit a technical analysis and await a DNRC scientific credibility review.
- Applications incorporating mitigation water could involve additional pre-application and technical analysis phases.
- Address potential findings of technical analysis (or credibility review).
- Submit a completed Application to Change a Water Right (Form 606) along with any applicable addendum forms.
- Await DNRC's Deficiency Letter (if issued) or Correct & Complete determination.
    - As required, respond to deficiencies with additional information.
        - Await Correct & Complete determination.
- Await DNRC's Draft Preliminary Determination and Public Notice for comment.
- Await DNRC's Preliminary Determination and Public Notice for opportunity to object.
- If no public comments or objections are received, the Preliminary Determination is adopted as final.

For authorized Beneficial Water Use Permit applications, the DNRC will issue a Provisional Permit detailing the time available to the appropriator in which to perfect the permit as a right (until final determination of existing rights under the decree process). The Department can reduce, modify, or reduce the amount of water granted in a provisional permit as necessary to protect existing water rights.

Additionally—while not an element of the water right permitting process—wells intended for supply of water to the public must also be permitted through the Montana Department of Environmental Quality (MDEQ). Public Water Systems (PWS) are legally defined as entities that provide water to 25 or more people for more than 60 days a year or have 15 or more service connections. This agency oversight helps to ensure that served water meets federal Safe Drinking Water Act and state regulations.

A Change Application to modify the GCCWSD's existing groundwater rights portfolio; or a new groundwater Permit Authorization, which retires a group of existing groundwater rights as mitigation; or some combination of both DNRC processes, will be required to aggregate the existing groundwater rights and their element parts to supply a future central water system. The refinements necessary to meet the GCCWSD's planned water needs could subject the individual right elements to further, and perhaps intensified, scrutiny during the Change Application or Permit Authorization Processes.

3. GCCWSD WATER RIGHT SUPPLY CONSIDERATIONS

3.1 EXISTING CAYNON AREA WATER SUPPLY

The District's Water Planning Area is located within Gallatin River Drainage Basin (41H). The Canyon Area is currently serviced by more than 60 individual groundwater rights (including certificates and permits) and dozens of Unfiled, exempt wells[3].

[3](85-2-306, MCA) An exempt well is a domestic or stockwater well that is exempted from the standard DNRC water right permitting process. Between 1973 and 1991 exempt well owners could appropriate up to 100 gpm. Since 1991, individual exempt well owners have been allowed to pump water at less than 35 gpm and to extract a

As discussed, WGM employed the DNRC's WRQS database to procure groundwater right information and to attribute POD (wellhead point of diversion) locations. *Table 1* below includes a combined listing of all existing water rights and uses that fall within the GCCWSD water supply project planning boundary. The cumulative total characterizes the Canyon Area's water supply volumes and flow rates at full current Abstract value according to their hypothetical maximums allowable by statutes and administrative rules. These speculative totals are not necessarily indicative of the water, which might be justifiably available for centralized District service.

TABLE 1: EXISTING WATER RIGHTS

Water Right Type	Combined Maximum Annual Volume [ac-ft]	Combined Maximum Flow Rate [gpm]
Permits	241.8	477
Groundwater Certificates	207.3	968
Existing Uses*	Up to 250	Up to 815
Suppositional Cumulative Total	**699.1**	**2260**

*Includes both Unquantified Certificates and Unfiled Exempt Wells. Flow rates up to 35 gpm per well and individual volumes up to 10ac-ft per year statutorily possible per combined appropriation. Subject to past beneficial use.

The authorized rights include 12 existing public water supply systems. The existing PWS wells (including their supplemental well networks) generally support higher pumping rates in order to service the following moderate-demand entities:

- Lazy J Utility Association (MT0004432),
- Ramshorn View Estates HOA (MT0004035),
- DT Ventures, LLC (MT0003963)
- Big Sky Lodging (MT0000105),
- Big Sky Business Center (MT0003949),
- Big Sky Exxon (MT0003839),
- Big Sky School District (MT0001281),
- Ophir Elementary (MT0004861),
- Buck's T-4 (MT 0001292),
- The Whitewater Inn (MT0004079),
- CAR Big Sky, LLC (MT0003984), and
- Conoco (MT0001832).

Some, but not all, of the PWS operators listed above have procured a provisional permit through the DNRC, which is necessary to allow for combined water appropriations exceeding 10 ac-ft per year. Supply rates for the above-listed systems above range from 35 to 180 gpm.

The GCCWSD Planning Area also encompasses approximately 40 wells with individual water rights (called Groundwater Certificates) for private domestic, business, and lawn & garden needs. Groundwater Certificates are issued for wells authorized by the DNRC as pumping less than 35 gpm and 10-acre-ft of total volume per year.

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maximum total volume less than 10 ac-ft per year, by filing only a Notice of Completion of Groundwater Development. The exemption has special conditions for new subdivisions (occurring after 2014).

Finally, utilizing the Montana Bureau of Mines & Geology's Ground Water Information Center (GWIC), WGM identified as many as thirty-eight unique well logs in the vicinity of the project area that do not appear to have associated water right filings. Historically, the GWIC system has catalogued well locations according to the quarter-quarter section legal description. The lack of well location resolution in dense areas of development can make it challenging to accurately assign GWIC listings to a particular parcel/ownership. However, this study has corroborated at least 21 wells that are demonstrably within the GCCWSD area. These Unfiled wells are assumed to provide flows at rates less than 35 gpm.

See *Appendix A*, *Figure 2* for an overview map of the Gallatin County Canyon Water & Sewer District and the Canyon Water Planning Area's existing groundwater well network.

3.2 POTENTIAL CAYNON AREA WATER FOR DISTRICT SUPPLY

While flow supply information is useful from an engineering and planning perspective, the rate of water supply is arguably not the most governing in terms of development density. For the Canyon Area, water storage alternates can feasibly be constructed to successfully overcome many of the flow limitations (including peaking factors) associated with the available well network. For example, well, pump, and piping infrastructure could be utilized to fill large, elevated tanks at lower flow rates during non-peak demand (e.g. nighttime hours). Then, during peak demand, stored volumes could be released and utilized to supplement pumped flows as well as to augment network pressures.

Based on the findings of this Viability Assessment, WGM considers the aggregate volume of legally available well water as the limiting factor for development density. As such, the guidance herein groups each of the groundwater sources within the District Boundary portfolio according to the type of water right: Permit, Certificate, or Unfiled/Exempt.

Groundwater Certificates were further categorized by comparing abstract-listed volumes against a 3 ac-ft per year threshold. This threshold value was selected because a typical residence (housing 5 persons or less) with a lot size of less than three-quarters of an acre is expected to consume under 3 ac-ft of water, including lawn irrigation water. As such, WGM did not review or scrutinize the perfected historical uses for 'Small' Certificates with listed volume elements below this trigger.

Since 1981, Montana Statutes have required that groundwater appropriators file a Notice of Completion of Groundwater Certificate (Form 602) within 60 days of completion of their wells and beneficial use of groundwater. An authorized Notice of Completion generates a groundwater Certificate that sets the priority date as well as documenting other right elements. The exempt groundwater completion notice process does not require the applicant to meet the criteria for demonstrating physical and legal availability (as compared to the senior existing rights in a drainage). Within the context of this technical memo, individual Canyon Area groundwater uses that qualify as exempt but have not obtained Certificates are classified as Unfiled. While there is currently no enforcement action for exempt well owners using wells that haven't filed a Notice of Completion, such wells do not have a valid water right and their use is not recognized or protected under Montana statute.

The DNRC has consistently accepted exempt well completion filings and issued Certificates for those appropriations even after considerable lapses of the 60-day deadline. Future legislative updates and administrated rule changes are unlikely to benefit exempt well eligibility or to simplify the Notice of Completion filing process. Additionally, it is unclear whether pre-existing wells will be 'grandfathered in' under new rules, which may be adopted or legislatively required. As such, WGM recommends the

timely filing of late Notices of Completion on—and acquisition of Certificates for—the more than 20 Unfiled wells identified within the District Planning Area.

Table 2 (following) summarizes an aggregated listing of the cumulative potential of all current water rights (and future Certificates) within the District Planning Area, which WGM believes are viable for consideration under the proposed GCCWSD water supply project. Please refer to *Section 3.3*, herein for an explanation of the methodologies employed to estimate the *Aggregated Annual Volume Available* for GCCWSD buildout.

TABLE 2: POTENTIAL WATER RIGHT VOLUME ESTIMATED TO BE JUSTIFIABLY AVAILABLE FOR GCCWSD SUPPLY**

Water Right Type	Aggregated Annual Volume Available [ac-ft]	Daily Average Domestic Equivalent [gpd]
Permits & Appurtenants	239.4	--
Large Certificates > 3 ac-ft	75.7	--
Small Certificates < 3 ac-ft	33.5	--
Unquantified Certificates	9.8	--
Unfiled Exempt Wells	21.0	--
Convertible Cumulative Total**	**379.3**	**339,000**

**Provisional valuation according to present day consumptive use patterns and simplifying assumptions. Total includes current irrigation uses/volumes under the existing rights.

The *Canyon Area Feasibility Study (May 2020)* prepared by WGM and AE2S, presented a 20-year growth projection based upon the completion of central water supply and sewage collection systems as well as the implementation of water conservation measures such as limits on lawn irrigation. Depending upon the actual future densities of living units and the possibility of large-scale of hotel development, the *Feasibility Study* estimated wastewater flows ranging from 265,000 to 305,000 gallons per day (gpd). Based on the *Feasibility Study's* wastewater projection range—which equates to the non-consumed[4] portions of groundwater diversions for most projected domestic and business uses—the estimated amount of water supply Volume needed for full build-out and centralized water system development is expected to range from 315 to 360 acre-feet per year.

Regardless of the actual eventual development density, it is important to recognize that some portion of the estimated Convertible Cumulative Total summarized in *Table 2* must be reserved for future irrigation, large-volume business use, and other probable consumptions (including any required mitigation[5]). These types of uses exist today and are likely to continue to exist to some degree after future development. Therefore, options and alternatives for development must be guided by an understanding of the legal availability of GCCWSD's water sources. Discussions of possible constraints on the assimilation of the groundwater rights and volumes generalized in Table 2 follow.

[4] Consumptive use of a water right is described in *Section 3.4*. The presented range is based upon a 5% consumption factor as compared to the total pumped (diverted) interior-use volumes within a year's time.
[5] Statute may require a mitigating water volume to offset potential adverse effects to downstream appropriators because of the planned changes to the existing water right appropriations.

3.3 HISTORICAL CONSTRAINTS

A water right is perfected when it is actually put to beneficial use by means of a non-wasteful approach. A right holder must uphold the elements of a water right, including the stated Flow Rate, Place of Use, and Period of Use.

As described previously, a water right cannot necessarily be taken at the face value of its summarized elements because the Abstract often does not encapsulate the nature of the right in practiced use. Applicants seeking to change an existing right—whether it be a historical right or a new appropriation—will only be allowed to change that portion of the right that can be established by a preponderance of evidence as having been historically beneficially used. The DNRC performs a historical use analysis to validate the amount of water that has been demonstrably and beneficially used under an existing right. The analysis considers whether the proposed change(s) will increase consumptive use(s).

Consequently, proposing a future change to the Canyon Area's existing adjudicated and permitted water rights may subject the individual right elements to renewed, and perhaps intensified, Department scrutiny. Hence, for a previously decreed (or permitted) water right, the Change Authorization process creates the potential for examination 'double jeopardy.' For example, while an Abstract includes a definitive element for the maximum Volume to be diverted (or pumped) under the right, the combination of the historical Flow Rate, POU area, and Period elements may be examined by the DNRC in a calculative justification. The Department may further limit the Volume element of a right (under a proposed change) if the diversion, conveyance, and historical use evidence for that right demonstrates that a lesser Volume is more likely than not.

The *Aggregated Annual Volumes Available* listed previously in *Table 2* incorporate simplified evaluations for the assumed perfected diversions of the existing groundwater rights and certificates within the possible GCCWSD well supply portfolio. At this preliminary juncture in the planning process, WGM endeavored to remain relatively conservative in assessing 'convertible' volumes, which might be assimilated for a future change application as a combined appropriation for District water supply. The following rationales—presented in descending order of investigative scrutiny—were used to compile this assessment.

- Permits: Provisional Permits and completed Groundwater Permits:
  - These rights were approved after the 1993 Upper Missouri Basin Closure. As such, WGM judges their permits, ancillary wells, and mitigation rights to have undergone sufficiently intense review under the DNRC's current examination processes and analyses. Additionally, the completion deadlines for the more significant permits have not yet sunset. Therefore, this Viability Assessment considers them viable and perfectible up to the full extent of their authorized elements.

- Large & Unquantified Certificates: Groundwater Certificates less than 10 ac-ft & greater than 3-ac-ft in Volume.
  - Based on WGM's experience, 'Large' Certificates have the greatest possibility of being 'over-stated.' The tendency of many exempt Certificate holders is to speculatively incorporate any and all foreseeable future uses when submitting the Notice of Completion (Form 602) even though full utilization may be improbable.
    - WGM utilized: Cadastral[6], business websites, PWS pumped volume reports, development reports, claim files, aerial photographs, and other readily available

[6] The Montana Cadastral is an online database that provides information about land ownership, dwelling units, and fractional property acreage in Montana. It includes public and private parcels and tax/deed information.

research materials to vet and approximate defensible water usage patterns for properties associated with 'Large' Certificates. Next, the DNRC's Water Calculation Guide (as well as other industry standard techniques) were employed to estimate the diverted volumes of each right in this category.

- The same methodology was applied to four Unquantified Certificates included as part of the water supply portfolio.

- Small Certificates: Groundwater Certificates less than 3-ac-ft in Volume.
  3 ac-ft was chosen as the threshold for this assessment because a typical residence (housing 5 persons or less) with a lot size of less than three-quarters of an acre is expected to divert under 3 ac-ft of water, including lawn irrigation. Small retail and office businesses are also assumed to draw less than 3 ac-ft per annum. As such, WGM did not review or scrutinize the historical diversions for 'Small' certificates with listed volume elements below this trigger. The minor contributory Volume elements on their abstracts were assumed valid in full. Of the 23 Small Certificate wells included in this assessment, only two had Volumes listed at more than 2 ac-ft.

- Unfiled Wells: Based upon GWIC well logs corroborated as being within the District Boundary
  - Performing perfection reviews to assess the past diversions for each of 21, unique Unfiled wells listed in the composite volumes presented in *Tables 1 and 2* was beyond the scope of this assessment. According to ARM[7], the DNRC will apply the following maximum standards when reviewing applications for new uses of water such as when considering the Unfiled and potentially exempt wells existing within the GCCWSD boundary:

    - 1 ac-ft for domestic use for a single household, and
    - 2.5 ac-ft per acre per year for lawn and garden uses.
    - For ease, this Viability Assessment treats all of the Unfiled wells as being associated with a residential/domestic use. WGM makes the blanket assumption that each 'Unfiled Residence' within the analysis waters a 0.5 acre lawn.
    - Therefore, according to current DNRC Guidelines, it could be assumed that each of the 21 Unfiled Wells represents as much as 2.25 ac-ft (1 for domestic and 0.5*2.5ac-ft/ac) of historical diversion.

  - Due to the abbreviated, high-mountain irrigation season, previous applications in the District vicinity have successfully justified irrigation requirements as low as 1.34, and as high as 2.0 ac-ft/acre. The following, more conservative simplifying assumption was applied to assign a total historical 1 ac-ft Volume to each of the existing Unfiled wells considered as part of the potential GCCWSD supply suite. Alternate MDEQ guidance allows 0.45 ac-ft per day of domestic use for a large residence. The lesser application rate of 1.34 ac-ft/acre was also applied for lawn and garden use in this climatic area and soil type. Using these more conservative guidelines, WGM calculated an assumed total of 1 ac-ft use for a large house with a 0.4 acre lawn.

WGM structured the rigor of analysis for this assessment to match the preliminary nature of the associated GCCWSD PER documents. The values within *Table 2* should be considered provisional, as

[7] Administrative Rules of Montana, https://rules.mt.gov/

the amount assigned for each enveloped water right may or may not accurately reflect actual historical use.

3.4 CONSUMPTIVE USE OF WATER

The concept of consumptive water use is a critical aspect in the DNRC's consideration of historical usage for a proposed water right change application. The Volume element of a water right, also known as diverted Volume consists of two components: consumed volume and non-consumed volume. The consumed volume is the portion of the diverted volume that is 'used' for a beneficial purpose such as irrigation, stock watering, or domestic supply. The consumed fraction of the total volume also includes incidental reductions in the diverted flow over time including, but not limited to: evaporation, transpiration, conveyance saturation, and sublimation. Plants uptake water, cows drink water, and wastewater treatment lagoons lose volume to evaporation. Each consumption reduces return flows to the watershed. An application to change an existing right will assess existing versus proposed consumption models. The following types of considerations will play important roles in balancing consumptive use patterns and addressing mitigation water needs when planning and permitting future development within the GCCWSD.

- Irrigation Consumption: To estimate the historical consumptive use of the irrigation portion of an existing right(s), the DNRC typically utilizes the USDA NRCS's Irrigation Water Requirements (IWR) method, weather station data, and alfalfa (a high-demand crop type). Most of the existing irrigation in the Canyon Planning Area relies upon pumped diversions and piped conveyances. Therefore, diverted irrigation volumes will be similar to applied volumes. Based on past area analyses (and depending on a variety of factors), the amount of consumed irrigation (compared as a ratio) to applied irrigation volume can be assumed to range between 45% and 55%.

- Domestic/Business Consumption: Indoor domestic diversions for residential and commercial/industrial applications are generally assessed as low consumption uses because the bulk of diversionary demand returns to the aquifer as effluent infiltration. Consumption of indoor diverted water in these applications can be estimated at 5% to 10%.

Along these lines, if future development results in the retirement of current irrigation acreages, the formerly consumed volume from the irrigation retirement could instead be made available for considerably denser residential and commercial development. This model for change in water right use patterns has been successfully applied within the Canyon Area and is well documented through relatively recent permit authorizations for the water rights now held by the Lazy J Utility Association.

3.5 RETURN FLOWS & MITIGATION WATER

The non-consumed volume (also known as the return flow) is the portion of the diverted flow, applied to affect a consumptive use, but is not consumed by the use (and is not permanently incorporated into other products). With some caveats, examples of non-consumed volumes include: conveyance seepage, excess flood water, carriage water, and groundwater infiltration.

Whether as surface water or infiltrated groundwater, non-consumed volumes return to the original source (or nearby sources). Other water users may be entitled to return flows from upstream rights as part of their water right. A core tenant of prior appropriation is that the State has an obligation to prevent 'injury' to existing water rights. For this reason, in instances where an application for a proposed water right permit (or change application) has the potential to impact the amounts and locations of return flows, the DNRC will also conduct a return flow analysis.

The DNRC's review of GCCWSD changed return flows will include reviews of:

- Existing non-consumed Volumes;
- Hydraulic connections between groundwater and surface water; and
- The rate and timing of existing return flows from non-consumed water.

Providing a preponderance of proof demonstrating and mitigating potential adverse effects to downstream surface water users as well as groundwater appropriators not annexed into the GCCWSD will likely represent a significant portion of the effort necessary to change the existing well rights to supply a central water system.

Certain potential adverse effects can successfully be addressed utilizing mitigation water in priority with respect to the affected appropriator(s). The purpose of a Mitigation Change is to modify the Purpose and Place of Use of an existing water right to offset potential adverse effects to a surface water source that are predicted:

- From a proposed beneficial use of groundwater right permit application; Or,
- As a result of a proposed change to an existing water right.

For proposals that require an appurtenant Mitigation Change(s), a mitigation plan demonstrating efficacy in offsetting adverse effects must be provided for analysis. The amount, timing, and location of mitigation water will be analyzed in conjunction with the parent application for a water right change or permit. As required, mitigation water for the proposed GCCWSD central supply will either have to be acquired (by purchasing and retiring an existing water right(s) within the Gallatin Watershed) or mitigation can be achieved by retiring a portion of the existing available groundwater Volume as presented in *Table 2*. Quantifying the specific potential Volume of mitigation water that may be prudent to validate proposed future use patterns will depend upon the finalized development configuration. As such, water right mitigation will be considered in tandem with future design and change of water right application work.

Previously, the Lazy J Utility Association's groundwater permit applications in the Canyon Area were able to make productive use of a mutually beneficial statute, which allowed the Fish Wildlife & Parks (FWP) as a downstream right holder to agree to a waiver of consent of adverse effect. This consent avenue eased the permitting process by absolving the applicant(s) from having to provide rigorous return flow timing, rate, and location data for the proposed changes relative to pre-existing returns. The statutory deadline for this waiver statute has since lapsed. A draft 'Waiver of Adverse Effect' Bill is under consideration for the 2025 Legislature. If successful, this Bill might provide a similar waiver for future groundwater changes/applications relative to the Canyon Area rights.

3.6 PHYSICAL & LEGAL AVAILABILITY & FLOW RATE

Any new permit application must prove that water is physically and legally available during the period in which the applicant intends to divert it for beneficial use. The GCCWSD supply concept intends to convert and assimilate the numerous existing diversions into a manifolded combined appropriation, which does not exceed the constraints of the existing rights or cause injury to existing right holders.

According to WGM's research, more than 80 wells fall within the GCCWSD Planning Area. The mechanical supply potentials of the top three (3) existing production wells within the Lazy J, Ramshorn View Estates, and Boyne Properties indicate that they alone could conceivably supply more than 600 ac-ft of water per year if pumped continuously at their authorized Flow Rates of 181, 180, and 75 gpm,

respectively. This oversimplified assertion of flow potential fails to adequately encapsulate numerous hydrogeologic, engineering, administrative, and water right limitations. However, Preliminary Engineering Report (PER) work for the Canyon Water Supply is being conducted in parallel with this Water Rights Viability Assessment. The *GCCWSD Water PER* indicates that existing (and new) well infrastructure when combined with a pressurized distribution network and water storage alternates can feasibly be designed to overcome the foreseeable Flow Rate and physical availability limitations. Water supply peaking factors and infrastructure redundancy considerations for public supply are considered within the preliminary engineering study.

3.7 PERIOD OF DIVERSION

At least ten of the existing water rights (representing an estimated convertible annual volume totaling 16.8 ac-ft) contain beneficial use components with seasonal restrictions. As such, the Period of Diversion element for the combined supply portfolio will require special consideration during water right application preparations for a predominantly year-round combined municipal appropriation.

4. CONTEMPLATED CHANGE/PERMIT APPROACH

4.1 INTANGIBLE CONSIDERATIONS

Recent legislative, administrative, and legal presidents have altered the landscape of the Water Right Permit Change and Permitting processes. For example, House Bill 114, passed by the 2023 Legislative Assembly, initiated the Comprehensive Water Review initiative, which included requirements to overhaul the New Appropriations Program's processes to improve consistency, transparency, and timeliness. New permit and change authorization application packages and requirements went into effect in January of 2024. In addition, a Stakeholder Working Group was formed to oversee the changes and to provide recommendations to streamline the implementation of the reformed processes.

The New Appropriations Program is a uniquely complex part of Montana's resource stewardship and administration responsibilities. Stakeholders and DNRC staff have been working closely with applicants to review and authorize applications under the new statutes and forms. WGM scientists remain hopeful that the new application processes will improve with time. However, regardless of potential future streamlining, the work to meet the burden of proof to support a new groundwater permit (or authorized change application) absorbing as many as 80 existing groundwater rights, will be unprecedented, involved, costly, and time consuming.

4.2 RECOMMENDED METHODOLOGY

Based upon WGM's experience, several possible strategies exist to attempt to secure a combined groundwater right capable of supplying the Volume, Flow Rate, use patterns, and development densities outlined within the Water Supply PER. Regardless of the permitting approach, WGM proposes to structure the GCCWSD's future application(s) by building upon the well-documented attempts and successes contained within the permit applications, change authorizations, and court orders for the Lazy J Utility Association Rights.

In WGM's opinion, the two most viable paths toward a successful groundwater supply application are summarized following:

1. Preparation of a single Application to Change all existing and annexed water rights simultaneously in order to achieve a combined appropriation. If fruitful, each supplemental

changed right would share common Use Types, identical Places of Use, and matching Points of Diversion (or commonly described and manifolded conveyance infrastructure); Or,

2. Submission of a new Groundwater Permit Application and a Mitigation Change Application, which proposes to retire all annexed wells (and associated individual rights) as in-ground and in-place mitigation for the new permit authorization.

Both of the approaches have advantages and drawbacks relative to the existing groundwater supply portfolio and the GCCWSD's central water supply proposal. The DNRC has recently demonstrated a hesitation in allowing the utilization of existing junior groundwater rights as mitigation water for new groundwater permit depletions under the updated permitting processes. In contemplation of this knowledge, WGM would advise preparing a mass Water Right Change as opposed to the submittal of a New Groundwater Permit appropriation. *Section 4.3* following describes several salient considerations of a possible future Change Application for the Canyon Area groundwater rights. However, WGM cautions that circumstances surrounding the New Appropriations Program may change between the release of this Viability Assessment and the onset of water right change efforts to supply the District.

4.3 CHANGING AND ASSIMILATING THE GCCWSD GROUNDWATER RIGHTS

This Viability Assessment presents a permissible approach for continued development of the Canyon Area in keeping with the GCCWSD's goal of centralized water supply and sewage treatment systems. In WGM's opinion, the source Volume required for future growth and water infrastructure will most efficiently be supplied by aggregating the existing groundwater developments and—as necessary—retiring (or purchasing) water rights for mitigation via the DNRC's Water Right Change application process.

Supplying the District through a single application to simultaneously change all of the assimilated water rights will require modifications to all three of the following elements (for each existing right):

1. Point of Diversion;
2. Place of Use; and
3. Purpose of Use.

POD Change: At this preliminary design juncture, numerous possibilities exist for discrete diversions in a potential well supply network. For redundancy, Public Water Systems require at least two wells. However, multiple wells can be manifolded and utilized for each primary and backup supply systems. Supply wells can consist of existing well points, new drilled wells, or a combination of both. There is a recent authorization precedent, which identifies the pressure manifold and distribution piping network as the POD for a water right change authorization. WGM feels that specifying the GCCWSD distribution network (rather than discrete well locations) will allow for maximum flexibility in the water rights, engineering, and hydrogeologic analysis and design processes.

If the existing wells servicing the Lazy J Utility Association and Ramshorn View Estates HOA can be acquired--and their rights changed—they represent a promising basis as components in the potential supply backbone for the future GCCWSD system. These wells are centrally located within the District Boundary and were drilled according to current industry standard practices. In addition, they were completed in basal formations at depths sufficient to provide a sustainable supply. Their completions likely preclude some of the dewatering concerns relative to shallower, near-surface aquifers. As PWSs supplies, they have also been vetted through pump testing, hydrogeologic analyses, and administrative scrutiny.

The Greater Big Sky area is underlain by an incredible and dynamic amalgamation of geologic elements. Extensive folding, faulting, thrusting, sliding, and volcanism have created complex subsurface lithologies. For example, along the Spanish Peaks fault line (which intersects Highway 191 just north of the Bighorn Center), pre-life, Precambrian formations have been mapped adjacent to 'new' limestones. As such, significant analysis of the hydraulic connectivity between various aquifers beneath the Canyon Area and the Gallatin River may be needed to support the GCCWSD change application. For efficiency, WGM proposes to build on numerous prior hydrogeologic analyses, which were prepared for existing water supply systems within the Canyon Planning Area.

For obligatory mitigation due to potential surface water depletions, which may be perceived relative to the proposed groundwater supply diversions, WGM would propose to address return flows within a targeted reach of the Gallatin River. In such a scenario, the Place of Use for a Mitigation Change application would be analogous with the segment of surface water identified as being potentially depleted by groundwater withdrawal as a result of the corresponding water right change application for District supply.

POU Change: The GCCWSD Boundary represents a potential service area. The legal description of the GCCWSD Service Area could be applied as the proposed POU for the mass water rights change application. This new POU would be proposed as common to all of the rights being changed. WGM believes that a service area POU would be defensible in the context of a single water right change application for all of the enveloped and annexed rights.

Purpose Change: WGM recommends changing the Purpose of Use on all the existing groundwater rights to 'Municipal'. This would be most appropriate because water and sewer districts are quasi-government entities that provide water in a manner similar to incorporated municipalities. As such, 'changed' water could be distributed to any member of the District for irrigation, stock, commercial, domestic, and other uses authorized by the GCCWSD as the governing entity. The flexibility of municipal use holds true as long as the combined annual appropriation conforms with the DNRC's permit authorization criteria. Based upon the final design for the completed development, analyses for the proposed change application will need provide a preponderance of evidence demonstrating that the aggregated beneficial uses of the District's rate payers will uphold the consumptive use models (and ancillary mitigation requirements) of the future groundwater permit.

Storage Change: If centralized supply infrastructure will be utilized to fill elevated tanks during non-peak demand such that stored volumes can be released to supplement pumped flows, a water right change application must include the addition of a storage element with commonly described components/tanks and locations.

WGM maintains that aligning these four water right elements across all of the integrated individual rights as part of a single Application to Change Water Right(s) represents the most viable opportunity for maximized GCCWSD centralized supply. The development possibilities of the District will ultimately depend upon which (and how many) of the existing groundwater right owners can be enticed toward annexation well in advance of infrastructure completion in order to capitalize on as much of the available volume potential (identified within *Table 2*) as possible.

WGM recognizes that the GCCWSD may find it challenging to encourage private water users to cede their water rights to the District. Submitting multiple, subsequent water right change applications in parallel with a more traditional, phased infrastructure installation approach would also be possible. However, due to ever-increasing administrative scrutiny, the demand for water in the closed Gallatin

Basin, prolonged application processing times, and considerably compounded consulting fees, WGM strongly recommends against this type of piecemeal water rights change approach.

To maximize the supply potential for the Planning Area, WGM recommends that the GCCWSD consider sewer service connections, connection fee waivers, material waivers/reductions, and any other available motivators to incentivize private right holders to surrender their water rights to the District.

4.4 INFRASTRUCTURE PHASING

Phased municipal infrastructure design and construction can be advantageous for reasons including, but not limited to, the following:

- Centralized connection by early-adopters may help generate annexation interest/trust;
- Phasing improves cash flow, resource management, and grant-ability;
- Later phases benefit from lessons learned during initial infrastructure design/installation work;
- Phased improvements add greater control over costs and completion times; and
- Structured improvements can sustain interest and collaboration with key stakeholders over time.

While WGM recommends a single mass water rights change application for the GCCWSD Planning Area rather than a phased water rights procurement approach, engineering design and construction phasing might be achieved within the context of the water right/permit Completion Date window. With suitable justification, the DNRC Administration Bureau regularly allows up to 20 years for entities developing public water supplies to fully 'perfect' full water use under their applications. Extensions to the Completion Date are also permissible. If authorized by the Department, MCA 85-2-420 allows the water right applicant to continue using a mitigation right for its pre-existing purpose until retired as mitigation while the over-arching change/permit application is being perfected. Assuming DNRC authorization for prior use retirement 'phased' throughout the Completion Date window, WGM believes it could be feasible to contract the ownership of the majority of the water rights summarized herein while allowing for a traditional incremental approach to infrastructure funding, design, and construction.

5. CONCLUSION & SUMMARY

The Canyon Area is undergoing rapid growth that will continue. Local stakeholders recognizing the need for responsible planned development formed the Gallatin County Canyon Water & Sewer District (GCCWSD) with the goal of providing centralized water supply and wastewater management. With current basin closures in effect and lengthy—and often complex—water right application and change processes to follow, achieving a consolidated groundwater supply for the GCCWSD will be challenging.

Regardless of eventual buildout density, it is important to recognize that options and alternatives for growth must be guided by an understanding of the legal availability of GCCWSD's existing groundwater sources. WGM has reviewed existing and potential water rights within the GCCWSD Planning Area to estimate the maximum potentially convertible groundwater volume for densified development: 380 ac-ft per annum. While this Water Rights Viability Assessment presents an approximate ceiling, the scale of future development and infrastructure centralization will be largely dependent on the number of existing water rights that can be assimilated as part of a single, mass change application, which aligns the elements of Storage and Use across a common District Service Area as the proposed Place of Use (POU). Similarly, to maximize design flexibility, WGM proposes to specify the water delivery network as the common Point of Diversion (POD) for each changed water right, rather than listing discrete wellhead locations. Phased engineering and construction for the central water system may be practicable under a single change application via a DNRC authorized Completion Date 'window'.

Enticing private owners to buy into the GCCWSD's centralized water main concept may be challenging. To maximize the supply potential for the Planning Area, WGM recommends that the District consider offering sewer service connections, connection fee waivers, material waivers/reductions, and any other available motivators to incentivize private right holders to surrender their water rights to the District.

Finally, to improve the efficacy of the amassed water right portfolio, the District's water right change approach should build upon previous permit applications and hydrogeologic and hydrologic analyses.

ABBREVIATIONS & ACRONYMS

AC-FT	Acre-Feet is the standard volumetric measure for water rights.
CFS	Flow rate measured in Cubic Feet per Second.
DNRC	The Montana Department of Natural Resources & Conservation.
FWP	The Montana Department of Fish Wildlife & Parks.
GCCWSD	Gallatin Canyon County Water & Sewer District.
GPM	Flow rate measured in Gallons Per Minute.
GWIC	Ground Water Information Center.
MBMG	The Montana Bureau of Mines and Geology.
MCA	The Montana Code Annotated is a compilation of the State Constitution and all Laws.
MDEQ	The Montana Department of Environmental Quality.
PER	A Preliminary Engineering Report is a planning document used to prioritize the most technically feasible solution given a particular set of budgetary, construction, environmental, time, or health/safety constraints.
POD	Point of Diversion. A groundwater right's POD typically consists of a well casing.
POU	Place of Use. The POU element(s) listed on a water right abstract designate the legal descriptions and location(s) where the water right can be put to beneficial use.

APPENDIX A

FIGURE 2: GCCWSD OVERVIEW MAP & GROUNDWATER WELL NETWORK

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Preliminary Engineering Report
Existing Wells and Public Water Supplies

N

Lone Mountain Trl
Gallatin Rd
2
Big Sky Canyon Village
Quarry PUD
5
4
Michener Creek Rd
Gallatin Rd
6
530,000 Gal
7
Lazy J
8
Buck's T-4
Cummings Ln
340,000 Gal
9
10
Riverview Ln
Gallatin River
Gallatin Rd
12
Gallatin River
13
Fortress Rd
Rd

- Public Water Supply Wells
- Other Potable Use Wells
- Other GWIC Wells
- Large Bolted Steel Storage Tanks (at grade)
- Exisitng Water Distribution Systems

Properties Served by PWSs

Properties Served by Public Water Systems

- Big Horn Center
- Big Sky Business Center
- Big Sky Exxon
- Big Sky School District
- Buck's T-4
- Conoco
- Lazy J PUD
- Ramshorn HOA
- Riverside Trailer Court
- Whitewater Inn
- Water PER Service Areas
- GCCWSD Planning Area
- Parcels

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LOC:	**Gallatin County**	PROJ MGR:	**SS**
TR:	**Several**	DRAWN BY:	**MAP**
BASE:	**2017 Aerial**	PROJ:	**220806**
FILE:	**Well and PWS Locations**	DATE:	**5/28/2024**

This is not a legally recorded map or survey. WGM does not guarantee the accuracy, current status, or completeness of the material contained herein and is not responsible for any misuse / misrepresentation of this information or its derivatives. This graphic representation is for general planning purposes only.

0 0.25 0.5 Miles

APPENDIX E

SYSTEM DEMAND FLOW ESTIMATE DETAILS

Assumptions:

Residential Lot/dwelling unit Flow	250	GPD
Acreage Flow	1765	GPD/acre
% Developable unplanned Quarry non-steep areas	80%	
% Developable SA4 non-floodplain/wet areas	70%	

Service Area	Description	Zoning	Current # Parcels	*Permitted Flow from Septic Inventory (GPD) + Bucks and Quarry Growth	Current Metered Flows (GPD)	Future Flows from Development Plans (GPD)	# of Residential Lots	# of New Planned Dwelling Units	# of New commercial connections	Nonfloodplain/ wetland/steep Acreage	Esimate Method	Flow Estimate (GPD) - (Owner/Developer Planning Request)	Flow Estimate (GPD) - Calculated - Land Use Rates & WW Permit/80%	Notes
2		Community Commercial and Commnity Facilities and Residential Signle Family (7,500 fqft/lot)	25	10,199			5				Permitted Flow from Septic Inventory/.8+ 1 house+ 7.66 acres(kenyon noble)*.80 useable*acreage flow	24,000	24,000	kenyon noble prop developing?
4	East of HWY 191	Comercial & Industrial Mixed Use	42	14,323						56.3	70% of Developable acreage at 1500gpd/acre	70,000	70,000	
5	Quarry PUD	Residential Cluster Single Family (Gross 1 acre minimum/dwelling unit) and Commercial & Industrial	1	76,500				300	30	34	Developer's Current Plans/.8	112,500	123,008	Planned development, per property owners: 300 residential units and 30 commercial units. Commercial details unknown 300 units*dwelling unit flow +(40commercial acres-6 steep acres)* 80%*acreage flow
6&7	Lazy J Residential Properties	Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit) and Commercial & Industrial Mixed Use	20	20,000							Developer's Current sewer Plans/.8	50,000	50,100	Existing commercial condos and residential parcels + Planned development, per property owners: 50 townhome units + 10 commercial units. Is this commercial the existing units? 149residential acreage/5*flow per lot +~10000gpd existing sewer/.8 + 50 townhome units+ 10 commericial
8	Buck's T-4	Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit) and Commercial & Industrial Mixed Use	4	29,400							existing permitted/.8 + 100person dorm*60gpd/person(DNRC Water Plannign Guide Form 615 guidance for Rooming Houses)+100residences*dwelling unit rate - Based on Developer's Current Plans	54,000	54,000	Planned development, per property owners: The existing hotel/commercial + 100 person employee dormitory + 100 residential units
9	Lower Ramshorn	Residential Single Family (11,000sqft/lot) and Commercial & Industrial Mixed Use	77	17,300			75				Permitted flow/.8	21,625	21,625	7 empty lots, assumed covered in permitted amount. This is less than 250/lot
10	Upper Ramshorn	Residential Cluster Single Family (Gross 1 acre minimum/dwelling unit) and Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit)	22	5,900			17				# lots * flow per lot	4,250	4,250	
12	Low Density Residential Area	Residential Cluster Single Family (Gross 5 acre minimum/dwelling unit)	13	2,550			13				# lots * flow per lot	3,250	3,250	
13	Schools	Community Facilities	2	5,525							permitted flow/.8 with 4% Growth for 20 years	15,132	15,132	
Total			206	181,697	-	-	110					354,757	365,365	

* Permitted Commerical +250gpd per residence

Phase 1 area at build out (~Service Areas 2,4-8)	310,500	gpd
	321,108	gpd (Calc based column totals)

APPENDIX F

CANYON SEPTIC INVENTORY & COLLECTION PRIORITIZATION STUDY

WGMGROUP

Canyon Septic Inventory & Collection Prioritization Study
Upper Gallatin Restoration
WGM Project Number: 210621
Client: Gallatin River Task Force
9.8.2022

109 East Main Street, Suite B, Bozeman, MT 59715 I **OFFICE** 406.728.4611 I **EMAIL** wgm@wgmgroup.com

REPORT DATE:

9.8.2022

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B – INVENTORY MAPS BY SERVICE AREA

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ACRONYMS

BGS	Below Ground Surface
BSCWSD	Big Sky County Water and Sewer District
BSRAD	Big Sky Resort Area District
DEQ	Montana Department of Environmental Quality
FS	Feasibility Study
GCCHD	Gallatin City County Health Department
GCCWSD	Gallatin Canyon County Water and Sewer District
GLWQD	Gallatin Local Water Quality District
GPD	Gallons per Day
GRTF	Gallatin River Task Force
GWIC	Ground Water Information Center
MBMG	Montana Bureau of Mines and Geology
MCEP	Montana Coal Endowment Program
MCL	Maximum Contaminant Level
mg/L	Milligrams/liter
MGD	Million Gallons per Day
MGY	Million Gallons per Year
N	Nitrogen
OWTS	Onsite Wastewater Treatment Systems
PE	Population Equivalent
PER	Preliminary Engineering Report
PWS	Public Water Supply
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
WRRF	Water Resource Reclamation Facility

EXECUTIVE SUMMARY

The Gallatin River Task Force (Task Force) has been a key proponent of the Gallatin Canyon Sewer project and instrumental in early planning efforts and formation of the Gallatin Canyon County Water and Sewer District (District). The purpose of this study is to provide an updated wastewater inventory in the Canyon Area and serve as a preliminary basis for collection area prioritization that is intended to aid District infrastructure planning decisions. The wastewater inventory component of the study serves two primary purposes; 1) provides the District with a GIS database of existing infrastructure to inform annexation and planning, and 2) quantification of nitrogen loading for individual "Service Areas" as a means to perform cost-benefit analyses.

Potential long-term impacts of excessive nutrient loading to our streams and rivers is a commonly discussed topic across the community and state. Just as critical, and arguably more so, drinking water wells located downgradient of septic systems represent a significant human health risk. The collection prioritization component of the study is intended to identify key areas throughout the developed Canyon corridor that are contributing the largest nutrient loads to the Gallatin River and pose the greatest public health risk to downgradient potable wells. This prioritization exercise includes evaluation of central sewer main extension costs, collection lateral costs for individual Service Areas, and existing disposal areas as potential "assets" based on providing both the physical infrastructure for treated effluent disposal and existing nutrient loads that can be removed as a means to achieve the Task Force and District objective of 'net-nutrient reduction' loading to the Gallatin River. The human health risk component is evaluated qualitatively, factoring in well proximity to upgradient septic drainfields and risk metrics including subsurface travel time related to pathogen risk reduction, well depth, and well water quality data as an indicator of elevated risk associated with cumulative nitrogen effects.

SEPTIC INVENTORY AND NITROGEN LOAD PROJECTIONS

A preliminary Gallatin Canyon Onsite Wastewater Treatment System (OWTS) Inventory was conducted as part of the 2020 Feasibility Study (FS) effort. The database included approximately 62 permitted systems totaling 92,968 gallons per day (gpd) design flow in the Canyon Study Area. "Ground truthing" was conducted via 2017 aerial imagery, review of as-built drawings and permits, and site observations to identify systems and associated design flows not accurately reflected within the database. The resulting estimated total design capacity of existing systems in the Canyon Study Area was calculated to be 115,000 gpd.

This initial OWTS inventory was used to estimate current and expected future nitrogen loading from each Service Area and as an input for ArcNLET analysis. This inventory also served as the basis for growth projections and preliminary sewer design in the 2021 Preliminary Engineering Report (PER). Since then, additional permits have been uploaded to the Gallatin City County Health Department's (GCCHD) online database, sewer design has progressed, and the data needs have changed. A refined inventory is presented below. The updated estimated existing nitrogen load to the Gallatin River is estimated at 5,850 lbs N/year, approximately 25 percent larger than the value presented in the FS.

This report includes updated nutrient load accounting for each Service Area, shown in **Table ES.1** and the **Figure ES.1**. The loads presented represents the projected nitrogen load to the aquifer. Subsurface denitrification processes result in reduced loading to the Gallatin River. Preliminary nitrogen fate and transport modeling included in the FS indicates an average subsurface nitrogen removal of approximately 20%. Refined fate and transport modeling is required to refine this estimate and is anticipated to be conducted as a component of the Montana Department of Environmental Quality (DEQ) groundwater discharge permitting process.

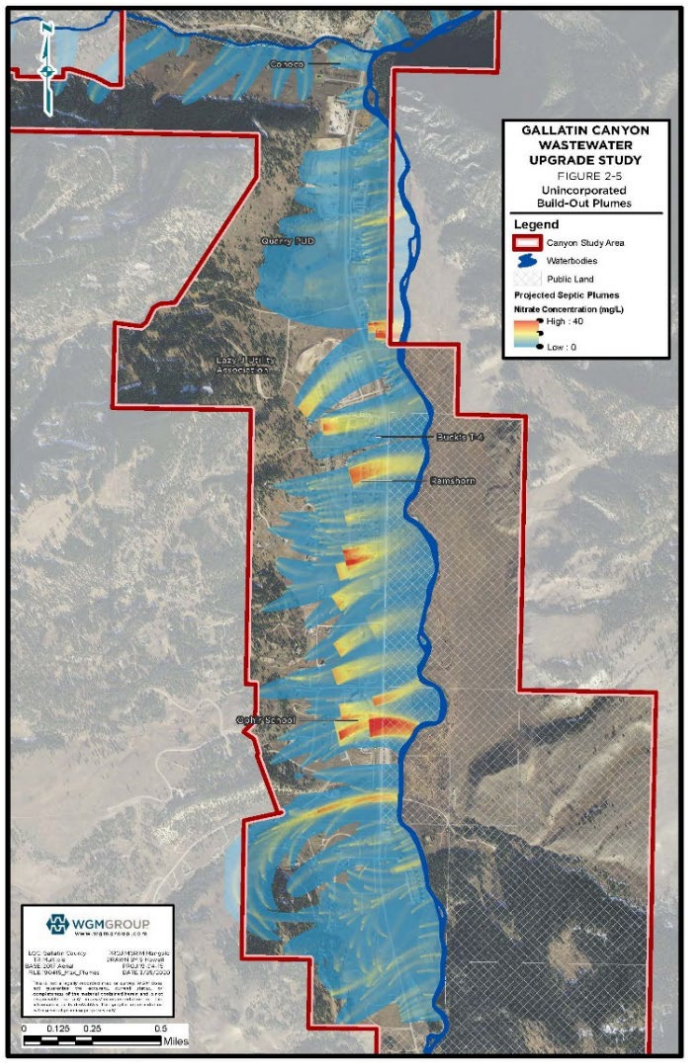


Figure from Preliminary Engineering Report illustrating nutrient impact analysis findings. The Gallatin River is projected to rapidly approach impaired status if Canyon Area development sprawl continues.

TABLE ES.1 – ONSITE WASTEWATER DISCHARGE INVENTORY SUMMARY

SERVICE AREA	TOTAL PERMITTED FLOW (GPD)	TOTAL PE	TOTAL NUMBER OF SYSTEMS	TOTAL ANNUAL N LOAD TO AQUIFER (LBS/YR)	RANKED N LOADS (1 = BIGGEST LOADER)
1	3,475	25	9	138	15
2	10,199	121	12	521	6
3	0	0	0	0	16
4	14,323	159	25	767	5
5**	x	765	x	1,380	1
6	20,000	247	1	801	4
7	0	0	0	0	16
8**	x	294	x	954	3
9	14,800	183	3	1,186	2
10	5,900	45	16	292	9
11	3,125	26	8	172	13
12	2,550	24	7	153	14
13	5,525	67	2	243	12
14	5,260	43	15	276	11
15	6,500	56	28	367	8
16	3,976	44	6	287	10
17	0	0	0	0	16
18	8,471	88	24	485	7
TOTALS	**104,104**	**2,187**	**156**	**8,022**	

**Represent the planned growth scenario based on approved development plans.

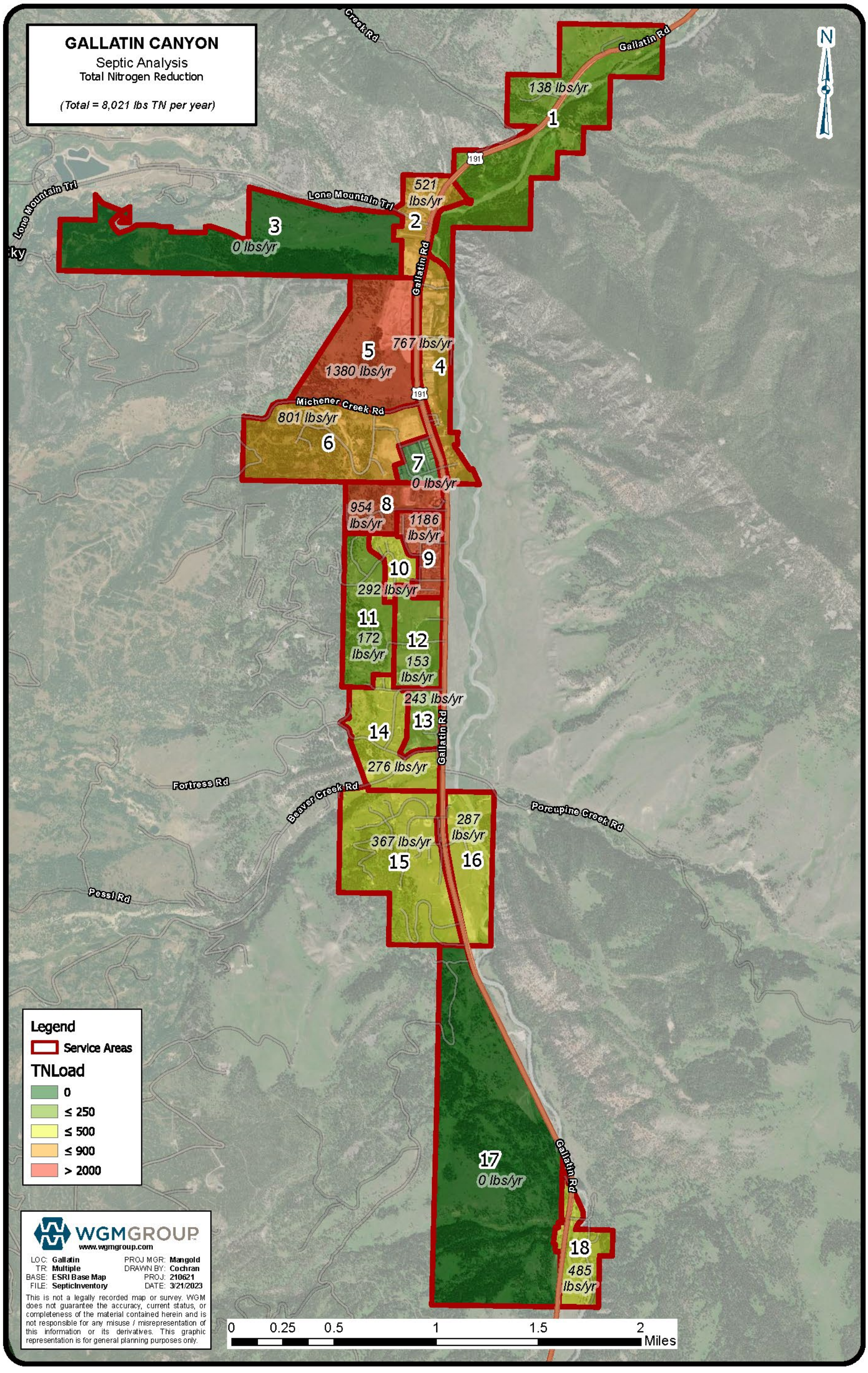


FIGURE ES.1– OWTS INVENTORY OVERVIEW – TN LOADS (LBS/YEAR)

WELL INVENTORY AND WATER QUALITY DATA

The well inventory can be separated into two categories: all Ground Water Information Center (GWIC) wells within the Sewer Planning Area (used primarily to document potable well distribution) and the 2020-2021 data from Montana Bureau of Mines and Geology's (MBMG) "Groundwater Investigation Program for the Upper Gallatin – Groundwater Monitoring Sites" (used primarily to document measured groundwater quality). According to GWIC data, there are 217 wells in the Canyon Study Area, 173 of which are used as a drinking water source. Twenty-two of these wells are public water supplies (PWS), subject to some level of DEQ oversight (i.e., water sample reporting), while the remaining 195 are private. These water sources are unregulated and tend to receive little to no monitoring and treatment and inconsistent maintenance. **Table 3.1** in the report provides a summary of wells and well types in each Service Area. There are 51 shallow potable wells in the shallow aquifer that represent drinking water sources that are most prone to septic related contamination (see **Figure ES.2)**.

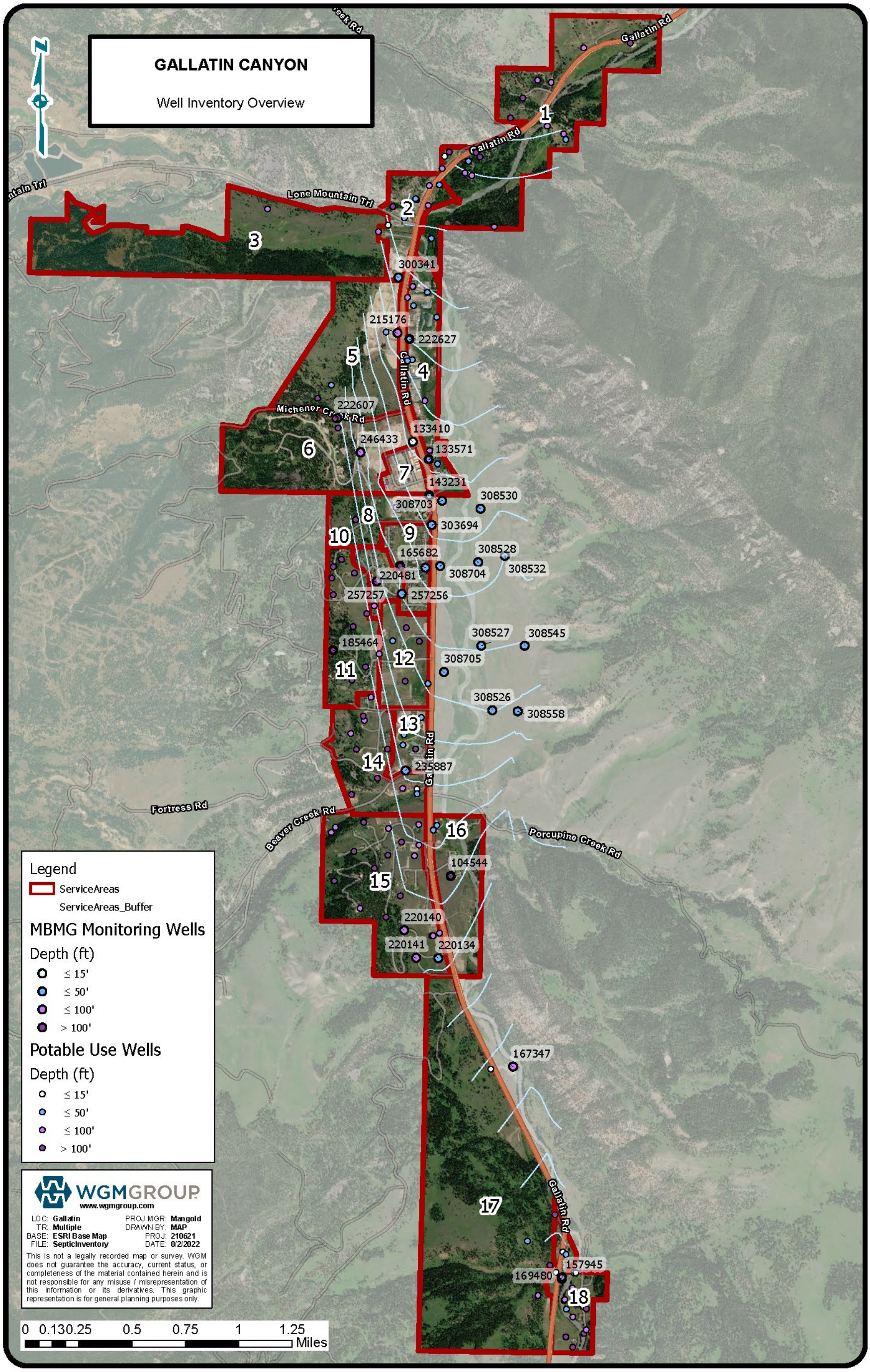


FIGURE ES.2 – WELL INVENTORY LOCATIONS

PUBLIC HEALTH

A detailed public health risk assessment is expected to be required during the groundwater discharge permitting process. The methodology included in this report is intended to serve as a preliminary public health risk characterization based on nitrate concentrations and travel time metrics for pathogen transport and potential well contamination. The analysis performed builds off the inventory of onsite wastewater systems in the Gallatin Canyon and associated nutrient load estimates discussed in the previous section.

Nitrogen, in the form of nitrates, are the most common groundwater contaminant in the United States with a maximum contaminant level (MCL) set by the Environmental Protection Agency (EPA) at 10 mg/L (EPA, 2009). The advisory threshold that indicates elevated levels and requires reporting in a consumer confidence report for Montana Public Water Supplies is 5mg/L nitrate. Elevated nitrate levels in drinking water may result in negative health effects, including decreases in blood pressure, increased heart rate, headaches, abdominal cramps, vomiting, and methemoglobinemia. (ATSDR, 2015). Sensitive populations include infants less than four months of age, pregnant women, dialysis patients, and persons with ulcers, anemia, gastritis or gastric carcinoma.

Nitrate in groundwater is also an indicator of septic system contamination in areas where there is no significant agricultural or natural source of nitrate. When nitrate is present in groundwater at 10 mg/L, it can indicate that at least 20 percent of that water originated from a septic system. High nitrates typically indicate that other soluble components of septic wastewater may be present as well, including many compounds of emerging concern (CECs), such as pharmaceuticals, personal-care products, and their metabolites.

Additionally, continued use of outdated and aging septic systems increases the chance of system failures that lead to surfacing of wastewater. Contact with surfaced septage is an acute health risk that exposes people, often children, to pathogens that cause diseases such as gastroenteritis, hepatitis, and dysentery. This health risk is not explored further in this report.

Both the general well data described above and the water quality data from the MBMG Groundwater Investigation provide useful health indicators. A summary of public health related metrics derived from the well inventory can be seen in the **Table 5.1** and **Figure 5.1** of the report. The inventory can be queried to find other health-related information as well.

The preliminary maps in this section illustrate the interactions between onsite wastewater systems, potable well locations, and nitrogen concentrations in the aquifer. Data available from the Discharge Inventory showed age data for 89 of the 159 OWTSs. Systems ranged from about 2 to 50 years old, with a median age of 19. At least 32 of the OWTS are approaching or at the end of their useful life (at least 20 years old), 17 of which are at least 30 years old. A third of the systems 20 years or older are in Service Area 4. Considering that Service Area 4 has the most (11) shallow potable wells, this presents a significant health risk. Note that the age of the system is not available for about 45 percent of inventoried discharges, so the number of older OWTSs is an undercount. Note that data related to groundwater gradient and hydraulic conductivity are preliminary and will be updated as the study progresses.

Figure ES.3 shows illustrated septic plumes roughly modeling the 200-day travel paths and their intersection with domestic wells. According to DEQ's *How to Perform a Nondegradation Analysis,* "An assessment of impacts to down-gradient drinking water supplies, including impacts from pathogens, should show 4-log microbial inactivation or the removal of 99.99 percent of viruses. 4-log microbial attenuation typically occurs within 200 days." Based on this, a 4-log microbial reduction is the limit that reasonably protects public health.

Only rough estimates of hydraulic conductivity in the Canyon's alluvial aquifer are known at this time, but it mostly likely falls between 10 and 100 feet/day, likely on the higher end of that range. This hydraulic conductivity estimate range was derived from preliminary analysis of pump test information included in the well logs of MBMG study wells in the canyon. The orange plumes illustrate 200-day travel time in a lower conductive scenario (10 feet/day) and the yellow plumes illustrate a highly conductive scenario (100 feet/day). In general, any well located inside the yellow plume is potentially at risk of pathogen contamination. However, there are many assumptions made to generate this map. ***This model was not calibrated or verified and serves to illustrate preliminary risk and approximate areas of potential septic influence only.*** Additional information about the model inputs and associated files can be found in **Appendix A.**

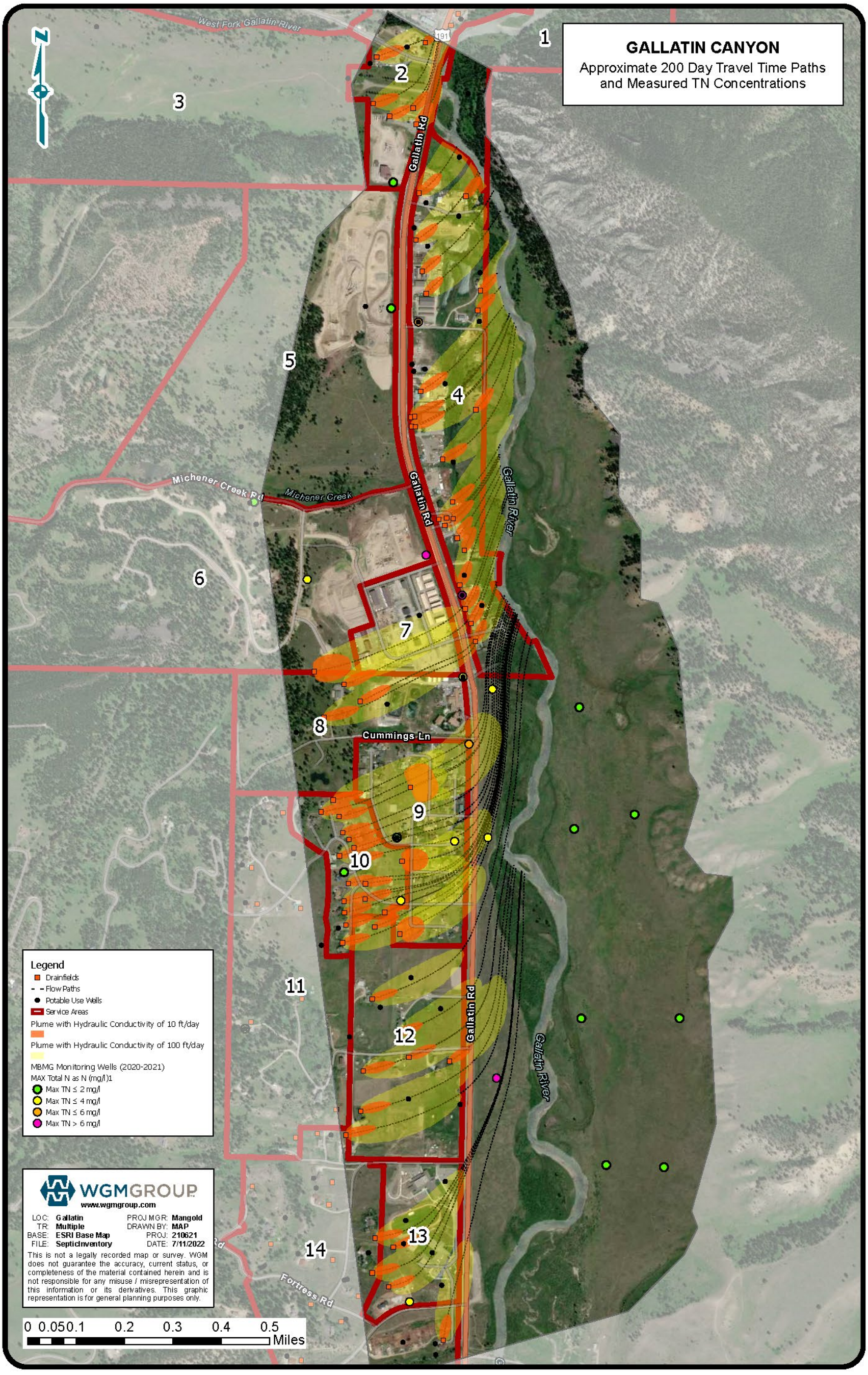


FIGURE ES.3 – ILLUSTRATION OF 200-DAY TRAVEL PATHS AND TN CONCENTRATIONS

COLLECTION PRIORITIZATION: COST-BENEFIT ANALYSIS

The three main variables used as a basis for the report's collection prioritization include 1) infrastructure cost, 2) nitrogen load removed, and 3) human health risk mitigation. Sewer collection plan-profile drawings were prepared (see **Appendix D**) to evaluate infrastructure cost on a 'per Service Area' basis. A preliminary opinion of probable project cost (OPC) was developed for the full collection limits, while isolating costs to collect each individual Service Area as presented in **Table ES.2**. Details of the basis of cost estimation can be found in **Appendix C.**

TABLE ES.2 – PRELIMINARY COLLECTION SYSTEM OPINION OF PROBABLE COST (OPC)

SEWER COLLECTION PROJECT COMPONENT	COST $ (Class IV AACE)
Service Area 1 – Dudley Creek Area	$812,000
Service Area 2 – Bighorn Center Area	$1,684,000
Service Area 3 – Kallestad Conservation Area	**NA***
Service Area 4 – River Front Properties	$2,427,000
Service Area 5 – Quarry PUD	$1,353,000
Service Area 6 & 7 – Lazy J Utility	$1,080,000
Service Area 8 – Bucks T-4	$413,000
Service Area 9 – Ramshorn Subdivision (Lower)	$863,000
Service Area 10 – Ramshorn Subdivision (Upper)	$760,000
Service Area 11 – North Foothills	$1,520,000
Service Area 12 & 13 – School Collection (w/ low density residential)	$1,513,000
Service Area 14 – South Foothills	$1,469,000
Service Area 15 – South Beaver Creek	$3,690,000
Service Area 16 – South Porcupine	$738,000
Service Area 17 – Burcalow Open Space	**NA***
Service Area 18 – Corral, Rainbow & Residences	$1,476,000

*Service Areas 3 and 17 have limited existing and/or planned future development.

For Service Areas 1, 15, 16, and 18, preliminary cost estimates to connect to the GCCWSD sewer were high (i.e., economically not feasible to collect), primarily due to their lower population density and distance from the existing District boundary. Rather than present these cost estimates for connections that will likely never occur, cost estimates assume enhanced de-centralized treatment (e.g., SepticNET) is utilized for each of these Service Areas.

One of the primary goals of the Gallatin Canyon Sewer is to reduce nutrient loading to the Gallatin River and the alluvial aquifer which serves as a drinking water source. While the nutrient reduction cost efficiency is important, the actual amount of nutrient reduction is as well. One of the metrics used to prioritize sewer collection is the total amount of nitrogen loading that will no longer be loaded through OWTSs. This is measured as "Total Annual N Load (lbs/year)."

As seen in the following figure, collecting Service Areas 5 and 8 provide the two largest opportunities for nitrogen reduction (accounts for planned and/or permitted growth). These areas are already in the GCCWSD and will be collected in Phase 1. Service Areas 4, 6, and 9 have the next largest loads of nitrogen. With loading directly adjacent to the Gallatin River, Service Area 4 is anticipated to have notably greater relative environmental impact compared to other service areas due to reduced aquifer related treatment benefits (e.g., denitrification, dilution, phosphorous adsorption, etc.).

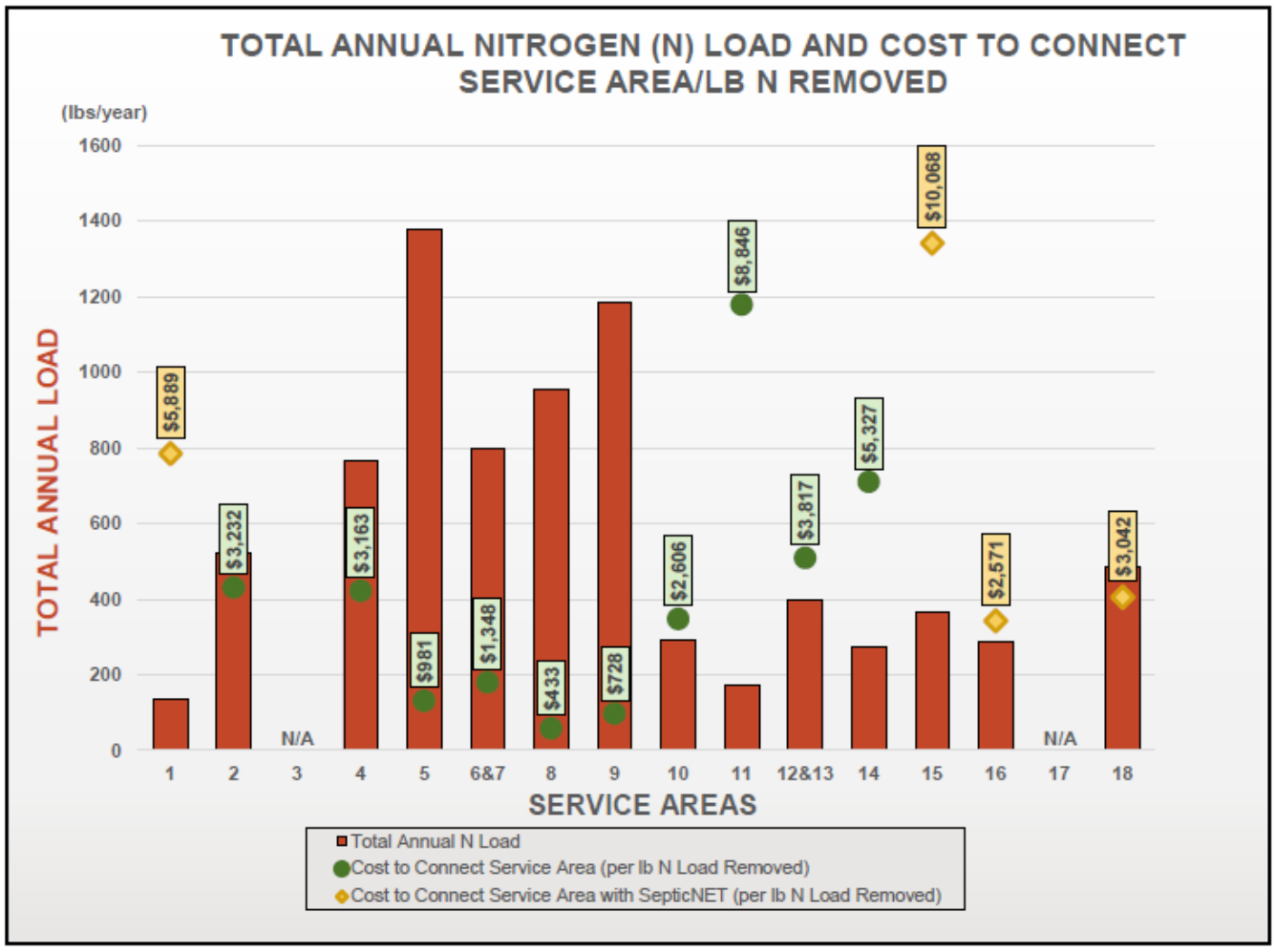


FIGURE ES.5 – ANNUAL NITROGEN LOAD AND COST TO REMOVE (COLLECT AND/OR TREAT)

Many human health risk factors were considered in this report focusing on different classes of wells and OWTS, their spatial relationships, and water quality data but data quality was variable across the risk factors considered. No single metric was adequate to rank health risks; therefore, a semi-subjective Public Health Risk Characterization and Metric were developed as seen in **Figure ES.6**. The unitless metric is derived from multiplying risk (1-4) by impact (2-8) and ranges from 2 to 32. A narrative justification for the scoring of each service area can be found in **Table 7.3** of the report.

Service Area 4 scored highest (32) due to its large potentially impacted population, at least two failing septic systems, and shallow potable wells. Service Areas 1, 11, and 12 scored lowest (2). These areas have small populations, and their disperses OWTSs result in reduced risk. The same risk metric value can be assigned for different reasons. For example, Service Area 16 scores six for a small potentially affected population exposed to risk from OWTS directly upgradient of a shallow well. Service Area 8 scores a six as well, however that is from a larger population exposed to low risk.

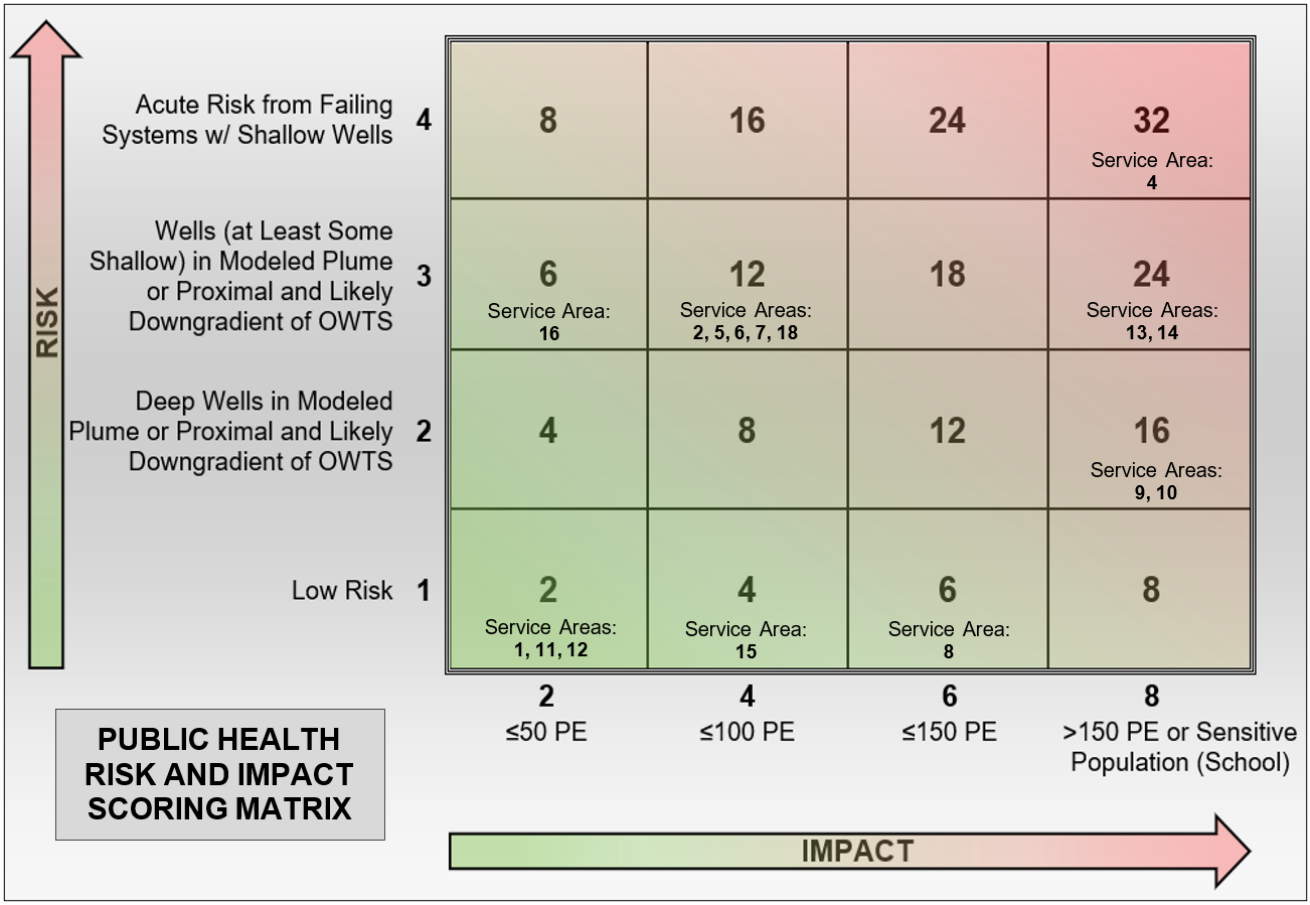


FIGURE ES.6 – RISK VERSUS IMPACT CHARACTERIZATION TO DERIVE PUBLIC HEALTH METRIC

COLLECTION PRIORITIZATION RECOMMENDATIONS – BRINGING IT ALL TOGETHER

The bar graph presented in **Figure ES.7** serves as a preliminary cost-benefit analysis with respect to nitrogen load reduction and human health. In simplest form, the higher the green bar, the greater the potential to protect Gallatin River water quality, and the higher the red bar, the greater the potential to protect Canyon Area water users. Service Area 2, and Service Areas 4 through 10 are recommended for collection prioritization. The elevated human health risk for Service Areas 13 and 14 is largely "population exposure" driven. Ophir Elementary and Lone Peak High School drinking water sources are potentially impacted by septic systems in this region. While the well water sources are considered "transient community" public water supplies (not the primary water source) and have not reported any water quality violations, children are generally at a higher risk from waterborne contamination than adults and the water system does not have chlorine disinfection.

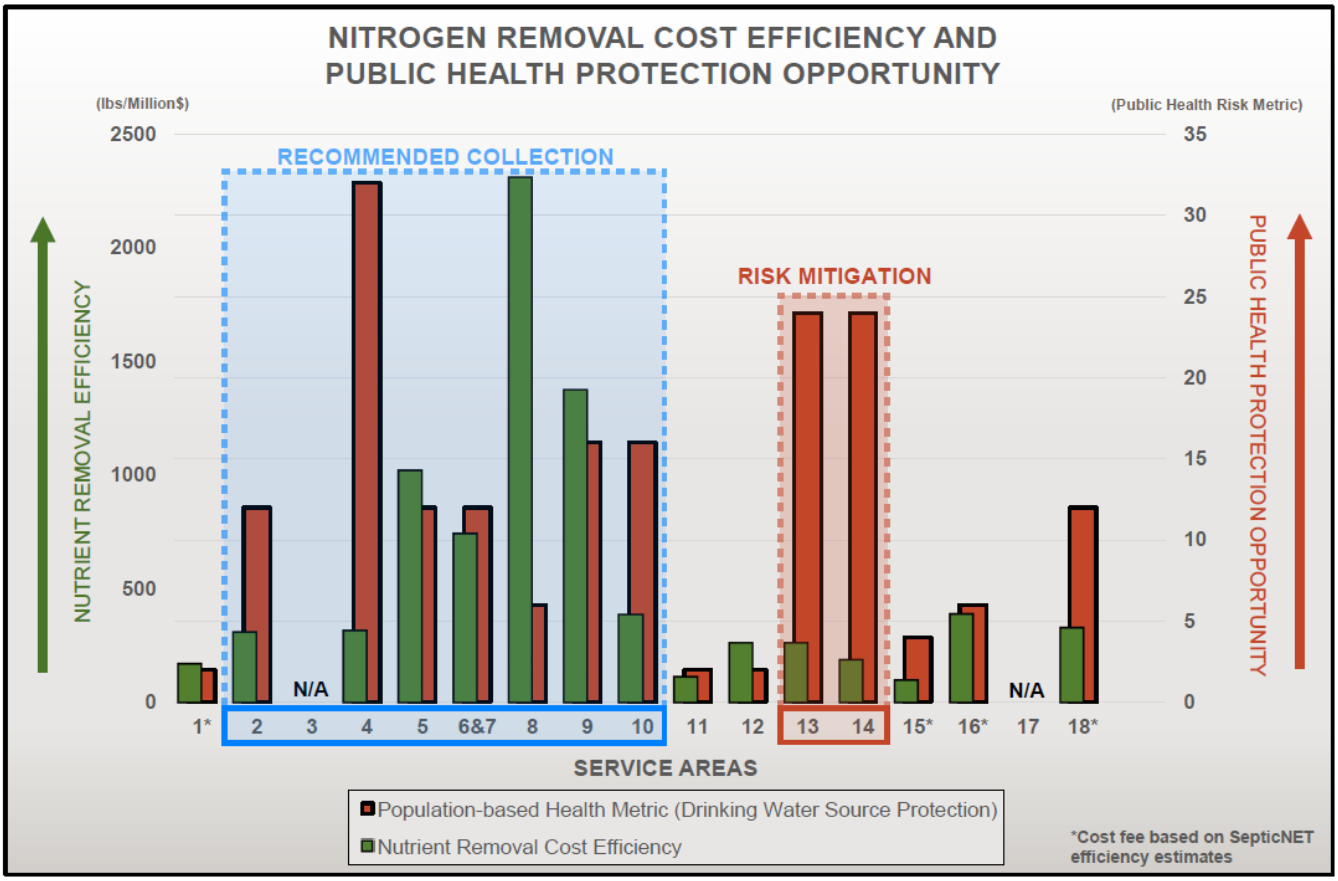


FIGURE ES.7 – NITROGEN REMOVAL VS HUMAN HEALTH PROTECTION

1.0 INTRODUCTION

The Gallatin River Task Force (Task Force) has been a key proponent of the Gallatin Canyon Sewer project and instrumental in early planning efforts and formation of the Gallatin Canyon County Water and Sewer District (District). The Task Force led *Big Sky Area Sustainable Watershed Stewardship Plan,* completed in 2018, identified addressing Canyon Area septic systems as a priority project to protect Gallatin River ecological health and local water supply. As a result, the Task Force and Big Sky Resort Area District (BSRAD) commissioned the *Canyon Area Sewer Feasibility Study* which was completed in 2020. Recommendations from the *Canyon Area Sewer Feasibility Study* included central sewer collection and treatment as well as the formation of a county utility district to own and operate. The District was formed in late 2020 and has continued to advance the Canyon Sewer Project through preliminary engineering phases and securing necessary funds.

The purpose of this study is to provide an updated wastewater inventory in the Canyon Area and provide a preliminary basis for collection area prioritization that is intended to aid District infrastructure planning decisions. The wastewater inventory component of the study serves two primary purposes; 1) provides the District with a GIS database of existing infrastructure to inform annexation and planning, and 2) quantification of nitrogen loading for individual “Service Areas” as a means to perform cost-benefit analyses.

The collection prioritization component of the study is intended to identify key areas throughout the developed Canyon corridor that are contributing the largest nutrient loads to the Gallatin River and pose the greatest public health risk to downgradient potable wells. This prioritization exercise includes evaluation of central sewer main extension costs, collection lateral costs for individual Service Areas, and existing disposal areas as potential “assets” based on providing both the physical infrastructure for treated effluent disposal and existing nutrient loads that can be removed as a means to achieve the Task Force and District objective of ‘net-nutrient reduction’ loading to the Gallatin River.

1.1 PROJECT MOTIVATION

Water and sewer service in the Gallatin Canyon currently consists of private wells and numerous septic systems, including several larger “public” wastewater systems servicing individual development areas.

These onsite wastewater systems release relatively low-quality effluent that elevates nutrient loading to the Gallatin River while increasing public health risks to those on private wells.

The Gallatin River is not yet deemed impaired for nutrients, but it has elevated nutrient concentrations as compared to other, similar rivers in undeveloped areas and algal blooms have become more common on the mainstem Gallatin in recent years. Nutrient fate and transport modeling conducted as part of the Feasibility Study (FS) and Preliminary Engineering Report (PER) efforts indicate that existing septic systems cause nutrient concentrations to roughly double in the adjacent stretch of the Gallatin River during baseflow conditions when the river is most sensitive to algal blooms. The fate and transport modeling, coupled with 12 years of Task Force stream data, estimates 4,000 to 5,000 lbs/yr of nitrogen enters the stretch of river flowing through the Canyon Study Area.

Before reaching the river, this nitrogen-laden wastewater effluent passes through the local alluvial aquifer. The combination of numerous wells and septic systems inter-mixed within the same aquifer results in notable public health risk. Additionally, the development model of private wells and septic systems results in land and resource intensive sprawl which is contributing to Big Sky's workforce housing shortage and general lack of affordability due to high infrastructure cost per capita. With the population expected to roughly triple in Canyon Area over the next 20-years, the Canyon Sewer Project provides the opportunity to stop the upward nutrient trend that is threatening the Gallatin River, substantially mitigate public health risk to potable water, and set foundational infrastructure for the Big Sky community.

1.2 PLANNING EXTENTS

The Gallatin Canyon Area, is a rapidly growing unincorporated development pocket along the Gallatin River and US Highway 191 near Big Sky, MT. For sewer planning purposes, several planning extents have been defined (see **Figure 1.1**). The current administrative boundary of the District is marked by blue hash marks. The "Conceptual Phase 1" boundary reflects planned project limits as communicated in the 2021 PER and recent funding application packages. It is deemed "conceptual" given that Ramshorn Subdivision is not currently in the District and would require annexation to be included in the Phase 1 project. The District is conducting outreach efforts to gage interest in annexation, especially with those property owners located immediately adjacent to planned Phase 1 infrastructure (e.g., Lazy J, Service Area 4) and larger system owners including Ophir Elementary and Lone Peak High School.

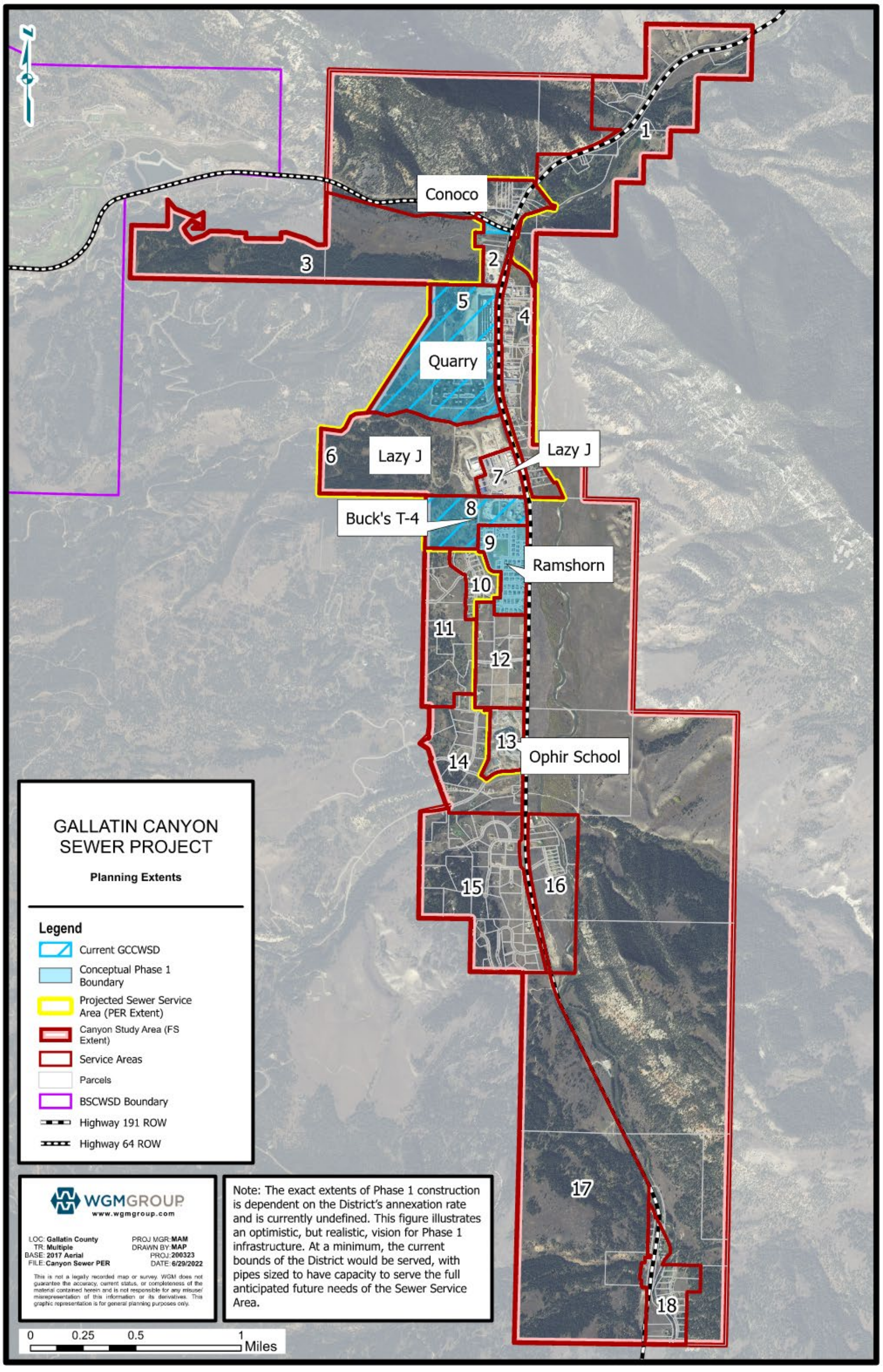


FIGURE 1.1 PLANNING EXTENTS

The red “Canyon Study Area” represents the area evaluated in the 2020 FS. The numbered Service Areas were delineated in the FS for planning purposes and to generally group properties by common ownership or similar land use type or density. A summary description of each Service Area can be seen in **Table 1.1** below. Note that Service Areas 6 and 7 are often considered as a single unit throughout this report. The yellow “Projected Sewer Service Area” represents the area evaluated in detail in the 2021 PER based on increased likelihood of future connection given the proximity to US Highway 191 and cost-effectiveness to connect to a central sewer main. At a minimum, Phase 1 infrastructure will be sized to include capacity for expansion to this extent and none of these planning boundaries are fixed. One of the primary goals of this study is to help inform and prioritize future phasing beyond the planned Phase 1 extents.

TABLE 1.1 – SERVICE AREA DESCRIPTIONS

SERVICE AREAS	DESCRIPTIONS
Service Area 1	Dudley Creek Area
Service Area 2	Bighorn Center Area
Service Area 3	Kallestad Conservation Area
Service Area 4	River Front Properties
Service Area 5	Quarry PUD
Service Area 6 & 7	Lazy J Utility
Service Area 8	Bucks T-4
Service Area 9	Ramshorn Subdivision (Lower)
Service Area 10	Ramshorn Subdivision (Upper)
Service Area 11	North Foothills
Service Area 12 & 13	School Collection (w/ low density residential)
Service Area 14	South Foothills
Service Area 15	South Beaver Creek
Service Area 16	South Porcupine
Service Area 17	Burcalow Open Space
Service Area 18	Corral, Rainbow & Residences

1.3 GALLATIN CANYON SEWER

A central sewer collection, treatment and disposal system was identified as the best way to sustainably address the wastewater-related issues in the Canyon. Following FS recommendations, the District was formed in December 2020 with the immediate goal of pursuing central wastewater management. The 2021 Preliminary Engineering Report built off the FS and proposed a “co-solution” consisting of

centralized sewer collection, Big Sky County Water and Sewer District (BSCWSD) treatment, and District disposal of treated effluent via groundwater discharge and irrigation reuse.

Collected wastewater will be conveyed largely by gravity to a new Canyon Area Lift Station constructed southwest of the intersection of Lone Mountain Road (Highway 64) and US Highway 191. The new lift station will pump wastewater west along Highway 64 to the Big Sky Water Resource Reclamation Facility (Big Sky WRRF). The Big Sky WRRF is currently undergoing an upgrade and expansion utilizing Membrane Bioreactor (MBR) technology and will produce a high-quality effluent compliant with Class A-1 reuse effluent which is Montana's highest designated wastewater effluent quality. Wastewater will be screened, de-gritted, and then treated through a series of anaerobic/anoxic/aerobic zones to maximize biological nutrient removal. Biosolids will be aerobically digested, dewatered, and composted with sawdust and coarse green waste.

Treated effluent would be conveyed by gravity back to the Canyon Area for disposal as groundwater recharge or as irrigation reuse. The disposal and reuse main will be extended south up the US Highway 191 corridor to facilitate disposal at several groundwater recharge locations that will be permitted through Montana Department of Environmental Quality's (DEQ) Water Protection Bureau. Effluent conveyed in the pipeline will also be available for irrigation of existing and future developments. Ancillary benefits of this groundwater discharge and irrigation include conserving cool, clean Gallatin River aquifer water by reducing irrigation with groundwater and recharging of the aquifer with high-quality treated effluent.

An overview of the proposed sewer can be seen in **Figure 1.2.** See the PER for additional details.

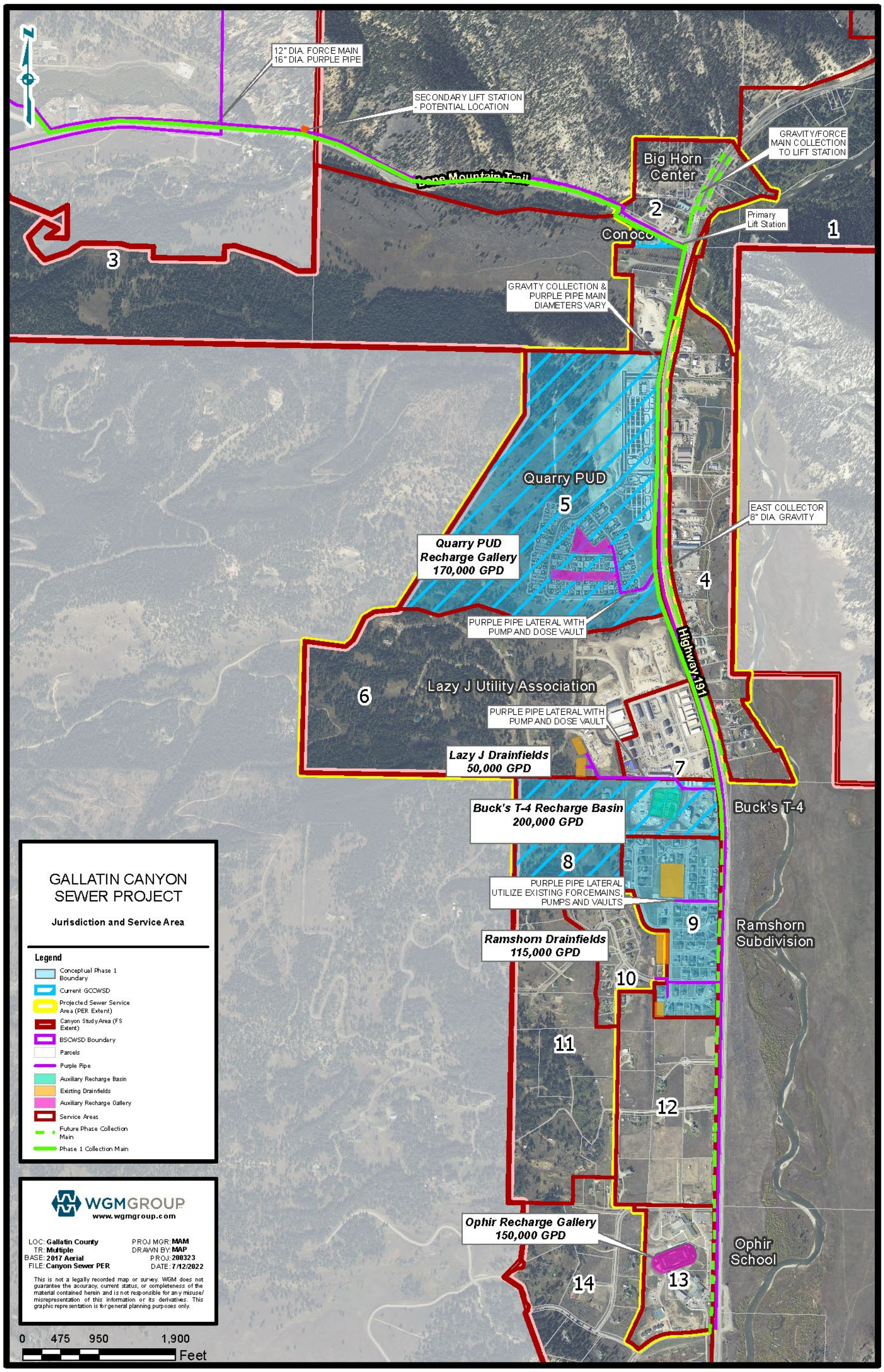


FIGURE 1.2 – CANYON SEWER PROJECT OVERVIEW

1.4 PROJECT PHASING

The Canyon Sewer Project as evaluated in the PER is a single-phase project that extends sewer collection from the Bighorn Center development cluster south to Lone Peak Highschool and Ophir Elementary. The total estimated Project Cost is $51.4 million including treatment capacity allocation purchase from BSCWSD. A phased implementation approach is anticipated given the project scale and range of Canyon Area landowners and stakeholders. Phasing the Canyon Sewer Project, and the corresponding District boundary expansion, allows advancement of planning with the present-day committed landowners while continuing to seek funding to improve affordability for future connections and users. It will also expedite near-term implementation timelines to allow the District to leverage private capital that would otherwise be used for individual, lower quality wastewater treatment and disposal systems, and applying the funds towards the much-needed public system to service existing residents and business and support long-term community goals.

Phase 1 includes the base infrastructure to fully serve the current extent of the current District boundary in addition to Ramshorn Subdivision (included based on recently received funding). Phase 1 extents can be seen in **Figure 1.2.** Phase 1 infrastructure includes collection mains, the force main and lift stations up to the Big Sky WWRF, and the effluent conveyance back to the Canyon discharge facilities will be included. Groundwater discharge feasibility is currently being evaluated on the Quarry parcel, with initial disposal estimates identifying potential for 200,000 gallons per day (gpd) scale recharge and irrigation reuse. The existing septic drainfields in Ramshorn Subdivision would be re-purposed to serve as District owned infrastructure, eliminating an existing nutrient source and homeowners' association (HOA) liability that will function to recharge the aquifer with Class A-1 reclaimed wastewater. Phase 1 will be built with the capacity to be extended to serve the expected future expanded District ("Projected Sewer Service Area" depicted on **Figure 1.2)**. The total estimated Phase 1 Project Cost is $28.0 million.

The District decision to prioritize inclusion of Ramshorn Subdivision is based on the fact that it is a concentrated area of existing septic loading adjacent to the present-day district boundary and represents a large percentage of existing residential homes located within the projected Sewer Service Area. Inclusion of Ramshorn also improves funding likelihood through multiple funding sources including Gallatin County ARPA allocations, Montana Coal Endowment Program (MCEP) and Renewable Resources Grant and Loan (RRGL), among others.

Future phases will largely be driven by funding and property owners' willingness to annex into the District and connect to sewer services. The Task Force and District have undertaken this prioritization effort to aid in achieving net-nutrient reduction objectives and to develop a phasing plan that balances environmental and public health benefits with infrastructure cost and ownership logistics (e.g., assets, liabilities, operation and maintenance, etc.).

2.0 GALLATIN CANYON ONSITE WASTEWATER INVENTORY

A preliminary Gallatin Canyon Onsite Wastewater Treatment System (OWTS) Inventory was conducted during the 2020 FS effort (see the FS Technical Memorandum 2). Since then, additional permits have been uploaded to the Gallatin City County Health Department's (GCCHD) online database, sewer design has progressed, and the data needs have changed. A refined inventory is presented below. The updated estimated existing nitrogen load to the Gallatin River is estimated at 5,850 lbs N/year, approximately 25 percent larger than the value presented in the FS.

Note: Nitrogen load estimates are approximate only. Actual loading is dependent on a range of factors that are difficult to quantify including but not limited to: occupancy rates, septic age, system operating condition (good, moderate, failing), and subsurface denitrification processes.

2.1 METHODS

As part of the 2020 FS, existing and projected wastewater flows as well as nitrogen loads were estimated (see Technical Memorandum #2). The database included approximately 62 permitted systems totaling 92,968 gpd design flow in the Canyon Study Area. "Ground truthing" was conducted via 2017 aerial imagery, review of as-built drawings and permits, and site observations to identify systems and associated design flows not accurately reflected within the database. The resulting estimated total design capacity of existing systems in the Canyon Study Area was calculated to be 115,000 gpd. This initial OWTS inventory was used to estimate current and expected future nitrogen loading from each Service Area and as an input for ArcNLET analysis. ArcNLET is a simplified nitrogen fate and transport model that provides conceptual level spatial analysis (based on quantitative inputs and base aquifer assumptions) that was used to evaluate cumulative effects of OWTS clusters. This inventory served as the basis of growth projections and preliminary sewer design in the 2021 PER.

Since 2020, additional septic permits have been entered in the GCCHD's online database, new systems have been built and updated aerial imagery has become available. As recommended in the FS, an updated OWTS database reflecting all installed systems with additional data such at treatment system type, design flow, and bedroom count was developed.

The OWTS inventory update takes these new data into account and provides additional data for each OWTS as well.

DATA SOURCES

The Discharge and Tank and Treatment Unit inventories developed and evaluated for this report are based on a modified version of Gallatin County permit records obtained from GIS@gallatin.mt.gov (current as of January 3rd, 2022). The permits record base data can be seen at Gallatin City-County Health Department (GCCHD)'s online septic system database. Most new septic permits are uploaded as they are approved, but the County is still catching up on inputting older records. Additionally, no septic permits were issued before 1966 and some systems are not at the right coordinates in the County dataset. Any permit marked void in the GHCCD data base was not included here. This dataset should not be considered a complete record of all wastewater disposal in the County. These updated inventories include additional sites that were assumed based off 2020 satellite imagery and Montana Cadastral data. Site locations were adjusted based off as-built drawings and aerial imagery where applicable. Additionally, replicate entries from the County's database and records from permits marked as “void” or replaced by another permit were removed.

In all, data from 134 unique permits are included, with 95 permits in the “Discharge” inventory and 120 in the “Tank and Treatment Unit” inventory. Note that this does not equal the number of features in each inventory. Several features can be under one permit and many features are unpermitted (or no permit was found). For example, a system may have several drainfields or a permitted system may have a trickling filter, a dose tank and a septic tank inventoried.

While significant growth is expected throughout the planning area, site specific development plans are only available for two sections of the Sewer Service Area. The Big Sky Quarry (Service Area 5) and Buck’s T-4 (Service Area 8) are both within the existing District boundary. Since these plans will be implemented on a similar timescale as the sewer, projected values will be used for these Service Areas while estimated existing conditions will be used for all other Service Areas.

Existing and projected Population Equivalents (PEs) are presented below in **Table 2.1** for these Service Areas. **PE and load values presented for Service Areas 5 and 8 in the remainder of the report are based on these projected PEs (not existing conditions) unless otherwise noted.** If central sewer is not built, these developments are assumed to be served by Level 2 systems (64 percent nitrogen removal) at a minimum, with the Quarry PUD committed to SepticNET treatment (approximately 80

percent removal). Loads are based off these assumptions. Projected PE used is the same "Total Nutrient PE" projected in the Unincorporated Build-out Load Summary in the FS (see page 182 of the FS).

TABLE 2.1 – PLANNED DEVELOPMENT POPULATION EQUIVALENTS

PROPERTY NAME	SERVICE AREA	EXISTING PE	PROJECTED PE	EXISTING N LOAD TO AQUIFER (LBS/YR)	PROJECTED N LOAD TO AQUIFER (LBS/YR)
Quarry PUD	5	0	765	0	1,380
Buck's T-4	8	219	294	129	954

DISCHARGE INVENTORY

Based on the data discussed above, an excel spreadsheet and GIS shape file set were developed to document a Discharge Inventory. Permitted systems that did not include discharge (tanks settings or holding tanks) are accounted for in the Tank and Treatment Unit Inventory, not here. For permits listing a single discharge capacity and multiple drainfields, load was assumed to be split equally across each drainfield. Additional columns with calculated data were added to the county database. The data categories included in the inventory can be seen in **Appendix A.** The full files are available upon request. Of the OWTS included in this inventory, 29 percent are unpermitted (assumed to exist based off of aerial imagery and Montana Cadastral data).

OWTS permits list design capacity flow rates. The design flow rate is likely notably larger than actual flows due to conservative design standards, development not being fully built-out, and irregular use patterns. To avoid this source of overestimation, this design capacity, labeled "Discharge" in the county's database and updated inventories is not directly used. Instead, PEs were developed and then used to calculate estimate nutrient loads. For residential flows and multi-residence systems, each residence is assumed to be occupied by the DEQ design standard of 2.5 people. Therefore, a single unit domestic unit would have 2.5 PE and a duplex would have 5 PE.

Given the notable variation in PE from non-domestic OWTSs, a different method was used. PE for non-domestic systems was calculated by dividing the design capacity "Discharge" by an assumed 81 gpd/PE, which was determined per the following analysis.

As a resort community with many seasonal businesses, non-residential systems are assumed to load at a reduced rate over the course of a year. To account for this, a seasonality factor of 0.61 was developed.

This seasonality factor was estimated based off monthly BSRAD resort tax income from 2016-2019. It was assumed that all non-domestic Canyon OWTSs were operating at 100 percent capacity in the month where the most resort tax income was generated. The average percent of resort tax collected in any given month was used to estimate a corresponding percent capacity for each month. For example, if a month generated half the tax income as the peak month, Canyon OWTSs were assumed to be operating at 50 percent capacity. These capacity values were then combined to give an estimate of capacity used over the course of a year. This resulted in an estimated 41 percent annual capacity. A 20 percent baseflow was assumed as well, giving an estimate annual capacity of 61 percent.

The Environmental Protection Agency's (EPA) Onsite Treatment Systems Handbook's estimates of 40-80 gpd/PE. The higher the gpd/PE, the lower the PE estimate will be. The 61 percent seasonality factor was used to scale 50gpd/PE (a middle value from the EPA's guidance) to 81 gpd/PE. The 81 gpd/PE is a conservatively large value that ultimately results in lower PE and therefore Total Nitrogen (TN) load estimates reflective of the Canyon's seasonal use. The design flow for the sewer will not be based on this gpd/PE value.

Note that PE values for domestic OWTS do not incorporate this seasonality factor. While many residences are likely used seasonally as well, the PE estimates are already conservative by using 2.5 PE per dwelling rather than based on number of bedrooms (design capacity).

PE was then used to estimate TN loading by using the "EPA Onsite Treatment Systems Handbook" estimated TN/PE mean of 11.2 grams nitrogen per day per PE. This value is captured in the "Total TN Load (g/day)" column. Nutrient load per PE is a much more consistent value than flow per PE and is an appropriate metric for this inventory.

Nitrogen removal from treatment and travel through the vadose zone was then accounted for by multiplying this "Total TN Load (g/day)" value by 1 minus the nitrogen treatment efficiency of the associated OWTS. This value is captured in the column "Total N Load to Aquifer (g/day)." The EPA has established a estimated 10% nitrogen reduction in septic tanks and an additional 20% reduction as effluent travels through the vadose zone – combined this leads to 28% reduction for septic systems. The 10% tank reduction and 60% nutrient reduction from level 2 treatment were combined to give 64% nutrient reduction for most level 2 systems. While some level 2 technologies can better treat nutrients, this is a valid conservative estimate. Most septic systems were assigned a treatment efficiency of 0.28 and level 2 treatment system were assigned a treatment efficiency of 0.64. A few custom values were assigned to systems that did not

fit within the main categories. For example, seepage pits were assigned a nitrogen treatment efficiency of 0.10, SepticNET treatment efficiency of 0.80, and spray irrigation was assigned 0.95. Note that these treatment efficiencies are for properly functioning systems. Some systems are currently failing. Many other systems are inconsistently maintained and/or approaching the end of their useful lifespan and therefore not operating optimally. These treatment efficiencies provide a conservatively low nutrient load estimate.

For permits with discharge spread across several drainfields, it was assumed for inventory purposes that the load was evenly distributed across each drainfield.

Another data limitation to note is that approximately 64 percent of the OWTS do not have associated age data and age of septic system is often correlated with reductions in performance.

TANKS AND TREATMENT UNITS INVENTORY

Based on the data discussed above, an excel spreadsheet and GIS shapefile set were developed to document a Tank and Treatment Unit Inventory. This inventory includes data on permitted and assumed septic and dose tanks as wells as treatment units such as lagoons and SBRs.

Most septic/dose tanks, even from permitted systems did not have a separate entry in the county database. For these systems, the corresponding data entry for the drainfield was used as the basis to create a new entry/feature for the tank. Note that most systems marked dose tank (DT) likely also have an associated septic tank (ST) – however, additional features were not added to account for this. Adjusting the location based on best available permit data and aerial imagery was a major focus of this effort in order to help plan sewer service line tie-ins. Most locations in this inventory no longer align with the locations in the source county database. These should be more accurate. Note that these confirmed locations are still placed based on aerial imagery and are not survey grade. Confirmed locations should be accurate within 10-20 feet, with better accuracy for those features that are visible or located next to a clear landmark such as a corner of a building or large tree.

In addition to the source database's data categories, several additional columns were added. Each tank or treatment unit was labeled with the appropriate Service Area, updated coordinates, and whether the location was verified to be close to the real location (based on permit as-built information, if it was GPS located by a sanitarian, or its location was visible in aerial imagery). Seepage Pits, Holding Tanks, and



extra treatment beyond a standard septic system were also called out in the dataset. The data categories included in the inventory can be seen in **Appendix A.** The full files are available upon request.

2.2 ONSITE WASTEWATER TREATMENT SYSTEMS DATA SUMMARY

Summary statistics from the inventories can be seen in the tables and figures below. Static maps showing the spatial context of the OWTS inventories can be seen in **Appendix B.** The spatial relationship between systems is especially important for identifying clusters of discharge that may contribute an outsized impact to aquifer quality and public health and for planning locations and cost for sewer service lines. In later sections the spatial relationships between OWTS, potable wells, and water quality will be evaluated.

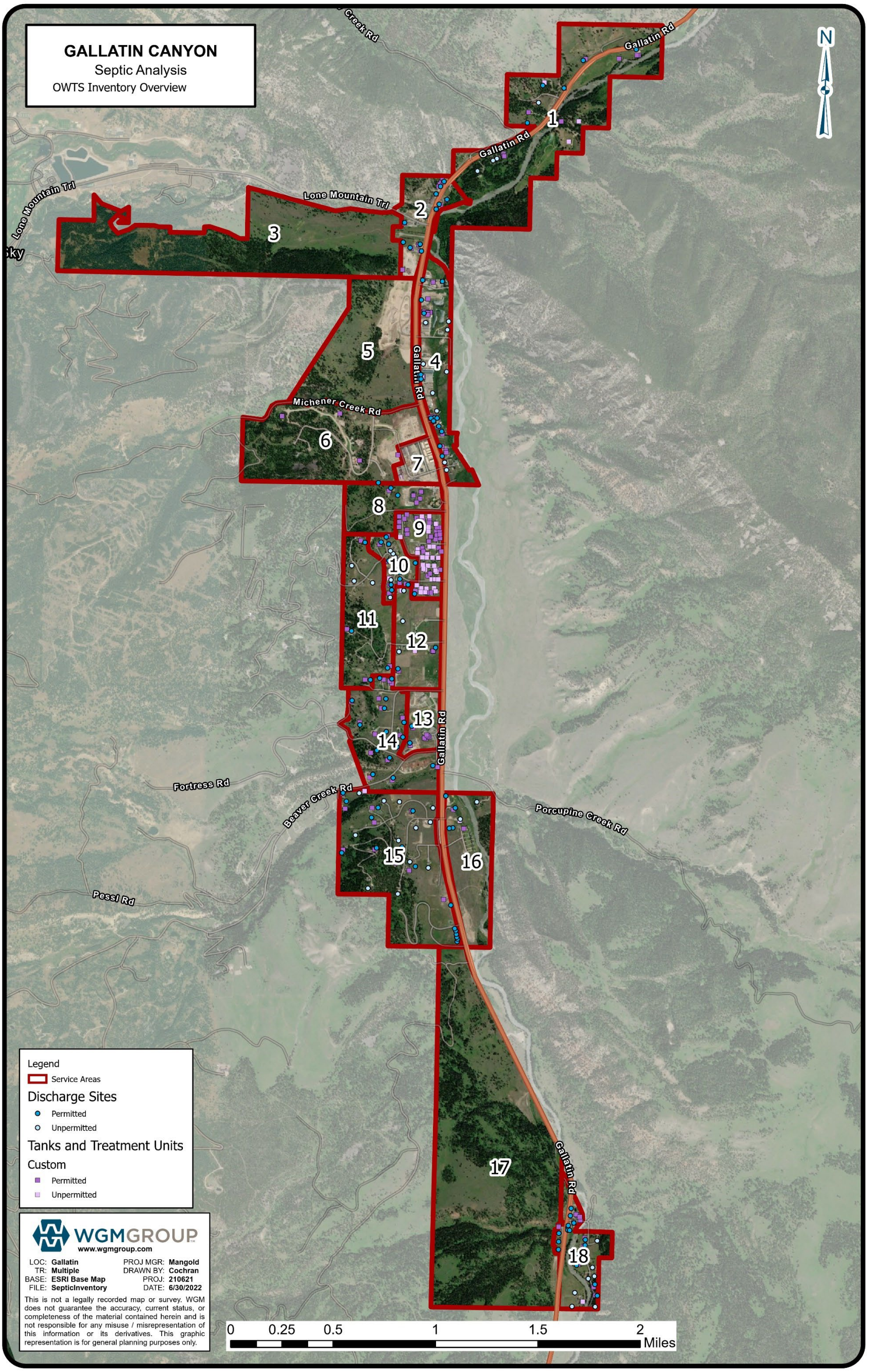


FIGURE 2.1 – OWTS INVENTORY OVERVIEW

DISCHARGE INVENTORY

The Discharge inventory includes 159 systems in the Canyon Study Area, 69 percent of which had permits available in the county's database. Data for the other 31 percent of systems was assumed based off Montana Cadastral data and aerial imagery. Note that about 64 percent of systems do not have associated age data.

Service Areas 3, 7, and 17 have no inventoried existing or clearly planned discharge, tanks or treatment units. Maps for these Service Areas were not included in **Appendix B** but are available in the geodatabase. Note that the vast majority of existing effluent discharged in Service Area 6 is generated from the existing development in Service Area 7.

Service Area 6 (part of Lazy J) has the most currently permitted flow and most existing PE with 247 PE. Service Areas 3,5, 7, and 17 currently have no OWTS. The wastewater generated in the existing Service Area 7 is disposed of in the large drainfield in Service Area 6 through a step system. Service Area 6 is currently generating only a little of its own wastewater from the few homes already built, with septic tanks which are assumed to lead into the same large drainfield. Significant growth is expected in Service Area 6; however, it is already accounted for in the permitted capacity of the single large drainfield serving Service Areas 6 and 7. This drainfield is assumed to be currently operating significantly under design capacity.

As discussed above, this inventory and prioritization effort mostly considers existing conditions, except in Service Areas 5 and 8 where the immediate growth plans are evaluated. Considering the planned growth in Service Areas 5 and 8, these areas will have the most PEs at 765 PE and 294 PE respectively.

GHCCD staff were contacted for data clarifications and to get some on-the-ground insight during the inventory process. They were unaware of current permit violations, but they mentioned concern about the Corral Bar's Public wastewater system in Service Area 18, which they suspect of exceeding existing capacity with recent business expansion. In general, they are most concerned with the older systems along the river (mostly in Service Area 4) and with higher-density clusters of OWTS. Community members have indicated that there are two failing OWTS in Service Area 4. Discharge clusters are concentrated in Service Areas 4, 10, and 18. The overlapping influence of these clustered systems are illustrated further in Section 5.3.

TABLE 2.2 – ONSITE WASTEWATER DISCHARGE INVENTORY SUMMARY

SERVICE AREA	TOTAL PERMITTED FLOW (GPD)	TOTAL PE	TOTAL NUMBER OF SYSTEMS	NUMBER OF NON-DISCHARGING SYSTEMS*	NUMBER OF SMALL DISCHARGING SYSTEMS	NUMBER OF LARGE DISCHARGING SYSTEMS	TOTAL N LOAD TO AQUIFER (G/DAY)	TOTAL ANNUAL N LOAD TO AQUIFER (LBS/YR)	RANKED N LOADS (1 = BIGGEST LOADER)
1	3,475	25	9	0	9	0	171	138	15
2	10,199	121	12	0	8	4	648	521	6
3	0	0	0	0	0	0	0	0	16
4	14,323	159	25	0	17	8	954	767	5
5**	x	765	x	x	x	x	1,714	1,380	1
6	20,000	247	1	0	0	1	996	801	4
7	0	0	0	0	0	0	0	0	16
8**	x	294	x	x	x	x	1,185	954	3
9	14,800	183	3	0	0	3	1,473	1,186	2
10	5,900	45	16	0	16	0	362	292	9
11	3,125	26	8	0	8	0	214	172	13
12	2,550	24	7	0	6	1	191	153	14
13	5,525	67	2	0	0	2	302	243	12
14	5,260	43	15	0	15	0	343	276	11
15	6,500	56	28	6	22	0	455	367	8
16	3,976	44	6	0	4	2	357	287	10
17	0	0	0	0	0	0	0	0	16
18	8,471	88	24	1	21	2	603	485	7
TOTALS	**104,104**	**2,187**	**156**	**7**	**126**	**23**	**9,967**	**8,022**	

*Non-discharging Systems includes drainfields that are built but not connected to any load. Non-discharging systems are visualized in maps and captured in “total number of systems” but not included in load calculations.

Represent the planned growth scenario, rather than the existing conditions shown for all other Service Areas. The equivalent table, with existing values for all Service Areas can be seen in **Appendix A.

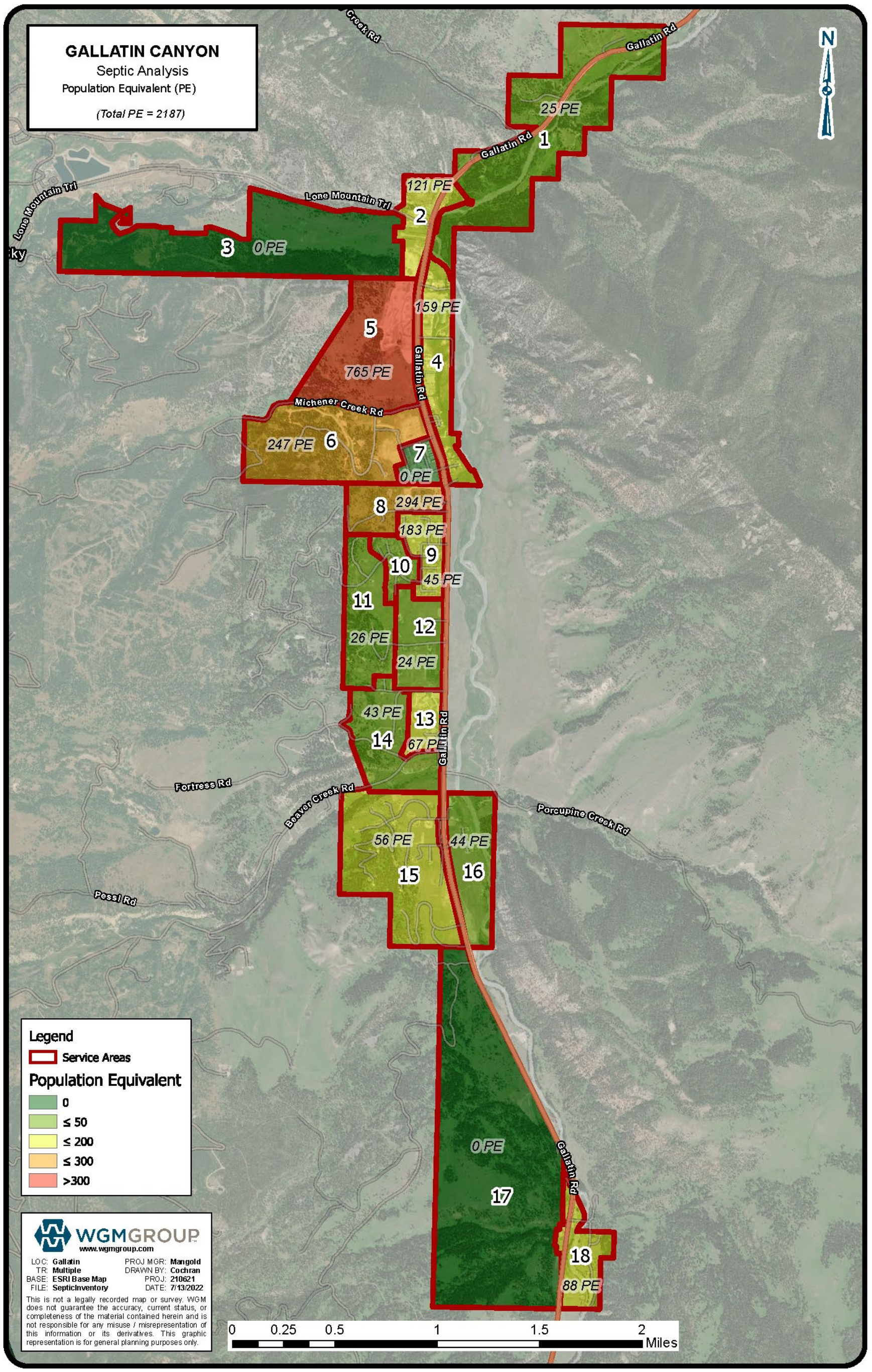


FIGURE 2.2 – OWTS INVENTORY OVERVIEW – POPULATION EQUIVALENT

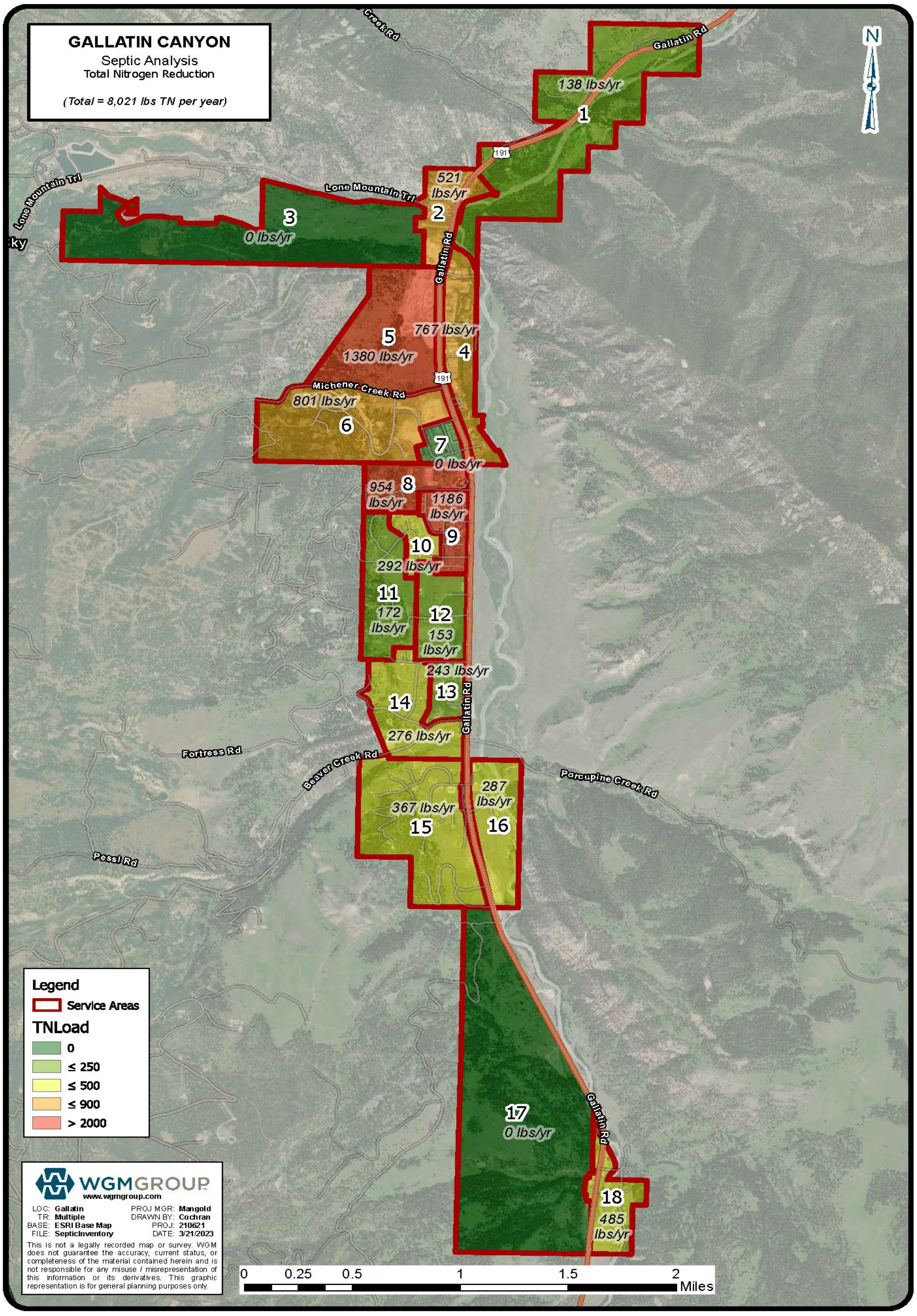


FIGURE 2.3 – OWTS INVENTORY OVERVIEW – TN LOADS (LBS/YEAR)

The nutrient load estimates for each service area, shown in **Table 2.2** and the **Figure 2.3** can also be seen as nutrient reduction opportunities as service areas connect to sewer. This concept is explored further in Section 7.0. Note that the load presented represents the projected nitrogen load to the aquifer. Subsurface denitrification processes result in reduced loading to the Gallatin River. Preliminary nitrogen fate and transport modeling included in the FS indicates an average subsurface nitrogen removal of approximately 20%. Refined fate and transport modeling is required to refine this estimate.

Under the proposed "co-solution" scenario, high quality treated effluent from the BSCWSD will be discharged back into the same aquifer such that the full calculated load is not completely removed from system. However, the GCCWSD is seeking to maintain a net nutrient reduction by progressively removing septic systems while limiting the quantity of treated effluent discharge. Preliminary discharge planning discussions have identified a goal of maintaining a minimum of 25% net-nutrient reduction.

TANKS AND TREATMENT UNIT INVENTORY

As seen in Table 2.3 below, there are approximately 252 separate OWTS tanks and treatment units in the Canyon Study Area. In total, 228 are septic and/or dose tanks, 6 are holding tank with no associated discharge, 1 is a seepage pit, and 17 are additional treatment units (chlorinator, lagoon, trickling sand filter, etc.). In many cases, several of these serve a single discharge. Ramshorn HOA (Service Area 9), which is served by SepticNET going to three drainfields under a single permit, has by far the most tanks. This reaffirms Service Area 9 as a Phase 1 priority. Of the tanks and treatment units included in this inventory, 46 percent had their location assumed based off aerial imagery and normal placement of systems. These are marked accordingly in the maps.

Since exact configuration of the treatment systems that would be developed for the planned growth in sections 5 and 8 is not yet established, the Tank and Treatment Units Inventory only track existing conditions.

TABLE 2.3 – ONSITE WASTEWATER TANK AND TREATMENT UNITS INVENTORY SUMMARY

SERVICE AREA	NUMBER OF TANKS AND TREATMENT UNITS	NUMBER OF ADDITIONAL TREATMENT UNITS	NUMBER OF SEEPAGE PITS	NUMBER OF HOLDING TANKS	NUMBER OF SEPTIC TANK AND/OR DOSE TANKS	NUMBER OF TANKS AND TREATMENT UNITS WITH LOCATION CONFIRMED BY PERMIT	% OF TANKS AND TREATMENT UNITS WITH LOCATION CONFIRMED BY PERMIT
1	16	0	0	3	13	9	56
2	17	2	1	0	14	10	59
3	0	0	0	0	0	0	0
4	39	4	0	3	32	23	59
5	1	0	0	0	1	1	100
6	5	0	0	0	5	0	0
7	0	0	0	0	0	0	0
8	6	4	0	0	2	6	100
9	64	1	0	0	63	32	50
10	16	0	0	0	16	10	63
11	8	0	0	0	8	5	63
12	9	0	0	0	9	2	22
13	7	2	0	0	5	5	71
14	16	0	0	0	16	16	100
15	21	1	0	0	20	9	43
16	4	1	0	0	3	2	50
17	0	0	0	0	0	0	0
18	23	2	0	0	21	7	30
TOTALS	**252**	**17**	**1**	**6**	**228**	**137**	**54**

2.3 DATABASE TOOL

Initial products of this inventory include this report and the map series previously discussed (see **Appendix B**).

All of this inventory data and the data discussed throughout this report is organized in an interactive and adaptable ArcGIS spatial database and/or excel files. A file directory and associated metadata can be seen in **Appendix A**. The full geodatabase as well as the ArcGIS and Excel file package are available upon request.

Much of the utility of this database is lost when printed as static maps. Access to the full geodatabase allows zooming in to view areas of interest in great detail and selecting features to see additional attributes that are not visible in a static map.

This database should be maintained as a functional data management and analysis tool for future efforts. Potential upcoming applications include but are not limited to creating visuals, statistics, and targeted property owner mailing lists to help with community outreach and encouraging annexation; further analysis of existing nutrient loads and health risks; and informing the upcoming Canyon Water Preliminary Engineering Report.

3.0 GALLATIN CANYON WELL INVENTORY

3.1 METHODS

The well inventory can be separated into two categories: all Ground Water Information Center (GWIC) wells within the Sewer Planning Area (used primarily to document potable well distribution) and the 2020-2021 data from Montana Bureau of Mines and Geology's (MBMG) "Groundwater Investigation Program for the Upper Gallatin – Groundwater Monitoring Sites" (used primarily to document measured groundwater quality).

Data associated with all GWIC well data located in the Canyon Planning area, regardless of data quality is included in the "Updated Discharge Inventory.xls" in the "GWIC Wells Attribute Table" tab and an associated shapefile. This table contains a variety of data about each well such as age, construction, use, and output. Some contain water quality data. The only data column added to this spreadsheet that differs from content directly available from GWIC labels each well with the corresponding Service Area. It is important to note that location data from GWIC is notoriously inaccurate, so spatial representation of these wells and associated values are estimates only.

Potable wells represent the wells in the GWIC database that include "Domestic", "Public Water Supply" or "Commercial" in their use description. If the use description includes Test, Monitoring, Unused, Industrial, Stock, Irrigation, or Fire Protection, but not Domestic or Commercial, the well was not considered potable. Wells marked "Unknown" or with no use description are assumed to be potable. For the purposes of this inventory, a "shallow well" was defined as any well 50 or less feet deep. Shallow wells are generally more susceptible to contamination from septic tanks than deeper wells.

Since 2018, MBMG has been working on "Groundwater Investigation Program for the Upper Gallatin." The project extents are similar the Canyon Study Area extents. The project, nominated by the Gallatin River Task Force, is supported by the Gallatin Canyon/Big Sky Zoning Committee, Gallatin Planning Commission, Big Sky Water and Sewer District. Project results will be used to evaluate potential changes in zoning, location of new wells and septic systems, and to make informed management decisions regarding new public water supplies and sewer systems. Data collection for this project is complete but data analysis and the final report are still in progress.

Only the wells included in MBMG's groundwater investigation were considered in this inventory. This data is saved in "N Data.xls" and an associated shapefile. The base data used here was collected by MBMG staff, properly verified and of high quality. Locations have been verified by survey or navigational grade GPS and is presumed to be accurate. This data is significantly more reliable than the general GWIC dataset. The water quality data used for this project is all from 2020 and 2021. Nitrogen (N) and Phosphorus (P) data were evaluated. Data for many other water quality parameters are included in the inventory. However, they were not evaluated at this time as N has been the main OWTS-related water quality parameter of concern for OWTS-related public and environmental health.

Nitrogen data, displayed in the maps in Section 5, come from MBMG data collected throughout 2020 and 2021. The MBMG water quality data used (from 2020 and 2021 monitoring efforts) include 194 samples at 31 wells, ranging from 1 to 14 sample events per well. The mean and max concentration are represented.

3.2 WELL DATA SUMMARY

The location of wells included in the well inventory can be found in the map below (**Figure 3.1**). Just like the OWTS inventory, it is most useful in its GIS based interactive database format, where the many different attributes connected to each well can be explored.

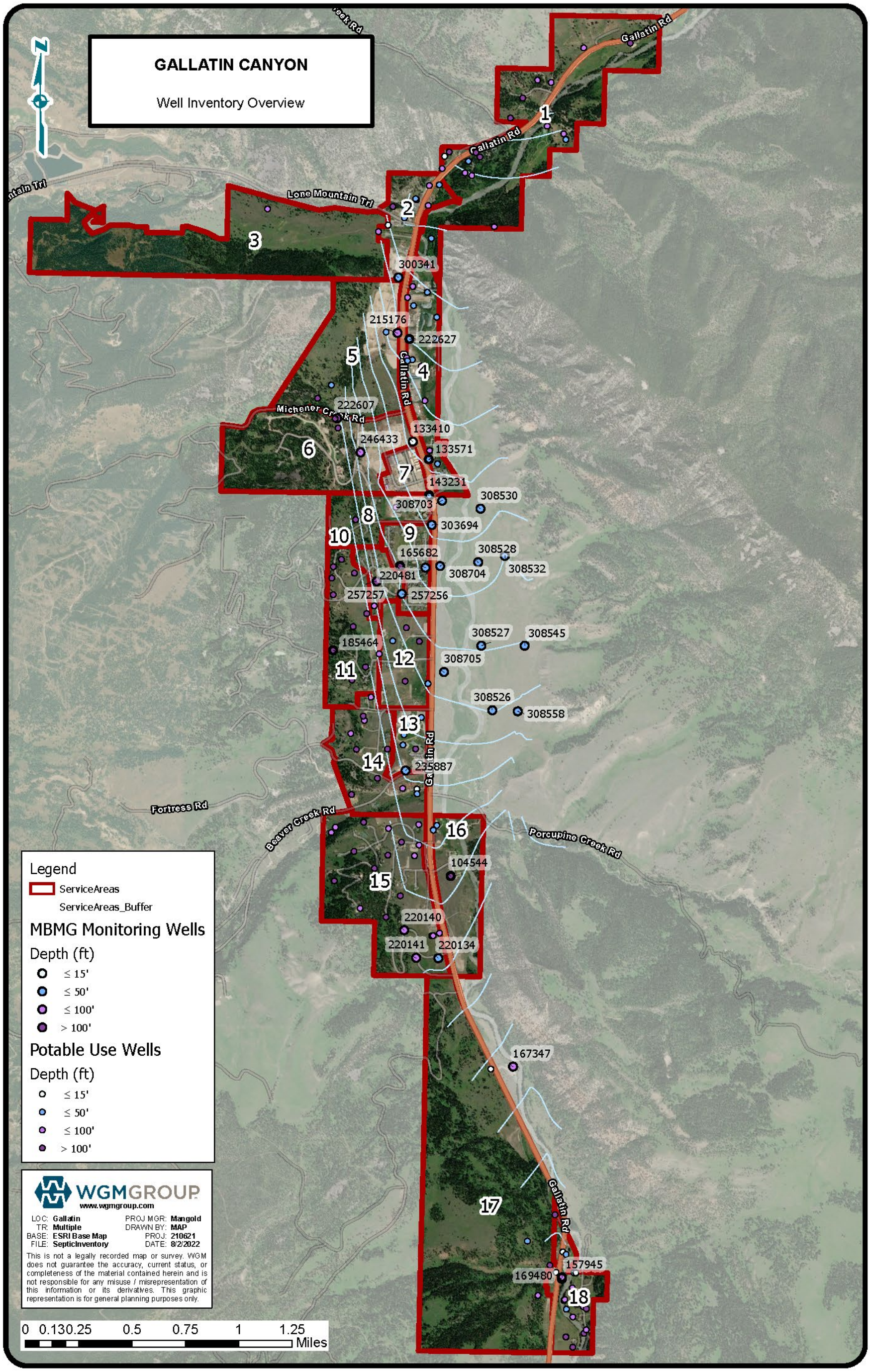


FIGURE 3.1 – WELL INVENTORY LOCATIONS

According to GWIC data, there are 217 wells in the Canyon Study Area, 173 of which are used as a drinking water source. Twenty-two of these wells are public water supplies (PWS), subject to some level of DEQ oversight, while the remaining 195 are private and unregulated.

Only 51 potable wells are shallow (29.5 percent of potable), half of which are concentrated in Service Areas 7, 18, and 2. These can be seen in **Figure 3.1**. For the purposes of this report, "shallow wells" are 50 feet deep or less.

TABLE 3.1 – SUMMARY WELL INVENTORY DATA

SERVICE AREA	# OF WELLS	# POTABLE WELLS	# OF SHALLOW POTABLE WELLS*	# OF DOMESTIC WELLS	# OF SHALLOW DOMESTIC WELLS	# OF PUBLIC WATER SUPPLIES	# OF SHALLOW PUBLIC WATER SUPPLIES
1	21	19	4	18	3	1	1
2	13	10	7	7	5	2	2
3	5	2	0	2	0	0	0
4	24	18	11	12	9	6	2
5	8	5	4	5	4	0	0
6	7	2	0	0	0	2	0
7	4	2	1	2	1	0	0
8	7	4	1	3	0	0	0
9	7	1	0	0	0	1	0
10	3	1	0	1	0	0	0
11	13	13	0	12	0	0	0
12	15	14	2	12	2	0	0
13	6	5	4	1	1	4	3
14	16	15	2	13	1	0	0
15	36	32	2	30	2	0	0
16	4	4	3	3	2	1	1
17	5	4	2	3	2	1	0
18	23	22	8	16	6	4	2
TOTAL	**217**	**173**	**51**	**140**	**38**	**22**	**11**

A summary of Water Quality data evaluated from 194 samples across 32 MBMG wells in 2020 and 2021 can be seen in **Table 3.2** below. The same data with values shown for each well can be seen in the **Table A.4** in **Appendix A**. Spatial representation of the summary TN data can be seen in the **Figure 3.2** below. Additional discussion and an equivalent map for Nitrate can be seen in Section 5.1. Note that all

parameters were not measured during all sample events, so direct comparison between the summary statistics presented in the table below cannot be made.

Note that all 167 orthophosphate samples in the 32-well MBMG investigation between 2020 and 2021 were non-detect or below the reporting limit. The detection limit for orthophosphate as P is 0.02 mg/L and the reporting limit is 0.100 mg/L.

TABLE 3.2 – NITROGEN DATA SUMMARY

MEAN NITRATE (MG/L)	MEAN NITRATE + NITRITE (MG/L)	MEAN TOTAL N AS N (MG/L)	MAX NITRATE (MG/L)	MAX NITRATE + NITRITE (MG/L)	MAX TOTAL N AS N (MG/L)
0.86	0.77	1.53	5.84	5.27	28

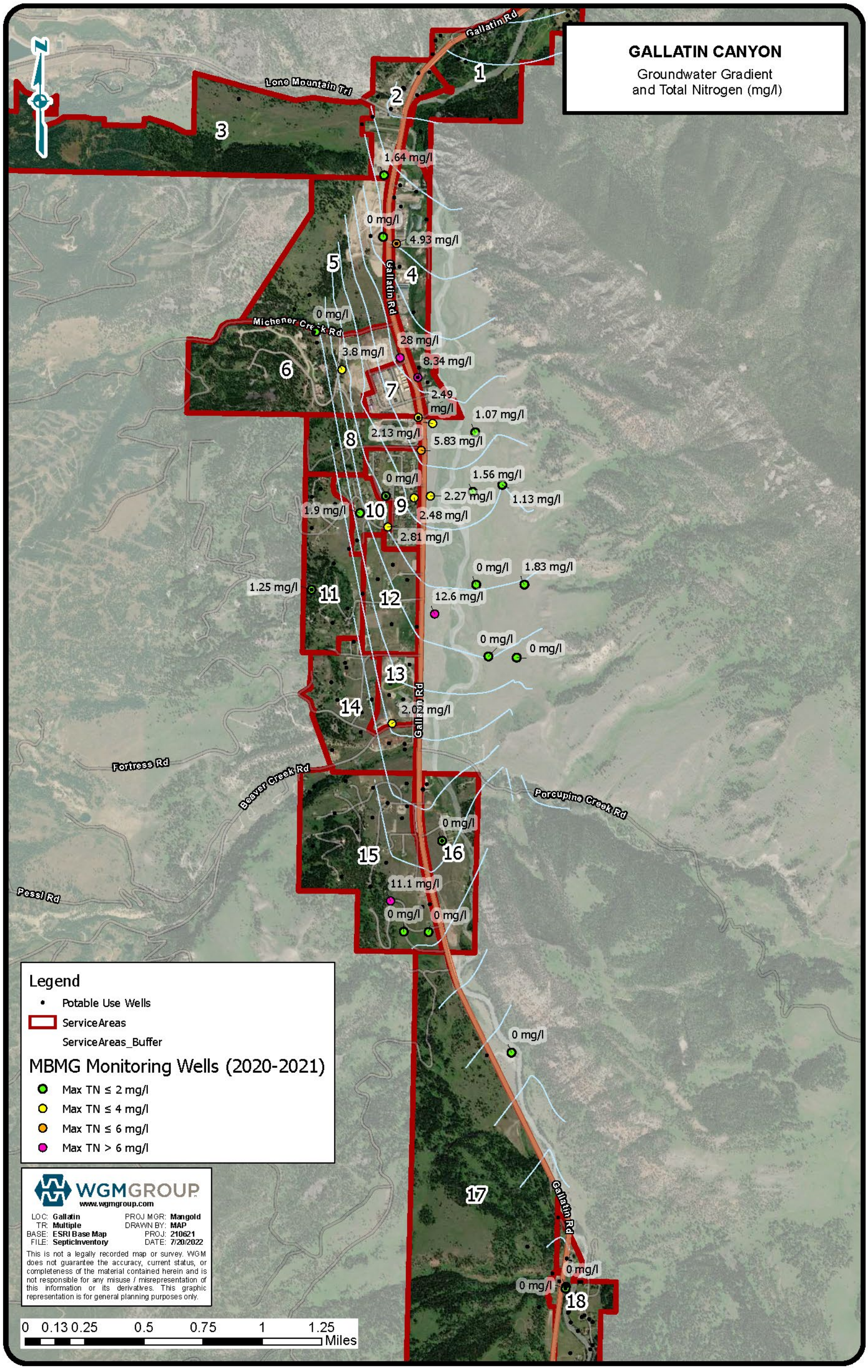


FIGURE 3.2 – TOTAL NITROGEN CONCENTRATIONS AND POTABLE WELL LOCATIONS

4.0 ENVIRONMENTAL HEALTH

The Gallatin River is an important part of the ecosystem and integral to the community's outdoor recreation-based culture and economy. Past studies have shown that in the Canyon Study Area, the Gallatin River and adjacent alluvial aquifer are hydraulically connected, and this stretch of river functioning as a "gaining reach". As a result, nitrogen loading and other septic system pollutants to the aquifer impact the River as well, albeit on a delayed timeframe and with some level of environmental 'buffering' provided by the aquifer (i.e., filtration, adsorption, dilution, etc.).

In recent years, the Gallatin River has experienced algae blooms which is an indicator of instream nutrient imbalances. In June 2022, the DEQ posted a draft listing of the Upper Gallatin River as impaired for algae. This impairment status was based of evaluation of 10 years of data, indicating the algae thresholds were exceeded in 25 percent of samples. While corresponding data did not show consistent exceedances of nutrient (Nitrogen and Phosphorus) thresholds, elevated nutrients are likely part of the cause of the algae impairment (Montana DEQ, n.d.). River sensitivity is greatest in late summer when base flow is low and water temperatures are elevated, increasing the risk of algae blooms and reduced dissolved oxygen, creating less favorable conditions for fish and other aquatic species.

Previously, the Task Force has identified nutrients as one of the main threats to the river's health and the many septic systems in the Canyon area as a significant source of nutrients. "On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)" were listed as one of several potential contributing causes of the recent algae impairment declaration.

4.1 WELL & OWTS INVENTORY HEALTH INDICATORS

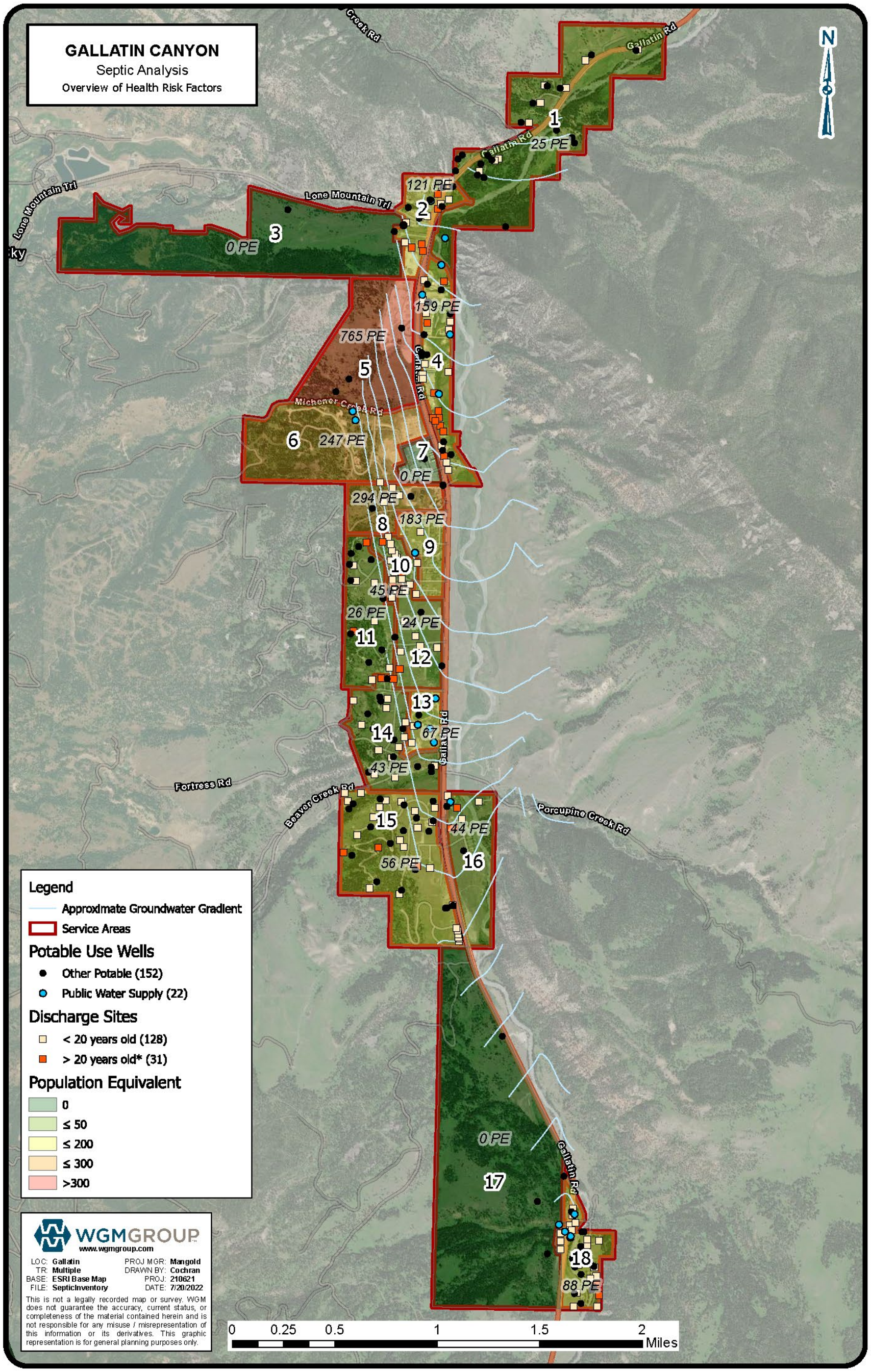
Both the general well data and the water quality data from the MBMG Groundwater Investigation provide useful health indicators. A summary of public health related metrics derived from the well inventory can be seen in the **Table 5.1** and **Figure 5.1** below. Note that the new inventory can be queried to find other health related information as well.

The Canyon Study Area has 217 documented wells, 173 of which are designated for potable use. This inventory indicates that 151 of these potable wells are private. These water sources are unregulated and tend to receive little to no monitoring and treatment and inconsistent maintenance. Shallow wells are especially susceptible to contamination from OWTS effluent. Less than a third of the potable wells in the Canyon Study Area are less than 50 feet deep.

There are also many minimally regulated non-point pollution sources (OWTSs). According to MSU Water Quality Extension, a properly maintained septic system lasts about 20-30 years. Data available from the Discharge Inventory showed age data for 89 of the 159 inventoried discharges in the Canyon Study Area. Systems ranged from about 2 to 50 years old, with a median age of 19. At least 32 of the OWTS are approaching or at the end of their useful life (at least 20 years old). Seventeen of these systems are at least 30 years old. A third of the systems 20 years or older are in Service Area 4. Considering that Service Area 4 has the most (11) shallow potable wells, this presents a significant health risk. Note that the age of the system is not available for about 45 percent of inventoried discharges, so the number of onsite discharge systems more than 20 years old is an undercount.

As seen in **Figure 5.1**, the most notable clusters of discharges are in the southern end of Service Area 4 (mostly older) and Service Areas 10 and 18. Dense clusters can lead to compounding downgradient impacts. Service Areas 4 and 18 also have the most wells immediately downgradient of drainfields. The Whitewater Inn PWS (MT0004079), immediately downgradient of the cluster of old OWTS, is chlorinated. The PWSs in 18 (MT0003893 and MT0001283) are not disinfected. While less dense, the drainfields in Service Areas 14 and 13 closely upgradient of the undisinfected school wells (MT0004861 and MT 0PI0497) and could potentially cause issues. Ramshorn's undisinfected PWS (MT0004035) currently serves the largest community population in the Canyon and is directly downgradient of the dense cluster of OWTS in Service Area 10. Fortunately, MBMG data indicates it still has low TN and nitrate concentrations.

According to Drinking Water Watch, each of these PWS have missed some monitoring requirements, but none have had water quality violations or had measured health standard exceedances in the past decade (*Drinking Water Branch*, 2022).



*Age data only available for 55% of Discharges

FIGURE 5.1 – OVERVIEW OF HEALTH RISK FACTORS

TABLE 5.1 – PUBLIC HEALTH SUMMARY METRICS

SERVICE AREA	# OF WELLS	# OF POTABLE WELLS	# OF SHALLOW POTABLE WELLS*	# OF DOMESTIC WELLS	# OF SHALLOW DOMESTIC WELLS	# OF PUBLIC WATER SUPPLIES	# OF SHALLOW PUBLIC WATER SUPPLIES	# OF ONSITE SYSTEMS	MIN DISCHARGE AGE	MAX DISCHARGE AGE	# OF ONSITE DISCHARGE SYSTEMS MORE THAN 20 YEARS OLD**
1	21	19	4	18	3	1	1	9	6	19	0
2	13	10	7	7	5	2	2	12	2	48	5
3	5	2	0	2	0	0	0	0	NA	NA	0
4	24	18	11	12	9	6	2	25	7	50	10
5	8	5	4	5	4	0	0	0	NA	NA	0
6	7	2	0	0	0	2	0	1	15	15	0
7	4	2	1	2	1	0	0	0	NA	NA	0
8	7	4	1	3	0	0	0	3	18	19	0
9	7	1	0	0	0	1	0	3	0	0	0
10	3	1	0	1	0	0	0	16	13	22	3
11	13	13	0	12	0	0	0	8	5	34	2
12	15	14	2	12	2	0	0	7	14	35	1
13	6	5	4	1	1	4	3	2	2	2	0
14	16	15	2	13	1	0	0	15	3	27	2
15	36	32	2	30	2	0	0	28	5	42	4
16	4	4	3	3	2	1	1	6	9	33	3
17	5	4	2	3	2	1	0	0	NA	NA	0
18	23	22	8	16	6	4	2	24	7	21	2
TOTAL	**217**	**173**	**51**	**140**	**38**	**22**	**11**	**159**	**2**	**50**	**32**

* For these purposes, a “Shallow Well” was defined as less than or equal to 50 feet deep.

**Note that age of system is not available for over 55 percent of onsite systems, so this is an undercount.

The MBMG water quality data indicates a clear problem of elevated nitrogen concentrations in many parts of the Canyon Study Area. One well (GWIC# 133410) has a mean TN level of 6.19 mg/L and has experienced a max TN concentration of 28 mg/L in the last two years. Several other wells exceed nitrogen health standards. Nitrogen concentrations on the east side of the Gallatin River where there is little to no wastewater input is low (<2 mgTN/l), as expected. This supports the assumption that elevated nitrogen concentrations in the west half of the aquifer are linked to wastewater effluent.

As previously mentioned, 5mg/L nitrate is the advisory threshold that indicates elevated levels and requires reporting in a consumer confidence report for Montana Public Water Supplies. GWIC# 133410 had a maximum nitrate concentration of 5.84mg/L, with a mean just below the threshold at 4.71mg/L. The fact that average concentrations across 13 samples are elevated as well, indicates that the problem is not a random high spike in concentration.

Exceedance of the EPA's MCL of 10mg nitrate/l as N was not observed. Although most water sources in the Canyon are private and therefore not regulated by these thresholds, these are important thresholds to track. Nitrate data indicates concentrations elevated above background in some areas, but no sustained exceedances of health advisory thresholds. However, TN data indicates elevated nitrogen concentrations at more sites. Three sites have mean TN concentrations above 5mg/L and two have maximum TN concentrations above 10mg/L.

Figure 5.2 below shows potable well locations, and nitrate concentrations in the aquifer. Note that data related to groundwater gradient throughout this report are preliminary and will be updated as the groundwater discharge permit study progresses or as final MBMG GWIP data becomes available.

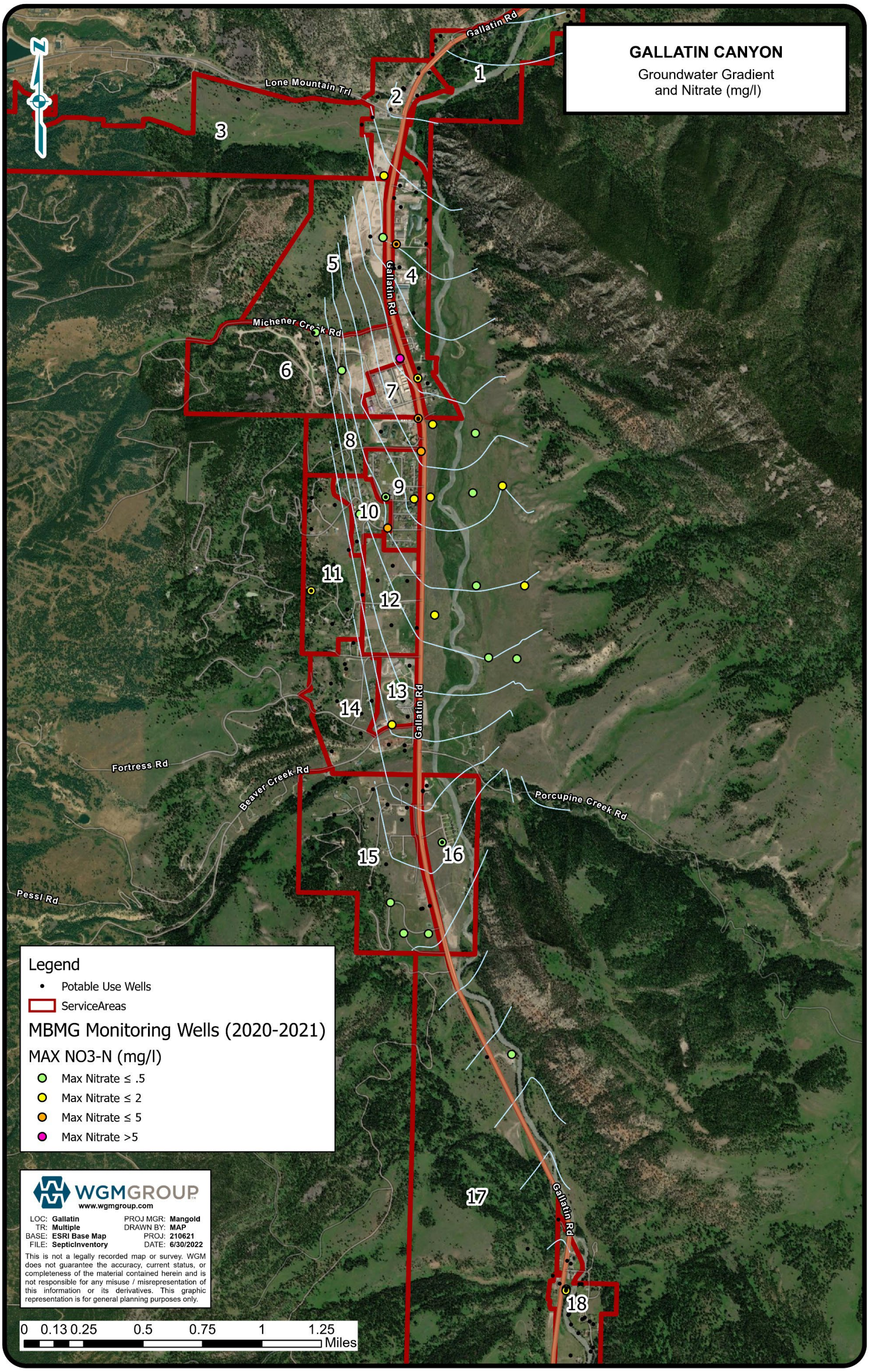


FIGURE 5.2 – NITRATE CONCENTRATIONS AND POTABLE WELL LOCATIONS

It is important to note that ten separate monitoring wells each had one sampling event where TN concentration was more than 1mg/L higher than nitrate + nitrite concentration (GWIC# 246433 had two occurrences). These sites can be seen in **Figure 5.3**, labeled with their corresponding GCWIC ID. Small differences between measured TN and nitrate + Nitrite can be attributed to differences in analysis sensitivity and reporting limits. However, a difference of more than 1mg/l likely indicates presence of Kjeldahl Nitrogen. Total Kjeldahl Nitrogen (TKN) can be calculated as TN minus nitrate + nitrite. In an aquifer such as this, the vast majority of N should be in the form of nitrate. A TKN of 1mg/L or more indicates that poorly treated wastewater likely makes up a significant portion of the water sampled. There should be further investigation at these sites to confirm what is happening.

The site with a max TN of 28mg/L (GWIC# 133410 in Service Area 4) had a calculated TKN of 23.6 when sampled 6.20.22. This well is only 14 feet deep, so it is especially susceptible to OWTS influence. However, some of the other wells with elevated TKN are deep. The nearby 31-foot deep GWIC# 133571 also experienced elevated calculated TKN in August 2021, but not in December 2021. This is also a potable well, representing a serious health concern.

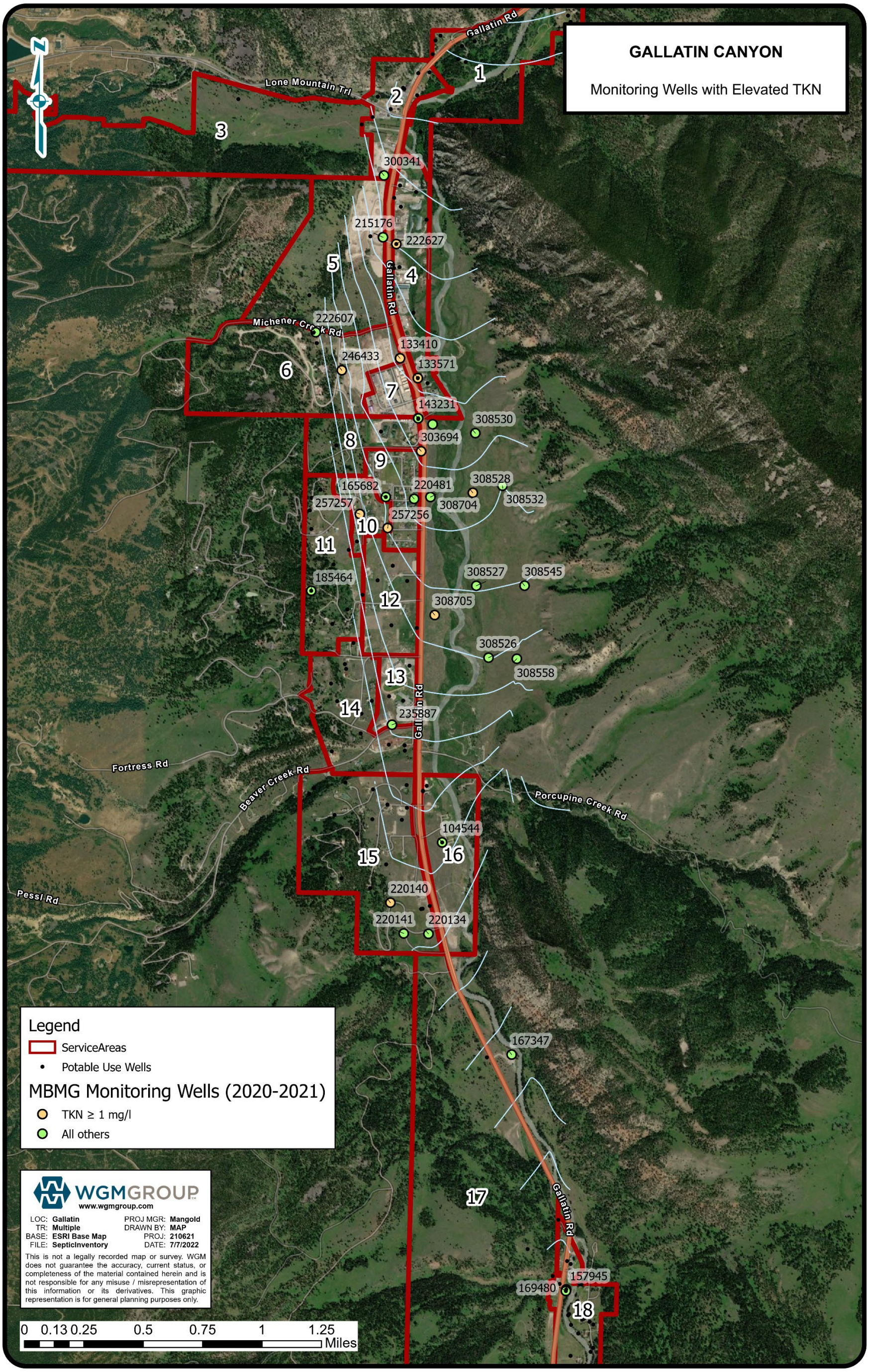


FIGURE 5.3 – WELLS WITH SIGNFICANT CALCULATED TKN

4.2 PHOSPHORUS (P) CONSIDERATIONS

According to the EPA, domestic wastewater has an average P concentration of 7-8 mg/L. As P-free detergents become more common, this value is shifting to an average of 5-6 mgP/l.

In past stages of the Canyon Sewer planning process, Phosphorus (P) has viewed as a secondary planning factor, and the majority of focus has been placed on nitrogen given its higher fate-transport characteristics. With respect to P, significant reductions are expected to occur in the drainfield-underlying soils and in the aquifer as groundwater travels laterally towards receiving waters. This will be verified with site-specific soil samples during the upcoming groundwater discharge study and permitting process. Once adsorbed, phosphorus does not easily resolubilize. Breakthrough of phosphorus downgradient eventually occurs simply due to saturation of adsorption sites in the substrate. For reference, newly permitted discharges are designed to a 50+-year breakthrough to surface water duration, however, cumulative effects are poorly accounted for.

These assumptions are supported by the findings of this Gallatin Canyon Well Inventory discussed in Section 3. All 167 orthophosphate samples in the 32-well MBMG investigation between 2020 and 2021 were non-detect or below the reporting limit of 0.100 mg/L. This helps corroborate the assumption that the underlying soils and aquifer are treating Phosphorus (P) sufficiently and that the existing septic systems have not yet contributed to elevated P concentrations in groundwater.

According to the 2020 DEQ – Water Quality Standards Attainment Record for the Upper Gallatin River, 80 TP samples were taken in the Gallatin, with only three exceeding the 0.03 mg/L threshold for surface water in the ecoregion. Additionally, the GRTF started an instream nutrient limitation study in the Upper Gallatin River in 2021. Preliminary results indicate that nitrogen is the limiting factor. This aligns with past assumptions that nitrogen load reductions and management is likely more critical to Gallatin River health than phosphorus.

Site specific soil phosphorus adsorption capacity will be measured at potential discharge sites in the Canyon during the groundwater discharge permitting process. This data can be used to help confirm past assumptions as well.

By using groundwater disposal, as planned for the Gallatin Canyon Sewer, the already high-quality effluent will be further polished, with P removal accomplished through soil adsorption.

4.3 NITROGEN (N) CONSIDERATIONS

Nitrate-laden groundwater can pass through aquifers to streams and rivers where the added nitrogen promotes algal growth and poses risks to the river ecosystems that Montana relies on for water, recreation, and tourism. Most nitrogen is initially bound in organic particles or found as urea in fresh wastewater. In septic tanks, the nitrogen is transformed to ammonium, which is discharged to the soil profile beneath the drainfield. Under the drainfield, the water percolates through a zone of unsaturated soil, or vadose zone, where ammonium is chemically attracted to soil particles. In the presence of oxygen, microorganisms nitrify the bound ammonium transforming it to nitrate. In most groundwater, the primary form of nitrogen present is nitrate. It is generally safe to assume that TN is approximately equivalent to nitrate in groundwater that is not directly adjacent to a wastewater discharge. If ammonium is found in groundwater it usually means that there is a failing septic system and/or drainfield directly upgradient.

The Canyon Area's close proximity to the Gallatin River likely results in relatively direct loading (i.e., limited aquifer dilution and little time for denitrification). This was confirmed by ArcNLET Modeling during the FS and PER, as illustrated in **Figure 4.1**.

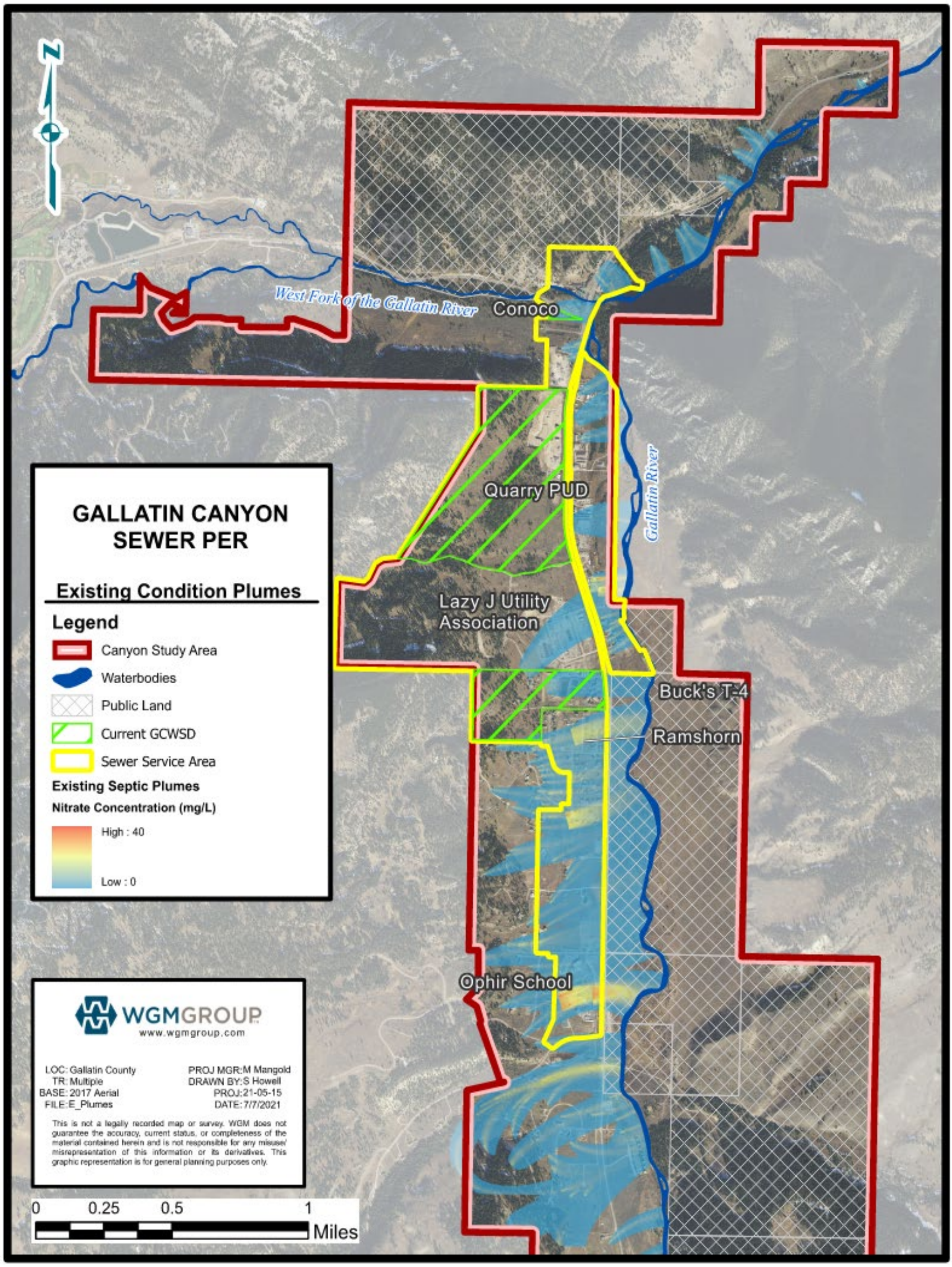


FIGURE 4.1 – 2021 PER'S EXISTING CONDITIONS NITROGEN MODELING

The Feasibility Study estimated that the OWTSs in the Canyon Planning Area cause the Nitrogen concentrations in the adjacent stretch of the Gallatin River to approximately double during base flow. Conversely, during spring runoff when nitrate concentrations are elevated, and flow rate is high, septic related nitrate load contributes only a small portion of the total load. This concept is illustrated by the data presented below in **Figure 4.2.**

Many factors affect nutrient concentrations in stream water, however there is often an inverse relationship between streamflow and concentrations. The Gallatin River Task Force (Task Force) has been collecting quarterly water quality samples on the Gallatin River since 2000. The general seasonal nitrate trend is elevated concentrations during the winter when stream flow is still relatively low and aquatic organisms are not using much nitrogen due to the lower temperatures and reduced sunlight. Nitrate concentrations reduce during spring runoff due to increased flow rate (i.e., dilution), however, the mass load is significantly elevated due to an influx of naturally loaded nitrogen. Lastly, baseflow concentrations are low relative to other periods, however, the ratio of septic load to natural load is greatest, representing an increased potential for algal blooms during the river's most sensitive period.

The Task Force's Buck monitoring station (Upgradient Station) is located across US Highway 191 from the Buck Creek access road and is upstream of the majority of the Canyon Study Area. The nutrient data collected from this site was assumed to be primarily from natural sources due to the limited upstream development and agricultural usage. Nitrate data from 45 samples collected between 2006 and 2018 at the Buck monitoring station was averaged by quarter to provide an estimated natural nitrate concentration. This data was used in conjunction with Stream Stats average monthly flow data to estimate the monthly natural load.

The Task Force's monitoring station titled "Upstream" is located downstream of most of the Canyon Study Area, but upstream of the West Fork confluence. Nitrate data from 83 samples collected between 2000 and 2018 was averaged by quarter to provide the estimated downgradient nitrate concentrations shown on **Figure 4.2**. Nitrate concentrations are consistently higher at this downgradient station compared to the upgradient station with septic systems being a likely contributor to the increase.

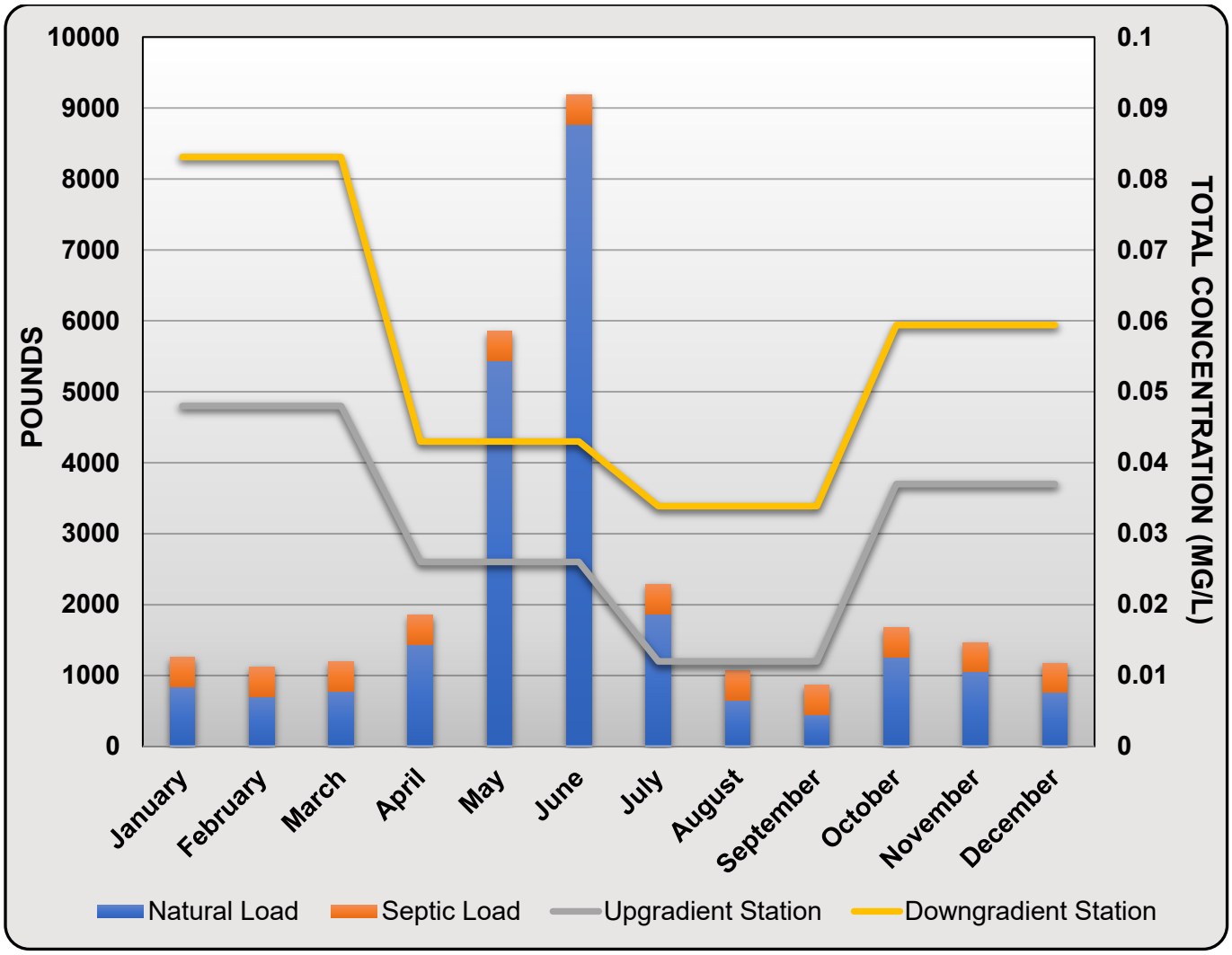


FIGURE 4.2 –EXISTING CONDITIONS NITRATE LOAD AND INSTREAM CONCENTRATIONS

Note that nitrogen load estimates in the graphic above are derived from the 2020 Feasibility Study OWTS inventory. Based on the updated OWTS inventory, the septic related loading anticipated to be higher present day. However, the concentrations and overall trend and takeaways remain the same.

Elevated nitrogen concentrations in the aquifer also have significant public health implications. Section 5 further examines risk to public health.

5.0 PUBLIC HEALTH

A detailed public health risk assessment is expected to be required during the groundwater discharge permitting process. The methodology included in this report is intended to serve as a preliminary public health risk characterization based on nitrate concentrations and DEQ travel time metrics for pathogen transport and potential well contamination. The analysis performed builds off the inventory of onsite wastewater systems in the Gallatin Canyon and associated nutrient load estimates discussed in the previous section.

5.1 WASTEWATER AND PUBLIC HEALTH

Nitrogen, in the form of nitrates, are the most common groundwater contaminant in the United States with a maximum contaminant level (MCL) set by the EPA at 10 mg/L (EPA, 2009). The advisory threshold that indicates elevated levels and requires reporting in a consumer confidence report for Montana Public Water Supplies is 5mg/L nitrate. Elevated nitrate levels in drinking water may result in negative public health effects, including interference with the blood's ability to deliver oxygen to the body, resulting in a condition known as methemoglobinemia, or blue baby syndrome. Infants are most susceptible to high nitrate levels and may develop a characteristic blue tint to the skin, denoting oxygen deprivation. Other potential health effects may include decreases in blood pressure, increased heart rate, headaches, abdominal cramps, and vomiting (ATSDR, 2015). Sensitive populations include infants less than four months of age, pregnant women, dialysis patients, and persons with ulcers, anemia, gastritis or gastric carcinoma.

Nitrate in groundwater is also an indicator of generalized septic system contamination in areas where there is no natural source of nitrate or significant agricultural source. When nitrate is present in groundwater at 10 mg/L, it can indicate that at least 20 percent of that water originated from a septic system. High nitrates typically indicate that other soluble components of septic wastewater may be present as well, including many compounds of emerging concern (CECs), such as pharmaceuticals, personal-care products and their metabolites.

Additionally, continued use of outdated and aging septic systems increases the chance of system failures that lead to surfacing of wastewater. Contact with surfaced septage is an acute health risk that exposes people, often children, to pathogens that cause diseases such as gastroenteritis, hepatitis, and dysentery. This health risk is not explored further in this report.

5.2 ILLUSTRATING POTENTIAL PATHOGEN RISK WITH ARCNLET

The preliminary maps in this section illustrate the interactions between onsite wastewater systems, potable well locations, and nitrogen concentrations in the aquifer. Note that data related to groundwater gradient and hydraulic conductivity are preliminary and will be updated as the study progresses.

According to DEQ's *How to Perform a Nondegradation Analysis,* "An assessment of impacts to down-gradient drinking water supplies, including impacts from pathogens, should show 4-log microbial inactivation or the removal of 99.99 percent of viruses. 4-log microbial attenuation typically occurs within 200 days." Based on this, a 4-log microbial reduction is the limit that reasonably protects public health.

Figure 5.4 shows illustrated septic plumes roughly modeling the 200-day travel paths and their intersection with domestic wells. Only rough estimates of hydraulic conductivity in the Canyon's alluvial aquifer are known at this time, but it mostly likely falls between 10 and 100 feet/day, likely on the higher end of that range. This hydraulic conductivity estimate range was derived from preliminary analysis of pump test information included in the well logs of MBMG study wells in the canyon. The orange plumes illustrate 200-day travel time in a lower conductive scenario (10 feet/day) and the yellow plumes illustrate a highly conductive scenario (100 feet/day). In general, any well located inside the yellow plume is potentially at risk of pathogen contamination. However, there are many assumptions made to generate this map and it should be used for illustrative and estimation purposes only.

To develop this map, the Discharge Inventory data was used to help illustrate potential pathogen exposure risks by using a modified application of ArcNLET. ArcNLET is a simplified nitrogen fate and transport model that provides conceptual level spatial analysis based on quantitative inputs as base aquifer assumptions that was used to evaluate cumulative effects of OWTS clusters. While designed for nitrogen, this model essentially evaluates first order decay as something moves along a flow path according to hydraulic gradient and conductivity. Virus reduction in groundwater generally follows first order decay. The model was adjusted to show the plumes associated with 4-log reduction through decay over approximately 200 days. Actual widths of some high-capacity drainfields were used, resulting in wider plumes. Additional information about the model inputs and associated files can be found in **Appendix A.** ***Note that this model was not calibrated or verified and serves to illustrate a concept and approximate areas of potential septic influence only.***

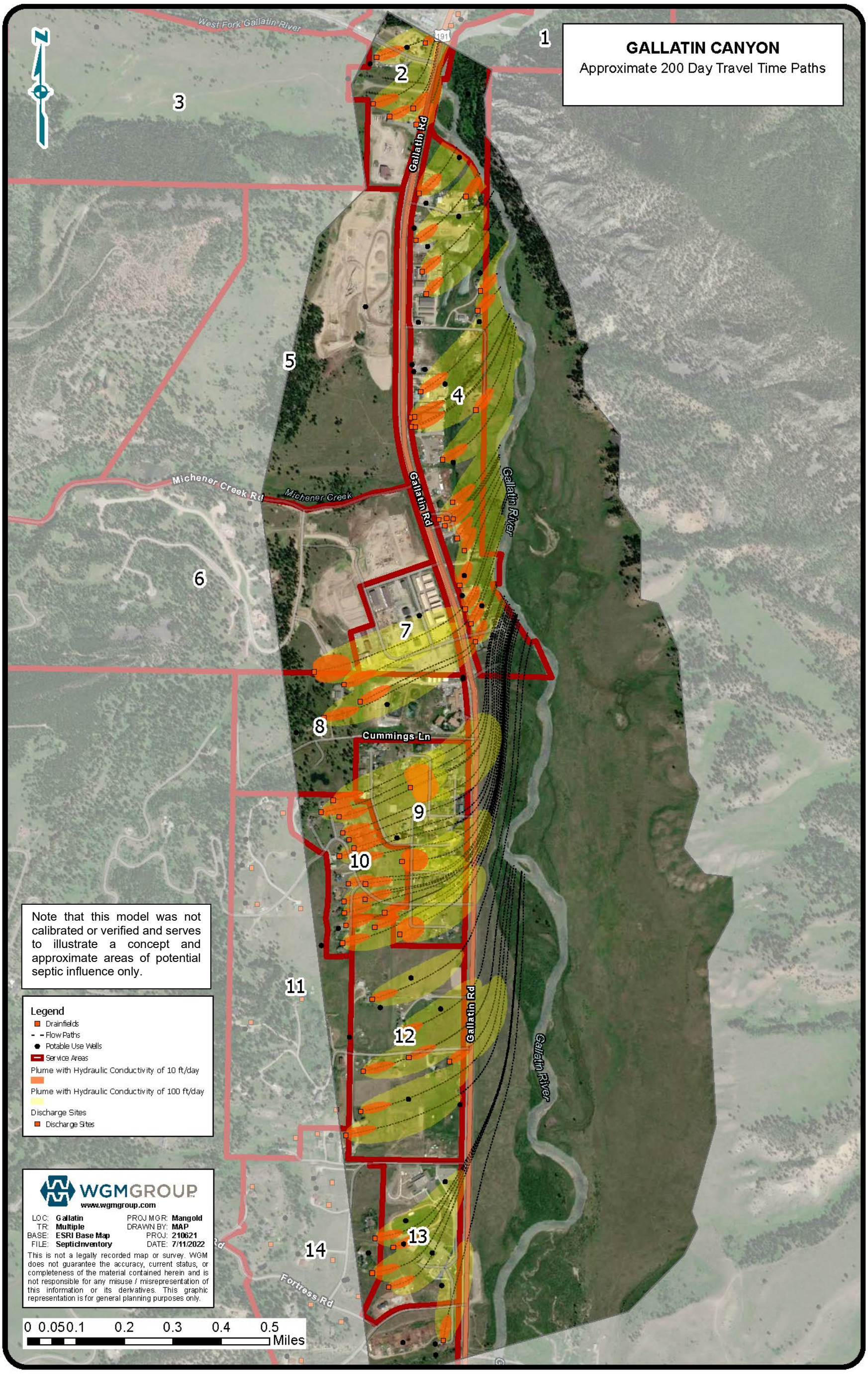


FIGURE 5.4 – ILLUSTRATION OF 200-DAY TRAVEL PATHS OF OWTS EFFLUENT

Dense clusters of OWTS with overlapping zones of influence are clearly illustrated in the lower half of Service Area 4 and in Service Area 10. The potable wells within the conservative orange plumes in Service Areas 4 and 13 are particularly concerning.

The table below summarizes the number of downgradient potable wells caused to be in the illustrated 200-day travel path due to the modeled OWTSs. It is important to note that the scope of the model is limited and only Service Areas 4, 6, 7, 9, 10, 12, and 13 have all of their loads fully captured in this model. It is also important to note that the potable well locations come from the GWIC databased and may not be accurate.

TABLE 5.2 – POTABLE WELLS IN 200-DAY TRAVEL PATHS

SERVICE AREA	NUMBER OF DOWNGRADIENT POTABLE WELLS IN ILLUSTRATED 200-DAY TRAVEL PATH DUE TO OWTS IN EACH SERVICE AREA.
1	**NA**
2	1*
3	**NA**
4	8
5	**NA**
6	0
7	0
8	1*
9	0
10	1
11	**NA**
12	3
13	2
14	4*
15	**NA**
16	**NA**
17	**NA**
18	**NA**

*Not all OWTs modeled – potentially an undercount.

The illustrated travel paths are overlain with the MBMG TN concentration data from 2020-2021 in **Figure 5.5.**

The monitoring wells with elevated TN levels, shown in pink and orange, do not clearly correspond to denser illustrated plumes. Note that nitrogen travels farther through the aquifer than the virus decay plumes illustrated but should generally follow the same flow paths. No firm conclusions can be drawn from this relationship of TN concentrations and plumes illustrated below. However, it may indicate a stronger south to north hydraulic gradient than used in the model or more dispersivity and general mixing within the aquifer. This relationship can be further explored as additional groundwater modeling and water quality testing is completed and as MBMG's GWIP report and final data is published.

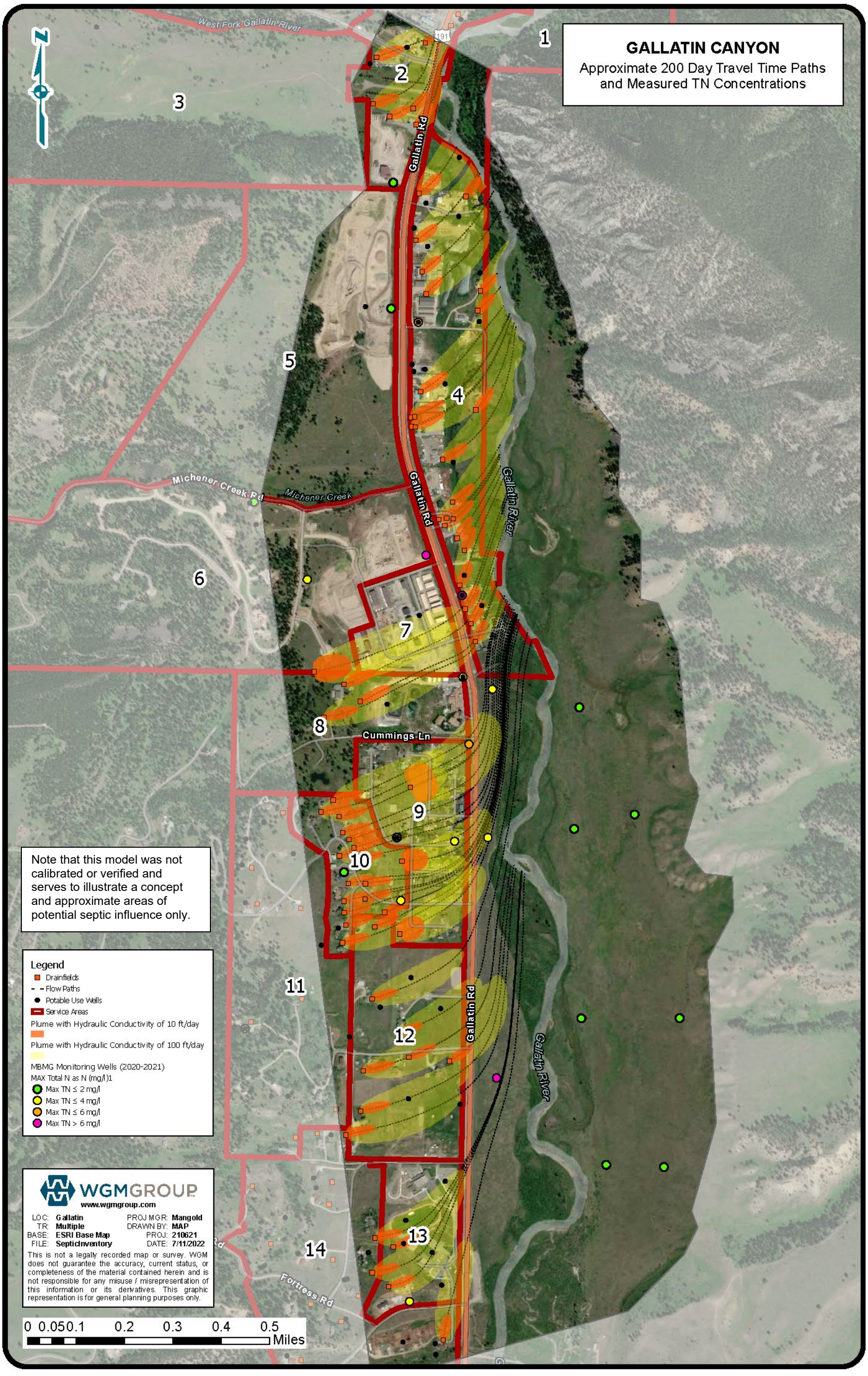


FIGURE 5.5 – ILLUSTRATION OF 200-DAY TRAVEL PATHS AND TN CONCENTRATIONS

5.3 PUBLIC HEALTH TAKEAWAYS

While public health modeling results are still preliminary, some general information can be assessed.

The MBMG water quality data indicates a clear problem of elevated nitrogen concentrations in many parts of the Canyon Study Area. The observed low nitrogen concentrations on the east side of the Gallatin River, where there is little to no wastewater input, supports the long-standing assumption that elevated nitrogen concentrations in the west half of the aquifer are linked to wastewater effluent.

There are numerous potable wells downgradient of septic systems in the aquifer. These are at risk of exposure to elevated nitrate concentrations and other wastewater associated contaminants. Nitrate MCL exceedances have not been observed, however, nearly one third of the monitoring wells appear to have experienced elevated calculated TKN levels at some point between 2020-2021. In this aquifer, that indicates a high likelihood of exposure to poorly treated and/or diluted wastewater. Only one monitoring well showed repeat elevated calculated TKN.

Additionally, the ArcNLET preliminary model indicates that many potable wells are likely within the 200-day travel plumes of onsite wastewater systems and potentially exposed to microbial contamination.

The current model of non-point source pollution via OWTS does not provide an adequate tool to protect groundwater quality, which ultimately impacts public health. With the expected rapid growth in the area, these health risks will increase significantly if development continues without addressing the wastewater-related issues. Decommissioning these many OWTS and connecting to a properly designed and managed central sewer will help improve public health.

The preliminary design for the canyon sewer would concentrate the effluent loading to a few larger disposal areas. Although effluent will be of a much higher quality than what is currently coming from OWTS, this may be a cause for concern for well users directly downgradient. This concern will be addressed through the permitting and design process to minimize any potential impacts.

The GCCWSD is currently pursuing funds for a Canyon Drinking Water PER to further evaluate the existing water supply deficiencies, public health concerns, and potential solutions. Both this and the groundwater discharge permitting process will help clarify ways to best protect public health through drinking water in the Gallatin Canyon.

6.0 PRELIMINARY COLLECTION SYSTEM

The Feasibility Study and PER each included a depiction of the collection system's backbone, as seen in **Figure 6.1**, and rough preliminary cost estimates. This section adds detail to that plan, considering topography and the lateral collection lines needed to connect each Service Area. It also provides cost estimates for several Service Areas not included in the PER and wastewater improvements through SepticNET in the Service Areas where connection to GCCWSD sewer was deemed economically infeasible.

Note that, based on the inventory finding that all wastewater loads in service area 7 are discharged in service area 6 and the fact that both are jointly owned and managed, these service areas are considered as one in the following sections. Additionally, service areas 12 and 13 were assigned the same cost estimate since, in order to serve service area 13, most of the infrastructure to serve 12 would be required as well. These service areas are considered as one for all cost-related estimates below, however, they are prioritized separately.

6.1 PRELIMINARY LAYOUT

The preliminary collection system layout reflects the design documented in the 2021 PER. A completely new sanitary sewer collection system is required to collect the raw sewage generated in the Canyon Area and convey it to treatment. Existing septic and community OWTS would be abandoned and properly de-commissioned once the structure(s) it previously served is connected by sewer service to the available main. The Canyon Area generally slopes downward from south to north, so most of the collection system would be a gravity system.

The collection system south of the Highway 64 intersection will all be gravity sewer lines. Based on the peak hour design flows previously derived, a system of 8-inch, 10-inch and 12-inch diameter pipes will be adequate to convey wastewater flows without surcharging the collection system. The gravity sewer main would parallel US Highway 191, from Beaver Creek Road (just south of Lone Peak High School) to Lone Mountain Road (Highway 64). A small sewer collection system would be extended approximately 0.2 miles north of Highway 64, and due to topography, this area would require a lift station just north of the West Fork of the Gallatin River, near the Bighorn Center. The lift station and pressurized sewer force mains would convey wastewater from this area under the West Fork to a to the existing Big Sky WRRF.

In two areas, a gravity main will be needed on both sides of US Highway 191 to collect wastewater from connections east of the road. These areas include existing commercial and residential development located from Running Iron Road to the Exxon gas station (Service Area 4), and low-density residential development located to the north of the Highway 64 / US Highway 191 intersection (Service Area 2).

Based on a preliminary hydraulic model of the Canyon Area main collection system, sewering the Canyon Area will require approximately 22,600 feet of pipe (5,500 feet of 12-inch, 3,900 feet of 10-inch, 13,000 feet of 8-inch, and 200 feet of 4-inch forcemain under the West Fork). Smaller pipe connecting residences and businesses (service lines) would be the responsibility of the landowner. Depiction of the collection backbone is presented in **Figure 6.1**. Preliminary sewer collection plan-profile drawings are included in **Appendix D**. These drawings include additional lateral collection planning information for each Service Area that is used to inform connection cost estimation as discussed in Section 6.2. Depth of pipe required to maintain adequate slope for gravity flow is an important factor in cost – this was accounted for in the cost estimates presented in Section 6.2. For example, there is an isolated rise in topography at the north end of the US Highway 191 corridor that will cause the collection main to have to be buried upwards of 20 feet deep and results in an increased cost per lineal foot.

For Service Areas 1, 15, 16, and 18, preliminary cost estimates to connect to the GCCWSD sewer were high (i.e. economically not feasible to collect), primarily due to their lower population density and distance from the existing District boundary. Preliminary collection layouts were not drafted for these areas and enhanced “decentralized” treatment is assumed to mitigate nitrogen loading impacts.

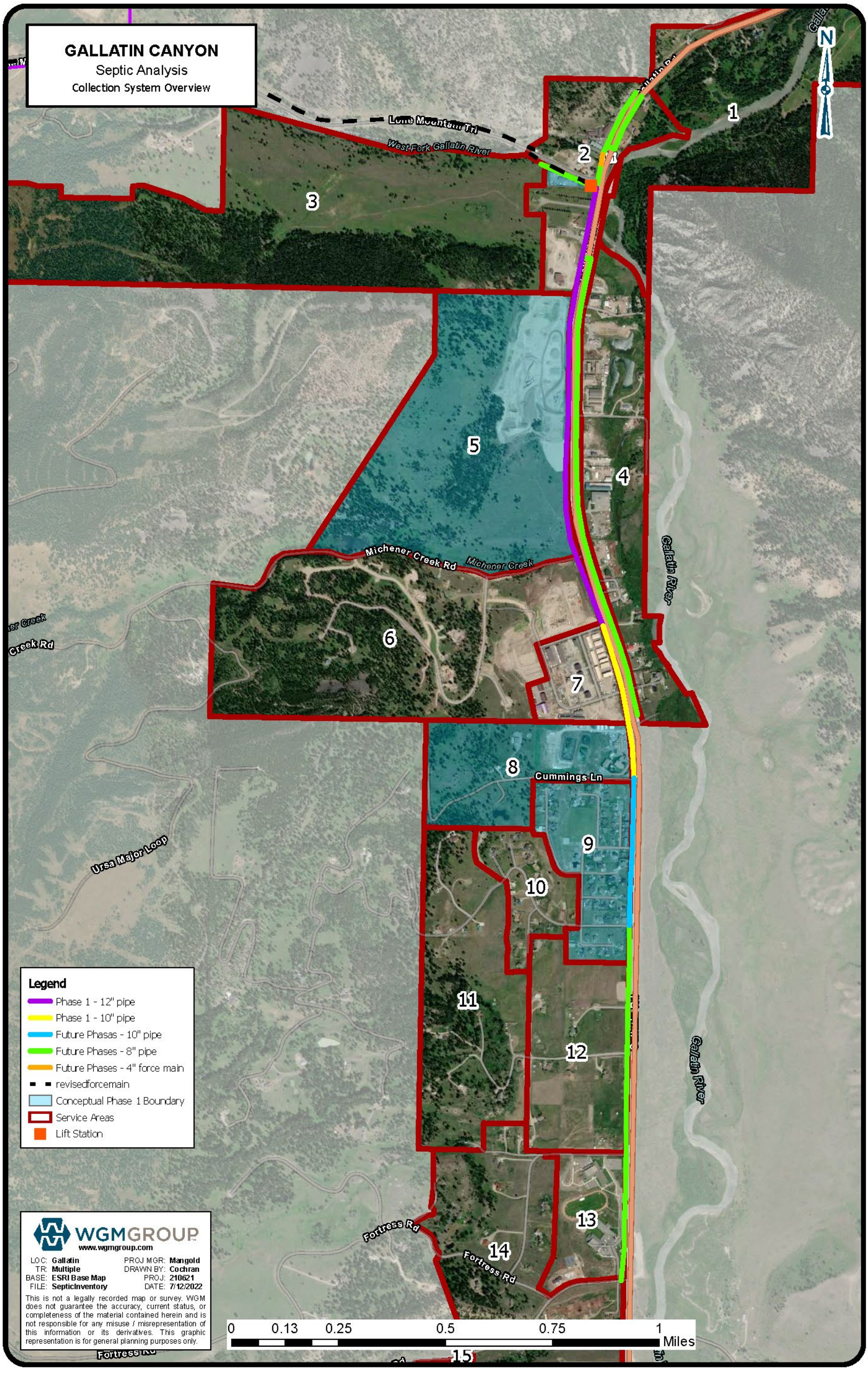


FIGURE 6.1 – PRELIMINARY COLLECTION SYSTEM LAYOUT OVERVIEW

6.2 OPINION OF PROBABLE COST

A preliminary opinion of probable cost (OPC) was developed for the full collection limits and include preliminary private system connections as depicted in the plan-profile drawings (see **Appendix D**). Details of the basis of cost estimation can be found in **Appendix C.** This cost opinion represents a Class 4 Estimate based upon the definitions of the Association for Advancement of Cost Engineering (AACE) International. This level of cost opinion is appropriate for planning level evaluations made with incomplete information. The cost opinion at this level of engineering is considered to have an accuracy range of +50/-30 percent. Total project costs are defined as the sum of planning, engineering, construction, and construction administration. Note that treatment and disposal costs are not included for the purposes of this exercise, and are the primary reason for total project cost discrepancies between this study and the 2021 PER.

Cost estimation assumptions include:

- $15/inch diameter/linear foot piping cost
- Additional $20/linear foot piping cost for deep sewer (depths greater than 10 feet)
- 20 percent Construction contingency
- 18 percent Engineering and Construction Administration
- 5 percent Geotechnical

Infrastructure costs are organized on a per Service Area basis to inform the cost-benefit analysis included in Section 7. All costs are in 2021 dollars. Escalation should be applied to the year of construction.

TABLE 6.1 – PRELIMINARY COLLECTION SYSTEM OPINION OF PROBABLE COST (OPC)

SEWER COLLECTION PROJECT COMPONENT	COST $ (Class IV AACE)
Service Area 1 – Dudley Creek Area	$812,000
Service Area 2 – Bighorn Center Area	$1,684,000
Service Area 3 – Kallestad Conservation Area	**NA***
Service Area 4 – River Front Properties	$2,427,000
Service Area 5 – Quarry PUD	$1,353,000
Service Area 6 & 7 – Lazy J Utility	$1,080,000
Service Area 8 – Bucks T-4	$413,000
Service Area 9 – Ramshorn Subdivision (Lower)	$863,000
Service Area 10 – Ramshorn Subdivision (Upper)	$760,000
Service Area 11 – North Foothills	$1,520,000
Service Area 12 & 13 – School Collection (w/ low density residential)	$1,513,000
Service Area 14 – South Foothills	$1,469,000
Service Area 15 – South Beaver Creek	$3,690,000
Service Area 16 – South Porcupine	$738,000
Service Area 17 – Burcalow Open Space	**NA***
Service Area 18 – Corral, Rainbow & Residences	$1,476,000

*Service Areas 3 and 17 have limited existing and/or planned future development.

For Service Areas 1, 15, 16, and 18, preliminary cost estimates to connect to the GCCWSD sewer were high (i.e., economically not feasible to collect), primarily due to their lower population density and distance from the existing District boundary. Rather than present cost estimates for connections that will likely never occur, cost estimates assume enhanced decentralized treatment (e.g., SepticNET) is utilized for each of these Service Areas. Service Area 11's connection cost is high for both connection to central sewer or a decentralized solution – costs estimates presented are for the slightly more cost-effective option of connection to the GCCWSD sewer.

7.0 ANNEXATION PRIORITIZATION

As discussed previously, annexation of future phases will largely be driven by funding and property owners' willingness to annex into the GCCWSD and connect to sewer services. The following metrics were identified to help prioritize sewer collection infrastructure planning and future annexation, ultimately serving as an infrastructure based 'informed growth plan' that balances maximizing public and environmental health benefits with cost and logistical/managerial efficiencies.

7.1 NUTRIENT REDUCTION COST EFFICIENCY

The cost estimates for sewering each Service Area discussed in Section 6.2 and the nitrogen load estimates discussed in Section 2 were used to develop a nutrient reduction cost efficiency metric as seen in the table below. The 'pounds TN removed annually per million dollars' (3rd column) was determined by dividing the "Total Annual N Load (lbs/year)" for each Service Area by the corresponding "Sewering OPC" value and multiplying by $1,000,000. Across the entire Canyon Study Area, an average of 405 lbs TN could be removed from the aquifer annually per $1M capital. This corresponds to an average of $2,468 per pound of TN removed annually. For the areas planned for collection as part of the "Phase 1" project identified in the PER (the Conoco and Service Areas 5, 8 & 9), an average of **1,215 lbs TN could be removed from the aquifer annually per $1M spent on sewer collection.** This corresponds to an average of $823 per pound TN removed annually. This nitrogen based const-benefit analysis indicates that the currently planned collection limits serve as a relatively cost-effective base plan for mitigating water quality impacts, along with identifying potential 'low hanging fruit' opportunities such as Service Area 10.

TABLE 7.1 – COST PER POUND TN REMOVED

ZONE	COST TO CONNECT SERVICE AREA ($)	LB REMOVED PER $1M	RANKED NUTRIENT REMOVAL COST EFFICIENCY
1	$812,000	170	12
2	$1,684,000	309	9
3	**NA**	**NA**	**NA**
4	$2,427,000	316	8
5	$1,353,000	1020	3
6&7	$1,080,000	742	4
8	$413,000	2309	1
9	$863,000	1,374	2
10	$760,000	384	6
11	$1,520,000	113	13
12&13	$1,513,000	262	10
14	$1,469,000	188	11
15	$3,690,000	99	14
16	$738,000	389	5
17	**NA**	**NA**	**NA**
18	$1,476,000	329	7
	TOTAL: $19,798,000	**AVERAGE: 405 lbs / $1M**	

Service Areas 16 and 17, ranked 6th and 7th respectively, assume enhanced decentralized treatment and are not currently being considered for GCCWSD connection. The findings presented in **Table 7.1** lend credence to the concept presented in the 2020 Feasibility Study to identify areas of septic system clusters where impacts could feasibly be mitigated via newer wastewater technology and/or management. However, annual operation, maintenance and replacement (OM&R) costs are not accounted for in the above analysis, which may change the rankings when comparing Service Areas planned for central collection vs. those that assume enhanced decentralized treatment.

Note: Based on the inventory finding that all wastewater loads in Service Area 7 are discharged in Service Area 6 and the fact that both are jointly owned and managed, these service areas are considered as one in the following sections. Similarly, service areas 12 and 13 were assigned the same cost estimate since, in order to serve service area 13, most of the infrastructure to serve 12 would be required as well. Note that the cost estimates for Service Area's 1, 15, 16, and 18 are based on decentralized solutions, not connection to the GCCWSD.

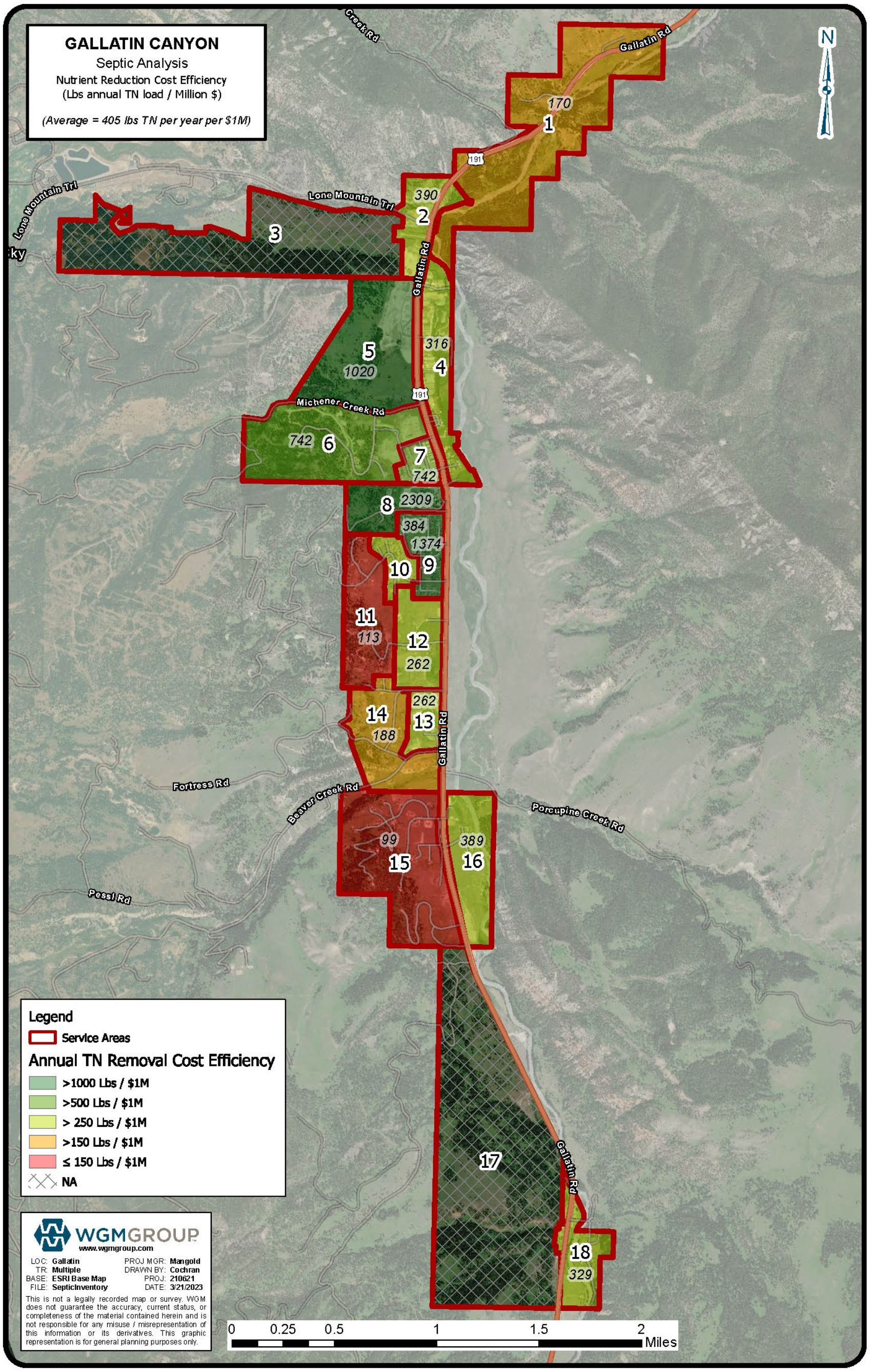


FIGURE 7.1 – POUNDS NON-POINT SOURCE TN REMOVED ANNUALY PER MILLION DOLLARS OF SEWER COLLECTON

7.2 NUTRIENT LOAD REDUCTION

One of the primary goals of the Gallatin Canyon Sewer is to reduce nutrient loading to the Gallatin River and the alluvial aquifer which serves as a drinking water source. While the nutrient reduction cost efficiency is important, the actual amount of nutrient reduction is as well. One of the metrics used to prioritize sewer collection is the total amount of nitrogen loading that will no longer be loaded through OWTSs. This is measured as "Total Annual N Load (lbs/year)."

As seen in the following figure and table, sewering Service Areas 5 and 8 provide the greatest opportunities for nitrogen reduction (when the planned growth is considered). These areas are already in the GCCWSD and will be sewered in Phase 1. Service Areas 4, 6, and 9 have the next largest loads of nitrogen. With loading directly adjacent to the Gallatin River, sewer Service Area 4 is likely to have a relatively elevated environmental impact.

TABLE 7.2 – NON-POINT SOURCE TN LOAD REMOVED

SERVICE AREA	TOTAL ANNUAL N LOAD (LBS/YR)	RANKED N LOADS (1 = BIGGEST LOADER)
1	138	15
2	521	6
3	0	-
4	767	5
5*	1,380	1
6&7	801	4
8*	954	3
9	1,186	2
10	292	9
11	172	13
12	153	14
13	243	12
14	276	11
15	367	8
16	287	10
17	0	-
18	485	7
TOTALS	**8,022**	

*Note that services areas 5 and 8 represent the planned growth scenario, rather than the existing conditions shown for all other Service Areas.

As previously discussed, the presented loads are not anticipated to be completely eliminated. Under the proposed “co-solution” scenario, high quality treated effluent (10x better nitrogen removal compared to standard septic systems) from the BSCWSD will be discharged back into the aquifer. The GCCWSD is seeking to maintain a net nutrient reduction by progressively removing septic systems while limiting the quantity of treated effluent discharge. Preliminary discharge planning discussions have identified a goal of maintaining a minimum of 25% net-nutrient reduction.

Figure 7.2 provides graphical illustration of both load scale and removal cost efficiency. A comparison of these two nutrient removal metrics can be seen in the figure below. Service Areas 2 through 10 generally stand-out as having the greatest opportunity to remove substantive load at a relatively cost-effective rate.

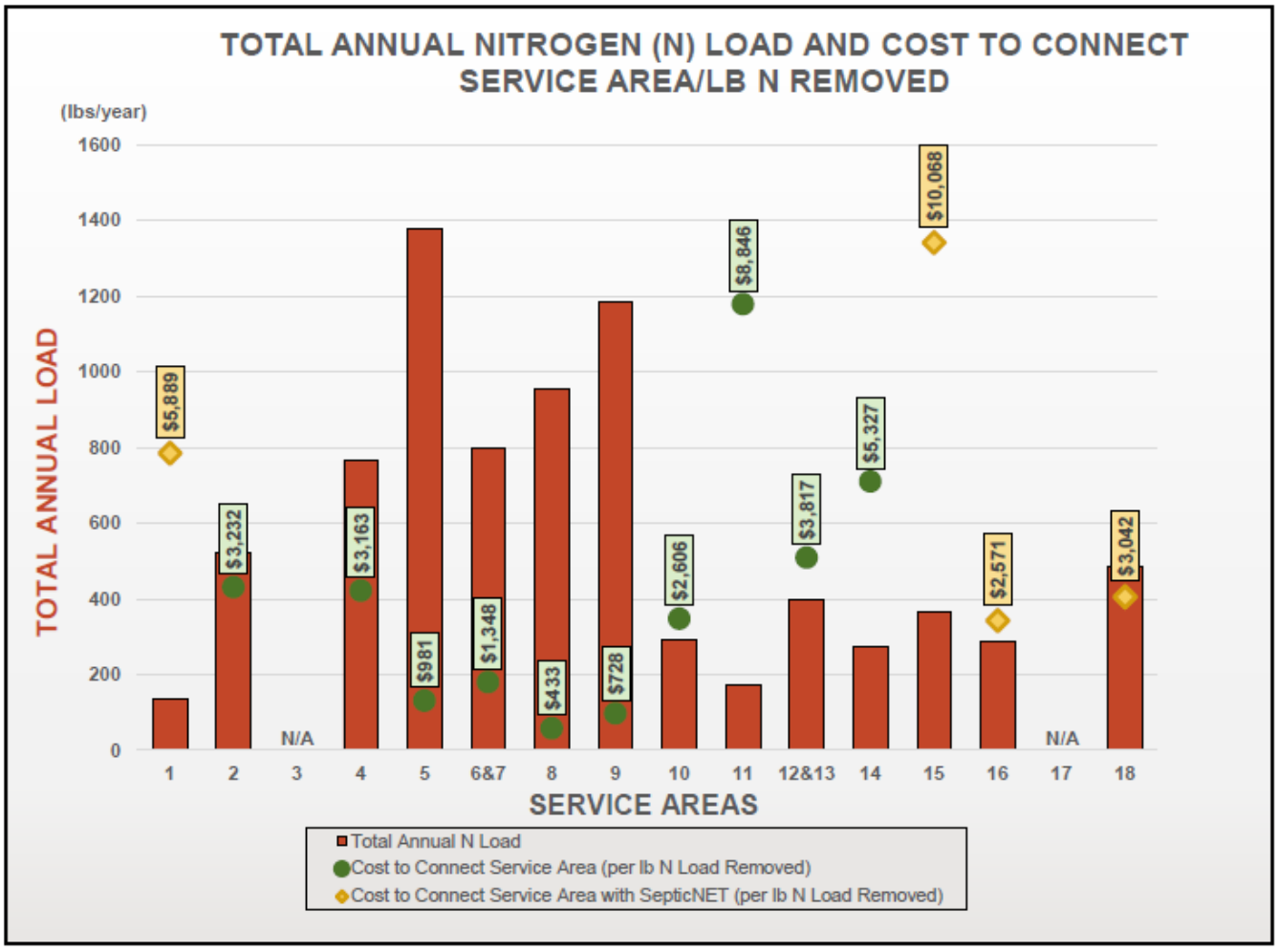


FIGURE 7.2 – TOTAL ANNUAL NITROGEN (N) LOAD AND COST TO CONNECT SERVICE AREA/LB N REMOVED

7.3 PUBLIC HEALTH RISK

A number of human health risk factors were considered in this report focusing on different classes of wells and OWTS and their spatial relationships and water quality data. Data quality was variable across the risk factors considered. For example, the “Number of downgradient potable wells caused to be in illustrated 200-day travel paths due to OWTS in each Service Area” metric is only applicable to the limited few Service Areas where ArcNLET modeling was applied. Furthermore, there are several assumptions included to illustrating the plumes and the potable well locations from GWIC are likely not fully accurate. OWTS age is also a notable factor in determining how well they are actually treating wastewater, however there was only age data for approximately 69 percent of inventoried discharges.

No single metric was adequate to rank health risks; therefore, a semi-subjective Public Health Risk Characterization and Metric were developed as seen in **Table 7.3**. The basis of the Risk Metric and assigned risk metric scores for each Service Area can be found in **Figure 7.3**. The unitless metric is derived from multiplying risk (1-4) by impact (2-8) and ranges from 2 to 32.

Service Area 4 scored highest (32) due to its large potentially impacted population, at least two failing septic systems, and shallow potable wells. Service Areas 1, 11, and 12 scored lowest (2). These areas have small populations, and their dispersed OWTS are anticipated present limited human health risk. The same risk metric value can be assigned, albeit subjectively, based on varying logic and/or reasoning. For example, Service Area 16 scores six for a small potentially affected population exposed to risk from OWTS directly upgradient of a shallow well. Service Area 8 scores a six as well, however that is from a larger population exposed to low risk.

TABLE 7.3 – PUBLIC HEALTH RISK METRIC AND CHARACTURIZATION NOTES

SERVICE AREA	PUBLIC HEALTH RISK METRIC	RISK CHARACTERIZATION NOTES
1	2	Low density and small potentially impacted population.
2	12	Not particularly dense, but 5 older septic tanks and shallow private wells serving a relatively large population. Only a portion of the population is assumed to be affected due to well locations and assumed hydraulic gradient. The population in this Service Area is largely transient non-community.
3	NA	No OWTS, one potable well. Risk not further evaluated.
4	32	Significant population, served by a high density of older systems (two of which are likely failing) and shallow wells. Measured elevated TN and Nitrate concentrations. Drinking Water Watch shows no recent water quality violations for the PWSs in this area. The PWS in the southern half is chlorinated.
5	12	The public well serving the Quarry will be upgradient of discharge (internal Service Area population is not at risk). Contributes a notable wastewater discharge quantity upgradient of the shallow wells in the north half of Service Area 4. The source should be new and public, providing a better than average level of treatment for an OWTS, especially for nitrates.
6&7	12	Most drinking water sources in the Service Area would be upgradient. However, the Service Area 7 well and many shallow Service Area 4 wells are downgradient. There is documented elevated nitrogen in the southern part of Service Area 4 downgradient of the large drainfield in Service Area 6 - that may be a contributing source.
8	6	Service Area 8's water source is upgradient of their Discharge. Although it is upgradient of Service Area 5 and likely some of 4, the main discharge is treated in a lagoon and chlorinated so the microbial load should be very low and present a low health risk.
9	8	According to the modeled groundwater gradient and plumes, Ramshorn's three large drainfields are unlikely to directly impact Ramshorn's public well and there are no immediately downgradient wells so it is classified as a low risk. If the groundwater gradient is slightly more south to north than modeled or if there is failure of these drainfields, the entire service area 9 population could be impacted. Service Area 9 load may be contributing to elevated nitrate concentrations observed downgradient.

TABLE 7.3 (CONT.)– PUBLIC HEALTH RISK METRIC AND CHARACTURIZATION NOTES

SERVICE AREA	PUBLIC HEALTH RISK METRIC	RISK CHARACTERIZATION NOTES
10	16	Service area 19 has a high density of drainfields immediately upgradient of Ramshorn's undisinfected public water system well, 3 of which are aged. This PWS serves the large population of lower Ramshorn. However, it is deep, which slightly lowers the risk. According to Drinking Water Watch, there have been no water quality violations at this PWS. Service Area 10 load may be contributing to elevated nitrate concentrations observed downgradient.
11	2	Low density and small potentially impacted population.
12	2	Low density and small potentially impacted population.
13	24	Ophir Elementary and Lone Peak High School are located in this Service Area. While the water sources are transient community public water supplies (not the primary water source) and have not reported any water quality violations, children are generally at a higher risk from waterborne contamination than adults and these wells are not disinfected. Drainfields are immediately upgradient of PWS wells, 2 of 3 of which are shallow. Drinking Water Watch shows no water quality violations for this system.
14	24	The school potable water system is downgradient of several additional Service Area 14 drainfields, and several Service Area 14 wells are directly downgradient of drainfields.
15	4	Low density and medium potentially impacted population. There are at least three older systems in this area.
16	6	Several drainfields, including one older than 20 years, are closely upgradient to the public water supply. However, the well is required to be monitored as a community PWS and a relatively small population would be impacted.
17	NA	No OWTS, four potable wells. Risk not further evaluated.
18	12	Drainfields and wells (some untreated shallow PWS) are sited close together, with some drainfields immediately upgradient. The entire Service Area's PE is potentially affected. The PWS wells serve transient non-community populations, lowering the associated health risk. Drinking Water Watch shows no water quality violations for this system.

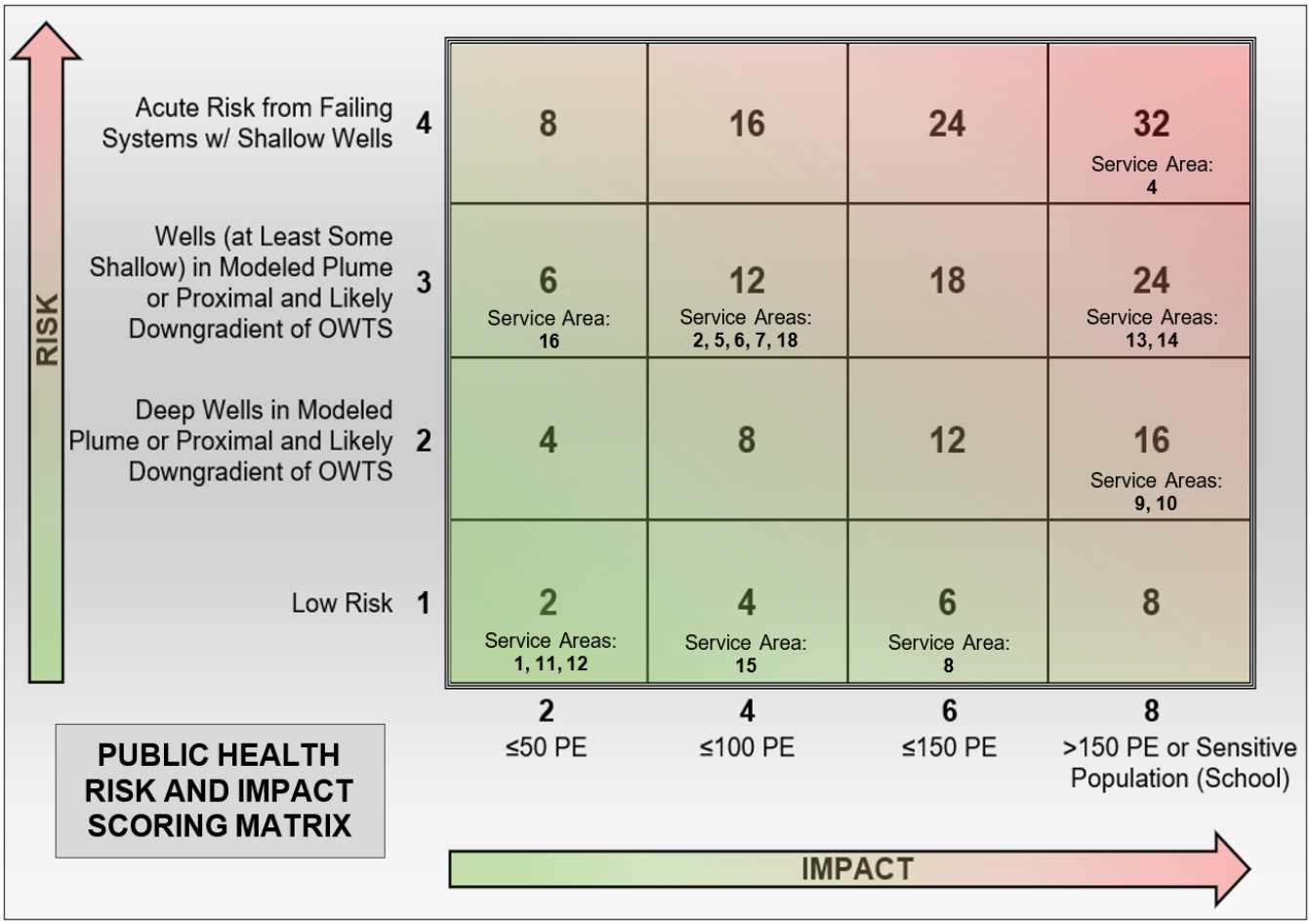


FIGURE 7.3 – RISK VS IMPACT CHARACTERIZATION TO DERIVE HUMAN HEALTH METRIC

7.4 COLLECTION PRIORITIZATION

The bar graph presented in **Figure 7.4** serves as a preliminary cost-benefit analysis with respect to nitrogen load reduction (quantitative) and human health protection (qualitative). In simplest form, the higher the green bar, the greater the potential to protect Gallatin River water quality, and the higher the red bar, the greater the potential to protect Canyon Area water users. Service Area 2, and Service Areas 4 through 10 are recommended for collection prioritization. The elevated human health risk for Service Areas 13 and 14 is largely "population exposure" driven. Ophir Elementary and Lone Peak High School drinking water sources are potentially impacted by septic systems in this region. While the well water sources are considered "transient community" public water supplies (not the primary water source) and have not reported any water quality violations, children are generally at a higher risk from waterborne contamination than adults and the water system does not have chlorine disinfection.

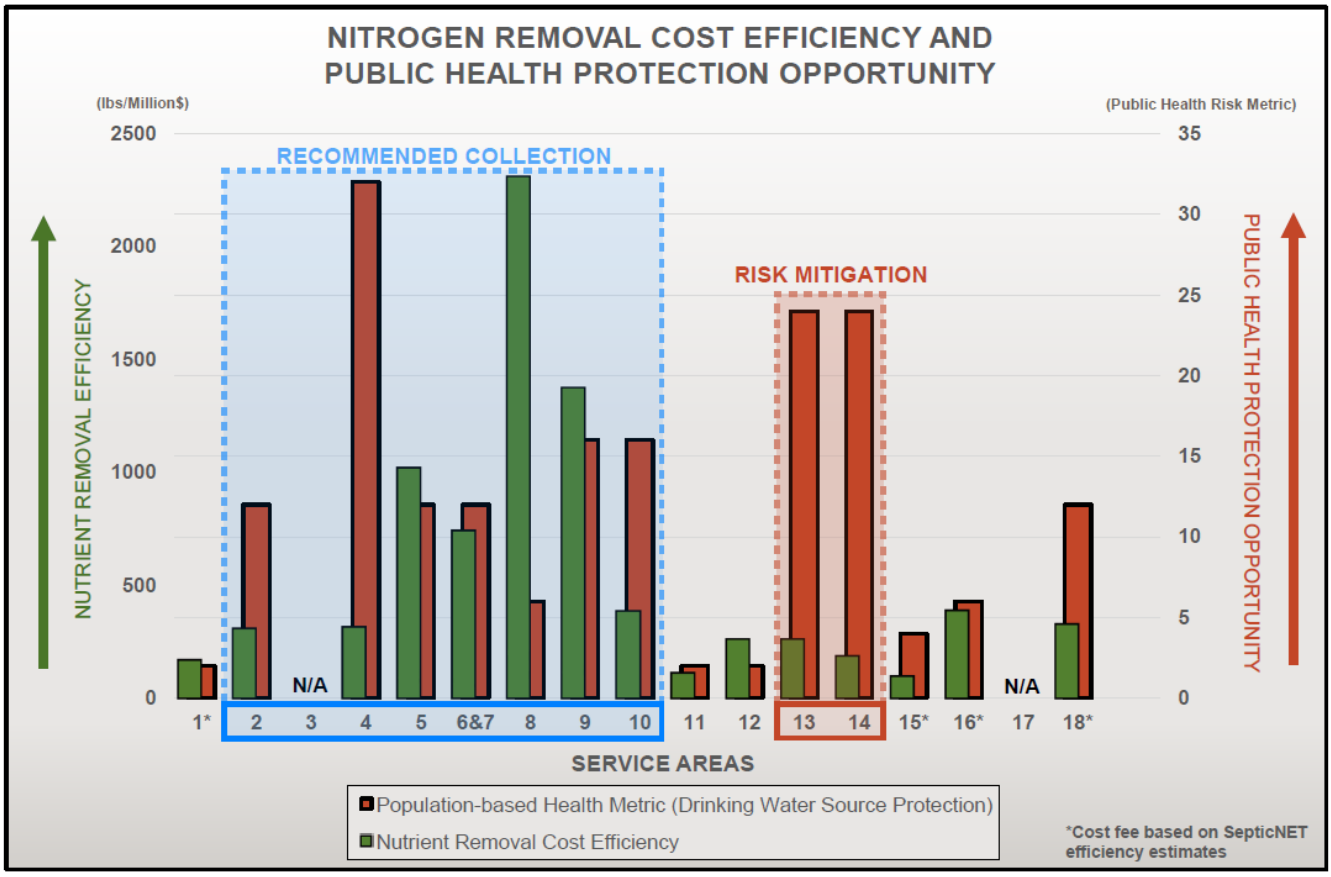


FIGURE 7.4 – NITROGEN REMOVAL VS HUMAN HEALTH PROTECTION

SUPPLEMENTAL DISCUSSION

CURRENT GCCWSD EXTENTS

As the existing members of the GCCWSD, collection system planning to date has assumed that the Quarry (Service Area 5), Buck's T4 (Service Area 8), and the Conoco will be included in Phase 1 of the Gallatin Canyon Sewer. Connection of Service Area 5 is the largest nutrient removal opportunity and the second most cost efficient. While connecting Service Area 8 is not essential for human health protection, it is the most cost-effective for nutrient reduction and is the second largest opportunity for removing nitrogen load. Inclusion of the Conoco requires almost no additional infrastructure and provides an ideal site for the primary lift station. This prioritization effort confirms that the existing GCCWSD properties are important components of an efficient and effective Canyon Sewer extent.

While sewering the existing District will largely serve new and/or ongoing development, including these properties allows for private capital that would otherwise be used for private, lower quality wastewater treatment and disposal systems. This capital availability is critical to the success of the Canyon Sewer Project and improving affordability for GCCWSD services long-term.

CONNECTION PRIORITY #1 – LOWER RAMSHORN SUBDIVISION

Service Area 9 (Lower Ramshorn Subdivision) is also slated to be connected to the Canyon Sewer in Phase 1 based on recent award of $200,000 that is anticipated to improve connection affordability to acceptable levels for existing residents. The GCCWSD's upcoming rate study will provide refined connection fees and user rates to inform the decision, which will ultimately be made by Ramshorn residents and not the district itself.

This collection prioritization study confirms that it is a prudent choice to prioritize to continue planning for a future Ramshorn connection. This property accounts for a large portion of existing nutrient loading and is directly adjacent to the existing District boundaries. Of the Service Areas not already included in the GCCWSD, Service Area 9 ranks second in nutrient removal and cost efficiency opportunity and represents a moderate public health risk reduction opportunity.

Addition of this load and many separate future sewer customers during Phase 1 helps extend the public and environmental health benefits of the sewer quickly and improves cost and operational efficiencies. Additionally, MCEP funding eligibility is directly dependent on Ramshorn (or another large group of existing potential sewer users) joining GCCWSD prior to funding award announcements (Spring, 2023).

This Service Area comes with the added benefit of consolidated large existing drainfields that could potentially be reused for GCCWSD effluent disposal.

CONNECTION PRIORITY #2 - EAST OF THE HIGHWAY

While connecting Service Area 4 is relatively expensive, it provides significant opportunity for both nutrient reduction and human health protection. Due to its proximity to the river, a high percentage of the nutrient load likely enters the Gallatin River. At least two actively failing OWTS and a third of the aged OWTS have been identified to be in this area along with measured elevated nitrogen concentrations. Because it is comprised of many independent property owners, it may take time to develop some form of collective majority to improve collection system affordability to acceptable limits and facilitate District annexation. Focused education and outreach efforts are recommended to aid this effort.

While central water would remove the drinking water-related human health risk for this section, it is still important to sewer this section for nutrient reduction purposes and since several OWTSs are failing or reaching the end of their expected useful lives.

Most of the health risk appears to be in the southern half of the Service Area. It is worthwhile exploring splitting this Service Area into smaller areas that could be annexed separately, depending on property owner willingness. This would likely necessitate multiple borings across the highway, which would in effect raise collection costs. However, sewering sections in a timely manner and phasing capital expenses represents an option likely worth further evaluation depending on the results of planned outreach efforts by the District.

CONNECTION PRIORITY #3 - UPPER RAMSHORN

Service Area 10 (upper Ramshorn) was previously not considered a top priority and was not included in the Sewer Service Area delineated during the FS and PER. However, this study showed that, assuming Service Area 9 is also connected, connecting Service Area 10 is still relatively cost effective (ranked sixth for cost efficiency). It also has the fourth most public health protection opportunity and ranks ninth in nutrient load removal. Adding this extent to the Sewer Service Area will not significantly change planning and design outlined in the PER.

While still part of Ramshorn, properties in this area are not likely decide to annex through the same HOA process that is anticipated for Service Area 9. In Service Area 9, all wastewater infrastructure is collectively owned, but in Service Area 10, each property owns its own septic system. This may delay connection.



CONNECTION PRIORITY #4 - LAZY J

Connecting Service Areas 6&7 (Lazy J) scores well for each prioritization category. It has the third largest load and has the fifth most cost-efficient nutrient reduction. Of the Service Areas not already included in the GCCWSD, Service Areas 6&7 have the biggest nutrient removal opportunity as they rank third for cost efficiency opportunity and are tied for fifth best public health protection opportunity. They also have a large existing drainfield that could potentially be reused for GCCWSD effluent disposal.

With respect to human health protection, Lazy J currently operates a comprehensive water system that could be utilized by the District as base infrastructure to provide future central potable water system for the Canyon Area. This represents an opportunity to substantially mitigate the human health risks identified in this study. In particular, Service Area 4 is located proximal to existing and planned water mains that could be extended to serve the east side of Highway 191 in conjunction with planned sewer collection mains (see Connection Priority #2).

CONNECTION PRIORITY #5 - OPHIR ELEMENTARY AND LONE PEAK HIGH SCHOOL

Both schools are located in Service Area 13 which is second highest for human health protection opportunity. For nutrients, there is only moderate removal opportunity, and it is relatively expensive to connect due to the notable length of collection main that would be required. The school district has expressed interest in eventual annexation for student health and environmental benefits, and to reduce their managerial burden of operating public water and public onsite septic. Additionally, as school district property, there is potential for funding opportunities that could substantially improve connection affordability.

CONNECTION PRIORITY #6 - BIGHORN CENTER AREA

Service Area 2 contains the Conoco which is already part of the GCCWSD and slated for Phase 1 connection. The remainder of the area presents moderate human health protection, nutrient removal, and cost efficiency opportunities. The required lift station and dual collection mains elevate the capital cost. Further evaluation is recommended to compare the cost-effectiveness of jus collecting the west side of Highway 191.

CONNECTION PRIORITY #7 - SERVICE AREA 14

Service Area 14 was not originally considered a priority and was not included in the Sewer Service Area evaluated in the PER, primarily due to low density and correspondingly high infrastructure cost on a per

user basis. However, this study showed that it presents a potential human health risk to well users within the service area and to the downgradient school water systems.

CONNECTION PRIORITY #8 - SERVICE AREA 12

Service Area 12 would likely not be recommended for central sewer connection if sewer mains did not have to be extended along its length in order to connect Service Area 13. However, if the schools connect, it may prove economical for future development within the service area to annex into the District

PROPERTIES NOT CURRENTLY RECOMMENDED FOR ANNEXATION

CLUSTER SYSTEM CANDIDATES

Service Areas 1, 15, 16, and 18, on the far north and south ends of the study area were deemed too expensive to be considered further for connection to the Gallatin Canyon Sewer. However, they could pursue other wastewater management improvements independently of the District. In this report, cost estimates for connection to SepticNET cluster systems were provided for each of these Service Areas. Service Area 15 has notable health protection opportunity but is the least cost efficient for nutrient removal. Service Area 16 and 18 are decently cost efficient at nutrient removal and are directly adjacent to the river, making nutrient removal even more important. Additionally, Service Area 18 has notable human health protection opportunity.

The GCCWSD would not plan to have jurisdiction over decentralized systems. However, there may be mutual benefits through future nutrient trading opportunities. Specifically, the Quarry development is anticipating installing multiple SepticNET systems that could be utilized in other service areas once Service Area 4 is connected to the central system. The nutrient load removed by providing enhanced decentralized treatment in Service Area 18, for example, could be used as an offsetting load as the District seeks to manage expanded future groundwater discharge while still achieving net-nutrient reduction goals.

LOWEST PRIORITIES

Service Areas 3 and 17 have no existing loads. Additionally, Service Area 11 presents low health risk, a relatively low nutrient load located relatively far from the Gallatin River, and low density that makes it cost inefficient to connect to central sewer or serve via a cluster system such as SepticNET. Service Area 1 also has a low health risk and is very cost inefficient to serve by a cluster system (note that costs were estimated based off a SepticNET cluster system). There is no need for further wastewater management evaluation for these Service Areas at this time. *If significant growth is planned in any of these Service Areas, wastewater management options should be revisited.*

REFERENCES

Atsdr, 2015. Nitrate/Nitrite – Toxfaqs. Cas#14797-55-8 (Nitrate), 14797-65-0 (Nitrite). Agency for Toxic Substances And Disease Registry, Division Of Toxicology And Human Health Sciences. Atlanta, GA. September, 2015

Drinking Water Branch. (2022). Mt.gov. http://sdwisdww.mt.gov:8080/DWW/

EPA. (2009). National Primary Drinking Water Regulations. EPA 816-F-09-004. Office of Groundwater and Drinking Water.

EPA. (2002). USEPA Onsite Wastewater Treatment Systems Manual https://www.epa.gov/sites/default/files/201506/documents/2004_07_07_septics_septic_2002_osdm_all.

MBMG - Ground Water Investigations Program. (n.d.). Mbmg.mtech.edu. https://mbmg.mtech.edu/WaterEnvironment/GWIP/ProjectUpdate.asp?projectid=GWIPUG&

Montana DEQ. (n.d.). Deq.mt.gov. Retrieved February 28, 2022, from https://deq.mt.gov/files/Water/WQPB/CWAIC/SummaryReports/2020/MT41H001_021_Summary.pdf

Montana DEQ. (2015). How To Perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems (SWTS) Under the Subdivision Review Process.

Water Systems. (2022). Mt.gov. Drinking Water Branch http://sdwisdww.mt.gov:8080/DWW/JSP/SearchDispatch?number=&name=ophir+&county=All&WaterSystemType=All&SourceWaterType=All&PointOfContactType=None&SampleType=null&begin_date=7%2F14%2F2020&end_date=7%2F14%2F2022&action=Search+For+Water+Systems

WGM Group, & AE2S. (2020). Canyon Area Feasibility Study [Review of Canyon Area Feasibility Study].

WGM Group, & AE2S. (2021). Gallatin Canyon Sewer Preliminary Engineering Report [Gallatin Canyon Sewer Preliminary Engineering Report].

APPENDIX A

INVENTORY DIRECTORY AND METADATA

1.0 FILE DIRECTORY

A word document “Updated Septic Inventory Metadata” is included in the database. This should be regularly updated to reflect the current location and contents of the various files related to the inventories described in this memo. It contains the working version of **Table 1** as well as a place to document file editing history.

TABLE 1: INVENTORY FILE DIRECTORY

FILE	DESCRIPTION	LOCATION
Septic Inventory	ArcPro Map and Geodatabase (includes discharge, tank and treatment unit, and well inventory data, relevant cadastral data, and other supporting files)	W:\Projects\210621\GIS\MXD
Updated Discharge Inventory.xls	Excel workbook with base data for Discharge feature, Existing Load Summary Calcs, data assumptions, GWIC well data, etc.	W:\Projects\210621\GIS\Tables
Updated Tank and Treatment Inventory.xls	Excel workbook with base data for Tank and Treatment Unit Feature	W:\Projects\210621\GIS\Tables
N Data.xls	Excel workbook with base data from the MBMG’s Groundwater Investigation Gallatin County sample sights within the Canyon Study Area.	W:\Projects\210621\GIS\Tables

Note: Health Risk Maps are in NAD 1983 UTM Zone 12N and meters. All other maps and features are in MT State Plane and feet. Pay attention to spatial references when using files.

2.0 DISHCARGE INVENTORY METADATA

The 30 columns of data included in the Discharge Inventory and a brief description of their basis can be seen in **Table 2** below.

TABLE 2: DATA TYPES INCLUDED IN DISCHARGE INVENTORY

COLUMN NAME	DESCRIPTION
Permit Available?	Whether or not a permit was located and used as the basis for data entry of this point, marked as Yes (Y) or No (N).
GCCHD Site and GCCHDWWTP	Permit identifiers that can be queried at Document Search (mt.gov). If no entry, this system is assumed to be unpermitted.
Purpose	New, Upgrade, Replacement… Inconsistently entered.
NonRes	Residential homes are marked N. All else marked Y
USE	Residential, Commercial, Mixed, Other, based off permit. Inconsistently entered.
System Type	Public (10+ connections), Individual (1), Shared (2), Multi-User (3-9)
System Type_ Assigned	Entries without System Type data already available were assigned “individual.” All but one of these were residential units.
AsbltDate	As-Built approval Date. Inconsistently entered.
IssueDate	Date permit issued. Inconsistently entered.
InspDate	Date inspected by GCCHD staff. Inconsistently entered.
IssuYr	Year permit issued, if applicable. Inconsistently entered.
Age	County dataset had this as the year from "IssueDate" for some systems. Where this was blank in the original data set and other date information was available, an estimated year was entered. Age of system can be assumed to be current year-this column.
TreatmentC	Treatment Type (See Codes table below). Rarely entered. Assumed to be standard septic system unless other entries indicate otherwise.
DischargeC	Discharge Type (See Codes table below). Rarely entered. Assumed to be standard septic system unless other entries indicate otherwise. Note that most system marked dose tank (DT) likely also have a septic tank (ST).
Details	Treatment and Discharge Details. Notes from county database, plus additional notes. "x" in this column mean that the number of bedrooms was taken from the cadastral layer.
Bedrooms	Number of bedrooms, based on permit and/or cadastral info.
Discharge	Design discharge capacity (gpd), based on permit or design standards for bedrooms based off cadastral layer.
Replaces	Old permitted system replaced by this permit.
DischargeP	Discharge permit number (public systems permitted through DEQ only).
Treatment Level	Assigned treatment level. Most common inputs are "Level 2' and "Septic", however custom inputs can be accounted for as is the case for the Spray irrigation from Bucks T-4. If no other information indicates otherwise, standard septic was assumed.

COLUMN NAME	DESCRIPTION
Population Equivalent	Calculated using design flow for commercial applications where design flow is divided by the population equivalent (PE) flow of 81gpd/PE. This value takes seasonal use of non-domestic discharges in Big Sky into consideration, assuming a seasonality factor of 0.61. For residential flows and multi-residence systems each residence is assumed to be occupied by the MT DEQ design standard of 2.5 people. Notes: Population Equivalent based on individual residences was chosen as opposed to design flow to more accurately assess likely loading compared to using the septic system design flow which results in an overestimate of nutrient loading. For example, a 4-bedroom home would be considered to have 5-6 residents by design flow standards, and that assumption does not match local population data.
Total TN load (g/day)	Calculated by multiplying PE by 11.2gN per PE per day.
Treatment Efficacy (% removal)	Treatment efficacy % TN removal, as a decimal based on treatment level. The EPA has established a 10% nitrogen reduction in septic tanks and an additional 20% reduction as effluent travels through the vadose zone – combined this leads to 28% reduction for septic systems. The 10% tank reduction and 60% nutrient reduction from level 2 treatment were combined to give 64% nutrient reduction for most level 2 systems. While some level 2 technologies can better treat nutrients, this is a valid conservative estimate. Septic systems are assigned a treatment efficiency of 0.28 and level 2 system are assigned 0.64. For Example, the spray irrigation for Bucks T-4 was given a 0.95 TN treatment efficacy, the Quarry's proposed Septic Net system was assigned 0.8, and the seepage tanks were a 0.10 TN removal rating.
Total N Load to Aquifer (g/day)	Calculated by: Total TN load (g/day) * (1-"Treatment Efficacy (% removal)")
Total N Load to Aquifer (lbsTN/year)	Total Load to River converted to lbs per year
EQ	An identifier used by state and county officials.
Notes	Notes from county database or entered during inventory update
Use_Assigned	Residential, Commercial, Shared, Mixed, Other, etc. Based off permit or cadastral data.
Service Area	Service Area the discharge is located in.
Longitude	Longitude, as calculated by ArcPro, in GCW_WGS_1984 datum (maps and shapefiles are all projected in NAD_1983_2011_StatePlane_Montana_FIPs_2500_Ft_Intl). Many of these were adjusted and no longer align with the locations in the county database.
Latitude	Latitude, as calculated by ArcPro, in GCW_WGS_1984 datum (maps and shapefiles are all projected in NAD_1983_2011_StatePlane_Montana_FIPs_2500_Ft_Intl). Many of these were adjusted and no longer align with the locations in the county database.

TABLE 3: TREATMENTC CODES

CODE	TREATMENT UNIT TYPE
CL	Effluent Chlorine System
DT*	Dose Tank
DT/ST	Dose Tank/Septic Tank
ISF	Intermittent Sand Filter
LGN	Lagoon System
OBSF	Open Bottom Sand Filter
RSF	Recirculating Sand Filter
RTF	Recirculating Trickling Filter
SBR	Sequenced Batch Reactor
ST	Septic Tank

*Note: most systems marked DT likely also have ST

TABLE 4: DISCHARGEC CODES

CODE	DISCHARGE UNIT TYPE
ABBED	Absorption Bed
DTDF	Deep Absorption Trenches
ESM	Elevated Sand Mound
FILL	Raised Drainfield
GYPD	Gray Water Drainfield
HOLD	Holding Tank
OBSF	Open Bottom Sand Filter
PDBED	Pressure Dosed Absorption Bed
PDDF	Pressure Dosed Drainfield
SCDF	Shallow Capped Dosed Drainfield
SEEP	Seepage Pit
SPI	Spray Irrigation Area
ST	Standard Drainfield

The report generally explores the OWTS inventory for existing systems in all service areas except 5 and 8, where OWTS and loading data associated with planned growth is explored. The table below presents the OWTS Discharge Inventory Summary based off of existing systems only (not considering the impending growth in service areas 5 and 8).

TABLE 5: ONSITE WASTEWATER TREATMENT SYSTEMS (OWTS) DISCHARGE INVENTORY SUMMARY – EXISTING ONLY

ZONE	TOTAL PERMITTED FLOW (GPD)	TOTAL PE	TOTAL NUMBER OF SYSTEMS	NUMBER OF NON-DISCHARGING SYSTEMS*	NUMBER OF SMALL DISCHARGING SYSTEMS	NUMBER OF LARGE DISCHARGING SYSTEMS	TOTAL N LOAD TO RIVER (G/DAY)	TOTAL ANNUAL N LOAD TO RIVER (LBS/YR)	RANKED N LOADS (1 = BIGGEST LOADER)
1	3,475	25	9	0	9	0	171.4	138	13
2	10,199	121	12	0	8	4	647.6	521	4
3	0	0	0	0	0	0	0.0	0	15
4	14,563	161	26	3	18	5	973.8	784	3
5	0	0	0	0	0	0	0.0	0	15
6	20,000	247	1	0	0	1	995.6	801	2
7	0	0	0	0	0	0	0.0	0	15
8	17,700	219	3	0	2	1	159.9	129	14
9	14,800	183	2	1	0	1	1,473.4	1,186	1
10	5,900	45	17	1	16	0	362.4	292	7
11	3,125	26	8	0	8	0	213.5	172	11
12	2,550	24	7	0	6	1	190.6	153	12
13	5,525	67	2	0	0	2	301.9	243	10
14	5,260	43	15	0	15	0	342.7	276	9
15	6,500	56	28	6	22	0	455.5	367	6
16	3,976	44	6	0	4	2	356.8	287	8
17	0	0	0	0	0	0	0.0	0	15
18	8,471	88	24	5	17	2	602.9	485	5
TOTALS	**122,044**	**1,349**	**160**	**16**	**125**	**19**	**7,248.0**	**5,832**	

3.0 TANK AND TREATMENT UNIT INVENTORY METADATA

The 28 columns of data included in the Tank and Treatment Unit Inventory and a brief description of their basis can be seen in **Table 6** below.

TABLE 6: DATA TYPES INCLUDED IN TANK AND TREATMENT UNIT INVENTORY

COLUMN NAME	DESCRIPTION
GPS	Is the location in the county database based on a GPS reading during an inspection by a sanitarian? Y or No.
GCCHD Site and GCCHDWWTP	Permit identifiers that can be queried at Document Search (mt.gov). If no entry, this system is assumed to be unpermitted.
Purpose	New, Upgrade, Replacement… Inconsistently entered.
NonRes	Residential homes are marked N. All else marked Y
USE	Residential, Commercial, Mixed, Other, based off permit. Inconsistently entered.
System Type	Public (10+ connections), Individual (1), Shared (2), Multi-User (3-9)
AsbltDate	As-Built approval Date. Inconsistently entered.
IssueDate	Date permit issued. Inconsistently entered.
InspDate	Date inspected by GCCHD staff. Inconsistently entered.
IssuYr	Year permit issued, if applicable. Inconsistently entered.
Age	County dataset had this as the year from "IssueDate" for some systems. Where this was blank in the original data set and other date information was available, an estimated year was entered. Age of system can be assumed to be current year minus this column.
TreatmentC	Treatment Type (See Codes table below). Rarely entered. Assumed to be standard septic system unless other entries indicate otherwise.
DischargeC	Discharge Type (See Codes table below). Rarely entered. Assumed to be standard septic system unless other entries indicate otherwise. Note that most system marked dose tank (DT) likely also have a septic tank (ST).
Details	Treatment and Discharge Details. Notes from county database, plus additional notes. "x" in this column mean that the number of bedrooms was taken from the cadastral layer.
Seepage Pit?	Marked Y if it is a seepage pit.
Extra Treatment?	Marked Y if it has more treatment than a standard septic system (not level 2, spray irrigation, etc.)
Holding Tank?	Marked Y if it is a holding tank (provides no discharge).
Bedrooms	Number of bedrooms, based on permit and/or cadastral info.
Discharge	Design discharge capacity (gpd), based on permit or design standards for bedrooms based off cadastral layer.
Replaces	Old permitted system replaced by this permit.
DischargeP	Discharge permit number (public systems permitted through DEQ only).
EQ	An identifier used by state and county officials.
Notes	Notes from county database or entered during inventory update
Model	Residential, Commercial, Shared, Mixed, Other, etc. Based off permit or cadastral data.

COLUMN NAME	DESCRIPTION
LocationBasedOnPermit?	Marked yes if the location was verified to be close to the real location, based on permit and as-built information, if GPS is marked Y, or its location was clearly visible from aerial data. Note that these confirmed locations are still placed based on aerial imagery and are not survey grade. Confirmed locations should be accurate withing 10-20', with better accuracy for those features that are visible or located next to a clear landmark such as a corner of a building or large tree. Otherwise marked N. Note that some tanks from permitted systems are marked N if it was not clear where it was located.
Service Area	Service Area the discharge is located in.
Longitude	Longitude, as calculated by ArcPro, in GCW_WGS_1984 datum (maps and shapefiles are all projected in NAD_1983_2011_StatePlane_Montana_FIPs_2500_Ft_Intl). Many of these were adjusted and no longer align with the locations in the county database.
Latitude	Latitude, as calculated by ArcPro, in GCW_WGS_1984 datum (maps and shapefiles are all projected in NAD_1983_2011_StatePlane_Montana_FIPs_2500_Ft_Intl). Many of these were adjusted and no longer align with the locations in the county database.

4.0 WELL INVENTORY METADATA

The well inventory is spread across two excel files. Data associated with all GWIC well data located in the Canyon Planning Area, regardless of data quality is included in the “Updated Discharge Inventory.xls” in the “GWIC Wells Attribute Table” tab. This table contains data about each well such as age, construction, use, and output. Some contain water quality data. The only data column added to this spreadsheet that differs from content directly available from GWIC labels each well with the corresponding service area.

Data associated with wells in the “Groundwater Investigation Program for the Upper Gallatin – Groundwater Monitoring Sites” within the Canyon Planning Area are saved in “N Data.xls” and an associated shapefile. This investigation is still underway; additional data and data verification will be made available at an unspecified date, along with a final report. The base data used here was collected by MBMG staff, properly verified and of high quality. Locations have been verified by survey or navigational grade GPS and should be accurate. This data is significantly more reliable than the general GWIC dataset.

The water quality data used for this project is all from 2020 and 2021. All water quality samples associated with the inventoried MGBG wells from 2020 and 2021 were used to calculate the number of samples taken as well as the mean and maximum measured concentrations of Nitrate as N, Nitrate +Nitrite as N, TN, and orthophosphate as P for each well. These calculated values were appended as additional columns to the MBMG source data table.

TABLE 7 – SUMMARY WATER QUALITY DATA FROM MGMG UPPER GALLATIN INVESTIGATION (2020-2021)

GWIC ID	SITE NAME	AQUIFER	DEPTH (ft)	NUMBER OF SAMPLES	MEAN NO3-N (mg/l)	MEAN NO3+NO2-N (mg/l)	MEAN TOTAL N as N (mg/l)	MAX NO3-N (mg/l)	MAX NO3+NO2-N (mg/l)	MAX TOTAL N as N (mg/l)
104544	SAN MARINO	217KOTN	102	1	0.09	0	0	0.09	0	0
133410	WESTLAND ENTERPRISES INC * MW #227-009 4	110SNGR	14	14	4.71	3.96	6.19	5.84	5.13	28
133571	HAMMOND PROPERTY MANAGEMENT	110ALVM	31	2	1.81	1.75	5.31	1.81	1.89	8.34
143231	BUCK T-4 * SOUTH WELL	110SNGR	60	1	2.15	2.1	2.49	2.15	2.1	2.49
157945	RAINBOW RANCH LODGE * WELL 1	330MDSN	80	1	0.24	0	0	0.24	0	0
165682	SCENIC LAND DEVELOPMENT [RAMSHORN PWS WELL]	217KOTN	1490	1	0	0	0	0	0	0
167347	MONTANA DEPARTMENT OF TRANSPORTATION	217KOTN	95	1	0.18	0	0	0.18	0	0
169480	RAINBOW RANCH LODGE * WELL 2	330MDSN	140	1	0.51	0.48	0	0.51	0.48	0
185464	HAMMOND, SCOTT	211FRNR	115	1	0.71	0.66	1.25	0.71	0.66	1.25
215176	LAZY-J GRAVEL PIT * MONITORING WELL	211FRNR	100	1	0	0	0	0	0	0
220134	RIMROCK, LLC	217KOTN	40	13	0.18	0.03	0	0.23	0.23	0
220140	RIMROCK, LLC	217KOTN	92	1	0	0	11.1	0	0	11.1
220141	RIMROCK, LLC	217KOTN	55	1	0.26	0.27	0	0.26	0.27	0
220481	HOMELANDS DEVELOPMENT CO. CCC	110ALVM	20	14	1.57	1.51	1.9	1.9	2.01	2.48
222607	S LAZY J WATER SYSTEMS	211FRNR	420	1	0	0	0	0	0	0
222627	FRENCH BETSY	110ALVM	35	14	3.32	2.93	3.6	4.29	3.79	4.93
235887	OPHIR SCHOOL C/O SUPERINTENDENT ANNE MARIE MESTRADA	217KOTN	50	12	1.07	0.96	1.19	1.62	1.54	2.02
246433	BOSTWICK PROPERTIES INC. * MW-13	110SNGR	91	8	0.01	0	0.64	0.05	0	3.8
257256	RAMSHORN SUBDIVISION * BUOTTE HOME	110ALVM	17.25	14	1.87	1.67	2.12	2.07	1.94	2.81
257257	RAMSHORN SUBDIVISION * TOWLE RESIDENCE	217MDDY	150	1	0	0	1.9	0	0	1.9
300341	KENYON NOBLE CONCRETE PLANT	UNASSIGNED	50	1	1.16	1.13	1.64	1.16	1.13	1.64
303694	RAMSHORN SUBDIVISION * MW-NORTHEAST CORNER	110ALVM	25.1	14	1.98	1.99	2.44	2.59	5.27	5.83
308526	UG FWP AREA * UG-1	110ALVM	21	8	0	0	0	0	0	0
308527	UG FWP AREA * UG-2	110ALVM	18	8	0	0	0	0	0	0
308528	UG FWP AREA * UG-3	110ALVM	23	8	0	0	0.19	0	0	1.56
308530	UG FWP AREA * UG-4	110ALVM	26	8	0.04	0.16	0.13	0.07	0.78	1.07
308532	UG FWP AREA * UG-5	110ALVM	31	8	0.6	0.51	0.47	0.71	0.66	1.13
308545	UG FWP AREA * UG-6	110ALVM	46	8	1.27	1.16	1.55	1.43	1.24	1.83
308558	UG FWP AREA * UG-7	110ALVM	45	4	0.29	0.17	0	0.38	0.38	0
308703	MONTANA FISH WILDLIFE AND PARKS MBMG UG-8 * UG-8	110ALVM	33	8	1.44	1.19	1.4	1.78	1.44	2.13
308704	MONTANA FISH WILDLIFE AND PARKS MBMG UG-9 * UG-9	110ALVM	35	8	1.16	1.05	1.14	1.64	1.7	2.27
308705	MONTANA FISH WILDLIFE AND PARKS MBMG UG-10 * UG-10	110ALVM	38	8	0.98	0.89	2.27	1.42	1.65	12.6
				Total= 194	**Mean= 0.86**	**Mean= 0.77**	**Mean= 1.53**	**Max = 5.84**	**Max = 5.27**	**Max = 28**

To allow averaging in **Table 7**, non-detect values were replaced with 0. The relevant detection limits are as follows:

Nitrate-N	0.010 mg/L (ppm)
Nitrite-N	0.010 mg/L (ppm)
Nitrate + Nitrite-N	0.200 mg/L (ppm)
Total Nitrogen	1.00 mg/L (ppm)
Ortho Phosphate-P	0.020 mg/L (ppm)

The reporting limits are:

Nitrate-N	0.050 mg/L (ppm)
Nitrite-N	0.050 mg/L (ppm)
Nitrate + Nitrite-N	0.200 mg/L (ppm)
Total Nitrogen	1.00 mg/L (ppm)
Ortho Phosphate-P	0.100 mg/L (ppm)

Additional metadata describing the various columns provided by GWIC for both sets of data can be found here: http://mbmggwic.mtech.edu/sqlserver/v11/help/pdf/GWIC_Metadata_ZF.pdf

5.0 CADASTRAL METADATA

Cadastral data was downloaded in January 2022, clipped to the canyon study area. Relevant fields were appended to the base shapefile download using SQL. This is saved as shapefile “Cadastral Data” in the “Septic Inventory” geodatabase.

The most up to date source data can be found at http://svc.mt.gov/msl/mtcadastral.

6.0 ARCNLET MODEL METADATA

A detailed groundwater model will be developed in 2022 and 2023, building off of recent MBMG Gallatin Canyon Groundwater Study and incorporating data from field efforts that are scheduled in summer 2022. This will be used to update the preliminary analyses described below and in the main report. Note that data related to groundwater gradient and hydraulic conductivity are especially loose estimates and will be updated as the study progresses.

According to MT DEQ's *How to Perform a Nondegradation Analysis,* "An assessment of impacts to down-gradient drinking water supplies, including impacts from pathogens, should show 4-log microbial inactivation or the removal of 99.99% of viruses. 4-log microbial attenuation typically occurs within 200 days." 4-log microbial reduction is the limit that reasonably protects public health. **Figure 5.2** in the Gallatin Canyon Wastewater Inventory and Sewer Prioritization Technical Memorandum shows illustrated septic plumes roughly modeling the 200-day travel paths and their intersection with domestic wells and monitoring wells with known elevated nitrogen.

To develop this map, The Discharge Inventory data was used to help illustrate potential pathogen exposure risks by using a modified application of ArcNLET. ArcNLET is a simplified nitrogen fate and transport model that provides conceptual level spatial analysis based on quantitative inputs as base aquifer assumptions that was used to evaluate cumulative effects of OWTS clusters. While designed for nitrogen, this model essentially evaluates first order decay as something moves along a flow path according to hydraulic gradient and conductivity. The model was modified to show the plumes associated with 4 log decay over approximately 200 days.

To run the ArcNLet model, a constant porosity of 0.2 was assumed and a DEM of groundwater elevations based on average static water levels (SWL) from the 2020/2021 MBMG Big Sky Canyon Groundwater Project was created to represent Hydraulic Gradient. These values are used in all scenarios run through the model.

The scope of the model is limited to only the area where there was sufficient SWL data from MBMG study wells (having highly accurate location and SWL readings). The scope was further reduced to only include the area between Beaver Creek and the West Fork of the Gallatin since those likely act as hydraulic boundaries, not captured in the Hydraulic Gradient data used.

Discharges sites inventoried that are included in the model scope area were used as the “sources” in the ArcNLet model. Note that the Spray Irrigation discharge in Service Area 8 was not included as a source since most viral load should be removed via the lagoon and chlorination treatment that proceeds disposal.

The included discharge sites were divided into three categories based on drainfield width. Most sources were assumed to have a width of 15 meters which is a conservatively wide estimate for most drainfields in the scope area. The large drainfield in Service Area 6 and the smaller two drainfields in Service Area 9 were assumed to have a width of 40 meters based off of permit data. The largest drainfield in Service Area 9 was assumed to have a width of 89 meters, again based off of permit data. Although the Ophir school (service area 13) discharge is also large, its drainfield is relatively narrow so this was evaluated with a width of 15 meters. Sources from these three categories were run through the model separately, with their corresponding widths. The resulting plumes are overlain in the maps presented throughout the report. Varying source width allowed for a better illustration of the area potentially impacted by these larger discharges.

Each set of sources was run through two conductivity scenarios to reflect the uncertainty in local hydraulic conductivity: 3.048 meters/day (10ft/day) and 30.48 meters/day (100ft/day). Only rough estimates of hydraulic conductivity in the canyon’s alluvial aquifer are known at this time, but it mostly likely falls between 10 and 100ft/day, likely on the higher end of that range. The red plumes illustrate 200-day travel time in a lower conductive scenario (10ft/day) and the yellow plumes illustrate a highly conductive scenario (100ft/day).

Sources, hydraulic conductivity, hydraulic gradient, porosity, and a surface water shapefile with approximated elevations were used to generate particle paths (shapefiles that show the center path and flowrate of a particle leaving each source).

Input initial and final concentrations were then set to represent 4-log removal. The decay rate (k) was set at 0.015 for the low hydraulic conductivity scenarios and 0.03 for the high to have the 4-log removal met at the 200-day travel time (as measured on the particle paths). Default longitudinal dispersivity values were used, and a horizontal dispersivity of 0.8 was manually input.

An example of the transport inputs used for the model for the 40 meter wide sources and high hydraulic conductivity can be seen in **Figure 1** below.

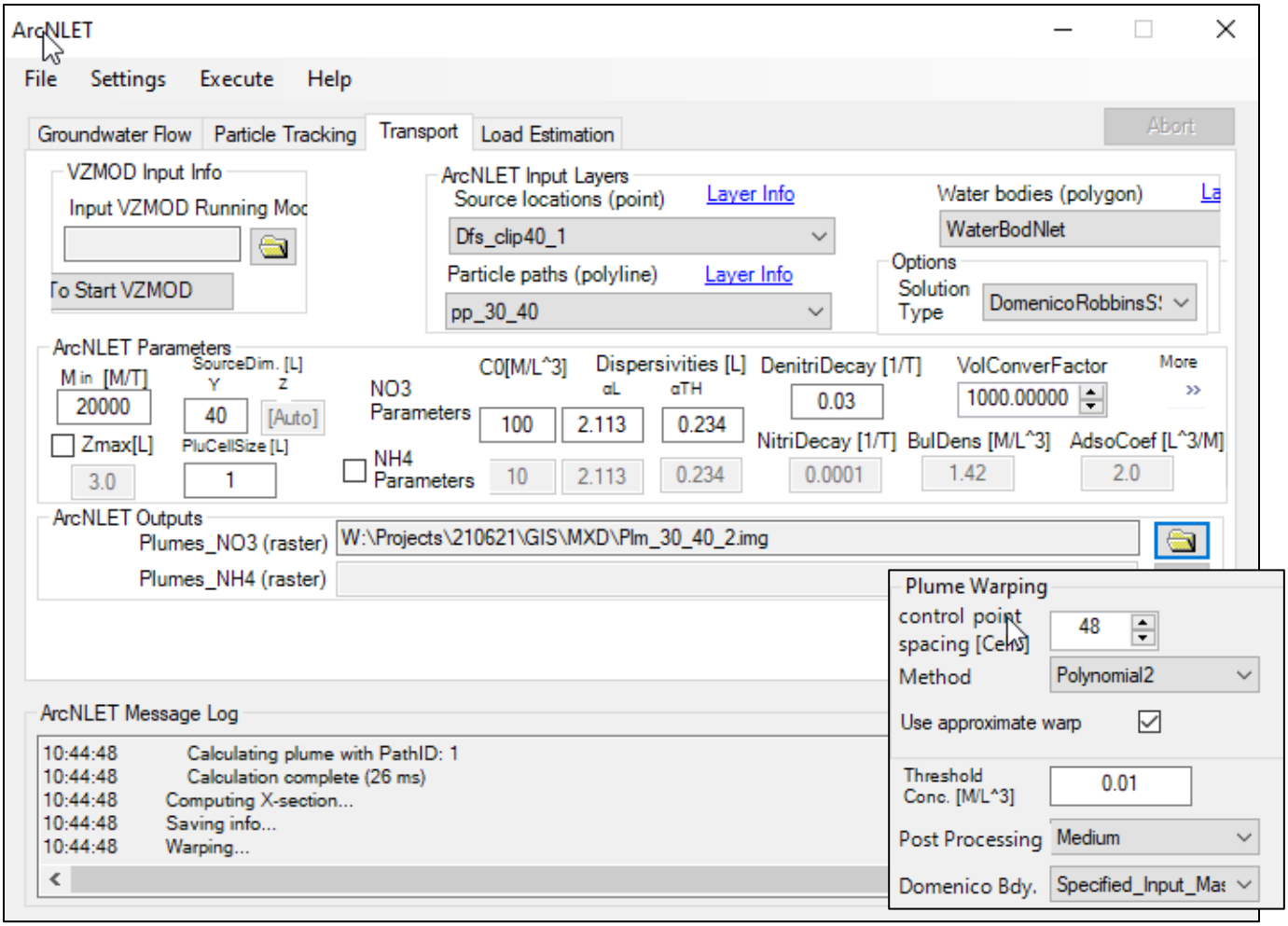


FIGURE 1: SAMPLE ARCNLET 200-DAY TRANSPORT TIME MODEL INPUTS

Once plumes were generated for each set of sources at both the high and low hydraulic conductivity values, these plume shapefiles were overlain and color-coded as seen in the maps presented in Section 5 of the Canyon Septic Inventory and Collection Prioritization Report.

Note: Health Risk Maps are in NAD 1983 UTM Zone 12N and meters. (All other maps and features are in MT State Plane and feet.) Pay attention to spatial references when using files.

APPENDIX B

INVENTORY MAPS BY SERVICE AREA

GALLATIN CANYON

Septic Analysis

OWTS Inventory Overview

N

Gallatin Rd

Lone Mountain Trl

Michener Creek Rd

Fortress Rd

Beaver Creek Rd

Porcupine Creek Rd

Pessl Rd

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Legend

Service Areas

Discharge Sites

- Permitted
- Unpermitted

Tanks and Treatment Units

Custom

- Permitted
- Unpermitted

WGMGROUP

www.wgmgroup.com

LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**6/30/2022**

This is not a legally recorded map or survey. WGM does not guarantee the accuracy, current status, or completeness of the material contained herein and is not responsible for any misuse / misrepresentation of this information or its derivatives. This graphic representation is for general planning purposes only.

0 0.25 0.5 1 1.5 2 Miles

GALLATIN CANYON

Septic Inventory

Service Area: 1

N

Dudley Creek Rd

Dudley Creek

Gallatin Rd

Levinski Creek

Lone Mountain Trl

Moton Ln

16 lbs/yr

8 lbs/yr

41 lbs/yr

165 lbs/yr

20 lbs/yr

1 lbs/yr

136 lbs/yr

72 lbs/yr

17 lbs/yr

12 lbs/yr

6 lbs/yr

81 lbs/yr

1

2

3

4

Legend

- Service Areas
- Parcels

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

0 0.07 0.15 0.3 0.45 0.6 Miles

WGMGROUP
www.wgmgroup.com

LOC:	**GALLATIN**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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GALLATIN CANYON

Septic Inventory

Service Area: 2

N

Gallatin Rd

16 lbs/yr

41 lbs/yr

165 lbs/yr

20 lbs/yr

16 lbs/yr

8 lbs/yr

1 lbs/yr

West Fork Gallatin River

Gallatin River

Lone Mountain Trl

136 lbs/yr

72 lbs/yr

16 lbs/yr

16 lbs/yr

17 lbs/yr

12 lbs/yr

6 lbs/yr

16 lbs/yr

Morton Ln

81 lbs/yr

1

2

3

4

5

Legend

Service Areas

Parcels

Tanks and Treatment Units

Location Unconfirmed

Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

≤ 50

≤ 200

≤ 500

> 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 90 180 360 540 720

Feet

GALLATIN CANYON

Septic Inventory

Service Area: 4

N

1
2
3
4
5
6
7
8

16 lbs/yr
16 lbs/yr
17 lbs/yr
12 lbs/yr
6 lbs/yr
16 lbs/yr
81 lbs/yr
8 lbs/yr
16 lbs/yr
16 lbs/yr
16 lbs/yr
24 lbs/yr
43 lbs/yr
43 lbs/yr
43 lbs/yr
16 lbs/yr
16 lbs/yr
32 lbs/yr
32 lbs/yr
65 lbs/yr
32 lbs/yr
49 lbs/yr
49 lbs/yr
16 lbs/yr
16 lbs/yr
16 lbs/yr
54 lbs/yr
801 lbs/yr
16 lbs/yr
96 lbs/yr
16 lbs/yr

Gallatin Rd
Morton Ln
Gallatin River
Michener Creek
Michener Creek Rd
Colters Run Loop
Straight Iron Rd
Running Iron Rd
Cold Iron Rd

Legend

- Service Areas
- Parcels
- Select Large Disposal Areas

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 155 310 620 930 1,240 Feet

GALLATIN CANYON

Septic Inventory

Service Area: 7

N

5

6

7

8

9

4

Gallatin Rd

Running Iron Rd

Straight Iron Rd

Cold Iron Rd

Cummings Ln

32 lbs/yr

32 lbs/yr

32 lbs/yr

65 lbs/yr

49 lbs/yr

49 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

54 lbs/yr

Legend

Service Areas

Parcels

Tanks and Treatment Units

Location Unconfirmed

Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

≤ 50

≤ 200

≤ 500

> 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 62.5 125 250 375 500 Feet

GALLATIN CANYON
Septic Inventory
Service Area: 8

N

801 lbs/yr
16 lbs/yr
Discharge via Spray Irrigation
96 lbs/yr
16 lbs/yr
32 lbs/yr
395 lbs/yr

6
7
8
9
10

Cummings Ln
Cummings Ln
Cummings Ln
Cummings Ln
Cummings Ln
Cummings Ln
Cummings Ln
Hyalite Dr
Silver Run Rd
Iron Rd

Legend

- Service Areas
- Parcels
- Select Large Disposal Areas

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

0 0.02 0.04 0.08 0.12 0.16 Miles

WGMGROUP
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LOC:	**GALLATIN**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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GALLATIN CANYON

Septic Inventory

Service Area: 9

N

8

9

10

12

Cummings Ln

Silver Run Rd

Sawtooth Dr

Blacktail Ln

Gallatin Rd

Anaconda Dr

Paintbrush Pl

Primrose Ln

Riverview Ln

Beartooth Rd

Rocky Range Ln

395 lbs/yr

32 lbs/yr

16 lbs/yr

Legend

- Service Areas
- Parcels
- Select Large Disposal Areas

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 62.5 125 250 375 500 Feet

GALLATIN CANYON

Septic Inventory

Service Area: 10

N

8

9

10

11

12

Hyalite Dr

Silver Run Rd

Ruby Range Ln

Riverview Ln

Solar Ranch Ln

Sonic Dr

Anaconda Dr

32 lbs/yr

16 lbs/yr

395 lbs/yr

Legend

- Service Areas
- Parcels
- Select Large Disposal Areas

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 62.5 125 250 375 500 Feet

GALLATIN CANYON

Septic Inventory

Service Area: 11

N

8

9

10

11

12

13

14

Solar Ranch Ln

Riverview Ln

Lazy T4 Rd

Scenic Dr

16 lbs/yr

32 lbs/yr

395 lbs/yr

42 lbs/yr

Legend

- Service Areas
- Parcels
- Select Large Disposal Areas

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 90 180 360 540 720

Feet

GALLATIN CANYON

Septic Inventory

Service Area: 14

N

11

12

13

14

15

Lazy T4 Rd

Gallatin Rd

Windy Pass Trl

Twin Peaks Trl

Fortress Rd

Beaver Creek Rd

Beaver Mountain Trl

Twin Antler Dr

Grouse Ridge Dr

Porcupine Creek

16 lbs/yr

56 lbs/yr

32 lbs/yr

42 lbs/yr

194 lbs/yr

49 lbs/yr

46 lbs/yr

Legend

Service Areas

Parcels

Tanks and Treatment Units

Location Unconfirmed

Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

≤ 50

≤ 200

≤ 500

> 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 125 250 500 750 1,000 Feet

GALLATIN CANYON

Septic Inventory

Service Area: 15

N

14

15

16

Beaver Creek Rd

Beaver Creek

Beaver Mountain Trl

Twin Antler Dr

Grouse Ridge Dr

Doe Creek Trl

Gallatin Rd

16 lbs/yr

18 lbs/yr

46 lbs/yr

96 lbs/yr

24 lbs/yr

0 lbs/yr

Legend

- Service Areas
- Parcels

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

WGMGROUP

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 125 250 500 750 1,000 Feet

GALLATIN CANYON

Septic Inventory

Service Area: 16

14

15

16

17

N

46 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

96 lbs/yr

96 lbs/yr

16 lbs/yr

24 lbs/yr

0 lbs/yr

0 lbs/yr

0 lbs/yr

0 lbs/yr

0 lbs/yr

0 lbs/yr

Twin Antler Dr

Creek Trl

Porcupine Creek Rd

Gallatin Rd

Gallatin River

Legend

- Service Areas
- Parcels

Tanks and Treatment Units

- Location Unconfirmed
- Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

- ≤ 50
- ≤ 200
- ≤ 500
- > 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

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0 90 180 360 540 720 Feet

GALLATIN CANYON

Septic Inventory

Service Area: 18

N

17

18

Gallatin River

Gallatin Rd

Jeep Trl

Twin Cabin Creek

Rainbow Ranch Rd

5 lbs/yr

5 lbs/yr

35 lbs/yr

5 lbs/yr

46 lbs/yr

5 lbs/yr

5 lbs/yr

0 lbs/yr

24 lbs/yr

128 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

16 lbs/yr

Legend

Service Areas

Parcels

Tanks and Treatment Units

Location Unconfirmed

Location Confirmed

Discharge Sites

Total Nitrogen Load (lbs/year)

≤ 50

≤ 200

≤ 500

> 500

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LOC:	**Gallatin**	PROJ MGR:	**Mangold**
TR:	**Multiple**	DRAWN BY:	**Cochran**
BASE:	**ESRI Base Map**	PROJ:	**210621**
FILE:	**SepticInventory**	DATE:	**7/11/2022**

This is not a legally recorded map or survey. WGM does not guarantee the accuracy, current status, or completeness of the material contained herein and is not responsible for any misuse / misrepresentation of this information or its derivatives. This graphic representation is for general planning purposes only.

0 90 180 360 540 720

Feet

APPENDIX C

OPINION OF PROBABLE COST (OPC) TABLES

Engineers Opinion of Probable Costs

(Conceptual, -30% / +50%)

Project Name: Canyon Sewer Project
Project No.:
Prepared By: Luke Stein, Mace Mangold
Reviewed By: Mace Mangold
Date: June 20, 2022

Description: **Collection Costs per Service Area**

- $15/inch diameter / linear foot piping
- Additional $40/linear foot for deep trench (>10-ft depth)
- 20% Contingency
- 18% Engineering and Construction Administation
- 5% Geotech

Item Number	Description	Quantity	Unit	Unit Price	Total	Notes
SERVICE AREA 1 - DUDLEY CREEK AREA						
1.1	SeticNet Treatment	11	LS	$ 50,000.00	$ 550,000	
1.2	20% Contingency		%		$ 110,000.00	
1.3	18% Engineering & Construction Admin		%		$ 118,800.00	
1.40	5% Geotech		%		$ 33,000.00	
				Subtotal	**811,800.00**	
SERVICE AREA 2 - BIGHORN CENTER AREA						
1.1	8" SDR26 PVC Sewer Main	1800	LF	$ 120.00	$ 216,000.00	
1.2	12" SDR26 PVC Sewer Main	1350	LF	$ 180.00	$ 243,000.00	
1.3	4" SDR26 PVC Force Main	200	LF	$ 60.00	$ 12,000.00	
1.4	Manhole	8	EA	$ 15,000.00	$ 120,000	
1.5	Jack & Bore highway crossing	1	EA	$ 150,000.00	$ 150,000	
1.6	Small North Lift Station	1	EA	$ 200,000.00	$ 200,000	
1.7	Connection & Abandonment	1	LS	$ 200,000.00	$ 200,000	
1.8	20% Contingency		%		$ 228,200.00	
1.9	18% Engineering & Construction Admin		%		$ 246,456.00	
1.10	5% Geotech		%		$ 68,460.00	
				Subtotal	**1,684,116.00**	
SERVICE AREA 4 - RIVER FRONT PROPERTIES						
2.1	8" SDR26 PVC Sewer Main	5700	LF	$ 120.00	$ 684,000.00	
2.2	12" SDR26 PVC Sewer Main	0	LF	$ 180.00	$ -	
2.4	Manhole	14	EA	$ 15,000.00	$ 210,000	
2.5	Jack & Bore highway crossing	1	EA	$ 150,000.00	$ 150,000	
2.7	Connection & Abandonment	1	LS	$ 600,000.00	$ 600,000	
2.8	20% Contingency		%		$ 328,800.00	
2.9	18% Engineering & Construction Admin		%		$ 355,104.00	
2.10	5% Geotech		%		$ 98,640.00	
				Subtotal	**2,426,544.00**	
SERVICE AREA 5 - QUARRY PUD						
2.1	8" SDR26 PVC Sewer Main	0	LF	$ 120.00	$ -	
2.2	12" SDR26 PVC Sewer Main	2800	LF	$ 180.00	$ 504,000.00	
2.3	Deep trench (>10-feet)	2700	LF	$ 40.00	$ 108,000.00	
2.4	Manhole	7	EA	$ 15,000.00	$ 105,000	
2.5	Connection & Abandonment	1	LS	$ 200,000.00	$ 200,000	
2.6	20% Contingency		%		$ 183,400.00	
2.7	18% Engineering & Construction Admin		%		$ 198,072.00	
2.8	5% Geotech		%		$ 55,020.00	
				Subtotal	**1,353,492.00**	
SERVICE AREA 6 & 7 - LAZY J UTILITY						
3.1	10" SDR26 PVC Sewer Main	1000	LF	$ 150.00	$ 150,000.00	
3.2	12" SDR26 PVC Sewer Main	1400	LF	$ 180.00	$ 252,000.00	
	Deep trench (>10-feet)	1000	LF	$ 40.00	$ 40,000.00	
3.3	Manhole	6	EA	$ 15,000.00	$ 90,000	
3.4	Connection & Abandonment	1	LS	$ 200,000.00	$ 200,000	
3.5	20% Contingency		%		$ 146,400.00	
3.6	18% Engineering & Construction Admin		%		$ 158,112.00	
3.7	5% Geotech		%		$ 43,920.00	
				Subtotal	**1,080,432.00**	

Table Continued on next page.

SERVICE AREA 8 - BUCKS T-4						
3.1	8" SDR26 PVC Sewer Main	500	LF	$ 120.00	$	60,000.00
3.2	10" SDR26 PVC Sewer Main	500	LF	$ 150.00	$	75,000.00
3.3	Manhole	3	EA	$ 15,000.00	$	45,000
3.4	Connection & Abandonment	1	LS	$ 100,000.00	$	100,000
3.5	20% Contingency		%		$	56,000.00
3.6	18% Engineering & Construction Admin		%		$	60,480.00
3.7	5% Geotech		%		$	16,800.00
				Subtotal		**413,280.00**
SERVICE AREA 9 - RAMSHORN SUBDIVISION (LOWER)						
3.1	8" SDR26 PVC Sewer Main	0	LF	$ 120.00	$	-
3.2	10" SDR26 PVC Sewer Main	1500	LF	$ 150.00	$	225,000.00
3.3	Manhole	4	EA	$ 15,000.00	$	60,000
3.4	Connection & Abandonment	1	LS	$ 300,000.00	$	300,000
3.5	20% Contingency		%		$	117,000.00
3.6	18% Engineering & Construction Admin		%		$	126,360.00
3.7	5% Geotech		%		$	35,100.00
				Subtotal		**863,460.00**
SERVICE AREA 10 - RAMSHORN SUBDIVISION (UPPER)						
3.1	8" SDR26 PVC Sewer Main	2000	LF	$ 120.00	$	240,000.00
3.2	10" SDR26 PVC Sewer Main	0	LF	$ 150.00	$	-
3.3	Manhole	5	EA	$ 15,000.00	$	75,000
3.4	Connection & Abandonment	1	LS	$ 200,000.00	$	200,000
3.5	20% Contingency		%		$	103,000.00
3.6	18% Engineering & Construction Admin		%		$	111,240.00
3.7	5% Geotech		%		$	30,900.00
				Subtotal		**760,140.00**
SERVICE AREA 11 - NORTH FOOTHILLS						
3.1	8" SDR26 PVC Sewer Main	4000	LF	$ 120.00	$	480,000.00
3.2	10" SDR26 PVC Sewer Main	0	LF	$ 150.00	$	-
3.3	Manhole	10	EA	$ 15,000.00	$	150,000
3.4	Connection & Abandonment	1	LS	$ 400,000.00	$	400,000
3.5	20% Contingency		%		$	206,000.00
3.6	18% Engineering & Construction Admin		%		$	222,480.00
3.7	5% Geotech		%		$	61,800.00
				Subtotal		**1,520,280.00**
SERVICE AREA 12 & 13 - SCHOOL COLLECTION						
3.1	8" SDR26 PVC Sewer Main	4000	LF	$ 120.00	$	480,000.00
3.2	10" SDR26 PVC Sewer Main	1000	LF	$ 150.00	$	150,000.00
3.3	Manhole	13	EA	$ 15,000.00	$	195,000
3.4	Connection & Abandonment	1	LS	$ 200,000.00	$	200,000
3.5	20% Contingency		%		$	205,000.00
3.6	18% Engineering & Construction Admin		%		$	221,400.00
3.7	5% Geotech		%		$	61,500.00
				Subtotal		**1,512,900.00**
SERVICE AREA 14 - SOUTH FOOTHILLS						
3.1	8" SDR26 PVC Sewer Main	5000	LF	$ 120.00	$	600,000.00
3.2	10" SDR26 PVC Sewer Main	0	LF	$ 150.00	$	-
3.3	Manhole	13	EA	$ 15,000.00	$	195,000
3.4	Connection & Abandonment	1	LS	$ 200,000.00	$	200,000
3.5	20% Contingency		%		$	199,000.00
3.6	18% Engineering & Construction Admin		%		$	214,920.00
3.7	5% Geotech		%		$	59,700.00
				Subtotal		**1,468,620.00**
SERVICE AREA 15 - SOUTH BEAVER CREEK						
1.1	SeticNet Treatment (residential scale)	50	LS	$ 50,000.00	$	2,500,000
1.2	20% Contingency		%		$	500,000.00
1.3	18% Engineering & Construction Admin		%		$	540,000.00
1.40	5% Geotech		%		$	150,000.00
				Subtotal		**3,690,000.00**

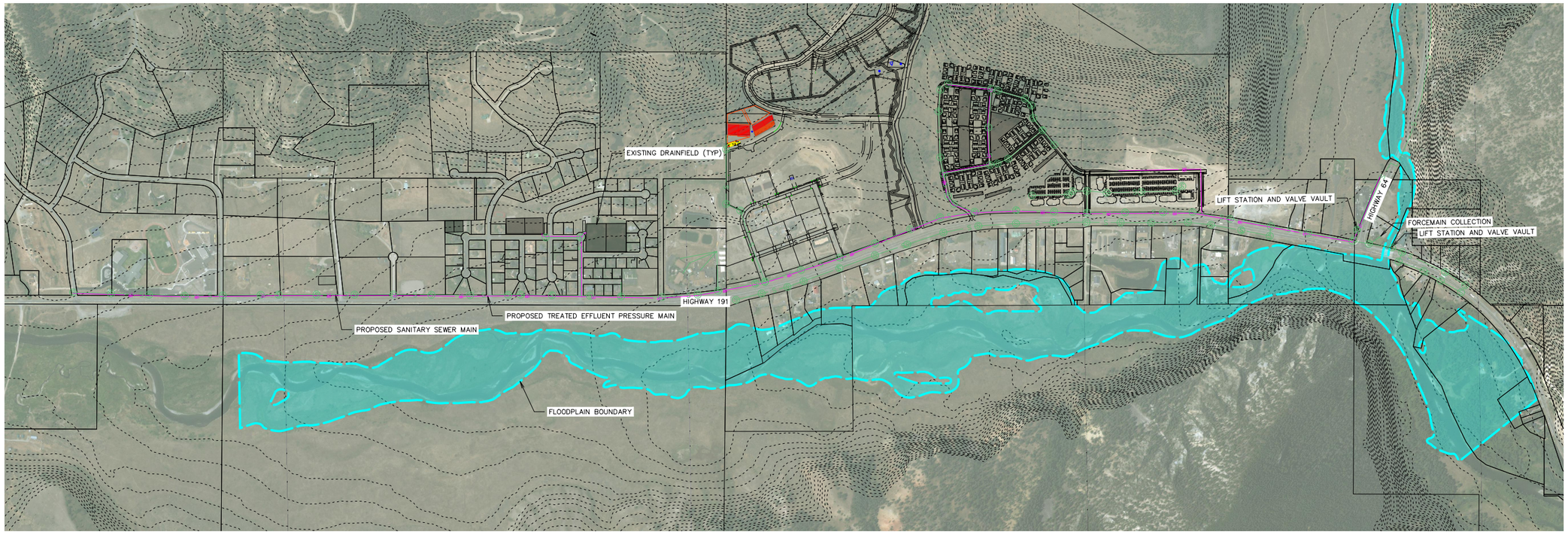
Table Continued on next page.

SERVICE AREA 16 - SOUTH PORCUPINE						
1.1	SeticNet Treatment (Community system)	1	LS	$ 500,000.00	$ 500,000	
1.2	20% Contingency		%		$ 100,000.00	
1.3	18% Engineering & Construction Admin		%		$ 108,000.00	
1.40	5% Geotech		%		$ 30,000.00	
				Subtotal	**738,000.00**	
SERVICE AREA 18 - Corral, Rainbow & Residences						
1.1	SeticNet Treatment (Community system)	2	LS	$ 500,000.00	$ 1,000,000	
1.2	20% Contingency		%		$ 200,000.00	
1.3	18% Engineering & Construction Admin		%		$ 216,000.00	
1.40	5% Geotech		%		$ 60,000.00	
				Subtotal	**1,476,000.00**	
				Total Project Cost	**$ 19,799,064**	**Conceptual: Subject to Change**
				$ 13,859,344.80	**$ 29,698,596.00**	

Please Note: The construction cost estimates presented are based on 2021 dollars. The engineer's opinion of probable project costs (EOPCC) was developed based on other, similar projects, budgetary cost proposals from suppliers, engineering judgement and RS Means cost estimating manuals. The EOPCC cost opinions in this report represent a **Class 4 Estimate** based on the definitions of the Association for Advancement of Cost Engineering (AACE) International. This level of cost opinion is appropriate for planning level evaluations made with incomplete information. The cost opinion at this level of engineering is considered to have an accuracy range of **-30/+50 percent**.The Opinion is only that; it represents the Consultant's best judgment as a design professional. Consultant does not guarantee the accuracy of the Opinion as compared to actual bids or cost to the Client. This is provided for general project budgeting purposes and will not be a guarantee of actual installation costs.

APPENDIX D

PRELIMINARY COLLECTION LAYOUT BY SERVICE AREA



OVERALL SANITARY SEWER PLAN
SCALE 1" = 600'

N

600 0 600 1200
SCALE – FEET

WGM GROUP
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SHEET 2 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

GALLATIN RIVER TASK FORCE
OVERALL SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

REVISIONS:

NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.0
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE: 7/8/2022

SHEET C2.0

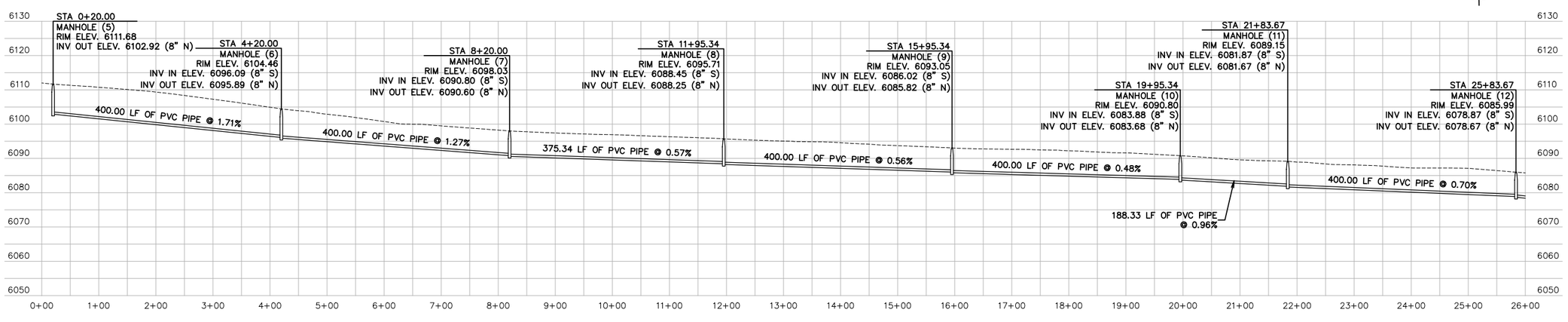


SANITARY SEWER PLAN

SCALE 1" = 100'

100 0 100 200
SCALE – FEET

N



SANITARY SEWER PROFILE

HORIZONTAL SCALE 1" = 100'
VERTICAL SCALE 1" = 16.67'

WGM GROUP
WWW.WGMGROUP.COM

SHEET 3 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

GALLATIN RIVER TASK FORCE
SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

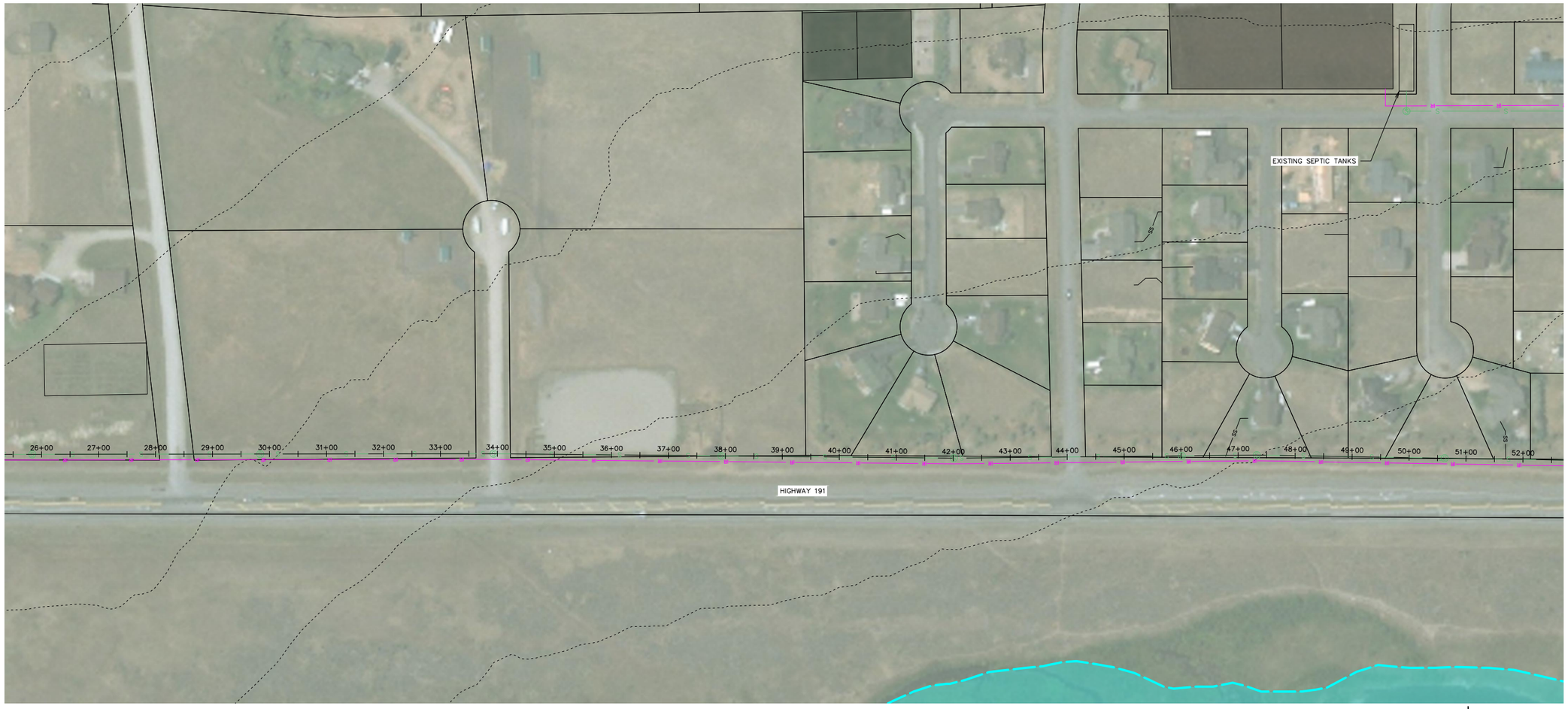
REVISIONS:

NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.1
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE:

7/8/2022

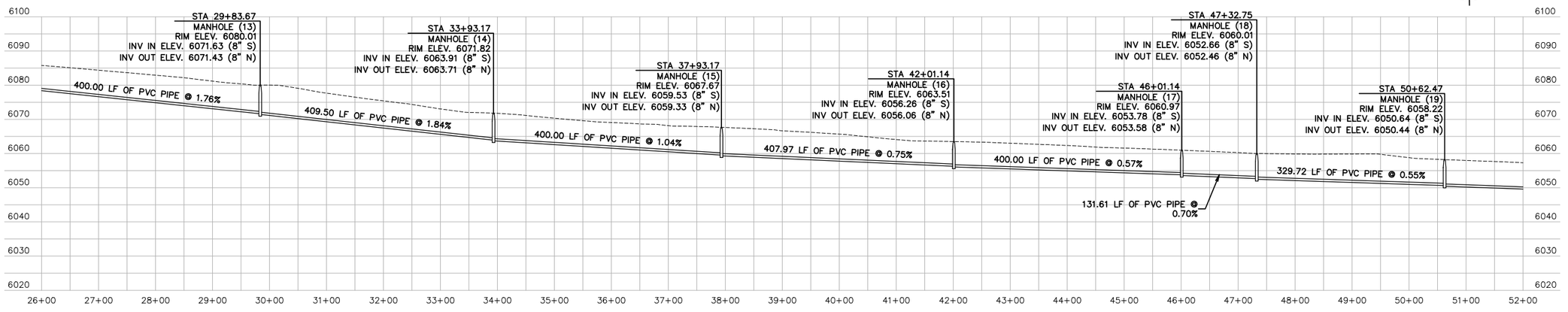
SHEET C2.1



SANITARY SEWER PLAN
SCALE 1" = 100'

100 0 100 200
SCALE – FEET

N



SANITARY SEWER PROFILE
HORIZONTAL SCALE 1" = 100'
VERTICAL SCALE 1" = 16.67'

WGM GROUP
WWW.WGMGROUP.COM

SHEET 4 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

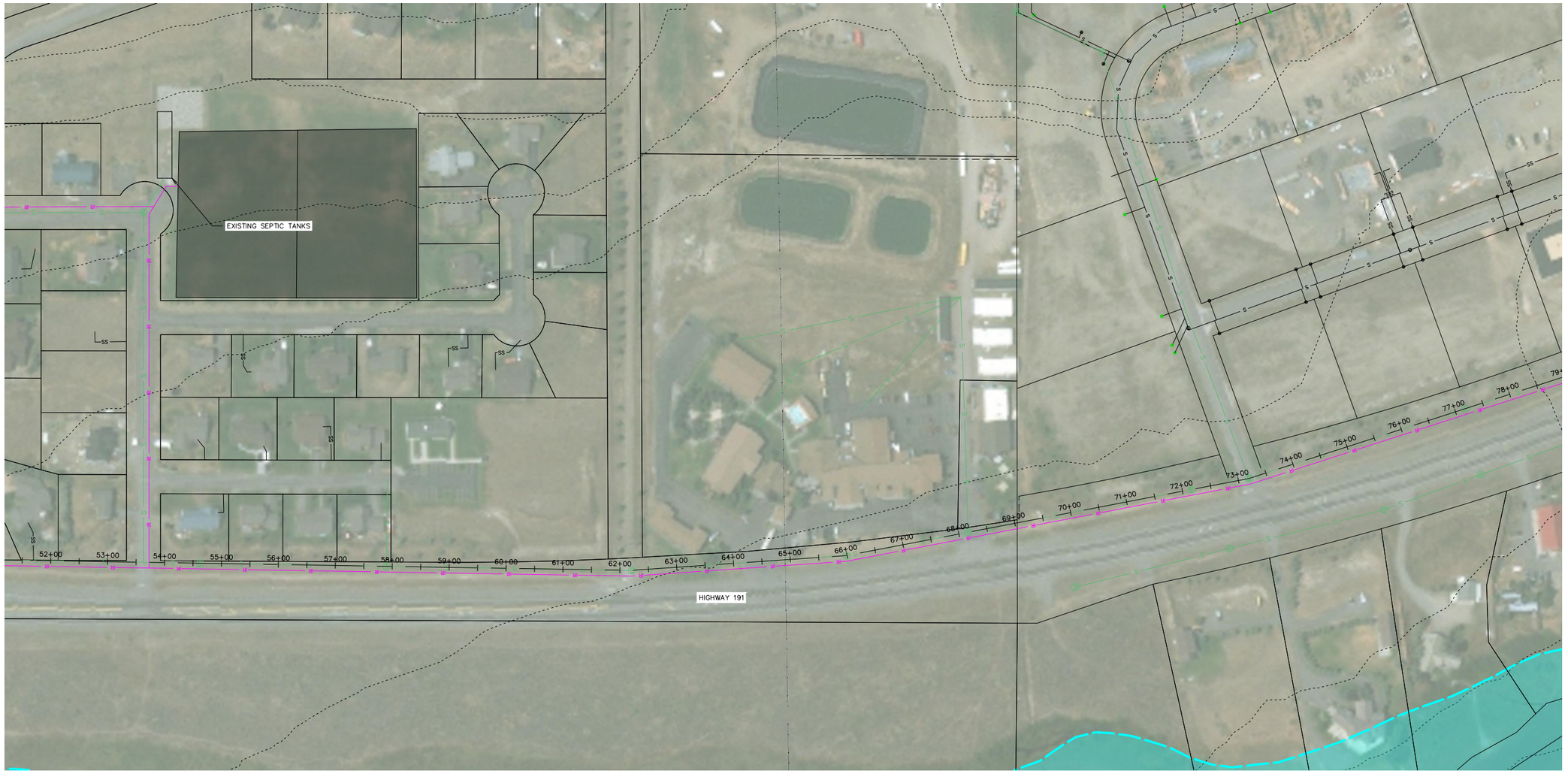
GALLATIN RIVER TASK FORCE
SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

REVISIONS:

NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.2
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE: 7/8/2022

SHEET C2.2

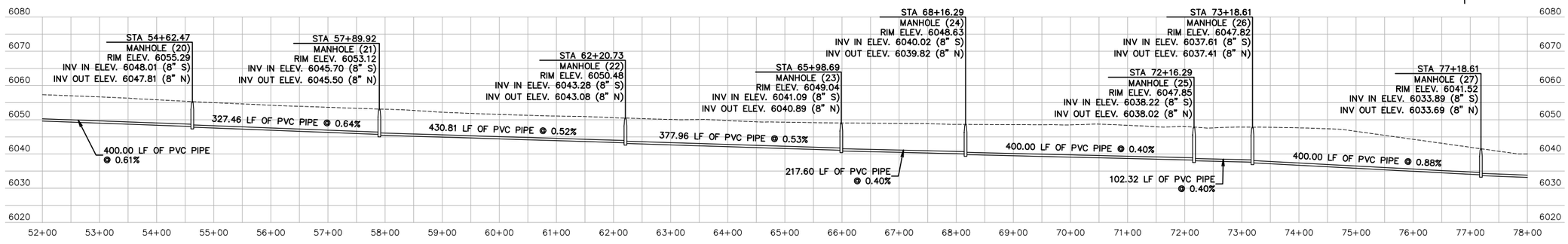


SANITARY SEWER PLAN

SCALE 1" = 100'

SCALE – FEET: 100 0 100 200

N



SANITARY SEWER PROFILE

HORIZONTAL SCALE 1" = 100'
VERTICAL SCALE 1" = 16.67'

WGM GROUP
WWW.WGMGROUP.COM

SHEET 5 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

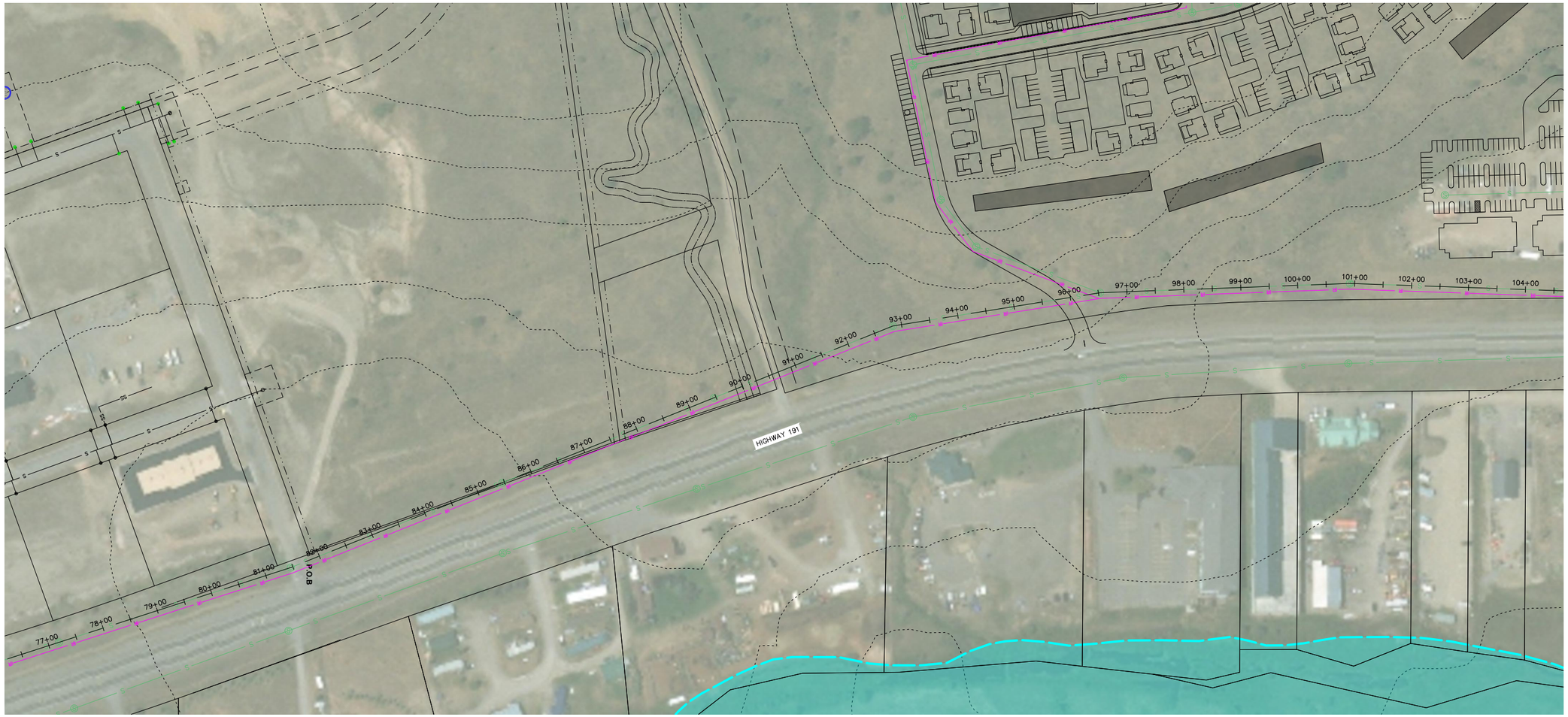
GALLATIN RIVER TASK FORCE
SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

REVISIONS:

NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.3
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE: 7/8/2022

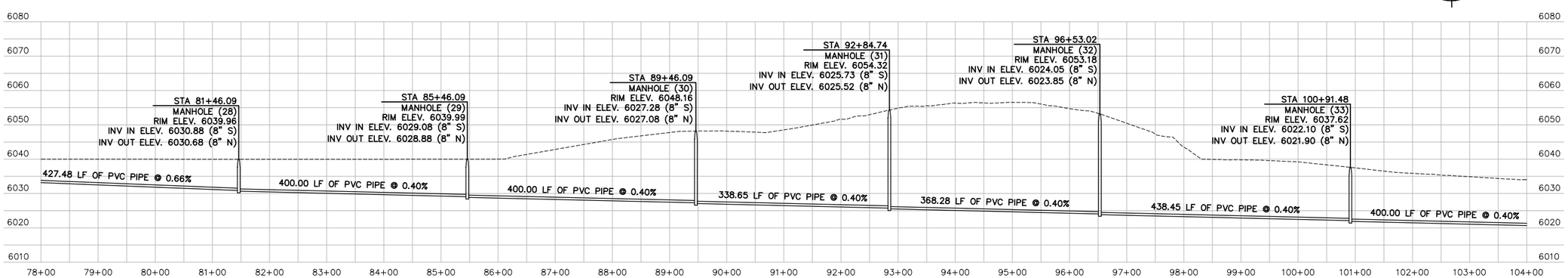
SHEET C2.3



SANITARY SEWER PLAN
SCALE 1" = 100'

100 0 100 200
SCALE – FEET

N



SANITARY SEWER PROFILE
HORIZONTAL SCALE 1" = 100'
VERTICAL SCALE 1" = 16.67'

WGM GROUP
WWW.WGMGROUP.COM

SHEET 6 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

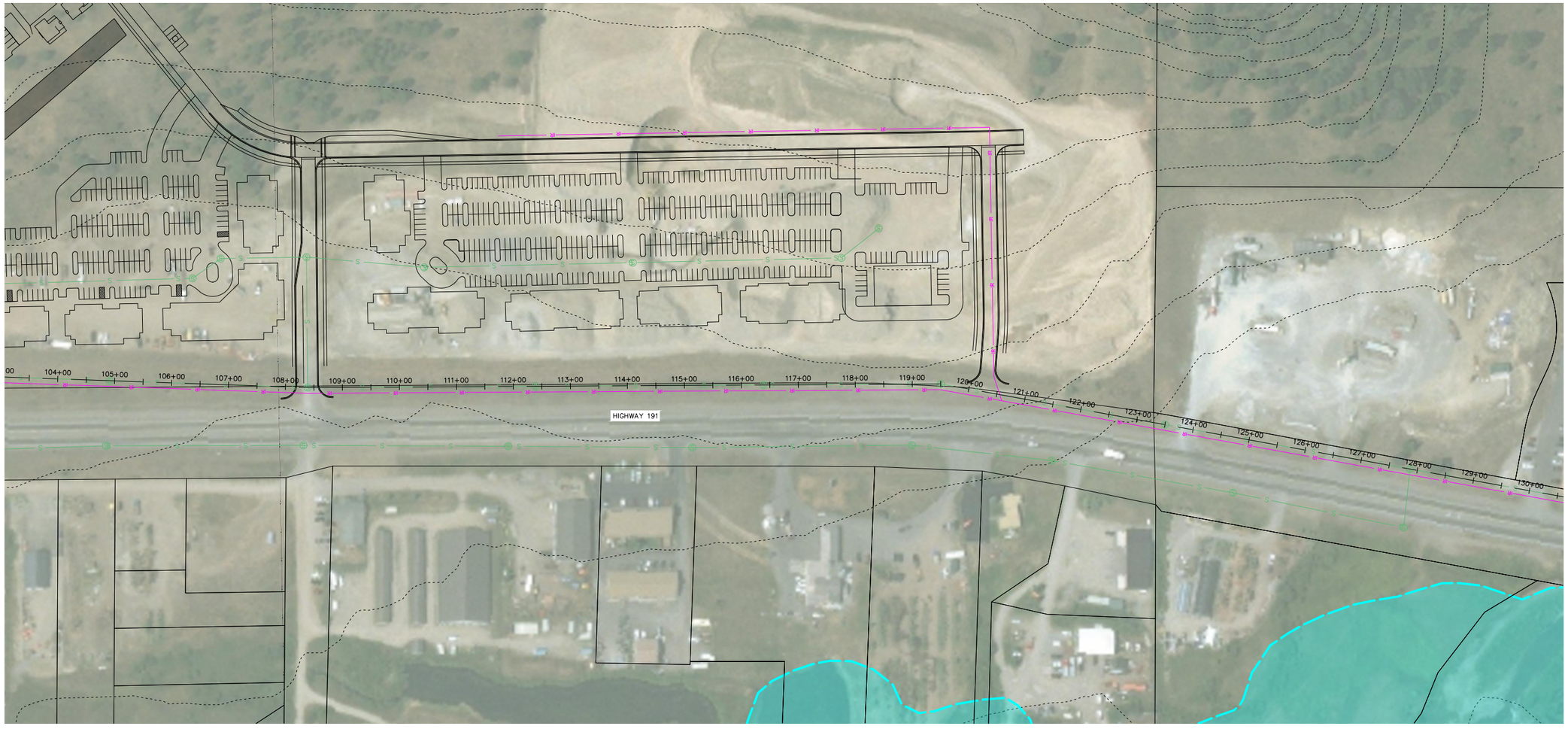
GALLATIN RIVER TASK FORCE
SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

REVISIONS:

NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.4
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE: 7/8/2022

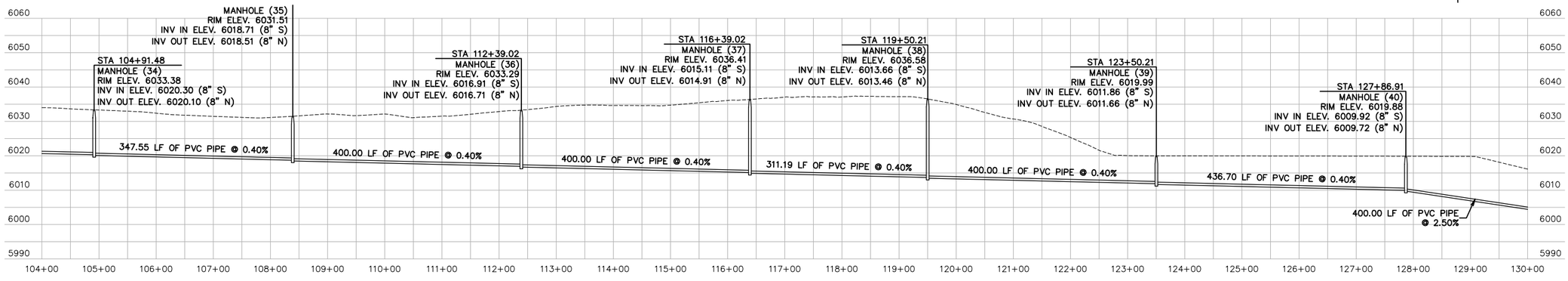
SHEET C2.4



SANITARY SEWER PLAN
SCALE 1" = 100'

100 0 100 200
SCALE – FEET

N



SANITARY SEWER PROFILE
HORIZONTAL SCALE 1" = 100'
VERTICAL SCALE 1" = 16.67'

WGM GROUP
WWW.WGMGROUP.COM

SHEET 7 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

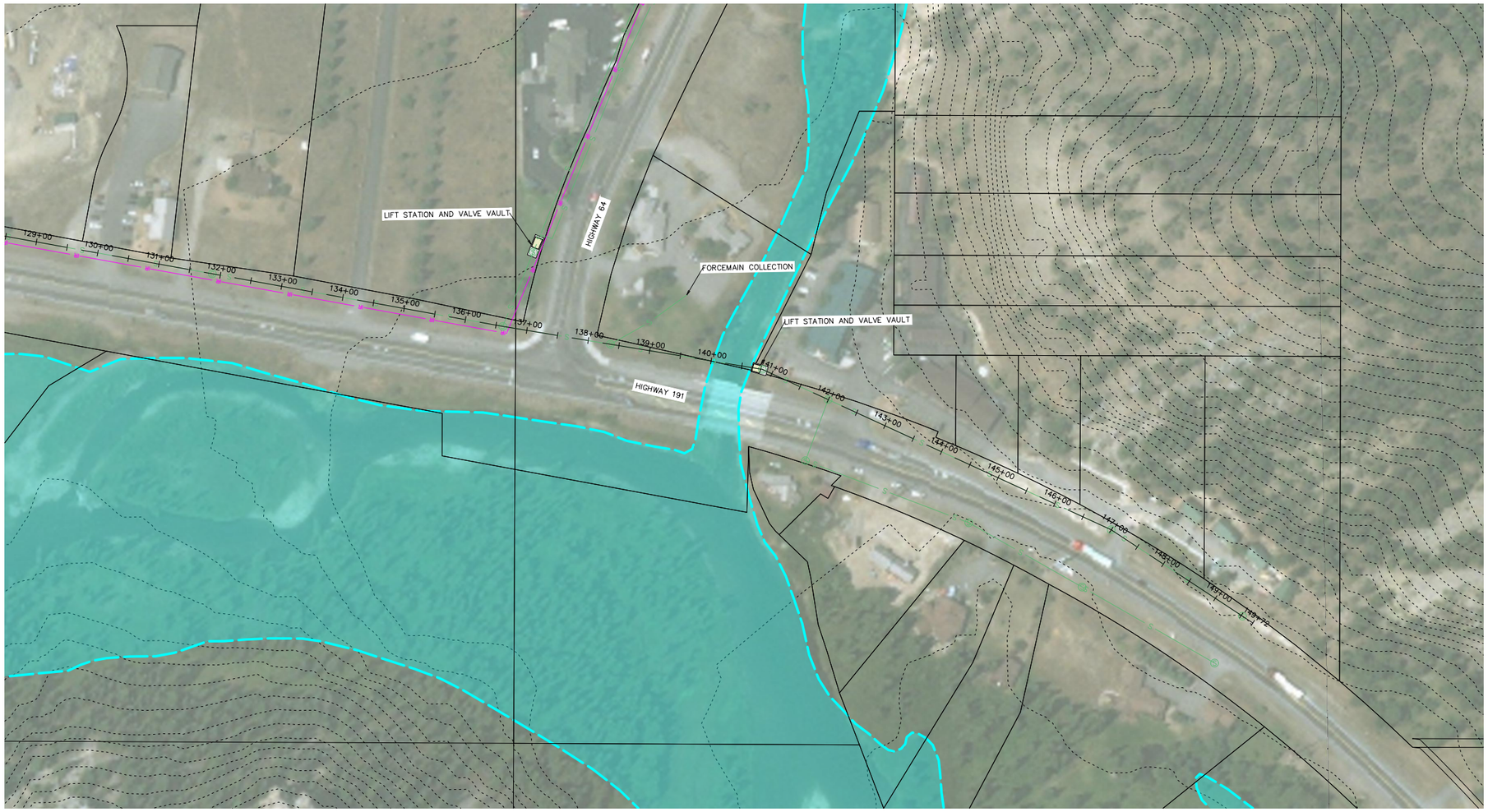
GALLATIN RIVER TASK FORCE
SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

REVISIONS:

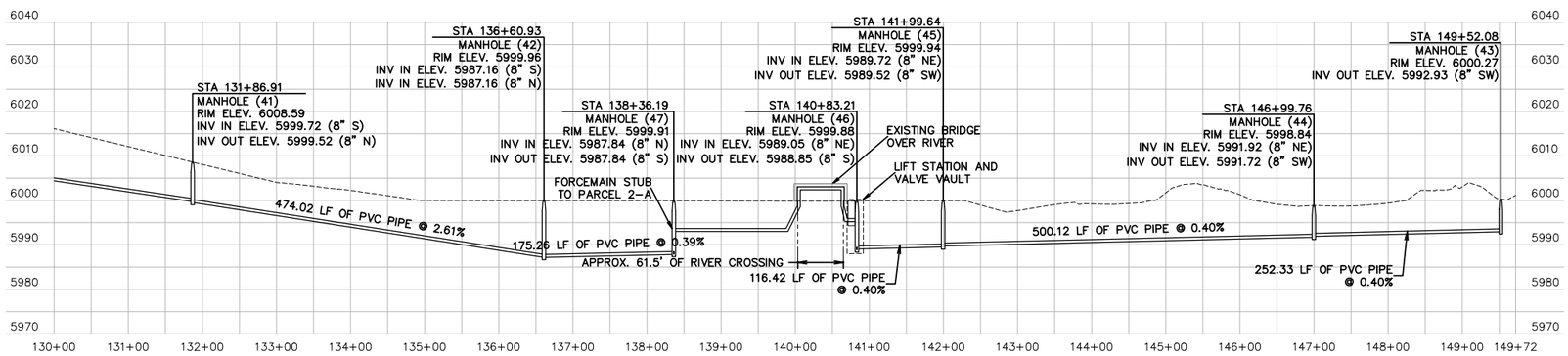
NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.5
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE: 7/8/2022

SHEET C2.5



SANITARY SEWER PLAN
SCALE 1" = 100'



SANITARY SEWER PROFILE
HORIZONTAL SCALE 1" = 100'
VERTICAL SCALE 1" = 16.67'

N

100 0 100 200
SCALE – FEET

WGM GROUP
WWW.WGMGROUP.COM

SHEET 8 OF 8

PRELIMINARY
PLOTTED: 7/8/22
SAVED: 7/8/22

GALLATIN RIVER TASK FORCE
SANITARY SEWER PLAN
GALLATIN COUNTY, MONTANA

REVISIONS:

NO.	DESCRIPTION	DATE

PROJECT: 21-06-21
LAYOUT: C2.6
SURVEYED: WGM
DESIGN: LRS
DRAFT: LRS
APPROVE: MAM
DATE: 7/8/2022

SHEET C2.6

APPENDIX E

ANNEXATION MCAS AND TEMPLATES

Addition Of Land To District -- Election Required -- Effect On Land And District

7-13-2341. Addition of land to district -- election required -- effect on land and district. (1) Except as provided in subsection (5), any portion of any county or any municipality, or both, may be added to any district organized under the provisions of part 22 and this part at any time upon petition presented in the manner provided in part 22 and this part for the organization of the district.

(2) The petition may be granted by ordinance of the board of directors of the district. The ordinance must be submitted for adoption or rejection by the qualified electors.

(3) If the ordinance is approved, the president and secretary of the board of directors shall certify that fact to the secretary of state and to the county clerk and recorder of the county in which the district is located. On receipt of the certification, the secretary of state shall within 10 days issue a certificate that states the passage of the ordinance and the addition of the territory to the district. A copy of the certificate must be transmitted to and filed with the county clerk and recorder of the county in which the district is situated.

(4) After the filing of the certificate, the territory is added to and is a part of the district with all the rights, privileges, and powers set forth in this part and necessarily incident to this part.

(5) If the board of directors determines that a district has a water facility or a sewer facility with a capacity greater than required to meet the needs of the current district, it may by ordinance, on petition of contiguous property owners and with the written consent of all property owners to whom the service is to be extended, expand the district to include land, to the extent of excess capacity, without complying with subsections (1) and (2). However, if the board determines that an election should be held or if 40% or more of the qualified electors petition for an election, compliance with subsections (1) and (2) is required.

(6) (a) Any property outside of the limits of a district that is benefited by a previously contracted improvement and is subsequently annexed to the district may be assessed for any improvements previously contracted for using the method provided in **7-12-2151**(1)(d).

(b) The benefited property may also be assessed for any improvement, within or outside the district limits, that is determined by the board to benefit property that was outside the district limits at the time of contracting for the improvement, whether or not an improvement district was previously created for the improvement.

(c) After any new property is annexed to the district, the total number of lots, tracts, or parcels in the district must be recalculated pursuant to **7-12-2151**(4).

(d) Assessment proceedings under this section are valid notwithstanding any failure of previous proceedings to comply with the provisions of law regarding improvements to be financed by special assessments.

INSTRUCTIONS FOR PETITIONING ANNEXATION
BIG SKY COUNTY WATER & SEWER DISTRICT No. 363

In order to assist with expedient processing of a petition for annexation, it is important to complete all of the information requested in the Petition for Annexation form.

1. The name of the applicant should submit the correct legal name. If the applicant is a corporate entity, the correct legal name and designation (LLC or Inc., etc.) must be utilized.

The legal description of the property to be annexed should be a complete description in a fashion that is able to be recorded in the office of the Gallatin County Clerk and Recorder.

2. To petition for annexation into the District, Montana law requires that the either:

   A. 100% of the owners of the real property petitioning must sign the petition; or

   B. At least 10% of the registered voters residing within the land petitioning for annexation must sign the petition.

3. The District favors all properties receiving both water and sewer service from the District. In the event the property is not seeking both water and sewer service, the petition may include an additional sheet of information that informs the District about the reason(s) that the property is seeking less than water and/or sewer services.

4. The petition must state if the real property petitioning annexation is contiguous or non-contiguous to the existing District boundary. Please note that if the property petitioning annexation is contiguous to the current District boundary and if the District determines that the District has a water facility and/or a sewer facility with a capacity greater than required to meet the needs of the current District, the Board of Directors of the District may proceed to annex the petitioning land without conducting an election on the petition for expansion of the District. However, it is fully within the Board's discretion of conduct an election on the petitioning land, even when the petitioning land is contiguous to the current District. Further, if the petitioning land is non-contiguous, the Board is required to conduct an election on the question of whether or not to annex the petitioning land.

5. The District has additional policies regarding annexation.

BIG SKY COUNTY WATER & SEWER DISTRICT No. 363

In regard to the Annexation of Property to the Big Sky County Water and Sewer District No. 363	**Petition for Annexation**

1. HF Powderlight South LLC is the owner (hereinafter referred to as Owner, whether singular or plural) of all that land set forth and described on **Exhibit A** attached hereto. The registered voters within the boundaries of that property are set forth on **Exhibit B** attached hereto.

3. The Owner, as set forth in paragraph 1, and the registered voters, as set forth in **Exhibit B**, if applicable, hereby petition the Big Sky County Water and Sewer District No. 363 (the District) to annex and otherwise incorporate all that property set forth and described on **Exhibit A** attached hereto within the jurisdictional authority and territory of the District.

4. The Petitioner(s) desires to obtain:

   ☒ Sewage and other wastewater collection and treatment, and potable water supply for the uses of those lands set forth on **Exhibit A**; or

   ☐ Sewage and other wastewater collection and treatment for the uses of those lands set forth on Exhibit A; or

   ☐ Potable water supply for the uses of those lands set forth on Exhibit A.

5. The real property described in **Exhibit A** is:

   ☒ Contiguous to the current District boundary; or

   ☐ Non-contiguous to the current District boundary.

6. Notice is provided to the Petitioner(s) of property requesting annexation that the Board will consider the petition for annexation. If the property petitioning annexation is contiguous to the current District boundary and if the District determines that the District has a water facility and/or a sewer facility with a capacity greater than required to meet the needs of the current District, the Board of Directors of the District may proceed to annex the petitioning land without conducting an election on the petition for expansion of the District

7. It is fully within the Board's discretion to conduct an election on the petitioning land, even when the petitioning land is contiguous to the current District and capacity is available. If the petitioning land is non-contiguous, the Board is required to conduct an election on the question of whether or not to annex the petitioning land. Therefor the Board of Directors of the District may proceed to:

    A. Annex the petitioning contiguous land without conducting an election on the petition for expansion of the District; or

    B. Annex the petitioning contiguous or non-contiguous lands after conducting an election of District residents and property owners. If the election is conducted by ballot 40% of the ballots must be returned and a majority vote of the received ballots must be in favor of the annexation prior to the annexation being approved by the District Board of Directors.

8. As the sole owner(s) of the property described on **Exhibit A**, the undersigned further gives consent to the inclusion of such land in the District and agrees to comply will all rules and regulations of the District if the property is annexed.

9. Upon approval of the First Amended and Restated Interlocal Agreement between Big Sky County Water and Sewer District No. 363, and Big Sky Resort Area District dated April 20, 2021 (Interlocal Agreement) utilized for the District to secure financing for the water resource recovery facility (WRRF) upgrade and expansion, which is currently contracted to occur, the District will have greater capacity than required to meet the needs of the current District upon completion of the WRRF Phase 1 construction. Owner acknowledges that the service capacity will not be available until the WRRF Phase I Project as defined in the Interlocal Agreement is completed. Further Owner stands ready and willing to execute such documentation that direct physical service and treatment will not be sought for the property described on **Exhibit A** until the WRRF Phase 1 construction is complete.

Done this 14th day of May, 2021.

HF Powderlight South LLC

By: 

Name: Matthew E. Kidd
Title: Managing Director

EXHIBIT A
MAP VIEW AND NARRATIVE DESCRIPTION OF PETION LANDS FOR ANNEXATION

Parcel I: Real property located in Gallatin County, Montana which is more particularly described as follows:

Tract 1, of Certificate of Survey No. 1858, located in the SW1/4 of Section 31, Township 6 South, Range 4 East, P.M.M., Gallatin County, Montana, according to the official survey thereof on file and of record in the office of the County Clerk and Recorder of Gallatin County, Montana. (Tax Parcel No. RKF18836)

AND

Tract 2B-1, of Correction Certificate of Survey No. 1858B, located in the SW1/4 of Section 31, Township 6 South, Range 4 East, P.M.M., Gallatin County, Montana, according to the official survey thereof on file and of record in the office of the County Clerk and Recorder, Gallatin County, Montana. (Tax Parcel No. RKF41292)

Parcel II: Real property located in Gallatin County, Montana which is more particularly described as follows:

Tract B, of Certificate of Survey No. 2459, located in Section 31, Township 6 South, Range 4 East, P.M.M., Gallatin County, Montana, according to the official survey thereof on file and of record in the office of the County Clerk and Recorder, Gallatin County, Montana. (Tax Parcel No. RKF65235)

A map showing Parcel I and Parcel II (the parcels are outlined in red) is included on the following page.

EXHIBIT A
MAP VIEW AND NARRATIVE DESCRIPTION OF PETION LANDS FOR ANNEXATION

Parcel I and Parcel II both lie to the south of Lone Mountain Trail (Highway 64) in Section 31, Township 6 South, Range 4 East, P.M.M., as outlined below.

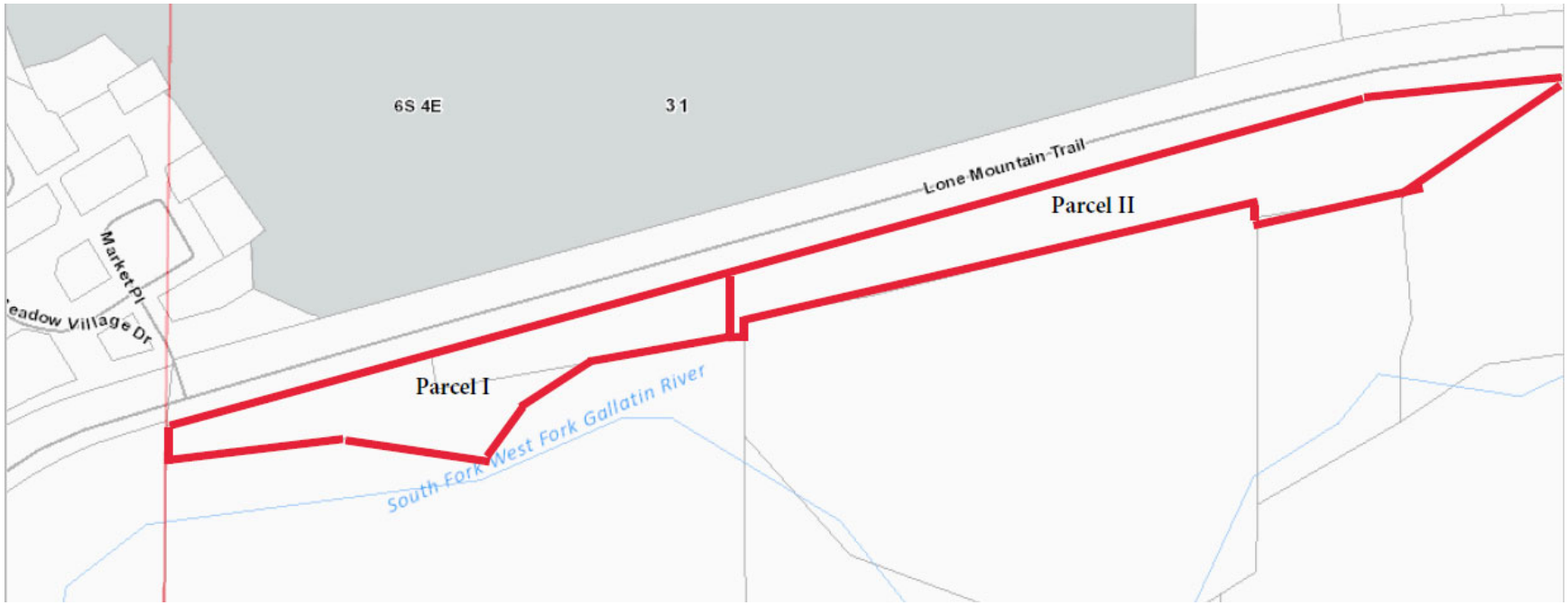


EXHIBIT B

LIST OF REGISTERED VOTERS WITHIN THE BOUNDARIES OF THAT PROPERTY SET FORTH ON EXHIBIT A

No.	PRINTED NAME	SIGNATURE	ADDRESS	TELEPHONE
1	Jeremy Glass	Tenant – unknow registered voter	1700 Lone Mountain Trail Big Sky, MT 59716	Tenant - unknown
2	Victor Arthur	Tenant – unknow registered voter	1700 Lone Mountain Trail Big Sky, MT 59716	Tenant - unknown
3	Giovanni Mas Risso	Tenant – unknow registered voter	1700 Lone Mountain Trail Big Sky, MT 59716	Tenant - unknown
4	Tim Donaldson	Tenant – unknow registered voter	1700 Lone Mountain Trail Big Sky, MT 59716	Tenant - unknown
5	Travis Keck	Tenant – unknow registered voter	1700 Lone Mountain Trail Big Sky, MT 59716	Tenant - unknown
6	Naralin Poosodsang	Tenant – unknow registered voter	1700 Lone Mountain Trail Big Sky, MT 59716	Tenant - unknown

Note: The individuals listed above are current tenants on Tract 1 of Parcel I as described on **Exhibit A**.

INSTRUCTIONS FOR PETITIONING ANNEXATION
BIG SKY COUNTY WATER & SEWER DISTRICT No. 363

In order to assist with expedient processing of a petition for annexation, it is important to complete all of the information requested in the Petition for Annexation form.

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The legal description of the property to be annexed should be a complete description in a fashion that is able to be recorded in the office of the Gallatin County Clerk and Recorder.

2. To petition for annexation into the District, Montana law requires that the either:

   A. 100% of the owners of the real property petitioning must sign the petition; or

   B. At least 10% of the registered voters residing within the land petitioning for annexation must sign the petition.

3. The District favors all properties receiving both water and sewer service from the District. In the event the property is not seeking both water and sewer service, the petition may include an additional sheet of information that informs the District about the reason(s) that the property is seeking less than water and/or sewer services.

4. The petition must state if the real property petitioning annexation is contiguous or non-contiguous to the existing District boundary. Please note that if the property petitioning annexation is contiguous to the current District boundary and if the District determines that the District has a water facility and/or a sewer facility with a capacity greater than required to meet the needs of the current District, the Board of Directors of the District may proceed to annex the petitioning land without conducting an election on the petition for expansion of the District. However, it is fully within the Board's discretion of conduct an election on the petitioning land, even when the petitioning land is contiguous to the current District. Further, if the petitioning land is non-contiguous, the Board is required to conduct an election on the question of whether or not to annex the petitioning land.

5. The District has additional policies regarding annexation.

BIG SKY COUNTY WATER & SEWER DISTRICT No. 363

In regard to the Annexation of Property to the Big Sky County Water and Sewer District No. 363	))))	**Petition for Annexation**

1. _____ is/are the owner(s) (hereinafter referred to as Owner, whether singular or plural) of all that land set forth and described on **Exhibit A** attached hereto. (*Please include a map view and narrative description of the property that includes plat references, tax parcel numbers, quarter section, section, township and range*.) The registered voters within the boundaries of that property set forth on **Exhibit A** and **Exhibit B** attached hereto.

3. The Owner, as set forth in paragraph 1 and the registered voters as set forth in Exhibit B, if applicable, hereby petition the Big Sky County Water and Sewer District No. 363 (the District) to annex and otherwise incorporate all that property set forth and described on **Exhibit A** attached hereto within the jurisdictional authority and territory of the District.

4. The Petitioner(s) desires to obtain (*Please check applicable services*):

   ☐ Sewage and other wastewater collection and treatment, and potable water supply for the uses of those lands set forth on **Exhibit A**; or

   ☐ Sewage and other wastewater collection and treatment for the uses of those lands set forth on Exhibit A; or

   ☐ Potable water supply for the uses of those lands set forth on Exhibit A.

5. The real property described in **Exhibit A** is (*Please check applicable location*):

   ☐ Contiguous to the current District boundary; or

   ☐ Non-contiguous to the current District boundary.

6. Notice is provided to the Petitioner(s) of property requesting annexation that the Board will consider the petition for annexation. If the property petitioning annexation is contiguous to the current District boundary and if the District determines that the District has a water facility and/or a sewer facility with a capacity greater than required to meet the needs of the current District. the Board of Directors of the District may proceed to:

7. It is fully within the Board's discretion to conduct an election on the petitioning land, even when the petitioning land is contiguous to the current District and capacity is available. If the petitioning land is non-contiguous, the Board is required to conduct an election on the question of whether or not to annex the petitioning land. Therefor the Board of Directors of the District may proceed to:

    A. Annex the petitioning contiguous land without conducting an election on the petition for expansion of the District; or

    B. Annex the petitioning contiguous or non-contiguous lands after conducting an election of District residents and property owners. If the election is conducted by ballot 40% of the ballots must be returned and a majority vote of the received ballots must be in favor of the annexation prior to the annexation being approved by the District Board of Directors.

8. As the sole owner(s) of the property described on **Exhibit A**, the undersigned further gives consent to the inclusion of such land in the District and agrees to comply will all rules and regulations of the District if the property is annexed.

Done this _____ day of _____, 20____.

_____

[Printed Name of Petitioner]

_____

[Company Name if Applicable]

_____

[Signature of Petitioner]

EXHIBIT A
MAP VIEW AND NARRATIVE DESCRIPTION OF PETION LANDS FOR ANNEXATION

EXHIBIT B

LIST OF REGISTERED VOTERS WITHIN THE BOUNDARIES OF THAT PROPERTY SET FORTH ON EXHIBIT A

No.	PRINTED NAME	SIGNATURE	ADDRESS	TELEPHONE
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				

ATTACHMENT I

_____COUNTY WATER AND SEWER DISTRICT

PETITION TO BOARD OF DIRECTORS FOR ADDING LAND TO DISTRICT

I (We), _____, own the following described property and am (are) petitioning the Board of Directors of the District to be included in the boundaries of the _____ County Water and Sewer District under provision of 7-13-2341(5), MCA.

Legal Description of Property Being Petitioned Into District:

I certify that this property is contiguous to the present boundaries of the District and that I (we) am (are) the only property owner(s) affected by this request.

I understand that the Board of Directors, _____ County Water and Sewer District, may determine to hold an election on the question of inclusion of the above-described property into the District. If the Board does not call for an election, then, upon Board acceptance by Ordinance of the property for inclusion in the District, the owner(s) of the above-described property will be responsible for all monthly fees for operation and maintenance of the wastewater (water) system.

I also understand that upon acceptance of this property into the District that I (we) will be responsible for the payment of the property assessment for the construction of the proposed wastewater (water) system. These assessments are set at _____ and must be paid upon approval of this petition by the Board of Directors.

I understand that the Board President and Secretary shall certify the fact that my (our) property has been included in the District boundaries to the Secretary of State and the County Clerk and Recorder. The Secretary of State shall issue a certificate reciting the addition of this land into the District. From the date of this certificate, the property that has been added becomes part of the District, and all rights, powers fiscal responsibilities, and privileges set forth in the statutes shall apply to my (our) property. (MCA, 7-13-2341(5).

SAMPLE

SIGNED:_____

SIGNED: _____

MAILING ADDRESS: _____

TOWN, STATE, ZIP CODE: _____

TELEPHONE: _____

The following action was taken by the Board of Directors of the _____ County Water & Sewer District at a regularly scheduled meeting:

_____ moved to accept the above property owner's petition for adding land to the district. Written approval by all property owners to whom this service will be extended has been received by signature on this document. _____ seconded the motion. Motion carried 5-0.

AYES:

NAYS:

The above described property was approved for inclusion in the District and this information submitted to the _____ county Clerk & Recorder and to the Secretary of State of the State of Montana.

Dated this _____ day of _____, 2003.

_____

President, Board of Directors

ATTEST:

_____

Secretary/Treasurer, Board of Directors

SAMPLE

ATTACHMENT I

_____County Water & Sewer District
Resolution No. ___

Policy Considerations in Evaluating Petitions
To Add Land To District

BE IT RESOLVED that the Board of Directors, _____ County Water & Sewer District, adopts the following policy considerations for use in evaluating information given in support or opposition at the public hearing on any petition to add land to the district:

In exercising its authority under Section 7-13-2341, MCA, the board will observe the following policy considerations:

1. In calculating the extent of excess capacity within the district, the board shall first subtract 113 potential EDUs within the original boundaries of the sewer district from the engineer's estimate of additional capacity resulting from the lagoon improvement project completed in July of 2003.

2. In considering what land is contiguous, the board will regard land which is next to the boundary of an existing sewer service area as contiguous land having priority over land which borders or touches a district boundary enclosing a non-service area or infrastructure.

3. All other things being equal, the board will deal with any petition for addition of land to the _____ County Water & Sewer District on a first-come, first-served basis.

4. At any time during the process of evaluating a petition for inclusion of land into the district, and for any reason which is sufficient in the judgment of a majority of the board acting on the petition, the board may determine that an election be held on the petitioned-for inclusion.

Furthermore, relying on its authority under 7-13-2218 (10), MCA, to establish rules and regulations for the availability of any of the district's systems, the board will also consider the following when necessary in evaluating petitions to add land to the district:

5. Regardless of capacity or contiguity considerations, a proposed addition to the district which, in the judgment of the board, may cause detriment to the existing district or result in sewer use which raises issues of compliance with the district operational ordinance, can either be rejected by the board or referred to the electorate for decision.

6. For reasons of orderly development of the district; ease of construction, maintenance, and repair of district equipment and infrastructure; and prevention of hardship for district consumers and employees and contractors; the board will give preference, when dealing with competing petitions, to in-filling the district boundaries before stretching them to the outer limits of service capacity.

Adopted this ___ day of May, 20__

_____ _____
President Secretary

Ayes_____ Nays_____

AGREEMENT TO TRANSFER OPERATION, CONTROL AND OWNERSHIP OF THE WATER SYSTEM

BACKGROUND:

1. Homeowners' Association (hereinafter "**The Association**") owns, operates and maintains a water system (hereinafter "**The System**");

2. Homeowners' Associations are unable to obtain some sources of funding like grants;

3. Water Districts are able to obtain grants and other sources of funding which are unavailable to Homeowners' Associations;

4. **Members of The Association** formed the (hereinafter "**The District**"); and

5. **The Association** wants to transfer **The System** to **The District** so that **The District** can obtain more kinds of funding like grants.

AGREED:

1. **TRANSFER OF ASSETS: The Subdivision** shall transfer **The System** to **The District. The System** shall include the following:

   A) Interests in real property owned by **The Association** upon which **The System is** located. **The Real Property** being transferred to **The District** is described as follows:

all easements for placement of, use of and access to water mains, pump houses and other System equipment including but not limited to easements shown on the official plat of Addition as recorded in the records of Missoula County, Montana.

   B) The following property which is part of **The System**:

- Water mains and lines and hydrants presently owned by **The System;**
- Pumps, supplies and all other equipment and personal property currently utilized in the operation of **The System** including but not limited to the equipment on List "A";
- All funds held by **The Association** at the time of execution of this agreement including Certificates of Deposit, Money Market funds, and funds in a checking account, except such funds collected that were for Park fees, or were already transferred;

- all accounts outstanding which are due or about to become due to **The Association** for services provided by **The System** except accounts which are delinquent when this contract is executed.; and
- all accounting and business records regarding for **The System**.

2. **DOCUMENTS OF CONVEYANCE:** The Real Property Easements shall be transferred using quitclaim deeds. Other tangible property shall be transferred using a bill of sale. This contract shall transfer ownership of all intangible assets of **The System**.

3 **OBLIGATIONS: The District** shall assume all outstanding operational obligations of **The Association**, including but not limited to, all outstanding expenses relative to water quality testing as required by the State of Montana, all costs of insurance and professional fees, and outstanding equipment expense, if any. It is understood by the parties that any existing obligations of **The Association** assumed by **The District** will not obligate **The District** for more than the value of the assets transferred to **The District** by **The Association**. **The District** shall assume responsibility for all expenses and obligations incurred by **The District** in operation, ownership, and maintenance of **The System** subsequent to the effective date of this agreement.

4. **RISK OF LOSS; INSURANCE:** Upon transfer of the real and personal property specified herein to **The District**, it shall be the responsibility of **The District** to insure the property against risk of loss or damage in amounts deemed necessary by **The District**. Risk of loss of any equipment or personal property shall remain with **The Association** until transferred to **The District**. **Transfer of real property shall be complete upon execution of Deeds to convey The System to The District by The Association. Transfer of personal property shall be deemed complete upon execution of a Bill of Sale to convey The System to The District**. A description of personal property in general terms within the Bill of Sale shall be sufficient to transfer all such property.

5. **PAST DUE ACCOUNTS:** The parties acknowledge and understand that **The Association** may, from time to time, receive payments for water that are delinquent. **The Association** shall deposit these amounts in their account and not forward them to **The District**. For purposes of this Contract, delinquent accounts are those accounts which have been filed as liens against the property owners at the time this Contract is executed.

6. **MUTUAL COOPERATION: The Association** and **The District** shall mutually cooperate to facilitate the transfer of assets and liability set forth herein, it being understood that the parties' mutual goal is to provide public safety and welfare in the operation and maintenance of **The System** and make prudent and appropriate application of public funds for such purpose.

7. **VENUE-CONTROLLING LAW:** This agreement shall be governed by the laws of the State of Montana. Venue for any suit arising in whole or in part out of this agreement

shall be in County, Montana.

8. **FUTURE INSTRUMENTS:** The parties shall promptly execute any and all future documents or instruments and to perform all acts which may be necessary to carry into full force and effect the terms of this agreement.

9. **VOLUNTARY AGREEMENT:** This agreement is entered into voluntarily, with each party, though its governing board, having read and approved the same upon an independent consideration of its terms and conditions. Each party shall pay their own attorney fees incurred in drafting and review of this agreement and attendant instruments.

DATED this _____day of _____, 20

County Water District Board Members

_____

_____

_____

_____

County Water District

By: _____
President

Subdivision HOA Board Members:

_____

_____

_____

_____

CONVEYANCE OF RIGHT-OF-WAY EASEMENT

The undersigned landowner(s) _____ Water Company, doing business within the County of _____, State of Montana, for a good and valuable consideration in the amount of $ _____, the receipt whereof is hereby acknowledged, does hereby grant unto the _____ County Water District (the District), a recognized governmental entity organized under the laws of the State of Montana and _____ County, whose address is _____ and to its successors or assigns, the perpetual right and easement to enter upon the lands of the undersigned, situated in the County of _____ State of Montana, and more particularly described as follows:

The property legally described and shown in Exhibit "A" – Tract _____ COS _____

This easement agreement conveys the right to construct, operate, replace, repair and to maintain over, under and across said lands and is, over, under, and upon all roads, streets or highways abutting or in any way adjoining said property, the following improvements:

- A booster pump station and appurtenant structures including piping, valves and surface features

- Two buried pipelines for the conveyance of water to the District's storage facility, with a permanent/perpetual easement of 40 feet in width (including the pre-existing 10' easement). The new pipeline shall follow the alignment of the existing pipeline to the greatest extent possible which is in the approximate center of the herein described easement on Tract _____

- Power and telemetry cables and conduits as necessary to provide electricity and communications to the District's storage tank site. Power and telemetry cables shall follow the alignment of the existing pipeline to the greatest extent possible.

The easement includes the right to keep the easement clear of all buildings, structures or other obstructions, including trees that present a hazardous risk to person or property, and to license, permit or otherwise agree to the joint use or occupancy of the lines, system or if any of said system is placed underground, of the trench and related underground facilities, by an other person, association or corporation. This agreement also conveys the right to construct, maintain, enlarge, repair, reduce or remove said water conveyance line(s) together with all necessary appurtenances thereto, in, over, through, and across the real property herein above-describe. The District will be responsible for all expenses associated with the construction and operation of the water facilities as described.

It is understood and agreed that the following covenants and conditions apply and pertain to the foregoing Grant of Easement:

- In the event of any excavation within said easement, the District or its agents shall backfill and restore the surface to its former condition,
- The landowner shall not make or construct any building or other permanent improvement upon the strip of land conveyed by this easement. The land conveyed shall be kept free of any obstruction that would impair or hinder the maintenance of the facilities placed therein,

- During the initial water facilities construction period only, the District, or its agents shall be entitled to encroach up to ten (10) feet beyond the boundaries of the perpetual easement granted herein and shall restore the surface encroached upon as provided hereinabove. During project construction, the topsoil shall be stripped from disturbed areas and replaced, upon final grading of affected areas,
- The District shall be responsible for the safety of it's officers, agents, employees and others utilizing the utility easement,
- The District shall obtain appropriate liabilty insurance to protect the landowner against claims,
- In the event that the District or it's successors no longer require the facilities located within the prescribed easement, the facilities not salvaged by the District or successors will revert to the undersigned landowner and the easement will be terminated,

And any dower, courtesy, distributive share of homestead interest that the Undersigned may have inconsistent with the rights hereinabove conferred is hereby relinquished and released to the extent necessary to permit the free enjoyment of said rights and to that extent only.

IN WITNESS WHEREOF, the undersigned has set his hand and signatures this ____day of _____ 20.

COUNTY WATER DISTRICT

By: _____

By: _____
Name

_____
Title

STATE OF MONTANA
County of

On this ___day of _____, 20 before me, the undersigned, a Notary Public for the State of Montana, personally subscribed to the foregoing instrument and acknowledged to me that he executed the same.

_____
Notary Public for the State of Montana
Residing at:
Commission Expires:

Attachment: Exhibit "A" – Utility Easement Tract

_____COUNTY WATER DISTRICT

RESOLUTION NO. _____

A RESOLUTION TO ACCEPT OWNERSHIP, CONTROL, MANAGEMENT AND OPERATION OF THE EAGLE RIDGE ESTATES WATER SYSTEM FROM WEST MONTANA VENTURES, LLC

WHEREAS, _____, LLC has agreed to turn over the ownership, control and management and operation of the water system for _____, and

WHEREAS, the Board of Directors of the _____County Water District has received and accepted the Agreement for this transfer;

THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE EAGLE RIDGE ESTATES COUNTY WATER DISTRICT that the District accepts the ownership, control, management and operation of the water system.

_____ moved to adopt Resolution No. _____ accepting the transfer of the _____water system to the _____County Water District. _____ seconded the motion. Motion carried 3-0. Two abstentions; _____

Adopted this 17th Day of October, 20__.

_____

_____

_____, Vice President _____, Board Member, Acting Recorder

SAMPLE

MT-28328

EASEMENT

BOOK 420 PAGE 962

THIS AGREEMENT, made and entered into this 13 day of June, 1994 by and between [redacted] hereinafter referred to as GRANTOR, of Missoula, Montana, and [redacted] ADDITION HOMEOWNERS ASSOCIATION hereinafter referred to as GRANTEE, also of [redacted] Montana, provided as follows:

WITNESSETH:

WHEREAS, GRANTOR is the owner of the property described as:

Lot 44 of [redacted] ADDITION, an amended subdivision of [redacted] Addition, according to the official recorded plat thereof in Book [redacted] of Plats at Page [redacted] County, Montana.

WHEREAS, GRANTEE wishes to obtain an easement over and across GRANTOR'S property to provide ingress and egress to Lot 52 of Spring Meadows Addition.

NOW THEREFORE, for and in consideration of the sum of Ten and no/100 Dollars ($10.00) and other good and valuable consideration, to GRANTOR paid by GRANTEE, the sufficiency and receipt of which is hereby acknowledged, GRANTOR does hereby grant, set over, bargain, sell and convey unto GRANTEE, an easement 7 1/2 feet in width, adjacent and parallel to the South boundary of the property described herein, to provide for ingress and egress to Lot 52 of [redacted] Addition.

The easement granted by GRANTOR to GRANTEE pursuant to the terms of this document, shall be non-exclusive, and GRANTOR shall be entitled to use the easement to provide ingress and egress to Lot 52 of [redacted] Addition.

This agreement is binding upon the heirs, successors and assigns of the parties hereto.

DATED the day and year first above written.

GRANTOR:

[redacted]

STATE OF MONTANA)
:ss
County of [redacted])

On this 15 day of June, 1994, before me, the undersigned Notary Public for the State of Montana, personally appeared [redacted] known to me to be the person whose name is subscribed to the within instrument, and acknowledged to me that he executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

[redacted]
Notary Public for the State of Montana
Residing at [redacted] Montana
My commission expires: 6/1/96

I RECEIVED AND FILED THIS INSTRUMENT FOR RECORD ON THE 21 DAY OF July 1994 AT 3:15 O'CLOCK P M AND IT IS RECORDED IN VOL 420 OF MICRO RECORDS OF THE COUNTY OF MISSOULA, STATE OF MONTANA ON PAGE 962 FEE 6.00 PAID
WITNESS MY HAND AND SEAL
[redacted] COUNTY RECORDER
BY [redacted] DEPUTY
RETURN TO
ADDRESS

9417923

94 JUL 21 PM 3 15

[redacted]

APPENDIX G

PWS SANITARY SURVEY INSPECTION REPORTS

DEQ
Montana Department
of Environmental Quality

June 28, 2024

Lazy J South Subdivision
Attn: Scott Hammond
PO BOX 161242
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Lazy J South Subdivision (PWSID: MT0004432).

Dear Owners, Administrators, and Consumers:

I would like to thank operator Shannon Burdick for assisting my colleagues and me during the sanitary survey inspection of the Lazy J South Subdivision public water supply system. As a non-transient non-community public water supply, your facility is required to have a sanitary survey inspection every five years. These routine 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 June 11, 2024.

SYSTEM DESCRIPTION:

The facilities are primarily located by the pump house on the south side of Michener Creek Road just west of the house at 15 Colters Run Loop. The subdivision is 16 mixed residential and commercial lots between Straight Iron Road and Running Iron Road on the west side of Gallatin Road. This water system consists of two source wells pumped to a common header, a pressure control, a storage tank, and then to distribution. The distribution system consists of 18 service connections serving approximately 35 people.

SOURCES:

WL002, Well 1 (GWIC 223891): Located just north of the pump house off of Michener Creek Road. The well log is attached for reference. No adverse conditions were noted with the area around the well, the well itself, or with the well cap. See photos for additional observations.

WL003, Well 2 (GWIC 227731): Located to the southeast of the pump house. The well log is attached for reference. No adverse conditions were noted with the area around the well, the well itself, or with the well cap. See photos for additional observations.

TREATMENT:

No treatment facilities were known to exist or observed to be in use at the time of inspection.

DISTRIBUTION:

DS001 Distribution System: Eight-inch PVC C900 mains were planned and approved. Commercial lots were planned to have 1-inch service connections. Residential service connections were planned to have 1.5-inch service connections. Four-inch C900 PVC fire service connections were also planned. Records indicate 18 commercial service connections. All active service connections are metered.

It is suspected there is some pressure reducing equipment somewhere in distribution since the tank is approximately 315ft higher in elevation than the distribution system however, plan records do not indicate any pressure reducing stations. No subdivision operated irrigation systems were reported. It was noted that construction crews periodically use water from fire hydrants without informing the system while building out the Blackfoot Hills PH 1 subdivision.

STORAGE:

ST001 Storage Tank 530,000 GAL: Located southwest of the pump house approximately one mile via Colters Run Loop. This facility consists of a Superior Tank Company bolted steel, coated, on-grade tank. Plan drawings show a 6-inch bottom inlet and an 8-inch bottom outlet. There is an 8-inch overflow. The tank should be periodically visually inspected inside and out, especially when positive bacteriological samples have been detected.

The air vent appeared to be adequately screened. The overflow pipe is 1 pipe diameter (8-inchs) above grade and screened. The tank hatch lid appeared to be adequately sealed and was tight. No issues were noted with the ladder or railing. There is no splash pad, the area beneath the overflow is gravel and sloped minimally away from the tank.

- Recommend a splash pad or channel to direct overflow water away from the tank foundation. A properly constructed channel could also allow for the required 3 pipe diameters (24-inchs) above ground level to be achieved.
- Recommend installing the manufacturers end-fitting or seal on the sight gauge pulley assembly- see photos.
- The tanks pipe vault shoebox style hatch was set in concrete with no provision for the built-in drain. Strongly recommend correcting the installation oversight to allow the hatch to drain.

PUMPS, PUMP FACILITIES, and CONTROLS:

PC001 Pressure Control: Located at the locked pump house off Michener Creek Road. This facility consists of the two submersible well pumps (and their pump controllers), a pressure transducer, and pressure gauge at the common header, a SCADA controller, and two automatic solenoid control valves -one for each well. Wells can fill the tank with minimal demand without the pumps running.

Both wells were showing 180+ psi closed in pressure. Tank pressure at full was registering 106.5 psi at the pump house. There is a single flow meter at the common header.

The recirculation pump plumbed between the distribution piping and tank fill pipe was reported to not be used. The cross-over pipe between the distribution and tank supply at the pump house may also serve as a dead-end pipe that needs to be flushed periodically. It was not immediately clear how the cross-over pipe is used or how often the valves are exercised.

- Recommend dedicated wiring for the remote telemetry rather than the pigtail to an outlet.
- Recommend to periodically check and clean the Well 2 pump controller vent fan per manufacturer instructions as it is air cooled.
- Recommend putting screen on the discharge pipes for both air/vacuum combination valves attached to the tank main and the distribution main.
- The distribution pressure relief valve exterior discharge screen was missing. **This issue was corrected 6/12/2024 and photo documentation was provided.**
- The distribution pressure relief valve had a small leak and appeared to require maintenance. This was noted to be an ongoing issue with the particular valve.

MONITORING, REPORTING, and DATA VERIFICATION:

In the preceding two-year period (6/11/2022- 6/11/2024) there were no violations on record. All other monitoring, reporting, and data verification appeared to be adequate at the time of inspection.

We briefly discussed that the Lead Service Line Inventory is due by 10/16/2024. Additional resources can be found at **tinyurl.com/LSL406** including funding for technical assistance and links to DEQ templates.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:

Management could improve the maintenance, safety, and operation by following the recommendations in this report. Several recommendations from the last inspection were noted to be addressed, this system's personnel are commended for taking initiative.

The test well east of Well 1 appears to be abandoned but with the casing intact and a removable well cap that was not secured. Abandoned wells are required to be properly abandoned according to the Administrative Rules of Montana 36.21.670. Keep in mind a certified well driller will need to verify the proper abandonment and record it in a well log.

Also, keep in mind the storage tank and tank control vault can be considered confined spaces. Confined space entry procedures and training should be considered and adhered to. Additionally, fall risk mitigation procedures, training, and equipment would be highly recommended for the safety of those having to climb into the tank or vault.

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 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:

Andrew Huggins is the primary, active, fully certified, class 4AB water system operator for this system. Shannon Burdick is an active, operator in training, class 4AB drinking water system operator for this system. This currently satisfies the state requirements for this class 4AB drinking water system.

WASTEWATER:

Served by a large capacity on-site wastewater sewer collection and drainfield system located on the southwest side of the current subdivision.

DATABASE CHANGES MADE:

None.

SIGNIFICANT DEFICIENCIES:

Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

The state of Montana adopted the federal Ground Water Rule (ARM 17.38.211) effective December 1, 2009. The Ground Water Rule establishes strict timelines for the identification of significant deficiencies, DEQ notification of the PWS system owner of the significant deficiency and the implementation of corrective action by the PWS.

The Department has established a Significant Deficiency Review Committee (Committee) to review deficiencies identified during a sanitary survey inspection or site visit to determine if they meet the Department's interpretation of significant.

No significant deficiencies were noted during this inspection.

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-7494.

Sincerely,

Kirk Yoder
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-7494
Email: kyoder@mt.gov

CC: Helena PWS file
Gallatin County file
Shannon Burdick (Email only, completed)

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

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View hydrograph for this site
View field visits for this site
View water quality for this site
View scanned well log (5/15/2006 10:52:13 AM)

Site Name: LAZY J WATER SYSTEMS * #1
GWIC Id: 223891
DNRC Water Right: 30116359

Section 1: Well Owner(s)

1) LAZY J WATER SYSTEMS (MAIL)
1045 REEVES ROAD EAST SUITE C
BOZEMAN MT 59718 [09/30/2005]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	NW¼ SW¼ NW¼ SE¼

County
GALLATIN

Geocode

Latitude	Longitude	Geomethod	Datum
45.25135338	-111.2607525	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6130.24	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6132.76	SUR-GPS	NAVD88	7/20/2011 4:03:00 PM

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: Friday, September 30, 2005

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	76	14
76	1191	12
1191	1278	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	1180	8	0.250		WELDED	STEEL
1153	1264	6	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1259	1219	6		.4	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	1180	CEMENT	
1153	1153	6X8 K PACKER	

Section 7: Well Test Data

Total Depth: 1278
Static Water Level: -353
Closed-in Pressure: 153 psi
Water Temperature:

Pump Test *

Depth pump set for test 545 feet.
181 gpm pump rate with 778 feet of drawdown after 72 hours of pumping.
Time of recovery 48 hours.
Recovery water level 353 feet.
Pumping water level 0 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

217KOTN - KOOTENAI FORMATION
221MRSN - MORRISON FORMATION

From	To	Description
0	3	TOPSOIL
3	10	GRAVEL WITH FINE SAND AND CLAY
10	57	GRAVEL WITH FINE SAND AND CLAY VERY DIRTY WITH STREAKS OF LIGHT BROWN CLAY
57	74	SHALE HIGHLY FRACTURED WITH GRAVEL
74	100	SHALE WITH STREAKS OF GREY CLAY
100	130	DARK GREY SHALE WITH TRACES OF GREY CLAY
130	195	BLACK SHALE
195	305	SHALE WITH STREAKS OF GRAY CLAY
305	325	GREY WITH STREAKS OF BLACK SHALE
325	345	BLACK SHALE WITH TRACES OF GREY CLAY
345	480	SHALE WITH STREAKS OF GREY CLAY
480	503	FRACUTED BLACK SHALE WITH LITE GREEN AND STREAKS OF GREY CLAY
503	507	HARD FRACTURED BLACK AND LITE SHALE
507	510	BLACK AND LITE GREEN SHALE, WITH STREAKS OF GREY CLAY
510	515	GREY CLAY WITH TRACES OF GREEN

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: TROY HAUSER
Company: RED TIGER DRILLING
License No: WWC-598
Date Completed: 9/30/2005

Site Name: LAZY J WATER SYSTEMS
GWIC Id: 223891
Additional Lithology Records

From	To	Description
515	518	SHALE WITH STREAKS OF GREY CLAY
518	524	BAD GUMBO, GREY CALY WITH STREAKS OF BLACK SHALE
524	525	SHALE BLACK, WITH TRACES OF GREEN
525	541	LITE GREY SANDSTONE
541	542	CLAY WITH GREY GUMBO
542	545	LITE GREY SANDSTONE WITH STREAKS OF GREY CLAY
545	567	LITE GREY SANDSTONE WITH STREAKS OF BLACK SHALE
567	575	LITE GREY SANDSTONE WITH STREAKS OF BLACK SHALE (FRACTURED) LOST APPROX. 600 GAL FLUID AND GAINED IT BACK
575	580	LITE GREY SANDSTONE WITH BLACK SHALE AND TRACES OF CLAY
580	604	LITE GREY SANDSTONE WITH BLACK AND GREEN SHALE, TRACES OF CLAY
604	606	LITE GREEN SHALE WITH BLACK AND GREY STREAKS
606	619	GREEN AND BLAKC SHALE WITH CLAY STREAKS
619	623	HARD BLACK SHALE
623	665	BLACK SHALE WITH CLAY STREAKS
665	685	GREY CLAY WITH STREAKS OF BLACK SHALE
685	698	GREY CLAY WITH STREAKS OF BLACK SHALE
698	705	SHALE - BLACK AND HARD WITH SOME CLAY
705	712	GREY CLAY AND BLACK SHALE
712	715	BLACK SHALE WITH TRACES OF GREY CLAY
715	725	BLACK SHALE
725	726	BLACK TO DARK GREY CLAY WITH BLACK SHALE
726	749	BLACK SHALE WITH TRACES OF CLAY
749	754	GREY SHALE WITH TRACES OF CLAY
754	765	BLACK SANDSTONE WITH TRACES OF WHITE (VERY HARD)
765	767	GREY CLAY, LITE IN COLOR WITH TRACES OF BLACK SHALE
767	785	HARD BLACK SHALE
785	787	GRAY CLAY LITE IN COLOR
787	790	REDDISH BROWN LIMEWTONE, BROWN SHALE
790	800	BLACK SHALE WITH LITE GREY CLAY STREAKS
800	820	BLACK SHALE WITH LITE GREY CLAY STREAKS
820	842	GREY SANDSTONE WITH STREAKS, BLACK SHALE AND GREY CLAY STREAKS
842	866	BLACK SHALE AND GREY SHALE, TRACES OF GREY CLAY
866	883	GREY STREAKED SHALE WITH LITE GREEN AND BLACK LOST APPROX. 350 TO 400 FLUID AT 860'
883	890	BLACK SHALE AND GREY SHALE, TRACES OF GREY CLAY
890	1012	GREY AND BLACK SHALE WITH STREAKS OF GREY CLAY
1012	1013	BLACK SHALE, AND DARK BROWN CLAY WITH TRACES OF RED GREEN SHALE
1013	1014	MOSTLY GREEN SHALE WITH TRACES OF RED SHALE AND GREY AND BROWN CLAY
1014	1015	RUSTY BROWN CLAY WITH BLACK AND GREEN SHALE
1015	1050	LITE BROWN CLAY
1050	1055	GREEN SHALE WITH LITE BROWN CLAY STREAKS
1055	1058	GREEN SHALE WITH RUST COLORED ROCK STREAKS AND GREY CLAY
1058	1065	GREEN SHALE WITH REDDISH ORANGE SHALE AND GREY CLAY STREAKS
1065	1075	GREEN SHALE AND TRACES OF RUST COLORED ROCK AND LITE BROWN CLAY
1075	1088	GREEN AND BROWN SHALE WITH TAN CLAY STREAKS
1088	1095	BLACK SHALE WITH GREY CLAY
1095	1100	GREEN SHALE WITH CLAY
1100	1105	GREEN AND BLACK SHALE, VERY LITTLE TRACES OF RUSTY RED
1105	1124	BLACK SHALE, WITH TRACES OF GREEN
1124	1127	LITE BROWN CLAY
1127	1130	BLACK GREEN SHALE WITH GREY, LITE BROWN CLAY AND TRACES OF RED SHALE
1130	1176	GREY CLAY WITH TRACES OF BLACK SHALE
1176	1201	GREEN AND BLACK SHALE WITH TRACES OF GREY CLAY AND GREY SHALE
1201	1217	GREY CLAY GUMBO
1217	1224	GREEN SHALE WITH GREY CLAY STREAKS AND TRACES OF SANDSTONE
1224	1242	GREY SANDSTONE WELL BEGINS TO FLOW
1242	1272	GREEN AND BLACK SOFT SHALE
1272	1278	GREEN AND GREY HARD SHALE

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

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site

Site Name: LAZY J WATER SYSTEMS * #2
GWIC Id: 227731
DNRC Water Right: 30116359

Section 1: Well Owner(s)

1) TAYLOR, JAMES (MAIL)
1045 REEVES RD E SUITE C
BOZEMAN MT 59718 [07/22/2006]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	SE¼ NE¼ NW¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.25072411	-111.2604601	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6123.14	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6126.73	SUR-GPS	NAVD88	8/1/2019

Addition: LAZY J SOUTH
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: Saturday, July 22, 2006

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	70	14
70	989	12
989	1325	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	950	8.8	0.280		THREAD AND COLLAR	A53B STEEL
912	1207	5.5	0.250		WELDED	A53B STEEL
1287	1302	5.5	0.250		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1207	1287	5.5		.040	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	989	CEMENT	

Section 7: Well Test Data

Total Depth: 1325
Static Water Level:
Closed-in Pressure: 160 psi
Water Temperature: 8.89 °C

Artesian/Flow Test *

14 gpm for _ hours.
Flow controlled by VALVE .

** 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
217KOTN - KOOTENAI FORMATION

From	To	Description
0	3	TOPSOIL
3	6	SILTY CLAY
6	18	SILTY CLAY & GRAVELS
18	30	FINE SAND & GRAVELS
30	45	FINE SAND & GRAVELS W/ CLAY STREAKS
45	60	FINE SAND & GRAVELS W/SHALE
60	78	SHALE W/ STREAKS GRAVEL
78	89	GRAY SHALE W/ STREAKS GRAY CLAY
89	204	BLACK SHALE W/STREAKS GRAY CLAY
204	277	BLACK FRACTURED SHALE
277	350	BLACK SHALE W/ STREAKS CLAY
350	541	BLACK SHALE
541	572	GREEN & GRAY STREAKED SHALE
572	582	BLACK & BROWN FRACTURED ROCK
582	592	GREEN & GRAY STREAKED SANDSTONE

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.

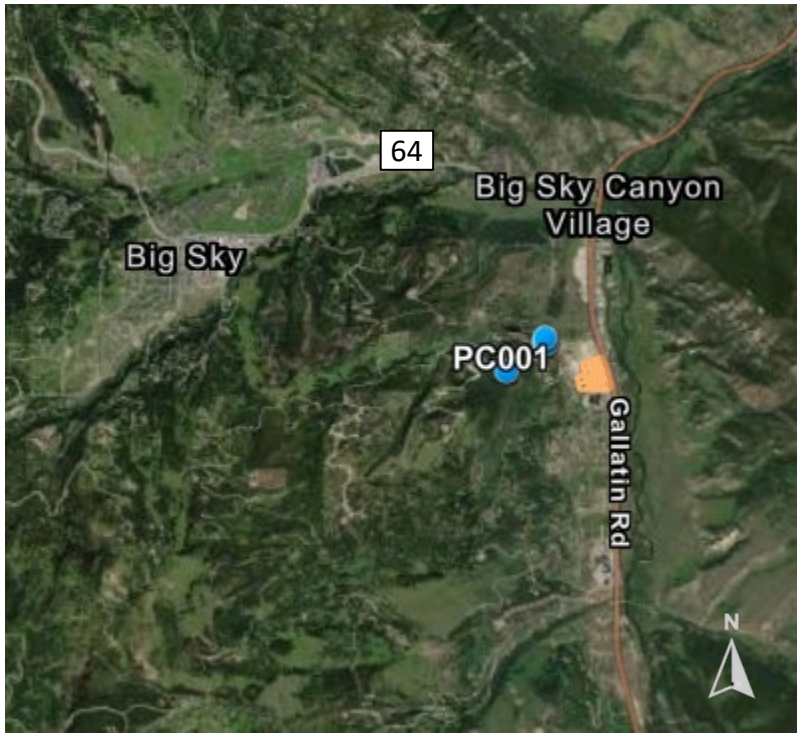
Name: TROY HAUSER
Company: RED TIGER DRILLING
License No: WWC-598
Date Completed: 7/22/2006

Site Name: LAZY J WATER SYSTEMS
GWIC Id: 227731
Additional Lithology Records

From	To	Description
592	596	GRAY SANDSTONE W/ TRACES GRAY CLAY
596	634	GRAY SANDTONE
634	654	GRAY SANDTONE W/TRACES GRAY CLAY
654	742	BLACK & GRAY SHALE W/TRACES CLAY
742	748	GRAY SHALE W/CLAY STREAKS
748	754	GRAY & BLACK SHALE W/TRACES GRAY CLAY
754	870	GRAY SHALE
870	890	BLACK SHALE W/ STREAKS CLAY
890	911	BLACK SHALE W/TRACES CLAY & QUARTZ
911	918	GRAY & BLACK SHALE W/TRACES CLAY
918	942	GRAY SANDSTONE W/TRACES GRAY CLAY
942	998	DARK GRAY CLAY W/TRACES BLACK SHALE
998	1003	GRAY CLAY W/BLACK STREAKS SHALE
1003	1016	GRAY CLAY W/BLACK GRAY & GREEN SHALE
1016	1036	GRAY SANDSTONE
1036	1070	RED & BROWN ROCK W/STREAKS CLAY
1070	1078	RED SHALE W/STREAKS GRAY SHALE
1078	1094	RED GRAY & BLACK SHALE
1094	1112	BLACK & GRAY STREAKED SHALE
1112	1124	GREEN SHALE W /GRAY CLAY STREAKS
1124	1143	DARK GREEN & BLACK SHALE W/ STREAKS TAN CLAY
1143	1182	GREEN & BLACK SHALE W/ STREAKS GRAY CLAY
1182	1188	GRAY CLAY W/ STREAKS LITE GREEN SHALE
1188	1201	LITE GREEN -DARK GREEN SHALE W/ TRACES GRAY CLAY
1201	1214	GREEN & BLACK SHALE W/TRACES GRAY CLAY
1214	1226	ROUNDED 3/8" BLACK SHALE W/ TRACES GRAY CLAY
1226	1231	BLACK GRAY & GREEN SHALE
1231	1235	HARD GRAY SANDSTONE
1235	1240	RED GREEN & BLACK SHALE W/TRACES GRAY CLAY
1240	1274	BLACK & GRAY SHALE W/ TRACES LIMESTONE
1274	1304	GRAY SHALE W/ LITE GRAY CLAY STREAKS
1304	1325	FRACTURED GRAY & BLACK STREAKED SHALE TRACES GRAY CLAY

Sanitary Survey Inspection Photos
Lazy J South Subdivision
PWSID: MT0004432
Inspector: Kirk Yoder, DEQ
June 11, 2024

Aerial View



Legend

DEQ Public Water Supply Facilities

Property Boundaries (Montana Cadastral)

Parcels

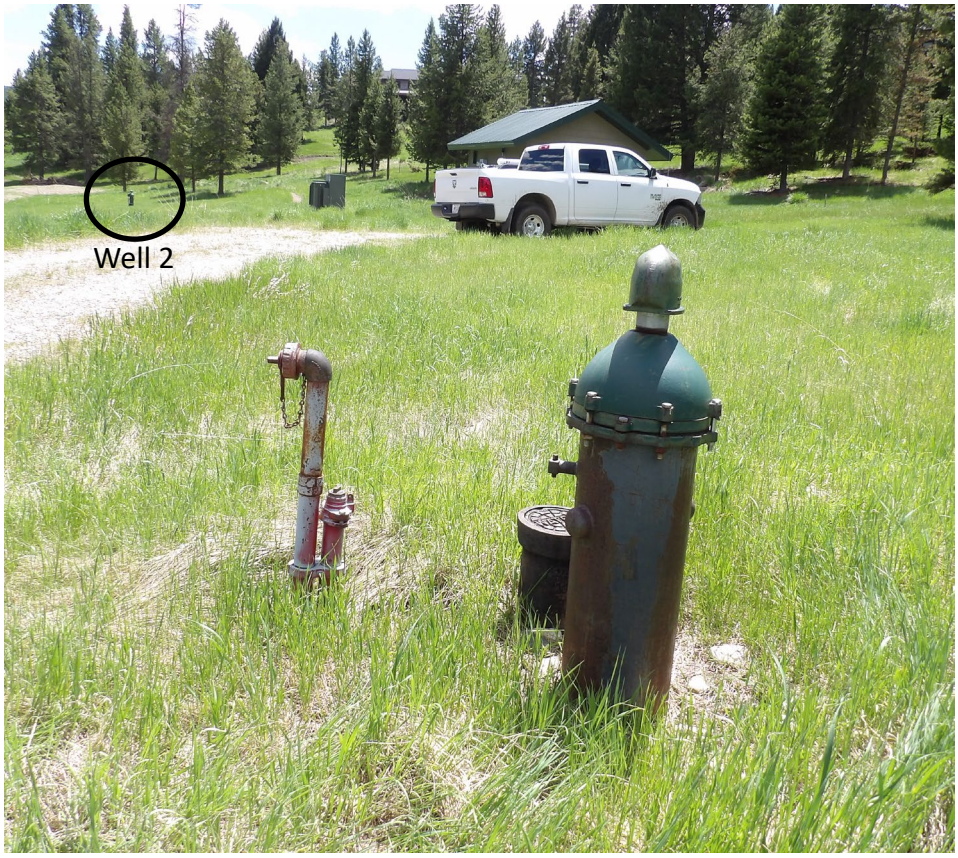
Lazy J South Sub.

System location overview.



Subdivision and facilities overview.

WL002, Well 1 (GWIC 223891)



View of the well looking south toward the pump house and Well 2.



Close view of both monitoring port plugs.



View looking northeast toward the test well.



Test well with the loose well cap. Consider proper abandonment of this well.

WL003, Well 2 (GWIC 227731)



View of the well looking north towards the pump house.



View of the well looking southeast.



Close view of both monitoring port plugs.



The valve box lid was found and installed.

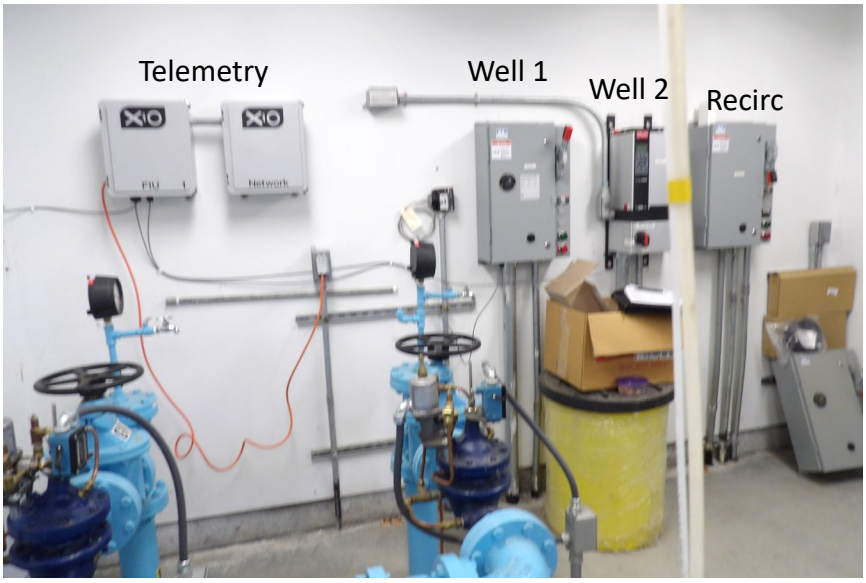
PC001 Pressure Control & CH001 Common Header



Common header and well inlet piping. Well 2 piping is in the foreground.



Power distribution and local telemetry/controller AB PanelView550.



Remote telemetry and pump controllers for the wells and recirculation pump.

PC001 Pressure Control, continued

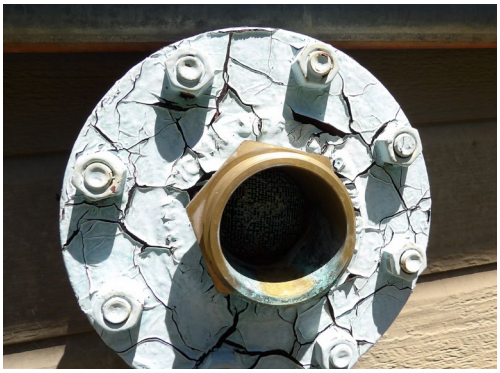


View showing the 1. pressure relief valves and 2.air/vac valves.



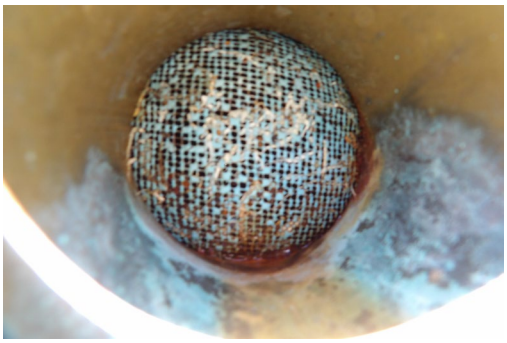
View showing the 1. pressure transducer, 2.pressure gauge, 3. tank bypass/crossover, 4. recirculation pump, 5. distribution piping, 6 tank piping.

PC001 Pressure Control, continued





View of the pump house south west corner showing the blow-off pipe termination and both pressure relief terminations.



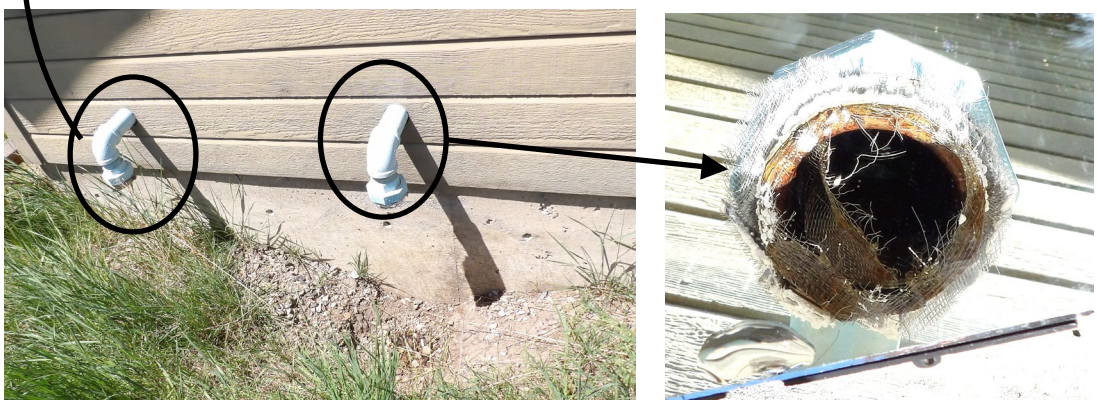
Blow-off valve screen.



Pump house north side.



Tank pressure relief discharge.





Pressure relief terminations. Left is the tank and right is the distribution. Note there is no splash pad to mitigate damage around the foundation. Consider a splash pad and sloping.

Left photo shows the screen missing during the inspection and right photos was provided by Shannon Burdick to show the screen was replaced.

ST001 Storage Tank 530,000 GAL



Overview of the tank looking west.



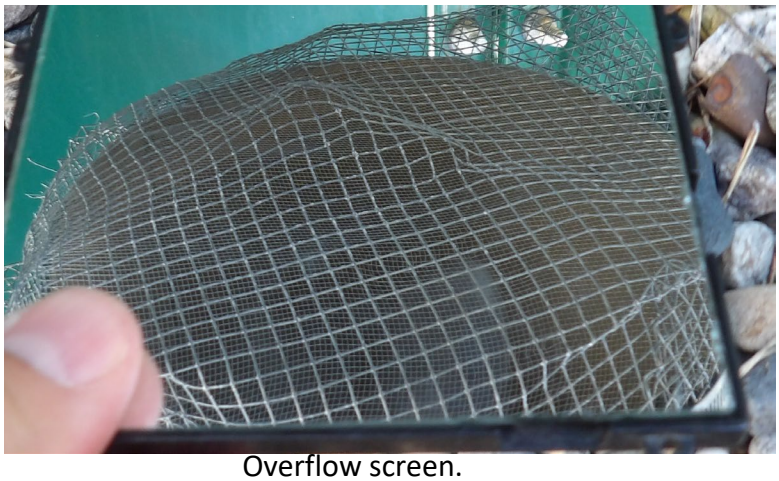
Tank ladder, cage, and locked gate.



View of the overflow pipe relative to the foundation and no splash pad.



Overflow piping overview.



Overflow screen.

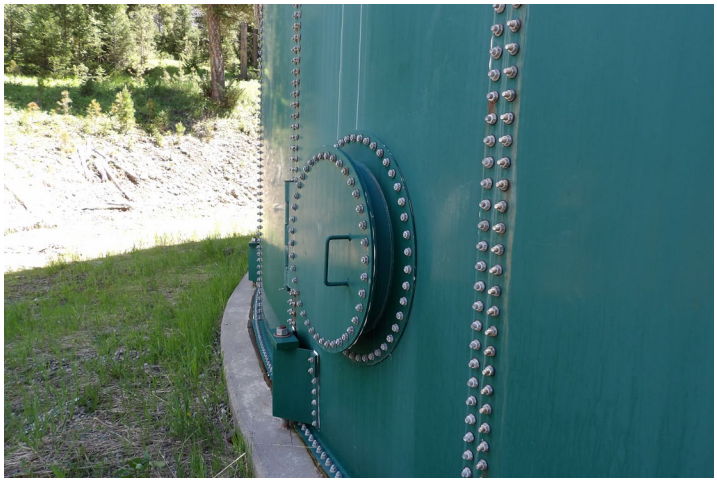
ST001 Storage Tank 530,000 GAL, continued



Sight gauge pulley without a fitting or seal.



Tank vent cover.



Lower tank access hatch.



Vent screen.



Tank valve vault hatch.



Tank upper hatch.

DEQ
Montana Department of Environmental Quality

October 22, 2024

Ramshorn View Estates
Attn: Jim Muscat
85 Cactus Lane
Townsend, MT 59644

Re: Sanitary Survey Inspection of Ramshorn View Estates (PWSID: MT0004035).

Dear Owners, Administrators, and Consumers:

I would like to thank Jim Muscat for assisting me during the sanitary survey inspection of the Ramshorn View Estates public water supply system. As a community public water supply, your facility is required to have a sanitary survey inspection every three years. These routine 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 September 19, 2024.

SYSTEM DESCRIPTION:

Located about 1.5 miles south of Lone Mtn. Trail (Hwy 64) on the west side of Gallatin Rd. (US 191) accessed via Anaconda Drive. This water system consists of two source wells pumped to a common header and then storage tank. From storage gravity sends water to the distribution system. The distribution system consists of 86 service connections serving approximately 185 people.

SOURCES:

WL002, Well 1 (GWIC 165682): Located about 350ft south of the pump control building. The well log is attached for reference. No adverse conditions were noted with the area around the well, the well itself, or with the well cap. See photos for additional observations. This is the primary well used almost exclusively.

WL003, Well 2 (GWIC 257253): Located about 400ft north of the pump control building. The well log is attached for reference. No adverse conditions were noted with the area around the well, the well itself, or with the well cap. See photos for additional observations. This is a backup well that can be used but was reported to require flushing to waste prior to use due to hydrogen sulfide if needed.

TREATMENT:

No treatment facilities were known to exist or observed to be in use at the time of inspection.

DISTRIBUTION:

DS001 Distribution System: Records indicate this facility consists of varying sizes of PVC piping. The distribution system is partially looped with the dead-end sections flushed annually or more frequently as needed. The fire hydrants (approximately 24) located throughout the distribution system are flushed by the system operator. A Watts 800M4 pressure vacuum breaker is used at the soccer field irrigation system connection for backflow prevention. No other cross connections were reported or observed.

STORAGE:

ST001 Storage Facility: Located uphill and west of the homes (about 980ft west of the pump control building). This facility consists of single on-grade, bolted steel, 340,000-gallon tank. It was reported to have a separate fill and distribution pipes. The overflow termination was reported to be on private property below the tank so was not observed the day of inspection. The vent riser has six bolt holes filled with sealant in 2014. Two of those holes were not filled leaving openings into the tank. The tank vent was screened. The telemetry wiring conduit at the base of the tank was broken leaving the critical wiring exposed for potential damage. The tank hatch did not have any seal but was padlocked. The caged ladder did have a locked anti-climb gate.

- Repair the broken wiring conduit for the tank level sensor to avoid damage and disruption (see photos).
- It was recommended to snug the tank anchor bolts.
- **Two of the west vent riser holes were re-sealed following the inspection (see photos).**
- **A hatch seal was added following the inspection (see photos).**
- **The overflow screen was not able to be observed during the inspection as it is on private property below the tank, PLEASE PROVIDE A PHOTO OF THE OVERFLOW TERMINATION.**

PUMPS, PUMP FACILITIES, and CONTROLS:

The wells are equipped with 30hp Franklin brand submersible well pumps. Well 1 is the main source well and is controlled by the storage tank level and radio telemetry. Well 2 must be manually activated and is used as a backup source. Water from both wells meet at a common header (CH001) then flows to the storage facility (ST001). Water is fed from the storage tank by gravity to the distribution system (DS001). The storage tank is on an elevated rise west of the subdivision.

- The manual blow-off pipe was capped following the inspection (see photos).

MONITORING, REPORTING, and DATA VERIFICATION:

In the preceding two-year period (9/19/2022- 9/19/2024) there were four violations on record. Violation dated 1/25/2023 for Failure to Report Inorganic Compounds, 3YR 20-22 was returned to compliance with monitoring and reporting 3/29/2023. Two violations dated 1/29/2023 for Failure to Report, Synthetic Organic Compounds and Volatile Organic Compounds, 3YR 20-22 were both returned to compliance with monitoring and reporting 3/29/2023. Violation dated 6/21/2023 for Failure to Report, Statewide Waivers (2020-2022) was returned to compliance with monitoring and reporting 10/23/2023.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:

Management could improve the maintenance, safety, and operation by following the recommendations in this report. As a reminder: The storage tank is a confined space. Confined space entry procedures and training should be considered and adhered to. Additionally, fall risk mitigation procedures, training, and equipment would be highly recommended for the safety of those having to climb on or into the tank.

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:

James Muscat is the primary, active, fully certified class 2A3B water system operator for this system. This currently satisfies the state requirements for this class 4AB drinking water system. It is recommended that the system make plans for a back-up certified operator (trained on this system's operation) in the event Jim is unavailable to perform his duties for any reason.

WASTEWATER:

Ramshorn View Estates wastewater is managed by an on-site collection system with a total of three sand filters and drain fields.

DATABASE CHANGES MADE:

Update principal city served to Big Sky, removing Gallatin Gateway.

SIGNIFICANT DEFICIENCIES:

Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

The state of Montana adopted the federal Ground Water Rule (ARM 17.38.211) effective December 1, 2009. The Ground Water Rule establishes strict timelines for the identification of significant deficiencies, DEQ notification of the PWS system owner of the significant deficiency and the implementation of corrective action by the PWS.

The Department has established a Significant Deficiency Review Committee (Committee) to review deficiencies identified during a sanitary survey inspection or site visit to determine if they meet the Department's interpretation of significant.

No significant deficiencies were noted during this inspection.

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-7494.

Sincerely,

Kirk Yoder
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-7494
Email: kyoder@mt.gov

CC: Helena PWS file
Gallatin County file
Email, Jim Muscat (completed)

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

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site
View water quality for this site
View scanned well log (2/25/2008 2:48:44 PM)

Site Name: SCENIC LAND DEVELOPMENT [RAMSHORN PWS WELL]
GWIC Id: 165682

Section 1: Well Owner(s)

1) RAMSHORN SUBDIVISION HOA (MAIL)
PO BOX 161164
BIG SKY MT 59716 [08/04/2010]
2) SCENIC LAND DEVELOPMENT (MAIL)
PO BOX 160085
BIG SKY MT 59716 [05/18/1994]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	SE¼ NW¼ SE¼ NE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.24144864	-111.2542	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6060.12	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6062.5	SUR-GPS	NAVD88	8/4/2010 5:05:00 PM

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, May 18, 1994

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	40	12
40	1490	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	1450	6	0.250		WELDED	STEEL
0	40	8	0.25		WELDED	STEEL
0	20	12	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1450	1490	6			OPEN HOLE

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	1450	CEMENT	

Section 7: Well Test Data

Total Depth: 1490
Static Water Level: -23.1
Closed-in Pressure: 10 psi
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
120 gpm pump rate with _ feet of drawdown after 24 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 600 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

217KOTN - KOOTENAI FORMATION
221MRSN - MORRISON FORMATION

From	To	Description
0	1	TOPSOIL
1	16	GRAVEL & BOULDERS
16	530	SHALE
530	540	SILTSTONE
540	1010	SHALE
1010	1055	RED BEDS SHALE
1055	1065	BLACK SHALE
1065	1090	RED SHALE SLOW STICKY
1090	1115	SANDSTONE
1115	1255	SHALE
1255	1285	GRAY SANDSTONE
1285	1435	SHALE
1435	1465	SANDY SHALE
1465	1490	SHALE

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: KEVIN HAGGERTY
Company: HAGGERTY DRILLING
License No: WWC-353
Date Completed: 5/18/1994

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

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View hydrograph for this site
View field visits for this site
View water quality for this site
View scanned well log (9/8/2011 2:00:17 PM)

Site Name: RAMSHORN SUBDIVISION HOA * UNUSED
GWIC Id: 257253

Section 1: Well Owner(s)

1) RAMSHORN SUBDIVISION HOA (MAIL)
PO BOX 161164
BIG SKY MT 59716 [07/29/2010]
2) HOMELANDS DEVELOPMENT CO US (MAIL)
1 RIVER VIEW LANE
GALLATIN GATEWAY MT 59730 [11/25/1999]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	NW¼ NW¼ SE¼ NE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.24192135	-111.2544534	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6061.92	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6062.95	SUR-GPS	NAVD88	7/29/2010 10:50:00 AM

Addition: **Block:** **Lot:**

Section 3: Proposed Use of Water

UNUSED (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, November 25, 1999

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	300	12
300	1320	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-3	720	8	0.322		WELDED	STEEL
704	1293	4	0.322		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1292	1312	4		30	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	300	BENTONITE	
300	705	K PACKER	
705	1060	FORMATION PACKER	

Section 7: Well Test Data

Total Depth: 1320
Static Water Level: 9
Water Temperature:

Pump Test *

Depth pump set for test 493 feet.
120 gpm pump rate with 384 feet of drawdown after 24 hours of pumping.
Time of recovery 12 hours.
Recovery water level 31 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

TD REPORTED FROM RAMSHORN RESIDENT.

Section 9: Well Log

Geologic Source

217KOTN - KOOTENAI FORMATION

From	To	Description
0	24	GRAVEL
24	960	BLACK SHALE
960	982	RED SHALE
982	995	DIRTY DARK BROWN SHALE
995	1232	MULTICOLORED SHALE
1232	1240	SAND
1240	1250	SHALE
1250	1315	SAND
1315	1320	BLACK SHALE

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: KEVIN HAGGERTY
Company: KEVIN HAGGERTY DRILLING INC
License No: WWC-353
Date Completed: 11/25/1999

Sanitary Survey Inspection Photos
Ramshorn View Estates
PWSID: MT0004035
Inspector: Kirk Yoder, DEQ
September 19, 2024

Aerial View



Facilities location overview and showing the pump control building and irrigation backflow preventer (BFP).



System location overview and access.

Legend

DEQ Public Water Supply Facilities

Property Boundaries (Montana Cadastral)

Parcels

WL002, Well 1 (GWIC 165682)



Overview of the well area looking north toward the pump control building (circled).



Well profile view looking west. Both monitoring port plugs were secure (circled).



Well profile view looking east.

WL003, Well 2 (GWIC 257253)



Well profile view looking south toward the pump control building (circled).



Both monitoring port plugs were secure.



View of the well area including post hydrant looking northeast.

Common Header (CH001)



View of the pump control building looking southeast.



View of the pump control building looking northeast.



Blow-off pipe on the east side not capped observed during inspection.



Common header piping and valves. Well 2 left side and Well 1 from the right side with the flow meter (circled) capturing total flow to distribution.



Photo by Jim Muscat showing the blow-off pipe capped submitted 10/21/2024.



Well pump controllers and electrical distribution.



Tank telemetry display.

ST001 Storage Facility



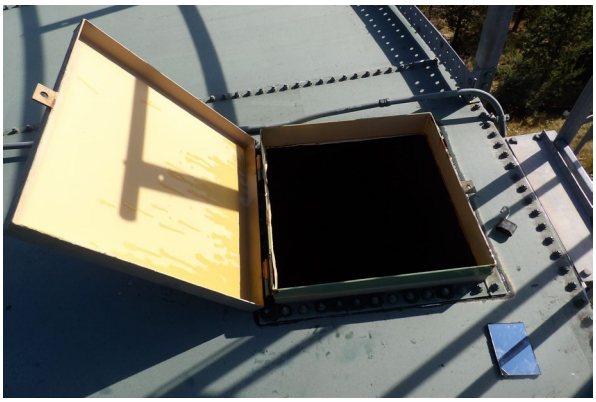
Overview of the tank looking north.



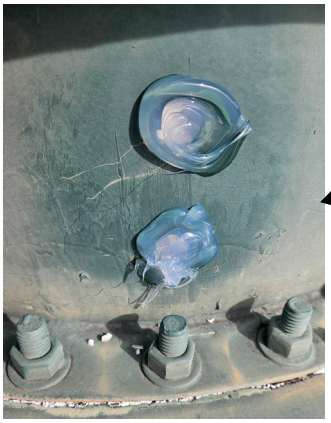
Broken conduit with exposed telemetry wiring (circled). Conduit appeared like it should be in the clamp and vertical with no bends.



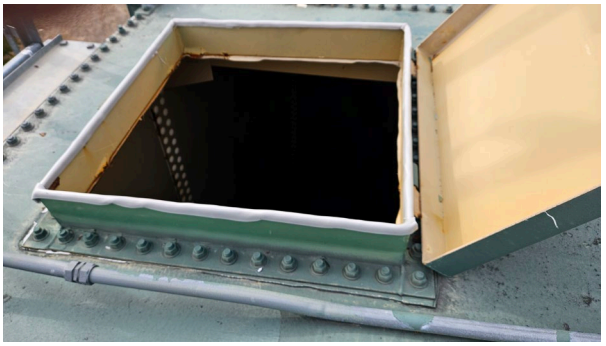
Two of the vent riser bolt holes with openings into the tank (west side of the vent riser).



Tank hatch with no seal during the inspection.



The two vent riser bolt holes with sealant added. Photo submitted by Jim Muscat 10/21/2024.



Tank hatch with a new seal submitted by Jim Muscat 10/21/2024.

ST001 Storage Facility, continued



Detail view of the locked gate for the ladder and overview of the overflow piping.



Overflow connection detail.



Overflow pipe connection to buried pipe.



Vent and tank level sensor.



Vent screen detail.

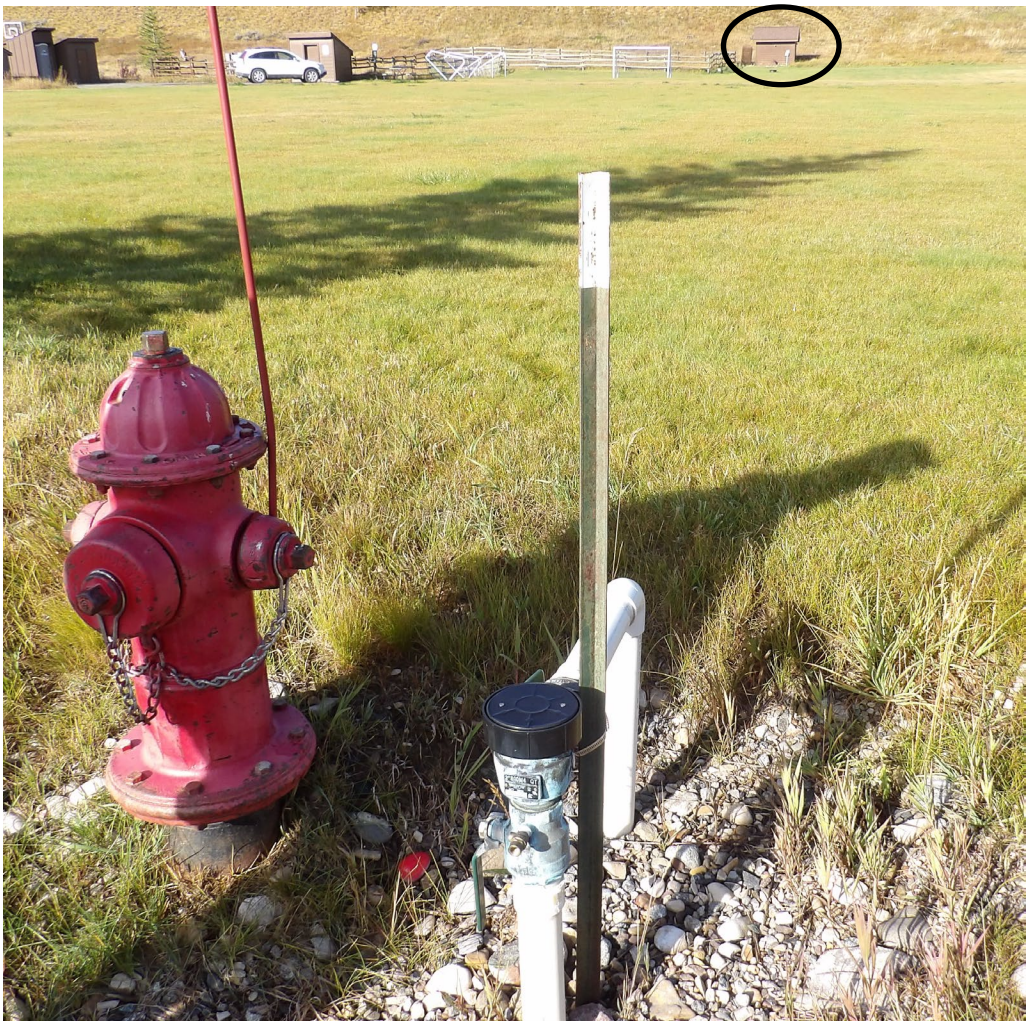


Sealed bolt holes on the west side of the vent riser.



Tank level sensor detail.

DS001 Distribution System



Ball field irrigation system connection looking west toward the pump control building (circled).



Backflow preventer information.

DEQ
Montana Department
of Environmental Quality

November 10, 2022

Big Sky School District No 72
Attn: Peter Manka
PO Box 161603
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Big Sky School District No 72 (PWSID: MT0001281).

Dear Peter,

I would like to thank you for assisting me during the sanitary survey inspection of the Big Sky School District No 72 public water supply system. As a non-transient non-community public water supply, your facility is required to have a sanitary survey inspection every five years. These routine 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 3, 2022.

SYSTEM DESCRIPTION: Big Sky School District No 72 is located south of Big Sky at 45465 Gallatin Gateway Road. The system currently serves water to 275 people through 2 service connections. However, the system is currently upgrading under DEQ Plan Review EQ# 21-2550. The project includes installing a new storage tank and removing the old one, installing a new booster station, and disconnecting one well from the public water supply to fill fire suppression tanks instead. Once the new facilities are placed into service, there will be only one service connection not two.

SOURCE(s): Well 2 GWIC 168031 (WL003) was drilled in February 1998 to a depth of 120 feet. The static water level is 30.9 feet, and it is grouted to 20 feet with bentonite. Well 3 GWIC 248254 (WL004) was drilled in October 2008 and is grouted to 22 feet with neat cement. Depth and static water level is unknown. WL003 was declared a ground water source for DEQ purposes in February 2017, and WL004 in December 2012. These determinations will be re-addressed if conditions around the wells change.

- The well log for WL004 is missing key data. It is recommended that the system measure depth and static water level for this well, especially since it will be the only PWS well in operation when the upgrades are complete.

On the day of the survey, WL003 was in use and WL004 was valved off for construction purposes. Once the upgrades are complete, WL004 will be the only well in operation, and WL003 will be disconnected from the public water supply and instead used to fill fire suppression tanks.

- On the day of the survey, the area around WL004 was dug up for construction purposes. It is recommended that the system double-check the well cap and gasket, electrical conduit, and

ground around the well casing before placing the well back into service. It might also be a good idea to chlorinate and/or flush the well too.

TREATMENT: The system does not currently treat the water.

DISTRIBUTION: Currently, this system has two distribution systems. Normally, WL003 serves the older portion of the distribution system DS001 while WL004 serves the newer portion of the distribution system DS002. However, on the day of the survey, valves between DS001 and DS002 were open. This allowed WL003 to supply water to both DS001 and DS002 while construction was in progress. Once system upgrades are completed, the system will have one distribution system served by WL004.

STORAGE: Storage tank ST001 has been removed and replaced with a new 6,000-gallon tank in the same general location as ST001. On the day of the survey, this new tank was NOT in service.

- On the day of the survey, nothing prevented me from easily opening the tank hatch lid. Before using the new storage tank, the hatch needs a gasket and the lid needs to be securely closed and locked. Even though this tank was tested for total coliform bacteria, it is recommended that the tank is again chlorinated, flushed, and tested for total coliform bacteria again before placing it into service.

PUMPS, PUMP FACILITIES and CONTROLS: Pressure control assembly 1 (PC001) was running on the day of the survey and is composed of the submersible well pump in WL003, 3 captive air tanks, and a VFD controller. Pressure control assembly 2 (PC002) was off-line on the day of the survey while pump facility PF001 was removed in order to install a new pump facility for the new storage tank. PC002 is in the process of an upgrade in order to support WL004 after upgrades are complete.

MONITORING, REPORTING and DATA VERIFICATION: The system has had no violations in the last two-year period. The operator is aware that extensive testing is required by the end of the year (nitrate, IOC's, VOC's, SOC's, etc) and that the asbestos waiver paperwork is due by the end of this month.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION: The system appears adequately managed and operated and expects to complete upgrades and begin to use the new facilities by the end of the year. The operator understands that the sanitary survey does not approve the new facilities – DEQ Plan Review may not approve the as-builts and/or make suggestions that were not discussed during the sanitary survey.

- DEQ requires as-builts to be submitted and approved before using the new facilities. It is recommended that the system submit the as-builts and keep in contact with DEQ plan review in order to activate the new facilities. The DEQ Plan Review contact is Jackie Kuhl, who can be reached by phone at 406-444-1515 and by email at jackie.kuhl@mt.gov.

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 MAP, MRW,

RATES and other DEQ staff to meet the demand for facility-based training opportunities. DEQ 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: Peter Manka (operator certification #7640) is the certified operator for the system. There is no back-up operator.

- It is recommended that the system hire and train a back-up operator for times when Peter is not available.

WASTEWATER: Wastewater is handled by septic and drain fields. The system is currently upgrading the wastewater system.

DATABASE CHANGES MADE: There are no database changes associated with this report.

SIGNIFICANT DEFICIENCIES: On the day of the survey, there were no observed significant deficiencies.

Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

If you find any inaccuracies in this letter or the attached report, please contact me with the appropriate corrections. Again, thank you for accompanying me on the inspection.

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-4071.

Sincerely,

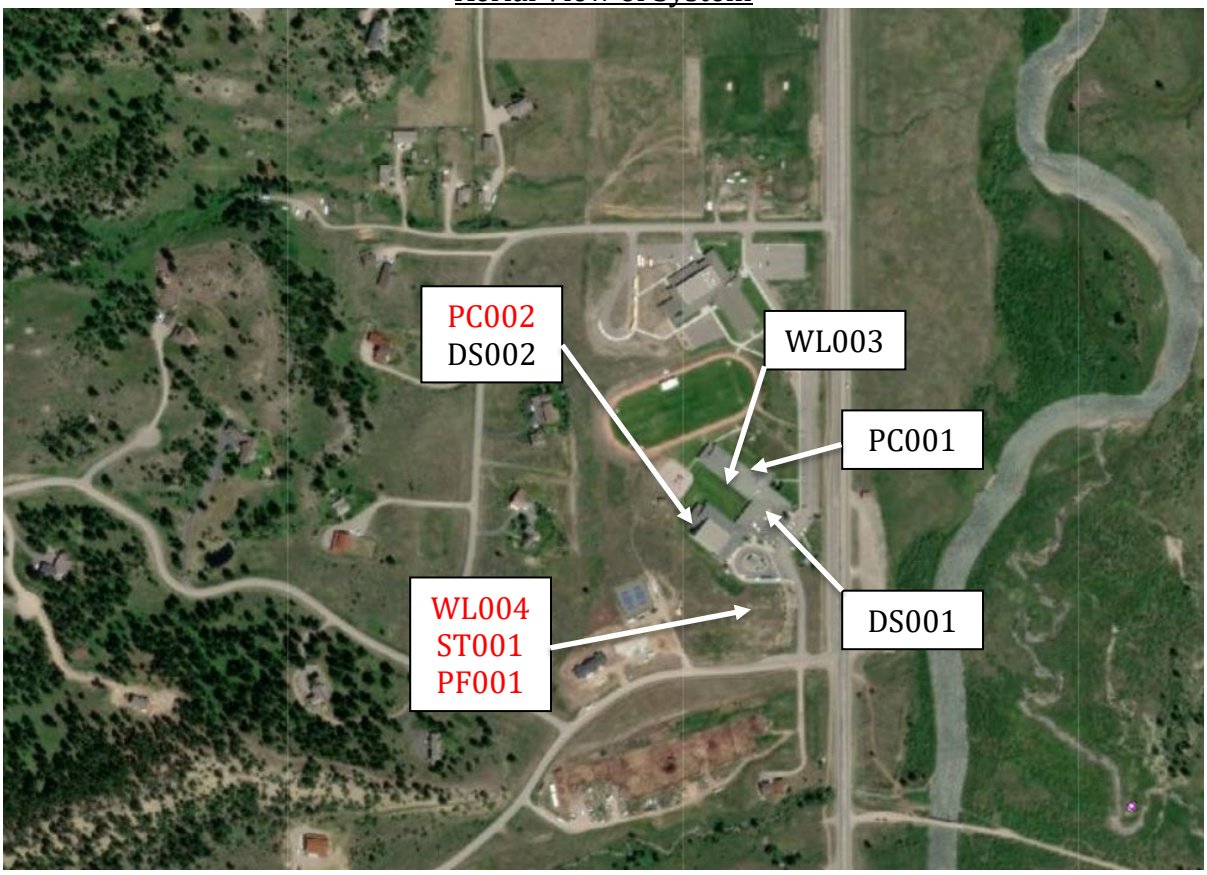
Tammy Jacobson
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-4071
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County files

Water System Facilities Table and Flow

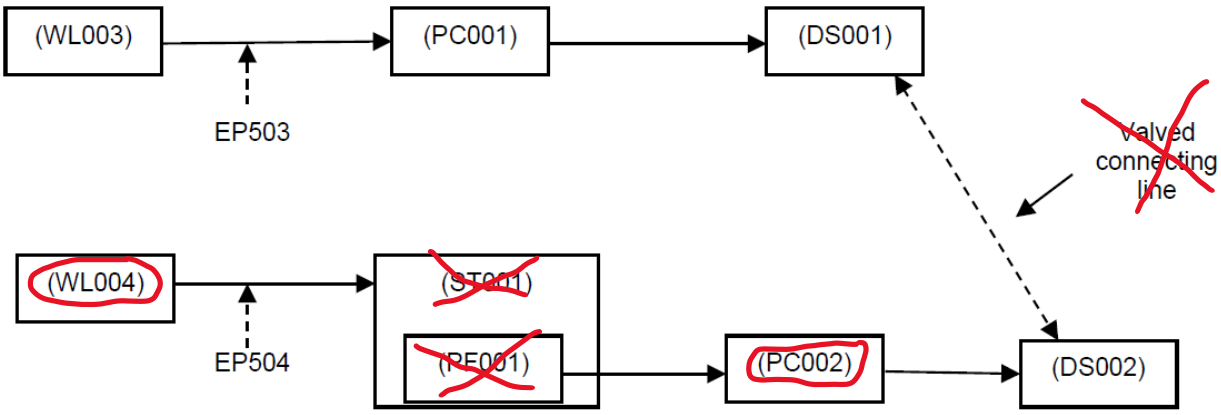
Flow ↓	WSF ID	WSF Name	Description
	WL003	Well 2 GWIC 168031	On the day of the survey, valves were open to allow these facilities to supply water to the entire school. WL003 and PC001 will be inactivated when construction is complete and new facilities activated.
	PC001	Pressure Control Assembly 1	
	DS001	Distribution System 1	
	WL004	Well 3 GWIC 248254	On the day of the survey, these facilities were not in use. WL004 was valved off, ST001 and PF001 were removed and a new storage tank in its place and PC002 was off-line. When construction is complete, WL004 will provide water with a new storage tank and new pump facility into what is currently DS001 and DS002.
	ST001	Storage Tank Well 3	
	PF001	Pump Facility Well 3	
	PC002	Pressure Control Well 3	
	DS002	Distribution System 2	

Aerial View of System



On the day of the survey, the valves separating DS001 and DS002 were open forming one distribution system. WL004 and PC002 were off-line, ST001 and PF001 were removed.

System Schematic (*pulled from last sanitary survey)*



On the day of the survey, the valves separating DS001 and DS002 were open forming one distribution system. WL004 and PC002 were off-line, ST001 and PF001 were removed.

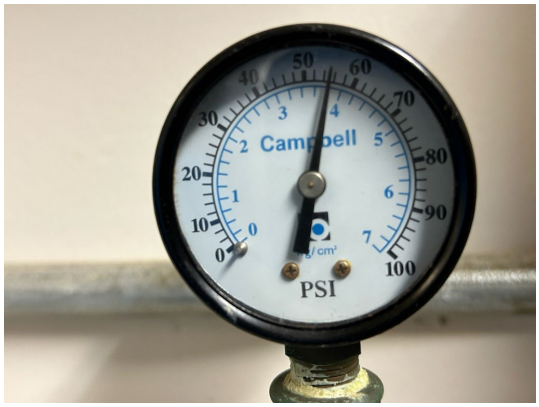
WL003





PC001







WL004, ST001, PF001, and PC002







WL004 was not active on the day of the survey. Before re-activating, be sure to add the bolt that is missing and properly slope dirt away from the well casing once the hole is filled with dirt.





ST001 and PF001 were both removed. This is the new storage tank and wet well (in the corner of the first picture above). Be sure to add a gasket, secure the hatch, and lock the tank before placing it into service.



WL004 and new pump facility controls – the operator was not sure which boxes will be used when these facilities are (re) - activated.



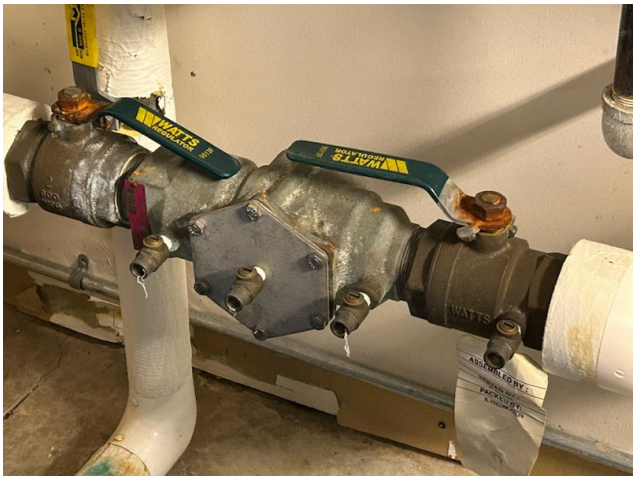




Irrigation Backflow Devices



Irrigation line off WL004.



Irrigation line off WL003. This device needs turned 45 degrees.

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 field visits for this site
View water quality for this site
View scanned well log (2/27/2008 8:14:15 AM)

Site Name: OPHIR SCHOOL DISTRICT 72 * WELL 2
GWIC Id: 168031
DNRC Water Right: 30051004

Section 1: Well Owner(s)

1) OPHIR SCHOOL (MAIL)
45465 GALLATIN RD
GALLATIN GATEWAY MT 59730 [02/17/1998]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	17	SW¼ SE¼ NE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.22905	-111.2523	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6118	MAP	NGVD2911	20/2019

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: Tuesday, February 17, 1998

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	120	6
0	25	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	60	6	0.250		WELDED	A53B STEEL
52	120	4.5			THREADED	PLASTIC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
40	50	6	5 PER FT		HOLTE AIR
80	100	4.5		0.25	CERTAINTEED SCREEN

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	

Section 7: Well Test Data

Total Depth: 120
Static Water Level: 30.9
Water Temperature:

Air Test *

60 gpm with drill stem set at _ feet for 1 hours.
Time of recovery 0.02 hours.
Recovery water level 30.9 feet.
Pumping water level 32.2 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
110SNGR - SAND AND GRAVEL (QUATERNARY)

From	To	Description
0	46	GRAVEL
46	76	MULTI COLORED CLAY
76	79	HARD GREY SILTSTONE
79	110	GREY SHALE
110	115	RED GREY SHALE
115	120	GREY SHALE

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: KEVIN HAGGERTY
Company: HAGGERTY DRILLING
License No: WWC-353
Date Completed: 2/17/1998

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 field visits for this site
View water quality for this site

Site Name: OPHIR SCHOOL * WELL 3
GWIC Id: 248254
DNRC Water Right: 30047180

Section 1: Well Owner(s)

1) OPHIR SCHOOL (MAIL)
P.O. BOX 161280
BIG SKY MT 59716 [10/28/2008]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	17	NE¼ NE¼ SE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.22808	-111.25187	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6125	MAP	NGVD29	11/8/2013

Addition	Block	Lot
PORCUPINE PARK SUBDIVISION		A

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: Tuesday, October 28, 2008

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	22	12
22	120	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
3	35	8			WELDED	A53B STEEL
20	35	6			THREAD AND COLLAR	PVC-SDR 21
55	120	6			THREAD AND COLLAR	PVC-SDR 21

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
35	55	6	200	.035	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	22	NEAT CEMENT GROUT	Y

Section 7: Well Test Data

Total Depth:
Static Water Level:
Water Temperature:

Pump Test *

Depth pump set for test 60 feet.
60 gpm pump rate with 2 feet of drawdown after 24 hours of pumping.
Time of recovery 1 hours.
Recovery water level 29.6 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

110SNGR - SAND AND GRAVEL (QUATERNARY)
217MDDY - MUDDY SANDSTONE MEMBER (OF THERMOPOLIS SHALE)

From	To	Description
0	6	BLACK TOPSOIL
6	27	LARGE GRAVELS, COBBLES, AND BOULDERS WITH SMALL AMOUNTS OF CLAY
27	50	COBBLES AND GRAVELS
50	54	BROWN CLAY AND RED ROCK
54	55	BROWN-GREY CLAY
55	60	BROWN SILTSONE AND MUDSTONE
60	66	RED SILTSTONE
66	70	RED, BROWN, AND YELLOW SILTSTONE
70	90	BLACK SHALE AND SOME GREY CLAY
90	96	BLUE SILTSTONE AND SOME GREY CLAY
96	101	RED AND GREY SANDSTONE
101	106	HARD GREY AND WHITE SANDSTONE
106	115	SOFT GREY SANDSTONE
115	120	BLACK SHALE

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: CURT SAMPSON
Company: BRIDGER DRILLING INC.
License No: WWC-560
Date Completed: 10/28/2008

DEQ
Montana Department
of Environmental Quality

May 25, 2022

Casey's Corner Store No 6
Attn: Roger Pelzer
PO Box 1842
100 27th Street NE
Minot, ND. 58703

Re: Sanitary Survey Inspection of Casey's Corner Store No 6 Public Water System (PWSID# MT0003839)

Dear Roger,

I would like to thank the Store Manager, Cheryl Caton, for her time and assistance with the sanitary survey inspection that I conducted for Casey's Corner Store No 6 public water supply system (PWS). Casey's Corner Store No 6 PWS system is classified as a transient non-community (TNC) public water supply. Transient non-community means a public water supply system that is not a community water system and that does not regularly serve at least 25 of the same persons for at least six months a year. As a TNC, your facility is required to have a sanitary survey inspection every fifth year. 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 operational and maintenance concerns.

SYSTEM DESCRIPTION:

Casey's Corner Store No 6 PWS system is at 47650 Gallatin Road in Big Sky, MT. The PWS system consists of one groundwater source well, a treatment plant, a pressure control facility, and a distribution system serving the convenience store/service station and two apartments. The PWS serves a daily population of four residents, three non-transient employees and approximately 503 transient customers through three active service connections.

The bulleted items that follow are my comments and recommendations related to the sanitary survey conducted May 10, 2022.

SOURCES:

Well 2 GWIC 238472 (WL003): Well 2 is located on the south side of the building on the edge of the parking area behind a cement barrier. The well was drilled by rotary method on 8/16/2007 by Kevin Haggerty Drilling, Inc. The annular space is grouted with bentonite to a depth of 29 feet. The log shows a static water level of 5 feet and a total depth of 96 feet. The 6 inch steel and 4.5 inch PVC casings go to 30 and 96 feet respectively. There is a factory slotted screen between 56 and 76 feet for water collection. The geologic source for the well is given as unassigned. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) website and enclosed with this letter.

Well 2 had a sanitary sealed well cap. The well cap bolts were tight, and the cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap. The air relief vent was downward facing and screened, and the hole for the electrical wire grounding screw was plugged. Grading around the well appeared adequate to promote surface water drainage away from the well. No issues were observed with Well 1.

TREATMENT:

Treatment Plant (TP001): The treatment plant is in the utility room and consists of a particulate cartridge filter that is maintained/replaced by Maintenance personnel (Denton), an ion-exchange water softening unit that is maintained by Culligan, and full-time disinfection using NSF approved 12.5% Sodium Hypochlorite delivered to the PWS by a Stenner brand chemical pump.

On May 10th, the free chlorine residual reading was 0.12mg/L. It was recommended the system increase the amount of chlorine being injected into the system as the minimum free chlorine residual the system must maintain is 0.2mg/L. I followed up with Cheryl (Store Manager) on May 25, 2022, at which time, the system reported the free chlorine residual was 0.31 mg/L, above the minimum requirement.

DISTRIBUTION:

Distribution System (DS001): The distribution system piping material from the well into the building is unknown. Within the building the pipes are mainly copper.

- There is a reduced pressure zone (RPZ) assembly that appears to have been installed to protect the source; however, the RPZ is installed vertically and is therefore considered "void". The RPZ assembly would not protect the source from potential contamination due to a backflow event in the orientation that it is currently installed. The RPZ assembly functions properly when it is installed horizontally. If you are interested in having a backflow preventer device or assembly installed correctly to protect your source, and need guidance or have questions, please contact DEQs backflow preventer expert, Karl Carlson, at 406-247-4444.

STORAGE:

No storage facilities are used by Casey's Corner Store No 6, at this time.

PUMPS, PUMP FACILITIES, and CONTROLS:

Pressure Control Assembly (PC001): The pressure control assembly is in the utility room and consists of the well pump that is controlled by a VFD Franklin Electric brand Subdrive 150 controller. The VFD controller is used to provide constant pressure to the system. There is also a pressure gauge and one Well Mate brand captive air tank. The tank appeared to be in good working condition. No issues were observed with the Pressure Control Assembly.

MONITORING, REPORTING, and DATA VERIFICATION:

In the two years prior to this survey (5/10/2020 – 5/10/2022) the system did not receive any violations (SDWIS Database, 2022). Currently, all drinking water monitoring and reporting requirements appear up to date.

The system has had full-time disinfection that was approved by DEQ in engineering plans EQ07-2810; however, the system was not submitting the daily/monthly chlorine reporting forms to DEQ due to a data entry error in SDWIS, which was discovered in 2022.

- Beginning June 1st, 2022, the system will be required to take a daily chlorine residual reading at Entry Point (EP502). The daily readings should be recorded on the Chlorine Reporting Form for Groundwater Public Water Systems that I provided to the Store Manager (in person) and to the A/C (via email). The completed form must then be submitted to DEQ deqchlorine@mt.gov by the 10th of the following month. If you have any questions regarding this monitoring and reporting requirement, please contact the Groundwater Rule Manager, Greg Butts, 406-755-8967 or gbutts@mt.gov.
- Since it was reported the system has a colorimeter that has been stored at the system for an extended time, please ensure the reagent used to measure the free chlorine residual is not expired. If it is expired, it is important to obtain and use unexpired reagent starting June 1st.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:

The system appears to be adequately managed and operated. No safety concerns were noted.

Please note that 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 MAP, MRW, RATES and other DEQ staff to meet the demand for facility-based training opportunities. DEQ 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. You will also find his contact information on the back of my business card.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:
Transient non-community public water supply systems are not required to have certified operators.

WASTEWATER:
Wastewater is managed by with a septic tank and drainfield. No issues were observed with wastewater management.

SIGNIFICANT DEFICIENCIES: No significant deficiencies were noted during this inspection.
Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

DATABASE CHANGES MADE:
- Changed name of facility PC001 to "Pressure Control Assembly" – Inventory Update

If you find any inaccuracies in this letter or in the attachments, please contact me with the appropriate corrections.

Again, please thank Cheryl for her time and assistance with the sanitary survey and for her 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 call me at 406-444-3967.

Sincerely,

Jodi Stoner-Granberg

Jodi Stoner-Granberg
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-3967
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County file

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

Site Name: BIG SKY EXXON HIDEAWAY LLC.
GWIC Id: 238472 Well 2 (WL003)
DNRC Water Right: C30029704

Section 1: Well Owner(s)

1) BIG SKY EXXON HIDEAWAY, LLC. (MAIL)
P.O. BOX 1201
BOZEMAN MT 59771 [08/16/2007]
2) BIG SKY EXXON HIDEAWAY, LLC. (WELL)
47650 GALLATIN RD
GALLATIN GATEWAY MT 59730 [08/16/2007]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	NE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.259754	-111.253259	TRS-TWN	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: Thursday, August 16, 2007

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	29	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	30	6	0.28		WELDED	A53B STEEL
16	56	4.5				PVC-SCHED 40
76	96	4.5				PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
56	76	4.5		.020	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	29	BENTONITE - 6 X 10" ANNULUS	
29	56	BENTONITE SEAL AROUND 6" ANNULAR SPACE	

Section 7: Well Test Data

Total Depth: 96
Static Water Level: 5
Water Temperature:

Pump Test *

Depth pump set for test 84 feet.
45 gpm pump rate with 42 feet of drawdown
after 24 hours of pumping.
Time of recovery 1 hours.
Recovery water level 5 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

K-PACKER AT 56 FEET. SITE IS AT 47650 GALLATIN ROAD IN BIG SKY.

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	4	TOPSOIL
4	19	GRAVEL
19	28	SHALE
28	47	SILTSTONE
47	67	SHALE
67	76	SILTSTONE, 50 GPM
76	83	GRAY
83	86	RED SHALE
86	96	GRAY SHALE

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: KEVIN HAGGERTY
Company: KEVIN HAGGERTY DRILLING INC
License No: WWC-353
Date Completed: 8/16/2007

Casey's Corner Store No 6 PWSID# MT0003839

May 10, 2022

State Representative: Jodi Stoner-Granberg

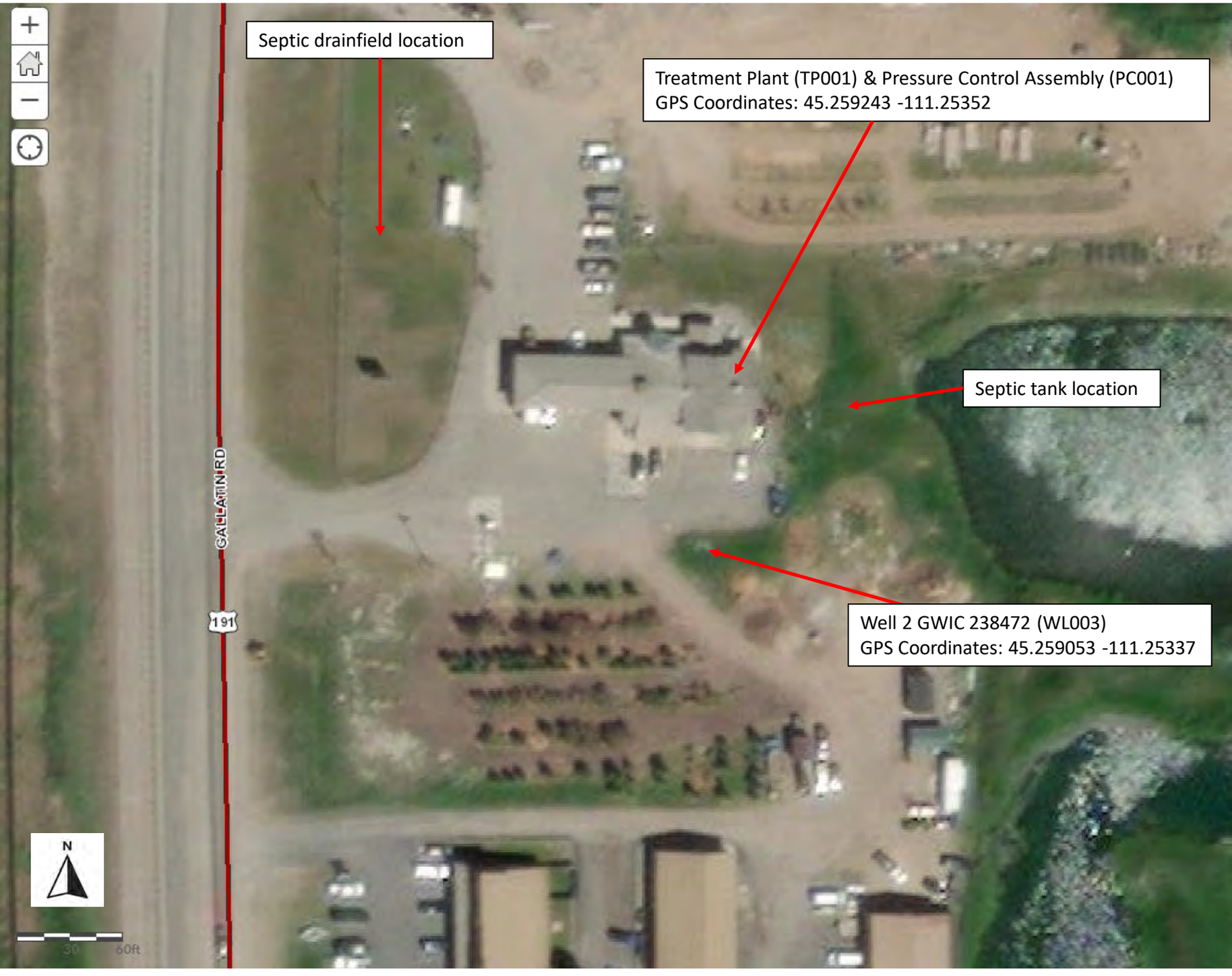
System Representative: Cheryl Caton (Store Manager)

OVERVIEW



Groundwater Sourced, Transient Non-Community Water System in Gallatin Co. –T07S R04E S5

PWS FACILITY LOCATIONS
(approximate)





Casey's Corner Store No 6



Septic drainfield located in front of store, adjacent to Hwy. 191



Septic tank located behind store

Well 2 GWIC 238472 (WL003)



Well 2 had a sanitary sealed well cap. The well cap bolts were tight, and the cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap. The air relief vent was downward facing and screened, and the hole for the electrical wire grounding screw was plugged. Grading around the well, to promote surface drainage away from the well appeared adequate.

Note: There was standing water just south of the well (snow melt) but not immediately adjacent to the well casing.







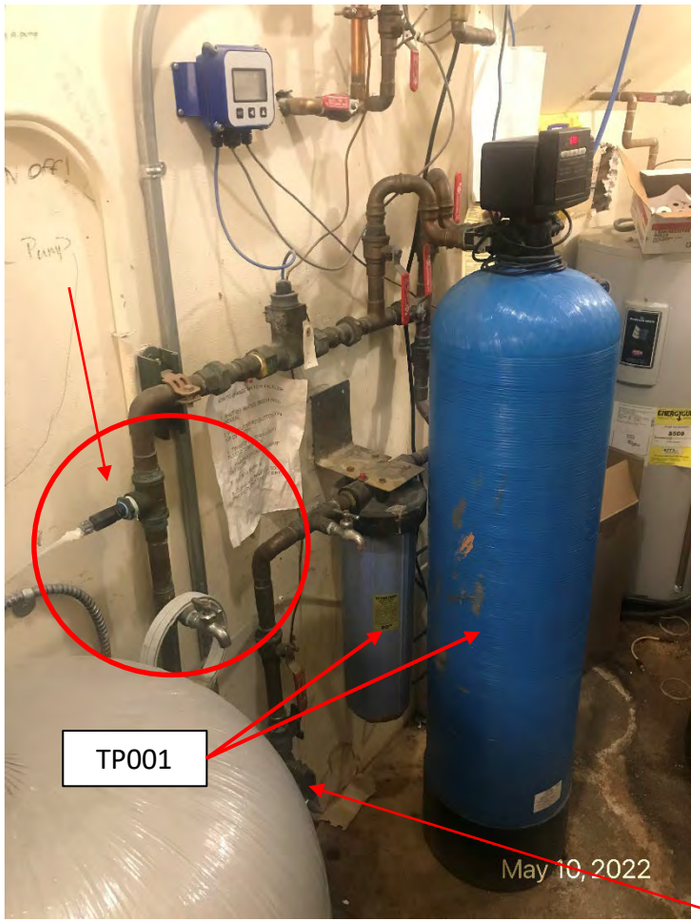
Pressure Control Assembly (PC001) & Treatment Plant (TP001)



Well pump controls (Franklin Electric brand VFD SubDrive 150 and Sta-Rite brand Model 10SP4D2H-03 submersible pump)



Pressure control facility consists of the 3hp submersible well pump, the VFD SubDrive 150 used to control the well pump and provide continuous pressure, a pressure gauge (system was maintaining a pressure of ~70psi), and one Well Mate brand captive air tank.



Treatment Plant consists of a particulate cartridge filter and ion-exchange water softener.

Chlorine injection point and Entry Point EP502 sample tap are within the red circle in photo above. Raw water sample tap is just to the right of EP502.



Vertically installed RPZ assembly is installed in this location
(see additional photo included on page with “Backflow Prevention”)



Free chlorine residual reading on May 10, 2022. The minimum free chlorine residual the system should be maintaining is 0.2mg/L. It is recommended the Stenner pump be adjusted to increase amount of chlorine being injected into the system.

Pressure Control Assembly (PC001) & Treatment Plant (TP001) *cont.*



Tank with NSF approved 12.5% Sodium Hypochlorite disinfection solution is in a small closet in this area of the utility room (entrance to closet is behind the water softener tank).

Batch tank and containment bin, and Stenner Pump Model PCM5 depicted to the left.

The backwash drain line for the water softening unit is in the area depicted on left side of photo. The drain line has an air gap.









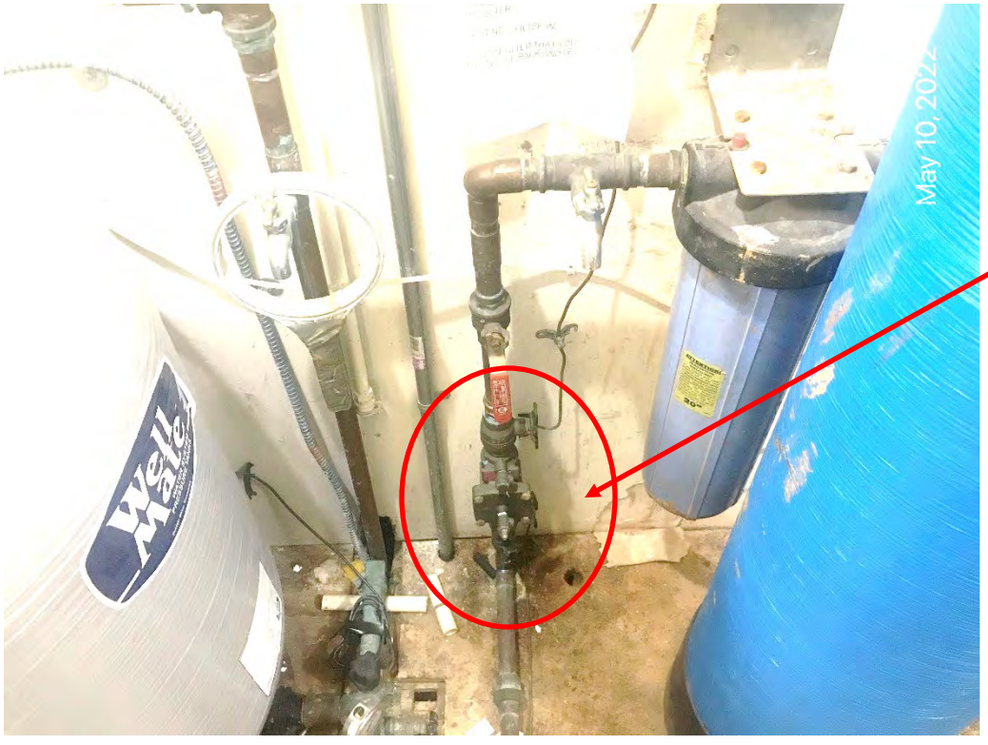
Backflow Prevention



Janitor's sink and kitchen sink soap dispensers had appropriate backflow preventers installed.





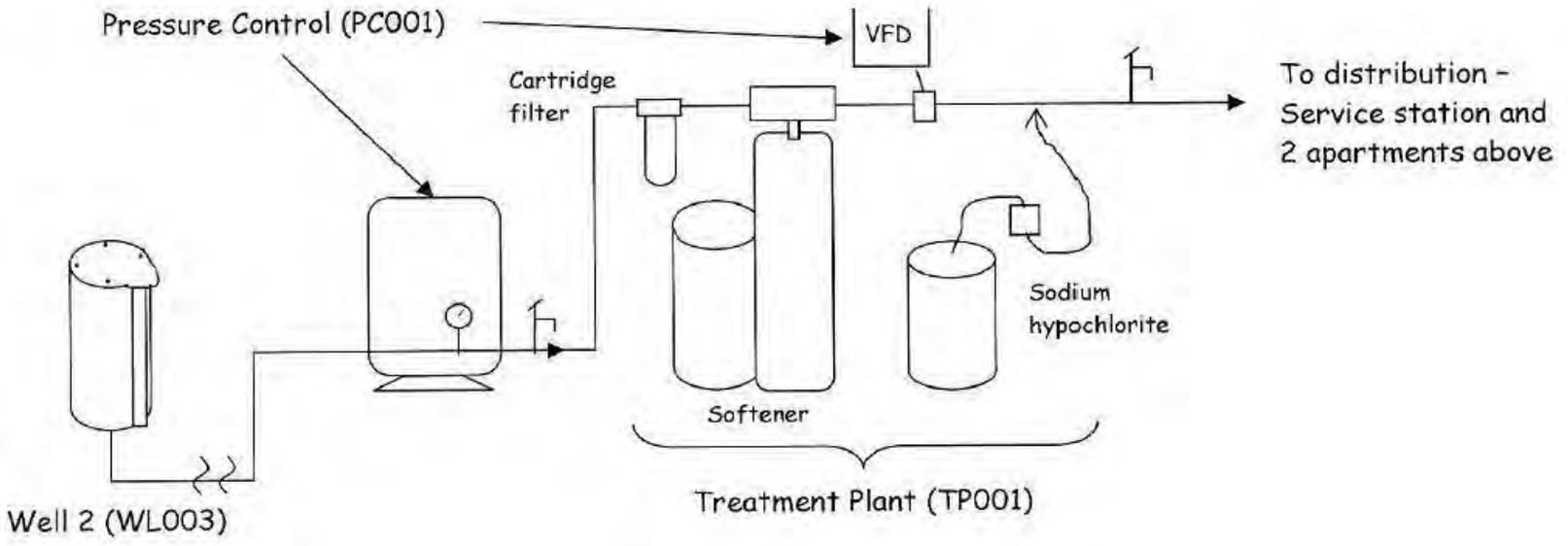


Note: This reduced pressure zone (RPZ) assembly installed for backflow prevention (to protect the source from potential contamination) was improperly installed. **The RPZ assembly is not providing backflow protection to the source in the position in which it is installed.** RPZ assemblies should be installed horizontally for the assembly to function properly.

Should you want to install a backflow preventer that will perform the function you are expecting and need guidance or have questions, please contact DEQ's backflow preventer expert, Karl Carlson, at 406-247-4444 or kcarlson2@mt.gov.

Drawing

(Drawing was taken from the 2017 Sanitary Survey report. It represents the system as observed in 2022)



Water System Facilities Table and Flow

WSF ID	WSF Name	Description
WL003	Well 2 GWIC 238472	3hp Sta-Rite brand submersible pump that is controlled by a Franklin Electric brand VFD controller SubDrive 150.
PC001	Pressure Control Assembly	Pressure control assembly consists of the VFD controlled submersible well pump, a pressure gauge, and one Well Mate brand captive air tank. The system was maintaining a pressure of ~70psi during the inspection.
TP001	Treatment Plant	Treatment consists of a particulate cartridge filter followed by an ion-exchange water softening unit and full-time disinfection using 12.5% Sodium Hypochlorite that is injected into the system using a Stenner brand pump. The cartridge filter is monitored and changed by store maintenance personnel. Culligan maintains the water softener and provides the NSF approved salt that is used in the brine. PPE is available (i.e., eye wash station and apron were observed). It is not known if a spare pump or spare pump parts are maintained onsite. System has a colorimeter to measure free chlorine residual.
DS001	Distribution System	Distribution system consists of copper pipes within the building. The pipe material from the well to the building is not known. A RPZ assembly was installed to protect the source and appears to have been installed after the 2017 Sanitary Survey; however, it is installed vertically and is therefore void.
Flow	WL003>PC001>TP001>DS001	

March 16, 2022

DT Ventures
Attn: Thomas Newberry
47995 Gallatin Road Ste 102B
Gallatin Gateway, MT 59730

Re: Sanitary Survey Inspection of DT Ventures (PWSID: MT0003963).

Dear Thomas,

I would like to thank you for assisting me during the sanitary survey inspection of the DT Ventures public water supply system. As a transient public water supply, your facility is required to have a sanitary survey inspection every five years. These routine 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 February 15, 2022.

SYSTEM DESCRIPTION: DT Ventures is located at 47995 Gallatin Road in Big Sky. It serves 8 resident, 15 non-transient, and 60 transient people through 7 service connections. Water flows from the well into the distribution system. Pressure is maintained through pressure control facilities.

SOURCE: Well 2 GWIC 162096 (WL003) was drilled in October 1996 to a depth of 42 feet. The static water level is 22 feet and it is grouted to 22 feet with cement grout. WL003 was declared a ground water source in November 2013.

- WL003 is located in a vehicle parking area. The system is currently looking for a contractor to place boulders around the well (or possibly to install metal rods to block off the well from vehicles). It is recommended that the system follow through with the plans to protect the well from vehicular impact.

WL002 is located in the pressure control house and is inactive. During the survey, there were gaps between the well cap and the well casing, and electrical wires were hanging from the hole where the electrical conduit, when present, connects with the well cap. After the survey, the system sealed the well cap (see pictures) so that no contaminants can enter the well.

TREATMENT: The system does not treat the water at this time.

DISTRIBUTION: Distribution system (DS001) is composed of PVC pipe.

STORAGE: The system does not store water at this time.

PUMPS, PUMP FACILITIES and CONTROLS: Pressure control consists of the submersible well pump, pressure gauge, pressure switch, and two pressure tanks. One pressure tank is new, installed shortly after the sanitary survey. It is a Flex-Lite FL12 35-gallon tank.

MONITORING, REPORTING and DATA VERIFICATION: The system has had one violation in the last two years. It was for failure to monitor and report total coliform bacteria during the January to March 2021 period. However, the system is currently in compliance.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION: The system appears to be well managed and operated. Thank you for quickly addressing the issues identified during the sanitary survey.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS: As a transient system, a certified operator is not required.

WASTEWATER: Wastewater is handled by two septic and drain field systems that are located over by the cabins and house (and away from the well head).

DATABASE CHANGES MADE: The non-transient population size needs to be increased from 10 to 15 people.

SIGNIFICANT DEFICIENCIES: On the day of the survey, the well gasket was broken and pieces hanging down. Shortly after the survey, the system purchased a new well cap and had it installed. There are no remaining observed significant deficiencies.

If you find any inaccuracies in this letter or the attached report, please contact me with the appropriate corrections. Again, thank you for accompanying me on the inspection

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-4071.

Sincerely,

Tammy Jacobson

Digitally signed by Tammy Jacobson
Date: 2022.03.16 14:33:15 -06'00'

Tammy Jacobson
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-4071
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County files

Water System Facilities Table and Flow

Flow ↓	WSF ID	WSF Name	Description
	WL003	Well 2 GWIC 162096	
	PC001	Pressure control 1	
	PC002	Pressure control 2	
	DS001	Distribution system	

Aerial View of System

Pulled from last sanitary survey.



Pressure Control Building



WL002




Well with old well cap. If you look closely, the picture on the right shows the gasket hanging down (close to the conduit).




New well cap and fresh gasket, installed shortly after the sanitary survey.

Pressure Control




Original pressure tanks, pressure gauge, and pressure switch. On the day of the survey, pressure was approximately 42psi.

Pressure Control (continued)



Newly installed pressure tank.

WL002 (inactive)





On the day of the survey, contaminants could enter the well through the conduit hole and/or between the well cap and the well casing. Shortly after the survey, the system sealed both with caulking material.

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 hydrograph for this site
View field visits for this site
View scanned well log (2/22/2008 4:03:08 PM)

Site Name: BIGHORN PROPERTIES INC
GWIC Id: 162096
DNRC Water Right: 100634

Section 1: Well Owner(s)
1) JUDE, ROD (WELL)
47995 GALLATIN RD
GALLATIN GATEWAY MT 59730 [10/12/2010]
2) JUDE, CHRIS (MAIL)
47995 GALLATIN RD
GALLATIN GATEWAY MT 59730 [10/15/1996]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	04E	32	SE¼ NW¼ NE¼ SE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.26633	-111.25339	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6010	MAP		10/12/2010

Measuring Point Altitude	MP Method	Datum	Date Applies
6012.8			10/12/2010 11:52:00 AM

Addition	Block	Lot
BIGHORN TRACT		L

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: Tuesday, October 15, 1996

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	22	10
22	42	6

Casing

-2	26	6	.250		WELDED	STEEL
21	42	4.5		160.00		PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
22	42	4.5	20	.025X1	FACTORY SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	22	CEMENT GROUT	

Section 7: Well Test Data

Total Depth: 42
Static Water Level: 22
Water Temperature:

Air Test *

30 gpm with drill stem set at _feet for 1 hours.
Time of recovery 0.25 hours.
Recovery water level 22 feet.
Pumping water level 40 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

From	To	Description
0	13	LARGE CLAYBOUND BOULDERS COBBLES AND GRAVEL
13	38	LIMESTONE - HARD
38	42	BROKEN UP LIMESTONE AND CLAY - LOST CIRCULATION AT 41 FEET - 30 GPM AT 35-42 FEET

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: HAYES DRILLING
License No: WWC-361
Date Completed: 10/15/1996

DEQ
Montana Department
of Environmental Quality

September 13, 2021

Whitewater Inn
Attn: Courtney Jones
PO Box 160001
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Whitewater Inn (PWSID: MT0004079).

Dear Courtney,

I would like to thank Dustin Long for assisting me during the sanitary survey inspection of the Whitewater Inn public water supply system. As a transient public water supply, your facility is required to have a sanitary survey inspection every five years. These routine 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 September 9, 2021.

SYSTEM DESCRIPTION: Whitewater Inn is a transient system located on US HWY 191 minutes south of the Lone Mountain Trail Road turn-off to Big Sky. It is a transient system serving 125 people through 1 service connection. Well water is disinfected with chlorine before entering the distribution system.

SOURCE: Well 1 GWIC 162954 (WL002) is located in the yard of the rental company next door, and was drilled in June 1997 to a depth of 68 feet. The static water level is 12 feet, and it is grouted to 25 feet with bentonite grout. WL002 was declared a ground water source in July 2016.

TREATMENT: Treatment plant TP001 consists of 4-log virus inactivation chlorination with LiquiChlor 12.5% sodium hypochlorite mixed 5 parts reverse osmosis water to 1 part chlorine. Since the last sanitary survey, the system installed a new FlexFlo Model A-100NV peristaltic pump to inject chlorine into the water. This pump doses chlorine based upon the amount of water flowing.

DISTRIBUTION: Distribution system DS001 consists of the main running from the well to the hotel, and copper and PVC pipe within the hotel. The main is necessary for chlorination contact time. Inside the hotel, there is a pool and spa. The pool/spa line has an RPZ backflow device installed.

- The backflow device for the pool/spa has never been tested/certified since installation. It is recommended that the system properly test and certify the backflow device yearly (or per manufacturer's recommendations).

STORAGE: The system does not store water.

PUMPS, PUMP FACILITIES and CONTROLS: Since the last sanitary survey, the system installed a new Goulds 65GS50 5-HP submersible well pump, a Titan P Series VFD controller,

and 119-gallon H2PL120 Flex2Pro captive air tank in the water treatment room. With the old well pump, a 0.79 ppm chlorine residual was required to achieve contact time for disinfection. However, with the new well pump, the required chlorine residual needs to be re-calculated. Until the chlorine value is re-calculated, it is important to stay at the higher end of the 1.2 to 1.8 ppm residual that you currently try to keep in the system.

- It is recommended that the system contact Margarite Juarez Thomas, PWS Review Section Supervisor, at email mjuarezthomas@mt.gov or by phone at 406-755-8956 to discuss plan review requirements for the new well pump. Please contact her as soon as you receive this letter and mention the other system changes at the same time (new pressure tank, new chlorine feed pump and RO unit, new VFD controller).

There are an additional four Well-X-Trol captive air tanks located in the basement laundry room of the hotel.

MONITORING, REPORTING and DATA VERIFICATION: The system has had two violations in the last two-year period. They were for failure to monitor total coliform bacteria in May 2021 and for late chlorine residual data in May 2020. However, the system is now in compliance.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION: The system appears adequately managed and operated. Thank you for quickly fixing the conduit and RO drain line issues discovered on the day of the survey.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS: As a transient system, a certified operator is not required.

WASTEWATER: Wastewater is handled by a septic tank and drainfield.

DATABASE CHANGES MADE: There are no database changes associated with this survey.

SIGNIFICANT DEFICIENCIES: On the day of the survey, the conduit was broken at ground level. In addition, the drain line for the RO unit, which produces water to mix with the sodium hypochlorite, was inserted into the drain. However, the system fixed the issues quickly and sent pictures to document both fixes.

If you find any inaccuracies in this letter or the attached report, please contact me with the appropriate corrections. Again, please thank Dustin for accompanying me on the inspection

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-4071.

Sincerely,

Tammy Jacobson

Digitally signed by Tammy Jacobson
Date: 2021.09.13 08:24:32 -06'00'

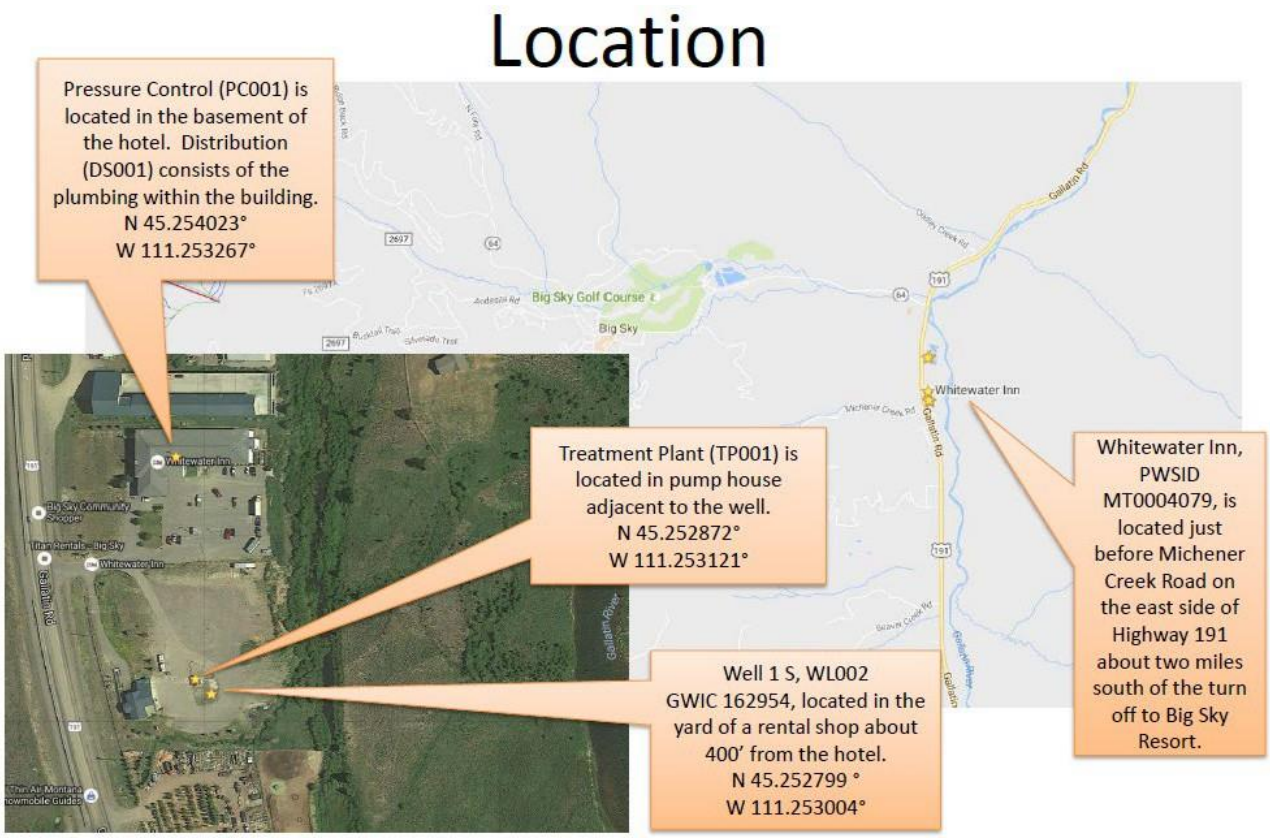
Tammy Jacobson
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-4071
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County files

Water System Facilities Table and Flow

Flow	WSF ID	WSF Name
↓	WL002	Well 1 S
	TP001	Treatment plant
	CW001	Contact time piping
	PC001	Pressure control assembly
	DS001	Distribution system

Aerial View of System (pulled from last sanitary survey)



WL002





WL002 (continued)





Broken and fixed conduit.

TP001







Treatment and chlorine injection point. In the left picture, the RO unit is used to treat the water used for chlorine dilution.

Treatment (continued)



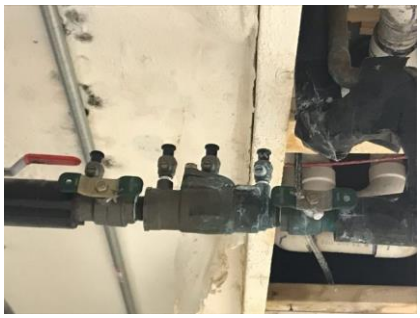



RO drain line, new chlorine injection pump, chlorine residual in the hotel.

PC001







Well control panels (located in treatment building).
Backflow device for pool and spa (located in pressure control room in hotel).




Pressure control in hotel basement.

MONTANA WELL LOG REPORT

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Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (2/25/2008 9:39:25 AM)

Site Name: MAUS RICHARD
GWIC Id: 162954
DNRC Water Right: 101959

Section 1: Well Owner(s)

1) MAUS, RICHARD (MAIL)
200 E WILLIAMS RD
GALLATIN GATEWAY MT 59730 [06/18/1997]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	NE¼ NE¼ SE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.252703	-111.25216	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition	Block	Lot
COS 1559A		TR A-2

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, June 18, 1997

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	25	12
25	68	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	26	8	0.322		WELDED	STEEL
14	68	6		160.00		PLASTIC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
28	68	6		1/2X1/2 IN	HOLES

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	25	BENTONITE GROUT	

Section 7: Well Test Data

Total Depth: 68
Static Water Level: 12
Water Temperature:

Air Test *

75 gpm with drill stem set at feet for 3 hours.
Time of recovery 0.5 hours.
Recovery water level 12 feet.
Pumping water level 68 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	12	GRAVEL & CLAY
12	19	GRAVEL
19	22	GREY SHALE
22	68	HARD GREY TO BROWN LIMESTONE WITH SOFT BLUEGREEN & WHITE SHALE LAYERS

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: BRIDGER DRILLING INC
License No: WWC-560
Date Completed: 6/18/1997

DEQ
Montana Department
of Environmental Quality

September 13, 2021

Big Sky Business Center
Attn: JD Bingham
PO Box 160003
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Big Sky Business Center (PWSID: MT0003949).

Dear JD,

I would like to thank you for assisting me during the sanitary survey inspection of the public Big Sky Business Center water supply system. As a transient public water supply, your facility is required to have a sanitary survey inspection every five years. These routine 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 September 8, 2021.

SYSTEM DESCRIPTION: Big Sky Business Center is located at 47520 Gallatin Road. It is a transient system serving 49 people through ten service connections. Water (WL002) passes through a cartridge filter and then enters the distribution system (DS001). Pressure control (PC001) maintains system pressure.

SOURCE: Well 1 GWIC 135265 (WL002) was drilled in June 1992 to a depth of 80 feet. The static water level is 6 feet, and it is grouted to 20 feet with bentonite. The well is located inside a gated yard near the east side of the property and behind the commercial condos. WL002 was declared a ground water source in October 2017. Since the last sanitary survey, the system installed a new well cap and placed a culvert, sideways, around the well head to protect it from vehicles driving in the area.

TREATMENT: Since the last sanitary survey, the system installed a cartridge filter. On the day of the survey, the cartridge was filled with brown sediment.

- It is recommended that the system change the filter as needed and keep a log to show when, what condition the filter was in, and who changed it.

DISTRIBUTION: Distribution system DS001 consists of a buried line from the wellhead to the pressure tank and the copper plumbing inside the commercial condos.

STORAGE: The system does not currently store the water.

PUMPS, PUMP FACILITIES and CONTROLS: The submersible well pump (size unknown) is controlled by a pressure switch. Pressure control facility PC001 is located in one of the condo buildings behind the fly shop. It consists of a newly installed WellMate captive air tank, pressure switch, and pressure gauge. There was no pressure relief valve.

- It is recommended that the system install a pressure relief valve. In the event the pressure switch does not turn off and pressure rises in the system, a properly installed and set pressure relief valve will help protect the piping and pressure tank from damage. The valve should be piped outside or to a floor drain to prevent flooding if the valve should release water. If the valve is piped to a floor drain, an air gap should be provided between the discharge end of the pipe and the drain.

MONITORING, REPORTING and DATA VERIFICATION: The system has had no violations in the last two-year period. On the day of the survey, the RTCR sample site plan was updated. The updated version was sent to the rule manager on 9/13/2021.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION: The system appears adequately maintained, managed, and operated.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS: As a transient system, a certified operator is not required.

WASTEWATER: Wastewater is handled by an on-site septic system.

DATABASE CHANGES MADE: There are no database changes associated with this survey.

SIGNIFICANT DEFICIENCIES: On the day of the survey, there were no observed significant deficiencies.

If you find any inaccuracies in this letter or the attached report, please contact me with the appropriate corrections. Again, thank you for accompanying me on the inspection

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-4071.

Sincerely,

Tammy Jacobson

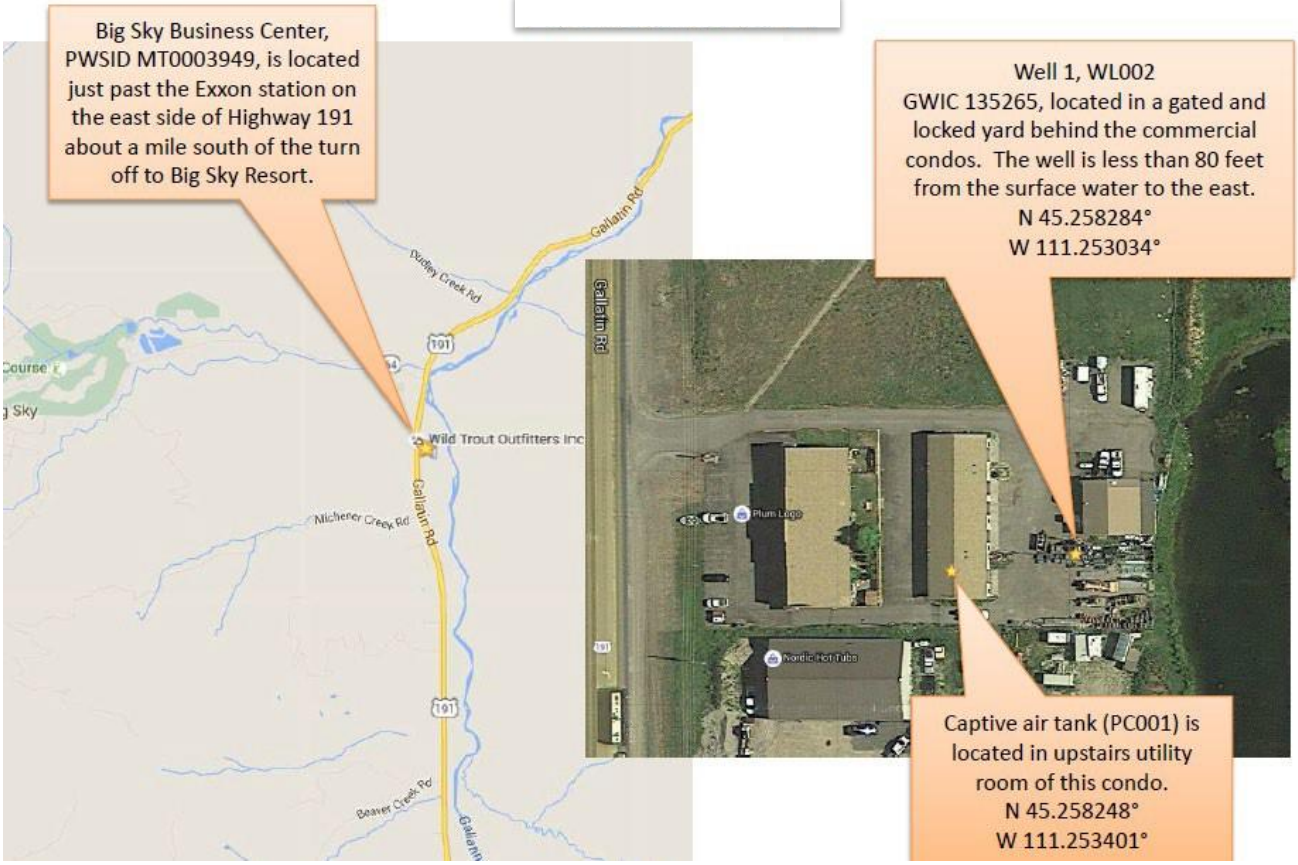
Digitally signed by Tammy Jacobson
Date: 2021.09.13 07:55:47 -06'00'

Tammy Jacobson
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-4071
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County files

Aerial View of System

Pulled from last sanitary survey.



WL002



Since the last sanitary survey, the well has been protected with a concrete piece.

WL002 (continued)





PC001







On the day of the survey, the pressure was 52psi.

MONTANA WELL LOG REPORT

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Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (2/22/2008 4:06:01 PM)

Site Name: BIG SKY BUSINESS CENTER
GWIC Id: 135265
DNRC Water Right: 30150818

Section 1: Well Owner(s)
1) MCGOUGH CONST. (MAIL)
PO BOX 160459
BIG SKY MT 59716 [06/03/1992]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	04E	32	SE¼ SE¼ SE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.261828	-111.252194	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, June 3, 1992

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	80	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	30	6	.250		WELDED	A53B STEEL
20	80	4.5		160.00		PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
60	80	4.5		1/8	HOLES

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	Y

Section 7: Well Test Data

Total Depth: 80
Static Water Level: 6
Water Temperature:

Air Test *

30 gpm with drill stem set at feet for 1 hours.
Time of recovery 0.5 hours.
Recovery water level 6 feet.
Pumping water level 75 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	2	TOPSOIL
2	16	SAND-GRAVEL AND BOULDERS
16	80	BLUE SHALE AND LIMESTONE

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: HILLMAN DRILLING
License No: WWC-436
Date Completed: 6/3/1992

July 6, 2021

Ramshorn View Estates
Attn: Jim Muscat
PO Box 160670
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Ramshorn View Estates (PWSID: MT0004035).

Dear Jim,

I would like to thank you for your time and assistance with the sanitary survey inspection of Ramshorn View Estates' public water supply (PWS) system. Ramshorn View Estates' public water supply is classified as a community (C) public water supply. Community means a public water supply system which serves at least 15 service connections used by year-round residents or that regularly serves at least 25 year-round residents. As a community water supply system, your facility is required to have a sanitary survey inspection every third year. 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 operational and maintenance concerns.

System Description:
Ramshorn View Estates is located on Highway 191 just south of the turn off to Big Sky. Ramshorn View Estates PWS system utilizes two groundwater sources (WL002 & WL003), a common header for the wells (CH001), a storage facility (ST001) and a distribution system (DS001) serving approximately 75 active connectionswith a population of approximately 185 people.

The bulleted item(s) that follow are my comments and recommendations related to the sanitary survey conducted on June 23, 2021.

SOURCE: WELL 1
Well 1 GWIC 165682 (WL002) is located south of the common header building. Well 1 was drilled 5/18/1994 to a total depth of 1490 feet with the casing to 1450 feet.Well 1 is an artesian well with a closed in pressure of 10 psi and was grouted to 1450 feet with cement. Well 1 was declared to be groundwater 1/22/2010. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) web site and enclosed with this letter.

- Well 1 well cap is cracked. It is recommended the well cap be replaced. This crack could be providing an unapproved opening that could allow insects and/or dust to potentially contaminate the source. On July 1, 2021, DEQ received photo documentation depicting caulk in the crack; however, this is a temporary fix. The well cap must be replaced, as soon as

possible, and a photo sent to DEQ of the corrective action.

SOURCE: WELL 2

Well 2 GWIC 257253 (WL003) is located north of the common header building. Well 2 was drilled 11/25/2009 to a total depth of 1320 feet with the casing to 1293 feet. Well 2 was grouted to a depth of 300 feet with bentonite and has a K packer from 300-705 feet and a formation packer from 700-1060 feet. Well 2 has a listed static water level of 9 feet and was declared to be groundwater 11/2/2012. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) web site and enclosed with this letter.

TREATMENT:

Treatment is not provided by Ramshorn View Estates at this time.

DISTRIBUTION:

Distribution System (DS001) consists of varying sizes of PVC piping. The distribution system is partially looped with the dead-end sections flushed annually or more frequently as needed. The fire hydrants (approximately 24) located throughout the distribution system are flushed by the system operator.

- An in-ground irrigation system is used to maintain the soccer/ball field. The irrigation system did not backflow protection. The lack of a backflow device or backflow assembly installed on the in-ground irrigation system is a high hazard and would be considered a significant deficiency; however, the Operator currently has the irrigation system shut-off at the curb stop and will not allow the system to be turned on until proper the backflow preventer is installed. It is recommended when the appropriate backflow prevention is installed, a photo of the corrective action be provided to DEQ.

STORAGE:

Storage Facility (DS001) consists of a single 340,000-gallon bolted steel storage tank (ST001). The storage tank is filled by a common header (CH001) from Wells 1 & 2 and feeds the distribution system via gravity. The storage facility was last inspected in July of 2017 and is reported to be inspected every five years. The storage tank overflow pipe and drainpipe were screened. The tank air vent was downward facing and screened, and the tank had a locked shoebox style hatch.

PUMPS, PUMP FACILITIES and CONTROLS:

The wells are equipped with 30hp Franklin brand submersible well pumps. Well 1 is the main source well and is controlled by the storage tank level and radio telemetry. Well 2 must be manually activated and is used as a backup source. Water from both wells meet at a common header (CH001) then flows to the storage facility (ST001). Water is fed from the storage tank by gravity to the distribution system (DS001). The storage tank is on an elevated rise west of the subdivision.

- One pressure gauge in the building with the common header was not functioning properly. It is recommended the gauge be replaced.
- The blow-off outlet on the exterior of the building with the common header was not screened. It is recommended the outlet be screened or plugged to prevent insects, dust, etc. from entering the pipe.

MONITORING, REPORTING and DATA VERIFICATION:
A two-year violations review showed one violation for failure to report (consumer confidence rule) in July of 2020 (DEQ-PWS Database, 2021). The system acknowledged the violation. All drinking water monitoring and reporting requirements appear up to date.

- Since one or more of the RTCR sampling site locations have been reported to be changed, please update the RTCR SSP once the sampling site locations are finalized and submit the Plan to DEQ. A RTCR SSP template is attached for use in updating the sampling site plan.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION:
The system appears to be competently managed and operated at this time. The only safety concern noted is the storage facility. All personnel entering the storage tank should have confined space entry safety training and follow the safety protocols.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:
The fully certified operator for this system is James P. Muscat (Cert. #1465; Class 2A & 3B).

WASTEWATER:
Ramshorn View Estates wastewater is managed by an on-site collection system with a total of three sand filters and drain fields. A wastewater operator manages the system.

SDWIS Database Inventory Changes Made During This Inspection:

- Associated Peter Bedel with this PWS system as a back-up operator – email to Op Cert Program

SIGNIFICANT DEFICIENCIES: The potential significant deficiencies noted during this inspection have been temporarily corrected (see photo log). Photos of the permanent corrective actions (i.e. new well cap and backflow preventer device or assembly) must be sent to DEQ once installed.

If you find any inaccuracies in this letter or in the attachments, please contact me with the appropriate corrections.

Again, 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 call me at 406-444-3967.

Sincerely,
Jodi Stoner-Granberg
Jodi Stoner-Granberg
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-3967
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County file
James Muscat (A/C) - email

MONTANA WELL LOG REPORT

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Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site
View water quality for this site
View scanned well log (2/25/2008 2:48:44 PM)

Site Name: SCENIC LAND DEVELOPMENT [RAMSHORN PWS WELL]
GWIC Id: 165682 Well 1 (WL002)

Section 1: Well Owner(s)

1) RAMSHORN SUBDIVISION HOA (MAIL)
PO BOX 161164
BIG SKY MT 59716 [08/04/2010]
2) SCENIC LAND DEVELOPMENT (MAIL)
PO BOX 160085
BIG SKY MT 59716 [05/18/1994]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	SE¼ NW¼ SE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.24144864	-111.2542	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6060.12	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6062.5	SUR-GPS	NAVD88	8/4/2010 5:05:00 PM

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, May 18, 1994

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	40	12
40	1490	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	1450	6	0.250		WELDED	STEEL
0	40	8	0.25		WELDED	STEEL
0	20	12	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1450	1490	6			OPEN HOLE

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	1450	CEMENT	

Section 7: Well Test Data

Total Depth: 1490
Static Water Level: -23.1
Closed-in Pressure: 10 psi
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
120 gpm pump rate with _ feet of drawdown after 24 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 600 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
217KOTN - KOOTENAI FORMATION
221MRSN - MORRISON FORMATION

From	To	Description
0	1	TOPSOIL
1	16	GRAVEL & BOULDERS
16	530	SHALE
530	540	SILTSTONE
540	1010	SHALE
1010	1055	RED BEDS SHALE
1055	1065	BLACK SHALE
1065	1090	RED SHALE SLOW STICKY
1090	1115	SANDSTONE
1115	1255	SHALE
1255	1285	GRAY SANDSTONE
1285	1435	SHALE
1435	1465	SANDY SHALE
1465	1490	SHALE

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: KEVIN HAGGERTY
Company: HAGGERTY DRILLING
License No: WWC-353
Date Completed: 5/18/1994

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 hydrograph for this site
View field visits for this site
View water quality for this site
View scanned well log (9/8/2011 2:00:17 PM)

Site Name: RAMSHORN SUBDIVISION HOA * UNUSED
GWIC Id: 257253 Well 2 (WL003)

Section 1: Well Owner(s)

1) RAMSHORN SUBDIVISION HOA (MAIL)
PO BOX 161164
BIG SKY MT 59716 [07/29/2010]
2) HOMELANDS DEVELOPMENT CO US (MAIL)
1 RIVER VIEW LANE
GALLATIN GATEWAY MT 59730 [11/25/1999]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	NW¼ NW¼ SE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.24192135	-111.2544534	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6061.92	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6062.95	SUR-GPS	NAVD88	7/29/2010 10:50:00 AM

Addition	Block	Lot

Section 3: Proposed Use of Water

UNUSED (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, November 25, 1999

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	300	12
300	1320	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-3	720	8	0.322		WELDED	STEEL
704	1293	4	0.322		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1292	1312	4		30	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	300	BENTONITE	
300	705	K PACKER	
705	1060	FORMATION PACKER	

Section 7: Well Test Data

Total Depth: 1320
Static Water Level: 9
Water Temperature:

Pump Test *

Depth pump set for test 493 feet.
120 gpm pump rate with 384 feet of drawdown after 24 hours of pumping.
Time of recovery 12 hours.
Recovery water level 31 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

TD REPORTED FROM RAMSHORN RESIDENT.

Section 9: Well Log

Geologic Source
217KOTN - KOOTENAI FORMATION

From	To	Description
0	24	GRAVEL
24	960	BLACK SHALE
960	982	RED SHALE
982	995	DIRTY DARK BROWN SHALE
995	1232	MULTICOLORED SHALE
1232	1240	SAND
1240	1250	SHALE
1250	1315	SAND
1315	1320	BLACK SHALE

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: KEVIN HAGGERTY
Company: KEVIN HAGGERTY DRILLING INC
License No: WWC-353
Date Completed: 11/25/1999

Ramshorn View Estates PWSID# MT0004035

June 23, 2021

State Representative: Jodi Stoner-Granberg

System Representative: Jim Muscat

OVERVIEW



Groundwater Sourced, Community Water System in Gallatin Co. – T07S R04E S8

Ramshorn View Estates PWSID# MT0004035

June 23, 2021

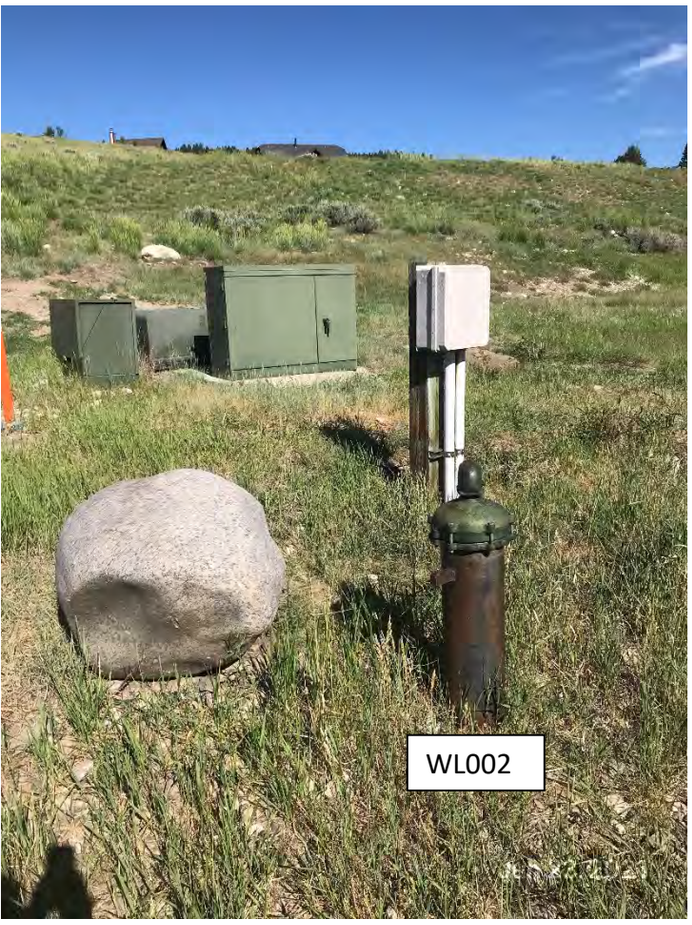
State Representative: Jodi Stoner-Granberg

System Representative: Jim Muscat

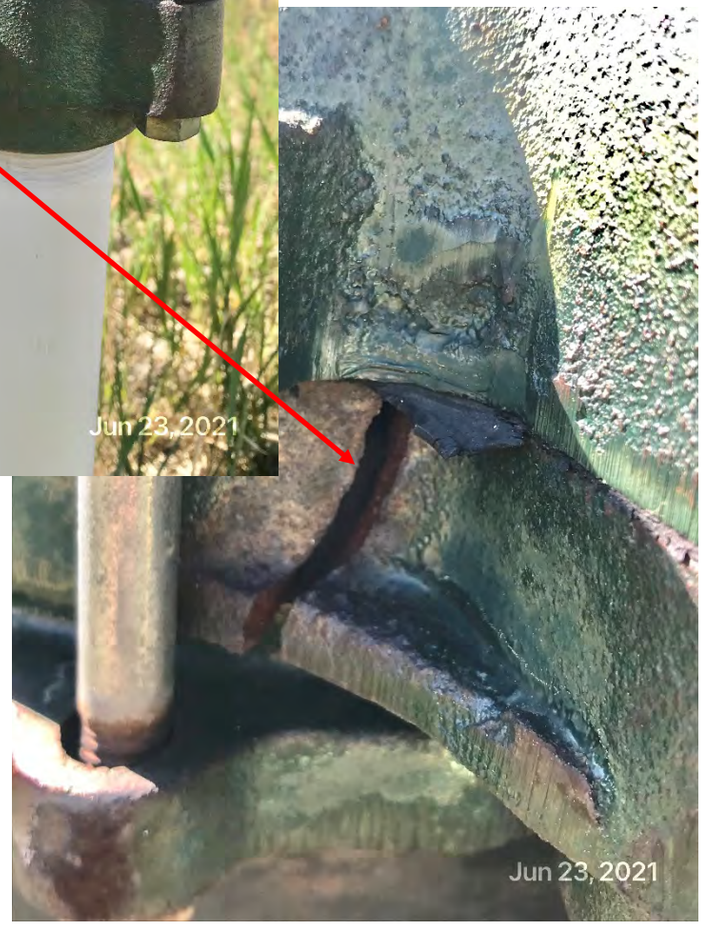
PWS FACILITY LOCATIONS (approximate)



Well 1 GWIC 165682 (WL002)







Well 1 had a Baker Monitor brand sanitary sealed well cap. The well cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap and the mushroom style air relief vent was adequately screened. Grading around the well was adequate.



Temporary Corrective Action: Sealant was placed in the crack. Well cap must be still be replaced and a photo of corrective action provided to DEQ, as this is a temporary fix.

Well 2 GWIC 257253 (WL003)



Well 2 had a Baker Monitor brand sanitary sealed well cap. The well cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap and the mushroom style air relief vent was adequately screened. Grading around the well was adequate.

Common Header Well 1 2 (CH002)

Air Vent Valves are screened

The pressure gauge (circled in yellow) was not functioning properly. It is recommended the pressure gauge be replaced.

It is also recommended the blow-off outlet be screened or plugged when not in use to prevent insects, dust etc. from entering the pipe.





Storage Facility (ST001)





ST001 is a 340,000-gallon bolted steel storage tank with a locked ladder. Tank was built around 2003. Tank is inspected and cleaned every five years. The last inspection/cleaning was in 2017. See next page for photos of tank air release vent, hatch, and overflow and drainpipes.



Storage Facility (ST001) *cont.*





Drainpipe

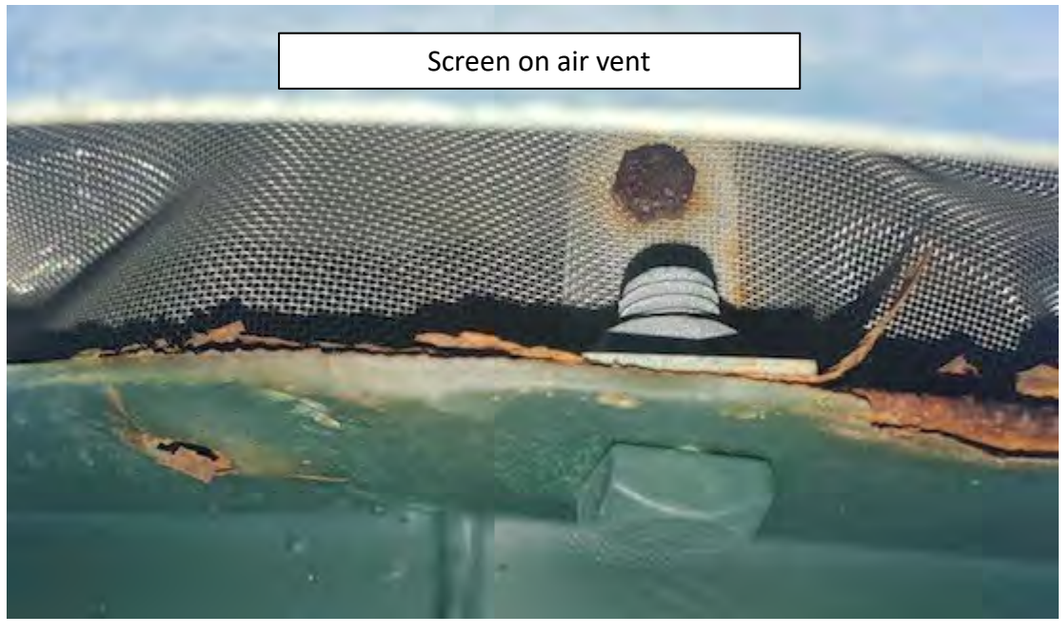
Overflow pipe



Air vent

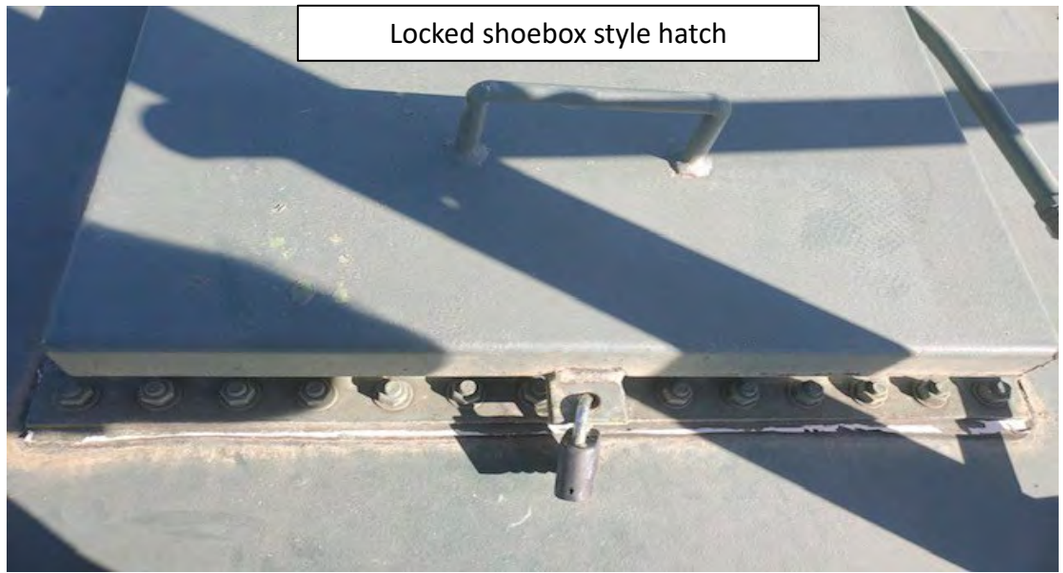


Screen on air vent



ST001 with screened outlets on the overflow pipe and on the drainpipe; and downward facing air vent with screen and shoebox style locking hatch.

Locked shoebox style hatch



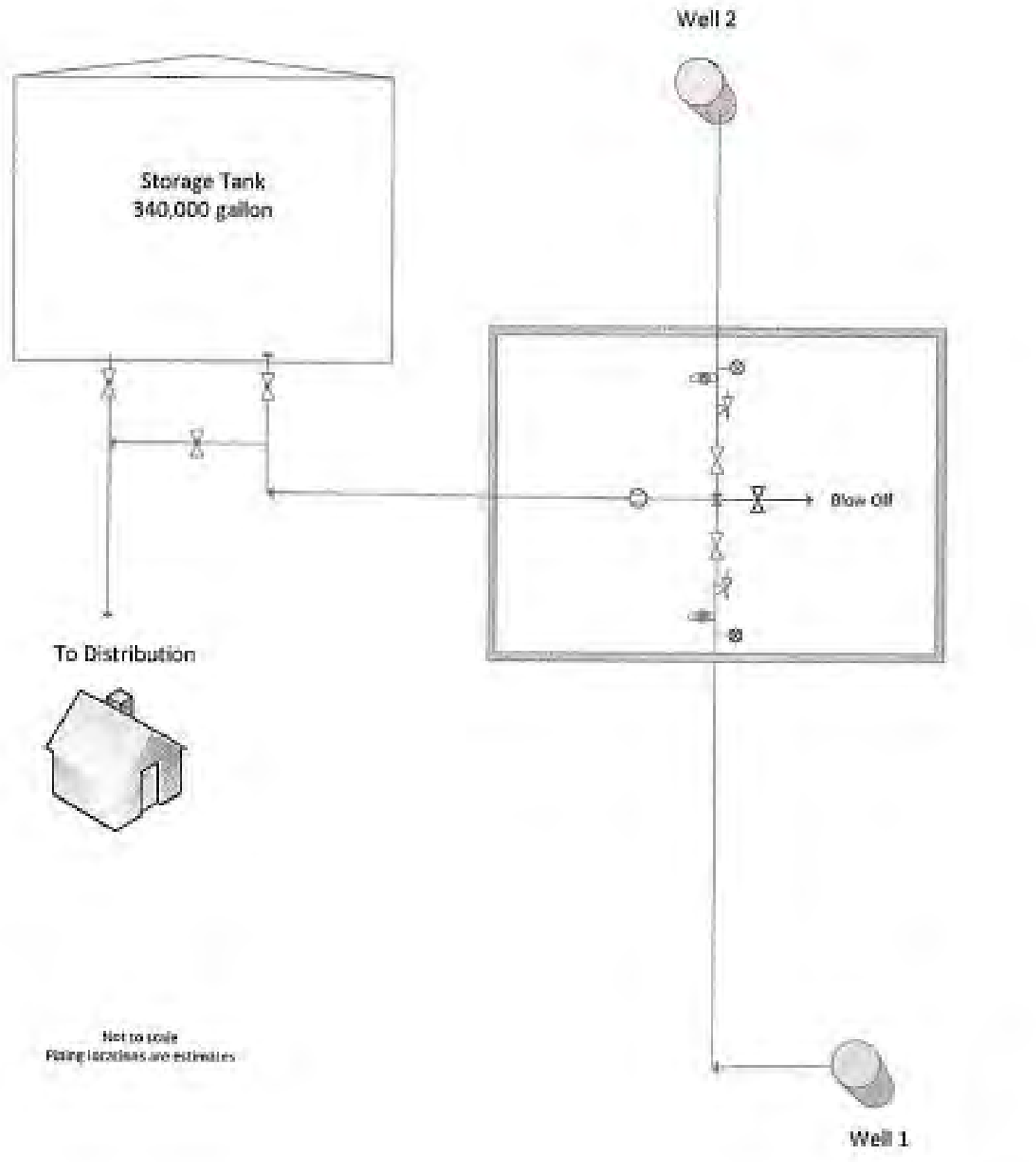


Soccer/Ball field with in-ground irrigation. The irrigation system does not have any backflow protection. It is recommended a backflow preventer device or assembly be installed prior to turning on the irrigation system. Picture on lower right shows irrigation system blow-off. Note: The Operator stated he has the irrigation system temporarily shut-off at the curb stop and will not allow the irrigation system to be turned on until the proper backflow preventer device or assembly is installed, at which time, the Operator will provide DEQ photo documentation of the corrective action.



System Schematic

Taken from 2018 Sanitary Survey report



Water System Facilities Table and Flow

WSF ID	WSF Name	Description
WL002	Well 1 GWIC 165682	30hp Franklin brand submersible well pump. Well 1 is the main source. Well pumping controlled by storage tank level and radio telemetry.
WL003	Well 2 GWIC 257253	30hp Franklin brand submersible well pump. Well 2 is the back-up source and is manually turned on.
CH001	Common Header Well 1 2	Water from both wells meet at the common header before flowing to the storage facility.
ST001	Storage Facility	340,000-gallon bolted steel storage tank. Built around 2003. Cleaned and inspected every five years. Last cleaned and inspected in 2017. Tank is filled by the common header and feeds the distribution system via gravity.
DS001	Distribution System	Various sizes of PVC pipes. Partially looped system with some dead ends. System is flushed at least annually, sometimes more frequently. There are ~24 fire hydrants that are flushed by water operator.
Flow	WL002 & WL003>CH001>ST001>DS001	

Montana Department of Environmental Quality

July 2, 2021

Gallatin Riverhouse Grill
Attn: Kyle Wisniewski
45130 Gallatin Road
Gallatin Gateway, MT. 59730

Re: Sanitary Survey Inspection of Gallatin Riverhouse Grill (PWSID: MT0001285).

Dear Kyle,

Thank you for assisting me during the sanitary survey inspection of Gallatin Riverhouse Grill's public water supply system. Gallatin Riverhouse Grill's PWS system is classified as a transient non-community (TNC) public water supply. Transient non-community means a public water supply system that is not a community water system and that does not regularly serve at least 25 of the same persons for at least six months a year. As a TNC, your facility is required to have a sanitary survey inspection every fifth year. 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 operational and maintenance concerns.

SYSTEM DESCRIPTION:

Gallatin Riverhouse Grill's PWS system is located on HWY. 191 just south of the road to Big Sky, MT. The system consists of one source well (WL003), a treatment plant (TP001), a pressure control facility (PC001) and a distribution system (DS001) serving a transient population of approximately 50 people through one active service connection.

The bulleted items below are my comments and recommendations relating to the sanitary survey conducted on June 23, 2021.

SOURCES:

2013 Well GWIC 273630 (WL003) was completed in 2013. The well was drilled to a total depth of 40 feet with a reported static water level of 25.56 feet and grouted to 25 feet with a cement slurry. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) web site and enclosed with this letter.

- WL003 had a sanitary well cap but the O-ring had slipped out of position and down the well casing. It is recommended the O-ring be properly positioned in the well cap to ensure a tight seal. On June 26, 2021, DEQ received photo documentation depicting the well cap O-ring repositioned within the well cap.

- The PVC coupling on the electrical conduit where it attaches to the well cap was broken resulting in an unapproved opening. It is recommended the coupling be replaced and the electrical conduit secured and sealed within the well cap. On June 26, 2021, DEQ received photo documentation depicting a new coupling on the electrical conduit and the conduit secured to the well cap.
- WL003 does not have at least a 100-foot wellhead protection zone to ensure water quality is not compromised. It is recommended a 100-foot wellhead protection zone be established around the well to protect water quality. The kitchen's used grease bin and empty kegs, etc. should be removed from the well area and stored elsewhere. Note: Kyle stated he plans to pave the restaurant's parking lot and establish a storage area for the used grease bin that will be away from the well and on the paved parking lot. These improvements are scheduled for 2022.

TREATMENT:

Treatment Plant (TP001): Treatment consists of a particulate cartridge filter as pre-treatment followed by 4-log virus inactivation using NSF approved 3% Sodium Hypochlorite. Contact time is achieved in two Flexcon brand Mixmaster tanks with a total volume of 238-gallons. The required minimum free chlorine residual concentration is 1.1mg/L. The free chlorine residual measured during the sanitary survey was 2.2mg/L. Water is then softened using an ion-exchange water softening unit. Ion-exchange water softening unit uses NSF approved salt. The treatment plant is serviced and maintained weekly by Pure Water Technology. No spare parts or an additional chlorine metering pump are maintained on-site. An eye-wash station was observed in the treatment room.

- The disinfection solution container was not labeled. It is recommended the container be labeled with the contents of the container and the disinfection dilution ratio.

DISTRIBUTION:

Distribution System (DS001): The distribution system serves one building (restaurant/bar) using copper and PVC piping.

STORAGE:

Gallatin Riverhouse Grill's PWS system does not have any storage facilities at this time.

PUMPS, PUMP FACILITIES, and CONTROLS:

Pressure Control (PC001): The pressure control assembly consists of the Franklin Subdrive 75 VFD controlled submersible well pump and a pressure transducer to monitor system pressures.

MONITORING, REPORTING, and DATA VERIFICATION:

In the two years prior to this survey, the system received six violations. All six violations (July , August, September and October 2019; February 2020 and February 2021) were for failure to monitor for chlorine. All violations were acknowledged by the system; however, the February 2021 violation remains open as DEQ has not yet received a copy of the Public Notice from the system. EPA's Quick Reference Guides on Record Keeping Rules and The Public Notification Rule were provided by email to the A/C, as well as a copy of DEQs violation letter dated February 17, 2021.

- Please contact Greg Butts, Groundwater Rule Manager (406-755-8967) to discuss the open violation and steps required too close the violation.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:
Maintenance and operation appear to be adequate. Management could improve this system by following the recommendations in this letter.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:
Transient non-community public water supply systems are not required to have certified operators.

WASTEWATER:
Wastewater is managed by a large capacity on-site septic system that has a grease trap installed.

SIGNIFICANT DEFICIENCIES: The potential significant deficiencies noted during this inspection were corrected.

DATABASE CHANGES MADE:
- Inactivated Storage Facility (ST001) -- Inventory Update.

If you find any inaccuracies in this letter or in the attachments, please contact me with the appropriate corrections.

Again, thank you very much for your time, for promptly implementing corrective actions, 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 call me at 406-444-3967.

Sincerely,

Jodi Stoner-Granberg

Jodi Stoner-Granberg
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-3967
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County file
Kyle Wisniewski, A/C - email

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 field visits for this site
View water quality for this site
View scanned update/correction (7/18/2013 10:34:24 AM)

Site Name: GALLATIN RIVERHOUSE GRILL
GWIC Id: 273630

Section 1: Well Owner(s)

1) GALLATIN RIVERHOUSE GRILL (WELL)
45130 GALLATIN ROAD
GALLATIN GATEWAY MT 59730 [09/03/2014]
2) GALLATIN RIVERHOUSE GRILL (WELL)
SAME
N/A N/A N/A [05/08/2013]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	16	NW¼ NW¼ NW¼ SW¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.2239	-111.2501	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6115	MAP	NGVD29	9/3/2014

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, May 08, 2013

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	25	11.5
25	40	7.3

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	40	6.6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
40	40	6.6	1	6"	OPEN BOTTOM

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	25	CEMENT SLURRY	

Section 7: Well Test Data

Total Depth: 40
Static Water Level: 25.56
Water Temperature:

Air Test *

25 gpm with drill stem set at 38 feet for 2 hours.
Time of recovery 1 hours.
Recovery water level 25.56 feet.
Pumping water level _ feet.

Pump Test *

Depth pump set for test 30 feet.
35 gpm pump rate with 1.61 feet of drawdown after 24 hours of pumping.
Time of recovery 1 hours.
Recovery water level 25.56 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

THIS WELL REPLACES GWIC ID: 104540

Section 9: Well Log

Geologic Source

110SNGR - SAND AND GRAVEL (QUATERNARY)

From	To	Description
0	3	TOP SOIL
3	16	FINE SAND GRAVELS COBBLES
16	38	FINE SAND GRAVELS & COBBLES W/ 25 GPM WATER
38	40	SHALE

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: TROY HAUSER
Company: RED TIGER DRILLING
License No: WWC-598
Date Completed: 5/8/2013

Gallatin Riverhouse Grill PWSID# MT0001285

June 23, 2021

State Representative: Jodi Stoner-Granberg

System Representative: Kyle Wisniewski

Overview



Groundwater Sourced, Transient, Non-Community Water System in Gallatin Co. – T07S R04E S16

PWS Facilities (Approximate Locations)



2013 Well GWIC 273630 (WL003)





WL003 is located adjacent to the kitchen in a storage area with empty kegs and within a few feet of the kitchen's used grease bin.

Ideally, a 100-foot radius Well Head Protection Zone (WHPZ) should exist around the well and be free of potential hazards to water quality. **Care should be taken to minimize potential threats to water quality.** It is recommended the clutter and grease bin be removed from the area around the well and stored elsewhere.





WL003 has a sanitary well cap. The bolts were tight and there are downturned, screened air vents. The electrical conduit was broken where the coupling connects with the well cap and the O-ring on the well cap was not positioned properly to ensure a tight seal. These unapproved openings must be corrected to prevent potential contamination to the source.

Corrective Action: 2013 Well GWIC 273630



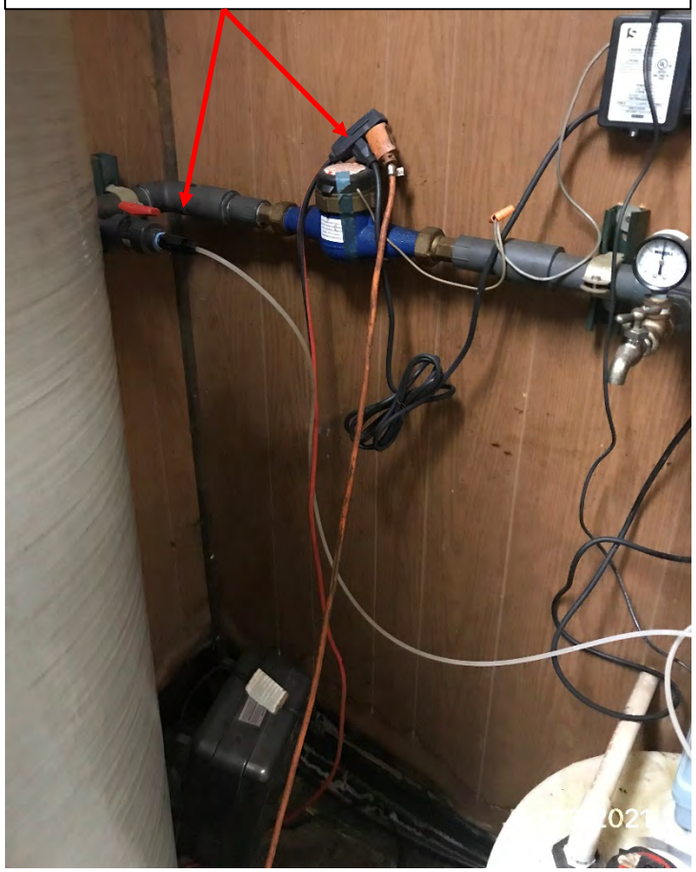




The well cap was cleaned, and the broken electrical conduit coupling was replaced and sealed within the well cap. The O-ring was repositioned to create a tight seal.

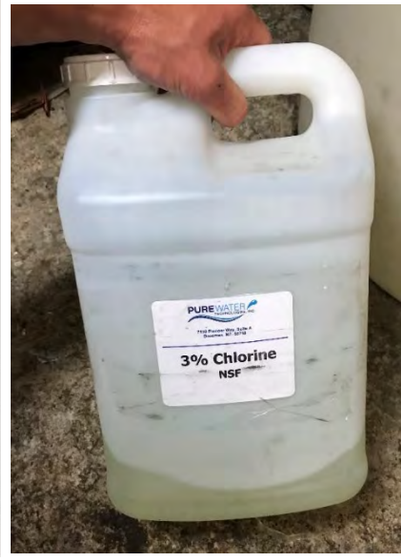
Treatment Plant (TP001)

Chlorine injection point and meter to pace injection.





It is recommended the disinfection solution container be labeled with the contents of the container and the dilution ratio.





4-log virus inactivation contact tanks



Stenner Peristaltic Pump

The treatment facility consists of a Stenner brand peristaltic pump that injects Sodium Hypochlorite that has been diluted 2:1 in a batch tank. Water then achieves contact time for 4-logvirus inactivation in two Mixmaster contact tanks.

Water is then softened using an ion-exchange style water softening unit (see next page).

Treatment Plant (TP001) *cont.*



Ion-exchange water softening unit and brine tank.





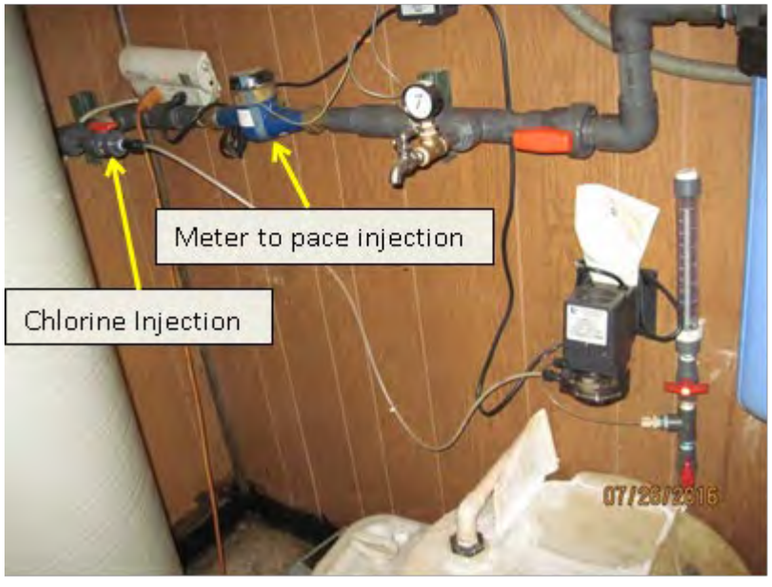
NSF approved salt and eye wash station.



Treatment Plant (TP001) & Pressure Control (PC001) photos taken from 2016 Sanitary Survey as these photos show a more complete system than photos taken during the 2021 Sanitary Survey.

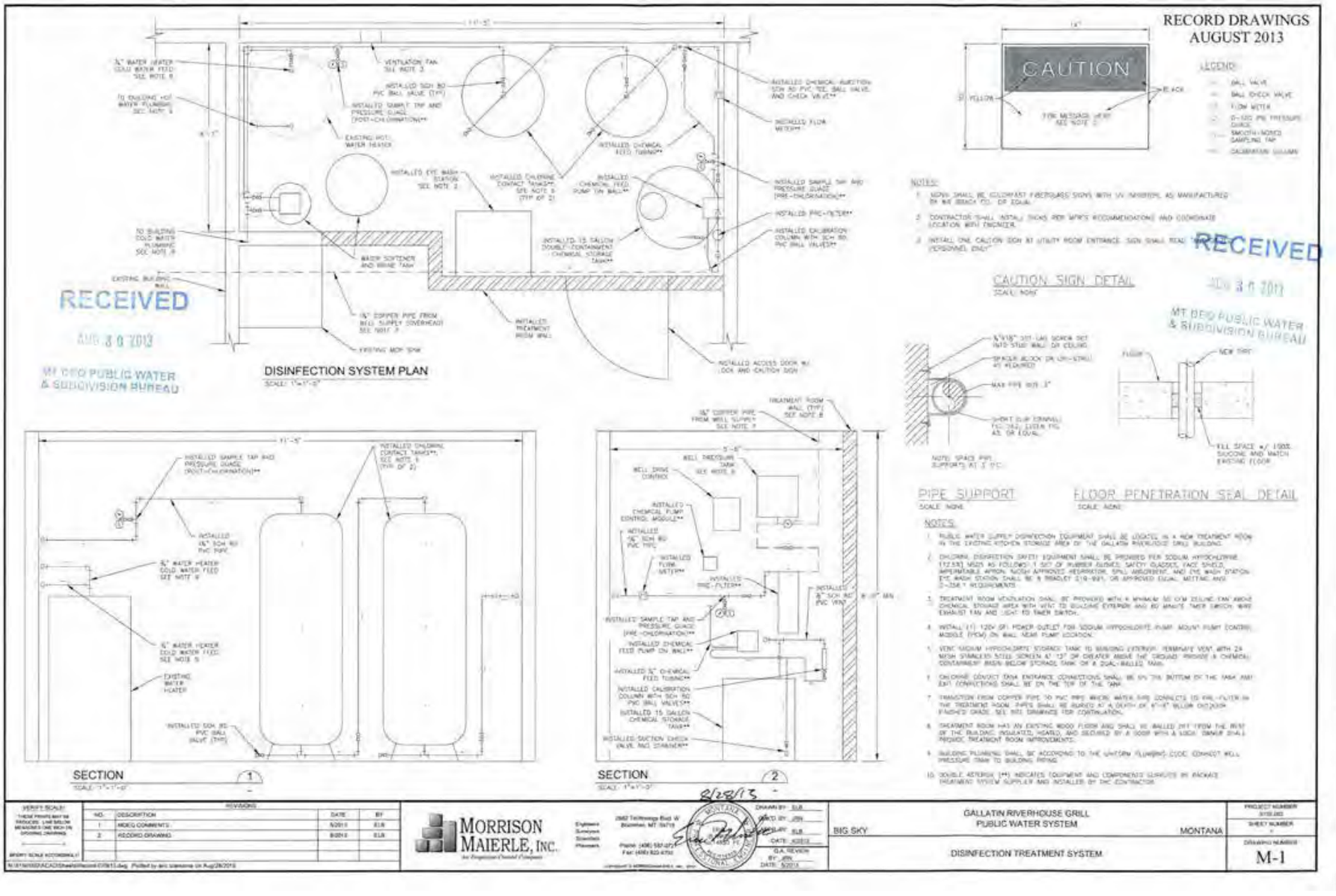


The pressure control facility (PC001) consists of the pressure transducer that relays pressure to the VFD well pump controller that maintains a set system pressure.

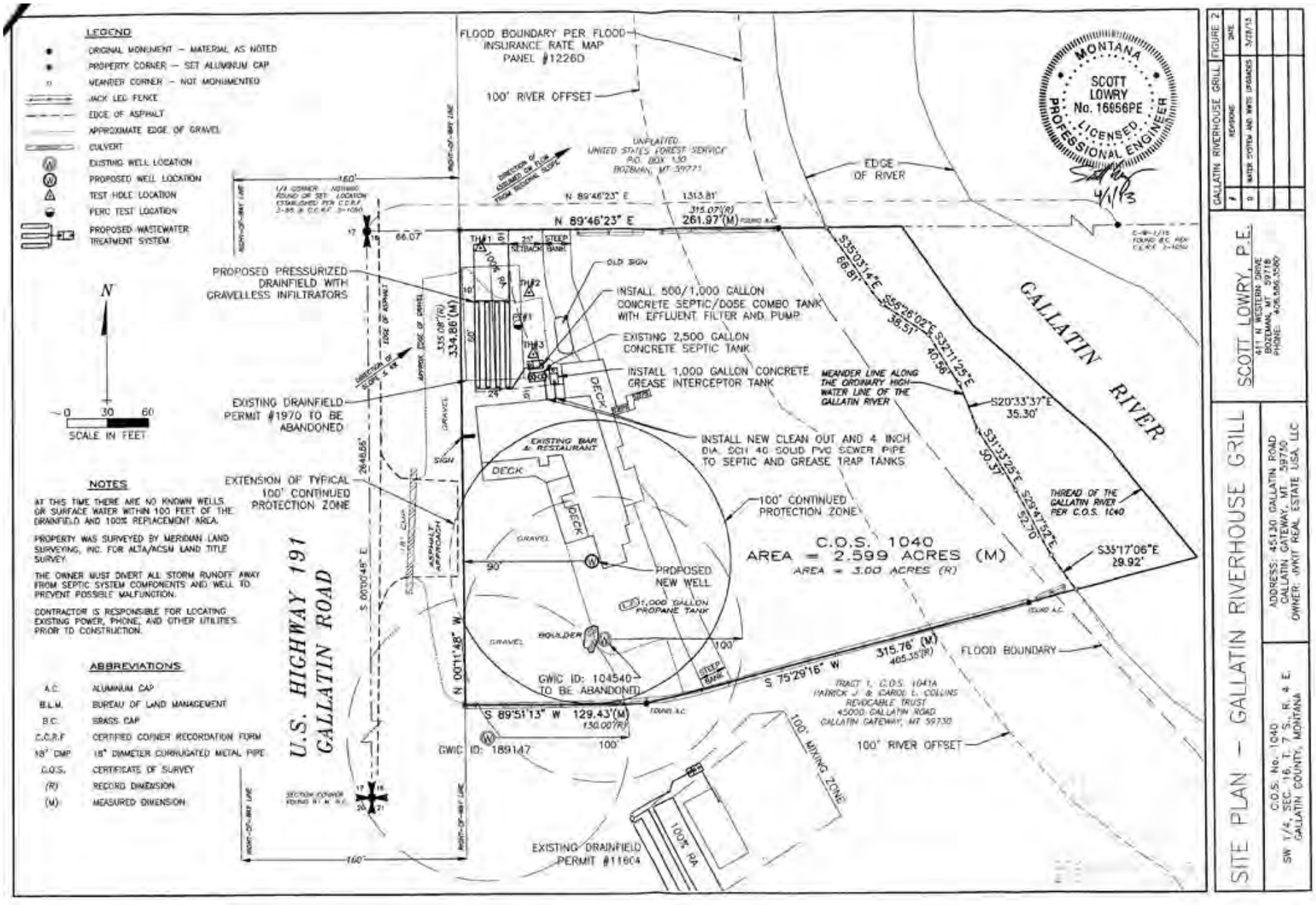




System Treatment Plant Drawing



System Site Plan



Water System Facilities Table and Flow

WSF ID	WSF Name	Description
WL003	2013 Well GWIC 273630	Submersible well pump. Size of pump is unknown.
TP001	Treatment Plant	Pre-treatment using a particulate filter followed by 4-log virus inactivation using 3% Sodium Hypochlorite. Contact time is achieved using two Flexcon brand Mixmaster tanks with total capacity of 238-gallons. Water is then softened by ion-exchange water softening unit.
PC001	Pressure Control	Franklin Subdrive 75 VFD well pump controller and a transducer to monitor system pressure.
DS001	Distribution System	Copper and PVC piping.
Flow	WL003>PC001>TP001>DS001	

DEQ
Montana Department
of Environmental Quality

November 18, 2020

Big Sky Conoco Travel Shoppe
Attn: Renae Schumacher
PO BOX 160640
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Big Sky Conoco Travel Shoppe (PWSID: MT0001832).

Dear Renae,

I would like to thank you for assisting me during the sanitary survey inspection of the Big Sky Conoco Travel Shoppe public water supply system. As a community public water supply, your facility is required to have a sanitary survey inspection every three years. These routine 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 October 14, 2020.

SOURCE:

WL002, Well 1 (GWIC 171240): Located on the east side of the property behind the coffee stand. The GWIC well log is attached for reference. The well is housed inside a small wooden doghouse style structure. The structure was in good condition however it was not locked, and the lid hinge was broken.

The Monitor/Baker cast iron "turtle" style well cap appeared to be securely attached and sealed to the well casing. The electrical conduit connection also appeared to be securely attached and sealed to the well cap. The well cap vent screens were both corroded. The chlorinator drop-pipe caulking had contracted away from the pipe.

- Recommend resealing around the chlorinator drop-pipe.

TREATMENT:

TP002 Treatment Plant: Facility consists of a pellet chlorinator at the wellhead (calcium hypochlorite). Followed by cartridge filter and ion-exchange water softener (dual tank) located inside the utility area of gas station/restaurant.

Pure Water technologies maintains treatment systems. No salt or calcium hypochlorite are stored onsite, so it was not possible to verify NSF approval of the chemicals. Adjustments to the calcium hypochlorite feed rate are kept to a minimum because of the high rate of variability with wellhead pellet chlorinators so reported residuals are much higher than required but trying to operate closer to the minimum requirement would result in periodic non-compliant residuals. The backwash drain for the water softener was adequately plumbed with an appropriate air gap to the wastewater system.

DISTRIBUTION:

DS001 Distribution System: Previously noted to be black poly pipe from the well to the building, then copper building piping. The backwash drain for the water softener had a proper air gap where it is plumbed to the wastewater system. One chemical mixing dispenser was observed in the kitchen with appropriate backflow certification labeling.

- The underground irrigation system was observed without proper backflow protection. **This was determined to be a significant deficiency (see Significant Deficiency Section below).**

STORAGE:

No storage facilities were known to exist or observed to be in use at the time of inspection.

PUMPS, PUMP FACILITIES, and CONTROLS:

PC001 Pressure Control: Located inside the utility area of gas station/restaurant. This facility consists of the 1/2hp submersible well pump, a pressure switch, a pressure gauge, and one captive air tank (Flex-LiteFL-30).

Pressure was static during the inspection at 58psi. Pressure switch cover has 44/64psi pressure window noted. There is no pressure relief valve.

- Recommend having a properly sized and correctly installed pressure relief valve to reduce the risk of injury or damage. This is important to ensure the safety of the water system, water system personnel, and consumers in the event a pressure control component malfunctions or fails unexpectedly.

MONITORING, REPORTING, and DATA VERIFICATION:

In the preceding two-year period (10/14/2018- 10/14/2020) there were three violations on record. Two were for Failure to Report Daily Entry Point Chlorine Residuals on Time, these violations were returned to compliance with late reporting. The other violation for Failure to Monitor Total Coliform Bacteria April 2019 was returned to compliance with late monitoring and reporting.

A revised RTCR Sample Site Plan and map was drafted during this inspection and submitted to the RTCR Rule Managers for review 10/21/2020. A revision was requested previously by the RTCR Rule Manager to include a site map after the initial March 2016 submittal.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:

Management could improve maintenance and safety by following the recommendations in this letter. Overall operations appeared to be adequate at the time of inspection.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:

At the time of inspection, a certified operator was not required for this classification (transient non-community) of public water system.

Significant Deficiencies and Immediate Action Required:

Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

The state of Montana adopted the federal Ground Water Rule (ARM 17.38.211) effective December 1, 2009. The Ground Water Rule establishes strict time lines for the identification of significant deficiencies, DEQ notification of the PWS system owner of the significant deficiency and the implementation of corrective action by the PWS.

The Department has established a Significant Deficiency Review Committee (Committee) to review deficiencies identified during a sanitary survey inspection or site visit to determine if they meet the Department's interpretation of significant. During this inspection, the following deficiency was identified and the DEQ Committee has determined that it meets the definition of significant:

Item 1 (Type #3) DS001 Distribution System: An unprotected cross-connection to an underground irrigation system was observed. A multi-zone underground irrigation system is used to water portions of the landscaping around the PWS property. The multizone controller and shut-off valve connection to the headworks of the underground irrigation system are located directly beside the well enclosure on the northwest corner (see photos). There is what appeared to be a dual-check plumbed after the shut-off valve, but that would be inadequate protection (see photos). After a tour of the irrigation system and seeing all the areas that are watered it was clear that there was no appropriate or properly installed backflow protection equipment visible above ground. As discussed with the Owner, proper protection would be a Reduce Pressure Zone assembly or Pressure Vacuum Breaker assembly installed ahead of the zone valves for a multizone underground irrigation system. Renae has reported after the inspection that their plumber has ensured there is not appropriate backflow prevention, as discussed, and a backflow preventer is on order and will be installed, but there is not enough time this Fall to complete the work.

********This was determined to be a significant deficiency.********

RECOMMENDATION(S) Item #1: The system must install proper backflow protection, such as a pressure vacuum breaker. Please contact the state backflow protection specialist Karl Carlson (247-4444) with any questions.

Big Sky Conoco Travel Shoppe will be receiving separate correspondence from Craig Fetkavich, DEQ Ground Water Rule Manager, that will outline regulatory requirements and time lines for correcting this significant deficiency. Upon receipt of this letter, it is recommended that you immediately contact Mr. Fetkavich (406) 444-3425.

Other System Deficiencies or Issues:

Items in the findings section above but not listed as significant sanitary deficiencies should be promptly addressed. While these items do not meet the EPA definition of significant deficiencies, they are issues that should be corrected to minimize the potential for contamination to the system and to safely and effectively operate the system.

WASTEWATER:

Served by a large capacity onsite septic and drainfield system.

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-7494.

Sincerely,

Kirk Yoder
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-7494
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County file

SANITARY SURVEY FORM - INVENTORY

1/2016

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

DATE OF SURVEY October 14, 2020 | COUNTY Gallatin | SURVEYOR NAME Kirk Yoder

(SYSTEM REPRESENTATIVE) Renae Schumacher | (OTHER REPRESENTATIVE) _____

SYSTEM ADDRESS – ADMINISTRATIVE CONTACT

Addressee Renae Schumacher (Primary Address)

Street PO BOX 160640

City Big Sky State MT Zip 59716

System Phone (406) 581-1357 Fax (_____) _____

SYSTEM OWNER

Addressee Renae Schumacher (Owners Address)

Street PO BOX 160640

City Big Sky State MT Zip 59716

Owner Phone (406) 581-1357 Fax (_____) _____

LOCATION OF SYSTEM

Nearest City Big Sky Description or Physical Address 90 Lone Mountain Trail. SW corner HWY 191/Gallatin Rd. and Lone Mountain Trail.

☐ seasonal operation dates: _____ to _____
☒ year round operation

OPERATOR OF SYSTEM

Name Renae Schumacher

Certified Operator? ☐ Yes ☒ No ☒ Not required

Copy of Certificate? ☐ Yes ☒ No Certification # _____

Phone # (_____) _____ Cell Phone # (_____) _____

Fax # (_____) _____

ALTERNATE OPERATOR OF SYSTEM

Name _____

Certified Operator? ☐ Yes ☐ No ☒ Not required

Copy of Certificate? ☐ Yes ☐ No Certification # _____

Phone # (_____) _____ Cell Phone # (_____) _____

SYSTEM STATUS

☒ **A** = Active ☐ **P** = Proposed *(Add New System)*
☐ **I** = Inactive

SYSTEM CLASS

☐ **C** = Community
☐ **NTNC** = Non-Transient Non-Community
☒ **TNC** = Transient Non-Community

Total Service Connections: Residential / Non-Transient: _____ Transient : 1

Total Active Connections: Residential / Non-Transient: _____ Transient: 1

Service Connections Metered? ☐ Yes ☒ No Percent Metered _____ %

Resident Population (Number of permanent residents utilizing PWS daily) _____

Non-Transient Population (Maximum number of non-transient persons utilizing PWS daily) _____

Transient Population (Maximum number of transient persons served by PWS daily) 1,000

OWNER TYPE

☐ 1 Federal Government
☒ 2 Private Subdivision, Investor, Trust, Cooperative, Water Association, etc.
☐ 3 State Government
☐ 4 Local Government Authority, Commission, District, Municipality, City, etc.
☐ 5 Mixed Public/Private
☐ 6 Native American

SERVICE AREA CHARACTERISTICS LIST

☐ BR Bar
☐ DC Day Care Center
☐ DI Dispenser
☐ HS Head Start
☐ HA Homeowners Assoc.
☐ HM Hotel/Motel
☐ HR Highway Rest Area
☐ IA Industrial/Agricultural
☐ IC Interstate Carrier
☐ IN Institution
☐ MF Medical Facility
☐ MH Mobile Home Park
☐ MU Municipality
☐ OA Other Area
☐ ON Other Non-Transient Area (_____Average Daily Visitors TNC)
☐ OR Other Residential Area
☐ OT Other Transient Area
☐ PA Recreation Areas
☐ RA Residential Area
☐ RE Retail Employees
☒ RS Restaurant
☐ RV RV Park
☐ SC School
☐ SI Sanitary Improvement District
☐ SK Summer Camp
☐ SR Secondary Residences
☒ SS Service Station
☐ SU Subdivision
☐ WBWater Bottler
☐ WH Wholesaler (Sells Water)

Service Category Description Gas Station and Restaurant

Comments: Last sanitary survey 4/29/2015.

The underground irrigation system was observed without proper backflow protection. This was determined to be a significant deficiency (see Significant Deficiency Section page 7).

SANITARY SURVEY FORM – WATER SYSTEM FACILITIES

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

Water System Facilities (WSF) numbers are WSF Type Codes plus an assigned number. (i.e. source facility numbering starts with 002 and all non-source facilities start with 001). See instruction sheet for a list of WSF Type Codes. When a source is operational it is considered ***A***ctive, this includes systems that are seasonal. ***I***nactive sources are those which are shut down but can return to active status, such as a system out of business. ***P***roposed sources are those that have been identified through the Plan Review process, but are not connected to the water system.

*A **water source facility** is a well, spring, intake, infiltration gallery or consecutive connections from which a system draws or purchases water:*

Total Number of Source Facilities 1

WATER SYSTEM FACILITIES SUMMARY (WSF)

WSF ID	Facility Name	Water Type Code	Purchased	Seller PWSID	Activity Status*
WL002	Well 1 GWIC 171240	GW	☐ Yes ☒ No		A
TP002	Treatment Plant		☐ Yes ☐ No		A
PC001	Pressure Control		☐ Yes ☐ No		A
DS001	Distribution System		☐ Yes ☐ No		A
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
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			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
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			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		

Description of Water System Facility flow: WL002> TP002> PC001> DS001

Notes: _____

(*Example: WL002 and WL003 > CH001 > TP001 > ST001 > PC001 > DS001*)

*(A)Active, (I)Inactive, (P)Proposed

EMERGENCY POWER

Does the system have emergency power? ☐ Yes ☒ No

If yes, what type: _____ Frequency of testing: _____

Record of primary power failures: _____ in last year Switchover: ☐ Automatic ☐ Manual

Comments: _____

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE | **STATUS OF SOURCE** ☒ **(A)**ctive ☐ **(I)**nactive ☐ **(P)**roposed

WSF ID WL002 *Entry Point ID* EP502
These are State assigned identification numbers

Source Name Well 1 GWIC 171240
Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) **90 Lone Mtn Tr.**

Entry Point Name EP for TP Well 1
Example: EP for North Well 1 & South Well 2

Entry Point is at WSF ID TP002
EP is at the first water system facility with finished water.

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA completed with this inspection ☐ Yes ☒ No

Log Available? ☒ Yes ☐ No

Average Production _____ indicate units

Maximum Production _____ indicate units

Date Drilled _____ if well. . date drilled

Casing Size _____ size of casing installed in well

Case Depth _____ depth of casing installed in well

Well Depth _____ depth of well expressed in feet

Grout Depth _____ depth of grout used to seal well walls

Log SWL _____ (static) expressed in feet below ground elevation

Log PWL _____ (pumping) expressed in feet below ground elevation

Test Pump Rate _____ expressed in gallons per min

Intake Type _____ example: screen, slots, perforations, open

Intake Interval _____ expressed in feet below ground elevation

Well Yield _____ pump tested in gallons per minute

Latitude 45.26450º in decimal degrees

Longitude -111.25540º in decimal degrees

WELLS

	Yes	No	Unk	N/A
Is well metered?	☐	☒	☐	☐
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least				
☒18 inches above outside ground level;	☒	☐	☐	☐
☐12 inches above finished floor inside well house; and	☐	☐	☐	☒
☐3 feet above 100 year flood elevation? (Check for appropriate distance)	☐	☐	☒	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☒	☐	☐	☐
Is well vent properly screened and terminated in a downward position?	☒	☐	☐	☐
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Treated	☒	☐	☐	☐
Are check valves, blow-off valves and water meters maintained and operating properly?	☐	☐	☐	☒
Is upper termination of well protected (housed or fenced)?	☒	☐	☐	☐
Is intake located below the maximum drawdown?	☐	☐	☒	☐

PUMPS

Type 1/2 hp submersible
(example: 30 hp line shaft turbine)
Rated Capacity N/A

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? As needed			☐	☐
Are backup pumps/motors provided?	☐	☒	☐	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☐	☒	☐	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐
Are recommended spare parts on hand?	☐	☒	☐	☐
Cross connection protection provided?	☐	☒	☐	☐

Comment: GWIC well log attached for reference. Well is housed inside a small wooden doghouse style structure. The structure was in good condition however it was not locked and the lid hinge was broken. The well cap vent screens were both corroded and the chlorinator drop pipe caulking had contracted away from the pipe.

Explain Controls: Submersible well pump triggered by a pressure switch.

Comment: _____

SANITARY SURVEY FORM - TREATMENT

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

Treatment Objective

B = Disinfection Byproduct Control
C = Corrosion Control
D = Disinfection
E = Dechlorination
F = Iron Removal
I = Inorganics Removal
M = Manganese Removal
O = Organics Removal
P = Particulate Removal
R = Radionuclides Removal
S = Softening (Hardness Removal)
T = Taste / Odor Control
Z = Other _____

WATER TREATMENT FACILITIES

WSF ID	Treatment Plant Name	Treatment Objectives and Code
TP002	Treatment Plant	D423 P341 S460

WSF ID	Location (Record in decimal degrees)	
TP002	Latitude 45.26450º	Longitude -111.24450º
	Latitude ____º	Longitude ____º
	Latitude ____º	Longitude ____º
	Latitude ____º	Longitude ____º
	Latitude ____º	Longitude ____º

Treatment plant description: Pellet chlorinator at the wellhead (calcium hypochlorite). Followed by cartridge filter and ion-exchange water softener (dual tank).

FOR SYSTEMS EMPLOYING FULL-TIME DISINFECTION

	Yes	No	Unk	N/A
What disinfectant is used? Calcium hypchlorite				
Is the disinfectant used NSF approved?	☐	☐	☒	☐
Is the amount of disinfectant used recorded? If Yes, amount used: _____lbs/day X ppm _____ other	☒	☐	☐	☐
Is the amount of disinfectant used compared to water pumped to verify concentration?	☐	☒	☐	☐
Is chemical storage adequate and safe? If No, explain _____	☒	☐	☐	☐
Is disinfectant residual being monitored daily?	☒	☐	☐	☐
Are residual reports submitted monthly?	☒	☐	☐	☐
Is 4-log removal (D361) required?	☐	☒	☐	☐
(D361) Minimum free chlorine residual concentration = _____mg/L				
Is minimum free chlorine residual maintained?	☒	☐	☐	☐
Is the disinfection equipment being operated and maintained properly?	☒	☐	☐	☐
Is operational standby equipment provided?	☐	☒	☐	☐
If not, are critical spare parts on hand?	☐	☐	☒	☐
Has disinfection system been free from failure during the past year – no interruption?	☒	☐	☐	☐
If No, give dates of interruptions _____				

Describe provisions for providing contact time between disinfection point and the first point of use: Piping from the well to building 3/4inch -previously reported.

IF USING GAS CHLORINATION

	Yes	No	Unk	N/A
Is a manifold provided to allow feeding gas from more than one cylinder?	☐	☐	☐	☒
Is there automatic switchover from cylinder to cylinder?	☐	☐	☐	☒
Are scales provided for weighing of containers?	☐	☐	☐	☒
Are chlorine storage and use areas isolated from other work areas?	☐	☐	☐	☒
Are stored cylinders capped and labeled?	☐	☐	☐	☒
Is room vented to the outdoors with suction located no more than 6 inches above the floor level?	☐	☐	☐	☒
Is vent inlet near the ceiling?	☐	☐	☐	☒
Is room containing chlorination treatment labeled sufficiently (DANGER signs, etc.)?	☐	☐	☐	☒
Is a view port provided into the room storing chlorine?	☐	☐	☐	☒
Is a means of leak detection provided? Type? _____	☐	☐	☐	☒
Is a self-contained breathing apparatus available for use during repair of leaks? Where? _____	☐	☐	☐	☒
Are personnel trained to use apparatus?	☐	☐	☐	☒
Are all doors hinged outward and equipped with panic bars?	☐	☐	☐	☒
Are all gas cylinders restrained near the top and about half way down by chaining to wall or by other means?	☐	☐	☐	☒

Comment: Pure Water technologies maintains treatment systems. No salt or calcium hypochlorite are stored onsite so it was not possible to verify NSF approval of the chemicals. Adjustments to the CaOCl feed rate are kept to a minimum because of the high rate of variability with wellhead pellet chlorinators so reported residuals are much higher than required but trying to operate closer to the minimum requirement would result in periodic non-compliant residuals. The backwash drain for the water softener was adequately plumbed with an appropriate air gap to the wastewater system.

SANITARY SURVEY FORM - PRESSURE CONTROL ASSEMBLIES

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

☒*CAPTIVE AIR TANK(S)* ☐*PRESSURE TANK(S)* ☐*NO TANK(S)*

WSF ID PC001 Location: Utility area of gas station/restaurant

Latitude 45.26480º in decimal degrees

Longitude -111.25540º in decimal degrees

Pump size and type 1/2hp submersible (ex: 3 hp submersible)

Rated Capacity N/A Pump installation date: N/A

Pump run time N/A Time of day 11:30AM

Cut-In 44 psi Cut-Out 64 psi

	Yes	No	Unk	N/A
Are redundant booster pumps provided?	☐	☐	☐	☒
Are spare pumps/motors provided?	☐	☒	☐	☐
Is there automatic cutoff for low suction pressure?	☐	☒	☐	☐
Is there a compound pressure gauge prior to the pump?	☐	☐	☐	☒
Is there a standard pressure gauge after the pump?	☒	☐	☐	☐
Does the low pressure level provide adequate pressure?	☒	☐	☐	☐
Is there a pressure relief valve?	☐	☒	☐	☐
Is the pressure relief valve properly sized?	☐	☐	☐	☒
Is the tank operating properly (not water logged)?	☒	☐	☐	☐
Is the tank(s) air charge system adequate?	☐	☐	☐	☒
Is exterior surface of the tank(s) in good physical condition?	☒	☐	☐	☐
Can tank(s) be by-passed for repair?	☐	☒	☐	☐
Is there a water level sight glass?	☐	☐	☐	☒
Is there a bottom drain valve on the tank(s)?	☐	☒	☐	☐
Is there adequate heating, lighting, and ventilation?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Are controls protected and functioning properly?	☒	☐	☐	☐
Are pump records maintained (amp, pressure, maintenance schedule, manuals, etc.)?	☐	☐	☒	☐
Is facility properly protected against trespass?	☒	☐	☐	☐
Is the plumbing protected from excessive corrosion?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐

Describe components and controls: 1/2hp submersible well pump, a pressure switch, a pressure gauge, and one captive air tank (Flex-LiteFL-30).

Comments: Pressure was static during the inspection at 58psi. Pressure switch cover has 44/64psi pressure window noted. There is no pressure relief valve. Recommend having a properly sized and correctly installed pressure relief valve.

☐*CAPTIVE AIR TANK(S)* ☐*PRESSURE TANK(S)* ☐*NO TANK(S)*

WSF ID _____ Location: _____

Latitude _____º in decimal degrees

Longitude _____º in decimal degrees

Pump size and type _____ (ex: 3 hp submersible)

Rated Capacity _____ Pump installation date: _____

Pump run time _____ Time of day _____

Cut-In _____ psi Cut-Out _____ psi

	Yes	No	Unk	N/A
Are redundant booster pumps provided?	☐	☐	☐	☐
Are spare pumps/motors provided?	☐	☐	☐	☐
Is there automatic cutoff for low suction pressure?	☐	☐	☐	☐
Is there a compound pressure gauge prior to the pump?	☐	☐	☐	☐
Is there a standard pressure gauge after the pump?	☐	☐	☐	☐
Does the low pressure level provide adequate pressure?	☐	☐	☐	☐
Is there a pressure relief valve?	☐	☐	☐	☐
Is the pressure relief valve properly sized?	☐	☐	☐	☐
Is the tank operating properly (not water logged)?	☐	☐	☐	☐
Is the tank(s) air charge system adequate?	☐	☐	☐	☐
Is exterior surface of the tank(s) in good physical condition?	☐	☐	☐	☐
Can tank(s) be by-passed for repair?	☐	☐	☐	☐
Is there a water level sight glass?	☐	☐	☐	☐
Is there a bottom drain valve on the tank(s)?	☐	☐	☐	☐
Is there adequate heating, lighting, and ventilation?	☐	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☐
Are controls protected and functioning properly?	☐	☐	☐	☐
Are pump records maintained (amp, pressure, maintenance schedule, manuals, etc.)?	☐	☐	☐	☐
Is facility properly protected against trespass?	☐	☐	☐	☐
Is the plumbing protected from excessive corrosion?	☐	☐	☐	☐
Is a preventive maintenance program in operation?	☐	☐	☐	☐

Describe components and controls : _____

Comments: _____

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

DISTRIBUTION SYSTEM EVALUATION

WSF ID DS001

	Yes	No	Unk	N/A
System drawings available?	☐	☒	☐	☐
Accurate As-Built drawing(s) on-site?	☐	☒	☐	☐
Lines adequately sized?	☒	☐	☐	☐
Adequate pressure maintained?	☒	☐	☐	☐
Mains protected from freezing?	☒	☐	☐	☐
Distribution system free of leaks?	☒	☐	☐	☐
Asbestos concrete pipe used?	☐	☒	☐	☐
Fire hydrants?	☐	☒	☐	☐
Dead end lines minimized by looping mains?	☐	☐	☐	☒
Flushing program?	☐	☐	☐	☒
Pressure reducing stations? Number _____	☐	☒	☐	☐
Booster stations? Number _____	☐	☒	☐	☐
Are individual booster pumps on any service lines? (see DEQ-1 6.4.4)	☐	☒	☐	☐
Were cross connections observed?	☒	☐		

Describe distribution: Previously noted to be black poly pipe from the well to the building, then copper building piping.

Comments: The underground irrigation system was observed without proper backflow protection.(This was determined to be a significant deficiency) The backwash drain for the water softener had a proper air gap where it is plumbed to the wastewater system. One chemical mixing dispenser was observed in the kitchen with appropriate backflow certification labeling.

SAFETY

	Yes	No	Unk	N/A
Were confined spaces observed?	☐	☒	☐	☐
Confined space safety adequate?	☐	☐	☐	☒
Fall risks adequately mitigated?	☐	☐	☐	☒

Describe any confined spaces observed _____

Note all safety deficiencies (consider items such as ladders, tank supports, guards on rotating electrical equipment, lightning protection for pumps, etc.)

_____

MONITORING AND RECORDKEEPING EVALUATION

	Yes	No	Unk	N/A
Does the system have a current Monitoring Schedule?	☒	☐	☐	☐
Bacti monitoring records maintained? (5 years)	☒	☐	☐	☐
Bacti Sample Site Plan submitted?	☒	☐	☐	☐
Familiar with repeat sampling?	☒	☐	☐	☐
Chemical monitoring records maintained? (10 years)	☒	☐	☐	☐
System specific records / plans maintained? (DBP, PB/CU, treatments, waivers, violations, etc.)	☒	☐	☐	☐
Familiar with Public Notice requirements?	☒	☐	☐	☐
Did Surveyor take a bacteriological sample?	☐	☒		

If Yes, date of Sample: _____ Time of Sample: _____

Comments: In the preceding two-year period (10/14/2018- 10/14/2020) there were three violations on record. Two were for Failure to Report Daily Entry Point Chlorine Residuals on Time and the other was for Failure to Monitor Total Coliform Bacteria April 2019. All three violations were returned to compliance with late monitoring and reporting.

A revised RTCR Sample Site Plan and map was drafted during this inspection and submitted to the RTCR Rule Managers for review 10/21/2020. A revision was requested previously by the RTCR Rule Manager to include a site map after the initial March 2016 submittal.

MANAGEMENT

	Yes	No	Unk	N/A
Are there sufficient personnel?	☒	☐	☐	☐
Are operators properly certified?	☐	☐	☐	☒
Are personnel adequately trained?	☒	☐	☐	☐
Is there a current O&M manual on-site?	☐	☒	☐	☐
Is an emergency plan on-site and workable?	☐	☒	☐	☐
Has system addressed concerns from previous sanitary survey(s) or technical visit(s)?	☒	☐	☐	☐
Budget exists?	☒	☐	☐	☐
Does system maintain an emergency fund?	☒	☐	☐	☐
Does system contribute to facility replacement fund?	☒	☐	☐	☐
Are abandoned wells present?	☐	☒	☐	☐
Do abandoned wells appear to be properly abandoned? (see ARM 36.21.670)	☐	☐	☐	☒

Comments: _____

PWSID **MT0001832** | SYSTEM NAME **Big Sky Conoco Travel Shoppe**

The State, or an authorized agent, must conduct sanitary surveys for all public water supply systems in Montana. DEQ believes that periodic sanitary surveys, along with appropriate corrective actions, are indispensable for assuring the long-term quality and safety of drinking water. When properly conducted, sanitary surveys can provide important information on a water system's design and operations and can identify minor and significant deficiencies for correction before they become major problems.

Minor deficiencies do not pose serious health threats. However, corrective action of minor deficiencies can be critical in the long-term operation and safety of a public water system. Minor deficiencies are generally described as suggested or recommended corrections in the letter to system owner(s).

Significant deficiencies can be defined as a defective water supply component(s) having or likely to have an adverse influence on public health. Significant deficiencies require immediate corrective action in efforts to protect consumers.

EPA and ASDWA guidance identifies eight broad components that should be covered in a sanitary survey. Using these eight broad components as a guide, minor and significant deficiencies should be described in the letter to system owner(s).

1) Source
2) Treatment
3) Distribution system
4) Finished water storage
5) Pumps, pump facilities, and controls
6) Monitoring and reporting, and data verification
7) System management and operation
8) Operator compliance with State requirements

With consideration that significant deficiencies may influence regulatory decisions and monitoring requirements, please list all significant deficiencies observed and corrective action(s) taken below.

Comments: **Item 1 (Type #3) DS001 Distribution System: An unprotected cross-connection to an underground irrigation system was observed.A multi-zone underground irrigation system is used to water portions of the landscaping around the PWS property. The multizone controller and shut-off valve connection to the headworks of the underground irrigation system are located directly beside the well enclosure on the northwest corner (see photos). There is what appeared to be a dual-check plumbed after the shut-off valve, but that would be inadequate protection (see photos). After a tour of the irrigation system and seeing all the areas that are watered it was clear that there was no appropriate or properly installed backflow protection equipment visible above ground. As discussed with the Owner, proper protection would be a Reduce Pressure Zone assembly or Pressure Vacuum Breaker assembly installed ahead of the zone valves for a multizone underground irrigation system. Renae has reported after the inspection that their plumber has ensured there is not appropriate backflow prevention, as discussed, and a backflow preventer is on order and will be installed, but there is not enough time this Fall to complete the work.**

********This was determined to be a significant deficiency.********

RECOMMENDATION(S) Item #1: The system must install proper backflow protection, such as a pressure vacuum breaker. Please contact the state backflow protection specialist Karl Carlson (247-4444) with any questions.

PWSID **MT0001832** SYSTEM NAME **Big Sky Conoco Travel Shoppe**

Aerial View



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

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (4/11/2011 4:23:41 PM)

Site Name: BIG SKY TRAVEL SHOPPE * WELL #1
GWIC Id: 171240

Section 1: Well Owner(s)

1) SMITH, CRAIG (MAIL)
N/A
BIG SKY MT N/A [08/25/2000]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	04E	32	NW¼ SE¼ SE¼

County

GALLATIN

Geocode

Latitude	Longitude	Geomethod	Datum
45.2638	-111.2511	MAP	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:
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Tuesday, November 2, 1971

Section 6: Well Construction Details

There are no borehole dimensions assigned to this well.

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1	20.5	7				CASING (TYPE UNKNOWN)
20	40.5	7				CASING (TYPE UNKNOWN)

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
20	35	7		1/8X6 IN	SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	GROUT	

Section 7: Well Test Data

Total Depth: 40.5
Static Water Level: 12
Water Temperature:

Bailer Test *

15 gpm with _ feet of drawdown after _ hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 22 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	4	TOPSOILS
4	18	ROCK
18	28	BROCKEN ROCK
28	40	CLAY AND ROCK

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: POTTS DRILLING INC
License No: -
Date Completed: 11/2/1971

Sanitary Survey Inspection Photos
Big Sky Conoco Travel Shoppe
PWSID: MT0001832
Inspector: Kirk Yoder, DEQ
October 14, 2020

WL002, Well 1 (GWIC 171240)



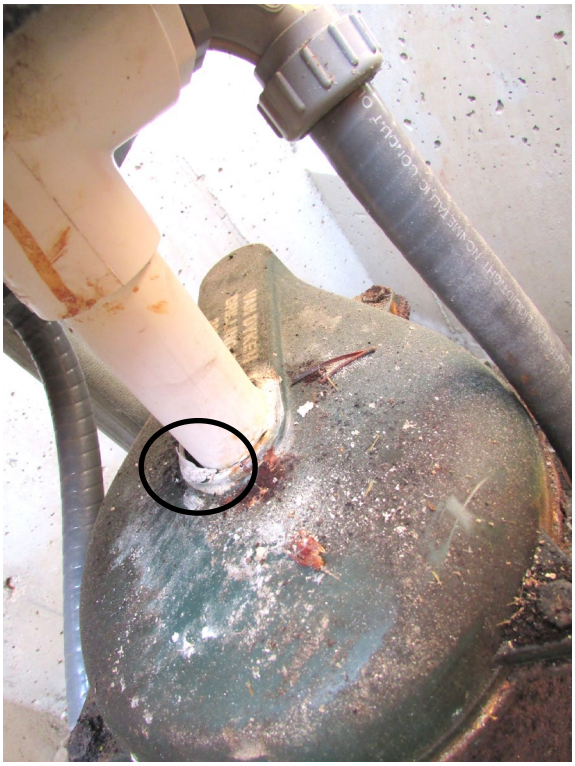
Well area and enclosure structure, looking northwest.



View inside the well enclosure structure.



Well vent screen (circled) and electrical conduit connection.



Well cap top view a small gap (circled) was noted between the cap and drop pipe, recommend resealing.



Second well cap vent screen (circled).

TP002 Treatment Plant



Pellet chlorinator at the well.



Softener backwash drain has an appropriate air gap to the wastewater system.



Cartridge filter and softener overview.

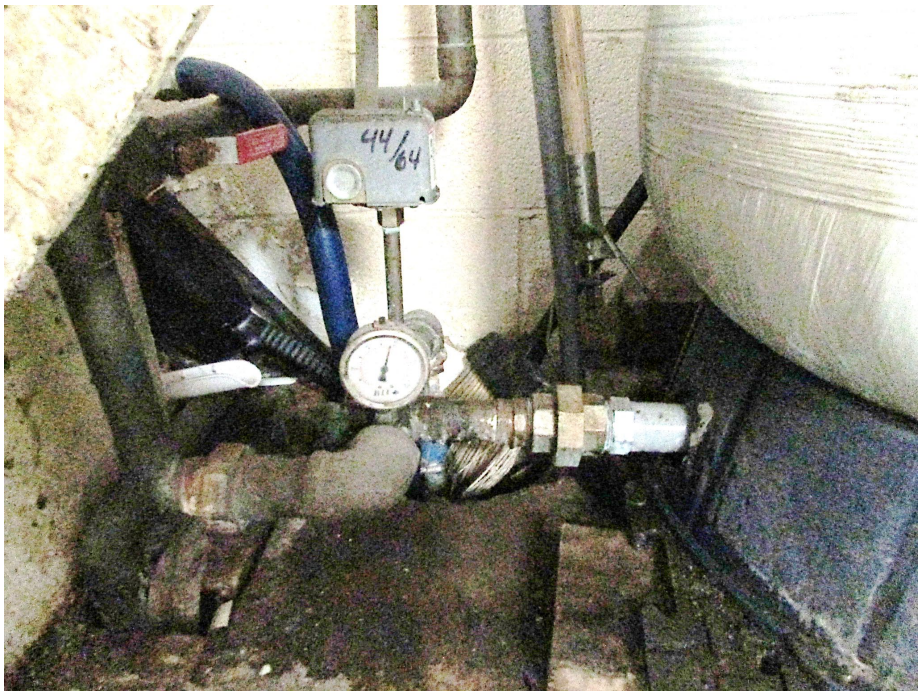


Alternate view of the softener's dual tanks and brine tank.

PC001 Pressure Control



Captive air tank and pressure control overview.



Pressure switch and pressure gauge are covered by a protective steel structure.

DS001 Distribution System



Well area looking northwest, noting there are no backflow assemblies visible around the well area. The irrigation system valve box (seen in the lower right photo) is on the opposite side of the well enclosure seen here (on the northwest corner of the well enclosure).



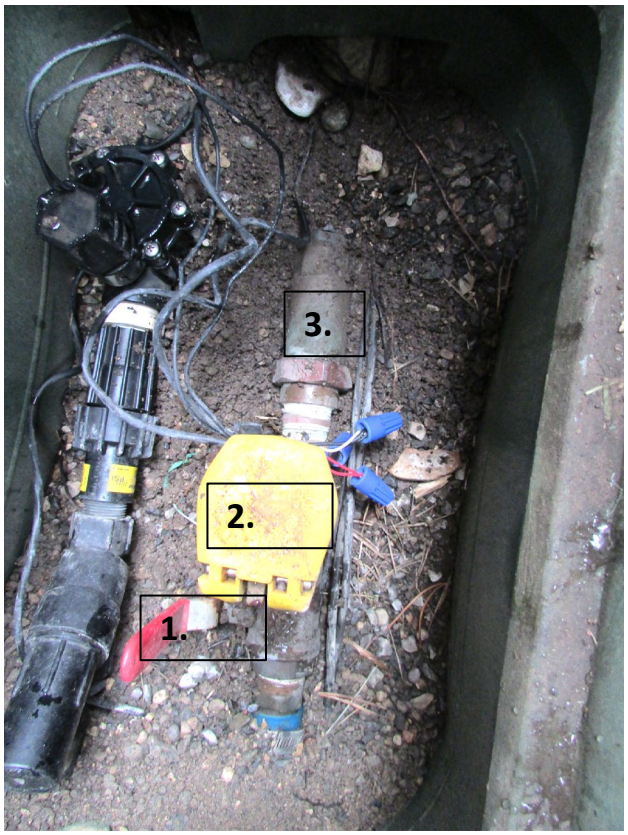
Irrigation system zone controller box circled. Located approximately 10 feet to the northeast of the well enclosure.



View inside the well enclosure. Noting no backflow assembly on the right (north) side.



Valve box overhead view. Noting no other backflow prevention or piping in or around the box.



Valve box overhead close view.
1. Shut off valve, 2. blow-out port, and 3. dual check valve inside the valve box.

DEQ
Montana Department
of Environmental Quality

January 17, 2020

Lazy J South Subdivision
Attn: Scott Hammond
PO BOX 161242
Big Sky, MT 59716

Re: Sanitary Survey Inspection of Lazy J South Subdivision (PWSID: MT0004432).

Dear Administrators and Operators,

I would like to thank Scott Hammond and operator Shannon Burdick for assisting me during the sanitary survey inspection of the Lazy J South Subdivision public water supply system. As a non-transient non-community public water supply, your facility is required to have a sanitary survey inspection every five years. These routine 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 December 27, 2019.

SOURCES:

Both wells were assessed for Ground Water Under the Direct Influence of Surface Water and both preliminary assessments had passing scores. Separate correspondence will be sent regarding the determination for each well.

WL002, Well 1 (GWIC 223891): Located just north of the pump house off of Michener Creek Road. The well construction log is included with this report and indicates that the well was completed in September 2005 to a total depth of 1,278 feet. Pressure at the pump house indicated that this well continues to be a flowing artesian with 160psi closed-in pressure.

The Monitor/Baker brand well cap appeared to be adequately sealed and secured to the well casing. The screened vent was securely attached.

- The well cap gasket appeared to be showing signs of weathering and cracking, it would be recommended to replace the gasket.

WL003, Well 2 (GWIC 227731): Located to the southeast of the pump house. The well construction log is included with this report and indicates that the well was completed in July 2006 to a total depth of 1,325 feet. Pressure at the pump house indicated that this well continues to be a flowing artesian with 165psi closed-in pressure.

The Monitor/Baker brand well cap appeared to be adequately sealed and secured to the well casing. The screened vent was securely attached. It is assumed that although the Well 2 well had two unapproved openings that the well itself is tightly sealed to the pitless adapter otherwise water would be coming out of the unapproved openings given the observed high pressure of the closed-in artesian flow.

- The well cap gasket appeared to be missing, it would be recommended to replace the gaskets on both wells at the same time. **It was reported by the operator on 1/16/2020 that both well seals would be replaced once they were received as they were not available locally and had to be ordered.**
- The casing had an open monitoring port and needed to be properly plugged. **This issue was corrected 1/16/2020 and photo documentation was provided.**

TREATMENT:

Chlorination treatment equipment is partially installed but not operational. Plan drawings indicated the same installed equipment, but the Department approval letter did not explicitly approve the installation of the chlorination equipment.

DISTRIBUTION:

DS001 Distribution System: Eight-inch PVC C900 mains were planned and approved. Commercial lots were planned to have 1-inch service connections. Residential service connections were planned to have 1.5-inch service connections. Four-inch C900 PVC fire service connections were also planned. At the time of inspection there were 18 commercial service connections. All active non-fire service connections are metered.

Pressure at 144D Straight Iron Rd was 44psi. It is suspected there is some pressure reducing equipment somewhere in distribution since the tank is approximately 315ft higher in elevation than the distribution system. Plan records do not indicate any pressure reducing stations. No irrigation systems were reported.

Department approved plans EQ 19-2050 & 19-2051 approve extension of this water system for a residential subdivision.

STORAGE:

ST001 Storage Tank 530,000 GAL: Located southwest of the pump house approximately one mile via Colters Run Loop. This facility consists of a Superior Tank Company bolted steel, coated, on-grade tank. Plan drawings show a 6-inch bottom inlet and an 8-inch bottom outlet. There is an 8-inch overflow. The tank should be periodically visually inspected inside and out, especially when positive bacteriological samples have been detected.

The air vent appeared to be adequately screened. The overflow pipe is 1 pipe diameter (8-inchs) above grade and screened. There is no splash pad, the area beneath overflow is gravel and sloped minimally away from the tank.

- Recommend a splash pad or channel to direct overflow water away from the tank foundation. A properly constructed channel could also allow for the required 3 pipe diameters (24-inchs) above the ground level to be achieved.
- Recommend having the tank inspected and/or cleaned at least every five years (AWWA recommends every 3-5 years).

At least one broken weld was observed on the handrail equipment near the ladder.

- Consider checking the climbing safety equipment for integrity.
- The sight gauge wire conduit was not closely observed and should be checked to ensure adequate seal is provided to prevent insects from entering the tank.

- The tank access hatch lid, ladder cage gate, and tank valve vault hatch lid were padlocked but not accessible by the operator without the lock code. This issue may have been corrected 1/16/2020 as access to the hatch lid was documented.
- The tank access hatch did not appear to be adequately sealed since the lid could be easily pushed down on the corners (rocking on the padlock). Further it was possible to lift the lid against the padlock indicating the lid did not have a tight seal. **This issue was corrected 1/16/2020 and photo documentation was provided.**

The anchor bolts were observed to be very loose.

- Consider tightening the bolts so they are at least snug to the tank anchor chair if the torque specifications are not available.

PUMPS, PUMP FACILITIES, and CONTROLS:

PC001 Pressure Control: Located at the locked pump house off Michener Creek Road. This facility consists of two submersible well pumps (and their pump controllers), a pressure transducer, and pressure gauge at the common header, a SCADA controller, and two automatic solenoid control valves -one for each well.

Both wells were registering 160+ psi closed in pressure. Tank pressure at full was registering 107 psi at the pump house. There is a single flow meter at the common header.

The recirculation pump (plumbed between the distribution piping and tank fill pipe) is reported to not be used despite having 4000+ hours on the controller. The cross-over pipe between the distribution and tank supply at the pump house may also serve as a dead-end pipe that needs to be flushed periodically. It was not immediately clear how the cross-over pipe is used or how often the valves are exercised.

- Both sections of piping may be areas that need to be periodically flushed so it will not harbor bacterial growth.

Both air/vacuum combination valves attached to the tank main and the distribution main had discharge pipes that were not screened.

- Although the pipes are approximately a foot up off the floor and inside a well-sealed building, they should still have fine mesh screen attached to prevent entry of contaminants.
- Both distribution and storage tank pressure relief valves have exterior discharges with screens that are deformed and are minimally attached to the pipe. **This issue was corrected 1/16/2020 and photo documentation was provided.**

MONITORING, REPORTING, and DATA VERIFICATION:

In the preceding two-year period (12/20/2017 - 12/20/2019) there was one violation on record. Violation for failure to monitor Total Coliform Bacteria September 2019 was returned to compliance the following month with continued routine monitoring. Late reporting due to a lab error indicates a Total Coliform sample was taken 9/25/2019. All other monitoring, reporting, and data verification appear to be adequate.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:

Management could improve maintenance, safety, and operation by following the recommendations in this letter.

Management should further consider replacing the bottom dial padlocks on facility components with locks that can be operated in winter and ensuring that the operators have appropriate access.

The test well east of Well 1 appears to be abandoned but with the casing intact and a removable well cap that was not secured. Abandoned wells are required to be properly abandoned according to the Administrative Rules of Montana 36.21.670. Keep in mind a certified well driller will need to verify the proper abandonment and record it in a well log.

Also, keep in mind the storage tank and tank control vault can be considered confined spaces. Confined space entry procedures and training should be considered and adhered to. Additionally, fall risk mitigation procedures, training, and equipment would be highly recommended for the safety of those having to climb into the tank or vault.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:

Andrew Huggins is the primary, active, fully certified, class 4AB water system operator for this system. Shannon Burdick is an active, operator in training, class 4AB drinking water system operator for this system. This currently satisfies the state requirements for this class 4AB drinking water system.

SIGNIFICANT DEFICIENCIES:

Three potential significant deficiencies were noted. All three issues were corrected 1/16/2020 and photo documentation was provided. Two issues were at the pressure control with both pressure relief valve discharge pipe screens and one issue was at the storage tank where the tank hatch lid was not sealed.

WASTEWATER:

Served by a large capacity on-site wastewater sewer collection and drainfield system located on the southwest side of the current subdivision.

If you have any questions about this report or public water supply regulations, please give me a call at (406) 444-7494.

Sincerely,

Kirk Yoder
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-7494
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County file

SANITARY SURVEY FORM - INVENTORY

1/2016

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

DATE OF SURVEY December 27, 2019 | COUNTY Gallatin | SURVEYOR NAME Kirk Yoder

(SYSTEM REPRESENTATIVE) Shannon Burdick | (OTHER REPRESENTATIVE) _____

SYSTEM ADDRESS – ADMINISTRATIVE CONTACT

Addressee Scott Hammond
Primary Address

Street PO BOX 161242

City Big Sky State MT Zip 59716

System Phone (406) 995-7220 Fax (_____) _____

SYSTEM OWNER

Addressee Lazy J Utility Association
Owners Address

Street PO BOX 161852

City Big Sky State MT Zip 59716

Owner Phone (406) 995-6633 Fax (_____) _____

LOCATION OF SYSTEM

Nearest City Big Sky Description or Physical Address Approx 1mile south of Lone Mtn Trail/MT64 on the west side of US 191 (Michener Creek Rd.).

☐ seasonal operation
dates: _____to _____
☒ year round operation

OPERATOR OF SYSTEM

Name Andrew Huggins

Certified Operator? ☒ Yes ☐ No ☐ Not required

Copy of Certificate? ☒ Yes ☐ No Certification # 7795

Phone # (406) 570-6843 Cell Phone # (_____) _____

Fax # (_____) _____

ALTERNATE OPERATOR OF SYSTEM

Name Shannon Burdick

Certified Operator? ☒ Yes ☐ No ☐ Not required

Copy of Certificate? ☒ Yes ☐ No Certification # 8607

Phone # (406) 404-9753 Cell Phone # (_____) _____

SYSTEM STATUS

☒ **A** = Active ☐ **P** = Proposed *(Add New System)*
☐ **I** = Inactive

SYSTEM CLASS

☐ **C** = Community
☒ **NTNC** = Non-Transient Non-Community
☐ **TNC** = Transient Non-Community

Total Service Connections: Residential / Non-Transient: 29
Transient : _____

Total Active Connections: Residential / Non-Transient: 18
Transient: _____

Service Connections Metered? ☒ Yes ☐ No
Percent Metered 100 %

Resident Population 10
(Number of permanent residents utilizing PWS daily)

Non-Transient Population 25
(Maximum number of non-transient persons utilizing PWS daily)

Transient Population _____
(Maximum number of transient persons served by PWS daily)

OWNER TYPE

☐ 1 Federal Government
☒ 2 Private Subdivision, Investor, Trust, Cooperative, Water Association, etc.
☐ 3 State Government
☐ 4 Local Government Authority, Commission, District, Municipality, City, etc.
☐ 5 Mixed Public/Private
☐ 6 Native American

SERVICE AREA CHARACTERISTICS LIST

☐ BR Bar
☐ DC Day Care Center
☐ DI Dispenser
☐ HS Head Start
☐ HA Homeowners Assoc.
☐ HM Hotel/Motel
☐ HR Highway Rest Area
☐ IA Industrial/Agricultural
☐ IC Interstate Carrier
☐ IN Institution
☐ MF Medical Facility
☐ MH Mobile Home Park
☐ MU Municipality
☐ OA Other Area
☐ ON Other Non-Transient Area (_____Average Daily Visitors TNC)
☐ OR Other Residential Area
☐ OT Other Transient Area
☐ PA Recreation Areas
☐ RA Residential Area
☐ RE Retail Employees
☐ RS Restaurant
☐ RV RV Park
☐ SC School
☐ SI Sanitary Improvement District
☐ SK Summer Camp
☐ SR Secondary Residences
☐ SS Service Station
☒ SU Subdivision
☐ WBWater Bottler
☐ WH Wholesaler (Sells Water)

Service Category Description Commercial subdivision with two residential condo units.

Comments: No prior site visits. Activated 4/1/19. RTCR Level 2 Assessment and Sanitary Survey Inspection conducted simultaneously.

EQ 19-2050 & 19-2051 approve extension of this water system for a residential subdivision.

Three potential significant deficiencies were noted. All three issues were corrected 1/16/2020 and photo documentation was provided. Two issues were at the pressure control with both pressure relief valve discharge pipe screens and one issue was at the storage tank where the tank hatch lid was not sealed.

Except for Well 1 all facility locations have been updated with more accurate coordinates.

SANITARY SURVEY FORM – WATER SYSTEM FACILITIES

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

Water System Facilities (WSF) numbers are WSF Type Codes plus an assigned number. (i.e. source facility numbering starts with 002 and all non-source facilities start with 001). See instruction sheet for a list of WSF Type Codes. When a source is operational it is considered ***A***ctive, this includes systems that are seasonal. ***I***nactive sources are those which are shut down but can return to active status, such as a system out of business. ***P***roposed sources are those that have been identified through the Plan Review process, but are not connected to the water system.

*A **water source facility** is a well, spring, intake, infiltration gallery or consecutive connections from which a system draws or purchases water:*

Total Number of Source Facilities 2

WATER SYSTEM FACILITIES SUMMARY (WSF)

WSF ID	Facility Name	Water Type Code	Purchased	Seller PWSID	Activity Status*
WL002	Well 1 GWIC 223891	GW	☐ Yes ☒ No		A
WL003	Well 2 GWIC 227731	GW	☐ Yes ☒ No		A
CH001	Common Header		☐ Yes ☐ No		A
PC001	Pressure Control		☐ Yes ☐ No		A
ST001	Storage Tank 530k		☐ Yes ☐ No		A
DS001	Distribution System		☐ Yes ☐ No		A
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
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			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
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			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		

Description of Water System Facility flow: WL002 and WL003 > CH001 > PC001 > ST001 > DS001

Notes: _____

(*Example: WL002 and WL003 > CH001 > TP001 > ST001 > PC001 > DS001*)

*(A)Active, (I)Inactive, (P)Proposed

EMERGENCY POWER

Does the system have emergency power? ☐ Yes ☒ No

If yes, what type: _____ Frequency of testing: _____

Record of primary power failures: _____ in last year Switchover: ☐ Automatic ☐ Manual

Comments: _____

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE | **STATUS OF SOURCE** ☒ **(A)**ctive ☐ **(I)**nactive ☐ **(P)**roposed

WSF ID WL002 *Entry Point ID* EP502
These are State assigned identification numbers

Source Name Well 1 GWIC 223891
Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) **R7S T4E SEC5**

Entry Point Name EP for CH Wells 1 2
Example: EP for North Well 1 & South Well 2

Entry Point is at WSF ID CH001
EP is at the first water system facility with finished water.

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA completed with this inspection ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production _____ indicate units

Maximum Production _____ indicate units

Date Drilled _____ if well. . date drilled

Casing Size _____ size of casing installed in well

Case Depth _____ depth of casing installed in well

Well Depth _____ depth of well expressed in feet

Grout Depth _____ depth of grout used to seal well walls

Log SWL _____ (static) expressed in feet below ground elevation

Log PWL _____ (pumping) expressed in feet below ground elevation

Test Pump Rate _____ expressed in gallons per min

Intake Type _____ example: screen, slots, perforations, open

Intake Interval _____ expressed in feet below ground elevation

Well Yield _____ pump tested in gallons per minute

Latitude 45.25139º in decimal degrees

Longitude -111.26078º in decimal degrees

WELLS

	Yes	No	Unk	N/A
Is well metered?	☐	☒	☐	☐
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least				
☒18 inches above outside ground level;	☒	☐	☐	☐
☐12 inches above finished floor inside well house; and	☐	☐	☐	☒
☒3 feet above 100 year flood elevation? (Check for appropriate distance)	☒	☐	☐	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☒	☐	☐	☐
Is well vent properly screened and terminated in a downward position?	☒	☐	☐	☐
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Treated	☐	☐	☐	☒
Are check valves, blow-off valves and water meters maintained and operating properly?	☒	☐	☐	☐
Is upper termination of well protected (housed or fenced)?	☐	☒	☐	☐
Is intake located below the maximum drawdown?	☐	☐	☒	☐

PUMPS

Type 25hp submersible MS6000 Grundfos 78355517
(example: 30 hp line shaft turbine)
Rated Capacity Typical 200gpm

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? As needed			☐	☐
Are backup pumps/motors provided?	☐	☒	☐	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☐	☐	☒	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☐	☐	☒	☐
Are recommended spare parts on hand?	☐	☐	☒	☐
Cross connection protection provided?	☐	☐	☒	☐

Comment: Well log attached. GWUDISW PA had a passing score of 10. Flowing at completion. The well cap seal appeared to be cracking and would benefit from being replaced.

Explain Controls: SCADA and tank level pressure transducer.

Comment: Solenoid control valve stops artesian flow. Secondary well with a standard pump controller.

SANITARY SURVEY FORM – WELLS & WELL PUMPS

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE PAGE FOR EACH SOURCE | **STATUS OF SOURCE** ☒ **(A)**ctive ☐ **(I)**nactive ☐ **(P)**roposed

WSF ID WL003 *Entry Point ID* EP502
These are State assigned identification numbers

Source Name Well 2 GWIC 227731
Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) **R7S T4E SEC5**

Entry Point Name EP for CH Wells 1 2
Example: EP for North Well 1 & South Well 2

Entry Point is at WSF ID CH001
EP is at the first water system facility with finished water.

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA completed with this inspection ☒ Yes ☐ No

Log Available? ☒ Yes ☐ No

Average Production _____ indicate units

Maximum Production _____ indicate units

Date Drilled _____ if well. . date drilled

Casing Size _____ size of casing installed in well

Case Depth _____ depth of casing installed in well

Well Depth _____ depth of well expressed in feet

Grout Depth _____ depth of grout used to seal well walls

Log SWL _____ (static) expressed in feet below ground elevation

Log PWL _____ (pumping) expressed in feet below ground elevation

Test Pump Rate _____ expressed in gallons per min

Intake Type _____ example: screen, slots, perforations, open

Intake Interval _____ expressed in feet below ground elevation

Well Yield _____ pump tested in gallons per minute

Latitude 45.25077° in decimal degrees

Longitude -111.26071° in decimal degrees

WELLS

	Yes	No	Unk	N/A
Is well metered?	☐	☒	☐	☐
Is well site protected from flooding?	☒	☐	☐	☐
Is well protected from potential sources of pollution (includes: surface water, known chemical spills, agricultural use, etc.)?	☒	☐	☐	☐
If no . . explain _____				
Does casing extend at least				
☒18 inches above outside ground level;	☒	☐	☐	☐
☐12 inches above finished floor inside well house; and	☐	☐	☐	☒
☒3 feet above 100 year flood elevation? (Check for appropriate distance)	☒	☐	☐	☐
Is top of the well casing properly sealed? (sanitary seal)	☒	☐	☐	☐
Is well vented?	☒	☐	☐	☐
Is well vent properly screened and terminated in a downward position?	☒	☐	☐	☐
Does well have suitable sampling tap? Raw Water	☒	☐	☐	☐
Does well have suitable sampling tap? Treated	☐	☐	☐	☒
Are check valves, blow-off valves and water meters maintained and operating properly?	☒	☐	☐	☐
Is upper termination of well protected (housed or fenced)?	☐	☒	☐	☐
Is intake located below the maximum drawdown?	☐	☐	☒	☐

PUMPS

Type 11 hp submersible
(example: 30 hp line shaft turbine)
Rated Capacity Typical is 30gpm

	Yes	No	Unk	N/A
Are pumps operable?	☒	☐	☐	☐
How frequently are pump(s) replaced? As needed			☐	☐
Are backup pumps/motors provided?	☐	☒	☐	☐
Are controls functioning properly and adequately protected?	☒	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☒
Is facility properly protected against trespassing and vandalism?	☒	☐	☐	☐
Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)?	☐	☐	☒	☐
Is the plumbing adequately painted to prevent excessive corrosion?	☒	☐	☐	☐
Are adequate heating, lighting, and ventilation provided?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☐	☐	☒	☐
Are recommended spare parts on hand?	☐	☐	☒	☐
Cross connection protection provided?	☐	☐	☒	☐

Comment: Well log attached. Flowing at completion. GWUDISW PA had a passing score of 0.The well cap seal was broken and should be replaced. The monitoring port on the side of the casing was missing one plug and was replaced 1/16/2020 and photo documentation was provided.

It is assumed that although the Well 2 well had two unapproved openings that the well itself is tightly sealed to the pitless adapter otherwise water would be coming out of the unapproved openings given the observed high pressure of the closed-in artesian flow.

Explain Controls: SCADA and tank level pressure transducer.

Comment: Solenoid control valve stops artesian flow. This is the primary well with a Danfoss VLT8000 AQUA VFD controller.

SANITARY SURVEY FORM - PRESSURE CONTROL ASSEMBLIES

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

☐ ***CAPTIVE AIR TANK(S)*** ☐ ***PRESSURE TANK(S)*** ☒ ***NO TANK(S)***

WSF ID PC001 Location: By wells-Michener Creek Rd pumphoue

Latitude 45.25107º in decimal degrees

Longitude -111.26086º in decimal degrees

Pump size and type 25hp submersible and 11hp submersible (ex: 3 hp submersible)

Rated Capacity Reported to be 230gpm Pump installation date: Approximately 2008

Pump run time Variable Time of day 1:00pm

Cut-In N/A psi Cut-Out 106 psi

	Yes	No	Unk	N/A
Are redundant booster pumps provided?	☐	☐	☐	☒
Are spare pumps/motors provided?	☐	☒	☐	☐
Is there automatic cutoff for low suction pressure?	☐	☒	☐	☐
Is there a compound pressure gauge prior to the pump?	☐	☐	☐	☒
Is there a standard pressure gauge after the pump?	☒	☐	☐	☐
Does the low pressure level provide adequate pressure?	☒	☐	☐	☐
Is there a pressure relief valve?	☒	☐	☐	☐
Is the pressure relief valve properly sized?	☒	☐	☐	☐
Is the tank operating properly (not water logged)?	☐	☐	☐	☒
Is the tank(s) air charge system adequate?	☐	☐	☐	☒
Is exterior surface of the tank(s) in good physical condition?	☐	☐	☐	☒
Can tank(s) be by-passed for repair?	☐	☐	☐	☒
Is there a water level sight glass?	☐	☐	☐	☒
Is there a bottom drain valve on the tank(s)?	☐	☐	☐	☒
Is there adequate heating, lighting, and ventilation?	☐	☐	☐	☒
Do underground compartments have a drain?	☐	☐	☐	☒
Are controls protected and functioning properly?	☒	☐	☐	☐
Are pump records maintained (amp, pressure, maintenance schedule, manuals, etc.)?	☐	☐	☒	☐
Is facility properly protected against trespass?	☒	☐	☐	☐
Is the plumbing protected from excessive corrosion?	☒	☐	☐	☐
Is a preventive maintenance program in operation?	☒	☐	☐	☐

Describe components and controls: Both submersible well pumps, a pressure transducer, SCADA controller, a pressure gauge, and two automatic control valves for each well.

Comments: Recommend adding screen to both of the air/vacuum relief valve discharge pipes at the pump house.
Both pressure relief valve discharge pipes outside the pump house had broken screens these need to be replaced. Both pressure relief discharge screens were replaced 1/16/2020 and photo documentation was provided.
Both wells were registering 160 psi closed in pressure. Tank pressure at full was registering 107 psi at the pump house. There is a single flow meter at the common header.

☐ ***CAPTIVE AIR TANK(S)*** ☐ ***PRESSURE TANK(S)*** ☐ ***NO TANK(S)***

WSF ID _____ Location: _____

Latitude _____º in decimal degrees

Longitude _____º in decimal degrees

Pump size and type _____ (ex: 3 hp submersible)

Rated Capacity _____ Pump installation date: _____

Pump run time _____ Time of day _____

Cut-In _____ psi Cut-Out _____ psi

	Yes	No	Unk	N/A
Are redundant booster pumps provided?	☐	☐	☐	☐
Are spare pumps/motors provided?	☐	☐	☐	☐
Is there automatic cutoff for low suction pressure?	☐	☐	☐	☐
Is there a compound pressure gauge prior to the pump?	☐	☐	☐	☐
Is there a standard pressure gauge after the pump?	☐	☐	☐	☐
Does the low pressure level provide adequate pressure?	☐	☐	☐	☐
Is there a pressure relief valve?	☐	☐	☐	☐
Is the pressure relief valve properly sized?	☐	☐	☐	☐
Is the tank operating properly (not water logged)?	☐	☐	☐	☐
Is the tank(s) air charge system adequate?	☐	☐	☐	☐
Is exterior surface of the tank(s) in good physical condition?	☐	☐	☐	☐
Can tank(s) be by-passed for repair?	☐	☐	☐	☐
Is there a water level sight glass?	☐	☐	☐	☐
Is there a bottom drain valve on the tank(s)?	☐	☐	☐	☐
Is there adequate heating, lighting, and ventilation?	☐	☐	☐	☐
Do underground compartments have a drain?	☐	☐	☐	☐
Are controls protected and functioning properly?	☐	☐	☐	☐
Are pump records maintained (amp, pressure, maintenance schedule, manuals, etc.)?	☐	☐	☐	☐
Is facility properly protected against trespass?	☐	☐	☐	☐
Is the plumbing protected from excessive corrosion?	☐	☐	☐	☐
Is a preventive maintenance program in operation?	☐	☐	☐	☐

Describe components and controls : _____

Comments: _____

SANITARY SURVEY FORM - STORAGE

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

COMPLETE ONE SECTION FOR EACH STORAGE FACILITY

Total storage provided 530,000 gallons | Total treated storage provided N/A gallons | Storage provides 14 days of water reserve

STORAGE FACILITY

WSF ID ST001

Location 1/2mi west of subdivision (Colter Run Loop)

Description Superior Tank Company Bolted steel on-grade

Latitude: 45.24818º in decimal degrees

Longitude: -111.26606º in decimal degrees

Storage Volume 530,000 gallons

Year constructed: N/A

Condition: ☒Good ☐Fair ☐Poor ☐Not accessible

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	☒	☐	☐	☐
Is the site protected against flooding?	☒	☐	☐	☐
Is the site protected against trespass/vandalism?	☒	☐	☐	☐
Ladders caged and locked?	☒	☐	☐	☐
Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface?	☐	☒	☐	☐
Overflow pad?	☐	☒	☐	☐
Is access hatch sealed properly and locked?	☐	☒	☐	☐
Are surface coatings in contact with water ANSI / NSF approved?	☒	☐	☐	☐
Is tank protected against icing and corrosion?	☒	☐	☐	☐
Can tank be isolated from system?	☒	☐	☐	☐
Is all treated water storage covered?	☐	☐	☐	☒
Are tanks disinfected after repairs are made?	☐	☐	☒	☐
What is cleaning frequency for tanks? N/A				
Is tank inspected every 5 years by a structural engineer for structural integrity?	☐	☐	☒	☐

N/A (Date of last inspection) N/A (By whom)

Comments: Overflow pipe is 1 pipe diameter (8-inchs) above grade. No splash pad, area beneath overflow is gravel and sloped minimally away from the tank. Recommend considering a splash pad or channel to direct overflow water away from the tank foundation.

At least one broken weld was observed on the handrail equipment near the ladder. Consider checking the climbing safety equipment for integrity.

The sight gauge wire conduit was not closely observed and should be checked to ensure adequate seal is provided to prevent insects from entering the tank.

Air vent appeared to be adequately screened. Hatch lid and the ladder cage cover were padlocked but not accessible by the operator.

Tank access hatch did not appear to be adequately sealed since the lid could be easily pushed down on the corners (rocking on the padlock). Further it was possible to lift the lid against the padlock indicating the lid did not have a tight seal. This issue was corrected 1/16/2020 and photo documentation was provided.

STORAGE FACILITY

WSF ID _____

Location _____

Description _____

Latitude: _____º in decimal degrees

Longitude: _____º in decimal degrees

Storage Volume _____ gallons

Year constructed: _____

Condition: ☐Good ☐Fair ☐Poor ☐Not accessible

	Yes	No	Unk	N/A
Does surface runoff and underground drainage drain away?	☐	☐	☐	☐
Is the site protected against flooding?	☐	☐	☐	☐
Is the site protected against trespass/vandalism?	☐	☐	☐	☐
Ladders caged and locked?	☐	☐	☐	☐
Are overflow lines, air vents, drainage lines or clean out pipes turned downward or covered, screened and terminated a minimum of 3 diameters above the ground or storage tank surface?	☐	☐	☐	☐
Overflow pad?	☐	☐	☐	☐
Is access hatch sealed properly and locked?	☐	☐	☐	☐
Are surface coatings in contact with water ANSI / NSF approved?	☐	☐	☐	☐
Is tank protected against icing and corrosion?	☐	☐	☐	☐
Can tank be isolated from system?	☐	☐	☐	☐
Is all treated water storage covered?	☐	☐	☐	☐
Are tanks disinfected after repairs are made?	☐	☐	☐	☐
What is cleaning frequency for tanks? _____				
Is tank inspected every 5 years by a structural engineer for structural integrity?	☐	☐	☐	☐

_____ (Date of last inspection) _____ (By whom)

Comments:

Continued- Recommend inspection and/or cleaning at least every five years (AWWA recommends every 3-5 years).

The anchor bolts were observed to be very loose. Consider tightening the bolts so they are at least snug to the tank anchor chair if the torque specifications are not available.

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

DISTRIBUTION SYSTEM EVALUATION

WSF ID DS001

	Yes	No	Unk	N/A
System drawings available?	☒	☐	☐	☐
Accurate As-Built drawing(s) on-site?	☒	☐	☐	☐
Lines adequately sized?	☒	☐	☐	☐
Adequate pressure maintained?	☒	☐	☐	☐
Mains protected from freezing?	☒	☐	☐	☐
Distribution system free of leaks?	☒	☐	☐	☐
Asbestos concrete pipe used?	☐	☒	☐	☐
Fire hydrants?	☒	☐	☐	☐
Dead end lines minimized by looping mains?	☒	☐	☐	☐
Flushing program?	☒	☐	☐	☐
Pressure reducing stations? Number _____	☐	☐	☒	☐
Booster stations? Number _____	☐	☒	☐	☐
Are individual booster pumps on any service lines? (see DEQ-1 6.4.4)	☐	☒	☐	☐
Were cross connections observed?	☐	☒		

Describe distribution: 8-inch C900 PVC mains with 1-inch commercial service connections and 1.5-inch residential service connections. 4-inch C900 PVC fire service connections were also planned.

Comments: Pressure at 144D Straight Iron Rd was 44psi. It is suspected there is some pressure reducing equipment somewhere in distribution since the tank is approximately 315ft higher in elevation than the distribution system. Plan records do not indicate any pressure reducing stations. No irrigation systems were reported.

SAFETY

	Yes	No	Unk	N/A
Were confined spaces observed?	☒	☐	☐	☐
Confined space safety adequate?	☐	☐	☒	☐
Fall risks adequately mitigated?	☐	☐	☒	☐

Describe any confined spaces observed Storage tank and tank vault.

Note all safety deficiencies (consider items such as ladders, tank supports, guards on rotating electrical equipment, lightning protection for pumps, etc.)

The storage tank and tank control vault can be considered confined spaces. Confined space entry procedures and training should be considered and adhered to.
Additionally, fall risk mitigation procedures, training, and equipment would be highly recommended for the safety of those having to climb into the tank or vault.

MONITORING AND RECORDKEEPING EVALUATION

	Yes	No	Unk	N/A
Does the system have a current Monitoring Schedule?	☒	☐	☐	☐
Bacti monitoring records maintained? (5 years)	☒	☐	☐	☐
Bacti Sample Site Plan submitted?	☒	☐	☐	☐
Familiar with repeat sampling?	☒	☐	☐	☐
Chemical monitoring records maintained? (10 years)	☒	☐	☐	☐
System specific records / plans maintained? (DBP, PB/CU, treatments, waivers, violations, etc.)	☒	☐	☐	☐
Familiar with Public Notice requirements?	☒	☐	☐	☐
Did Surveyor take a bacteriological sample?	☐	☒		

If Yes, date of Sample: _____ Time of Sample: _____

Comments: In the preceding two-year period (12/20/2017 - 12/20/2019) there was one violation on record. Violation for failure to monitor Total Coliform Bacteria September 2019 was returned to compliance the following month with continued routine monitoring. Late reporting due to a lab error indicates a Total Coliform sample was taken 9/25/2019. All other monitoring, reporting, and data verification appear to be adequate.

MANAGEMENT

	Yes	No	Unk	N/A
Are there sufficient personnel?	☒	☐	☐	☐
Are operators properly certified?	☒	☐	☐	☐
Are personnel adequately trained?	☒	☐	☐	☐
Is there a current O&M manual on-site?	☒	☐	☐	☐
Is an emergency plan on-site and workable?	☐	☒	☐	☐
Has system addressed concerns from previous sanitary survey(s) or technical visit(s)?	☐	☐	☐	☒
Budget exists?	☒	☐	☐	☐
Does system maintain an emergency fund?	☐	☐	☒	☐
Does system contribute to facility replacement fund?	☐	☐	☒	☐
Are abandoned wells present?	☒	☐	☐	☐
Do abandoned wells appear to be properly abandoned? (see ARM 36.21.670)	☐	☒	☐	☐

Comments: Test well east of Well 1 appears to be abandoned but with the casing intact and a removable well cap that was not secured. Recommend proper abandonment, if the well is not to be abandoned then a secured well cap needs to be installed.

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

The State, or an authorized agent, must conduct sanitary surveys for all public water supply systems in Montana. DEQ believes that periodic sanitary surveys, along with appropriate corrective actions, are indispensable for assuring the long-term quality and safety of drinking water. When properly conducted, sanitary surveys can provide important information on a water system's design and operations and can identify minor and significant deficiencies for correction before they become major problems.

Minor deficiencies do not pose serious health threats. However, corrective action of minor deficiencies can be critical in the long-term operation and safety of a public water system. Minor deficiencies are generally described as suggested or recommended corrections in the letter to system owner(s).

Significant deficiencies can be defined as a defective water supply component(s) having or likely to have an adverse influence on public health. Significant deficiencies require immediate corrective action in efforts to protect consumers.

EPA and ASDWA guidance identifies eight broad components that should be covered in a sanitary survey. Using these eight broad components as a guide, minor and significant deficiencies should be described in the letter to system owner(s).

1) Source
2) Treatment
3) Distribution system
4) Finished water storage
5) Pumps, pump facilities, and controls
6) Monitoring and reporting, and data verification
7) System management and operation
8) Operator compliance with State requirements

With consideration that significant deficiencies may influence regulatory decisions and monitoring requirements, please list all significant deficiencies observed and corrective action(s) taken below.

Comments: **Three potential significant deficiencies were noted. All three issues were corrected 1/16/2020 and photo documentation was provided. Two issues were at the pressure control with both pressure relief valve discharge pipe screens that were broken and one issue was at the storage tank where the tank hatch lid was not sealed.**

PWSID **MT0004432** | SYSTEM NAME **Lazy J South Subdivision**

Aerial View



Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard

Property Boundaries

Parcels

- Lazy J South Subdivision

BLACKFOOT HILLS SUBDIVISION

PHASE 1

OVERALL EXISTING & PROPOSED WATER & SEWER INFRASTRUCTURE MAP

N

GRAPHIC SCALE
160 0 80 160 320
(IN FEET)
1 inch = 160 ft.

EXISTING LJUA WATER SUPPLY PUMP HOUSE w/ (2) PUBLIC WATER SUPPLY WELLS PER EQ#05-1822, TO SERVE BLACKFOOT HILLS PHASE 1

MICHENER CREEK ROAD

LOT 1 1.38 ACRES
OPEN SPACE (D) 2.00 ACRES
POND D
BUFFALO DANCE WAY
LOT 4 1.52 ACRES
UTILITY LOT 1 .26 AC
WELL LSV-1
POND B2
LOT 5 1.64 ACRES
LOT 15 1.72 ACRES
OPEN SPACE (A) 1.52 ACRES
OPEN SPACE (B) 3.10 ACRES
US HIGHWAY 191
LANDSCAPE CORRIDOR
0.51 ACRES
PRAIRIE FIRE ROAD
OPEN SPACE (E) 4.43 ACRES
LOT 3 1.40 ACRES
LOT 2 1.49 ACRES
PHASE 1
PHASE 2
LOT 25 1.60 ACRES
OPEN SPACE (H) 0.34 ACRES
LOT 19 1.61 ACRES
LOT 18 1.52 ACRES
LOT 6 1.68 ACRES
WELL LSV-2
BFH1 WATER CONNECTION TO EXISTING
POND B3
60' ROAD & UTILITY EASEMENTS (TYP.) WITHIN CI LOT 1
OPEN SPACE (C) 8.49 ACRES
RUNNING IRON ROAD
COLTERS RUN LOOP
OPEN SPACE (G) 10.24 ACRES
LOT 26 2.03 ACRES
BFH1 WATER CONNECTION TO EXISTING
LOT 20 1.49 ACRES
OPEN SPACE (I) 1.24 ACRES
LOT 17 1.78 ACRES
LOT 7 1.57 ACRES
BFH1 WATER CONNECTION TO EXISTING
BFH CI LOT 1 40.6 acres
LOT 28 2.07 ACRES
LOT 27 2.07 ACRES
LOT 32 2.06 ACRES
ELK HORSE WAY
LOT 21 1.25 ACRES
LOT 16 1.89 ACRES
LOT 8 1.77 ACRES
PHASE 2 PHASE 1
LOT 24 1.83 ACRES
LOT 22 1.21 ACRES
LOT 31 2.08 ACRES
LOT 30 2.06 ACRES
LOT 29 2.04 ACRES
UTILITY LOT 3 .45 AC
LOT 23 1.59 ACRES
SEWER MAIN TO BE EXTENDED IN FUTURE PHASE
LOT 14 1.87 ACRES
LOT 9 1.92 ACRES
BFH1 WATER CONNECTION TO EXISTING
EXISTING MONITORING WELL MW-1A
OPEN SPACE (F) 15.19 ACRES
POND B1
EXISTING LJUA UTILITY EASEMENT PER DOC.#2623078
LOT 10 1.62 ACRES
LOT 13 1.84 ACRES
LOT 11 1.32 ACRES
STRAIGHT IRON ROAD
(5) 1.16 ACRES
(6) 1.09 ACRES
(14) 1.31 ACRES
(4) 1.01 ACRES
(7) .95 ACRE
COLD IRON ROAD
(3) .98 ACRE
(13) 1.31 ACRES
(8) .95 ACRE
(2) .93 ACRE
LAZY J SOUTH SUBDIVISION (SHADED)
(16) 1.63 ACRES
(9) .95 ACRE
(12) 1.24 ACRES
RUNNING IRON ROAD
(15) 1.66 ACRES
(1) 1.55 ACRE
(11) 1.20 ACRE
(10) 1.42 ACRES
OPEN SPACE (K) 2.63 ACRES
OPEN SPACE (J) 26.33 ACRES
EXISTING LJUA WATER STORAGE TANK PER EQ#05-1822, TO SERVE BLACKFOOT HILLS PHASE 1
VILLAGE ROAD
BLACKFOOT HILLS SUBDIVISION PHASE II (SHADED)
BLACKFOOT HILLS SUBDIVISION PHASE I (UNSHADED)
LOT 12 1.88 ACRES
BFH1 SEWER CONNECTION TO EXISTING
EXISTING LJUA 20,000-GPD DRAINFIELD PER EQ#05-1822, TO SERVE BLACKFOOT HILLS PHASE 1
EXISTING LJUA ADVANTEX LEVEL II TREATMENT SYSTEM PER EQ#05-1822, TO SERVE BLACKFOOT HILLS PHASE 1
EXISTING LAZY J SOUTH WATER & SEWER INFRASTRUCTURE PER EQ#05-1822

5
8

LEGEND

- BLACKFOOT HILLS SUBDIVISION BOUNDARY (TRACT 1)
- BLACKFOOT HILLS SUB. PHASE 1 BOUNDARY
- PROPOSED LOT BOUNDARY
- EXISTING LOT BOUNDARY
- PROPOSED ROAD & UTILITY EASEMENT
- EXISTING LJUA UTILITY EASEMENT
- 10' INTERVAL CONTOUR
- EXISTING WATER SUPPLY MAIN
- EXISTING SANITARY SEWER MAIN
- PROPOSED WATER MAIN EXTENSION
- PROPOSED SANITARY SEWER MAIN EXTENSION

LEGAL DESCRIPTION:
TRACT 1 OF COS 2450, SEC. 5, T7S, R4E, P.M.M., GALLATIN COUNTY, MT. (188.152 ACRES)

NOTES:

1. THE BLACKFOOT HILLS PHASE I SUBDIVISION (BFH1) SINGLE-FAMILY RESIDENTIAL LOTS 1-15 SHALL BE SERVED BY THE EXISTING LAZY J UTILITY ASSOCIATION (LJUA) WATER & SEWER SYSTEMS APPROVED UNDER EQ#05-1822 WITH THE PROPOSED WATER AND SEWER MAIN EXTENSIONS.

EQ# 19 2051

MONTANA
MELANIE M. DYBA
No. 16529PE
PROFESSIONAL ENGINEER
4/23/2019

JOB NAME: BFH1
DRAWN BY: MD
DESIGNED BY: MD
CHECKED BY:

WARNING
0 1/2" 1"
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CLIENT:
BFH HOLDING, LLC
PO BOX 161190
BIG SKY, MT 59716
PHONE:

BEI
CIVIL and STRUCTURAL ENGINEERING
PROJECT MANAGEMENT
BRIDGER ENGINEERS, INC.
2150 ANALYSIS DRIVE BOZEMAN, MONTANA 59718
PH (406) 585-0590
FAX (406) 582-1057

BLACKFOOT HILLS SUB. PH. 1
TR. 1 OF COS 2450, SEC 5, T7S, R4E, GALLATIN CO.
BIG SKY, MONTANA

WATER & SEWER INFRASTRUCTURE MAP

DATE:
04.22.2019

REVISION:	DATE:
△	
△	
△	
△	

Sheet No.
C1.2

F:\Projects\BFH HOLDING, LLC\CAD\BFH1-C1.2_LL-1-3.dwg

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
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View field visits for this site
View water quality for this site
View scanned well log (5/15/2006 10:52:13 AM)

Site Name: LAZY J WATER SYSTEMS
GWIC Id: 223891

Section 1: Well Owner(s)

1) LAZY J WATER SYSTEMS (MAIL)
1045 REEVES ROAD EAST SUITE C
BOZEMAN MT 59718 [09/30/2005]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	NW¼ SW¼ NW¼ SE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.25139	-111.26078	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6120	MAP	NAVD88	7/20/2011

Measuring Point Altitude	MP Method	Datum	Date Applies
6122.4	MAP	NAVD88	7/20/2011 4:03:00 PM

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: Friday, September 30, 2005

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	76	14
76	1191	12
1191	1278	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	1180	8	0.250		WELDED	STEEL
1153	1264	6	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1259	1219	6		.4	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	1180	CEMENT	
1153	1153	6X8 K PACKER	

Section 7: Well Test Data

Total Depth: 1278
Static Water Level: -353
Closed-in Pressure: 153 psi
Water Temperature:

Pump Test *

Depth pump set for test 545 feet.
181 gpm pump rate with 778 feet of drawdown after 72 hours of pumping.
Time of recovery 48 hours.
Recovery water level 353 feet.
Pumping water level 0 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

221MRSN - MORRISON FORMATION

From	To	Description
0	3	TOP SOIL
3	10	GRAVEL WITH FINE SAND AND CLAY
10	57	GRAVEL WITH FINE SAND AND CLAY VERY DIRTY WITH STREAKS OF LIGHT BROWN CLAY
57	74	SHALE HIGHLY FRACTURED WITH GRAVEL
74	100	SHALE WITH STREAKS OF GREY CLAY
100	130	DARK GREY SHALE WITH TRACES OF GREY CLAY
130	195	BLACK SHALE
195	305	SHALE WITH STREAKS OF GRAY CLAY
305	325	GREY WITH STREAKS OF BLACK SHALE
325	345	BLACK SHALE WITH TRACES OF GREY CLAY
345	480	SHALE WITH STREAKS OF GREY CLAY
480	503	FRACUTED BLACK SHALE WITH LITE GREEN AND STREAKS OF GREY CLAY
503	507	HARD FRACTURED BLACK AND LITE SHALE
507	510	BLACK AND LITE GREEN SHALE, WITH STREAKS OF GREY CLAY
510	515	GREY CLAY WITH TRACES OF GREEN

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: RED TIGER DRILLING
License No: WWC-598
Date Completed: 9/30/2005

Site Name: LAZY J WATER SYSTEMS
GWIC Id: 223891
Additional Lithology Records

From	To	Description
515	518	SHALE WITH STREAKS OF GREY CLAY
518	524	BAD GUMBO, GREY CALY WITH STREAKS OF BLACK SHALE
524	525	SHALE BLACK, WITH TRACES OF GREEN
525	541	LITE GREY SANDSTONE
541	542	CLAY WITH GREY GUMBO
542	545	LITE GREY SANDSTONE WITH STREAKS OF GREY CLAY
545	567	LITE GREY SANDSTONE WITH STREAKS OF BLACK SHALE
567	575	LITE GREY SANDSTONE WITH STREAKS OF BLACK SHALE (FRACTURED) LOST APPROX. 600 GAL FLUID AND GAINED IT BACK
575	580	LITE GREY SANDSTONE WITH BLACK SHALE AND TRACES OF CLAY
580	604	LITE GREY SANDSTONE WITH BLACK AND GREEN SHALE, TRACES OF CLAY
604	606	LITE GREEN SHALE WITH BLACK AND GREY STREAKS
606	619	GREEN AND BLAKC SHALE WITH CLAY STREAKS
619	623	HARD BLACK SHALE
623	665	BLACK SHALE WITH CLAY STREAKS
665	685	GREY CLAY WITH STREAKS OF BLACK SHALE
685	698	GREY CLAY WITH STREAKS OF BLACK SHALE
698	705	SHALE - BLACK AND HARD WITH SOME CLAY
705	712	GREY CLAY AND BLACK SHALE
712	715	BLACK SHALE WITH TRACES OF GREY CLAY
715	725	BLACK SHALE
725	726	BLACK TO DARK GREY CLAY WITH BLACK SHALE
726	749	BLACK SHALE WITH TRACES OF CLAY
749	754	GREY SHALE WITH TRACES OF CLAY
754	765	BLACK SANDSTONE WITH TRACES OF WHITE (VERY HARD)
765	767	GREY CLAY, LITE IN COLOR WITH TRACES OF BLACK SHALE
767	785	HARD BLACK SHALE
785	787	GRAY CLAY LITE IN COLOR
787	790	REDDISH BROWN LIMEWTONE, BROWN SHALE
790	800	BLACK SHALE WITH LITE GREY CLAY STREAKS
800	820	BLACK SHALE WITH LITE GREY CLAY STREAKS
820	842	GREY SANDSTONE WITH STREAKS, BLACK SHALE AND GREY CLAY STREAKS
842	866	BLACK SHALE AND GREY SHALE, TRACES OF GREY CLAY
866	883	GREY STREAKED SHALE WITH LITE GREEN AND BLACK LOST APPROX. 350 TO 400 FLUID AT 860'
883	890	BLACK SHALE AND GREY SHALE, TRACES OF GREY CLAY
890	1012	GREY AND BLACK SHALE WITH STREAKS OF GREY CLAY
1012	1013	BLACK SHALE, AND DARK BROWN CLAY WITH TRACES OF RED GREEN SHALE
1013	1014	MOSTLY GREEN SHALE WITH TRACES OF RED SHALE AND GREY AND BROWN CLAY
1014	1015	RUSTY BROWN CLAY WITH BLACK AND GREEN SHALE
1015	1050	LITE BROWN CLAY
1050	1055	GREEN SHALE WITH LITE BROWN CLAY STREAKS
1055	1058	GREEN SHALE WITH RUST COLORED ROCK STREAKS AND GREY CLAY
1058	1065	GREEN SHALE WITH REDDISH ORANGE SHALE AND GREY CLAY STREAKS
1065	1075	GREEN SHALE AND TRACES OF RUST COLORED ROCK AND LITE BROWN CLAY
1075	1088	GREEN AND BROWN SHALE WITH TAN CLAY STREAKS
1088	1095	BLACK SHALE WITH GREY CLAY
1095	1100	GREEN SHALE WITH CLAY
1100	1105	GREEN AND BLACK SHALE, VERY LITTLE TRACES OF RUSTY RED
1105	1124	BLACK SHALE, WITH TRACES OF GREEN
1124	1127	LITE BROWN CLAY
1127	1130	BLACK GREEN SHALE WITH GREY, LITE BROWN CLAY AND TRACES OF RED SHALE
1130	1176	GREY CLAY WITH TRACES OF BLACK SHALE
1176	1201	GREEN AND BLACK SHALE WITH TRACES OF GREY CLAY AND GREY SHALE
1201	1217	GREY CLAY GUMBO
1217	1224	GREEN SHALE WITH GREY CLAY STREAKS AND TRACES OF SANDSTONE
1224	1242	GREY SANDSTONE WELL BEGINS TO FLOW
1242	1272	GREEN AND BLACK SOFT SHALE
1272	1278	GREEN AND GREY HARD SHALE

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

Site Name: LAZY J WATER SYSTEMS #2
GWIC Id: 227731

Section 1: Well Owner(s)

1) TAYLOR, JAMES (MAIL)
1045 REEVES RD E SUITE C
BOZEMAN MT 59718 [07/22/2006]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	SE¼ NE¼ NW¼

County
GALLATIN

Geocode

Latitude	Longitude	Geomethod	Datum
45.2507	-111.2614	NAV-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
LAZY J SOUTH		

Section 3: Proposed Use of Water

COMMERCIAL (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Saturday, July 22, 2006

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	70	14
70	989	12
989	1325	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	950	8.8	0.280		THREAD AND COLLAR	A53B STEEL
912	1207	5.5	0.250		WELDED	A53B STEEL
1287	1302	5.5	0.250		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1207	1287	5.5		.040	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	989	CEMENT	

Section 7: Well Test Data

Total Depth: 1325
Static Water Level:
Closed-in Pressure: 160 psi
Water Temperature: 8.89 °C

Artesian/Flow Test *

14 gpm for _ hours.
Flow controlled by VALVE .

** 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	TOP SOIL
3	6	SILTY CLAY
6	18	SILTY CLAY & GRAVELS
18	30	FINE SAND & GRAVELS
30	45	FINE SAND & GRAVELS W/ CLAY STREAKS
45	60	FINE SAND & GRAVELS W/SHALE
60	78	SHALE W/ STREAKS GRAVEL
78	89	GRAY SHALE W/ STREAKS GRAY CLAY
89	204	BLACK SHALE W/STREAKS GRAY CLAY
204	277	BLACK FRACTURED SHALE
277	350	BLACK SHALE W/ STREAKS CLAY
350	541	BLACK SHALE
541	572	GREEN & GRAY STREAKED SHALE
572	582	BLACK & BROWN FRACTURED ROCK
582	592	GREEN & GRAY STREAKED SANDSTONE

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: RED TIGER DRILLING
License No: WWC-598
Date Completed: 7/22/2006

Site Name: LAZY J WATER SYSTEMS #2
GWIC Id: 227731
Additional Lithology Records

From	To	Description
592	596	GRAY SANDSTONE W/ TRACES GRAY CLAY
596	634	GRAY SANDTONE
634	654	GRAY SANDTONE W/TRACES GRAY CLAY
654	742	BLACK & GRAY SHALE W/TRACES CLAY
742	748	GRAY SHALE W/CLAY STREAKS
748	754	GRAY & BLACK SHALE W/TRACES GRAY CLAY
754	870	GRAY SHALE
870	890	BLACK SHALE W/ STREAKS CLAY
890	911	BLACK SHALE W/TRACES CLAY & QUARTZ
911	918	GRAY & BLACK SHALE W/TRACES CLAY
918	942	GRAY SANDSTONE W/TRACES GRAY CLAY
942	998	DARK GRAY CLAY W/TRACES BLACK SHALE
998	1003	GRAY CLAY W/BLACK STREAKS SHALE
1003	1016	GRAY CLAY W/BLACK GRAY & GREEN SHALE
1016	1036	GRAY SANDSTONE
1036	1070	RED & BROWN ROCK W/STREAKS CLAY
1070	1078	RED SHALE W/STREAKS GRAY SHALE
1078	1094	RED GRAY & BLACK SHALE
1094	1112	BLACK & GRAY STREAKED SHALE
1112	1124	GREEN SHALE W /GRAY CLAY STREAKS
1124	1143	DARK GREEN & BLACK SHALE W/ STREAKS TAN CLAY
1143	1182	GREEN & BLACK SHALE W/ STREAKS GRAY CLAY
1182	1188	GRAY CLAY W/ STREAKS LITE GREEN SHALE
1188	1201	LITE GREEN -DARK GREEN SHALE W/ TRACES GRAY CLAY
1201	1214	GREEN & BLACK SHALE W/TRACES GRAY CLAY
1214	1226	ROUNDED 3/8" BLACK SHALE W/ TRACES GRAY CLAY
1226	1231	BLACK GRAY & GREEN SHALE
1231	1235	HARD GRAY SANDSTONE
1235	1240	RED GREEN & BLACK SHALE W/TRACES GRAY CLAY
1240	1274	BLACK & GRAY SHALE W/ TRACES LIMESTONE
1274	1304	GRAY SHALE W/ LITE GRAY CLAY STREAKS
1304	1325	FRACTURED GRAY & BLACK STREAKED SHALE TRACES GRAY CLAY

Sanitary Survey Inspection Photos
Lazy J South Subdivision
PWSID: MT0004432
Inspector: Kirk Yoder, DEQ
December 27, 2019

WL002, Well 1 (GWIC 223891)



Abandoned test well east of Well 1



View of Well 1 looking northeast.



View of Well 1 looking southwest.



Numerous cracks were observed on the casing seal.



Both casing monitoring ports were plugged

WL003, Well 2 (GWIC 227731)



View of Well 2 looking west.



A piece of the well cap seal was observed around one bolt. There was also a visible gap between the upper and lower halves where the gasket was missing on both sides.



The monitoring port was plugged following the site visit and this photo was provided 1/16/2020 to document the fix.



The bottom plug was missing on the casing monitoring port.

PC001 Pressure Control



View of the pump house from the road.



South side view.



North side view.



Both distribution and storage tank pressure relief valves have exterior discharges with screens that are deformed and are minimally attached to the pipe.





Both discharge pipe screens were repaired and these photos submitted by the operator 1/16/2020 documenting the repairs.



Well inlet piping.
1. Well 1. 2. Well 2.



Electrical controls for the pumps.

PC001 Pressure Control, continued



The blow-off pipe is screened.



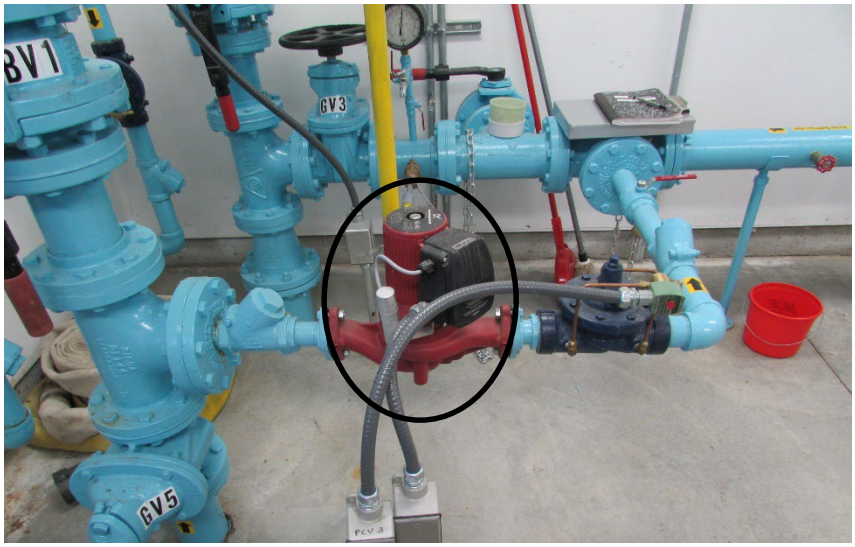
Chlorine tank vent is not connected but is plugged.



1. Pressure transducer.
2. Pressure gauge.

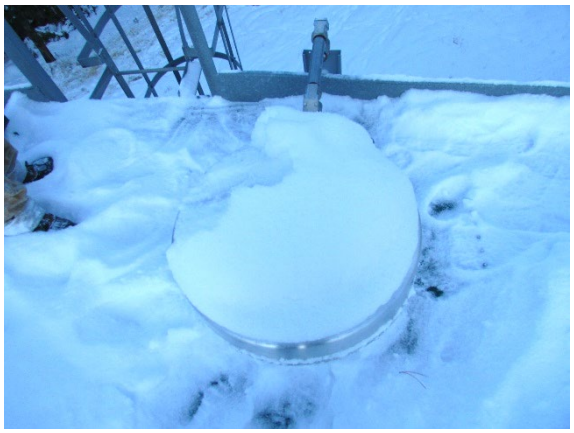


Outlet piping and common header.
1. Distribution. 2. Tank fill. 3. Crossover pipe.



The recirculation pump (plumbed between the distribution piping and tank fill pipe) is reported to not be used despite having 4,000+ hours on the controller hour meter. This may be an area that needs to be periodically flushed so it will not harbor bacterial growth.

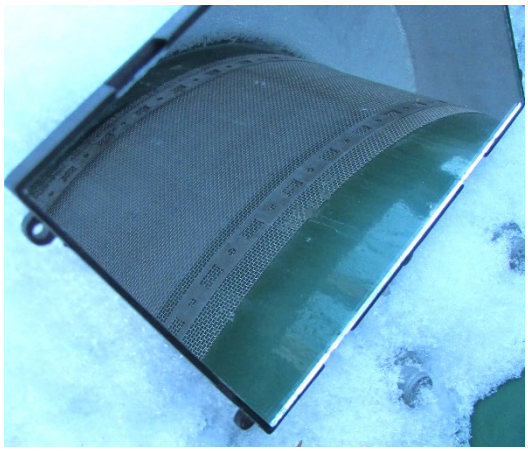
ST001 Storage Tank 530,000 GAL



Tank vent.



Tank overview.



Vent screen.



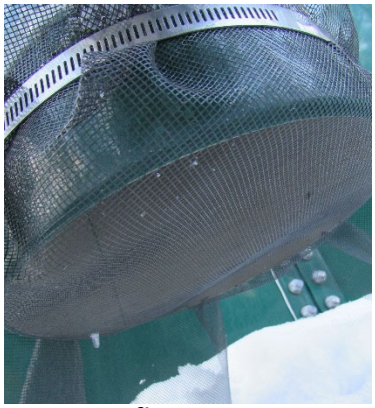
Tank access hatch did not appear to be adequately sealed. The hatch was padlocked with a bottom dial lock that was frozen.



View of the overflow proximity to ground level.



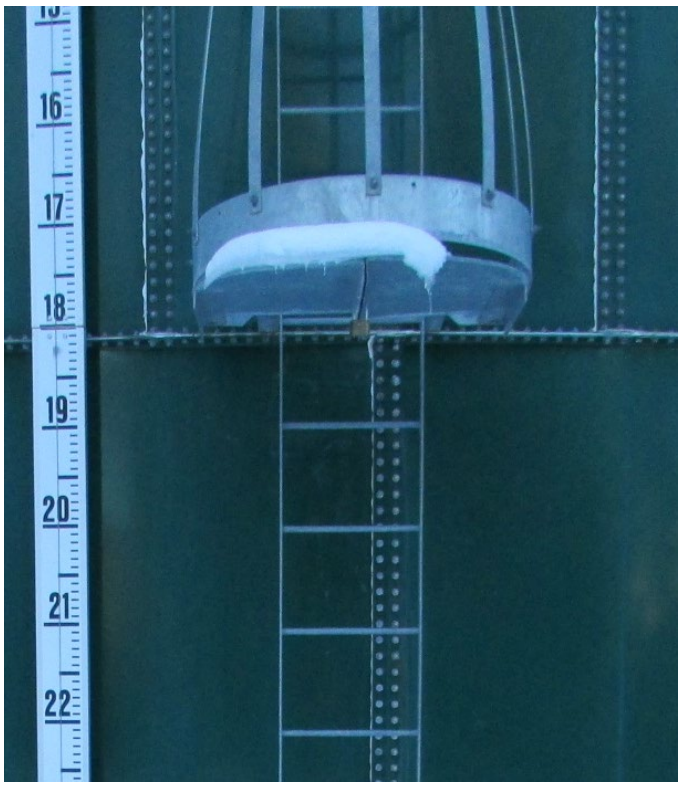
The anchor bolts were clearly not tight. Recommend snugging these bolts if the torque specification are not available.



Overflow screen.



Sealing material was added to the underside of the hatch lid. This photo was submitted by the operator to document the fix 1/16/2020.



Padlocked ladder gate.



The sight gauge wire conduit was not closely observed and should be checked to ensure adequate seal is provided to prevent insects from entering the tank.

DS001 Distribution System



One fire hydrant was observed to have one of the caps removed.



Several buildings are still under construction with contractors working throughout the subdivision.

DEQ FILES

C X N ___ P ___

PWSID # MT0000105

Sanit. survey ☒

Bacti ___

Correspondence ___

Chlorine/Turbidity ___

Lead & Copper ___

Phase II & V ___

GWUDISW ___

Initials dw

sDavis/pws

7-14-01

The Cadmus Group, Inc
2620 Colonial Drive, Suite B
Helena, MT 59601
Phone 406-443-9194 Fax 406-443-9197

February 11, 2001

Bill Hymas
Riverside Trailer Park
PO Box 160432
Big Sky, MT 59716

GALLATIN COUNTY

Re: Sanitary survey of Riverside Trailer Park's PWS, PWSID No. 00105

Dear Bill:

I'd like to thank you for meeting with me and Ian Kline and showing us your public water system on February 1, 2001. Your cooperation was greatly appreciated. Our visit was a routine inspection or "sanitary survey" of the water system facilities that the Montana Department of Environmental Quality (MDEQ) performs at about 3 - 5 year intervals at public water supplies. Sanitary surveys are required of public water systems by both State and federal regulations and the MDEQ provides the sanitary surveys as a service to the regulated systems.

I work for The Cadmus Group, Inc. and Cadmus is a contractor for the MDEQ. As such, we perform many sanitary surveys for them. Sanitary surveys are intended to discover potential sanitary defects (flaws in the system that could allow the entry of contaminants) and suggest corrective actions before the deficiencies cause public health problems. We also look for safety problems and provide advice when appropriate.

My letter will give a brief description of your public water system and, at the end, I will list recommendations that I believe may help you avoid contamination or safety problems in the future.

The Riverside Trailer Park Water System

Water system description

This system has a single dug well that is reported to be about 20 feet in depth and cased with a corrugated metal pipe of about 4 feet in diameter. The well has a well house constructed over it and has two 1 ½ HP submersible pumps that provide water to the trailer homes. The cycling of the pumps is controlled by two pressure tanks located within the pump house.

Point of use (POU) reverse osmosis (RO) units have been recently installed for each individual service. The POU devices were installed in order to achieve compliance with the Lead and Copper Rule.

Data entered JD

Recommendations:

1. Shallow wells such as your dug well are often vulnerable to viruses and the coliform testing you perform on a monthly basis is not useful for detecting viral contamination. I suggest that you have full time disinfection installed. As you mentioned, UV light may be your best choice if the RO membranes are damaged by low concentrations of chlorine.
2. I suggest that you install a gasket for the access hatch in order to make sure dust and insects cannot enter the dug well via this route.
3. If you gasket the access hatch you will need to install a vent. As you noted, you have a slab penetration that appears to be suitable for this purpose. The vent should be of the inverted U type and should be screened to keep out insects.
4. Remember you have a lot of sampling due during 2001. The file indicates you need to collect samples for nitrate, VOCs, SOCs, IOCs and lead and copper.

Again, I appreciate your cooperation and if you have any questions or if I can be of any help, please call me at 443-9194. You may also wish to call Eric Minneti of the MDEQ at 444-4769.

Sincerely yours,

Dan L. Fraser, P.E.

C. Sanitarian's office
Eric Minneti, MDEQ

C:\My Documents\MyFiles\Montana\SanSurvey\SanSurvey Work\Reports\GallatinCo\RiverSideTCBigSky.wpd

SANITARY SURVEY FORM - INVENTORY Page 1 of 7

1/11/2001

DATE OF SURVEY 2/1/01	COUNTY Gallatin	SURVEYOR NAME Dan Fraser
PWSID 00105	SYSTEM NAME Riverside Trailer Court - Big Sky	
(SYSTEM REPRESENTATIVE) Bill Hymas	(OTHER REPRESENTATIVE)	

Mail Address
Addressee Bill Hymas
Street Riverside Trailer Ct PO Box 160432
City Big Sky State MT Zip 59716
System Phone (406) 995-4981 Fax (406) None

SYSTEM OWNER
Owners Address
Addressee
Street
City _____ State _____ Zip
Owner Phone (____) _____ Fax (____)

LOCATION OF SYSTEM
Nearest City Big Sky Description or Physical Address 46950 Gallatin Road - West up the river from Big Sky turn-off, between Buck's T-4 & Comfort Inn.

OPERATOR OF SYSTEM
Name Bill Hymas
Certified Operator ☐ No ☒ Yes If, yes Class V
Certification # _____ Phone (406) 995-4981

ALTERNATE OPERATOR OF SYSTEM
Name
Certified Operator ☐ No ☐ Yes If, yes
Certification # _____ Phone # (____)

SYSTEM STATUS
☒ A = Active ☐ P = Pending *(Add New System)*
☐ I = Inactive

SYSTEM CLASS
☒ C = Community
☐ NTNC = Non-Transient Non-Community
☐ NC = Transient Non-Community

Total Service Connections: Residential / Non-Transient: 16
Transient:

Total Active Connections: Residential / Non-Transient: 16
Transient:

Service Connections Metered? ☐ Yes (Metered) ☒ No %

Resident Population — Number of permanent residents utilizing PWS daily — Summer: 35-45 Winter: ____

Non-Transient Population — Number of non-transient persons utilizing PWS daily — Summer: ____ Winter: ____

Transient Population — Number of transient persons served by PWS daily — Summer: ____ Winter: ____

OWNER TYPE
☐ 1 Federal Government
☒ 2 Private Subdivision, Investor, Trust, Cooperative, Water Association, etc.
☐ 3 State Government
☐ 4 Local Government Authority, Commission, District, Municipality, City, etc.
☐ 5 Mixed Public/Private
☐ 6 Native American Indian Tribes & Reservations

SERVICE AREA CHARACTERISTICS LIST

☐ DC Day Care Center
☐ DI Dispenser
☐ HA Homeowners Assoc.
☐ HM Hotel/Motel
☐ HR Highway Rest Area
☐ IA Industrial/Agricultural
☐ IC Interstate Carrier
☐ IN Institution
☐ MF Medical Facility
☒ MH Mobile Home Park
☐ MP Mobile Home Park, Principle Residence
☐ MU Municipality
☐ OA Other Area
☐ ON Other Non-Transient Area
☐ OR Other Residential Area
☐ OT Other Transient Area
☐ PA Recreation Areas
☐ RA Residential Area
☐ RE Retail Employees
☐ RS Restaurant
☐ SC School
☐ SI Sanitary Improvement District
☐ SK Summer Camp
☐ SR Secondary Residences
☐ SS Service Station
☐ SU Subdivision
☐ WB Water Bottler
☐ WH Wholesaler (Sells Water)

Service Category Description

Comments:

SANITARY SURVEY FORM - WATER SYSTEM FACILITIES

Water System Facilities (WSF) numbers are WSF Type Codes plus an assigned number. (I.e. source facility numbering starts with 002 and all non-source facilities start with 001). See instruction sheet for a list of WSF Type Codes. When a source is operational it is considered Active, this includes systems that are seasonal. Inactive sources are those which are shut down but can return to active status, such as a system out of business. Proposed sources are those that have been identified through the Plan Review process, but are not connected to the water system.

*A **water source facility** is a well, spring, intake, infiltration gallery or consecutive connections from which a system draws or purchases water.*

Total Number of Source Facilities _____

WATER SYSTEM FACILITIES SUMMARY (WSF)

WSF ID	Facility Name	Water Type Code	Purchased	Seller PWSID
DS 001	Distribution System			
WL002	Well No. 1	WL	☐ Yes ☒ No	
PC001	Pump house & Tanks		☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	
			☐ Yes ☐ No	

Description of Water System Facility flow: A dug well w/ 4' diameter CMP to 20'. 2 1.5 HP Sub pumps pressurize system and 2 pressure tanks control cycling.

Example: Well 1(WL002) is pumped into pumphouse where chlorine is applied (TP001) and from there to the storage tank (ST001). The treated water flows by gravity to the Distribution System (DS001)

EMERGENCY POWER

Does the system have emergency power? ☐ Yes ☒ No

If yes, what type:

Frequency of testing: _____

Record of primary power failures: _____ in last year.

Switchover: ☐ Automatic ☐ Manual

Comments:

SANITARY SURVEY FORM - WELLS & PUMPS Page 3 of 7

(Please copy this sheet for additional wells & pumps)

COMPLETE ONE SECTION FOR EACH SOURCE — **STATUS OF SOURCE** ☐ (A)ctive ☐ (I)nactive ☐ (P)roposed

WSF ID WL002 *Entry Point ID* 502
These are state assigned identification numbers

Source Name Well No 1
Name of Source - Example: Well 1 or South well, etc.

Location of Water Source (TRS or street address) Down grade from trlr. Crt

Entry Point Name EP for Well No. 1
Name of EP - Example: Entry point for North Well 1 & South Well 2

Location of Entry Point Pump house

Available ☒ Perm ☐ Emerg ☐ Interim ☐ Seasonal ☐ Other
If seasonal: _____ to _____

GWUDISW PA Completed ☒ Yes ☐ No this survey

Log Available? ☐ Yes ☒ No

Average Production UNK (indicate units)

Maximum Production _____ (indicate units)

Date Drilled 1971 If well.. date drilled

Casing Size 4" size of casing installed in well

Case Depth 20' depth of casing installed in well

Well Depth 20' depth of well expressed in feet

Grout Depth None depth of grout used to seal well walls

Log SWL UNK (static) expressed in feet below ground elevation

Log PWL _____ (pumping) expressed in feet below ground elevation

Pump Capacity 2 1.5 HP capacity of pump installed expressed in gallons per min

Intake Type Sub type of intake mechanism

Screened Interval UNK expressed in feet below ground elevation

Well Yield UNK pump tested in gallons per minute

Latitude 45° 15.05' latitude of source

Longitude 111° 15.09' longitude of source

WELLS - COMPLETE ONE SECTION FOR EACH SOURCE

WSF ID WL002
Example: WL002

Is well site subject to flooding? ☐ Yes ☒ No

Is well located in proximity of a potential source of pollution (includes surface water, known chemical spills, agricultural use, etc.)? ☐ Yes ☐ No

If yes . . explain Close to surface water

Does casing extend at least ☐ 18 inches above outside ground level; ☐ 12 inches above finished floor inside well house; and ☐ 3 feet above 100 year flood elevation? (Check for appropriate distance) Dug well NA ☐ Yes ☐ No

Is top of the well casing properly sealed? (sanitary seal) NA ☐ Yes ☐ No

Is the well vent properly screened and terminated in a downward position? ☐ Yes ☒ No

Does well have suitable sampling tap? ☒ Yes ☐ No

Are check valves, blow-off valves and water meters maintained and operating properly? OK ☐ Yes ☐ No

Is upper termination of well protected (housed or fenced)? ☒ Yes ☐ No

Is intake located below the maximum drawdown? ☒ Yes ☐ No

Comments: (Such as, detailed information on any items with identified deficiencies)

— Dug well w/ slab over a CMP w/ access hatch that overlaps but is not gasketed, therefore allowing venting but unsealable to dust & insects

PUMPS - COMPLETE ONE SECTION FOR EACH SOURCE

WSF ID WL002

Type 2 1 1/2 HP Submers. (example: 30 hp line shaft turbine)

Rated Capacity UNK — Either capable of supplying system

Are pumps operable? ☒ Yes ☐ No

How frequently has pumps(s) been replaced? UNK

Are backup pumps/motors provided? Redundant pumps ☐ Yes ☒ No

Are controls functioning properly and adequately protected? ☒ Yes ☐ No

Do underground compartments have a drain? NA ☐ Yes ☐ No

Is facility properly protected against trespassing and vandalism? ☒ Yes ☐ No

Are pump records maintained (amp, drawdown, discharge, pressure, maintenance schedule, manuals, etc.)? OK ☐ Yes ☐ No

Is the plumbing adequately painted to prevent excessive corrosion? Rusty tank ☒ Yes ☒ No

Is adequate heating, lighting, and ventilation provided? ☒ Yes ☐ No

Is a preventive maintenance program in operation? OK ☐ Yes ☐ No

Are recommended spare parts on hand? ☐ Yes ☐ No

Comments: (Such as, detailed information on any items with identified deficiencies)

SANITARY SURVEY FORM - PRESSURE CONTROL ASSEMBLIES Page 4 of 7

COMPLETE ONE SECTION FOR EACH PRESSURE CONTROL ASSEMBLY

CAPTIVE AIR TANK(S)

WSF ID PC001 Location, Description In well house
1 Captive air & 1 air/water interface

Is there a pressure relief valve? ☐ Yes ☒ No

Is there an operable pressure gauge? ☒ Yes ☐ No

Does low pressure level provide adequate pressure? ☒ Yes ☐ No

Are there water-logged tanks? ☐ Yes ☒ No

Is the exterior surface of the tanks in good physical condition? One is rusty ☐ Yes ☒ No

Can tank(s) be by-passed for repair? ☐ Yes ☐ No

Pump run time UNK - didn't cycle

Time of Day 1:00 PM Cut-In UNK psi

Cut-Out ↓ psi

Pump Type: _____

Comments: 58psig at time of visit

PRESSURE TANK(S)

WSF ID _____ Location, Description _____

Is there an operable pressure gauge? ☐ Yes ☐ No

Does low pressure level provide adequate pressure? ☐ Yes ☐ No

Pump recharge rate _____ Cut-In _____ psi

Time of day _____ Cut-Out _____ psi

Is the tank water logged? ☐ Yes ☐ No

Is air charge system adequate? ☐ Yes ☐ No

Is the exterior surface of the pressure tank in good physical condition? ☐ Yes ☐ No

Is there a water level sight glass? ☐ Yes ☐ No

Is there a bottom drain valve? ☐ Yes ☐ No

Is there a pressure relief valve? ☐ Yes ☐ No

Can tank(s) be by-passed for repair? ☐ Yes ☐ No

Pump type:

Comments: _____

CAPTIVE AIR TANK(S)

WSF ID _____ Location, Description _____

Is there a pressure relief valve? ☐ Yes ☐ No

Is there an operable pressure gauge? ☐ Yes ☐ No

Does low pressure level provide adequate pressure? ☐ Yes ☐ No

Are there water-logged tanks? ☐ Yes ☐ No

Is the exterior surface of the tanks in good physical condition? ☐ Yes ☐ No

Can tank(s) be by-passed for repair? ☐ Yes ☐ No

Pump run time _____

Time of Day _____ Cut-In _____ psi

Cut-Out _____ psi

Pump Type: _____

Comments: _____

PRESSURE TANK(S)

WSF ID _____ Location, Description _____

Is there an operable pressure gauge? ☐ Yes ☐ No

Does low pressure level provide adequate pressure? ☐ Yes ☐ No

Pump recharge rate _____ Cut-In _____ psi

Time of day _____ Cut-Out _____ psi

Is the tank water logged? ☐ Yes ☐ No

Is air charge system adequate? ☐ Yes ☐ No

Is the exterior surface of the pressure tank in good physical condition? ☐ Yes ☐ No

Is there a water level sight glass? ☐ Yes ☐ No

Is there a bottom drain valve? ☐ Yes ☐ No

Is there a pressure relief valve? ☐ Yes ☐ No

Can tank(s) be by-passed for repair? ☐ Yes ☐ No

Pump type:

Comments: _____

SANITARY SURVEY FORM - TREATMENT Page 5 of 7

Treatment Objective

B = Disinfection By - Product Control
C = Corrosion Control
D = Disinfection
E = Dechlorination
F = Iron Removal
I = Inorganics Removal
M = Manganese Removal
N = *No Treatment at Source*
O = Organics Removal
P = Particulate Removal
R = Radionuclides Removal
S = Softening (Hardness Removal)
T = Taste / Odor Control
Z = Other _____

Treatment Codes

(See separate sheet of Treatment Codes)

Example →

WATER TREATMENT FACILITIES

WSF ID	Treatment Plant Name	Treatment Objective and Code			
TP 001	Chlorination for Well 1	D421			Example
TP 002	Filtration and Disinfection for Spring	P341	D720	D421	Example
TP001	Point of Use RO for Pb/Cu	I690			

Treatment Description / Comments:

FOR SYSTEMS EMPLOYING FULL-TIME DISINFECTION

What disinfectant is used?

Do you record the amount of disinfectant used? ☐ Yes ☐ No

If yes, amount used: _____ lbs/day _____ ppm _____ other (give units)

Do you compare disinfectant use with water pumped to verify concentration? ☐ Yes ☐ No

Is chemical storage adequate and safe? ☐ Yes ☐ No

If no, explain _____

Is disinfectant residual being monitored daily? ☐ Yes ☐ No

Are residual reports submitted to the State monthly? ☐ Yes ☐ No

Is the disinfection equipment being operated and maintained properly? ☐ Yes ☐ No

Is operational standby equipment provided? ☐ Yes ☐ No

If not, are critical spare parts on hand? ☐ Yes ☐ No

Have there been any interruptions in disinfection during the past year due to disinfection system failure? ☐ Yes ☐ No

Dates _____

Describe provisions for providing contact time between disinfection point and the first point of use. _____

IF USING GAS CHLORINATION

Is a manifold provided to allow feeding gas from more than one cylinder? ☐ Yes ☐ No

Is there automatic switchover from cylinder to cylinder?

Are scales provided for weighing of containers? ☐ Yes ☐ No

Are chlorine storage and use areas isolated from other work areas? ☐ Yes ☐ No

Are caps on stored cylinders? ☐ Yes ☐ No

Is room vented to the outdoors by exhaust grills located no more than 6 inches above the floor level? ☐ Yes ☐ No

Is vent inlet near the ceiling? ☐ Yes ☐ No

Is room containing chlorination treatment labeled sufficiently (DANGER signs, etc.)? ☐ Yes ☐ No

Is a view port provided into the room storing chlorine? ☐ Yes ☐ No

Is a means of leak detection provided? ☐ Yes ☐ No

Is a self-contained breathing apparatus available for use during repair of leaks? ☐ Yes ☐ No

Are personnel trained to use apparatus? ☐ Yes ☐ No

Are all doors hinged outward and equipped with panic bars? ☐ Yes ☐ No

Are all gas cylinders restrained near the top and about half way down by chaining to wall or by other means? ☐ Yes ☐ No

Comments:

SANITARY SURVEY FORM - MISCELLANEOUS Page 6 of 7

DISTRIBUTION SYSTEM EVALUATION

System description: Plastic lines to trailers

System drawings available? ☐ Yes ☒ No

Lines adequately sized? ☒ Yes ☐ No

Adequate pressure maintained? ☒ Yes ☐ No

Mains subject to freezing? ☐ Yes ☒ No

Distribution system leaks? ☐ Yes ☒ No

Cross-connections noted? ☐ Yes ☒ No

Comments: Distribution system appears to function adequately

SAFETY

Note any safety deficiencies (consider items such as ladders, tank supports, guards on rotating electrical equipment, lightning protection for pumps, etc.)

— the steel pressure tank is badly rusted on the exterior & could present a risk.

MONITORING EVALUATION

Bacti monitoring satisfactory? ☒ Yes ☐ No

Familiar with repeat sampling? ☒ Yes ☐ No

Chemical monitoring satisfactory? Some problems in the past ☐ Yes ☐ No

Monitoring records maintained? ☐ Yes ☐ No

Bacti Sample Site Plan submitted to state? (Community Systems Only) ☒ Yes ☐ No

Did Surveyor take a bacteriological sample? ☐ Yes ☒ No

If Yes,

Date of Sample(s): _____ Time of Sample(s): ____

Sample Result(s)

Comments: the monitoring schedule indicates NO_3, SOC, VOC, IOC and Pb/Cu are all due in year 2001.

MANAGEMENT

Are personnel adequately trained? ☒ Yes ☐ No

Are operators properly certified? ☒ Yes ☐ No

Are there sufficient personnel? ☒ Yes ☐ No

Is an emergency plan available and workable? ok ☐ Yes ☐ No

Are abandoned wells present? ☐ Yes ☒ No

Do abandoned wells appear to be properly abandoned? ☐ Yes ☐ No

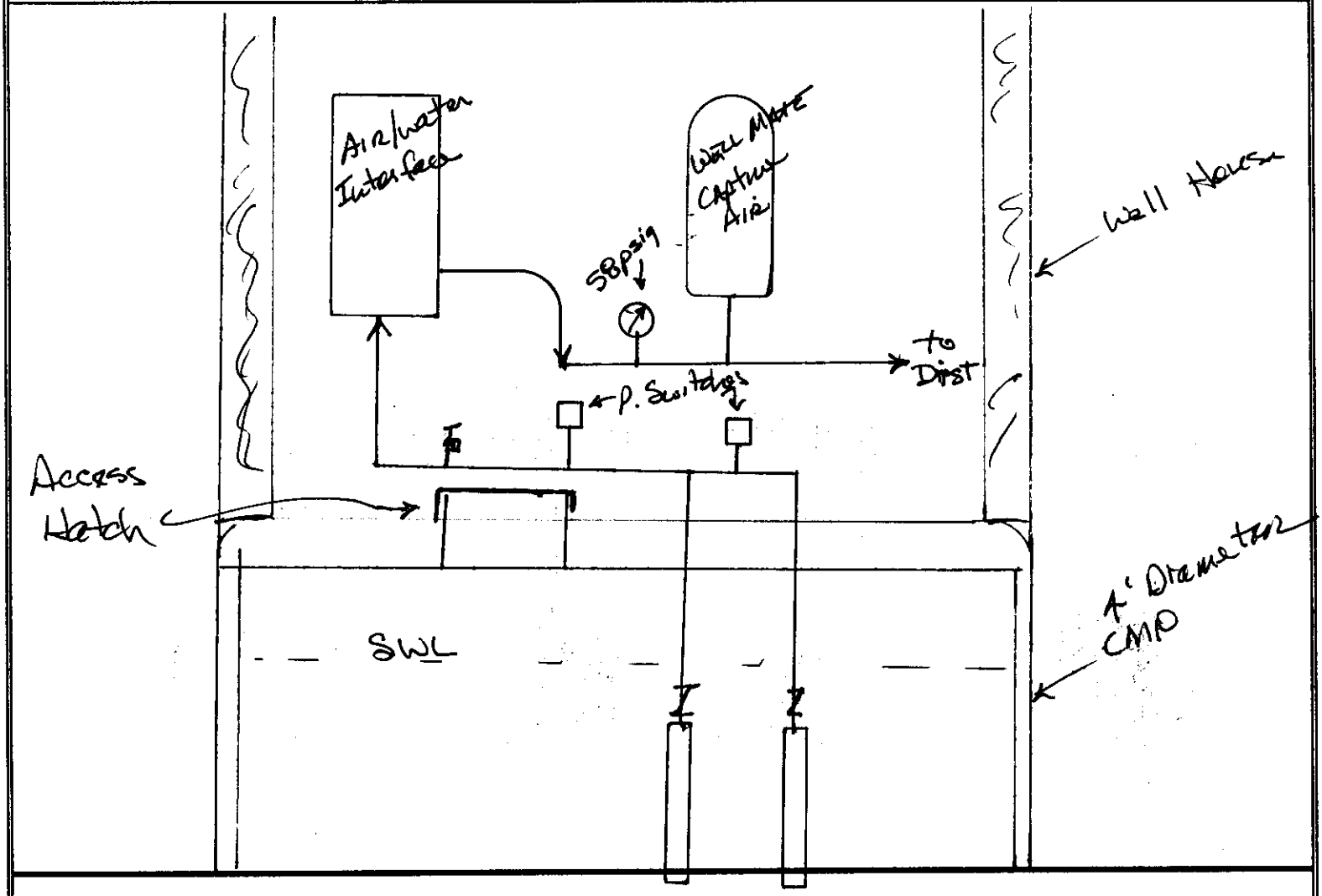
Is operator aware of rules regarding well abandonment? NA ☐ Yes ☐ No

Does the system have a current DEQ Monitoring Schedule? ☒ Yes ☐ No

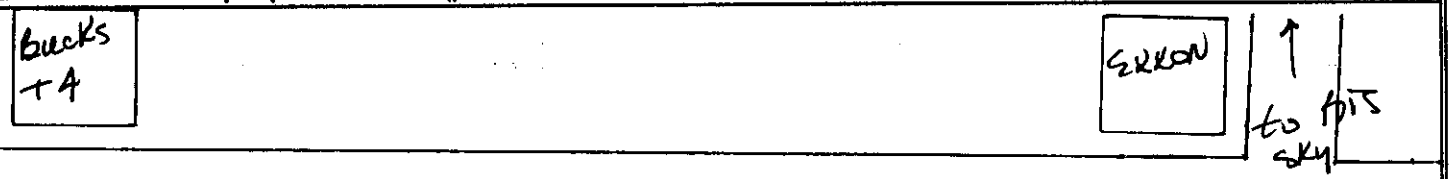
Comments:

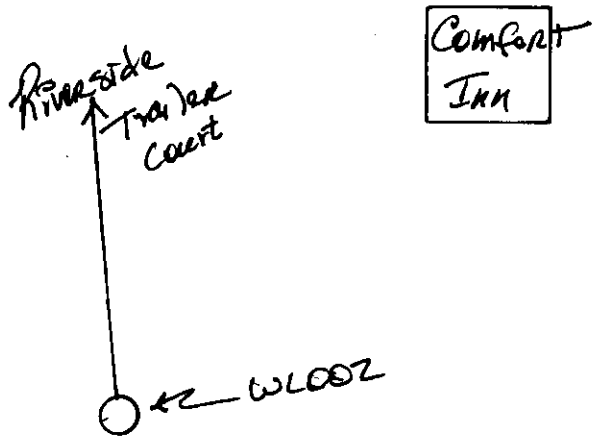
SANITARY SURVEY FORM - DIAGRAMS Page 2 of 7

Draw brief site plan showing location of well(s), springs(s), water storage, distribution system, pumphouse(s), entry point(s), treatment, etc. and label with appropriate facility designation. (See example on instruction sheet)

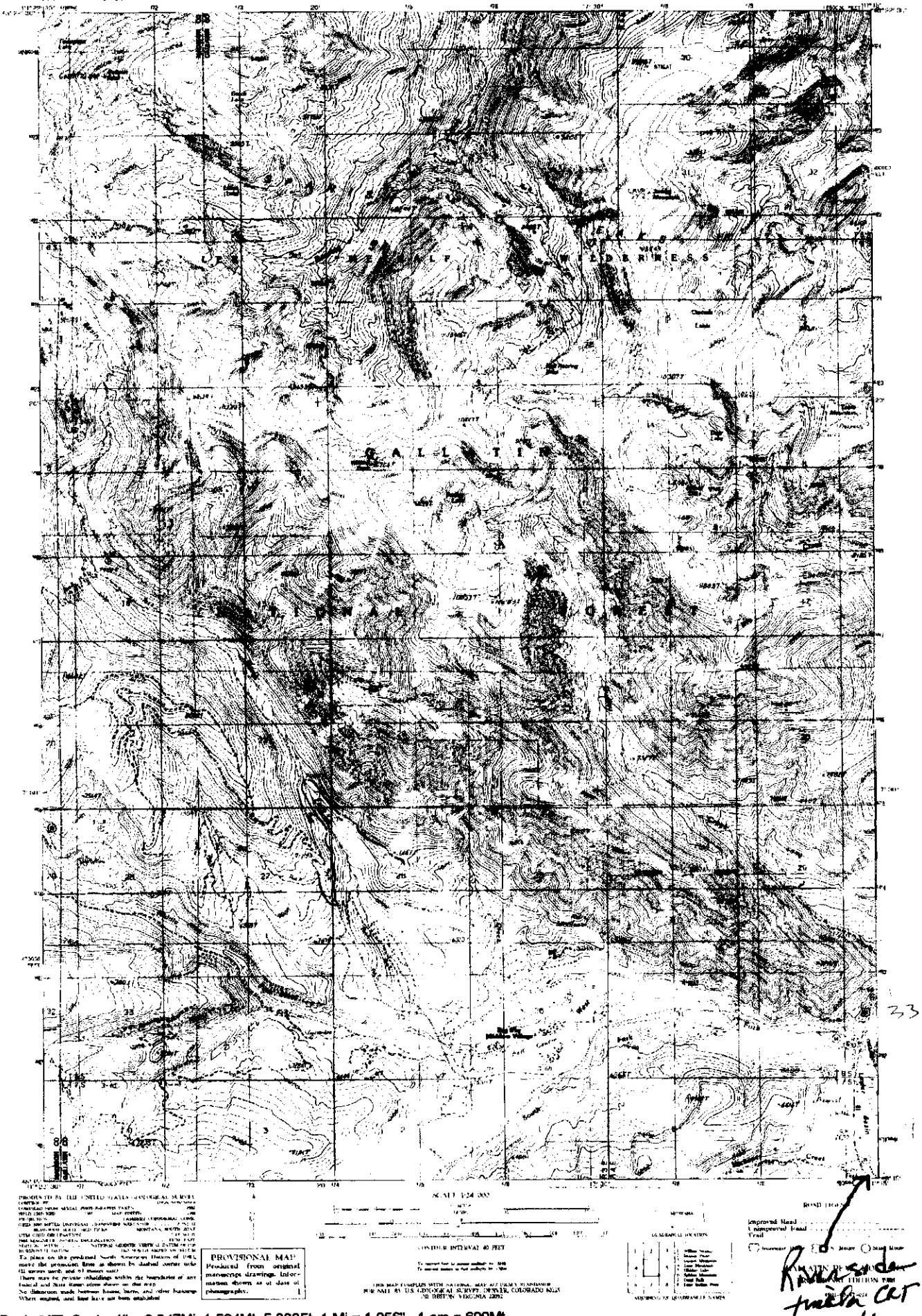


Draw brief schematic of pumphouse facilities (pressure control assemblies, treatment(s) valves, filters, meters, electrical controls, etc.)

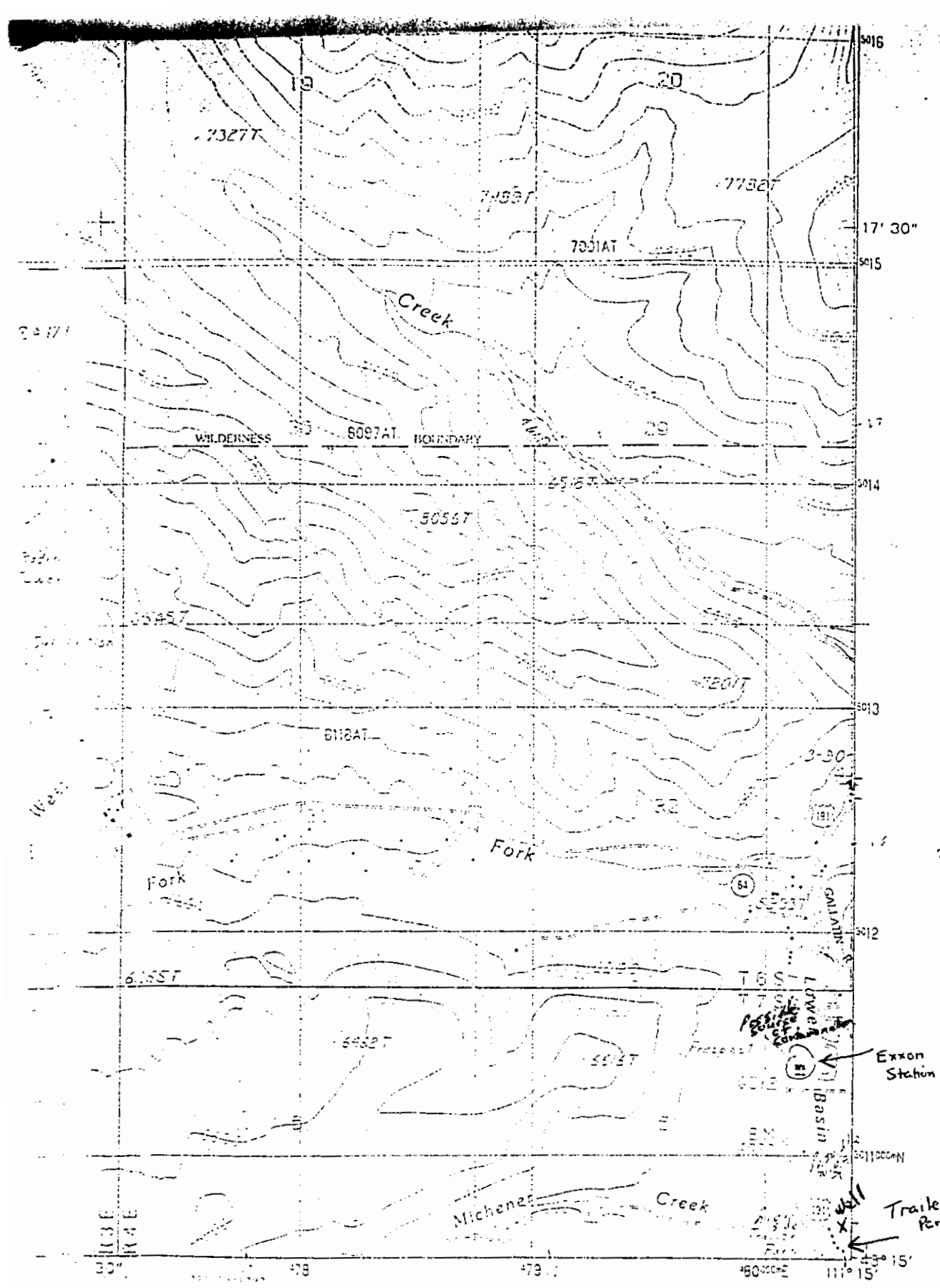




West Gallatin River



'Gallatin Peak; MT'; Scale: 1" = 0.947Mi 1,524Mt 5,000Ft, 1 Mi = 1.056" , 1 cm = 600Mt


C
105C
Riverside
Trailer
Park.
Big Sky
Exxon
Station
Trailer
Park
WILDERNESS
BOUNDARY
Creek
Fork
Michener
Creek
Basin
17' 30"
111° 15'
ROAD LEGEND
Improved Road
Unimproved Road
Trail
Interstate Route
State Route
QUADRANGLE LOCATION
GALLATIN PEAK MONTANA

Walker, Debbie

From: Walker, Debbie
Sent: Sunday, July 15, 2001 9:27 AM
To: Minneti, Eric; Melstad, Jim; Bowen, Lyla
Subject: MT0000105 RIVERSIDE TRAILER PARK

MT0000105 RIVERSIDE TRAILER PARK

ERIC,

WOULD YOU TAKE A LOOK AT THE ABOVE SYSTEM IN SDWIS AND MAKE SURE IT LOOKS OK TO YOU. IT IS DIFFERENT, EACH SERVICE HAS A RO UNIT. I LEFT THE ENTRY POINT OFF OF WELL BUT NOT SURE ABOUT IT. DAN ALSO SUGGESTS THAT SITE SHOULD CONSIDER FULL TIME DISINFECTION. LET ME KNOW IF I HAVE TO MAKE ANY CHANGES.

THANKS
DEB

02-01-01 DAN FRASER SANITARY SURVEY - SITE IS A MB HM PARK LOCATED AT 46950 GALLATIN RD - JUST UP THE RIVER FROM BIG SKY TURN-OFF BETWEEN BUCKS T-4 AND COMFORT INN - SYSTEM CONSISTS OFA SINGLE DUG WELL THAT IS REPORTED TO BE 20 FT DEEP AND CASED WITH CORRUGATED 4 FT DIAMETER METAL PIPE - WELL HAS WELLHOUSE CONSTRUCTED OVER IT AND TWO 1 1/2 HP SUBMERSIBLE PUMPS PROVIDE WATER TO TRAILER HOUSES - HAS 2 PRESSURE TANKS LOCATED IN PUMPHOUSE - TREATMENT CONSISTS OF POINT OF USE (POU) REVERSE OSMOSIS (RO) UNITS THAT HAVE BEEN RECENTLY INSTALLED FOR EACH INDIVIDUAL SERVICE - DEVICES WERE INSTALLED IN ORDER TO ACHIEVE COMPLIANCE WITH THE LEAD AND COPPER RULE - INSPECTOR SUGGUSTS FULL TIME DISINFECTION INSTALLED BECAUSE OF SHALLOW DUG WELL - NEED TO INSTALL GASKET ON ACCESS HATCH ON DUG WELL AND INSTALL A INVERTED U TYPE VENT - UNMETERED T.SVC IS 16 - RES POP SERVED IS 35-45 DW*

Debbie Walker
State of Montana
(406) 444-2891
dewalker@state.mt.us

Walker, Debbie

From: Leland, Ryan
Sent: Tuesday, July 17, 2001 5:01 PM
To: Walker, Debbie
Cc: Minneti, Eric; Melstad, Jim
Subject: RE: [redacted]105 RIVERSIDE TRAILER PARK

Deb,

I think the best way to do this is apply the Entry Point 502 to well #1. Then put a treatment plant for the distribution, and put the point-of-use devices for lead and copper in the name. Jim was right the treatment is IOC removal/RO. I made the changes to SDWIS that I thought were appropriate. Let me know if I made a mistake or if you have any question.

Thanks,

Ryan

-----Original Message-----
From: Melstad, Jim
Sent: Tuesday, July 17, 2001 7:11 AM
To: Walker, Debbie; Levens, Melissa
Cc: Minneti, Eric; Leland, Ryan
Subject: RE: MT0000105 RIVERSIDE TRAILER PARK

Ryan said that he would take a look at it for us. Ryan reviewed the plans for these treatment units. The treatment that has been assigned is IOC removal/RO. I think this is correct - Ryan would know for sure.

I don't think SDWIS has any special codes for POU treatment, so associating the treatment with the source is probably the best we can do. However, I think it would be important to state in comments in SDWIS that the treatment is at the point-of-use, not at the source.

I agree with Eric - we can't require disinfection until either they start having bad samples, or until the EPA Groundwater Rule goes into effect.

-----Original Message-----
From: Walker, Debbie
Sent: Monday, July 16, 2001 4:05 PM
To: Melstad, Jim; Levens, Melissa
Cc: Minneti, Eric
Subject: FW: MT0000105 RIVERSIDE TRAILER PARK

JIM / MELISSA - IS THERE ANY SPECIAL WAY TO ENTER A RO UNIT ON EACH SERVICE CONNECTION? I ENTERED IT AS A SINGLE TREATMENT PLANT.

DEB

-----Original Message-----
From: Minneti, Eric
Sent: Monday, July 16, 2001 3:56 PM
To: Walker, Debbie
Subject: RE: MT0000105 RIVERSIDE TRAILER PARK

Deb,

I am not sure what you are asking of me here? The system looks fine, I highlighted the info if needed for any changes and have to talk with the contractor about the full-time disinfection, I can't just require the treatment. I don't know what the codes are for point of use, I see you sent this to Jim as well. Did you get anything from him on it?

Eric

-----Original Message-----
From: Walker, Debbie
Sent: Sunday, July 15, 2001 9:27 AM
To: Minneti, Eric; Melstad, Jim; Bowen, Lyla
Subject: MT0000105 RIVERSIDE TRAILER PARK

MT0000105 RIVERSIDE TRAILER PARK

ERIC,

WOULD YOU TAKE A LOOK AT THE ABOVE SYSTEM IN SDWIS AND MAKE SURE IT LOOKS OK TO YOU. IT IS DIFFERENT, EACH SERVICE HAS A RO UNIT. I LEFT THE ENTRY POINT OFF OF WELL BUT NOT SURE ABOUT IT. DAN ALSO SUGGESTS THAT SITE SHOULD CONSIDER FULL TIME DISINFECTION. LET ME KNOW IF I HAVE TO MAKE ANY CHANGES.

THANKS
DEB

02-01-01 DAN FRASER SANITARY SURVEY - SITE IS A MB HM PARK LOCATED AT 46950 GALLATIN RD - JUST UP THE RIVER FROM BIG SKY TURN-OFF BETWEEN BUCKS T-4 AND COMFORT INN - SYSTEM CONSISTS OFA SINGLE DUG WELL THAT IS REPORTED TO BE 20 FT DEEP AND CASED WITH CORRUGATED 4 FT DIAMETER METAL PIPE - WELL HAS WELLHOUSE CONSTRUCTED OVER IT AND TWO 1 1/2 HP SUBMERSIBLE PUMPS PROVIDE WATER TO TRAILER HOUSES - HAS 2 PRESSURE TANKS LOCATED IN PUMPHOUSE - TREATMENT CONSISTS OF POINT OF USE (POU) REVERSE OSMOSIS (RO) UNITS THAT HAVE BEEN RECENTLY INSTALLED FOR EACH INDIVIDUAL SERVICE - DEVICES WERE INSTALLED IN ORDER TO ACHIEVE COMPLIANCE WITH THE LEAD AND COPPER RULE - INSPECTOR SUGGUSTS FULL TIME DISINFECTION INSTALLED BECAUSE OF SHALLOW DUG WELL - NEED TO INSTALL GASKET ON ACCESS HATCH ON DUG WELL AND INSTALL A INVERTED U TYPE VENT - UNMETERED T.SVC IS 16 - RES POP SERVED IS 35-45 DW*

Debbie Walker
State of Montana
(406) 444-2891
dewalker@state.mt.us

DEQ
Montana Department
of Environmental Quality

May 26, 2022

Buck's T4
c/o Lone Mountain Land Company
Attn: Pete Adams
25 Town Center Ave.
PO Box 160040
Big Sky, MT. 59716

Re: Sanitary Survey Inspection of Bucks T4 Public Water System (PWSID# MT0001292)

Dear Pete,

I would like to thank you, Norwood Michel and Brian Busick for your time and assistance with conducting the sanitary survey inspection of Bucks T4 public water supply system (PWS). Bucks T4 PWS system is classified as a transient non-community (TNC) public water supply. Transient non-community means a public water supply system that is not a community water system and that does not regularly serve at least 25 of the same persons for at least six months a year. As a TNC, your facility is required to have a sanitary survey inspection every fifth year. 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 operational and maintenance concerns.

SYSTEM DESCRIPTION:

Bucks T4 PWS system is at 46625 Gallatin Road in Big Sky, MT. The PWS system consists of two groundwater source wells, a common header, a treatment plant, a pressure control facility, a storage facility, a pumping facility, and a distribution system serving the motel with restaurant, pool & jacuzzi, seasonal employee housing, Geyser Building and five mobile homes. The PWS serves a transient population of approximately 250 and 20 employees/residents through ten active service connections.

The bulleted items below are my comments and recommendations related to the sanitary survey conducted May 11, 2022.

SOURCES:

Well 1 North GWIC 104527 (WL002): Well 1 is located just to the west of HWY. 191 in the northeast corner of the property. Well 1 was completed on July 22, 1974, to a depth of 35 feet. The well casing is set from -1.5 to 35 ft feet with slots from 17.5 to 22.5 feet. A lead packer was installed at an unreported depth, but the annular space is not grouted. The slotted casing intercepts an interval of sediments comprised of clay, sand, and gravel. At the time the well was completed the static water level was 10 feet; a pump test was run at 50gpm for 6 hours, but a pumping water level was not recorded. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) website and enclosed with this letter.

Well 1 had a sanitary sealed well cap. The well cap bolts were tight, and the cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap. The air relief vent was downward facing and screened, and the hole for the electrical wire grounding screw was plugged. Grading around the well was adequate to promote surface water drainage away from the well. No issues were observed with Well 1.

Well 2 South GWIC 143231 (WL003): Well 2 is located just to the west of HWY. 191 in the northeast corner of the property. Well 2 was completed on November 3, 1993, to a depth of 60 feet. The well casing is set from -2 to 40 feet with a slotted interval from 28-37 feet. The annular space is sealed with cement to 20 feet. The slotted casing intercepts an interval of gravel with clay layers and shale. At the time the well was completed the static water level was 13 feet and a pump test resulted in 2 feet of drawdown when purged with air at 20gpm for 2 hours. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) website and enclosed with this letter.

Well 2 had a sanitary well cap. The well cap bolts were tight, and the cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap. The air relief vent was downward facing and screened, and the hole for the electrical wire grounding screw was plugged. Grading around the well was adequate to promote surface water drainage away from the well.

- The well cap was missing a portion of the gasket. It is recommended a new gasket be placed between the well cap and collar to create a watertight seal. On the afternoon of May 11th, DEQ received photo documentation depicting sealant placed around the well cap gasket area to form a watertight seal (see photo log).

TREATMENT:

Treatment Plant (TP001) and Contact Time Pipe (TM001): The treatment plant consists of full-time disinfection using Sodium Hypochlorite (T-CHLOR 12.5) that is diluted in a 2:1 ratio and softening using ion-exchange water softening units. The salt is provided by Culligan and they maintain the units; three water softeners on located in the Geyser Bldg. and one water softener is in the motel kitchen. No issues were observed with the treatment plant.

DISTRIBUTION:

Distribution System (DS001): The distribution system piping is mostly PVC with some black poly, copper, and iron pipe in the pumphouse and at service connections. System pressure is maintained by the two submersible well pumps. Pump cycling is reduced using seven captive air tanks; three of the tanks are in the Geyser Bldg., the other four tanks are in the motel. The system has no dead-end lines. Backflow prevention is provided using a reduced pressure zone (RPZ) assembly for the hot tubs and a pressure vacuum breaker on the in-ground irrigation system.

- RPZ assemblies and pressure vacuum breakers should be routinely tested in accordance with manufacturer recommendations (i.e., annually) to ensure they are functioning properly. It is recommended the backflow preventers be tested by a certified backflow preventer testing professional and documentation of testing maintained with your PWS system records.

STORAGE:

Storage Tank (ST001): The storage facility consists of two buried 10,000-gallon polyethylene tanks that are tied together. The tanks have downward facing screened air vents. No overflow or drainpipes were observed. The tanks were installed in the Spring of 2021 (Engineering plans EQ20-2462) and serve the motel and new 12-unit seasonal employee housing building.

- The two tank risers did not have a gasket/seal between the lid and riser to create a watertight seal. On the afternoon of May 11th, DEQ received photo documentation depicting gaskets on the risers (see photo log).

PUMPS, PUMP FACILITIES, and CONTROLS:

Pressure Control (PC001): The pressure control assembly consists of the two (1 1/2-hp and 2hp) Franklin Electric brand submersible well pumps, two pressure switches that are used to control the pumps with pressure settings of cut-in 40psi and cut-out 60psi. The pumps are on an offset timer of ~10 seconds and generally run together, a pressure relief valve, pressure gauges and seven captive air tanks used to pressurize the system and minimize cycling of the well pumps.

Pumping Facility (PF001): The pumping facility consists of two pitless booster pumps that are VFD controlled. The pumps are set up in a duty/redundant configuration that are rotated daily. Pumping facility was installed in Spring 2021 (Engineering plans EQ20-2462). The pumps take suction from the storage facility and provide water to the motel and to the new 12-unit seasonal employee housing building.

MONITORING, REPORTING, and DATA VERIFICATION:

In the two years prior to this survey (5/11/2020 – 5/11/2022) the system has not received any violations (SDWIS Database, 2022). Currently, all drinking water monitoring and reporting requirements appear up to date.

MAINTENANCE, MANAGEMENT, SAFETY, and OPERATION:
System is well managed, maintained and operated. The Operator (Pete Adams) and Maintenance personnel (Norwood and Brian) are very knowledgeable about the system and are quick to respond to implementing recommendations and corrective actions. They are commended on their dedication to providing safe drinking water.

Please note that 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 MAP, MRW, RATES and other DEQ staff to meet the demand for facility-based training opportunities. DEQ 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. You will also find his contact information on the back of my business card.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:
Transient non-community public water supply systems are not required to have certified operators; however, the PWS system has a fully certified operator for the system, Pete Adams (Cert. #7071, Class 3A 4B 1C).

WASTEWATER:
Wastewater is managed by an on-site lagoon system. No issues were observed with wastewater management.

SIGNIFICANT DEFICIENCIES: The potential significant deficiencies noted during this inspection were corrected.
Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

DATABASE CHANGES MADE:
- Updated contact information for new owner, A/C and F/C – Inventory Update
- Updated number of active service connections – Inventory Update
- Added ST001 and PF001 to system list of facilities – Inventory Update

If you find any inaccuracies in this letter or in the attachments, please contact me with the appropriate corrections.

Again, thank you for your time and assistance with the sanitary survey. Please thank Norwood and Brian for the assistance as well and for promptly implementing corrective actions (i.e., sealing the Well 2 well cap and placing gaskets on the tank risers). Finally, thank you all 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 call me at 406-444-3967.

Sincerely,

Jodi Stoner-Granberg

Jodi Stoner-Granberg
Environmental Science Specialist
DEQ PWS, Helena
Phone: (406) 444-3967
Fax: (406) 444-1374

CC: Helena PWS file
Gallatin County file
Pete Adams (A/C) and Norwood Michel (Maintenance Manager) - email

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 hydrograph for this site
View field visits for this site
View scanned well log (2/25/2008 2:31:47 PM)

Site Name: BUCKS T4 MOTEL * NORTH WELL
GWIC Id: 104527 Well 1 North (WL002)
DNRC Water Right: 9358

Section 1: Well Owner(s)

1) BUCKS T-4 MOTEL (WELL)
N/A
N/A N/A N/A [12/12/2019]
2) SCHOLZ, CARL (MAIL)
CANYON RT
GALLATIN GATEWAY MT 59730 [07/22/1974]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	NW¼ NE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.246328	-111.251541	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6035	MAP	NAVD88	12/12/2019

Measuring Point Altitude	MP Method	Datum	Date Applies
6036.1	MAP	NAVD88	12/18/2019

Addition	Block	Lot

Section 3: Proposed Use of Water

UNUSED (1)

Section 4: Type of Work

Drilling Method: CABLE
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Monday, July 22, 1974

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	35	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1.5	18	6			WELDED	STEEL
22.5	35	5				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
17.5	22.5	6		.04X5 IN	SLOTS

Annular Space (Seal/Grout/Packer)

There are no annular space records assigned to this well.

Section 7: Well Test Data

Total Depth: 35
Static Water Level: 10
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
50 gpm pump rate with _feet of drawdown after 6 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	18	GRAVEL
18	20.5	SAND & GRAVEL
20.5	22.5	CLAY & GRAVEL
22.5	35	SHALE

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: MILTON JONES
Company: JONES WELDING & DRILLING CO.
License No: WWC-17
Date Completed: 7/22/1974

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.

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View hydrograph for this site
View field visits for this site
View water quality for this site
View scanned well log (2/25/2008 2:30:09 PM)

Site Name: BUCK T-4 * SOUTH WELL
GWIC Id: 143231 Well 2 South (WL003)

Section 1: Well Owner(s)

1) BUCK, T-4 (MAIL)
PO BOX 160279
BIG SKY MT 59716 [11/03/1993]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	NE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.24629074	-111.2515556	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6046.27	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6047.57	MAP	NAVD88	12/12/2019

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: Wednesday, November 3, 1993

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	25	10
25	60	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	40	6	0.280		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
28	37	6	9	1/4X1	HOLTE PERFORATOR SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	NEAT CEMENT	

Section 7: Well Test Data

Total Depth: 60
Static Water Level: 13
Water Temperature:

Air Test *

20 gpm with drill stem set at _feet for 2 hours.
Time of recovery 0.5 hours.
Recovery water level 13 feet.
Pumping water level 15 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
110SNGR - SAND AND GRAVEL (QUATERNARY)

From	To	Description
0	2	TOPSOIL
2	34	GRAVEL WITH CLAY LAYERS
34	60	SHALE

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: KEVIN HAGGERTY
Company: HAGGERTY DRILLING
License No: WWC-353
Date Completed: 11/3/1993

Bucks T4 PWSID# MT0001292

May 11, 2022

State Representative: Jodi Stoner-Granberg

System Representatives: Pete Adams (Operator), Norwood Michel and Brian Busick (Maintenance)

OVERVIEW

(boundaries are approximate)



Groundwater Sourced, Transient Non-Community Water System in Gallatin Co. – T07S R04E S8

PWS Facility Locations

(approximate)



Well 1 North GWIC 104527 (WL002) & Well 2 South GWIC 143231 (WL003)

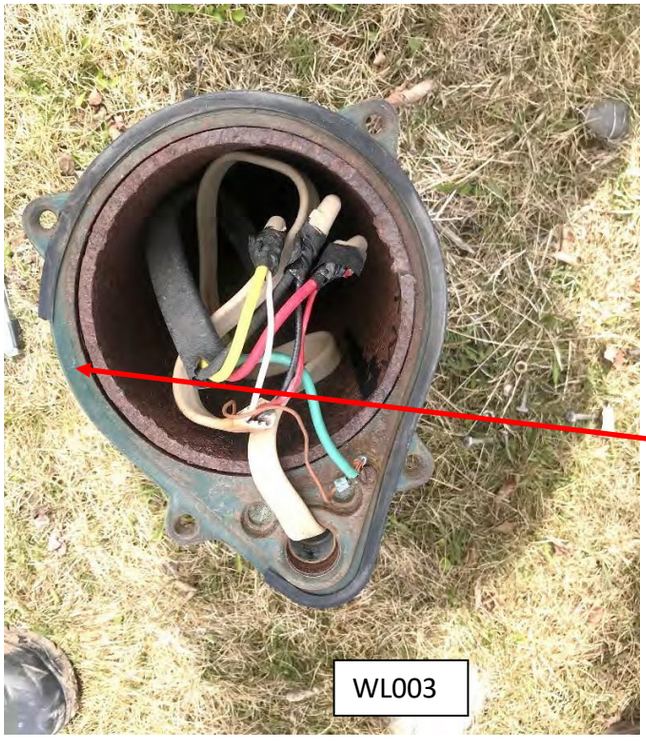


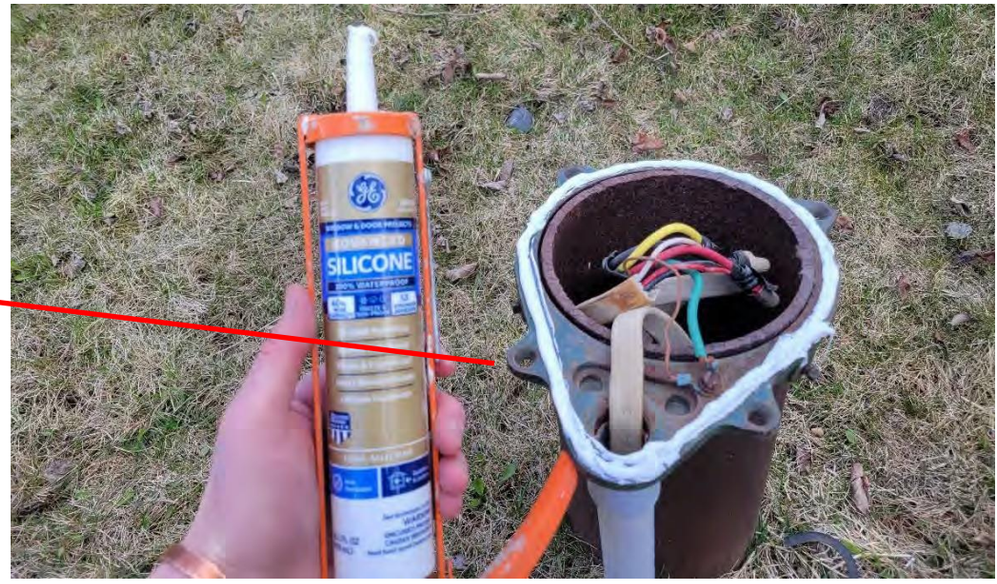


Well 1 had a sanitary sealed well cap. The well cap bolts were tight, and the cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap. The air relief vent was downward facing and screened, and the hole for the electrical wire grounding screw was plugged. Grading around the well was adequate to promote surface water drainage away from the well.



Well 2 had a sanitary well cap; however, a portion of the gasket was missing (bottom left photo). The well cap bolts were tight, and the cap was securely attached to the well casing. The electrical conduit was sealed and tightly secured within the well cap. The air relief vent was downward facing and screened, and the hole for the electrical wire grounding screw was plugged. Grading around the well was adequate to promote surface water drainage away from the well.





A portion of the gasket on Well 2 was missing. The system representatives removed the cap to see if the electrical grounding screw hole was plugged (it was) at which time, we observed the broken gasket. Sealant was place around the gasket area on the well cap (on the day of the inspection) and the well cap was bolted back onto the collar.

Pressure Control In Geyser Bldg (PC001) & Treatment Plant (TP001)



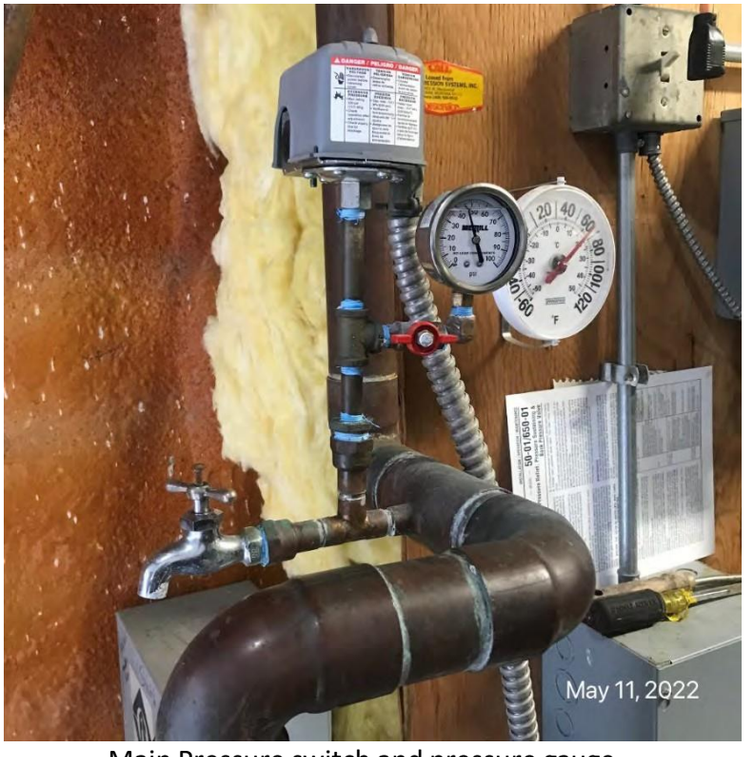
Locked Geyser/Raft Building with the treatment plant and pressure control facility.



Well pump control boxes

Pressure control facility consists of the two Franklin Electric brand 1 1/2hp and 2hp submersible well pumps, two pressure switches to control the well pumps, pressure gauges, a pressure relief valve, and seven captive air tanks to pressurize the system and minimize pump cycling.

Note: Four of the seven captive air tanks are in the Motel (after the boiler) they are controlled by the main pressure switch that is in the Geyser Bldg.



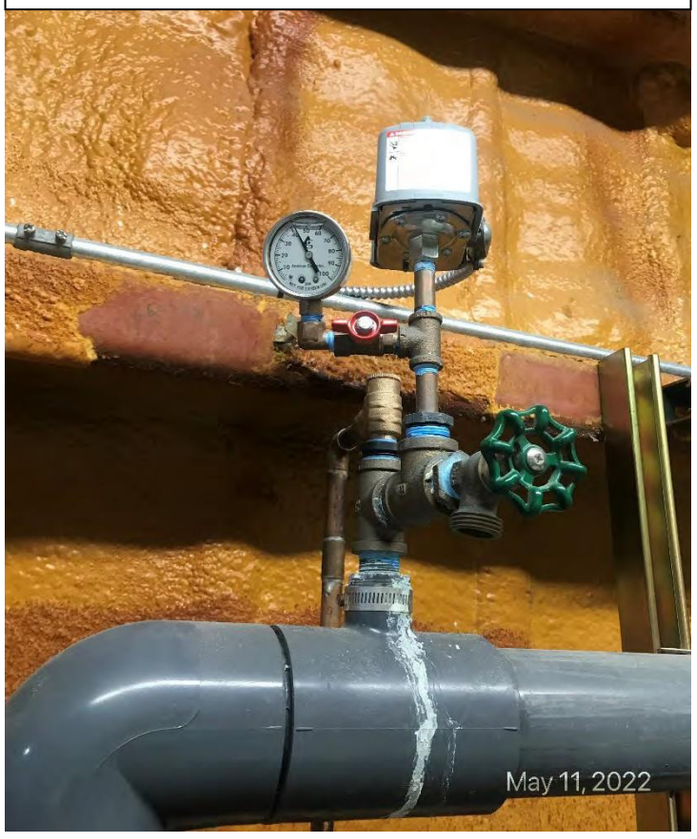
Main Pressure switch and pressure gauge



Another view of the same pressure switch

Pressure Control In Geyser Bldg (PC001) & Treatment Plant (TP001) *cont.*

Additional pressure switch that is set for a 10sec. delay, pressure gauge and pressure relief valve.







Chlorine injection point, disinfection solution tank and containment bin





Three Pentair brand captive air tanks are in the Geyser Bldg. and four Well-X-Trol brand captive air tanks are in Motel. The pressure switch depicted left is disconnected.

It is recommended the pressure switch be removed from the system.

Pressure Control In Geyser Bldg (PC001) & Treatment Plant (TP001) *cont.*



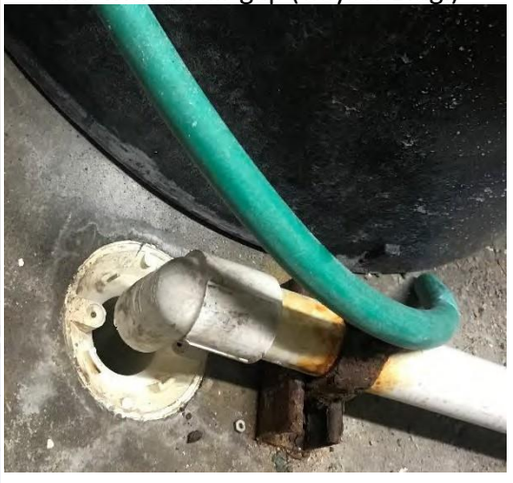
Raw water and treated water sample taps



Flow pacing meter for disinfection dosing



Softening units and backflush drain line with an air gap (Geyser Bldg.)







Softening unit in a closet within the restaurant/motel kitchen. Backflush drain line had an air gap.

Pressure Control In Geyser Bldg (PC001) & Treatment Plant (TP001) *cont.*



Disinfection solution tank with diluted T-CHLOR 12.5 and safety eye wash



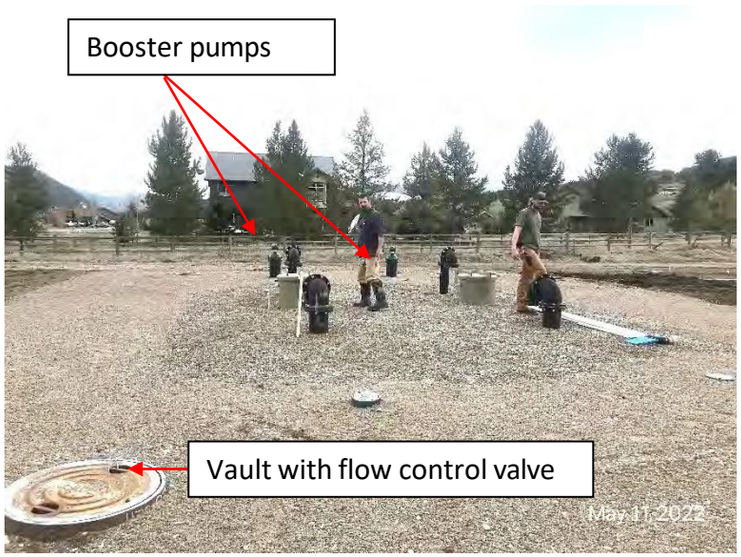
Vent to the outside from the chlorine tank was clogged and screen was damaged.



On May 11, 2022, DEQ received photo documentation depicting the screen replaced on the vent outlet (right photo).



Storage Facility (ST001) & Pumping Facility (PF001)









ST001 consists of two buried poly tanks that are connected to each other. Each tank is 10,000-gallons for a total storage capacity of 20,000-gallons. The downward facing air vents (four vents) were screened. No drainpipe was observed. Each tank has a riser that is kept padlocked; however, the riser lids did not have gaskets to create a tight seal.

It is recommended gaskets be placed on the riser lids to create a tight seal. On May 11th, DEQ received photos depicting the gaskets installed on the tank risers.

Within the control vault near the tanks there is a pressure transmitter and a flow meter.

PF001 consists of two pitless booster pumps (250gpm each) that are VFD controlled.







Pump casing with pitless adaptor label and pump control panels are depicted to the right.

Backflow Preventers



Jacuzzi/hot tub system with appropriate backflow preventer installed (RPZ assembly). It is recommended the reduced pressure zone assembly (RPZ assembly) be routinely tested by a certified backflow preventer testing professional to ensure it is functioning properly.





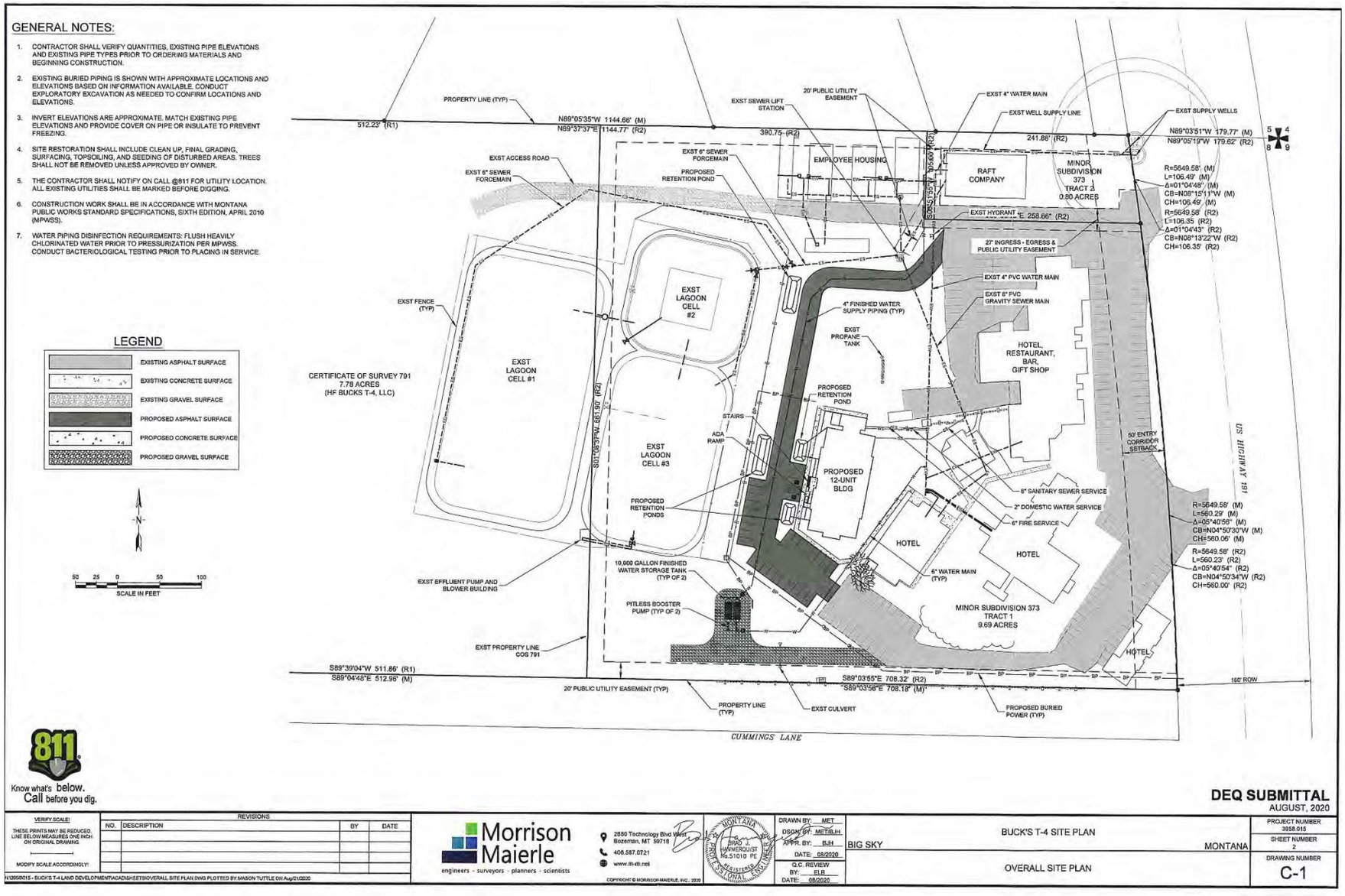
Janitors closet faucet and in-ground irrigation system with appropriate backflow preventers installed. It is recommended the pressure vacuum breaker on the in-ground irrigation system be routinely tested by a certified backflow preventer testing professional to ensure it is functioning properly.





Kitchen soap dispensers with appropriate backflow preventers installed.

System Drawings (1 of 6)



System Drawings (2 of 6)

GENERAL NOTES:

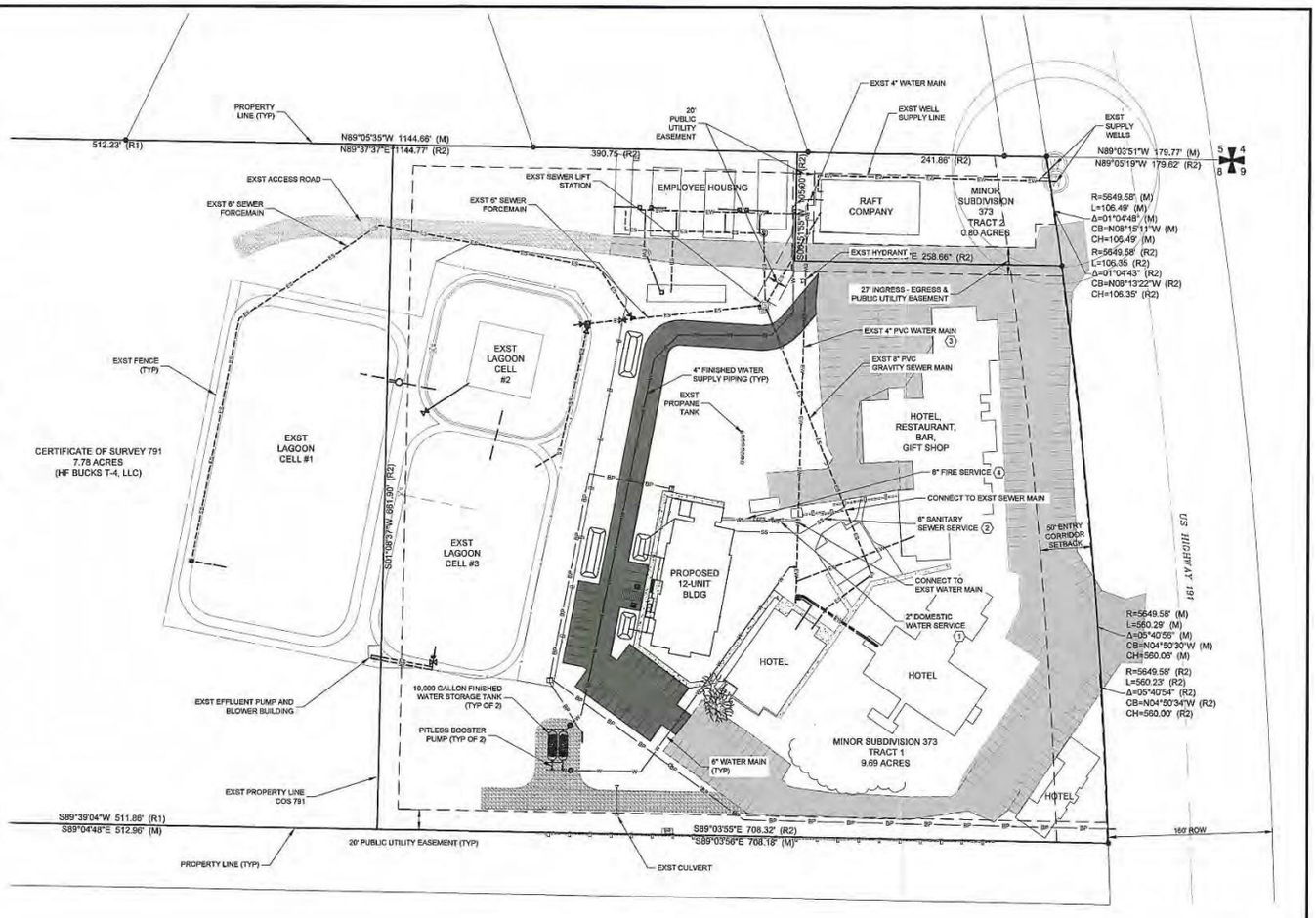
1. CONTRACTOR SHALL VERIFY QUANTITIES, EXISTING PIPE ELEVATIONS AND EXISTING PIPE TYPES PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION.
2. EXISTING BURIED PIPING IS SHOWN WITH APPROXIMATE LOCATIONS AND ELEVATIONS BASED ON INFORMATION AVAILABLE. CONDUCT EXPLORATORY EXCAVATION AS NEEDED TO CONFIRM LOCATIONS AND ELEVATIONS.
3. INVERT ELEVATIONS ARE APPROXIMATE. MATCH EXISTING PIPE ELEVATIONS AND PROVIDE COVER ON PIPE OR INSULATE TO PREVENT FREEZING.
4. SITE RESTORATION SHALL INCLUDE CLEAN UP, FINAL GRADING, SURFACING, TOPSOILING, AND SEEDING OF DISTURBED AREAS. TREES SHALL NOT BE REMOVED UNLESS APPROVED BY OWNER.
5. THE CONTRACTOR SHALL NOTIFY ON CALL @811 FOR UTILITY LOCATION. ALL EXISTING UTILITIES SHALL BE MARKED BEFORE DIGGING.
6. CONSTRUCTION WORK SHALL BE IN ACCORDANCE WITH MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS, SIXTH EDITION, APRIL 2010 (MPWSS).
7. WATER PIPING DISINFECTION REQUIREMENTS: FLUSH HEAVILY CHLORINATED WATER PRIOR TO PRESSURIZATION PER MPWSS. CONDUCT BACTERIOLOGICAL TESTING PRIOR TO PLACING IN SERVICE.

KEY NOTES:

1. INSTALL WATER SERVICE IN ACCORDANCE WITH MPWSS STANDARD DRAWING 02660-8. MAINTAIN 6.5' OF COVER OR INSULATE. CONNECT TO EXISTING WATER MAIN WITH ROMAC STYLE 306 STAINLESS STEEL SERVICE SADDLE, OR APPROVED EQUAL. INSTALL MUELLER H-15028N CORPORATIONSTOP AND MUELLER H-15209N CURB VALVE WITH GRIP COMPRESSION FITTINGS, OR APPROVED EQUALS. PIPING SHALL BE SDR 9 HDPE CTS WATER SERVICE PIPE COMPATIBLE WITH SERVICE FITTINGS, OR APPROVED EQUAL.
2. INSTALL SEWER SERVICE IN ACCORDANCE WITH MPWSS STANDARD DRAWING 02730-2. MAINTAIN 5.5' OF COVER OR INSULATE. CONNECT TO EXISTING GRAVITY SEWER MAIN USING GPK 101-SERIES SOLVENT WELD SADDLE WYE WITH STAINLESS STEEL CLAMPS OR INSERTA TEE WITH STAINLESS STEEL BAND. INSTALL SERVICE AT A MINIMUM 2% SLOPE WITH CLEANOUTS AT BENDS AND 3' FROM BUILDING. CLEANOUTS SHALL BE INSTALLED AT NO MORE THAN 100-FOOT INTERVALS. PIPING SHALL BE SDR 35 PVC.
3. RECORD DRAWINGS PROVIDE CONFLICTING INFORMATION REGARDING EXISTING WATER MAIN SIZE. CONTRACTOR TO VERIFY PIPE SIZE DURING CONSTRUCTION.
4. REFER TO MPWSS SECTION 02660 3.4 FOR TESTING AND DISINFECTION REQUIREMENTS FOR FIRE SERVICE LINE. ACCORDING TO NFPA 24, A FLOW RATE OF 880 GALLONS PER MINUTE IS REQUIRED FOR FLUSHING A 6" FIRE SERVICE LINE.

LEGEND

- EXISTING ASPHALT SURFACE
- EXISTING CONCRETE SURFACE
- EXISTING GRAVEL SURFACE
- PROPOSED ASPHALT SURFACE
- PROPOSED CONCRETE SURFACE
- PROPOSED GRAVEL SURFACE



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AUGUST, 2020

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REVISIONS			
NO.	DESCRIPTION	BY	DATE

N:\2019\2019-15 - BUCK'S T-4 LAND DEVELOPMENT\ACAD\SHEETS\UTILITY PLAN.DWG PLOTTED BY: MASON TUTTLE ON Aug/21/2020

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APPR. BY:	BJH
DATE:	08/2020
Q.C. REVIEW BY:	ELB
DATE:	08/2020

BUCK'S T-4 SITE PLAN
BIG SKY MONTANA
UTILITY PLAN

PROJECT NUMBER	2858.015
SHEET NUMBER	5
DRAWING NUMBER	C-4

System Drawings (3 of 6)

GENERAL NOTES:

1. CONTRACTOR SHALL VERIFY QUANTITIES, EXISTING PIPE ELEVATIONS AND EXISTING PIPE TYPES PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION.
2. EXISTING BURIED PIPING IS SHOWN WITH APPROXIMATE LOCATIONS AND ELEVATIONS BASED ON INFORMATION AVAILABLE. CONDUCT EXPLORATORY EXCAVATION AS NEEDED TO CONFIRM LOCATIONS AND ELEVATIONS.
3. INVERT ELEVATIONS ARE APPROXIMATE. MATCH EXISTING PIPE ELEVATIONS AND PROVIDE COVER ON PIPE OR INSULATE TO PREVENT FREEZING.
4. SITE RESTORATION SHALL INCLUDE CLEAN UP, FINAL GRADING, SURFACING, TOPSOILING, AND SEEDING OF DISTURBED AREAS. TREES SHALL NOT BE REMOVED UNLESS APPROVED BY OWNER.
5. THE CONTRACTOR SHALL NOTIFY ON CALL @811 FOR UTILITY LOCATION. ALL EXISTING UTILITIES SHALL BE MARKED BEFORE DIGGING.
6. CONSTRUCTION WORK SHALL BE IN ACCORDANCE WITH MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS, SIXTH EDITION, APRIL 2010 (MPWSS).
7. WATER PIPING DISINFECTION REQUIREMENTS: FLUSH HEAVILY CHLORINATED WATER PRIOR TO PRESSURIZATION PER MPWSS. CONDUCT BACTERIOLOGICAL TESTING PRIOR TO PLACING IN SERVICE.

KEY NOTES:

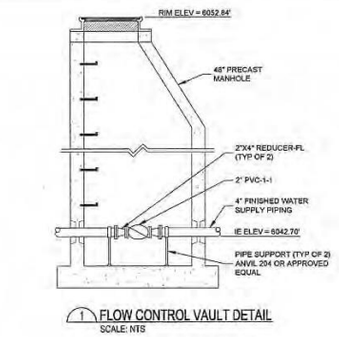
(1) INSTALL PER MANUFACTURER'S RECOMMENDATIONS. SEE WATER SHEETS FOR MORE DETAILS.

(2) SEE DETAIL SHEETS FOR GRAVEL ACCESS ROAD AND PAD SPECIFICATIONS.

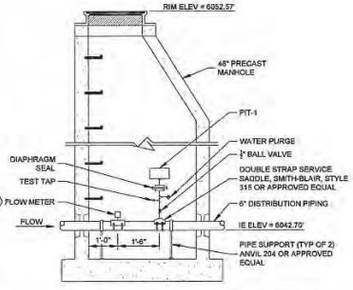
(3) FLOW METER SHALL BE 6" MCCROMETER M0300 STRAP-ON SADDLE FLOW METER WITH STANDARD MECHANICAL FLOW RATE INDICATOR AND TOTALIZER, OR APPROVED EQUAL.

OPERATIONAL NOTES:

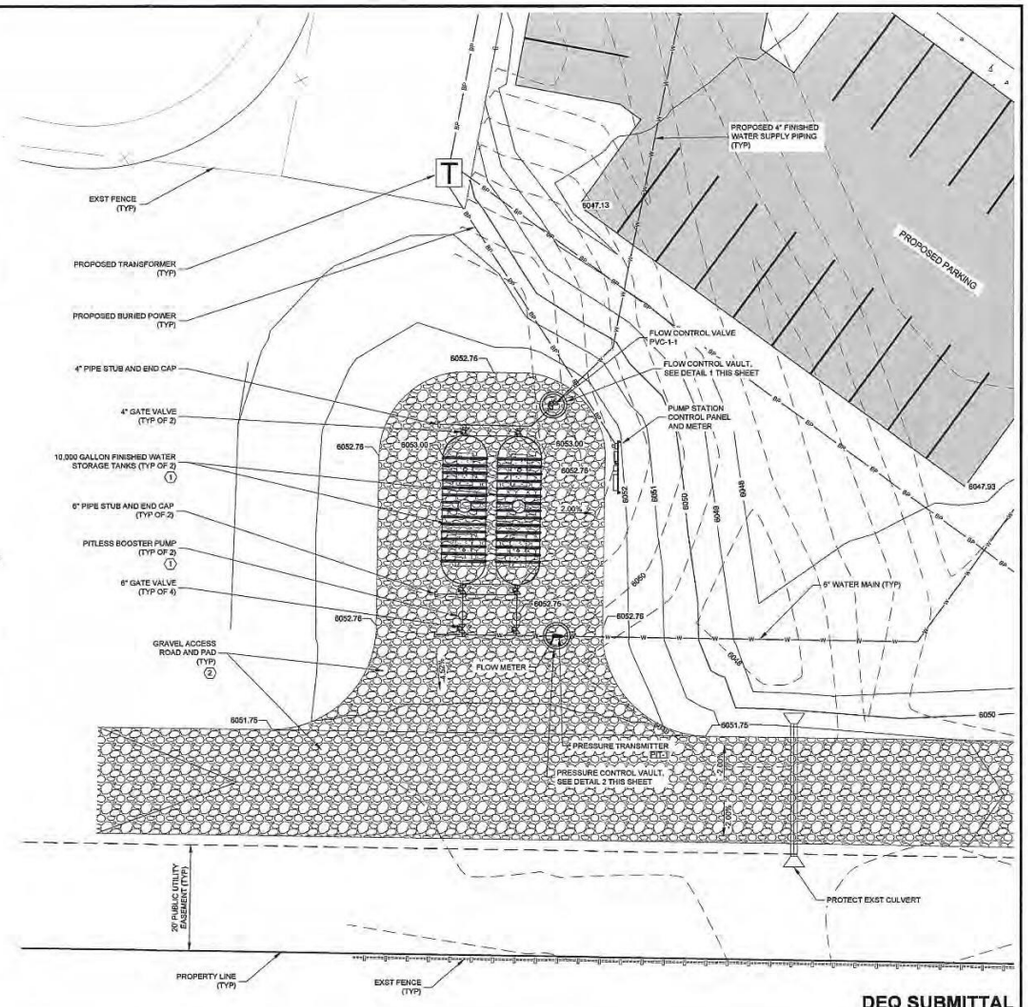
1. THE EXISTING WELLS WILL BE CALLED BASED ON TANK LEVEL AS MEASURED BY FLOATS. WHEN THE FLOAT REACHES THE LOW SETTING, IT WILL OPEN A SOLENOID VALVE LOCATED IN THE FLOW CONTROL VAULT ON THE SUPPLY SIDE OF THE STORAGE TANKS. THE PRESSURE WILL DROP IN THE SUPPLY LINE AND THE WELL PRESSURE SWITCH WILL START THE WELL PUMPS. THE SOLENOID VALVE WILL HAVE A BACKPRESSURE FUNCTION THAT WILL BE SET TO KEEP THE WELLS ON THEIR PUMP CURVE. PROVIDE CONTINUING USE OF THE EXISTING SODIUM HYPOCHLORITE 4-LOG VIRUS DISINFECTION SYSTEM AND SOFTENING EQUIPMENT, AND MAINTAIN EXISTING SERVICE PRESSURE TO THE TRACT 2 BUILDING.
2. THE BOOSTER PUMP SYSTEM CONTROLS WILL BE SET UP IN A DUTY/REDUNDANT CONFIGURATION IN WHICH EACH PUMP WILL BE CAPABLE OF MEETING THE DESIGN FLOW AND PRESSURE AND THE OTHER WILL BE AVAILABLE AS BACKUP IN CASE OF DUTY PUMP FAILURE. THE DUTY PUMPS WILL BE ROTATED DAILY TO ENSURE BOTH PUMPS ARE EXERCISED AND REMAIN IN GOOD OPERATING CONDITION. A VARIABLE FREQUENCY DRIVE WITH CONSTANT PRESSURE CONTROL WILL BE INSTALLED ON BOTH PUMP MOTORS TO ACHIEVE DUTY POINTS BETWEEN THE MAXIMUM DAY DEMAND AND THE ESTIMATED PEAK INSTANTANEOUS DEMAND WHILE LIMITING CYCLING.



1 FLOW CONTROL VAULT DETAIL
SCALE: NTS



2 PRESSURE CONTROL VAULT DETAIL
SCALE: NTS



LEGEND

- EXISTING ASPHALT SURFACE
- EXISTING CONCRETE SURFACE
- EXISTING GRAVEL SURFACE
- PROPOSED ASPHALT SURFACE
- PROPOSED CONCRETE SURFACE
- PROPOSED GRAVEL SURFACE

N

10 5 0 10 20
SCALE IN FEET

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AUGUST, 2020

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REVISIONS NO.	DESCRIPTION	BY	DATE

N:\3958\15 - BUCK'S T-4 LAND DEVELOPMENT\ACAD\SHEETS\WATER STORAGE PLAN.DWG PLOTTED BY: JERRY A. CHAMBERS ON Aug/21/2020

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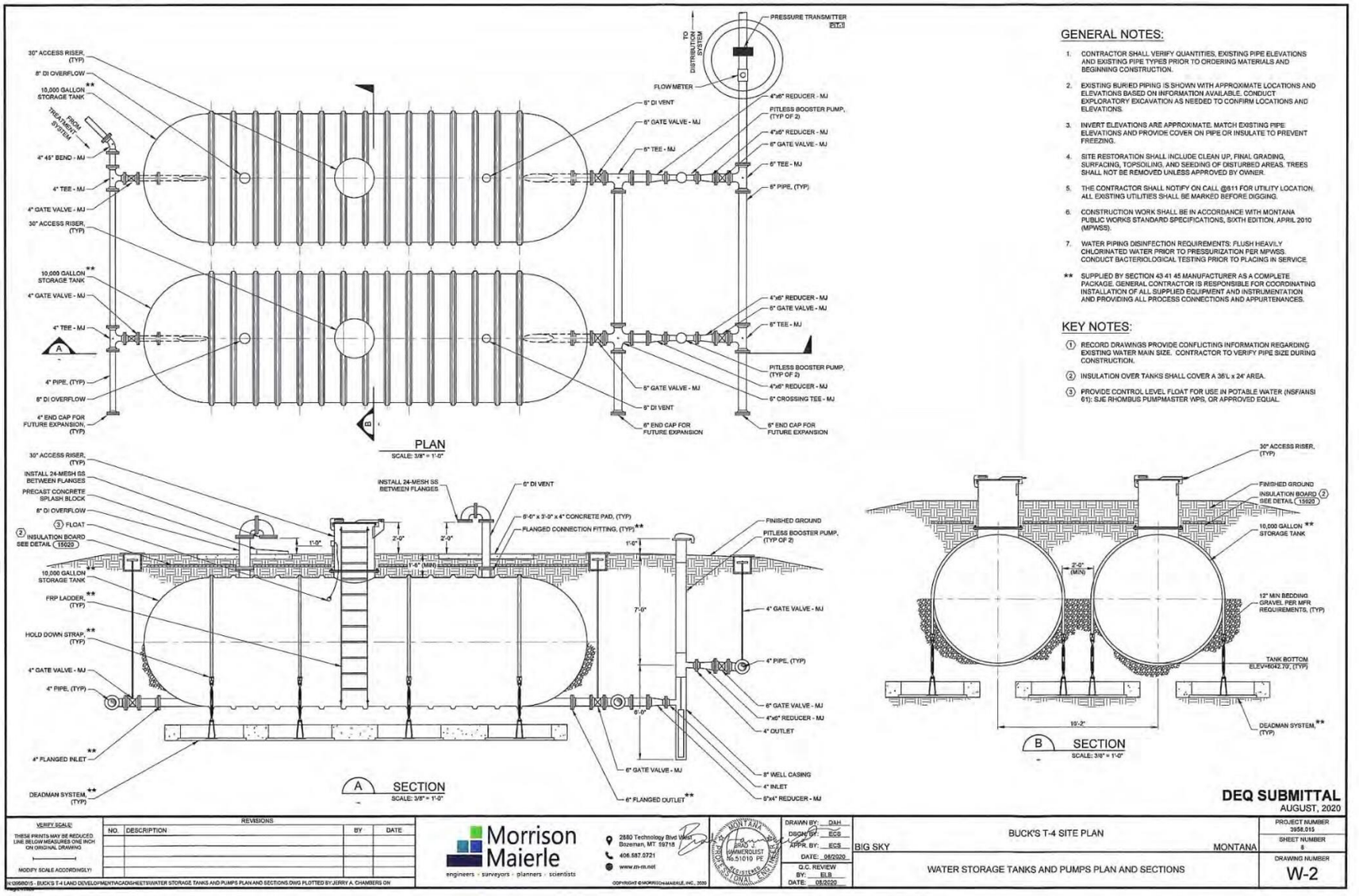
REGISTERED PROFESSIONAL ENGINEER — STATE OF MONTANA — 21482 — JAMES J. HAMMERQUIST — No. 51010 PE

DRAWN BY: MET
DSGN BY: METS/JH
APPR. BY: BJH
DATE: 08/2020
Q.C. REVIEW BY: ELB
DATE: 08/2020

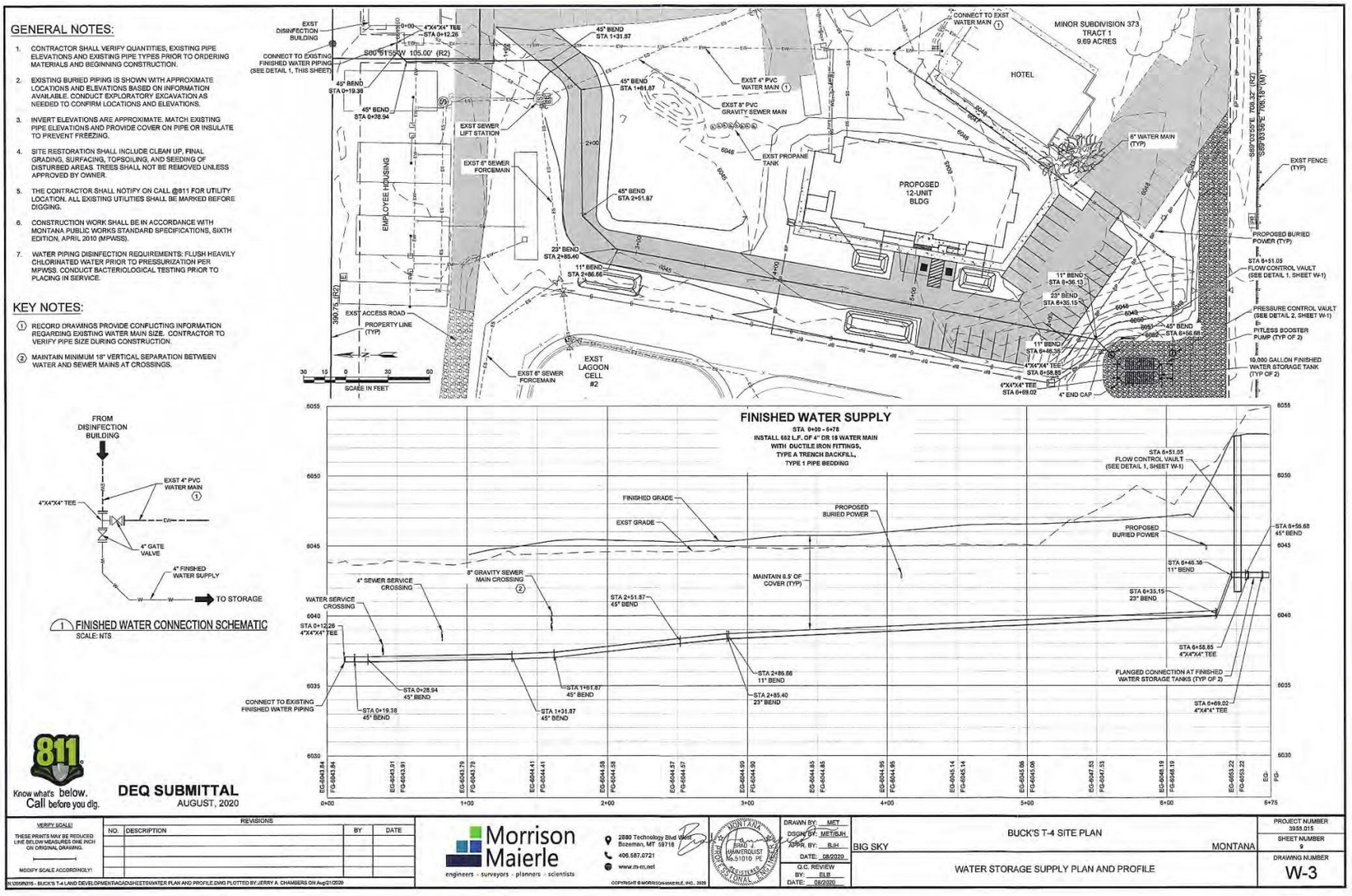
BUCK'S T-4 SITE PLAN
BIG SKY MONTANA
WATER STORAGE PLAN

PROJECT NUMBER 3958.015
SHEET NUMBER 7
DRAWING NUMBER W-1

System Drawings (4 of 6)



System Drawings (5 of 6)



System Drawings (6 of 6)

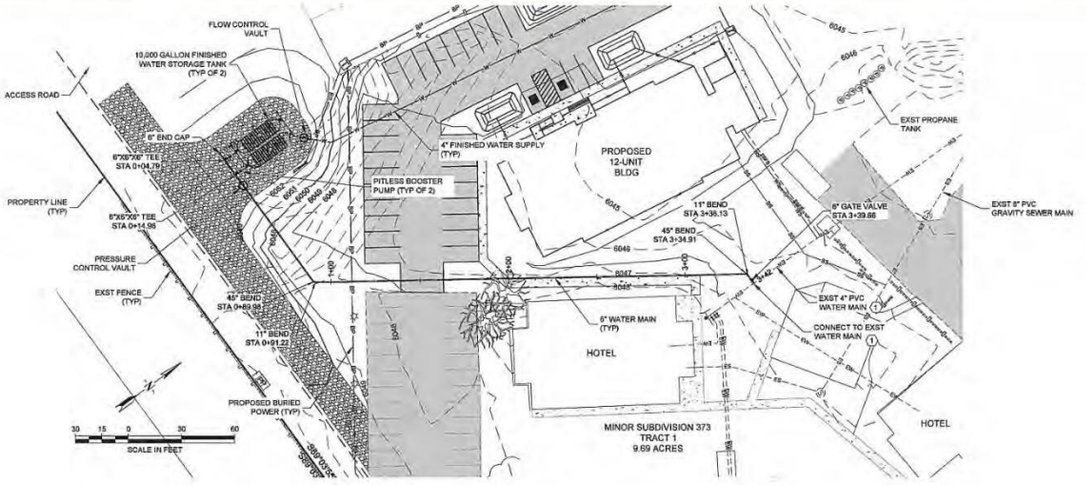
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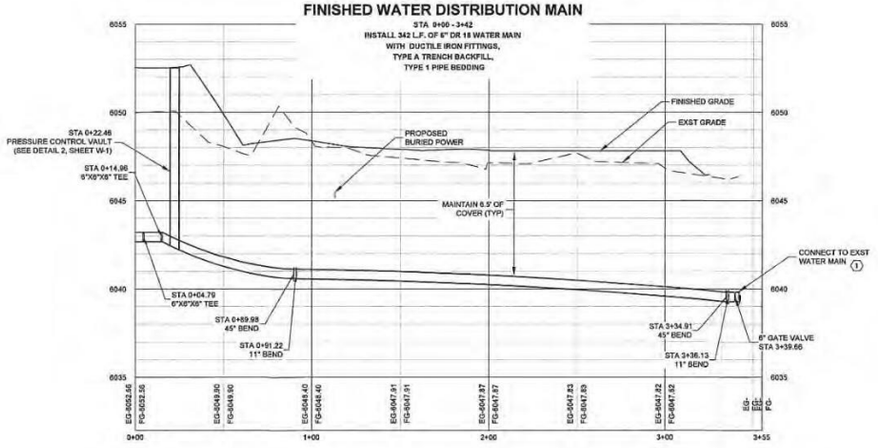
KEY NOTES:

(1) RECORD DRAWINGS PROVIDE CONFLICTING INFORMATION REGARDING EXISTING WATER MAIN SIZE. CONTRACTOR TO VERIFY PIPE SIZE DURING CONSTRUCTION.

(2) MAINTAIN MINIMUM 18" VERTICAL SEPARATION BETWEEN WATER AND SEWER MAINS AT CROSSINGS.



FINISHED WATER DISTRIBUTION MAIN



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AUGUST, 2020

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N:\2058015 - BUCK'S T-4 LAND DEVELOPMENT\ACAD\SHEETS\WATER PLAN AND PROFILE 2.DWG PLOTTED BY MASON TUTTLE ON Aug/21/2020

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BRAD J. HAMMERQUIST No. 51010 PE REGISTERED PROFESSIONAL ENGINEER STATE OF MONTANA

DRAWN BY:	MET
DSGN BY:	MET/BJH
APPR. BY:	BJH
DATE:	08/2020
Q.C. REVIEW BY:	ELB
DATE:	08/2020

BUCK'S T-4 SITE PLAN

BIG SKY MONTANA

WATER STORAGE DISTRIBUTION PLAN AND PROFILE

PROJECT NUMBER	2058.015
SHEET NUMBER	10
DRAWING NUMBER	W-4

Water System Facilities Table and Flow

WSF ID	WSF Name	Description
WL002	Well 1 North GWIC 104527	WL002 has a 2hp Franklin Electric brand submersible pump that is controlled by a pressure switch. Well activates 10 sec after Well 2.
WL003	Well 2 South GWIC 143231	WL003 has a 1 1/2hp Franklin Electric brand submersible pump installed in2018 that is controlled by a pressure switch. First well to activate.
CH001	Common Header Well 1 2	CH001 is underground in the grassy area near Well 1 and Well 2. After wells meet at the Common Header, water flows to the Geyser Building with PC001 & TP001.
PC001	Pressure Control In Geyser Bldg	PC001 consists of the two well pumps that controlled by two pressure switches. One switch is set for a 10sec. delay, pressure gauges, a pressure relief valve and seven captive air tanks to minimize well pump cycling (three tanks in Geyser Bldg. and four tanks in Motel).
TP001	Treatment Plant	TP001 consists of ion-exchange water softening and full-time disinfection using Culligan brand salt and diluted 2:1 T-Chlor 12.5, respectively.
TM001	Contact Time Pipe	TM001 consists of an in-ground pipe used to provide required disinfection contact time prior to distribution. The pipe is adjacent to and just north of the Geyser Bldg.
ST001	Storage Tank	ST001 consists of two buried 10,000-gallon poly tanks that are connected. Installed in Spring 2021. The tanks fill and empty at the same rate. There is no overflow or drainpipe for the tanks.
PF001	Pumping Facility	PF001 consists of two pitless booster pumps set up in a duty/redundant configuration that are rotated daily. Pumping facility was installed in Spring 2021. The booster pumps are VFD Controlled.
DS001	Distribution System	DS001 consists of copper, iron, black poly and PVC pipes in the treatment building, 4” PVC pipe from treatment building to storage facilities and 6” PVC mains to distribute finished water. The in-ground irrigation system and jacuzzi system have backflow preventers installed. There is no emergency power available, but system is considering buying a generator. All water is metered. There is an inactive back-up well (WL004) that has a secure top welded onto the casing.
Flow	WL002 and WL003> CH001>PC001>TP001>TM001>DS001 (Geyser/Raft bldg. and five mobile homes) >ST001>PF001>DS001 (hotel and new 12-unit bldg.)	

Drinking Water Branch

Violations

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0001292	**Federal Type :**	NTNC
Water System Name :	BUCKS T4	**State Type :**	NTNC
Principal County Served :	GALLATIN	**Primary Source :**	GW
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
2010-10633	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	TP001	TREATMENT PLANT
2007-9193	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	CH001	COMMON HEADER WELL 1 2
2005-6796	V	03	MONITORING, ROUTINE MAJOR	NITR	CDS NITRATE NITRITE	CH001	COMMON HEADER WELL 1 2

Total Number of Records Displayed = 3

Individual Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Code	Analyte Name	Water System Facility State Asgn ID	Water System Facility Name
2019-95635	V	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	null	null
2016-95634	V	MS	STATE CHLORINE MONITORING DAILY	0999	CHLORINE	TP001	TREATMENT PLANT
2016-95633	V	MS	STATE CHLORINE MONITORING DAILY	0999	CHLORINE	TP001	TREATMENT PLANT
2016-95632	V	MS	STATE CHLORINE MONITORING DAILY	0999	CHLORINE	TP001	TREATMENT PLANT
2015-95631	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2015-95630	V	MS	STATE CHLORINE MONITORING DAILY	0999	CHLORINE	TP001	TREATMENT PLANT
2014-95629	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2014-95628	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null

2012-95624	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2012-95621	V	34	MONITOR GWR TRIGGERED/ADDITONAL, MAJOR	3014	E. COLI	WL002	WELL 1 NORTH GWIC 104527
2012-95622	V	34	MONITOR GWR TRIGGERED/ADDITONAL, MAJOR	3014	E. COLI	WL003	WELL 2 SOUTH GWIC 143231
2012-95619	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2011-95613	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2011-95612	V	34	MONITOR GWR TRIGGERED/ADDITONAL, MAJOR	3014	E. COLI	WL002	WELL 1 NORTH GWIC 104527
2008-95208	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2008-95108	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2008-94908	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2007-94807	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2006-94606	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2005-94505	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2005-94205	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2005-94105	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2005-94005	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2004-93804	V	21	MCL (TCR), ACUTE	3100	COLIFORM (TCR)	null	null
2004-93504	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2004-93404	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
2003-93203	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2003-93003	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1997-80297	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1989-189	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1988-188	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1987-187	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1986-286	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1986-186	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1985-185	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1984-284	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null

1984-184	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1983-53883	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1983-53783	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1982-92682	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1982-92482	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1981-18881	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1981-38181	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null

Total Number of Records Displayed = 43

Drinking Water Branch

Violations

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0004432	**Federal Type :**	NTNC
Water System Name :	LAZY J SOUTH SUBDIVISION	**State Type :**	NTNC
Principal County Served :	GALLATIN	**Primary Source :**	GW
Status :	A	**Activity Date :**	04-01-2019

****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

Total Number of Records Displayed = 0

Individual Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Code	Analyte Name	Water System Facility State Asgn ID	Water System Facility Name
2020-1	V	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	null	null

Total Number of Records Displayed = 1

Drinking Water Branch

Violations

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0004035	**Federal Type :**	C
Water System Name :	RAMSHORN VIEW ESTATES	**State Type :**	C
Principal County Served :	GALLATIN	**Primary Source :**	GW
Status :	A	**Activity Date :**	06-20-2000

****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
2023-16517	V	03	MONITORING, ROUTINE MAJOR	SWW	STATE WIDE WAIVERS	null	null
2023-16379	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	CH001	COMMON HEADER WELL 1 2
2023-16378	V	03	MONITORING, ROUTINE MAJOR	SOC	CDS SOC REGULATED	CH001	COMMON HEADER WELL 1 2
2023-16303	V	03	MONITORING, ROUTINE MAJOR	INO1	CDS P2-5 INORGANICS	CH001	COMMON HEADER WELL 1 2

Total Number of Records Displayed = 4

Individual Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Code	Analyte Name	Water System Facility State Asgn ID	Water System Facility Name
2020-3815	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2019-3814	V	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	null	null
2017-3813	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2014-3812	V	71	CCR REPORT	7000	CONSUMER CONFIDENCE RULE	null	null
2014-3811	V	66	LEAD CONSUMER NOTICE (LCR)	5000	LEAD & COPPER RULE	null	null

2005-2605	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2004-1004	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2004-904	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2004-804	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER RULE	null	null
2000-100	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null

Total Number of Records Displayed = 10

Drinking Water Branch

Violations

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0001281	**Federal Type :**	NTNC
Water System Name :	BIG SKY SCHOOL DISTRICT NO 72	**State Type :**	NTNC
Principal County Served :	GALLATIN	**Primary Source :**	GW
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
2023-16456	V	03	MONITORING, ROUTINE MAJOR	VOC1	CDS VOC	WL003	WELL 2 1998 GWIC 168031
2023-16457	V	03	MONITORING, ROUTINE MAJOR	SOC	CDS SOC REGULATED	WL003	WELL 2 1998 GWIC 168031

Total Number of Records Displayed = 2

Individual Violations

Violation No.	Status	Violation Type	Violation Name	Analyte Code	Analyte Name	Water System Facility State Asgn ID	Water System Facility Name
2019-4417514	V	34	MONITOR GWR TRIGGERED/ADDITONAL, MAJOR	3014	E. COLI	null	null
2019-4417513	V	3A	MONITORING, ROUTINE, MAJOR (RTCR)	3014	E. COLI	null	null
2019-4417512	V	4C	REPORT STARTUP PROCEDURES CERT FORM RTCR	8000	REVISED TOTAL COLIFORM RULE (RTCR)	null	null
2018-4417511	V	66	LEAD CONSUMER NOTICE (LCR)	5000	LEAD & COPPER RULE	null	null
2014-4417510	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2014-4417509	V	22	MCL (TCR), MONTHLY	3100	COLIFORM (TCR)	null	null
2011-4417508	V	51	INITIAL TAP SAMPLING (LCR)	5000	LEAD & COPPER	DS002	DISTRIBUTION SYSTEM

					RULE		
2006-4417406	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1996-4416896	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1995-272695	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1993-215393	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1992-239592	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1992-176092	V	23	MONITORING (TCR), ROUTINE MAJOR	3100	COLIFORM (TCR)	null	null
1990-290	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1990-190	V	02	MCL, AVERAGE	3000	COLIFORM (PRE-TCR)	null	null
1989-189	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1988-188	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1985-185	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1982-93382	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1982-93282	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1981-11981	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1981-19481	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null
1981-39181	V	03	MONITORING, ROUTINE MAJOR	3000	COLIFORM (PRE-TCR)	null	null

Total Number of Records Displayed = 23

APPENDIX H

WELL LOGS – LAZY J & RAMSHORN PWS SYSTEMS

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 hydrograph for this site
View field visits for this site
View water quality for this site
View scanned well log (5/15/2006 10:52:13 AM)

Site Name: LAZY J WATER SYSTEMS
GWIC Id: 223891

Section 1: Well Owner(s)

1) LAZY J WATER SYSTEMS (MAIL)
1045 REEVES ROAD EAST SUITE C
BOZEMAN MT 59718 [09/30/2005]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	NW¼ SW¼ NW¼ SE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.25139	-111.26078	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
6120	MAP	NAVD88	7/20/2011

Measuring Point Altitude	MP Method	Datum	Date Applies
6122.4	MAP	NAVD88	7/20/2011 4:03:00 PM

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: Friday, September 30, 2005

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	76	14
76	1191	12
1191	1278	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	1180	8	0.250		WELDED	STEEL
1153	1264	6	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1259	1219	6		.4	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	1180	CEMENT	
1153	1153	6X8 K PACKER	

Section 7: Well Test Data

Total Depth: 1278
Static Water Level: -353
Closed-in Pressure: 153 psi
Water Temperature:

Pump Test *

Depth pump set for test 545 feet.
181 gpm pump rate with 778 feet of drawdown after 72 hours of pumping.
Time of recovery 48 hours.
Recovery water level 353 feet.
Pumping water level 0 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

221MRSN - MORRISON FORMATION

From	To	Description
0	3	TOP SOIL
3	10	GRAVEL WITH FINE SAND AND CLAY
10	57	GRAVEL WITH FINE SAND AND CLAY VERY DIRTY WITH STREAKS OF LIGHT BROWN CLAY
57	74	SHALE HIGHLY FRACTURED WITH GRAVEL
74	100	SHALE WITH STREAKS OF GREY CLAY
100	130	DARK GREY SHALE WITH TRACES OF GREY CLAY
130	195	BLACK SHALE
195	305	SHALE WITH STREAKS OF GRAY CLAY
305	325	GREY WITH STREAKS OF BLACK SHALE
325	345	BLACK SHALE WITH TRACES OF GREY CLAY
345	480	SHALE WITH STREAKS OF GREY CLAY
480	503	FRACUTED BLACK SHALE WITH LITE GREEN AND STREAKS OF GREY CLAY
503	507	HARD FRACTURED BLACK AND LITE SHALE
507	510	BLACK AND LITE GREEN SHALE, WITH STREAKS OF GREY CLAY
510	515	GREY CLAY WITH TRACES OF GREEN

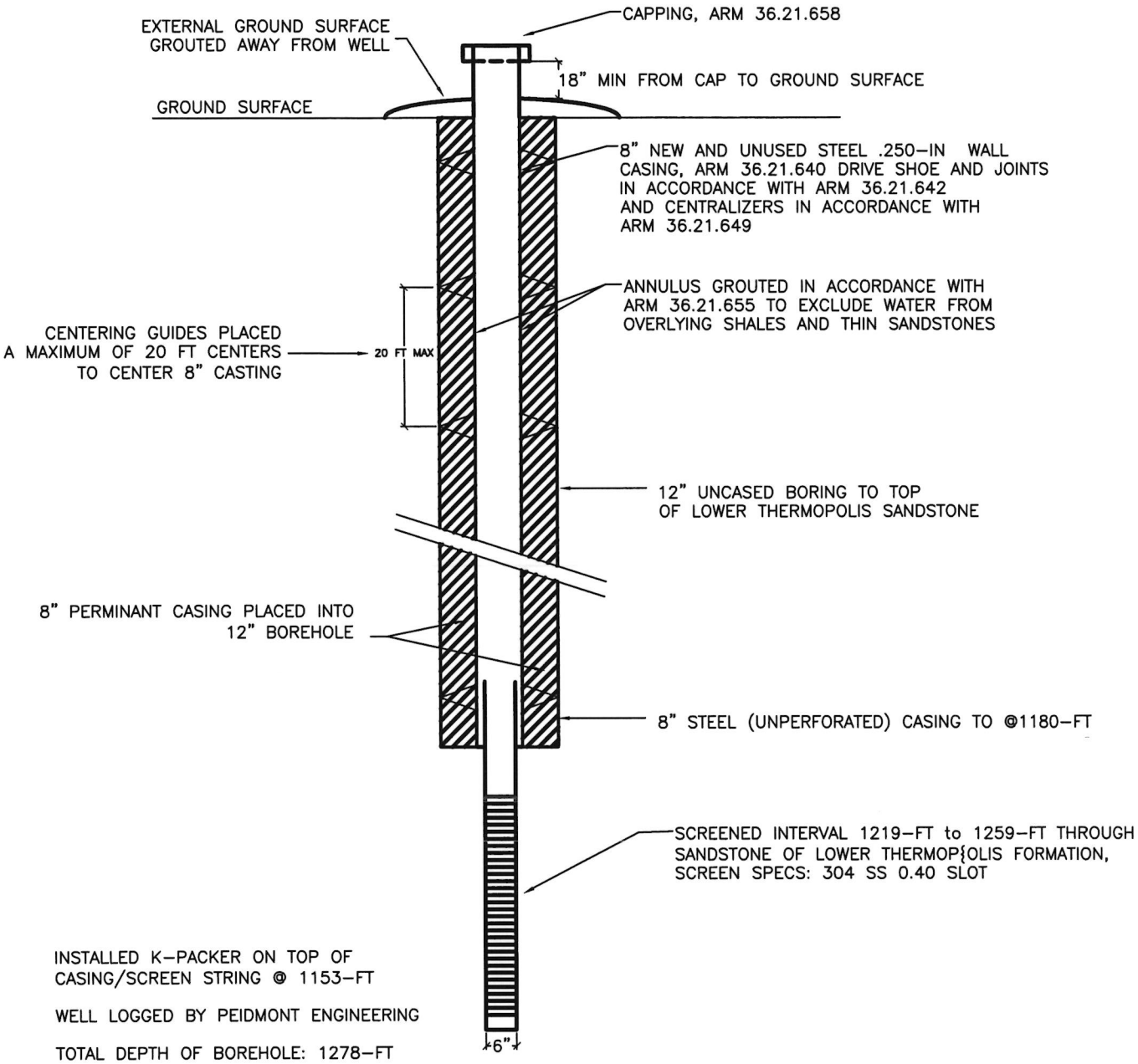
Driller Certification

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: RED TIGER DRILLING
License No: WWC-598
Date Completed: 9/30/2005

Site Name: LAZY J WATER SYSTEMS
GWIC Id: 223891
Additional Lithology Records

From	To	Description
515	518	SHALE WITH STREAKS OF GREY CLAY
518	524	BAD GUMBO, GREY CALY WITH STREAKS OF BLACK SHALE
524	525	SHALE BLACK, WITH TRACES OF GREEN
525	541	LITE GREY SANDSTONE
541	542	CLAY WITH GREY GUMBO
542	545	LITE GREY SANDSTONE WITH STREAKS OF GREY CLAY
545	567	LITE GREY SANDSTONE WITH STREAKS OF BLACK SHALE
567	575	LITE GREY SANDSTONE WITH STREAKS OF BLACK SHALE (FRACTURED) LOST APPROX. 600 GAL FLUID AND GAINED IT BACK
575	580	LITE GREY SANDSTONE WITH BLACK SHALE AND TRACES OF CLAY
580	604	LITE GREY SANDSTONE WITH BLACK AND GREEN SHALE, TRACES OF CLAY
604	606	LITE GREEN SHALE WITH BLACK AND GREY STREAKS
606	619	GREEN AND BLAKC SHALE WITH CLAY STREAKS
619	623	HARD BLACK SHALE
623	665	BLACK SHALE WITH CLAY STREAKS
665	685	GREY CLAY WITH STREAKS OF BLACK SHALE
685	698	GREY CLAY WITH STREAKS OF BLACK SHALE
698	705	SHALE - BLACK AND HARD WITH SOME CLAY
705	712	GREY CLAY AND BLACK SHALE
712	715	BLACK SHALE WITH TRACES OF GREY CLAY
715	725	BLACK SHALE
725	726	BLACK TO DARK GREY CLAY WITH BLACK SHALE
726	749	BLACK SHALE WITH TRACES OF CLAY
749	754	GREY SHALE WITH TRACES OF CLAY
754	765	BLACK SANDSTONE WITH TRACES OF WHITE (VERY HARD)
765	767	GREY CLAY, LITE IN COLOR WITH TRACES OF BLACK SHALE
767	785	HARD BLACK SHALE
785	787	GRAY CLAY LITE IN COLOR
787	790	REDDISH BROWN LIMEWTONE, BROWN SHALE
790	800	BLACK SHALE WITH LITE GREY CLAY STREAKS
800	820	BLACK SHALE WITH LITE GREY CLAY STREAKS
820	842	GREY SANDSTONE WITH STREAKS, BLACK SHALE AND GREY CLAY STREAKS
842	866	BLACK SHALE AND GREY SHALE, TRACES OF GREY CLAY
866	883	GREY STREAKED SHALE WITH LITE GREEN AND BLACK LOST APPROX. 350 TO 400 FLUID AT 860'
883	890	BLACK SHALE AND GREY SHALE, TRACES OF GREY CLAY
890	1012	GREY AND BLACK SHALE WITH STREAKS OF GREY CLAY
1012	1013	BLACK SHALE, AND DARK BROWN CLAY WITH TRACES OF RED GREEN SHALE
1013	1014	MOSTLY GREEN SHALE WITH TRACES OF RED SHALE AND GREY AND BROWN CLAY
1014	1015	RUSTY BROWN CLAY WITH BLACK AND GREEN SHALE
1015	1050	LITE BROWN CLAY
1050	1055	GREEN SHALE WITH LITE BROWN CLAY STREAKS
1055	1058	GREEN SHALE WITH RUST COLORED ROCK STREAKS AND GREY CLAY
1058	1065	GREEN SHALE WITH REDDISH ORANGE SHALE AND GREY CLAY STREAKS
1065	1075	GREEN SHALE AND TRACES OF RUST COLORED ROCK AND LITE BROWN CLAY
1075	1088	GREEN AND BROWN SHALE WITH TAN CLAY STREAKS
1088	1095	BLACK SHALE WITH GREY CLAY
1095	1100	GREEN SHALE WITH CLAY
1100	1105	GREEN AND BLACK SHALE, VERY LITTLE TRACES OF RUSTY RED
1105	1124	BLACK SHALE, WITH TRACES OF GREEN
1124	1127	LITE BROWN CLAY
1127	1130	BLACK GREEN SHALE WITH GREY, LITE BROWN CLAY AND TRACES OF RED SHALE
1130	1176	GREY CLAY WITH TRACES OF BLACK SHALE
1176	1201	GREEN AND BLACK SHALE WITH TRACES OF GREY CLAY AND GREY SHALE
1201	1217	GREY CLAY GUMBO
1217	1224	GREEN SHALE WITH GREY CLAY STREAKS AND TRACES OF SANDSTONE
1224	1242	GREY SANDSTONE WELL BEGINS TO FLOW
1242	1272	GREEN AND BLACK SOFT SHALE
1272	1278	GREEN AND GREY HARD SHALE



INSTALLED K-PACKER ON TOP OF CASING/SCREEN STRING @ 1153-FT

WELL LOGGED BY PEIDMONT ENGINEERING

TOTAL DEPTH OF BOREHOLE: 1278-FT

6-IN CASING INSTALLED TO 1264-FT BGS

LAZY J South – Sec 5, T7S R4E
DEQ Reference: EQ 05-1822

RECEIVED
FEB 06 2006
SUBDIVISIONS

WELL CONSTRUCTION SCHEMATIC

GALLATIN COUNTY, MONTANA

LAZY J SOUTH SUBDIVISION, BOSTWICK PROPERTIES

BEI
CIVIL and STRUCTURAL ENGINEERING
LAND SURVEYING
PROJECT MANAGEMENT
BRIDGER ENGINEERS, INC.
2150 ANALYSIS DRIVE
BOZEMAN, MONTANA 59718
Ph# (406) 585-0590
Fax# (406) 582-1057

DATE: 1/31/06

FIG 4

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

Site Name: LAZY J WATER SYSTEMS #2
GWIC Id: 227731

Section 1: Well Owner(s)

1) TAYLOR, JAMES (MAIL)
1045 REEVES RD E SUITE C
BOZEMAN MT 59718 [07/22/2006]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	5	SE¼ NE¼ NW¼

County
GALLATIN

Geocode

Latitude	Longitude	Geomethod	Datum
45.2507	-111.2614	NAV-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
LAZY J SOUTH		

Section 3: Proposed Use of Water

COMMERCIAL (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Saturday, July 22, 2006

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	70	14
70	989	12
989	1325	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	950	8.8	0.280		THREAD AND COLLAR	A53B STEEL
912	1207	5.5	0.250		WELDED	A53B STEEL
1287	1302	5.5	0.250		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1207	1287	5.5		.040	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	989	CEMENT	

Section 7: Well Test Data

Total Depth: 1325
Static Water Level:
Closed-in Pressure: 160 psi
Water Temperature: 8.89 °C

Artesian/Flow Test *

14 gpm for _ hours.
Flow controlled by VALVE .

** 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	TOP SOIL
3	6	SILTY CLAY
6	18	SILTY CLAY & GRAVELS
18	30	FINE SAND & GRAVELS
30	45	FINE SAND & GRAVELS W/ CLAY STREAKS
45	60	FINE SAND & GRAVELS W/SHALE
60	78	SHALE W/ STREAKS GRAVEL
78	89	GRAY SHALE W/ STREAKS GRAY CLAY
89	204	BLACK SHALE W/STREAKS GRAY CLAY
204	277	BLACK FRACTURED SHALE
277	350	BLACK SHALE W/ STREAKS CLAY
350	541	BLACK SHALE
541	572	GREEN & GRAY STREAKED SHALE
572	582	BLACK & BROWN FRACTURED ROCK
582	592	GREEN & GRAY STREAKED SANDSTONE

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: RED TIGER DRILLING
License No: WWC-598
Date Completed: 7/22/2006

Site Name: LAZY J WATER SYSTEMS #2
GWIC Id: 227731
Additional Lithology Records

From	To	Description
592	596	GRAY SANDSTONE W/ TRACES GRAY CLAY
596	634	GRAY SANDTONE
634	654	GRAY SANDTONE W/TRACES GRAY CLAY
654	742	BLACK & GRAY SHALE W/TRACES CLAY
742	748	GRAY SHALE W/CLAY STREAKS
748	754	GRAY & BLACK SHALE W/TRACES GRAY CLAY
754	870	GRAY SHALE
870	890	BLACK SHALE W/ STREAKS CLAY
890	911	BLACK SHALE W/TRACES CLAY & QUARTZ
911	918	GRAY & BLACK SHALE W/TRACES CLAY
918	942	GRAY SANDSTONE W/TRACES GRAY CLAY
942	998	DARK GRAY CLAY W/TRACES BLACK SHALE
998	1003	GRAY CLAY W/BLACK STREAKS SHALE
1003	1016	GRAY CLAY W/BLACK GRAY & GREEN SHALE
1016	1036	GRAY SANDSTONE
1036	1070	RED & BROWN ROCK W/STREAKS CLAY
1070	1078	RED SHALE W/STREAKS GRAY SHALE
1078	1094	RED GRAY & BLACK SHALE
1094	1112	BLACK & GRAY STREAKED SHALE
1112	1124	GREEN SHALE W /GRAY CLAY STREAKS
1124	1143	DARK GREEN & BLACK SHALE W/ STREAKS TAN CLAY
1143	1182	GREEN & BLACK SHALE W/ STREAKS GRAY CLAY
1182	1188	GRAY CLAY W/ STREAKS LITE GREEN SHALE
1188	1201	LITE GREEN -DARK GREEN SHALE W/ TRACES GRAY CLAY
1201	1214	GREEN & BLACK SHALE W/TRACES GRAY CLAY
1214	1226	ROUNDED 3/8" BLACK SHALE W/ TRACES GRAY CLAY
1226	1231	BLACK GRAY & GREEN SHALE
1231	1235	HARD GRAY SANDSTONE
1235	1240	RED GREEN & BLACK SHALE W/TRACES GRAY CLAY
1240	1274	BLACK & GRAY SHALE W/ TRACES LIMESTONE
1274	1304	GRAY SHALE W/ LITE GRAY CLAY STREAKS
1304	1325	FRACTURED GRAY & BLACK STREAKED SHALE TRACES GRAY CLAY

MONTANA WELL LOG REPORT

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Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site
View water quality for this site
View scanned well log (2/25/2008 2:48:44 PM)

Site Name: SCENIC LAND DEVELOPMENT [RAMSHORN PWS WELL]
GWIC Id: 165682

Section 1: Well Owner(s)

1) RAMSHORN SUBDIVISION HOA (MAIL)
PO BOX 161164
BIG SKY MT 59716 [08/04/2010]
2) SCENIC LAND DEVELOPMENT (MAIL)
PO BOX 160085
BIG SKY MT 59716 [05/18/1994]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	SE¼ NW¼ SE¼ NE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.24144864	-111.2542	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6060.12	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6062.5	SUR-GPS	NAVD88	8/4/2010 5:05:00 PM

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, May 18, 1994

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	40	12
40	1490	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	1450	6	0.250		WELDED	STEEL
0	40	8	0.25		WELDED	STEEL
0	20	12	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1450	1490	6			OPEN HOLE

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	1450	CEMENT	

Section 7: Well Test Data

Total Depth: 1490
Static Water Level: -23.1
Closed-in Pressure: 10 psi
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
120 gpm pump rate with _ feet of drawdown after 24 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 600 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

217KOTN - KOOTENAI FORMATION
221MRSN - MORRISON FORMATION

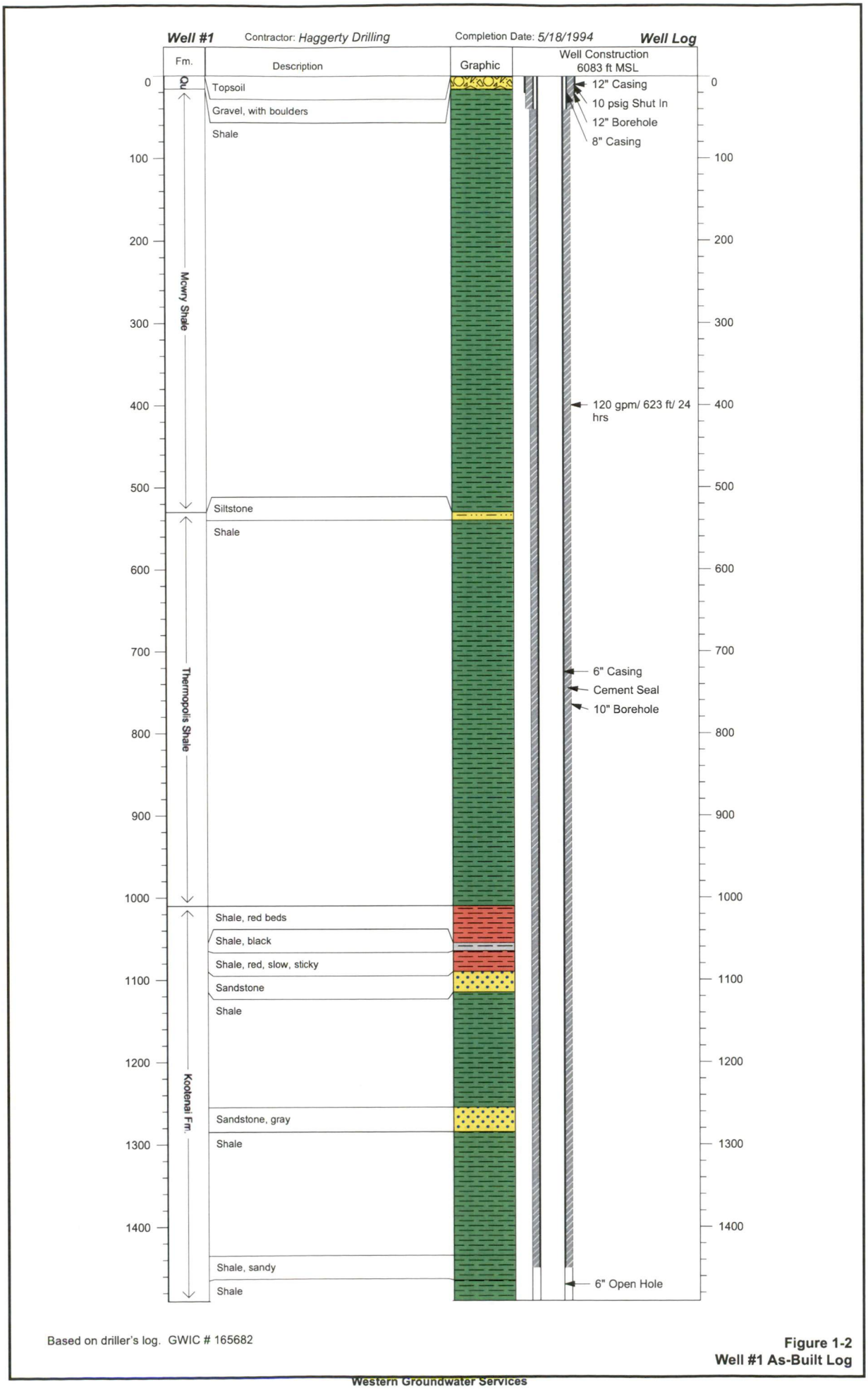
From	To	Description
0	1	TOPSOIL
1	16	GRAVEL & BOULDERS
16	530	SHALE
530	540	SILTSTONE
540	1010	SHALE
1010	1055	RED BEDS SHALE
1055	1065	BLACK SHALE
1065	1090	RED SHALE SLOW STICKY
1090	1115	SANDSTONE
1115	1255	SHALE
1255	1285	GRAY SANDSTONE
1285	1435	SHALE
1435	1465	SANDY SHALE
1465	1490	SHALE

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: KEVIN HAGGERTY
Company: HAGGERTY DRILLING
License No: WWC-353
Date Completed: 5/18/1994

Ramshorn Well 1 Specs - from 2012 Well 2 Evaluation Report



Based on driller's log. GWIC # 165682

Figure 1-2
Well #1 As-Built Log

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

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View hydrograph for this site
View field visits for this site
View water quality for this site
View scanned well log (9/8/2011 2:00:17 PM)

Site Name: RAMSHORN SUBDIVISION HOA * UNUSED
GWIC Id: 257253

Section 1: Well Owner(s)

1) RAMSHORN SUBDIVISION HOA (MAIL)
PO BOX 161164
BIG SKY MT 59716 [07/29/2010]
2) HOMELANDS DEVELOPMENT CO US (MAIL)
1 RIVER VIEW LANE
GALLATIN GATEWAY MT 59730 [11/25/1999]

Section 2: Location

Township	Range	Section	Quarter Sections
07S	04E	8	NW¼ NW¼ SE¼ NE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
45.24192135	-111.2544534	SUR-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date
6061.92	SUR-GPS	NAVD88	10/30/2020

Measuring Point Altitude	MP Method	Datum	Date Applies
6062.95	SUR-GPS	NAVD88	7/29/2010 10:50:00 AM

Addition: **Block:** **Lot:**

Section 3: Proposed Use of Water

UNUSED (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, November 25, 1999

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	300	12
300	1320	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-3	720	8	0.322		WELDED	STEEL
704	1293	4	0.322		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1292	1312	4		30	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	300	BENTONITE	
300	705	K PACKER	
705	1060	FORMATION PACKER	

Section 7: Well Test Data

Total Depth: 1320
Static Water Level: 9
Water Temperature:

Pump Test *

Depth pump set for test 493 feet.
120 gpm pump rate with 384 feet of drawdown after 24 hours of pumping.
Time of recovery 12 hours.
Recovery water level 31 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

TD REPORTED FROM RAMSHORN RESIDENT.

Section 9: Well Log

Geologic Source

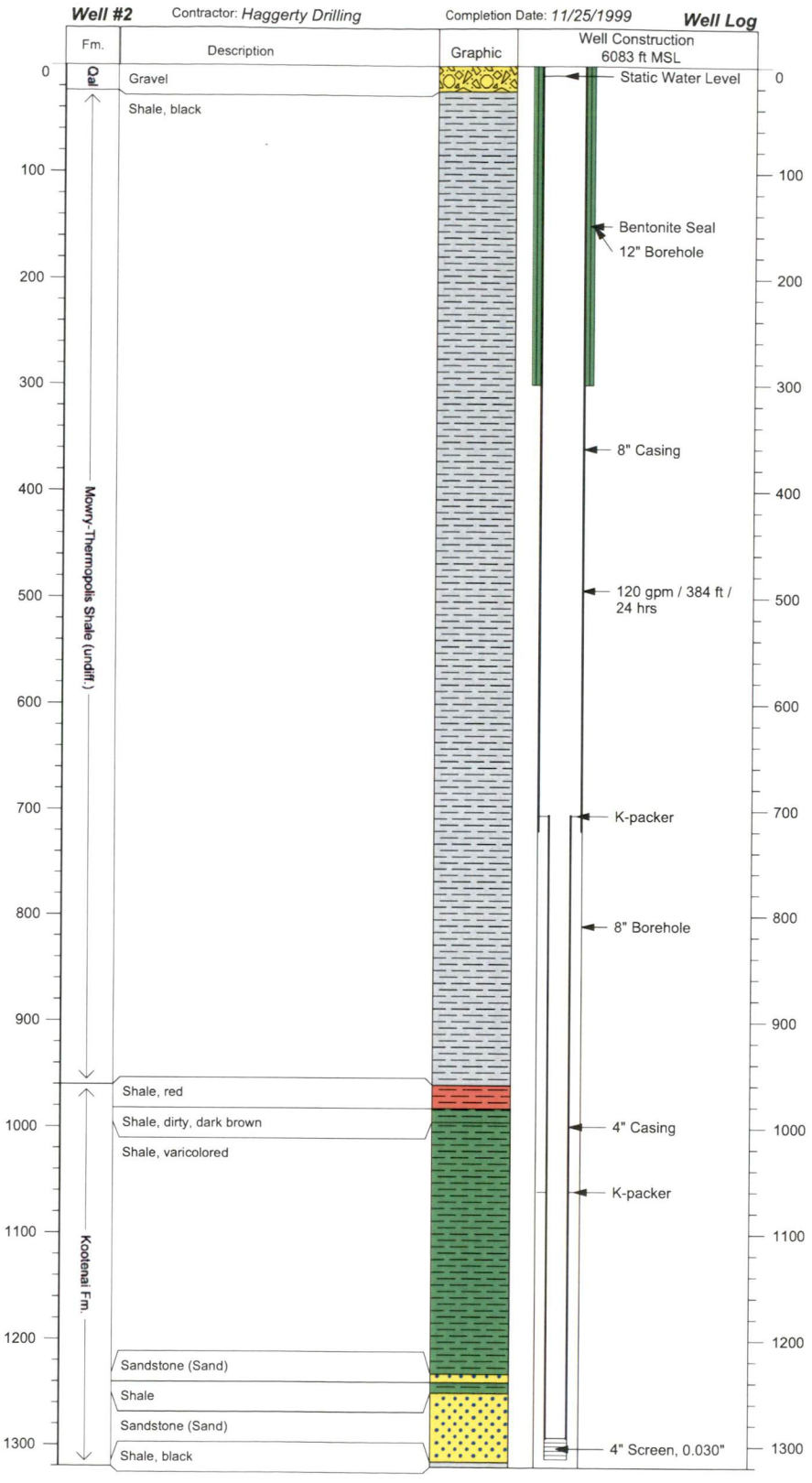
217KOTN - KOOTENAI FORMATION

From	To	Description
0	24	GRAVEL
24	960	BLACK SHALE
960	982	RED SHALE
982	995	DIRTY DARK BROWN SHALE
995	1232	MULTICOLORED SHALE
1232	1240	SAND
1240	1250	SHALE
1250	1315	SAND
1315	1320	BLACK SHALE

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: KEVIN HAGGERTY
Company: KEVIN HAGGERTY DRILLING INC
License No: WWC-353
Date Completed: 11/25/1999



Based on driller's log. GWIC # 257253

Figure 1-3
Well #2 As-Built Log

APPENDIX I

ALTERNATIVE COST ESTIMATES

Engineers Opinion of Probable Costs (Class 4 AACE, -30% / +50% OPC RANGE)

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 10, 2025

Description: **Gallatin Canyon Water System PER - Source Alternative Existing Wells**

Item Number	Description	Quantity	Unit	Unit Price	Total
UPGRADE EXISTING LAZY J WELLS					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 10,000.00	$ 10,000.00
1A.2	LJS Well 2 - Pull Existing Pump, Drop Pipe, Pitless Unit	1	EA	$ 6,000.00	$ 6,000.00
1A.3	LJS Well 2 - Install New Pump, Drop Pipe	1	EA	$ 60,000.00	$ 60,000.00
1A.4	New Pitless Unit	1	EA	$ 10,000.00	$ 10,000.00
1A.5	Well Electrical	1	EA	$ 10,000.00	$ 10,000.00
1A.6	72-HR Well Yield/Aquifer Testing	1	EA	$ 25,000.00	$ 25,000.00
1A.7	6" Water Main Well Manifold	215	LF	$ 110.00	$ 23,650.00
1A.8	4" Well Lead/Connection Piping & Valves	2	EA	$ 5,000.00	$ 10,000.00
1A.9	Site Clearing	1	LS	$ 1,700.00	$ 1,700.00
1A.10	Surface Restoration & Seeding	235	LF	$ 4.00	$ 940.00
				CONSTRUCTION SUBTOTAL	$ 157,290.00
NON-CONSTRUCTION ITEMS					
	Design Engineering (12%)				$ 19,000.00
	Construction Engineering (12%)				$ 19,000.00
	Legal/Admin (5%)				$ 8,000.00
	Construction Contingency (25%)				$ 40,000.00
				NON-CONSTRUCTION SUBTOTAL	$ 86,000.00
ALTERNATIVE ANNUALIZED O&M					
	Well/Pump Maintenance Labor & Parts	2	EA	$ 2,500.00	$ 5,000.00
	Well Pump Replacement (20-YR Life)	2	EA	$ 3,800.00	$ 7,600.00
	New Water Main Maintenance	235	LF	$ 1.50	$ 352.50
				O&M SUBTOTAL	$ 12,952.50
				ALTERNATIVE TOTAL	$ 256,242.50
UPGRADE EXISTING RAMSHORN WELLS					
CONSTRUCTION ITEMS					
1B.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 21,000.00	$ 21,000.00
1B.2	Ramshorn Wells 1 & 2 - Pull Existing Pump, Drop Pipe, Pitless Unit	2	EA	$ 6,000.00	$ 12,000.00
1B.3	Ramshorn Wells 1 & 2 - Install New Pump, Drop Pipe	2	EA	$ 60,000.00	$ 120,000.00
1B.4	New Pitless Unit	2	EA	$ 10,000.00	$ 20,000.00
1B.5	Well Electrical	2	EA	$ 10,000.00	$ 20,000.00
1B.6	72-HR Well Yield/Aquifer Testing	2	EA	$ 25,000.00	$ 50,000.00
1B.7	6" Water Main Well Manifold	800	LF	$ 110.00	$ 88,000.00
1B.8	4" Well Lead/Connection Piping & Valves	2	EA	$ 5,000.00	$ 10,000.00
1B.9	Site Clearing	1	LS	$ 4,900.00	$ 4,900.00
1B.10	Surface Restoration & Seeding	820	LF	$ 4.00	$ 3,280.00
				CONSTRUCTION SUBTOTAL	$ 349,180
NON-CONSTRUCTION ITEMS					
	Design Engineering (12%)				$ 42,000.00
	Construction Engineering (12%)				$ 42,000.00
	Legal/Admin (5%)				$ 18,000.00
	Construction Contingency (25%)				$ 88,000.00
				NON-CONSTRUCTION SUBTOTAL	$ 190,000.00
ALTERNATIVE ANNUALIZED O&M					
	Well/Pump Maintenance Labor & Parts	2	EA	$ 2,500.00	$ 5,000.00
	Well/Pump Replacement (20-YR Life)	2	EA	$ 3,800.00	$ 7,600.00
	New Water Main Maintenance	820	LF	$ 1.50	$ 1,230.00
				O&M SUBTOTAL	$ 13,830
				ALTERNATIVE TOTAL	$ 553,010.00
RAMSHORN WELLS TO LAZY J WELLS TRANSMISSION (REQ'D WITH ONE COMBINED SYSTEM ALTERNATIVE USING BOTH WELL FIELDS)					
CONSTRUCTION ITEMS					
1C.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 39,000.00	$ 39,000.00
1C.2	6" Transmission Main Ramshorn Wells to Lazy J Well Manifold	4600	LF	$ 110.00	$ 506,000.00
1C.3	Gravel Road Surface Repair/Patching	465	LF	$ 25.00	$ 11,625.00
1C.4	Asphalt Pavement Replacement	775	LF	$ 60.00	$ 46,500.00
1C.5	Site Clearing	1	LS	$ 15,200.00	$ 15,200.00
1C.6	Surface Restoration & Seeding	3350	LF	$ 4.00	$ 13,400.00
				CONSTRUCTION SUBTOTAL	$ 631,725.00
NON-CONSTRUCTION ITEMS					
	Design Engineering (12%)				$ 76,000.00
	Construction Engineering (12%)				$ 76,000.00
	Legal/Admin (5%)				$ 32,000.00
	Construction Contingency (25%)				$ 158,000.00
	Permanent Pipeline and Access Easement	75900	SF	$ 5.00	$ 379,500.00
				NON-CONSTRUCTION SUBTOTAL	$ 721,500.00
ALTERNATIVE ANNUALIZED O&M					
	New Water Main Maintenance	4600	LF	$ 1.50	$ 6,900.00
				O&M SUBTOTAL	$ 6,900
				ALTERNATIVE TOTAL	$ 1,360,125.00
COMMON SYSTEM ANNUALIZED O&M					
	Energy Cost (Electrical)	12	Months	$ 3,000.00	$ 36,000.00
	Well WQ Sampling & Testing	1	LS	$ 5,000.00	$ 5,000.00
				SUBTOTAL	$ 41,000
				TOTAL - LAZY J WELL UPGRADES (1 OR 2 DISTRIBUTION SYSTEMS)	**$ 297,243**
				TOTAL - RAMSORN WELL UPGRADES (1 DISTRIBUTION SYSTEM)	**$ 1,954,135**
				TOTAL - RAMSORN WELL UPGRADES (2 DISTRIBUTION SYSTEMS)	**$ 594,010**

Engineers Opinion of Probable Costs (Class 4 AACE, -30% / +50% OPC RANGE)

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 10, 2025

Description: **Gallatin Canyon Water System PER - Source Alternative New Wells**

Item Number	Description	Quantity	Unit	Unit Price	Total
ADDITION OF NEW WELLS - LAZY J WELLFIELD					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 72,000.00	$ 72,000.00
1.1	New Well Construction (174 GPM, 1,300' depth)	2	EA	$ 475,000.00	$ 950,000.00
1.4	Well Electrical	2	EA	$ 10,000.00	$ 20,000.00
1.5	72-HR Well Yield/Drawdown Testing	2	EA	$ 25,000.00	$ 50,000.00
	6" Water Main Well Manifold	645	LF	$ 110.00	$ 70,950.00
	4" Well Lead/Connection Piping & Valves	2	EA	$ 5,000.00	$ 10,000.00
	Site Clearing	1	LS	$ 4,000.00	$ 4,000.00
	Surface Restoration & Seeding	665	LF	$ 4.00	$ 2,660.00
				SUBTOTAL	$ 1,179,610.00
NON-CONSTRUCTION ITEMS					
	DNRC Water Rights Change Application Process to Secure/Combine Water Rights				$ 300,000.00
	Hydrogeologic Study For Well Siting				$ 50,000.00
	Well DEQ Permitting				$ 24,000.00
	Design Engineering (10%)				$ 118,000.00
	Construction Engineering (12%)				$ 142,000.00
	Legal/Admin (2.5%)				$ 30,000.00
	Construction Contingency (25%)				$ 295,000.00
	Permanent Pipeline & Access Easement	17000	SF	$ 5.00	$ 85,000.00
				SUBTOTAL	$ 1,044,000.00
ALTERNATIVE ANNUALIZED O&M					
	Well/Pump Maintenance Labor & Parts	2	EA	$ 2,500.00	$ 5,000.00
	Pump Maintenance/Replacement (20-YR Life)	2	EA	$ 3,800.00	$ 7,600.00
	Energy Cost (Electrical)	12	Months	$ 3,000.00	$ 36,000.00
	New Water Main Maintenance	665	LF	$ 1.50	$ 997.50
	Well WQ Sampling & Testing	1	LS	$ 5,000.00	$ 5,000.00
				SUBTOTAL	$ 54,597.50
				ALTERNATIVE TOTAL	$ 2,278,207.50
NEW WELL/PUMP CONTROL HOUSE					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 46,000.00	$ 46,000.00
	Site Preparation and Building Grading	1	LS	$ 45,000.00	$ 45,000.00
2.1	Well/Pump Control Building	480	SF	$ 355.00	$ 170,400.00
2.2	Building Foundation	1	LS	$ 40,000.00	$ 40,000.00
	Building Process Piping/Plumbing	1	LS	$ 65,000.00	$ 65,000.00
2.3	Building Process Monitoring/Control Equipment	1	LS	$ 45,000.00	$ 45,000.00
2.4	Building Mechanical	1	LS	$ 15,000.00	$ 15,000.00
2.5	Building Electrical	1	LS	$ 50,000.00	$ 50,000.00
	Power/Control Wiring Distribution - Building to Wells	900	LF	$ 85.00	$ 76,500.00
	Emergency Generator with Automatic Transfer Switch	1	LS	$ 100,000.00	$ 100,000.00
2.6	New SCADA System	1	LS	$ 100,000.00	$ 100,000.00
				SUBTOTAL	$ 752,900.00
NON-CONSTRUCTION ITEMS					
	Utility Lot Expansion Purchase	4750	SF	$ 20.00	$ 95,000.00
	Plat Amendment - Survey & C.O.S. to Amend Existing Utility Lot				$ 20,000.00
	Design Engineering (MEP & Civil - 25%)				$ 189,000.00
	Architectural Design (25% of Building Only)				$ 43,000.00
	Construction Engineering (12%)				$ 91,000.00
	Legal/Admin (5%)				$ 38,000.00
	Construction Contingency (25%)				$ 189,000.00
				SUBTOTAL	$ 665,000.00
ALTERNATIVE ANNUALIZED O&M					
	Pump Control Building/Systems O, M & R (50-YR Life)	1	LS	$ 12,000.00	$ 12,000.00
	Well/Pump Control Building Energy Cost (Not Incl. Pump Running Power)	1	LS	$ 3,000.00	$ 3,000.00
	Consumables (Instruments, bulbs, filters, fuses, etc.)	1	LS	$ 3,000.00	$ 3,000.00
				SUBTOTAL	$ 18,000
				ALTERNATIVE TOTAL	$ 1,435,900.00
TOTAL - ADDITION OF NEW WELLS - LAZY J WELL FIELD W/ NEW CONTROL BLDG (1 OR 2 DISTRIBUTION SYSTEMS)					**$ 3,714,108**
TOTAL - ADDITION OF NEW WELLS - LAZY J WELL FIELD NO NEW CONTROL BLDG (1 OR 2 DISTRIBUTION SYSTEMS)					**$ 2,278,207.50**

Engineers Opinion of Probable Costs (Class 4 AACE, -30% / +50% OPC RANGE)

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 10, 2025

Description: **Gallatin Canyon Water System PER - Storage Alternative Existing Tanks**

Item Number	Description	Quantity	Unit	Unit Price	Total
EXISTING BOLTED STEEL GROUND TANK					
COMMON CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 4,000.00	$ 4,000.00
1.1	Install Tank Mixer	1	EA	$ 50,000.00	$ 50,000.00
				SUBTOTAL	$ 54,000.00
COMMON NON-CONSTRUCTION ITEMS					
	Design Engineering (12%)				$ 6,000.00
	Construction Engineering (12%)				$ 6,000.00
	Legal/Admin (2.5%)				$ 2,000.00
	Construction Contingency (25%)				$ 14,000.00
				SUBTOTAL	$ 28,000.00
ALTERNATIVE ANNUALIZED O&M (EXISTING LAZY J TANK)					
	Annualized Routine Inspection and Maintenance (5-Year Cycle, 40-Year Life)	1	LS	$ 1,000.00	$ 1,000.00
	Annualized Tank Replacement Cost (20-Years Remaining - Same Size)	1	LS	$ 30,475.00	$ 30,475.00
				SUBTOTAL	$ 31,475.00
ALTERNATIVE ANNUALIZED O&M (EXISTING RAMSHORN TANK)					
	Annualized Routine Inspection and Maintenance (5-Year Cycle, 40-Year Life)	1	LS	$ 1,000.00	$ 1,000.00
	Annualized Tank Replacement Cost (20-Years Remaining - Same Size)	1	LS	$ 22,100.00	$ 22,100.00
				SUBTOTAL	$ 23,100.00
	TOTAL - UTILIZE EXISTING LAZY J GROUND TANK (1 OR 2 DISTRIBUTION SYSTEMS)				**$ 113,475**
	TOTAL - UTILIZE EXISTING RAMSHORN GROUND TANK (2 DISTRIBUTION SYSTEMS)				**$ 105,100**

Engineers Opinion of Probable Costs (Class 4 AACE, -30% / +50% OPC RANGE)

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 10, 2025

Description: **Gallatin Canyon Water System PER - Storage Alternative New Tanks**

Item Number	Description	Quantity	Unit	Unit Price	Total
NEW BOLTED STEEL GROUND TANK					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	LS	$ 44,000.00	$ 44,000.00
1.1	Construct/Erect Tank (665,000 - 65.5' Diameter)	1	EA	$ 665,000.00	$ 665,000.00
				SUBTOTAL	$ 709,000.00
NON-CONSTRUCTION ITEMS					
	Construction Contingency (20%)				$ 142,000.00
				SUBTOTAL	$ 142,000.00
ALTERNATIVE ANNUALIZED O&M					
	Gasket Repair/Replacement	1	LS	$ 1,000.00	$ 1,000.00
	Tank Replacement (40-Year Life)	1	LS	$ 17,725.00	$ 17,725.00
				SUBTOTAL	$ 18,725.00
				ALTERNATIVE TOTAL	$ 869,725.00
NEW WELDED STEEL GROUND TANK					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	LS	$ 44,000.00	$ 44,000.00
2.1	Construct/Erect Tank (665,000 - 65.5' Diameter)	1	LS	$ 1,247,000.00	$ 1,247,000.00
				SUBTOTAL	$ 1,291,000
NON-CONSTRUCTION ITEMS					
	Construction Contingency (20%)				$ 259,000.00
				SUBTOTAL	$ 259,000.00
ALTERNATIVE ANNUALIZED O&M					
	Tank Coating Replacement	1	LS	$ 20,000.00	$ 20,000.00
	Tank Replacement (45-YR Life)	1	LS	$ 28,688.89	$ 28,688.89
				SUBTOTAL	$ 48,689
				ALTERNATIVE TOTAL	$ 1,598,688.89
NEW PRESTRESSED CONCRETE GROUND TANK					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	LS	$ 44,000.00	$ 44,000.00
2.1	Construct/Erect Tank (665,000 - 65.5' Diameter)	1	LS	$ 1,450,000.00	$ 1,450,000.00
2.4					
				SUBTOTAL	$ 1,494,000.00
NON-CONSTRUCTION ITEMS					
	Construction Contingency (20%)				$ 299,000.00
				SUBTOTAL	$ 299,000.00
ALTERNATIVE ANNUALIZED O&M					
	Tank Coating Replacement	1	LS	$ -	$ -
	Tank Replacement (50-YR Life)	1	LS	$ 29,880.00	$ 29,880.00
				SUBTOTAL	$ 29,880
				ALTERNATIVE TOTAL	$ 1,822,880.00
COMMON CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	LS	$ 33,000.00	$ 33,000.00
	Site Preparation/Grading	500	CY	$ 55.00	$ 27,500.00
	Crushed Stone Leveling/Base Gravel	200	CY	$ 75.00	$ 15,000.00
	Geotextile Separation Fabric	710	SY	$ 14.00	$ 9,940.00
	Tank Foundation	1	LS	$ 85,000.00	$ 85,000.00
	Tank Piping & Appurtenances	1	LS	$ 85,000.00	$ 85,000.00
	Install Tank Mixer	1	LS	$ 50,000.00	$ 50,000.00
	6" Supply Main Extension/Connection to New Tank Piping	105	LF	$ 110.00	$ 11,550.00
	8" Distribution Main Extension/Connection to New Tank Piping	105	LF	$ 120.00	$ 12,600.00
	Altitude Valve Vault With Bypass	1	LS	$ 150,000.00	$ 150,000.00
	Tank Testing & Disinfection	1	LS	$ 50,000.00	$ 50,000.00
				SUBTOTAL	$ 529,590.00
COMMON NON-CONSTRUCTION ITEMS					
	Utility Lot Expansion Purchase	11965	SF	$ 20.00	$ 239,300.00
	Plat Amendment - Survey & C.O.S. to Amend Existing Utility Lot	1	LS	$ 20,000.00	$ 20,000.00
	Design Engineering (12%)				$ 182,000.00
	Construction Engineering (12%)				$ 182,000.00
	Legal/Admin (5%)				$ 36,000.00
	Common Construction Item Contingency (25%)	1	LS	$ 133,000.00	$ 133,000.00
				SUBTOTAL	$ 792,300.00
COMMON ANNUALIZED O&M					
	Routine Inspection & Maintenance	1	LS	$ 1,000.00	$ 1,000.00
	Altitude Valve/Actuators Repair/Replace	1	EA	$ 1,500.00	$ 1,500.00
				SUBTOTAL	$ 2,500
				COMMON ITEM TOTAL	$ 1,324,390.00
				TOTAL - BOLTED STEEL TANK	**$ 2,194,115**
				TOTAL - WELDED STEEL TANK	**$ 2,923,079**
				TOTAL - PRESTRESSED CONCRETE TANK	**$ 3,147,270**

Engineers Opinion of Probable Costs (Class 4 AACE, -30% / +50% OPC RANGE)

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 10, 2025

Description: **Gallatin Canyon Water System PER - Treatment Alternatives**

Item Number	Description	Quantity	Unit	Unit Price	Total
CENTRAL REVERSE OSMOSIS TREATMENT					
CONSTRUCTION ITEMS					
1A.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	LS	$ 71,000.00	$ 71,000.00
1.1	Two Redundant RO Skids	1	LS	$ 500,000.00	$ 500,000.00
	Install Mechanical/Process Pipe Gallery	1	LS	$ 300,000.00	$ 300,000.00
	8" Sanitary Sewer Main Extension (Concentrate Collection/Disposal)	800	LF	$ 85.00	$ 68,000.00
	Sanitary Sewer Manhole	4	EA	$ 5,000.00	$ 20,000.00
	Asphalt Pavement Repair/Patching	600	LF	$ 60.00	$ 36,000.00
	Additional Control Building Area to House Skids/Piping	456	SF	$ 355.00	$ 161,880.00
				SUBTOTAL	$ 1,156,880.00
NON-CONSTRUCTION ITEMS					
	Construction Contingency (25%)	1	LS	$ 290,000.00	$ 290,000.00
	Design Engineering (12%)	1		$ 139,000.00	$ 139,000.00
	Construction Engineering (12%)	1		$ 139,000.00	$ 139,000.00
	Legal/Admin (5%)	1		$ 24,000.00	$ 24,000.00
	Additional Utility Lot Area Purchase	1045	SF	$20.00	$ 20,900.00
				SUBTOTAL	$ 612,900.00
ANNUALIZED O&M					
	Membrane Replacement (5-Year Life)	1	LS	$ 2,500.00	$ 2,500.00
	Membrane Cleaning Chemicals	1	LS	$ 6,000.00	$ 6,000.00
	RO Energy Cost (Electrical)	1	LS	$ 13,200.00	$ 13,200.00
				SUBTOTAL	$ 21,700.00
				ALTERNATIVE TOTAL	$ 1,791,480.00
HOUSEHOLD (POU) REVERSE OSMOSIS TREATMENT					
CONSTRUCTION ITEMS (PROVIDED MATERIAL ONLY AT COST)					
1.1	Provide POU To Customers (+/- 116 Existing Residences)	116	LS	$ 3,000.00	$ 348,000.00
				SUBTOTAL	$ 348,000.00
NON-CONSTRUCTION ITEMS					
	Construction Contingency (N/A)	1	LS	$ -	$ -
	Design Engineering (N/A)	1		$ -	$ -
	Construction Engineering (N/A)	1		$ -	$ -
	Legal/Admin (N/A)	1		$ -	$ -
				SUBTOTAL	$ -
ANNUALIZED O&M					
	O&M - Homeowner Responsibility (N/A)	1	LS	$ -	$ -
				SUBTOTAL	$ -
				ALTERNATIVE TOTAL	$ 348,000.00

Engineers Opinion of Probable Costs (Class 4 AACE, -30% / +50% OPC RANGE)

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 10, 2025

Description: **Gallatin Canyon Water System PER - Distribution Alternatives**

Item Number	Description	Quantity	Unit	Unit Price	Total
SINGLE COMBINED DISTRIBUTION SYSTEM (With South Loop)					
CONSTRUCTION ITEMS					
1.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 458,000.00	$ 458,000.00
1.1	8" Water Main	16015	LF	$ 110.00	$ 1,761,650.00
	10" Water Main	11015	LF	$ 120.00	$ 1,321,800.00
1.4	8" Gate Valve w/ Valve Box	59	EA	$ 4,000.00	$ 236,000.00
	10" Gate Valve w/ Valve Box	41	EA	$ 4,500.00	$ 184,500.00
1.5	Connect to Existing Water Main	10	EA	$ 4,500.00	$ 45,000.00
	Jack & Bore Steel Casing (HWY 191 Crossing)	250	LF	$ 3,000.00	$ 750,000.00
	Fire Hydrant Assembly	53	EA	$ 6,000.00	$ 318,000.00
	6" Fire Hydrant Lead Incl. Auxillary Valve & Box	53	EA	$ 3,500.00	$ 185,500.00
	PRV Station Incl. Vault, Valves, Fittings, & Appurtenances	1	EA	$ 250,000.00	$ 250,000.00
	Water Service Extension (Incl. Saddle, Corp. Stop, & Curb Stop w/ Box)	489	EA	$ 2,500.00	$ 1,222,500.00
	Install New Water Meters at Existing Structures	255	EA	$ 1,500.00	$ 382,500.00
	Set New Water Meters for New Build Services	384	EA	$ 1,000.00	$ 384,000.00
	Temporary Water System	1	LS	$ 95,000.00	$ 95,000.00
	Site Clearing	1	LS	$ 61,700.00	$ 61,700.00
	Surface Restoration & Seeding	9470	LF	$ 4.00	$ 37,880.00
	Gravel Road Surface Repair/Patching	10050	LF	$ 25.00	$ 251,250.00
	Asphalt Pavement Replacement	7510	LF	$ 60.00	$ 450,600.00
				SUBTOTAL	$ 8,395,880.00
NON-CONSTRUCTION ITEMS					
	Design Engineering (8%)				$ 672,000.00
	Construction Engineering (9%)				$ 756,000.00
	Legal/Admin (1.5%)				$ 126,000.00
	Construction Contingency (25%)				$ 2,099,000.00
	Permanent Pipeline & Access Easement	131100	SF	$ 5.00	$ 655,500.00
				SUBTOTAL	$ 4,308,500.00
ALTERNATIVE ANNUALIZED O&M					
	Water Main Maintenance - Existing Mains	20680	LF	$ 2.00	$ 41,360.00
	Water Main Maintenance - New Mains	34627	LF	$ 1.00	$ 34,627.00
	PRV Valve/Actuators Repair Replace	1	EA	$ 2,500.00	$ 2,500.00
				SUBTOTAL	$ 78,487.00
				ALTERNATIVE TOTAL	$ 12,782,867.00
TWO SEPARATE DISTRIBUTION SYSTEMS (NORTH & SOUTH With South Loop)					
CONSTRUCTION ITEMS					
1.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 445,000.00	$ 445,000.00
1.1	8" Water Main	16011	LF	$ 110.00	$ 1,761,210.00
	10" Water Main	9682	LF	$ 120.00	$ 1,161,840.00
1.4	8" Gate Valve w/ Valve Box	59	EA	$ 4,000.00	$ 236,000.00
	10" Gate Valve w/ Valve Box	37	EA	$ 4,500.00	$ 166,500.00
1.5	Connect to Existing Water Main	8	EA	$ 4,500.00	$ 36,000.00
	Jack & Bore Steel Casing (HWY 191 Crossing)	250	LF	$ 3,000.00	$ 750,000.00
	Fire Hydrant Assembly	52	EA	$ 6,000.00	$ 312,000.00
	6" Fire Hydrant Lead Incl. Auxillary Valve & Box	52	EA	$ 3,500.00	$ 182,000.00
	PRV Station Incl. Vault, Valves, Fittings, & Appurtenances	1	EA	$ 250,000.00	$ 250,000.00
	Water Service Extension (Incl. Saddle, Corp. Stop, & Curb Stop w/ Box)	489	EA	$ 2,500.00	$ 1,222,500.00
	Install New Water Meters at Existing Structures	255	EA	$ 1,500.00	$ 382,500.00
	Set New Water Meters for New Build Services	384	EA	$ 1,000.00	$ 384,000.00
	Temporary Water System	1	LS	$ 95,000.00	$ 95,000.00
	Site Clearing	1	LS	$ 58,500.00	$ 58,500.00
	Surface Restoration & Seeding	8133	LF	$ 4.00	$ 32,532.00
	Gravel Road Surface Repair/Patching	10050	LF	$ 25.00	$ 251,250.00
	Asphalt Pavement Replacement	7510	LF	$ 60.00	$ 450,600.00
				SUBTOTAL	$ 8,177,432.00
NON-CONSTRUCTION ITEMS					
	Design Engineering (8%)				$ 655,000.00
	Construction Engineering (9%)				$ 736,000.00
	Legal/Admin (1.5%)				$ 123,000.00
	Construction Contingency (25%)				$ 2,045,000.00
	Permanent Pipeline & Access Easement	82000	SF	$ 5.00	$ 410,000.00
				SUBTOTAL	$ 3,969,000.00
ALTERNATIVE ANNUALIZED O&M					
	Water Main Maintenance - Existing Mains	20680	LF	$ 2.00	$ 41,360.00
	Water Main Maintenance - New Mains	33290	LF	$ 1.00	$ 33,290.00
	PRV Valve/Actuators Repair Replace	1	EA	$ 2,500.00	$ 2,500.00
				SUBTOTAL	$ 77,150
				ALTERNATIVE TOTAL	$ 12,223,582.00
SINGLE COMBINED DISTRIBUTION SYSTEM (12" Extension With No Loop)					
CONSTRUCTION ITEMS					
1.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 432,000.00	$ 432,000.00

1.1	8" Water Main	12715	LF	$ 110.00	$ 1,398,650.00
	10" Water Main	5629	LF	$ 120.00	$ 675,480.00
	12" Water Main	5386	LF	$ 130.00	$ 700,180.00
1.4	8" Gate Valve w/ Valve Box	47	EA	$ 4,000.00	$ 188,000.00
	10" Gate Valve w/ Valve Box	21	EA	$ 4,500.00	$ 94,500.00
	12" Gate Valve w/ Valve Box	20	EA	$ 5,000.00	$ 100,000.00
1.5	Connect to Existing Water Main	10	EA	$ 4,500.00	$ 45,000.00
	Jack & Bore Steel Casing (HWY 191 Crossing)	250	LF	$ 3,000.00	$ 750,000.00
	Fire Hydrant Assembly	48	EA	$ 6,000.00	$ 288,000.00
	6" Fire Hydrant Lead Incl. Auxillary Valve & Box	48	EA	$ 3,500.00	$ 168,000.00
	PRV Station Incl. Vault, Valves, Fittings, & Appurtenances	1	EA	$ 250,000.00	$ 250,000.00
	Water Service Extension (Incl. Saddle, Corp. Stop, & Curb Stop w/ Box)	489	EA	$ 2,500.00	$ 1,222,500.00
	Install New Water Meters at Existing Structures	255	EA	$ 1,500.00	$ 382,500.00
	Set New Water Meters for New Build Services	384	EA	$ 1,000.00	$ 384,000.00
	Temporary Water System	1	LS	$ 95,000.00	$ 95,000.00
	Site Clearing	1	LS	$ 41,500.00	$ 41,500.00
	Surface Restoration & Seeding	6170	LF	$ 4.00	$ 24,680.00
	Gravel Road Surface Repair/Patching	10050	LF	$ 25.00	$ 251,250.00
	Asphalt Pavement Replacement	7510	LF	$ 60.00	$ 450,600.00
				SUBTOTAL	$ 7,941,840.00
NON-CONSTRUCTION ITEMS					
	Design Engineering (8%)				$ 636,000.00
	Construction Engineering (9%)				$ 715,000.00
	Legal/Admin (1.5%)				$ 120,000.00
	Construction Contingency (25%)				$ 1,986,000.00
	Permanent Pipeline & Access Easement	131100	SF	$ 5.00	$ 655,500.00
				SUBTOTAL	$ 4,112,500.00
ALTERNATIVE ANNUALIZED O&M					
	Water Main Maintenance - Existing Mains	20680	LF	$ 2.00	$ 41,360.00
	Water Main Maintenance - New Mains	31327	LF	$ 1.00	$ 31,327.00
	PRV Valve/Actuators Repair Replace	1	EA	$ 2,500.00	$ 2,500.00
				SUBTOTAL	$ 75,187.00
				ALTERNATIVE TOTAL	$ 12,129,527.00
TWO SEPARATE DISTRIBUTION SYSTEMS (12" Extension With No Loop)					
CONSTRUCTION ITEMS					
1.1	General Conditions (Tax, Bonds, Insurance, Mobilization, SW Mgmt)	1	EA	$ 422,000.00	$ 422,000.00
1.1	8" Water Main	12711	LF	$ 110.00	$ 1,398,210.00
	10" Water Main	4296	LF	$ 120.00	$ 515,520.00
	12" Water Main	5386	LF	$ 130.00	$ 700,180.00
1.4	8" Gate Valve w/ Valve Box	47	EA	$ 4,000.00	$ 188,000.00
	10" Gate Valve w/ Valve Box	16	EA	$ 4,500.00	$ 72,000.00
	12" Gate Valve w/ Valve Box	20	EA	$ 5,000.00	$ 100,000.00
1.5	Connect to Existing Water Main	8	EA	$ 4,500.00	$ 36,000.00
	Jack & Bore Steel Casing (HWY 191 Crossing)	250	LF	$ 3,000.00	$ 750,000.00
	Fire Hydrant Assembly	52	EA	$ 6,000.00	$ 312,000.00
	6" Fire Hydrant Lead Incl. Auxillary Valve & Box	52	EA	$ 3,500.00	$ 182,000.00
	PRV Station Incl. Vault, Valves, Fittings, & Appurtenances	1	EA	$ 250,000.00	$ 250,000.00
	Water Service Extension (Incl. Saddle, Corp. Stop, & Curb Stop w/ Box)	489	EA	$ 2,500.00	$ 1,222,500.00
	Install New Water Meters at Existing Structures	255	EA	$ 1,500.00	$ 382,500.00
	Set New Water Meters for New Build Services	384	EA	$ 1,000.00	$ 384,000.00
	Temporary Water System	1	LS	$ 95,000.00	$ 95,000.00
	Site Clearing	1	LS	$ 38,300.00	$ 38,300.00
	Surface Restoration & Seeding	8133	LF	$ 4.00	$ 32,532.00
	Gravel Road Surface Repair/Patching	10050	LF	$ 25.00	$ 251,250.00
	Asphalt Pavement Replacement	7510	LF	$ 60.00	$ 450,600.00
				SUBTOTAL	$ 7,782,592.00
NON-CONSTRUCTION ITEMS					
	Design Engineering (8%)				$ 623,000.00
	Construction Engineering (9%)				$ 701,000.00
	Legal/Admin (1.5%)				$ 117,000.00
	Construction Contingency (25%)				$ 1,946,000.00
	Permanent Pipeline & Access Easement	82000	SF	$ 5.00	$ 410,000.00
				SUBTOTAL	$ 3,797,000.00
ALTERNATIVE ANNUALIZED O&M					
	Water Main Maintenance - Existing Mains	20680	LF	$ 2.00	$ 41,360.00
	Water Main Maintenance - New Mains	29990	LF	$ 1.00	$ 29,990.00
	PRV Valve/Actuators Repair Replace	1	EA	$ 2,500.00	$ 2,500.00
				SUBTOTAL	$ 73,850
				ALTERNATIVE TOTAL	$ 11,653,442.00
				SINGLE COMBINED SYSTEM (SOUTH LOOP)	**$ 12,782,867**
				SINGLE COMBINED SYSTEM (12" EXTENSION W/ NO LOOP)	**$ 12,129,527**
				TWO SEPARATE SYSTEMS (SOUTH LOOP)	**$ 12,223,582**
				TWO SEPARATE SYSTEMS (12" EXTENSION W/ NO LOOP)	**$ 11,653,442**

APPENDIX J

AE2S TECH MEMO – DISTRIBUTION SYSTEM MODELING

TECHNICAL MEMORANDUM

To: Shane Strong, PE, Senior Project Engineer

From: Donovan Voeller, PE, Lead Distribution & Collection System Modeling Services Specialist
Emily McKenzie, EIT

Re: **Gallatin Canyon Water System**

Date: May 28, 2025

BACKGROUND

Authorization, Scope & Model Assumptions

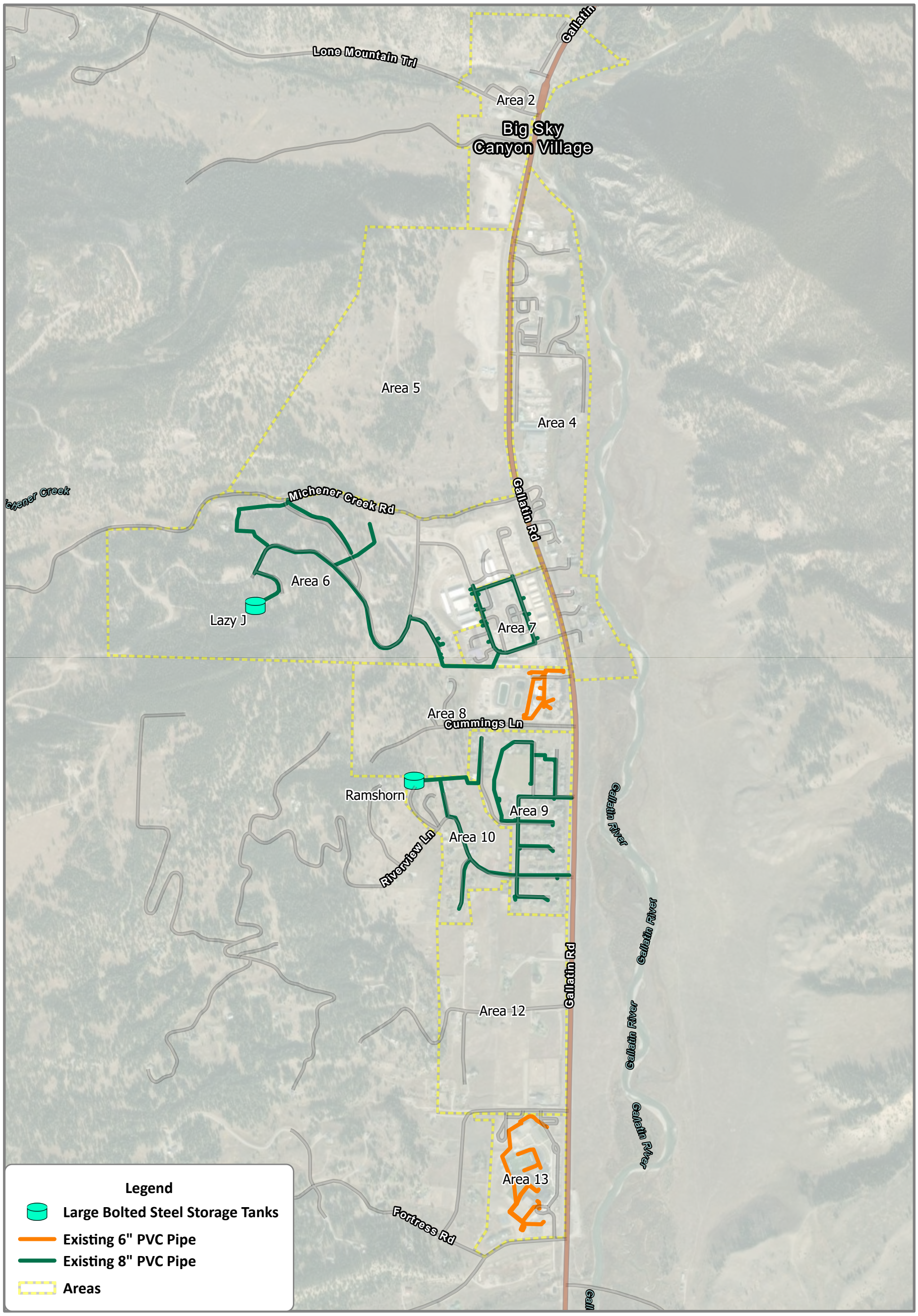
AE2S received a request from the WGM Group to develop a conceptual water distribution system for the Gallatin Canyon Water and Sewer District Preliminary Engineering Report. The project area consists of approximately 860 acres southeast of Big Sky, Montana in Gallatin County. The area currently encompasses three separate, small water systems which have their own supply, storage, and distribution facilities and are owned by the Lazy J Public Utility District (PUD), the Ramshorn Homeowner Association (HOA), and the Big Sky School District. Refer to Figure 1 for an overview of the project area.

WGM Group requested AE2S assess the feasibility of serving buildout development in the project area. Two options were considered: (1) a central system which uses the highest tank in the system to gravity feed to all connections or (2) a north and south system which would have independent water sources and storage.

Modeling tasks included the following:

- Development of a steady-state hydraulic model.
- Lay out potential pressure zones and distribution system networks.
- Assessment of system pressures and fire flow availability.
- Identification of system improvements.

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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | Project Area

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Locator Map Not to Scale

N

0 500 1,000

Feet

1 inch = 1,167 feet

FIGURE 1

WATER SYSTEM PRELIMINARY ENGINEERING REPORT
PROJECT AREA

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Gallatin County, MT

Date: 4/30/2025

Existing System Information

WGM Group provided system details including demands, existing distribution network information, and storage tank details. Existing piping was assumed to be 6-inch or 8-inch PVC (Hazen-Williams roughness factor of 140). Bottom floor elevations, operating levels, and overflow levels were provided for the two bolted steel storage tanks, Lazy J Tank and Ramshorn Tank, and are summarized in Table 1.

Table 1 Existing Storage Tank Details

Parameter	Lazy J	Ramshorn
Bottom Floor Elevation	6359.20	6201.70
Operating Elevation	6381.40 – 6382.40	6228.88 – 6229.88
Overflow Elevation	6384.90	6232.38
Diameter (ft)	59.42	41.60
Nominal Volume (gal)	530,000	340,000

System Demands

The system was evaluated under max day demand (MDD) for buildout conditions. Table 2 shows the estimated buildout demands, provided by WGM, that were used to assess the system. A peaking factor of 2 and 3 was applied to the average day demand (ADD) to obtain max day demand (MDD) and peak hour demand (PHD), respectively.

Table 2 Estimated Buildout Demands by Service Area

Service Area	ADD (GPD)	ADD(GPM)	MDD (GPM)	PHD (GPM)
Service Area 2 – Bighorn Center Area	24,000	17	33	50
Service Area 4 – River Front Properties	70,000	49	97	146
Service Area 5 – Quarry PUD	123,008	85	171	256
Service Area 6 & 7 – Lazy J Utility	50,100	35	70	104
Service Area 8 – Bucks T-4	54,000	38	75	113
Service Area 9 – Ramshorn Subdivision (Lower)	21,625	15	30	45
Service Area 10 – Ramshorn Subdivision (Upper)	4,250	3	6	9
Service Area 12 – Low Density Residential Area	3,250	2	5	7
Service Area 13 – Schools	15,132	11	21	32
Total	**365,365**	**254**	**507**	**761**

PERFORMANCE REQUIREMENTS

The analysis of the water system followed requirements set by the Montana Department of Environmental Quality (DEQ) and recommended industry standards.

System Pressure Guidelines

The model was used to determine pressures in the service areas to meet the following criteria:

- Minimum pressure of 35 psi during peak hour demand;
- Minimum pressure for fire flow of 20 psi.
- Maximum pressure of 120 psi.
- Maximum pressure fluctuation during normal operation of 20 psi.

Fire Flow Guidelines

Available fire flow in the model was assessed using the following assumptions:

- Fire flow goal was set at 1,500 gallons per minute (gpm).
- Minimum calculated residual pressure was set at 20 psi maintained at all locations within the distribution system.
- Fire flow scenarios were run during MDD.

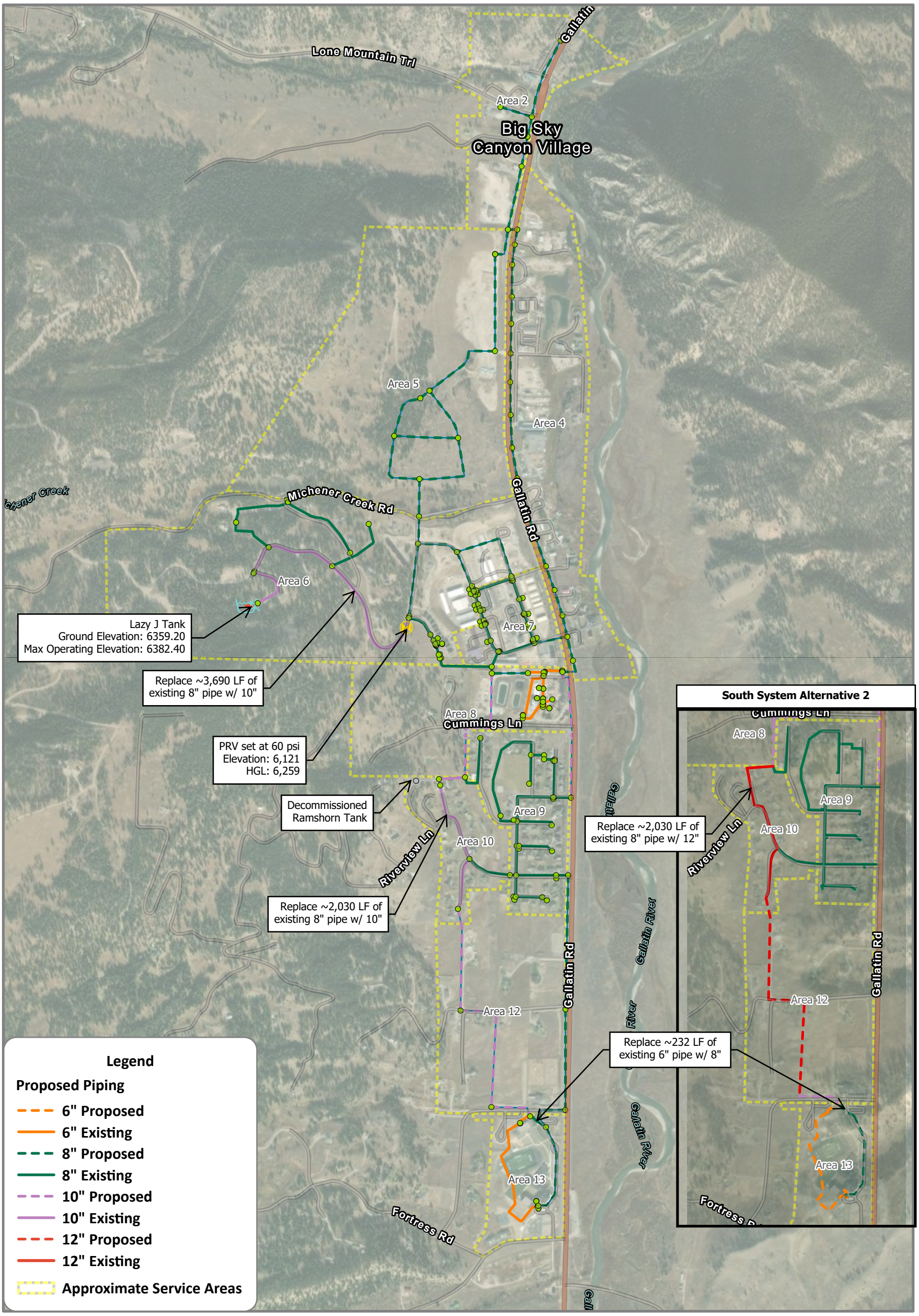
MODELING SCENARIOS ANALYZED

Modeling facilities were set up for two alternative distribution systems: the Central System and the North & South Systems. The Central System alternative includes the following:

- Gravity feed by Lazy J Tank and decommissioning of Ramshorn Tank
- Installation of a pressure reducing valve (PRV) downstream of Lazy J Tank.
- Proposed piping to connect the Lazy J PUD system in Areas 6 & 7 to existing systems (Ramshorn HOA and Big Sky School District) in Areas 8 through 13, as well as anticipated developments in Areas 2, 4, and 5.
- Replacement of 5,720 ft existing 8-inch pipe with larger 10-inch diameter pipe, and replacement of 232 ft existing 6-inch pipe with larger 8-inch diameter pipe.

Since the Lazy J Tank sits at an elevation of approximately 6359.20 feet and most of the distribution system lies at an elevation between 5990 and 6115 feet, the installation of a PRV was recommended and included in the modeling scenarios with a setting of 60 psi to bring system pressure below the maximum pressure threshold. The PRV is located at a ground elevation of approximately 6,121, bringing the HGL of this zone to 6,259 ft. Figure 2 shows the recommended piping and facilities for the Central System alternative.

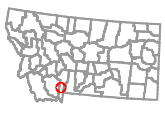
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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | Central System1

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar



Locator Map Not to Scale

N

0 500 1,000

Feet

1 inch = 1,167 feet

FIGURE 2

WATER SYSTEM PRELIMINARY ENGINEERING REPORT
CENTRAL WATER SYSTEM ALTERNATIVE

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Gallatin County, MT

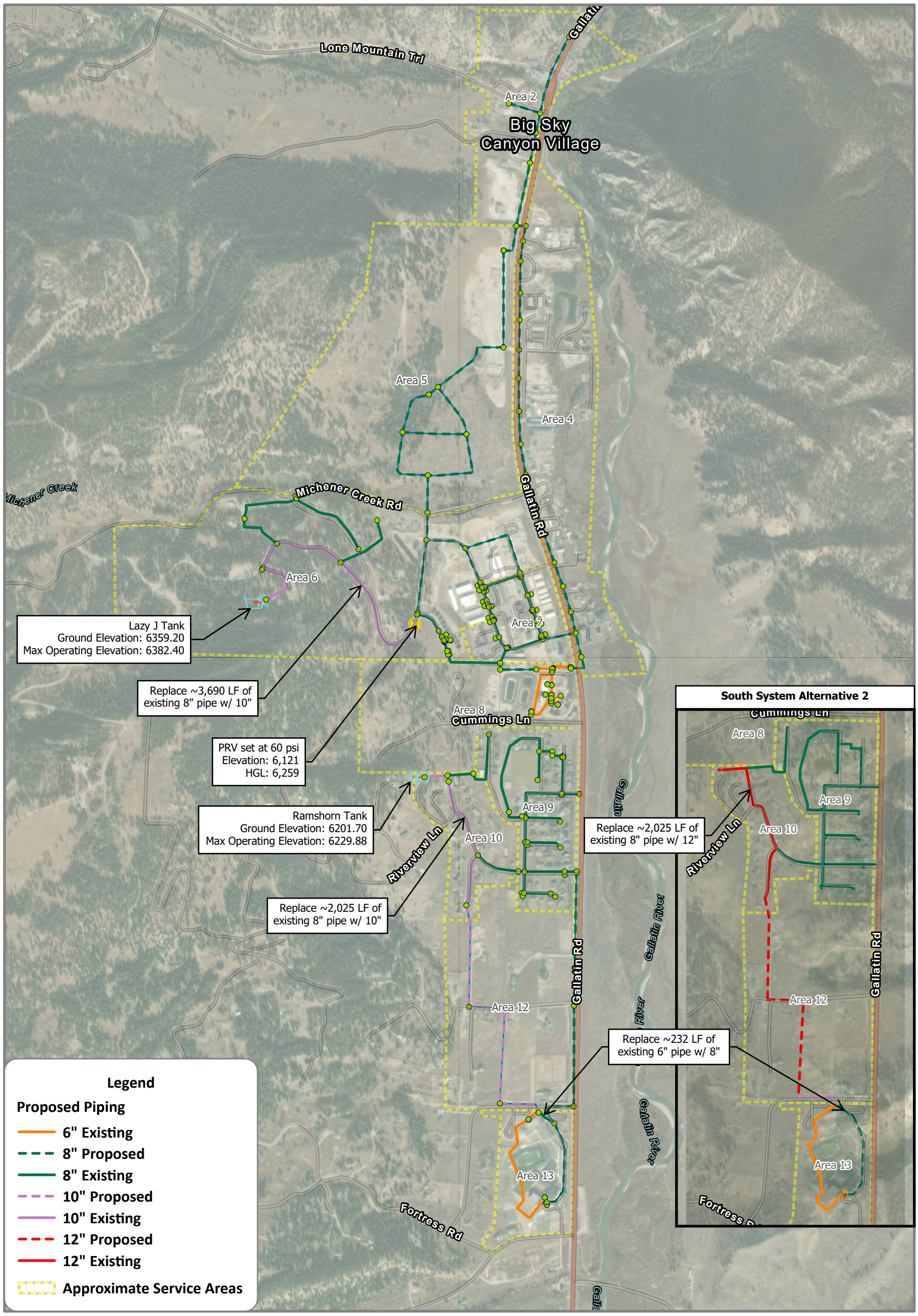
Date: 5/28/2025

The North & South Systems alternative includes the following:

- North System
  - Gravity feed by Lazy J Tank and installation of a pressure reducing valve (PRV).
  - Proposed piping to connect the Lazy J PUD system in Areas 6 & 7 to anticipated developments in Areas 2, 4, and 5.
  - Replacement of 3,690 ft existing 8-inch pipe with larger 10-inch diameter pipe.
- South System
  - Gravity feed by Ramshorn Tank.
  - Proposed piping to connect the Ramshorn HOA system in Areas 9 & 10 to the Big Sky School District system in Area 13, as well as anticipated development in Area 12.
  - Replacement of 2,025 ft of existing 8-inch pipe with larger 10-inch diameter pipe and replacement of 232 ft of existing 6-inch pipe with larger 8-inch pipe.

Similarly to the Central System alternative, the installation of a PRV is recommended within the North System and is included in the modeling scenarios with a setting of 60 psi to bring system pressures below the maximum pressure threshold. The PRV is located at a ground elevation of approximately 6,121, bringing the HGL of this zone to 6,259 ft. The South System did not need a PRV since the Ramshorn tank sits at an elevation of approximately 6201.70 feet. Figure 3 shows the recommended piping and facilities for the North and South Systems alternative.

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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | North South System1

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar

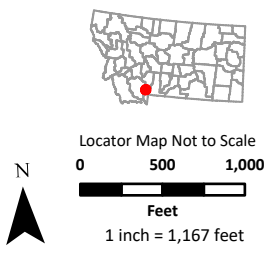


FIGURE 3

WATER SYSTEM PRELIMINARY ENGINEERING REPORT
NORTH & SOUTH WATER SYSTEMS ALTERNATIVE

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT
Gallatin County, MT

Date: 5/28/2025

Table 3 provides a comparison of the proposed improvements for each alternative.

Table 3 Comparison of Central System and North & South Systems

Item	Central System	North & South Systems
Number of Tanks (existing)	1	2
Number of PRVs	1	1
Length of Proposed 6" Pipe (ft)	40	40
Length of Proposed 8" Pipe (ft)	24,220	24,220
Length of Proposed 10" Pipe (ft)	6,349	3,356
Length of Existing 8-Inch Pipe to Replace with 10-Inch Pipe (ft)	5,720	5,715
Length of Existing 6-Inch Pipe to Replace with 8-Inch Pipe (ft)	232	232

Several model scenarios were used to analyze the pressure and available fire for both alternatives.

- Maximum Day Demand
  - Used to evaluate system pressures during peak day with growth area demands.
- Maximum Day Fire Flow
  - Used to evaluate available fire flow during peak day with growth area demands.

In all scenarios, the system(s) were assumed to be fed by the tanks via gravity. Tanks were assumed to be at maximum operating level.

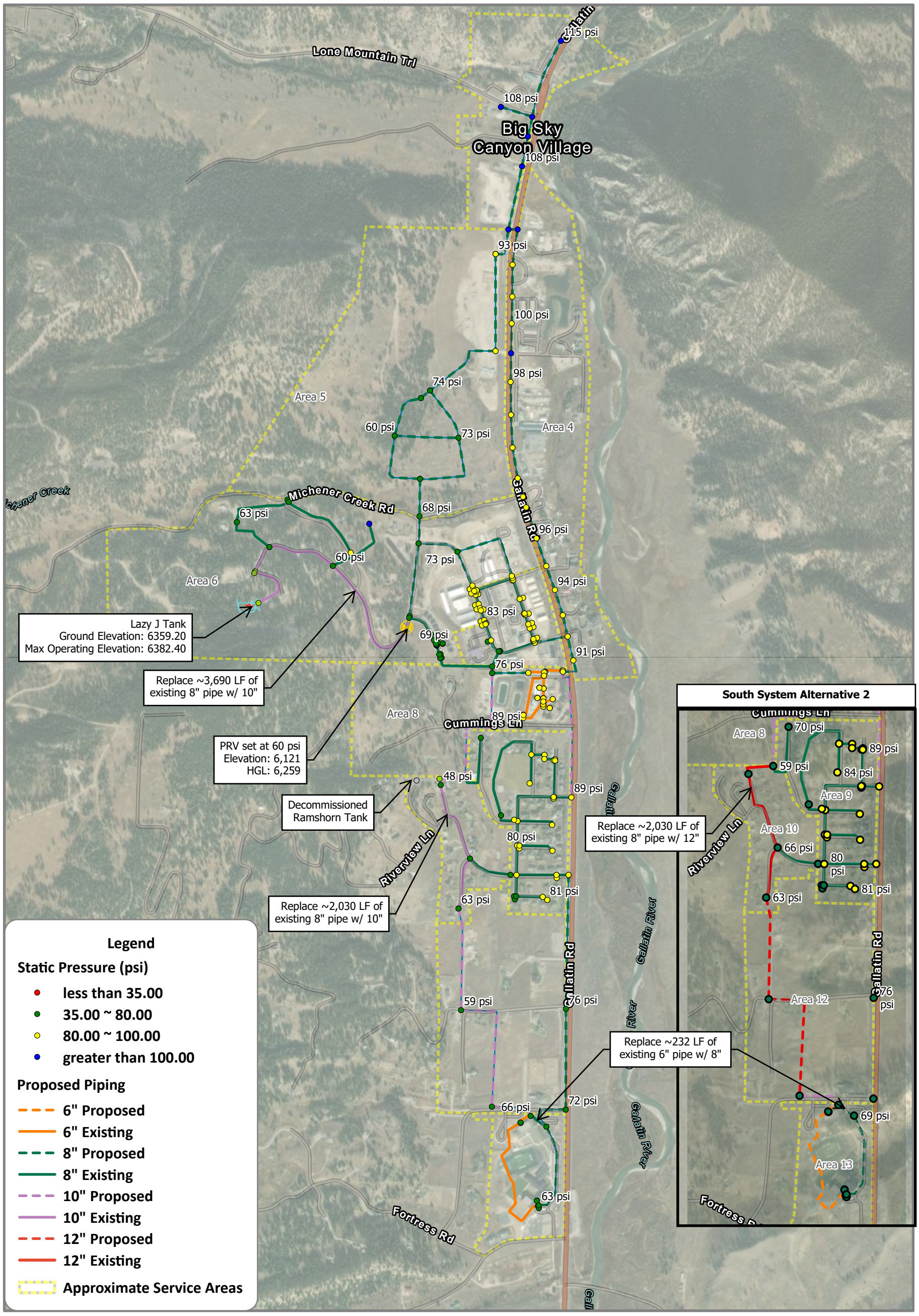
MODELING RESULTS

System Pressure Review

System pressures for the Central System alternative during MDD are presented in Figure 4. Downstream of the PRV, the system's low point in Area 2 experiences pressures of 115 psi and the system's high point in Area 10 experiences pressures of 58 psi. A few houses are fed off the Lazy J Tank's main transmission main upstream of the PRV. These connections have a large pressure variance – 40 psi to 110 psi – due to the large elevation change in the area.

For the North and South Systems alternative, system pressures during MDD are shown in Figure 5. Downstream of the PRV, the north system's low point in Area 2 experiences pressures of 115 psi and the north system's high point in Area 5 experiences pressures of 60 psi. A few houses are fed off the tank's main transmission main upstream of the PRV. These connections have a large pressure variance – 40 psi to 110 psi – due to the large elevation change in the area. For the south system, the low point in Area 9 has a pressure of 77 psi and the high point in Area 10 has a pressure of 36 psi. The high point is in the existing distribution system; its minimum pressure is close to the required minimum value due to its proximity to the Ramshorn Tank.

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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | Central System

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar

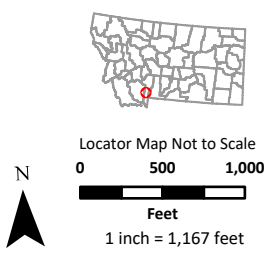
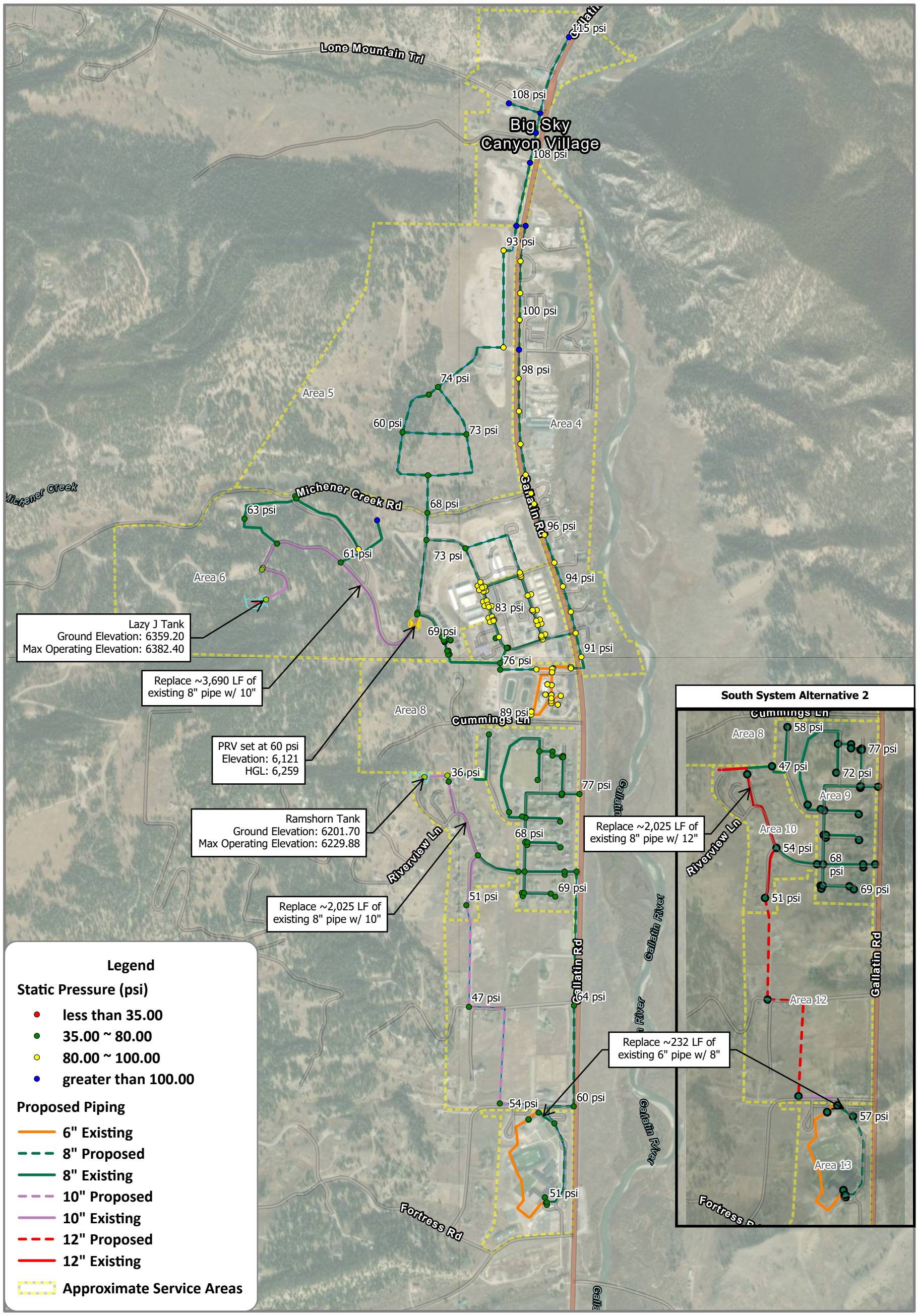


FIGURE 4

WATER SYSTEM PRELIMINARY ENGINEERING REPORT
CENTRAL WATER SYSTEM ALTERNATIVE
GALLATIN CANYON COUNTY WATER & SEWER DISTRICT
Gallatin County, MT

Date: 5/28/2025



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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | North South System

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar

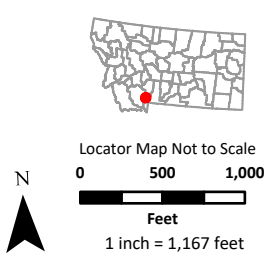


FIGURE 5

WATER SYSTEM PRELIMINARY ENGINEERING REPORT
NORTH & SOUTH WATER SYSTEMS ALTERNATIVE

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Gallatin County, MT

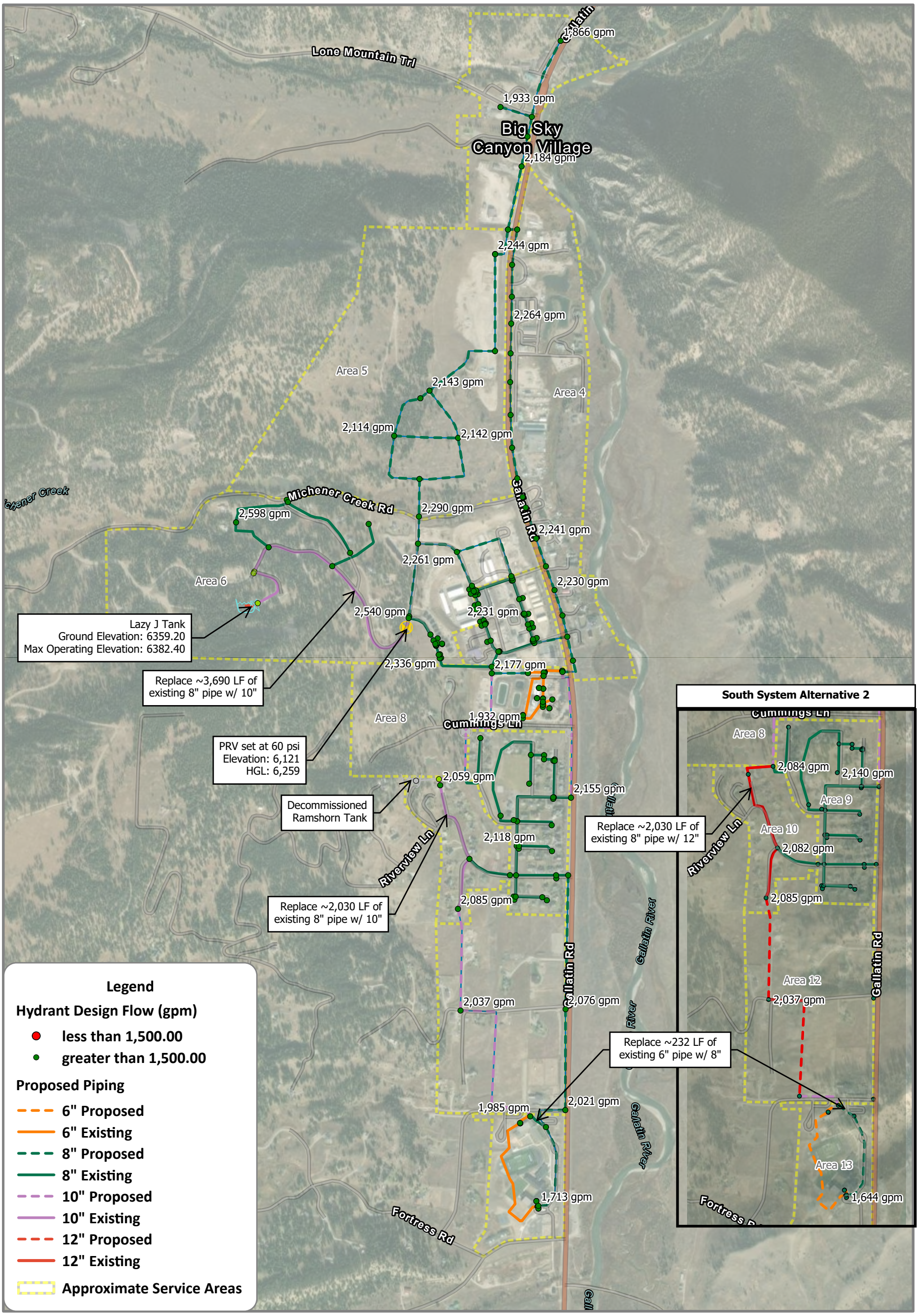
Date: 5/28/2025

System Available Fire Flow Review

Note that the available fire flow is calculated based on maintaining a minimum system pressure of 20 psi at all locations. Local residual pressure at the fire flows presented may be higher than 20 psi.

Available fire flow for the Central System alternative during MDD is presented in Figure 6. Available fire flow ranges from 1,596 gpm in Area 13 and 2,612 gpm downstream of the Lazy J Tank.

For the North and South Systems alternative, available fire flow during MDD are shown in Figure 7. For the north system, available fire flow ranges from 1,830 gpm in Area 8 and 2,627 gpm downstream of Lazy J Tank. For the south system, available fire flow ranges from 1,503 gpm in Area 13 and 4,675 gpm downstream of the Ramshorn Tank.



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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | Central System

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar

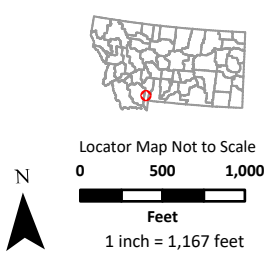


FIGURE 6

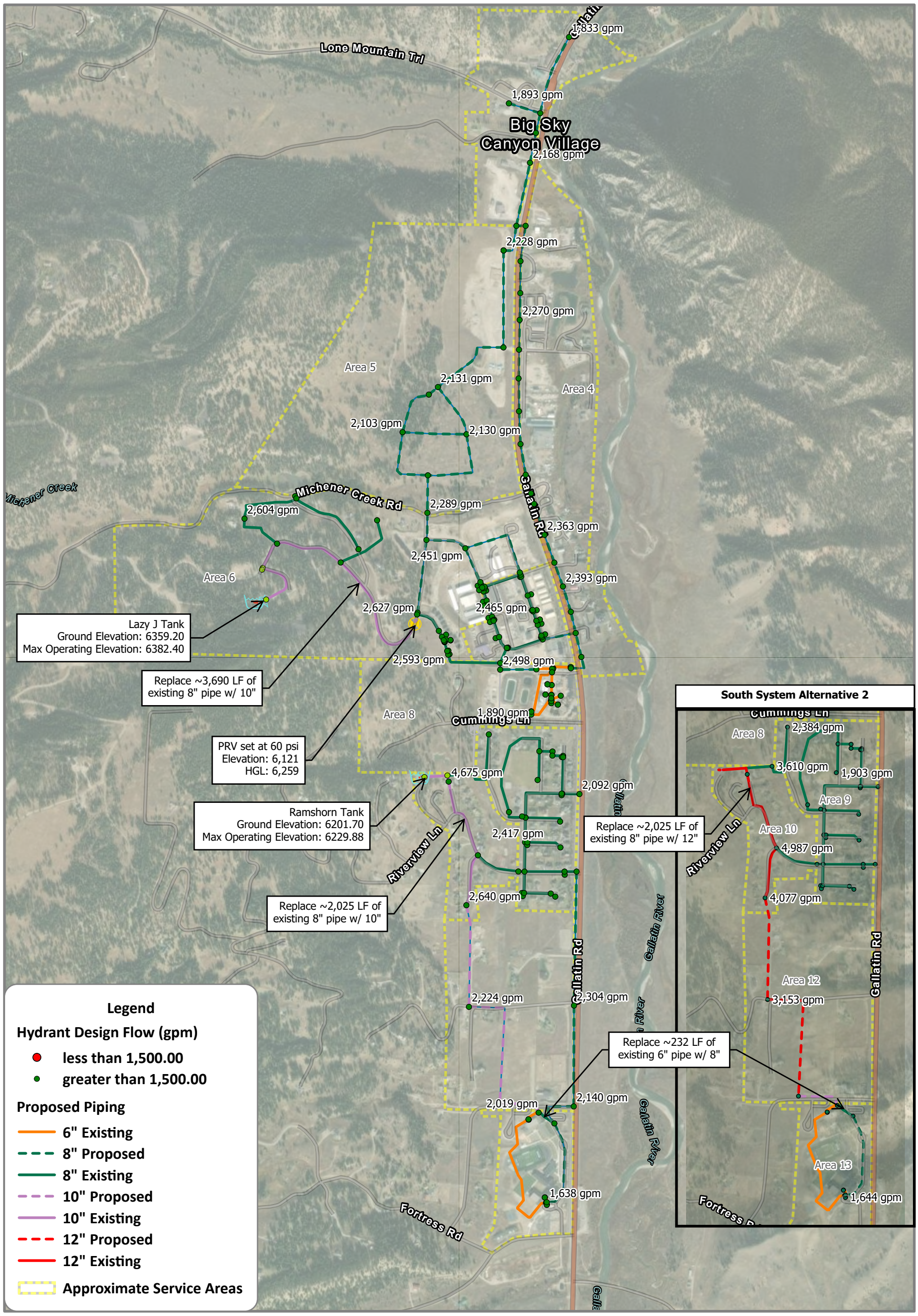
WATER SYSTEM PRELIMINARY ENGINEERING REPORT
CENTRAL WATER SYSTEM ALTERNATIVE

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT

Gallatin County, MT

Date: 5/28/2025

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Coordinate System: NAD 1983 StatePlane Montana FIPS 2500 Feet Intl | Edited by: EMcKenzie | C:\0-Projects\G\Gallatin Canyon\Gallatin Canyon - Water Model.aprx | North South System

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Maxar

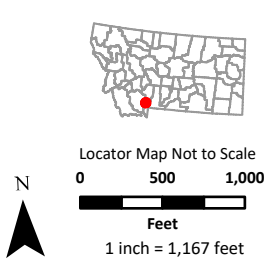


FIGURE 7

WATER SYSTEM PRELIMINARY ENGINEERING REPORT
NORTH & SOUTH WATER SYSTEMS ALTERNATIVE

GALLATIN CANYON COUNTY WATER & SEWER DISTRICT
Gallatin County, MT

Date: 5/28/2025

APPENDIX K

ALTERNATIVE LIFE CYCLE COST ANALYSIS

PROJECT ALTERNATIVE LIFE CYCLE COST ANALYSIS

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Source Alternative Existing Wells**

UPGRADE EXISTING LAZY J WELLS			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	157,290.00
1.2	Non-Construction Items Total	$	86,000.00
	TOTAL CAPITAL COSTS	**$**	**243,290.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	53,952.50
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$884,447.08**
Salvage Value (SPPW)			
	Design Period (Years)		20
	Planning Period (Years)		20
	Capital Cost (Well Pumps)	$	76,000.00
	Salvage Value		$0.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$0.00**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**1,127,737.08**
UPGRADE EXISTING RAMSHORN WELLS			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	349,180.00
1.2	Non-Construction Items Total	$	190,000.00
	TOTAL CAPITAL COSTS	**$**	**539,180.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	54,830.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$898,832.00**
Salvage Value (SPPW)			
	Design Period (Years)		20
	Planning Period (Years)		20
	Capital Cost (Well Pumps)	$	152,000.00
	Salvage Value		$0.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$0.00**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**1,438,012.00**
RAMSHORN WELLS TO LAZY J WELLS TRANSMISSION (REQ'D WITH ONE COMBINED SYSTEM ALTERNATIVE USING BOTH WELL FIELDS)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	631,725.00
1.2	Non-Construction Items Total	$	721,500.00
	TOTAL CAPITAL COSTS	**$**	**1,353,225.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	6,900.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$113,112.18**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Transmission Main)	$	506,000.00
	Salvage Value		$303,600.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$196,464.39**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**1,269,872.79**

NPV - LAZY J WELL UPGRADES (1 OR 2 DISTRIBUTION SYSTEMS)	**$**	**1,127,737.08**
NPV - RAMSORN WELL UPGRADES (1 DISTRIBUTION SYSTEM)	**$**	**2,707,884.79**
NPV - RAMSORN WELL UPGRADES (2 DISTRIBUTION SYSTEMS)	**$**	**1,438,012.00**

PROJECT ALTERNATIVE LIFE CYCLE COST ANALYSIS

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Source Alternative New Wells**

ADDITION OF NEW WELLS - LAZY J WELLFIELD			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	1,179,610.00
1.2	Non-Construction Items Total	$	1,044,000.00
	TOTAL CAPITAL COSTS	**$**	**2,223,610.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	54,597.50
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$895,020.61**
Salvage Value (SPPW)			
	Design Period (Years)		20
	Planning Period (Years)		20
	Capital Cost (Well Pumps)	$	152,000.00
	Salvage Value		$0.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$0.00**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**3,118,630.61**
NEW WELL/PUMP CONTROL HOUSE			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	752,900.00
1.2	Non-Construction Items Total	$	665,000.00
	TOTAL CAPITAL COSTS	**$**	**1,417,900.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	18,000.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$295,075.25**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Pump House & Equipment)	$	661,900.00
	Salvage Value (Pump House & Equipment)		$397,140.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$256,995.62**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**1,455,979.64**
	NPV - ADDITIONAL WELLS - LAZY J WELLFIELD	**$**	**3,118,630.61**
	NPV - NEW PUMP CONTROL HOUSE	**$**	**1,455,979.64**
	NPV - COMBINED NEW WELLS - LAZY J WELLFIELD AND PUMP HOUSE	**$**	**4,574,610.25**

PROJECT ALTERNATIVE LIFE CYCLE COST ANALYSIS

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Storage Alternative Existing Tanks**

EXISTING BOLTED STEEL GROUND TANK (Lazy J 530,000 Gallons)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	54,000.00
1.2	Non-Construction Items Total	$	28,000.00
	TOTAL CAPITAL COSTS	**$**	**82,000.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	31,475.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$515,971.86**
Salvage Value (SPPW)			
	Design Period - Remaining Life (Years)		20
	Planning Period (Years)		20
	Capital Cost (Existing Tank - 1/2 Life Value)	$	304,750.00
	Salvage Value		$0.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$0.00**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**597,971.86**
EXISTING BOLTED STEEL GROUND TANK (Ramshorn 340,000 Gallons)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	54,000.00
1.2	Non-Construction Items Total	$	28,000.00
	TOTAL CAPITAL COSTS	**$**	**82,000.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	23,100.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$378,679.91**
Salvage Value (SPPW)			
	Design Period - Remaining Life (Years)		20
	Planning Period (Years)		20
	Capital Cost (Existing Tank - 1/2 Life Value)	$	221,000.00
	Salvage Value		$0.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$0.00**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**460,679.91**

NPV - EXISTING LAZY J TANK	**$**	**597,971.86**
NPV - EXISTING RAMSHORN TANK	**$**	**460,679.91**

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Storage Alternative New Tanks**

NEW BOLTED STEEL GROUND TANK			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	1,238,590.00
1.2	Non-Construction Items Total	$	934,300.00
	TOTAL CAPITAL COSTS	**$**	**2,172,890.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	21,225.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$347,942.90**
Salvage Value (SPPW)			
	Design Period (Years)		40
	Planning Period (Years)		20
	Capital Cost (Tank Only)	$	709,000.00
	Salvage Value		$354,500.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$229,402.59**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**2,291,430.31**
NEW WELDED STEEL GROUND TANK			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	1,820,590.00
1.2	Non-Construction Items Total	$	1,051,300.00
	TOTAL CAPITAL COSTS	**$**	**2,871,890.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	51,188.89
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$839,143.02**
Salvage Value (SPPW)			
	Design Period (Years)		45
	Planning Period (Years)		20
	Capital Cost (Tank Only)	$	1,291,000.00
	Salvage Value		$717,222.22
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$464,125.92**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**3,246,907.10**
NEW PRESTRESSED CONCRETE GROUND TANK			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	2,023,590.00
1.2	Non-Construction Items Total	$	1,091,300.00
	TOTAL CAPITAL COSTS	**$**	**3,114,890.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	32,380.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$530,807.59**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Tank Only)	$	1,494,000.00
	Salvage Value		$896,400.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$580,074.71**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**3,065,622.88**
	NPV - NEW BOLTED STEEL TANK	**$**	**2,291,430.31**
	NPV - NEW WELDED STEEL TANK	**$**	**3,246,907.10**
	NPV - NEW PRESTRESSED TANK	**$**	**3,065,622.88**

PROJECT ALTERNATIVE LIFE CYCLE COST ANALYSIS

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Treatment Alternatives**

CENTRAL REVERSE OSMOSIS TREATMENT			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	1,156,880.00
1.2	Non-Construction Items Total	$	612,900.00
	TOTAL CAPITAL COSTS	**$**	**1,769,780.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	21,700.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$355,729.61**
Salvage Value - Skid/Controls Minus Vessels & Membranes (SPPW)			
	Design Period (Years)		30
	Planning Period (Years)		20
	Capital Cost	$	450,000.00
	Salvage Value		$150,000.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$97,067.39**
Salvage Value - Mechanical/Process Pipe Gallery (SPPW)			
	Design Period (Years)		40
	Planning Period (Years)		20
	Capital Cost	$	300,000.00
	Salvage Value		$150,000.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$97,067.39**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**1,931,374.83**
HOUSEHOLD (POU) REVERSE OSMOSIS TREATMENT			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	348,000.00
1.2	Non-Construction Items Total	$	-
	TOTAL CAPITAL COSTS	**$**	**348,000.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	-
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$0.00**
Salvage Value (SPPW)			
	Design Period (Years)		20
	Planning Period (Years)		20
	Capital Cost	$	348,000.00
	Salvage Value		$0.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$0.00**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**348,000.00**
	NPV - CENTRAL RO TREATMENT	**$**	**1,931,374.83**
	NPV - POU RO TREATMENT	**$**	**348,000.00**

PROJECT ALTERNATIVE LIFE CYCLE COST ANALYSIS

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Distribution Alternatives**

SINGLE COMBINED DISTRIBUTION SYSTEM (With South Loop)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	8,395,880.00
1.2	Non-Construction Items Total	$	4,308,500.00
	TOTAL CAPITAL COSTS	**$**	**12,704,380.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	78,487.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$1,286,642.85**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Water Mains)	$	3,083,450.00
	Salvage Value Water Mains		$1,850,070.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$1,197,209.75**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**12,793,813.10**
TWO SEPARATE DISTRIBUTION SYSTEMS (NORTH & SOUTH With South Loop)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	8,177,432.00
1.2	Non-Construction Items Total	$	3,969,000.00
	TOTAL CAPITAL COSTS	**$**	**12,146,432.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	77,150.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$1,264,725.32**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Water Mains)	$	2,923,050.00
	Salvage Value Water Mains		$1,753,830.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$1,134,931.31**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**12,276,226.00**
SINGLE COMBINED DISTRIBUTION SYSTEM (12" Extension W/ No Loop)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	7,941,840.00
1.2	Non-Construction Items Total	$	4,112,500.00
	TOTAL CAPITAL COSTS	**$**	**12,054,340.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	75,187.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$1,232,545.72**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Water Mains)	$	2,774,310.00
	Salvage Value Water Mains		$1,664,586.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$1,077,180.10**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**12,209,705.62**
TWO SEPARATE DISTRIBUTION SYSTEMS (NORTH & SOUTH 12" Extension W/ No Loop)			
Capital Costs Estimate (C)			
1.1	Construction Items Total	$	7,782,592.00
1.2	Non-Construction Items Total	$	3,797,000.00
	TOTAL CAPITAL COSTS	**$**	**11,579,592.00**
O&M And Replacements Estimate (USPW)			
	Annualized O&M	$	73,850.00
	Real Discount Rate		2.20%
	Planning Period (Years)		20
	PRESENT WORTH (DISCOUNTED AT 2.20%/YEAR FOR 20-YEAR PLANNING PERIOD)		**$1,210,628.19**
Salvage Value (SPPW)			
	Design Period (Years)		50
	Planning Period (Years)		20
	Capital Cost (Water Mains)	$	2,613,910.00
	Salvage Value Water Mains		$1,568,346.00
	Real Discount Rate		2.20%
	SINGLE PAYMENT PRESENT WORTH SALVAGE VALUE		**$1,014,901.66**
	NET PRESENT VALUE (C + USPW O&M - SPPW S)	**$**	**11,775,318.52**

NPV - SINGLE COMBINED SYSTEM (W/ SOUTH LOOP)	**$**	**12,793,813.10**
NPV - SINGLE COMBINED SYSTEM (12" EXTENSION NO SOUTH LOOP)	**$**	**12,209,705.62**
NPV - TWO SEPARATE SYSTEMS (N & S W/ SOUTH LOOP)	**$**	**12,276,226.00**
NPV - TWO SEPARATE SYSTEMS (N & S NO SOUTH LOOP)	**$**	**11,775,318.52**

PROJECT ALTERNATIVE LIFE CYCLE COST ANALYSIS

Project Name: Gallatin Canyon Water PER for GCCWSD
Project No.: 220806
Prepared By: TSS
Reviewed By:
Date: June 26, 2025

Description: **Gallatin Canyon Water System PER - Alternative Selection Summary**

NPV - SOURCE ALTERNATIVES		
UPGRADE EXISTING LAZY J WELLS	$	1,127,737.08
UPGRADE EXISTING RAMSHORN WELLS	$	1,438,012.00
RAMSHORN WELLS TRANSMISSION TO LAZY J TANK(S)	$	1,269,872.79
LAZY J WELL FIELD - ADDITION OF 2 NEW WELLS	$	3,118,630.61
NEW WELL HOUSE - LAZY J	$	1,455,979.64

NPV - EXIST. LAZY J & RAMSHORN WELLS - NO NEW WELL HOUSE - 1 SYSTEM	**$**	**3,835,621.87**
NPV - EXIST. LAZY J & RAMSHORN WELLS - NEW WELL HOUSE - 1 SYSTEM	**$**	**5,291,601.51**
NPV - EXIST. & NEW LAZY J WELLS - NO WELL HOUSE - 1 STSTEM	**$**	**4,246,367.70**
NPV - EXIST. & NEW LAZY J WELLS - NEW WELL HOUSE - 1 SYSTEM	**$**	**5,702,347.34**
NPV - EXIST. & NEW LAZY J WELLS + EXIST. RAMSHORN WELLS - NO WELL HOUSE - 2 SYSTEMS	**$**	**5,684,379.70**
NPV - EXIST. & NEW LAZY J WELLS + EXIST. RAMSHORN WELLS - NEW WELL HOUSE - 2 SYSTEMS	**$**	**7,140,359.34**

NPV - TANK ALTERNATIVES		
EXISTING LAZY J TANK	$	597,971.86
EXISTING RAMSHORN TANK	$	460,679.91
NEW BOLTED STEEL GROUND TANK (665K GAL.)	$	2,291,430.31
NEW WELDED STEEL GROUND TANK (665K GAL.)	$	3,246,907.10
NEW PRESTRESSED CONCRETE GROUND TANK (665K GAL.)	$	3,065,622.88

NPV - EXISTING LAZY J TANK (CURRENT CONDITIONS - 1 SYSTEM)	**$**	**597,971.86**
NPV - EXISTING LAZY J & RAMSHORN TANKS (CURRENT CONDITIONS - 2 SYSTEMS)	**$**	**1,058,651.77**
NPV - EXIST. + NEW LAZY J TANK (BUILDOUT CONDITIONS - 1 SYSTEM)	**$**	**2,889,402.17**
NPV - EXIST. + NEW LAZY J TANK + EXIST. RAMSHORN TANK (BUILDOUT CONDITIONS - 2 SYSTEMS)	**$**	**3,350,082.08**

NPV - TREATMENT ALTERNATIVES		
RO - CENTRAL	$	1,931,374.83
RO - POU	$	348,000.00
NO TREATMENT	$	-

NPV - CENTRAL RO TREATMENT (1 OR 2 SYSTEMS)	**$**	**1,931,374.83**
NPV - POINT OF USE RO TREATMENT (1 OR 2 SYSTEMS)	**$**	**348,000.00**
NPV - NO TREATMENT	**$**	**-**

NPV - DISTRIBUTION ALTERNATIVES		
SINGLE COMBINED SYSTEM (W/ SOUTH LOOP)	$	12,793,813.10
SINGLE COMBINED SYSTEM (12" EXTENSION NO LOOP)	$	12,209,705.62
TWO SEPARATE SYSTEMS (N&S W/ SOUTH LOOP)	$	12,276,226.00
TWO SEPARATE SYSTEMS (N&S NO LOOP)	$	11,775,318.52

NPV - COMPLETE SYSTEM ALTERNATIVES (MIN. & MAX)		
SINGLE CENTRAL SYSTEM MIN. NPV	**$**	**18,934,729.67**
SINGLE CENTRAL SYSTEM MAX. NPV	**$**	**23,316,937.44**
2 SEPARATE SYSTEMS MIN. NPV	**$**	**20,809,780.30**
2 SEPARATE SYSTEMS MAX. NPV	**$**	**24,698,042.25**

NPV - RECOMMENDED PROJECT (SINGLE DISTRIBUTION SYSTEM OPERATED BY LAZY J's EXISTING AND NEW WELLS & TANKS W/ NEW WELL CONTROL BUILDING)	**$**	**20,801,455**