Montana Department of Environmental Quality

Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

PERMIT FACT SHEET

MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee/Applicant:	Alpine Pacific Utilities, LLC
Permit Number:	MTX000164
Permit Type:	Domestic Wastewater
Application Type:	Major Modification
Facility Name:	Glacier Ranch Subdivision
Facility Location:	SESE 1/4, Section 09, Township 29 North, Range 21 West Flathead County Latitude: 48.28400°, Longitude: -114.27052°
Facility Contact:	Justin Ahmann, Alpine Pacific Utilities, LLC
Treatment Type:	Advanced
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / Subsurface Drainfield
Effluent Type:	Domestic strength wastewater
Mixing Zone:	None
Effluent Limit Type:	Water Quality
Effluent Limits:	Total nitrogen: 0.28 mg/L Total phosphorus: 0.025 mg/L
Flow Rate:	Current approved design: 52,000 gpd Proposed design maximum: 100,000 gpd Proposed design average: 100,000 gpd
Fact Sheet Date:	January 23, 2019
Prepared By:	Chris Boe

1.0 PERMIT INFORMATION

DEQ issues Montana Ground Water Pollution Control System (MGWPCS) permits for a period of five years. A permit may be reissued at the end of the period, subject to evaluation of the hydrology, hydrogeology, cumulative effects, fate and transport, and measurable impacts to surface water. This fact sheet provides the basis for DEQ's decision to issue a modified ground water discharge permit for the modified Glacier Ranch Subdivision wastewater system.

1.1 PERMIT HISTORY

On April 04, 2007, DEQ issued a new MGWPCS permit to Glacier Horse Ranch, LLC. This permit authorized a discharge of 52,000 gallons per day (gpd). The permit included effluent limitations on total nitrogen and total phosphorus expressed as both daily maximum concentration and 90-day average load limits. The permit also required construction of four ground water monitoring wells and sampling of influent, effluent, and ground water.

As required by nondegradation provisions of the Montana Water Quality Act, and as based on the 2007 proposal, DEQ evaluated whether the discharge of 52,000 gpd would cause a significant change in water quality in either the receiving ground water or the nearest downgradient surface water. The nearest reach of Trumbull Creek was dry in 2007, but the developer intended to establish surficial stream flow by deepening the channel below the water table.

Unlike today, there were no numeric nutrient criteria in 2007 for Trumbull Creek, only narrative requirements. The nondegradation rules state that for parameters with only narrative standards, changes which have no measurable effect on existing or anticipated uses or do not cause measurable change in aquatic life or ecological activity are nonsignificant. In 2007, the permittee's consultant performed a fate-and-transport study using the QUAL2K model to evaluate the potential effect of discharging 52,000 gpd of wastewater near Trumbull Creek. The model evaluated nitrate, phytoplankton, and bottom algae. DEQ found the model to be credible and determined that the proposed discharge in compliance with the 2007 permit requirements would be nonsignificant absent any numeric nutrient criteria and further data on the impacts to aquatic life and other uses of an altered Trumbull Creek.

On April 29, 2009, permit ownership was transferred to First Interstate Bank. Permit ownership was again transferred on January 17, 2017, to Alpine Pacific Utilities, LLC, the current permittee. On October 11, 2017, DEQ received an application for modification of the existing MGWPCS permit from the permittee. Additional information on this application is provided below in **Section 1.3**.

1.2 PERMIT ACTION OVERVIEW

The permittee requested modification of the existing permit to increase the discharge capacity of their current wastewater system. The proposed increase makes the facility a new or increased source, subject to nondegradation evaluation. DEQ is therefore required to do an updated significance determination rather than relying on the 2007 findings.

Trumbull Creek was altered to a flowing stream since the last permit issuance. In August 2014, the Montana Board of Environmental Review passed numeric nutrient criteria for Trumbull Creek giving DEQ a more precise understanding of how discharges affect aquatic life and other uses. Following the establishment of new nutrient criteria, the First Judicial District Court held in *Bitterrooters for Planning, Inc., et al v. DEQ* (Cause No. CDV-2014-505) and in *Bitterrooters for Planning, Inc., et al v. DEQ and Stephen Wanderer and Georgia Filcher* (Cause No. ADV-2015-32) that, in accordance with ARM 17.30.715, DEQ must consider impacts to nearby surface waters, cumulative impacts, and any other potential impacts on water quality that may arise from the activity authorized by the permit in determining whether the proposed discharge results in significant or nonsignificant changes to water quality. DEQ requested the permittee provide site-specific information on the shallow ground water aquifer, its relationship to the altered Trumbull Creek, and the potential effects of the proposed discharge based the new numeric criteria. To date, DEQ has not received sufficient site-specific information from the permittee, and the permittee has requested a conservative permit that could be established without this information. This correspondence is summarized below in **Section 1.3**. DEQ will therefore take a conservative approach in development of this permit in order to protect surface water and to maintain the beneficial uses of ground water in accordance with the nondegradation provisions in the Montana Water Quality Act **(Section 3)**.

1.3 APPLICATION

On November 23, 2011, DEQ received notice of the permittee's intent to renew their existing 2007 permit. DEQ deemed the initial application as deficient. After not receiving any updates from the permittee about the deficient application, DEQ notified the permittee on February 12, 2013 of DEQ's intent to withdraw or deny the application, and possibly initiate enforcement action if the application deficiencies were not addressed by the permittee. On February 19, 2013, the permittee submitted an unsigned updated application. On March 27, 2013, DEQ received additional application information. This information preceded the permittee's proposal to double the design capacity of the wastewater system.

After the January 17, 2017 transfer of the permit, discussions with the current permittee (Alpine Pacific Utilities, LLC) on the proposed permit modifications (**Section 1.4**) began during the summer of 2017. On August 22, 2017, August 24, 2017, and August 28, 2017, DEQ brought attention to the following topics of concern:

- The permit was last issued in 2007;
- The proposed doubling of the wastewater design flow capacity; and,
- The deepening of Trumbull Creek has resulted in surficial flows.

These conversations were consolidated and discussed within a meeting with the permittee on September 01, 2017.

On October 11, 2017, DEQ received an application for modification of the existing MGWPCS permit from the permittee. On October 09, 2017, and October 16, 2017, DEQ contacted the permittee regarding the complexities of the proposal and to request additional site-specific information. The following topics were discussed:

- Fate and transport of nitrogen;
- Impacts to surface waters are not authorized under a MGWPCS permit;
- The DEQ Circular 12A nutrient criterion for Total Nitrogen is 0.275 mg/L; and,
- Recent District Court and Montana Supreme Court cases of interest.

The permittee also sent supplemental information to DEQ on October 13, 2017. Information received by the permittee on October 11, 2017, and October 13, 2017, was deemed insufficient by DEQ for anything other than a very conservative analysis of water quality impacts; therefore, on November 03, 2017, DEQ sent the permittee a letter requesting additional information. The letter cited the following topics:

- The proposed design flow capacity of the wastewater system is doubled to 100,000 gpd;
- The proposed design does not provide for a higher level of treatment;
- The nearby Trumbull Creek has been excavated in depth resulting in surficial water flows;
- The ground water flow direction in the immediate area may be towards Trumbull Creek;
- A description on the proposed disposal methods and locations were not received;
- A site-specific fate and transport study was not received;
- A site-specific reasonable potential analysis on surface water was not received; and,
- Most of the information received was from the earlier application submittal of 2007 and may therefore not reflect the modification proposal.

The letter requested that the permittee collect:

- Site-specific information on hydrology, hydrogeology, cumulative effects, fate and transport, and measurable impacts to surface water.

A follow-up phone conversation with the permittee on November 16, 2017 summarized the need for site-specific information.

On December 27, 2017, the permittee submitted a Montana Pollutant Discharge Elimination System (MPDES) discharge permit application to DEQ. On January 11, 2018, DEQ requested additional information and provided information on the potential complexities in obtaining a MPDES permit. On March 29, 2018, a meeting was held with the permittee and the permittee's legal counsel. On March 30, 2018 and April 03, 2018, both DEQ and the permittee's legal counsel provided follow-up summaries within email communications that stated:

- That a fate and transport model is needed.

On April 27, 2018, DEQ received a response from the permittee in regards to the November 03, 2017, MGWPCS letter. In follow-up communications on April 30, 2018, May 01, 2018, and May 02, 2018, DEQ expressed that the requested information was not included. On June 13, 2018, a meeting was held with the permittee, and a follow-up memo summarizing the requirements of a fate and transport model was provided. Additional follow-up conversations occurred on July 24, 2018, July 25, 2018, and August 02, 2018.

During a phone conversation about how the minimal information in the application could result in extremely low limits set at the end-of-pipe at the surface water standard, DEQ asked for confirmation whether to accept the minimal information as final or give the permittee additional time for the items requested by DEQ. During the phone conversation, the permittee mentioned it may withdraw the application altogether. The following week, on October 15, 2018, the permittee confirmed that DEQ should accept the minimal information as final and develop the permit. The information discussed above has not been received to date (document draft date).

1.4 CHANGES TO THIS PERMIT

As discussed above, the modified permit must be evaluated in light of the following changes:

- increase in discharge volume,
- surface water flow in Trumbull Creek,
- recently promulgated numeric nutrient criteria.

These changes require DEQ to perform an updated significance determination **(Section 3.2)**. For any limits that account for the attenuation and dilution of the discharge, site-specific information is needed on hydrology, hydrogeology, cumulative effects, fate and transport, and measurable impacts to Trumbull Creek. The permittee has not provided this information and has requested that DEQ instead prepare a conservative MGWPCS permit using the available information (refer to correspondence in **Section 1.3**).

The minimal information in the permit application does not indicate any dilution or attenuation of the discharge. Therefore, DEQ has ensured this discharge will comply with the Montana Water Quality Act's nondegradation provisions at the point of discharge by establishing effluent limits that ensure that any water quality changes in downgradient Trumbull Creek will be nonsignificant. The nonsignificance determinations are discussed further in **Section 3**. No mixing zone is authorized in this permit.

DEQ established the following requirements:

- The most restrictive water quality standards must be met prior to discharge (**Section 5.1)**.
- An additional monitoring well must be installed to characterize the ambient quality of the receiving water **(Section 5).**
- Sampling, analysis, and reporting plans must be prepared and submitted **(Section 5).**
- In order to modify the new conditions of this permit, the permittee in coordination with DEQ must collect and submit site-specific information on hydrology, hydrogeology, cumulative effects, fate and transport, and measurable impacts to surface water in order to complete a significance determination.

2.0 FACILITY INFORMATION

2.1 LOCATION

The Glacier Ranch Subdivision wastewater treatment system is located in the central portion of the Flathead Valley; approximately 1.75 miles southwest of the Glacier Park International Airport Terminal (**Figure 1, Figure 2**).

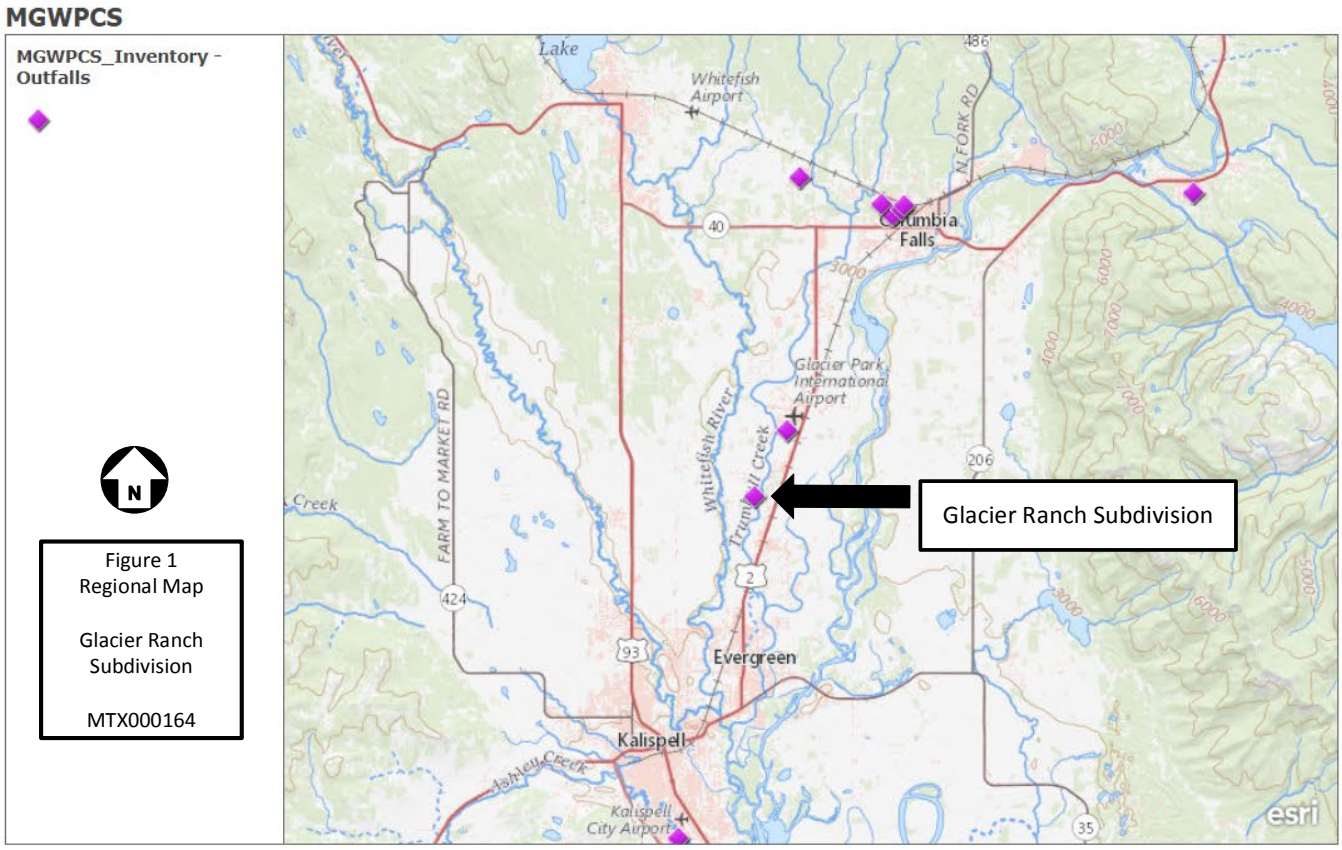

Figure 1. Regional Map

Figure 2. Vicinity Map

2.2 OPERATIONS

System operations are summarized below in **Table 1**.

Table 1: Collection, Treatment, and Disposal System Summary	
Inflows	
Contributing Sources of Wastewater: Domestic In-Nature Standard Industrial Code(s) (SIC) of contributing sources: 4952	
Influent Sampling Location: INF-001: Sample port (tee) with a capped riser, located between the lift station and the comminutor, prior to the dose tanks.	
Treatment System	
Santec Sequencing Batch Reactor with extended aeration and secondary treatment by a Parkenson sand filter with tertiary treatment via alum injection.	
Treatment Level: Advanced	
Location: SESE 1/4, Section 09, Township 29 North, Range 21 West Latitude: 48.28400°, Longitude: -114.27052°	
Disposal System	
Disposal Structure: Outfall 001	
Method of Disposal: Pressure dosed subsurface drainfield.	
Location: NENE 1/4 and NWNE 1/4, Section 16, Township 29 North, Range 21 West; and, SESE 1/4, Section 09, Township 29 North, Range 21 West Latitude: 48.28356°, Longitude: -114.27033°	
Current Design Flows (2007 MGWPCS Permit):	
Average Daily Design Flow (gpd): 52,000	Daily Maximum Design Flow (gpd): 52,000
Proposed Design Flows (Modification Request):	
Average Daily Design Flow (gpd): 100,000	Daily Maximum Design Flow (gpd): 100,000
Effluent Sampling Location: EFF-001: Drainfield Dose Tank.	
Flow Monitoring Equipment: FM-001: Sensus Magnetic Drive Propeller Meter, Model 101/102. Located just prior to the sand filter.	

The existing wastewater treatment and disposal system locations are displayed in the figure below (**Figure 3**). The outfall footprint displayed is for the current system's drainfield (55,000 gpd design capacity) and may not be of the proposed system (100,000 gpd). A major modification of the permit may be needed in the future if major expansion of the existing outfall is needed, or if an additional outfall is needed.

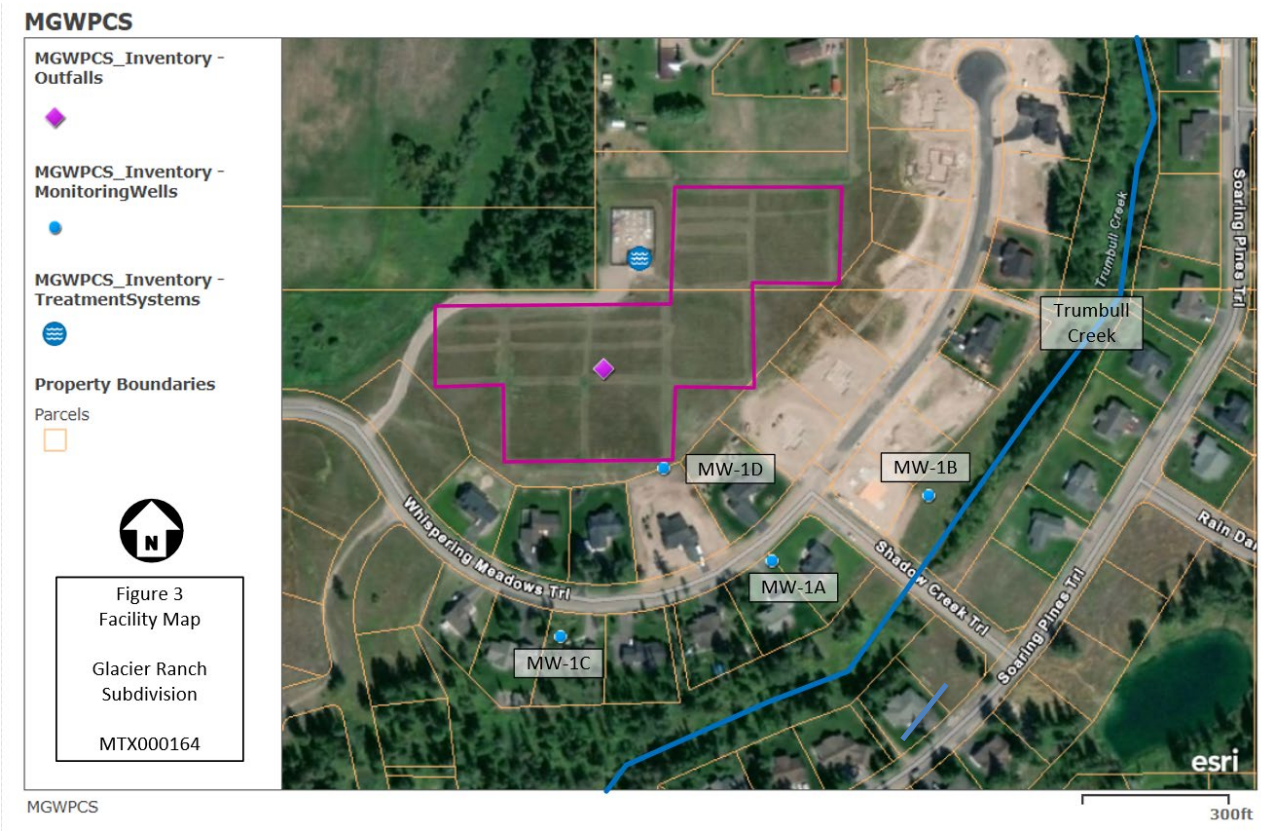

Figure 3. Facility Map

2.3 EFFLUENT CHARACTERISTICS

The permittee submitted both influent and effluent sampling data starting in June of 2014. DEQ however observed reporting errors in regards to the submitted nitrogen data; therefore, this data will be omitted from this fact sheet. DEQ will require a special condition report requiring the permittee to create a standard operating procedure (SOP) document for monitoring, sampling, calculating, and reporting effluent and influent wastewater data. This SOP will help to ensure that the data is representative of the nature of the monitored wastewater in-flows and discharge. The SOP is further discussed in **Section 5.**

2.4 GEOLOGY

The facility is located within the Flathead Valley which is an intermontane basin filled with unconsolidated Pleistocene glacial or glacial lake deposits and post glacial quaternary alluvial sediment. The basin is bounded by north to south trending mountain ranges of Precambrian bedrock (MBMG).

2.5 HYDROGEOLOGY

The facility is located on the Evergreen aquifer which is generally described as being located in between the Whitefish and Flathead Rivers of the Flathead Valley. This shallow aquifer generally flows with the rivers (north to south) and may daylight near the confluence of the Stillwater and Flathead Rivers (LaFave, 2004). Aquifer recharge is primarily from precipitation and surficial water losses from local surface waters (Konizeski, 1968).

The aquifer is primarily composed of unconsolidated alluvial gravel, with minor amounts of sand and silt. This unconfined aquifer is underlain by glacial till and glacio-lacustrine sediment deposits which tend to have low permeability (LaFave, 2004).

Ground water flow direction was generally considered to be to the S22˚E; however, more recent water level measurements indicate seasonal and variable flow directions between the drainfield and Trumbull Creek [(RLK Hydro, 2005) and (2014-2018 DMR data)]. The top contact of the water bearing zone is approximately eleven feet in depth and may be unconfined. The top contact of the underlying confining unit is unknown. Additional site-specific hydrogeology information will be required once the permittee applies to modify the conditions of this permit.

2.6 HYDROLOGY

Trumbull Creek is the nearest surface water body (**Figure 3**) located approximately 500 feet from the eastern edge of the drainfield. Very little information is known about the daylighted Trumbull Creek and the hydraulic relation with the shallow aquifer.

2.7 GROUND WATER MONITORING WELLS

There are four known monitoring wells associated with this permit: MW-1A, MW-1B, MW-1C, and MW-1D. The well locations are shown on **Figure 3**. Monitoring well construction details are provided below in **Table 2,** and the driller's logs are attached as **Appendix A**.

An ambient monitoring well has not yet been established for this permit. DEQ will therefore require installation of a permanent monitoring well for long-term monitoring of the background ground water quality of the shallow aquifer. Installation requirements are discussed in **Section 5.**

If a DEQ-approved monitoring well is abandoned, destroyed or decommissioned, or is no longer able to be sampled due to fluctuations in the ground water table, the permittee must install or designate a new well to replace the abandoned, destroyed, decommissioned, or non-viable well.

Table 2: Monitoring Well Summary
Monitoring Well: MW-1A
MBMG GWIC #: Not Reported
Status: Active. Constructed on 07/22/2009
Location: Located 160 feet southwest of the road intersection of Whispering Meadows Trail and Shadow Creek Trail. Latitude: 48.28234 Longitude: -114.26943
Representation: Shallow ground water downgradient of the discharge structure.
Monitoring Well: MW-1B
MBMG GWIC #: Not Reported
Status: Active. Constructed on 07/22/2009
Location: Located 240 feet east of the road intersection of Whispering Meadows Trail and Shadow Creek Trail. Latitude: 48.28270 Longitude: -114.26816
Representation: Shallow ground water downgradient of the discharge structure.
Monitoring Well: MW-1C
MBMG GWIC #: Not Reported
Status: Active. Constructed on 07/22/2009
Location: Located 580 feet southwest of the road intersection of Whispering Meadows Trail and Shadow Creek Trail. Latitude: 48.28193 Longitude: -114.27119
Representation: Shallow ground water downgradient of the discharge structure.
Monitoring Well: MW-1D
MBMG GWIC #: Not Reported
Status: Active. Constructed on 07/23/2009
Location: Located 300 feet west of the road intersection of Whispering Meadows Trail and Shadow Creek Trail. Latitude: 48.28286 Longitude: -114.27034
Representation: Shallow ground water downgradient of the discharge structure.
Monitoring Well: MW-1E
MBMG GWIC #: TBD
Status: Not Active. Monitoring well to be installed and monitoring to commence during the permit cycle (see Special Condition requirements).
Location: To be constructed in shallow ground water, upgradient of the subsurface drainfield. Installation requirements are listed in Section 5. See Figure 4 for tentative well placement locations. Latitude: TBD Longitude: TBD
Representation: Upgradient of the discharge structure.

2.8 GROUND WATER QUALITY CHARACTERISTICS

The permittee submitted ground water monitoring data starting in June of 2014. All monitoring results are from monitoring wells that may be downgradient of the drainfield (**Table 2**). These results are provided below in **Table 3.**

DEQ observed reporting errors in regards to the submitted nitrogen data, therefore this data will be omitted from this fact sheet. DEQ will require a special condition report requiring the permittee to create a standard operating procedure (SOP) document for monitoring, sampling, and reporting ground water data. This SOP will help ensure that the data is representative of the nature of the shallow aquifer. Special condition requirements are discussed in **Section 5.**

DEQ will require the installation and ongoing monitoring of an ambient monitoring well. The well is to be located upgradient of the discharge structure. Special condition requirements are discussed in **Section 5**.

Table 3: Ground Water Monitoring Results

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data
MW-1A	Shallow ground water downgradient of the discharge structure.	Chloride (as Cl)	mg/L	5	7	11	22	DMR
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	22	DMR
		Specific Conductivity (@ 25°C)	µS/cm	386	430	470	22	DMR
		Static Water Level (SWL)	ft-bmp	5.5	8.7	9.8	22	DMR
MW-1B	Shallow ground water downgradient of the discharge structure.	Chloride (as Cl)	mg/L	5	7	10	22	DMR
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	22	DMR
		Specific Conductivity (@ 25°C)	µS/cm	370	423	452	22	DMR
		Static Water Level (SWL)	ft-bmp	5.9	7.9	10.2	22	DMR
MW-1C	Shallow ground water downgradient of the discharge structure.	Chloride (as Cl)	mg/L	5	7	11	22	DMR
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	22	DMR
		Specific Conductivity (@ 25°C)	µS/cm	410	456	531	22	DMR
		Static Water Level (SWL)	ft-bmp	6.2	8.3	10.0	22	DMR
MW-1D	Shallow ground water downgradient of the discharge structure.	*Escherichia coli* Bacteria	CFU/100 ml	<1	<1	<1	22	DMR
		Static Water Level (SWL)	ft-bmp	9.2	10.9	11.9	22	DMR

Footnotes:

Period of record: June 2013 through September 2018

bmp = below measuring point

CFU = Colony Forming Units

DMR = Self Reported Discharge Monitoring Reports

(1) Refer to Table 2 of the Fact Sheet for the existing or proposed location of the monitoring wells.

(2) Maximum value recorded of all quarterly reported values.

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

DEQ issues discharge permits authorizing permittees to discharge pollutants to state waters under conditions that do not cause or contribute to pollution. Additionally, all discharges are subject to the nondegradation provision of the Montana Water Quality Act, which requires preservation of existing high quality waters.

3.1 WATER QUALITY STANDARDS

Montana has water quality standards for both surface water and ground water. The numeric criteria for each are different because they support different uses. DEQ writes permits to protect the most sensitive use, thereby protecting all uses. DEQ must protect the uses designated for Trumbull Creek, which is classified B-1. Therefore, the effluent limits in this permit are based upon the aquatic life criteria published in DEQ Circular 12A.

- The total nitrogen criterion is 0.28 mg/L, and
- The total phosphorus criterion is 0.025 mg/L.

These criteria are found in DEQ Circular 12A, Table 12A-1, Northern Rockies Ecoregion. By setting effluent limitations based on the most restrictive water quality standard at end-of-pipe prior to discharge (**Section 5.0**), DEQ ensures that this discharge will not cause or contribute to impairment of any state water.

3.2 NONDEGRADATION

Montana's nondegradation policy is intended to preserve the existing condition of high-quality state waters. Any water whose existing condition is better than the water quality standards must be maintained in that high quality. Nondegradation policy allows discharges to cause only nonsignificant changes in water quality. Changes in water quality that are deemed significant require an authorization to degrade. An authorization to degrade is not an authorization to pollute because the water quality standard must not be exceeded.

The First Judicial District Court held in *Bitterrooters for Planning, Inc., et al v. DEQ* (Cause No. CDV-2014-505) and in *Bitterrooters for Planning, Inc., et al v. DEQ and Stephen Wanderer and Georgia Filcher* (Cause No. ADV-2015-32) that, in accordance with ARM 17.30.715, DEQ must consider impacts to nearby surface waters, cumulative impacts, and any other potential impacts on water quality that may arise from the activity authorized by the permit in determining whether the proposed discharge results in significant or nonsignificant changes to water quality.

The permittee proposed to increase the design capacity of their wastewater treatment. Trumbull Creek is now a flowing waterbody and DEQ has promulgated numeric nutrient criteria that apply to Trumbull Creek. The nonsignificance determination completed in 2007 is insufficient to evaluate the currently permitted discharge against numeric nutrient criteria in Trumbull Creek. The proposed increase in discharge volume makes this outfall an increased source, triggering DEQ's statutory requirement to perform a nondegradation review. DEQ must complete a new significance determination. In order to do so, the permittee, in coordination with DEQ, will need to collect and submit site-specific information on hydrology, hydrogeology, cumulative effects, nitrogen fate and transport, and measurable impacts to surface water.

DEQ cannot perform a surface water significance determination with the data provided by the permittee to date. Therefore, DEQ's only course for compliance with the nondegradation provisions of the Montana Water Quality Act is to set effluent limitations equal to the surface water quality standards (**Section 3.2**). This ensures that any water quality changes in Trumbull Creek will be nonsignificant.

4.0 MIXING ZONE

A mixing zone is a specifically defined area of the receiving water where water quality standards may be exceeded. DEQ evaluates the suitability according to criteria established in the Administrative Rules of Montana. The mixing zone is then defined in the permit.

A mixing zone is not authorized for this discharge due to the following:

- This permit ensures nonsignificance at the point of discharge **(Section 3)**; and,
- Site-specific hydrogeologic information has not yet been received.

5.0 PERMIT CONDITIONS

Discharge permits include conditions that ensure compliance with the Montana Water Quality Act and the regulations used to implement it. These conditions include effluent limits as well as any special conditions that DEQ deems necessary to protect the quality of the receiving water.

5.1 EFFLUENT LIMITATIONS

A mixing zone is not authorized, therefore the permittee must meet the most restrictive water quality standards prior to discharge (end-of-pipe). The effluent limitations are provided in **Table 4**.

Table 4: Final Effluent Limits – Outfall 001

Parameter	Units	Daily Maximum
Nitrogen, Total (as N)	mg/L	0.28
Phosphorus, Total (as P)	mg/L	0.025

5.2A SPECIAL CONDITIONS: MONITORING WELL INSTALLATION

The permittee is required to install a minimum of one (1) monitoring well (MW-1E) that is representative of the ambient nature of the receiving shallow aquifer. Within six (6) months of the permit effective date, the permittee must create a Monitoring Well Installation Plan. The plan must be approved by DEQ prior to well installation. The installation must take place within one (1) year of the permit effective date.

Details of the location and design of the proposed drainfield capable of handling the increase in wastewater flows has not yet been submitted; therefore, DEQ is currently unaware of the future footprint of the proposed drainfield. A preapproved monitoring well placement map is included in **Figure 4**; however, this may need to be updated pending the location and footprint of the proposed drainfield. Unless otherwise approved by DEQ, the monitoring well is not to be closer than 125 feet or further than 600 feet away from the proposed drainfield.

The well must be constructed to be representative of the top 20 feet of the shallow water table (first saturated water bearing unit). The well must be secured and accessible over the long term. The well must be located hydraulically upgradient of the proposed drainfield.

Sampling and reporting for the new ambient well(s) will commence fifteen (15) months after the permit effective date.

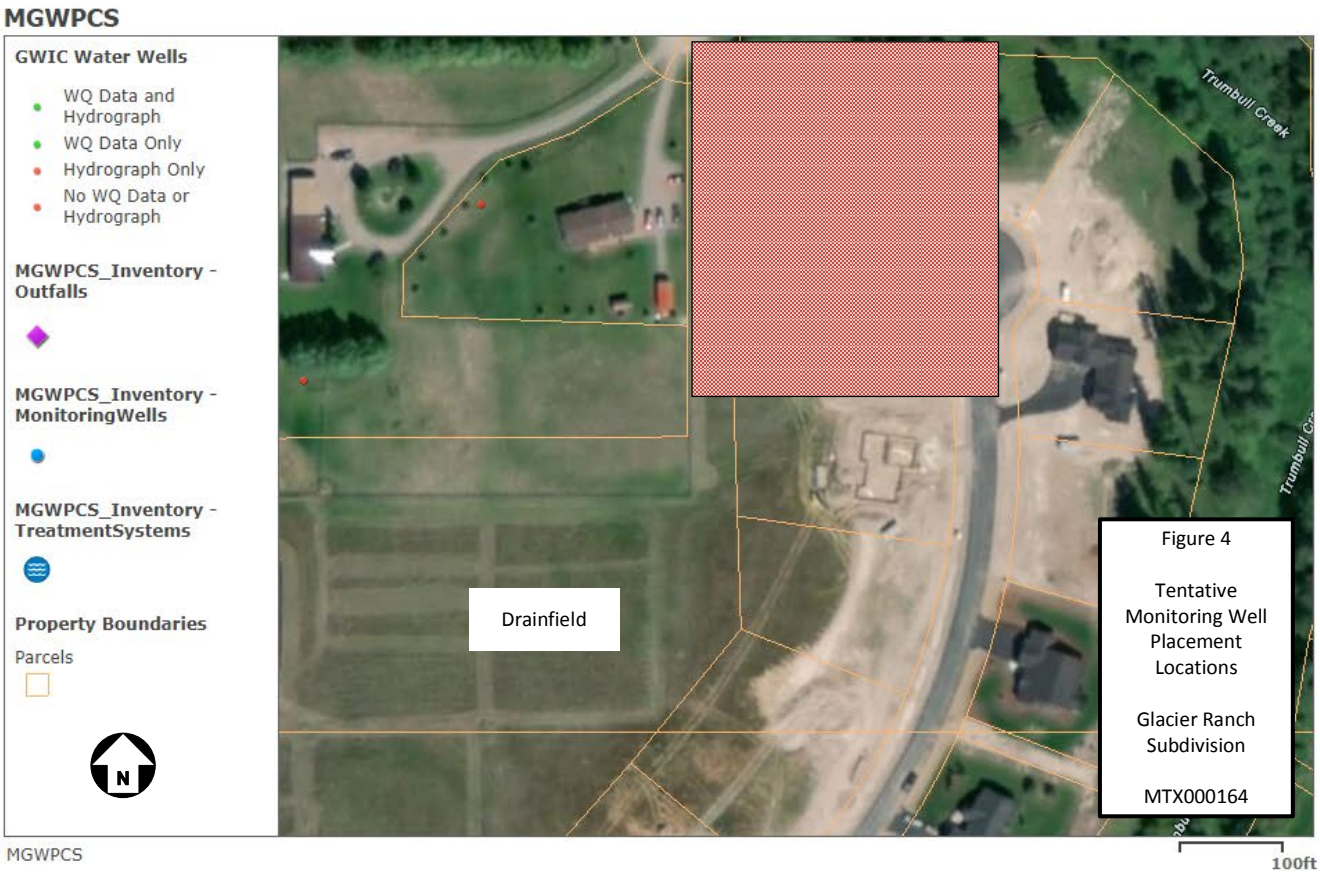

Figure 4. Monitoring Well Installation Map

5.2B SPECIAL CONDITIONS:
STANDARD OPERATING CONDITIONS – SAMPLING, ANALYSIS AND REPORTING PLANS

The permittee will be required to use best management practices (BMPs) in developing standard operating procedures (SOPs) for sampling and reporting ground water and wastewater. The plans need to be site-specific and result in monitoring and reporting that is representative of the nature of ground water and wastewater. The plans will need to provide a method for consistent and accurate calculation and reporting of all sampling and monitoring data.

Within six (6) months of the permit effective date, the permittee must create a Ground Water Sampling, Analysis, and Reporting Plan. The site-specific procedure plan will need to provide for the consistent identification, development, monitoring, sampling, recording, calculating, and reporting of the monitoring wells. The permittee will need to maintain monitoring well development records on-site that document the proper development of the wells (representative sample). The plan, along with the well development records, need to be maintained on-site at all times. Ground water monitoring requirements are further discussed in **Section 6**.

Within six (6) months of the permit effective date, the permittee must create a Wastewater Sampling, Analysis and Reporting Plan. The site-specific procedure plan will need to provide for the consistent monitoring, sampling, recording, calculating, and reporting of the influent and effluent wastewater. The permittee will need to maintain wastewater sampling records on-site that document the proper composite sample (representative sample). The plan, along with the wastewater sampling records, need to be maintained on-site at all times. Wastewater monitoring requirements are further discussed in **Section 6**.

6.0 MONITORING AND REPORTING REQUIREMENTS

Influent, effluent, and ground water monitoring is required as a condition of this permit. All monitoring and sampling required by this permit must be representative (nature); therefore, the permit identifies specific monitoring locations. Monitoring requirements and rationale are summarized below.

6.1 INFLUENT MONITORING

Influent monitoring was established by DEQ in 2007. Influent monitoring will be maintained in order to provide information regarding the operations and maintenance of the wastewater treatment system. Influent samples must be representative of the nature and volume of the wastewater inflows.

All analytical methods must meet the laboratory reporting limit listed for each respective parameter. Specific laboratory analytical methods are listed for both Total Nitrogen and Total Phosphorus. The sampling and flow measurement locations are described within **Table 1**. Influent monitoring and reporting requirements are summarized in **Table 5**.

Table 5: Influent Monitoring and Reporting Requirements – Outfall 001

Analyte/Measurement/ Method	Monitor Location	Units	Sample Type[1]	Minimum Sample Frequency	Reporting Requirements[1][2][3]	Report Freq	Laboratory Reporting Limit[4]
Biological Oxygen Demand (BOD_5)	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-
Count of Daily Samples Collected During Reporting Period	INF-001	-	-	-	Count	Monthly	-
Nitrogen, Nitrite+Nitrate (as N)	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.02
Nitrogen, Total Ammonia (as N)	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.07
Nitrogen, Total Kjeldahl (TKN)(as N)	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.5
Nitrogen, Total (as N) Persulfate Digestion[6]	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.04
		lbs/day[8]	Calculate	1/Month	Daily Minimum[9] Monthly Average[10] Daily Maximum[11]	Monthly	-
Phosphorus, Total (as P) Semi-Automated Colorimetry[7]	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.005
		lbs/day[8]	Calculate	1/Month	Daily Minimum[9] Monthly Average[10] Daily Maximum[11]	Monthly	-
Total Suspended Solids (TSS)	INF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-

Footnotes:

Compositing Period: 6 to 24 hours

CFU = Colony Forming Units

EFF-001: Description provided in Table 1

INF-001: Description provided in Table 1

FM-001: Description provided in Table 1

If no discharge occurs during the reporting period, "no discharge" shall be recorded on the effluent Discharge Monitoring Report (DMR) report forms.

(1) See definitions in Part V of the permit.

(2) Daily Minimum: Report lowest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(3) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(4) The Laboratory Reporting Limit (LRL) is the detection level that must be achieved in reporting effluent monitoring or compliance data to DEQ. The LRL is DEQ's best determination of a standard level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories. Parameter analytical results shall meet the LRLs listed, or as otherwise approved by DEQ.

(5) Requires recording device or totalizing meter, must be capable of recording daily effluent volume.

(6) Total Nitrogen shall be analyzed using a Persulfate Digestion method, or as otherwise approved by DEQ. The analysis shall be completed by a certified lab capable of meeting the laboratory reporting level of 0.04 mg/l, or as otherwise approved by DEQ.

(7) Total Phosphorus shall be analyzed using Method 365.1, Semi-Automated Colorimetry, or similar. The analysis shall be completed by a certified lab capable of meeting the laboratory reporting level of 0.005 mg/l, or as otherwise approved by DEQ.

(8) Load calculation: lbs/day = (mg/L) x flow (gpd) x [8.34×10^{-6}].

(9) Daily Minimum Load calculation: lbs/day = the minimum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

(10) Monthly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

(11) Daily Maximum Load calculation: lbs/day = the maximum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

6.2 EFFLUENT MONITORING

This permit includes numeric effluent limitations with specific magnitudes and durations to ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see **Section 3**). Accordingly, the permittee is required to monitor and report at a specified frequency in order to demonstrate compliance with these limitations. Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent.

All analytical methods must meet the laboratory reporting limit listed for each respective parameter. Specific laboratory analytical methods are listed for both Total Nitrogen and Total Phosphorus. These sampling and flow measurement locations are described within **Table 1**. Effluent monitoring and reporting requirements are summarized in **Table 6**.

Table 6: Effluent Monitoring and Reporting Requirements – Outfall 001

Analyte/Measurement/ Method	Monitor Location	Units	Sample Type[1]	Minimum Sample Frequency	Reporting Requirements[1][2][3]	Report Freq	Laboratory Reporting Limit[4]
Biological Oxygen Demand (BOD_5)	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-
Count of Daily Samples Collected During Reporting Period	EFF-001	-	-	-	Count	Monthly	-
Flow Rate, Effluent[5]	FM-001	gpd	Contin-uous	Contin-uous	Daily Minimum Monthly Average Daily Maximum	Monthly	-
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.02
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.07
Nitrogen, Total Kjeldahl (TKN)(as N)	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.5
Nitrogen, Total (as N) Persulfate Digestion[6]	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.04
		lbs/day[8]	Calculate	1/Month	Daily Minimum[9] Monthly Average[10] Daily Maximum[11]	Monthly	-
Phosphorus, Total (as P) Semi-Automated Colorimetry[7]	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.005
		lbs/day[8]	Calculate	1/Month	Daily Minimum[9] Monthly Average[10] Daily Maximum[11]	Monthly	-
Total Suspended Solids (TSS)	EFF-001	mg/L	Composite	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-

Footnotes:

Compositing Period: 6 to 24 hours

CFU = Colony Forming Units

EFF-001: Description provided in Table 1

INF-001: Description provided in Table 1

FM-001: Description provided in Table 1

If no discharge occurs during the reporting period, "no discharge" shall be recorded on the effluent Discharge Monitoring Report (DMR) report forms.

(1) See definitions in Part V of the permit.

(2) Daily Minimum: Report lowest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(3) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(4) The Laboratory Reporting Limit (LRL) is the detection level that must be achieved in reporting effluent monitoring or compliance data to DEQ. The LRL is DEQ's best determination of a standard level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories. Parameter analytical results shall meet the LRLs listed, or as otherwise approved by DEQ.

(5) Requires recording device or totalizing meter, must be capable of recording daily effluent volume.

(6) Total Nitrogen shall be analyzed using a Persulfate Digestion method, or as otherwise approved by DEQ. The analysis shall be completed by a certified lab capable of meeting the laboratory reporting level of 0.04 mg/l, or as otherwise approved by DEQ.

(7) Total Phosphorus shall be analyzed using Method 365.1, Semi-Automated Colorimetry, or similar. The analysis shall be completed by a certified lab capable of meeting the laboratory reporting level of 0.005 mg/l, or as otherwise approved by DEQ.

(8) Load calculation: lbs/day = (mg/L) x flow (gpd) x $[8.34 \times 10^{-6}]$.

(9) Daily Minimum Load calculation: lbs/day = the minimum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

(10) Monthly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

(11) Daily Maximum Load calculation: lbs/day = the maximum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

6.3 GROUND WATER MONITORING

DEQ requires ground water monitoring to provide long term ambient and downgradient characterization of the aquifer. There are currently four downgradient monitoring wells MW-1A, MW-1B, MW-1C, and MW-1D; however, there are currently no ambient monitoring wells. Therefore, DEQ will establish a special condition requiring the establishment of a monitoring well (MW-1E) upgradient of the discharge structure. Please see **Section 5** for monitoring well installation requirements.

All analytical methods must meet the laboratory reporting limit listed for each respective parameter. Specific laboratory analytical methods are listed for both Total Nitrogen and Total Phosphorus. Information on the monitoring wells is provided in **Table 2.** Ground water monitoring and reporting requirements are summarized in **Table 7**. Ground water monitoring will be required at all five monitoring wells.

Table 7: Ground Water Monitoring and Reporting Requirements - Separately for each Individual Well

Action Date: Monitoring and Reporting for MW-1A, MW-1B, MW-1C, and MW-1D will commence on the permit effective date.

Action Date: Monitoring and Reporting for MW-1E will commence 15 months after the permit effective date.

Analyte/Measurement/ Method	Monitor Location[1]	Units	Sample Type[2]	Minimum Sampling Frequency	Reporting[2][3][4][5] Requirements	Reporting Frequency	Laboratory Reporting Limit[6]
Chloride (as Cl)	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	mg/L	Grab	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-
Count of Daily Samples Collected During Reporting Period	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	-	-	-	Count	Monthly	-
Escherichia coli Bacteria	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	CFU/100ml	Grab	1/Month	Daily Minimum Monthly Average[7] Daily Maximum	Monthly	1/100 ml
Nitrogen, Nitrate + Nitrite (as N)	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	mg/L	Grab	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.02
Nitrogen, Total Ammonia (as N)	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	mg/L	Grab	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.07
Nitrogen, Total Kjeldahl (TKN)(as N)	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	mg/L	Grab	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.5
Nitrogen, Total (as N) Persulfate Digestion[8]	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	mg/L	Grab	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.04
pH	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	s.u.	Instant-aneous	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-
Specific Conductivity @ 25°C	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	µS/cm	Grab or Instant-aneous	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	-
Static Water Level (SWL)[9]	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	ft-bmp	Instant-aneous	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.01
Temperature	MW-1A, MW-1B, MW-1C, MW-1D, MW-1E	°C	Instant-aneous	1/Month	Daily Minimum Monthly Average Daily Maximum	Monthly	0.1

Footnotes:

CFU = Colony Forming Units

ft-bmp = feet below measuring point

s.u. = standard units

At no time shall the permittee mark or state "no discharge" on any monitoring well DMR form.

Each monitor well to be individually sampled and analyzed for each respective parameter listed above.

If any monitoring well(s) are abandoned, destroyed or decommissioned, or are no longer able to be sampled due to fluctuations in the ground water table; the permittee shall install a new well to replace the abandoned, destroyed, decommissioned, or non-viable well(s).

Submittal of discharge monitoring report forms (DMRs) will be required, regardless of the operational status of the facility or of each individual monitoring well.

(1) Refer to Table 2 of the Fact Sheet for the existing or proposed location of the monitoring wells.

(2) See definitions in Part V of the permit.

(3) Submittal of DMRs will be required, regardless of the installation status of each individual monitoring well. If the monitoring well(s) is not installed for an individual monitoring period, the following shall be stated upon each applicable DMR: "monitoring well has not been installed" (or the respective NODI code as established by DEQ).

(4) Daily Minimum: Report lowest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(5) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(6) The Laboratory Reporting Limit (LRL) is the detection level that must be achieved in reporting effluent monitoring or compliance data to DEQ. The LRL is DEQ's best determination of a standard level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories. Parameter analytical results shall meet the LRLs listed, or as otherwise approved by DEQ.

(7) The geometric mean must be reported if more than one sample is taken during a reporting period.

(8) Total Nitrogen shall be analyzed using a Persulfate Digestion method, or as otherwise approved by DEQ. The analysis shall be completed by a certified lab capable of meeting the laboratory reporting level of 0.04 mg/l, or as otherwise approved by DEQ.

(9) Measuring point (point of reference) for SWL measurements shall be from top of casing and measured to within 1/100th of one foot.

COMPLIANCE SCHEDULE

The actions listed in **Table 8** below must be completed on or before the respective scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date. Unless otherwise states, completion of all actions or deliverables must be reported to DEQ in accordance with Part II.D and Part IV.G of the permit.

Table 8: Compliance Schedule

Action	Freq.	Scheduled Completion Date of Action[1]	Scheduled Report Due Date.[2]
Develop and implement a site-specific **Wastewater Sampling, Analysis, and Reporting Plan**.[3]	Single event	*Within six (6) months of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*
Develop and implement a site-specific **Ground Water Sampling, Analysis, and Reporting Plan**.[3]	Single event	*Within six (6) months of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*
Complete a **Monitoring Well Installation Plan**.[3]	Single event	*Within six (6) months of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*
Complete the installation of the monitoring well(s).[4]	Single event	*Within one (1) year of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*
Commence monitoring and reporting of the newly installed monitoring well(s).	Single event	*Within fifteen (15) months of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*

Footnotes:

(1) The actions must be completed on or before the scheduled completion dates.

(2) Reports must be received by DEQ on or before the scheduled report due dates. The reports must include all information as required for each applicable action as listed in Section 5.

(3) The completed plan (action), in place of a written report, must be received by the DEQ on or before the scheduled report due date.

(4) The written report documenting monitoring well installation must include: drilling methods used; borehole lithologic logs; diagram of well construction details; measuring point details; surveyed base location of all monitoring wells; surveyed measuring point elevation of all monitoring wells; depth to the top contact of the first saturated ground water bearing zone; well development records; depth to static water level (post development). This information must be included for each respective monitoring well.

PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on May 06, 2019. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or to:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice are mailed to the applicant, state and federal agencies, and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: http://deq.mt.gov/Public/notices/wqnotices.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-5546 or email DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number (MTX000164), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

References

40 CFR § 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants. 2011.

Administrative Rules of Montana, Title 17, Chapter 30, Water Quality:

- Subchapter 2 - Water Quality Permit Fees.
- Subchapter 5 – Mixing Zones in Surface and Ground Water.
- Subchapter 7 – Nondegradation of Water Quality.
- Subchapter 10 – Montana Ground Water Pollution Control System.
- Subchapter 13 – Montana Pollutant Discharge Elimination System.

Crowley et al., 2017. Montana Bureau of Mines and Geology (MBMG), Principal Aquifers of Montana, MBMG Hydrogeologic Map 11.

Department of Environmental Quality, Water Quality Circulars:

- Circular DEQ-2 – Design Standards for Wastewater Facilities.
- Circular DEQ-4 – Montana Standards for On-Site Subsurface Sewage Treatment Systems.
- Circular DEQ-7 – Montana Numeric Water Quality Standards, Required Reporting Values, and Trigger Values.

Department of Environmental Quality, Site Visit Report, Glacier Ranch Subdivision, MTX000164. June 11, 2014.

Department of Environmental Quality. Engineering Review, EQ#17-2178. “Glacier Ranch Phase 5 Response.” Message to Justin Ahmann, APEC. August 08, 2017.

Department of Environmental Quality. MGWPCS Files, Preapplication Meeting. “Glacier Ranch Phase 5 Response.” Message to Justin Ahmann, APEC. August 22, 2017.

Department of Environmental Quality. Preapplication Meeting. “Glacier Ranch Phase 5 Response.” Message to Justin Ahmann, APEC. August 22, 2017.

Department of Environmental Quality. Preapplication Discussion, MTX000164. “Glacier Ranch Phase 5” Message to Justin Ahmann, APEC. August 24, 2017.

Department of Environmental Quality. Preapplication Discussion, MTX000164. “Glacier Ranch Phase 5” Message to Justin Ahmann, APEC. August 28, 2017.

Department of Environmental Quality, Preapplication Meeting, Glacier Ranch Subdivision, MTX000164. September 01, 2017.

Department of Environmental Quality. Preapplication Discussion, MTX000164. “Surface Water Impact.” Message to Justin Ahmann, APEC. October 09, 2017.

Department of Environmental Quality. Preapplication Discussion, MTX000164. “Surface Water Impact.” Message to Justin Ahmann, APEC. October 16, 2017.

Department of Environmental Quality. Notification of Deficiency, MTX000164. November 03, 2017.

Department of Environmental Quality. Phone Call Discussion, MTX000164. “Form 1 Deficiency Letter.” Discussion with Justin Ahmann, APEC. November 16, 2017.

Department of Environmental Quality. Additional Information Request, MT0031917. January 11, 2018.

Department of Environmental Quality. Post Legal Meeting. “APU Discharge Permit.” Message to Vicki A. Marquis, Holland & Hart. April 03, 2018.

Department of Environmental Quality. Post Legal Meeting. “APU Discharge Permit.” Message to Vicki A. Marquis, Holland & Hart. April 03, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch GW Permit.” Message to Justin Ahmann, APEC. April 30, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch GW Permit.” Message to Justin Ahmann, APEC. May 01, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch GW Permit.” Message to Justin Ahmann, APEC. May 02, 2018.

Department of Environmental Quality. Memo: Glacier Ranch Subdivision Fate and Transport Model Requirements. June 13, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch Fate and Transport Study.” Message to Justin Ahmann, APEC. June 13, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch Fate and Transport Study.” Message to Justin Ahmann, APEC. July 24, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch Fate and Transport Study.” Message to Justin Ahmann, APEC. July 25, 2018.

Department of Environmental Quality. Deficiency. “Glacier Ranch Fate and Transport Study.” Message to Justin Ahmann, APEC. August 02, 2018.

Department of Environmental Quality. Internal Water Protection Memo. October 26, 2018.

Fetter, C.W., Applied Hydrogeology, 1994.

Freeze, R., and Cherry, J., Groundwater, 1979.

Kendy, E. and R.E. Tresch. 1996. Geographic, Geologic, and Hydrologic Summaries of Intermontane Basins of the Northern Rocky Mountains, Montana. USGS Water-Resources Investigations Report: 96-4025.

Konizeski et al., 1968. Montana Bureau of Mines and Geology (MBMG), Geology and ground-water resources of the Kalispell Valley, Northwestern Montana. MBMG Bulletin 68, p. 42.

LaFave et al., 2004. Montana Bureau of Mines and Geology (MBMG), Ground Water Assessment Program (GWAP), Ground-water Assessment of Selected Shallow Aquifers in the North Flathead Valley and Flathead Lake Perimeter Area. MBMG Open-File Report 492.

Noble et al., 1986, Ground-water resources and water quality of the unconfined aquifers in the Kalispell Valley, Montana. Montana Bureau of Mines and Geology, Open-File Report 177.

Montana Bureau of Mines and Geology, 2004 Ground Water Resources of the Flathead Lake Area: Flathead, Missoula, and Sanders Counties, Montana – Part A & B, Ground Water Assessment Atlas 2.

Montana Bureau of Mines and Geology, Ground-Water Information Center, Retrieved February 2018, from the GWIC database, http://mbmggwic.mtech.edu.

Montana Code Annotated, Title 75, Chapter 5, *Montana Water Quality Act*, 2011.

RLK Hydro. Glacier Ranch Subdivision Potentiometric Maps. 2005.

U.S. Environmental Protection Agency, Effluent Limitation Guidelines, http://water.epa.gov/scitech/wastetech/guide/, 2013.

U.S. Environmental Protection Agency, Guidance Manual for Developing Best Management Practices http://www.epa.gov/npdes/pubs/owm0274.pdf>, 1993.

U.S. Environmental Protection Agency, NPDES Permit Writers' Manual, 833-K-10-001, September 2010.

U.S. Environmental Protection Agency, *Onsite Wastewater Treatment Systems Manual*, 625/R-00/008, Office of Research and Development and Office of Water. 2002b.

U.S. Environmental Protection Agency, 1991. *Technical Support Document for Water Quality-Based Toxics Control* (TSD). EPA-505/2-90-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. www.epa.gov/npdes/pubs/owm0264.pdf

U.S. Geological Survey, Basic Ground Water Hydrology, http://pubs.usgs.gov/wsp/2220/report.pdf, 2016.

U.S. Geological Survey, Groundwater Basics, http://water.usgs.gov/ogw/basics.html, 2016.

Woessner, W., Troy, T., Ball, P. and D.C. DeBorde. 1998. Virus Transport in the Capture Zone of a Well Penetrating a High Hydraulic Conductivity Aquifer Containing a Preferential

Vuke et al., Montana Bureau of Mines and Geology, Geologic Map of Montana, Geologic Map 62, 2007.

APPENDIX A – 2009 MONITORING WELL INSTALLATION REPORT