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:	Countryside Homeowners Association
Permit Number:	MTX000177
Permit Type:	Domestic Wastewater
Application Type:	Renewal
Facility Name:	Countryside Estates Subdivision
Facility Location:	Southeast ¼ of Northeast ¼, Section 09, T01S, R04E Gallatin County Latitude: 45.76519° Longitude: -111.22889°
Facility Address:	The existing treatment and disposal site is 2 miles west of the city of Belgrade; and ½ mile south of the intersection of Countryside Lane and Amsterdam Road
Facility Contact:	Daniel Purcell Countryside Estates HOA 72 River Woods Road Belgrade, MT 59714 (405) 308-1899
Treatment Type:	Level 2
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / Subsurface Discharge Structure – Domestic Wastewater
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 5.2 lbs/day
Flow Rate:	Design maximum: 30,920 gpd Design average: 19,390 gpd
Effluent sampling:	Quarterly, EFF-001
Ground water sampling:	Quarterly, MW-1A and MW-1B
Fact Sheet Date:	June 6, 2022
Prepared By:	Michelle Peziol

1.0 PERMIT INFORMATION

DEQ issues Montana Ground Water Pollution Control System (MGWPCS) permits for a period of five years. The permit may be reissued at the end of the period, subject to reevaluation of the receiving water quality and permit limitations. This fact sheet provides the basis for DEQ's decision to renew a MGWPCS wastewater discharge permit to Daniel Purcell, Countryside Estates HOA President for the Countryside Estates Subdivision.

1.1 APPLICATION

DEQ received an application for renewal of the permit on March 06, 2020. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on April 01, 2020.

1.2 PERMIT HISTORY

The Montana Ground Water Pollution Control System (MGWPCS) discharge permit for Countryside Estates Subdivision was first authorized in 2007. The facility has been built and is currently in operation. Based on the permit renewal application, no new or increased source of pollutants is proposed.

2.0 FACILITY INFORMATION

2.1 LOCATION

The Countryside Estates Subdivision Facility is located 2 miles west of the city of Belgrade; and ½ mile south of the intersection of Countryside Lane and Amsterdam Road in Gallatin County (**Figure 1**).

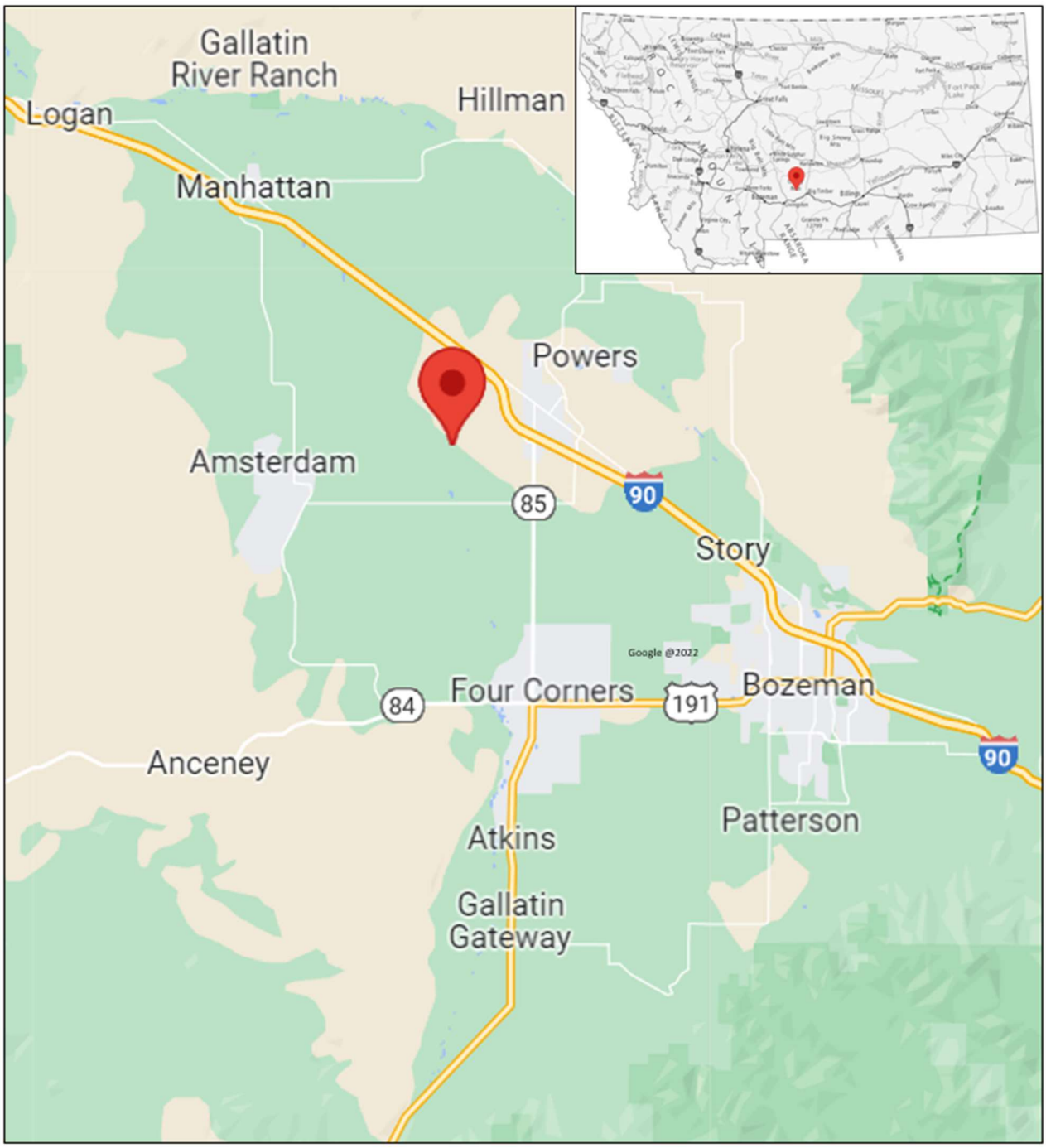


Figure 1. Location of the Countryside Estates Subdivision.

The Countryside Estates Subdivision wastewater treatment system provides centralized collection, treatment and disposal of domestic wastewater generated by the residents of the subdivision. The wastewater facility serves 86 connections for single-family residential homes, commercial office buildings, and a 9-unit apartment building. The development encompasses approximately 76 total acres (**Figure 2**).

Figure 2. Location of the Countryside Estates Subdivision Wastewater Treatment System.

2.2 OPERATIONS

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

Table 1: Operations Summary
Sources and Treatment
Contributing Sources of Wastewater: Domestic-in-Nature, Residential Strength Standard Industrial Code(s) (SIC) of contributing sources: 7389, 8811, 6513 Treatment System: All wastewater service connections contain individual septic tanks. The collected wastewater then undergoes Level II nitrogen treatment using a community 9-pod AdvanTex® trickling filter system. Location of System: Southeast ¼ of Northeast ¼ Section 09, Township 01 South, Range 04 East Latitude: 45.76519°, Longitude: -111.22889° Gallatin County
Sampling/Monitoring
Wastewater System: EFF-001: Effluent wastewater sample point located at sample port located after the drainfield dose tank. FM-001: Badger Meter Recordall Turbo 2000 Meter (2 located in series).
Disposal Operation
Domestic Wastewater/Sewage: Outfall 001 Method of Disposal: Infiltration to ground water Location: Southeast ¼ of Northeast ¼ Section 09, Township 01 South, Range 04 East Latitude: 45.76519º, Longitude: -111.22889º Design Capacity: Average Daily Flow (gpd): 19,390 Maximum Daily Flow (gpd): 30,920

The existing facility serves as a centralized collection, treatment and disposal system for domestic wastewater generated by residents and businesses located within the subdivision. Residential lots have at least a 1,000-gallon septic tank. Each of the four (4) commercial lots have a 1,500-gallon septic tank, and the multi-family building has a 7,000-gallon septic tank.

Wastewater collected from the septic tanks will gravity drain to a 72-inch (i.d.) lift station via a sanitary sewer collection system. A force main will take the wastewater to a 30,000-gallon recirculation tank. The influent wastewater will leave the recirculation tank at a ratio no less than four (4) treated effluent parts, to one (1) part untreated wastewater. Level II wastewater treatment will occur in an Orenco AdvanTex AX100 9 POD recirculating trickling filter system. The effluent will be discharged to a 10,000-gallon dose tank with four (4) 20 horsepower pumps. After exiting the dose tank, flow volumes will be metered on each effluent flow line, separately, through four (4) Badger 6-inch recordall turbo flow meters, prior to discharging to a subsurface drainfield (**Figure 3 – Flow Line Diagram**).

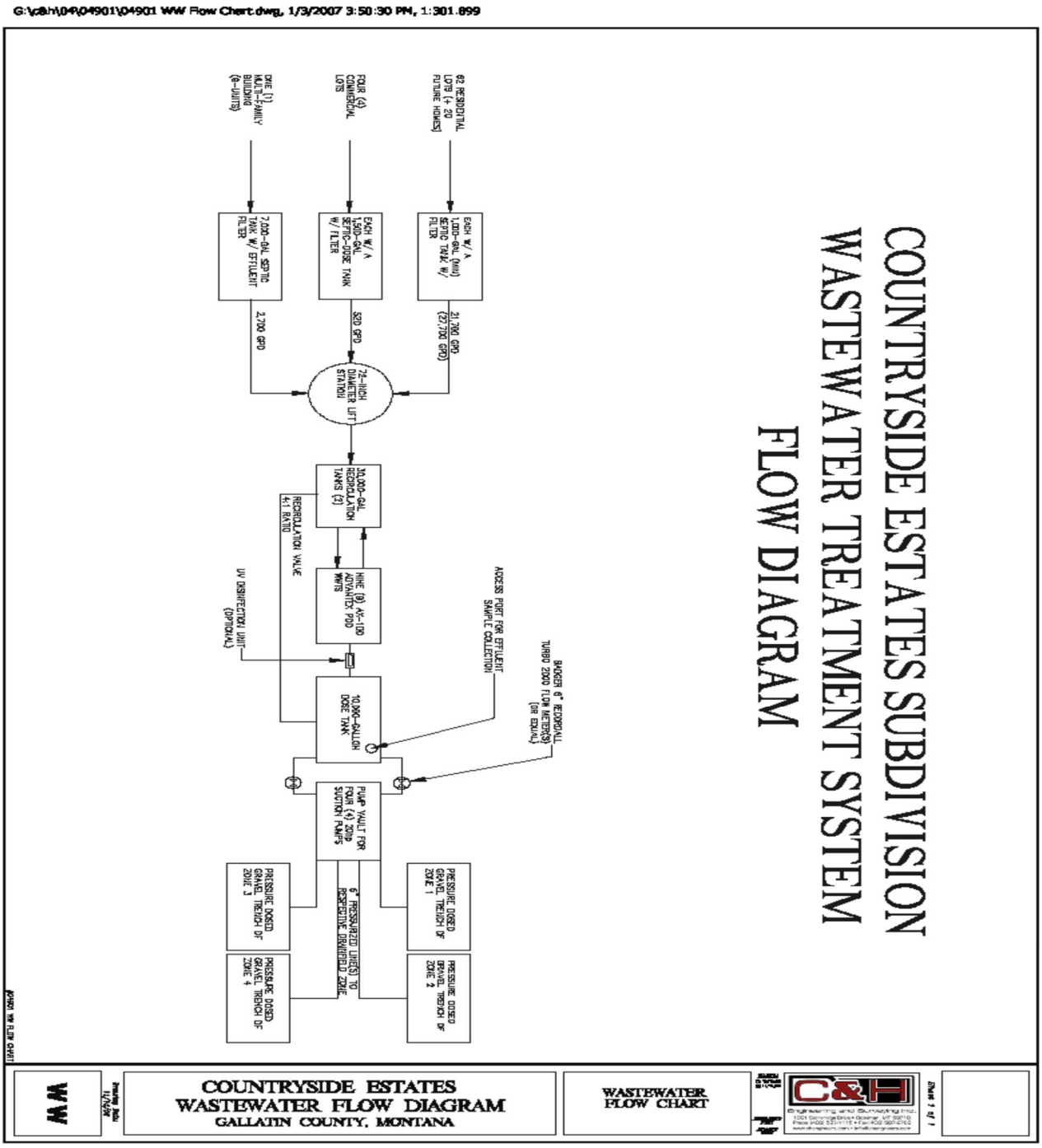


Figure 3. Wastewater Treatment System Line Diagram of the collection, treatment and disposal process.

2.3 GEOLOGY/HYDROGEOLOGY/HYDROLOGY

A summary of the site geology and ground water characteristics are provided in **Table 2**.

Table 2: Geology/Hydrogeology/Hydrology Summary	
Geology	The variable stratigraphy and natural sorting of the sediments in this area suggests a Quaternary alluvial depositional environment associated with braided river floodplains. Rapid to abrupt transitions from fine-grained clayey (with cobbles) materials to coarse sands and gravels are common in the subsurface in these areas due to the variable stream velocities encountered throughout the ever-changing meandering river system over time (DEQ, 2007b).
Hydrogeology	No ground water was encounter in 7 test holes (TH) dug with a backhoe in and around the proposed drainfield. The THs ranged from 8-10 feet bgs.
Ground Water Flow	An onsite ground water potentiometric surface map shows ground water flow direction in the vicinity of the discharge structure primarily due N30ºE with a hydraulic gradient of 0.0089 feet/feet (DEQ, 2007b). This flow direction was determined using five wells on or adjacent to the facility, and agrees with published groundwater flow directions (e.g. Hackett et al., 1960). A local aquifer pump test was conducted at the South Irrigation Well (GWIC #22316), which resulted in a calculated hydraulic conductivity of 155.37 ft/day (DEQ, 2007b).
Hydrology	The nearest downgradient surface water from the discharge structure is the Durham Ditch. This ditch is likely not a water of the state, and as an irrigation ditch is likely losing, rather than gaining. The ditch is approximately 0.75 miles in a N30°E direction from the discharge structure (DEQ, 2007b). The nearest downgradient state surface water is either Thompson Creek (5.25 miles) or the East Gallatin River (6.2 miles). This uncertainty is due to the distance involved and the fact that regional groundwater flow varies seasonally between from N30°E to a more northerly trend. The Gallatin River is 0.4 miles west of the site, in a hydrologically upgradient direction.

A geologic map is provided as **Figure 4**.

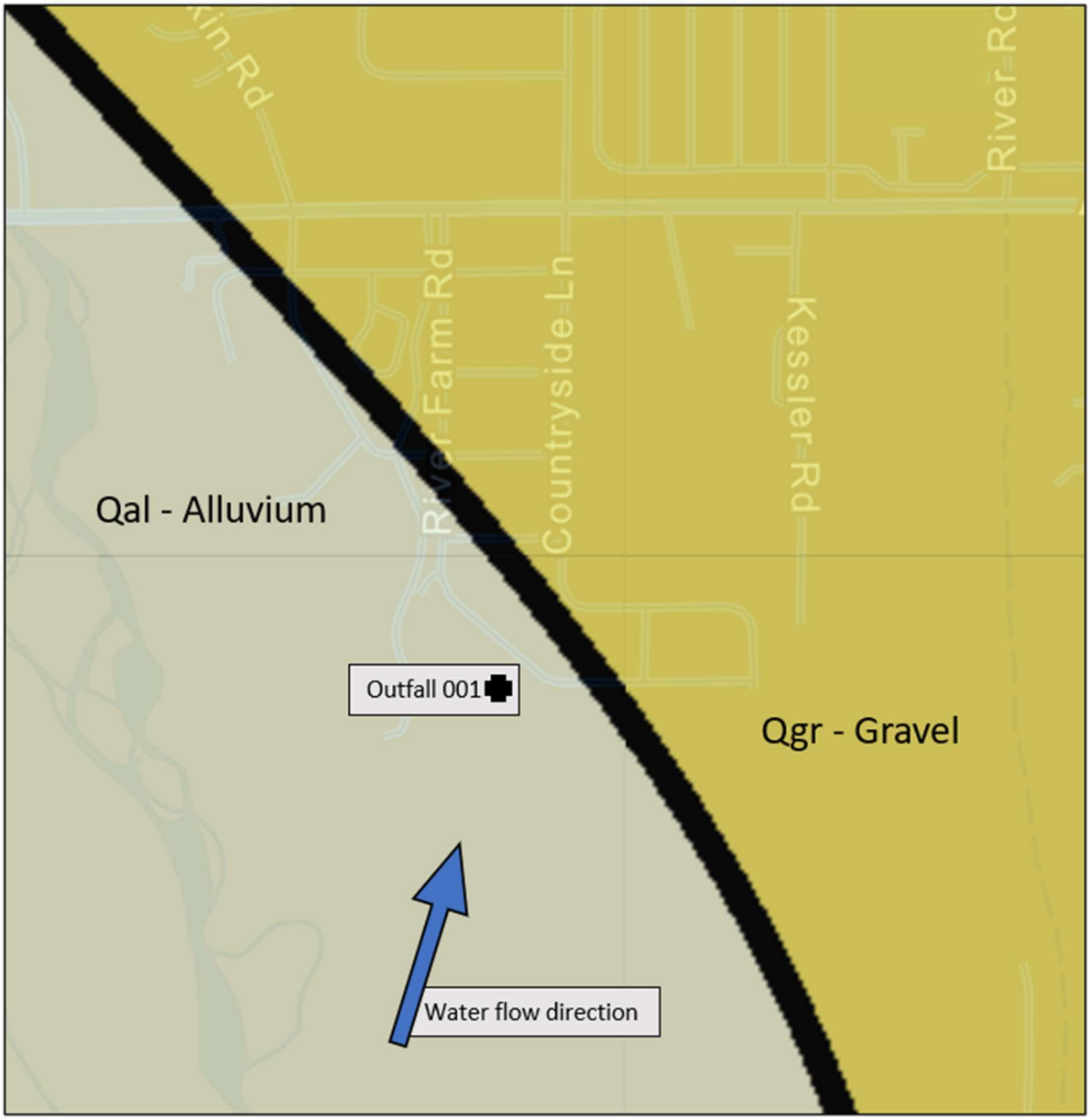


Figure 4. Geologic Map of Countryside Estates Subdivision.

2.5 Ground Water Monitoring Network

The existing facility serves as a centralized collection, treatment and disposal system for domestic wastewater generated by residents and businesses located within the subdivision. Each lot maintains an individual septic tank with a filter to remove floatable and settleable solids in the raw sewerage. The collected wastewater then undergoes level II nitrogen treatment in a community 9-pod AdvanTex® trickling filter system. The treated effluent is discharged to a nearby subsurface discharge drainfield. There are two monitoring wells associated with this permit: MW-1A and MW1-B. These wells are plotted on **Figure 2** and well information is provided in **Table 2.**

Table 2: Monitoring Well Summary
Monitoring Well: MW-1A
Use: Monitoring of the first water bearing zone downgradient of the discharge structure.
Permit Status: Active.
Location: Approximately 500 feet N30°E Latitude: 45.766884° Longitude: -111.227934°
Representation: Located on the downgradient boundary of an established 500 foot groundwater mixing zone. Established as a long term monitoring site with potential representation of ground water quality downgradient of Outfall 001.
Monitoring Well: MW-1B
Use: Monitoring of the first water bearing zone downgradient of the discharge structure.
Permit Status: Active.
Location: Approximately 50 feet N30ºE from subsurface drainfield.
Representation: Located 50 feet downgradient of subsurface drainfield. Established as a long term monitoring site with potential representation of ground water quality within the mixing zone.

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.

2.6 QUALITY INFORMATION

Countryside Estates Subdivision facility uses a Level 2 wastewater treatment system that is capable of removing 60% of the raw wastewater nitrogen load. A summary of the estimated effluent characteristics is provided in **Table 3** .

Table 3: Estimated Effluent and Influent Quality – Outfall 001.

Parameter[1]	Location	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data	2015 Permit Limit
Biochemical Oxygen Demand (BOD_5)	EFF-001	mg/L	-	-	17	1	DMR	-
Flow Rate, Discharge	FM-001	gpd	7217	9333	11452	23	DMR	
Nitrogen, Nitrate + Nitrite (as N)	EFF-001	mg/L	1.4	17.1	28.2	23	DMR	-
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	5.0	13.3	29.5	23	DMR	-
Nitrogen, Total Kjeldahl (as N)	EFF-001	mg/L	7	16	36	23	DMR	-
Nitrogen, Total (as N)	EFF-001	mg/L	22.3	33.0	41.2	21	DMR	-
		lbs/day	1.75	2.67	4.30	22	DMR	1.6
Phosphorus, Total (as P)	EFF-001	mg/L	-	-	8	1	DMR	-

Footnotes:
CFU = Colony Forming Unit
DMR = Self-Reported Discharge Monitoring Reports

EFF-001: See Table 1
FM-001 = See Table 1
DMR Period of Record: 06/2016 through 12/2021.
s.u. = standard units
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.
(2) Maximum value recorded of all quarterly reported Daily Maximum Values.

Ambient ground water quality characteristics of the shallow aquifer were collected from MW-1A and MW-1B. A summary of the ground water quality is provided in **Table 4.**

Table 4: Ground Water Monitoring Results

Monitor Source[1]	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data
MW-1A	Chloride (as Cl)	mg/L	3	10	33	23	DMR
	Escherichia coli Bacteria	CFU/100 ml	1.00	1.07	1.00	23	APP
	Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.50	2.25	7.13	23	DMR
	Nitrogen, Total Kjeldahl (as N)	mg/L	0.5	0.64	0.80	5	DMR
	Organic Carbon	mg/L	NR	3	NR	1	APP
	pH	s.u.	NR	7.1	NR	1	APP
	Specific Conductivity (@ 25°C)	µS/cm	354	412	519	23	DMR
	Static Water Level (SWL)	ft-bgs	13.00	31.52	39.60	22	DMR
	Total Dissolved Solids (TDS)	mg/L	NR	271	NR	1	APP
MW-1B	*Escherichia coli* Bacteria	CFU/100 ml	1.00	1.02	1.50	23	DMR
	Nitrogen, Nitrate + Nitrite (as N)	mg/L	1.07	3.52	11.80	23	DMR
	Static Water Level (SWL)	ft-bgs	21.00	29.98	36.60	22	DMR

Footnotes:
APP = Application Form GW-1 and supplemental materials.
bgs = below ground surface
CFU = Colony Forming Units
DMR = Self-Reported Discharge Monitoring Reports
NR = Not Reported
Period of Record: 06/30/2016 through 12/31/2021.
s.u. = standard units
(1) Refer to Section II of the Fact Sheet for the existing or proposed location of the monitoring wells.
(2) Maximum value recorded of all monthly or quarterly reported values.

3.0 WATER QUALITY STANDARDS

Part of DEQ's mission is to protect and sustain the quality of state waters. Water quality standards provide the basis for limitations that protect state waters. These include beneficial use maintenance, specific water quality

standards, and the Nondegradation policy. DEQ protects all designated uses of state water by basing effluent limitations on the most restrictive water quality standards intended to protect the most sensitive uses.

3.1 BENEFICIAL USES

The receiving state water is Class I ground water which is a high quality water of the state. The current and future beneficial uses of the aquifer will be protected. The beneficial uses and water quality standards are listed below.

Beneficial uses:

- Public and private water supplies;
- Culinary and food processing purposes;
- Irrigation;
- Drinking water for livestock and wildlife; and,
- Commercial and industrial purposes.

3.2 WATER QUALITY CRITERIA

Water quality standards are established to protect these beneficial uses. Standards are as follows:

- Ground water human health;
- Harmful, detrimental, or injurious activity; and,
- Nondegradation provisions.

DEQ protects all the assigned beneficial uses by protecting the most sensitive. The most restrictive standard will be used in formulating limitations (**Section 5)**. The corresponding numeric and narrative standards are listed in **Table 5**.

Table 5: Water Quality Standards.

Parameter(1)	Units	Ground Water Human Health Standards	Pollutant Category(2)	Nonsignificance Criteria(3)
Nitrogen, Nitrate + Nitrite [as N]	mg/L	10.0	T	7.5
Nitrogen, Total (TN)(4)	mg/L	10.0	-	7.5
Phosphorus, Total Inorganic	-	-	H	Surface water breakthrough time greater than 50 years(5)

Footnotes:

CFU = Colony Forming Unit

These standards establish the allowable changes in ground water quality and are the basis for limiting discharges to ground water.

(1) The list includes identified parameters of interest.

(2) Circular DEQ-7: Carcinogen (C), Harmful (H), and Toxic (T) parameter. Toxic pollutant with a Bioconcentrator (B) factor.

(3) Criteria indicates threshold for a significant activity that may lead to degradation.

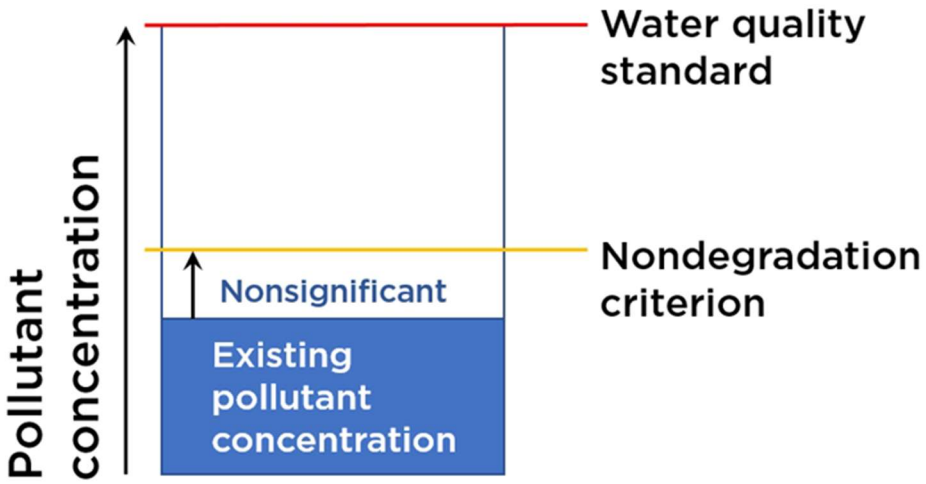
(4) DEQ conservatively assumes all forms of nitrogen will convert to nitrates within the aquifer. DEQ recognizes that other nitrogen forms may be harmful to the beneficial uses therefore will use Total Nitrogen for projecting impacts and in formulation of compliance efforts (limitations).

(5) Changes in receiving ground water quality are not significant if water quality protection practices approved by the DEQ have been fully implemented and if the listed nonsignificance criteria is met.

3.3 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; the water quality standard must not be exceeded. An authorization to degrade is not authorized for this activity.



Nonsignificant changes do not require further nondegradation review.

3.4 NONSIGNIFICANCE

The proposed activity is the reauthorization of an existing discharge. DEQ must determine whether water quality changes resulting from this source are significant. Some nonsignificant activities are specified in the Administrative Rules of Montana; other activities are evaluated for significance according to a process provided in the Rules. DEQ evaluated the significance of this discharge using the criteria and methods described below.

3.4.1 Ground Water Nonsignificance Criteria

Nitrogen

Under Montana statute, ground water nitrate at or below 7.5 mg/L at the downgradient end of the mixing zone (see **Section 4**) is a nonsignificant change in water quality, so long as the discharge does not cause degradation

of surface water. Evaluation of the effects to surface water are discussed below in **Section 3.4.2**. Using the nonsignificance criterion of 7.5 mg/L, DEQ established effluent limits that cause the discharge to comply with ground water nonsignificance/nondegradation criteria at the end of the mixing zone. This is discussed in detail in **Section 5.1**. The calculations underlying these projections are discussed and provided in full in **Appendix B**. These projections demonstrate that nitrate in ground water will not result in degradation. Therefore, water quality changes that result from discharges in compliance with this permit are nonsignificant.

Phosphorus

A total phosphorus surface water breakthrough time of greater than 50 years is a nonsignificant change in water quality. The phosphorus criterion requires an analysis to determine a breakthrough time based on the adsorption capacity of the soil. Breakthrough occurs when the subsurface soils lose their capability to adsorb any more phosphorus, and it has a potential to reach surface water. A phosphorus breakthrough analysis conducted by DEQ (DEQ, 2007a) estimated that a phosphorus breakthrough is expected to occur in 126.4 years. The predicted phosphorus breakthrough is greater than 50 years, and therefore is not considered to be significant.

3.4.2 Surface Water Nondegradation

The phosphorus breakthrough analysis is based upon distance and time to nearest surface water, inherently addressing the potential for degradation of surface water. Therefore, the analysis of reasonable potential for surface water degradation in this section is limited to nitrogen.

The nearest downgradient surface water from the discharge structure is Durham Ditch, approximately 0.75 miles in a N30E direction (DEQ, 2007b). The ditch is most likely losing water, and does not appear on aerial imagery to be a water of the state due to total consumption prior to return to state waters.

These analyses show that the discharge activity is not significant, and the discharge permit requires that the permittee complies with these established limitations on a long-term basis.

3.5 CUMULATIVE EFFECTS

DEQ considered the direct, secondary, and cumulative environmental impacts of the operation of the facility and found no significant adverse effects on water quality, the human environment, and the physical environment. The DEQ analysis included the cumulative impact from other past and present actions.

All major discharge permitting actions, including the current action and any future actions, will include any substantive information derived from public input relating to potential impacts on the human environment and on water quality. All future actions related to this current action will be addressed by DEQ through additional discharge permitting process procedures. Any actions that are outside the purview of the discharge permit may not be addressed by DEQ until the next permitting action takes place.

To protect beneficial uses, there shall be no increase of a pollutant to a level that renders the waters harmful, detrimental, or injurious. Therefore, no wastewaters may be discharged such that the wastewater either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard.

The allowable discharge will be derived from a mass-balance equation that determines the assimilative capacity of the receiving aquifer. This factors in the cumulative impacts of all existing upgradient discharges in the

receiving aquifer. Testing of the aquifer was completed to determine the existing impacts of all upgradient discharge sources. The resulting ambient nitrogen levels were used to determine the assimilative capacity to ensure limitations were achieved that factors in these existing sources.

Looking more broadly at cumulative effects, DEQ identified and assessed nutrient sources across the Gallatin Valley. This work is described in the Lower Gallatin Planning Area TMDLs & Framework Water Quality Improvement Plan (DEQ, 2013; hereafter referred to as the TMDL document). Regional groundwater flow direction varies seasonally from the N30E reported in onsite wells at Countryside Estates to more northerly (Hackett, et al., 1960). The nearest state surface water downgradient of the facility is therefore either Thompson Creek (assessment unit MT41H003_090), roughly 5.25 miles distant or the East Gallatin River (assessment unit MT41H003_020), 6.2 miles away. DEQ determined that Thompson Creek does not fully support all beneficial uses, and identified total nitrogen and chlorophyll-a as causes of impairment. DEQ determined that the primary controllable sources of excess nutrients are agriculture and residential/developed land use (respectively 84% and 5% of the existing load). These two source categories are each assigned an 80.6% reduction in order to meet the total nitrogen TMDL. Subsurface wastewater treatment and disposal (such as the Countryside Estates wastewater treatment facility) is the smallest identified source, comprising 2% of the existing load. This source category is assigned a 0% reduction to meet TMDL conditions. For the East Gallatin River reach below the mouth of Hyalite Creek, DEQ assigns a 20% reduction to the subsurface wastewater treatment and disposal category. The TMDL document recommends implementing this reduction by "retiring existing septic systems by providing sewer connections to existing wastewater treatment plants or Level 2 treatment systems requirements for new or replacement septic systems," (Montana DEQ, 2013). This proposed permitting action reauthorizes operation of an existing wastewater treatment plant that provides Level 2 treatment and is therefore consistent with the intent of the TMDL document.

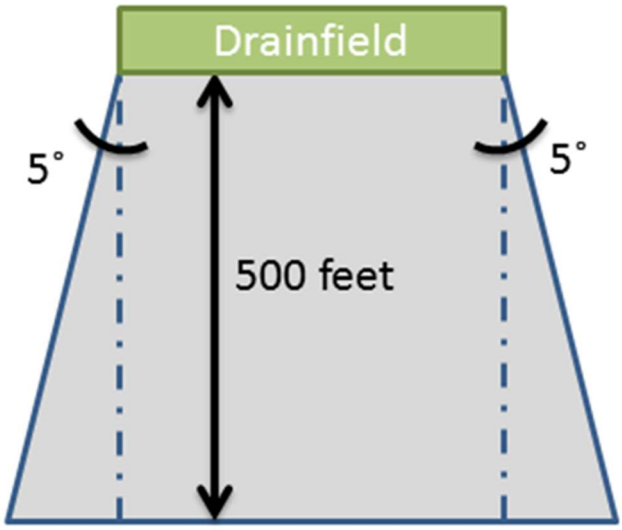
A ground water monitoring network has been established that will provide for long-term monitoring of the aquifer. The ground water data collected will provide continually monitoring of the health of the aquifer including the impacts of any upgradient dischargers. This data is made available to the public for their viewing and will be used by DEQ to update future permit limitations. In addition, any update to limitations, including cumulative effect analyses, will be noticed to the public and will undergo public comment.

Long-term monitoring and reporting, continual analysis and updates of permit conditions, and public notice and comment procedures is a benefit to having a system that is covered under a discharge permit.

4.0 MIXING ZONE

A mixing zone is an area of the receiving shallow ground water where the aquifer is able to assimilate wastewater pollutants. It is a specifically defined area of the receiving aquifer where water quality standards may be exceeded. The availability of dilution is based on the site-specific aquifer characteristics and the drainfield dimensions. The allowable level of dilution is limited by the permit to ensure that water quality standards are met at the end of the mixing zone.

The applicant requested a standard mixing zone or this combined discharge. A standard mixing zone extends 500 feet downgradient from the source. The upgradient boundary is equal to the width of the source (measured perpendicular to the ground water flow direction). The mixing zone widens in the downgradient direction by 5° on either side. The width of the downgradient boundary is calculated by adding the increased width for each side (the tangent of 5° (0.0875) times the mixing zone length) to the width of the upgradient boundary. Standard mixing zones extend 15 feet below the top contact of the ground water table.



Information below provides details on how DEQ calculates the available dilution of the receiving aquifer. A summary is provided in **Table 6.**

Table 6: Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	2.67
Ground Water Flow Direction	azimuth/bearing	N30°E
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	344
Width of Mixing Zone at Down Gradient Boundary	feet	431.5
Cross Sectional Area of Mixing Zone (A)	ft^2	6472.5
Hydraulic Conductivity (K)	feet/day	155
Hydraulic Gradient (I)	ft/ft	0.009
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	8,950

The cross-sectional area (A) is the area of the ground water flux boundary at the maximum width of the mixing zone. Based on the dimensions of the mixing zone, and the hydrogeologic characteristics (**Section 2**), the volume of ground water ($\mathbf{Q_{GW}}$) available to mix with the wastewater is calculated using Darcy's Equation:

$$\mathbf{Q_{GW} = K\ I\ A}$$

Where:
$\mathbf{Q_{GW}}$ = ground water flow volume (ft^3/day)
K = hydraulic conductivity (ft/day)
I = hydraulic gradient (ft/ft)
A = cross-sectional area (ft^2) of flow at the downgradient boundary of the mixing zone.

Modern drainfield systems are designed to minimize the likelihood of the subsurface transport of pathogenic bacteria. Pathogens are a direct existential threat to public and environmental health. In general, DEQ recognizes that replacement of an older drainfield with a newly designed one may have environmental benefits.

5.0 LIMITATIONS

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 NITROGEN

To protect beneficial uses, there shall be no increase of a pollutant to a level that renders the waters harmful, detrimental, or injurious. Therefore, no wastewaters may be discharged such that the wastewater either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ will establish an effluent limitation for nitrogen within this permit. The limit will conservatively be based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate.

The allowable discharge will be derived from a mass-balance equation which is a simple steady-state model that determines the assimilative capacity of the receiving aquifer. The equation factors in cumulative impacts of existing upgradient discharges in the receiving aquifer and any available dilution within the mixing zone. The mass-balance equation derived for ground water is as follows:

$$Q_{gw}C_{gw} + Q_{eff}C_{eff} = Q_{comb}C_{proj}$$

Where:

Q_{gw}	=	ground water available for mixing
C_{gw}	=	ambient receiving ground water concentration
Q_{eff}	=	design capacity of wastewater system
C_{eff}	=	effluent pollutant concentration
Q_{comb}	=	combined ground water and effluent ($Q_{comb} = Q_{gw} + Q_{eff}$)
C_{proj}	=	projected pollutant concentration (after available dilution)

The mass-balance equation has been arranged to calculate the maximum amount of nitrogen that can be added to the aquifer without causing or contributing to an exceedance of the water quality standard.

$$C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:
C_{lmt} = effluent limitation concentration
C_{std} = water quality standard concentration
C_{gw} = ambient receiving ground water concentration
D = dilution ratio (Q_{gw} / Q_{eff})

Numeric effluent limits are often expressed as loads which inherently regulates both volume and strength of the discharge. The load limit ensures compliance with the ground water standard at the end of the mixing zone.

$$L_{lmt} = (CON)\,(C_{eff})(DC_{eff})$$

Where:
L_{lmt} = effluent limitation-load
C_{eff} = allowable effluent concentration
DC_{eff} = design capacity of wastewater treatment system (gpd)
CON = conversion factor [$8.34(10^{-6})$]

The calculated effluent limitation for nitrogen is:

5.2 lbs/day
C_{lmt} = 32.2 mg/L
Design Capacity = 19,390 gpd

DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing impacts to the receiving water.

The effluent limitations for this permit are summarized in **Table 7.**

Table 7: Effluent Limitations – Outfall 001

Parameter	Units	Quarterly Average
Nitrogen, Total [as N]	lbs/day	5.2
Quarterly load calculation: The quarterly average of all individual daily concentrations and the quarterly flow total must be used in the load calculations. Calculation rules are provided within the Wastewater Monitoring Tables.		

5.2 PHOSPHORUS

As discussed in **Section 3**, the phosphorus breakthrough analysis estimated the phosphorus breakthrough to occur in 126.4 years. Predicted phosphorus breakthrough within 50 years is considered significant. Therefore a limit has not been developed.

6.0 MONITORING AND REPORTING

Long-term monitoring and reporting of wastewater and ground water will be established as a condition of the permit. Monitoring of the wastewater characteristics before and after treatment will help ensure operation, maintenance, and compliance with the permit limitations. Wastewater monitoring and reporting requirements are provided in **Table 8**.

Table 8: Influent and Effluent Monitoring and Reporting Requirements – Outfall 001

Analyte/Measurement	Monitor Location	Units	Sample Type(1)	Minimum Sample Frequency	Reporting Requirements(1)(2)	Report Frequency
Flow Rate, Effluent(3)	FM-001	gal/day	Continuous	Continuous	Quarterly Average(4)	Quarterly
Nitrogen, Nitrite+Nitrate [as N]	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total Ammonia [as N]	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)[as N]	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total [as N](5)	EFF-001	mg/L	Calculate	1/Quarter	Quarterly Average	Quarterly

		lbs/day(6)	Calculate	1/Quarter	Quarterly Average	Quarterly

Footnotes:

EFF-001: Description provided in Table 1 of the Fact Sheet document.

FM-001: Description provided in Table 1 of the Fact Sheet document.

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

Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above or within a deviation authorized by DEQ.

(1) See definitions in Part V of the permit unless defined within this table or by a permit condition.

(2) Quarterly Average: The average of all individual daily concentrations (mg/L) analyzed during the quarterly reporting period.

(3) Requires recording device and/or totalizing meter. Equipment must be capable of recording daily, quarterly, and annual effluent volumes.

(4) Quarterly Average Flows: Determine total flows (gal/quarter) that occurred during the quarterly reporting period. Divide total flow by the number of calendar days in the Quarterly reporting period to get a unit of daily flow (gal/day).

(5) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.

(6) Quarterly Load Calculation. Determine concentration (mg/L): Use the average of all individual daily concentrations (mg/L) analyzed during the quarterly reporting period. Determine totalized quarterly flows (gal/quarter): Total flow that occurred during the quarterly reporting period. Convert to a daily flow average (gal/day): Divide the total quarterly flow (gal/quarter) by the total calendar days (days) of the quarterly reporting period. Calculate quarterly load (lbs/day): Concentration (mg/L) x Flows (gal/day) x [8.34×10^{-6}].

Ground water monitoring will provide DEQ with ongoing information on the current and future health of the aquifer. Ground water monitoring and reporting requirements are provided in **Table 9**.

Table 9: Ground Water Monitoring and Reporting Requirements

Analyte/Measurement	Monitor Location	Units	Sample Type(1)	Minimum Sampling Frequency	Reporting(2) Requirements	Report Frequency
Chloride [as Cl]	MW-1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Escherichia coli Bacteria	MW-1A MW-1B	CFU/100 ml	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Nitrite+Nitrate [as N]	MW-1A MW-1B	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total Ammonia [as N]	MW-1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)[as N]	MW-1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1A	µS/cm	Grab or Instantaneous	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)(4)	MW-1A MW-1B	ft-bmp	Instantaneous	1/Quarter	Quarterly Average	Quarterly

Footnotes:

CFU = Colony Forming Units

ft-bmp = feet below measuring point

A description of each monitoring well can be found in Table 4 of the Fact Sheet document.

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

Each monitor well to be individually monitored and sampled for the analyte and measurements respectively listed.

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).

Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.

Samples must not be collected until after the well casing is properly purged as determined by the DEQ approved Ground Water Monitoring Operational Manual.

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) See definitions in Part V of the permit unless defined within this table or by a permit condition.

(2) Quarterly Average: The average of all individual daily concentrations (mg/L) analyzed during the quarterly reporting period.

(3) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.

(4) Measuring point (point of reference) for SWL measurements shall be from top of inner casing or as established by the Operational Manual and measured to within 1/100th of one foot.

Reporting must be completed in use of Discharge Monitoring Reports (DMRs). The permittee or operator will file DMRs electronically in use of the online NetDMR program. Information and contacts for this program can be found here: https://deq.mt.gov/water/assistance.

7.0 Special Conditions

7.1 Monitoring Well Viability

The permittee shall monitor and collect representative ground water samples from the receiving ground water aquifer. If any of the wells are abandoned, destroyed, decommissioned, or non-viable; or are no longer able to be monitored due to obstructions or fluctuations in the ground water table; the permittee shall rehab the non-viable well or replace with the installation of a new well.

7.2 Monitoring Well Replacement, Rehabilitation, and Abandonment

If for any reason a monitoring well needs to be replaced, rehabilitated, or abandoned, the permittee shall submit a plan to DEQ for approval prior to the action taking place. The plan must document existing site-specifics and the reasoning behind the proposed action. The plan must detail the specific steps to take place during deconstruction, drilling, workover, and/or construction of the respective wells.

Written permission from DEQ is needed prior to the abandonment of any monitoring well. At minimum, monitoring well abandonment activities must be done in accordance with ARM 36.21.810(2-5). If the monitoring well is located in or around any collection, storage, treatment, disposal, land application, and/or mixing zone workings (or similar) additional actions may be required to prevent preferential subsurface flows, cross contamination, and to mitigate against any unauthorized wastewater releases. All new well installations must have detailed drilling, lithology, geospatial, and well construction information. A follow-up report summarizing all actions and details must be submitted to DEQ within 30 calendar days.

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 **August 24, 2022**. 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 (MTX000177), 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.

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- Subchapter 7 – Nondegradation of Water Quality.
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