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:	Bridge Creek Estates, LLC
Permit Number:	MTX000141
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	Bridge Creek Estates
Facility Location:	West ½ , Section 17, T11N, R3W, Lewis and Clark County Latitude: 46.708864° Longitude: -112.023218°
Facility Address:	Hackamore Drive, Helena, MT
Facility Contact:	Phil Wirth
Treatment Type:	Individual septic tanks to recirculating sand filter. Level 2 treatment
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001, pressure dose to four subsurface drainfields
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 5.8 lbs/day
Flow Rate:	Design average: 29,400 gpd, 3,930 cfd
Effluent sampling:	Latitude: 46.70968, Longitude: -112.01295, Quarterly monitoring.
Ground water sampling:	**MW-C**, Latitude: 46.71432, Longitude: -112.01424, ambient, quarterly monitoring. **MW-1**, Latitude: 46.70968, Longitude: -112.01248, 100 ft. down gradient, quarterly monitoring. **MW-2**, Latitude: 46.70968, Longitude: -112.01248, 100 ft. down gradient, quarterly monitoring.
Fact Sheet Date:	June 2019
Prepared By:	Rich Morse

1.0 PERMIT INFORMATION

DEQ issues 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 Bridge Creek Estates, LLC for the Bridge Creek Estates wastewater treatment system.

1.1 APPLICATION

DEQ received an application for renewal of the permit on May 31, 2016. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on June 2, 2016.

1.2 PERMIT HISTORY

This is a permit renewal for a Montana Ground Water Pollution Control System (MGWPCS) discharge permit for Bridge Creek Estates (BCE). The original permit was issued to Hamlin Construction and Development Co. Inc. on November 30, 2004, with an effective date of January 1, 2005. The permit was modified on January 18, 2007 and re-issued to reflect the change in the permittee to Bridge Creek Estates, LLC. Based on the permit renewal application, no new or increased source of pollutants is proposed.

Bridge Creek Estates received a Certificate of Subdivision Plat Approval (EQ#06-1693) on March 24, 2006. Water supply is from a community water system (PWSID# MT0004555).

This permit was renewed in 2011 with Level 2 treatment DEBEL limits (24 mg/L TN or 60% removal of TN). A Department inspection of the facility was conducted in 2013. Recommendations from the inspection included plans for improved effluent treatment.

1.3 CHANGES TO THIS PERMIT

This renewal will include additional nitrogen effluent sampling requirements. In order to calculate total nitrogen, monitoring will include both N+N and TKN for nitrogen. The limits for this permit are changed from a DBEL to a WQBEL. The WQBEL is expressed as a load limit. Effluent monitoring is a continued requirement of this permit.

2.0 FACILITY INFORMATION

2.1 LOCATION

The Bridge Creek Estates wastewater treatment facility is located in the northern portion of the Helena Valley (**Figure1.** and **Figure 2.**).

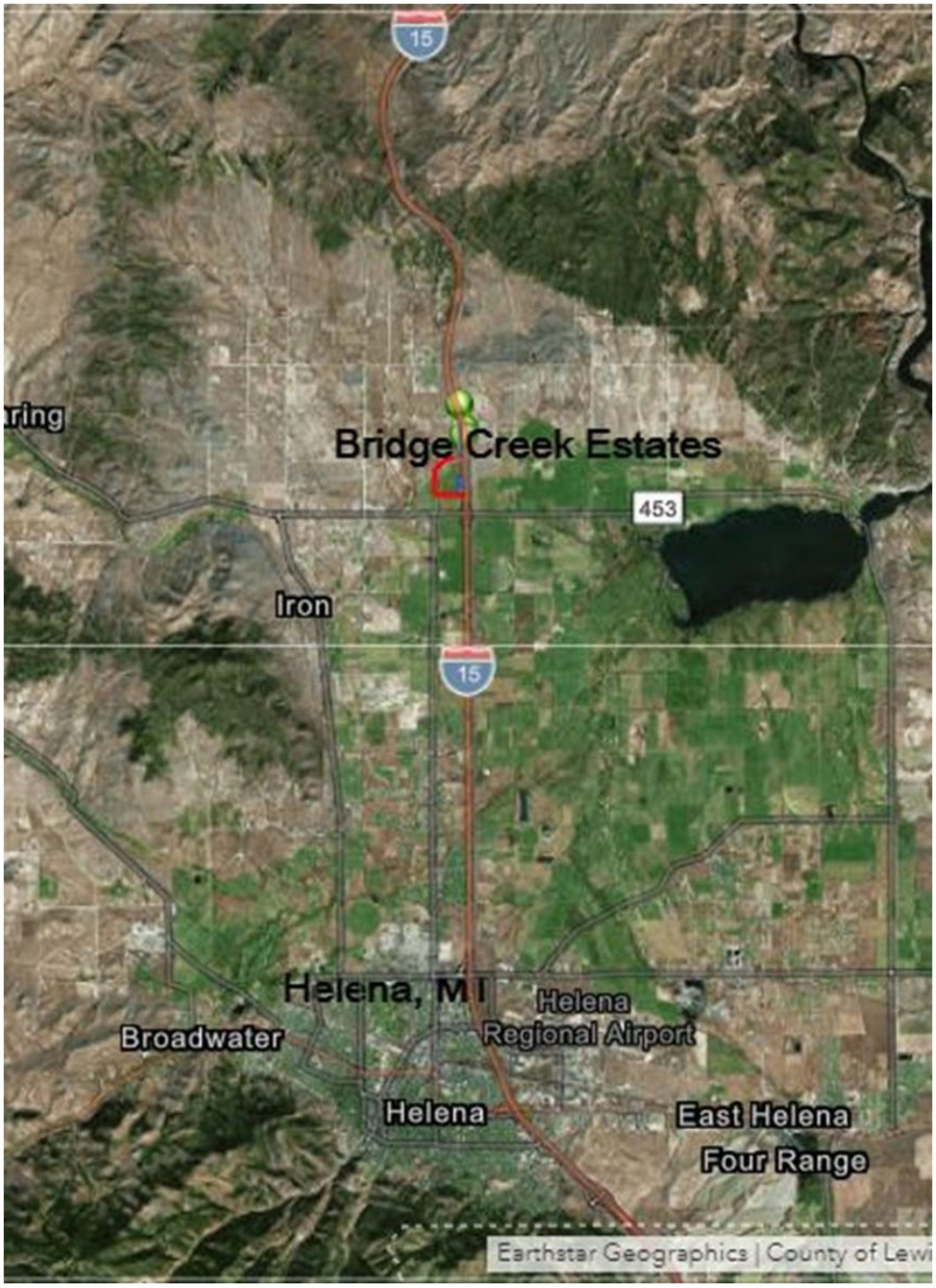


Figure 1. Location of the Bridge Creek Estates

Bridge Creek Estates is accessed from North Montana Avenue in Helena. The property lies between North Montana Avenue and Interstate 15. The mixing zone for the facility extends under Interstate 15 (**Figure 2**). Bridge Creek Estates is a residential development originally designed with 98 home sites. In 2014 DEQ approved a modification of the subdivision to allow 137 homes. The development is currently 64 percent built out with 89 residences hooked to the system at the time of this permit renewal. The effluent treated in the facility is domestic in nature. Maximum designed flow is 29,400 gallons per day.

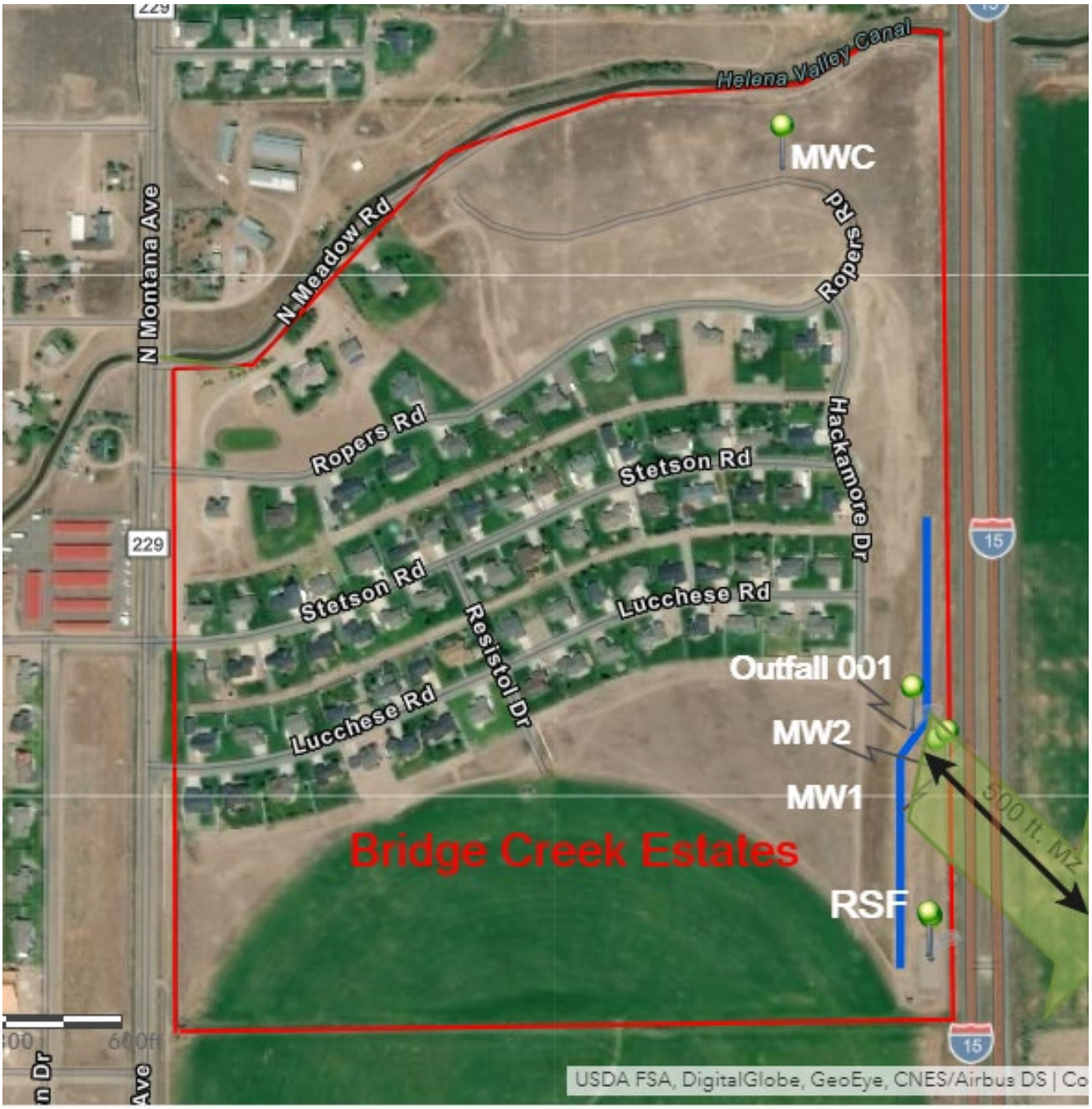


Figure 2. Bridge Creek Estates Site Map

2.2 OPERATIONS

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

Table 1. Collection, Treatment, and Disposal Summary

Collection: (SIC #4952)	
Contributing sources:	137 residences
Collection method:	Gravity sewer lines from individual septic tanks to community lift stations.
Flow volume:	Maximum daily design flow: 29,400 gallons per day
Treatment	
Treatment level:	Level 2
Treatment technology:	Individual residential septic tanks, three recirculating tanks, three recirculating sand filters, and four pressure-dosed drainfields.
Disposal	
Method of disposal:	Infiltration to ground water
Disposal structure:	Subsurface drainfield (Outfall 001)
Outfall location:	Latitude:46.710244 Longitude -112.012857

The Bridge Creek Estates wastewater system is designed to collect effluent from 137 residences on the site. Individual residences have septic tanks that discharge to a gravity fed collection system. Effluent is treated in a recirculating sand filter system in the southeast corner of the property. The applicant indicates the effluent passes through the sand filter four times before being pumped to the pressure dose drain fields. There are four drainfields which are dosed on a rotational basis. Four flow meters located in the metering vault monitor the flow to each drainfield (**Figure 3**.).

Monitoring and sampling requirements are further discussed in **Section 6**.

Figure 3 below is a line drawing of the collection, treatment, and disposal process as supplied by the applicant for the 2011 permit renewal application. No changes have been made since that date.

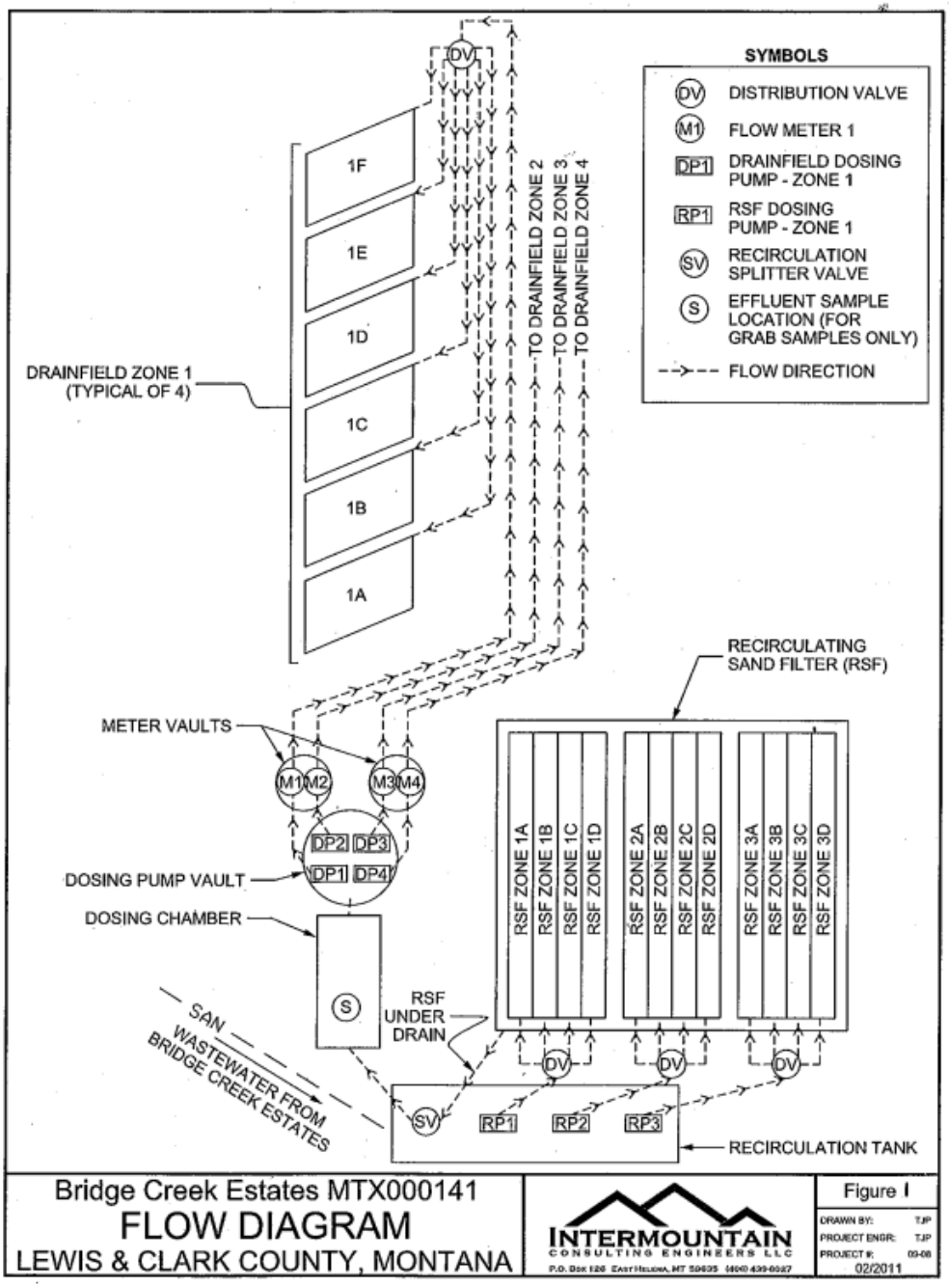


Figure 3. Line Diagram of Bridge Creek Estates Wastewater Treatment

2.3 EFFLUENT CHARACTERISTICS

DEQ requires a permit applicant to disclose the quality of the effluent so that DEQ may evaluate the potential for pollution of state water. During the previous permit cycle, the facility sampled and reported effluent quality criteria to DEQ in the form of discharge monitoring reports (DMRs). These data are summarized below in **Table 2.** The majority of the concentrations are reported in units of milligrams per liter (mg/L), which is equivalent to one part per million.

Table 2. Effluent Quality Data from Outfall 001

Parameter	Units	Reported DMR values			2011 Limit	# of Samples
		Minimum	Maximum	Average		
Flow rate	Gallons/day	5,582	20,314	10,845	29,400	10
	Gallons/day (30 day average)	5,582	20,314	10,845	29,400	10
Nitrogen, nitrate+nitrite	mg/L	1.99	27.3	11.76	–	10
Nitrogen, total Kjeldahl	mg/L	5.0	28.8	14.1	–	10
Nitrogen, total*	mg/L	14.8	40.2	24.75	24	10
	pounds/day	0.84	4.2	2.1	-	10
BOD_5	CFU	2.0	15	7.3	-	9

*Total Nitrogen = Nitrate + Nitrite + Total Kjeldahl Nitrogen (as N)
CFU= Colony Forming Units
Period of record: 03/31/16 – 6/30/18

2.4 GEOLOGY

The subsurface drainfield is constructed in the Helena Valley-fill aquifer system, which consists of interbedded gravels, sand, silt and clay. There are numerous interbedded clay layers that are impermeable or semi-permeable, but these layers are laterally discontinuous, and therefore the ground water in this area is unconfined. Six test pits completed within the drainfield area indicate soils beneath the drainfield are composed of primarily loam, sandy loam, and sandy clay loam (DEQ, 2004).

2.5 HYDROGEOLOGY

The hydraulic properties assigned to the shallow valley-fill aquifer in the previous permit shall remain the same in the permit renewal. The hydraulic conductivity (K) is based on a 12-hour constant rate pumping test conducted in well MW-A, and two 24-hour constant rate pumping tests conducted in MW-B, and MW-C. The average K from this pump test data is 154.3 ft/day. Hydraulic gradient (I) is 0.0024 ft/ft based on onsite static water level (SWL) measurements collected before the irrigation canal emptied (9/2003) and continuing through canal drainage (4/2004). The location of the canal is north and cross gradient to Outfall 001. The direction of shallow ground water flow was determined to be S50ºE in the area of the community drainfield. No natural or artificial changes have occurred in this area to alter these values or the direction of ground water flow. Important hydrogeologic characteristics are summarized below in **Table 3**.

Table 3. Hydrogeologic Summary

Average depth to ground water	17 feet
General ground water flow direction	$S50^0E$
Hydraulic conductivity	154.3 feet per day
Hydraulic gradient	0.0024 feet/feet
Nearest downgradient surface water	BLM underground drainage (1,150 ft.)

2.6 GROUND WATER MONITORING WELLS

There are 3 monitoring wells associated with this permit: MW-1 and MW-2 and MW-C. These wells are plotted in **Figure 2**. Monitoring well construction details are provided below in **Table 4**. Drilling information for each monitoring well are attached in **Appendix A**.

Table 4.

Monitoring Well Summary
Monitoring Well: MW-1
Lithologic Log ID: Interbedded gravels, sand, silt and clay.
GWIC ID: 248703
Status: Constructed on December 5, 2008 Currently being monitored. Total depth =57 feet with PVC 2" factory screen from 29-57 ft. SWL is 29 feet.
Location: Between Outfall 001 and Interstate 15
Latitude: 46.70968º Longitude: -112.012248º
Representation: Downgradinet inside the mixing zone. This is only 100 feet from Outfall 001. Approximately 30 feet from MW2.
Monitoring Well: MW-2
Lithologic Log ID: Interbedded gravels, sand, silt and clay.
GWIC id: 248707
Status: Constructed on December 5, 2008 Currently being monitored. Total depth =72 feet with PVC 2" factory screen from 57-72 ft. SWL is 29 feet.
Location: Between Outfall 001 and Interstate 15.
Latitude: 46.70968º Longitude: -112.012248º
Representation: Downgradinet inside the mixing zone. This is only 100 feet from Outfall 001. Approximately 30 feet from MW1.
Monitoring Well: MW-C
Lithologic Log ID: Interbedded gravels, sand, silt and clay.
GWIC id: 207596
Status: Constructed on October 5, 2003. Currently being monitored for ambient. Total depth = 68 feet with PVC 4" factory screen from 48-58 ft. SWL is 47 feet.
Location: North east part of the subdivision, side gradient.
Latitude: 46.71432º Longitude: -112.01424º
Representation: Side gradinet ambient monitoring.

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.

2.7 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from MW-C are provided below in **Table 5**. Based on the 485 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water. Total nitrogen used for the previous renewal is used for the receiving water total nitrogen level in this renewal. Total nitrogen analysis is not available for this renewal. This renewal requires the monitoring of nitrate + Nitrite and TKN so that TN may be calculated.

Table 5. Ambient Water Quality Reported From Monitoring Well MWC

Parameter	Units	Reported DMR values			# of Samples
		Minimum	Maximum	Average	
Chloride (as Cl)	mg/L	10	13	12	3
Nitrogen, nitrate+nitrite (as N)	mg/L	.32	.78	.54*	3
Specific conductivity (@25°C)	µS/cm	452	509	485	3

*Ambient analysis from this monitoring well is for N+N only. For ambient Total Nitrogen, this permit uses 1.6 mg/L TN reported in 2010 report by Prothero (11/15/2010).

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

Ground water is a water of the state. The State of Montana uses several water quality measures to protect, sustain, and improve the quality of state waters. These water quality limitations provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). DEQ protects all designated uses of state water by basing effluent limits on the most restrictive water quality limitations, intended to protect the most sensitive uses.

3.1 BENEFICIAL USES

With a specific conductivity of 485 µS/cm (**Table 5.**), the receiving water is Class I ground water and therefore a high-quality water of the State. Class I ground waters must be maintained suitable for the following uses with little or no treatment:

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

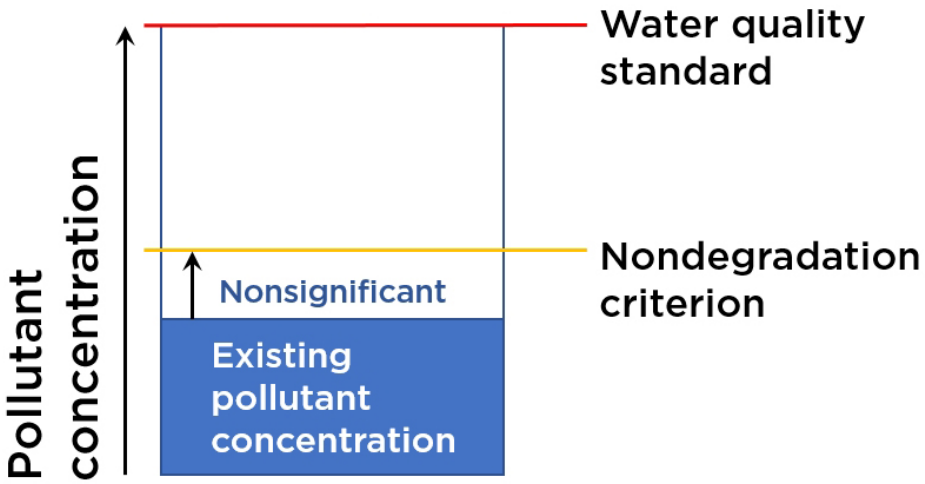
DEQ protects all the assigned beneficial uses by protecting the most sensitive. Drinking water is the most sensitive use of this receiving water.

3.2 WATER QUALITY STANDARDS

DEQ's ground water standard for nitrate is 10.0 mg/L, as is the standard for nitrate + nitrite (as nitrogen). Class I ground water must be maintained suitable for use as a drinking water supply with little or no treatment, and therefore must meet the corresponding human health standard of 10.0 mg/L total nitrogen. These water quality standards may not be exceeded outside a designated mixing zone (**Section 4**).

3.3 NONDEGRADATION

Montana's nondegradation policy is intended to preserve 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 states that certain types of common activities cause nonsignificant changes in water quality, and also provides criteria for determining whether changes in water quality are significant.



Nonsignificant changes do not require further nondegradation review. Therefore, DEQ must determine whether the proposed discharge will result in significant changes in water quality.

3.4 NONSIGNIFICANCE

This section establishes whether or not a significance determination is required for this action.

When developing the initial permit (2005), DEQ determined that discharges in compliance with this permit result in nonsignificant changes in water quality. This discharge has not changed or increased since this determination, and therefore DEQ did not perform a new significance determination for this permit renewal. DEQ determined that the discharge continues to meet ground water nonsignificance/nondegradation criteria (described below) at the end of the mixing zone (**Section 4**). DEQ used these criteria and updated ground water quality data to establish effluent limits (discussed below in **Section 5**). Ambient nitrogen from MWC used in the 2005 application material was used for the calculation of limits for this renewal.

3.4.1 Ground Water Nonsignificance Criteria

For this discharge to ground water, the following nonsignificance criteria are relevant:

Nitrogen

Under Montana statute, ground water total nitrogen 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**.

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. Breakthrough occurs when the subsurface soils lose their capability to adsorb any more phosphorus, and it reaches surface water.

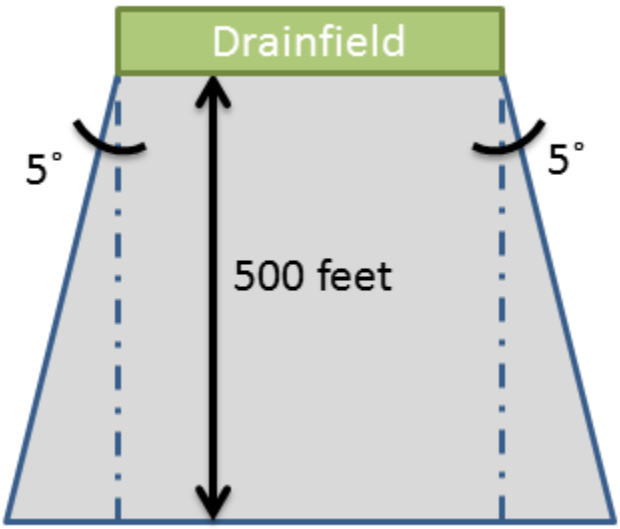
A phosphorus breakthrough analysis conducted by DEQ in 2011 (DEQ, 2011) estimated the phosphorus breakthrough to occur in 59.8 years (*i.e.* >50) years. Phosphorus breakthrough time of greater than 50 years is considered nonsignificant. The 2011 permit established an effluent limit in order to maintain the 50-year breakthrough. This 2011 effluent limitation is maintained within this proposed permit renewal.

Ground water discharges meeting these criteria are nonsignificant, so long as they do not cause degradation of surface waters (see **Section 3.4.2**).

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. The applicant requested a standard mixing zone for this discharge, consistent with previous permit cycles.

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 of 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 ground water table.



The volume of ground water (Q_{GW}) available to mix with the effluent is calculated using Darcy's Equation: $Q_{GW} = KIA$

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

Table 6. summarizes the variables used in Darcy's equation and the resulting volume of ground water available to mix at Outfall 001. These values are drawn from the previous fact sheet and permit application information.

Table 6. Standard Mixing Zone for Total Nitrogen Discharged from Outfall 001

Parameter	Units	Value
Receiving water nitrogen concentration	1.6*	mg/L
Ground water flow direction	S50E	Bearing
Length of mixing zone	500	Feet
Depth of mixing zone	15	Feet
Upgradient width of mixing zone	1,876.67	Feet
Downgradient width of mixing zone	1,937.5	Feet
Cross-sectional area of mixing zone (A)	29,460	Square feet
Hydraulic conductivity (K)	154.3	Feet per day
Hydraulic gradient (I)	0.0024	Feet per feet
Volume of ground water available for mixing (Q_{GW})	10,910	Cubic feet per day

*Total nitrogen monitoring data from 2011 renewal (Prothero, 11/15/10).

In order to determine whether a mixing zone is allowable, DEQ calculates a predicted concentration at the downgradient end of the mixing zone. This mixing calculation follows the following procedure:

- Volume of ground water times the concentration of the parameter = existing load;
- Volume of discharge times the concentration of the parameter = waste load; and
- (Existing load + waste load) / total volume = predicted concentration.

Because the predicted concentration must satisfy the most stringent nonsignificance criterion (**Section 3**), DEQ can calculate water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration (**Section 5**).

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.

Montana's numeric water quality standards are published in Circular DEQ-7. Water quality criteria applicable to this permit are summarized below in **Table 7**. The permit establishes effluent limits that will meet water quality standards and nondegradation criteria, thereby protecting beneficial uses and existing high quality waters. The most restrictive criteria in **Table 7** provide the basis for the effluent limits.

Table 7. Applicable Ground Water Quality Criteria

Parameter	Human Health Standard	Beneficial Use Support	Nondegradation Criteria
Nitrate plus nitrite (as Nitrogen[N])	10 mg/L	-	-
Total Nitrogen	-	10 mg/L	**7.5 mg/L**
Total Phosphorus	-	-	**>50 year breakthrough**

This discharge permit includes numeric WQBELs that restrict the strength and volume of the discharge. The ground water nonsignificance criteria (**Section 3.4.1**) provide the basis for the limits. DEQ calculates WQBELs by rearranging the mixing zone equation (**Section 4**) and solving for the effluent concentration that satisfies the water quality criteria. 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 cumulative impacts to the receiving water.

5.1 TOTAL NITROGEN EFFLUENT LIMIT

The nonsignificance criterion of 7.5 mg/L is the most restrictive of the water quality criteria applicable to this permit; therefore it is the water quality target for this effluent limit. DEQ established the final WQBEL for this discharge by back-calculating the effluent concentration that results in 7.5 mg/L at the end of the mixing zone, given the available dilution. Available dilution is determined by 2010 ground water quality sampling of the receiving water. Ambient total nitrogen averaged 1.6 mg/L (**Table 5 and Table 6**). DEQ calculates an effluent limit that protects receiving water quality and beneficial uses according to the following equation:

$$\underline{\text{Equation 1:}}\quad C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:

C_{lmt} = effluent limitation concentration
C_{std} = limiting water quality criterion
C_{gw} = ambient receiving ground water concentration
D = dilution ratio (Q_{gw} / Q_{eff})
Q_{gw} =ground water flux at the end of the mixing zone
Q_{eff} = average maximum daily discharge

Using the values provided above in **Table 6.**, the result for C_{lmt} is 23.9 mg/L. This is more restrictive than the previous definition-based limits at 24 mg/L, and is therefore the basis for the permit renewal limit. This is the final WQBEL expressed as a concentration. Load limits are more appropriate for discharges to ground water since the long-term loading is the greater concern in absence of aquatic life considerations. Additionally, load limits inherently control both the strength and volume of the discharge. A discharge of 29,400 gallons per day containing 23.9 mg/L total nitrogen is equivalent to 5.8 pounds per day. The limit calculations are provided in detail in **Appendix B**.

5.2 TOTAL PHOSPHORUS EFFLUENT LIMIT

DEQ previously determined (2011) that phosphorous discharged to ground water would reach the surface water (Bridge Creek Estates) in 59.8 years. A phosphorous breakthrough time of less than 50 years is considered significant. As discussed above, the total phosphorous effluent limit will stay the same as the last permit cycle. The phosphorous effluent limit is 631.12 pounds per year.

Based on the information and analyses presented above, DEQ proposes the following numerical effluent limitations in **Table 8.** below.

Table 8.

Proposed Final Effluent Limits – Outfall 001			
Parameter	**Units**	**Annual Maximum**(1)	**Rationale**
Total Nitrogen	lbs/day	5.8 lbs	Nondegradation Significance Criteria
Phosphorus, Total (as P)	lbs/year	631 lbs	Previous Permit Limit
Footnotes:			
Beneficial Uses: ARM 17.30.1006			
(1) See definition in Part V of permit.			

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent and ground water monitoring to assure compliance with the effluent limitations and therefore water quality standards. Effluent monitoring and ground water monitoring is required as a condition of this permit. All monitoring and sampling required by this permit must be representative; therefore the permit identifies specific monitoring locations. Monitoring requirements and rationale are summarized below.

6.1 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. The effluent sample location (EFF-001) is at the existing dosing chamber prior to discharge as shown in **Figure 3**. The permittee is required to install, maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow. The flow measuring devices (FM-001, FM002, FM003, and FM004) are located in the metering chamber between dose tank and drainfield (**Figure 3**).

Effluent monitoring and reporting requirements are summarized in **Table 9.** below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 9. Effluent Monitoring Requirements

Effluent Monitoring and Reporting Requirements – Outfall 001						
Analyte	**Monitor Location**	**Units**	**Sample Type**(1)	**Minimum Sample Frequency**	**Reporting Requirements**(1)(2)	**Report Freq**
Escherichia coli Bacteria	EFF-001	CFU/ 100mL	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Flow Rate, Effluent(3)	FM-001	gpd	Contin-uous	Contin-uous	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total (as N)(4)	EFF-001	mg/L	Calculate	1/Quarter	Daily Maximum Quarterly Average	Quarterly
		lbs/day(5)	Calculate	1/Quarter	Daily Maximum(6) Quarterly Average	Quarterly
Phosphorus, Total (as P)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly

Foot notes:

CFU = Colony Forming Units

EFF-001: located at dose tank prior to discharge to drainfield.

FM-001: located between wastewater sumps and prior to release into the collection tank.

If no discharge occurs during the reporting period, "no discharge" shall be recorded on the effluent Discharge Monitoring Report

Grab sample will represent concentration for a 24 hour period.

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

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

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

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

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

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

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

6.2 GROUND WATER MONITORING

As a condition of this permit, ground water monitoring to provide long term ambient and downgradient characterization of the aquifer is required. Ground water monitoring will be required at monitoring wells MW-1, and MW-2, and MW-C. Data collected via ground water monitoring will be used for mixing zone evaluation and aquifer characterization in future permit renewals. Sampling and reporting requirements shall commence upon the effective date of the permit.

Ground water monitoring and reporting requirements are summarized in **Table 10.** below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 10. – Ground Water Monitoring Requirements for MW-1 and MW-2

MW-1 and MW-2 Ground Water Monitoring and Reporting Requirements						
Analyte/Measurement	**Monitor Location**	**Units**	**Sample Type**(1)	**Minimum Sampling Frequency**	**Reporting**(1)(2)(3)(4) **Requirements**	**Reporting Frequency**
Chloride (as Cl)	MW-1 MW-2	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Escherichia coli Bacteria	MW-1 MW-2	CFU/100ml	Grab	1/Quarter	Daily Maximum Quarterly Average(3)	Quarterly
Nitrogen, Nitrate + Nitrite (as N)	MW-1 MW-2	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Ammonia (as N)	MW-1 MW-2	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	MW-1 MW-2	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
pH	MW-1 MW-2	s.u.	Grab	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1 MW-2	µS/cm	Grab	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)(4)	MW-1 MW-2	ft-bmp	Instant-aneous	1/Quarter	Quarterly Average	Quarterly

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).

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

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.

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

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

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

Table 11. Ground Water Monitoring Requirements for MW-C

MW-C Ground Water Monitoring and Reporting Requirements						
Analyte/Measurement	**Monitor Location**	**Units**	**Sample Type**(1)	**Minimum Sampling Frequency**	**Reporting**(1)(2)(3) **Requirements**	**Reporting Frequency**
Nitrogen, Nitrate + Nitrite (as N)	MW-C	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	MW-C	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Static Water Level (SWL)(3)	MW-C	ft-bmp	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Footnotes:						
ft-bmp = feet below measuring point						
At no time shall the permittee mark or state "no discharge" on any monitoring well DMR form.						
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.						
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.						
(2) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR).						
(3) Measuring point (point of reference) for SWL measurements shall be from top of casing and measured to within 1/100th of one foot.						

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 14, 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 (MTX000141), 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.

APPENDIX A – MONITORING WELL SUMMARY

Monitoring Well Summary
Monitoring Well: MW1
Lithologic Log ID: Interbedded gravels, sand, silt and clay.
GWIC ID: 248703
Status: Constructed on December 5, 2008 Currently being monitored. Total depth =57 feet with PVC 2" factory screen from 29-57 ft. SWL is 29 feet.
Location: Between Outfall 001 and Interstate 15
Latitude: 46.70968º Longitude: -112.012248º
Representation: Downgradinet inside the mixing zone. This is only 100 feet from Outfall 001. Approximately 30 feet from MW2.

Monitoring Well: MW2
Lithologic Log ID: Interbedded gravels, sand, silt and clay.
GWIC id: 248707
Status: Constructed on December 5, 2008 Currently being monitored. Total depth =72 feet with PVC 2" factory screen from 57-72 ft. SWL is 29 feet.
Location: Between Outfall 001 and Interstate 15.
Latitude: 46.70968º Longitude: -112.012248º
Representation: Downgradinet inside the mixing zone. This is only 100 feet from Outfall 001. Approximately 30 feet from MW1.

Monitoring Well: MWC
Lithologic Log ID: Interbedded gravels, sand, silt and clay.
GWIC id: 207596
Status: Constructed on October 5, 2003. Currently being monitored for ambient. Total depth = 68 feet with PVC 4" factory screen from 48-58 ft. SWL is 47 feet.
Location: North east part of the subdivision, side gradient.
Latitude: 46.71432º Longitude: -112.01424º
Representation: Side gradinet ambient monitoring.

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map
View scanned well log (11/21/2006 11:17:11 AM)

Site Name: HAMLIN CONSTRUCTION 'MW-C
GWIC Id: 207596

Section 1: Well Owner

Owner Name
HAMLIN CONSTRUCTION
Mailing Address
900 NORTH MONTANA AVENUE SUITE A-6

City	State	Zip Code
HELENA	MT	59601

Section 2: Location

Township	Range	Section	Quarter Sections
11N	03W	17	SE¼ NW¼

County	Geocode
LEWIS AND CLARK	

Latitude	Longitude	Geomethod	Datum
46.715741	112.013575	TRS-SEC	NAD83

Altitude	Method	Datum	Date

Addition	Block	Lot
BRIDGE CREEK		

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY

Section 5: Well Completion Date
Date well completed: Sunday, October 05, 2003

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	68	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	18	6	0.250		WELDED	STEEL
8	68	4		160.00	SOLVENT WELD	PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
48	58	4		0.020	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	18	BENTONITE	

Section 7: Well Test Data

Total Depth: 68
Static Water Level: 40.66
Water Temperature:

Pump Test *

Depth pump set for test 50 feet.
38 gpm pump rate with 6.26 feet of drawdown after 24 hours of pumping.
Time of recovery 24 hours.
Recovery water level 38.44 feet.
Pumping water level 46.92 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	1	TOP SOIL
1	35	BROWN CLAY AND SHALEY GRAVEL
35	68	SHALE AND CLAY

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: SHAWN TONEY
Company: H & L DRILLING INC
License No: WWC-447
Date Completed: 10/5/2003

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report was completed online by the driller. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Site Name: BRIDGE CREEK ESTATES
GWIC Id: 248703

Section 1: Well Owner

Owner Name
BRIDGE CREEK ESTATES
Mailing Address
P.O. BOX 233

City	State	Zip Code
WOLF CREEK	MT	59648

Well Address
N/A

City	State	Zip Code
N/A	N/A	N/A

Section 2: Location

Township	Range	Section	Quarter Sections
11N	03W	17	SW¼ NE¼

County: LEWIS AND CLARK
Geocode:
Latitude: Longitude: Geomethod: Datum:

Addition: BRIDGE CREEK ESTATES - MONITORING WELL #1
Block Lot:

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY

Section 5: Well Completion Date

Date well completed: Friday, December 05, 2008

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	57	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	18	6	0.25b		WELDED	A53B STEEL
-2	57	2			THREADED	PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
29	57	2		.010	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	27	BENTONITE	
27	57	10/20 SILICA SAND	

Section 7: Well Test Data

Total Depth: 57
Static Water Level: 29
Water Temperature:

Air Test *

5 gpm with drill stem set at 57 feet for 1 hours.
Time of recovery 0.13 hours.
Recovery water level 29 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

From	To	Description
0	57	SHALEY GRAVEL & CLAY

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TONEY SHAWN
Company: H AND L DRILLING
Address: 4150 HWY 12 EAST
City: HELENA MT 59635
License No: WWC-447
Date Certified: 1/6/2009

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report was completed online by the driller. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Site Name: BRIDGE CREEK ESTATES
GWIC Id: 248703

Section 1: Well Owner

Owner Name
BRIDGE CREEK ESTATES
Mailing Address
P.O. BOX 233

City	State	Zip Code
WOLF CREEK	MT	59648

Well Address
N/A

City	State	Zip Code
N/A	N/A	N/A

Section 2: Location

Township	Range	Section	Quarter Sections
11N	03W	17	SW¼ NE¼

County: LEWIS AND CLARK
Geocode:
Latitude: Longitude: Geomethod: Datum:
Addition: BRIDGE CREEK ESTATES - MONITORING WELL #1
Block Lot:

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY

Section 5: Well Completion Date

Date well completed: Friday, December 05, 2008

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	57	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	18	6	0.250		WELDED	ASSB STEEL
-2	57	2			THREADED	PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
29	57	2		.010	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	27	BENTONITE	
27	57	10/20 SILICA SAND	

Section 7: Well Test Data

Total Depth: 57
Static Water Level: 29
Water Temperature:

Air Test *

5 gpm with drill stem set at 57 feet for 1 hours.
Time of recovery 0.13 hours.
Recovery water level 29 foot.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

From	To	Description
0	57	SHALEY GRAVEL & CLAY

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TONEY SHAWN
Company: H AND L DRILLING
Address: 4150 HWY 12 EAST
City: HELENA MT 59635
License No: WWC-447
Date Certified: 1/6/2009

APPENDIX B – EFFLUENT LIMIT CALCULATIONS

The system consists of a recirculating sand filter (RSF) system (Class 2 method for nitrogen treatment).

To protect beneficial uses [ARM 17.30.1006(1)(b)(ii)], there shall be no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses. Therefore, no wastes may be discharged such that the waste either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ establishes the effluent limitations for nitrogen based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate (USEPA, 2002a).

The allowable discharge concentrations are derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The mass-balance equation (Equation 1) derived for ground water is as follows:

Equation 1:

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

Where:

Q_{gw}	=	ground water available for mixing
C_{gw}	=	ambient receiving ground water concentration
Q_{eff}	=	maximum 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 mixing)

The mass-balance equation has been arranged to calculate effluent limits so that the discharge does not cause or contribute to an exceedance of the most restrictive water quality standard. This equation can be applied to any effluent and receiving water where the applicable dilution ratio is known. This equation will only be used for nitrogen which has been authorized a mixing (Section 4).

Equation 2:

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

Where:

C_{lmt} = effluent limitation concentration

C_{std} = water quality standard concentration = 7.5 mg/L

C_{gw} = ambient receiving ground water concentration = 1.6 mg/L

D = dilution ratio (Q_{gw} / Q_{eff}) = 10,910/3,930

$C_{lmt} = 7.5 + (10{,}910/3{,}930)(7.5 – 1.6)$ **= 23.88 mg/L**

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3), MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. Based on the proposed design capacity, the respective load effluent limitation is:

5.8 lb/day
[(8.34*10-6)* 23.88 mg/L*29,400 gpd]
as based on the following equation:

Equation 3:

LImt =CON * Ceff *

DCeff Where:
LImt = effluent limitation-load
Ceff = allowable effluent concentration
DCeff = design capacity of wastewater treatment system
(gpd) CON = conversion factor [$8.34*10^{-6}$]

The Final Effluent Limits are summarized in **Table 8.** for Outfall 001.

MASS BALANCE EQUATION
ALLOWABLE DISCHARGE CONCENTRATION DETERMINATION

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

C1	Ambient ground water (background) concentration (mg/L)	1.6
C2	**Allowable discharge concentration (mg/L)**	**23.88**
C3	Ground water concentration limit for pollutant (from Circular WQB-7) at the end of the mixing zone.	7.50
Q1	Ground water volume (ft^3 / day)	10910
Q2	Maximum flow of discharge (design capacity of system in ft^3 / day)	3930

The volume of ground water that will mix with the discharge (Q_s) is estimated using Darcy's equation: Q1=K I A

Q1	**Ground water flow volume (ft^3 / day)**	**10910**
K	hydraulic conductivity (ft/day)	154.3
I	hydraulic gradient (ft/ft)	0.0024
A	cross-sectional area (ft^2) of flow at the down-gradient boundary of a standard 500-foot mixing zone.	29460

Outfall 001 - Bridge Creek Estates, R. Morse, 10/28/2018