



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

## PERMIT FACT SHEET

### MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee:	Fox Crossing III Homeowners Association, Inc.
Permit Number:	MTX000174
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	Fox Crossing Residential Subdivision Phase III / FXIII
Facility Location:	Northeast ¼ of Section 18, Township 10 North, Range 2 West, Lewis and Clark County Latitude: 46.63134°, Longitude: -111.89975°
Facility Address:	3799 Fox Crossing Road
Facility Contact:	Mary Smith, Treasurer, Fox Crossing III HOA
Treatment Type:	Level II
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / Drainfield
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 3.5 lbs/day
Flow Rate:	Design maximum: 18,000 gpd Actual discharge average: 6,887 gpd (2014 – 2018)
Effluent sampling:	Quarterly, dose tank (EFF-001)
Ground water sampling:	Quarterly, MW-1AQ
Fact Sheet Date:	July 2019
Prepared By:	Darryl Barton

## 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 to Fox Crossing III Homeowners Association, Inc. for the Fox Crossing Residential Subdivision Phase III (FXIII) wastewater treatment system.

### 1.1 APPLICATION

DEQ received an application for renewal of the permit on December 28, 2018. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on January 7, 2019.

### 1.2 PERMIT HISTORY

The permittee submitted the original permit application on March 3, 2006. The application was determined to be complete on August 11, 2006. A permit was issued in 2007 that expired on December 31, 2011. On October 10, 2013, DEQ received an updated renewal permit application submitted by the permittee, in response to a deficiency letter dated August 1, 2012. DEQ determined that the application was complete on October 17, 2013. A renewal permit was issued effective July 1, 2014. On December 28, 2018, DEQ received a renewal application that was incomplete. On July 26, 2019 the application was deemed complete.

### 1.3 CHANGES TO THIS PERMIT

There is a change in the effluent limitation for total nitrogen. The prior limit was 3.4 pounds per day (lbs/day) total nitrogen. The limit has been recalculated using updated ambient groundwater quality data. The updated limit is 3.5 lbs/day total nitrogen. The prior permit set a limit of 580 pounds per year for total phosphorus. There is no limitation for phosphorus in this permit renewal. Phosphorus is discussed in more detail in **Section 5.2**. Phosphorus will continue to be monitored in effluent monitoring.

## 2.0 FACILITY INFORMATION

### 2.1 LOCATION

The FX III wastewater treatment system is located about 5 miles northeast of Helena (**Figure 1**). The subdivision is fully built, contains 60 homes and is bordered on the east by Lake Helena Drive. The wastewater system sits near the corner of Lilly Road and Orchid Road.

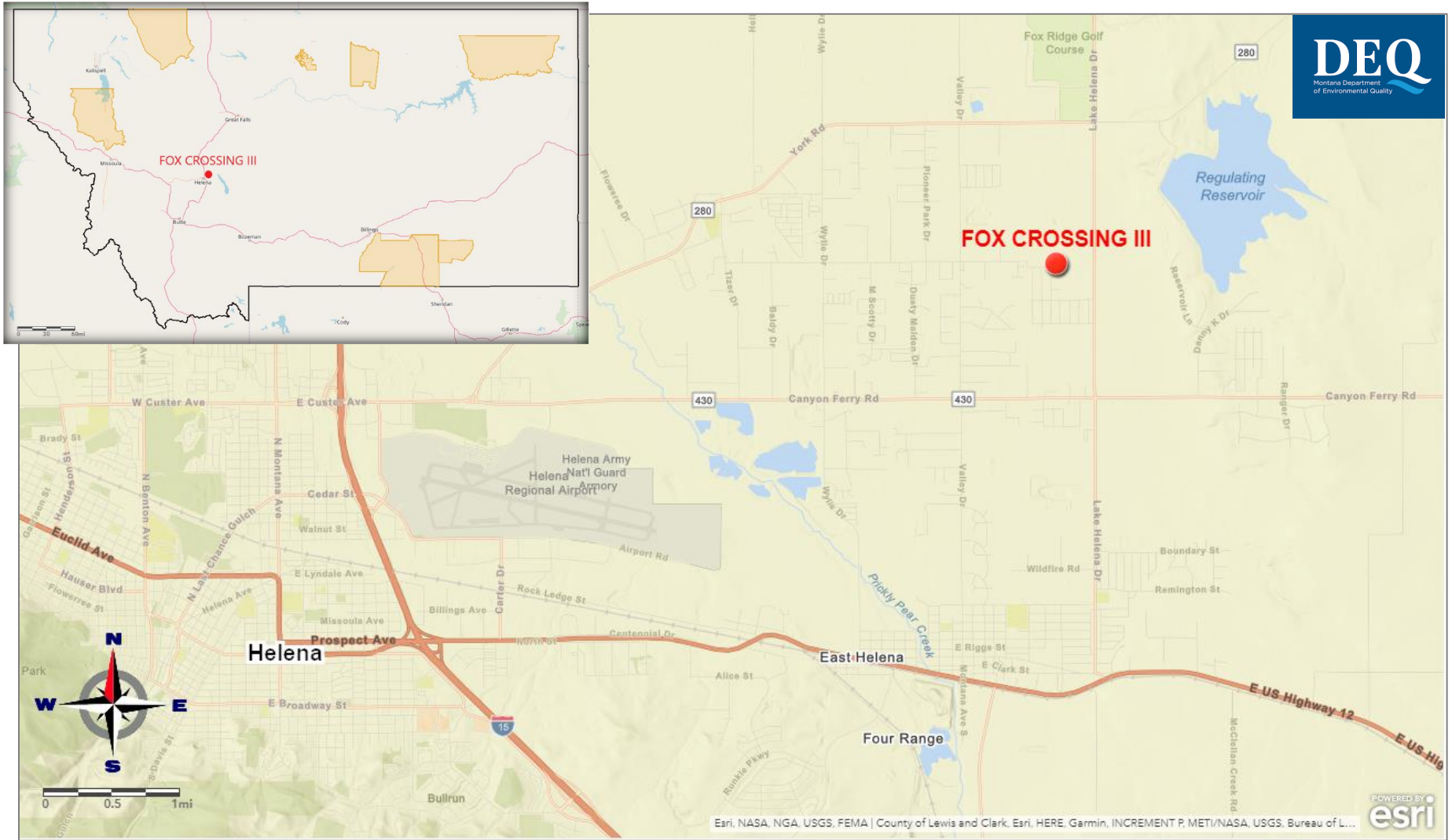


Figure 1. Location of FOX CROSSING III

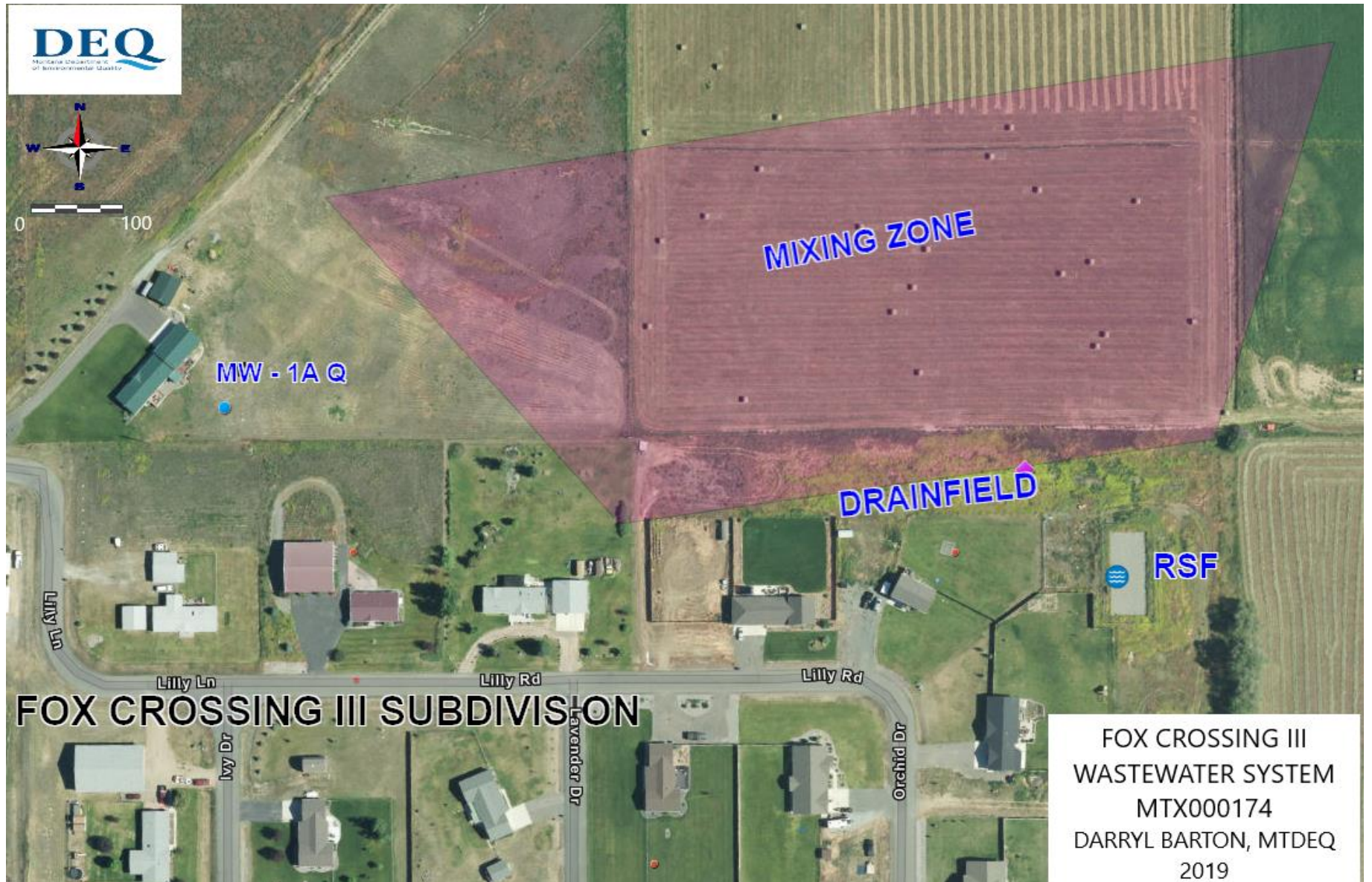


Figure 2. FOX CROSSING III Wastewater System



## 2.2 OPERATIONS

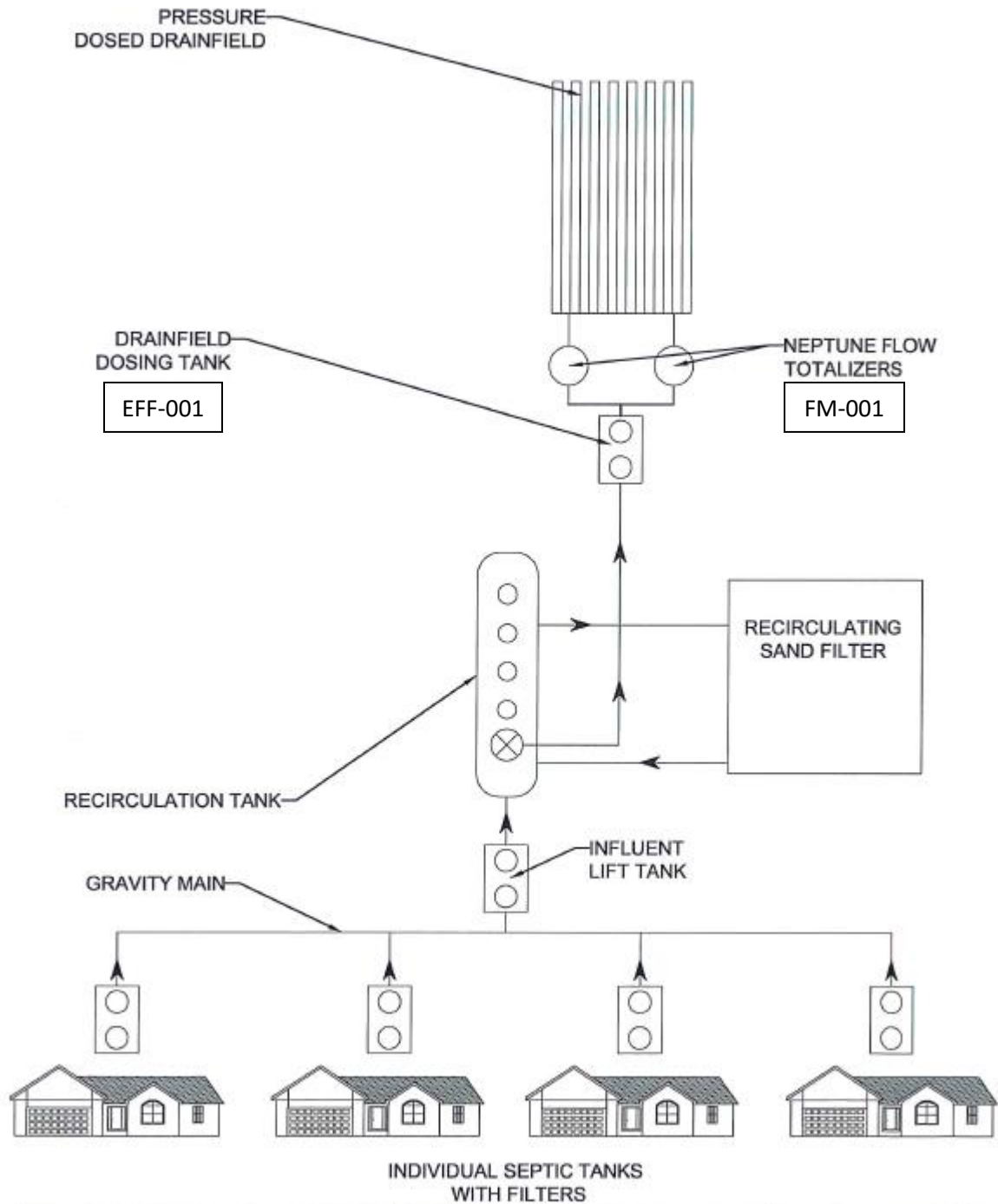
System operations are summarized in **Table 1**.

<b>Table 1: Collection, Treatment, and Disposal System Summary</b>	
<b>Inflows</b>	
Contributing Sources of Wastewater: Domestic In-Nature Standard Industrial Code(s) (SIC) of contributing sources: 4952 The number of connected residences: 60 The number of connected business: 0	
<b>Treatment</b>	
Recirculating Sand Filter (RSF)	
Treatment Level: Level II	
Location: Northeast ¼ of Section 18, Township 10 North, Range 2 West, Latitude: 46.63134°, Longitude: 111.89975°	
<b>Disposal System</b>	
Disposal Structure: Outfall 001	
Method of Disposal: Pressurized subsurface drainfield	
Location: Northeast ¼ of Section 18, Township 10 North, Range 2 West, Latitude: 46.63165°, Longitude: 111.90050°	
Average Daily Flow (gpd): 6,887 gpd (2014 – 2018)	Daily Maximum Design Flow (gpd): 18,000
Effluent Sampling Location: EFF-001: Drainfield dose tank	
Flow Monitoring Equipment: FM-001: After dose tank prior to discharge to drainfield.	

Each home has an individual septic tank for primary treatment. Effluent flows by gravity to a lift station that pumps to a recirculation tank. The recirculation tank supplies water to the recirculating sand filter (RSF) where it undergoes secondary treatment. The RSF routes 80% of the treated effluent back into the recirculation tank and 20% to the dose tank that pressure-doses to a subsurface drainfield.

Effluent is sampled at the drainfield dose tank (EFF-01). Flow is monitored with a flow meter located after the dose tank prior to discharge to the drainfield. Monitoring and sampling requirements are further discussed in **Section 6**.

**Figure 3** is a flow diagram of the collection, treatment, and disposal process.




As-Shown SHEET 1 OF 1 9/12/2018	Project: <b>FOX CROSSING III</b> NE 1/4, S18, T10N, R2W LEWIS & CLARK COUNTY, MONTANA	Sheet Title: <b>WWTS FLOW DIAGRAM</b>	Casne & Associates, Inc. PO Box 1128 Helena, Montana 59604 (406) 463-1058 ryan@casneto.com	 CASNE ASSOCIATES INCORPORATED Civil, Mechanical, Electrical, Energy and Construction
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Figure 3. Wastewater Treatment System Flow Diagram

### 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 in **Table 2**.

<b>Table 2: Effluent Quality – Outfall 001 - per DMR</b>						
<b>Parameter<sup>(1)</sup></b>	<b>Location</b>	<b>Units</b>	<b>Reported Minimum Value</b>	<b>Reported Average Value</b>	<b>Reported Maximum Value<sup>(2)</sup></b>	<b># of Samples</b>
Biochemical Oxygen Demand (BOD <sub>5</sub> )	EFF-001	mg/L	3.00	7.08	21.00	19
Flow rate, Discharge <sup>(3)</sup>	FM-001	gpd	6347	6887	10,500	19
Nitrogen, Nitrate + Nitrite (as N)	EFF-001	mg/L	0.10	15.14	46.00	19
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	0.90	14.97	38.40	19
Nitrogen, Total Kjeldahl (as N)	EFF-001	mg/L	0.80	16.97	40.80	19
Nitrogen, Total (as N) <sup>(4)</sup>	EFF-001	mg/L	16.20	32.69	50.20	19
		lbs/day	0.86	1.86	2.62	19
Phosphorus, Total (as P)	EFF-001	mg/L	3.60	6.04	8.40	19
Total Suspended Solids (TSS)	EFF-001	mg/L	4.00	8.33	11.00	19

Footnotes:  
 DMR = Self-Reported Discharge Monitoring Reports  
 Period of Record: July 1, 2014 through March 31, 2019.  
 (1) Conventional and nonconventional pollutants only, table does not include all possible toxics.  
 (2) Maximum value recorded of all quarterly reported Daily Maximum Values.  
 (3) Design flow rate is 18,000 gallons per day  
 (4) Permit limit for Total Nitrogen set at 3.4 pounds per day maximum

### 2.4 GEOLOGY

Soils are a Nippt gravelly loam (406A) alluvium according to the soil survey provided by the Natural Resources Conservation Service (NRCS). Soils are well-drained, slope 0 – 2%, depth to restrictive layer is typically greater than 80-inches, and water table is also greater than 80-inches. Soils consist of gravelly loam down to very gravelly sand. Gravel and sand concentration increase with depth. **Appendix A** contains a soils map and detailed soil description.

### 2.5 HYDROGEOLOGY

The area’s aquifer consists of 100-feet of quaternary gravelly alluvium over thousands of feet of sandy and gravelly tertiary sediments. The permit renewal application estimates the hydrogeological conditions pertinent to the site and mixing zone: hydraulic gradient (I) is 0.0032 ft/ft, ground water flows N36°W, and hydraulic conductivity (K) is 251.2 ft/day. Well logs in the area show sandy gravel soils and depths to water 19 – 30 feet below ground surface (bgs) (23 ft bgs avg.).

Two surface water bodies flow within one mile of Outfall 001: Helena Valley Irrigation Canal and an unnamed stream / wetland. Helena Valley Irrigation Canal is the nearest downgradient surface water body from Outfall 001 at 3,520 feet.

Receiving waters are Class I ground water based on specific conductivity averaging 367 microsiemens/cm ( $\mu\text{S}/\text{cm}$ ) (three samples taken 2018 – 2019). Class I ground waters have specific conductivity less than or equal to 1,000  $\mu\text{S}/\text{cm}$  at 25 °C.

Important hydrogeologic characteristics are summarized in **Table 3**.

**Table 3. Hydrogeologic Summary**

Average depth to ground water	23 feet bgs
General ground water flow direction	N36°W
Hydraulic conductivity	251.2 feet per day
Hydraulic gradient	0.0032 feet/feet
Nearest downgradient surface water	Helena Valley Irrigation Canal (3,520 feet)

## 2.6 GROUND WATER MONITORING WELLS

There are 2 monitoring wells associated with this permit: MW-1AQ and MW-2AQ. Both are plotted on **Figure 4**. Monitoring well construction details are provided in **Table 4**. MW-2AQ is upgradient from Outfall-001 and represents ambient receiving groundwater. MW-1AQ is side-gradient about 200-feet west of the mixing zone. Ideally, a monitoring well would be downgradient of the mixing zone. Until installation of such a monitoring well groundwater monitoring will resume at MW-1AQ. Groundwater monitoring is discussed further in **Section 6.2**. Driller’s logs are attached as **Appendix C**.

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.



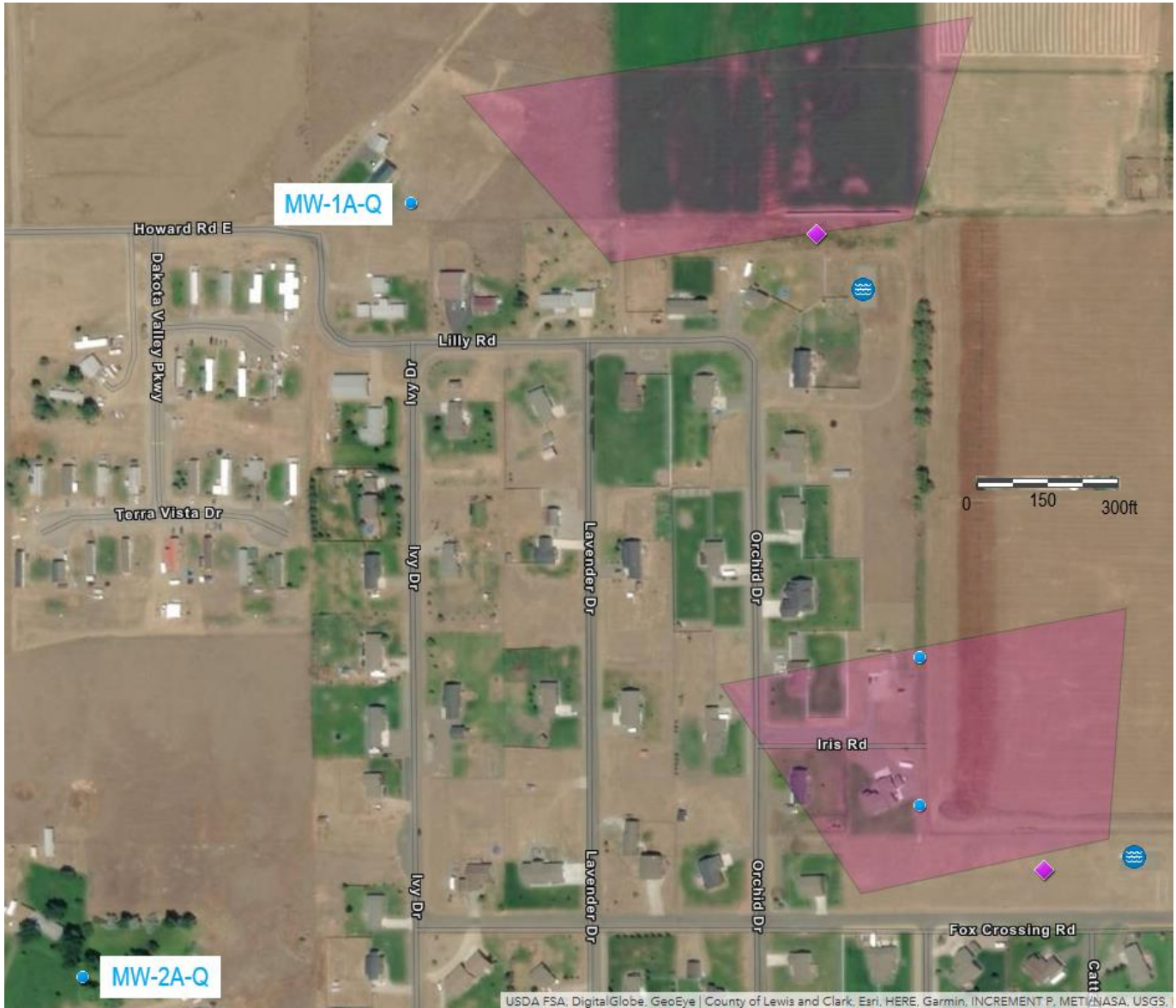


Figure 4. Monitoring Wells FXIII

<b>Table 4: Monitoring Well Summary</b>	
Monitoring Well: MW-1AQ	
MBMG GWIC #: 236468	
Constructed on: 6/01/2007	
Location: West of outfall and mixing zone, 3602 Howard Road	
Latitude: 46.63179	Longitude: -111.90361
Representation: Side gradient water quality	
Monitoring Well: MW-2AQ	
MBMG GWIC #: 60733	
Constructed on: 9/01/1981	
Location: Rodeo Road, southwest of system	
Latitude: 46.62704	Longitude: -111.90645
Representation: Ambient shallow receiving ground water, upgradient of Outfall 001	

## 2.7 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from MW-2AQ are provided in **Table 5**. Based on the 367 microsiemens per centimeter ( $\mu\text{S}/\text{cm}$ ) specific conductance, the receiving water is Class I ground water. Data reported in the table is taken from three ambient groundwater samples taken: 9/25/2018, 3/14/2019, and 6/18/2019.

Monitor Source <sup>(1)</sup>	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum <sup>(2)</sup> Value	# of Samples	Source of Data
MW-2AQ	Ambient Ground Water Quality	Chloride (as Cl)	mg/L	11.5	15.7	24.2	3	APP
		<i>Escherichia coli</i> Bacteria	CFU/100 ml	<1	<1	<1	3	APP
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	1.40	1.52	1.67	3	APP
	Shallow ground water, Upgradient from Outfall 001	Nitrogen, Total Kjeldahl (as N)	mg/L	0.22	0.28	0.38	3	APP
		Organic Carbon	mg/L	< 1	2.1	2.9	3	APP
		pH	s.u.	7.4	7.5	7.6	3	APP
		Specific Conductivity (@ 25°C)	$\mu\text{S}/\text{cm}$	362	367	370	3	APP
		Total Dissolved Solids (TDS)	mg/L	206	402	644	3	APP
<b>Footnotes:</b>								
APP = Application Form GW-2 and supplemental materials.								
CFU = Colony Forming Units								
Three ambient groundwater samples taken: 9/25/2018, 3/14/2019, 6/18/2019								
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 AND NONDEGRADATION

Part of DEQ’s mission is to protect, sustain, and improve the quality of state waters. Water quality standards provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). These standards include three components: designated uses, water quality criteria, and nondegradation policy. 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 DESIGNATED USES

With a specific conductivity of 367  $\mu\text{S}/\text{cm}$  (**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 CRITERIA

Montana has water quality standards for both surface water and ground water. The numeric criteria for each are different because they must support different uses. DEQ writes permits to protect the most sensitive, thereby protecting all uses. 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**).

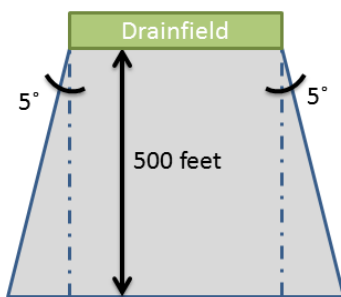
### 3.3 NONSIGNIFICANCE

DEQ has determined that the activity is not considered to be a new or increased source resulting in a change of existing water quality occurring on or after April 29, 1993. DEQ is therefore not required to perform a significance determination. The applicable water quality standards for Class I ground water are summarized in **Table 7**. This permit includes monitoring, reporting, and corrective action requirements to establish, confirm, and maintain compliance with permit limitations.

## 4.0 MIXING ZONE

DEQ authorizes a standard mixing zone for total nitrogen discharged from Outfall 001. 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<sup>3</sup>/day)

$K$  = hydraulic conductivity (feet/day)

$I$  = hydraulic gradient (feet/feet)

$A$  = cross-sectional area (feet<sup>2</sup>) 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.

<b>Table 6: Hydrogeologic and Mixing Zone Information - Outfall 001</b>		
<b>Parameter</b>	<b>Units</b>	<b>Value</b>
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	1.52
Ground Water Flow Direction	azimuth/bearing	N36°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	438
Width of Mixing Zone at Down Gradient Boundary	feet	525.5
Cross Sectional Area of Mixing Zone (A)	ft <sup>2</sup>	7882.5
Hydraulic Conductivity (K)	feet/day	251
Hydraulic Gradient (I)	ft/ft	0.003
Volume of Ground Water Available for Mixing (Q <sub>gw</sub> )	ft <sup>3</sup> /day	6,331

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.

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 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	<b>7.5 mg/L</b>
Total Phosphorus	-	-	<b>&gt;50 year breakthrough</b>

This discharge permit includes numeric WQBELs that restrict the strength and volume of the discharge. 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.

DEQ calculated the effluent limits using the same method as for the previous permit. DEQ uses updated ambient ground water quality data to re-evaluate the receiving water quality and the assimilative capacity for dilution.

### 5.1 TOTAL NITROGEN EFFLUENT LIMIT

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 recent ground water quality sampling of the receiving water. Ambient total nitrogen averaged 1.52 mg/L (**Section 2**). DEQ calculates an effluent limit that protects receiving water quality and beneficial uses according to the following equation, which has been rearranged to determine the allowable discharge expressed as a load:

$$L_{EFF} = [C_{STD}(Q_{GW} + Q_{EFF})]X - C_{AMB}Q_{GW}X$$

Where:

$L_{EFF}$  = daily maximum load (lbs/day)

$C_{STD}$  = most stringent applicable ground water quality standard (mg/L)

$C_{AMB}$  = ambient ground water concentration (mg/L) of nitrate + nitrite (as N)

$Q_{GW}$  = ground water volume (gpd) available for mixing at the end of the mixing zone

$Q_{EFF}$  = volume of effluent (gpd)

$X$  =  $8.34 \times 10^{-6}$ , the conversion factor that converts concentration (mg/L) and flow (gpd) into load (lbs/day)

$L_{EFF} = 3.5 \text{ lbs/day}$

Using the values provided in **Table 6**, the result for  $L_{EFF}$  is **3.5 pounds per day**.

The limit calculations are provided in detail in **Appendix B**.

### 5.2 TOTAL PHOSPHORUS EFFLUENT LIMIT

DEQ determined that phosphorous discharged to ground water would reach the surface water Helena Valley Irrigation Canal in 322 years. A phosphorous breakthrough time of more than 50 years is considered insignificant. So there will not be an effluent limit for phosphorus in this permit. Phosphorus will continue to be monitored in effluent monitoring.

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

<b>Table 8: Final Effluent Limits – Outfall 001</b>		
<b>Parameter</b>	<b>Units</b>	<b>Daily Maximum<sup>(1)</sup></b>
Total Nitrogen (as N)	lbs/day	3.5
Footnotes: (1) See definition in Part V of permit.		

## 6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent monitoring to assure compliance with the effluent limitations and therefore water quality standards. Effluent 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.

### 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 located at the dose tank (**Figure 3**). The permittee is required to maintain and report flow measurements using a flow-measuring device capable of measurements within 10 percent of the actual flow. The flow measuring device (FM-001) is located after the dose tank prior to discharge in the drainfield (**Figure 3**). The flow measuring device must be in operating condition prior to discharge.

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



<b>Table 9: Effluent Monitoring and Reporting Requirements</b>							
<b>Parameter</b>	<b>Monitoring Location</b>	<b>Units</b>	<b>Sample Type<sup>(1)(2)</sup></b>	<b>Minimum Sampling Frequency</b>	<b>Reporting Requirements<sup>(1)(3)</sup></b>	<b>Report Frequency</b>	<b>Rationale</b>
Flow Rate <sup>(4)(5)</sup>	Flow Meter	gpd	Continuous	Continuous	Daily Max and Quarterly Average	Quarterly	Permit Compliance/ Effluent Characterization
Biochemical Oxygen Demand (BOD <sub>5</sub> )	Dose Tank	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Proper O&M/ Effluent Characterization
Total Suspended Solids (TSS)	Dose Tank	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Proper O&M/ Effluent Characterization
Nitrate + Nitrite (as N)	Dose Tank	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Permit Compliance/ Proper O&M
Total Ammonia (as N)	Dose Tank	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Proper O&M
Total Kjeldahl Nitrogen (as N)	Dose Tank	mg/L	Grab	1/Quarter	Daily Max and Quarterly Average	Quarterly	Permit Compliance
Total Nitrogen (N) <sup>(5)(6)</sup>	Dose Tank	mg/L	Calculate	1/Quarter	Daily Max and Quarterly Average	Quarterly	Permit Compliance
		lbs/day <sup>(7)</sup>					

Footnotes:  
 (1) See definitions in Part IV of the permit.  
 (2) Grab sample will represent concentration for a 24 hour period.  
 (3) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.  
 (4) If no discharge occurs during the reporting period, "No Discharge" shall be recorded on the DMR report form.  
 (5) Requires recording device or totalizing meter, must record daily effluent volume.  
 (6) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.  
 (7) Quarterly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

## 6.2 GROUND WATER MONITORING

This permit requires ground water monitoring to provide long term characterization of the aquifer. Ground water monitoring will be required at monitoring well MW-1AQ. Data collected via ground water monitoring will be used for mixing zone evaluation and aquifer characterization in future permit renewals. The initial permit established groundwater monitoring. Monitoring was discontinued in the previous permit (2014) because the well is not downgradient of the mixing zone. MW-1AQ is a side-gradient well in terms of groundwater flow in the mixing zone. Monitoring the water quality from a side-gradient well is better than not monitoring at all, so ground water monitoring at MW-1AQ will be reinstated. Currently the mixing zone extends onto the neighboring properties to the north (Johnson). It would be better to have a monitoring well at the end of the mixing zone. There is a fence line just west of the hayfield to the north that would be an appropriate location. A monitoring well installed about 350-feet north of the property corner along the fence line would be just beyond the mixing zone. Until installation of such a monitoring well, groundwater monitoring will resume at MW-1AQ. Ground water monitoring and reporting requirements are summarized in **Table 10**. Sampling and reporting requirements shall commence upon the effective date of the permit.

**Table 10: Ground Water Monitoring and Reporting Requirements**

Parameter <sup>(1)</sup>	Monitoring Location	Units	Sample Type <sup>(2)</sup>	Minimum Sampling Frequency	Reporting <sup>(2)(3)(4)</sup> Requirements	Reporting Frequency
Chloride (as Cl)	MW-1AQ	mg/L	Grab	Quarterly	Quarterly Average	Quarterly
Nitrate + Nitrite (as N)	MW-1AQ	mg/L	Grab	Quarterly	Daily Maximum & Quarterly Average	Quarterly
Nitrogen (as N), Total Kjeldahl Nitrogen	MW-1AQ	mg/L	Grab	Quarterly	Daily Maximum & Quarterly Average	Quarterly
Static Water Level (SWL) <sup>(5)</sup>	MW-1AQ	ft-bmp	Instantaneous	Quarterly	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1AQ	µS/cm	Instantaneous	Quarterly	Quarterly Average	Quarterly

Footnotes:

CFU = Colony Forming Units

ft-bmp = feet below measuring point

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

- (1) Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136
- (2) See definitions in Part V of the permit.
- (3) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.
- (4) The geometric mean must be reported if multiple samples are taken during a reporting period.
- (5) Measuring point 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 {Date-close of PN}. 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](mailto:DEQWPBPublicComments@mt.gov). All inquiries will need to reference the permit number (MTX000XXX), 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 – SOILS MAP**



Fox Crossing III Soil Survey - USDA / NRCS soil survey

Lewis and Clark County Area, Montana (MT630)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
406A	Nippt gravelly loam, 0 to 2 percent slopes	29.9	100.0%

## Report — Map Unit Description

### Lewis and Clark County Area, Montana

#### 406A—Nippt gravelly loam, 0 to 2 percent slopes

##### Map Unit Setting

*National map unit symbol:* 4yt0  
*Elevation:* 3,600 to 4,500 feet  
*Mean annual precipitation:* 10 to 14 inches  
*Mean annual air temperature:* 37 to 45 degrees F  
*Frost-free period:* 105 to 120 days  
*Farmland classification:* Not prime farmland

##### Map Unit Composition

*Nippt and similar soils:* 95 percent  
*Minor components:* 5 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

##### Description of Nippt

###### Setting

*Landform:* Stream terraces  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Gravelly alluvium over sandy and gravelly alluvium

###### Typical profile

*E - 0 to 3 inches:* gravelly loam  
*Bt - 3 to 9 inches:* very gravelly clay loam  
*Bk1 - 9 to 15 inches:* very gravelly sandy loam  
*2Bk2 - 15 to 60 inches:* very gravelly sand

###### Properties and qualities

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Capacity of the most limiting layer to transmit water (Ksat):*  
 Moderately high to high (0.57 to 1.98 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 15 percent  
*Available water storage in profile:* Very low (about 2.3 inches)

###### Interpretive groups

*Land capability classification (irrigated):* 6s  
*Land capability classification (nonirrigated):* 6s  
*Hydrologic Soil Group:* B  
*Ecological site:* Shallow to Gravel (SwGr) 10-14" p.z.  
 (R044XC454MT), Upland Grassland (R044BP818MT)  
*Hydric soil rating:* No



## 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:

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 recent ground water quality sampling of the receiving water. Ambient total nitrogen averaged 1.61 mg/L (**Section 2**). DEQ calculates an effluent limit according to the following equation, which has been rearranged to determine the allowable discharge expressed as a load:

$$L_{EFF} = [C_{STD}(Q_{GW} + Q_{EFF})]X - C_{AMB}Q_{GW}X$$

Where:

$L_{EFF}$  = daily maximum load (lbs/day)

$C_{STD}$  = most stringent applicable ground water quality standard (mg/L) = **7.5 mg/L**

$C_{AMB}$  = ambient ground water concentration (mg/L) of nitrate + nitrite (as N) = **1.52 mg/L**

$Q_{GW}$  = ground water volume (gpd) available for mixing at the end of the mixing zone = **47,358 gpd**

$Q_{EFF}$  = volume of effluent (gpd) = **18,000 gpd**

$X = 8.34 \times 10^{-6}$ , the conversion factor that converts concentration (mg/L) and flow (gpd) into load (lbs/day)

$$L_{EFF} = [7.5 (47,358 + 18,000)] 8.34 \times 10^{-6} - (1.52 * 47,358 * 8.34 \times 10^{-6})$$

$L_{EFF} = 3.4877$  lbs/day rounded to **3.5 lbs/day**

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

## **APPENDIX C – MONITORING WELL LOGS**

### MW-1AQ

MONTANA WELL LOG REPORT	Other Options
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.	<p style="text-align: right;"> <a href="#">Return to menu</a>  <a href="#">Plot this site in State Library Digital Atlas</a>  <a href="#">Plot this site in Google Maps</a>  <a href="#">View scanned well log (7/31/2007 1:33:33 PM)</a> </p>

**Site Name: TENNESON ENTITIES**  
**GWIC Id: 236468**

**Section 1: Well Owner(s)**

- 1) TENNESON ENTITIES (MAIL)  
3703 SLY RD  
EAST HELENA MT 59635 [06/01/2007]
- 2) TENNESON ENTITIES (WELL)  
FOX CROSSING  
N/A N/A N/A [06/01/2007]

**Section 2: Location**

Township	Range	Section	Quarter Sections
10N	02W	7	SE¼ SW¼
County		Geocode	
LEWIS AND CLARK			
Latitude	Longitude	Geomethod	Datum
46.634024	-111.906897	TRS-SEC	NAD83
Ground Surface Altitude	Ground Surface Method	Datum Date	
Addition	Block	Lot	
TENNESON 3RD PH			

**Section 3: Proposed Use of Water**  
MONITORING (1)**Section 4: Type of Work**Drilling Method: ROTARY  
Status: NEW WELL**Section 5: Well Completion Date**

Date well completed: Friday, June 1, 2007

**Section 6: Well Construction Details****Borehole dimensions**

From	To	Diameter
0	60	6

**Casing**

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	58	6				STEEL

**Completion (Perf/Screen)**

From	To	Diameter	# of Openings	Size of Openings	Description
40	55	6	75	5X.2	PERFORATED CASING

**Annular Space (Seal/Grout/Packer)**

From	To	Description	Cont. Fed?
0	20	BENTONITE	

**Section 7: Well Test Data**

Total Depth: 60  
 Static Water Level: 35  
 Water Temperature:

**Air Test \***

30 gpm with drill stem set at 58 feet for 1 hours.  
 Time of recovery 1 hours.  
 Recovery water level 35 feet.  
 Pumping water level   feet.

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

**Section 8: Remarks****Section 9: Well Log****Geologic Source**

Unassigned

From	To	Description
0	4	TOPSOIL
4	50	CLAY AND GRAVEL
50	60	SAND AND GRAVEL

**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:** BRITT LINDSAY  
**Company:** LINDSAY DRILLING CO INC  
**License No:** WWC-570  
**Date**  
**Completed:** 6/1/2007

**MW-2AQ**

MONTANA WELL LOG REPORT	Other Options
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.	<a href="#">Return to menu</a> <a href="#">Plot this site in State Library Digital Atlas</a> <a href="#">Plot this site in Google Maps</a> <a href="#">View scanned well log (10/18/2006 9:23:09 AM)</a>

**Site Name: HOMESTEAD VALLEY WUA \* #1**  
**GWIC Id: 60733**  
**DNRC Water Right: 063480 00**

**Section 1: Well Owner(s)**  
 1) HOMESTEAD VALLEY WUA (MAIL)  
 PO BOX 5344  
 HELENA MT 59601 [06/25/1999]  
 2) BAHNY, BILL (MAIL)  
 PO BOX 4895  
 HELENA MT 59601 [09/01/1981]

**Section 2: Location**

Township	Range	Section	Quarter Sections
10N	02W	18	NE¼ NE¼ SW¼ SW¼
County		Geocode	
LEWIS AND CLARK			
Latitude	Longitude	Geomethod	Datum
46.62581	-111.90865	MAP	NAD27
Ground Surface Altitude	Ground Surface Method	Datum Date	

**Section 7: Well Test Data**

Total Depth: 123  
 Static Water Level: 36  
 Water Temperature:

**Air Test \***

99 gpm with drill stem set at    feet for 1 hours.  
 Time of recovery    hours.  
 Recovery water level    feet.  
 Pumping water level 110 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 3: Proposed Use of Water**

PUBLIC WATER SUPPLY (1)

**Section 4: Type of Work**

Drilling Method: AIR ROTARY  
 Status: NEW WELL

**Section 5: Well Completion Date**

Date well completed: Tuesday, September 1, 1981

**Section 6: Well Construction Details**

**Borehole dimensions**

From	To	Diameter
0	123	8

**Casing**

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	123	8				STEEL

**Completion (Perf/Screen)**

From	To	Diameter	# of Openings	Size of Openings	Description
72	110	8			3/8 X 2 INCH SLOTS

**Annular Space (Seal/Grout/Packer)**

From	To	Description	Fed?	Cont.
0	10	CEMENT		

**Section 8: Remarks**

**Section 9: Well Log**

**Geologic Source**  
 110ALVM - ALLUVIUM (QUATERNARY)

From	To	Description
0	3	TOPSOIL
3	30	GRAVEL
30	72	CLAY AND GRAVEL
72	110	GRAVEL AND SAND
110	123	SAND, GRAVEL, 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.

<b>Name:</b> TERRY LINDSAY <b>Company:</b> LINDSAY DRILLING CO INC <b>License No:</b> WWC-253 <b>Date</b> <b>Completed:</b> 9/1/1981
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## APPENDIX D – REFERENCES

40 CFR § 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants. 2017.

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 6 – Surface Water Quality Standards and Procedures.
- Subchapter 7 – Nondegradation of Water Quality.
- Subchapter 10 – Montana Ground Water Pollution Control System.
- Subchapter 13 – Montana Pollutant Discharge Elimination System.

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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.

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Fetter, C.W. 2001. Applied Hydrogeology 4<sup>th</sup> Edition. Prentice Hall. Upper Saddle River, NJ.

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