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)

Applicant:	4-DOT Meadows County Water and Sewer District
Permit Number:	MTX000108
Facility Name:	4-DOT Meadows Subdivision Wastewater Treatment System
Facility Location:	Section 28 and Section 29, Township 01 North, Range 04 East; Latitude: 45.81139, Longitude: -111.24439; Gallatin County
Facility Address:	16355 Frontage Road, Belgrade, MT 59714
Facility Contact:	Paul Schneider, Board President P.O. Box 648 Manhattan, MT 59741
Receiving Water:	Class I Ground Water
Number of Outfalls:	1 (one)
Outfall/Type:	001 – Subsurface drainfield

I. PERMIT STATUS

This fact sheet outlines the basis for renewing a MGWPCS wastewater discharge permit to 4-DOT Meadows County Water & Sewer District for the 4-DOT Meadows Subdivision Wastewater Treatment System (WWTS). The MGWPCS permit application and supplemental materials provide the information that serves as the basis for the development of the effluent limits and the monitoring requirements outlined within this fact sheet. The scope of this permitting action is for the operation and maintenance of the wastewater treatment and disposal system.

A. Application Info

On February 16, 2016, DEQ received a MGWPCS permit renewal application and supporting materials from Gaston Engineering, Inc. for the 4-DOT Meadows Subdivision WWTS. The application fee of $2,500.00 was received on January 19, 2016. The permit application was deemed complete on February 26, 2016, and the Department issued an application completeness letter.

B. Permit Changes

No permit modifications have been requested by the applicant.

II. FACILITY INFORMATION

A. Facility Location

The 4-DOT Meadows Subdivision is an existing 113-lot subdivision located two miles northwest of Belgrade, on the north side of I-90, near the intersection of Frontage Road and 4-DOT Lane (Figures 1 and 2). The WWTS serves phase 1 and 2 of the 4-DOT Meadows Subdivision. Application materials indicate that there are no businesses or industrial facilities connected to the WWTS. The facility is permitted to discharge domestic wastewater only. No industrial or other wastewater sources are permitted.

B. Facility and Operations

The 4-DOT Meadows Subdivision WWTS has a design capacity of 39,550 gallons per day (5,287 ft^3/day). Domestic wastewater is piped from the individual-lot septic tanks (1,000 gallons, each) to an 8-inch diameter gravity sewer system. The lift station contains two pumps, one pump sends wastewater to the Phase 1 section of the treatment system, and the other pump sends wastewater to the Phase 2 section of the treatment system. Each section (phase 1 or 2) is designed as follows: from the lift station pump, wastewater is collected in a 31,000-gallon recirculation tank. From the recirculation tank, effluent enters a recirculating sand filter [100 feet x 67 feet]. From the recirculating sand filter, wastewater is returned to the recirculating tank, then it goes to a dose tank, followed by ultraviolet (UV) disinfection, prior to entering a 2,000-gallon drainfield dose tank (Figure 3), where it is discharged from a system of six (6) adjacent pressurized subsurface drainfields. Table 1 summarizes the collection, treatment, and disposal of wastewater at 4-DOT Meadows Subdivision.

Table 1: Collection, Treatment, and Disposal System Summary	
Outfall 001 - Domestic Wastewater/Sewerage	
Method of Disposal: Infiltration to ground water	
Disposal Structure: Subsurface Drainfields (Outfall 001) Section 28 and Section 29, Township 01 North, Range 04 East Latitude: 45.81139; Longitude: -111.24439	
Contributing Sources of Wastewater: Standard Industrial Code(s) (SIC) of contributing sources: 4952, residential wastewater/sewerage	
Average Daily Design Flow (gpd): Not Reported (NR) (ft^3/day): NR	Daily Maximum Design Flow (gpd): 39,550 (ft^3/day): 5,287
Effluent Sampling Location: EFF-001: Effluent sampling port/dose tank located just prior to the drainfield.	
Flow Monitoring Equipment: FM-001: Master Meter WT flow meters	
Flow Monitoring Location: Flow meters are located after UV disinfection and prior to the drainfield dose tanks.	
Treatment: Level 2 via a Recirculating Sand Filter; UV disinfection.	

C. Effluent Discharge Structures

The proposed permit renewal authorizes the permittee to discharge treated domestic wastewater from Outfall-001 to Class I ground water. Outfall 001 contains six (6) adjacent pressurized subsurface drainfields. Two drainfields are designed for a flow rate of 9,884 gpd (each) and discharge wastewater from Phase 1. Four drainfields have a design flow rate of 4,945.5 gpd (each) and discharge wastewater from Phase 2. The overall design flow rate is 39,550 gpd (5,287 ft^3/day). All six drainfields provide a cumulative length perpendicular to ground water flow of 1,697 feet.

The drainfields are located adjacent to the Frontage Road, 200 feet east of the intersection of Frontage Road and 4-Dot Lane, in Sections 28 and 29, Township 01 North, Range 04 East; Latitude 45.8107 and Longitude -111.2434, in Gallatin County, Montana.

D. Effluent Monitoring Location

The effluent quality sampling location will remain as previously established at the drainfield dose tanks as shown in Figure 3.

Sampling requirements are further discussed in Appendix VI.

E. Effluent Characteristics

DEQ requires that the applicant disclose the quality of the effluent to be discharged such that the potential pollutants are identified, and the proposed discharge can be analyzed with terms and conditions incorporated within the permit to prevent pollution of state water consistent with the Montana Water Quality Act, 75-5-101, et. seq., Montana Code Annotated (MCA). The applicant provided an effluent quality estimate for Outfall 001 as summarized within Appendix I.

F. Geology

The soil underlying and immediately downgradient of the 4-DOT Meadows Subdivision WWTS drainfield site is composed of Beaverell-Beavwan loam and Meadowcreek loam soil units. The Beaverell-Beavwan loam unit has an alluvium parent material that is typically formed on stream terraces with 0 to 2 percent slopes. The soil has a drainage class of well drained, with a low available water capacity. The typical soil profile is of very cobbly, clay loam from 7 to 20 inches below ground surface overlying extremely cobbly loamy coarse sand (NRCS, 2018).

The Meadowcreek loam unit has an alluvium parent material and is typically formed on stream terraces with 0 to 4 percent slopes. The soil has a drainage class of somewhat poorly drained, with a low available water capacity. The typical soil profile is of silt loam from 11 to 25 inches below ground surface overlying very gravelly sand (NRCS, 2018).

Within the Gallatin Valley there are two primary aquifer systems, which appear to be in hydraulic communication. These aquifer systems are recent (Quaternary) alluvium, deposited by the Gallatin River, overlying eroded Tertiary-aged sediments. The practice of considering the shallow alluvium, and underlying Tertiary deposits as a single aquifer system is well-established in previous hydrologic studies of the area (Hackett *et al*., 1960; Slagle, 1995).

G. Hydrogeologic Characteristics

The Quaternary alluvial aquifer includes relatively coarse sand and gravel deposited in the floodplain of the Gallatin River and tributaries. This aquifer is unconfined and in direct communication with the surface waters in the Gallatin River drainage system. Depth to ground water underlying the 4-DOT Meadows Subdivision is less than 10 feet.

The Gallatin River is over one-mile to the southwest of the drainfield. The nearest downgradient receiving surface water based on the north-northwest ground water flow direction is the Dwight Stone irrigation system. The irrigation ditch is located approximately 2,020 feet from the nearest drainfield site (DEQ, February 1999).

A summary table of hydrogeologic characteristics used to determine the mixing zone is provided in Appendix IV.

H. Ground Water Monitoring Wells

One monitoring well MW1A is used to monitor the water quality downgradient of Outfall 001. MW1A is located 500 feet downgradient of Outfall 001; and represents shallow ground water quality along the downgradient boundary of the standard mixing zone (Figure 2). Well information for monitoring well MW1A is summarized in Appendix II.

I. Ground Water Quality Characteristics

There are no upgradient monitoring wells representative of shallow ground water within 1,000 feet upgradient of Outfall 001. Therefore, there is no background (ambient) ground water quality. The reported concentration of 4.07 milligrams per liter (mg/L) for N+N is from monitoring well MW1A.

DEQ used this concentration to characterize the receiving water quality, recognizing that this is a very conservative assumption.

The specific conductance of ground water in the vicinity of Outfall 001 is 482 micro Siemens per centimeter (µS/cm). Based on the specific conductance value of the ground water; Outfall 001 discharges into Class I ground water.

Additional ground water quality monitoring results are summarized in Appendix III.

III. MIXING ZONE

The Montana Water Quality Act (75-5-103, Montana Code Annotated (MCA)) states that a mixing zone is an area of the receiving water, established in a permit, where the water quality standards may be exceeded. The Department will maintain the existing 500-foot standard mixing zone authorized by DEQ in 2005. The mixing zone rationale is further discussed in Appendix IV.

[CB1]IV. PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

Section IV presents the basis for discharge limitations in accordance with the requirements at ARM 17.30.1006, ARM 17.30.1031 and ARM 17.30.715. The bases for deriving and establishing effluent limitations are further discussed in Appendix V. Based on the information and analyses presented in Sections III and IV, pursuant to ARM 17.30.1031, DEQ proposes the following numeric effluent limitations:

Table 2: Numeric Effluent Limits – Outfall 001

Parameter	Units	Annual Maximum (1)	Daily Maximum (1)	Rationale
Nitrogen, Total (as N)	mg/L	NA	24	Nondegradation Significance Criteria ARM 17.30.715(1)(d)(i)
Phosphorus, Total (as P)	mg/L	NA	NA	Previous Permit Limit
	lbs/year	1,278	NA	
Footnotes:				
Beneficial Uses: ARM 17.30.1006				
(1) See definition in Part V of permit.				

V. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. ARM 17.30.1031 requires that all issued MGWPCS permits contain monitoring requirements that assure compliance with the developed numeric effluent limitations and therefore water quality standards. Effluent monitoring and ground water monitoring will be required as a condition of this permit. Monitoring requirements and respective rationale are summarized in Appendix VI.

VI. SPECIAL CONDITIONS

In accordance with ARM 17.30.1031 this section contains the basis for special permit conditions that are necessary to assure compliance with the ground water quality standards and the Montana Water Quality Act. The following special condition(s) will be included in the permit.

A. Ground Water Monitoring

As discussed in Section II, H., the established monitoring well is needed to analyze site-specific ground water characteristics downgradient of the drainfield site. The Department will continue to require, upon issuance of this permit renewal, sampling of MW1A. The minimal sampling frequency for sampling parameters is quarterly. Ground water monitoring requirements are summarized in Appendix VI.

The original permit lists Fecal coliform as the pathogen parameter. Since then the human health standard in Circular DEQ-7 (August 2010) was updated to *Escherichia coli* (E-coli) bacteria. The permittee shall report the daily maximum value for nitrite + nitrate (as N), Specific Conductivity, and *Escherichia coli* parameters, all additional parameters shall be reported as an average.

VII. NONSIGNIFICANT DETERMINATION AND REASONABLE POTENTIAL ANALYSIS[CB2]

DEQ determined (DEQ, 2010) that the 4-DOT Meadows Subdivision WWTS is a new or increased source resulting in a change of existing water quality occurring on or after April 29, 1993 (ARM 17.30.702). The applicable water quality standards for Class I or II ground water and nondegradation provisions are summarized in Appendix V. Discharges in compliance with the limitations of this permit are considered nonsignificant. The permit includes monitoring, reporting and corrective action requirements to establish, confirm, and maintain compliance with the permit limits.

VIII. 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 **June 6, 2018**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or at:

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.

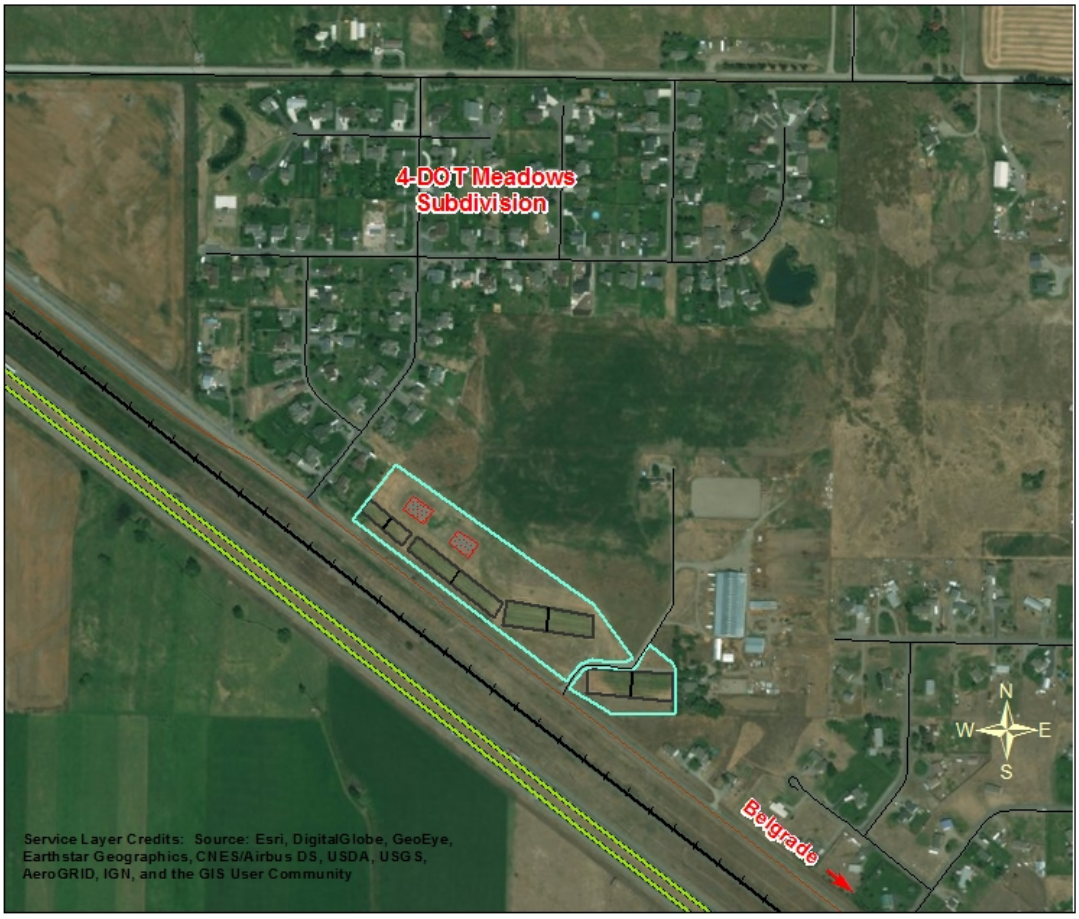
Copies of the public notice were mailed to the applicant, state and federal agencies and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public 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) 444-3080 or email DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number (**MTX000108**), 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.

FIGURE 1.

Figure 1. 4-DOT Waste Water & Sewer District Vicinity Map



Scale

500 250 0 500 Feet

Legend

- Subdivision
- Wastewater Facility
- Drainfield
- Recirculating Sand Filter
- City-County Roads
- Interstate 90 West/ East
- Route 205
- Railroad

Mapping by Carolyn DeMartino, DEQ Water Quality Division, February 2018

FIGURE 2.

Figure 2. 4-DOT Meadows Subdivision Wastewater Treatment System

Scale

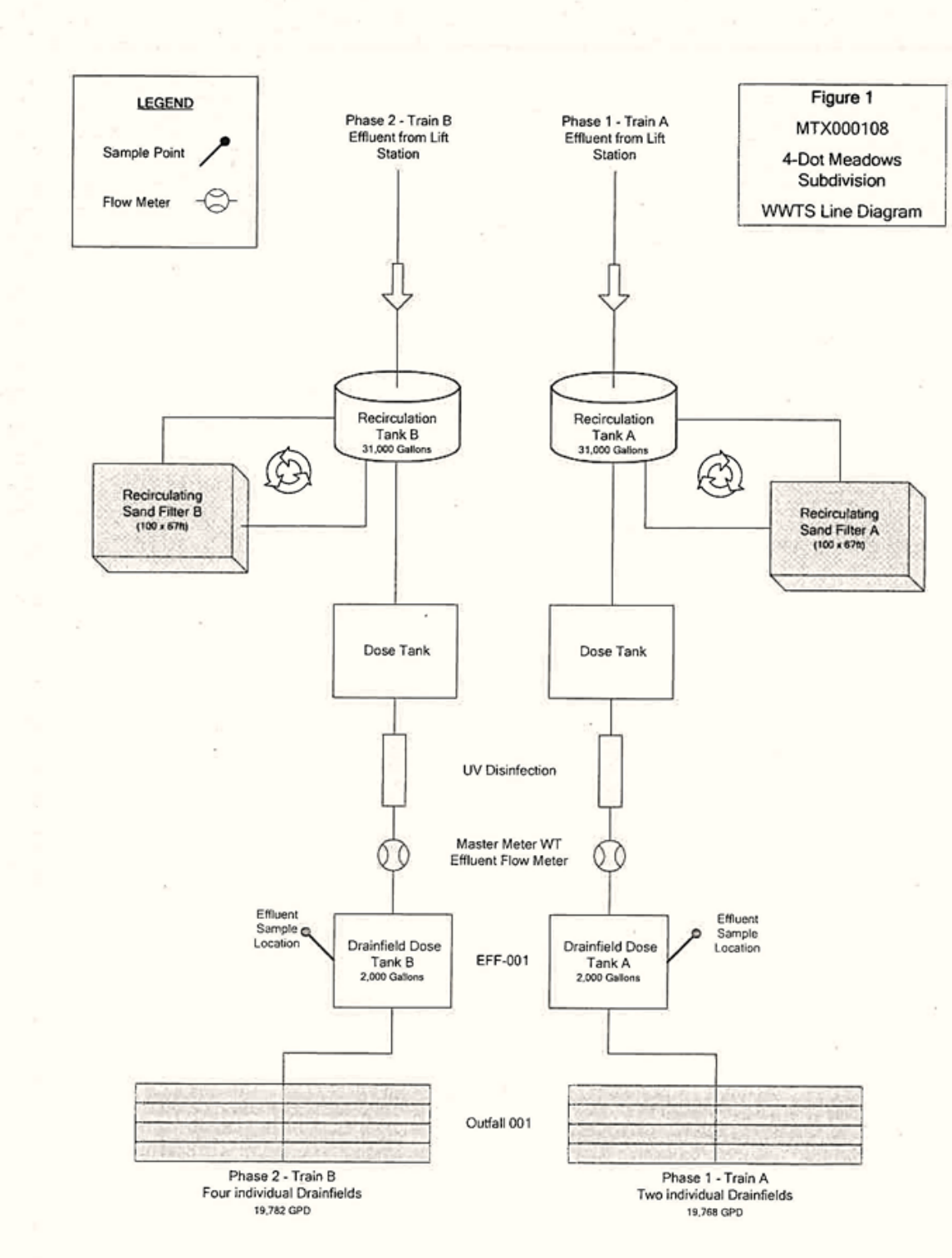
200 100 0 200 Feet

Legend

- Drainfield
- Recirculating Sand Filter
- Monitoring Well
- City-County Roads
- Interstate 90 West/ East
- MT Highway 205
- Railroad

Mapping by Carolyn DeMartino, DEQ Water Quality Division, February 2018

Figure 3. 4-DOT Meadows WWTS Site Layout



APPENDIX I - EFFLUENT QUALITY

Effluent Quality – Outfall 001.

Parameter (1)	Location	Units	Reported Minimum Value	Reported Average Value	Reported Maximum(2) Value	# of Samples	Source of Data
Flow rate, Discharge	FM-001	gpd	12,479	22,261	36,353	27	DMR
Biochemical Oxygen Demand (BOD_5)	EFF-001	mg/L	4	4	4	26	DMR
Total Suspended Solids (TSS)	EFF-001	mg/L	11	575	754	9	DMR
pH (Maximum	EFF-001	mg/L	4.9	6.5	7.2	27	DMR
Specific Conductivity @ 25°C	EFF-001	µS/cm	88	973	1,200	27	DMR
Chloride (as Cl)	EFF-001	mg/L	46	144	200	27	DMR
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	0.06	0.93	3.3	22	DMR
Nitrogen, Total Kjeldahl (as N)	EFF-001	mg/L	0.3	2.9	16.8	15	DMR
Nitrogen, Nitrate + Nitrite (as N)	EFF-001	mg/L	10.80	24.6	36.9	27	DMR
Nitrogen, Total (as N)	EFF-001	mg/L	12.0	28.0	41.0	33	DMR
		lbs/day	3.96	9.24	13.52	NA	Calculated
Phosphorus, Total (as P)	EFF-001	mg/L	0.9	233.0	308.0	6	DMR
		lbs/day	0.30	77.00	101.60	NA	Calculated
		lbs/year	109.50	28,105.00	37,084.00	NA	Calculated
Total Dissolved Solids (TDS)	EFF-001	mg/L	352	604	750	26	DMR

Footnotes:

APP = Application Form GW-2 and supplemental materials.

DMR = Self-Reported Electronic Discharge Monitoring Reports

EFF-001: Effluent sample site located at end of discharge pipe to drainfield.

Period of Record: 03/2011 through 12/2017.

NA = Not Analyzed

NR = Not Reported

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.

APPENDIX II – MONITORING WELL SUMMARY

Monitoring Well Summary
Monitoring Well: MW1A
MBMG GWIC #: 217386
Status: Constructed on January 22, 2002
Location: SE1/4NE1/4 Sec. 29 Latitude: 45.8124º North Longitude: -111.2433º West
Representation: Quality of the shallow receiving ground water, down gradient of Outfall 001.

The detailed well log is on the following page.

MONTANA WELL LOG REPORT

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

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (12/4/2006 11:21:46 AM)

Site Name: 4 DOT LLC (MW1A)
GWIC Id: 217386

Section 1: Well Owner(s)

1) 4 DOT LLC (MAIL)
BOX 990
MANHATTAN MT 59741 [01/22/2002]

Section 2: Location

Township	Range	Section	Quarter Sections
01N	04E	29	SE¼ NE¼

County	Geocode
GALLATIN	

Latitude	Longitude	Geomethod	Datum
45.811009	-111.244004	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition	Block	Lot
4 DOT MEADOWS		

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: Tuesday, January 22, 2002

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	26	7

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	6	6	0.250		WELDED	STEEL
-2	6	2		160.00	THREADED	PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
6	26	2		0.010	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	4	3/8 BENTONITE CHIPS	
6	26	10/20	

Section 7: Well Test Data

Total Depth: 26
Static Water Level: 6.5
Water Temperature:

Air Test *

30 gpm with drill stem set at 24 feet for 1 hours.
Time of recovery 1 hours.
Recovery water level 6.5 feet.
Pumping water level _ feet.

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

Section 8: Remarks

WELL LOG LOST

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	1	TOPSOIL
1	26	FINE SAND GRAVEL & COBBLES

Driller Certification

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

Name: TROY HAUSER
Company: RED TIGER DRILLING
License No: WWC-598
Date Completed: 1/22/2002

APPENDIX III - GROUND WATER QUALITY MONITORING RESULTS

4-DOT Meadows County Water and Sewer District Ground Water Monitoring Results

Monitor Source (1)	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum (2) Value	# of Samples	Source of Data
MW1A	Ground Water Quality 500 feet down gradient of Outfall 001	Specific Conductivity (@ 25°C)	µS/cm	397	416	482	27	DMR
		Total Dissolved Solids (TDS)	mg/L	233	245	287	27	DMR
		pH	s.u.	6.10	7.14	7.80	27	DMR
		Chloride (as Cl)	mg/L	7	10.6	25	27	DMR
		Escherichia coli Bacteria	CFU/100 ml	ND	ND	ND	14	APP
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	1.99	3.14	4.11	27	DMR
		Ammonia, Total (as) N	mg/L	NA	NA	NA	NA	DMR
		Organic Carbon	mg/L	NA	NA	NA	NA	APP
		Nitrogen, Total Kjeldahl (as N)	mg/L	0.50	0.50	0.50	1	DMR
		Phosphorus, Total (as P)	mg/L	0.02	0.04	0.06	27	DMR
			lbs/day	0.006	0.01	0.02	27	DMR
			lbs/yr	2.2	3.65	7.3	27	DMR
		Static Water Level (SWL)	ft-bgs	5.10	6.20	7.45	27	DMR

Footnotes:

APP = Application Form GW-2 and supplemental materials.

bgs = below ground surface

CFU = Colony Forming Units

DMR = Electronic Self-Reported Discharge Monitoring Reports

NA = Not Analyzed

ND = Not Detected

Period of Record: 03/31/2011 through 12/31/2017.

s.u. = standard units

(1) Refer to Section II of the Fact Sheet for the existing location of the monitoring well.

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

APPENDIX IV – MIXING ZONE RATIONALE

A mixing zone is an area of the receiving water, established in a permit, where the water quality standards may be exceeded. Mixing zones are subject to the conditions imposed by DEQ and consistent with the rules adopted by the Board of Environmental Review (Board).

The 4-DOT Meadows WWTS requested that the previously approved Department Standard Mixing Zone of 500 feet be continued for this permit renewal.

DEQ determines whether a mixing zone is appropriate pursuant to the requirements and procedures of ARM 17.30.501 et seq. DEQ must conduct a water quality assessment in accordance with ARM 17.30.506 to determine if and what type of mixing zone may be authorized. A person applying to DEQ for a mixing zone must indicate the type of mixing zone requested and supply information of sufficient detail for DEQ to make a determination regarding the authorization of the mixing zone (ARM 17.30.515).

In making its mixing zone determination, DEQ will consider the potential cumulative effects of additional existing discharges in the area (ARM 17.30.506(2)(f)). In addition, DEQ will analyze the assimilative capacity of the aquifer that is available for the proposed discharge. The derived effluent limitation (Section IV) will maintain the beneficial uses of all downgradient ground water.

A mixing zone may be denied if it will threaten or impair existing uses (Section IV) in accordance with ARM 17.30.505. In making this determination DEQ will consider whether current available data can accurately predict ground water or pollutant movement, or whether there is sufficient unpredictability that might result in adverse impacts due to a particular concentration of a parameter within the mixing zone [ARM 17.30.506; and 517].

A mixing zone may be granted for individual parameters in a discharge (ARM 17.30.505). A mixing zone may be granted for individual parameters in a discharge (ARM 17.30.505(1)(a)). As part of the water quality assessment described above, the concentration of pollutants at the downgradient boundary of the mixing zone must be estimated in accordance with ARM 17.30.517 in order to determine if the discharge qualifies for a standard ground water mixing zone. If the estimated concentration meets the applicable standard and/or the nonsignificance criteria at the boundary of the mixing zone the discharge may qualify for a standard mixing zone(s) (ARM 17.30.517(1)(c)).

The table on the following page summarizes the 4-DOT Meadows Subdivisions WWTS Mixing Zone Information.

Mixing Zone Information - Outfall 001		
Parameter	**Units**	**Value**
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	4.07
Ground Water Flow Direction	azimuth/bearing	N6°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	1,697
Width of Mixing Zone at Down Gradient Boundary	feet	1,785
Cross Sectional Area of Mixing Zone (A)	ft^2	26,768
Hydraulic Conductivity (K)	feet/day	2,738
Hydraulic Gradient (I)	ft/ft	0.003
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	197,937

APPENDIX V - RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

A. Water Use Classification & Applicable Water Quality Standards

The receiving water is Class I ground water and a high-quality water of the state (75-5-103, MCA). The quality of Class I ground water must be maintained so that these waters are suitable for the following beneficial uses with little or no treatment (ARM 17.30.1006):

- Public[CB3] and private water supplies;
- Culinary and food processing purposes;
- Irrigation;
- Drinking water for livestock and wildlife; and,
- Commercial and industrial purposes.

Persons may not cause a violation of the following specific water quality standards in Class I ground water, pursuant to ARM 17.30.1006, except within a DEQ approved mixing zone as provided in ARM 17.30.1005:

- The[CB4] human health standards for ground water listed in Circular DEQ-7;
- For concentrations of parameters for which human health standards are not listed in DEQ-7, no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses listed for Class I water. DEQ may use any pertinent credible information to determine these levels; and,
- No increase of a parameter that causes a violation of the nondegradation provisions of 75-5-303, MCA.

The applicable ground water standards pursuant to ARM 17.30.1006 and the nondegradation-nonsignificance criteria at ARM 17.30.715 for the identified parameters are summarized in the table below and will be used as the basis for developing effluent limitations in the permit.

Applicable Ground Water Quality Standards.

Parameter[1]	**Units**	**17.30.1006(1)(b)(i) Human Health Standards - Ground Water**	**17.30.1006(1)(b)(ii) Beneficial Uses - Ground Water**	**Pollutant Category**[2]	**17.30.715 Nondegradation - Nonsignificance Criteria**[3][4]
Nitrogen, Nitrate + Nitrite (as N)	mg/L	10.0	-	T	7.5
Phosphorus, Total Inorganic	-	-	-	H	Surface water breakthrough time greater than 50 years[5]
Escherichia coli	CFU	<1/100 mL	-	H	Receiving water changes < 10% of applicable standard.

Footnotes:

CFU = Colony Forming Unit

These standards establish the maximum allowable changes in ground water quality and are the basis for limiting discharges to ground water, ARM 17.30.1005(1); Circular DEQ-7 (2012), Footnote 16; and ARM 17.30.715(1)(d).

(1) The list only includes identified parameters of interest.

(2) Circular DEQ-7 (2012): Carcinogen (C), Harmful (H), and Toxic (T) parameter. Toxic pollutant with a Bioconcentrator (B) factor.

(3) Discharges in compliance with the nondegradation significance criteria constitute nonsignificant degradation.

(4) Toxic parameters, the change is not significant if the resulting concentration outside of a mixing zone designated by DEQ does not exceed 15% of the lowest applicable standard per ARM 17.30.715(1)(c). Carcinogen parameters or parameters with a bioconcentration factor (>300); change is not significant if concentrations are less than or equal to the concentrations of those parameters in the receiving water per ARM 17.30.715(1)(b).

(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.

B. Pollutants and Parameters of Interest (POI)

DEQ has identified pollutants and parameters of interest (POI) for the proposed discharge. The individual POIs are further discussed below.

C. Development of Effluent Limits

ARM 17.30.1006 and 17.30.715 set forth the basis for developing effluent limitations that will protect water quality. The ground water quality standards establish the maximum allowable changes to ground water quality; are the basis for limiting discharges to ground water; and may only be exceeded within a mixing zone authorized by DEQ.

1) Water Quality Based Effluent Limitations

a. Nitrogen

Application materials indicate that nitrogen will be present in the proposed wastewater stream (Section II.D.). 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 will establish 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 will be derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine the POI concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The equation factors in cumulative impacts of existing upgradient discharges and will limit the discharger to the assimilative capacity currently available in the receiving aquifer. 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 mixing (Section III).

Equation 2:

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

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})

i. Outfall 001

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:

44.86 lbs/day
[$(8.34*10^{-6})$*136 mg/L*39,550 gpd]
as based on the following equation:

Equation 3:

$$L_{lmt} = CON * C_{eff} * DC_{eff}$$

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 proposed final limitations are the most stringent applicable limitations for each individual parameter as developed in the previous sections. This fact sheet has developed two limits for the TN parameter: the concentration based Level II treatment limit (24 mg/L) as discussed in Section IV.B.1, and the load based WQBEL limit (44.86 lbs/day) for total nitrate as developed in Section IV.B.2.a. To determine the more stringent of these two limits, the concentration based limit (mg/L)

can be translated into a load based limit (lbs/day).

For flow DEQ uses the conversion value of 8.34×10^{-6} multiplied by the proposed design capacity flow value of 39,550 gallons per day, multiplied by the Level II treatment limit value of 24 mg/L. The resulting load amount equals 7.9 lbs/day. For the individual parameter TN, the Level II treatment limit is more stringent than the TN WQBEL limit (44.86 lbs/day). Therefore, the proposed final effluent limits will include the TN Design Based Effluent Limit (DBEL) of 24 mg/L for the individual parameter TN.

See Section IV for the proposed numerical effluent limitations.

b. Phosphorus[CB5]

A phosphorous breakthrough analysis conducted by the Department (DEQ, July 1999) estimated that the phosphorous breakthrough would occur greater than 50 years in the future. A phosphorus breakthrough that would occur within 50 years would be considered significant (ARM 17.30.715).

The Department stated that the total phosphorus discharged to the drainfields was not to exceed 1,278 lbs/yr for Outfall #001 (DEQ, July 1999). The effluent limit is based on an annual maximum load. The limit of 1,278.0 lbs/year (Table 5) was maintained in the previous permit cycle (2011-2016); and will be maintained within this current permit renewal. See Section IV.

D. Final Effluent Limitations

Based on the information and analyses presented in Sections III and IV and pursuant to 75-5-402, MCA and ARM 17.30.1031, DEQ proposes to reestablish numerical effluent limitations.

The numeric effluent limitations are expressed as loads whenever possible since this type of limitation inherently regulates both the volume and the strength of the effluent as prescribed at 75-5-402(3), MCA. Load limits also ensure compliance with the ground water standards at the end of the mixing zone. The proposed final effluent limits are listed in Section IV.

APPENDIX VI – RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

ARM 17.30.1031 requires that all issued MGWPCS permits contain monitoring requirements that assure compliance with the developed numeric effluent limitations and the water quality standards. Effluent monitoring and ground water monitoring requirements will be maintained and made conditions of this permit.

A. Effluent Monitoring - Compliance

Final numeric effluent limitations are maintained in this permit with specific magnitudes and durations based on site-specific conditions that ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see Sections III and IV). Accordingly, the Department will require the permittee to continue to monitor and report monitoring results quarterly in order to demonstrate compliance with the applicable effluent limitations. Effluent monitoring and reporting requirements are summarized in the table below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

B. Effluent Monitoring - Sampling Location

Samples shall be representative of the nature of the monitored discharge (Permit Part II.A.). As discussed in Section II.C. The effluent quality sampling location (EFF-001) will remain as previously established at the drainfield dose tanks as shown in Figure 3. Samples or measurements shall be representative of the volume and nature of the monitored discharge. Grab samples are required. Each sample will be combined so that it evenly represents both treatment trains, 50% from dose tank A and 50% from dose tank B. Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR 136.

C. Discharge Monitoring

Flow measurements shall be representative of the volume of the monitored discharge (Permit Part II.A.). The applicant will be required to maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow (Permit Part II.B.). The flow measuring devices (FM-001) are located after the UV disinfection chambers and prior to drainfield dose tanks A and B (Figure 3). Flow measuring devices must be in operating condition prior to discharge. Flow monitoring and reporting requirements are summarized in the table on the following page.

Effluent Monitoring and Reporting Requirements – Outfall 001

Parameter/Method	Monitor Location	Units	Sample Type[1]	Minimum Sample Frequency	Reporting Requirements[1]	Report Freq	Rationale
Flow Rate, Effluent[2] [3]	FM-001	gpd	Contin-uous	Contin-uous	Daily Maximum[4] Quarterly Average[4]	Quarterly	Permit Compliance
Nitrogen, Total (as N)	EFF-001	mg/L	Calculated	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
		lbs/day[5]	Calculate	1/Quarter	Daily Maximum Quarterly Average	Quarterly	
Nitrogen, Total Kjeldahl (TKN) (as N)[6]	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total Ammonia (as N)[7]	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Phosphorus, Total (as P)[8]	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
		lbs/day	Calculate	1/Quarter	Quarterly Average	Quarterly	
		lbs/year[9]	Calculate	1/Quarter	Annual Maximum	Annually	
pH	EFF-001	s.u.	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Specific Conductivity	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Total Dissolved Solids	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Biochemical Oxygen Demand (BOD_5)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Total Suspended Solids (TSS)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance
Chloride	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Permit Compliance

Footnotes:

EFF-001: Refer to Section I. D. of the permit.

FM-001: Flow meters are located after UV disinfection and prior to the drainfield dose tanks.

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

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) Requires recording device or totalizing meter, must record daily effluent volume.

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

(4) Permittee is to report the daily maximum and quarterly average.

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

(6) Total nitrogen is the sum of Nitrate+Nitrite and Total Kjeldahl Nitrogen

(7) Total Inorganic Nitrogen is the sum of Nitrate + Nitrite and Ammonia.

(8) Annual maximum load shall be reported on an annual basis on the electronic DMR (due January 28 each permit cycle).

(9) Annual Load calculation: lbs/year = (mg/L) x flow (gpd) x [8.34 x 10-6] x 365 (days/year).

A. Ground Water Quality Monitoring

As a special condition (ARM 17.30.1031), ground water monitoring will be established in this permit to provide for long term ambient and downgradient monitoring of the aquifer. Ground water monitoring will be required at monitoring well MW1A. Ground water monitoring will be used for mixing zone determination, aquifer characterization, and in collection of data that is required for future permit renewal (Part III.A., Duty to Reapply). Ground water monitoring and reporting requirements are summarized in the table below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter. The existing ground water monitoring well MW1A shall be maintained and monitored during the term of the upcoming permit cycle. Sampling and reporting requirements shall commence upon the effective date of the permit.

Ground Water Monitoring and Reporting Requirements, Separately							
Parameter	**Monitor Location**	**Units**	**Sample Type**[1]	**Minimum Sampling Frequency**	**Reporting**[1] **Requirements**	**Reporting Frequency**	**Rationale**
Static Water Level (SWL) (feet below top of casing)	MW1A[2]	ft-bmp	Measured	1/Quarter	Instantaneous	Quarterly	Aquifer Characterization
Specific Conductivity @ 25°C	MW1A	µS/cm	Grab	1/Quarter	Daily Maximum[3]	Quarterly	Aquifer Characterization
pH	MW1A	s.u.	Grab	1/Quarter	Quarterly Average	Quarterly	Aquifer Characterization
Total Dissolved Solids (TDS) 25°C	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Aquifer Characterization
Chloride (as Cl)	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement
Escherichia coli	MW1A	CFU/100ml	Grab	1/Quarter	Daily Maximum[6]	Quarterly	Current Permit Requirement
Nitrogen, Total Kjeldahl (TKN)(as N)	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement
Nitrogen, Total Ammonia (as N)	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement
Nitrogen, Nitrate + Nitrite (as N)	MW1A	mg/L	Grab	1/Quarter	Daily Maximum	Quarterly	Current Permit Requirement
Phosphorus (as P), mg/L	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement

Footnotes:
CFU = Colony Forming Units
ft-bmp = feet below measuring point; measuring point (point of reference) for SWL measurements shall be from top of casing and measured to within 1/100th of one foot.
s.u. = standard units
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).
Monitoring for the proposed monitoring well MW1A shall commence upon the effective date of this permit (Section VI.B.)
Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.
Submittal of electronic discharge monitoring report forms (DMRs) will be required, regardless of the operational status of the facility or of each individual monitoring well.
At no time shall the permittee mark or state “no discharge” on any monitoring well electronic DMR form.
(1) See definitions in Part V of the permit.
(2) Ground water quality samples will be collected from monitoring well, MW1A, located 500-feet downgradient from Outfall 001.
(3) Report highest measured daily value for the reporting period on the electronic Discharge Monitoring Report (DMR).

APPENDIX VII - REFERENCES CITED

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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.
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