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:	City of Bozeman
Permit Number:	MTX000224
Facility Name:	City of Bozeman Water Treatment Plant
Facility Location:	Section 06, Township 03 South, Range 06 East, Gallatin County
Facility Address:	7024 Sourdough Canyon Rd. Bozeman, MT 59715
Facility Contact:	Jill Miller, Lab and Compliance Coordinator 7024 Sourdough Canyon Road Bozeman, MT 59715
Receiving Water:	Class I Ground Water
Number of Outfalls:	One
Outfall/Type:	002 – Domestic Wastewater to a Subsurface Drainfield

I. PERMIT STATUS

The following fact sheet outlines the basis for renewing a MGWPCS wastewater discharge permit to the City of Bozeman (City) for the City of Bozeman Water Treatment Plant (WTP) located on Bozeman Creek at the mouth of Sourdough Canyon (Figure 1). The MGWPCS permit application and supplemental materials provides the information that serves as the basis for redevelopment of the existing 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.

The WTP facility is concurrently permitted under a separate Montana Pollutant Discharge Elimination System (MPDES) MT0030155 permit. The current MPDES permit, most recently issued on November 01, 2014, permits the discharge of industrial wastewater to Bozeman Creek. The MPDES permit does not authorize discharge of wastewater to ground water.

On December 14, 2010, DEQ received the initial application package from the City of Bozeman requesting modification of the existing MPDES permit. On or about March 8, 2011, DEQ made the determination that the two individual outfalls, one which discharges to surface water and the other to ground water, would discharge to separate state water bodies (DEQ, 2011). Therefore the modification would entail two permits, a modification of the existing MPDES (surface water), and issuance of a new MGWPCS (ground water). The new MGWPCS permit was issued for the first time to the City on October 01, 2011. The new water treatment plant came online in March of 2014.

The WTP facility has been authorized by rule under the U.S. Environmental Protection Agency (USEPA) Underground Injection Control (UIC) program. The UIC permitting program runs concurrent to the State MGWPCS permitting program. The City also maintains Public Water Supply approval pursuant to 75-6-101, MCA et seq.

A. Application Info

The application to renew current MGWPCS permit coverage was received from the City of Bozeman on December 18, 2015. The submitted application and respective application fee was determined complete by DEQ on January 13, 2016.

B. Permit Updates

The 2011 MGWPCS permit included special conditions that required the City to develop and implement best management practices to prevent non-domestic wastes from entering into the wastewater collection and treatment system. To date, the City has complied with all permit special conditions in development and implementation of the best management practices plans. DEQ recognizes that these plans may limit the likelihood of non-domestic wastes from entering into the wastewater system. The City's current best management practices plans are included in Appendix VII and VIII.

The City, within the 2015 MGWPCS permit application, has requested permit coverage for discharge of only domestic wastewaters (e.g. sinks, toilets, showers). Therefore, the proposed permit will only authorize discharge of wastewaters that are domestic-in-nature. The monitoring and reporting requirements have been updated to reflect the domestic wastewaters.

The 2011 MGWPCS permit included special conditions that required the City to install and monitor three monitoring wells sidegradient and downgradient of the discharge structure. To date, the City has complied with these respective permit conditions as summarized in Appendix IX. Documentation of these installed monitoring wells, along with the City's respective monitoring well sampling and operation procedure manuals, is included in Appendix X and XI. The proposed permit requires continued monitoring of these monitoring wells. Additional discussion on these monitoring wells is included within Section II.G. of this fact sheet.

II.FACILITY INFORMATION

A. Facility Location

The City has operated water treatment at this Bozeman Creek location since 1957. The City constructed an entirely new plant which came online in March of 2014 and currently serves over 40,000 water users.

B. Outfall/Discharge Structure Status

There are two outfall structures at the WTP facility currently permitted under the Montana Water Quality Act. They are summarized below:

- Outfall 001 is authorized under a Montana Pollution Discharge Elimination System (MPDES) permit (MT0030155). The discharge structure is located near Bozeman Creek and discharges wastewater associated with water treatment. This outfall is not addressed within this document. Please refer to the following website for more information on this permit: https://deq.mt.gov/Water/WPB/mpdes

- Outfall 002 is authorized under this Montana Ground Water Pollution Control System (MGWPCS) permit (MTX000224). The discharge structure is approximately 1,500 feet sidegradient and to the east of Bozeman Creek. It discharges wastewater associated with domestic sources (e.g. sinks, toilets, showers) to shallow ground water. This outfall is discussed further within this document.

C. Facility and Operations

1) Water Treatment Plant

The new WTP building was located adjacent to the previous building which was deconstructed. Application materials indicate water treatment (SIC: 4941) as the primary process of the building.

Application materials indicate that domestic sources of wastewater may originate from the following: bathrooms, break rooms, laboratory, and the process area (Figure 3). The City has developed best management practices (Appendix VII and Appendix VIII) to limit the likelihood of non-domestic wastewaters from entering into the wastewater collection system. Additional information about the laboratory and the process area is discussed individually below.

Application materials indicate that the design capacity for the wastewater treatment system is 3,050 gallons per day (gpd) as based on daily maximum flow. This is for the combined flow originating from the water treatment plant and the Operator's home. These wastewater streams are collected together in a centralized 9,000 gallon septic tank. The tank provides for conventional treatment then sends the wastewater through an 8,000 gallon dose tank to a 112 x 200 foot subsurface drainfield (Figure 3). The discharged wastewater infiltrates to shallow ground water.

There are multiple water supplies that may contribute to the wastewater sources. The water supplies for the WTP building includes:

- Raw water - taken directly from Bozeman Creek and Hyalite Creek;
- Treated water - occurring from any of the multiple treatment stages within the proposed potable water treatment process; and,
- Finished water that is chlorinated but not fluoridated.

a) Water Treatment Plant - Process Area

The WTP process area contains floor drains which feed into the wastewater collection system addressed under this permit. The process area may house non-domestic materials; therefore a best management practices plan was required in the 2011 permit to minimize the potential for non-domestic wastes from entering into the wastewater collection system. On December 31, 2012, the City submitted a DEQ approved plan which was implemented upon construction of the WTP. The current plan is included within Appendix VII. This permit renewal will require the City to submit to DEQ any subsequent updates or modifications to the existing best management practices plan.

b) Water Treatment Plant - Laboratory

The WTP laboratory contains sinks which feed into the wastewater collection system addressed under this permit. The laboratory may house non-domestic materials; therefore a best management practices plan was required in the 2011 permit to minimize the potential for non-domestic wastes from entering into the wastewater collection

system. On June 01, 2012, the City submitted a DEQ approved plan which was implemented upon construction of the WTP. The current plan is included within Appendix VIII. This permit renewal will require the City to submit to DEQ any subsequent updates or modifications to the existing best management practices plan.

2) Operator's House

Application materials indicate that only domestic wastewater is to be collected from the Operator's home. This wastewater flows into the septic tank which combines with the wastewater originating from the WTP building (Figure 3). The Operator's home source water supply is treated water that is chlorinated but not fluoridated.

3) Additional Waste Generators

For informational purposes, the following additional waste stream generators were listed within application materials. Each source listed below does not discharge to Outfall 002. No additional outfalls have been assigned to this MGWPCS permit.

- The WTP grit removal, flocculation, and sedimentation treatment steps include the storage of wastewater within a lagoon. A new lagoon was recently constructed and contains a 60 mil HDPE liner and therefore is unlikely to discharge to ground water. Wastewater from this lagoon may be directly discharged to Bozeman Creek as covered under the MPDES MT0030155 permit.

- The WTP water treatment membranes will be cleaned approximately once a month with citric acid solution in sequence with a sodium hydroxide/sodium hypochlorite mixture. This cleaning solution will be neutralized and collected on-site. The used solution will be disposed of off-site at the Bozeman Wastewater Treatment Facility.

- The WTP building includes a vehicle maintenance bay and vehicle parking bays. A floor drain allows for draining of the snow melt and wash down water. The floor drain leads to a 1,000 gallon sand/oil interceptor followed by a 2,000 gallon holding tank. As needed, the containment vault will be pumped and the contents disposed of at the Bozeman Wastewater Treatment Facility. No discharge to ground water from this source has been proposed.

- Storm water runoff from paved areas, roof runoff and nearby vegetated areas flow to an unlined detention pond. No additional waste water sources have been noted.

Table 1: Collection, Treatment, and Disposal System Summary	
Outfall 002 - Domestic Wastewater/Sewerage	
Method of Disposal: Infiltration to shallow ground water	
Disposal Structure: Subsurface drainfield (Outfall 002)	
Latitude: 45.599157º North; Longitude: 111.022672º West	
Contributing Sources: Domestic sources and floor drains from the Operator's House and Water Treatment Plant building.	
Average Daily Design Flow (gpd): not provided	Daily Maximum Design Flow (gpd): 3,050
(ft^3/day): not provided	(ft^3/day): 407
Effluent Sampling Location: EFF-002: Dose tank located just prior to the drainfield.	
Flow Monitoring Equipment: FM-002: Electromagnetic Badger M-2000 flow meter	
Flow Monitoring Location: Located in the riser of the dose tank, the flow meter was installed (February, 2014) in between the dose pump and the drainfield.	
Treatment: Conventional septic tank	

D. Effluent Monitoring Location

The effluent sampling location (EFF-002) is from within the dose tank located just prior to the drainfield (Figure 3). Sampling requirements are further discussed in Section V.

E. Effluent Characteristics

Pursuant to ARM 17.30.1023, DEQ requires the applicant to disclose the quality of the effluent to be discharged such that the potential pollutants can be identified and the proposed discharge can be examined to determine if it will cause pollution of state water, 75-5-605, Montana Code Annotated (MCA). The City has been reporting effluent characteristics to DEQ through discharge monitoring reports on a regular basis since construction of the WTP. Data collected reflects the quality of effluent concurrent to the implemented best management practices plans (Section II.C.). The effluent quality data for Outfall 002 is summarized within Appendix I.

F. Geology and Hydrogeologic Characteristics

The Bavdark loam soil unit has been identified as the major soil component located at the drainfield site. The soil has an alluvium-colluvium parent material and is typically formed on alluvial fans having 8 to 25 percent slope. The typical soil profile is of sandy clay loam from 18 to 42 inches and coarse sandy loam from 42 to 60 inches below ground surface (NRCS, 2011). These estimates of soil physical properties generally agree with test pits dug on-site in the immediate vicinity of the proposed drainfield. Multiple test pits indicate the underlying soil horizons having a sandy clay loam to sand texture. The test pits were completed to depths up to eleven feet, four inches. No limiting layers were noted within these test pits (DEQ, 2011).

The drainfield discharges treated wastewater to shallow ground water located within the Quaternary alluvial fan (Qaf) deposit approximately 1,500 feet to the east and sidegradient of Bozeman Creek. The gravel ground water bearing zone under the drainfield is approximately 56 to 60 feet in depth.

The USGS Water Resource Investigation report titled, Geohydrologic Conditions and Land Use in the Gallatin Valley, Southwestern Montana (Slagle, 1995) was cited by the applicant in order to estimate the hydraulic gradient at 0.0088 ft/ft, and ground water flow direction at N22ºW.

Original application materials (DEQ, 2011) submitted by the applicant were used to estimate the hydraulic conductivity (K) of the alluvium at 144 ft/day. This estimate was obtained from five (5) water wells that are completed in the shallow alluvium and located in the vicinity of the WTP. The estimate was calculated by using existing well test data obtained from the respective well log reports. The final estimate is an average obtained after the removal of outlier data. The median value was similar to the average (144 ft/day).

Based on ground water flow direction (Figure 4), the nearest surface water body is the Williams Ditch. The ditch is reported by the applicant as being 110 feet downgradient from the proposed outfall. Shallow ground water monitoring indicates that the bottom of the ditch is located approximately fifty feet above the shallow ground water bearing unit. The ditch may therefore be a losing surface water body in the vicinity of the drainfield. Original application materials (DEQ, 2011) also indicate that the ditch has not been used in at least 20 years and has been reported as dry during the irrigation season. Additional surface water bodies are the 68 Ditch and Bozeman Creek, respectively located 1,350 feet and 1,750 feet downgradient as based on ground water flow direction.

A summary table is provided within Appendix II.

G. Ground Water Monitoring Wells

The City installed three new monitoring wells in April and May of 2012. These monitoring wells were constructed in the immediate area surrounding the drainfield (Outfall 002). Two monitoring wells were installed downgradient and one was installed sidegradient from the drainfield (Figure 5). Information regarding these monitoring wells, including location and representation, have been summarized and listed in Appendix II. The monitoring well installation report and the respective well construction diagrams are included in Appendix X.

H. Ground Water Quality Characteristics

The applicant self-reported ground water quality data from the monitoring wells discussed above (Section II.G.). Ground water quality results confirm that the ambient ground water is Class I pursuant to ARM 17.30.1006 (<1,000 µS/cm). Downgradient and ambient ground water quality 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. DEQ authorized a mixing zone for Outfall 002 in the 2011 discharge permit (DEQ, 2011). As discussed in Section I.B., this permit renewal will only authorize discharge of wastewater that is domestic-in-nature. Therefore, parameters authorized for dilution within a mixing zone will be restricted to those commonly found in domestic wastewater. The mixing zone rationale is further discussed in Appendix IV.

IV.RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

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. 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. As discussed in Section I.B., this permit renewal only authorizes discharge of wastewater that is domestic-in-nature. Therefore, effluent limitations will be developed for those parameters commonly found in domestic wastewater. 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 numerical effluent limitations:

Table 2: Proposed Final Effluent Limits – Outfall 002

Parameter	Units	Daily Maximum(1)	Rationale
Nitrogen, Total (as N)	lbs/day	1.79	Nondegradation-Nonsignificance Criteria

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. As discussed in Section I.B., this permit renewal only authorizes discharge of wastewater that is domestic-in-nature. Therefore, monitoring and reporting requirements will be developed for those parameters commonly found in domestic wastewater. Effluent monitoring and ground water monitoring requirements will be required

as a condition of this permit. Monitoring requirements and respective rationale are summarized in Appendix VI.

VI.SPECIAL CONDITIONS

Special conditions have not been established.

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VII.COMPLIANCE SCHEDULE

A compliance schedule has not been established.

VIII.NONSIGNIFICANT DETERMINATION

DEQ has determined (DEQ, 2011) that the discharge constitutes a new source and is subject to the Montana Nondegradation Policy (75-5-303, MCA; ARM 17.30.702). The applicable water quality standards for Class I ground water and nondegradation-nonsignificance criteria 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.

IX.PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on May 10, 2016. 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 (MTX000224), 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 – Vicinity Map

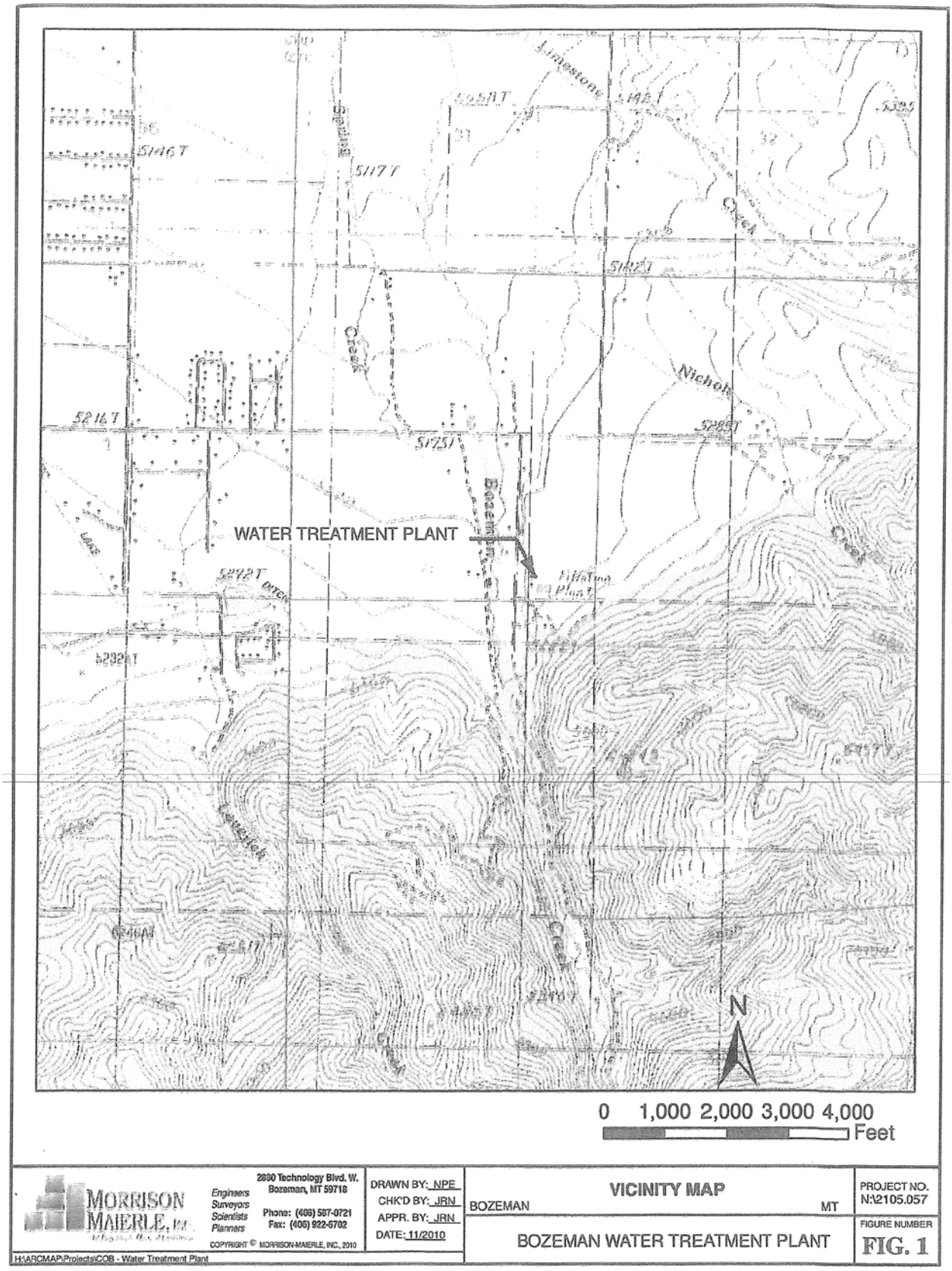


FIGURE 2 – Site Map

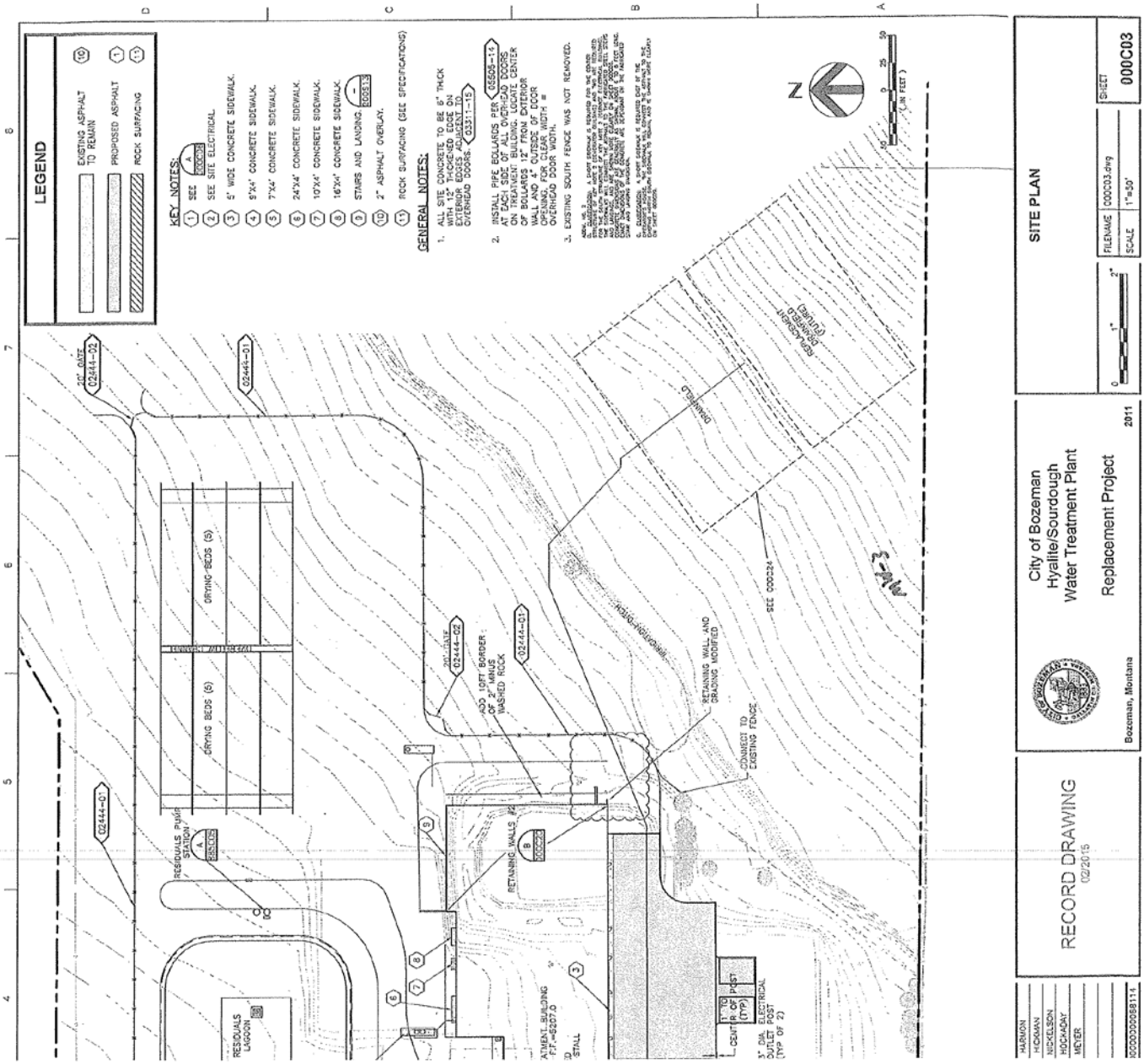


FIGURE 3 – Waste Water Line Diagram

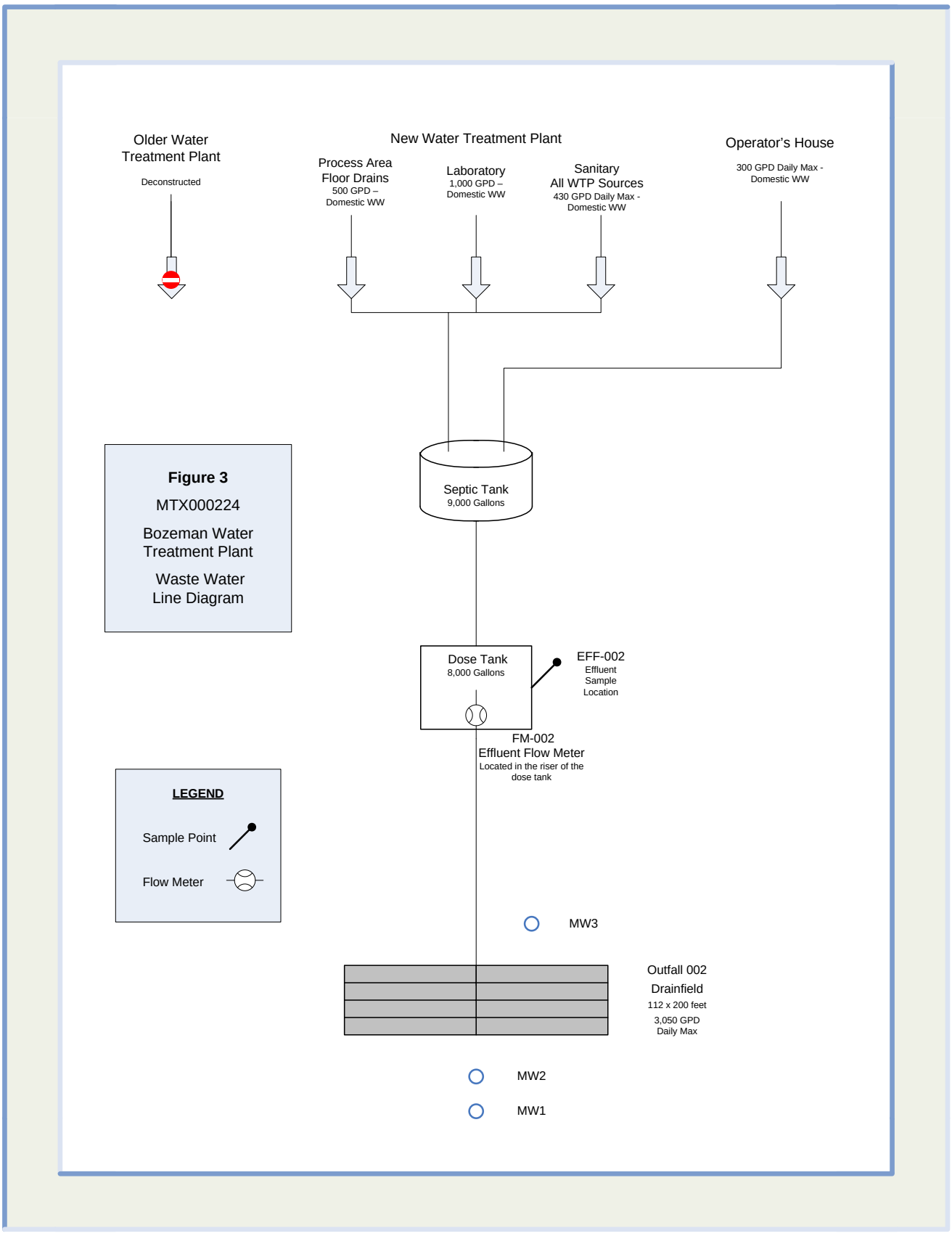
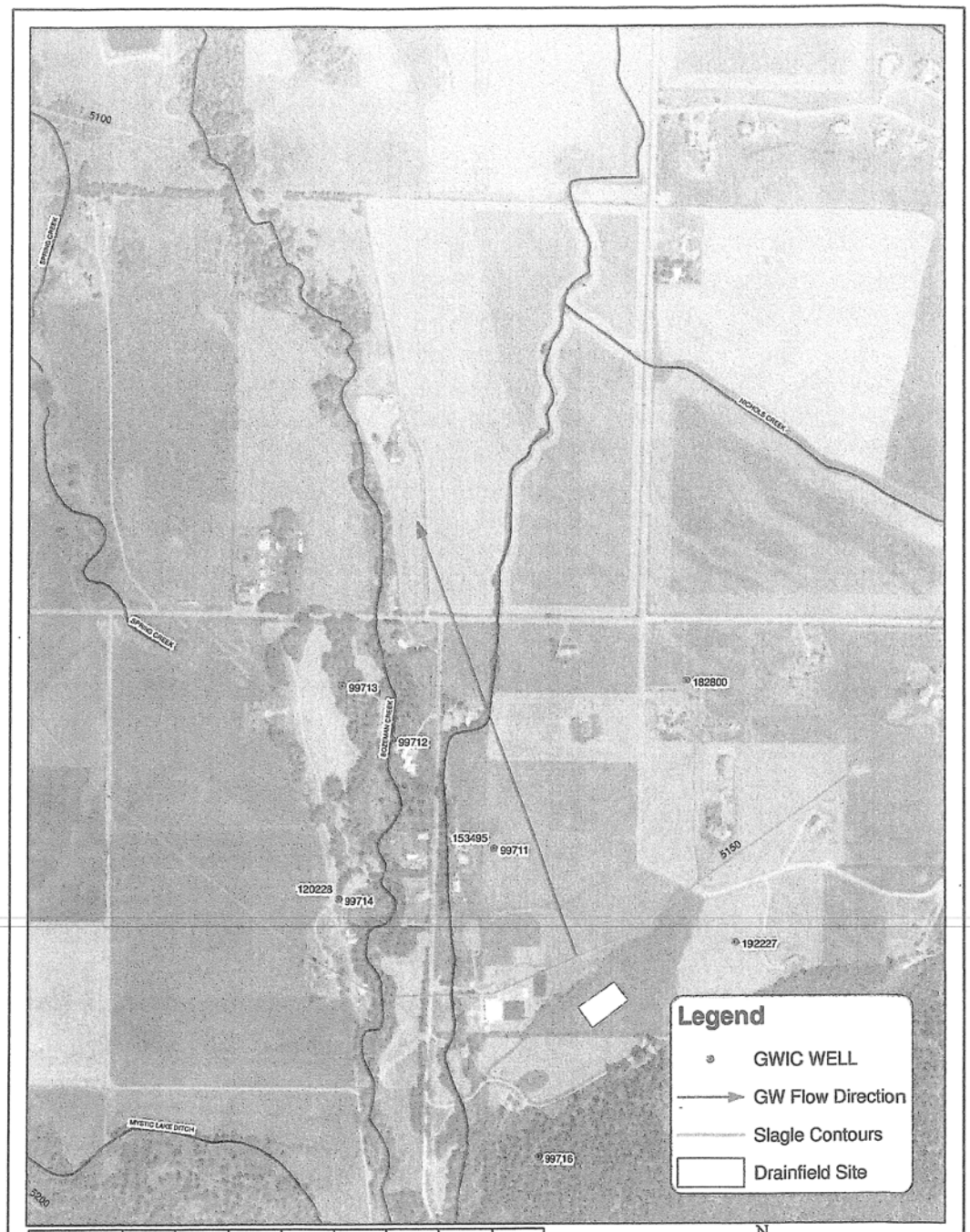


FIGURE 4 – Ground Water Flow Map



Well GWIC ID	TD feet	Q feet	swl feet	pwl feet	s feet	T ft²/day	b feet	K ft/day
99711	42	20	17	30	13	1521.44	10	152.14
99712	45.5	25	9	20	11	1976.03	10	197.60
99713	58	20	25	56	31	849.93	10	84.99
99714	37	15	13	28	15	1140.01	10	114.00
99716	97	15	7	77	70	406.14	10	40.61
120228	42.5	40	12	17	5	4591.75	10	459.17
153495	38	20	14	25	11	1701.63	10	170.16
182800	90	18	67.5	85	17.5	1161.73	10	116.17
192227	91	35	58	92	34	1162.37	10	116.24
214077	75	20	30	70	40	716.50	10	71.65
224726	77	30	14	72	58	732.96	20	36.65
Average	63	23	24	52	28	1451	11	142

Groundwater Gadient is 0.0088 ft/ft (50 ft/5700 ft) at 338 degrees
Groundwater Contours Reproduced from:
Slagle, Steven E., 1995, Geohydrologic Conditions and Land Use in the Gallatin Valley, Southwestern Montana, 1992-1993: U.S. Geological Survey Water Resources Investigations Report 95-4034.

MORRISON MAIERLE, INC.
Engineers Surveyors Scientists Planners
2800 Technology Blvd. W. Bozeman, MT 59718
Phone: (406) 587-0721 Fax: (406) 922-6702
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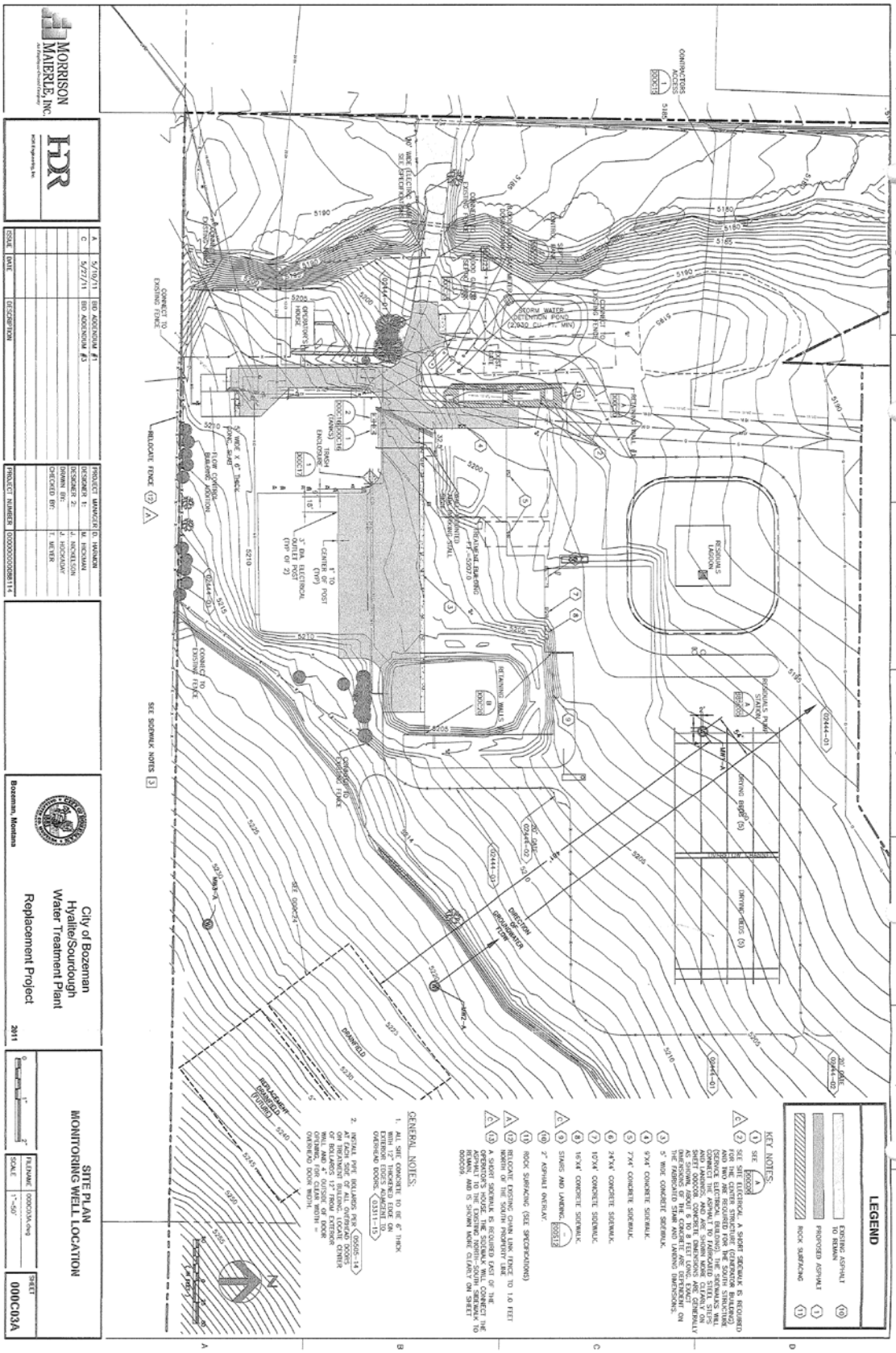
DRAWN BY: NPE
CHK'D BY: JRN
APP'R. BY: JRN
DATE: NOV 2010

WATER TREATMENT PLANT
Bozeman MT
CITY OF BOZEMAN

PROJECT NO. N:\2105.057.605
FIGURE NUMBER FIG. 2

FIGURE 5 – Monitoring Well Map



APPENDIX I

Estimated Effluent Quality – Outfall 002.

Parameter[1]	Location	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data	RRV	2011 Permit Limit
Flow rate, Discharge	FM-002	gpd	790	1928	7432	-	DMR	-	-
Nitrogen, Nitrate + Nitrite (as N)	EFF-002	mg/L	0.04	0.16	0.51	7	DMR	0.02	-
Nitrogen, Total Ammonia (as N)	EFF-002	mg/L	0.21	2.21	5.10	6	DMR	0.07	-
Nitrogen, Total Kjeldahl (as N)	EFF-002	mg/L	1.2	3.6	5.4	6	DMR	-	-
Nitrogen, Total (as N)	EFF-002	mg/L	1.7	3.7	5.4	6	DMR	-	-
		lbs/day	0.04	0.05	0.09	6	DMR	-	1.81
Phosphorus, Total (as P)	EFF-002	mg/L	-	0.39	0.69	8	APP	-	-
Specific Conductivity (@ 25°C)	EFF-002	µS/cm	-	335	746	8	APP	-	-
Total Dissolved Solids (TDS)	EFF-002	mg/L	45	167	380	7	DMR	-	500

Footnotes:

Outfall 001 is the outfall for the MPDES MT0030155 Permit.

APP = Application Form GW-1 and supplemental materials.

DMR = Self Reported Discharge Monitoring Reports.

EFF-002: Dose tank located just prior to the drainfield.

FM-002: Effluent flow meter located in riser of drainfield dose tank.

Period of Record: Start of discharge - 1st quarter 2014 through 3rd quarter 2015.

s.u. = standard units

(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.

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

APPENDIX II

Monitoring Well Summary
Monitoring Well: MW-1
MBMG GWIC #: 265706
Well Construction Log ID: MW-1A
Status: Installed on May 10, 2012
Location: MW-1 is located immediately west of the drying beds. It is located approximately 481 feet northwest (downgradient) from the drainfield. It is offset by approximately 54 feet to the southwest of the downgradient projection of the drainfield centroid (Figure 5).
Latitude: 45.600119º North Longitude: 111.024367 º West
Representation: Shallow ground water quality downgradient of the discharge drainfield near the downgradient boundary of the Outfall 002 mixing zone.
Monitoring Well: MW-2
MBMG GWIC #: 265702
Well Construction Log ID: MW-2A
Status: Installed on April 30, 2012
Location: MW-2 is located approximately 50 feet northwest (downgradient) from the drainfield. It is located on the downgradient projection of the drainfield centroid (Figure 5).
Latitude: 45.599245º North Longitude: 111.023196 º West
Representation: Shallow ground water quality located immediately downgradient from the discharge drainfield and within the Outfall 002 mixing zone.
Monitoring Well: MW-3
MBMG GWIC #: 265697
Well Construction Log ID: MW-3A
Status: Installed on April 30, 2012
Location: MW-3 is located approximately 110 feet southwest (sidegradient) from the drainfield (Figure 5).
Latitude: 45.598536º North Longitude: 111.023415 º West
Representation: Ambient quality of the shallow ground water, sidegradient of Outfall 002.

APPENDIX III

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
MW1	Shallow ground water, at the end of a 500 foot mixing zone, downgradient from Outfall 002	Aluminum, Dissolved	mg/L	<0.009	<0.009	0.05	12	DMR
		Chloride (as Cl)	mg/L	6	20	45	13	DMR
		Fluoride, Total	mg/L	<0.2	<0.2	0.2	13	DMR
		Iron, Dissolved	mg/L	<0.02	<0.02	0.03	12	DMR
		Manganese, Dissolved	mg/L	ND	ND	0.001	12	DMR
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	1.45	2.14	3.50	13	DMR
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	1.7	12	DMR
		pH	s.u.	7.1	7.3	7.5	13	DMR
		Specific Conductivity (@ 25°C)	µS/cm	436	529	710	13	DMR
		Static Water Level (SWL)	ft-bgs	57.20	60.32	64.00	13	DMR
		Sulfate	mg/L	7	8	10	13	DMR
		Total Dissolved Solids (TDS)	mg/L	242	290	371	13	DMR
MW2	Shallow ground water, 50 feet downgradient from Outfall 002	Chloride (as Cl)	mg/L	1	2	10	13	DMR
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	3	BASE
		pH	s.u.	7.0	7.2	7.4	13	DMR
		Specific Conductivity (@ 25°C)	µS/cm	443	525	650	13	DMR
		Static Water Level (SWL)	ft-bgs	56.50	57.24	60.00	13	DMR
MW3	Ambient Ground Water Quality Shallow ground water, 100-200 feet sidegradient from Outfall 002	Aluminum, Dissolved	mg/L	<0.009	<0.009	0.05	13	DMR
		Chloride (as Cl)	mg/L	1	1	2	13	DMR
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	15	APP
		Fluoride, Total	mg/L	0.2	0.3	0.3	13	DMR
		Iron, Dissolved	mg/L	NR	NR	NR	-	DMR
		Manganese, Dissolved	mg/L	ND	ND	0.004	13	DMR
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.11	0.13	0.15	13	DMR
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	0.1	13	DMR
		pH	s.u.	7.7	8.0	8.4	13	DMR
		Specific Conductivity (@ 25°C)	µS/cm	254	272	300	13	DMR
		Static Water Level (SWL)	ft-bgs	62.50	63.21	64.00	13	DMR
		Sulfate	mg/L	10	12	13	13	DMR
		Total Dissolved Solids (TDS)	mg/L	125	140	172	13	DMR

Footnotes:

APP = Application Form GW-2 and supplemental materials.

BASE = Baseline ground water quality report submitted on October 22, 2012. Period of record: May 2012 through October 2012.

bgs = below ground surface

CFU = Colony Forming Units

DMR = Self Reported Discharge Monitoring Reports

ND = Not Detected

NR = Not Reported

Period of Record: 3rd Quarter 2012 through 3rd Quarter 2015.

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.

APPENDIX IV – MIXING ZONE RATIONALE

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. Mixing zones are subject to the conditions imposed by DEQ and consistent with the rules adopted by the Board of Environmental Review (Board).

The applicant has requested reauthorization of one standard ground water mixing zone. 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).

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].

For purposes of reauthorization determination, DEQ will reference the following rules for water quality assessment of the mixing zone. A mixing zone may be granted for individual parameters in a discharge (ARM 17.30.505). 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 to determine if the discharge qualifies for a (500 foot) ground water mixing zone. After an assessment of the application information (ARM 17.30.505), DEQ will reauthorize a mixing zone established in the previous permit (DEQ, 2011) for the parameters listed within the table below as the potential impact to beneficial uses may be minimal (Section II and Section IV).

For purposes of determining the mixing zone area, DEQ will reference the following rules for mixing zones. Pursuant to ARM 17.30.502 a “Mixing Zone" is defined as a limited area of a portion of an aquifer where initial dilution of a discharge takes place, where water quality changes may occur, and where certain water quality standards may be exceeded. DEQ will reauthorize the mixing zone based on the hydrogeologic and mixing zone information as previously established (DEQ, 2011). ARM 17.30.517 states that a specific depth and width are necessary to determine the aquifer cross-section area (A) for a mixing zone. The width of the outfall structures perpendicular to ground water flow direction are reported within the table below. ARM 17.30.517 states that the depth of a ground water mixing zone extends from the top of the water table beneath the source down to 15 feet below the water table.

The cross sectional area (A) is the area of the ground water flux boundary at the terminus of the mixing zone (ARM 17.30.517). The down gradient boundary mixing zone width is the width of the source (drainfield width perpendicular to ground water flow direction), plus the distance determined by the tangent of 5° (0.0875) times the length of the mixing zone times two (2) (ARM 17.30.517). The calculated widths and respective cross section areas (A) are listed within the table below.

Based on the dimensions of the standard mixing zones, and the hydrogeologic characteristics (Section II), the volume of ground water (QGW) available to mix with the effluent is calculated using Darcy's Equation (ARM 17.30.517):

$$Q_{GW}=KIA$$

Where:
Q_{GW} = ground water flow volume (ft3/day)
K = hydraulic conductivity (ft/day)
I = hydraulic gradient (ft/ft)
A = cross-sectional area (ft2) of flow at the downgradient boundary of the mixing zone.

The mixing zone dimensions, characteristics, and volume of ground water available to mix at Outfall 002 are listed within the table below.

Based on the description of the mixing zone above, and analysis presented in Section III, DEQ has determined pursuant to ARM 17.30.505 that a standard mixing zone is still applicable and will be reauthorized only for the individual parameters listed in the table below for Outfall 002.

Mixing Zone Information - Outfall 002

Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Quality - Nitrate + Nitrite	mg/L	0.13
Ground Water Flow Direction	azimuth/bearing	N22°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	200
Width of Mixing Zone at Down Gradient Boundary	feet	287.5
Cross Sectional Area of Mixing Zone (A)	ft^2	4,312.5
Hydraulic Conductivity (K)	feet/day	144
Hydraulic Gradient (I)	ft/ft	0.0088
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	5,465

APPENDIX V - RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

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. 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.

A. Water Use Classification & Applicable Water Quality Standards

The receiving water is Class I ground water and therefore high quality waters 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 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 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 nondegradation rules (ARM 17.30.701, et seq.) implement Montana's nondegradation policy, which applies to any activity of man resulting in a new or increased source which may cause degradation (ARM 17.30.705). In accordance with ARM 17.30.706, DEQ is required to determine whether a new or increased source may cause degradation or whether it is nonsignificant according to ARM 17.30.715.

DEQ performed a significance determination for the proposed activity as part of permit development (DEQ, 2011). The determination established that the proposed discharge is a new or increased source (ARM 17.30.702) because it is an activity resulting in a change of existing water quality occurring on or after April 29, 1993. Discharges in compliance with the nondegradation-nonsignificance criteria established within this permit, constitute nonsignificant degradation.

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]
Nitrogen, Nitrate + Nitrite (as N)	mg/L	10.0	-	T	5.0
Nitrogen, Total (TN)	mg/L	-	10.0	-	5.0
Phosphorus, Total Inorganic	-	-	-	H	Surface water breakthrough time greater than 50 years[4]

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) Includes known pollutants and parameters of concern only.

(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. Current treatment in use is a conventional septic tank system.

(4) 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's) for the proposed discharge in review of the submitted application and the applicant's stated operations. The applicant has stated only domestic-in-nature wastewater will be collected, treated, and disposed by this treatment system. As earlier discussed in Section II, the applicant has developed and implemented a best management practices plan to minimize the potential for non-domestic wastes from entering into the wastewater collection system.

Each individual POI is discussed further 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

Nitrogen in raw wastewater is primarily in the form of organic matter and ammonia. After primary treatment wastewater is primarily 85% ammonia. After discharge to the drainfield, ammonia is almost entirely converted to nitrite, and ultimately to nitrate (EPA 2002). For the purposes of predicting the nitrate plus nitrite concentration in the ground water at the end of mixing zone, DEQ assumes that the entire nitrogen load in the treated wastewater is converted and enters the ground water as nitrate. DEQ will retain and update the limit for total nitrogen (TN) in this permit.

The allowable discharge concentration is derived from a mass balance equation, which considers available dilution and background concentration of the receiving water. As shown in Appendix IV, the volume of receiving water available to mix with effluent (Q_{GW}) is 5,465 ft^3/d (or 40,881 gpd) as determined using Darcy's equation. Q_{GW} (in gallons per day) is used in the mass balance equation (ARM 17.30.517(1)(d)(vi) and (vii)) to determine the applicable water quality based effluent limit for TN. The mass balance equation has been rearranged to the following form to determine the allowable discharge load such that the applicable ground water standard is not exceeded.

$$\boldsymbol{L}_{EFF} = (\boldsymbol{C}_{STD}(\boldsymbol{Q}_{GW} + \boldsymbol{Q}_{EFF}))\boldsymbol{X} - \boldsymbol{C}_{AMB}\boldsymbol{Q}_{GW}\boldsymbol{X}$$

Where:

$\boldsymbol{L}_{EFF}$ = the daily maximum load (lbs/day)
$\boldsymbol{C}_{STD}$ = ground water quality standard
$\boldsymbol{C}_{AMB}$ = ambient ground water concentration of NO_2+NO_3 (as N) mg/L
$\boldsymbol{Q}_{GW}$ = ground water volume (gpd) available for mixing at the end of the mixing zone
$\boldsymbol{Q}_{EFF}$ = volume of effluent (gpd)
$\boldsymbol{X}$ = [$8.34x10^{\wedge-6}$] the conversion factor to convert conc. and flow into load (lbs/day).

As indicated in the table above, the most stringent applicable ground water quality standard ($\boldsymbol{C}_{STD}$) for NO_2+NO_3 is 5.0 mg/L. The ambient concentration of NO_2+NO_3 (as N) in the receiving water ($\mathbf{C}_{AMB}$) is 0.13 mg/L, as collected from the ambient ground water monitoring well (Appendix III). As described in Section III, $\mathbf{Q}_{GW}$ has been calculated to be 5,465 ft^3/d or 40,881 gpd. Finally, the applicant has proposed a daily discharge flow ($\mathbf{Q}_{EFF}$) of up to 3,050 gpd as based on the design capacity flow of the system. Solving for $\mathbf{L}_{EFF}$, the TN WQBEL

limit is 1.79 lbs/day. This limit has been updated from the original 2011 permit limit due to the updated on-site ambient water quality samples. The daily maximum TN load must not exceed 1.79 lbs/day.

The updated effluent limitation for nitrogen is displayed in Section IV.

b. Phosphorus

Phosphorus levels in surface waters are measured as Total Phosphorus as P (TP). As such, any permit condition regarding phosphorus and its potential effect on surface water will be measured as TP. Phosphorus in wastewater is removed mainly through soil sorption processes, which vary based on soil composition. The 50-year breakthrough nondegradation criterion is based on the amount of soil available to adsorb the load of phosphorus from the wastewater source between the discharge point and the closest downgradient surface water.

A phosphorous breakthrough analysis was conducted by DEQ (DEQ, 2011) using information provided by the applicant, submitted as part of permit application materials. The limiting layer depth was originally based on data collected from on-site soil test pits which observed no physical limiting layers. Since 2011, the City has installed three on-site monitoring wells in the vicinity of the discharge structure (Section II.G.). The associated borehole logs also did not show a physical limiting layer in the subsurface. Measurements collected from the monitoring wells show the static water level around 60 feet below ground surface. This updated site specific information therefore indicates that the limiting layer may be up to 60 feet below ground surface. This may provide for a greater amount of soil available for sorption than what was estimated in the 2011 analysis.

The design capacity is based on the reported maximum daily flow of the treatment system's design capacity of 3,050 gpd, as confirmed by the applicant. This is the flow that the system is permitted to discharge for this MGWPCS permit. To date, actual flow discharge measurements indicate flows occurring at around an average of 1,900 gallons per day. In addition, the original effluent TP concentration representative of this treatment system was 10.6 mg/L (DEQ, 2011). This was based on the DEQ Nondegradation Analysis for Subsurface Wastewater Treatment Systems document (DEQ, 2009). Since construction, the permittee has been reporting actual effluent characteristics to DEQ. The self-reported effluent average for phosphorus concentrations is 0.39 mg/L (Appendix I). The actual phosphorus load being discharged is quite lower than what was originally projected.

DEQ took a conservative approach in this analysis and used the 68 Ditch as the potential receiving surface water body (DEQ, 2011). In use of the most conservative data, the phosphorus breakthrough analysis indicated that phosphorous discharged to ground water would not reach the ditch from Outfall 002 in a significant amount of time (DEQ, 2011). At the proposed discharge rate the phosphorous breakthrough is expected to occur in 86 years. A phosphorous breakthrough that would occur within 50 years would be considered significant therefore a TP limit was not established. It is to be noted, that updated site specific information received since 2011 shows that the original determination was indeed conservative.

E. 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 establish 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 reestablished as conditions of this permit.

A. Effluent Monitoring - Compliance

Final numeric effluent limitations will be reestablished 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 permittee will be required to continue monitor and report monitoring results at a specified frequency in order to demonstrate compliance with the applicable effluent limitations. The reestablished 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 sample location is located at the dose tank (EFF-002) located just prior to the drainfield (Figure 3).

C. Discharge Monitoring

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 City installed a flow measuring device (FM-002) within the riser of the dose tank (Figure 3) located in between the dose pump and the drainfield. Flow monitoring and reporting requirements are summarized in the table below.

Effluent Monitoring and Reporting Requirements – Outfall 002

Parameter/Method	Monitor Location	Units	Sample Type[1]	Minimum Sample Frequency	Reporting Requirements[1][2]	Report Freq	Rationale
Flow Rate, Effluent[3]	FM-002	gpd	Contin-uous	Contin-uous	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Nitrite+Nitrate (as N)	EFF-002	mg/L	Composite	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total Ammonia (as N)	EFF-002	mg/L	Composite	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total Kjeldahl (TKN)	EFF-002	mg/L	Composite	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total (as N)[4]	EFF-002	mg/L	Calculate	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
		lbs/day[5]	Calculate	1/Quarter	Daily Maximum[6] Quarterly Average[7]	Quarterly	
Phosphorus, Total (as P)	EFF-002	mg/L	Composite	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement/ Effluent Characterization

Footnotes:

Compositing Period: 6 to 24 hours

EFF-002: Dose tank located just prior to the drainfield.

FM-002: Effluent flow meter located in riser of drainfield dose tank.

If no discharge occurs during the reporting period, "no discharge" shall be recorded on the effluent DMR report forms.

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 record 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.

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

D. Ground Water Quality Monitoring

As a special condition (ARM 17.30.1031), ground water monitoring was established in the 2011 permit (DEQ, 2011) to provide for long term ambient and downgradient monitoring of the aquifer. Ground water monitoring requirements will be maintained for monitoring wells MW-1, MW-2, and MW-3 due to the following site-specific reasons:

- The aquifer beneath Outfall 002 is shallow and unconfined.
- Continue downgradient ground water characterization.
- Duty to reapply (Permit Part III.A.) requires ambient ground water quality.
- Proximity to Bozeman Creek, tributaries, and ditches.

Ground water monitoring and reporting requirements are summarized in the table below. Requirements have been reestablished and are now based on parameters of interest associated with the proposed wastewater stream (Section II). All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter. All existing ground water monitoring wells shall be maintained and monitored during the term of the upcoming permit cycle.

Ground Water Monitoring and Reporting Requirements, Separately

Parameter/Method	Monitor Location[1]	Units	Sample Type[2]	Minimum Sampling Frequency	Reporting[2][3][4] Requirements	Reporting Frequency	Rationale
Chloride (as Cl)	MW-1 MW-2 MW-3	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
Escherichia coli Bacteria	MW-2 MW-3	CFU/ 100ml	Grab	1/Quarter	Daily Maximum Quarterly Average[5]	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
Nitrogen, Nitrate + Nitrite (as N)	MW-1 MW-3	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
Nitrogen, Total Kjeldahl (TKN)	MW-1 MW-3	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
pH	MW-1 MW-2 MW-3	s.u.	Grab or Instant-aneous	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
Specific Conductivity @ 25°C	MW-1 MW-2 MW-3	µS/cm	Grab or Instant-aneous	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
Total Dissolved Solids (TDS)	MW-1 MW-3	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply
Static Water Level (SWL)[6]	MW-1 MW-2 MW-3	ft-bmp	Instant-aneous	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement Aquifer Characterization Duty to Reapply

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) Refer to Section II.G. of the Fact Sheet for the existing location of the monitoring wells.

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

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

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

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

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

APPENDIX VII – BEST MANAGEMENT PRACTICES PLANS – PROCESS AREA

This plan is available for viewing at the following website:
http://deq.mt.gov/Water/WQINFO/mgwpcs

APPENDIX VIII – BEST MANAGEMENT PRACTICES PLANS – LABORATORY

This plan is available for viewing at the following website:
http://deq.mt.gov/Water/WQINFO/mgwpcs

APPENDIX IX – 2011 COMPLIANCE STATUS & CONSTRUCTION UPDATE REPORT

This report is available for viewing at the following website:
http://deq.mt.gov/Water/WQINFO/mgwpcs

APPENDIX X – MONITORING WELL INSTALLATION REPORT

This report is available for viewing at the following website:
http://deq.mt.gov/Water/WQINFO/mgwpcs

APPENDIX XI – MONITORING WELL SAMPLING AND OPERATION PROCEDURE MANUAL

This manual is available for viewing at the following website:
http://deq.mt.gov/Water/WQINFO/mgwpcs

APPENDIX XII - REFERENCES CITED

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

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

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

City of Bozeman, Groundwater Monitoring Wells Sampling and Analysis Plan for The City of Bozeman Water Treatment Plant. Received on May 17, 2012.

City of Bozeman, Groundwater Monitoring Wells Manual for The City of Bozeman Water Treatment Plant. Received on May 17, 2012.

City of Bozeman, Monitoring Well Installation Report for The City of Bozeman Water Treatment Plant. Prepared by Pat Eller, Morrison Maierle, Inc. Report dated May 31, 2012.

City of Bozeman, Laboratory Best Management Practices for The City of Bozeman Water Treatment Plant. Section II, Waste Disposal and Spill Response Program. Received on June 01, 2012.

City of Bozeman, Process Area Best Management Practices for The City of Bozeman Water Treatment Plant. Received on December 31, 2012.

Department of Environmental Quality, Water Quality Circulars:

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

Department of Environmental Quality. 2011. Administrative Record of Montana Ground Water Pollution Control System (MGWPCS) permit application and supplemental materials, City of Bozeman Water Treatment Plant, MTX000224.

Department of Environmental Quality. 2016. Administrative Record of Montana Ground Water Pollution Control System (MGWPCS) permit application and supplemental materials, City of Bozeman Water Treatment Plant, MTX000224.

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

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

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

Montana Bureau of Mines and Geology, Ground-Water Information Center, Referenced on December 31, 2015, from the GWIC database, http://mbmggwic.mtech.edu.

Vuke, S. et al. 2002. Montana Bureau of Mines and Geology, Preliminary Geologic Map of the Bozeman Quadrangle. Open File No. 469.

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

Slagle, S.E.., 1995, Geohydrologic Conditions and Land Use in the Gallatin Valley, Southwestern Montana, 1992-1993, Water Resources Investigation Report 95-4034.

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

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

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

U.S. Environmental Protection Agency, Nitrification, 625/R-00/008, Office of Ground Water and Office of Water. 2002a.

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

Woessner, W., Troy, T., Ball, P. and D.C. DeBorde. 1998. Virus Transport in the Capture Zone of a Well Penetrating a High Hydraulic Conductivity Aquifer Containing a Preferential Flow Zone: Challenges to Natural Disinfection. In Proc. Source Water Protection Int., Dallas, TX. 28–30 Apr. 1998. National Water Research Inst., Fountain Valley, CA.

Prepared By: Chris Boe, March 2016