# 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: | Missoula County Public Schools |
| Permit Number: | MTX000237 |
| Facility Name: | Educational Meat Processing Facility<br>Missoula County Public Schools Vo-Ag Center |
| Facility Location: | Latitude: 46.845318º; Longitude: -114.069579º<br>Section 36, Township 13 North, Range 20 West<br>Missoula County |
| Facility Address: | 3637 South Ave. W., Missoula, MT |
| Facility Contact: | Burley McWilliams, O&M Supervisor |
| Receiving Water: | Class I Ground Water |
| Number of Outfalls: | One |
| Outfall/Type: | 001 – Industrial (Other) Wastewater |

## I. PERMIT STATUS

The following fact sheet outlines the basis for issuing a new MGWPCS wastewater discharge permit to Missoula County Public Schools for the Educational Meat Processing Facility located within the Missoula County Public Schools Vo-Ag Complex west of Missoula. 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 construction, operation, and maintenance of the wastewater treatment and disposal system.

A. Application Info

DEQ received a MGWPCS permit application from the applicant on August 29, 2016. On October 05, 2016, DEQ received all pertinent application fees and review of the application materials commenced. On October 31, 2016, DEQ requested submittal of additional application information. On December 27, 2016, DEQ received all requested information and the application was subsequently deemed complete on January 09, 2017.

## II.FACILITY INFORMATION

A. Facility Location and Operations

The Missoula County Public Schools (MCPS) Vocational-Agricultural (Vo-Ag) Complex is an existing public educational facility located near the City of Missoula. MCPS plans on constructing and operating an Educational Meat Processing Facility within the Vo-Ag complex.

The processing facility will have limited capacity and be used solely for educational purposes. The facility will contain a meat processing kitchen that will process small amounts of beef and pork (up to 2 cows, or 4 pigs per week). Blood and entrails from the slaughtered animals will be collected and removed from the waste stream. Blood will be captured via a segregated drain and collected for use along with the offal and butcher waste through the on-site compositing process.

The facility will have multiple sinks and floor drains which will capture wash-down water and rinsate. These are the only sources that will be connected to the proposed wastewater treatment system. No toilets or showers have been proposed at this facility building. It is estimated that 99% of all captured wastewater is that of rinse water. The collected wastewater will flow through a grease interceptor then into a conventional septic tank and be then disposed of through an on-site subsurface drainfield.

DEQ has established permit conditions that require the permittee to establish and maintain Standard Operating Procedures (SOPs) in use of Best Management Practices (BMPs) to prevent butcher and meat processing wastes from entering into the wastewater collection system. These practices and procedures will assist with the school's current plan to collect and recycle or compost wastes collected from meat processing. MCPS has submitted tentative BMPs to DEQ as part of the application materials; they are displayed in Appendix VIII. Future BMP permit condition requirements are further discussed in Section VI.

| **Table 1: Collection, Treatment, and Disposal System Summary** | |
|---|---|
| Outfall 001 - Industrial Wastewater/Sewerage | |
| Method of Disposal: Infiltration to ground water | |
| Disposal Structure: Subsurface Drainfield (Outfall 001)<br>Section 36, Township 13 North, Range 20 West<br>Latitude: 46.845318º; Longitude: -114.069579º | |
| Contributing Sources: The public education program will process small amounts of beef and pork. All produced waste (blood, entrails, ect.) from the processing will be collected and recycled/composited. Wastewater will only consist of rinse water (floor drains, 80%) and sink drains (20%). Conditions of the permit require the permittee to establish and maintain Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) to prevent other wastes from entering into the wastewater collection system. No toilets or showers have been proposed at this facility. | |
| Average Daily Design Flow (gpd): 280<br>($ft^3$/day): 37 | Daily Maximum Design Flow (gpd): 560<br>($ft^3$/day): 74 |
| Effluent Sampling Location: EFF-001: To be established within the Wastewater Sampling Plan (Section VI). | |
| Flow Monitoring Location: FM-001: To be established within the Wastewater Sampling Plan (Section VI). | |
| Treatment: Grease interceptor, conventional septic tank, and subsurface drainfield. | |

B. Effluent Discharge Structure

The proposed drainfield (Outfall 001) will be located on-site immediately adjacent to (southwest-side) of the proposed Meat Processing building (Figure 3). Additional details are provided in Table 1.

C. Effluent Monitoring Location

Effluent sampling (EFF-001) will be located after treatment and just prior to discharge of the wastewater within the drainfield (Figure 4). Effluent collection techniques and locations will be established by the applicant within the Wastewater Sampling Plan (Section VI). Effluent sampling requirements are further discussed in Section V.

D. Effluent Characteristics

Pursuant to ARM 17.30.1023, DEQ requires 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 has proposed implementation of BMPs in order to prevent wastes and nutrients from entering the wastewater collection

system. Therefore, the applicant estimates that all discharged nutrients may originate from their source water obtained from an on-site water well. The applicant provided an effluent quality estimate for Outfall 001 as summarized within Appendix I.

E. Geology and Hydrogeologic Characteristics

The Missoula aquifer is unconfined or semi-confined and composed mainly of unconsolidated Quaternary alluvium. The Quaternary alluvium generally consists of three main layers:

- A top sand/silt, gravel, cobble and boulder layer;
- A middle clay-rich layer, which yields little water; and,
- A bottom layer of sand, gravel and cobbles (Woessner, 1988).

The facility is located within the southern end of the Missoula-Ninemile Valley which sits upon the Missoula Valley alluvial aquifer (Figure 1). This sole source aquifer primarily consists of unconsolidated alluvial sand, gravel and cobbles and is primarily recharged by leakage from the Clark Fork River (Woessner, 1988).

The depth to the shallow water table is at approximately 25 feet (Woessner, 1988; GWIC# 70261 well log). The shallow water bearing zone (top layer) is approximately 26 feet thick and composed of sand grading to depth into a sand and gravel matrix (GWIC# 70261 well log, Figure 5). This shallow receiving water bearing zone is underlain by 44 feet of predominately clay (middle layer), which overlays sand and gravel (bottom layer).

The bottom layer is the primary water bearing zone for most ground water wells located on this alluvial aquifer. Review of construction diagrams, lithologic logs, and water level records of wells in the primary vicinity of the Vo-Ag complex indicates that both the top and bottom alluvial layers are:

- being actively used as a water resource; and,
- in potential hydraulic connection.

F. Ground Water Wells

The Vo-Ag campus has a public water supply (MT0003505) which utilizes an on-site ground water well (GWIC# 70261, Figure 2). Water well information has been summarized and is listed in Appendix II.

G. Ground Water Quality Characteristics

The Vo-Ag water well was used in the collection of on-site ground water quality data. Ground water sample results are summarized in Appendix III. The receiving ground water is Class I as further discussed in Appendix V.

## 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 will be authorizing a mixing zone within this permit. The mixing zone rationale is further discussed in Appendix IV.

## IV.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. 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 001**

| Parameter | Units | Daily Maximum(1) | Rationale |
|---|---|---|---|
| Nitrogen, Total (as N) | lbs/day | 0.6 | Nondegradation Significance Criteria ARM 17.30.715(1)(d)(i) |

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 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. Flow Meter Installation

Prior to discharge, an effluent flow measuring device must be installed and in operating condition. Flow meter and recording device requirements are further discussed in Appendix VII. Installation and reporting requirements are listed within Table 3.

B. Waste Mitigation Plan

As discussed in Section II.A., the applicant plans to collect and recycle or compost wastes generated from on-site meat processing. Practices and procedures must be in place to prevent wastes and pollutants from entering into the wastewater collection system and state waters. The applicant will be required to develop (or update), implement, and maintain Standard Operating Procedures (SOPs) to employ Best Management Practices (BMPs) that prevent the discharge of pollutants. The action and reporting dates are listed within Table 3. This plan must be kept up to date, implemented, and maintained at the facility at all times.

C. Wastewater Sampling Plan

As discussed in Section V, DEQ requires collection of wastewater samples at Outfall 001 such that they are representative of the nature of the monitored discharge. In addition, DEQ also requires that effluent flow rate measurements be representative of the volume of the monitored discharge (Permit Part II.A.).

The applicant will be required to develop (or update) and maintain a Sampling Procedure Plan for collection of wastewater samples and flow rate measurements at Outfall 001. The plan must address on-site procedures for collection of wastewater samples and flow rates so that they are representative of normal operations occurring over a normal operating day (24 hour period). The action and reporting dates are listed within Table 3. This plan must be kept up to date, implemented, and maintained at the facility at all times.

## VII.COMPLIANCE SCHEDULE

A compliance schedule is included to allow a reasonable opportunity for the permittee to attain and maintain compliance with permit requirements. The actions listed in the table below must be completed on or before the respective scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date. Completion of all actions or deliverables must be reported to DEQ in accordance with Part II.D and Part IV.G of the permit.

**Table 3: Compliance Schedule**

| Authority | Permit Condition | Action | Freq. | Scheduled Completion Date of Action(1) | Scheduled Report Due Date.(2) |
|---|---|---|---|---|---|
| ARM 17.30.1031 | Part I.E.1. | Flow Meter Installation | Single event | Prior to discharge | *Due on or before the 28th day of the month following discharge initiation* |
| ARM 17.30.1031 | Part I.E.2. | Waste Mitigation Plan | Single event | *Within 180 days of the effective date of the permit.* | *Due on or before the 28th day of the month following the completion date (3)* |
| ARM 17.30.1031 | Part I.E.3. | Wastewater Sampling Plan | Single event | *Within 180 days of the effective date of the permit.* | *Due on or before the 28th day of the month following the completion date (3)* |

Footnotes:
(1) The actions must be completed on or before the scheduled completion dates or actions.
(2) Reports must be received by DEQ on or before the scheduled report due dates. The reports must include all information as required for each applicable action as listed in Section VI.
(3) The completed plan (action), in place of a written report, must be received by the DEQ on or before the scheduled "report" due date.

## VIII.NONSIGNIFICANCE DETERMINATION AND REASONABLE POTENTIAL ANALYSIS

DEQ has determined that the proposed activity 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 ground water and nondegradation provisions are summarized in Appendix VII. 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.

In addition to utilizing nonsignificance criteria as a restricting factor within the development of effluent limitations (Section IV); DEQ also performed projections to demonstrate the significance of the proposed activity. In the use of recent site specific information, projections indicate that nitrate in ground water will not exceed the significance criteria. These projections are conservative in that they do not credit potential losses of nitrogen due to chemical transformation, or attenuation that may occur within the vadose zone, ground water aquifer, or hyporheic zone. These projections include all potential cumulative impacts including upgradient (ambient) sources; and downgradient with an estimation of existing downgradient septic systems. DEQ has not identified any additional ground water sources of nitrate to the local ground water system. The projections indicate that the discharge is not a significant activity. These projections may be reanalyzed every permit cycle to factor in up-to-date site specific information including the potential of new upgradient or downgradient sources of nitrates. The projections have been summarized within Appendix IX.

In addition to the applicant certifying their request for a discharge to ground water (and not surface water); DEQ also performed a reasonable projection analysis to demonstrate whether aquatic life standards may be exceeded at the nearest projected downgradient surface water. The projections used recent site specific information (Appendix IX). These projections are conservative-in-nature in that they do not credit potential losses of nitrogen due to chemical transformation, or attenuation that may occur within the vadose zone, ground water aquifer, or hyporheic zone. These projections include all potential cumulative impacts including upgradient (ambient) sources obtained from on-site water well samples; and downgradient with an estimation of downgradient septic systems. DEQ has not identified any additional permitted discharge systems, or additional ground water sources of nitrate in the vicinity of the facility. The projections indicate that the activity will not result in a reasonable potential to exceed aquatic life standards in downgradient surface water. These projections may be reanalyzed every permit cycle to factor in up-to-date site specific information including the potential of new upgradient or downgradient sources of nitrate. The projections have been summarized within Appendix IX.

## 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 March 15, 2017. 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 (MTX000237), 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**

Figures can be found at: http://deq.mt.gov/Public/notices/wqnotices

**FIGURE 2 - Vicinity Map of Wells**

Figures can be found at: http://deq.mt.gov/Public/notices/wqnotices

**FIGURE 3 - Facility Site Plan**

Figures can be found at: http://deq.mt.gov/Public/notices/wqnotices

**FIGURE 4 - Line Diagram**

Figures can be found at: http://deq.mt.gov/Public/notices/wqnotices

**FIGURE 5 - Well Logs**

Figures can be found at: http://deq.mt.gov/Public/notices/wqnotices

## APPENDIX I - ESTIMATED EFFLUENT QUALITY

**Estimated Effluent Quality – Outfall 001.**

| Parameter[1] | Location | Units | Reported Average Value | Reported Maximum Value | Source of Data |
|---|---|---|---|---|---|
| Biochemical Oxygen Demand ($BOD_5$) | EFF-001 | mg/L | <0.01 | <0.01 | WA Dept. Health |
| Chloride (as Cl) | EFF-001 | mg/L | 6.1 | 7.0 | (2) |
| Chlorine, Total Residual (TRC) | EFF-001 | mg/L | 5 | 50 | (2) |
| *Escherichia Coliform* Bacteria | EFF-001 | CFU/100ml | ND | ND | (2) |
| Nitrogen, Nitrate + Nitrite (as N) | EFF-001 | mg/L | 0.64 | 0.68 | (2) |
| Nitrogen, Total Ammonia (as N) | EFF-001 | mg/L | <0.07 | <0.07 | (2) |
| Nitrogen, Total Kjeldahl (as N ) | EFF-001 | mg/L | <0.5 | <0.5 | (2) |
| Oil & Grease | EFF-001 | mg/L | <0.01 | <0.01 | (2) |
| Phosphorus, Total (as P) | EFF-001 | mg/L | 0.002 | 0.02 | (2) |
| Specific Conductivity | EFF-001 | µS/cm | 360 | 364 | (2) |
| Total Dissolved Solids (TDS) | EFF-001 | mg/L | 204 | 212 | (2) |
| Total Suspended Solids (TSS) | EFF-001 | mg/L | <0.01 | <0.01 | WA Dept. Health |

Footnotes:
CFU = Colony Forming Unit
EFF-001: See Table 1
ND = Non-Detect
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.
(2) Applicant's best professional judgement in analyzing on-site water wells and proposed activities.

## APPENDIX II – WATER WELL SUMMARY

| **Water Well Summary** |
|---|
| Well: Vo-Ag Water Well |
| MBMG GWIC #: 70261 |
| Status: Constructed on August 04, 1986. |
| Location: Within the Missoula Public Schools Vo-Ag building complex. Upgradient of the proposed discharge structure, located in between the Classroom and Shop buildings.<br>Latitude: 46.84566º North Longitude: 114.06915º West |
| Representation: Ambient quality of the shallow receiving ground water, upgradient of Outfall 001. |

## APPENDIX III - GROUND WATER QUALITY MONITORING RESULTS

**Ground Water Monitoring Results**

| Monitor Source[(1)] | Representation | Parameter | Units | Reported Minimum Value | Reported Average Value | Reported Maximum Value | # of Samples | Source of Data |
|---|---|---|---|---|---|---|---|---|
| GWIC# 70261 | Ambient Ground Water Quality<br><br>On-site shallow ground water well upgradient from Outfall 001 | Chloride (as Cl) | mg/L | 5.0 | 6.1 | 7.0 | 3 | APP |
| | | Nitrogen, Nitrate + Nitrite (as N) | mg/L | 0.61 | 0.64 | 0.68 | 3 | APP |
| | | Nitrogen, Total Kjeldahl (as N ) | mg/L | <0.5 | <0.5 | <0.5 | 3 | APP |
| | | pH | s.u. | 7.9 | 7.9 | 7.9 | 3 | APP |
| | | Specific Conductivity (@ 25°C) | µS/cm | 355 | 360 | 364 | 3 | APP |
| | | Total Dissolved Solids (TDS) | mg/L | 197 | 212 | 204 | 3 | APP |

Footnotes:
APP = Application Form GW-1 and supplemental materials.
Period of Record: 04/04/16 through 11/01/16.
s.u. = standard units
(1) Refer to Section II of the Fact Sheet for the location of the water well.

## 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).

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). 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 ground water mixing zone. After an assessment of this information, DEQ had determined it is appropriate to authorize a mixing zone for the parameters listed within the table below as the potential impact to beneficial is expected to be minimal (Section IV).

The applicant submitted information which justifies the authorization of a standard 500-foot mixing zone. 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 authorize the mixing zone based on the hydrogeologic and mixing zone information presented in this fact sheet. 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 in the below table.

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

$$\mathbf{Q_{GW}=KIA}$$

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

The table below displays the respective mixing zone parameters used in the above equation. The table also lists the resulting volume of ground water available to mix at Outfall 001.

Based on the description of the mixing zone above, and analysis presented in Section IV, DEQ has determined pursuant to ARM 17.30.505 that a standard mixing zone is applicable and will be authorized in this permit for the parameters listed in the table below for Outfall 001.

| Mixing Zone and Hydrogeology Information - Outfall 001 | | |
|---|---|---|
| **Parameter** | **Units** | **Value** |
| Mixing Zone Type | - | Standard |
| Authorized Parameters | - | Total Nitrogen |
| Ambient Ground Water Concentrations, Nitrate + Nitrite | mg/L | 0.64 |
| Ground Water Flow Direction | azimuth/bearing | W |
| Length of Mixing Zone | feet | 500 |
| Thickness of Mixing Zone | feet | 15 |
| Outfall Width, Perpendicular to Ground Water Flow Direction | feet | 40 |
| Width of Mixing Zone at Down Gradient Boundary | feet | 127.5 |
| Cross Sectional Area of Mixing Zone (A) | $ft^2$ | 1912.5 |
| Hydraulic Conductivity (K) | feet/day | 426 |
| Hydraulic Gradient (I) | ft/ft | 0.0017 |
| Volume of Ground Water Available for Mixing ($Q_{gw}$) | $ft^3$/day | 1,385 |

## 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 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 of state waters (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. The significance determination documentation has been incorporated into this fact sheet (Section VIII). 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. The proposed activity will result in discharges that if maintained in compliance with the nondegradation-nonsignificance criteria established within this permit, will not constitute a significant activity.

The applicable ground water standards pursuant to ARM 17.30.1006 and the nondegredation-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** | **17.30.715 Nondegradation - Nonsignificance Criteria**[2] |
|---|---|---|---|---|
| Nitrogen, Nitrate + Nitrite (as N) | mg/L | 10.0 | - | 7.5 |
| Nitrogen, Total (TN) | mg/L | - | 10.0 | 7.5 |
| Phosphorus, Total Inorganic | - | - | - | Surface water breakthrough time greater than 50 years[3] |

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) Activities that comply with the nondegradation significance criteria are considered not to be significant. Total Nitrogen is measured due to potential chemical transformation and cumulative impacts per ARM 17.30.715(2).
(3) Changes in receiving ground water quality are not significant if water quality protection practices approved by 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 (POIs) for the proposed discharge based on the following:

- Reported effluent characteristics (Section II.D),
- Water quality standards (Appendix V),
- Water use classification of the receiving ground water (Appendix V), and,
- Reported best management practices and standard operating procedures.

Each individual POI is further discussed in development of effluent limits 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 may be present in the proposed wastewater stream (Section II.D.). The applicant has proposed use of a conventional septic for treatment system (Section II.A.).

The applicant has proposed to mitigate the generation of wastewater by collecting and recycling on-site wastes through use of best management practices (Section II.A.). The applicant estimates the resulting effluent quality on average to be approximately 0.64 mg/L for total nitrogen (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 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 ($Q_{gw} / Q_{eff}$)

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:

**0.6 lb/day**
$[(8.34*10^{-6})*135.9mg/L*560gpd]$

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 $[8.34*10^{-6}]$

b. Phosphorus

The nondegradation-nonsignificance criteria set forth in ARM 17.30.715 state that the phosphorus concentration must be removed for a period of 50 years prior to discharge to any surface water. 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 points and the closest downgradient surface water.

A phosphorus breakthrough analysis (Appendix VI) has been completed by DEQ for the proposed Outfall 001 using site specific data and regional studies. In providing a conservative analysis, DEQ notes the following factors:

- The facility is anticipated to discharge phosphorus at minuscule levels (Section II).
- The limiting layer depth is based on the ground water table which occurs at approximately 25 ft-bgs.
- Research indicates that ground water flows west toward the Bitterroot River which is located over 1.7 miles away. Ground water will first intercept the hyporheic zone which boarders the river. However for this analysis, DEQ will conservatively treat this stretch of river as immediately gaining ground water.

Using these conservative estimates, the phosphorus breakthrough analysis indicates that phosphorus discharged to ground water would not reach surface water from Outfall 001 within 50 years. A phosphorus breakthrough that would occur within 50 years would be considered significant (ARM 17.30.715). Because there will be no phosphorus breakthrough within 50 years, a limit for phosphorus will not be included within the proposed permit.

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 which ensures 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 – PHOSPHORUS BREAKTHROUGH ANALYSIS

# MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

## PHOSPHOROUS BREAKTHROUGH ANALYSIS

| | |
|---|---|
| **Site Name** | Missoula County Public Schools Vo-Ag Center - Educational Meat Processing Facility |
| **Location:** | Missoula Valley Aquifer |
| **Permit #:** | MTX000237, Outfall 001 |
| **Notes** | Variables used are based on conservative measurements |
| | Design Capacity = 280 gpd = 37 ft³/day |
| | These calculations do not credit potential losses within the hyporheic zone. |

| VARIABLES | DESCRIPTION | VALUE | UNITS |
|---|---|---|---|
| Lg | Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow | 40 | ft |
| L | Length of Primary Drainfield's Long Axis | 40 | ft |
| W | Width of Primary Drainfield's Short Axis | 14 | ft |
| B | Depth to Limiting Layer from Bottom of Drainfield Laterals* | 25 | ft |
| D | Distance from Drainfield to Surface Water | 9029 | ft |
| T | Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils, | 0.5 | ft |
| Ne | 1.0 ft for fine soils)** | | |
| Sw | Soil Weight (usually constant) | 100 | lb/ft3 |
| Pa | Phosphorous Adsorption Capacity of Soil (usually constant) | 200 | ppm |
| #l | Number of proposed wastewater treatment systems | 1 | |
| **CONSTANTS** | | | |
| Pl | Phosphorous Load per proposed wastewater treatment system | 0.0017 | lbs/yr |
| X | Conversion Factor for ppm to percentage (constant) | 1.0E+06 | |
| **EQUATIONS** | | | |
| Pt | Total Phosphorous Load = (Pl)(#l) | 0.0017 | lbs/yr |
| W1 | Soil Weight under Drainfield = (L)(W)(B)(Sw) | 1400000 | lbs |
| W2 | Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw) | 374720429 | lbs |
| P1 | Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)] | 75224 | lbs |
| **SOLUTION** | | | |
| **BT** | **Breakthrough Time to Surface Water = P / Pt** | 44,249,462 | years |

***NOTES:*** ** Depth to limiting layer is typically based on depth to water in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.*

*Projections performed by C. Boe on December 28, 2016* *REV. 04/2000*

## APPENDIX VII – 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 requirements will be required and made conditions of this permit.

A. Effluent Monitoring

Final numeric effluent limitations are developed 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 monitor and report monitoring results at a specified frequency 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.

Samples shall be representative of the nature of the monitored discharge (Permit Part II.A.). As discussed in Section II, the effluent sampling location (EFF-001) will be located after treatment and just prior to discharge within the drainfield. Effluent collection and reporting techniques must be established by the applicant within the Wastewater Sampling Plan (Section VI). Effluent sampling and reporting requirements are summarized in the table below.

B. 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 device must be installed and in operating condition prior to discharge. Flow monitoring and reporting techniques must be established by the applicant within the Wastewater Sampling Plan (Section VI). Flow monitoring and reporting requirements are summarized in the table below.

## Effluent Monitoring and Reporting Requirements – Outfall 001

| Parameter/Method | Monitor Location | Units | Sample Type[1] | Minimum Sample Frequency | Reporting Requirements[1][2] | Report Freq | Rationale |
|---|---|---|---|---|---|---|---|
| Flow Rate, Effluent[3] | FM-001 | gpd | Contin-uous | Contin-uous | Daily Maximum<br>Quarterly Average | Quarterly | Permit Compliance |
| Nitrogen, Nitrite+Nitrate (as N) | EFF-001 | mg/L | Composite | 1/Quarter | Daily Maximum<br>Quarterly Average | Quarterly | Permit Compliance |
| Nitrogen, Total Ammonia (as N) | EFF-001 | mg/L | Composite | 1/Quarter | Daily Maximum<br>Quarterly Average | Quarterly | Effluent Characterization |
| Nitrogen, Total Kjeldahl (TKN)(as N) | EFF-001 | mg/L | Composite | 1/Quarter | Daily Maximum<br>Quarterly Average | Quarterly | Permit Compliance |
| Nitrogen, Total (as N)[4] | EFF-001 | mg/L | Calculate | 1/Quarter | Daily Maximum<br>Quarterly Average | Quarterly | Permit Compliance |
| | | lbs/day[5] | Calculate | 1/Quarter | Daily Maximum[6]<br>Quarterly Average[7] | Quarterly | |
| Phosphorus, Total (as P) | EFF-001 | mg/L | Composite | 1/Quarter | Quarterly Average | Quarterly | Permit Compliance |

Footnotes:

Composite sample procedure and compositing period shall be established within the Wastewater Sampling SOP (Section VI).

EFF-001: see Table 1.

FM-001: see Table 1.

If no discharge occurs during the reporting period, "no discharge" shall be recorded within the effluent Discharge Monitoring Report (DMR) report. The determination of no discharge may be established within the Wastewater Sampling SOP (Section VI).

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 [$8.34 \times 10^{-6}$].

(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.

## APPENDIX VIII – INTERIM WASTE MITIGATION PLAN

WGM GROUP
PLANNING • SURVEYING • ENGINEERING • DESIGN
[illegible] E. BROADWAY
MISSOULA, MT 59802
TEL: 406-728-4611
FAX: 406-728-3476
www.wgmgroup.com

# MEMORANDUM

**ATTACHMENT F.1**

**DATE:** August 5, 2016

**TO:** DEQ

**FROM:** Mike Smith, WGM Group, Inc.

**RE:** Additional info for Ground Water Pollution Control System (MGWPCS) Permit Application for MCPS Vo-Ag Center Meat Processing Kitchen

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***Treatment System Description* (Section F)**

Blood and entrails from slaughtered animals will be collected and removed from waste stream. Blood will be captured via a segregated drain and collected for use, along with the offal and butcher waste, in the composting process accompanying the slaughtering and processing activities. The kitchen area will include multiple sinks where the meat processing activities will be taught and practiced. The facility will also include floor drains to capture wash-down water and rinsate that will be connected to the septic system. There will be no bathrooms associated with this septic system. All collected water and wastewater will be routed through a grease interceptor prior to treatment in a septic tank and conventional drainfield.
Multiple Best Management Practices (BMPs) will be implemented to ensure proper operation of the septic system. These BMP's include:

- Blood and offal will be collected to the maximum extent practicable and removed from the wastewater stream.
- Students will be trained and tested on every component of the processing system before any animal is slaughtered.
- A physical barrier and sloped floors will be used to separate the blood collection vat from system drains. Carcasses will not be moved from the segregated area until the animal is completely skinned, eviscerated, and drained.
- No cleaning chemicals will be introduced to the composing materials.
- Offal and butcher waste will be composted on the Vo-Ag premises in a designed composting system designed by Montana State University.
- Screens will be placed over every drain and solid materials will be collected and disposed of in the compost system. No solid material will be permitted to enter the septic system.
- The grease interceptor will be regularly monitored and maintained to ensure proper operation.
- The septic tank will be regularly monitored and maintained to ensure proper operation.
- Only industry-standard cleaners and disinfectants will be used for wash-down and facility and equipment sanitization.

## APPENDIX IX – SIGNIFICANCE AND REASONABLE POTENTIAL ANALYSES

(pages 31-33)

## MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

**Significance and Reasonable Potential Analysis Summary**
**Montana Ground Water Pollution Control System**
**MTX000237, Outfall 001**
**Missoula County Public Schools Vo-Ag Center - Educational Meat Processing Facility**
**Missoula Aquifer**

### Ground Water Dilution Projection (GWDP) - Nondegradation Significance Analysis

Dilution projections were performed to provide insight into whether a proposed activity may cause significant changes to the existing water quality of a high quality state water (ARM 17.30.715). On-site information and research was used in these projections. The results have been summarized below:

| | |
|---|---|
| Yes | Has DEQ determined the activity to be a new or increased source (ARM 17.30.702)? |
| Yes | Will the proposed activity result in a discharge to high quality state ground water (ARM 17.30.702)? |
| 1:30,630 | Ratio of the ground water flow rate (vicinity) in comparison to the Bitterroot River flow rate (ground water:surface water). |
| Zero | In use of best management practices, the applicant estimates that the proposed project will not add any additional nutrients to the aquifer. (effluent = aquifer). |
| 0.003 lb/d:0.12 lb/d | Ratio of the proposed Vo-Ag discharge nitrogen load vs a typical single-household septic tank nitrogen load. (Vo-Ag load:household load). |
| 0.003 lb/d:30 lb/d | Ratio of the proposed Vo-Ag discharge nitrogen load vs the unpermitted septic tank nitrogen load (in the vicinity). (Vo-Ag load:septic load). |
| 0.64 mg/L | Actual ambient concentration of nitrates in the receiving ground water aquifer. |
| 0.64 mg/L | Projected concentration of nitrates in the aquifer, at the downgradient edge of the ground water mixing zone. |
| 0.64 mg/L:0.64 mg/L | No measurable on-site impacts to the aquifer. (ambient:downgradient ground water quality) |
| 0.91 mg/L | Actual concentration of nitrates in the ground water aquifer near the downgradient surface water body (Missoula Valley Water Quality District Well, GWIC 151188). |
| Zero | Distance in ground water from the discharge source, in which the concentration of the aquifer is projected to be at or below the significance criteria (5 mg/L). |

**The projections above indicate that the proposed activity is not significant (<5 mg/L).**

Active monitoring of the aquifer (upgradient and downgradient) near the proposed project area indicates that the nearby existing nutrient sources (septics) are not causing a significant activity. This project only proposes to discharge nutrients which originate from the aquifer (source water well). Therefore the impacts both individually and cumulatively are negligible as the proposed project is not expected to add to the existing nutrient load of the aquifer.

### Surface Water Dilution Projection (SWDP) - Reasonable Potential (RP)

Dilution projections were performed in order to estimate whether the proposed actions will result in a reasonable potential to exceed surface water aquatic standards. On-site information and research was used in these projections. The results have been summarized below:

| | |
|---|---|
| Yes | While not a requirement for non-domestic systems, does the proposed location of the discharge structure meet the Department's Subsurface Wastewater Treatment System setback requirements? |
| No | Is the potential receiving surface water listed as impaired for nutrients? |
| No Measurable Change | Projected concentration of nitrogen in the surface water, if the treated wastewater was directly injected into the surface water body. |
| No Measurable Change | Projected concentration of nitrogen in the surface water, if the ground water aquifer as a whole (at the downgradient edge of the ground water mixing zone) was directly injected into the surface water body. |
| No Measurable Change | Projected concentration of nitrogen in the surface water, if the ground water aquifer as a whole (just prior to the downgradient surface water body) was directly injected into the surface water body. |

**The conservative projections above show that this proposed activity will not result in a measurable change, and will not exceed the surface water aquatic standard (0.30 mg/L).**

Active monitoring of the Bitterroot River (upgradient and downgradient) near the proposed project area indicates that the nearby existing nutrient sources (septics) may not currently result in a measurable change to the River. The proposed project is not expected to add to the existing nutrient load of the aquifer, therefore the potential impacts both individually and cumulatively are negligible.

**In summary, the proposed permitting action will not individually or cumulatively have a significant impact on the human environment, and does not have a reasonable potential to exceed surface water standards.**

Analyses performed by C. Boe on December 30, 2016.

## MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

### Montana Ground Water Pollution Control System

### Ground Water Dilution Projection (GWDP) - Nondegradation Significance Analysis

These projections estimate the parameter concentrations in the aquifer downgradient of the subsurface discharge. After dilution with ground water, the projected concentration is compared to the respective significance criteria in determining nonsignificant changes in water quality (ARM 17.30.715).

**Site Name:** Missoula County Public Schools Vo-Ag Center - Educational Meat Processing Facility

**Location:** Missoula Valley Aquifer

**Permit #:** MTX000237, Outfall 001

**Notes:** Design Capacity = 560 gpd; 74 ft³/d

These calculations are for the following parameter of interest: Nitrate

These calculations use the most restrictive ground water standard.

These calculations do not credit potential losses due to chemical transformation.

These calculations do not credit potential losses due to attenuation.

**Projected Concentration Calculation**

$$Cr = \frac{(Qd)(Cd) + (Qs)(Cs)}{Qd + Qs}$$

The Activity is Not Significant if Cr < Significance Criteria

**GWDP(a) - Ground Water Nitrate Projection at the End of the Mixing Zone.**

| | | | |
|---|---|---|---|
| **Qd =** | **74** | ft³/d | Design capacity - effluent flow rate |
| **Cd =** | **0.64** | mg/L | Concentration - effluent (treated wastewater) |
| | **500** | ft | Length of ground water dilution zone |
| | **15** | ft | Thickness of dilution zone |
| | **40** | ft | Outfall width, perpendicular to ground water flow direction |
| | **128** | ft | Projected width of downgradient dilution zone |
| | **1913** | ft² | Cross sectional area of dilution zone (A) |
| | **426** | ft/d | Hydraulic conductivity (K) |
| | **0.0017** | ft/ft | Hydraulic gradient (I) |
| **Qs(Qgw) =** | **1385** | ft³/d | Ground water volume (Qgw) |
| **Cs =** | **0.64** | mg/L | Ambient nitrate concentration in ground water |
| **Cr =** | **0.64** | mg/L | Projected concentration - end of the mixing zone |
| **Sign. Criteria =** | **5.0** | mg/L | Nonsignificance Criteria, ARM 17.30.715 |
| **Sign. Activity?** | **<5.0** | mg/L | **The activity is not significant** |

**GWDP(b) - Ground Water Nitrate Projection just prior to the Downgradient Surface Water.**

| | | | |
|---|---|---|---|
| **Qd =** | **74** | ft³/d | Design capacity - effluent flow rate |
| **Cd =** | **0.64** | mg/L | Concentration - effluent (treated wastewater) |
| | **Actual downgradient ground water quality was used to characterize cumulative impact with non-permitted area septic systems (see summary table).** | | |
| | **9029** | ft | Length of ground water dilution zone |
| | **15** | ft | Thickness of dilution zone |
| | **40** | ft | Outfall width, perpendicular to ground water flow direction |
| | **1620** | ft | Projected width of downgradient dilution zone |
| | **24301** | ft² | Cross sectional area of dilution zone (A) |
| | **426** | ft/d | Hydraulic conductivity (K) |
| | **0.0017** | ft/ft | Hydraulic gradient (I) |
| **Qs(Qgw) =** | **17599** | ft³/d | Ground water volume (Qgw) |
| **Cs =** | **0.64** | mg/L | Ambient nitrate concentration in ground water |
| **Cr =** | **0.91** | mg/L | Actual concentration of ground water - just prior to surface water |
| **Sign. Criteria =** | **5.0** | mg/L | Nonsignificance Criteria, ARM 17.30.715 |
| **Sign. Activity?** | **<5.0** | mg/L | **The activity is not significant** |

**GWDP(c) - Distance in Ground Water from the discharge source where the Significance Criteria for Nitrate is met.**

| | | | |
|---|---|---|---|
| **Qd =** | **74** | ft³/d | Design capacity - effluent flow rate |
| **Cd =** | **0.64** | mg/L | Concentration - effluent (treated wastewater) |
| | **0** | ft | Length of ground water dilution zone |
| | **15** | ft | Thickness of dilution zone |
| | **40** | ft | Outfall width, perpendicular to ground water flow direction |
| | **40** | ft | Projected width of downgradient dilution zone |
| | **600** | ft² | Cross sectional area of dilution zone (A) |
| | **426** | ft/d | Hydraulic conductivity (K) |
| | **0.0017** | ft/ft | Hydraulic gradient (I) |
| **Qs(Qgw) =** | **426** | ft³/d | Ground water volume (Qgw) |
| **Cs =** | **0.64** | mg/L | Ambient nitrate concentration in ground water |
| **Cr =** | **0.64** | mg/L | Projected concentration |
| **Sign. Criteria =** | **5.0** | mg/L | Nonsignificance Criteria, ARM 17.30.715 |
| **Distance =** | **Zero** | ft | **Distance needed to meet the significance criteria** |

Projections performed by C. Boe on December 30, 2016

# MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

## Montana Ground Water Pollution Control System

## Surface Water Dilution Projection (SWDP) - Reasonable Potential (RP)

Estimation of parameter concentrations after instantaneous dilution with the projected downgradient receiving surface water. After dilution, there is no reasonable potential if the projected concentration is below the applicable aquatic standard (DEQ-Circular 7). Also after dilution, if the projected concentration is below the applicable required reporting value (RRV) (DEQ-Circular 7) than the action is not measurable.

**Site Name:** Missoula County Public Schools Vo-Ag Center - Educational Meat Processing Facility

**Location:** Missoula Valley Aquifer

**Permit #:** MTX000237, Outfall 001

**Notes:** Design Capacity = 560 gpd; 74 ft³/d

These calculations are for the following parameter of interest: Total Nitrogen

Certain calculations may not credit potential ground water dilution.

These calculations do not credit potential ground water dispersion.

These calculations do not credit potential losses due to attenuation.

These calculations do not credit potential losses due to chemical transformation.

These calculations do not credit potential dilution or losses within the hyporheic zone.

**Projected Concentration Calculation**

$$Cr = \frac{(Qd)(Cd) + (Qs)(Cs)}{Qd + Qs}$$

The activity may not have a Reasonable Potential if Cr < Aquatic Std.
The activity may not be measurable if Cr < Required Reporting Value (RRV)

**SWDP(a) - Reasonable Potential of Injecting Treated Wastewater directly into the Downgradient Surface Water**

| | | | |
|---|---|---|---|
| **Qd =** | **74** | ft³/d | Wastewater Treatment System design capacity - effluent flow rate |
| **Cd =** | **0.64** | mg/L | Concentration - effluent (treated wastewater) |
| **Qs =** | **491** | ft³/s | Flow rate of surface water (14Q5) |
| **Cs =** | **0.24** | mg/L | Concentration in surface water |
| **Cr =** | **0.24** | mg/L | Projected concentration after instantaneous dilution |
| **Standard =** | **0.30** | mg/L | Surface Water Aquatic Standard, DEQ Circular - 7 |
| **RRV =** | **0.02** | mg/L | Required Reporting Value, DEQ Circular - 7 |
| | **<0.30** | mg/L | **There is not a reasonable potential.** |
| **Results** | **no change** | Cs=Cr | **The activity does not result in a measurable change (ambient vs downgradient).** |

**SWDP(b) - Reasonable Potential of Injecting the Ground Water Aquifer (located at the Downgradient Edge of the Ground Water Mixing Zone) directly into the Downgradient Surface Water**

| | | | |
|---|---|---|---|
| **Qd =** | **1385** | ft³/d | Ground Water Volume (Qgw) |
| **Cd =** | **0.64** | mg/L | Projected Concentration of Ground water (edge of ground water mixing zone) |
| **Qs =** | **491** | ft³/s | Flow rate of surface water (14Q5) |
| **Cs =** | **0.24** | mg/L | Concentration in surface water |
| **Cr =** | **0.24** | mg/L | Projected concentration after instantaneous dilution |
| **Standard =** | **0.30** | mg/L | Surface Water Aquatic Standard, DEQ Circular - 7 |
| **RRV =** | **0.02** | mg/L | Required Reporting Value, DEQ Circular - 7 |
| | **<0.30** | mg/L | **There is not a reasonable potential.** |
| **Results** | **no change** | Cs=Cr | **The activity does not result in a measurable change (ambient vs downgradient).** |

**SWDP(c) - Reasonable Potential of Injecting the Ground Water Aquifer (located just prior to the Downgradient Surface Water) directly into the Downgradient Surface Water**

| | | | |
|---|---|---|---|
| **Qd =** | **17599** | ft³/d | Ground Water Volume (Qgw) |
| **Cd =** | **0.91** | mg/L | Actual Concentration of Ground water (just prior to surface water body) |
| **Qs =** | **491** | ft³/s | Flow rate of surface water (14Q5) |
| **Cs =** | **0.24** | mg/L | Concentration in surface water |
| **Cr =** | **0.24** | mg/L | Projected concentration after instantaneous dilution |
| **Standard =** | **0.30** | mg/L | Surface Water Aquatic Standard, DEQ Circular - 7 |
| **RRV =** | **0.02** | mg/L | Required Reporting Value, DEQ Circular - 7 |
| | **<0.30** | mg/L | **There is not a reasonable potential.** |
| **Results** | **no change** | | **The activity does not result in a measurable change (ambient vs downgradient).** |

Projections performed by C. Boe on December 30, 2016

## APPENDIX X - 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.

Crisp, Ken. 2005. Source Water Delineation and Assessment Report: Missoula County Schools Vo-Ag Public Water System, PWSID# MT0003505.

Clark, K., 1986. Interactions between the Clark Fork River and Missoula Aquifer, Missoula. University of Montana.

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.

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, Retrieved October, 2016, from the GWIC database, http://mbmggwic.mtech.edu.

Missoula Valley Water Quality District, Water Quality Data from Monitoring Well GWIC: 151188. Data obtained on December 06, 2016.

Montana Bureau of Mines and Geology (MBMG), Ground Water Assessment Program (GWAP), Ground Water Assessment Atlas, Ground Water Quality in Basin-fill and Bedrock Aquifers, Missoula County. 2006.

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

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.

U.S. Geological Survey, Basic Ground Water Hydrology, http://pubs.usgs.gov/wsp/2220/report.pdf, 2016.

U.S. Geological Survey, Groundwater Basics, http://water.usgs.gov/ogw/basics.html, 2016.

Washington State Department of Health, BOD/TSS study.

Woessner, W. 1988. Missoula Valley Aquifer Study: Hydrogeology of the Eastern Portion of the Missoula Aquifer. Montana Department of Natural Resources and Conservation.

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.

World Health Organization, Guidelines for Drinking-Water Quality, Chlorination Disinfection, Viruses and Pathogen Mitigation. 1996.

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