Non-degradation 101

-for Subsurface Wastewater Treatment Systems (SWTS)

Presented on
November 15, 2023
Helena, MT

Presented by:
Nathan Danz
w/ Department of Environmental Quality

Overview

- Introduction
- Nitrate Sensitivity Analysis (NSA)
- Phosphorous Breakthrough Analysis (PBA)
- Adjacent to State Waters – Trigger Value Calculation
- Categorical Exemptions

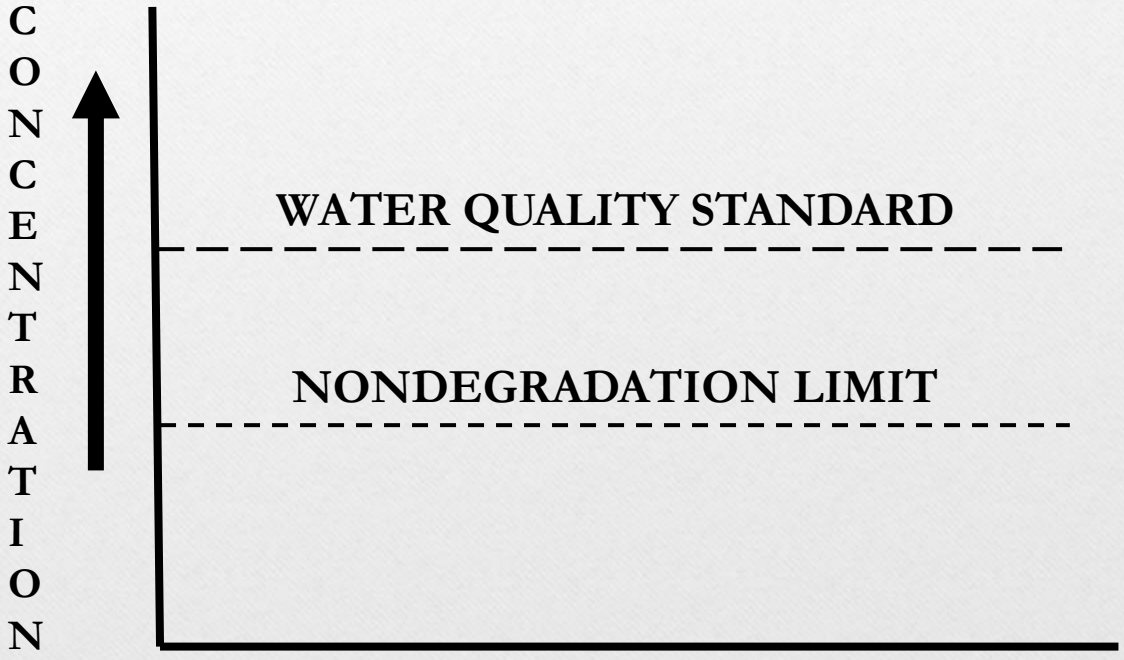
Introduction – Basis of Non-Degradation

- **Water Quality Act – 75-5-303, MCA**
- **Non-Degradation Rules (ARM 17.30.701 et seq.)**
- **Mixing Zone Rules (ARM 17.30.501 et seq.)**

Introduction – What is Non-Degradation?

- Limits the contamination of surface water and groundwater to "nonsignificant" amounts (some degradation is allowed in most cases),
- Prevent exceedances of water quality standards (i.e. health and aquatic standards).
- Applies to High Quality State Waters
- Applies to many discharges (Industrial, Mining, etc.), not just subdivisions.

Introduction –
"Nondeg" vs Standards



Introduction – Statute

- **Water Quality Act - 75-5-303, MCA (Non-degradation Policy)**:
  - Existing uses of state waters and the level of water quality necessary to protect those uses must be maintained and protected.
  - Unless authorized by the Department or determined to be non-significant, the quality of high-quality waters must be maintained.

Introduction – Definitions

- **State Waters - 75-5-103(32) MCA - A body of water, irrigation system or drainage system either surface or underground except:**
  - Ponds or lagoon used solely for treating, transporting or impounding pollutants, or
  - Irrigation or land application water that is used up within the disposal system and not returned to state waters.

Introduction – Definitions

- **High-quality Waters - 75-5-103(12), MCA - All state waters, except:**
  - Ground water classified as of January 1, 1995, within the "III" or "IV" classifications – specific conductance is > 2,500;
  - Surface water that doesn't support any of the designated uses (already has poor quality), and,
  - Surface water that has no flow for more than 270 days a year.

Introduction – Definitions

- **"New or Increase Source" - ARM 17.30.702(17) - Means an activity resulting in a change of existing water quality occurring on or after April 29, 1993.**
- "New" means new discharge (LOAD) or new location of an existing source.
- New locations should be determined with respect to impacts on sensitive receptors i.e., surface water, wells, etc…
- Replacement areas for single-family homes are not typically considered new sources.
- Existing sources are existing regardless of whether they had proper permits/approval prior to 1993, and are not subject to nondegradation as long as the use is unchanged.

Nitrate (as Nitrogen)

- **Nitrate Dilution Model - Bauman-Schafer, 1984**
  - **Obtain a first approximation of the potential impact of septic system nitrates on ground-water quality.**
  - Model does not account for decay of nitrogen in vadose zone [ARM 17.30.517(1)(d)(v)], or in saturated zone,
  - If decay does occur, most likely method is denitrification (biological conversion of nitrate to nitrogen gas),
  - Creates a situation where aquifers that readily transport contaminants are the easiest to pass the dilution equation

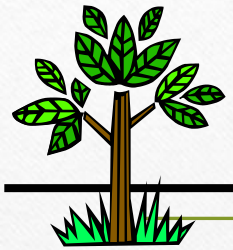
Nitrate (as Nitrogen)

- Three sources of nitrate and water:
  - Nitrate in ground water,
  - Nitrate in precipitation, and
  - Nitrate in septic effluent
- Mixing occurs to generate Mixing Zones
- **A Mixing Zone is an estimated distance needed for discharge to mix evenly with the ground water**

Nitrate Sensitivity Analysis (NSA)

- **Most Sensitive Parameters**
  - Hydraulic Conductivity
  - Hydraulic Gradient
  - Background Nitrate
- **Shallowest Ground Water ("receiving" water)**
  - Mixing-zone rules apply to shallowest ground water
  - Depth of nitrate mixing in aquifer is 15 feet (this is not the total aquifer thickness)
  - Confined aquifers not usually subject to mixing-zone rules (ARM 17.30.517(1)(a)).

Mixing Zone Schematic



Drainfield

Water Table

Wastewater
Plume

15 FT.

Ground Water Flow

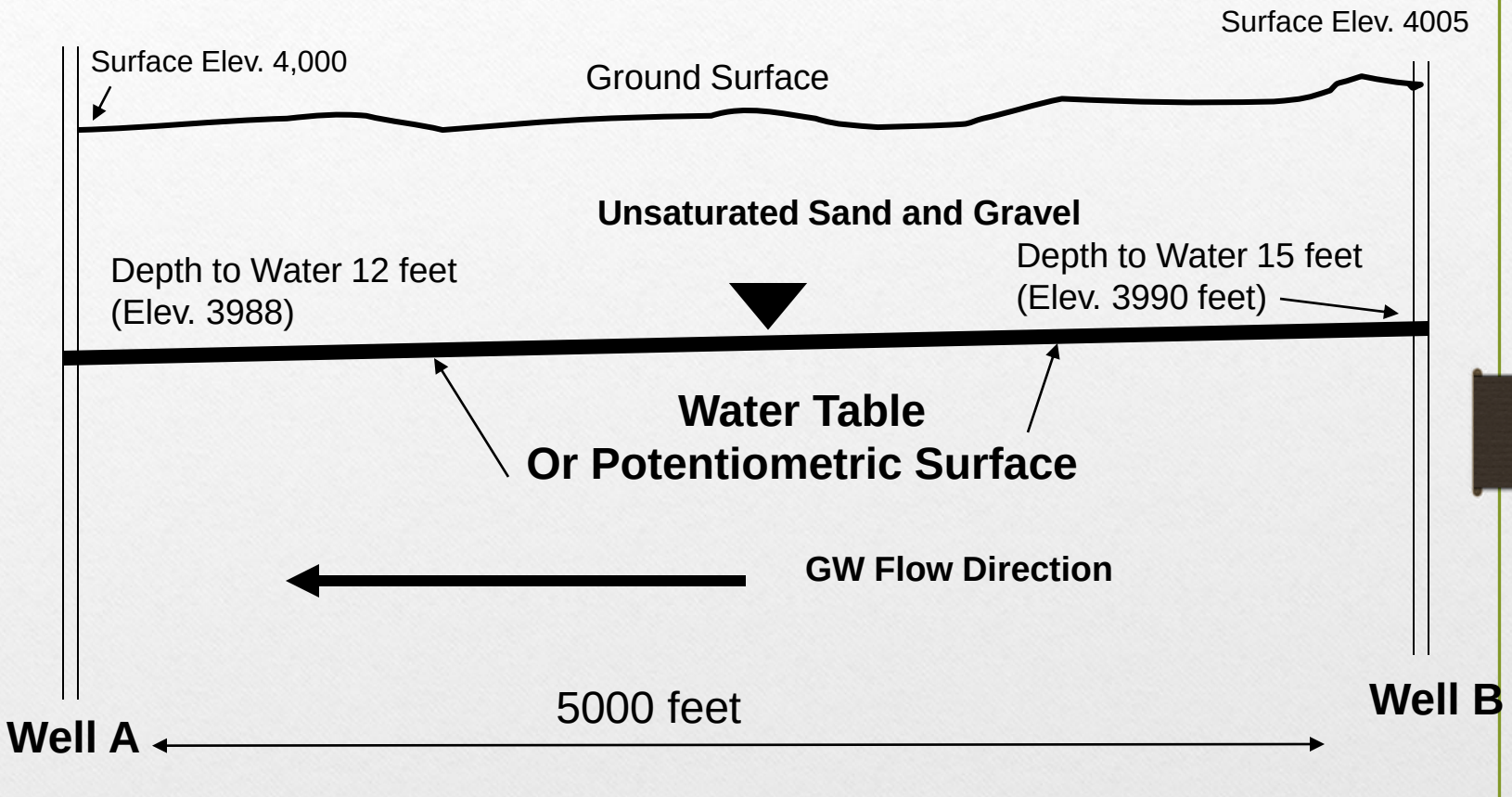
Nitrate Parameters

- **Hydraulic Conductivity (K)-** Strata's ability to transmit water (length/time).
  - Aquifer pumping tests (most representative),
  - Slug test (lower values than above),
  - Published detailed hydrologic studies of site area,
  - Well Log Tests/ Drawdown Tests –
    - Cooper-Jacob equation (bedrock units) or Razack & Huntley equation (unconsolidated units).
- Not acceptable:
  - Sieve tests, Permeameter tests, or Published charts

Nitrate Parameters

- **Hydraulic Gradient (i) –** Measure of the slope of the water table in the direction that yields the maximum slope.
  - Static water level elevations from minimum of 3 wells completed in the shallowest ground water, surveyed on the ~ same day.
  - Published gradient data.
  - 1/3 regional slope from USGS topographic map (maximum 0.05, minimum 0.001).
  - Other methods may work - Gradient from one well to downgradient surface water (no springs).

Gradient - Wells

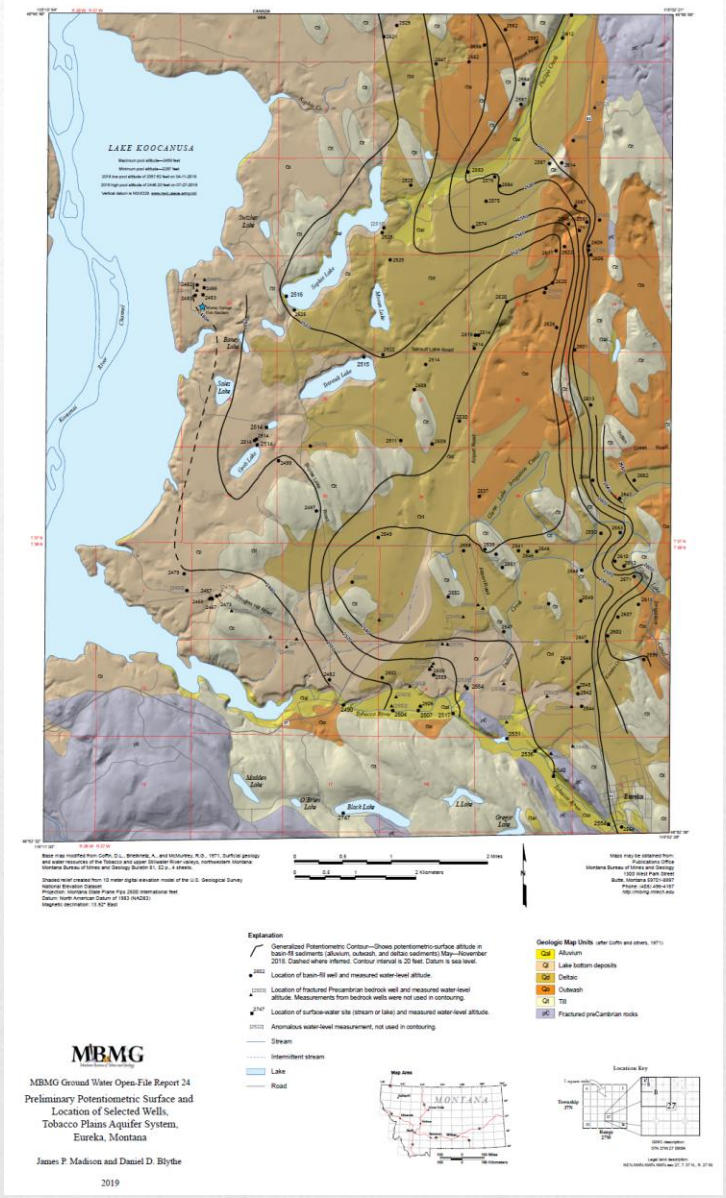


$$\text{Gradient} = \frac{(4005 \text{ feet} - 15 \text{ feet}) - (4000 \text{ feet} - 12 \text{ feet})}{5000 \text{ feet}} = \frac{3990 \text{ feet} - 3988 \text{ feet}}{5000 \text{ feet}}$$

Gradient Equals 0.0004 ft/ft or $\frac{2}{5{,}000}$

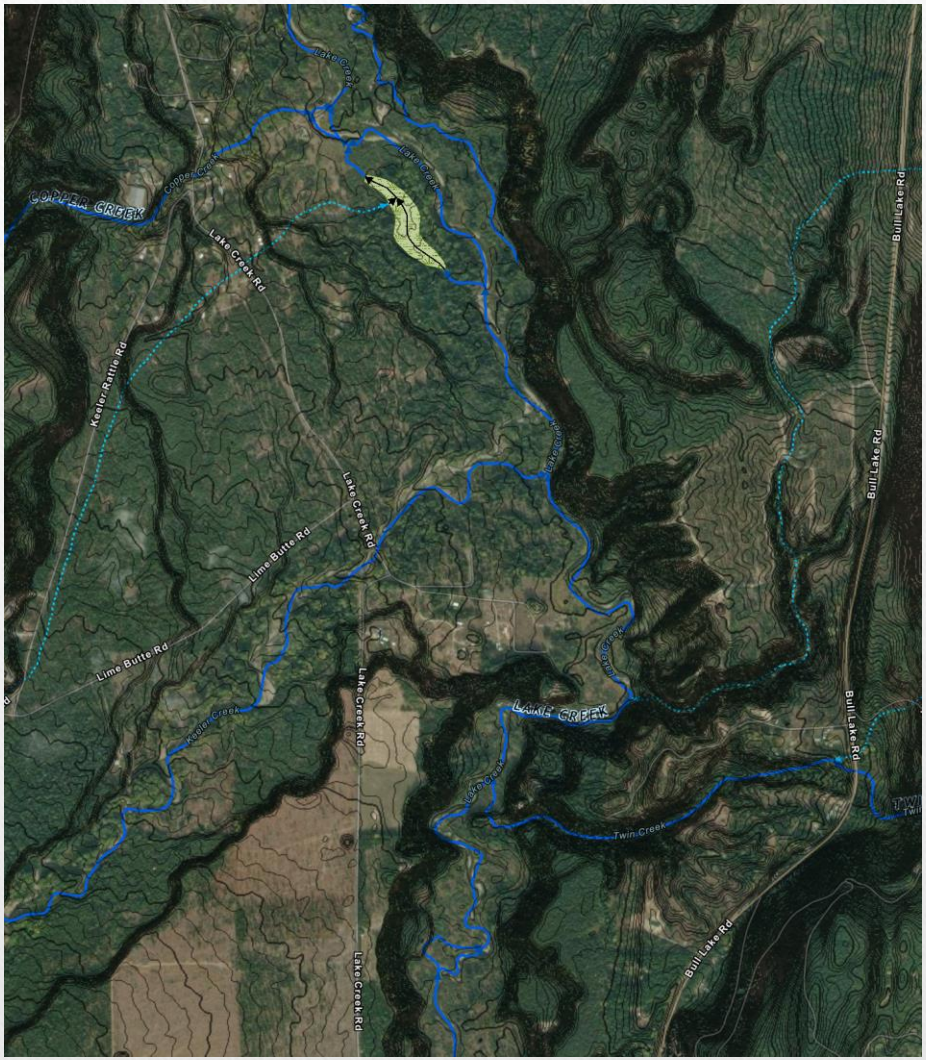
Gradient – Published Data

- Montana Bureau of Mines and Geology (MBMG) is a great source for gathering published studies for areas across the state
- [MBMG Publication Catalog (mtech.edu)]



Gradient - Topography

- Ground water flows from the highest points in the watershed downhill into a river or lake.
- You can use a topographic map to determine a general flow direction and slope of gradient.
- Using topography, may need to go to the nearest surface water body, even if upgradient.



Nitrate Parameters

- **Background Nitrate**
  - Sample well in shallowest "receiving" ground-water, preferably immediately upgradient.
    - Often use wells completed below upper 15 feet when site conditions don't dictate more exact measurements.
  - MUST provide well log and location on map.
  - Sample should be <1 year old.

Nitrate Parameters

- **Concentration in effluent:**
  - 50 mg/L for conventional
  - 24 mg/L for level 2
  - <24 for certain level 2
  - For specific level 2 approvals go to:

  Engineering Infrastructure & Subdivisions | Montana DEQ (mt.gov)

- **Loading Rate:**
  - Single Family Home (2-5 bedrooms) = 200 gpd
  - Single Family Home (1 bedroom) = 150 gpd
  - Single Family Home: Add 80 gpd to 200 for each bedroom over 5
  - Commercial: Design flow (gpd)

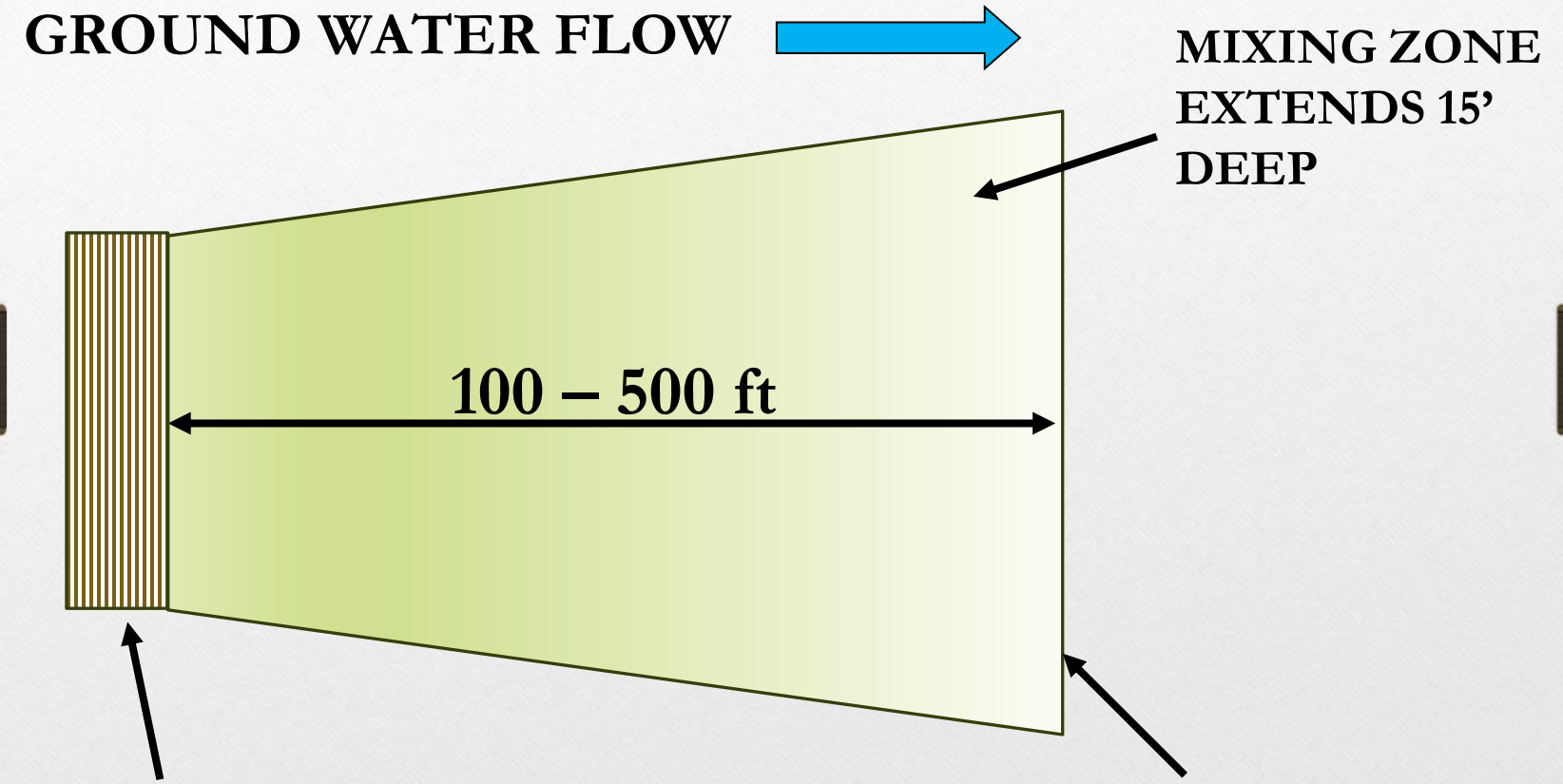
Allowed Nitrate Concentration for Non-degradation

Background Nitrate (mg/L)	Allowed Nitrate Concentration at end of Mixing Zone (mg/L)
0.0 – 5.0	5.0 for non-level 2 system; 7.5 for Level 2 treatment.
5.0 – 7.5	7.5 for level 2 systems; 7.5 for non-level 2 systems (if nitrate is primarily from sources other than human waste; otherwise can't use non-level 2 system).
7.5 – 10, >10	NO INCREASE (super level 2 or level 2 may work)

Groundwater Mixing Zone

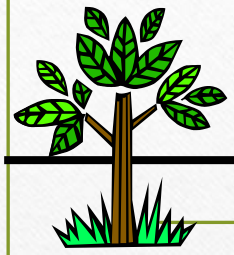
- Allowed to "pollute" within mixing zone.
- BOTH primary and replacement drainfields (with 5° dispersion on each side) must be drawn along direction of ground-water flow (direction of gradient)
- Standard mixing zones [A.R.M. 17.30.517(1)(d)(viii)]
  - Single-family < 2 acres: 100 feet (OK to use 100' for all single family),
  - Single-family ≥ 2 acres, subdivision 5 -10 acres: 200 feet,
  - Single-family ≥ 2 acres, subdivision <5 or >10 acres: 500 ft,
  - Commercial, public, and multi-user drainfields: 500 feet

Ground Water Mixing Zone



Groundwater Mixing Zone

(side view)



Drainfield

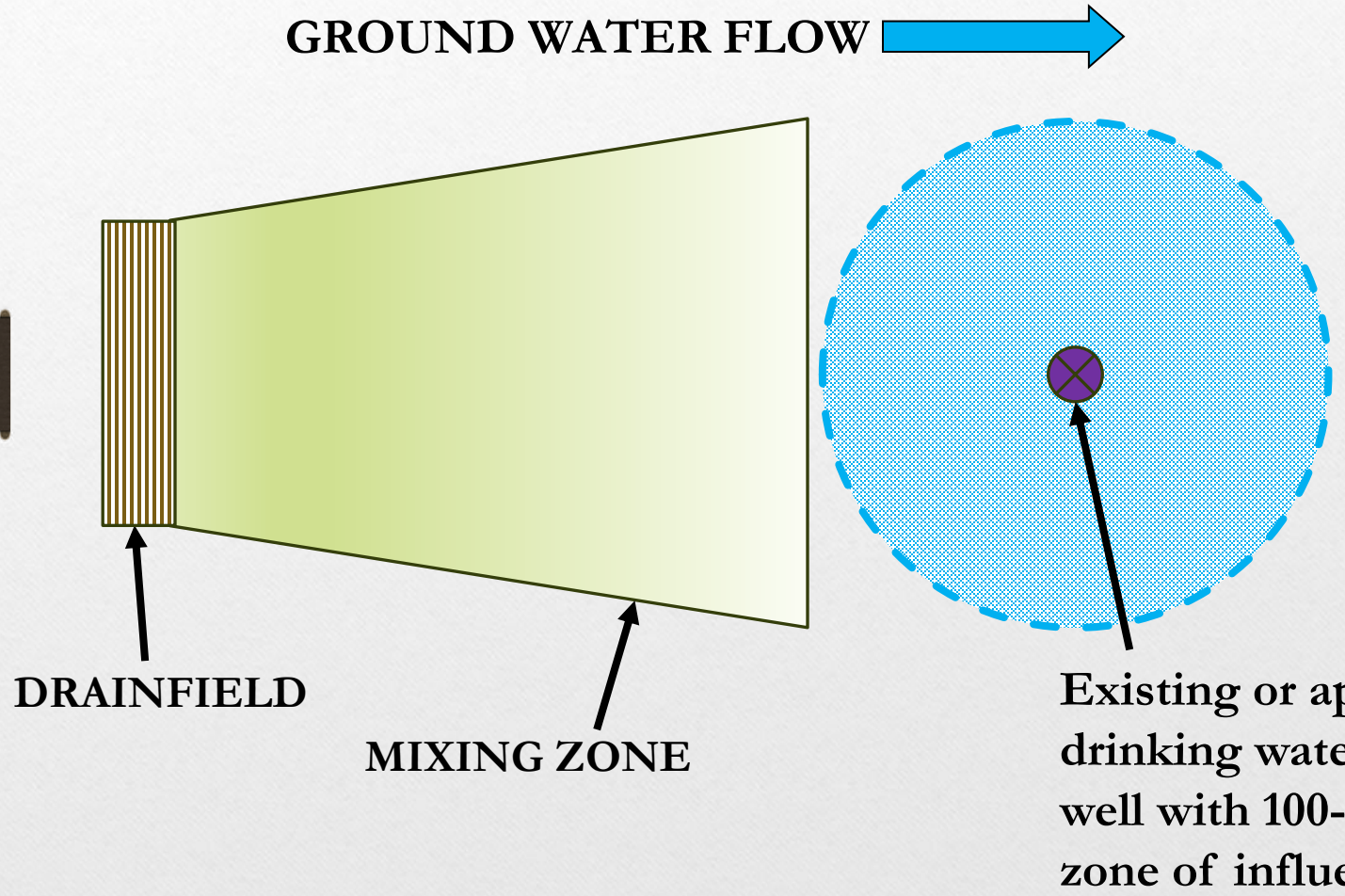
Water Table

Wastewater
Plume

15 FT.

Ground Water Flow

Ground Water Mixing Zone Setbacks



NSA – Appendix E

AppendixE1_.xls (live.com)

Appendix E

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

NITRATE SENSITIVITY ANALYSIS

ITE NAME:
OUNTY:
OT #:
OTES:

ARIABLES	DESCRIPTION	VALUE	UNITS
	Hydraulic Conductivity	100.00	ft/day
	Hydraulic Gradient	0.0010	ft/ft
	Mixing Zone Thickness (usually constant)	15.0	ft
	Mixing Zone Length (see ARM 17.30.517(1)(d)(viii)	500	ft
	Width of Drainfield Perpendicular to Ground Water Flow	200	ft
g	Background Nitrate (as Nitrogen) Concentration	1.00	mg/L
r	Nitrate (as Nitrogen) Concentration in Precipitation (usually constant)	1.0	mg/L
e	Nitrate (as Nitrogen) Concentration in Effluent	50.00	mg/L
	Number of Single Family Homes on the Drainfield	1.0	
l	Quantity of Effluent per Single Family Home	26.70	ft3/day
	Precipitation	15.0	in/year
	Percent of Precipitation Recharging Ground Water (usually constant)	0.20	
QUATIONS			
/	Width of Mixing Zone Perpendicular to Ground Water Flow = (0.175)(L)+(Y)	287.50	ft
m	Cross Sectional Area of Aquifer Mixing Zone = (D)(W)	4312.50	ft2
s	Surface Area of Mixing Zone = (L)(W)	143750.00	ft2
g	Ground Water Flow Rate = (K)(I)(Am)	431.25	ft3/day
r	Recharge Flow Rate = (As)(P/12/365)(V)	98.46	ft3/day
e	Effluent Flow Rate = (#l)(Ql)	26.70	ft3/day
OLUTION			
t	Nitrate (as Nitrogen) Concentration at End of Mixing Zone =((Ng)(Qg)+(Nr)(Qr)+(Ne)(Qe)) / ((Qg)+(Qr)+(Qe))	3.35	mg/L

Y:
ATE: November 15, 2023

REV. 03/2005

Class III/IV Waters (ARM 17.30.1006)

- Specific Conductance (S.C.) must be greater than 2,500 μS/cm in at least two samples from the shallowest ground water (no samples <2,500). >2,500 is class III; >15,000 is class IV.
  - The human health standard for nitrate (10 mg/L) must be met at the end of the mixing zone
  - For water with a S.C. greater than 7,000 μS/cm, the limit of 50 mg/L nitrate concentration must be met (50 = discharge from conventional septic system)
- If a water is Class III/IV AND has a K of less than 0.1 ft/d, then the nitrate sensitivity analysis is non-significant. The hydraulic conductivity must be determined from a pumping test of a well either on or near the site.

Source Specific Mixing Zone (SSMZ)

- Will be discussed by Eric Regensburger & Kevin Krogstad on Thursday, November 16 @ 10:45-11:45am.

Cumulative Effects/Analysis

- Will be discussed by Eric Regensburger & Kevin Krogstad on Thursday, November 16 @ 10:45-11:45am.

Phosphorous Breakthrough Analysis (PBA)

- Requires sufficient soil adsorption capacity of 50 years prior to discharge to surface water.
  - Adsorption down to water table and laterally from drainfield to surface water
- Applicable to high-quality state surface water
  - Must be calculated to any surface water, unless:
    - No flow for more than 270 days most years, or
    - Is an irrigation ditch that does not return to state waters, or
    - Is losing year-round

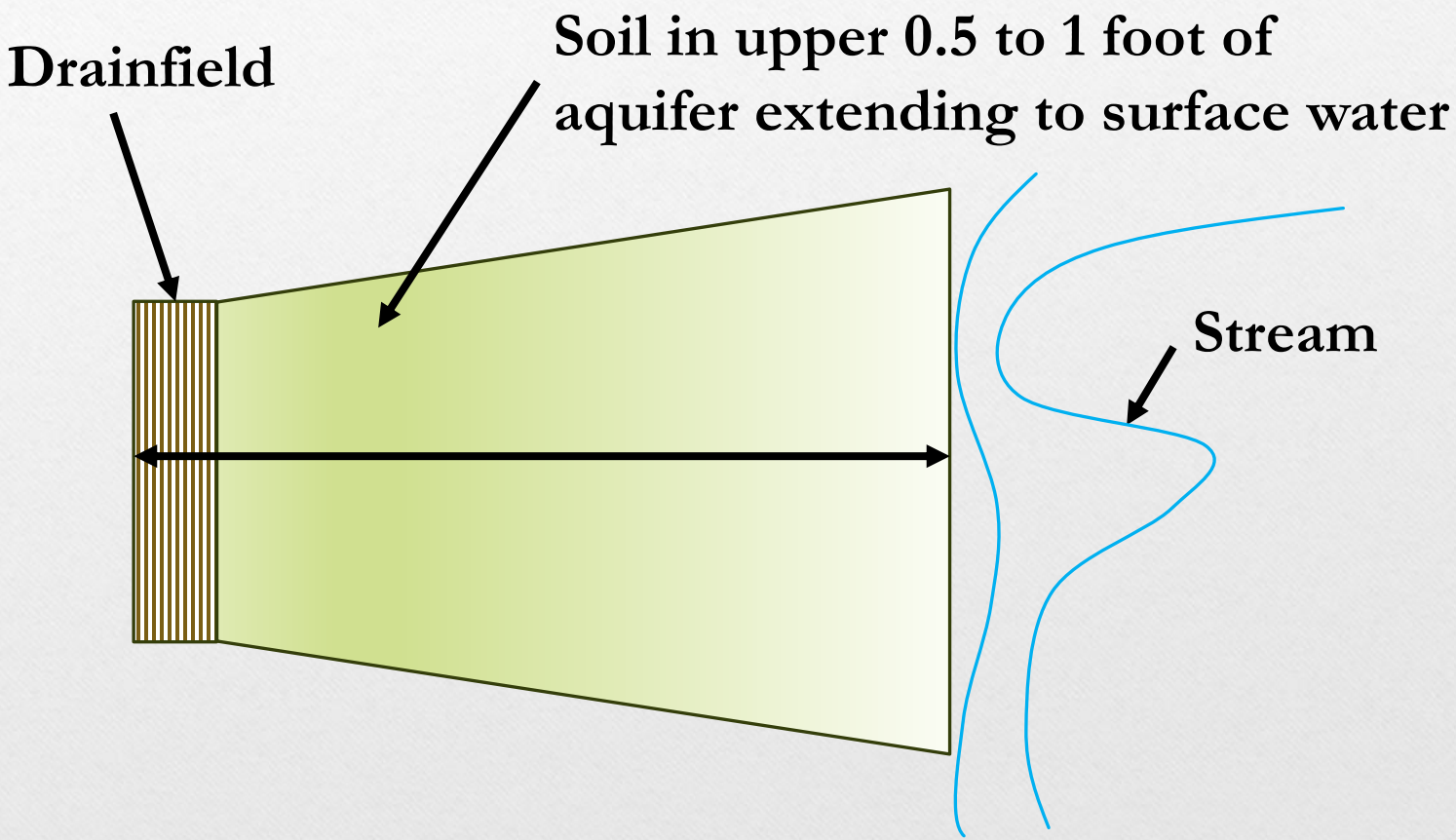
Phosphorous Parameters

- **Distance to surface water (D) -**
  - Along hydraulic gradient if measured on site or defined in hydrologic report,
  - Along shortest distance to surface water if gradient estimated from 1/3 topography.
- **Mixing depth (T) -**
  - 0.5 ft if coarse soil
  - 1.0 ft if fine soil (Soil can be defined as type of loam or finer)

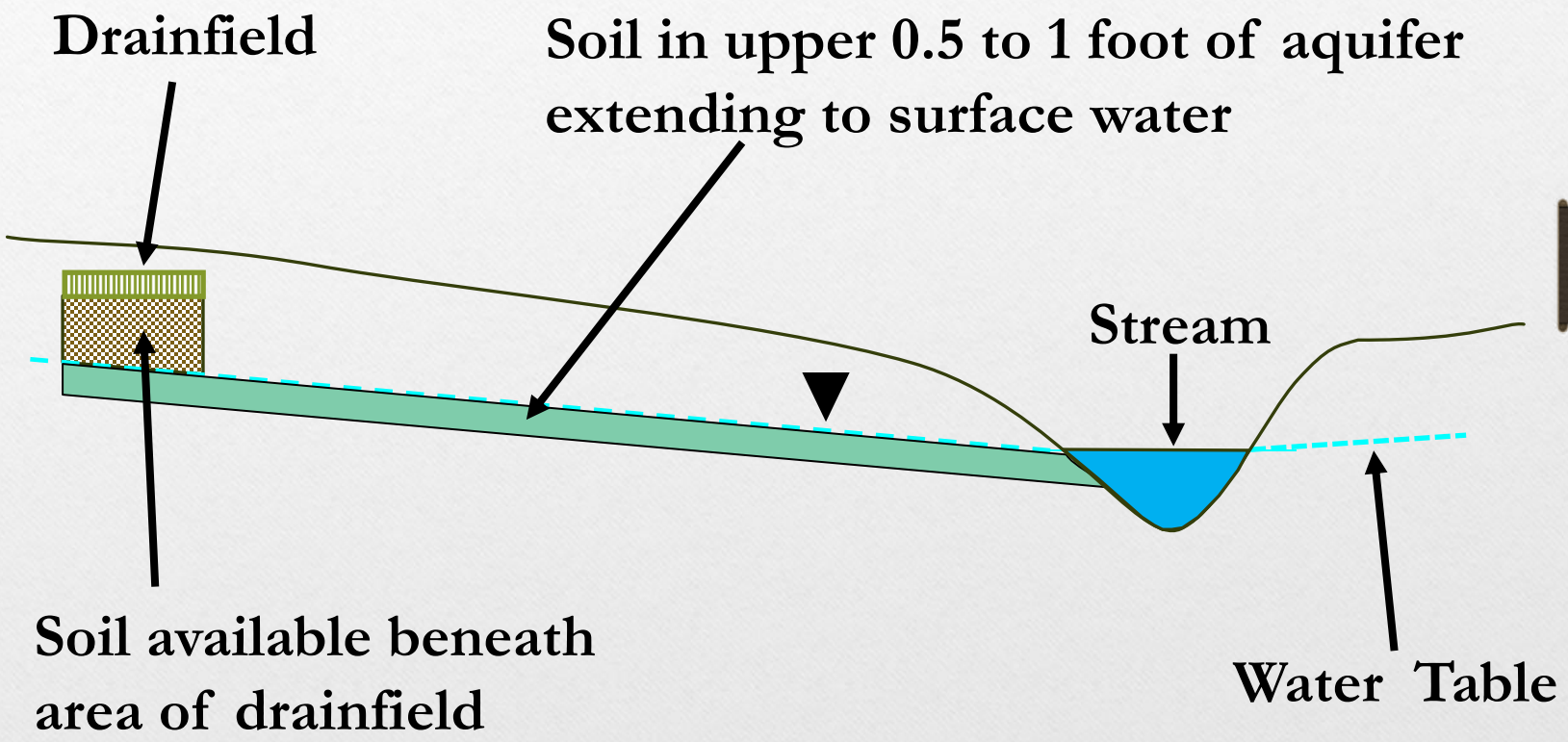
Phosphorous Parameters

- **Depth to limiting layer (B)**- The amount of soil directly beneath the drainfield available for absorption. This may be dependent upon a limiting layer.
- **Concentration in effluent (Pl) = 10.6 mg/L ~ 6.44 lbs/year**
- **Loading Rate :**
  - Single family home (1 bedroom) = 4.83 lbs/yr
  - Single family home (2-5 bedrooms) = 6.44 lbs/yr
  - Single family home: add 2.58 lbs/yr for each bedroom over 5
  - Commercial: design flow (gpd) x 10.6 mg/L x 0.00305 = load (lbs/yr).

Available Soil for Phosphorous Adsorption (map view)



Available Soil for Phosphorous Adsorption (cross-section view)



PBA – Appendix N

Appendix N_rev2007.xls (live.com)

Appendix N

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME: _____
COUNTY: _____
LOT #: _____
NOTES: _____

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	27.0	ft
L	Length of Primary Drainfield's Long Axis	40.0	ft
W	Width of Primary Drainfield's Short Axis	12.0	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	8.0	ft
D	Distance from Drainfield to Surface Water	120.0	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils, 1.0 ft for fine soils)**	1.0	ft
Sw	Soil Weight (usually constant)	100.0	lb/ft3
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200.0	ppm
#I	Number of Single Family Homes on the Drainfield	1.0	
CONSTANTS			
PI	Phosphorous Load per Single Family Home (constant)	6.44	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	
EQUATIONS			
Pt	Total Phosphorous Load = (PI)(#I)	6.44	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	384000.0	lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	450000.0	lbs
P	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	166.8	lbs
SOLUTION			
BT	**Breakthrough Time to Surface Water = P / Pt**	25.9	years

BY:
DATE: November 15, 2023

NOTES:

** Depth to limiting layer is typically based on depth to a limiting layer (such as clay, bedrock or water) in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.*

*** Material type is usually based on test pit. A soil that can be described as loam (e.g. gravelly loam, sandy loam, etc.) or finer according to the USDA soil texture classification system is considered a "fine" soil.*

REV. 12/2007

Adjacent to State Waters – Rules

- **ARM 17.36.124 - Subdivisions Adjacent to State Waters –** Subdivisions located adjacent to state surface waters will require an analysis of the effects of the proposed sewage treatment system(s) on the quality of the nearest downgradient high quality state surface water.
  - To assure compliance with the Water Quality Act (75-5 MCA), and water quality and non-degradation standards of ARM 17.30 subchapters 6, 7, 10, & 12.

What is Adjacent to?

- Without specific distance criteria in rule, what criteria does DEQ use?
- **Site Specific**
  - Geology – type of soil/rock
    - Depth to ground water
  - Hydrologic connection (gaining/losing)
    - Hydraulic Gradient
    - Hydraulic Conductivity
  - Quantity and quality of wastewater source
  - Distance / travel time to surface water

What is Trigger value?

- Is the allowable increase in nutrients (for both nitrogen and phosphorous) above the existing background concentration in the receiving surface water.
- **The trigger value (listed in DEQ-7), for nitrate (as N) is 0.01 mg/L and for phosphorous (as P) is 0.001 mg/L.**
- Use dilution to determine the increase concentration
- **ARM 17.30.715 - Nonsignificant Changes** – Those that are below trigger values or will not have a measurable effect on uses or cause changes in aquatic life or ecological integrity.
  - See WQB-7 and ARM 17.30.715(1)(c).

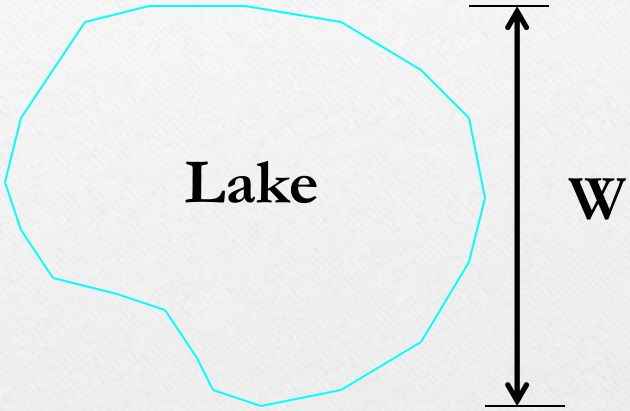
Trigger Value Parameters

- This equation requires the following:
- **Flow rate -**
  - **Darcy's Law (Q = KiA)** - Flow rate into or out of the water body for lakes and ponds, or ground-water flow or
  - **StreamStats – (QL = ft^3/s)** - 7-day, 10-year low flow (7Q10) or 14-day, 5-year low flow (14Q5) for streams and rivers. StreamStats (usgs.gov)
  - Background nitrate or phosphorous in receiving water can be considered zero because only the increase is important

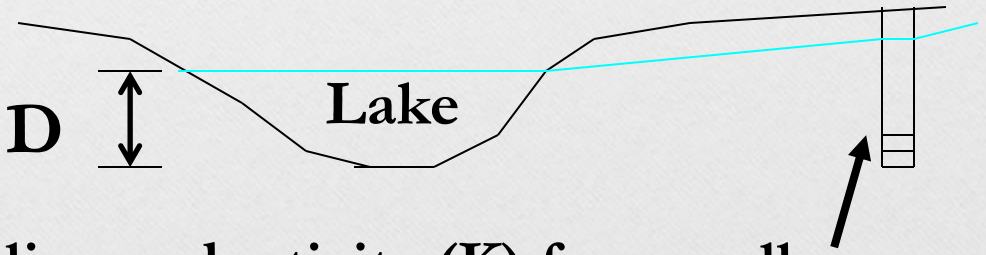
Darcy's Law (Map view)

$$Q = KiA$$
$$A = W*D$$

Gradient (i)



Cross-section



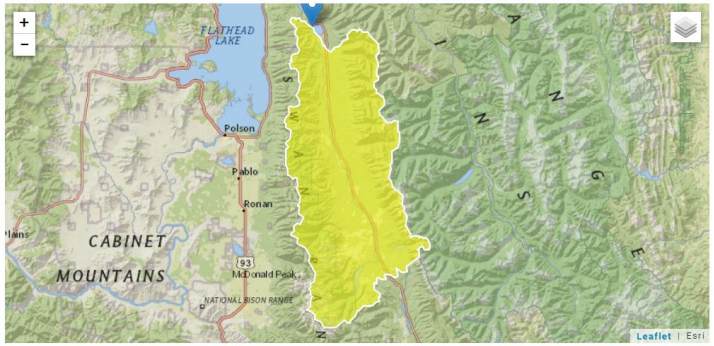
Hydraulic conductivity (K) from well

StreamStats

- StreamStats (usgs.gov)

StreamStats Report

Region ID: MT
Workspace ID: MT20231114185327900000
Clicked Point (Latitude, Longitude): 47.92772, -113.88093
Time: 2023-11-14 11:53:58 -0700



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
CONTDA	Area that contributes flow to a point on a stream	603.5	square miles
SLOP50_30M	Percent area with slopes greater than 50 percent from 30-meter DEM.	21.5	percent

Seasonal Flow Statistics

Seasonal Flow Statistics Parameters [W Region LowFlow GLS 2015 5019G]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
CONTDA	Contributing Drainage Area	603.5	square miles	6.4	2520
SLOP50_30M	Slopes_gt_50pct_from_30m_DEM	21.5	percent	1.87	67.5

Seasonal Flow Statistics Flow Report [W Region LowFlow GLS 2015 5019G]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
Jul_to_Oct_14_Day_5_Yr_Low_Flow	125	ft^3/s	43	363	71.5

Seasonal Flow Statistics Citations

McCarthy, P.M., Sando, Roy, Sando, S.K., and Dutton, D.M.,2016, Methods for estimating streamflow characteristics at ungaged sites in western Montana based on data through water year 2009: U.S. Geological Survey Scientific Investigations Report 2015–5019–G, 19 p.

Trigger Value Parameters

- **Number of drainfields in Subdivision (N)**
- **Nitrate Concentration (CD)**
  - **50 mg/L for conventional**
  - **24 mg/L for Level 2**
- Background nitrate or phosphorous in receiving water can be considered zero because only the increase is important

Trigger Calculations

- **Appendix Q -** Appendix_Q-10-2015.xls (live.com)
- **Dilution equation for nitrate:**

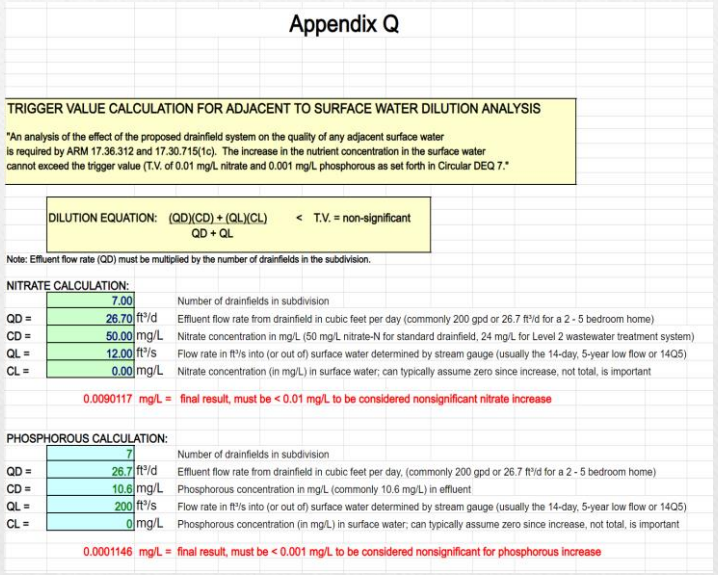
T.V. = (# drainfields)(26.7 ft³/d)(50 mg/L)
(26.7 ft³/d)(# drainfields) + surface flow (ft³/d)

(necessary even if passes the g.w. mixing zone)

- **Dilution equation for phosphorous:**

T.V.=(# drainfields)(26.7 ft³/d)(10.6 mg/L)
(26.7 ft³/d)(# drainfields) + surface flow (ft³/d)

(not necessary if breakthrough >50 years)



Appendix Q

TRIGGER VALUE CALCULATION FOR ADJACENT TO SURFACE WATER DILUTION ANALYSIS

"An analysis of the effect of the proposed drainfield system on the quality of any adjacent surface water is required by ARM 17.36.312 and 17.30.715(1c). The increase in the nutrient concentration in the surface water cannot exceed the trigger value (T.V. of 0.01 mg/L nitrate and 0.001 mg/L phosphorous as set forth in Circular DEQ 7."

DILUTION EQUATION: $\frac{(QD)(CD) + (QL)(CL)}{QD + QL}$ < T.V. = non-significant

Note: Effluent flow rate (QD) must be multiplied by the number of drainfields in the subdivision.

NITRATE CALCULATION:

	7.00		Number of drainfields in subdivision
QD =	26.70	ft³/d	Effluent flow rate from drainfield in cubic feet per day (commonly 200 gpd or 26.7 ft³/d for a 2 - 5 bedroom home)
CD =	50.00	mg/L	Nitrate concentration in mg/L (50 mg/L nitrate-N for standard drainfield, 24 mg/L for Level 2 wastewater treatment system)
QL =	12.00	ft³/s	Flow rate in ft³/s into (or out of) surface water determined by stream gauge (usually the 14-day, 5-year low flow or 14Q5)
CL =	0.00	mg/L	Nitrate concentration (in mg/L) in surface water; can typically assume zero since increase, not total, is important
	0.0090117	mg/L =	final result, must be < 0.01 mg/L to be considered nonsignificant nitrate increase

PHOSPHOROUS CALCULATION:

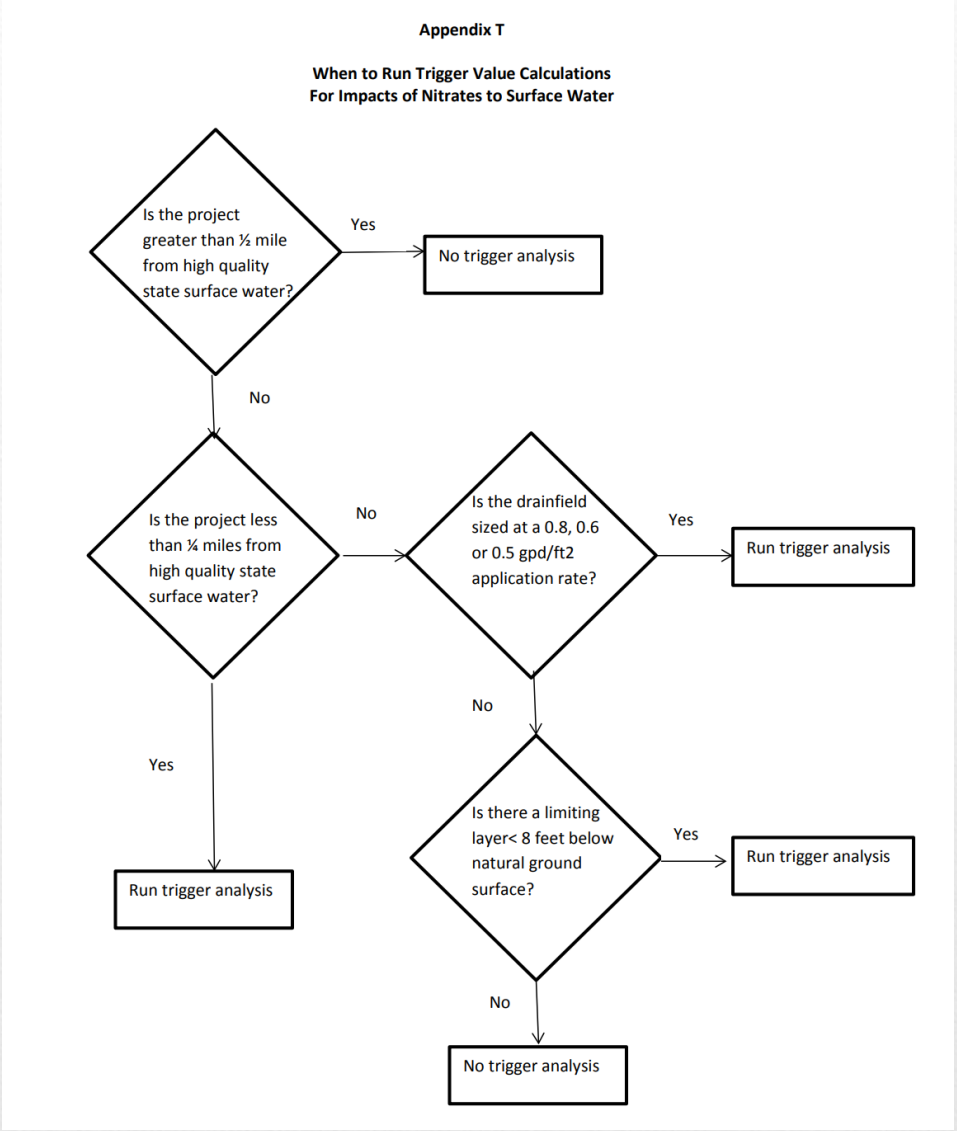
	7		Number of drainfields in subdivision
QD =	26.7	ft³/d	Effluent flow rate from drainfield in cubic feet per day. (commonly 200 gpd or 26.7 ft³/d for a 2 - 5 bedroom home)
CD =	10.6	mg/L	Phosphorous concentration in mg/L (commonly 10.6 mg/L) in effluent
QL =	200	ft³/s	Flow rate in ft³/s into (or out of) surface water determined by stream gauge (usually the 14-day, 5-year low flow or 14Q5)
CL =	0	mg/L	Phosphorous concentration (in mg/L) in surface water; can typically assume zero since increase, not total, is important
	0.0001146	mg/L =	final result, must be < 0.001 mg/L to be considered nonsignificant for phosphorous increase

Adjacent to State Waters

- If the effluent increases the phosphorous or nitrate concentration in the surface water by more than either trigger value, then the applicant must demonstrate that the increase will not cause an impact based on the narrative standards (ARM 17.30.715(1)(g)). (If you reach this point, please talk to DEQ.)
- Other options are:
  - Demonstrating that the surface water is losing to ground water
  - Using Level 2 treatment to reduce nitrate (not valid for phosphorous)

Flow Diagram – Appendix T

- Can be found at: Appendix-T-revised.pdf (mt.gov)
- This chart is not for use with phosphorous analysis. Phosphorous trigger value calculations need to be run when the 50-year breakthrough criteria cannot be met regardless of distance, soil type of limiting layer.



CATERGORIES OF NONSIGNIFICANT DEGRADATION

(aka CATEGORICAL EXEMPTIONS)

Categorical Exemptions Explained

- Five categories
- Meet nondeg requirements using information that is typically required as part of the regular subdivision review
- **Exemption specific to each lot in a subdivision**
- Can combine regular nondeg review and exemptions on different lots
- Cumulative effects for lots not using exemptions:
  - downgradient exempt lot not included in analysis
  - upgradient exempt lot is included in analysis

Categorical Exemptions Explained

- Designed to allow development in areas with low groundwater dilution but still no threat to contamination of that ground water due to:
  - Adequate soil treatment (e.g. finer soils)
  - Larger depth to bedrock/groundwater
  - Low growth
  - Low density / larger lot size
  - Higher treatment

Categorical Exemptions- A.R.M. 17.30.716(2)(a)

- **General Requirements:**
  - Distance to high-quality surface water - 1,000' for gravity & 500' for pressure-dose,
  - Soil types and percolation rate (pressure dosing - not applicable),
  - SWTS designed for < 2 single-family units or non-industrial flow < 700 gpd,
  - SWTS is located on lot being served & only one SWTS on lot,
  - Meets requirements of DEQ-4 and ARM 17.36 sub-chapter 3,
  - Background nitrate concentration – less than 2 mg/L

Categorical Exemptions- ARM 17.30.716(2)(b)

- **Specific Requirements:**
  - Lot size,
  - Percolation rate,
  - Soil type – minimum of 6',
  - Depth to ground water and bedrock,
  - Pressure dosing requirements,
  - Number of lots in subdivision,
  - Distance to neighboring SWTS,
  - Number of lots creating in county over last 10 fiscal years,
  - Distance to nearest town with >500 persons,
  - Burial depth of drainfield laterals,
  - Level 2 SWTS requirements,
  - Well Setback (ARM 17.30.716(3)

Category #1

- **General Requirements, PLUS:**
- Greater than equal to 2 acres,
- Perc rate is 16 mpi or slower if perc test conducted,
- Minimum of 6’ of very fine sand, sandy clay loam or finer soil,
- Depth to limiting layer (bedrock/groundwater/ impermeable unit) is greater than 8’ (based on test pit only),
- 100’ Provisional mixing zone

Category #2

- **General Requirements (not including soil and perc rate), PLUS:**
- Greater than equal to 2 acres,
- Perc rate is 6 mpi or slower if perc test conducted,
- Minimum of 6' of medium sand, sandy loam or finer soil,
- Depth to limiting layer (bedrock/groundwater/ impermeable unit) is greater than 12' (based on test pit only),
- Pressure-dosing required,
- 100' Provisional mixing zone

Category #3

- **General Requirements (not including soil and perc rate), PLUS:**
- Greater than 1 acre,
- Perc rate is 6 mpi or slower if perc test conducted,
- Minimum of 6' of medium sand, sandy loam or finer soil,
- Depth to limiting layer (bedrock/groundwater/ impermeable unit) is greater than 100' (test pit and local well logs),
- Pressure-dosing required,
- Maximum of 5 lots in the subdivision,
- No existing or approved SWTSs within 500' of the subdivision boundaries,
- 100' Provisional mixing zone

Category #4

- **General requirements, PLUS:**
- Total number of subdivision lots reviewed under 76-4-101 and created in the county during previous 10 state fiscal years is less than150. DEQ updates list annually,
- Lot is greater than 1 mile from city limits of any town with population greater than 500 (based on most recent census),
- 100' Provisional mixing zone

Category #5

- **General requirements, PLUS:**
- Greater than equal to 2 acres,
- Depth to limiting layer (bedrock/groundwater/ impermeable unit) is greater than 6’ (based on test pit only),
- Bottom of absorption trenches is greater than equal to 18” below ground surface,
- Level 2 system required,
- 100’ Provisional mixing zone

Appendix P

`SUMMARY OF REQUIREMENTS FOR NONDEGRADATION "EXEMPTIONS" IN ARM 17.30.716
FISCAL YEAR 2008 VERSION[1]

NOTE: This is not part of the official rule – it is an informational summary. To ensure compliance with all requirements of the rule, r

REQUIREMENTS	CATEGORY #1	CATEGORY #2	CATEGORY #3	CATEGORY #4[1]	CATEGORY #5
General Requirements [ARM 17.30.716(2)(a)]					
Distance between absorption trench and impacted downgradient high-quality surface water	≥1,000 feet (500 if trench is pressure-dosed)	≥500 feet	≥500 feet	≥400 feet (200 if trench is pressure-dosed)	≥1,000 feet (500 if trench is pressure-dosed)
Perc rate[2] and soil requirement if absorption trench (AT) is not pressure-dosed (if AT is pressured-dosed, these requirements don't apply).	Perc. rate between 16 and 50 min/inch; AND 6 feet of VFS, SCL, CL, or SiCL soil	NOT APPLICABLE	NOT APPLICABLE	Perc. rate between 16 and 50 min/inch; AND 6 feet of VFS, SCL, CL, or SiCL soil	Perc. rate between 16 and 50 min/inch; AND 6 feet of VFS, SCL, CL, or SiCL soil
SWTS designed for ≤ 2 single-family residences, or non-industrial design flow ≤ 700 gal. per day	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
SWTS is on the lot being served and there is only one SWTS on the lot	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
SWTS meets current requirements in DEQ-4 and ARM 17.36 sub-chapter 3	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE	APPLICABLE
Background nitrate concentration limit (does not apply to lots ≥20 acres when the absorption trench is greater than 500 feet from the downgradient property boundary)	<2 mg/L	<2 mg/L	<2 mg/L	<2 mg/L	<2 mg/L
Specific Requirements [ARM 17.30.716(2)(b)]	**ARM 17.36.716(2)(b)(i)**	**ARM 17.36.716(2)(b)(ii)**	**ARM 17.36.716(2)(b)(iii)**	**ARM 17.36.716(2)(b)(iv)**	**ARM 17.36.716(2)(b)(v)**
Lot size	≥2 acres	≥2 acres	≥1 acre	NOT APPLICABLE	≥2 acres
Percolation rate[2][3]	≥ 16 min/inch	≥ 6 min/inch	≥ 6 min/inch	NOT APPLICABLE	NOT APPLICABLE
Soil type required beneath the absorption trench (minimum thickness of 6 feet)	VFS, SCL or finer material	MS, SL or finer material	MS, SL or finer material	NOT APPLICABLE	NOT APPLICABLE
Depth to bedrock and ground water below ground surface	≥8 feet (*seasonally* high ground water)	≥12 feet (*seasonally* high ground water)	≥100 feet	NOT APPLICABLE	NOT APPLICABLE
Depth to limiting layer below ground surface	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	>6 feet
Pressure-dosing of absorption trench required	NOT APPLICABLE	APPLICABLE	APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
Number of lots in subdivision	NOT APPLICABLE	NOT APPLICABLE	≤ 5	NOT APPLICABLE	NOT APPLICABLE
Distance from subdivision boundaries to any neighboring existing/approved SWTSs	NOT APPLICABLE	NOT APPLICABLE	≥ 500 feet	NOT APPLICABLE	NOT APPLICABLE
Number of subdivision lots created in the county over last 10 fiscal years	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	<150[4]	NOT APPLICABLE
Distance between lot and any town with a population > 500	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	>1 mile	NOT APPLICABLE
Depth of absorption trench below ground surface	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	≤18 inches
Level II SWTS required	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	APPLICABLE
Well Setback [ARM 17.30.716(3)]					
Separation between a provisional mixing zone and any existing/approved drinking water supply well	≥100 feet	≥100 feet	≥100 feet	≥100 feet	≥100 feet

NOTES:

(1) Requirements for category 4 include
fiscal years. Therefore, this table will be upda
(2) Percolation rates are only necessary
no percolation test has been conducted, the so
(3) The symbol "≥" indicates a percolati
listed.
(4) For fiscal year 2008, the counties tha
Custer, Daniels, Dawson, Fallon, Garfield, Gl
Meagher, Musselshell, Petroleum, Phillips, Po
Sheridan, Teton, Toole, Treasure, Wheatland,

ABBREVIATIONS:

SWTS = SUBSURFACE WASTEWATER TI
VFS = VERY FINE SAND
SCL = SANDY CLAY LOAM
CL = CLAY LOAM
SiCL = SILTY CLAY LOAM
MS = MEDIUM SAND
SL = SANDY LOAM

Rev. 9/2008

Sources of Well and Water Quality Information

- **Montana Bureau of Mines and Geology (MBMG). Well log and selected ground water quality database:**
- MBMG | Welcome (mtech.edu)
- **Environmental Protection Agency (EPA). Contains both groundwater and surface water data.**
- U.S. Environmental Protection Agency | US EPA

United States Geological Survey (USGS). Contains both groundwater and surface water data.

- USGS.gov | Science for a changing world

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