### N and P Cumulative Effects & Gaining/Losing Surface Water

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Presented by: <u>Eric Regensburger</u> <u>Department of Environmental Quality</u> <u>444-6714</u> <u>eregensburger@mt.gov</u>

#### Nitrate Cumulative Ground Water Effects

- Nitrate effects between two or more consecutive drainfields
  - Applies to all consecutive on-site drainfields aligned with the ground-water flow direction
  - May include nearby off-site lots (may not include established upgradient lots due to background N)
  - Only consecutive drainfields in a straight line downgradient are included (5° spread on either side of mixing zone is not accounted for)



**Cumulative Nitrogen Impacts** 

NOT TO



- 1. The background concentration for A is based on groundwater sample
- Calculate the background concentration for B and C (updated spreadsheet) using distances shown above using nitrate spreadsheet. These calculations are ONLY used to determine the background for each drainfield downgradient of A.
- 3. Use those background values for A, B and C to calculate final concentration at end of each mixing zone to determine if it meets the applicable criteria (e.g. 5, 7.5 mg/L)

#### **DRAFT NITROGEN SPREADSHEET**

TABLE 1.	. Append	ix B Exai	mple. C	Calculation of Bac	ckgrouna	Concent	trations f	or use in	the Cur	nulative l	Effects C	alculatio	ns in Tal	ole 2 (be	low).				
Variable	(K)	(I)	(D)	(L)	(Y)	(Ng)	(Nr)	(Ne)	(#I)	(QI)	<del>(P)</del>	<del>(V)</del>	(W)	(Am)	(As)	(Qg)	<del>(Qr)</del>	(Qe)	Nb
			Mix	Distance to end of last	Drain-	Back-	Nitrate	Effluent	# of	Effluent			Down-	Mix	Mix. zone	Ground			
	Hydr.	Hydr.	zone	(most downgradient)	field	ground	in	Nitrate	single	per	Annual	Percent	grad.	zone	surface	water	Recharge	Effluent	Background Nitrate (as N)
	cond.	grad.	thick	mixing zone	width	nitrate	precip	conc.	family	drain.	precip.	precip.	width	area	area	flow	flow	flow	downgradient absorption
drainfield	(ft/day)	(ft/ft)	(feet)	(feet)	(feet)	(mg/l)	(mg/l)	(mg/l)	homes	(ft3/day)	(in/yr)	recharge	(feet)	(ft <sup>2</sup> )	(ft²)	(ft3/day)	(ft3/day)	(ft3/day)	system (mg/L)
А	20.00	0.010	15.0	525	100.0	0.30	1.0	50.0	1.0	26.70	12.0	0.2	191.88	2878.13	100734.38	575.63	55.20	26.70	2.50
В	20.00	0.010	15.0	375	100.0	2.50	1.0	50.0	1.0	26.70	12.0	0.2	165.63	2484.38	62109.38	496.88	34.03	26.70	4.93
С	20.00	0.010	15.0	200	100.0	4.93	1.0	50.0	1.0	26.70	12.0	0.2	135.00	2025.00	27000.00	405.00	14.79	26.70	7.71
						7.71					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
						#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
				/	/	#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
					/	#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
						#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
						#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
						#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
						#DIV/0!					12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!
						#DIV/0!			1		12.0	0.2	0.00	0.00	0.00	0.00	0.00	0.00 DEV 06/20	#DIV/0:
	Annond	iv B Eva	mala Cu	mulativa Drainfia	ld Calcula	tions (af	ftor corr	ot backs	uround v	مايرمو مما	culated	n Tabla (	n i					NL V. 00/20	120
														(A ma)	(4 -)	( <b>O</b> erl	(0)	(0-1)	N14
variable	(^)	(1)	(D)	(L)	(1)	(Ng)		(Ne)	(#1)	(QI)	<del>(P)</del>	(*)	(11)	( <i>A</i> m)	(AS)	(Qg)	<del>(Gr)</del>	(Qe)	Nt
	Unda	الم معام	MIX		Drain-	васк-	Nitrate /	FTILIENT	# OT	Effluent			Down-	MIV	MIX ZONG	Ground			
	Hyar.	HV/1r		Mixing zone length	E . I .I	ana		Mitzete			A	Deveent					Deshares	<b>F</b> 40	
	cond	arad	zone	Mixing zone length	field	ground	in	Nitrate	single	per	Annual	Percent	grad.	zone	surface	water	Recharge	Effluent	
drainfield	cond. (ft/day)	grad.	zone thick (feet)	Mixing zone length	field width (feet)	ground nitrate (mg/l)	in precip (mg/l/)	Nitrate conc.	single family homes	per drain. (ft3/day)	Annual precip. (in/yr)	Percent precip.	grad. width	zone area (ft <sup>2</sup> )	surface area (ft <sup>2</sup> )	water flow (ft3/day)	Recharge flow (ft3/day)	Effluent flow (ft3/day)	Nitrate (as N) concentration at
drainfield	cond. (ft/day) 20.00	grad. (ft/ft)	zone thick (feet)	Mixing zone length (feet) 100	field width (feet)	ground nitrate (mg/l)	in precip (mg/l)	Nitrate conc. (mg/l)	single family homes	per drain. (ft3/day) 26.70	Annual precip. (in/yr)	Percent precip. recharge	grad. width (feet)	zone area (ft <sup>2</sup> )	surface area (ft <sup>2</sup> )	water flow (ft3/day)	Recharge flow (ft3/day)	Effluent flow (ft3/day) 26.70	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80
A B	cond. (ft/day) 20.00 20.00	grad. (ft/ft) 0.010 0.010	zone thick (feet) 15.0 15.0	Mixing zone length (feet) 100 100	field width (feet) 100	ground nitrate (mg/l) 0.30 2.50	in precip (mg/) 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0	single family homes 1.0 1.0	per drain. (ft3/day) 26.70 26.70	Annual precip. (in/yr) 12.0 12.0	Percent precip. recharge 0.2	grad. width (feet) 117.50 117.50	zone area (ft <sup>2</sup> ) 1762.50 1762.50	surface area (ft <sup>2</sup> ) 11750.00 11750.00	water flow (ft3/day) 352.50 352.50	Recharge flow (ft3/day) 6.44 6.44	Effluent flow (ft3/day) 26.70 26.70	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84
A A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	Mixing zone length (feet) 100 100 200	field width (feet) 100 100	ground nitrate (mg/l) 0.30 2.50 4.93	in precip (mg/l) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2	grad. width (feet) 117.50 117.50 135.00	zone area (ft <sup>2</sup> ) 1762.50 1762.50 2025.00	surface area (ft <sup>2</sup> ) 11750.00 11750.00 27000.00	water flow (ft3/day) 352.50 352.50 405.00	Recharge flow (ft3/day) 6.44 6.44 14.79	Effluent flow (ft3/day) 26.70 26.70 26.70	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72
A A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	(feet)   100   100   200	field width (feet) 100 100 100.0	ground nitrate (mg/l) 0.30 2.50 4.93 7.71	in precip (mg()) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2	grad. width (feet) 117.50 117.50 135.00 0.00	zone area (ft <sup>2</sup> ) 1762.50 2025.00 0.00	surface area (ft <sup>2</sup> ) 11750.00 11750.00 27000.00 0.00	water flow (ft3/day) 352.50 352.50 405.00 0.00	Recharge flow (ft3/day) 6.44 6.44 14.79 0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	Mixing zone length (feet) 100 100 200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0!	in precip (mg/l) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2	grad. width (feet) 117.50 117.50 135.00 0.00 0.00	Intx   zone   area   (ft²)   1762.50   2025.00   0.00   0.00	surface area (ft <sup>2</sup> ) 11750.00 27000.00 0.00 0.00	water flow (ft3/day) 352.50 352.50 405.00 0.00 0.00	Recharge flow (ft3/day) 6.44 6.44 14.79 0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	Mixing zone length (feet) 100 100 200	field width (feet) 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0!	in precip (mg/)) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2	grad. width (feet) 117.50 135.00 0.00 0.00 0.00	Intx   zone   area   (ft²)   1762.50   2025.00   0.00   0.00   0.00	surface area (ft <sup>2</sup> ) 11750.00 27000.00 0.00 0.00 0.00	water flow (ft3/day) 352.50 352.50 405.00 0.00 0.00 0.00	Recharge   flow   (ft3/day)   6.44   6.44   0.00   0.00   0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	Mixing zone length (feet) 100 100 200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0! #DIV/0!	in precip (mg/)) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2 0.2	grad. width (feet) 117.50 135.00 0.00 0.00 0.00 0.00	Intx   zone   area   (ft²)   1762.50   2025.00   0.00   0.00   0.00   0.00   0.00   0.00	surface area (ft <sup>2</sup> ) 11750.00 27000.00 0.00 0.00 0.00 0.00	water flow (ft3/day) 352.50 352.50 405.00 0.00 0.00 0.00	Recharge   flow   (ft3/day)   6.44   6.44   14.79   0.00   0.00   0.00   0.00   0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0	(feet)   100   100   200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0! #DIV/0! #DIV/0!	in precip (mg/l) 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	grad.   width   (feet)   117.50   135.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	Intx   zone   area   (ft²)   1762.50   2025.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	surface   area   (ft <sup>2</sup> )   11750.00   11750.00   27000.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	water flow (ft3/day) 352.50 352.50 405.00 0.00 0.00 0.00 0.00	Recharge   flow   (ft3/day)   6.44   6.44   14.79   0.00   0.00   0.00   0.00   0.00   0.00	Effluent flow (ft3/day) 26.70 26.70 0.00 0.00 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0	(feet)   100   100   200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0! #DIV/0! #DIV/0!	in precip (mg/l) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	grad.   width   (feet)   117.50   117.50   135.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	Infa   zone   area   (ft²)   1762.50   1762.50   2025.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	surface area (ft <sup>2</sup> ) 11750.00 11750.00 27000.00 0.00 0.00 0.00 0.00 0.00 0	water flow (ft3/day) 352.50 352.50 405.00 0.00 0.00 0.00 0.00 0.00 0.00	Recharge   flow   (ft3/day)   6.44   6.44   14.79   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00 0.00 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	(feet)   100   200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!	in precip (mg/l) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per   drain.   (ft3/day)   26.70   26.70   26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	grad. grad.   width (feet)   117.50 117.50   135.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00	Initial   zone   area   (ft <sup>2</sup> )   1762.50   2025.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	surface area (ft <sup>2</sup> ) 11750.00 11750.00 27000.00 0.00 0.00 0.00 0.00 0.00 0	water   flow   (ft3/day)   352.50   352.50   405.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	Recharge   flow   (ft3/day)   6.44   6.44   14.79   0.00   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	ffeet)   100   100   200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!	in precip (mg/l) 1.0 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per drain. (ft3/day) 26.70 26.70 26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	grad. grad.   width (feet)   117.50 117.50   135.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00	Initial   zone   area   (ft <sup>2</sup> )   1762.50   2025.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	surface   area   (ft <sup>2</sup> )   11750.00   11750.00   27000.00   0.00	water   flow   (ft3/day)   352.50   352.50   405.00   0.00	Recharge   flow   (ft3/day)   6.44   6.44   14.79   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!
drainfield A B C	cond. (ft/day) 20.00 20.00 20.00	grad. (ft/ft) 0.010 0.010 0.010	zone thick (feet) 15.0 15.0 15.0	(feet)   100   100   200	field width (feet) 100 100 100	ground nitrate (mg/l) 0.30 2.50 4.93 7.71 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!	in precip (mg/l) 1.0 1.0	Nitrate conc. (mg/l) 50.0 50.0 50.0	single family homes 1.0 1.0 1.0	per   drain.   (ft3/day)   26.70   26.70   26.70	Annual precip. (in/yr) 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0	Percent precip. recharge 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	grad. grad.   width (feet)   117.50 117.50   135.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00   0.00 0.00	initial   zone   area   (ft <sup>2</sup> )   1762.50   2025.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	surface   area   (ft <sup>2</sup> )   11750.00   11750.00   27000.00   0.00	water   flow   (ft3/day)   352.50   352.50   405.00   0.00	Recharge   flow   (ft3/day)   6.44   6.44   14.79   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	Effluent flow (ft3/day) 26.70 26.70 26.70 0.00 0.00 0.00 0.00 0.00 0.00 0.00	Nitrate (as N) concentration at end of mixing zone (mg/L) 3.80 5.84 7.72 #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0! #DIV/0!



#### Phosphorous Breakthrough

- Must be calculated for all drainfields to nearest impacted high-quality surface water. High quality does not include (75-5-103, MCA):
  - Doesn't flow or no surface expression for more than 270 days in most years, or
  - is an irrigation ditch that does not return to state waters,
- Distance to surface water from drainfield
  - Along hydraulic gradient if measured on site or defined in hydrologic report
  - Along shortest distance to surface water if gradient estimated from topography

## Available Soil for Phosphorous Adsorption (map view)



## Available Soil for Phosphorous Adsorption (cross-section view)



#### **Cumulative Effects for Phosphorous**

- Phosphorous effects accumulate between two or more consecutive drainfields
  - Applies to all consecutive on-site drainfields (using assumed or measured groundwater flow)
  - Can Include off-site lots both up and downgradient
  - Only consecutive drainfields in a straight line are included (drainfields within 5° spread on either side not included)
  - Easy for drainfields with same design flow otherwise call us (draft phosphorus spreadsheet addresses this issue)

#### **Cumulative Effects for Phosphorous**

If less than 50 years to breakthrough between consecutive drainfields, final breakthrough to surface water must account for total of extra years required.



### Gaining or Losing Surface Water

- Impacts to surface waters only applies to surface waters that receive groundwater/effluent ("gain") for any length of time during the applicable period....
  - 7Q10 applicable period is all year (but <u>usually</u> can just look during spring runoff to determine if it gains)
  - 14Q5 applicable period is July, August, September, October.
- Most canals/ditches are losing, but some gain (some are even designed to gain excess irrigation).
- Elevation of surface water must be below the bottom of absorption trench to be gaining (assume water does not flow up).
- Shallow confining layer follow topography or top of confining unit slope (if known)

#### Surface Water - Ground Water Interaction Examples



# When Effluent Cannot Reach a State Water 1



# When Effluent Cannot Reach a State Water 2



# When Effluent Cannot Reach a State Water 3



### **Measuring Gaining or Losing**

- Most common way is to simultaneously measure water elevations in surface water and adjacent groundwater.
  - Groundwater measuring point approximately 10-30 feet from surface water (site condition dependent)
  - Weekly measurements during the applicable period
  - Two methods: one when groundwater flow direction at the site is measured and other when its just estimated.
  - Interimt method has been used, hope to publish final with the new Nondeg Circular (scheduled for July 2025).

## Questions?



## Why is a Surface Water Analysis Necessary?

- Complying with ground water N and P limits doesn't necessarily protect surface water
- Eutrophication negative visual, human health, and biota impacts
  - Excess algae
  - Algal blooms (toxic)
  - Decreased dissolved oxygen
- What about "dead" pothole lakes?
  - High quality state water nondeg still applies