Missouri Department of Natural Resources

WORKSHOP ANNOUNCEMENT

WASTEWATER ENGINEERING – CONSTRUCTION PERMIT PROCESS AND REGULATIONS CHANGES

Are you designing a new or modified wastewater treatment system?

Do you have questions about the new rules and regulations regarding the construction permitting process?

See a "Case Study" example of the construction permitting process.

No-Discharge? Ammonia? Nutrients? New Technology? What is the latest in the world of wastewater treatment?

Take this opportunity to learn about wastewater construction permitting and to discuss your particular concerns.

November 3, 2015
Powder Valley Conservation
Nature Center - Auditorium
11715 Cragwold Road
Kirkwood, MO 63122

November 4, 2015
Cape Girardeau Conservation
Nature Center - Auditorium
2289 County Park Drive
Cape Girardeau, MO 63701

November 10, 2015
James C. Kirkpatrick State
Information Center – Room 139
600 West Main Street
Jefferson City, MO 65102

November 17, 2015
Springfield Conservation
Nature Center - Auditorium
4601 S Nature Center Way
Springfield, MO 65804

November 18, 2015
Burr Oak Woods Conservation
Nature Center - Auditorium
1401 NW Park Road
Blue Springs, MO 64015

Suggested audience:
Engineering Consultants

Professional Engineers –
Six PDHs are available.

The Water Protection Program has developed a Web page that provides information about wastewater construction permitting. Visit: http://www.dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm.

Limited seating – Register today to reserve a seat. Walk-ins may be restricted or denied due to room capacity. Questions call Keith Forck.

AGENDA:

8:45 a.m. – **Registration**

9:00 a.m. – **Introduction**

9:10 a.m.
Antidegradation Review
Case Study, Water Quality Requirements, Alternative Analysis

10:30 a.m. – **Break**

10:50 a.m.
Facility Plan
Flow, Alternatives, Blending, Bypass, Peak Flow Storage

11:30 a.m.
Roundtable Discussion
Question and Answer

12:00 p.m. – **Lunch**

12:40 p.m.
Missouri Geological Survey
Geohydrological Evaluation

1:10 p.m.
Construction Permit Process and Post-Construction
Forms, Fees, Land Application, Lagoon Closure, Determinations

2:10 p.m. – **Break**

2:30 p.m.
Rule & Regulation Update
10 CSR 20 Ch. 8 Design Guide

3:40 p.m.
Roundtable Discussion
Innovative Technology Process

4:15 p.m. – **Adjourn**

REGISTRATION

Please register before October 1, 2015 to confirm seating. These sessions will have deli sandwich type lunch, coffee, soda, and water available for $12.00 at the door. Exact cash is requested. No checks, please.

To attend one of these sessions, please notify Keith Forck via e-mail at keith.forck@dnr.mo.gov or phone at (573) 526-4232. Please provide the following information:

Name _____ Email Address _____

Company/Department _____ Phone Number _____

Address _____ City _____ State ____ ZIP _____

Circle Choice: Session Location and Date: St. L – 11/3 Cape – 11/4 JC – 11/10 Springfield - 11/17 KC – 11/18

Lunch Preference: Beef Turkey Ham Vegetarian No Lunch

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2015 Wastewater Engineering Workshop

Refaat Mefrakis, PE
Engineering Section Chief

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Introduction/Presenters

- Todd Blanc – Environmental Scientist
- John Rustige, PE – Wastewater Engineering
- Cailie Carlile – Environmental Engineer
- Fletcher Bone – Geologist
- Andy Appelbaum, PE – Environmental Engineer
- Keith Forck, PE – Environmental Engineer
- Leasue Meyers – Environmental Engineer
- Cindy LePage, PE – Construction Permits

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Logistics/Housekeeping

- Keep mobile phones off/silent
- Help yourself with coffee
- Restroom location
- We break for
  - Five minutes between presentations
  - 20 minutes at 10:30 am and 2:10 pm
  - Lunch from 12:00 noon until 12:40 pm
- Please pay at Registration Desk
  - Lunch order
  - Lunch cost $12.00

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Workshop Objectives

- Introduce new information/regulatory requirements
- Share experiences/new practices/ methods in the wastewater field
- Receive complete applications
- Feedback for better services to the communities we regulate

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2015 Engineering Workshop Antidegradation Case Study

John Rustige, P.E. & Todd Blanc

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John Doe Resort

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John Doe Resort

- What Is The First Step?

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John Doe Resort

- What Is The First Step?
  - Evaluate Non-degrading Options

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Non-Degrading Alternatives

- Regionalization
- Recycling or reusing wastewater (i.e., closed loop systems)
- Hold and transport to facilities for treatment (pump and haul)
- Alternative discharge location??? Truly non-degrading?
- Land application, subsurface irrigation – evaluate soils, slope, calculate total application acreage, size lagoon, costs

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Recommend Evaluating…..

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John Doe Resort

- What Is The First Step?
  - Evaluate Non-degrading Options
- What is the Second Step?

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John Doe Resort

- What Is The First Step?
  - Evaluate Non-degrading Options
- What is the Second Step?
  - Identify Receiving Water

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Stream Characterization

Receiving Stream Characteristics

Water Protection Program

Map Gallery

http://dnr.mo.gov/env/wpp/wpp-map-gallery.htm

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Stream Characterization

Water Protection Program Map Gallery

- Simple Map Viewer
- Simple Map Viewer Instructions

303(d) Listed Waters

- Internet Map Viewer
- Simple Map Viewer
- About the Map

Who's Monitoring Your Watershed?

- Internet Map Viewer
- Simple Map Viewer
- About the Map

Animal Feeding Operations

- Internet Map Viewer
- Simple Map Viewer
- About the Map

Missouri Water Quality Report - 305(b)

- Internet Map Viewer
- Simple Map Viewer
- About the Map

Current Boil Orders

- Map of Current Boil Water Orders
- Report of Current Boil Water Orders

Where Does My Rainwater Flow?

- **Surface Water Drainage for Southwest Missouri** - This map is 36in. x 36in. but can be printed as an 8.5in. x 11in.
- **72 dpi** (1.3 MB)
- **600 dpi** (5.6 MB)

Department GIS page - Geographic and Digital Data, Landfills, Facilities, Transfer Stations, Site Cleanup Maps, Waste Watersheds, Water Protection

All Simple Map Projects

Missouri Watershed Tool - This tool was recently developed by CARES and should be helpful for watershed group and/or other entities looking for information regarding their watershed.

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Stream Characterization

Water Protection Map Gallery

Water Protection Program Map Gallery

- Simple Map Viewer
- Simple Map Viewer Instructions

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Water Protection Map Gallery

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Stream Characterization

Receiving Stream Characteristics

- Receiving Stream: **Fake Creek (P)**
- Legal Description: T21N,R22W, S16, Crick County
- Outfall UTM Coordinates: X=6XXXXX, Y=42YYYYY

- First Classified Stream and ID: Fake Creek (P) (0000)
- Second Receiving Water Body: Rock Lake (L2)
- USGS Basin & Sub-watershed No.:(11010001-0XXX)

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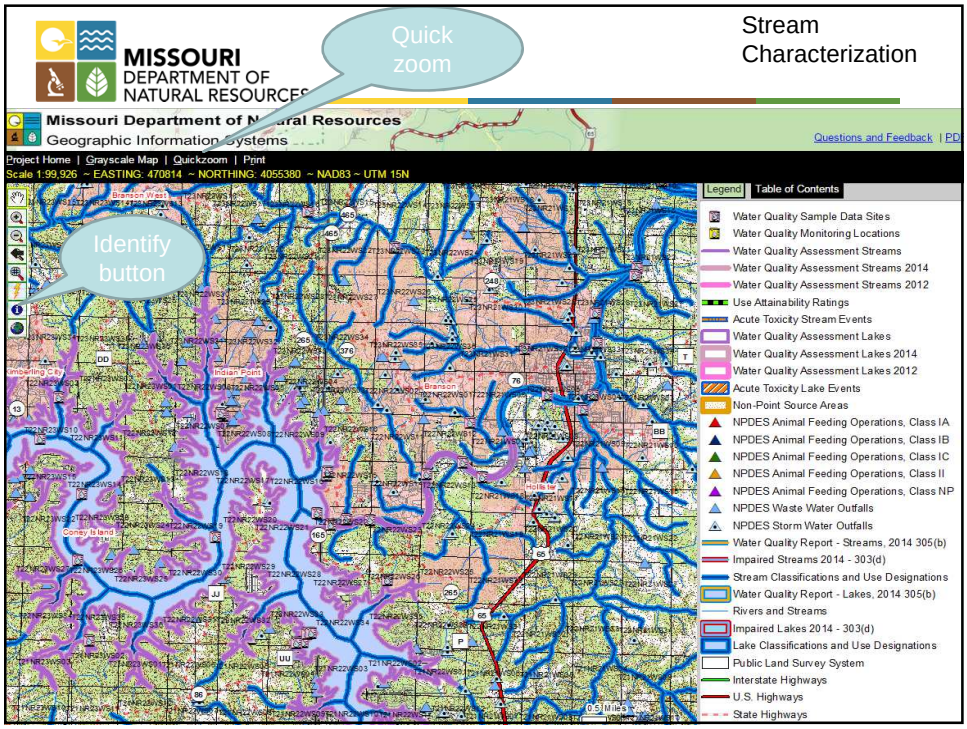
Stream Characterization



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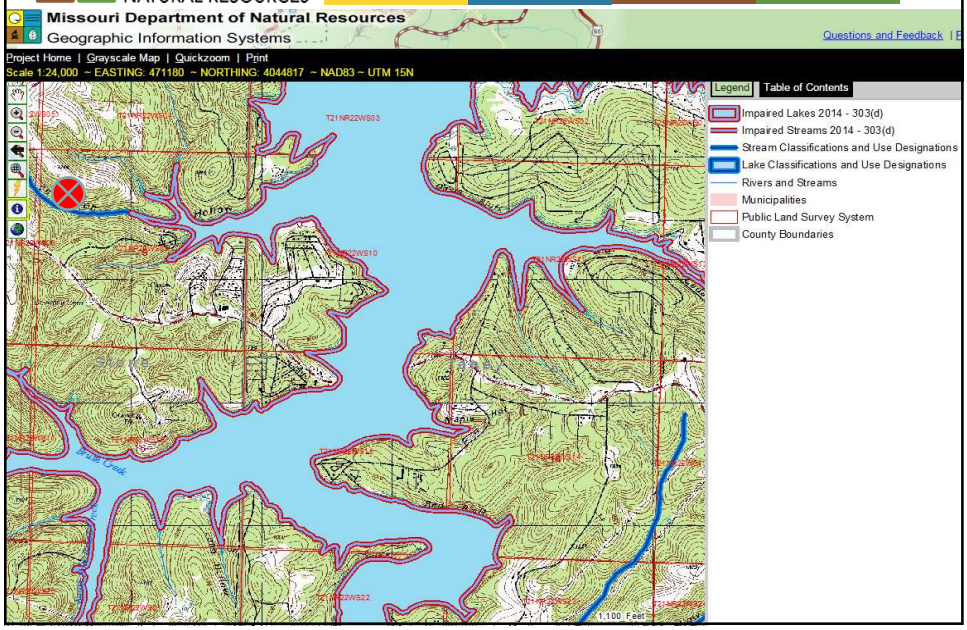
Stream Characterization



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John Doe Resort

- What Is The First Step?
  - Evaluate Non-degrading Options
- What is the Second Step?
  - Identify Receiving Water
- What Is The Third Step?

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John Doe Resort

- What Is The First Step?
  - Evaluate Nondegrading Options
- What is the Second Step?
  - Identify Receiving Water
- What Is The Third Step?
  - Note All of the Water Uses

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Stream Characterization

Fake Creek Classification

Layer	Stream Classifications and Use Designations
DNR assigned number used to identify water body	0XXX.0
Name as described in State Water Quality Standards	Fake Creek
Water body classification in State Water Quality Standards	P
Designated Use(s) of water body	AQL, LWW, SCR, IRR, WBCR(B)

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Stream Characterization

Rock Lake Classification

Layer	Lake Classifications and Use Designations
DNR assigned number used to identify water body	7XXX.0
Water body name	Rock Lake
Water body classification in State Water Quality Standards	L2
Size of water body in acres	57,005.0
Designated use(s) of water body	AQL, LWW, SCR, WBC A
Upstream and/or downstream county in which the water body resides	Crick County

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John Doe Resort

1. Evaluate Nondegrading Options
2. Identify Receiving Water
3. Note All of the Water Uses

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John Doe Resort

- What Is The Fourth Step?

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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern

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Pollutants of Concern

Pollutant		Pollutant	
BOD_5		pH	
DO		E. Coli	
TSS		TRC	
Summer Ammonia			
Winter Ammonia			

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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern
- What is the Fifth Step?

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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern
- What is the Fifth Step?
  - Assign Tiers To Each Pollutant

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Tier Determination (assumed)

Pollutant	Tier	Pollutant	Tier
BOD_5	2	**pH**	__
DO	2	**E. Coli**	2
TSS	__	**TRC**	2
Summer Ammonia	2		
Winter Ammonia	2		

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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern
- What is the Fifth Step?
  - Assign Tiers To Each Pollutant
- What is the Sixth Step?

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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern
- What is the Fifth Step?
  - Assign Tiers To Each Pollutant
- What is the Sixth Step?
  - Determine Stream Flows

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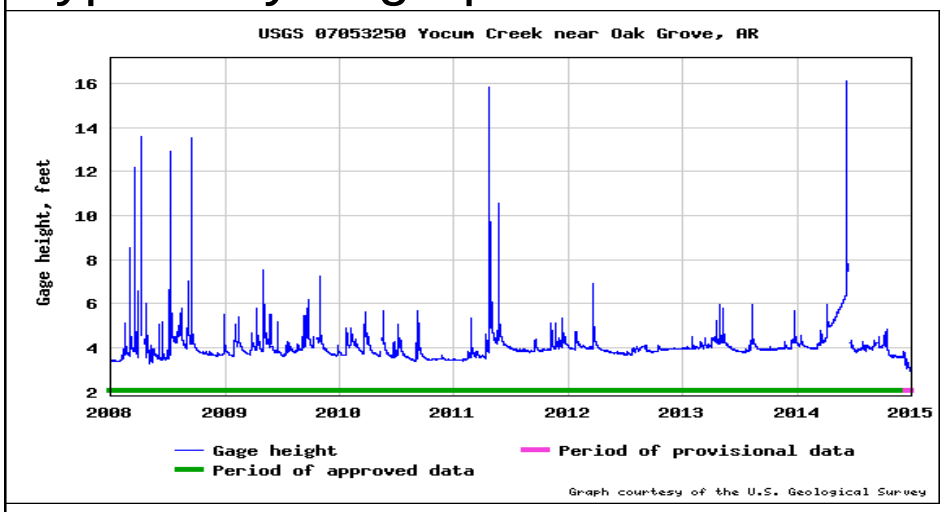
Typical Hydrograph



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Low Flow Values

- **1Q10: Lowest 1-day average flow that occurs (on average) once every 10 years.**
- **7Q10: Lowest 7-day average flow that occurs (on average) once every 10 years.**
- **30Q10: Lowest 30-day average flow that occurs (on average) once every 10 years.**

Low Flow Calculations

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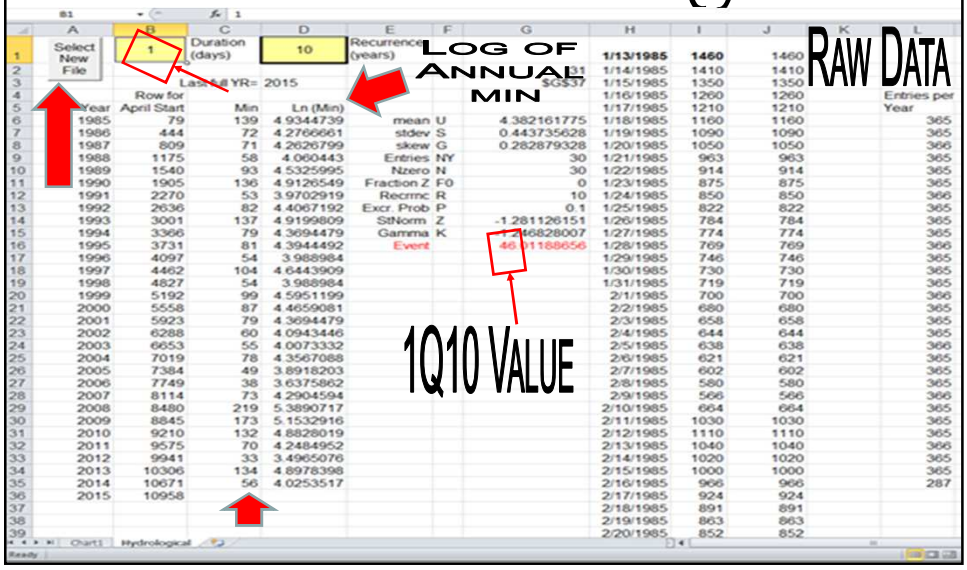
Low Flow Calculation – xQy



Low Flow Calcs

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Low Flow Calculation – xQy

Log Pearson Type III Distribution:

$$\text{Exp}\,[U + K\,(G, R(y))] * S$$

U = mean of **<u>Log e of historical annual low flows</u>**

K = the frequency factor for skewness G and return period y

G = skewness coefficient of **<u>log e of low flow values</u>**

S = standard deviation of **<u>log e annual minimums</u>**.

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Low Flow Calculation – 1Q10

Log Pearson Type III: Exp [U + K (G, R(y))] * S

mean	U	4.38
stdev	S	0.44
skew	G	0.28
Recrrnc	R (y)	10
Excr. Prob	P	0.1
StNorm	Z	-1.28
Gamma	K	-1.24
Event	1Q10 =	46.0 CFS

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Low Flow Calculation – 30Q10

mean	U	4.66
stdev	S	0.44
skew	G	-0.11
Recrrnc	R (y)	10
Excr. Prob	P	0.1
StNorm	Z	-1.28
Gamma	K	-1.29
Event	30Q10 =	59.9 CFS

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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern
- What is the Fifth Step?
  - Assign Tiers To Each Pollutant
- What is the Sixth Step?
  - Determine Stream Flows… an alternative method

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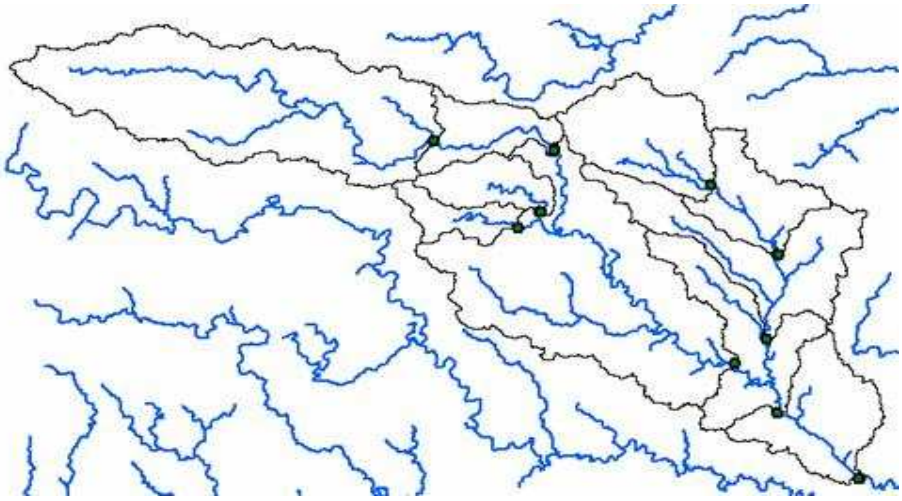
Stream Flow Estimation



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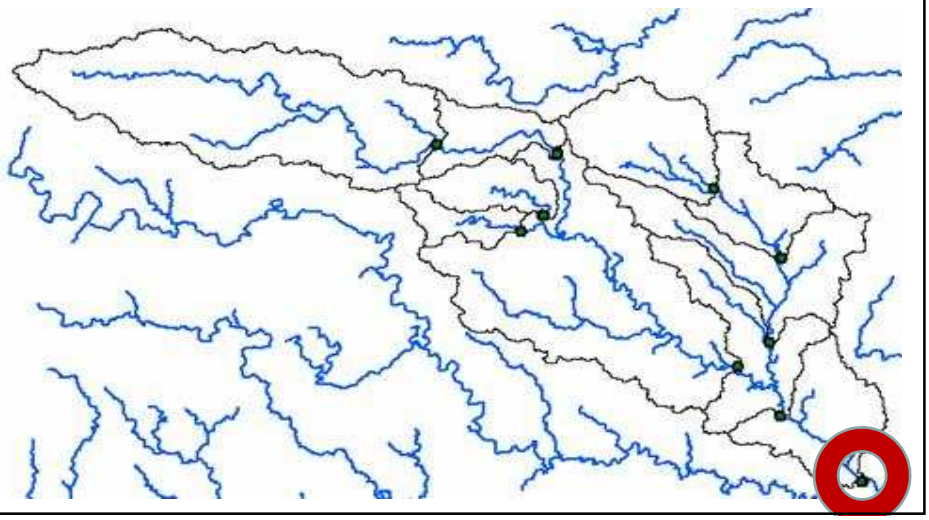
Stream Flow Estimation



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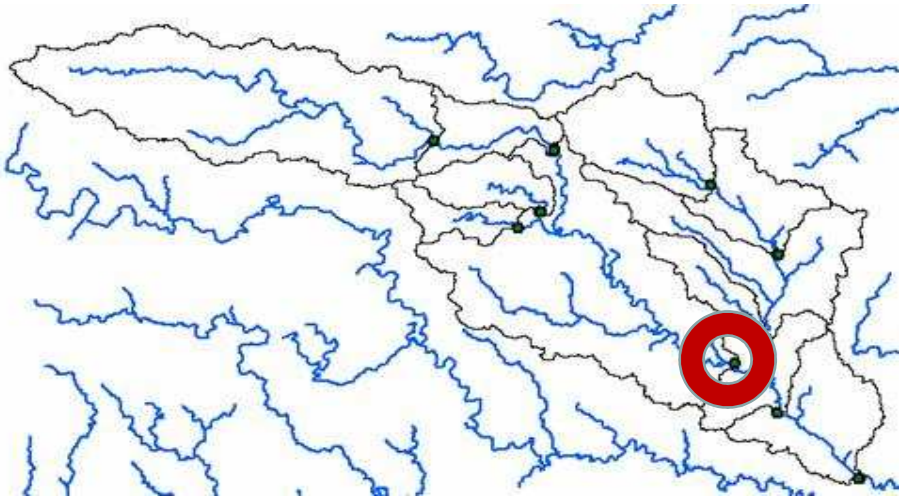
Stream Flow Estimation



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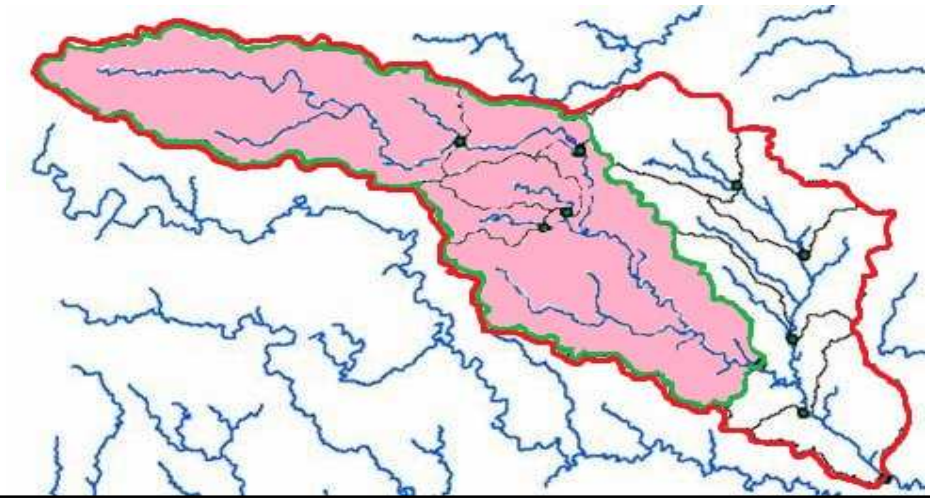
Stream Flow Estimation



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John Doe Resort

- What Is The Fourth Step?
  - List All Pollutants of Concern
- What is the Fifth Step?
  - Assign Tiers To Each Pollutant
- What is the Sixth Step?
  - Determine Stream Flows… Defaults

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Default Flows

	1Q10	7Q10	30Q10
Class **P** Streams (CFS)	0.1	0.1	1.0
Class **C** Streams (CFS)	0.0	0.0	0.1

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John Doe Resort

1. Evaluate Nondegrading Options
2. Identify Receiving Water
3. Note All of the Water Uses
4. List All Pollutants of Concern
5. Assign Tiers To Each Pollutant
6. Determine Stream Flows

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John Doe Resort

- What Is The Seventh Step?

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John Doe Resort

- What Is The Seventh Step?
  - Mixing

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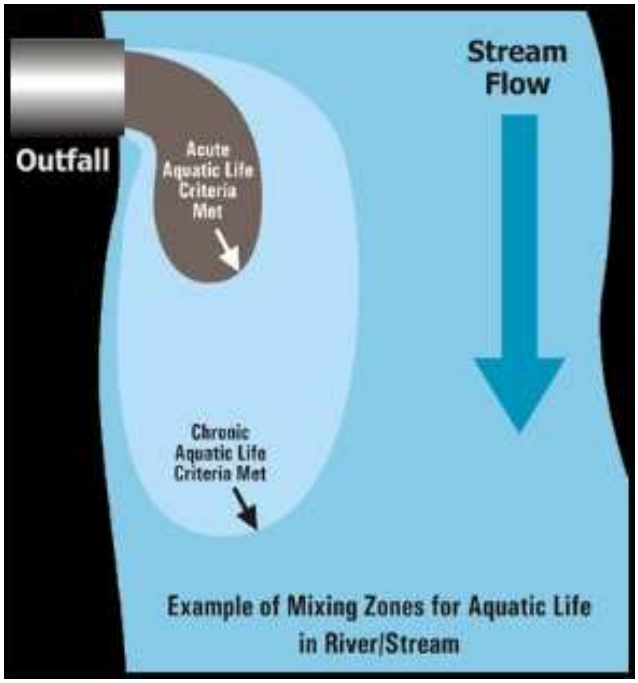
Toxics / Mixing

Ammonia
Metals



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John Doe Resort

- What Is The Seventh Step?
  - Mixing
- What is the Eighth Step?

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John Doe Resort

- What Is The Seventh Step?
  - Mixing
- What is the Eighth Step?
  - Calculate / Determine Minimum Requirements

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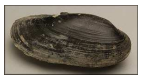

Default Ammonia Limits

Season	MDL (mg/L) ELS / Mussel	AML (mg/L) ELS / Mussel
Summer	**3.7 / 1.7**	**1.4 / 0.6**
Winter	**7.5 / 5.6**	**2.9 / 2.1**

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WQBEL Scenario: Ammonia

- Ammonia assumed Tier 2 in Fake Creek
- Calculate of WQBEL for Protection of beneficial uses (i.e., aquatic life) in Fake Creek.
  - *Mass balance equation*
  - "Technical Support Document for Water Quality-based Toxics Control", EPA/505/2-90-001
  - *Guidance: "Guidance for Water Quality and Antidegradation Review Assistance"*

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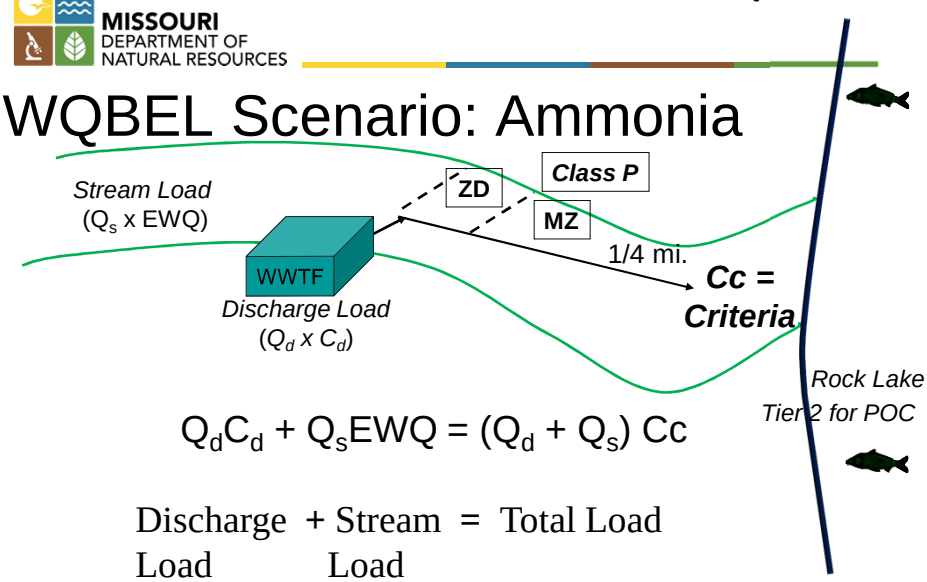
WQBEL Scenario: Ammonia



$$Q_dC_d + Q_sEWQ = (Q_d + Q_s)\ Cc$$

Discharge Load + Stream Load = Total Load

MZ = mixing zone, ZD = zone of initial dilution

WQBEL Scenario

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Two-value Steady-State WLA Procedure for Aquatic Life Protection

Step One: Calculate 2-value WLA (chronic and acute, (c, a))

Step Two: Use statistical procedure for LTAc, a and use minimum of LTAc, a in next step

Step Three: With minimum LTA, use statistical procedures for MDL and AML

WQBEL Scenario

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Step One: Water Quality Standards -- Current and Future Ammonia

ELS present / Mussels Present

Season	Temp (˚C)	pH (SU)	CCC (chronic) (mg/L)	CMC (acute) (mg/L)
Summer	26	7.8	1.5 / 0.7	12.1 / 3.4
Winter	6	7.8	3.1 / 2.3	12.1 / 13

WQBEL Scenario

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Step One: MZ and ZID

Mixing Zone (CFS) [10 CSR 20-7.031(5)(A)4.B.(III)(a)]			Zone of Initial Dilution (CFS) [10 CSR 20-7.031(5)(A)4.B(III)(b)]		
1Q10	7Q10	30Q10	1Q10	7Q10	30Q10
11.5	-	15	0.47 1.15	-	N/A

WQBEL Scenario

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Step One: WLA for Ammonia

Discharge Load + Stream Load = Total Load

Qd Cd + Qs EWQ = (Qd + Qs) Cc

Cd = [((Qd + Qs) Cc - Qs EWQ)/ Qd]

Acute

Cd = [((0.047 CFS + 0.47 CFS)* 12.1 mg/L – 0.47 CFS * 0.1 mg/L) / 0.047 CFS]

Cd = (6.3 CFS mg/L –0.047 CFS mg/L) / 0.047CFS

Cd = WLA_a acute summer = 133 mg/L

WQBEL Scenario

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Step Two: Long Term Average (LTA)

WLA_a = 133 mg/L (**Acute summer**)

The WLA is converted into a Long-Term Average effluent concentration that will meet the criteria design characteristics.

$LTA_a = WLA_a \times multiplier$ (or 0.780 for chronic)

LTA_a = 133 x (0.321) = **42.7 mg/L**

Multiplier based on Coefficient of Variation (CV) = 0.6, 99th Percentile

WQBEL Scenario

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Step Three: MDL / AML Statistics

Summer Limits: Maximum daily (MDL) and average monthly (AML) effluent limitations calculated.

$= min\ (LTA_a, LTA_c) \times multiplier$

MDL = **42.7 mg/L** (3.11) = 132.8 mg/L

[CV = 0.6, 99th Percentile]

AML = **42.7 mg/L** (1.19) = 50.8 mg/L

[CV = 0.6, 95th Percentile, n = 30]

"Technical Support Document for Water Quality-based Toxics Control" EPA/505/2-90-001

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WQBEL Scenario

Final Ammonia Limits

Season	MDL (mg/L) ELS / Mussel	AML (mg/L) ELS / Mussel
Summer	**132.8 / 36.8**	**50.8 / 14.1**
Winter	**132.8 / 143.4**	**50.8 / 54.9**

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John Doe Resort

- What Is The Seventh Step?
  - Mixing
- What is the Eighth Step?
  - Calculate / Determine <u>Minimum Requirements</u>

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Minimum Requirements

PARAMETER	Units	Concentration		
		DAILY MAX	WEEKLY AVERAGE	MONTHLY AVERAGE
BOD_5	mg/L		45	30
DO	mg/L	*		*
TSS	mg/L		45	30
Summer Ammonia	mg/L	132.8 / 36.8		50.8 / 14.1
Winter Ammonia	mg/L	132.8 / 143.4		50.8 / 54.9

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Minimum Requirements (cont')

PARAMETER	Units	Concentration		
		DAILY MAX	WEEKLY AVERAGE	MONTHLY AVERAGE
pH	SU	**		**
E. Coli (WBC – A)	#/100 ml	630		126
TRC	µg/L	17 (130 ml)		8 (130 ml)

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John Doe Resort

- What Is The Ninth Step?

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John Doe Resort

- What Is The Ninth Step?
  - Find a "Base Case" Technology and Identify Less Degrading Alternatives

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Alternative Analysis

Goal:

To identify a technology that performs such that the high quality waters in Missouri are not allowed to degrade to meet only the minimum standards.

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Alternatives

3 Types:

- Base Case
- Non-Degrading
- Less-Degrading

Reasonable?

- Practicable
- Economically Efficient
- Affordable

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Selection Criteria

- Economic Efficiency (120% rule of thumb)
- Reliability
- Maintenance / Operation Concerns
- Aesthetics
- Familiarity
- Footprint
- Phasing

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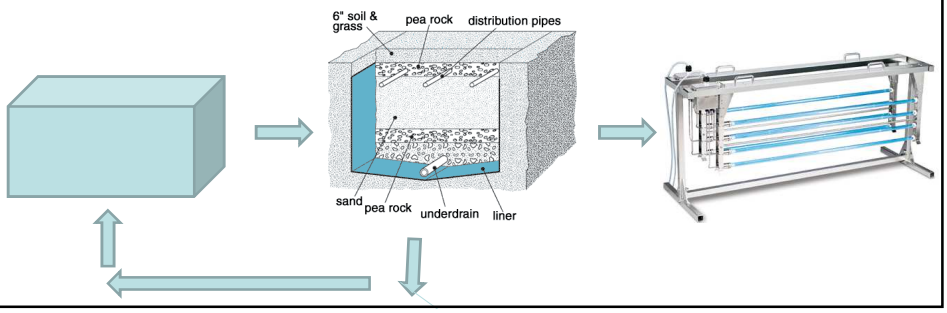
Base Case Alternative

- Equalization Tank, Recirculating Sand Filter, followed by UV disinfection



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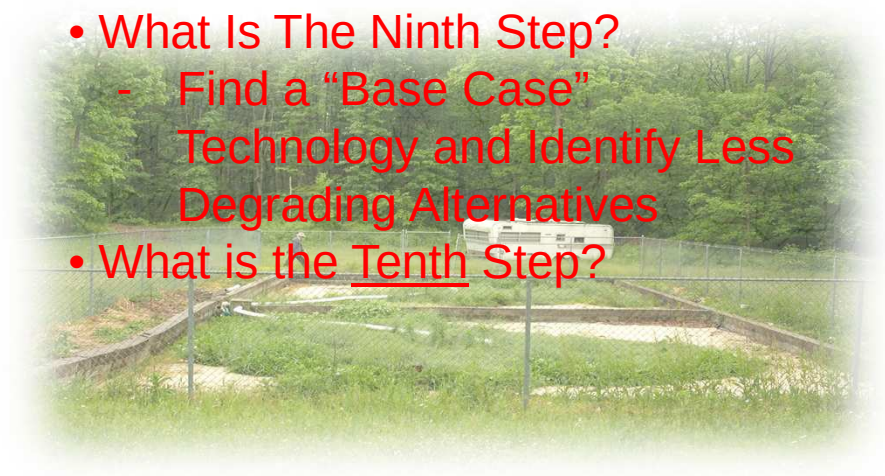
John Doe Resort

- What Is The Ninth Step?
  - Find a "Base Case" Technology and Identify Less Degrading Alternatives
- What is the Tenth Step?



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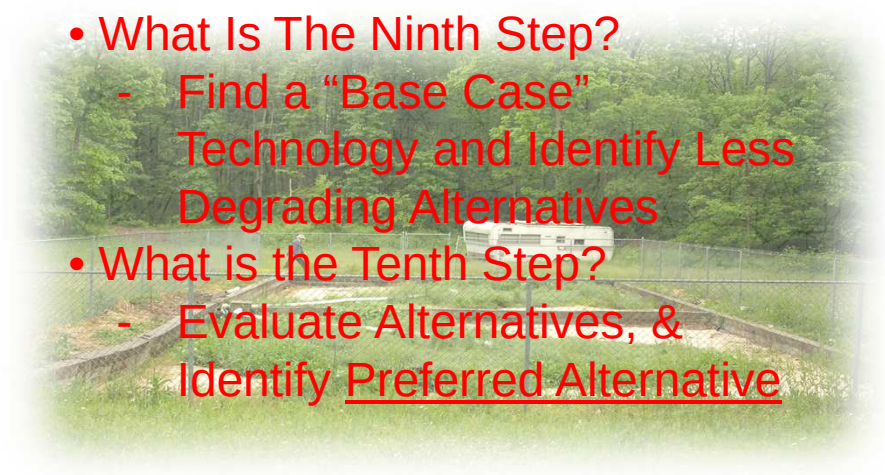
John Doe Resort

- What Is The Ninth Step?
  - Find a "Base Case" Technology and Identify Less Degrading Alternatives
- What is the Tenth Step?
  - Evaluate Alternatives, & Identify Preferred Alternative



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Non-Degrading Alternatives

- Regionalization
- Recycling or reusing wastewater (i.e., closed loop systems)
- Hold and transport to facilities for treatment (pump and haul)
- Alternative discharge location??? Truly non-degrading?
- Land application, subsurface irrigation – **evaluate soils, slope, calculate total application acreage, size lagoon, costs**

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Less-Degrading Alternatives

1. Equalization Tank, Recirculating Sand Filter, followed by UV disinfection
2. Mechanical Plant, Extended Aeration
3. Oxidation Ditch
4. Sequencing Batch Reactor

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Comparison of Treatment Alternatives

Parameter	Recirculating Sand Filter	Extended Aeration	Oxidation Ditch	Sequencing Batch Reactor
BOD	20	10	10	8
TSS	20	10	10	8
Ammonia	5	2	1.5	1.0
E. Coli	126	126	126	126
Practicability	Yes	Yes	Yes	Yes
Present Worth	$720,000	$1,130,000	$1,440,000	$1,580,000
Ratio	100%	157%	200%	219%
Economically Efficient	Yes	No	No	No

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Alternative Analysis Tips

- Always Look At Plant Life
  - How Will the Plant Meet Future Criteria?
    - Mussel Ammonia (always evaluate this)
- Present A Defensible Set Of Reasonable Alternatives
  - Find Appropriate Less-Degrading Options
    - Not Solely High Expense Options
    - Not Options That Don't Fit the Setting
- Find Alternatives That Are Truly Less-Degrading
  - Ask Vendors To Provide Data
- Good Alternatives Analysis Is Now A Point Of Emphasis Of Antidegradation Review

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Preferred Alternative

PARAMETER	Units	Concentration		
		DAILY MAX	WEEKLY AVERAGE	MONTHLY AVERAGE
BOD_5	mg/L		**30**	**20**
DO	mg/L	*		*
TSS	mg/L		**30**	**20**
Summer Ammonia	mg/L	**13**		**5**
Winter Ammonia	mg/L	**26**		**10**

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Preferred Alternative (cont')

PARAMETER	Units	Concentration		
		DAILY MAX	WEEKLY AVERAGE	MONTHLY AVERAGE
pH	SU	**		**
E. Coli (WBC – A)	#/100 ml	**630**		**126**
TRC	µg/L			

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John Doe Resort

- What Is The Eleventh Step?

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John Doe Resort

- What Is The Eleventh Step?
  - Social & Economic Importance

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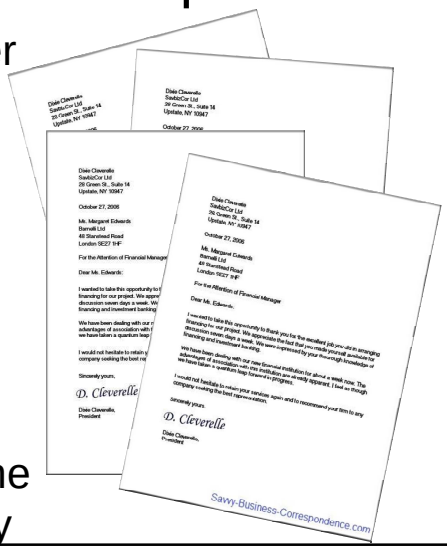
Social and Economic Importance

Suggest obtaining letter of support from community leader indicating that

1) Degradation is acceptable

2) The project has economic benefits to the surrounding community



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1. Evaluate Nondegrading Options
2. Identify Receiving Water
3. Note All of the Water Uses
4. List All Pollutants of Concern
5. Assign Tiers To Each Pollutant
6. Determine Stream Flows
7. Mixing
8. Calculate / Determine Minimum Requirements
9. Find a “Base Case” Technology and Identify Less Degrading Alternatives
10. Evaluate Alternatives, & Recommend Preferred Alternative
11. Social & Economic Importance

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To Make Your Review Go Smoothly:

- Seek Assistance/Direction Early
  - Pre-application meeting
- Website
- Forms, Signatures, Fees
- Do A Heritage Report
- Well Written Documents

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To Make Your Review Go Smoothly:

- Economic Comparison – Use Present Worth
- Establish Rapport With Reviewer, Raise Issues With Unit Chiefs
- Engineer's Role Is To Present the Antideg Alternatives To the Owner As A Decision Tool

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2015 Engineering Workshop Antidegradation Case Study

John Rustige, P.E. & Todd Blanc

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Key Concepts

<u>True or False?</u>

You need collect stream data to determine what “Tier” a receiving water is?

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Key Concepts

False!

The Antidegradation Implementation Procedure allows you to assume a water is Tier 2 if you don't have information.

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Key Concepts

How many less-degrading options should each project consider?

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Key Concepts

At a minimum each project should consider three non-degrading options and at least two less degrading options.

In general, the department would like to see three or four less-degrading options, and in the future may ask for more if we think there is a technology that is worthy of evaluation for your project.

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Key Concepts

What is a “Tier 3” water?

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Key Concepts

Tier 3 waters are specifically designated in regulation, and they include the outstanding national and state resource waters (10 CSR 20-7.031 Tables D & E). No lowering of water quality is allowed in Tier 3 waters.

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Key Concepts

True or False?

30Q10 is defined as the lowest 30-day average flow that occurs (on average) once every 10 years.

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Key Concepts

True!

30Q10 is defined as the lowest 30-day average flow that occurs (on average) once every 10 years.

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Check All That Apply:

Factors that can used to document Social and Economic Importance:

- ❑ Number of New Jobs
- ❑ Economic Condition of Community
- ❑ Location of Vendor
- ❑ Approval of Zoning
- ❑ Identity Downstream Landowner
- ❑ Community Health Goals
- ❑ Enforcement Status of Existing Facility
- ❑ Description of Recreational Opportunities in Receiving Water
- ❑ Discussion of Local Housing Market
- ❑ Importance of Development to the Owner
- ❑ Endangered Species
- ❑ Bankruptcy Status
- ❑ Percentage of Project Sourced By American Manufacturing

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Facility Plans and Engineering Reports

Cailie Carlile
cailie.carlile@dnr.mo.gov
573-751-1714

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Names (10 CSR 20-8.020 and 10 CSR 20-8.110)

Engineer's Report <22,500 gpd

Only when required by DNR

Engineering Report ≥22,500 gpd

Gravity or pressure sewers, pump stations, force mains

Facility Plan ≥22,500 gpd

- WWTF changes
- Funded through DNR Grant and Loan Programs at 10 CSR 20-4

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Facility Plan/Engineering Report

Applicability

- ≥ 22,500 gpd
- For Projects that require a CP
- NOT required for 8 in sewer extensions

ONE Paper copy and electronic copy

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Facility Plan/Engineering Report

- Identify and Evaluate problem(s)
- Basic information
- Design criteria and assumptions
- Alternatives (not for ER)
- Preliminary layouts - maps, photos, diagrams
- Conclusion and Recommended Alternative

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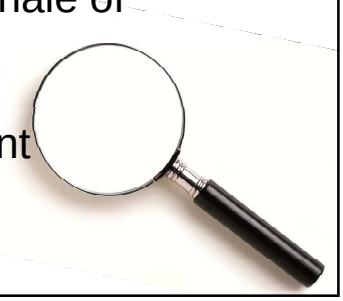
Level of Detail

- Detail and size of the report depends on the scope of the project
- Enough detail to follow rationale of selected alternative
- Project should be transparent



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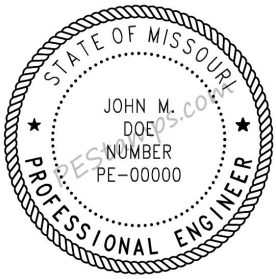
Title Page



- ✓ Name of Project
- ✓ Owner of System
- ✓ Continuing Authority
- ✓ Name, Address, Phone, Email
  for Owner AND Engineer
- ✓ Date of Submittal
- ✓ **<u>Missouri P.E. Seal and Signature</u>**

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Project Description and Site Info

Written description of proposed project

Conditions and problems needing correction

- SOC
- Enforcement orders
- I&I issues
- CSOs, SSOs

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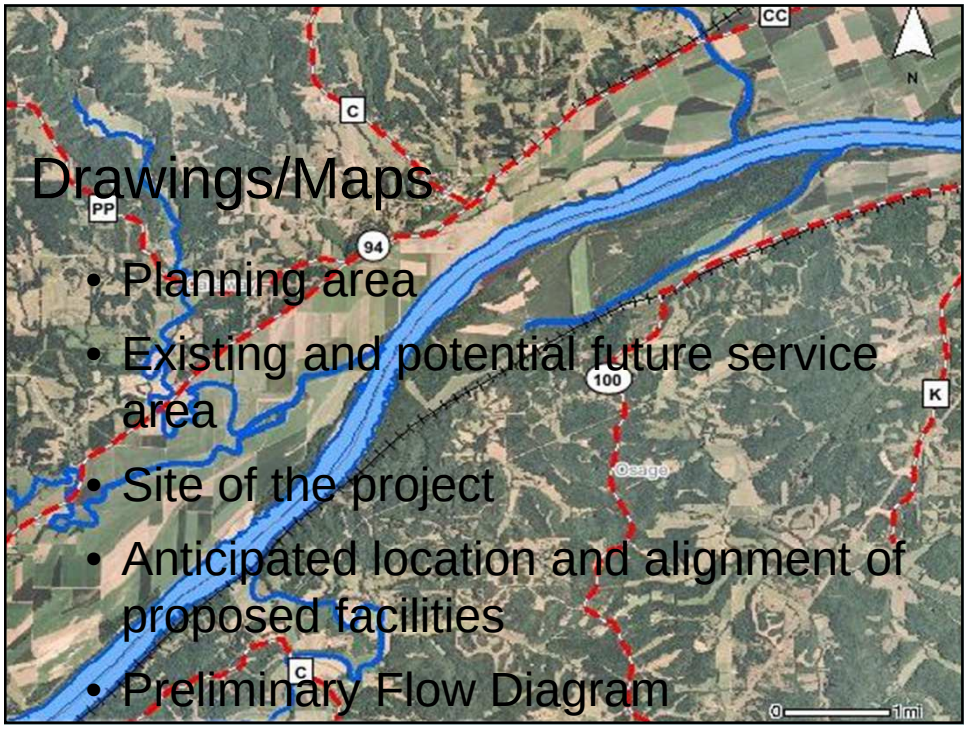
Project Description and Site Info

Geological site evaluation from MGS required for new WWTFs and all earthen basins

<u>If Applicable</u>:

Topography, soils, geologic conditions, depth to bedrock, groundwater level, floodplain considerations, distance to water supply structures, roads, residences, etc.



Drawings/Maps

- Planning area
- Existing and potential future service area
- Site of the project
- Anticipated location and alignment of proposed facilities
- Preliminary Flow Diagram

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Flow for Existing Systems

Permitted Design Flow or **Actual Flow**

Impact on all existing wastewater facilities, including gravity sew
stations, and treatment facilitie

Lagoons – Influent Monitoring

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Flow for New Systems

Average Daily Flow:

≥ 100 gallons per capita per day

Peak Flows:

$$Q = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Q = Peak Hourly Flow / Design Average Flow

P = Population **in thousands**

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Existing BOD and TSS Loading

Projections shall be made from

ACTUAL WASTELOAD DATA

to the extent possible

Influent Wastewater tests to characterize the Actual Organic loading rate

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Organic Loading for New Systems

≥ **0.17 lbs. BOD_5** per capita per day

≥ **0.20 lbs. Suspended Solids** per capita per day

- Unless justified in writing

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Proposed Conditions and Loads

Design capacity is the design average flow at the design average BOD_5

Based on **20 YEAR** planning period

Projections shall be made from **ACTUAL DATA** to the extent possible

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Detailed Alternatives Evaluation

- May be done as part of Antide
- Consider several options
- Consider no-discharge system
- Estimate Present Worth
- Estimate User Charge

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Detailed Alternatives Evaluation

- Land use restrictions
- Future plant expansion
- Geologic considerations
- Present and Future effluent limits
- Outfall location and access
- Unit Sizing
- Flow diagram
- Emergency Operation

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Alternatives Evaluation – LAND APP

- Land availability
  - Cost
  - Lease vs. buy
  - Space Required based on Application Rate & Storage
- Geohydrologic and Soils Info
  - Surface vs. subsurface
  - Application Rates
- Present Worth Cost vs. lifecycle of mechanical

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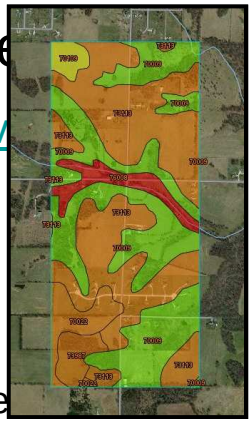
Land Application Resource



- http://websoilsurvey.nrcs.usda.gov
  - Slope
  - Soil Types
  - Drainage
  - Frequency of Flooding
  - Capacity to store and transmit wate
  - Depth to water table and restrictive feature
  - Suitability for several methods of land application

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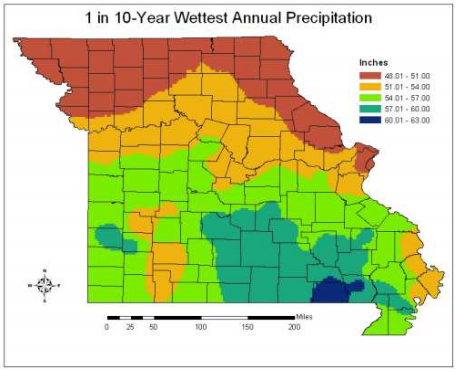
Land Application Resources

Missouri Climatic Atlas for Design of Land Application Systems

- 1 in 10-year Precipitation
- Evaporation Rates



Available at our construction permitting

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Recommended Project

- Capital, O&M, & Present Worth Cost
- Estimated User Charge
- Design Average & Peak Flows
- Design Organic Loading
- Units to be Upgraded
- Average & Peak Hourly Flow for Pumps Stations & Sewers
- Engineering Criteria for Preliminary Sizing

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Engineering Design Criteria

10 CSR 20-8 – **Design Guides**

Deviations allowed with adequate technical justification

Identify **Assumptions**

Criteria and **calculations** to determine design flow, velocity, pipe size, pumping station calculations, and preliminary unit sizing

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Flood Considerations

Treatment works structures, electrical and mechanical equipment shall be

- Protected from Physical Damage by the **100 year flood**
- Fully Operational & Accessible during the **25 year flood**

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Emergency Operation – Pump Stations

A method to **prevent or minimize overflows**

- Storage Capacity
- Pump driven by internal combustion engine
- 2 independent public utility sources or engine-driven generating equipment

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Emergency Operation - WWTF

Alternate source of electric power to allow **continuity of operation** during power failures

- 2+ independent public utility sources,
- Internal combustion engine equipment
- Portable pumping equipment when only emergency pumping is required.
- **Continuous disinfection**

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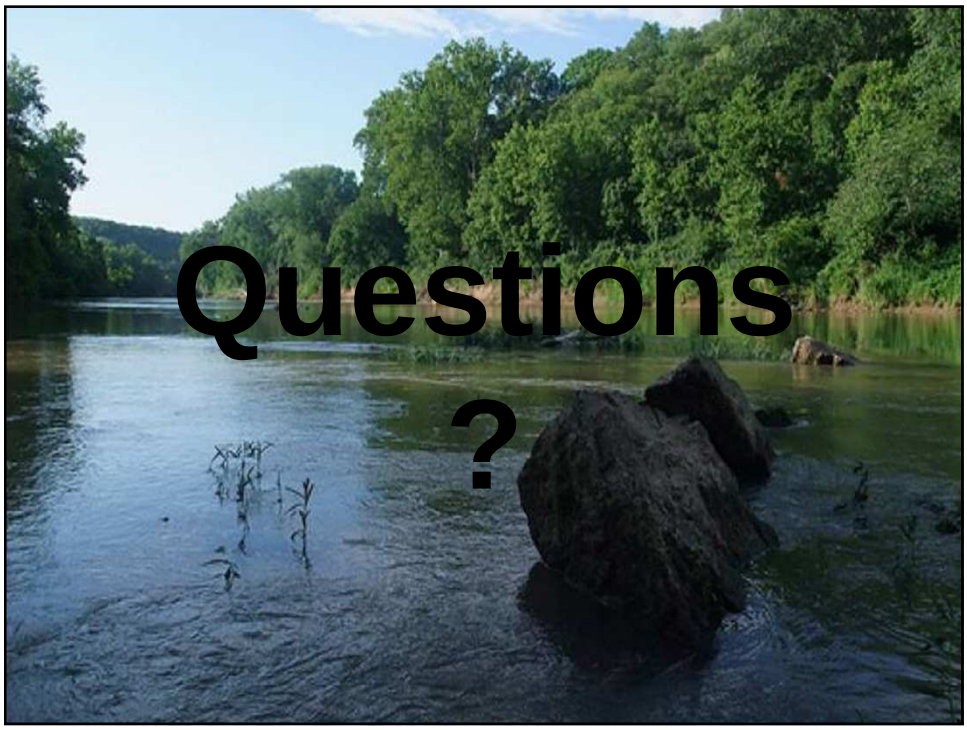
Next Steps

Your FP or ER approval letter will include guidance on what the next steps are



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Blending

Excessive I&I

Missouri's Approach on Blending 2015 Engineering Workshop

VCA

Refaat Mefrakis, P.E.
Engineering Section
November 2015

Outfall 2

Peak flow Clarifiers

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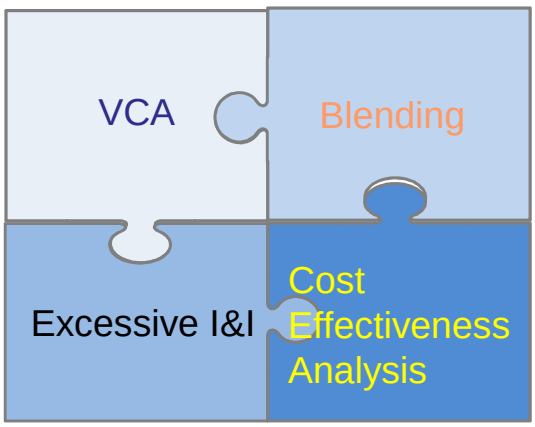
Discussions



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Diversion to Peak Flow Clarifiers

- Approximately 55 communities diverted high peak influent flows to primary treatment and discharged (Outfall 002).
- Missouri received an interim objection from EPA in 2009. EPA considers the practice a bypass and must not be authorized in permits.

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Voluntary Compliance Agreement

- Allowed ten (10) yrs. to eliminate Outfall 002 Discharges
- Required the development of Outfall Elimination Plan (includes I & I reduction plan)
- Must not blend as VCA was originally developed

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Iowa League vs. EPA Decision

- In 2013, the U.S Court of Appeals for the Eight Circuit rendered a decision which vacated EPA's policy letter prohibiting blending at WWTPs.
- The decision has implications for Missouri communities with peak flow clarifiers (also commonly called "Outfall 002").
- Missouri decided to entertain revision to these agreements for cities that wish to incorporate blending as part of their treatment solution when appropriate.

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Definition of bypass in State rule

10 CSR 20-7.015(9)(G) defines bypass as: "Bypass means the **intentional diversion of waste streams from any portion of a treatment facility**, **except in the case of blending**…"

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What is Blending?

Blending is the practice of diverting wet-weather flows around any treatment unit and **recombining those flows within the treatment facility**, while providing primary and secondary or biological **treatment up to the available capacity**, **consistent with all applicable effluent limits and conditions.**

10 CSR 20-7.015(9)G

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May blend if

- It can be demonstrated that BOD and TSS treatment efficiencies in accordance with 40 CFR 133.103(d).
  - It is recognized that it may be difficult to meet the 85 % removal requirement. Alternative removal efficiency can be allowed.
  - For situations where the diverted flow is blended with the treatment plant effluent, the 85% removal requirement is based on the combined effluent outfall and the influent, measured at the headworks. Percent removal is based on a 30 day average.

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Blending- Factors to consider

- Practical way to manage wet weather flows
- Protects wastewater treatment infrastructure
- Protect the biological systems
- Prevent basement backups
- Prevents overflows in the collection system
- Pump back from storage reduces design capacity of a treatment facility
- Future regulatory uncertainty

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- Storage requires large footprint
- Pathogens must be fully treated to protect public health
- Flow increases as a community grows or infrastructure ages
- Blending is not a long term solution to excessive peak flows.
- Difficult to meet removal efficiency
- Must be authorized in a permit
- Permits will require more monitoring during the event

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Removal efficiency

- 40 CFR 133.103 (d) allows lower removal when the POTW has a less concentrated influent

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Conditions for lower efficiency

- Must constantly meet effluent limits
- Treatment would have to meet significantly more stringent limitations than otherwise be required
- Less concentrated influent wastewater to the treatment works is not the result of excessive I/I

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EPA definition of excessive flow

- 40 CFR Part 35.2005(b)(16) *Excessive infiltration/inflow*. The quantities of infiltration/inflow which can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the infiltration/inflow conditions to the total costs for transportation and treatment of the infiltration/inflow.

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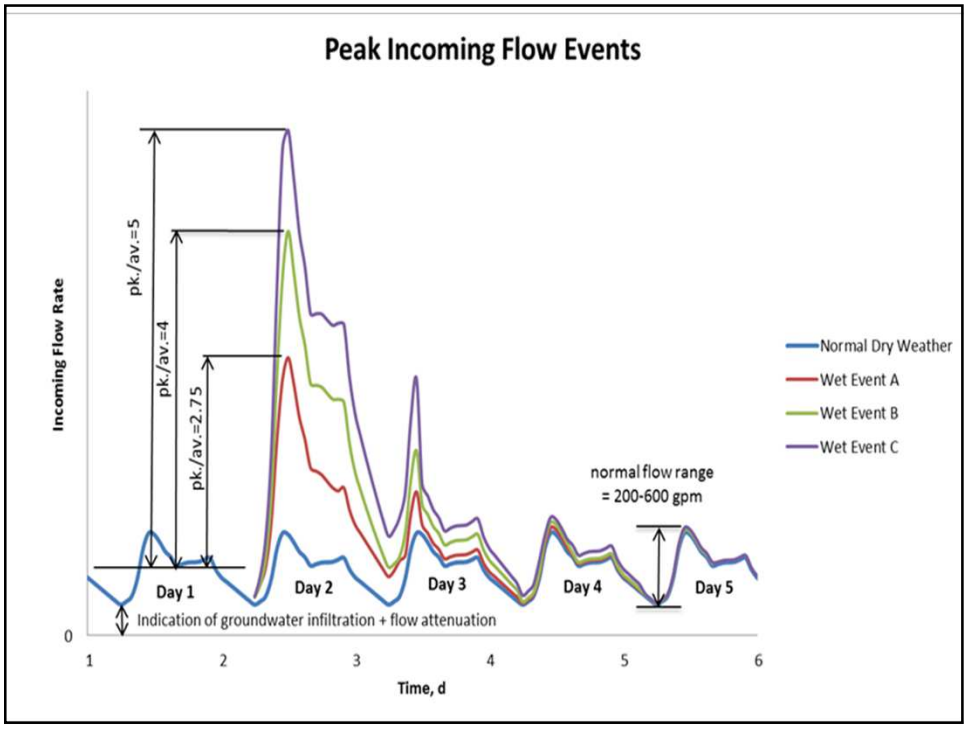
Excessive I & I criterion for sanitary sewer systems

- Excessive I & I is defined as the quantities of I & I that can be economically eliminated from a sewer system versus transport and treatment, or
- Is greater than a total flow (wastewater plus inflow plus infiltration) of 275 gallons per person per day.



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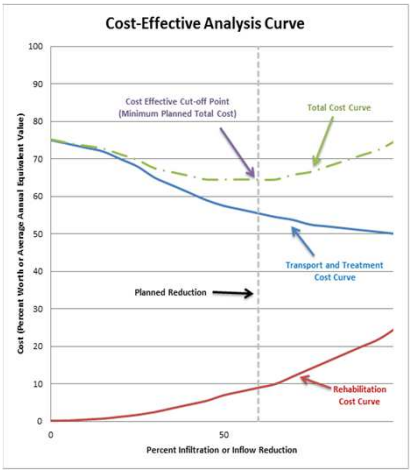
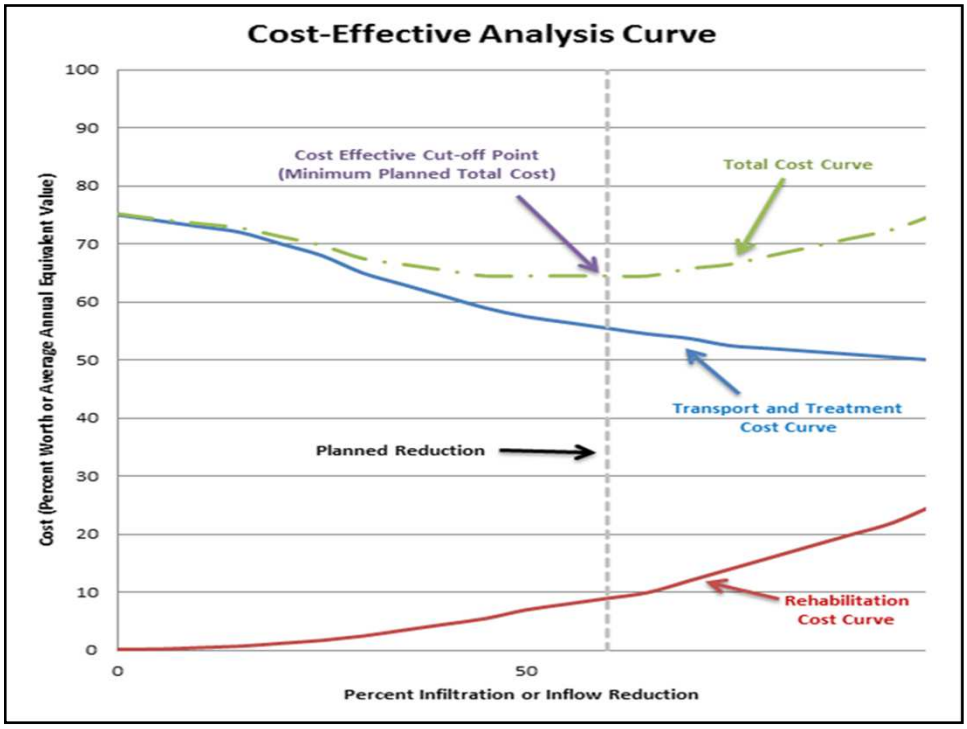
Cost effectiveness analysis at various levels of I/I removal

- Cost of transport and treating existing I/I
- Cost of I/I reduction- Include rehabilitation, repair, replacement and engineering.





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NPDES Permit Modification/Renewal Ap

- Must be authorized in the permit
- Provide “design blend” flow/ Water balance diagram
- Permit Requirements
  - Bypasses not authorized must be reported
  - Monitoring influent and effluent for BOD/TSS as a 24-hr composite once per day during blending events
  - Meet the removal efficiency on a 30-day average

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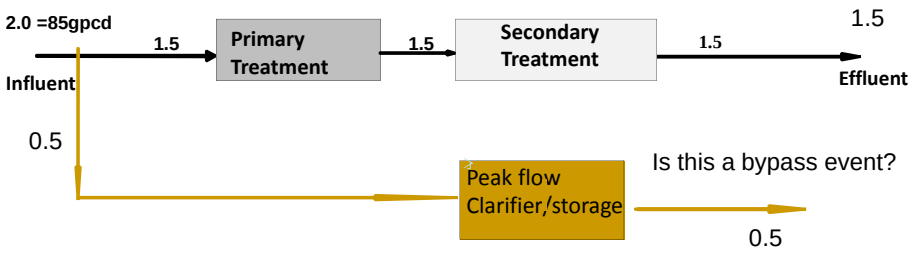
Dry flow



Values in MGD

YES

139

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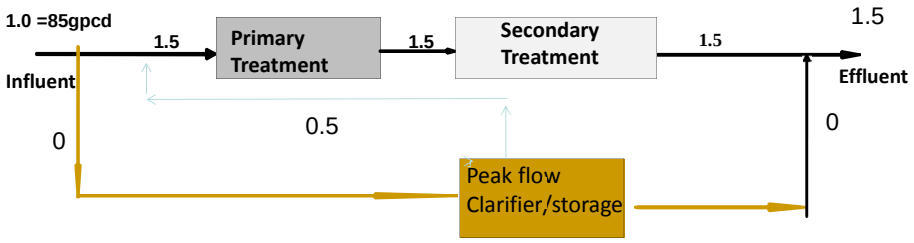
Dry flow



Values in MGD

140

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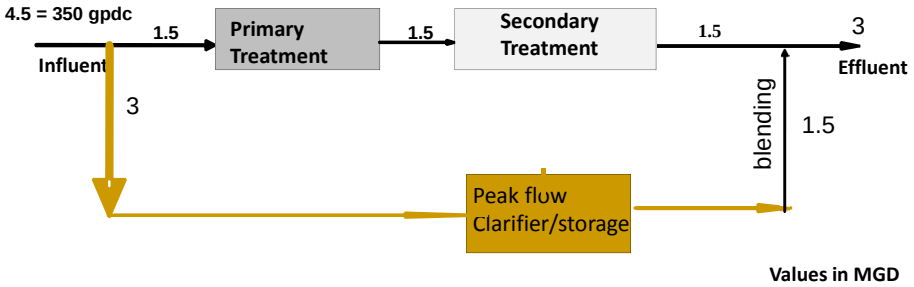
Excessive I &I Blending/Bypasses During Wet Weather

Given:
Not meeting 275 criteria
meets limits, %removal, and conditions

Is this a Bypass event?



141

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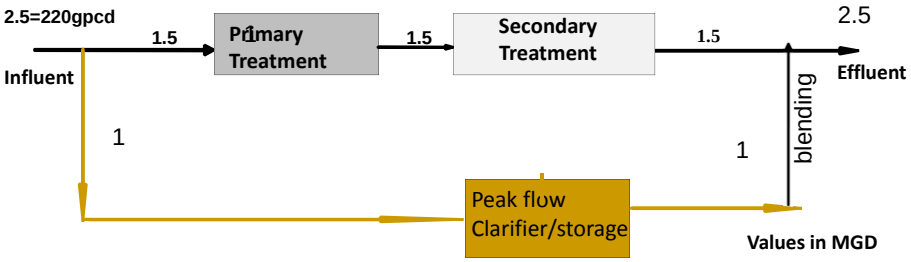
Blending/Bypasses During Wet Weather Event

Given:
Meets 275 criteria
Does not meet removal efficiency

Is this a bypass?



142

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What is Blending?

Blending is the practice of diverting wet-weather flows around any treatment unit and **recombining those flows within the treatment facility**, while providing primary and secondary or biological **treatment up to the available capacity**, **consistent with all applicable effluent limits and conditions.**

10 CSR 20-7.015(9)G

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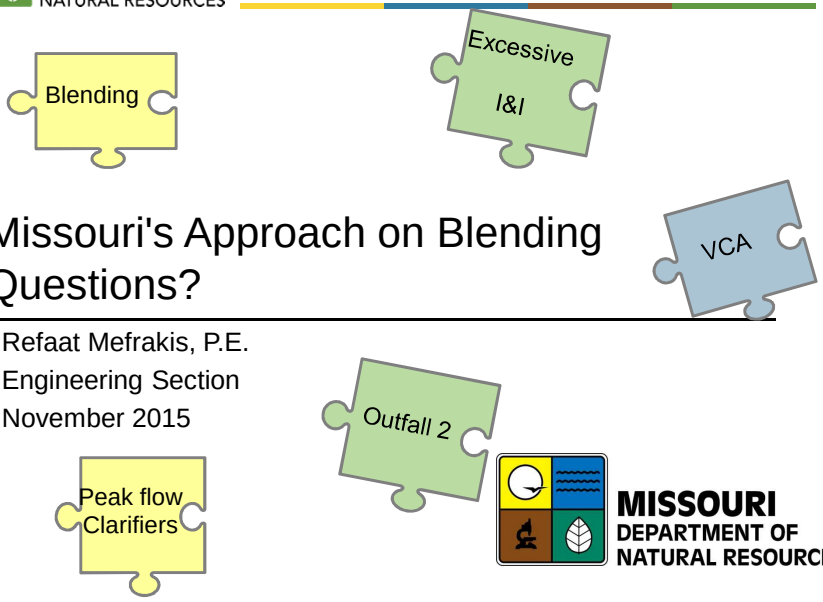

Missouri's Approach on Blending Questions?

Refaat Mefrakis, P.E.
Engineering Section
November 2015

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- Geohydrologic Evaluations - Environmental Assistance Unit

Fletcher Bone, Geologist
Geological Survey Program

Wastewater Engineering – Regulation Changes and Construction Permit Process
March 26, 2015 St. Louis, Missouri

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What is a Geohydrologic Evaluation?

- The objective of a geohydrologic evaluation is to examine site-specific geologic and hydrologic conditions.
- Determine the potential of the facility to impact groundwater.

When do I Need to Have a Geohydrologic Evaluation Performed?

- In accordance with 10 CSR 20-7.010 through 10 CSR 20-7.031

and

- 10 CSR 20-8.020 through 10 CSR 20-8.500, these evaluations are required for:

When do I Need to Have a Geohydrologic Evaluation Performed?

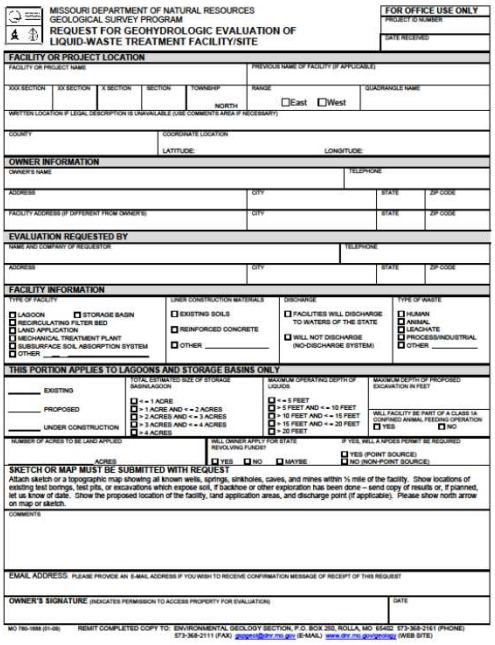
- Both new and modified earthen lagoons, with or without discharge
- Mechanical treatment plants
- Recirculating filter beds
- Land application sites
- Other types of wastewater treatment facilities

When do I Need to Have a Geohydrologic Evaluation Performed?

At the beginning stages of the permitting process.

Where Can I Get the Request for a Geohydrologic Evaluation??

- Missouri Department of Natural Resources website at http://dnr.mo.gov
  - Forms and Permits tab
    - Search the Geology Category
      - Geological Survey
        - » Request for Geohydrologic Evaluation of Liquid-Waste Treatment Facility/Site



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GEOLOGICAL SURVEY PROGRAM
REQUEST FOR GEOHYDROLOGIC EVALUATION OF LIQUID-WASTE TREATMENT FACILITY/SITE

FOR OFFICE USE ONLY
PROJECT ID NUMBER
DATE RECEIVED

FACILITY OR PROJECT LOCATION
FACILITY OR PROJECT NAME | PREVIOUS NAME OF FACILITY (IF APPLICABLE)
XXX SECTION | XX SECTION | X SECTION | SECTION | TOWNSHIP NORTH | RANGE ☐East ☐West | QUADRANGLE NAME
WRITTEN LOCATION IF LEGAL DESCRIPTION IS UNAVAILABLE (USE COMMENTS AREA IF NECESSARY)
COUNTY | COORDINATE LOCATION LATITUDE: LONGITUDE:

OWNER INFORMATION
OWNER'S NAME | TELEPHONE
ADDRESS | CITY | STATE | ZIP CODE
FACILITY ADDRESS (IF DIFFERENT FROM OWNER'S) | CITY | STATE | ZIP CODE

EVALUATION REQUESTED BY
NAME AND COMPANY OF REQUESTOR | TELEPHONE
ADDRESS | CITY | STATE | ZIP CODE

FACILITY INFORMATION
TYPE OF FACILITY: ☐ LAGOON ☐ STORAGE BASIN ☐ RECIRCULATING FILTER BED ☐ LAND APPLICATION ☐ MECHANICAL TREATMENT PLANT ☐ SUBSURFACE SOIL ABSORPTION SYSTEM ☐ OTHER _____
LINER CONSTRUCTION MATERIALS: ☐ EXISTING SOILS ☐ REINFORCED CONCRETE ☐ OTHER _____
DISCHARGE: ☐ FACILITIES WILL DISCHARGE TO WATERS OF THE STATE ☐ WILL NOT DISCHARGE (NO-DISCHARGE SYSTEM)
TYPE OF WASTE: ☐ HUMAN ☐ ANIMAL ☐ LEACHATE ☐ PROCESS/INDUSTRIAL ☐ OTHER _____

THIS PORTION APPLIES TO LAGOONS AND STORAGE BASINS ONLY
_____ EXISTING
_____ PROPOSED
_____ UNDER CONSTRUCTION
TOTAL ESTIMATED SIZE OF STORAGE BASIN/LAGOON: ☐ <= 1 ACRE ☐ > 1 ACRE AND <= 2 ACRES ☐ > 2 ACRES AND <= 3 ACRES ☐ > 3 ACRES AND <= 4 ACRES ☐ > 4 ACRES
MAXIMUM OPERATING DEPTH OF LIQUIDS: ☐ <= 5 FEET ☐ > 5 FEET AND <= 10 FEET ☐ > 10 FEET AND <= 15 FEET ☐ > 15 FEET AND <= 20 FEET ☐ > 20 FEET
MAXIMUM DEPTH OF PROPOSED EXCAVATION IN FEET
WILL FACILITY BE PART OF A CLASS 1A CONFINED ANIMAL FEEDING OPERATION: ☐ YES ☐ NO
NUMBER OF ACRES TO BE LAND APPLIED: _____ ACRES
WILL OWNER APPLY FOR STATE REVOLVING FUNDS? ☐ YES ☐ NO ☐ MAYBE
IF YES, WILL A NPDES PERMIT BE REQUIRED: ☐ YES (POINT SOURCE) ☐ NO (NON-POINT SOURCE)

SKETCH OR MAP MUST BE SUBMITTED WITH REQUEST
Attach sketch or a topographic map showing all known wells, springs, sinkholes, caves, and mines within ½ mile of the facility. Show locations of existing test borings, test pits, or excavations which expose soil, if backhoe or other exploration has been done -- send copy of results or, if planned, let us know of date. Show the proposed location of the facility, land application areas, and discharge point (if applicable). Please show north arrow on map or sketch.

COMMENTS

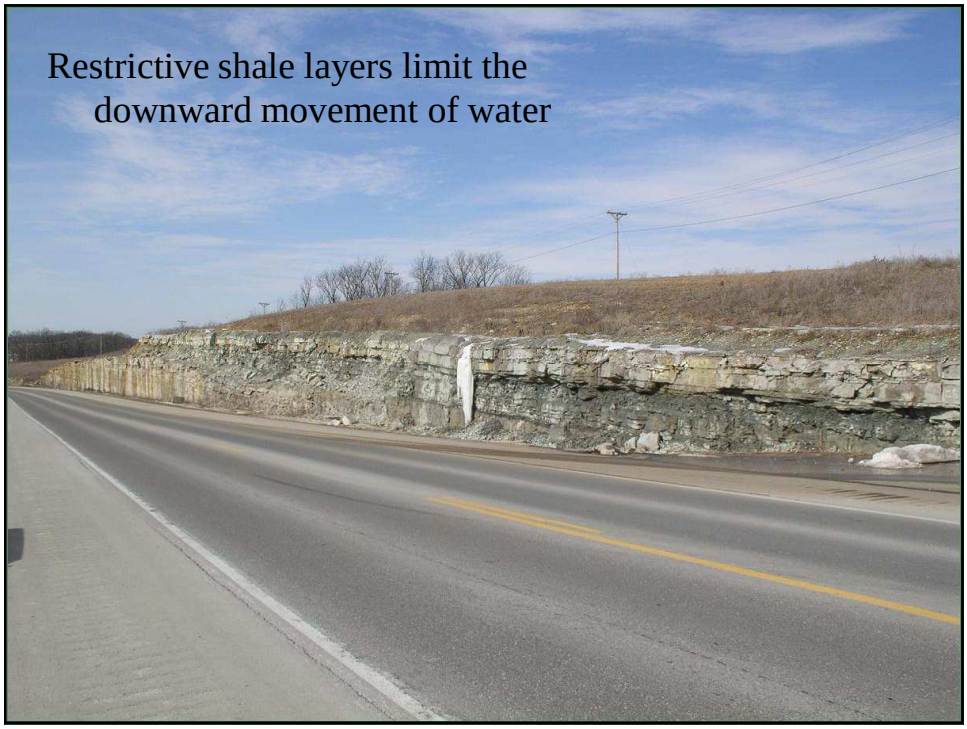
EMAIL ADDRESS: PLEASE PROVIDE AN E-MAIL ADDRESS IF YOU WISH TO RECEIVE CONFIRMATION MESSAGE OF RECEIPT OF THIS REQUEST

OWNER'S SIGNATURE (INDICATES PERMISSION TO ACCESS PROPERTY FOR EVALUATION) | DATE

MO 780-1888 (01-09) REMIT COMPLETED COPY TO: ENVIRONMENTAL GEOLOGY SECTION, P.O. BOX 250, ROLLA, MO 65402 573-368-2161 (PHONE) 573-368-2111 (FAX) geogwr@dnr.mo.gov (E-MAIL) www.dnr.mo.gov/geology (WEB SITE)

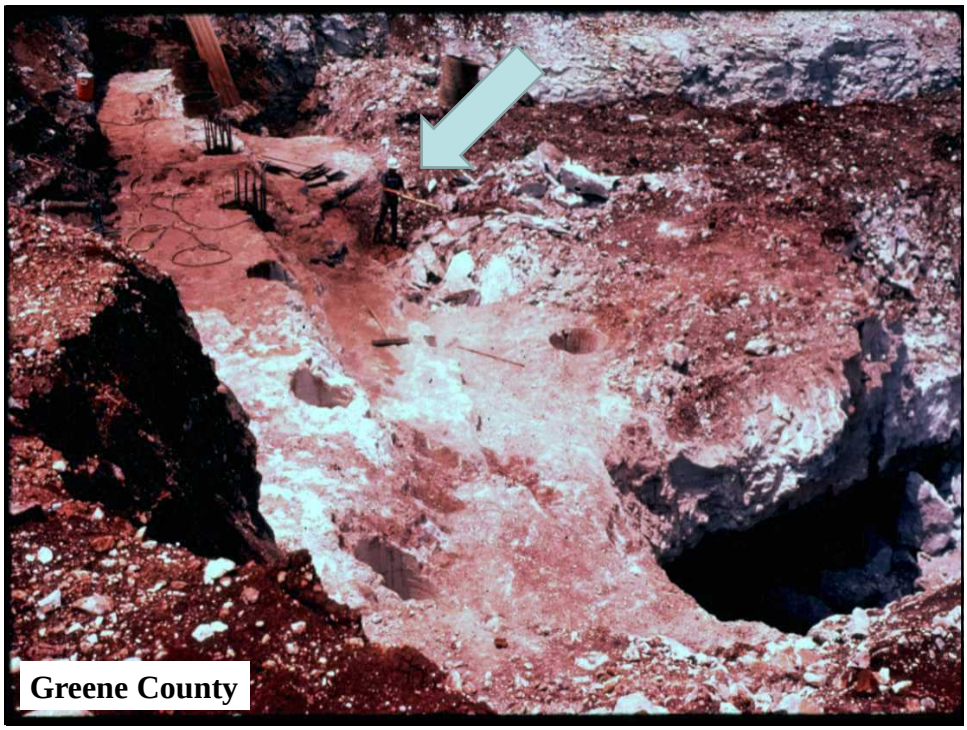
Site Visit By a Geologist…What Are We Looking At?

- Bedrock - permeability



Groundwater is found in fractures

Christian County


Greene County

Site Visit By a Geologist…What Are We Looking At?

- Bedrock - permeability
- Surficial materials - permeability

Surficial materials are highly variable
- Thick deposits
- Wind-blown Loess (up to 50 feet)
- Glacial Till (up to 200 feet)

Broad and flat alluvial plain

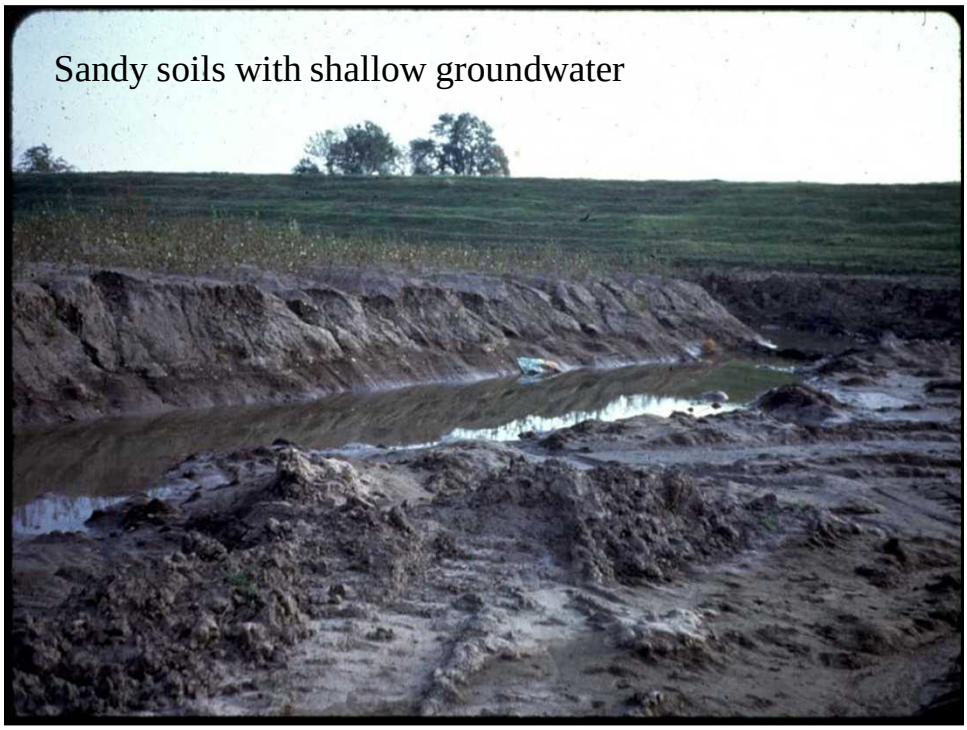
Camden County

Dallas County

Greene County

Site Visit By a Geologist…What Are We Looking At?

- Bedrock - permeability
- Surficial materials - permeability
- Hydrology of the site



Clear Creek Park Spring, Greene County

Geologic Stream Classification

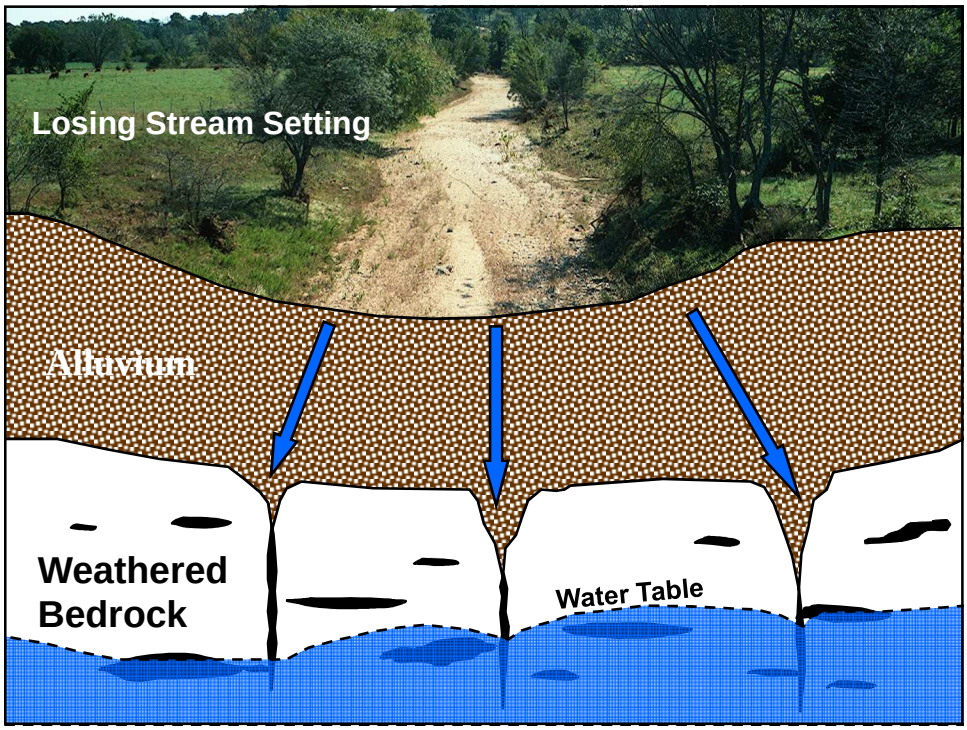
Gaining

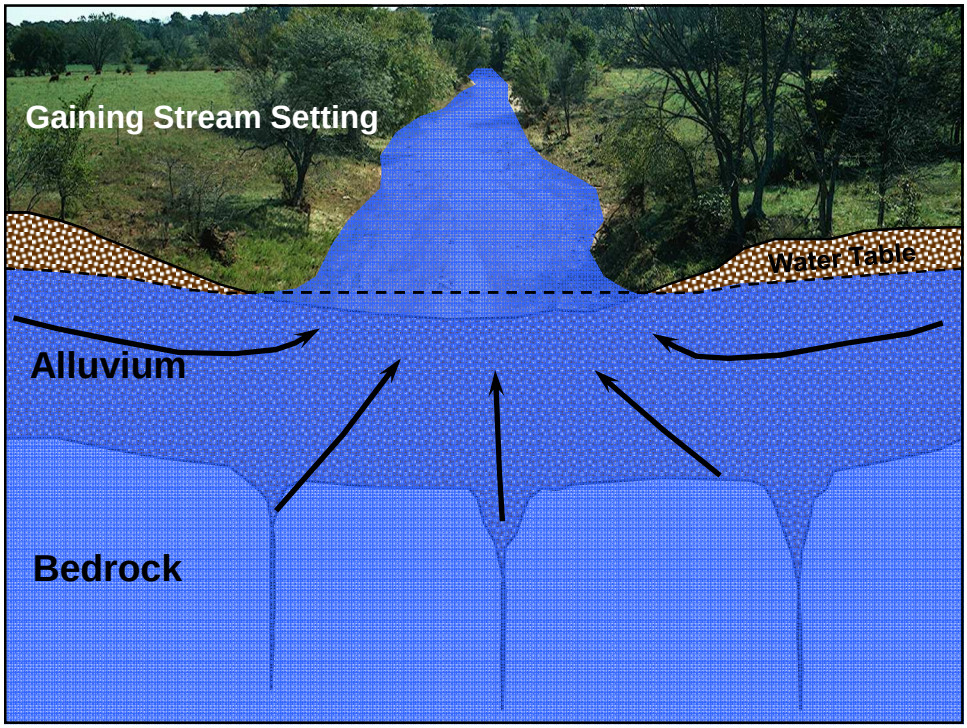
or

Losing

LOSING STREAM….

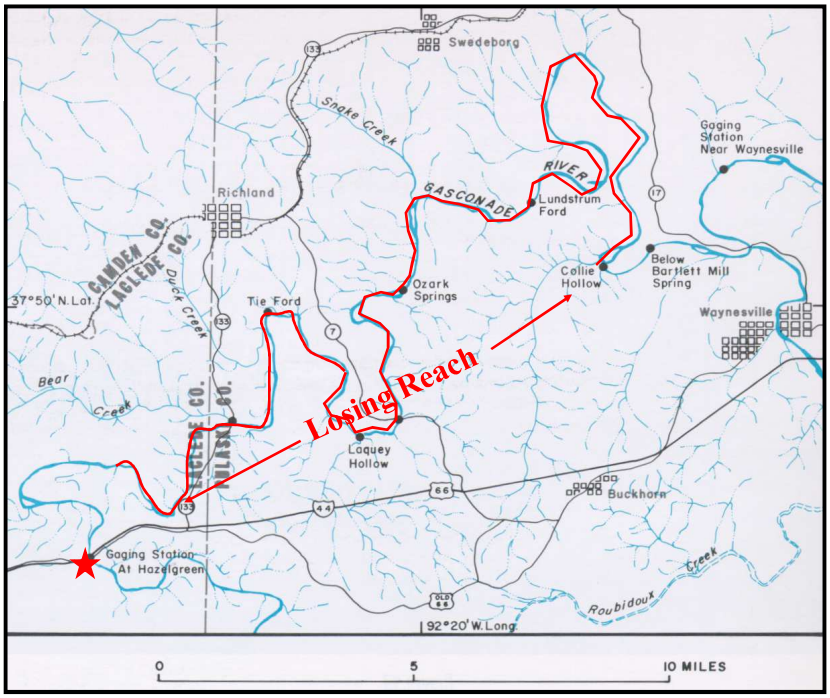
A stream that loses a significant part of its normal runoff into bedrock openings beneath the streambed.

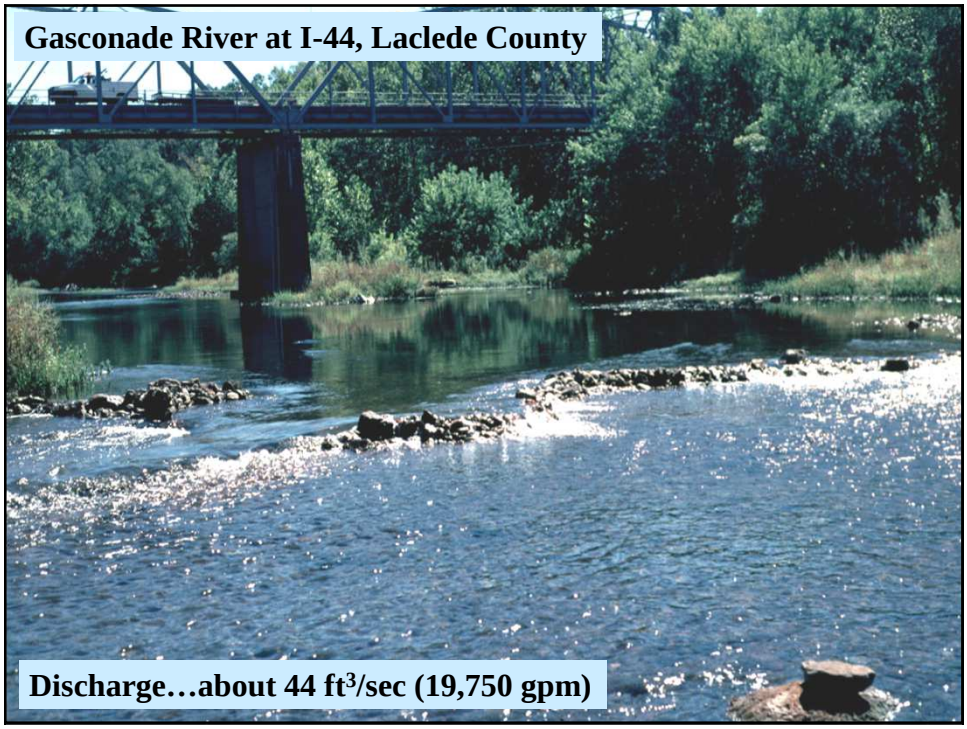


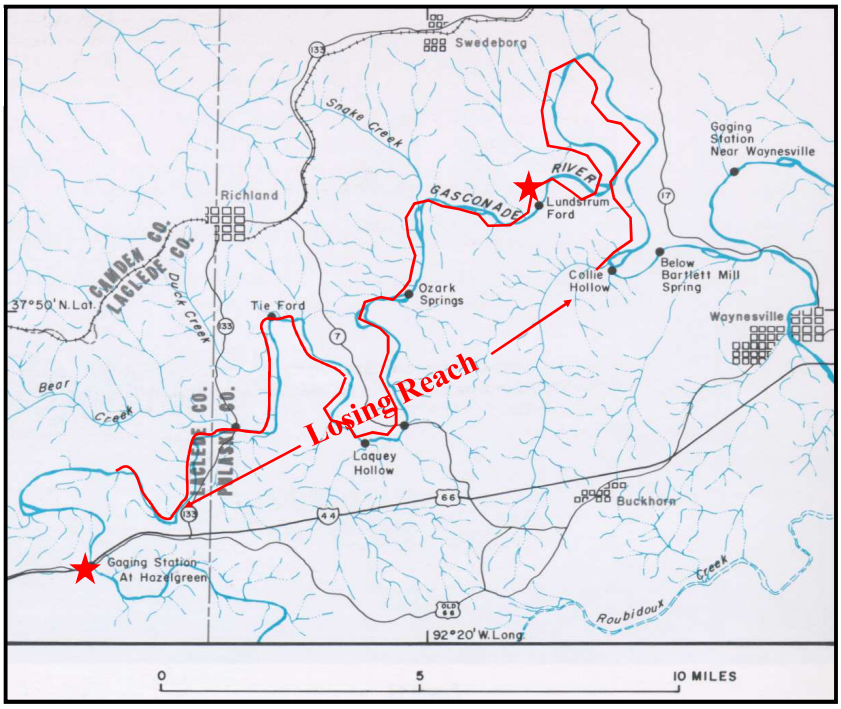


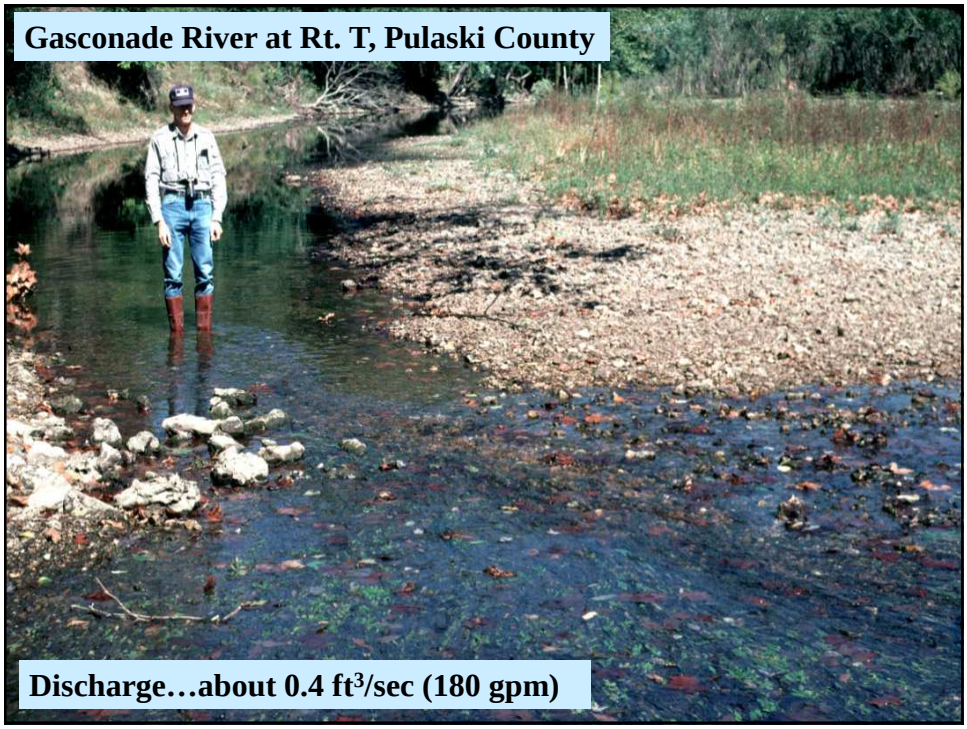
Typical Losing Stream

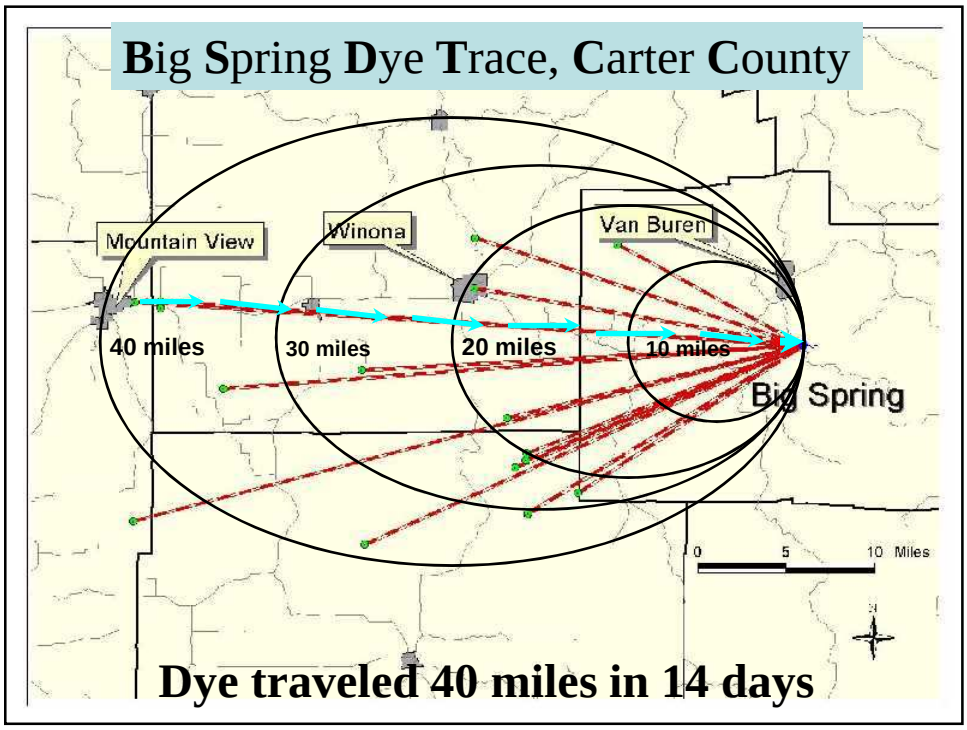
Typical Losing Stream




Gasconade River at I-44, Laclede County
Discharge…about 44 ft³/sec (19,750 gpm)


Swedeborg
Snake Creek
Gaging Station Near Waynesville
RIVER
GASCONADE
Lundstrum Ford
Richland
CAMDEN CO.
LACLEDE CO.
Duck Creek
Below Bartlett Mill Spring
Cellie Hollow
Ozark Springs
37°50' N.Lat.
Tie Ford
Waynesville
Losing Reach
Bear Creek
PULASKI CO.
Laquey Hollow
Buckhorn
Gaging Station At Hazelgreen
Roubidoux Creek
92°20' W.Long.
0
5
10 MILES

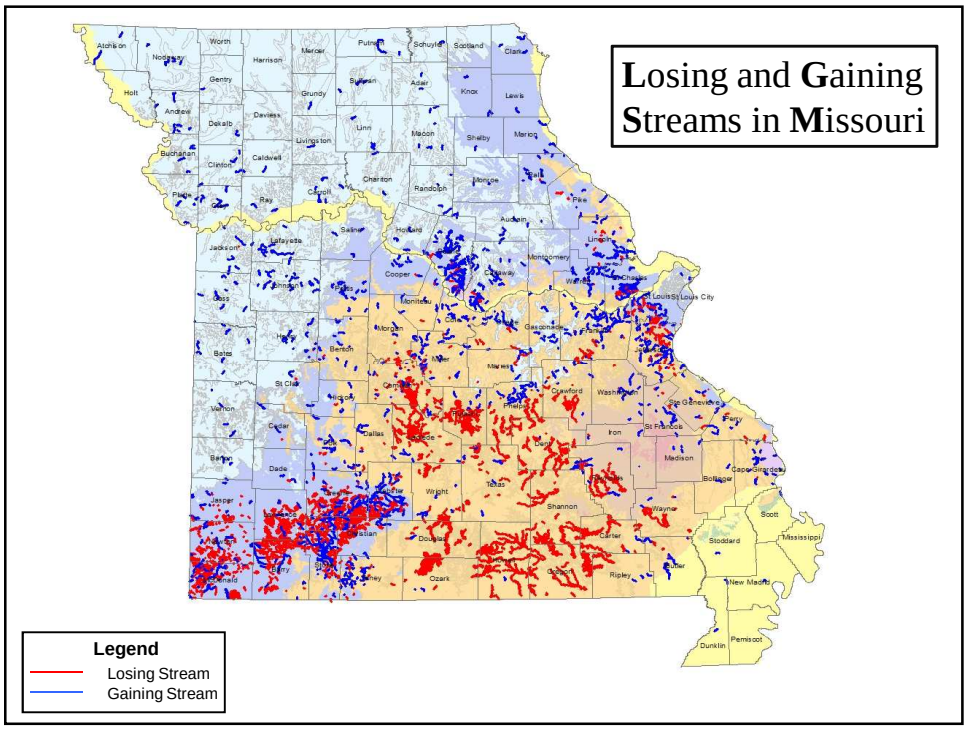

Gasconade River at Rt. T, Pulaski County
Discharge…about 0.4 ft3/sec (180 gpm)

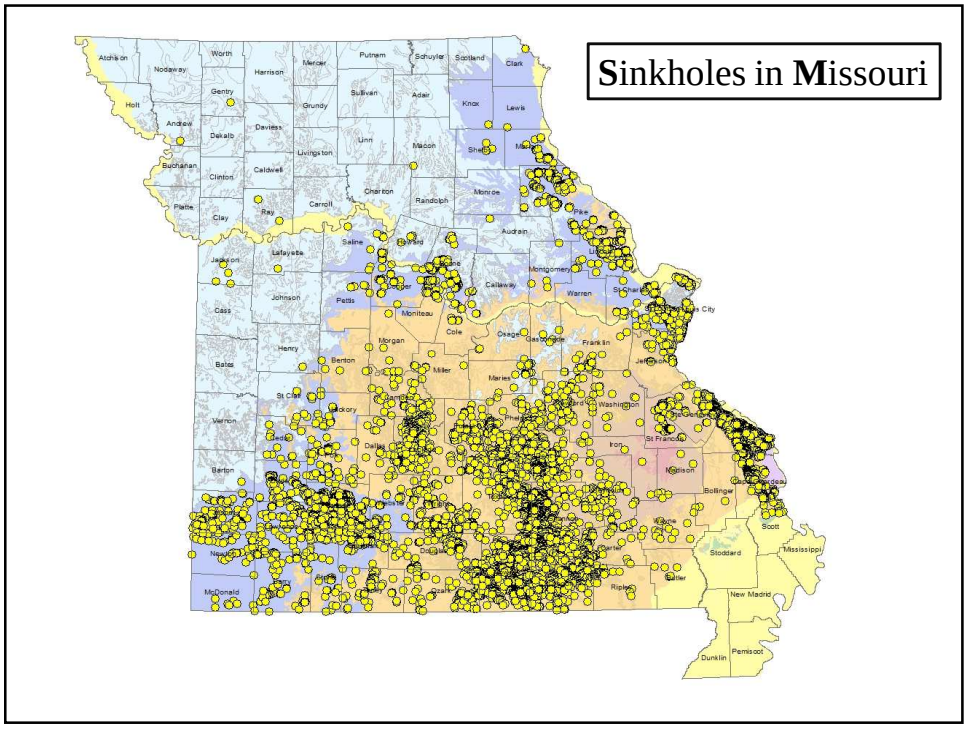

Big Spring Dye Trace, Carter County
Mountain View
Winona
Van Buren
40 miles
30 miles
20 miles
10 miles
Big Spring
0
5
10 Miles
Dye traveled 40 miles in 14 days

Schluersburg Karst Chasm

July 2000
Completely filled with coarse gravel

January 2000
237 feet long, 30 feet deep, 5 to 10 feet wide




Sinkholes in Missouri

Pike County

Jasper County

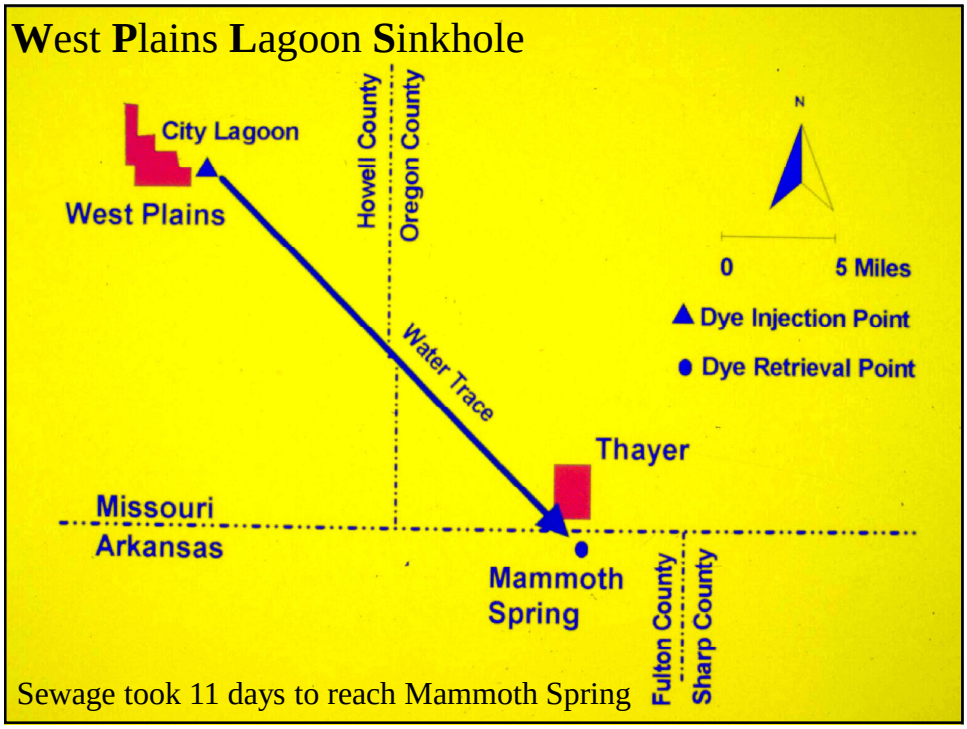
Lincoln County

Karst areas are underlain by highly permeable bedrock and soils...

Groundwater aquifers are highly susceptible to contamination from the surface!!!

Just How Susceptible???

Lancaster Road Sinkhole Dump, Laclede County



Evaluation of Collapse Potential of Liquid-Waste Treatment Site

Required for new or modified earthen lagoons/storage basins

Evaluation of Collapse Potential of Liquid-Waste Treatment Site

- Stream classification
- Depth to water table
- Bedrock
- Proximity of sinkholes and underground openings

Evaluation of Collapse Potential of Liquid-Waste Treatment Site

- Residuum thickness
- Surface area of facility
- Maximum operating depth

Evaluation of Collapse Potential of Liquid-Waste Treatment Site

Slight

Moderate

Severe

Geologic Limitations Rating

Slight

Moderate

Severe

Slight Geologic Limitations Rating

	Earthen Facilities	Mechanical Treatment Plant
Surficial Materials	Sufficient materials present on site which can be compacted to achieve low permeability	Not applicable
Bedrock	Low permeability below a weathered zone or a surficial material thickness and permeability which makes bedrock unimportant	Not applicable
Receiving Stream	Receiving stream must be gaining for 2 miles downstream of the discharge point for discharging facilities Streams may be losing if non-discharging facility	Receiving stream must be gaining for 2 miles downstream of the discharge point for all discharging facilities
Collapse Potential	Slight	Not applicable
Required Construction	Compacted clay liner Facility must meet gaining stream effluent quality standards	Must meet gaining stream effluent quality standards
Impact	Liner or treatment failure can affect local shallow groundwater in alluvium or other limited shallow groundwater supplies	Treatment failure can affect local shallow groundwater in alluvium or other limited shallow groundwater supplies

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Moderate Geologic Limitations Rating

	Earthen Facility	Mechanical Treatment Plant
Surficial Materials	Surficial materials onsite or nearby which can be compacted or artificially sealed to achieve low permeability	Note: Moderate geologic limitations do not apply to mechanical treatment plants
Bedrock	Low to high permeability	
Receiving Stream	Receiving stream must be gaining for 2 miles downstream of the discharge point for discharging facilities Streams may be losing if non-discharging facility	
Collapse Potential	Slight or Moderate	
Required Construction	Thickness of compacted clay liner determined by Division of Environmental Quality. May also require: artificial sealing, depth limits, subsurface diversion of water, and/or rock excavation Facility must meet gaining stream effluent quality standards	
Impact	Liner or treatment failure can affect local, shallow and/or regional groundwater supplies	

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Severe Geologic Limitations Rating

	Earthen Facility	Mechanical Treatment Plant
Surficial Materials	Highly permeable or an insufficient amount of surficial materials onsite or nearby. Surficial materials can not be remolded or sealed to achieve low permeability	Not applicable
Bedrock	High permeability	Not applicable
Receiving Stream	Losing within two miles downstream of the discharge point	Losing within two miles downstream of the discharge point
Collapse Potential	Moderate or severe. If a severe collapse potential rating is given then overall geologic limitations rating must also be severe.	Not applicable
Required Construction	Mechanical treatment plant, or reinforced concrete facility No earthen lagoon storage of waste is permitted.	Facility must meet losing stream effluent quality standards.
Impact	Treatment failure can affect regional groundwater supplies	Treatment failure can affect regional groundwater supplies.

Sinkhole due to soil piping into 9-inch fracture

Cedar County

Why are **W**astewater **S**ystems **R**egulated……
To protect our underground sources of current and potential drinking water resources from contamination.

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Thank You

- Fletcher Bone
- 573-368-2183
- fletcher.bone@dnr.mo.gov
- Department's website: http://dnr.mo.gov

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November 2015 Wastewater Engineering Workshop

CP Process and Post-Construction

Wastewater Construction Permitting webpage:

http://dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm

Keith Forck
573-526-4232
keith.forck@dnr.mo.gov

Andy Appelbaum
314-416-2062
andy.appelbaum@dnr.mo.gov

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Topics include

- Forms
- Fees
- Determinations
- Lagoon Closures
- Land Application

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Forms

- Current versions available on the web at: http://dnr.mo.gov/forms/#WaterPollution

Antidegradation

Construction (Water Pollution)

- Application for Construction Permit - Sewer Extension, Form--MO 780-1632
- Application for Construction Permit - Wastewater Treatment Facility, Form--MO 780-2189 and Instructions
- Application for Letter of Authorization, Form--MO 780-2154
- Application for Transfer of Construction Permit--MO 780-2156
- Continuing Authority and Receiving Wastewater Treatment Facility Acceptance--MO 780-2584
- Substantial Completion and Operable Wastewater Construction--MO 780-2152
- Statement of Work Completed--MO 780-2155

Discharge (Water Pollution)

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Forms

- Always use the latest form from the DNR website.
- Read forms and fill out completely.

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Sewer Extension

- Look for the new form soon
- Certification checklist section
- Also new form for Continuing Authority and Treatment Facility acceptance

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Part of checklist future SE form

SEWER EXTENSION DESIGN CERTIFICATION

Answer all questions yes, no, or N/A. Answer N/A only if the question is clearly not applicable to the design of the proposed sewer extension **OR** if a deviation was previously allowed by the Department in the approval of Standard specifications or Standard Detail Sheets.

7.0 SEWER EXTENSION CHECKLIST – Part 1					
	REGULATION		YES	NO	N/A
1.	8.110(6)(C) 8.020(4)	Is there a detailed plan showing tributary area, boundaries, pertinent elevations, topography, existing and proposed facilities?			
2.	8.120(3)	Does the sewer receive only sewage and not combined sewage?			
3.	8.120(4)(B) 8.020(9)(B)	Is the design flow based on 100 gpcd with a peaking factor of 4? Is the design flow based on the design peak hourly flow in accordance with 8.110(4)(C)4?			
4.	8.120(5)(G) 8.020(9)(A)	Does the sewer pipe comply with ASTM standards for sewer pipe?			
5.	8.120(5)(I)4 8.020(9)(A)	Are the joints sealed to prevent infiltration > 100 gal/inch of pipe dia/mile/day for receiving WWTF with a design flow > 22,500 gpd, and >200 gal/inch of pipe dia/mile/day for receiving WWTF with a design flow ≤ 22,500 gpd?			
6.	8.120(5)(D)4 8.120(6)(A) 8.020(9)(C)	Are manholes located at all changes in grade, size or alignment, at all intersections, and at distances of not greater than 400 feet for sewers 15 inches and less, or 500 feet for sewers 18 – 30 inches?			
7.	8.120(5)(A) 8.020(9)(B)	Is the gravity sewer no less than 8" in diameter?			

MISSOURI
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NATURAL RESOURCES

Continuing Authority form for SE

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
CONTINUING AUTHORITY AND RECEIVING WASTEWATER TREATMENT FACILITY ACCEPTANCE

1. PROJECT INFORMATION

NAME OF PROJECT	DESIGN AVERAGE FLOW (GPD)	DESIGN PEAK HOURLY FLOW (GPH)	
ADDRESS	CITY	STATE	ZIP CODE
PROJECT DESCRIPTION			

2. PROJECT OWNER

NAME	TELEPHONE NUMBER WITH AREA CODE	EMAIL ADDRESS	
ADDRESS	CITY	STATE	ZIP CODE

3. CONTINUING AUTHORITY: I agree to operate, maintain, and modernize this wastewater project, and to abide by the rules, regulations, orders and decisions of the Missouri Clean Water Commission upon construction completion in accordance with the department's issued construction permit.

CONTINUING AUTHORITY NAME	TELEPHONE NUMBER WITH AREA CODE	EMAIL ADDRESS	
ADDRESS	CITY	STATE	ZIP CODE
AUTHORIZED SIGNATURE	TITLE OR CORPORATE POSITION		
PRINTED NAME	DATE		

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Wastewater Treatment Facility

- Separate forms for Construction Permit and Operating Permit
- Facility plan approval letter sets the schedule for submitting OP application
  - Prior to or with CP application
  - During/after construction

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Operating Permit Application

- Site specific – submit Form B or B2 application and fee for new/modification prior to or with construction permit
- General permit – submit Form B application and fee to regional office at least 60 days before operation
- Do not use Form E for domestic wastewater General Permits

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Statement of Work Completed

- Needs to be completed and submitted for issuance of the new or modified operating permit
- As-Builts required if alterations during construction
- Significant alterations or deviations from the design guide requires approval before construction

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WASTEWATER CONSTRUCTION STATEMENT OF WORK COMPLETED

PART A – BASIC INFORMATION – All applicants must complete Part A.

1. THIS FORM IS FOR:

☐ Construction is 100% Complete.

☐ Construction is Substantially Complete and Operable. Expected date of 100% Completion: _____

2. ISSUANCE OF AN OPERATING PERMIT:

☐ Request issuance of the new/modified site-specific operating permit previously public noticed. MO-_____

☐ Request general operating permit from the appropriate Regional Office at least 60 days prior to operation.
MO-G_____; ☐ Form B **or** ☐ Form E; ☐ Appropriate fee

☐ No issuance of a new/modified operating permit is necessary.

3. PROJECT INFORMATION

NAME OF THE PROJECT	ESTIMATED PROJECT CONSTRUCTION COST	FINAL PROJECT CONSTRUCTION COST
	$	$

CONSTRUCTION PERMIT #	RECEIVING WASTEWATER TREATMENT FACILITY #	DEPARTMENT FUNDED PROJECT #
CP	MO-	

4. AS-BUILT PLANS

If construction is 100% complete, an electronic copy of the as-builts is required and included with this form when:
☐ Non-department funded projects, in which changes from the previously submitted plans and specifications occurred.
☐ Department funded projects.
☐ N/A

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Fees – 10 CSR 20-6.011(2)

Operating Permit

- Privately Owned Treatment Works
- Industrial Process Wastewater
- Publically Owned Treatment Works (POTW)
- General Permit

- Factsheet Permit Fees, State Operating Permits
http://dnr.mo.gov/pubs/pub2564.htm

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Fees – Construction Permit

- WWTP with design flow less than 500,000 gallons per day is $1000
- WWTP with design flow greater than or equal to 500,000 gallons per day is $3000
- Sewer extension is $300

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Incomplete Applications

10 CSR 20-6.010(4)(E).

Incomplete permit applications or related engineering documents will be returned by the department if they are not completed in the time frame established by the department in a comment letter to the project owner. Permit fees for returned applications shall be forfeited.

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A complete application includes:

- Form(s)
- Fee(s)
- Map
- Signature
- Supporting Documentation

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Supporting Documentation

- Engineering report, if not already approved
- Plans
- Specifications
- Summary of design
- Continuing Authority documentation
- Geohyrologic Evaluation
- Other items as necessary

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Facility Plan

- Required before a CP application is submitted for all facilities > 22,500 GPD
- Prior approval recommended for most other projects unless minor or routine
- Approval letter will spell out next step in process

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Plans and specifications

- Must be sealed and signed by Missouri PE
- Require at least one hard copy
- Request and appreciate electronic copy

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Continuing Authority

10 CSR 20-6.010(3)(B)

1. 208 Authority
2. Regional Provider approved by CWC
3. Municipality, Public Sewer District, or Sewer Company regulated by Public Service Commission
4. Owner (with complete control)
5. Property Owners Association

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Property Owners Association

10 CSR 20-6.010(3)(B)5.

A. No higher continuing authority available

B. Owns the facility and has sewer easements

C. Impose covenants on each property owner

(I) Power to regulate use of the facility

(II) Power to levy assessments & liens

(III) Ability to transfer to higher CA

(IV) Requirement that members connect

D. Corporation registered with MO SOS

MISSOURI DEPARTMENT OF NATURAL RESOURCES

CP Review Process

- Completeness Check
- Technical Review
- Public Notice

- Common Omissions

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Completeness Check

- Verifies that the submittal has:
  - Application Forms
  - Correct Fee
  - Correct Signature
  - Plans and Specs / sealed by MO P.E.
  - Antidegradation review when required

- Applications that are grossly incomplete may be returned without review.

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Technical Review

- Review application and supporting information for compliance with applicable rules and regulations
- Communicate review comments with letters, emails, phone calls, or meetings
- Draft construction and operating permits

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OP Public Notice Process

- 15-day applicant review (pre public notice)
- 30-day public notice
- Depending on the project, the department may conduct a concurrent technical review of construction permit during public notice process

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OP Public Notice Process

- Owners are encouraged to submit Operating Permit Application after approval of Facility Plan but before submission of Construction Permit Application
- Allows Public Notice of Operating Permit prior to final development of plans

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Common Omissions

- Signature on application
- Current form
- Fee (missing or incorrect)
- Map
- Sealed plans and specifications
- Contact information
- Other supporting documentation

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Construction Permit Exemptions

- Missouri Clean Water Law Statute - 644.051.3
  - http://www.moga.mo.gov/mostatutes/stathtml/64400000511.html
- 10 CSR 20 – 6.010 (1)
- 10 CSR 20 – 6.015(3)
- Determination
  - Written request

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Statute citation - 644.051.3
- A construction permit is required… The following activities shall be excluded from construction permit requirements:

(1) Facilities greater than one million gallons per day with an approved program

(2) Sewer extensions <= 1000 feet with fewer than two lift stations

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Statute citation - 644.051.3 (continued)

(3) All sewer collection projects that are authorized through a local supervised program; and

(4) Any other exclusions the commission may promulgate by rule.

  - See draft rule 10 CSR 20-6.010 on website

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Statute citation - 644.051.3(4) (continued)
  - Shall be constructed in accordance with a registered professional engineer's design and plans and the design guide
  - A post construction site inspection may be conducted prior to issuance of the operating permit

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Construction Permit Exemptions

- 10 CSR 20 – 6.010 (1)(B)

1. Nonpoint source discharges
2. Service connections
3. Internal plumbing
4. Routine maintenance or repair
5. Single family residence

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- 10 CSR 20 – 6.010 (1)(B) (continued)

6. Environmental emergency cleanup site
7. Water used in constructing and maintaining a water well
8. Small scale pilot projects
9. Application of pesticides

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Construction Permit Exemptions

- 10 CSR 20 – 6.015(3)(B) (No-Discharge)

6. Non-discharge facilities for domestic wastewater flows of <= 3,000 gpd

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Construction Permit Exemptions

- 3,000 Gallon per day or less no-discharge permit exemption for domestic wastewater design guidance (http://dnr.mo.gov/pubs/pub1319.htm)

- Lagoon followed by onsite surface land application with proper operation

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Construction Permit Exemptions

- 644.051.3
- Exempts (by omission) industrial sources from construction permit requirements.
- Earthen basins are not exempt when used for wastewater treatment or storage.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Any wastewater control project exempt from a construction permit still must:
  - Be designed by a registered PE in accordance with the commission's design rules.
  - Be constructed in accordance with registered PE's design and plan.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Determination Request
  - Provide a written request
    - Brief summary of the proposed project
    - Rationalization for the request
  - Department will review request
    - Request additional information if necessary
    - Provide written determination

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Determinations
  - Certain dechlorination projects will be exempted but a determination must first be received by the Department

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- After construction
  - Once construction is complete, use the facility as designed and constructed
  - The department does not require any submittals – no as-builts, certifications, etc.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Exemptions

- Exemption from a Construction Permit does not exempt anyone from needing to obtain or modify an Operating Permit.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Lagoon Closure

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Lagoon Closure

- Department approval of plan required:
  - 10 CSR 20-6.010(12)
  - Standard Conditions Part III – Section H
- Wastewater Treatment Plant Closure Fact Sheet PUB2568
- Facility Closure Request Form – MO 780-2512

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
FACILITY CLOSURE REQUEST FORM

A closure plan must be approved by the Missouri Department of Natural Resources prior to the initiation of closure activities. A complete closure plan will consist of this closure request form and the information requested herein.

PART A – GENERAL INFORMATION

1. PERMIT #MO-

2. FACILITY

NAME			TELEPHONE NUMBER WITH AREA CODE	
ADDRESS (PHYSICAL)	CITY		STATE	ZIP CODE
Legal description: ¼, ¼, ¼, Sec. , T , R ,			COUNTY	

3. OWNER

NAME	EMAIL ADDRESS		TELEPHONE NUMBER WITH AREA CODE	
ADDRESS	CITY		STATE	ZIP CODE

4. CONTACT

NAME	TITLE

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Lagoon Closure – Technical Information

- Facility start and end dates
- Reason for closing facility. Future treatment?
- Sludge analysis, volume, and lagoon area
- Water removal – discharge, irrigation, WWTP
- Sludge disposal – land apply, landfill, WWTP, mix w/ soil

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Lagoon Closure – Technical Information

- Land disturbance permit
- Timeline
- Additional information
- Remove piping and other materials
- Grade and vegetate
- Terminate permit – Form H or J

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Sludge left in place

- Less than 300 lbs PAN/acre
- Mixed at least 1 to 1 with soil
- The lagoon berm shall be demolished
- The site shall be graded and contain ≥70% vegetative density over 100% of the site

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Land application of lagoon sludge

- Agronomic rates based on crop requirements
- Setback distances
- Map
- Slopes
- Incorporation
- Vegetation

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Wastewater Land Application

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Land Application

- 3000 Gallon per Day or Less No-Discharge Exemption for Domestic Wastewater
  - Fact Sheet PUB1319 – Design Guidance
- General Permit MO-G823XXX
  - Regional Office Issuance
- Site Specific Permit
  - Application submitted prior to or with CP

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Land Application

- Treatment – 34 lbs BOD per acre
- Storage of wastewater and 1-in-10 year rainfall
- Surface vs. Sub-surface
- Operation and Maintenance
- Set – backs

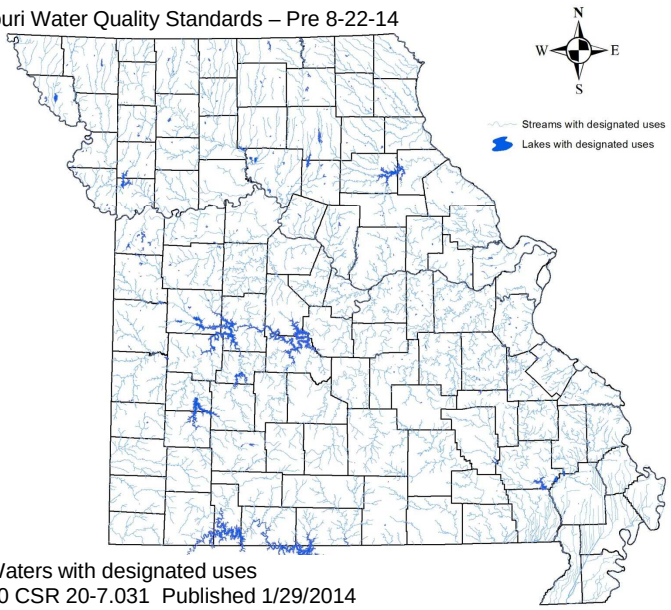
MISSOURI DEPARTMENT OF NATURAL RESOURCES

Set-Backs for Land Application

- 300 feet of any down gradient pond, lake, sinkhole, losing stream or water supply withdrawal
- 100 feet of gaining streams or tributaries
- 150 feet of dwelling or public use areas
- 50 feet of the property line

MISSOURI DEPARTMENT OF NATURAL RESOURCES

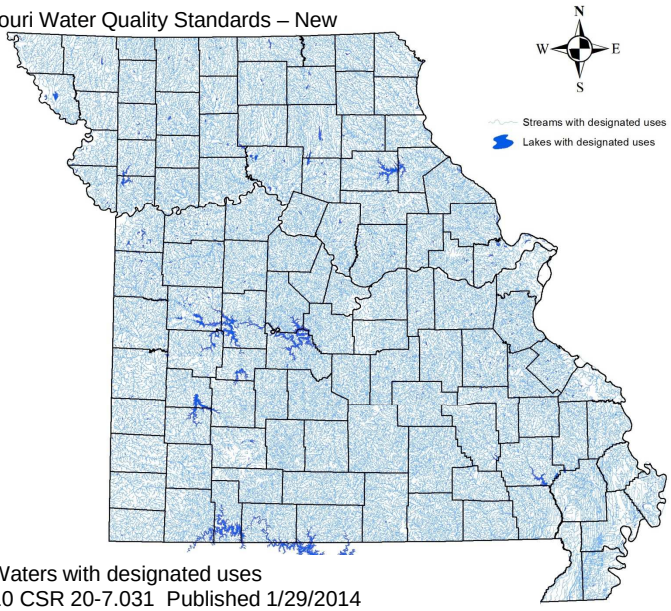
Missouri Water Quality Standards – Pre 8-22-14



Waters with designated uses
10 CSR 20-7.031 Published 1/29/2014

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Missouri Water Quality Standards – New



Waters with designated uses
10 CSR 20-7.031 Published 1/29/2014

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Design Guide for Land Application Systems

- Small Systems
  - 10 CSR 20-8.020(11), (13), and (15)
- Large Systems
  - 10 CSR 20-8.200 and 8.220

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Design Guide Requirements

- Primary Treatment
- Storage and Irrigation Requirements
- Pumpdown Marker
- Emergency Spillway
- Basin Requirements – Berm, Liner, Piping, and Stormwater Diversion

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Design Guide Requirements

- Access Road, Fence, and Signs
- Operation and Maintenance Manual
- No Public Access unless Disinfection
- Geohydrologic Evaluation – Lagoon and Land Application Area
- 1 in 10-year rainfall minus evaporation

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Land Application Guidelines

- Slopes should be less than ten percent.
- Irrigation area must be cropped/vegetated.
- Grazing and forage harvesting deferment.
- Set-Backs
- Public use areas
- Fence to restrict access

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Land Application Guidelines

- Application rates
- Basin must be pumped down to minimum operating level by November 30th
- Daily inspections when irrigating
- No application on frozen, saturated, or snow covered soil
- Land apply during daylight hours

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Land Application Guidelines

- If land applying greater than 24 inches/year
  - Soils evaluation
  - Nitrogen loading rate requirements
  - Monitoring wells

MISSOURI DEPARTMENT OF NATURAL RESOURCES

THANKS

CP Process and Post-Construction
Wastewater Construction Permitting webpage:
http://dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm

Keith Forck
573-526-4232
keith.forck@dnr.mo.gov

Andy Appelbaum
314-416-2062
andy.appelbaum@dnr.mo.gov

MISSOURI DEPARTMENT OF NATURAL RESOURCES

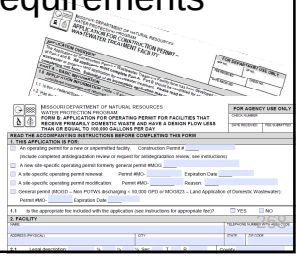
Design Guides Update

Engineering Workshops
November 2015
Leasue Meyers, Engineering Section

MISSOURI DEPARTMENT OF NATURAL RESOURCES

6.010 Construction & Operating Permits

- Rule Additions
  - Cost of Compliance Procedure Reference
  - Continuing Authority Clarifications
  - Level 2 Continuing Authority Procedure
  - Antideg Application Requirements
  - Construction Permit Application Requirements
  - Construction Permit Exemptions
  - Variance Procedures
  - Treatment Plant Authority
  - Electronic Reporting


MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
FORM B: APPLICATION FOR OPERATING PERMIT FOR FACILITIES THAT RECEIVE PRIMARILY DOMESTIC WASTE AND HAVE A DESIGN FLOW LESS THAN OR EQUAL TO 100,000 GALLONS PER DAY

FOR AGENCY USE ONLY

READ THE ACCOMPANYING INSTRUCTIONS BEFORE COMPLETING THIS FORM

1. TYPE OF PERMIT REQUESTED
An operating permit for a new or expanded facility – Construction Permit #
(include completed antidegradation review or request for antidegradation review, see instructions)
A new site-specific operating permit formerly general permit #MO0G
A site-specific operating permit renewal Permit #MO- Expiration Date
A site-specific operating permit modification Permit #MO- Reason
General permit (MO0G0 – Non POTWs discharging < 50,000 GPD or MO0G25 – Land Application of Domestic Wastewater):
Permit #MO- Expiration Date

1.1 Is the appropriate fee included with the application (see instructions for appropriate fee)? YES NO

2. FACILITY

MISSOURI DEPARTMENT OF NATURAL RESOURCES

10 CSR 20-8 Changes

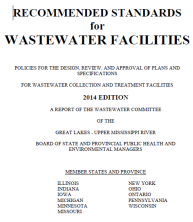
- Small design guides (8.020) incorporate into appropriate sections of rest of Ch. 8
- Small facilities exemptions based on flow, but small flow varies from 22, 500 to 100,000 gpd depending on the section & requirements
- Comprehensive & Cohesive
- Additional resources concurrently completed

269

MISSOURI DEPARTMENT OF NATURAL RESOURCES

10 State Standards & Design Guides

- 2014 State Standards
- TR-16 Guides for the Design of Wastewater Treatment Works
- Other states evaluated, include:
  - Texas
  - Washington
  - Colorado
  - Iowa
  - Oklahoma
  - Minnesota
  - Virginia


RECOMMENDED STANDARDS
for
WASTEWATER FACILITIES

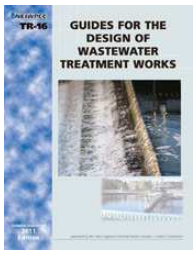
POLICIES FOR THE DESIGN, REVIEW, AND APPROVAL OF PLANS AND SPECIFICATIONS
FOR WASTEWATER COLLECTION AND TREATMENT FACILITIES

2014 EDITION

A REPORT OF THE WASTEWATER COMMITTEE
OF THE
GREAT LAKES - UPPER MISSISSIPPI RIVER
BOARD OF STATE AND PROVINCIAL PUBLIC HEALTH AND ENVIRONMENTAL MANAGERS

MEMBER STATES AND PROVINCE

ILLINOIS
INDIANA
IOWA
MICHIGAN
MINNESOTA
MISSOURI
NEW YORK
OHIO
ONTARIO
PENNSYLVANIA
WISCONSIN



270

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.110 Plans & Specs

- Stakeholder meeting in 2016
- Reorganize the section to clearly break out
  - Engineering Reports
  - Facility Plans
  - Summary of Design
- Clarify requirements
- Electronic submittals
- Last rule for revision to ensure consistency with the other sections

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.120 Sewers

- Stakeholder meeting completed in 2015
- Addition of definitions-sewer, lateral, service line, trunk sewer
- Trenchless Technologies
- NEW WEBSITE: Approved Standard Specifications
  - dnr.mo.gov/env/wpp/permits/sewer-specs.htm

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.125 Alternative Sewers-**NEW RULE**

- Stakeholder Meeting started in October
- Rule will cover:
  - Grinder pump systems
  - STEP
  - STEG
- Rule will not cover vacuum systems
  - Case-by-case only

273

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.130 Pump Station

- Stakeholder meeting completed in 2015
- Minimum pump cycle volume
- High water levels
- Elapsed time meters
- Alarm systems
- Portable standby facilities
- Emergency operations

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.140 Wastewater Treatment Facilities

- Stakeholder meetings completed in 2014
- 100 year flood plain + 4 ft
- Definition of innovative technologies
- Types of flow measurement
- Types of sampling equipment provisions
- Influent sampling
- Chemical Housing & Safety
- Reduced the information under Lab Facilities

275

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.150 Headworks & 8.160 Settling

- Stakeholder meetings in 2016
- Following 10 States
- Adding pump & haul
- Welcoming ideas for improvement

276

MISSOURI DEPARTMENT OF NATURAL RESOURCES

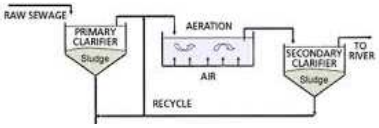
8.170 Sludge

- Stakeholder meetings in 2016
- Digestors
- Centrifuges
- Nutrient Removal Operations
- Land Application
- Welcoming ideas for improvements

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.180 Biological Treatment

- Stakeholder Meetings in 2014
- Additional treatment technologies
  - Oxidation Ditch
  - Recirculating Media Filters
  - IFAS
  - SBR
  - MBR
  - MBBR



- Draft revised rule posted soon

278

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.190 Disinfection

- Stakeholder Meetings completed in 2014
- Addition of UV Disinfection and Peracetic Acid
- Discussion of dechlorination in the chlorination section
- Alarm System discussion for all technologies
- UV bioassay & UVT monitoring
- Spare Part Requirements
- MBR discussion

279

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.200 Lagoons, Land App, Subsurface

- Combine 8.200 & 8.220
- Stakeholder Meetings ongoing
- Lagoons
  - Flow Equalization
  - Storage
- Land Application
  - 24 inches per year
  - >24 inches per year
- Subsurface Application
  - Drip
  - LPP
- Lagoon Retrofits
  - Baffles
  - Covers
  - Polishing Reactors
- Soils Report
- Geohydrological Evaluation

280

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.210 Supplemental Treatment

- Stakeholder Meeting in 2016
- Tentative Treatment Technologies:
  - Sidestream Nutrient Removal
  - Chemical Phosphorus Removal
  - Chemical Precipitation for Metals Removal
  - Tertiary Filtration
  - Carbon Addition
  - pH adjustment

281

MISSOURI DEPARTMENT OF NATURAL RESOURCES

8.020 & 8.220

- To be rescinded
- 8.020 exemptions incorporated into the other rules- based on flow, not just 22,500 gpd or 100,000 gpd
- 8.220 incorporated into 8.200 as lagoons being constructed are for land application

282

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Timeline

- 2015
  - Stakeholder Mtgs
  - 8.120, 8.125, 8.130, 8.200, 8.220
  - Engineering Workshops in November
- 2016
  - Stakeholder Mtgs
  - 8.110, 8.150, 8.160, 8.170, 8.210
  - Engineering Workshops
- 2017
  - Follow up Stakeholder Mtgs
  - Regulatory Impact Report & Fiscal Notes
  - Public Hearing
- 2018
  - Adoption
  - Rescinding of 8.020 & 8.220
  - Rule Effective **July 1, 2018**
  - Updated Resources

283

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Upcoming Stakeholder Meeting Dates

- All meetings start at 10 am in Lewis & Clark Office Building, Jefferson City
  - December 15, 2015 in Nightingale
  - March 29, 2016 in Gasconade Camp
  - June 16, 2016 in Gasconade Camp
  - August 24, 2016 in Gasconade Camp
  - October 19, 2016 in Gasconade Camp
  - December 14, 2016 in Gasconade Camp

284

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Construction Permit Manual

- Updates include:
  - Antideg
  - Financing Discussion
  - Treatment Plant Authority
  - Sewer Extensions
  - Technologies
  - Pilot Projects
  - Standard Specs
  - SRF Affordability & Cost of Compliance Analysis

285

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Resources Updated…

- Closure Plan Factsheet
  - dnr.mo.gov/pubs/pub2568.htm
- Update Facility Plan Factsheet
  - dnr.mo.gov/pubs/pub2416.htm
- Update Engineering Report Factsheet
  - dnr.mo.gov/pubs/pub2415.htm
- Update New & Innovative Technology
  - dnr.mo.gov/pubs/pub2453.htm

286

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Resources to be Developed…

- NEW -Treatment Plant Authority
- NEW- Continuing Authority
- NEW- Level 2 Continuing Authority
- NEW- Rerating a Treatment Plant

287

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Questions

- 8.110-8.160, 8.190: Emily Carpenter
  - emily.carpenter@dnr.mo.gov

- 6.010, 8.170, 8.180, 8.200, 8.210: Leasue Meyers
  - leasue.meyers@dnr.mo.gov

288

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Draft Rule Discussion

- 8.200: Lagoons, Land Application & Subsurface Systems

- Comments on any of the rules are always welcome, please email to Leasue & Emily

289

MISSOURI DEPARTMENT OF NATURAL RESOURCES

290

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Innovative Technology

Cindy LePage, P.E.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

What will you learn?

- Definitions
- Approval Process
- Operating Permit
- Current and Completed Projects

292

MISSOURI DEPARTMENT OF NATURAL RESOURCES

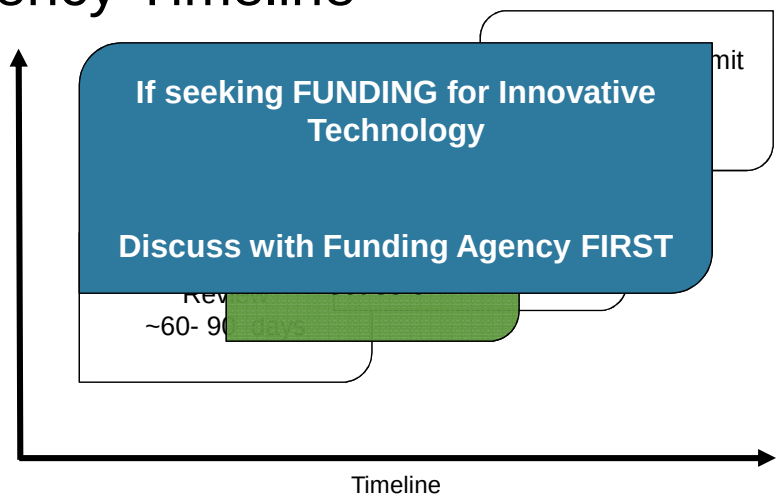
Wastewater Technology	Ammonia Effluent Limit (mg/L)			
	< 0.7	0.7 - 1.4	1.5 - 2.5	2.5 - 5.0
Land Application	A	A	A	A
Wetland	D	D	D	D
Facultative Lagoon	D	D	D	C
Aerated, Partial Mix Lagoon	D	D	D	C
Lagoons with Approved Retrofits	C	C	C	B
Recirculating Sand Filter	C	C	C	B
Trickling Filter	D	D	C	B
Oxidation Ditch	B	B	B	B
Extended Aeration Package Plant	D	C	B	B
Sequencing Batch Reactor	B	B	B	B
Biological Nutrient Removal	B	B	B	B
Enhanced Biological Nutrient Removal	B	B	B	B
Membrane Bioreactors	B	B	B	B
Breakpoint Chlorination	D	D	C	C
Moving Bed Biofilm Reactor	B	B	B	B
Integrated Fix Film Activated Sludge	B	B	B	B
Side Stream Nutrient Removal	B	B	B	B

A – Preferred when feasible
B – Has demonstrated capability in meeting ammonia when designed appropriately
C – Shows potential for meeting ammonia limitations.
D – Unlikely to meet ammonia limitations, or data inconclusive

293

MISSOURI DEPARTMENT OF NATURAL RESOURCES

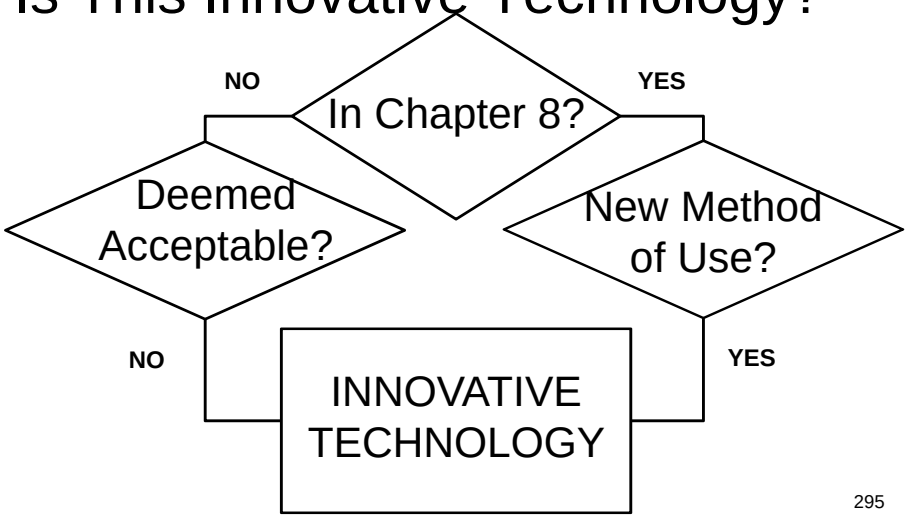
Agency Timeline



294

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Is This Innovative Technology?



295

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Small Scale Pilot Project Stage

- No construction permit
- Purpose is compliance with limits
- Test Plan approved by Department
- Temporary
- Discharge is returned to and treated by existing WWTF
- Typically last one year

296

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Demonstration Stage

- Construction Permit Required
- Full Scale
- Engineering Report – Requirements in Fact Sheet
- Test Plan approved by Department
- Operating Permit Modification Required

297

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Demonstration Operating Permit

- Permittee Needs to Know
  - Their Operating Permit will include
    - Monitoring of additional parameters
    - Additional monitoring frequency and locations
    - Engineering evaluation Report upon completion of the demonstration
  - Chance of replacing system

298

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

FACILITY DESCRIPTION

Outfall #001 – Residential Subdivision – SIC # 4952
The use or operation of this facility shall be by or under the supervision of a **Certified "C" Operator**
Two-cell lagoon / Moving Bed Biofilm Reactor / polishing lagoon cell /sludge holding lagoon/ chlorination/ D
Design population equivalent is XXXX,
Design flow is XXXXXX gallons per day. Actual flow is XXXXXX gallons per day.
Design sludge production is XX dry tons/year

Permitted Feature #IMP1 – Internal Monitoring Point – Internal monitoring point location – after cell #2 but p
Permitted Feature #IMP2 – Internal Monitoring Point – Internal monitoring point location – after the MBBR b

299

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

OUTFALL #001	TABLE A-1. INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS	PAGE NUMBER 2 of 7
		PERMIT NUMBER MO-XXXXXX

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective on Effective Date and remain in effect through **Effective date + 1 years – 1 day**. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	INTERIM EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	every 2 weeks	24 hr. total
Biochemical Oxygen Demand5	mg/L		45	30	every 2 weeks	grab
Total Suspended Solids	mg/L		45	30	every 2 weeks	grab
E. coli (Note 1, Page 3)	#/100mL	1030		206	every 2 weeks	grab
pH – Units	SU	**		**	once/month	grab
Ammonia as N (April 1 – Sept 30) (Oct 1 – March 31)	mg/L	3.9 8.8		1.4 2.8	every 2 weeks	grab
Oil & Grease	mg/L	15		10	once/month	grab
Dissolved Oxygen	mg/L	*		*	once/month	grab
Total Residual Chlorine (Note 2)	µg/L	17 (130ML)		8 (130ML)	once/month	grab

300

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Permitted Feature #IMP1 and #IMP2	TABLE B. INTERIM INTERNAL MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The interim effluent limitations shall become effective on Effective Date and remain in effect through **Effective date + 1 years – 1 day**. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	INTERIM EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	every 2 weeks	24 hr. total
Biochemical Oxygen Demand$_5$	mg/L		*	*	every 2 weeks	grab**
Total Suspended Solids	mg/L		*	*	every 2 weeks	grab**
Ammonia as N	mg/L	*		*	every 2 weeks	grab**

MONITORING REPORTS SHALL BE SUBMITTED QUARTERLY; THE FIRST REPORT IS DUE MONTH 28, 20XX.

301

MISSOURI DEPARTMENT OF NATURAL RESOURCES

OUTFALL #001	TABLE A-2. FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS	PAGE NUMBER 3 of 7
		PERMIT NUMBER MO-XXXXXXX

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective on **Effective Date + 1 year** and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow	MGD	*		*	once/month	24 hr. total
Biochemical Oxygen Demand$_5$	mg/L		45	30	once/month	grab
Total Suspended Solids	mg/L		45	30	once/month	grab
E. coli (Note 1, Page 2)	#/100mL	1030		206	once/month	grab
pH – Units	SU	**		**	once/month	grab
Ammonia as N (April 1 – Sept 30) (Oct 1 – March 31)	mg/L	3.9 8.8		1.4 2.8	once/month	grab
Oil & Grease	mg/L	15		10	once/month	grab
Total Residual Chlorine (Note 2, Page 2)	µg/L	17 (130ML)		8 (130ML)	once/month	grab

302

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Proven Stage

- 3 successful demonstration projects
  - In Missouri or a climate similar to Missouri
  - Various operating conditions (i.e. diurnal effects, seasonal impact, peak flow loading…)
- Acceptable-use demonstration design parameters
- Design parameters included in our Design Guides 10 CSR 20-8

303

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Innovative Technology for WWT

- Approval Process for Innovative Technology, Fact Sheet—PUB2453
- Current and completed projects can be found under Wastewater Pilot Projects in Missouri

http://dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm

304

MISSOURI DEPARTMENT OF NATURAL RESOURCES

The Department of Natural Resources Does Not Endorse or Recommend Treatment Systems

305

MISSOURI DEPARTMENT OF NATURAL RESOURCES

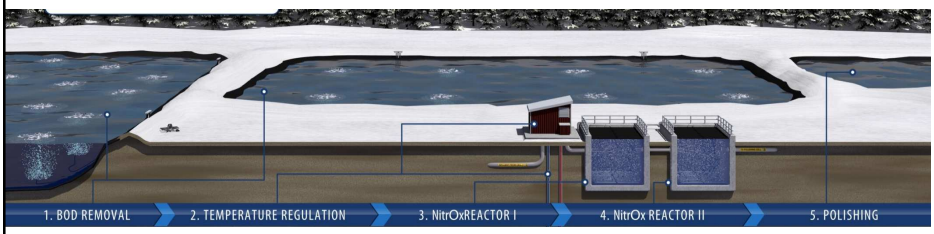
Examples of Innovative Lagoon Upgrades

- Bio-Domes (Poo Gloos)
- BiO2 Solution
- Biolac by Parkson
- IDEAL (Intermittently Decanted Extended Aeration Lagoon)

306

MISSOURI DEPARTMENT OF NATURAL RESOURCES

NitrOx™ Reactor System

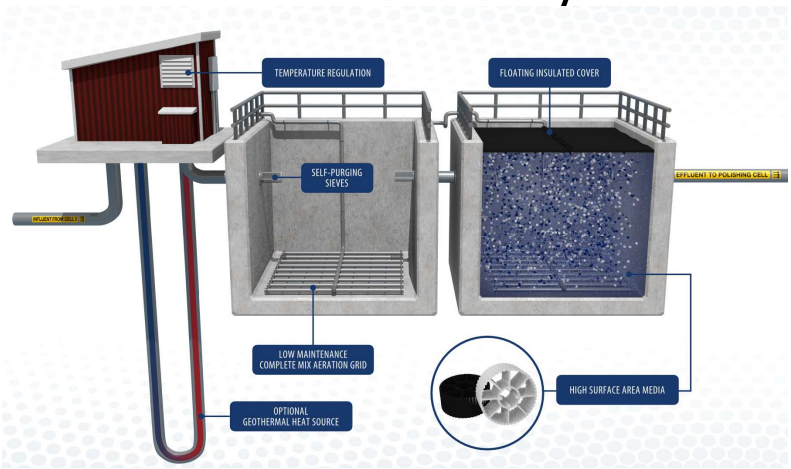


Moving Bed Bioreactor between Lagoon Cells 2 and 3

307

MISSOURI DEPARTMENT OF NATURAL RESOURCES

NitrOx™ Reactor System



308

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Pilot Project

- **NitrOx™ Reactor System**
- Ellington WWTF
  - Initiated 12/15/2014
  - MBBR between the final 2 cells of a lagoon

309

MISSOURI DEPARTMENT OF NATURAL RESOURCES

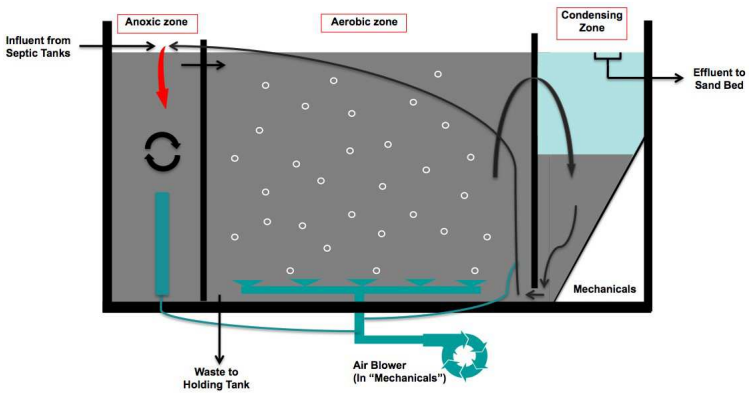
Demonstration Projects

- **NitrOx™ Reactor System**
- Hillcrest Manor Subdivision
  - CP0001685 Issued 3/25/2015
- Villages at Whiteman WWTF
  - CP0001711 Issued 4/7/2015

310

MISSOURI DEPARTMENT OF NATURAL RESOURCES

New Limits' Bow Reactor



311

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Pilot Projects

- **New Limits' Bow Reactor**
- Stoney Creek Subdivision WWTF
  - Initiated 7/1/2014
  - Self-contained unit
  - Ammonia

312

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Pilot Projects

- **Peracetic Acid Disinfection**
- Algoa Regional WWTF
  - Conducted in 2012
- Hannibal WWTF
  - Initiated 3/14/2014
  - Ongoing

313

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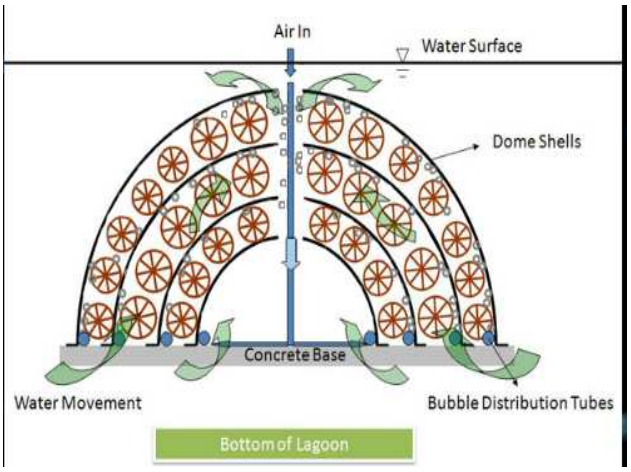
Biodome



314

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Biodome

315

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Pilot Projects

- **BioDome**
- Laddonia WWTF
  - Side Stream
  - Initiated 2/7/2013
  - Ammonia
- Archie WWTF
  - Full Scale installation
  - Initiated 8/25/2011
  - Ammonia

316

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Pilot Project

- **Blissfield PRO_2 Accelerator**
- Cedar Valley WWTF
  - Initiated 7/1/2014
  - Completed
  - Not appropriate at this site
- Van Loo Estates WWTF
  - RSF in Cole county

317

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BiO_2 Solutions

318

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BiO_2 Solutions

319

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Demonstration Projects

- **BiO_2 Solutions**
- Otterville, MO
  - Facility Plan Concurrence 1/30/2015
  - Construction Permit is under review

320

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Demonstration Projects

- Lagoon SBR by EDI
- Stoddard County Common Sewer District No. 1 -
  - In operation since 2012
  - BOD 11 mg/l
  - TSS 5 mg/l

321

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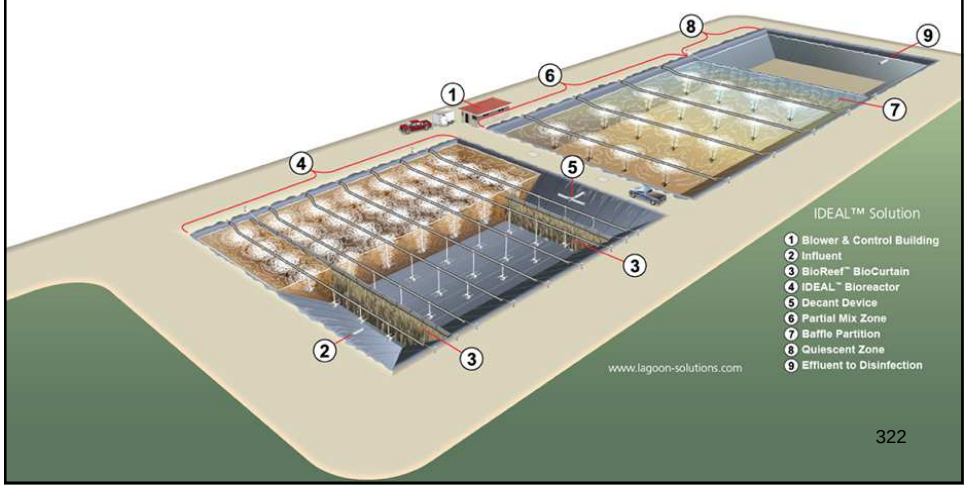
EDI – IDEAL



322

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IDEAL BioReef® System

323

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Demonstration Projects

- **IDEAL** by EDI
- Miner, MO
  - In operation since 2013
  - Ammonia averages
    - ~ 2 mg/l summer
    - ~1 mg/l winter
  - BOD 12 mg/l
  - TSS 15 mg/l

324

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Demonstration Projects

- **IDEAL by EDI**
- Sweet Springs, MO
  - CP comments sent
  - OPPN August 21, 2015

325

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No Longer DEMONSTRATION

- Fixed Film Activated Sludge
- Submerged Attached Growth Reactor (SAGR™) by Nelson Environmental
- Lemna Lagoon Cover with Polishing Reactor
- Advantex
- MBBR as secondary treatment

326

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Submerged Attached Growth Reactor (SAGR™)

327

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LemTec with Polishing Reactor

Lagoon Cover

328

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LemTec with Polishing Reactor

Polishing Reactor

329

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Lemna Polishing Reactor

330

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Orenco Advantex

331

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What have you seen?

Cindy.LePage@dnr.mo.gov

332

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Financial Assistance Center – Project Funding

- Funding programs may change due to federal law revisions, funding availability and new guidance
- Grant funding availability is limited and funding from multiple programs cannot always be combined
- Facility Plans should not assume grant funding availability from the department
  - Please confirm grant and funding program information is current
- Communities need to have sufficient bonding capacity and/or monies on hand to fund the entire project
- U.S Securities and Exchange Commission (SEC) Municipal Advisor Rule became effective in 2014

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Financial Assistance Center – Project Funding

- Grant availability under the Clean Water State Revolving Fund is now subject to an Additional Subsidization Affordability Analysis and eligibilities have changed
  - http://dnr.mo.gov/env/wpp/cwforum/docs/092115-cwsrf-memo-final.pdf
  - Refer to Page 36 in the 2016 CWSRF Intended Use Plan
- Procurement of A/E Services must follow sections 8.285 through 8.291 and 327.181 RSMO
- Direct questions regarding eligibility and funding programs to the department's Financial Assistance Center
  - Shawn Muenks 573.751.1402 or shawn.muenks@dnr.mo.gov

http://dnr.mo.gov/env/wpp/srf/srf-contact-info.htm

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Wastewater Engineering – Construction Permit Process and Regulation Changes

Summary of resources and web addresses related to the specific workshop presentations:

Antidegradation Review

- Antidegradation Implementation Main Page: http://dnr.mo.gov/env/wpp/permits/antideg-implementation.htm
- Example Antidegradation Report Outline: http://dnr.mo.gov/env/wpp/permits/docs/AIPrptoutline.pdf
- Natural Heritage Review: http://newmdcgis.mdc.mo.gov/EnvReview/Default.aspx
- Geohydrologic Evaluation Request: http://www.dnr.mo.gov/forms/780-1688-f.pdf
- Streeter Phelps DO Model: http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html
- Qual2K model: http://www2.epa.gov/exposure-assessment-models/surface-water-models
- DO Modeling & BOD Effluent Limit Development Guidance: http://dnr.mo.gov/env/wpp/permits/docs/DO_Modeling_Administrative_Guidance_Dec_09.pdf
- EPA Economic Guidance for Water Quality Standards: http://water.epa.gov/scitech/swguidance/standards/economics/
- Missouri Use Designation Dataset. That interactive GIS layer can be found at: http://www.dnr.mo.gov/simplemap/construct.do?config=wclsuse
- New Technology Definitions and Requirements: http://dnr.mo.gov/pubs/pub2453.htm
- Social and Economic Importance Evaluation: http://dnr.mo.gov/env/wpp/permits/docs/worksheet.pdf
- Retrieving Data from USGS Gage: http://dnr.mo.gov/env/wpp/permits/docs/retrieving-data-usgs.pdf
- xQy Low Flow Calculator: http://dnr.mo.gov/env/wpp/permits/docs/xqy-low-flow-calculator.xls

Facility Plan

- Wastewater Construction Permitting Website: http://dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm
- Facility Plan Guidance: http://dnr.mo.gov/pubs/pub2416.htm
- Engineering Report Guidance: http://dnr.mo.gov/pubs/pub2415.htm
- USDA Web Soil Survey: http://websoilsurvey.nrcs.usda.gov
- DNR GeoSTRAT: http://dnr.mo.gov/geostrat/
- Missouri Climatic Atlas for Design of Land Application Systems: http://dnr.mo.gov/env/wpp/permits/docs/mo-climatic-atlas-2004.pdf

Missouri's Approach on Blending

- 10 CSR 20-7.015: http://s1.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c20-7a.pdf
- 40 CFR Part 35.2005(b)(16): https://www.law.cornell.edu/cfr/text/40/35.2005
- 40 CFR 133.103(d): https://www.law.cornell.edu/cfr/text/40/133.103

Missouri Geological Survey

- Request for Geohydrologic Evaluation of Liquid-Waste Treatment Facility/Site: http://dnr.mo.gov/forms/780-1688-f.pdf
- Request for Geohydrogic Evaluation of Residential Housing Development (Subdivision): http://www.dnr.mo.gov/forms/780-1690-f.pdf
- Missouri Geological Survey Geo-Sciences Technical Resource Assessment Tool: http://dnr.mo.gov/geostrat/
- Interactive Mapper Services: http://dnr.mo.gov/internetmapviewer/

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Wastewater Engineering – Construction Permit Process and Regulation Changes

Construction Permits Process and Post-Construction

- Revised Statutes for the State of Missouri Chapter 644 (Missouri General Assembly): http://www.moga.mo.gov/
- Code of State Regulations – 10 CSR 20 (Clean Water Commission): http://www.sos.mo.gov/adrules/csr/current/10csr/10csr
- Water Pollution Factsheets and Publications: http://dnr.mo.gov/pubs/
- Wastewater Construction Permitting: http://dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm
- Water Pollution Forms: http://dnr.mo.gov/forms/
- Construction Permit Form: http://dnr.mo.gov/forms/780-2189-f.pdf
- Statement of Work Completed: http://dnr.mo.gov/forms/780-2155-f.pdf
- MOGD – Non-POTW's Discharging <50,000 GPD http://dnr.mo.gov/env/wpp/permits/issued/docs/GD00000.pdf
- 3,000 Gallon Per Day or Less No-Discharge Permit Exemption for Domestic Wastewater Design Guidance, Fact Sheet--PUB1319: http://dnr.mo.gov/pubs/pub1319.htm
- 10 CSR 20 Chapter 6 – Permits: http://s1.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c20-6.pdf
- 10 CSR 20 Chapter 8 – Design Guides: http://s1.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c20-8.pdf
- Master General Permit Template MOG823 - Land Application of Domestic Wastewater: http://dnr.mo.gov/env/wpp/permits/issued/docs/G823000.pdf
- Subsurface Drip Distribution System Fact Sheet: http://dnr.mo.gov/pubs/PUB2435.pdf
- Wastewater Treatment Plant Closure Fact Sheet: http://dnr.mo.gov/pubs/pub2568.htm
- Standard Conditions Part III: http://dnr.mo.gov/env/wpp/permits/docs/sc3-030115.pdf

Rules and Regulation Update

- Revised Statutes for the State of Missouri Chapter 644 (Missouri General Assembly): http://www.moga.mo.gov/
- Code of State Regulations (Clean Water Commission): http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp#10-20
- Water Protection Forum: http://dnr.mo.gov/env/wpp/cwforum/index.html
- Chapter 6.010 Stakeholder Group: http://dnr.mo.gov/env/wpp/cwforum/ca-group.htm
    - 10 CSR 20-6: http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-6a.pdf
- Chapter 8 Design Guides Stakeholder Group: http://dnr.mo.gov/env/wpp/cwforum/chapter8workgroup.htm
    - 10 CSR 20-8: http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-8.pdf
    - 10 State Standards: hhttp://10statesstandards.com/wastewaterstandards.pdf
- Standard Specs Webpage: http://dnr.mo.gov/env/wpp/permits/sewer-specs.htm
- Pilot Project Webpage: http://dnr.mo.gov/env/wpp/pilot-projects.htm
- Wastewater Construction Permitting: http://dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm
    - Wastewater Engineering Construction Permitting Manual: http://dnr.mo.gov/env/wpp/permits/const-permit-manual.htm
    - Wastewater Construction Permit Manual: http://dnr.mo.gov/pubs/pub2445.pdf
    - New Technology: http://dnr.mo.gov/pubs/pub2453.pdf
    - Closure Plan Factsheet: http://dnr.mo.gov/pubs/pub2568.htm

Roundtable Discussion

- New Technology Definitions and Requirements: http://www.dnr.mo.gov/pubs/pub2453.pdf
- Wastewater Pilot Projects in Missouri: http://dnr.mo.gov/env/wpp/pilot-projects.htm
- Ammonia Criteria: New EPA Recommended Criteria: http://dnr.mo.gov/pubs/pub2481.htm
- EPA Aquatic Life Criteria – Ammonia. 2013 Final Ammonia Criteria: http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/ammonia/
- NPDES Operating Permit Manual: http://dnr.mo.gov/env/wpp/permits/manual/permit-manual.htm