Missouri Department of Natural Resources

WORKSHOP ANNOUNCEMENT

WASTEWATER ENGINEERING – CONSTRUCTION PERMIT PROCESS AND REGULATION CHANGES

Are you designing a new or modified wastewater treatment system?

Looking at funding options for a municipal wastewater treatment system?

Do you have questions about the regulation changes?

Land Application? What does this require?

Want to learn the new review process for subsurface irrigation?

Questions about Facility Plan or Antidegradation?

Take this opportunity to learn about wastewater construction permitting.

November 27, 2018
Powder Valley Conservation
Nature Center Auditorium
11715 Cragwold Road
Kirkwood, MO 63122

November 28, 2018
Cape Girardeau Conservation
Nature Center Auditorium
2289 County Park Drive
Cape Girardeau, MO 63701

December 4, 2018
Springfield Conservation
Nature Center Auditorium
4600 South Chrisman Avenue
Springfield, MO 65804

December 5, 2018
Burr Oak Woods Conservation
Nature Center Auditorium
1401 NW Park Road
Blue Springs, MO 64015

December 11, 2018
Boone Electric Cooperative
Community Room
1413 Rangeline Street
Columbia, MO 65201

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.

AGENDA:

8:45 a.m. – **Registration**

9:00 a.m. – **Introduction & Process Review Improvements**

9:30 a.m. – **Regulatory Update** – 10 CSR 20 Chapter 8 Design Standards, Permit Rule, and Water Quality Standards

10:10 a.m. - **Break**

10:20 a.m. **– Antidegradation vs. Facility Plan** – Alternative Analysis

11:10 a.m. **Financial Assistance Center Information** – Funding, Process, and Time

12:00 a.m. – **Lunch**

12:40p.m. – **Geohydrologic** – On-Line Request Information

1:30 p.m. – **Subsurface Irrigation** – Soils Report – Expectations and New Procedure

2:20 p.m. – **Break**

2:30 p.m. – **Surface Land Application**

3:00 p.m. – **Design Guide and Round Table Discussion**

3:45 p.m. – **Adjourn**

REGISTRATION

Please register before November 9, 2018 to confirm seating. $11 at the door for deli sandwich type lunch, coffee, soda, and water. Exact cash is requested. No checks, please.

To attend one of these sessions, please notify Keith Forck via e-mail 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 Choices: Session Location and Date: St. Louis – 11/27 Cape Girardeau – 11/28 Spr.–12/4 Blue Springs–12/5 Columbia–12/11

Lunch Preference: Beef Turkey Ham Vegetarian No Lunch

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Construction Permitting Efficiency

Refaat Mefrakis, PE

Engineering Section Chief

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Introduction

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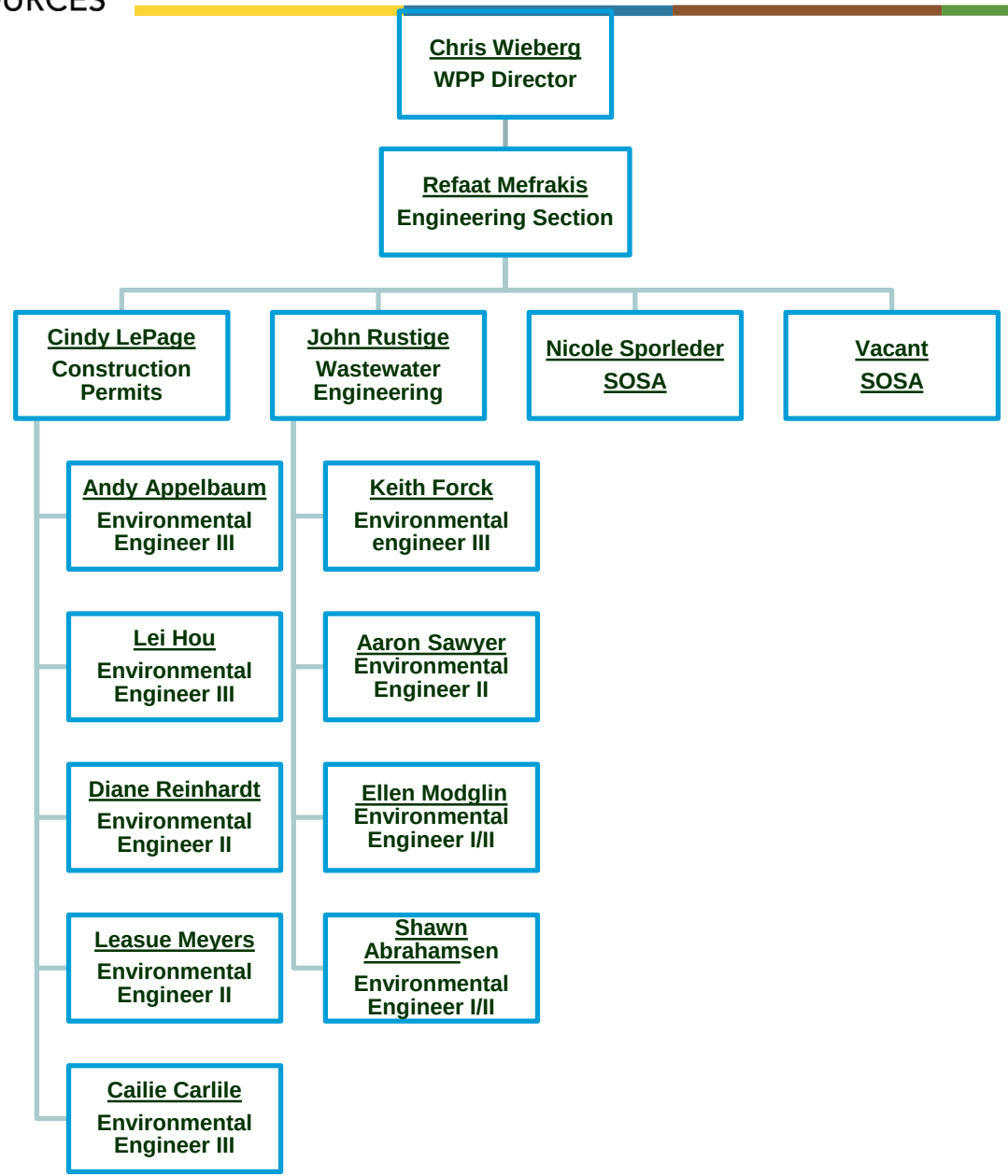

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Presentations

- Process Review Improvements
- Regulatory Update
- Antidegradation
- Financial Assistance Center Information
- Lunch 12:00-12:40
- Geohydrologic Request
- Subsurface Irrigation
- Surface Land Application
- Design Guide and Roundtable Discussion

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Construction Permits Processing Time

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Basis

- Consistent with Department Strategic Initiative Plan (Placemat)
  - Theme: Enhancing Services to Regulated Public
  - Measure: Permit Issuance Time
- Wastewater Engineering Review Memo dated May 11, 2018
  - Complete Application
  - Calendar days

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Statutory vs. Stretch Goal

- Statutory Timeframe (Goal)
  - Wastewater Projects – 180 days
  - Sewer Extension – 60 days
- Stretch Goal
  - Wastewater Projects – 135 days
  - Sewer Extension – 45 days

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Review Process

- Deficiency Review are conducted within 30 days from receipt of an application
  - Call the engineer for a quick response
  - Email deficiency, allow five business days
  - Certified letter to owner, allow 15 days to respond
  - Return incomplete application

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Technical Review

- Identify technical deficiency within 30 days
  - Call the engineer for quick response
  - Draft an email to the engineer, allow five (5) business days
  - Certified letter to owner, allow 15 days
  - Return application after two certified letters for no or inadequate response

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Complete Application Consists of:

- Appropriate forms/fees/signature
- Valid continuing authority
- Approved facility plan/soil reports
- Approved antidegradation review
- Plans and specifications
- Summary of design
- Geohydrologic evaluation

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Questions?

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Regulations Update

- Chapter 8 – Minimum Design Standards
- 10 CSR 20-6.010 Permit Rule
- 10 CSR 20-7.031 Water Quality Standards

John Rustige, PE

Wastewater Engineering

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Title 10 – Department of Natural Resources
Division 20 – Clean Water Commission
Chapter 8 – Design Guides

Existing Regulation

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Chapter 8 – Design Guides

Existing Regulation

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Dow – 838
Inflation – 11.2%
Gas - $0.86
Corolla - $3,698

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Division 20 – Clean Water Commission
Chapter 8 – Design Guides

Existing Regulation

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Title 10 – Department of Natural Resources
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80 pages

Existing Regulation

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Existing Regulation

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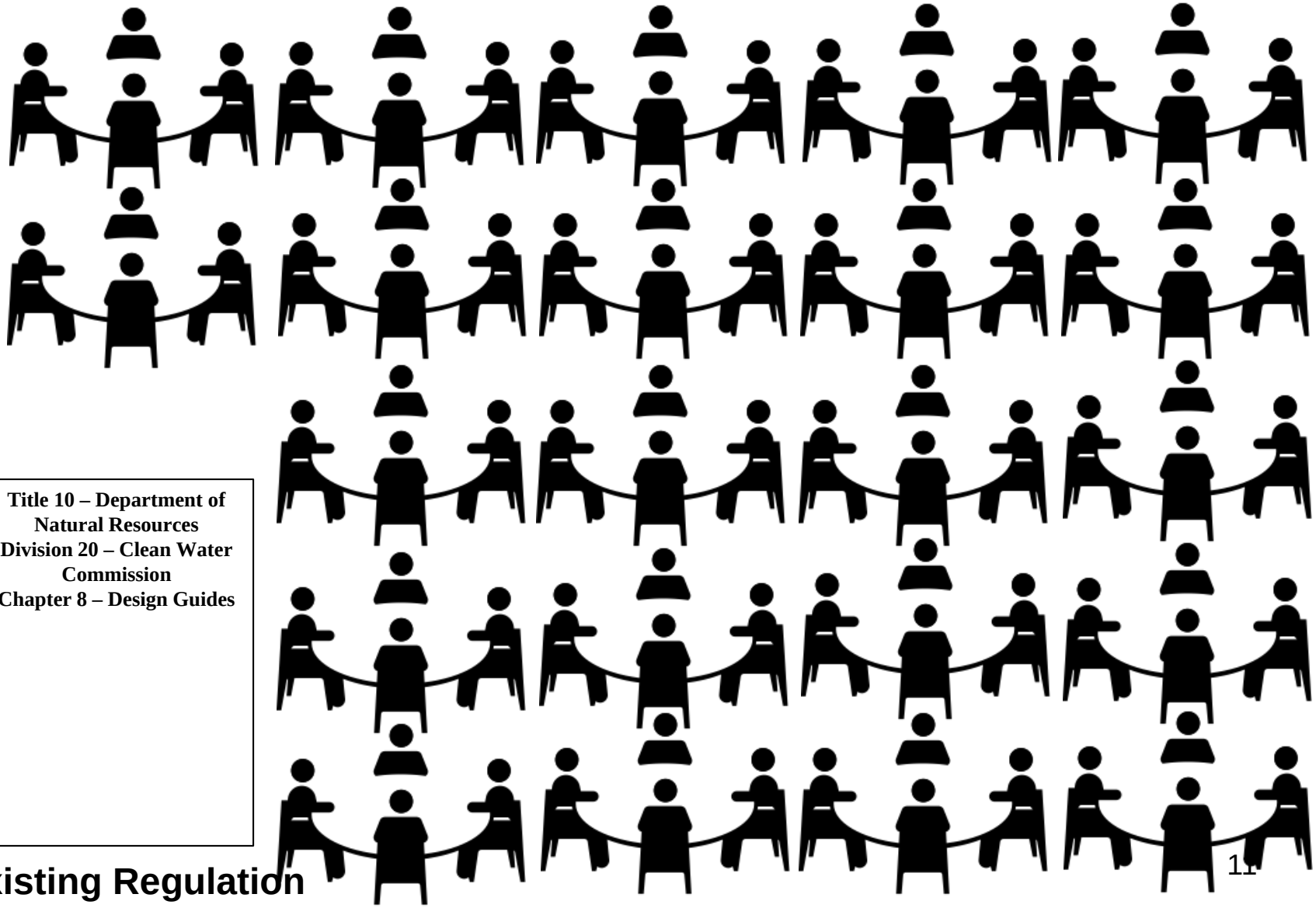

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Existing Regulation

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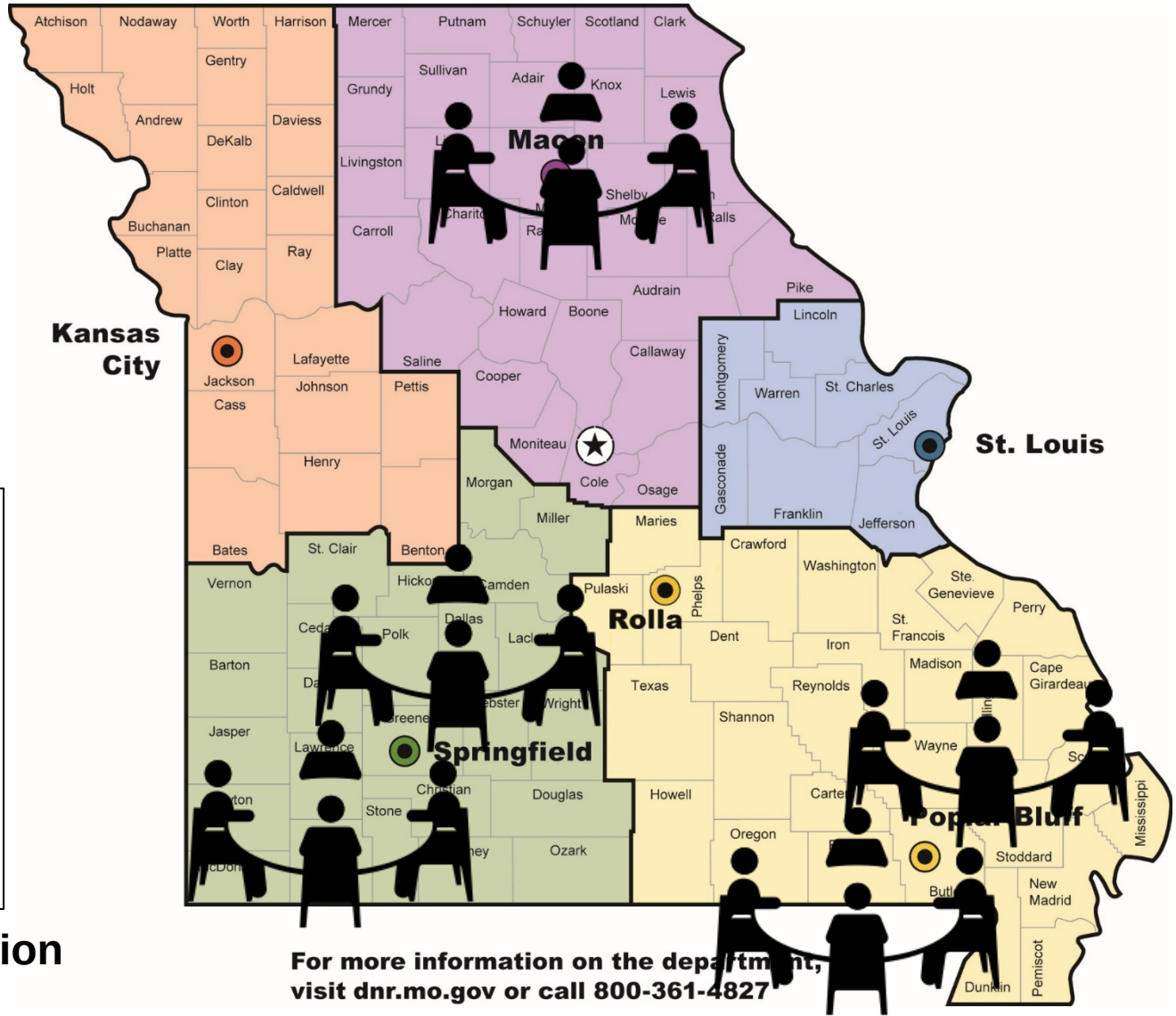

For more information on the department, visit dnr.mo.gov or call 800-361-4827

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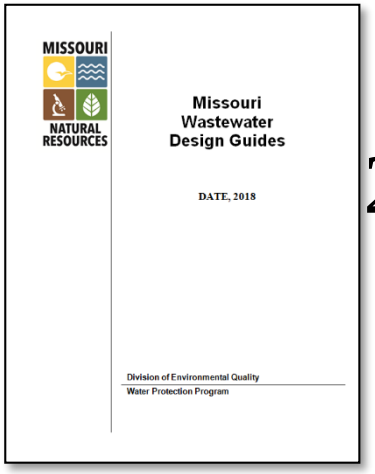

288 pages

NEW GUIDE

Missouri Guide

Title 10 – Department of Natural Resources
Division 20 – Clean Water Commission
Chapter 8 – Design Guides

80 pages

Existing Regulation

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Design Guide's Approach to Red Tape Reduction

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Meaningful review of the rules

- Remove unnecessary burdensome rules
- Remove duplicative language
- Remove non-relevant rules
- Solely for protection of human health, safety, and environment
- Minimum design requirements, no exceptions/deviations

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(1) Applicability.

Wastewater systems shall be designed based on criteria contained in this rule, published standards, applicable federal and state requirements, standard textbooks, current technical literature and applicable safety standards. To the extent of any conflict between the above criteria, the requirement in this rule shall prevail.

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Rule Title Change

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 8—*[Design Guides]* Minimum Design Standards

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Title 10 – Department of Natural Resources
Division 20 – Clean Water Commission
Chapter 8 – Design Guides

80 pages

Existing Regulation

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Title 10 – Department of Natural Resources
Division 20 – Clean Water Commission
Chapter 8 – Design Guides

80 pages

Red Tape →

Title 10 – Department of Natural Resources
Division 20 – Clean Water Commission
Chapter 8 – Minimum Design Standards

24 pages

Existing Regulation

NEW REGULATIONS

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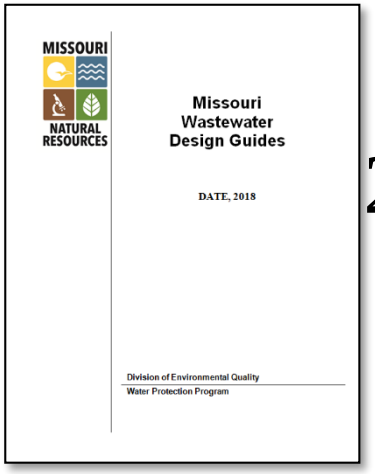

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NEW GUIDE

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Division 20 – Clean Water Commission
Chapter 8 – Design Guides

80 pages

Red Tape

Title 10 – Department of Natural Resources
Division 20 – Clean Water Commission
Chapter 8 – Minimum Design Standards

24 pages

Existing Regulation

NEW REGULATIONS

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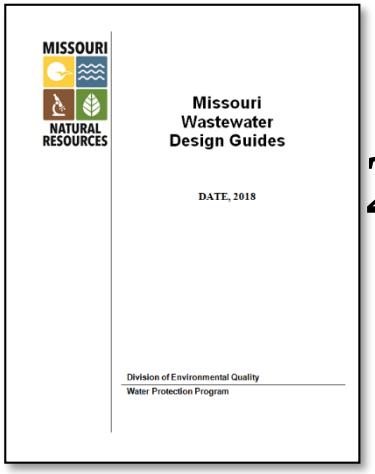
- Good engineering practice
- Active voice recommendations
- Includes the rule language with appropriate citations
- Not referenced by rule



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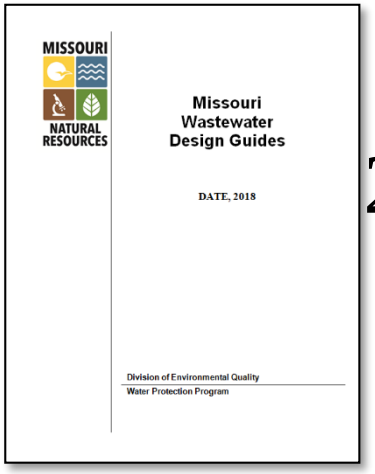

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NEW GUIDE

Missouri Guide

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Red Tape

Title 10 – Department of Natural Resources
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Chapter 8 – Minimum Design Standards

24 pages

Existing Regulation

NEW REGULATIONS

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Existing Regulation

(6) Manholes.

(A) Location.

1. Manholes shall be installed—

(a) At the end of each line;

(b) At all changes in grade, size, or alignment;

(c) At all sewer pipe intersections;

(d) At distances not greater than four hundred feet (400') (120 m) for sewers fifteen inches (15") (38 cm) or less; and

(e) At distances not greater than five hundred feet (500') (150 m) for sewers sixteen inches to thirty inches (16"–30") (46 cm–76 cm).

2. Spacing of manholes greater than five hundred feet (500') (150 m) may be approved by the department in cases where adequate cleaning equipment can justify such spacing.

3. Greater spacing may be permitted in larger sewers.

4. Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the end of laterals greater than one hundred fifty feet (150') (46 m) in length.

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New Regulation

(4) Manholes.

(A) Location.

1. Manholes shall be installed—

(a) At the end of each line;

(b) At all changes in grade, size, or alignment;

(c) At all sewer pipe intersections;

New Design Guide

Manholes shall be installed [See 10 CSR 20-8.120(4)(A)]—

- **At the end of each line;**
- **At all changes in grade, size, or alignment; and**
- **At all sewer pipe intersections.**

MISSOURI DEPARTMENT OF NATURAL RESOURCES

New Design Guide

Manholes shall be installed [See 10 CSR 20-8.120(4)(A)]—

At the end of each line;

At all changes in grade, size, or alignment; and

At all sewer pipe intersections.

Install manholes—

At distances not greater than four hundred feet (400') for sewers that are fifteen inches (15") or less; and

At distances not greater than five hundred feet (500') for sewers that are sixteen inches to thirty inches (16"–30").

Spacing of manholes greater than the distances above may be approved by the Department in cases where the continuing authority of the sanitary sewer system gives written assurance to the Department that adequate cleaning equipment justifies such spacing.

Cleanouts may be used only for special conditions and are not expected to be substituted for manholes nor installed at the end of laterals greater than one hundred fifty feet (150') in length.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

New Design Guide

Manholes shall be installed [See 10 CSR 20-8.120(4)(A)]—

At the end of each line;

At all changes in grade, size, or alignment; and

At all sewer pipe intersections.

Install manholes—

At distances not greater than four hundred feet (400') for sewers that are fifteen inches (15") or less; and

At distances not greater than five hundred feet (500') for sewers that are sixteen inches to thirty inches (16"–30").

Spacing of manholes greater than the distances above may be approved by the Department in cases where the continuing authority of the sanitary sewer system gives written assurance to the Department that adequate cleaning equipment justifies such spacing.

Cleanouts may be used only for special conditions and are not expected to be substituted for manholes nor installed at the end of laterals greater than one hundred fifty feet (150') in length. **Enclose cleanouts in a watertight valve box with a locking cap. Provide cleanouts with proper support, such as crushed stone, concrete pads, or a well compacted trench bottom.**

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Rescissions

- 10 CSR 20-8.020 - Design of Small Sewage Works
- 10 CSR 20-8.220 - Land Treatment

New Regulation

- 10 CSR 20-8.125 Alternative Sewer Systems

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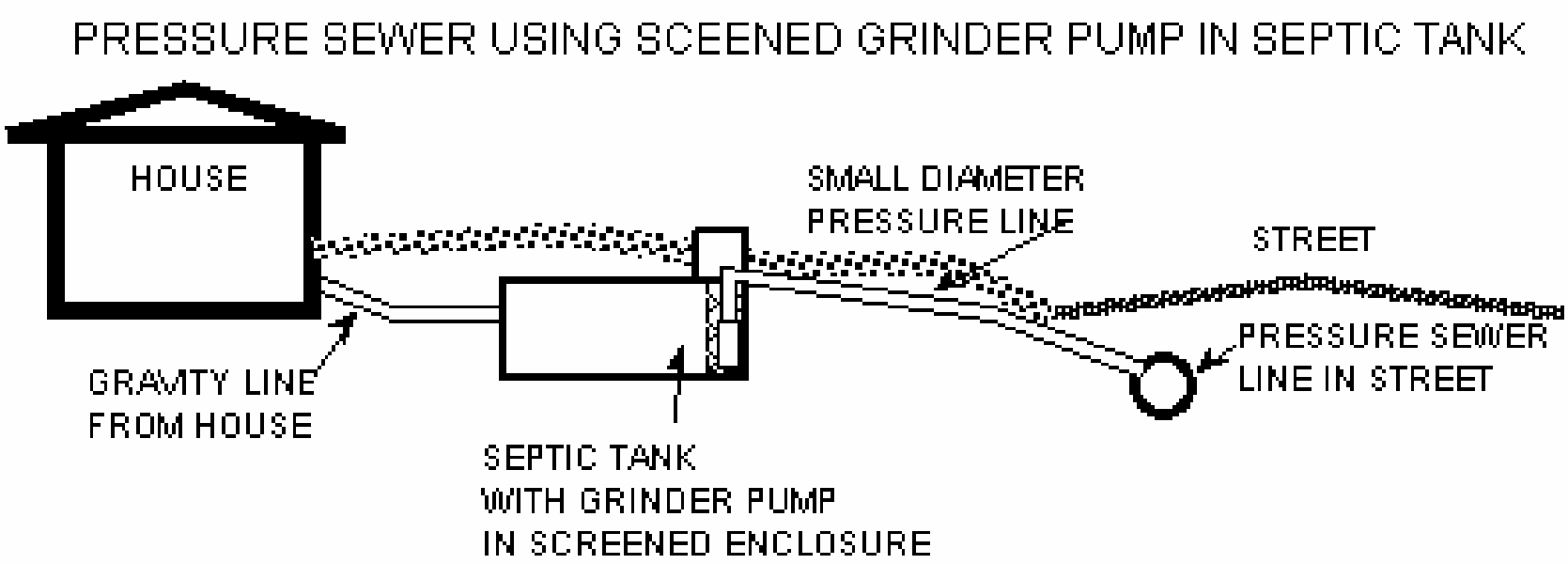
New Processes

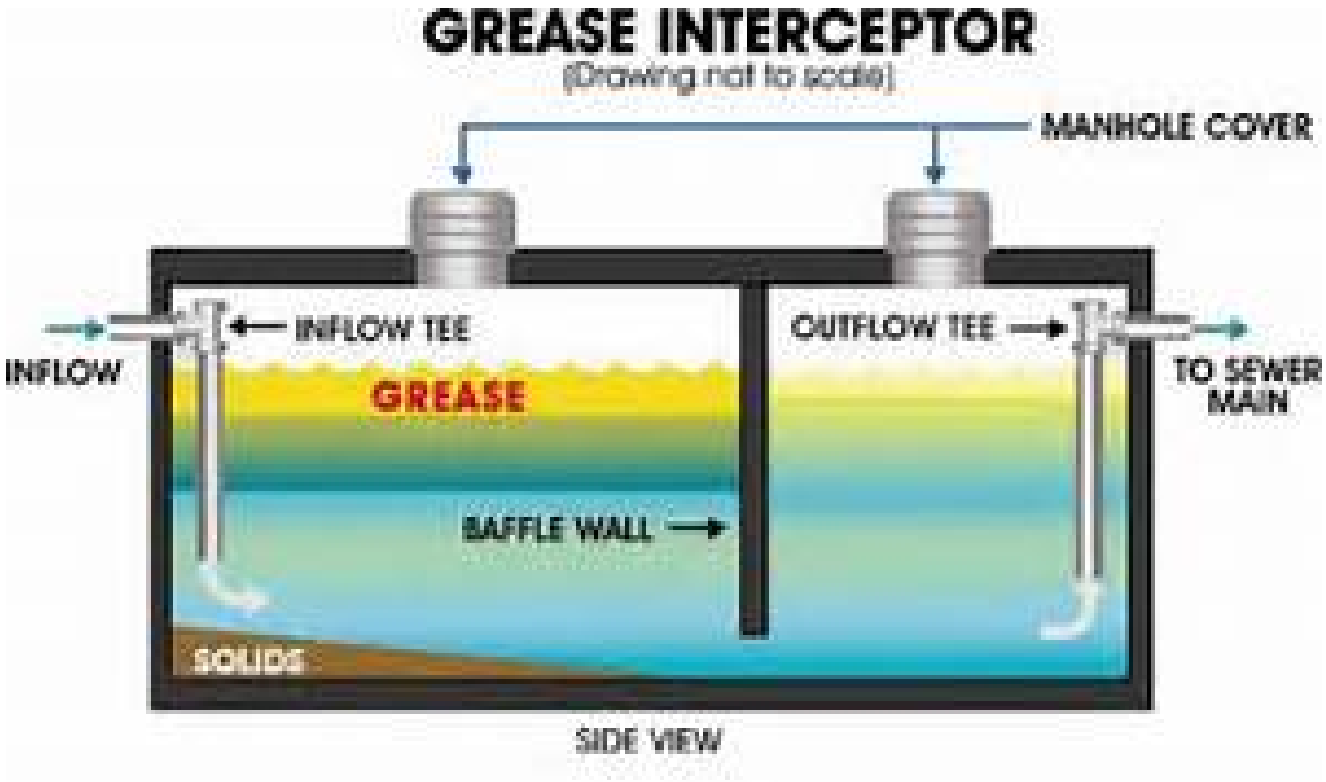
New Processes

- Alternative Sewers: STEP Systems



New Processes

- Grease Interceptors



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New Processes

- Biosolids Composting

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New Processes

- UV Disinfection

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New Processes

- Storage and Land Application

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Construction Permitting Review

- Same quality reviews by the Department
- Engineering criteria listed in Design Guides is considered guidance and do not require deviations from the Department
- Focus on Chapter 8 minimum design standards
- In the case where the facility's ability to meet effluent limits is in question, additional engineering justification may be requested

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Rulemaking Schedule

- Public Hearing – August 15, 2018
- Public Comments Closed – August 23, 2018
- Adopted – October 18, 2018

- **Effective Date – February 28, 2019**

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10 CSR 20-6.010 Construction and Operating Permits

- Continuing Authority
- Construction Permits

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It’s Been A Journey…

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Continuing Authority Definition

- Each application for a construction permit or operating permit shall identify the person, as that term is defined in section 644.016(15), RSMo, that is the owner of, operator of, or area-wide management authority for a water contaminant source, point source, wastewater treatment facility, or sewer collection system. This person shall be designated as the continuing authority and shall sign the application. By doing so, the person designated as the continuing authority acknowledges responsibility for compliance with all permit conditions.

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Continuing Authority

- Removes the discussion of “operate, maintain, and modernize”
- Removes PSC facilities from Level 2
- PSC facilities have to have their certificate of necessity before they apply, not just before the permit is issued
- Added 393’s to Level 4
- **Defines Availability**
- Draft factsheet explaining the hierarchy & responsibilities to be published

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Facility Plan

- All size facilities before applying for a CP
- Soils report is part of FP
- Facility plan or engineering report not required for:
  - Disinfection promulgated in 10 CSR 20-8.190;
  - Projects exempted from construction permitting;
  - Sewer extensions permitted under the MOGC;
  - Sewer projects that submit Sewer Extension Design Certification

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CP Process Regulation Changes

- Default 2 year construction permits
- Allow more than one extension
- No more Deviations
- Demonstration Projects
- General permit for sewer extensions
- Reference to Missouri Minimum Design Standards in 10 CSR 20-8
- Exemption List

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Construction Permit Exemptions

- Sewer extensions <1,000' with 1 pump station or less;
- Nondomestic projects except earthen basins;
- Projects under other DNR jurisdictions;
- Addition of Metal Salts for Phosphorus Removal (e.g. $Al_2(SO_4)_3$ & $FeCl_3$);
- Pre-engineered dechlorination;
- Case-by-case can be waived;

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Minor Project Exemptions

- Internal piping changes;
- pH adjustment;
- Addition of solids storage tanks;
- Screening equipment;
- Grit removal equipment;
- Administrative buildings;
- Fences and access roads;
- Flow measuring devices;
- Mixing equipment;
- Addition and/or improvement of sampling equipment;
- Replacement of aeration equipment; and
- Polymer additives.

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Complete Application

- 1 hard copy (non-funded), 1 electronic copy
- Appropriate permit fee;
- An approved antidegradation evaluation*;
- If applicable, approved facility plan or engineering report
- A summary of design;
- Signed & sealed engineering plans & technical specifications;
- A map showing outfalls; and
- Process flow diagram

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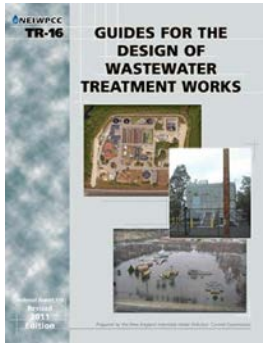
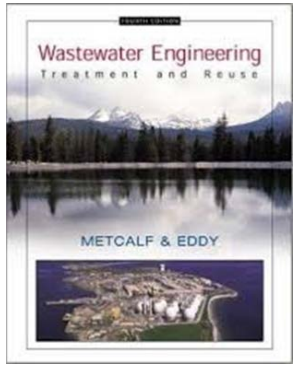
Request Additional Info

- The minimum design standards requirements in 10 CSR 20-8 do not preclude utilizing other published technical design guides during the review process.
- The department may request additional information/engineering justification to determine the facility's ability to meet limits.





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Delinked: Construction & Operating Permits

- An Antidegradation review (public noticed) can serve as the public notice requirement for the CP
- If construction is intended to meet effluent limits & permit conditions already established in OP, no OP modification is necessary
- If the applicant is seeking a general permit, no additional public notice is necessary
- Just apply for your Operating Permit Modification 180 days prior to initial discharge

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When is a Geohydrologic Evaluation Necessary?

Project	Purpose
New Discharge to a Stream	Gaining or Losing
Earthen Basin	Collapse Potential
Irrigation Systems	Collapse Potential & Karst Features
Subsurface Disposal	Karst Features

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Project Planning Timeframes

- Geohydrological Evaluation (~30-60 days)
- Natural Heritage Review (~30-60 days)
- Antidegradation (~60-90 days)
  - Public notice Antideg (~45 days)
- Facility Plan (~30-60 days)
- Construction Permit (180 days*)
- Facility Constructs (~2 years)
- Submit Complete OP Application 180 days prior to initial discharge (if necessary)
- Submit Statement of Work Complete - OP modification issued

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Missouri Water Quality Standards 2018 Update

- Adopted numeric nutrient criteria for lakes and reservoirs
- Revised definitions and implementation methods
- Incorporated by reference updated antidegradation procedures and multiple discharger variance framework
- Updated waterbody tables and incorporated GIS data for losing streams

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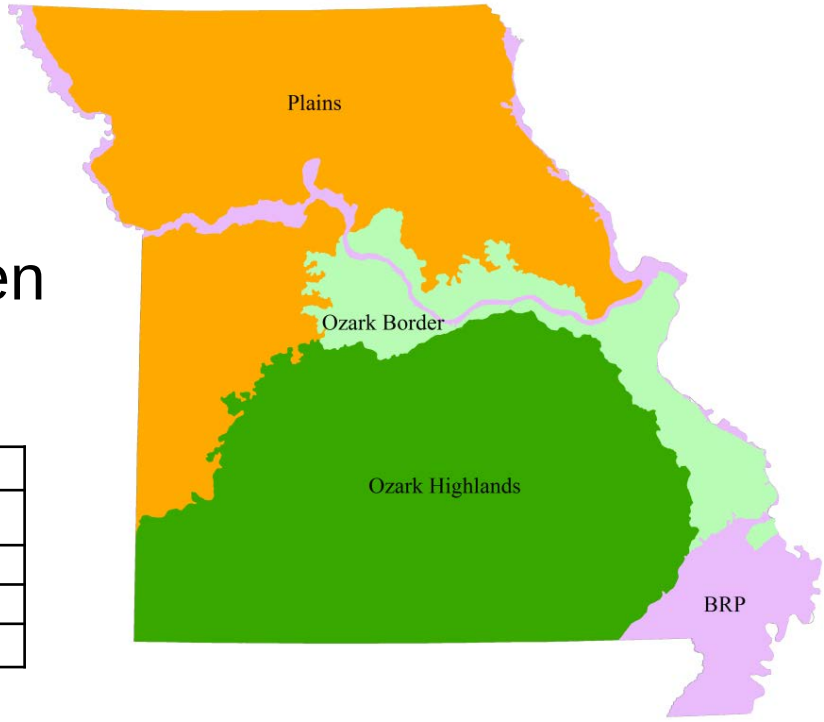
Update: Nutrient Criteria for Lakes

- Parameters for total phosphorus and total nitrogen and for algae as chlorophyll-a
- Parameters specific to Missouri ecoregions
- Weight-of-evidence approach when impairment status is unclear



Lake Ecoregion*	Chl-a Criteria (µg/L)	Screening Thresholds (µg/L)		
		TP	TN	Chl-a
Plains	30	49	843	18
Ozark Border	22	40	733	13
Ozark Highland	15	16	401	6

* Nutrient Criteria for Big River Floodplains not developed at this time

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Update: Other WQS Provisions

- Waters of the State definition – 644.016 RSMo
- Hardness based metals calculations will be based upon the median (50th percentile) hardness within the ecoregion
- General criteria for maintaining the quality of downstream waters
- pH clarified as a chronic criteria (4-day average conc.)
- Chloride, Sulfate and Chloride criteria reverted to previous values
- Losing Streams – Table J removed, replaced

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Update: WQS Tables

Table A1-Criteria for Designated Uses and Health Advisory Levels

Criteria for Designated Uses							
		Aquatic Life Protection		Human Health Protection	DWS	IRR/ LWP	GRW
POLLUTANT	CAS #	Acute	Chronic	Fish Consumption			
METALS (µg/L)							
Aluminum (pH 6.5-9.0 SU)	7429905	750					
Antimony	7440360						
Arsenic	7440382	340	150				
Barium	7440393						
Beryllium	7440417		5				
Boron	7440428						
Cadmium	7440439	Table A2	Table A2				
Chromium (III)	16065831	Table A2	Table A2				
Chromium (VI)	18540299	16	11				
Cobalt	7440484						

10 CSR 20-7—DEPARTMENT OF NATURAL RESOURCES Division 20—Clean Water Commission

Table J – Water Quality Standards Variances

Facility Name	Permit ID	Effective Permit Date	Easting (UTM)	Northing (UTM)	Receiving Stream	WBID	HUC 8	Highest Attainable Condition (designated use and criterion)		Variance Expiration (EPA Approval) Date
Fulton WWTP	MO-0103331	1/1/15	592755.59	4299234.181	Stinson Creek	710	10300102	AQL	9 mg/L - CBOD 5 mg/L - TSS 4.0 mg/L - TN 0.10 mg/L - TP	12/1/35 (2/25/15)
Kirksville WWTP	MO-0049506	*TBD	537368.878	4445117.91	Bear Creek	115	07110005	AQL	15.0 mg/L - 5-Day BOD** 23.0 mg/L - TN 6.0 mg/L - TP	12/31/33 (*TBD)

*Effective upon issuance of the permit and EPA approval
**Includes CBOD and NBOD

Table K
Site-Specific Criteria

Reserved for Site-Specific Criteria established pursuant to 10 CSR 20-7.031(5)(S).

There are no site-specific criteria proposed at this time.

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Questions?

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Water Quality and Antidegradation Reviews (WQAR)

Aaron Sawyer
Water Protection Program
Engineering Section
aaron.sawyer@dnr.mo.gov

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What you need to know about the process of antidegradation?

- Applies to new or expanding discharges
- Department target is to complete WQAR in 60-90 days
- We encourage pre-application meetings. It can help **reduce complications** the process

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What is Antidegradation?

Protecting and maintaining existing water quality (EWQ) in all waters of the state.

Prohibits degradation of Tier III (outstanding quality) waters. Effluent limits are established in operating permits with the appropriate waste load allocation for Tier I (impaired) waters.

Ensures a **limited** lowering of water quality for Tier II waters; therefore, corresponding effluent limits are established in operating permits.

Water quality may be lowered after a determination of necessity of degradation to EWQ based on justification of economic and social importance for Tier II waters.

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Boiling Down The Process for Consultants

1. How do consultants develop an Antidegradation Report and Submittal?

2. What is the Department looking for during its review process?

3. What will the effluent limits be for the proposed facility?

Determine the appropriate level of Protection for each Pollutant of Concern:

- **Tier 3**: No degradation allowed. Outstanding National and State Resource Waters.
- **Tier 1**: Review designed to prohibit degradation that may cause or contribute to the impairment of a beneficial use, or violation of water quality criteria and prohibit further degradation of existing water quality (EWQ) where pollutants of concern (POCs) have resulted in the water being included on the 303(d) list.
- **Tier 2**: Degradation allowed. Minimal and Significant. Alternatives analysis for significantly degrading pollutants of concern. **Assume Tier 2 in absence of existing water quality data**.

Tier 3 Protection

- Outstanding National Resource Water (**ONRW**)
- Outstanding State Resource Waters (**OSRW**)

No degradation allowed.

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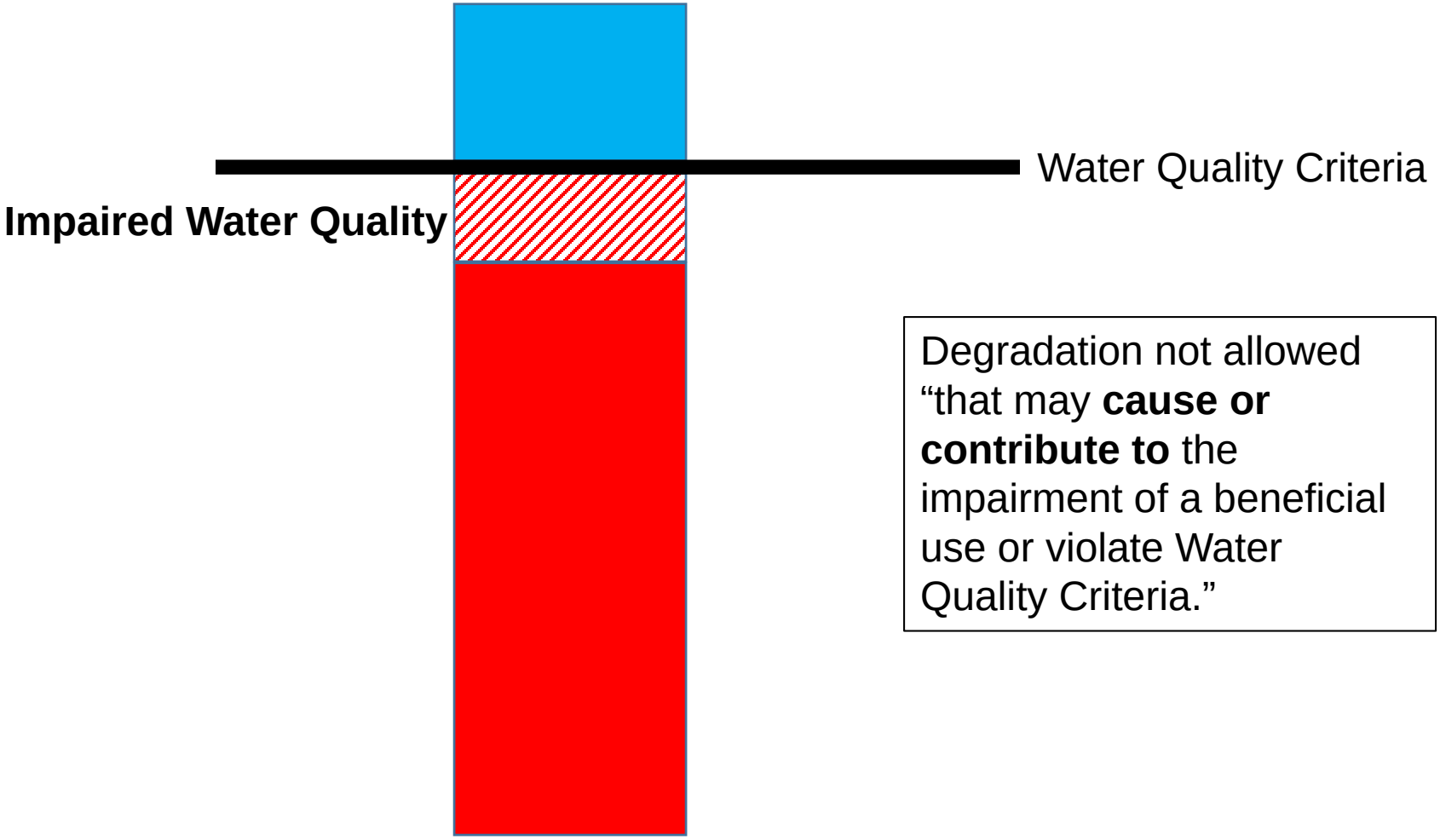
Tier 1 Protection



Degradation not allowed "that may **cause or contribute to** the impairment of a beneficial use or violate Water Quality Criteria."

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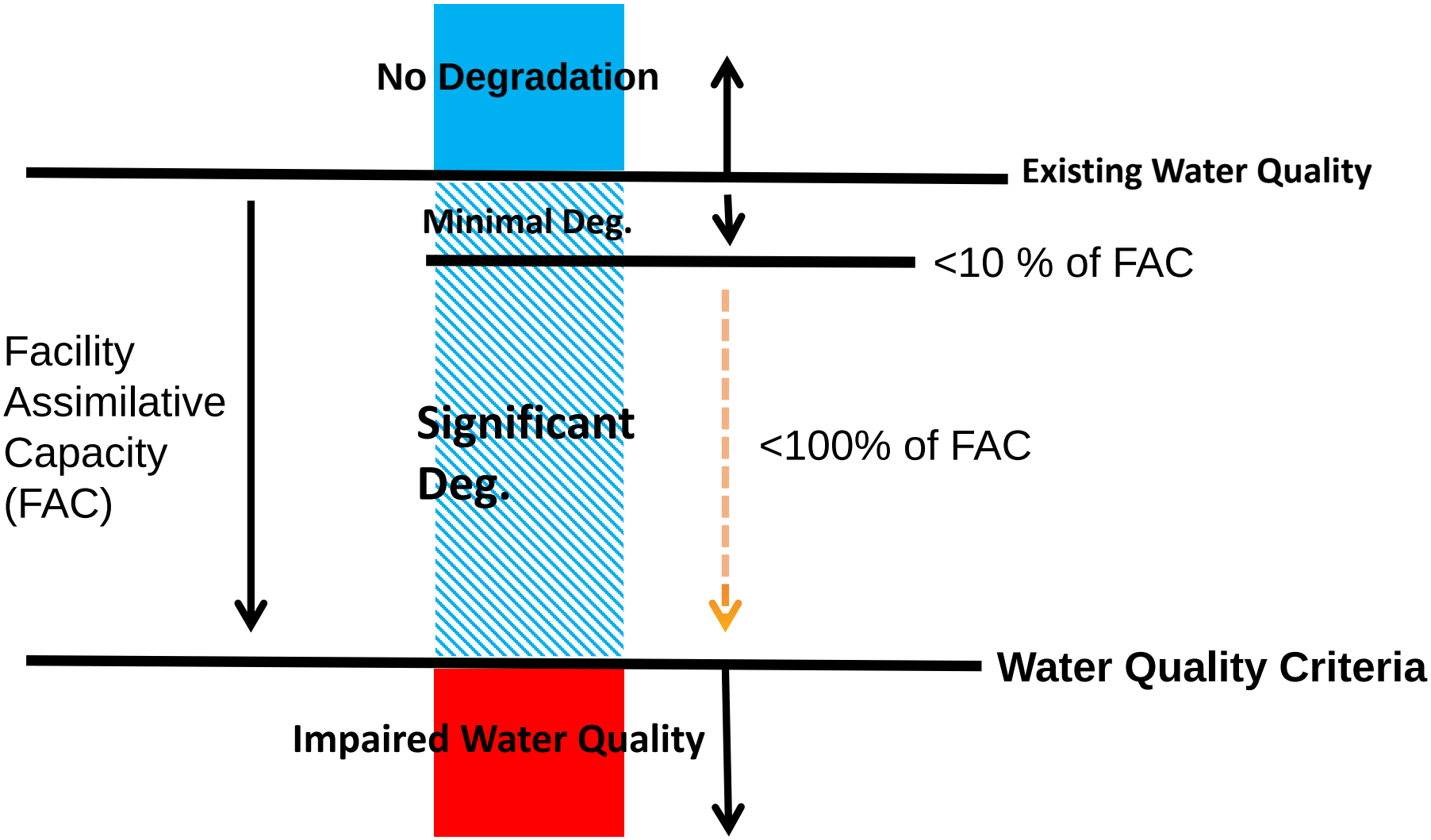
Tier 2 Protection



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Submittal Basics

- **Application form requesting review**
  - Pick the right form for project (Significant, Minimal, Non-degrading)
  - https://dnr.mo.gov/forms/#WaterPollution
  - Forms serve as summary for Public Notice in the operating permit

- **Antidegradation Report**
  - Answer questions from application form in more thorough detail
  - Include all pertinent information that will assist the reviewer in understanding the project

- **Geohydrologic Evaluation**
  - https://dnr.mo.gov/geology/geosrv/envgeo/eau.htm

- **Natural Heritage Review (Conservation Dept.)**
  - https://mdc.mo.gov/property/responsible-construction/Missouri-natural-heritage-program

Characterize the Influent and Identify Pollutants of Concern (POC)

- **Is the project for a new or expanding discharge?**
  - First evaluate the possibility of non-degrading or minimally degrading
  - Summarize performance history of existing facility

- **Is the wastewater domestic?**
  - Look at existing permit effluent table
  - BOD / TSS / Ammonia / E. coli / DO

- **What are the industrial contributions to the wastewater?**
  - Metals, Chemicals, Volatile Organic Compounds, etc.

Identify non-point source alternatives.

Land Application

- Surface/Subsurface
- How much land is needed for treatment?
- Soils Report may be needed

Regionalization

- Is there a viable option to connect to an existing treatment facility nearby?
- Give detailed description why it is not viable option

When is DO an issue and modeling required?

- Effluent discharge must achieve, at a minimum, 5.0 mg/L, for most waterbodies, by the time the effluent enters classified waters
  - Serves as a baseline for antidegradation alternatives analysis
- Only applicable to Significantly Degrading projects
- DO modeling not required when proposed BOD limits are less than or equal to 10 mg/L monthly average and 15 mg/L weekly average. Typically 10/15 mg/L is economically efficient.
- New facilities >100,000 gpd need to perform DO modeling

Identify the location of the discharge

- Gaining or losing stream?
  - If a losing stream is the preferred receiving water analyze and justify why gaining streams in the vicinity are not better suited to receive the discharge.
  - Losing stream effluent limits serve as baseline for alternatives analysis.
- Impaired? 303(d) listed or TMDL
- Facility under enforcement?

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4 Different Types of Effluent Limit

1. **Water Quality Based (WQBEL)**
   - Baseline for minimum treatment
   - Found in 10 CSR 20-7.031

2. **Technology Based Effluent Limits (TBEL) - Effluent Limit guidelines (ELG)**
   - Baseline for minimum treatment
   - Found in 10 CSR 20-7.015

3. **Tier 2 Antidegradation Effluent Limits**
   - Preferred Effluent Limits (PEL)
     - Significant or minimal degradation basis
   - No Discharge Effluent Limits (NDEL)

4. **TMDL – Wasteload allocation**
   - Tier 1 analysis
   - Limits established in TMDL

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Case Study: Establishing Effluent Limits for Non-Degrading projects

The Situation

*Facility expanding from 9,600 gpd to 18,800 gpd

*Adding second treatment train with identical sand filter setup

*Facility currently covered under MOGD

*One limit for summer and winter for ammonia

*Discharging to tributary to lake

*Design loading rate adjusted from 5.0 gal/ft2/day to 3.0 gal/ft2/day to achieve desired non-degrading ammonia effluent concentration

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Existing permit effluent limits.

BOD: 30 mg/L avg. monthly
TSS: 30 mg/L avg. monthly
Ammonia: 4.6/12.1 mg/L (summer and winter)

Proposed Effluent Limits

BOD: 20 avg. monthly
TSS: 20 avg. monthly
Ammonia: 2.3/6.0 (summer and winter)

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Non-degrading Demonstration for Ammonia

Current / proposed design flow = 0.0096 / 0.0188 MGD

Current/New effluent limit = 4.6 mg/L / **???**

Mass conversion = 8.34 lbs/MGD

Existing Load=(0.0096 MGD)*(4.6 mg/L)*(8.34)=0.368 lbs/day

$$\text{New effluent limit} = \frac{\text{Existing Load}}{(\text{proposed flow} * \text{conversion})}$$

New Effluent Limit = 0.368 lbs/day / (0.0188*8.34) = 2.3 mg/L

2.3 mg/L represents the highest effluent concentration that can be proposed by the applicant to be eligible for non-degrading analysis for ammonia.

Establishing Effluent Limits for Significantly Degrading Projects

- **Tier 2, Significant Degradation: Alternatives Analysis**
  - Compare and analyze **at least 3 different discharging treatment technologies** that are practical.
  - Establish base case technology
    - Must meet WQBELs/TBELs
    - Establishes economic baseline with which to compare all other technologies against
  - Prepare cost analysis for each technology
    - Present worth life-cycle costs
    - Provide interest rate
    - Demonstrate economic efficiency **(rule of thumb is <120% base case)**

Establishing Effluent Limits for Significantly Degrading Projects

- **How to establish the base case technology.**
  - Lowest life-cycle cost that is capable of achieving water quality based effluent limits.

Base Case Technology

Technology	POC WQS (Ammonia)	Cost Ratio @ WQS	0.8 / 2.1 2.3 / 6.0	.6 / 1.7 2.1 / 5.6
Technology #1	S: 1.4 / 3.6 W: 2.9 / 7.5	$55,000 1 : 1	$65,000 1 : 1.18	$69,000 1 : 1.25
Technology #2	S: 1.4 / 3.6 W: 2.9 / 7.5	$60,000 1 : 1.09	$66,000 1 : 1.20	$73,000 1 : 1.32
Technology #3	S: 1.4 / 3.6 W: 2.9 / 7.5	$65,000 1 : 1.18	$85,000 1 : 1.55	
Technology #4	S: 1.4 / 3.6 W: 2.9 / 7.5			$107,000 1 : 1.95

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Establishing Effluent Limits for a Significantly Degrading project

Economically efficient (<120%) and more protective than WQS

Possibly economically efficient technology (~120%)

Technology	POC WQS (Ammonia)	Cost Ratio @ WQS	0.8 / 2.1 2.3 / 6.0	.6 / 1.7 2.1 / 5.6
Technology #1	S: 1.4 / 3.6 W: 2.9 / 7.5	$55,000 1 : 1	$65,000 1 : 1.18	$69,000 1 : 1.25
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Technology #4	S: 1.4 / 3.6 W: 2.9 / 7.5	—	—	$107,000 1 : 1.95

Establishing Effluent Limits for a Minimally Degrading Project

Requires existing water quality (EWQ) and 7Q10 flow data. If no USGS stream gauge data available then preferably 2 years of sampling data required to establish EWQ.

Minimal degradation can be calculated for a variety of situations

1. New discharge
2. Expanding discharge
3. New discharge replacing two existing discharges
4. Expanding discharge replacing an existing discharge
5. Expanding discharge undergoing multiple expansions
6. Multiple new discharges

Specific examples calculations of each can be found in the appendix of the AIP.

Steps for Calculating the Percent Reduction in FAC from a proposed Discharge

1. Calculate FAC
   - New Discharge: FAC = [(WQC*(Qs+Qd2))-(Cs*Qs)]/CF
   - Expanding Discharge: FAC = [(WQC*(Qs+Qd2))-(Cs*(Qs+Qd1))]/CF

2. Calculate load of the new or expanded discharge and the current load of the existing discharge (if applicable)
   - New discharge load = (Cd2*Qd2)*CF
   - Current discharge load = (Cd1*Qd1)*CF

3. Determine if new or expanding load is greater than 10% of FAC
   - % of FAC = [(New discharge load – Current discharge load)/FAC]*100

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So what does all this amount to and what is the point of Antidegradation?

- Prior to 2008 the Department issued Water Quality Review Sheets that allowed degradation to water quality standards without expectation of producing higher quality effluent.

- Antidegradation aims to not only maintain water quality standards but maintain and preserve existing water quality.

- Using the 120% cost of base case rule of thumb to determine economic efficiency of a technology allows for enhanced protection of Missouri waters. At the same time project owners are protected from unreasonable financial expectations to achieve high quality effluent.

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Fast Track for Reviews of Facilities with Design Flow Less Than 10,000 gpd

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WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH
ANTIDEGRADATION REVIEW SUBMITTAL
ATTACHMENT E: TIER 2 – SIGNIFICANT DEGRADATION USING DEPARTMENT'S ALTERNATIVES ANALYSIS FOR DOMESTIC WASTEWATER FACILITIES WITH DESIGN FLOW LESS THAN 10,000 GALLONS PER DAY

- Applicable to domestic wastewater
- Achievable effluent limits
- Consultants need to demonstrate no discharge alternative
- **Discharging alternatives analysis is not needed from the consultant as it has been conducted by the Department**

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Fast Track for Reviews of Facilities with Design Flow Less Than 10,000 gpd

- The Department is looking at increasing the limit to facilities <50,000 gpd to match the MOGD.

- Coordination with Operating Permits Section to possibly incorporate general antidegradation reviews into the MOGD as well.
  - Benefits:
    - Expedient antidegradation review
    - Consultant does not need to perform discharging alternatives analysis
    - Expedient operating permit review

    - Stakeholder meeting to discuss MOGD is scheduled for December 6th

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Limits straight out of Attachment E for <10,000gpd

The chosen alternative must be capable of meeting the following effluent limitations:

Pollutant of Concern*		Units	Daily Maximum	Weekly Average	Monthly Average
BOD_5		mg/L		15	10
TSS		mg/L		15	10
Ammonia as N Summer		mg/L	1.7		0.6
Ammonia as N Winter		mg/L	5.6		2.1
pH		SU	6.5– 9.0		6.5 – 9.0
Escherichia coli (*E. coli*)	WBC(A)	#/100 mL	630***		126
	WBC(B)	#/100 mL	1030***		206
	Losing Stream**	#/100 mL	126***		Monitoring only

* Permit limits for other parameters, including oil and grease, total residual chlorine, nitrates, and total phosphorus, will be included in the operating permit based on applicable water quality standards and criteria as applicable.

Total residual chlorine (TRC) effluent limits of 0.017 mg/L daily maximum, 0.008 mg/L monthly average are recommended if chlorine is used as a disinfectant. Standard compliance language for TRC, including the minimum level (ML), may be included in the operating permit.

** For any facility that will discharge to a waterbody designated as a losing stream or within two miles flow distance upstream of a losing stream.

*** Publicly owned treatment works will receive a weekly average limit and private facilities will receive a daily maximum limit.

If any Tier 1 Pollutants of Concern not addressed in this alternatives analysis will be discharged, the applicant must submit *Attachment D: Tier 1 Review* (dnr.mo.gov/forms/780-2024-f.pdf) for those pollutants.

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Just Reminder….

When the existing operating permit limits are changing due to a schedule of compliance and the facility is **not** increasing design flow, an antidegradation review is **not** necessary.

If new POC is being introduced to the facility a review is necessary from the Department.

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A Brief History and Facts

- Federal Requirement: 40 CFR section (§)131.12.
- State Regulation: 10 CSR 20-7.031(3)
- Antidegradation Implementation Policy (AIP) for Missouri became effective in 2008
  - https://dnr.mo.gov/env/wpp/permits/antideg-implementation.htm
  - Previously the Department conducted water quality review sheets

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- What have you struggled with in the antidegradation process?

- Where do you feel clarity is needed to be more effective in developing Antidegradation Reports.

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Water Protection Program Financial Assistance Center

Joan Doerhoff
CW Coordinator Unit

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Financial Assistance Center Improvements

- Streamlined our processes to shorten timeframes
- Updated Standard Operating Procedures
- Creating consistency
- Updating internal policies & exploring more non-traditional financing
- Developing new marketing materials
  - SRF Community Guide-Borrower's Guide to the SRF process
  - Matrix shows comparisons between funding partners
  - Creating cost-savings calculators
  - Funding workshops state-wide

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Funding Workshops

- Hosted 8 financing workshops throughout the state
- USDA-RD and Community Development Block Grant
  - Opportunities for networking
  - Community leaders, engineers,
  - Financial advisors, and others
- We are here to help!

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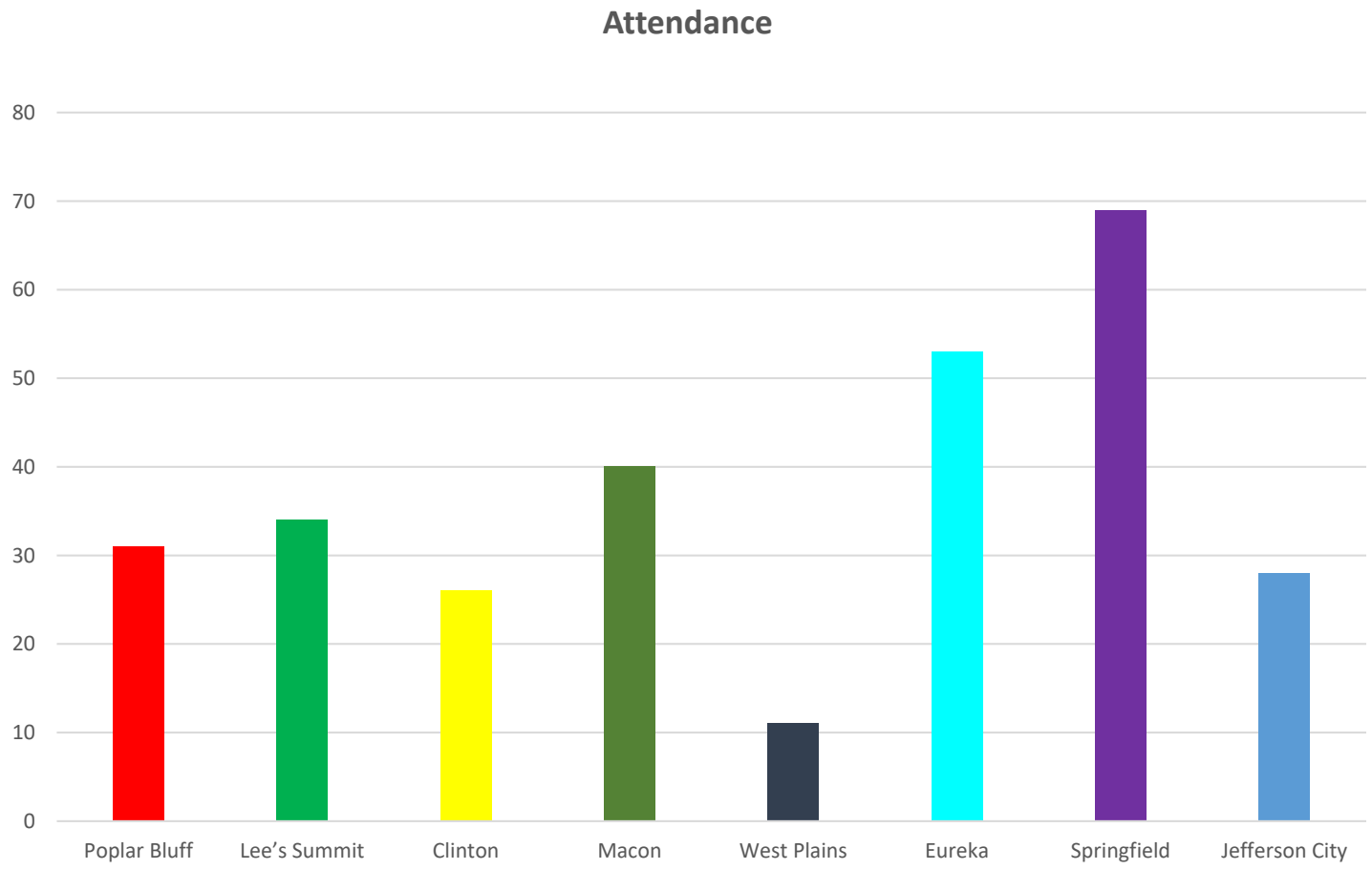

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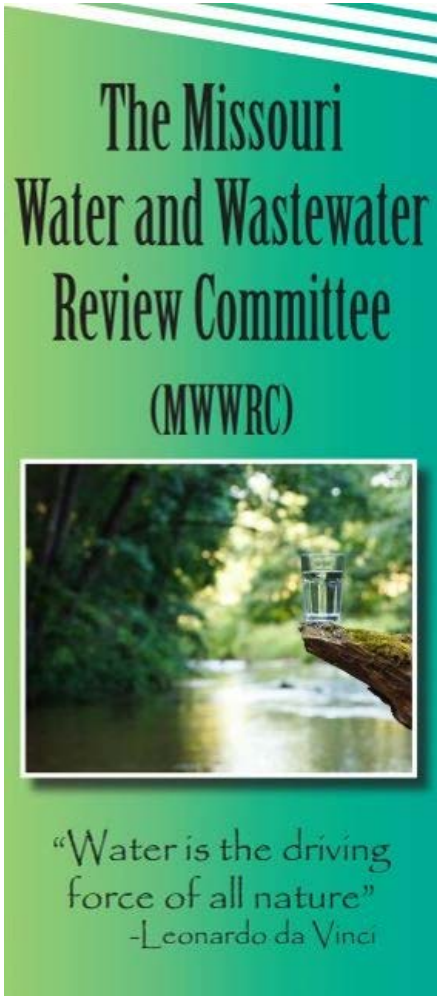
Missouri Water and Wastewater Review Committee (MWWRC)

Members:

- Missouri Department of Economic Development - Community Development Block Grant Program
- Missouri Department of Natural Resources
- U.S. Department of Agriculture-Rural Development

Purpose

- This committee meets monthly to jointly review applications and coordinate financial resources to maximize public infrastructure funds



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Financial Assistance Center

Who We Are

DNR's Financial Assistance Center provides funding to communities for water, wastewater and stormwater infrastructure. Our team of engineers, project coordinators and administrative staff are dedicated to helping Missouri communities plan and fund infrastructure that benefits the community's health, economy and overall well being.

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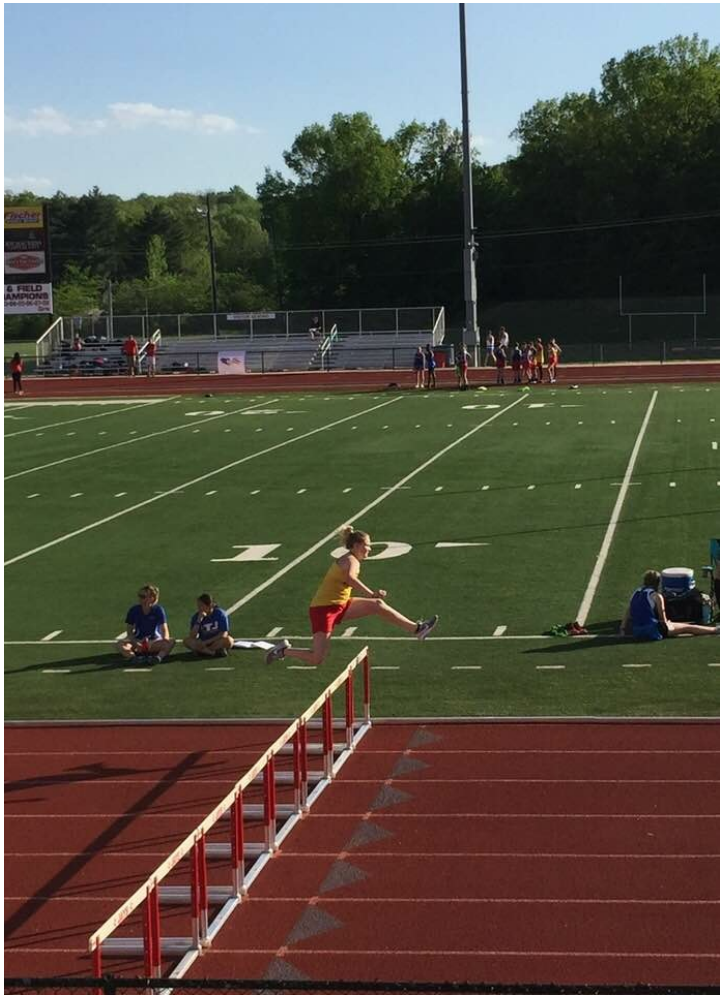
Federal and state financial assistance programs do have special requirements…



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Financial Assistance Center

- Clean Water State Revolving Fund Loan Program
- Drinking Water State Revolving Fund Loan Program
- Small Community Engineering Assistance Program – For wastewater
- Drinking Water Engineering Report Services Grants – For drinking water

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SRF Loan Programs

Clean Water SRF (wastewater and non-point source projects)

- Municipalities, counties, public water or sewer districts, political subdivisions or instrumentalities of the state are eligible for wastewater loans

Drinking Water SRF

- Community water systems and not-for-profit noncommunity water systems are eligible for drinking water loans

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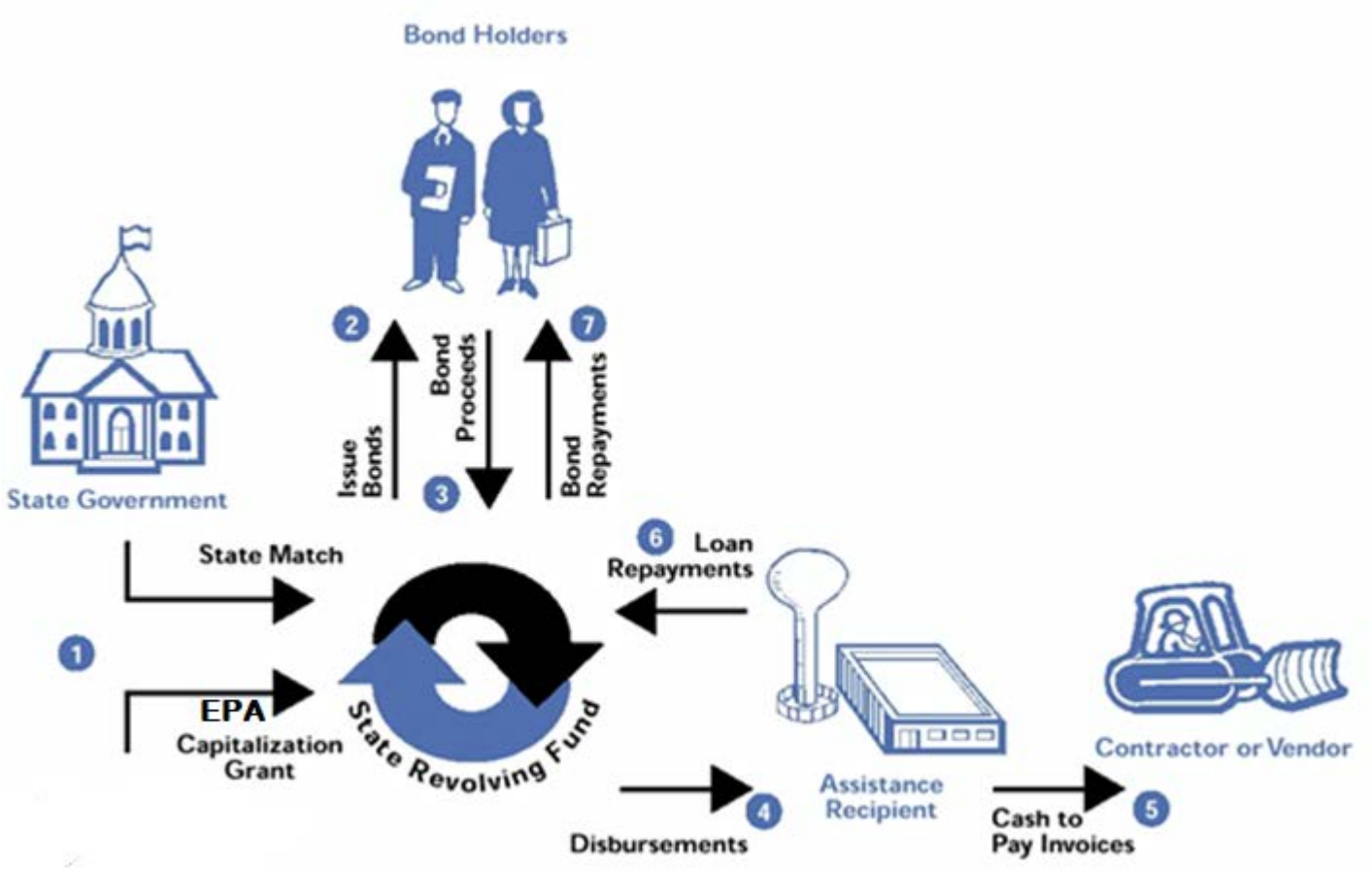
State Revolving Fund (SRF) Loan Programs

What is a State Revolving Fund?



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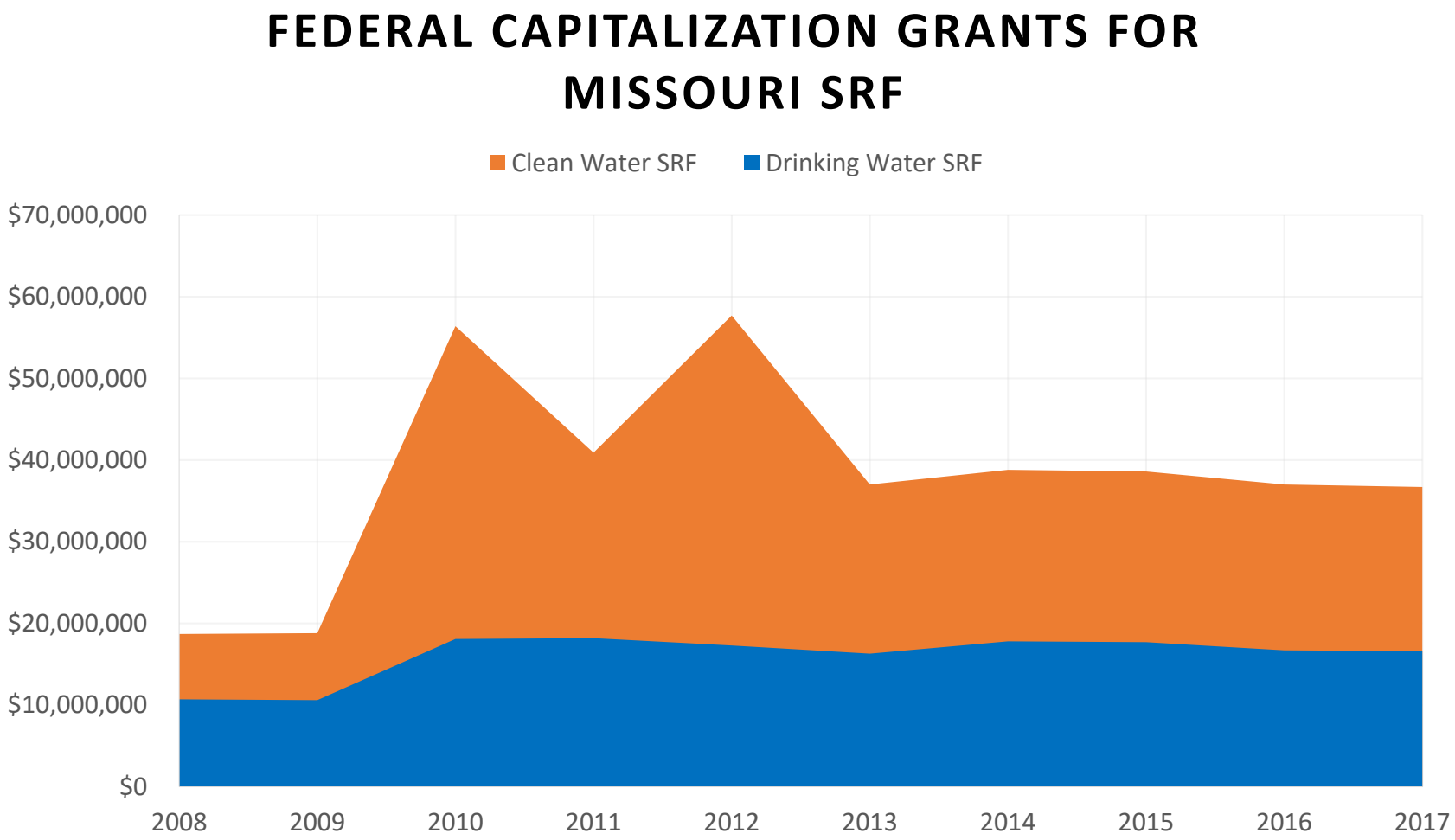
SRF Loan Programs



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SRF Loan Programs

- Both SRFS are primarily loan programs
- Below market rate loan program – interest subsidy 70% of market interest rate
- ½ percent annual administrative fee
- Loan term typically 20 years, but may vary based on project

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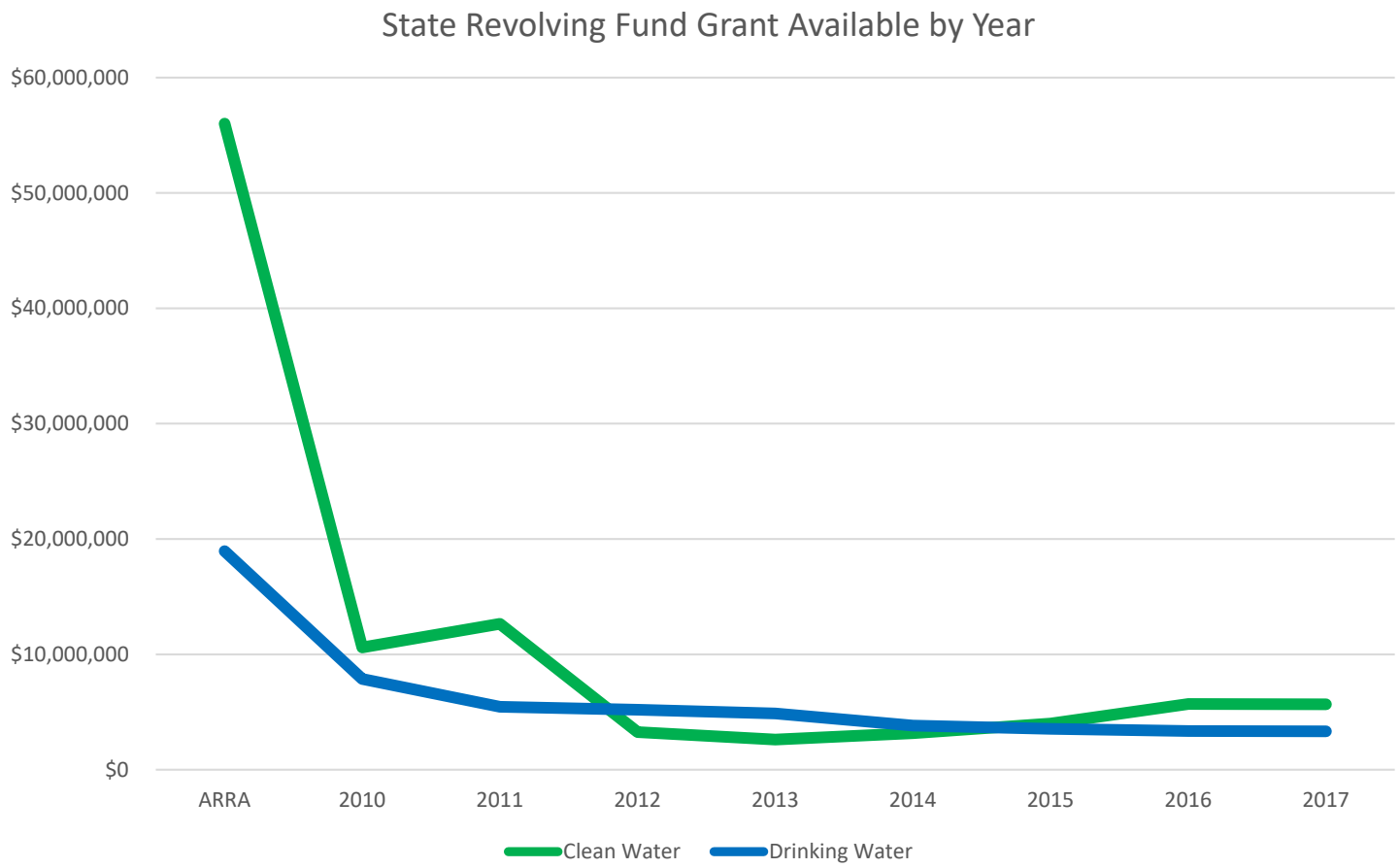
Missouri SRF Available Grant Funds



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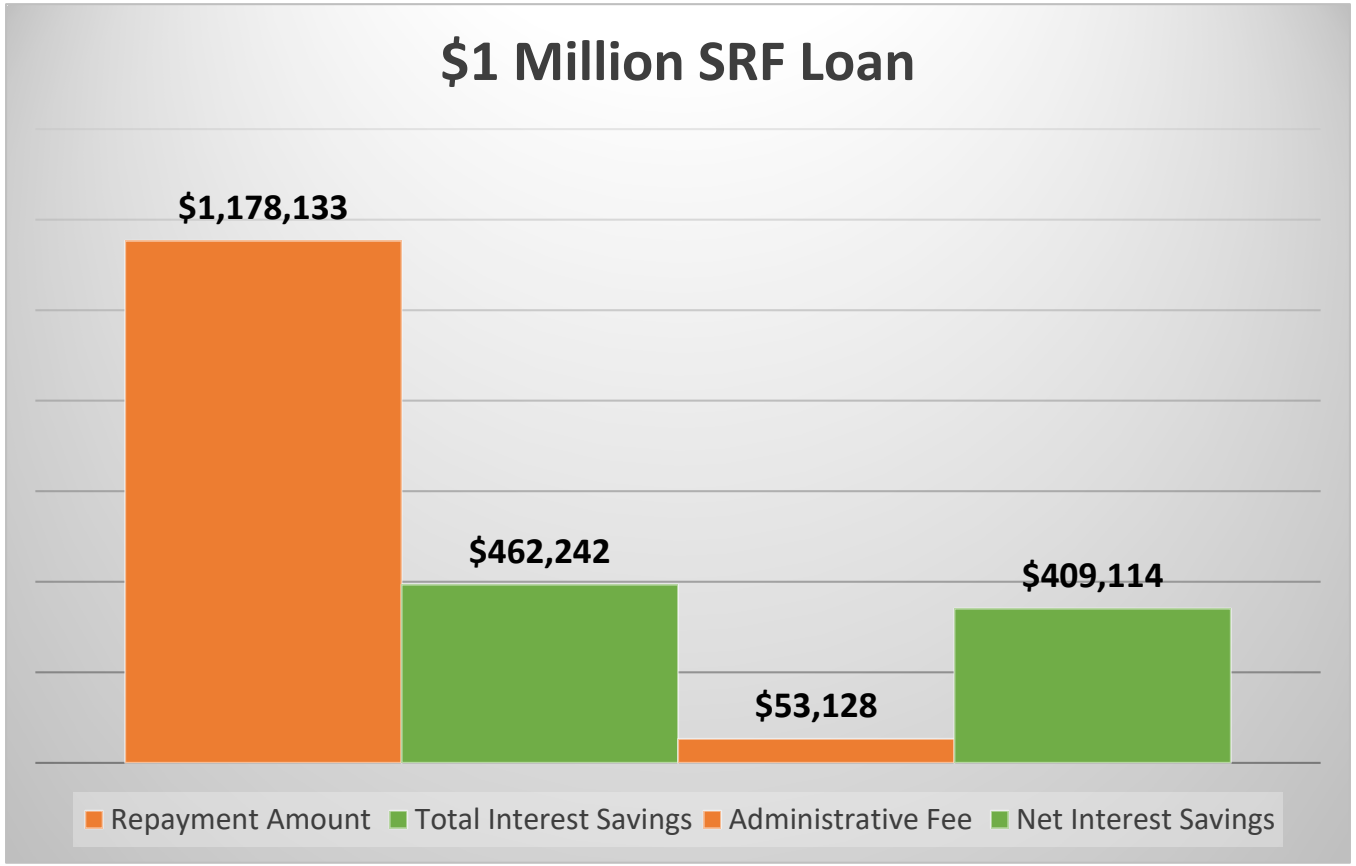
SRF Loan Potential Interest Savings for Borrowers



Total Interest Savings
– Administrative fees
= Net interest Savings

- For example purposes only
- Assumes market interest rates at 5.00% and a subsidized SRF interest rate of 1.50%
- Actual interest rates, payments, fees, and savings may vary based on market conditions and project specific details

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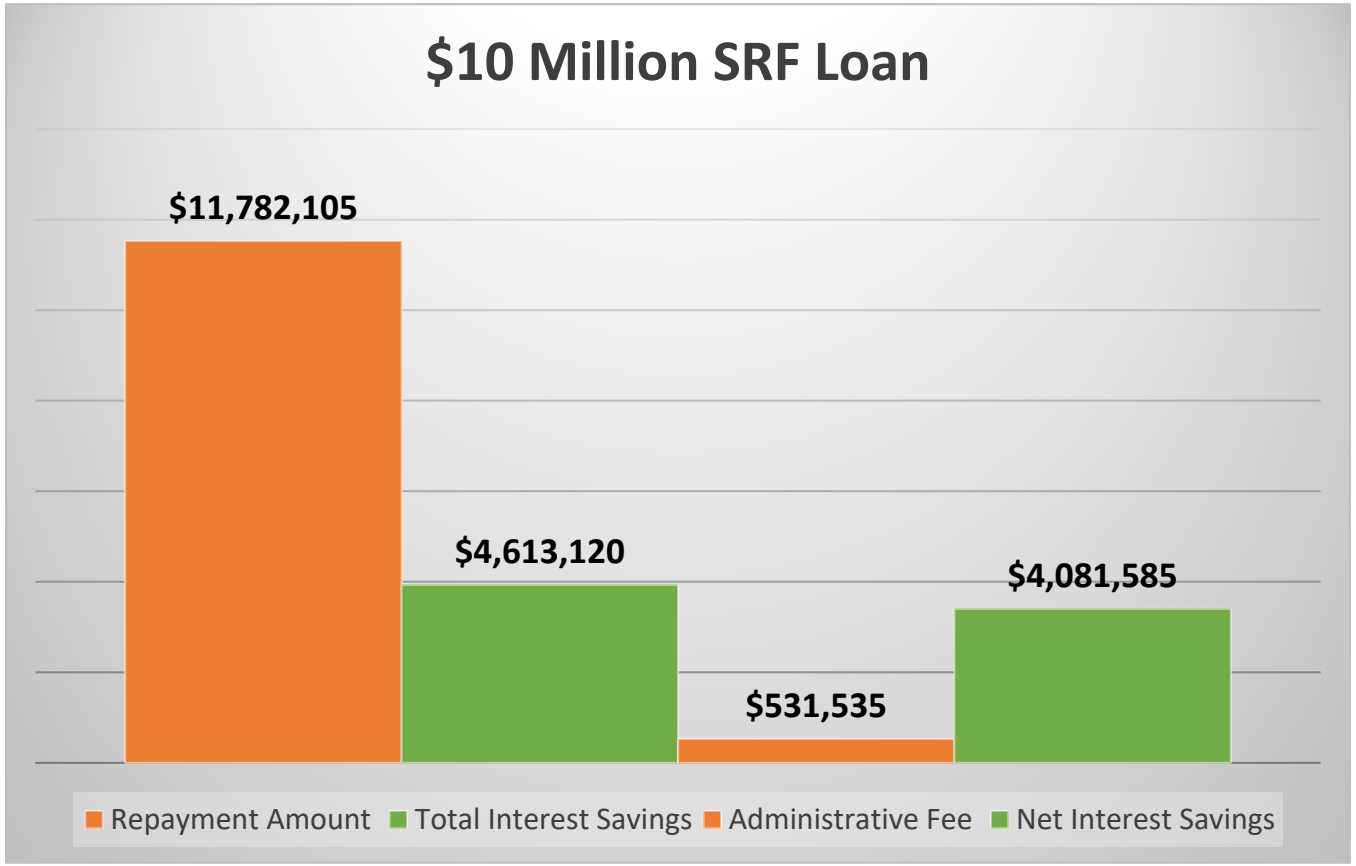
SRF Loan Potential Interest Savings for Borrowers



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Clean Water State Revolving Fund (CWSRF) Loan Program

Liberty wastewater treatment facility taken by Goodwin Brothers DB Team

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CWSRF Loan Program

Eligibility:

New construction or improvements to:

- ❖ Wastewater treatment plants
- ❖ Sewer lines
- ❖ Storm sewer control
- ❖ Non-point source infrastructure projects

Ineligible Projects:

- ❖ Operations and Maintenance
- ❖ Some projects are limited by public and private ownership

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CWSRF Grant

- Must serve a population of 10,000 or less
- Eligible applicants are those that analysis indicates would have difficulty financing projects without additional subsidization. Analysis based on:
  - Income
  - Unemployment data
  - Population trends
  - Other economic and demographic data

As funding is available, eligible communities may be awarded a grant up to 50% of the eligible project costs, with a maximum grant of $2 million. Grant Funding is Limited!

https://dnr.mo.gov/env/wpp/srf/wastewater-assistance.htm

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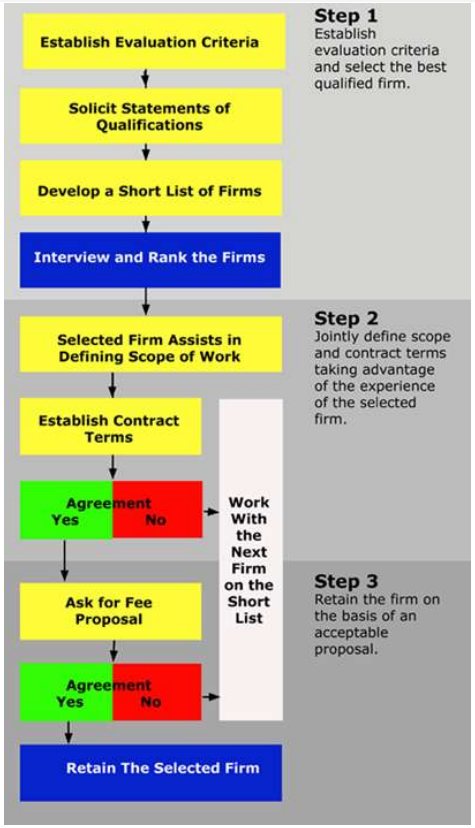
Know Before You Begin…

Architectural/Engineering Procurement and Contracting

- Missouri "political subdivisions of the state" must follow qualifications based selection process to procure professional design and engineering services per RSMo. 8.285 – 8.291
  - ✓ Use Qualifications Based Selection (QBS) Process
- Federal funding recipients entering into contracts must seek and encourage bids from Disadvantaged Business Enterprises (DBEs).
  - ✓ Follow "Six Good Faiths"
- Check with your funding agency for assistance

QBS Process Recommended by American Council of Engineering Companies



Courtesy of American Council of Engineering Companies of Missouri, Inc., www.acecmo.org/qbs/

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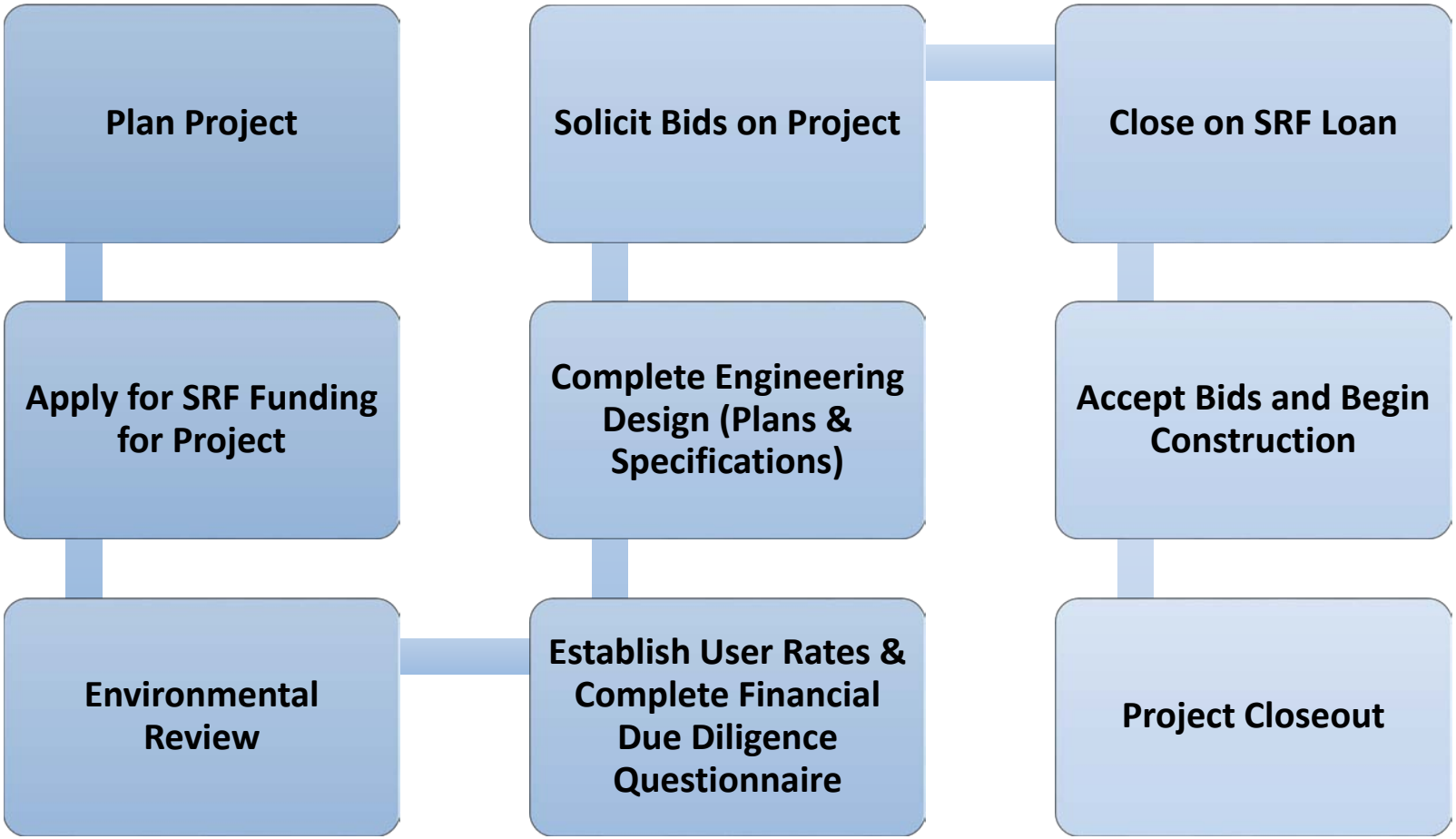
Borrowers Guide to Steps in the SRF Process



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SRF Overview

- Planning
- Financial
- User Charge, Sewer Use Ordinances
- Environmental Review
- Architectural & Engineering
- Bidding and Construction

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Planning-SRF Loan Programs

Intended Use Plans and Priority Lists

- Formal planning documents prepared annually
- Approved by Clean Water Commission / Safe Drinking Water Commission
- Details projects, priority points and allocation of funds
- Funding allocation requires a recipient to have an acceptable debt instrument such as a voter approved Revenue Bond or General Obligation Bond and a complete facility plan (engineering report) showing the need for the project

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SRF Application to Award Process

- Applicant submits application to the Financial Assistance Center. Application deadlines:
  - November 15th for Clean Water
  - February 15th for Drinking Water
- Applications are scored and competitively placed on annual Intended Use Plan
  - Intended Use Plan list all projects allocated funding for the federal fiscal year (Oct 1 – Sept 30), approved in October following public comment period and meetings
- Financial Assistance Center assigns project coordinator and engineer to provide funding assistance oversight and support project advancement

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SRF Application to Award Process continued

- A kick off meeting is scheduled to discuss project and they are given a binder with the SRF checklist and necessary guidance/templates
- A project schedule is prepared and updated as needed
- Checklist is kept up-to-date and shared frequently with the system to remind them of what we still need prior to loan closing to satisfy environmental, technical and financial review

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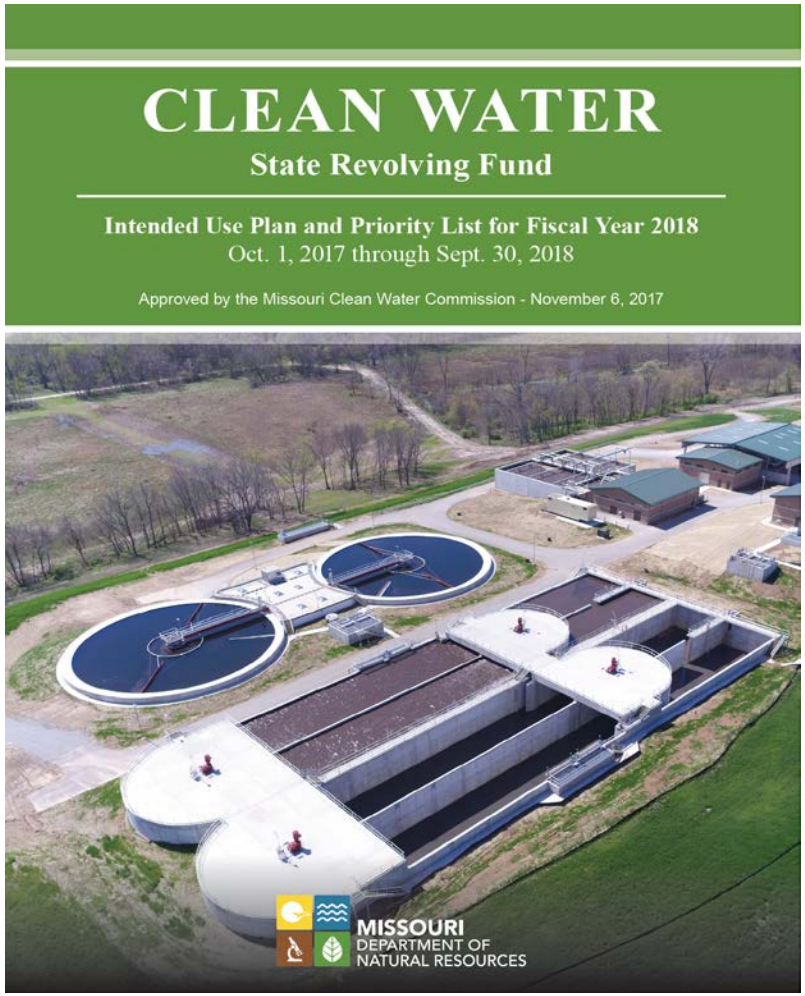
Planning-Clean Water IUP Timeline

- Application: Mid November
- Draft Priority: Mid March
- Budget Discussions: Early April
- Internal Review: Mid May
- Public Notice: Early June
- Public Hearing: Early July
- Comments: Mid August
- Final Adoption: Early October
  - By Clean Water Commission



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Financial: Due Diligence Questionnaire

- Fiscal year financial statements
- Revenues exceed expenses
- Debt service coverage 110%
- Outstanding debt on sewer or combined system

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User Charge, Sewer Use Ordinances

- Designed to produce adequate revenues for O/M
- Reserve for replacement
- Account for revenues generated by the system, debt service, and expenditures for O/M

Model Sewer Use and User Charge Ordinances are available on the DNR website:

http://dnr.mo.gov/env/wpp/srf/wastewater-project-guidance.htm

Photo:http://www.hypebot.com/.a/6a00d83451b36c69e201a3fbc41d92970b-600wi

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Architectural & Engineering Agreement

Reviewed for:

- Scope of Work- eligibility
- City and Engineer signed
- Costs in dollars
- Timeframe in days
- Payment method
- Complies with procurement regulations

Major change in scope of work

- Will need to re-procure if not included in contract

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Bidding and Construction

- After plans and specifications approval
- Must advertise for at least 30 days
- Bids opened, tabulation spreadsheet
- Submit bid documents for review and concurrence
- We prefer at least 90 days before bids expire
- Davis Bacon Requirements
- Department of Labor and Industrial Relations
- American Iron and Steel (AIS)

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Construction Financing

- CWSRF funding occurs:
  - after project is bid
  - the community submits a recommendation of award
- CWSRF interest rates:
  - determined the Friday before loan closing
  - Interest rates are 30% of the market rate
- Applicants are responsible for all costs incurred;
  - including ineligible project costs
  - and costs that exceed the financed amount.

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Construction Financing cont.

- Loan is finalized after construction bids are opened
- Process takes about 18 months
- Communication is key!

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STATE GRANTS AND LOANS

Small Community Engineering Assistance Program (SCEAP) - Wastewater

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Small Community Engineering Assistance Program

- Population of 10,000 or less
- To finance the development of engineering report/facility plan for wastewater project – does not cover engineering work already completed
- Funds 80% of cost for most communities, or funds 90% of cost for disadvantaged communities with a maximum award of $50,000

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Small Community Engineering Assistance Program

- Will not pay for services or worked performed prior to the grant award
- Budget period is for 2 years
- Submit facility plan at least 90 days prior to budget period expiration

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Questions????

Financial Assistance Center

573-751-1192

fac@dnr.mo.gov

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Clean Water State Revolving Fund (CWSRF) Process

Cynthia Smith, PE

SRF Engineering Unit

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10 CSR 20-4 Grants and Loans

Prior to the Construction Permit

SRF Funding Application → Facility Plan, Clearances, Public Meetings, FONSI/CATEX → Construction Permit App, Plans & Specs → Public notice of operating permit (if applicable)

After Construction Permit Issuance

Bidding, Pre Construction Meeting → Quarterly or Interim Inspections → Works in Operation, Substantial Completion, → Final Inspection, Statement of Work Complete

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Process Flow

- Parallel track process
  - Financial/Technical
- Project Coordinator - Financial
  - Project tracking
  - User Charge and Bid Review
  - Financing paperwork
- Project Engineer - Technical
  - Facility Plan/EID - Environmental Review/Approval
  - Plans and Specs Approval – Construction Permit
  - Inspections

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Facility Plan – Complete!

- First step in the Facility Plan Approval Process – Is it Complete?
- The Facility Plan Submittal Checklist (page 1) identifies the required elements in a Complete Facility Plan.
- SRF Engineer reviews and comments.
- Comments addressed – Complete!

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CWSRF Facility Plan Requirements

- Evaluate most reasonable, environmentally sound, implementable, cost effective alternatives
  - Recommend evaluate 3 or more alternatives
  - Treatment plant alternatives must consider a no-discharge system and regionalization
  - No discharge alternatives may require a soils report
  - Consider water and energy efficiency alternatives

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CWSRF Facility Plan Requirements

- Include User Charge Information
  - current user charge
  - estimated future user charge
  - basis for estimate
- Assess the environmental conditions and environmental impact of the proposed project
- Department will use assessment to make an environmental determination

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CWSRF Facility Plan Requirements

- No Facility Plan Approval prior to:
  - Environmental Review/Determination
  - Public Participation
- Projects switching funding to SRF may be subject to:
  - Additional Facility Plan review
  - New construction permit
- Facility Plan Guidance:
  - http://dnr.mo.gov/pubs/pub2418.htm

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SCEAP Facility Plans

- SCEAP Engineering report/Facility Plan requirements similar to SRF complete facility plan stage
- Deviations from these requirements considered on case-by case basis

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SCEAP Facility Plans

- Anti-Degradation evaluation/determination must be included in report/plan
- Allow time for Anti-Degradation Review – begin needed steps early in report development time frame
- SCEAP payments could be impacted by reports submitted near the end of a grant period

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Environmental Determination

- Three possible Determinations
  - Categorical Exclusion (CE)
  - Finding of No Significant Impact/Environmental Assessment (FNSI/EA)
  - Record Of Decision (ROD)

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Environmental Determination

- Revised 10 CSR 20-4.050, Effective Feb. 28, 2019
- Allows acceptance of environmental reviews from other agencies
  - When the funding source has changed
  - When there is Joint Project funding (SRF with USDA-RD and/or CDBG)
- DNR will confirm review meets our regulations
- DNR will send a letter with concurrence or reasons review not acceptable

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Categorical Exclusion (CE)

- Commonly known as CatEx
- For projects excluded from formal environmental review including:
  - Minor rehab projects for existing facilities
  - Construction of small facilities on existing site
  - Project in communities of less that 10,000 population with minor expansion or upgrade
  - New sewer lines in previously disturbed existing right–of-way

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Categorical Exclusion (CE) - Not Eligible!

- Construction of new sewer lines outside of existing right-of-ways
- Increase of more than 30% in pollutant loading or volume
- Provides for capacity 30% or greater than the existing population
- Known or expected impacts to cultural resources, threatened/endangered species, or sensitive areas
- Construction project not cost-effective or likely to cause significant public controversy

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Finding of No Significant Impact Environmental Assessment

- Department FNSI determination based on Environmental Information Documents (EID) provided by applicant
- Provide Department copies of letter and support information sent to agencies requesting environmental clearances
- Provide Department responses to all clearance requests
- Address any issues

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Clearance Letter Requests

- Request and proposed project information to local, state, and federal agencies below:
  - U.S. Army Corps of Engineers
  - United States Fish and Wildlife
  - Missouri Office of Administration – Federal Assistance Clearinghouse
  - Department of Conservation
  - DNR Office of Historical Preservation
  - DNR Missouri Geological Survey
  - DNR Division of State Parks

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Finding of No Significant Impact Environmental Assessment

- Publish 30 day public notice of public meeting or hearing to discuss the proposed project and its Environmental Impact
- Provide Department a complete record of the public meeting or hearing
- Provide any additional information requested by department

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Finding of No Significant Impact Environmental Assessment

- Department makes determination of no significant impact, issues FNSI, distributes to interested parties
- Facility plan can not be approved for at least 30 days after the publication of the FNSI
- FNSI Comments addressed prior to facility plan approval

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Record of Decision (ROD)

- Required for Projects with Significant Environmental Impacts
- The ROD is based on an Environmental Impact Statement
- SRF projects requiring an ROD are rare (I have never seen one)

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Plans and Specifications

- ***After facility plan approval*** submit:
  - Construction permit application
  - Plans & specs
  - Summary of Design
- Plans reviewed by SRF engineer
- Specs reviewed by SRF engineer & SRF coordinator

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Plans and Specifications

- Design must comply with 10 CSR 20-8 Minimum Design Standards (Effective Feb. 28, 2019)
- Plans and Specs compliant with 10 CSR 20 – 4.040 CW SRF General Assistance Regulations

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Plans and Specifications

- SRF requirements:
  - Signed and sealed by professional engineer
  - SRF upfront assurance documents in the specs
  - Sole Source Restrictions
  - Experience Clause Restrictions
  - MO Domestic Products Procurement Law
  - American Iron and Steel

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Alternative Project Procurement

- Design-Bid-Build current project delivery
- Aug. 2016 Statute RSMo 67.5060 allows use of alternative procurement for Water/Wastewater infrastructure project delivery
- Authorizes use of Design-Build (DB) and Construction Manager-At Risk (CMAR)

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Design-Bid-Build

- Traditional way to implement water & wastewater infrastructure projects
- Design and construction clearly separated
- Owner issues RFQ to select Engineer
- Engineer designs - contactors bid project
- Owner selects lowest, responsible, responsive, contractor’s bid

Design–Build

- Design-Build Engineer/Contractor Team handle design ***and*** construction of project
- RFQ to select licensed engineer to prepare Design-Build RFQ/RFP and evaluation documents
- Owner selects Design-Build Procurement Process:
  - Progressive
  - Fixed Price

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Construction Manager At Risk

- CMAR – a hybrid of Design-Bid-Build and Design-Build
- Owner puts out RFQ for Design engineer
- Design begins
- Owner put outs RFQ for Construction Manager
- Project is bid

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Construction Monitoring

- Pre-construction conference
- Quarterly/Interim Inspections
  - On-site review of American Iron and Steel paperwork and products
- Statement of Substantial Completion
  - Allows issuance of Operating Permit
- Final Inspection
- Statement of Work Complete

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Recent SRF Changes

- SRF loans can extend up to 30 yrs.
  - Loan term cannot exceed useful life of project
  - All projects require Useful Life certification from project engineer
- SRF projects must show the use QBS method of engineer selection
- Loan Recipient must certify project cost effective project

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Recent SRF Changes

- Land Acquisition and easements are SRF eligible costs
  - Land must be required to complete project
  - Appraisal and Review Appraisal Required
  - SRF pays up to appraisal value
  - Land must be purchased in accordance with the *Uniform Relocation and Real Property Acquisition Policies Act*

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Green Project Reserve

- 20% of federal capitalization grant reserved Green Projects
- Additional SRF Loan Application Priority Points given to projects with Green Project elements including:
  - Green Infrastructure
  - Energy Efficiency
  - Water Efficiency
  - Environmentally Innovative

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- Questions?
- Thank you!

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MGS Web Applications

Jeremiah Jackson, R.G.

Environmental Assistance Unit Chief

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GeoEDGE

- Geologic Evaluation Data Gateway Exchange
- Web-based application
- Request and complete geohydrologic evaluations

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MISSOURI DEPARTMENT OF NATURAL RESOURCES
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) gspgeol@dnr.mo.gov (E-MAIL) www.dnr.mo.gov/geology (WEB SITE)

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State of Missouri
Citizens Application Gateway

Login Page

Fields labeled with a red asterisk (*) are required.

*User Id

*Password

Password must contain seven to forty characters and contain at least one digit, one upper case letter, one lower case letter and one non-alphanumeric (for example: !, $,#, or %) character. Do not use your first name, last name or user id in your password.

Login

Missouri Department of Natural Resources
P. O. Box 176, Jefferson City, MO 65102
1-800-361-4827 / (573) 751-3443
E-mail: contact@dnr.mo.gov

Missouri Department of Agriculture
Land Survey Program
P. O. Box 937, Rolla, MO 65402-0937
(573) 368-2300
E-mail: landsurv@mda.mo.gov

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Geologic Evaluation Data Gateway Exchange

- User Profile Settings
- Logout

Home | Search Geohydrologic Investigations | Maintain Access | Water Tracer Registration

Evaluation Menu

New Evaluation

Please select the type of evaluation below to begin. After you have selected the type of evaluation you will need to fill out the "General Information" about your site or facility and then provide the project location using our Geospatial tool.

*Evaluation Type: -Select-

*Type of Facility: -Select-

Start Request

Evaluations in Progress

You do not have any Evaluations in Progress.

Completed Evaluations

You do not have any Completed Evaluations.

Missouri Department of Natural Resources
PO Box 250; 111 Fairgrounds Road Rolla, MO 65402
Telephone: 573-368-2100
E-mail: gspgeol@dnr.mo.gov

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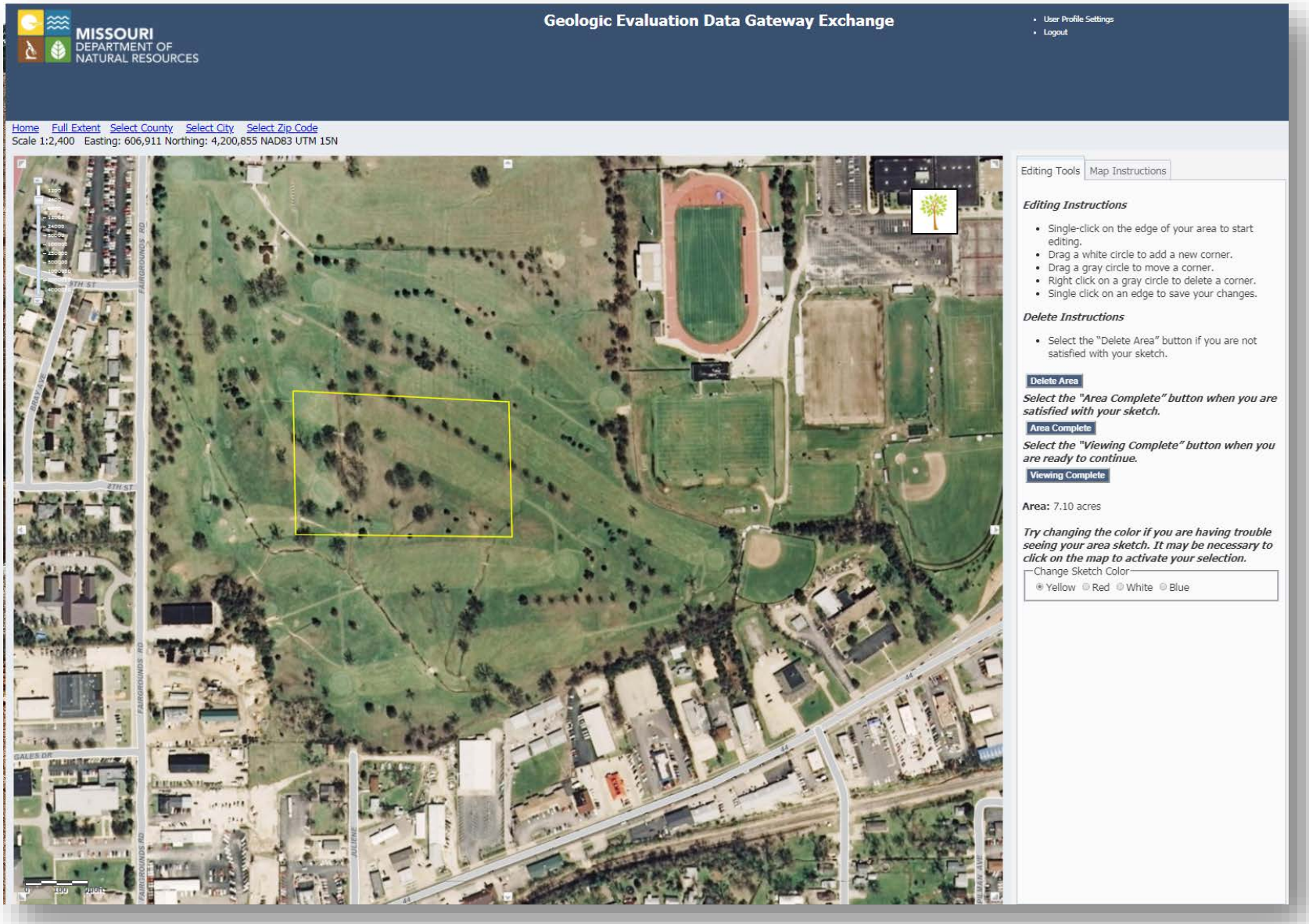

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- Logout

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Map | General Info | Additional Documents | Requestor Signature | Owner Signature

Request for Geohydrologic Evaluation of Liquid Waste Treatment Facility/Site

Requestor: Jeremiah Jackson 111 Fairgrounds Rd Rolla Missouri 65401 573-368-2182 jsjackson1977@gmail.com

*Indicates a required field.

Facility or Project Information

*Facility or Project Name: Test Project #1
*County: Phelps
Mailing Address Line 1: Fairgrounds Rd
Mailing Address Line 2:
City: Rolla
Zip: 65401

Owner Information

Check here if the same as requestor: ☐
*Owner Last Name: Jackson
*Owner First Name: Jeremiah
Email:
*Mailing Address Line 1: 111 Fairgrounds Rd
Mailing Address Line 2:
*City: Rolla
*State: MISSOURI
*Zip: 65401
*Primary Telephone: 573-368-2182
Secondary Telephone:
Company:

Facility Information

*Type of Facility: LAGOON OR STORAGE BASIN W/LAND APP
Other Facility Type:
Liner Materials: EXISTING SOILS
Other Material:
*Discharge: FACILITIES WILL
*Primary Waste: HUMAN (DOMEST
Other Waste Type:
Number of Acres of Land Application or Subsurface Soil Absorption Area: 4
Check if application will be made for State Revolving Funds: ☐
Check here if an NPDES permit will be required: ☐

This portion Applies to Lagoons and Storage Basins Only

Site/Facility is: PROPOSED
Total Estimate Size of Storage Basin/Lagoon: LESS THAN OR EQUAL TO 1 ACRE
Maximum Operating Depth of Liquids: GREATER THAN 5 FEET BUT LES
Maximum Depth of Proposed Excavation in Feet: 10
Check here if Site/Facility will be part of a Class 1A Confined Animal Feeding Operation: ☐

Comments

Comments:

Save Print

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- User Profile Settings
- Logout

Home | Search Geohydrologic Investigations | Maintain Access | Water Tracer Registration

Map | General Info | Additional Documents | Requestor Signature | Owner Signature

Requestor Signature

Requestor: Jeremiah Jackson 111 Fairgrounds Rd Rolla Missouri 65401 573-368-2182 jsjackson1977@gmail.com

*** Indicates a Required Field**

I verify that, to the best of my knowledge, this request is accurate and complete. By signing below, I agree to the Uniform Electronic Transactions Act, Sections 432.200 through 432.295.

***First Name:** Jeremiah ***Last Name:** Jackson **Date Signed:** 03/12/2018

Click "Save" to electronically sign the request form.

Save

Missouri Department of Natural Resources
PO Box 250; 111 Fairgrounds Road Rolla, MO 65402
Telephone: 573-368-2100
E-mail: gspgeol@dnr.mo.gov

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- User Profile Settings
- Logout

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Map | General Info | Additional Documents | Requestor Signature | Owner Signature

Owner Signature

Requestor: Jeremiah Jackson 111 Fairgrounds Rd Rolla Missouri 65401 573-368-2182 jsjackson1977@gmail.com

* Indicates a Required Field

If the property owner is not available to eSign, click print to generate the request form for the owner to sign. Print

When the owner has signed the form, it can be electronically submitted by scanning and saving it in PDF format. Click Browse to find the file location of your document. Click Add to load it as an attachment for submission before clicking the Submit button. The file must be a PDF no larger than 30 MB. Click Delete Attachment to remove the file from the upload list.

File: Choose File No file chosen

Add

If you are the property owner, or the property owner is available to eSign, please electronically sign to give permission for a DNR Geologist to access the property.

I verify that, to the best of my knowledge, this request is accurate and complete. By signing below, I agree to the Uniform Electronic Transactions Act, Sections 432.200 through 432.295.

***First Name:** Jeremiah ***Last Name:** Jackson ***Date Signed:** 03/12/2018

Click "Submit" to electronically sign the request form.

Submit

Missouri Department of Natural Resources
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Evaluation Menu

New Evaluation

Please select the type of evaluation below to begin. After you have selected the type of evaluation you will need to fill out the "General Information" about your site or facility and then provide the project location using our Geospatial tool.

*Evaluation Type: -Select- Start Request

Evaluations in Progress

The following is a list of your evaluations in process that have been initiated through Missouri Geologic Evaluation Data Gateway Exchange. Please click on one of the status links to navigate to your evaluation. A green check mark indicates you have completed the section of the evaluation. The red ✗ indicates that portions of the request needs to be completed before work on the project can be initiated. Please complete these areas.

Evaluation Type	Facility or Project	Begin Date	Status of Evaluation					
			Map	General Info	Requestor Signature	Owner Signature	Status	Status Date
LIQUID WASTE			✓	✗	✗	✗		
LIQUID WASTE	Test Project #1	3/12/18	✓	✓	✓	✓	Status RECEIVED	Status Date 3/12/18

Completed Evaluations

You do not have any Completed Evaluations.

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Geologic Evaluation Data Gateway Exchange

- User Profile Settings
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Home | Search Geohydrologic Investigations | Maintain Access | Water Tracer Registration

Geohydrologic Investigations Search

Enter at least one search criteria. This tool allows you to search for records of completed geohydrologic evaluations. The tool will return results based on the search criteria you enter below. Multiple counties or evaluation types may be selected. You can limit a search to a date range. If more than 500 records match the search criteria, an error message will be displayed and you will have to revise you search criteria; for example, selecting fewer counties. Click the Search button to return results. Click the Clear button to clear the current search criteria and any returned records. Clicking the Print button opens the search results list in a PDF window to print or save.

Project ID:

County:
-Select-
Adair
Andrew
Atchison

Evaluation Type:
-Select-
BENEFICIAL REUSE
LIQUID WASTE
RESIDENTIAL HOUSING

Project Name:

Requestor First Name:

Requestor Last Name:

Owner First Name:

Owner Last Name:

Start Date:

End Date:

Search | Clear

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Geologic Evaluation Data Gateway https://www.wunderground.com ttings

- Logout

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Geohydrologic Investigations Search

Enter at least one search criteria. This tool allows you to search for records of completed geohydrologic evaluations. The tool will return results based on the search criteria you enter below. Multiple counties or evaluation types may be selected. You can limit a search to a date range. If more than 500 records match the search criteria, an error message will be displayed and you will have to revise you search criteria; for example, selecting fewer counties. Click the Search button to return results. Click the Clear button to clear the current search criteria and any returned records. Clicking the Print button opens the search results list in a PDF window to print or save.

Project ID:

County: -Select- Adair Andrew Atchison

Evaluation Type: -Select- BENEFICIAL REUSE LIQUID WASTE RESIDENTIAL HOUSING

Project Name:

Requestor First Name:

Requestor Last Name:

Owner First Name:

Owner Last Name:

Start Date: 05/01/2017

End Date: 06/30/2017

Search Clear Print

Search Results: Your search returned 9 records.

Project ID	Facility Name	Requestor	Owner	County	Completed
LWE17065	Big Mike's Big ol' Kitty Litter Box	Big Mike Bone	Bone Fletcher	Phelps	06/26/2017
LWE17063	Tree Town TEST	Kelly Lundfrin	Alanna Hovey	Taney	06/20/2017
RHD17026	Harmon and St. Clair	Brad Wingfield		McDonald	06/02/2017
BR17018	Leon Martin TEST	Leon Martin	Leon Martin	Moniteau	05/19/2017
MIS17043	Hillcrest Broiler Farm	Jake Faulkner			05/19/2017
SW17010	Tom Green Show	Loren Mill	Loren Mill	Ray	05/19/2017
RHD17024	Test app			Buchanan	05/19/2017
SWR17017	Springfield Sanitary Landfill	Mikel C. Carlson, R.G.			05/19/2017
LWE17061	Barker Farms	Bob Barker	Bob Barker	Phelps	05/19/2017

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Application Status

- Access
  - CAG (current)
  - E-Services (near future)
- Web page
  - https://dnr.mo.gov/geology/geosrv/envgeo/eau.htm

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MISSOURI GEOSTRAT

GEOSCIENCES TECHNICAL RESOURCE ASSESSMENT TOOL

http://dnr.mo.gov/geostrat/

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NASCIO 2015 State IT Recognition Awards Finalist

Missouri Department of
Natural Resources

Missouri Geological Survey Geosciences Technical Resource Assessment Tool (GeoSTRAT)

The Missouri Geological Survey provides this application as a resource to assist citizens in interpretation and understanding of our subsurface resources.

Although this map and its underlying data sets have been compiled by the Missouri Department of Natural Resources (Department), no warranty, expressed or implied, is made by the Department as to the accuracy of the data and related materials. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the Department in the use of these data or related materials.

View Map

Data Layers

Group	Description	General Information	Data Documentation	Google Earth Data	Esri Data
Dams	Dams	general information	metadata	kmz file	layer package
Bedrock Geology	Bedrock (1:24,000 scale)	general information	metadata	kmz file	layer package
	Bedrock (1:100,000 scale)	general information	metadata	kmz file	layer package
	Bedrock (1:500,000 scale)	general information	metadata	kmz file	layer package
	Depth to Bedrock	general information	metadata	kmz file	layer package
	Top of Bedrock-Elevation	general information	metadata	kmz file	layer package
	Geologic Structures	general information	metadata	kmz file	layer package

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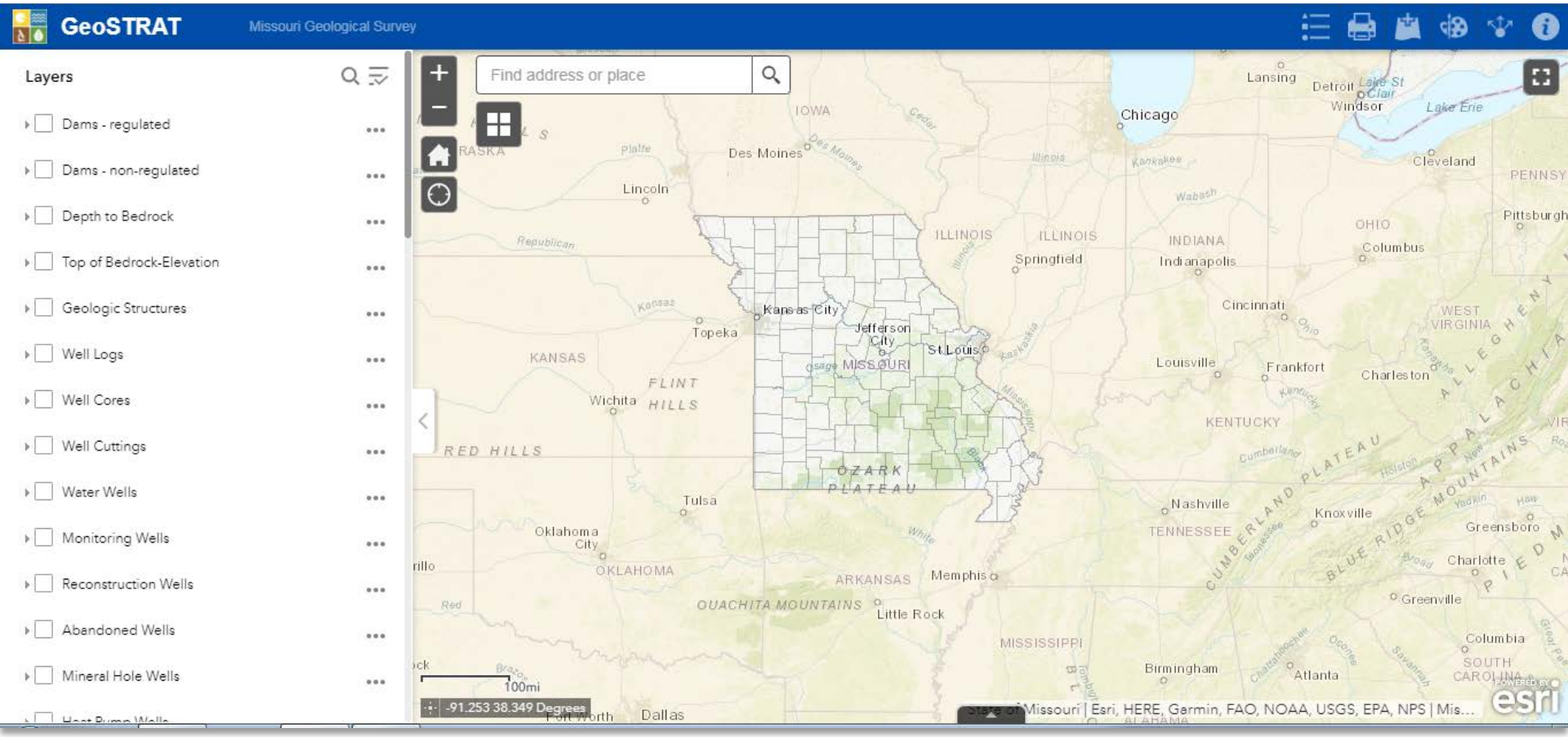

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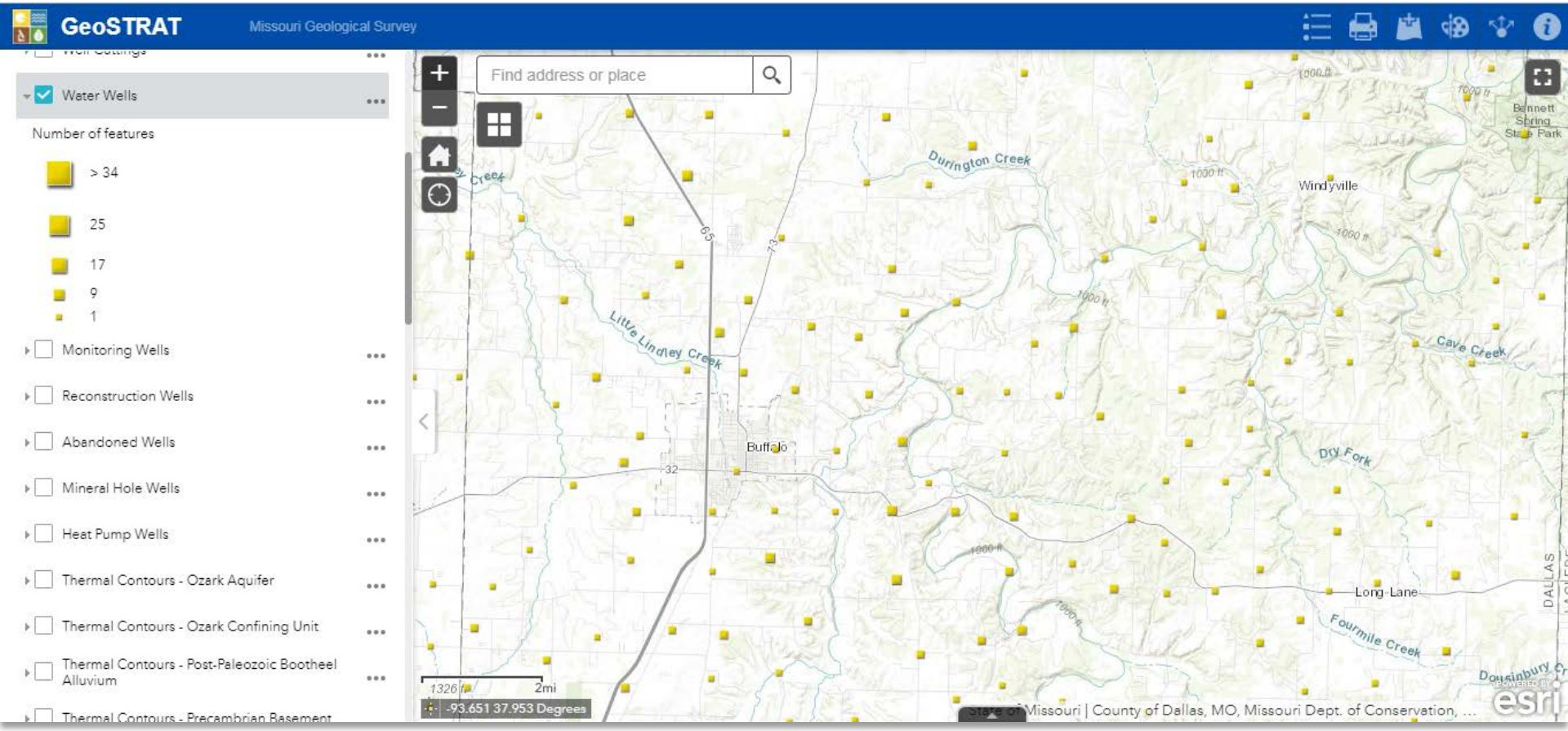

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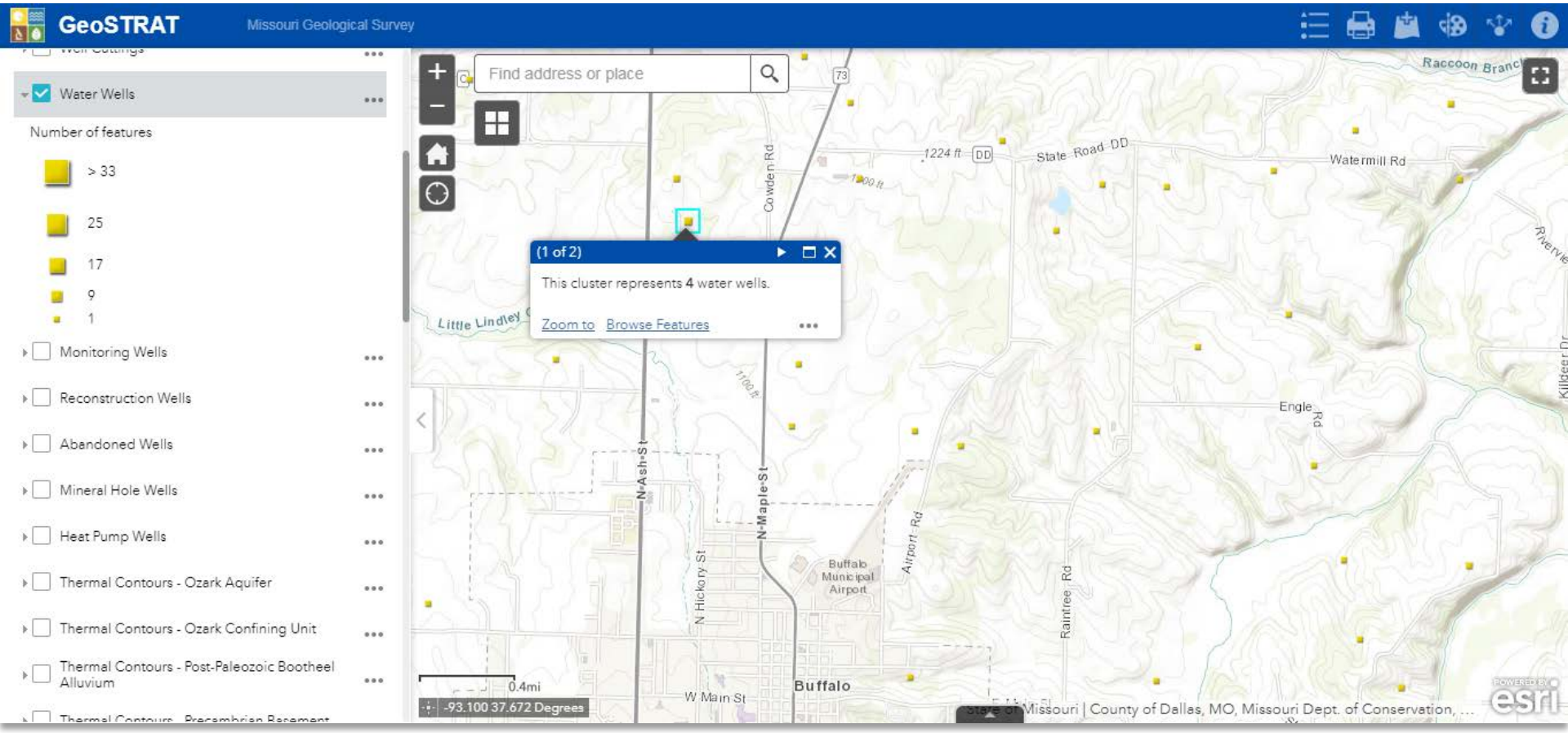

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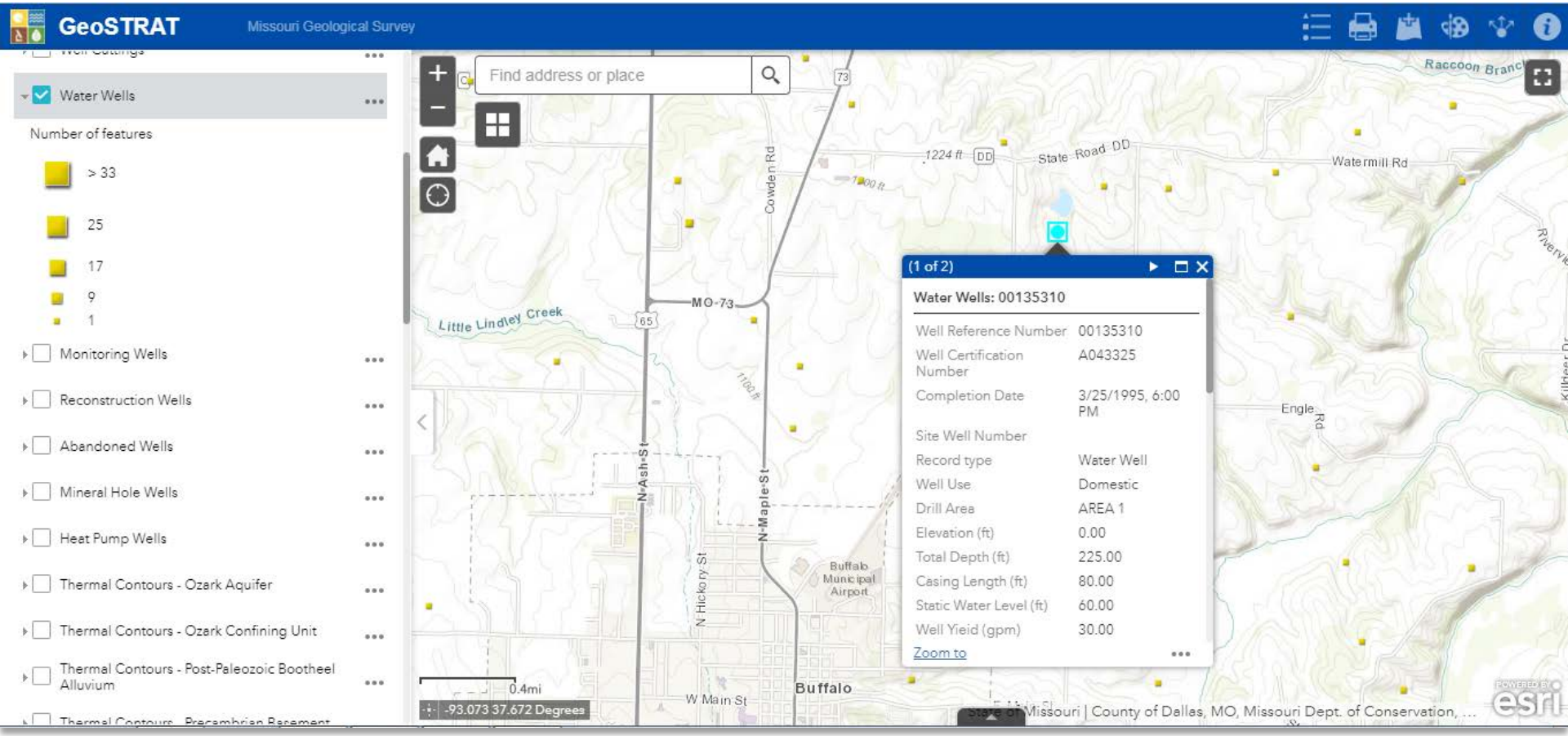

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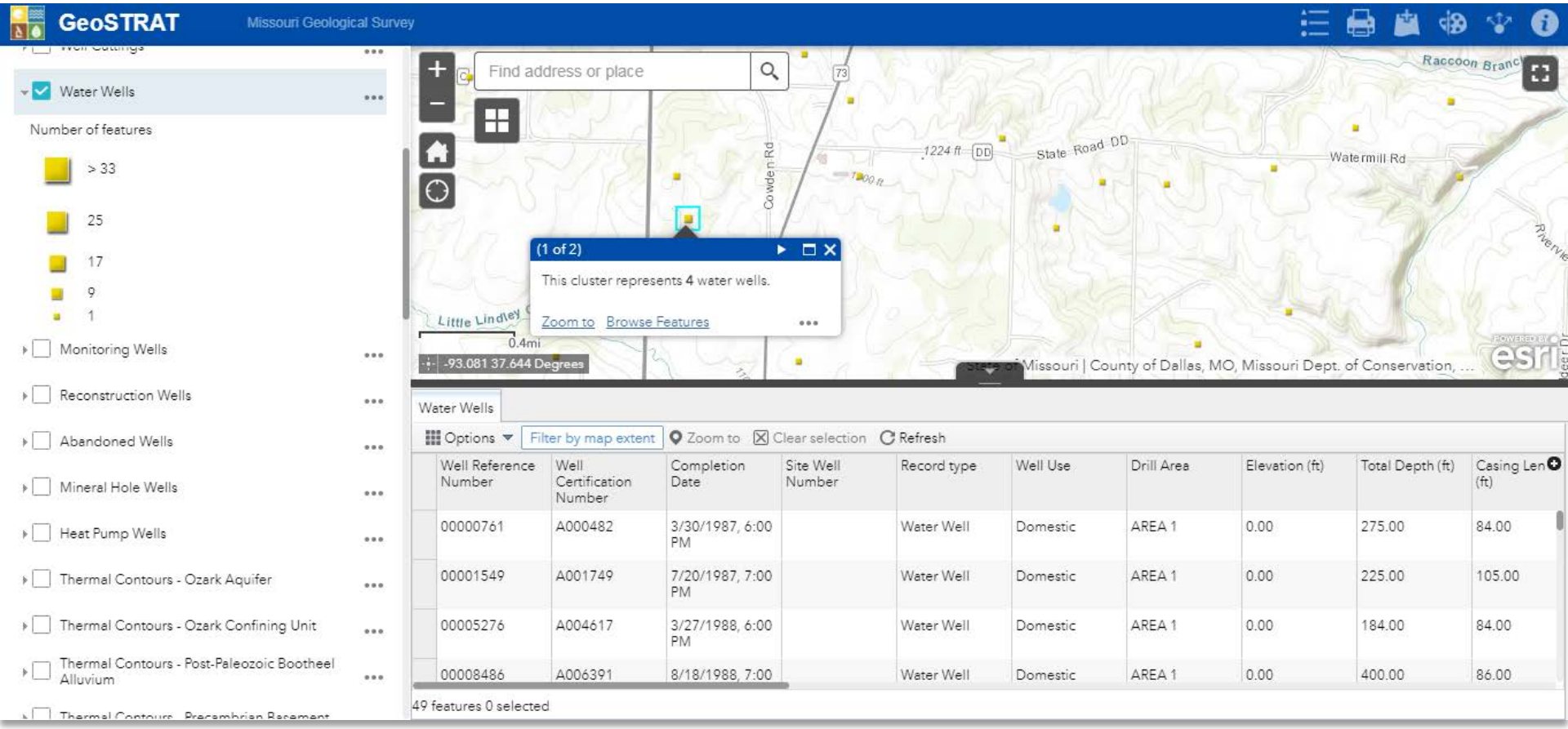

Well Reference Number	Well Certification Number	Completion Date	Site Well Number	Record type	Well Use	Drill Area	Elevation (ft)	Total Depth (ft)	Casing Len (ft)
00000761	A000482	3/30/1987, 6:00 PM		Water Well	Domestic	AREA 1	0.00	275.00	84.00
00001549	A001749	7/20/1987, 7:00 PM		Water Well	Domestic	AREA 1	0.00	225.00	105.00
00005276	A004617	3/27/1988, 6:00 PM		Water Well	Domestic	AREA 1	0.00	184.00	84.00
00008486	A006391	8/18/1988, 7:00		Water Well	Domestic	AREA 1	0.00	400.00	86.00

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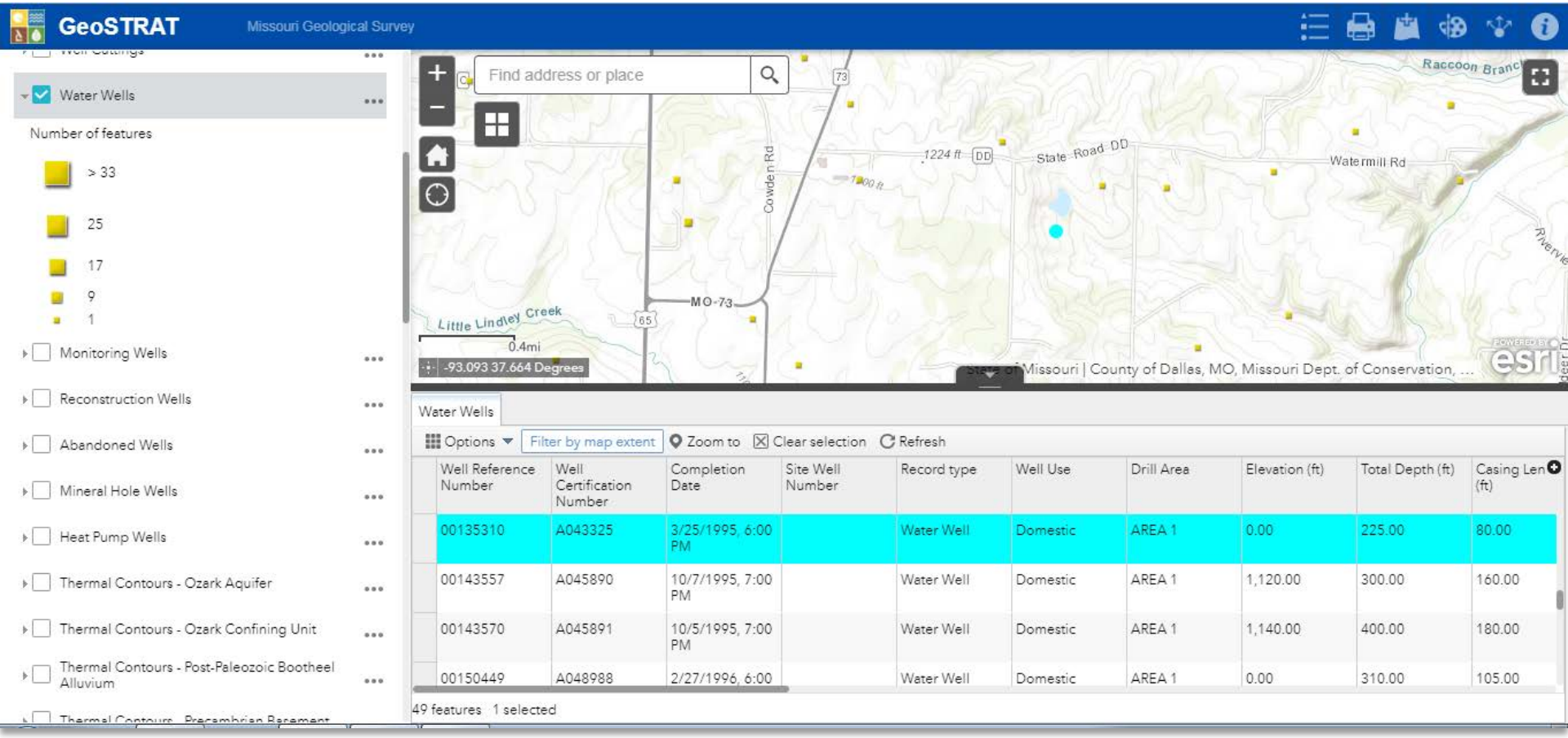

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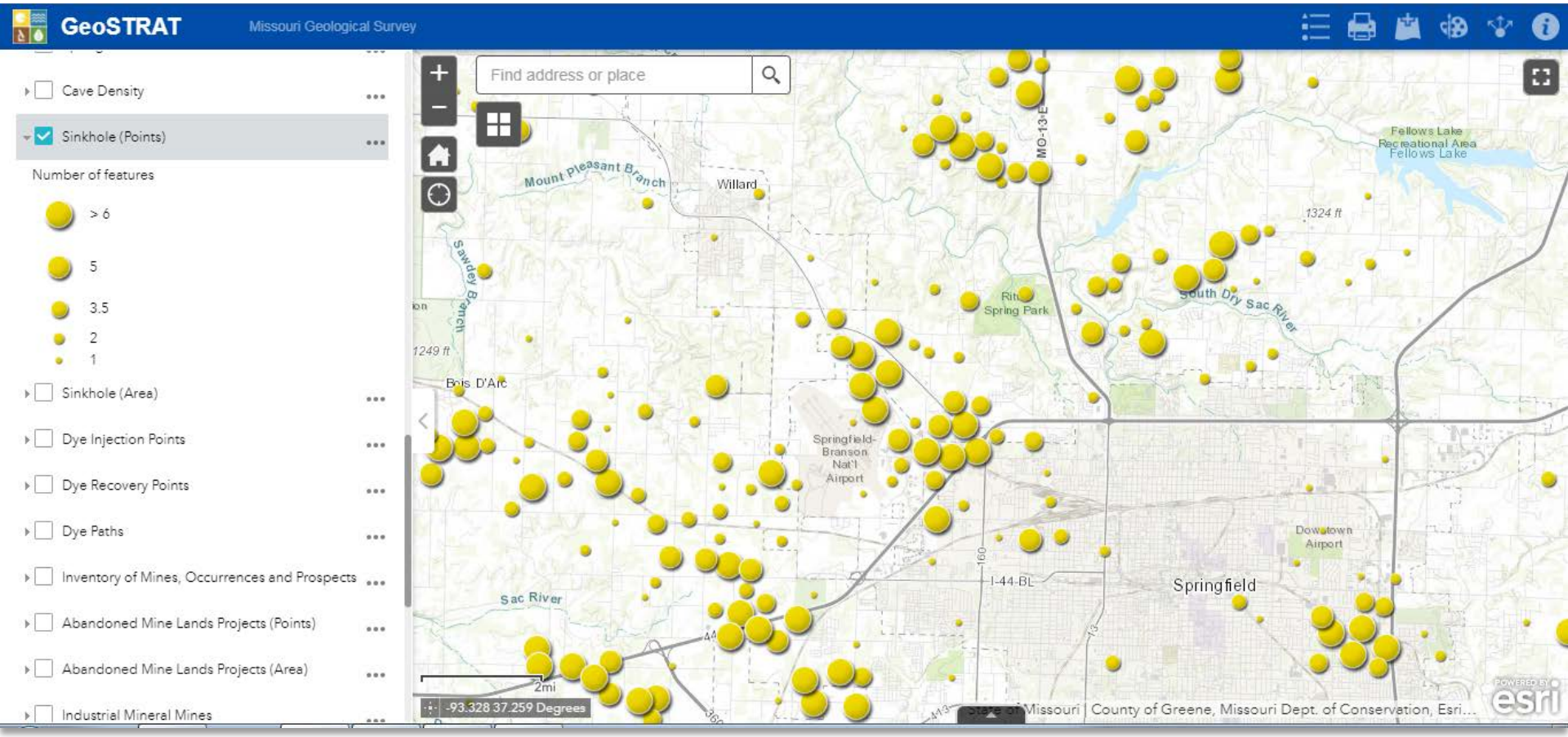

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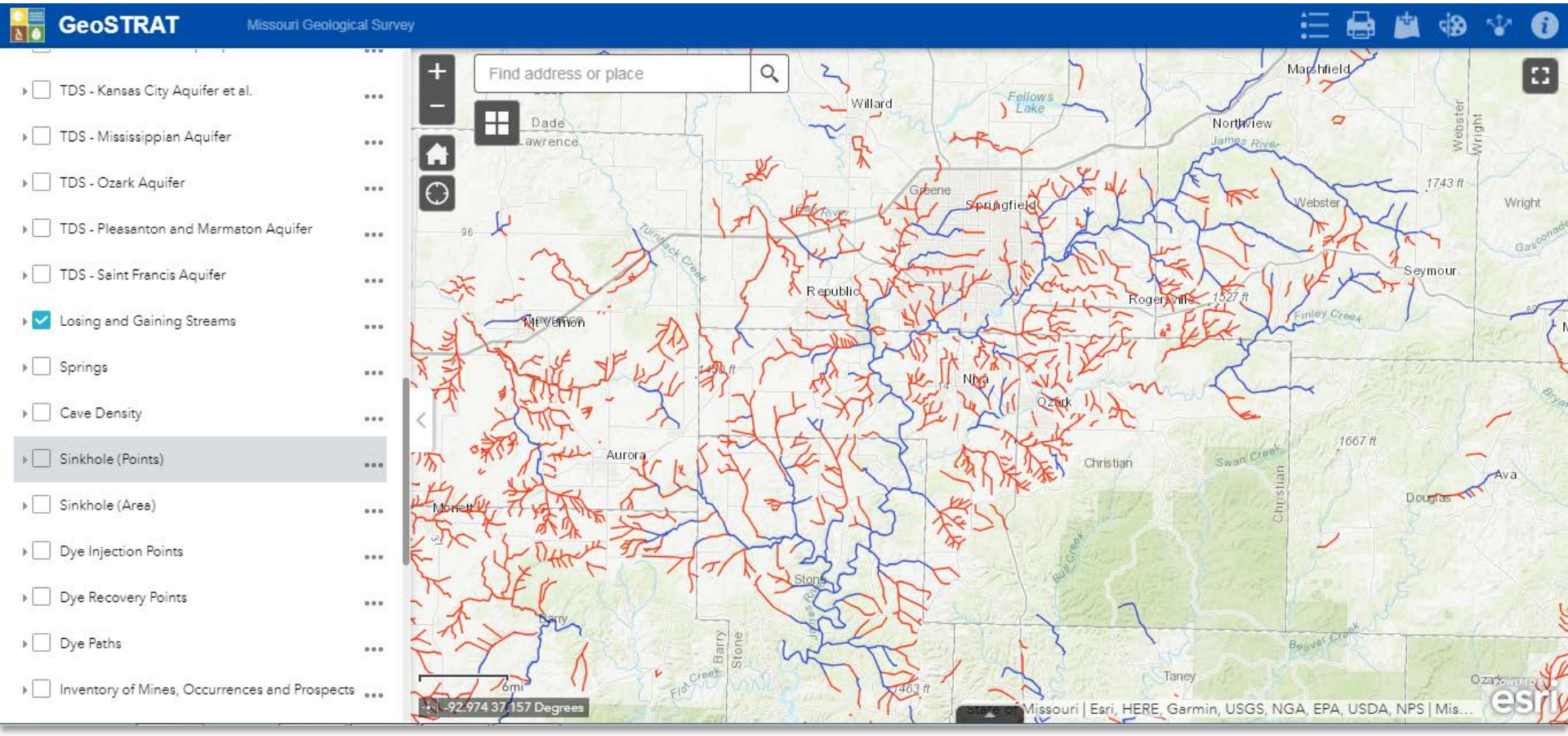

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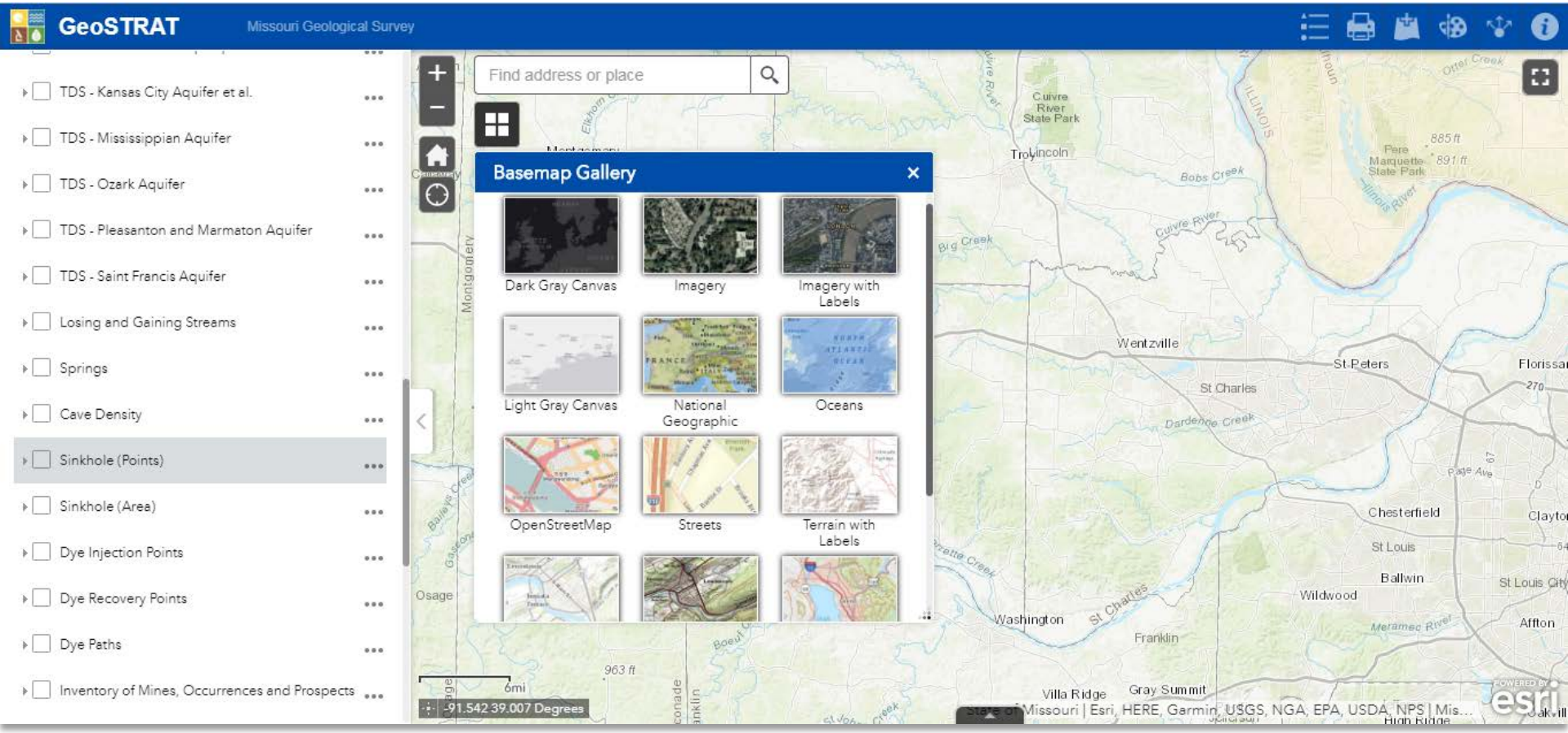

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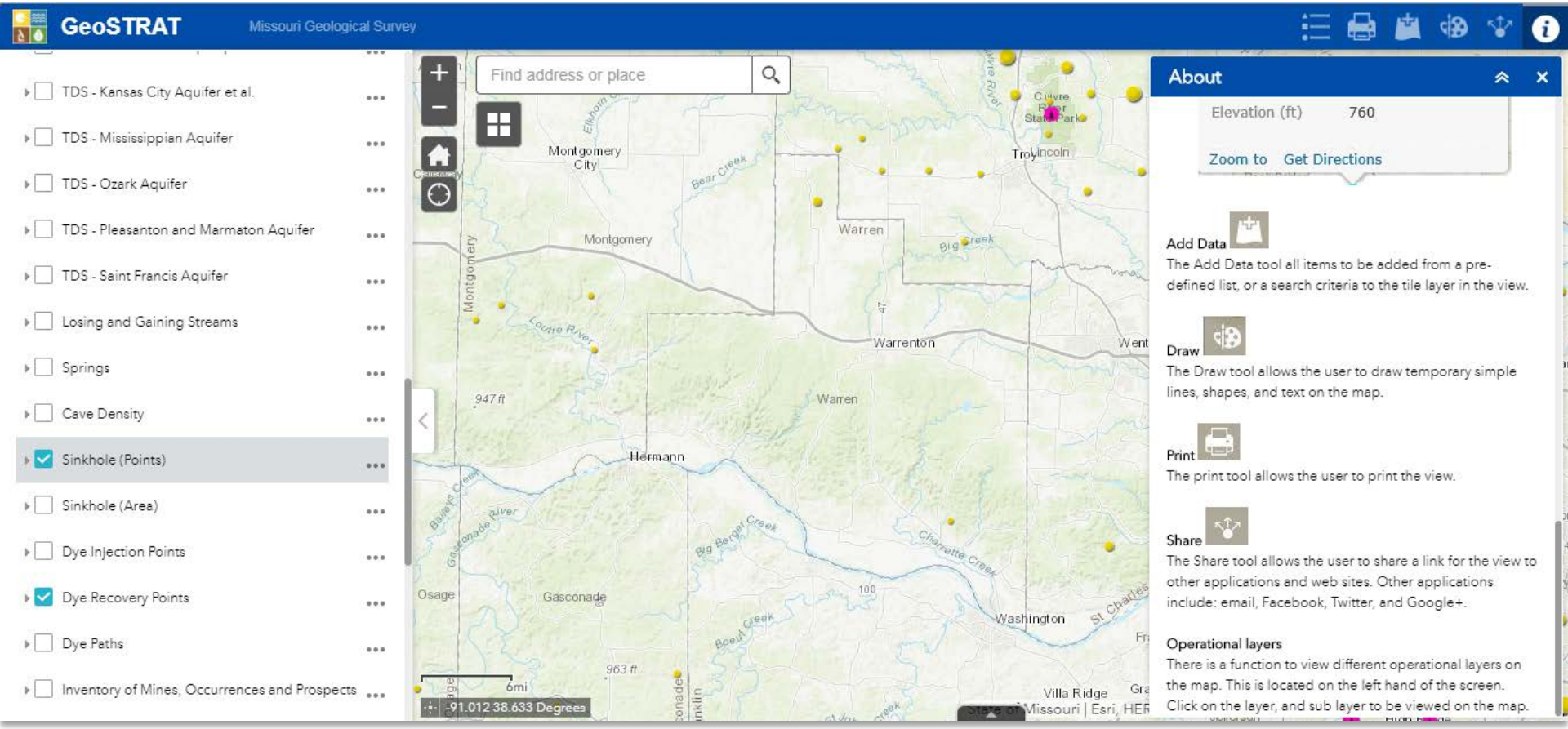

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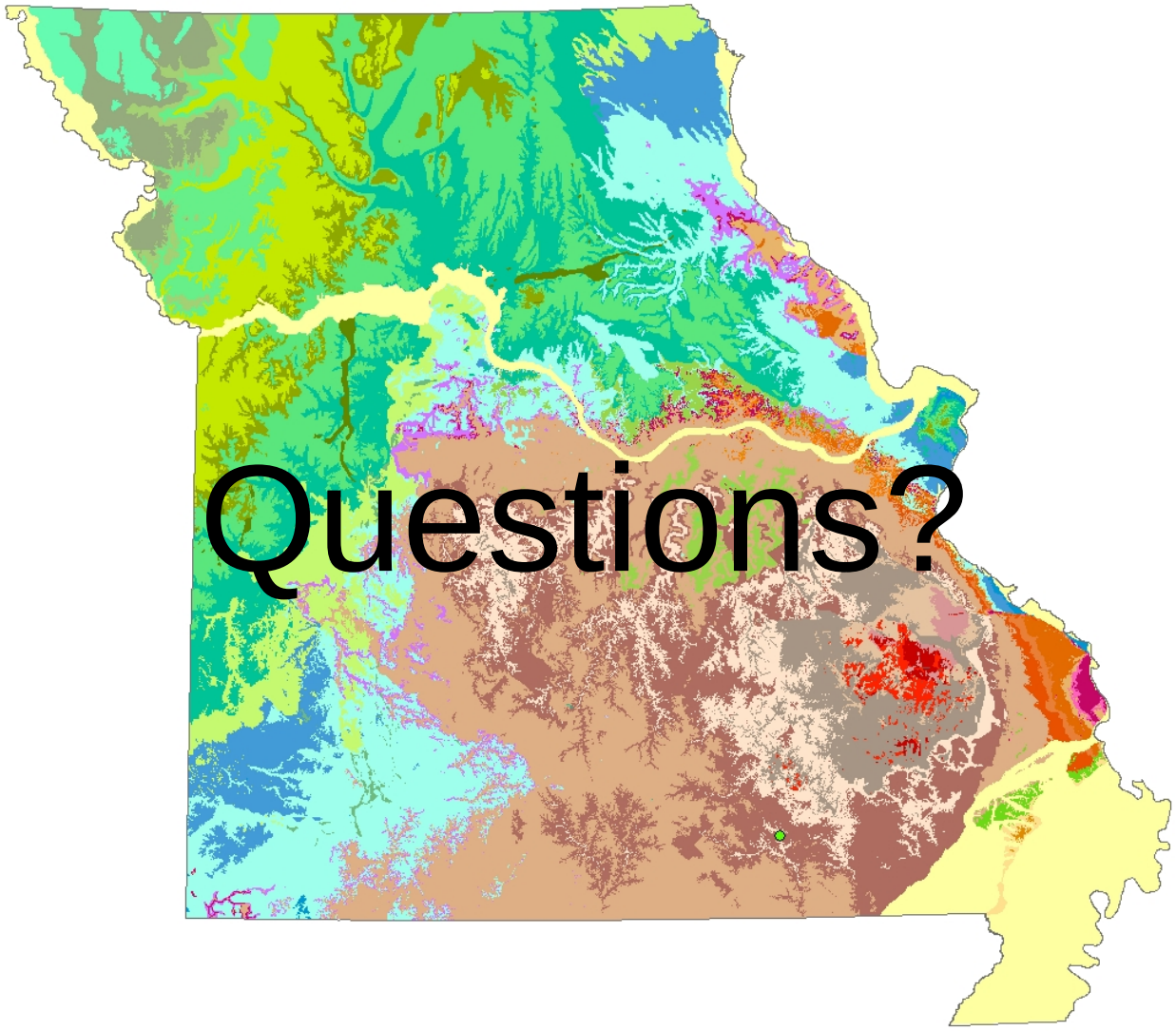

Questions?

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Subsurface Soil Dispersal

Cindy LePage, P.E.
Water Protection Program
Engineering Section

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Subsurface Irrigation System

- Subsurface dispersal or irrigation is a method of dispersing effluent (dosing) from a wastewater treatment facility into subsurface soil uniformly and under unsaturated soil conditions allowing for efficient water use and nutrient uptake by vegetation.

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Subsurface Irrigation Systems

- Domestic Wastewater
  - Any Domestic Wastewater Flows >3,000 gallons per day
- Industrial Wastewater
  - All Industrial (Process) Waste Flows - anything not defined as domestic sewage

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Webpage

- No-Discharge Wastewater Treatment

  dnr.mo.gov/env/wpp/no-discharge.htm

  – Surface wastewater irrigation

  – Subsurface soil dispersal

  – Links to applicable publications

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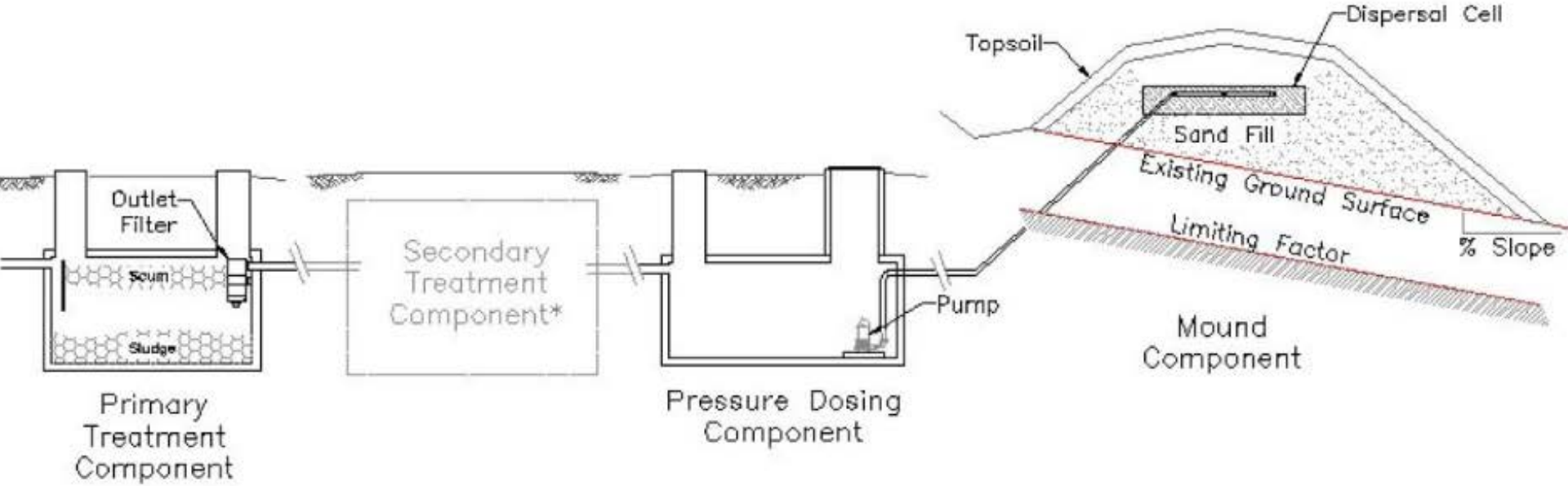
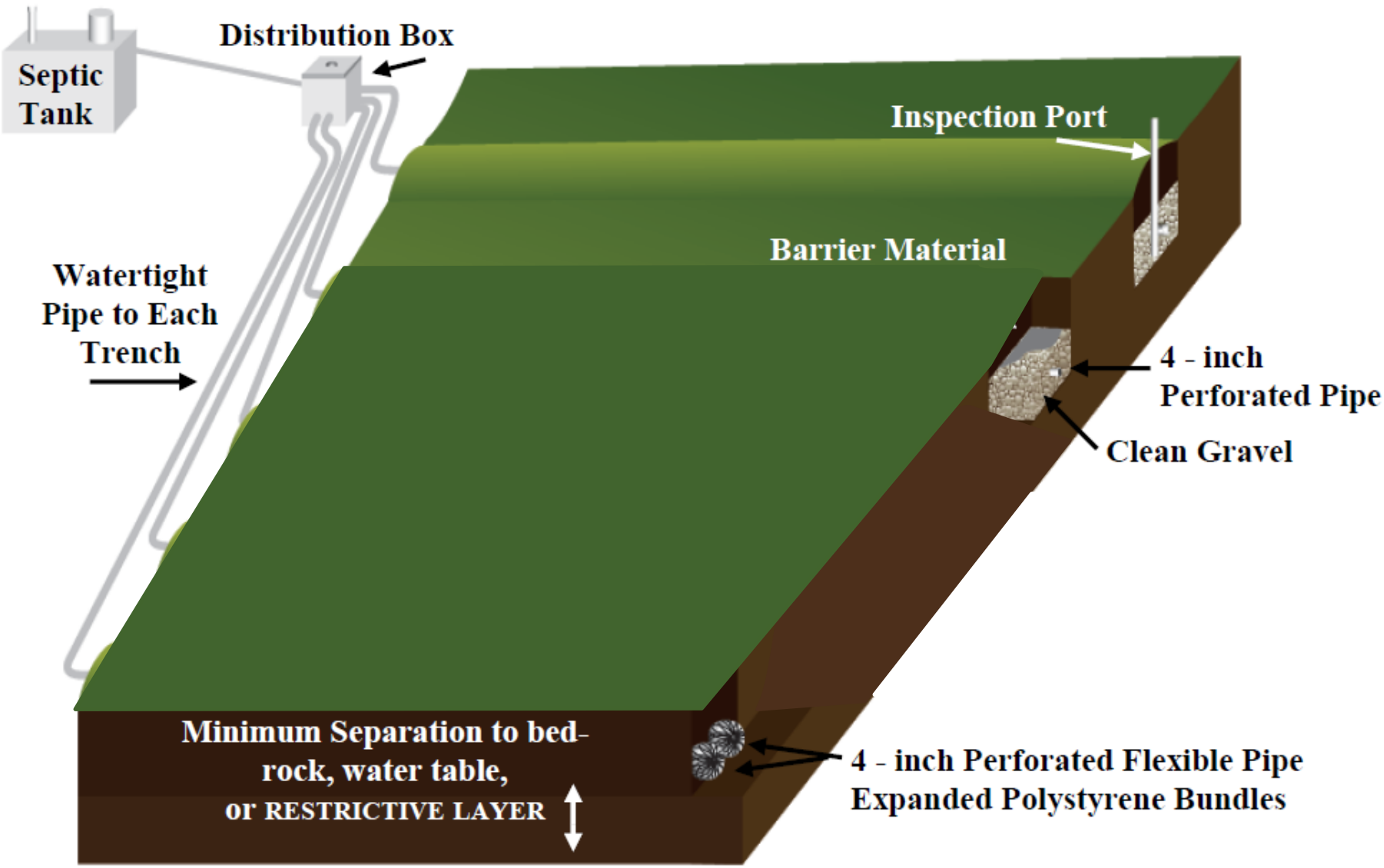
Types of Subsurface Systems

- Conventional
- LPP (low pressure pipe)
- Drip
- Mound

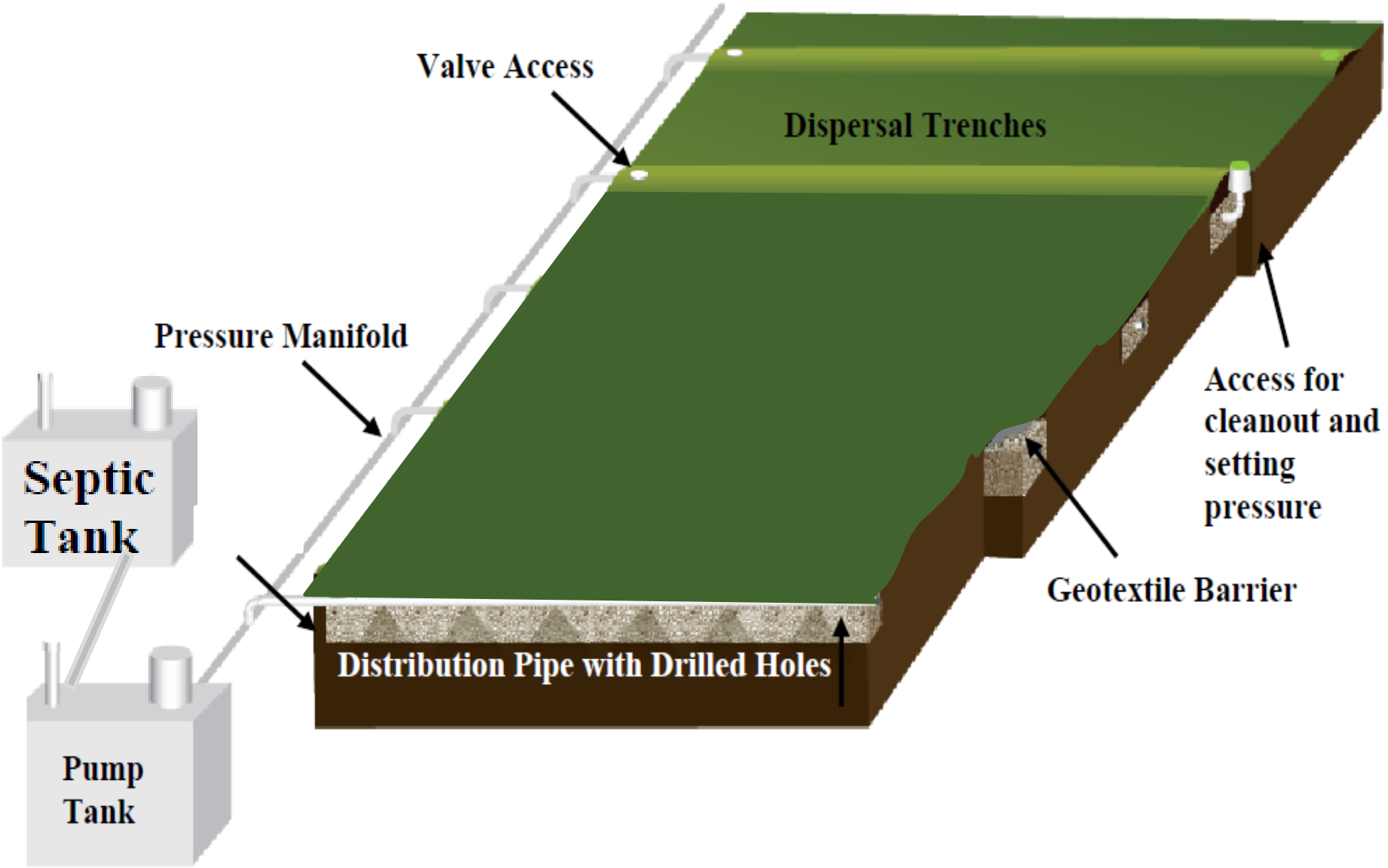
Mound


Dispersal Cell
Topsoil
Sand Fill
Existing Ground Surface
Limiting Factor
% Slope
Outlet Filter
Scum
Sludge
Secondary Treatment Component*
Pump
Mound Component
Primary Treatment Component
Pressure Dosing Component

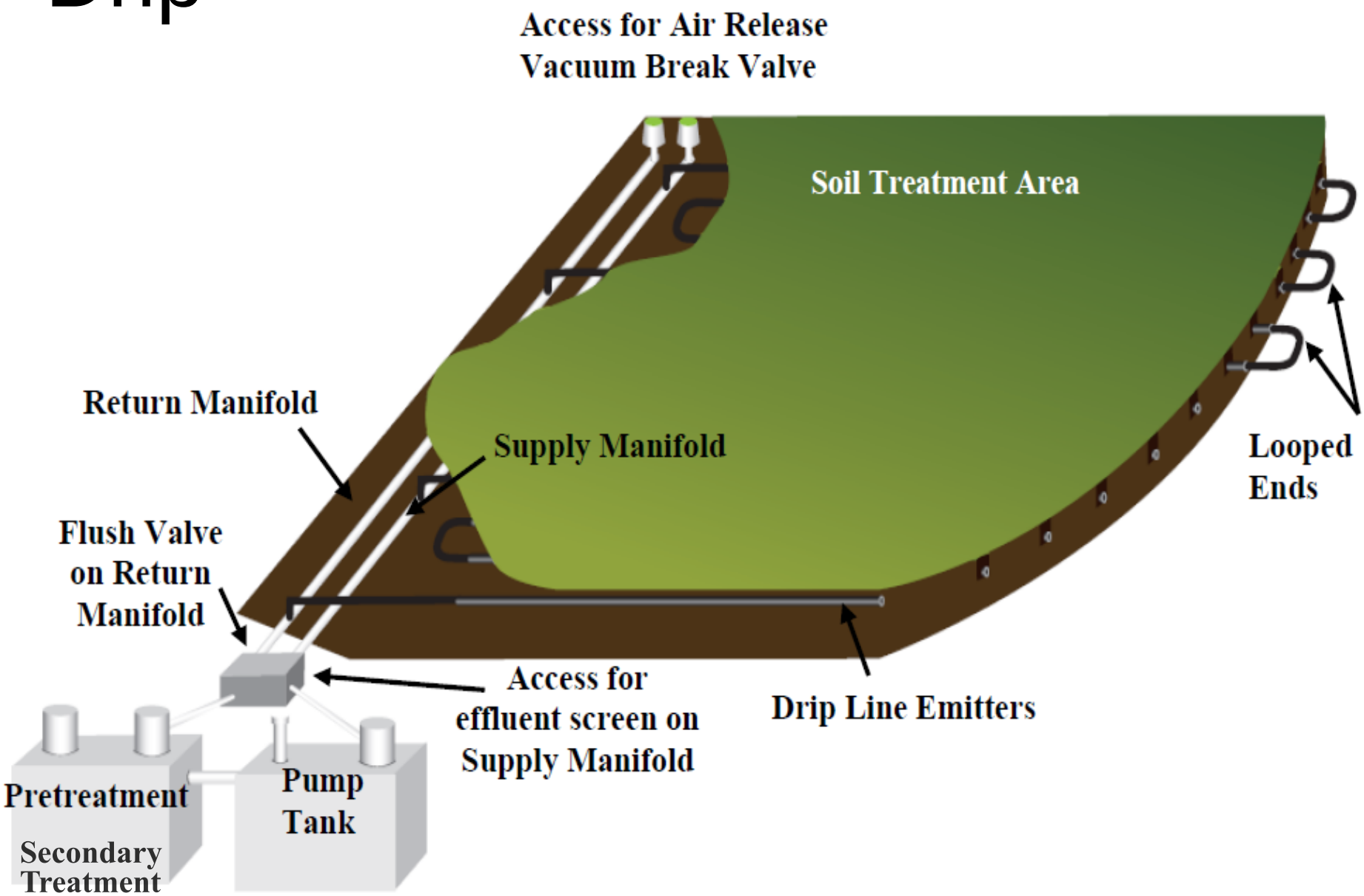
Conventional



Low Pressure Pipe (LPP)



Drip


Access for Air Release
Vacuum Break Valve
Soil Treatment Area
Return Manifold
Supply Manifold
Looped
Ends
Flush Valve
on Return
Manifold
Access for
effluent screen on
Supply Manifold
Drip Line Emitters
Pretreatment
Secondary
Treatment
Pump
Tank

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In Planning Stage

- Geohydrologic Evaluation
- Soils Report

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Geohydrological Evaluation

- Why is one required?
  - Identify Karst Areas
  - Identify fissures
  - Identify conduits to groundwater

- Include treatment components on App

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Soils Evaluation

- Required for all subsurface systems

- <u>Must</u> be written and signed by a soil scientist or qualified individual responsible for its content.
  - Design engineer must verify

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Soils Evaluation

- >1 year old at time of Facility Plan
  - Soil Scientist provide written documentation soils report still valid
  - Another soil and site investigation may be required depending upon how and what was altered and it must be addressed in the facility plan.

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Review of Soils Evaluation

The Consultant:

- Review the Soils Evaluation
- Include in Facility Plan
  - Soils Evaluation Summary
  - Address Soils Limitations

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New Procedure

Department Review:

- Facility Plan with Summary and Consultant’s Conclusions
- Soil treatment extent in facility plan same as soils report
- Loading Rates are reasonable
- May consult with the Department’s soil scientist

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Summary Form

- Soils Report Summary Form, Form MO780-2692, found at https://dnr.mo.gov/forms/780-2696-f.pdf

- Filled out and signed by Soil Scientist or Qualified Individual

- Include in Facility Plan

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Soils Report Components

- Drawings and Maps
- Soil Profile Descriptions
- Conclusion
  - Appropriate Loading Rate…

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Map-Site Drawing

- Locations of all soil observation pits Delineated and Labeled

- Extent of the soil treatment area Delineated
  - Line around whole area the pits represent

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Beneficial Maps

- USDA-Natural Resources Conservation Services, **County Soil Survey** map and legend with the area of the proposed soil treatment area clearly delineated

- **USGS topographic** map with the area of the proposed soil treatment area clearly delineated

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Soils Report Discussion cont.

- Amount of acceptable area and landscape position
- Percent slope
- Depth to limiting layer (clay pans, fragipans, dense tills, etc.)

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Soils Report Discussion cont.

- Depth to bedrock
- Geological risks such as karst features, etc.
- Rock outcrops
- Any other applicable feature

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Soils Report Discussion cont.

- Linear loading rates (gpd/linear foot) and landscape drainage with respect to oversaturation of the soil treatment area's lowest elevation

- Potential for groundwater mounding below the system

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Soils Report Discussion cont.

- Flooding and/or ponding frequency and duration
- Setback distances

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Soils Report Discussion cont.

- Include all soil profile description forms
- There are no standard soil profile description forms
- Should contain all applicable information

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SOIL PROFILE DESCRIPTION

Owner: Lateral Field Pool Area Date: 1/24/14

SOIL CHARACTERISTICS MANO Excavation Depth: Pit (required for new installation) or Core #: 1

Vegetation: oak trees Parent Material: gravelly colluvium / residuum

Suitability (S, PS, U)	Horizon: Designation	Horizon: Depth / Boundary(1)	Munsell Color (moist)	Redoximorphic Features(2)	Texture: USDA (3)	Texture: % Clay	% Coarse Fragments by volume: <3"	% Coarse Fragments by volume: >3"	Consistence (4)	Structure (5)	Roots/Pores (6)	Shrink/Swell	Soil Group	Application Rate: Conv. (Table 13)	Application Rate: LPP (Table 14)
PS	Ap	0-5" / cs	10YR 4/3	—	sil	12	45	2	vfr	2 fgr	mf / m+c	L	5	0.50	0.20
PS	BE	5-15 / cs	10YR 5/3	—	sil	15	45	10	vfr	2 fsbk	mf / m+c	L	5	0.48	0.20
PS	Bt1	15-26" / cw	10YR 5/3	7.5YR 5/6 5%	sil	24	30	15	vfr	2 fsbk	cl / vvf	L	5	0.45	0.20
PS	2Bt2	26-36"	7.5YR 4/4 70%	7.5YR 5/6 20% 10YR 5/2 10%	sicl	33	15	15#	fr	2 fsbk	cl / vvf	M	3	0.42	0.20
U	2Bt3	36-65"	2.5YR 4/6	10YR 5/2 20%	c	70	10	5	vfi	1 MPR / 2 fsbk	ff	H	4b	0.35	0.20

Notes Pit #1 N 37.32570 ±22' W-92.82185

sandstone flags at top of this Horizon 2Bt2

Pit 2 N 37.32558 ±24' W-92.82204

Similar to 1

2Bt2 @ 22" 3Bt @ 36" gray mottles @ 36"

Pit #3 N 37.32561 ±20' W-92.82247

2Bt @ 24"

3Bt & water table @ 36"

similar to Pit #1 less clay in 2Bt. 28%

Notations used on Soil Profile Description

(1) **Boundary** distinctness: A-abrupt, C-clear, G-gradual; topography: S-smooth, W-wavy, I-irregular;

(2) **Redox Features** Report low chroma Munsell colors and iron and manganese concentrations indicative of soil drainage limitations;

(3) **Texture** s-sand, ls-loamy sand, sl-sandy loam, l-loam, sil-silt loam, si-silt, scl-sandy clay loam, cl-clay loam, sicl-silty clay loam, sc-sandy clay, sic-silty clay, c-clay; Designate estimated clay content for all horizons;

(4) **Consistence** (report moist consistence) moist: fr-friable, fi-firm, vfi-very firm; wet: ss-slightly sticky, s-sticky, vs-very sticky and sp-slightly plastic, p-plastic, vp-very plastic; dry: sh-slightly hard, h-hard, vh-very hard;

(5) **Structure** grade: 1-weak, 2-moderate, 3-strong; size: f-fine (thin if platy), m-medium, c-coarse (thick if platy); shape: ABK-angular blocky, SBK-subangular blocky, GR-granular, PL-platy, PR prismatic, MA-massive;

(6) **Roots/Pores** abundance: f-few, c-common, m-many; size: vf-very fine, f-fine, m-medium, c-coarse.

Loading rate 0.2 gpd/sq ft with an LPP system

Pit 4 near lagoon N 37.32606 ±22' W-92.82150

2Bt @ 26"

3Bt @ 38"

water table @ 38"

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l for new installation) or Core #: 1

ium / residuum

e	Roots /Pores (6)	Shrink /Swell	Soil Group	Application Rate Conv. (Table 13)	Application Rate LPP (Table 14)
	mf / mfc	L	5	0.50	0.20
k	mf / mfc	L	5	0.48	0.20
k	cr / vvf	L	5	0.45	0.20
k	cr / vvf	M	3	0.42	0.20
bk	ff	H	4b	0.35	0.20

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Facility Plan Additional Info

- Summarize Soils Report
- Address any Soils Limitations
- Reserve area that may be set aside for repair, replacement, etc.
  - A soil and site investigation of the reserve area is not required until it would be utilized as such.
- Include Soils Report

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Facility Plan

- Submit Facility Plan for Review
  - Do Not Submit Application for Construction

- Approval Letter
  - Direct you to the next steps

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Construction Permit Requirements

Domestic Wastewater

- Construction Permit Application
  - Fee
  - Summary of Design
  - Plans and Specifications
  - Operation and maintenance plan
- Site-Specific Operating Permit Application

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Design considerations

- Preceded by Primary Treatment at min.
- Design Flow BOD Loading Rate
- Dosing Rate
- Subsurface Treatment Area
  - Different areas may have different loading rates depending on soils
- Filtration is essential for Drip

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Other design data needed

- Land use
- Depth of installation
- Lateral spacing
- Height above restrictive layer

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Dispersal Area Location

- Appropriate Soils
- Divert run-off
- No traffic
- No building
- No gardening
- No animal grazing
- No planting new trees or shrubs nearby

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Setbacks required

- 10 feet from Property Line
- 100 feet from well, water supply source or structure

Example

Assumptions:

- Q = 10,000 gpd

- Loading Rate = 0.5 gpd/sf Conventional
  = 0.2 gpd/sf LPP
  = 0.2 gpd/sf Drip

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Conventional System

- 100’ Laterals
- 18” wide Trench
- At least 5’ between Laterals
- Treatment Area per Lateral
  - Area of Trench bottom (100’ X 1.5’= 150 sf)

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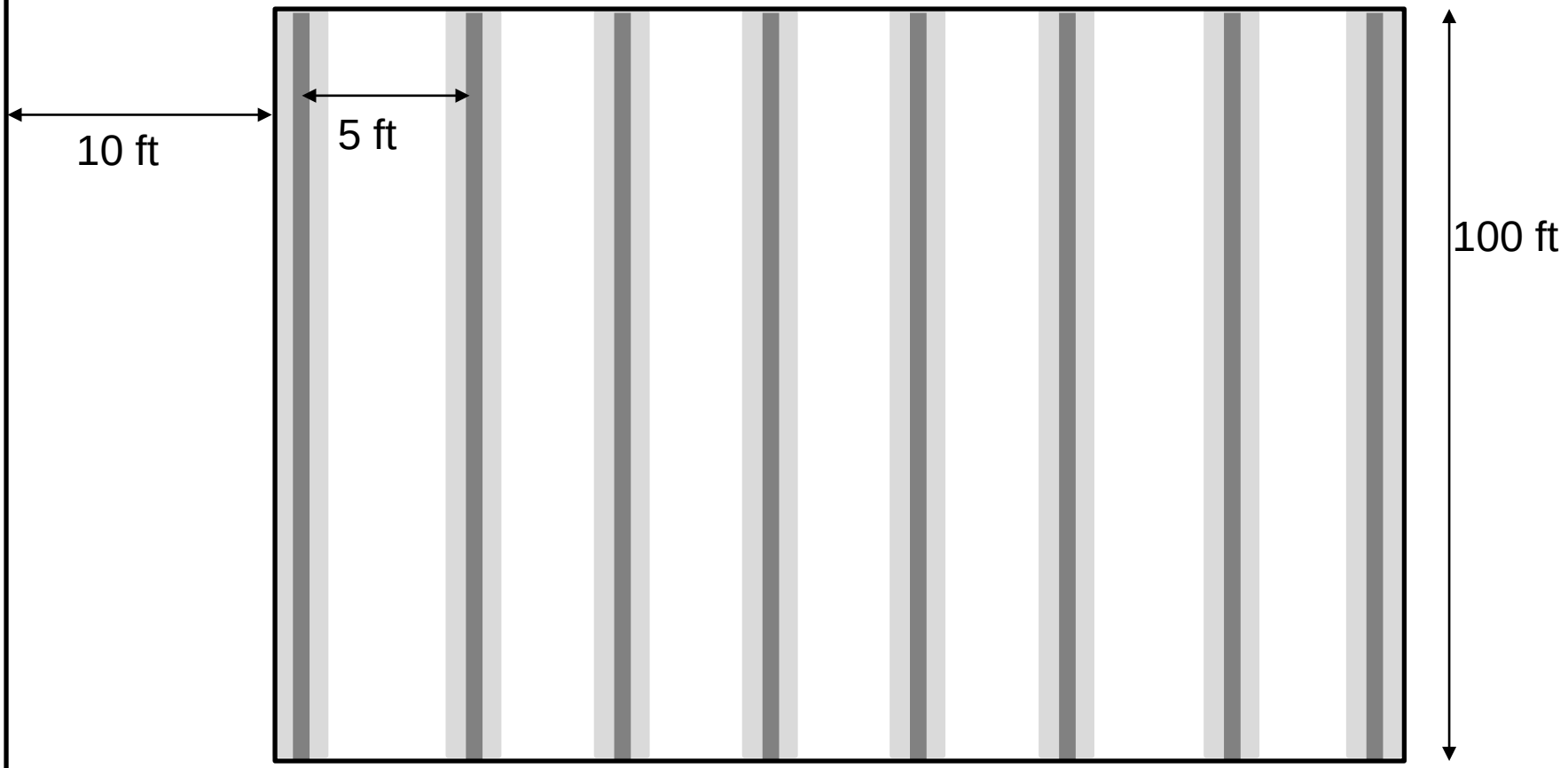
Conventional

- # Laterals = 10,000 gpd/0.5 gpdpsf/150 sf
  =134 laterals
- Land Area = 134 X 5 ft X 100 ft long
  = 67,000 sf

- Add in Setbacks = 82,800 sf
  = 1.9 acres

Trench Width 18-inches
Pipe Diameter 4-inches

Total area needed is 82,800 sf or 1.9 acres



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Conventional

- Downslope
- Higher linear loading rate
- Only trench bottom used to calculate area

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LPP System

- 70’ Laterals
- 8” wide Trench
- 5’ between Laterals

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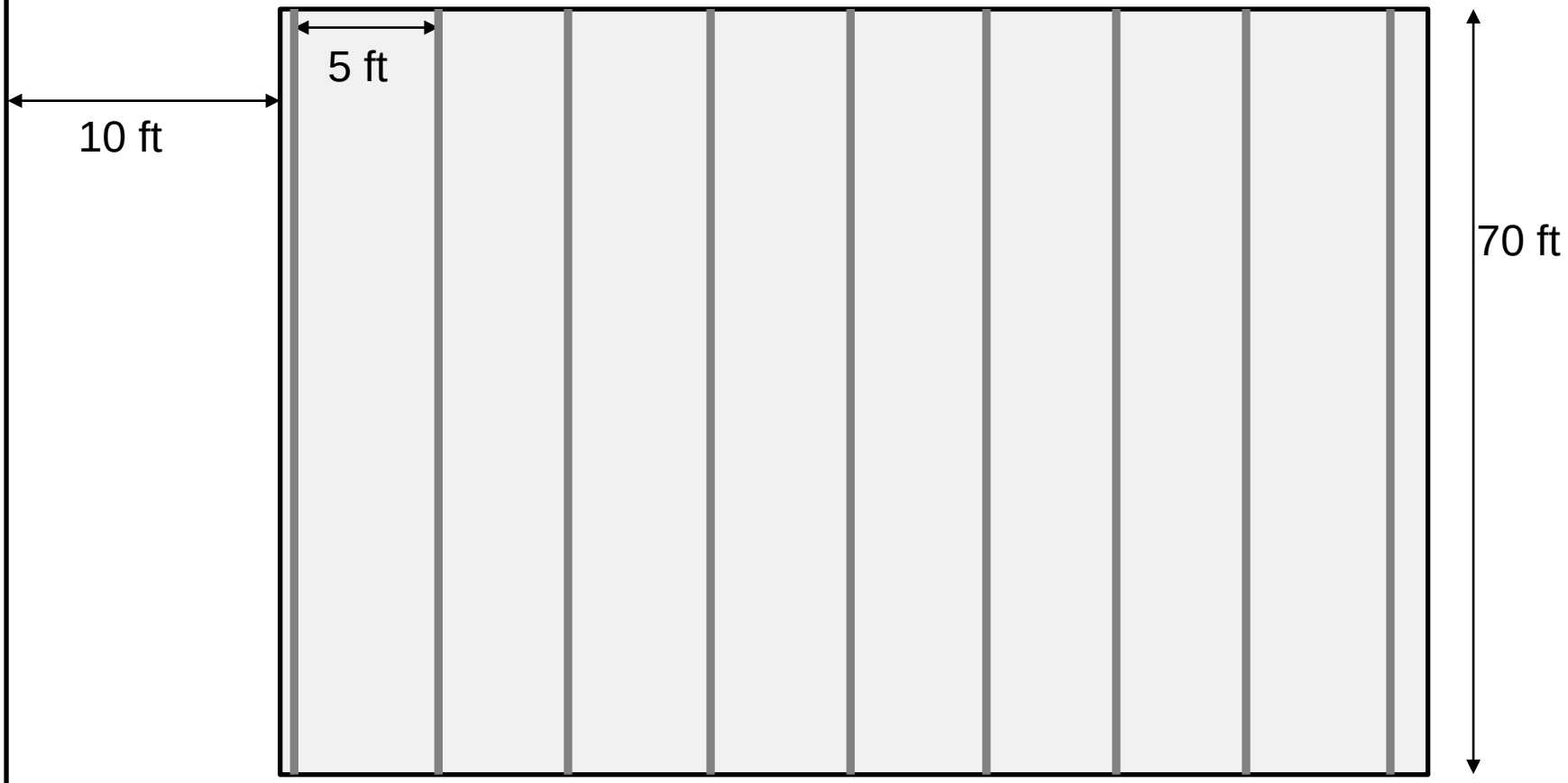
LPP System

- Land Area = Q / loading rate
  = 50,000 sf

- Add in Setbacks = 66,086 sf
  = 1.5 acres

Trench Width 8-inches
Pipe Diameter 2-inches

Total area needed is 50,000 sf or 1.5 acres



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LPP System

- More Flexible on Location of Treatment Area
- Use the entire area
- Dosed

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Drip Dispersal System

- ½” tubing with Emitters at 2’ intervals
- 2’ between Laterals
- No Trench Needed
- Loop design
- Treatment Area per Emitter = 4 sf

Pipe Diameter 1/4-inches

Total area needed 66,086 sf or 1.5 acres

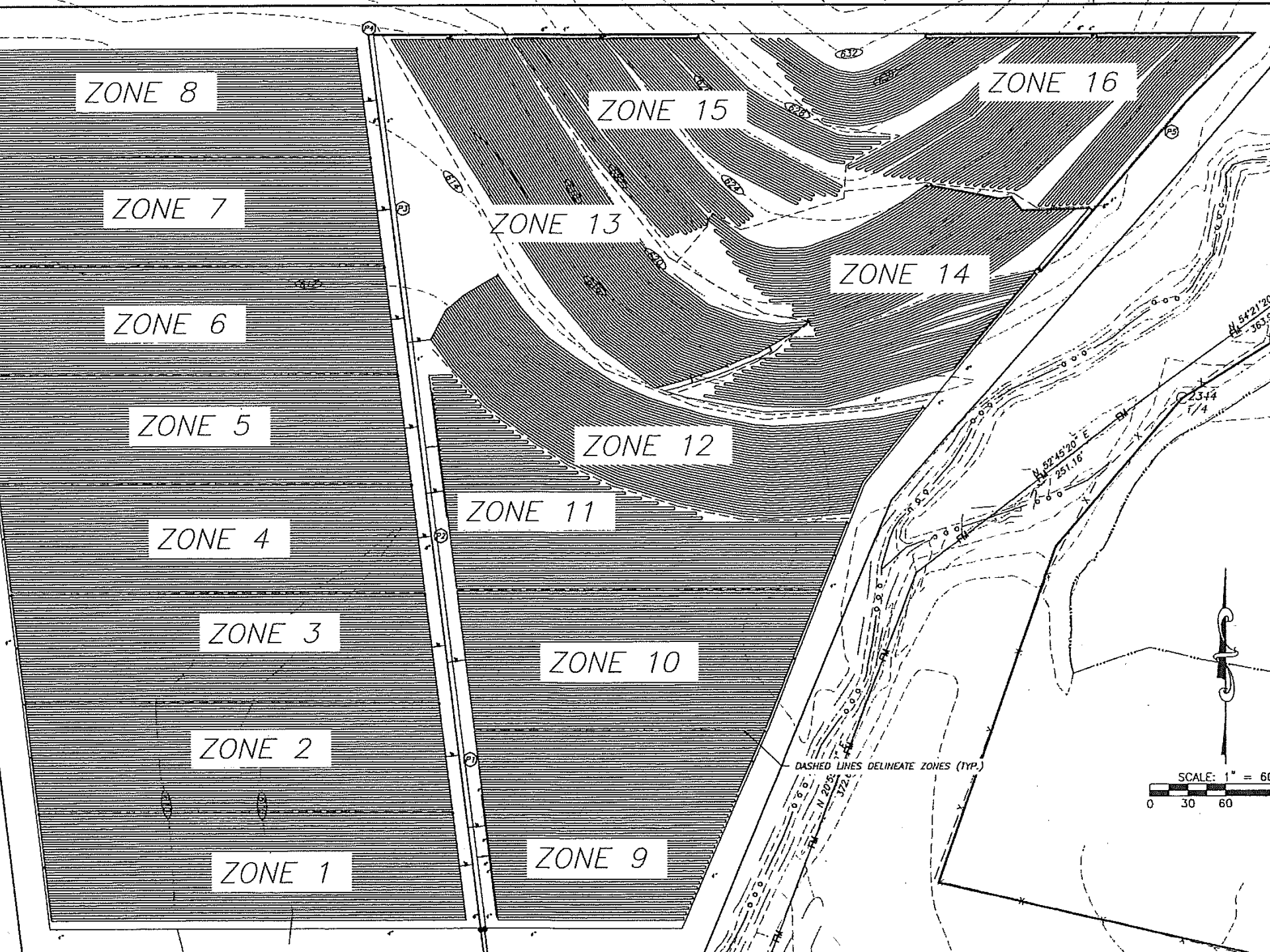
Drip Dispersal System

- Land Area = Q / loading rate

  = 50,000 sf

- Add in Setbacks = 66,086 sf

  = 1.5 acres


ZONE 8
ZONE 7
ZONE 6
ZONE 5
ZONE 4
ZONE 3
ZONE 2
ZONE 1
ZONE 15
ZONE 16
ZONE 13
ZONE 14
ZONE 12
ZONE 11
ZONE 10
ZONE 9
DASHED LINES DELINEATE ZONES (TYP.)
SCALE: 1" = 60
0 30 60

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Drip Dispersal System

- Treatment Area Flexibility
- Less Land Disturbance
- Applicable in Clayey Soils
- Dosed

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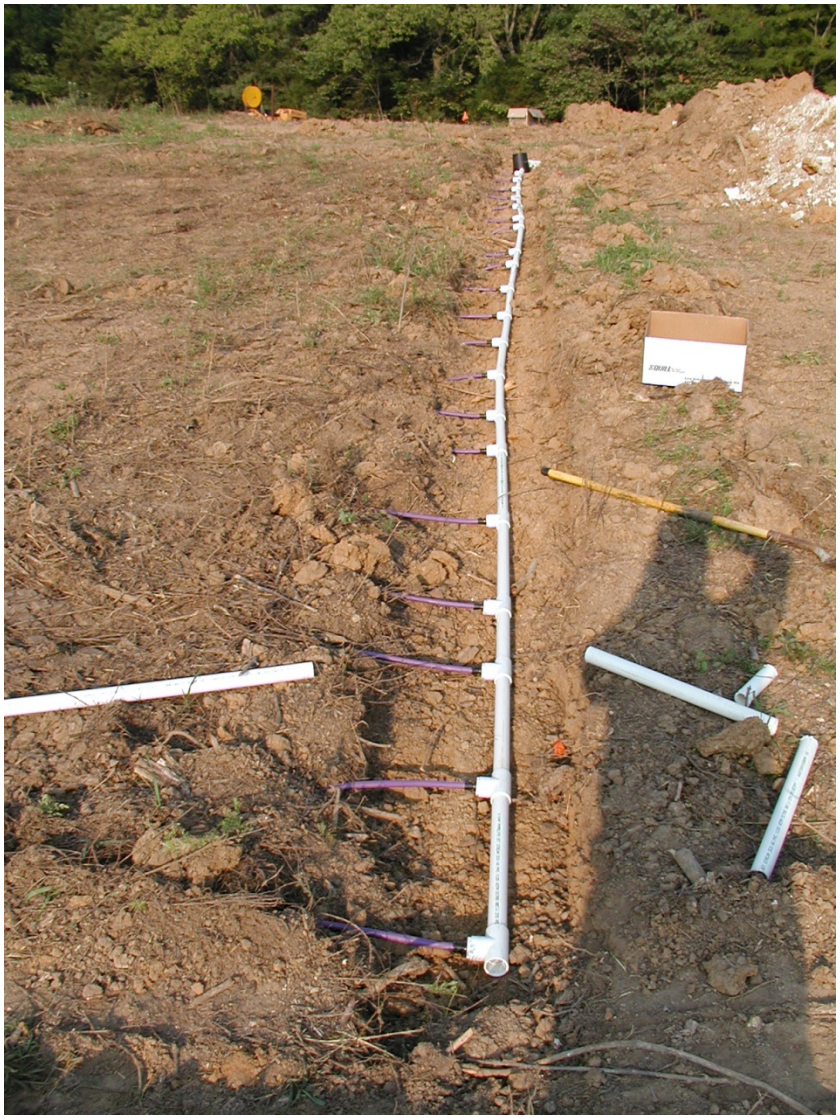

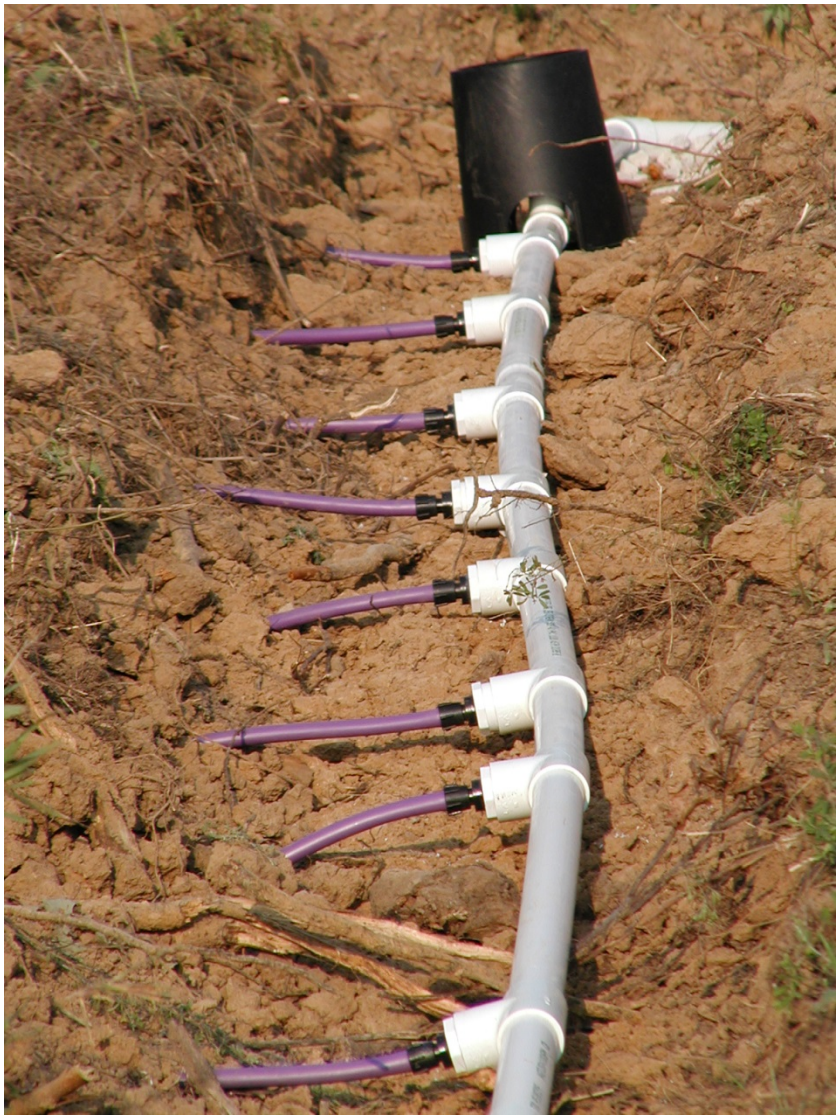

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Operating Permit

- MOG823
- Visually inspect once/month
- Maintain maintenance records
- Considered Class V well if serves ≥20 people

http://dnr.mo.gov/forms/780-1774-f.pdf

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Guidance

- Chapter 8: http://www.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c20-8.pdf
- Subsurface Drip Distribution System Factsheet: http://dnr.mo.gov/pubs/PUB2435.pdf
- No-Discharge Wastewater Treatment: http://dnr.mo.gov/env/wpp/no-discharge.htm
- General soils information: https://websoilsurvey.nrcs.usda.gov/app/
- Manufacturer’s guidelines!

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Soils Report Fact Sheet

- Under Development
- Stakeholder Input
- Outline soils report components
- Assist the design engineer review

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Wastewater Engineering Workshop – Nov./Dec. 2018

Surface Land Application - Irrigation

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

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Topics include

- New Design Regulations
- Pictures
- Design / Permitting Process
- Operating Permit Requirements

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Design Guides for Land Application Systems change to Design Regulations

- Proposed 10 CSR 20-8.200 (effective February 2019) Replaces
  - Small Works
    - 10 CSR 20-8.020(11), (13), and (15)
  - Large Works
    - 10 CSR 20-8.200 and 8.220

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Lagoon Design Regulations

- Maximum surface irrigation of 24 inches per year without soils investigation
- Berm, and seal requirements including geosynthetic liner
- Irrigation set-back distances
- Treatment and Storage Requirements
  - 75 to 120 Day Storage of wastewater and 1-in-10 year rainfall minus evaporation

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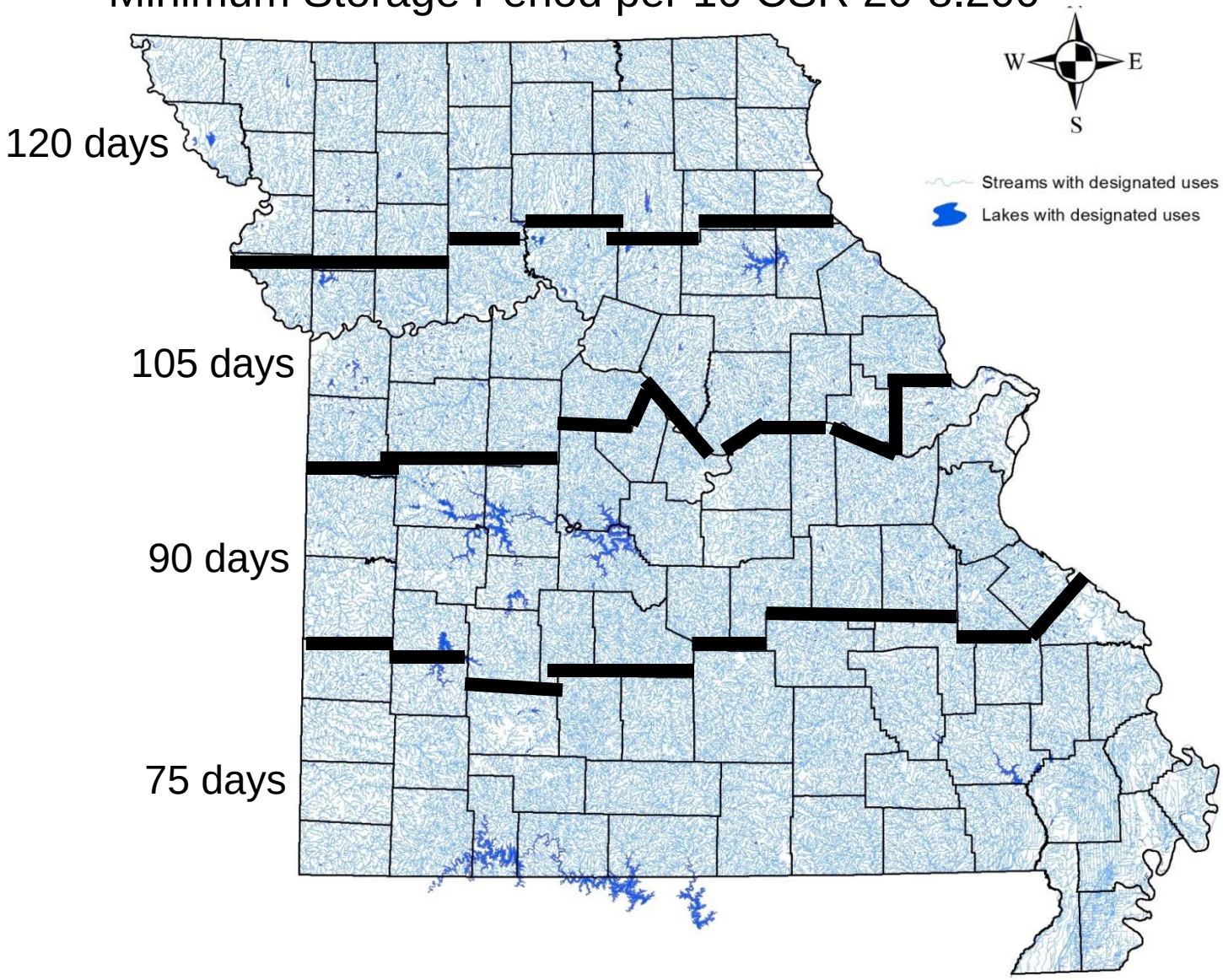
Minimum Storage Period per 10 CSR 20-8.200



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Lagoon Regulations (continued)

- Application Rates
- Grazing and Harvest Deferment
- Public Access
- Pressure Monitoring Alarm System
- Geohydrologic Evaluation
  - Lagoon and Land Application Area

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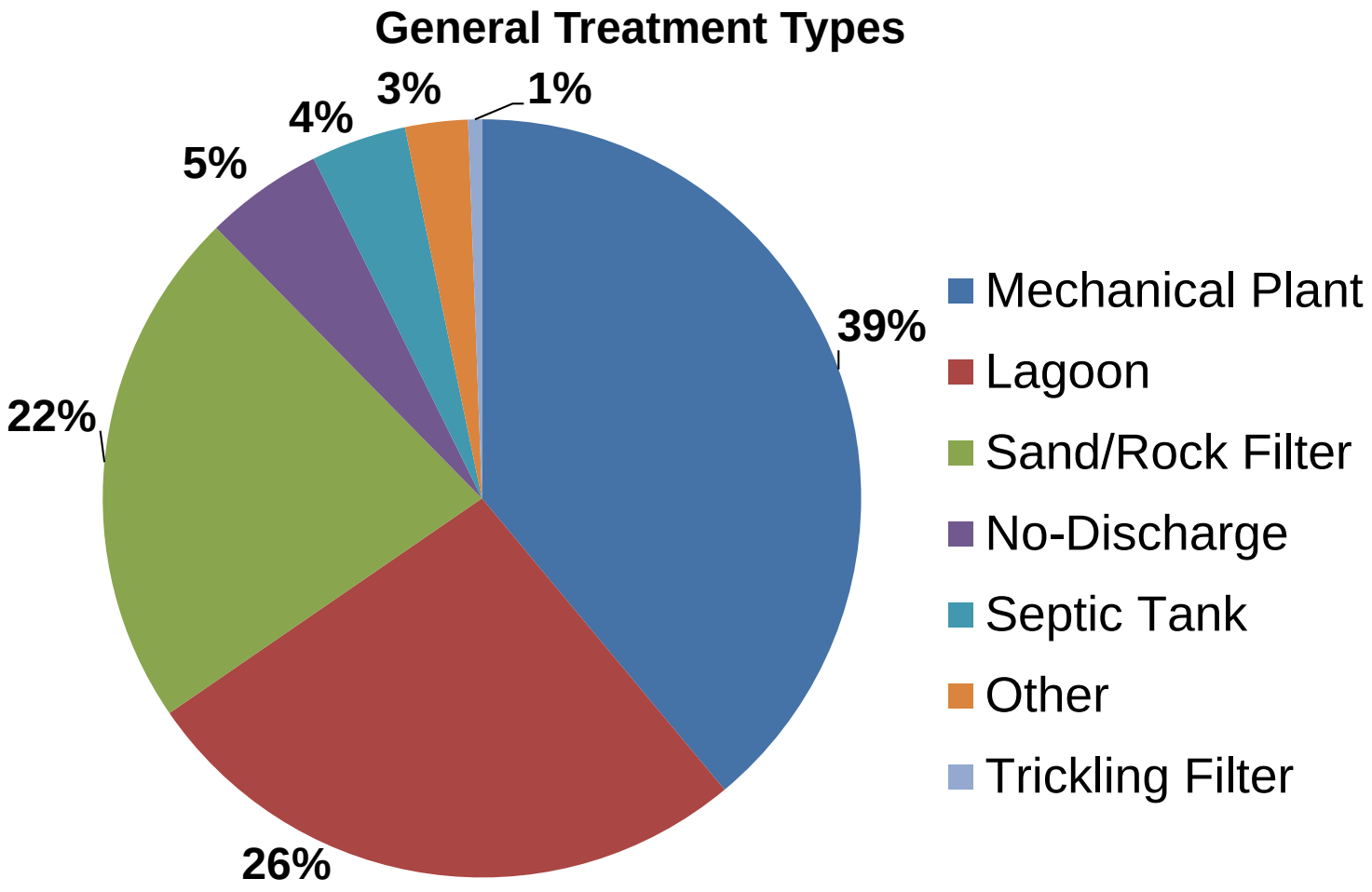
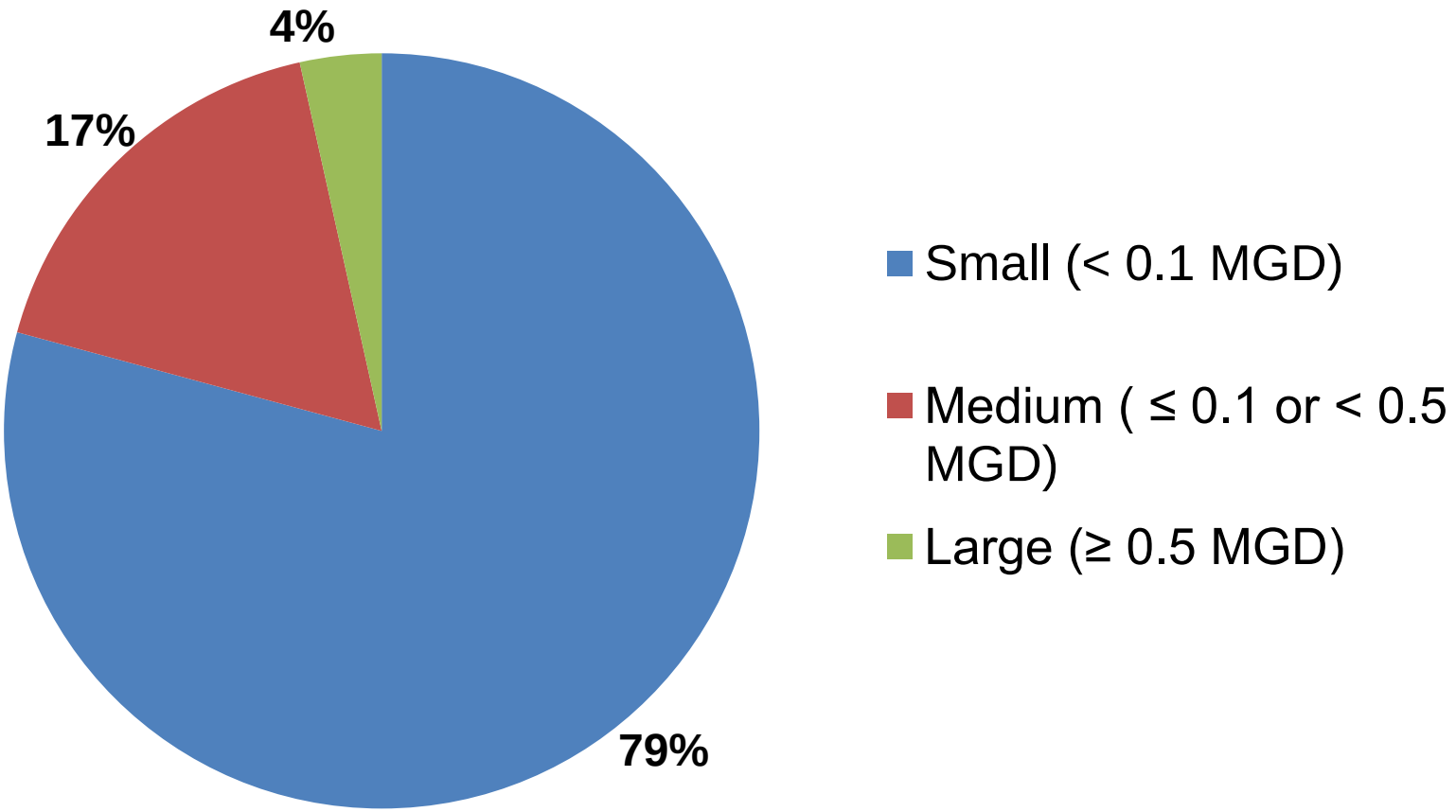
3,253 Permitted WWTFs



Discharging Lagoon Sizing



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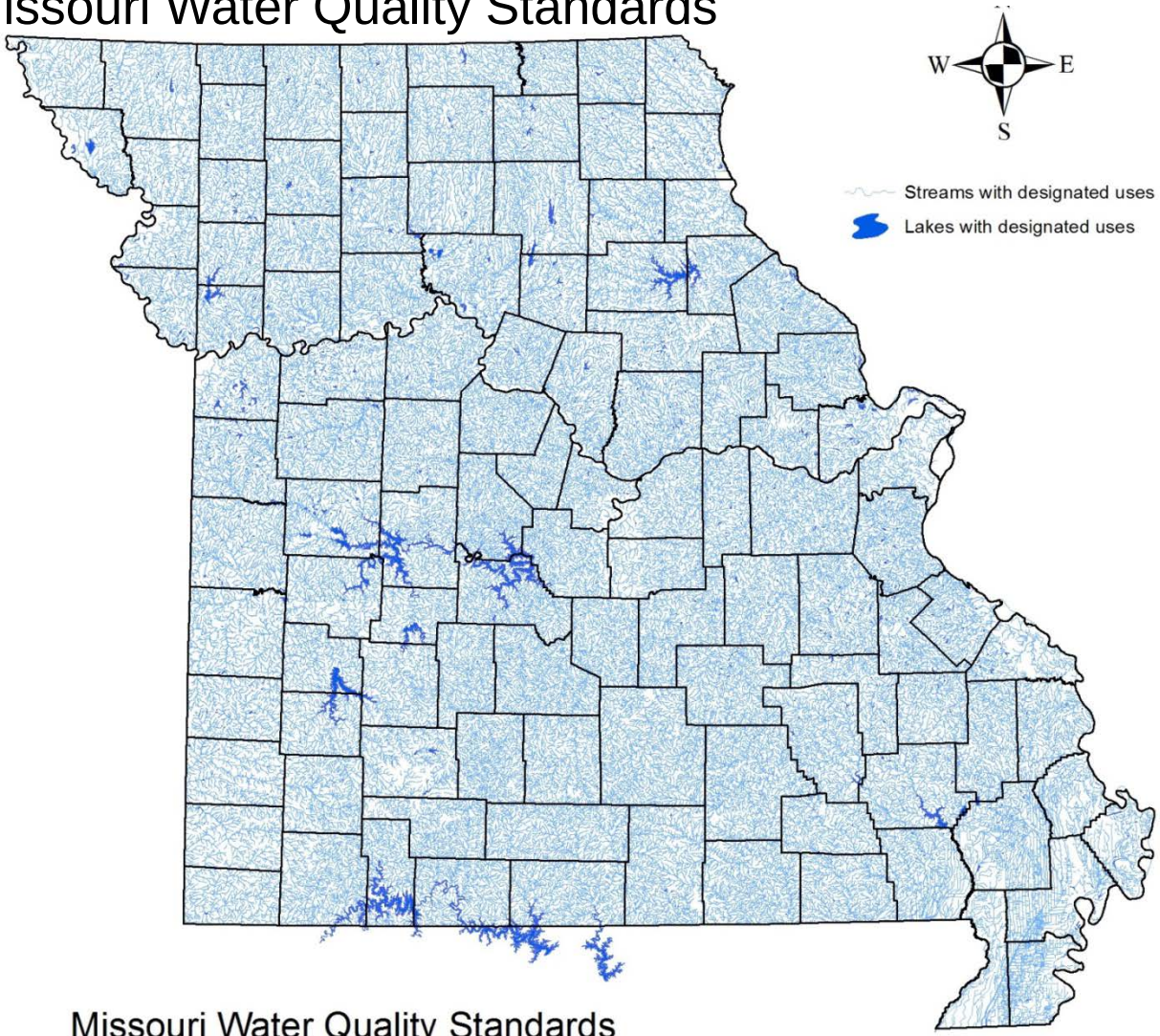
Missouri Water Quality Standards



Missouri Water Quality Standards
Waters with designated uses
10 CSR 20-7.0.31 Published: 1/29/2014

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Challenges facing small systems

- Expanded Stream Classification
  - Disinfection
  - Current Ammonia Criteria
- Future Ammonia Criteria
- Nutrients & Emerging Pollutants of Concern
- Inflow & Infiltration, Duckweed, Sludge Buildup, Insufficient Lagoon Size, Maintenance Issues, Underfunded, Declining Population…

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Challenges facing small systems

- Current Ammonia (with no mixing)

	Daily Max (mg/L)	Monthly Avg. (mg/L)
Summer	3.6 mg/L	1.4 mg/L
Winter	7.5 mg/L	2.9 mg/L

- Nitrogen & Phosphorus monitoring at facilities >100,000 gal/day

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Existing Lagoon Can’t Meet Limits

- What to do?
  - Improve Operation and Maintenance
  - Upgrade
  - Regionalize
  - Land Apply
- Financial Burden? – POTW
  - SCEAP Grant
  - MDV

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Existing System Can’t Meet Limits

- Upgrade Considerations
  - Operator Certification Level
  - Operating Cost
  - Labor
  - Sludge
  - Treatment plant designed for twenty year life but may need to be upgraded sooner
  - No-Discharge is a long term alternative

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Potential Solutions

- Traditional Options
  - Replace Lagoon with Mechanical Plant
  - Retrofit Lagoon (New Tech)
- Land Application
  - Surface vs. Subsurface
  - Setbacks
  - Sizing
  - Sludge Evaluation/Removal
  - Vegetation, etc.

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Benefits of Land Application

- Reduced Testing Requirements
  - No limits or monitoring for BOD, TSS, Ammonia, or Disinfection
  - Equivalent to Secondary Limits switch to Secondary Limits for BOD/TSS if upgrading lagoon instead
- No Antidegradation Review Required
- Environmental Benefits

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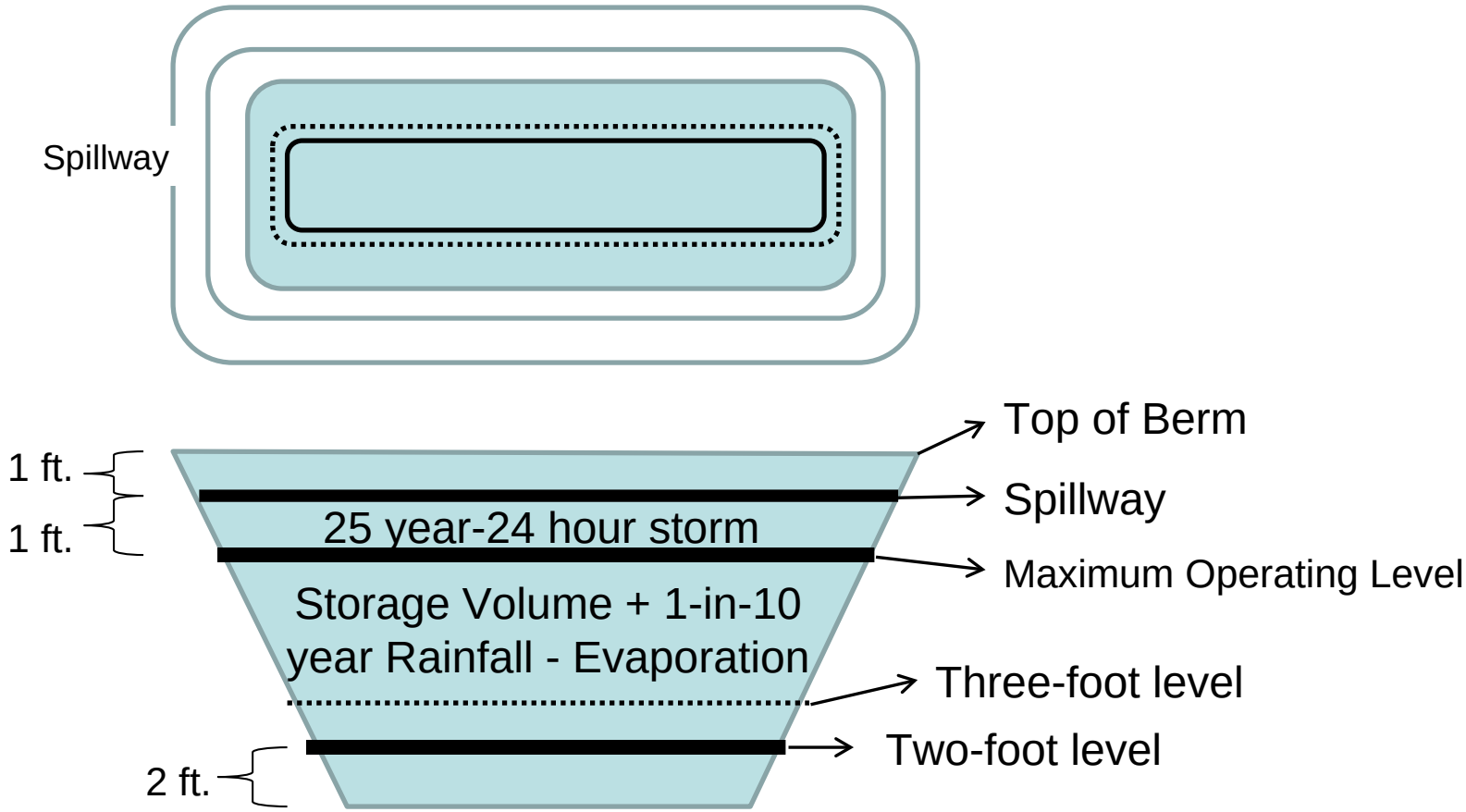
Lagoon Storage Volume



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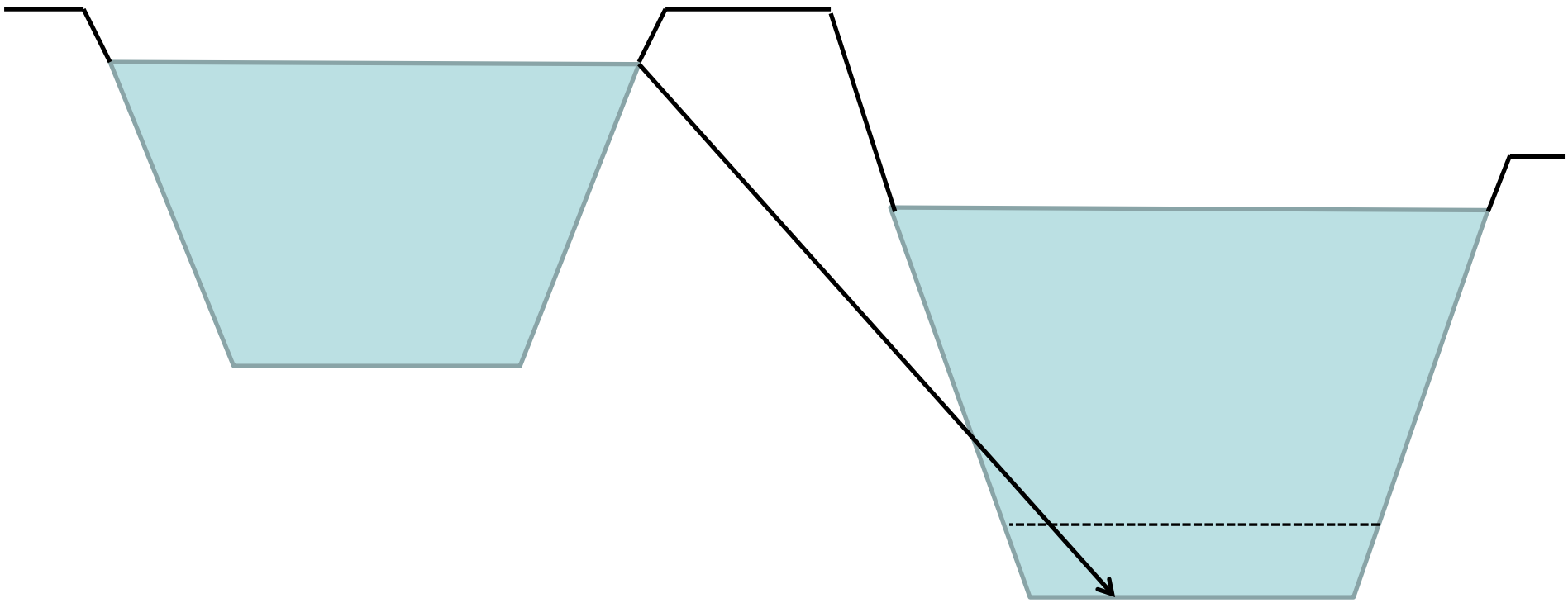
Different Berm Height Elevations



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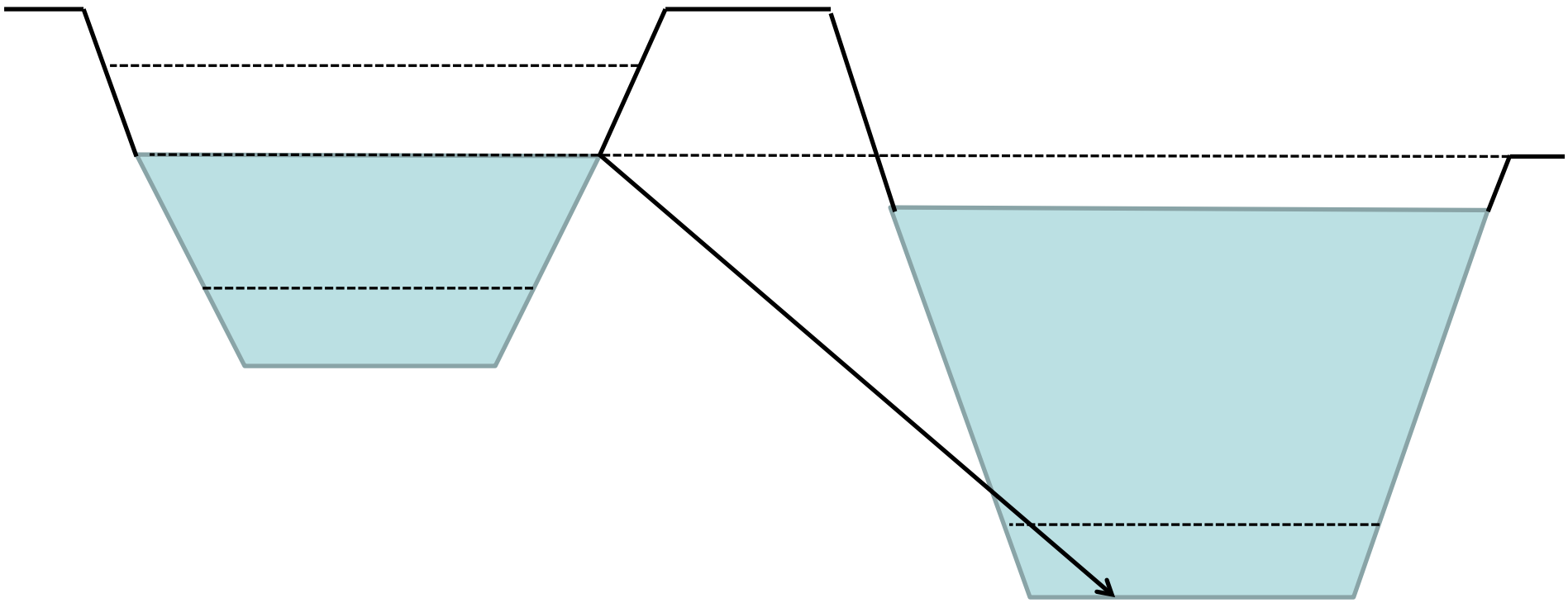
Different Berm Height Elevations



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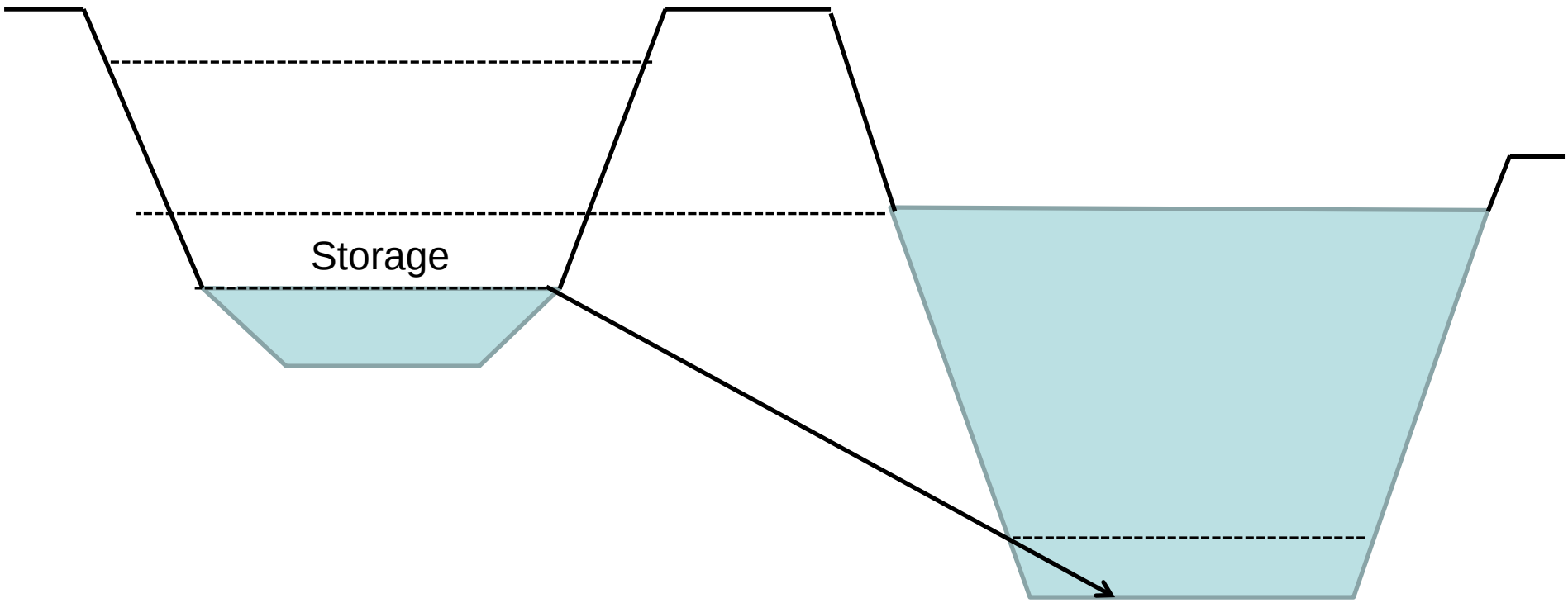
Different Berm Height Elevations



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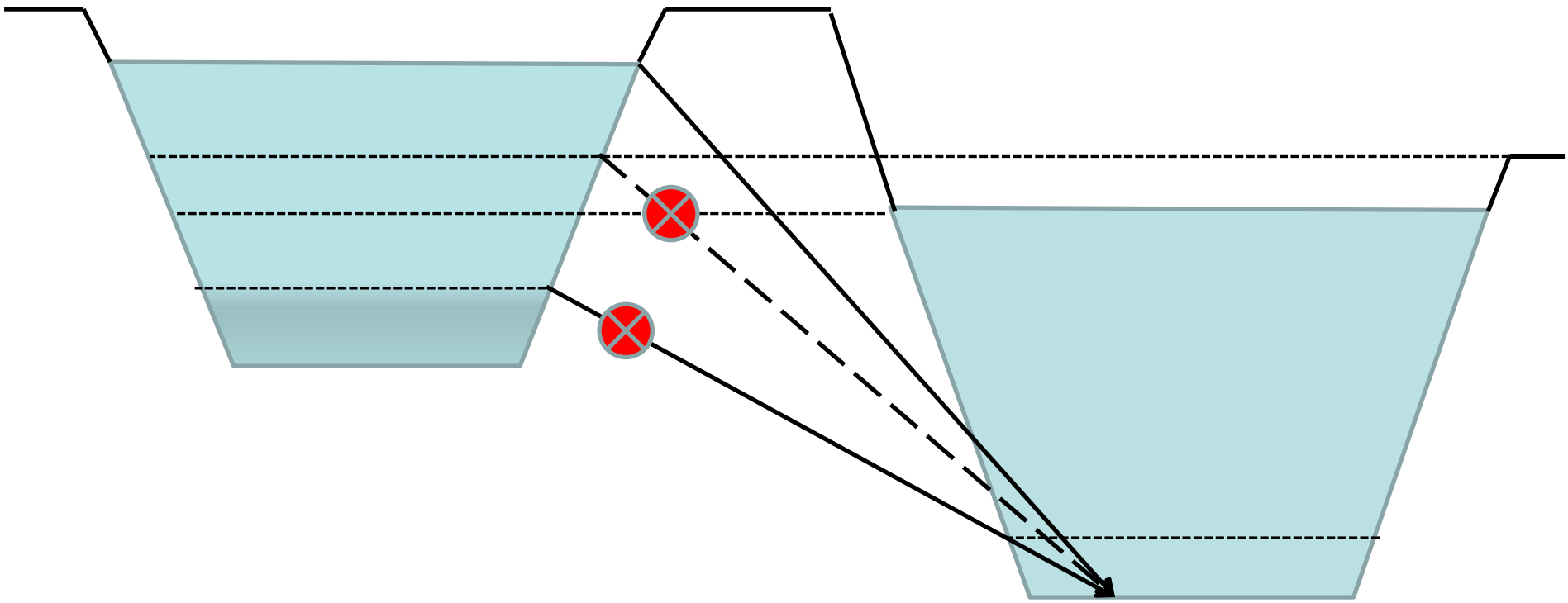
Different Berm Height Elevations



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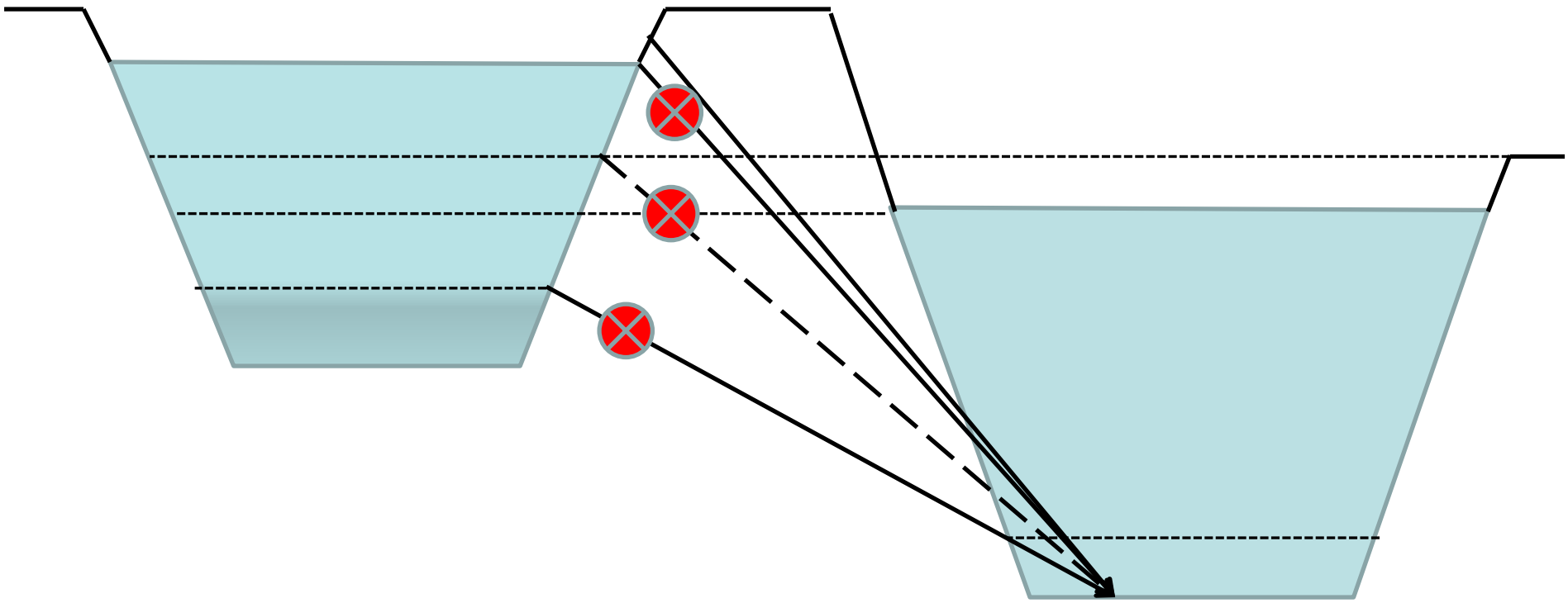
Different Berm Height Elevations



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2015/11/23

Land Application Methods

- Surface Irrigation
  - Center Pivot
  - Solid Set Sprinkler
  - Traveling Gun
- Subsurface Land Application
  - Drip
  - LPP (Low Pressure Pipe)
  - Conventional

Center Pivot Irrigation

Pros

- Low labor
- Uniform distribution
- Irrigate large area
- Reliability

Cons

- Maintenance cost
- Field shape
- Dry corners in square fields
- High capital cost for very small systems

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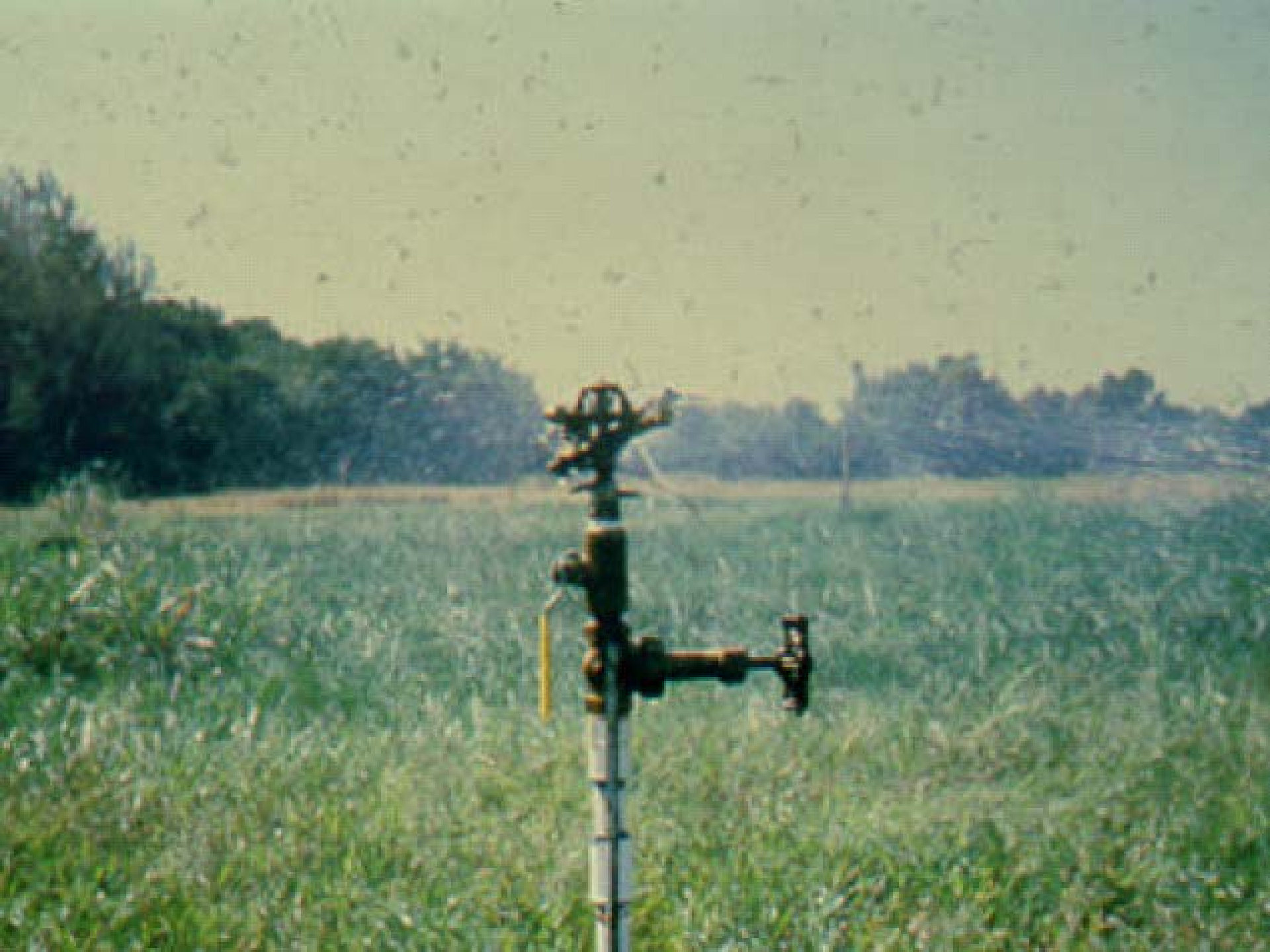
Solid Set Sprinkler



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Solid Set Sprinkler

Pros

- Adaptable to field shape
- Low labor

Cons

- Not suitable for tall vegetation
- High capital cost for large systems

Traveling Gun Irrigation

Pros

- Can be used in tall vegetation
- Portable
- Large nozzle – no plugging

Cons

- High operation and maintenance cost / Short life
- High labor / High energy pumps
- Large droplets / Drift
- Non-rectangular shaped fields

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Land Application Regulations

- Slopes less than ten percent
- Irrigation area must be cropped/vegetated
- Grazing and forage harvesting deferment
- No public use area unless disinfection
- Fence to restrict access
- No application on frozen, saturated, or snow covered soil

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Land Application Regulations

Setbacks

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

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Land Application Guidelines

- Basin must be pumped down to minimum operating level by November 30th
- Daily inspections when irrigating
- Land apply during daylight hours

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Land Application Guidelines

- If land applying greater than 24 inches/year
  - Soils evaluation
- Note Operating Permit may require:
  - Nitrogen loading rate requirements
  - Monitoring wells on case-by-case basis for sensitive situations due to rate, groundwater, soils, and/or geology

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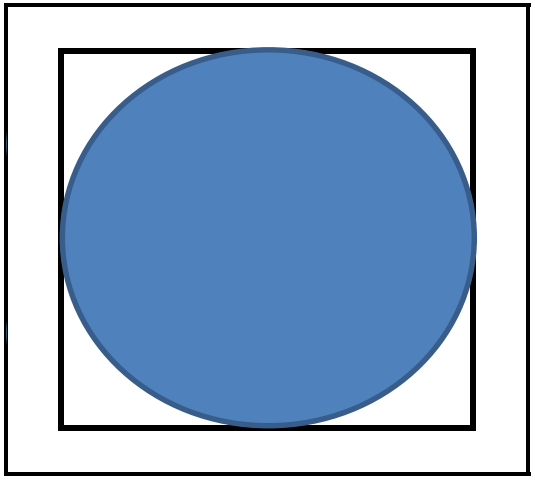
Land Application

- Effective area of approximately 0.7 acres for each 1000 gallons per day dry weather design flow, which on small systems will be an acre or more of actual area.



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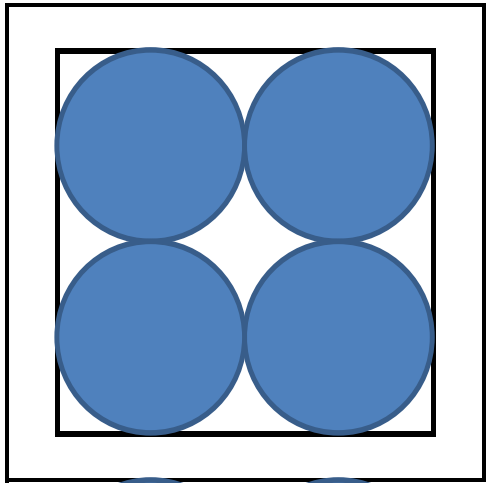
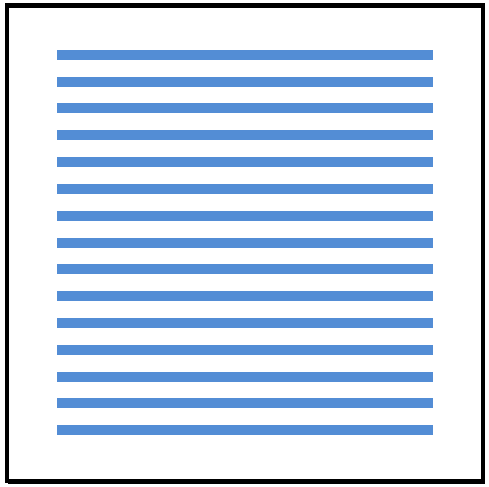
Land Application

- Effective area is the area effectively irrigated whether it be linear or circles.





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Quick Case Study

- Rural town with three-cell lagoon
- Lagoon has schedule of compliance for disinfection and ammonia
- Lagoon will not meet the final limitations for ammonia or E. coli without upgrading
- Population is shrinking
- Median household income is below average

MISSOURI STATE OPERATING PERMIT

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No.	MO-01XXXXX
Owner:	Small Village
Address:	101 West High, Small Village, MO 6XXXX
Continuing Authority:	Same as above
Address:	Same as above
Facility Name:	Small Village
Facility Address:	1 Lagoon Boulevard, MO 6XXXX
Legal Description:	SE ¼, Sec. 1X, T46N, R1xW, Corn County
UTM Coordinates:	X = 58xxxxx, Y = 42xxxxxx
Receiving Stream:	Tributary to Turkey Creek
First Classified Stream and ID:	8-20-13 MUDD V1.0 (C) (3960)
USGS Basin & Sub-watershed No.:	10300102-XXXX

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

Outfall #001 – POTW – SIC #4952

The use or operation of this facility shall be by or under the supervision of a Certified "D" Operator.
Three-cell lagoon / sludge retained in lagoon
Design population equivalent is 200
Design flow is 17,800 gallons per day.
Actual flow is 15,000 gallons per day.
Design sludge production is 3.0 dry tons/year.

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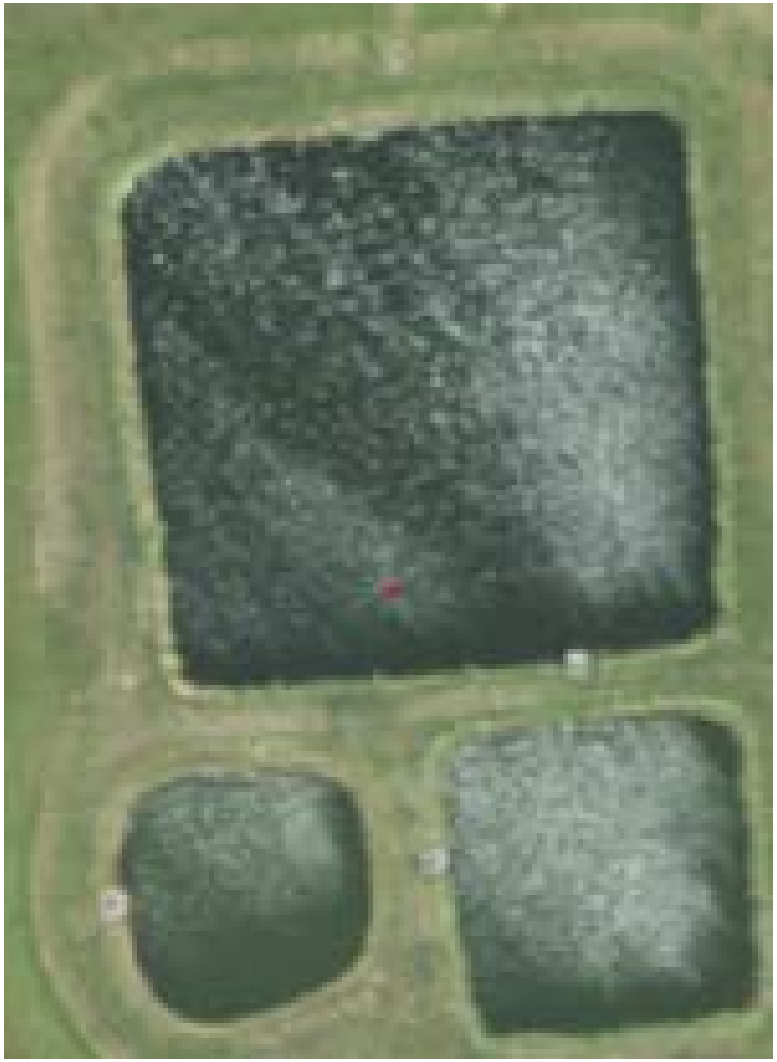
Existing Lagoon

Dimensions – Length, Width, and Depth of Each Cell?

Sludge Depth?



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Options

- Traditional upgrade
  - Not Affordable
- Regionalization
  - 8 miles and not adequate capacity
- Land Application
  - Evaluate
    - Is the lagoon large enough?
    - Is land available?

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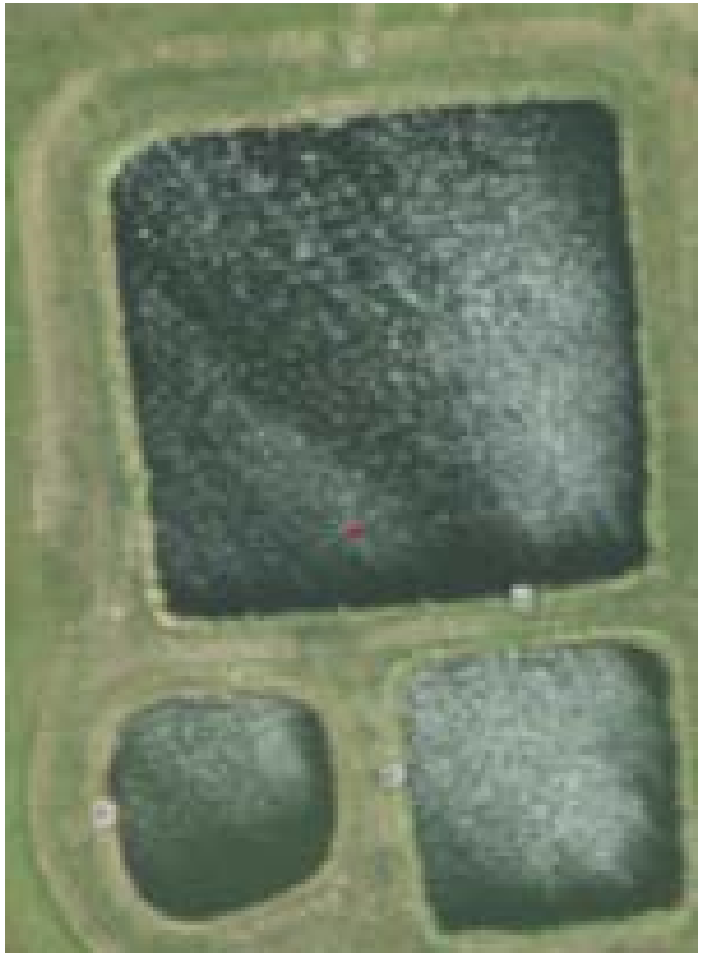
Storage volume of lagoon
= Length x Width x Depth

Have to factor in the side slopes and two feet on the bottom

Example:
First cell surface is
210 feet x 210 feet.
Slope is 3:1.
Total depth is 5 ft.



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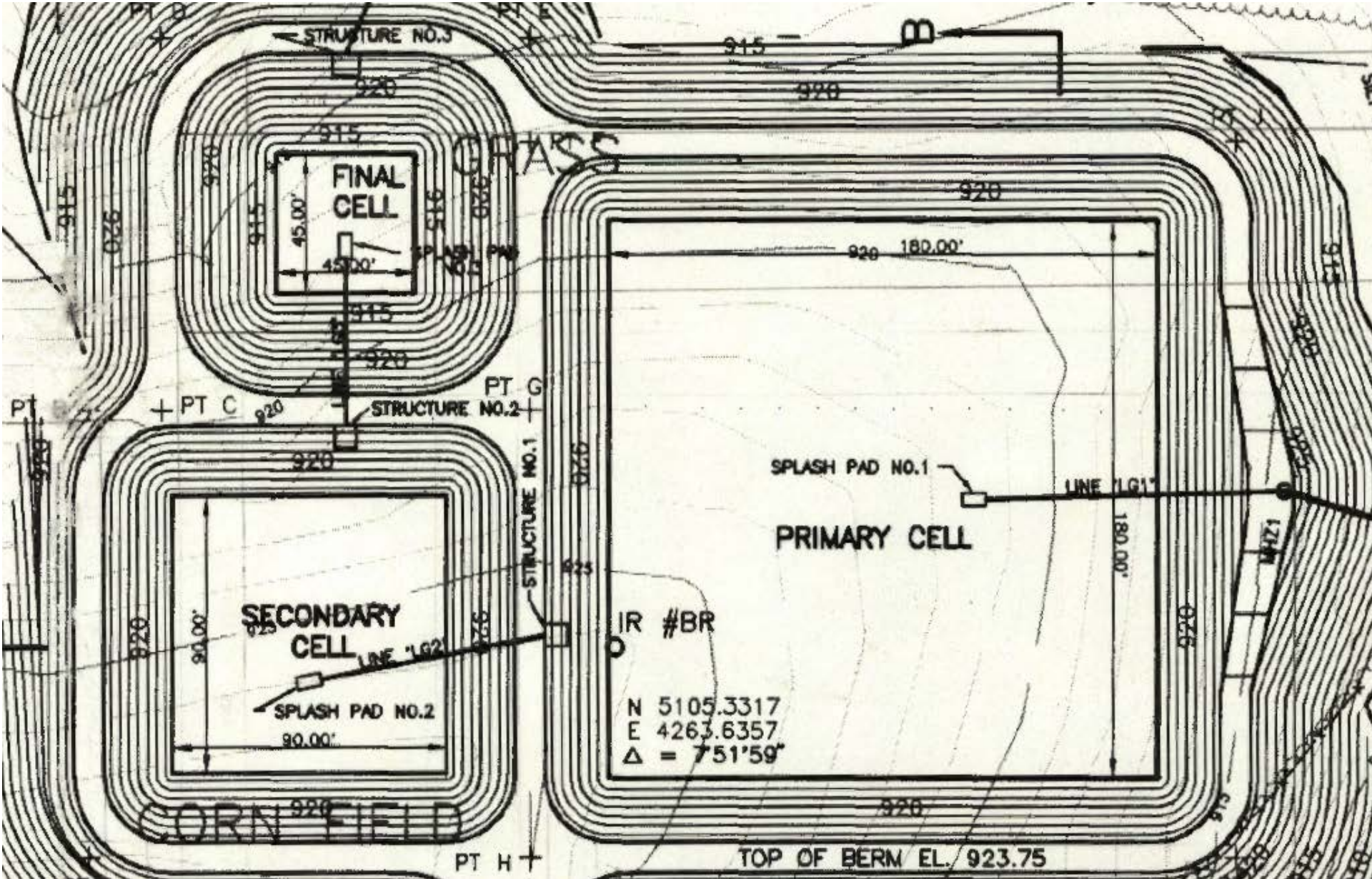

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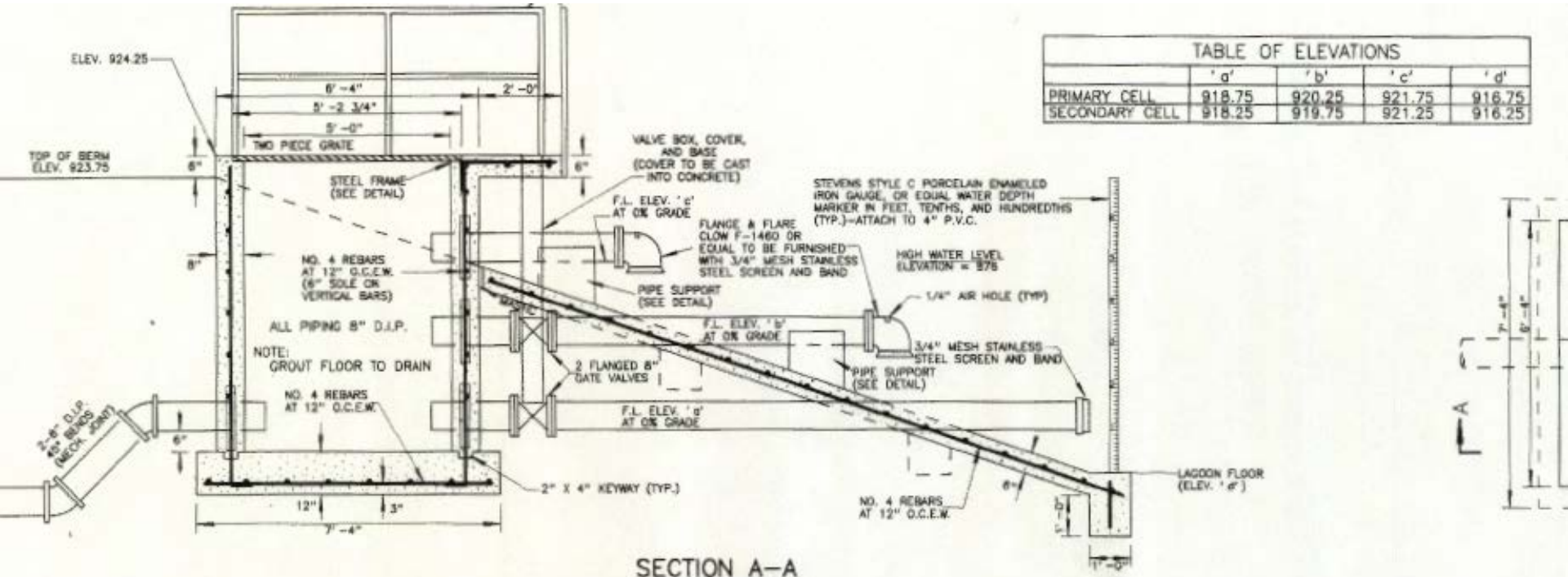

TABLE OF ELEVATIONS	'a'	'b'	'c'	'd'
PRIMARY CELL	918.75	920.25	921.75	916.75
SECONDARY CELL	918.25	919.75	921.25	916.25

SECTION A–A

STRUCTURES NO. 1 AND NO. 2

N.T.S.

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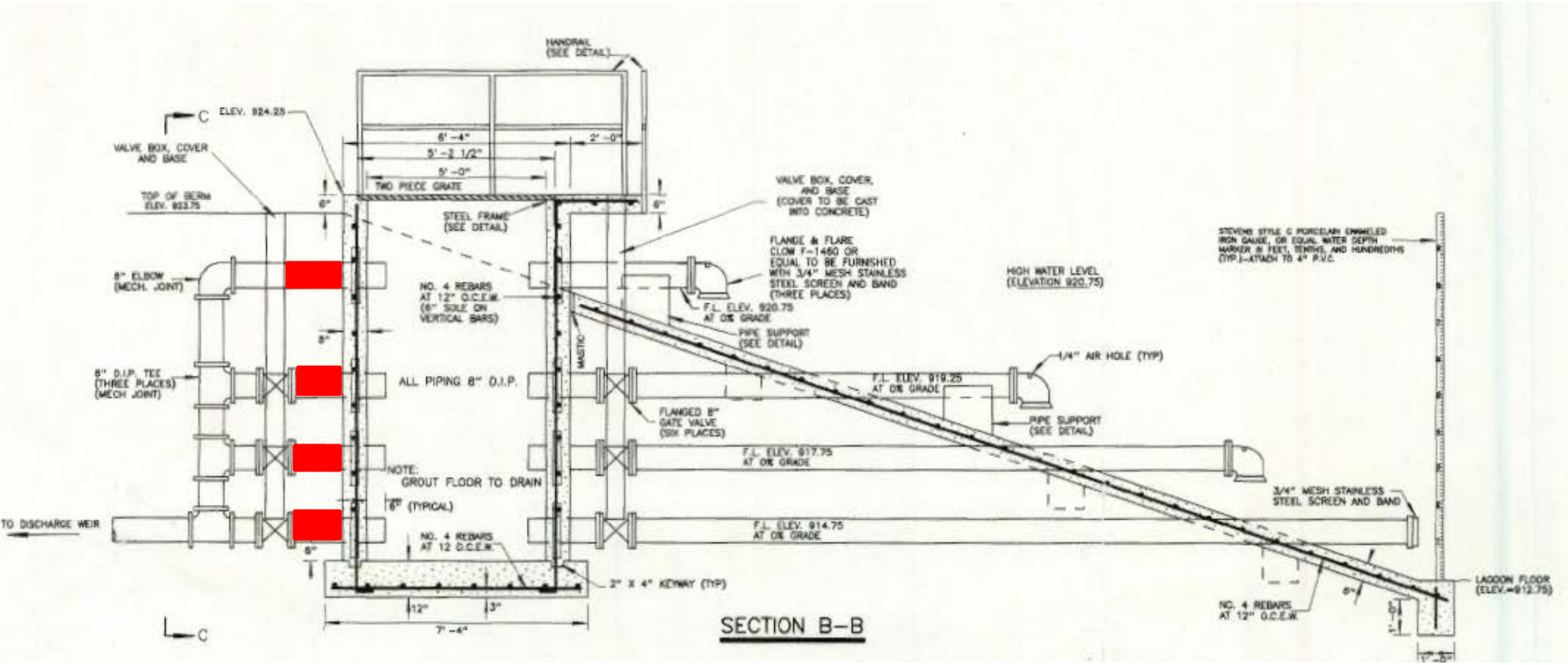

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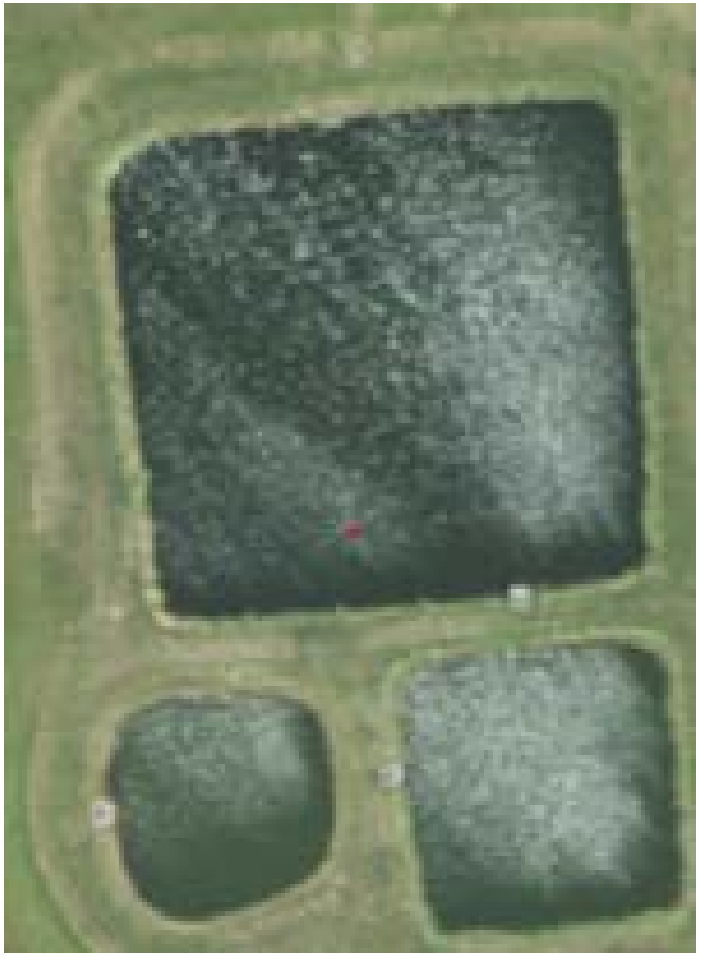
As-builts comparison:
First Cell:
180 x 180 bottom x 5
210 x 210 top x 5
Second Cell:
90 x 90 bottom x 5
115 x 115 top x 5
Third Cell:
45 x 45 bottom x 8
93 x 93 top x 6



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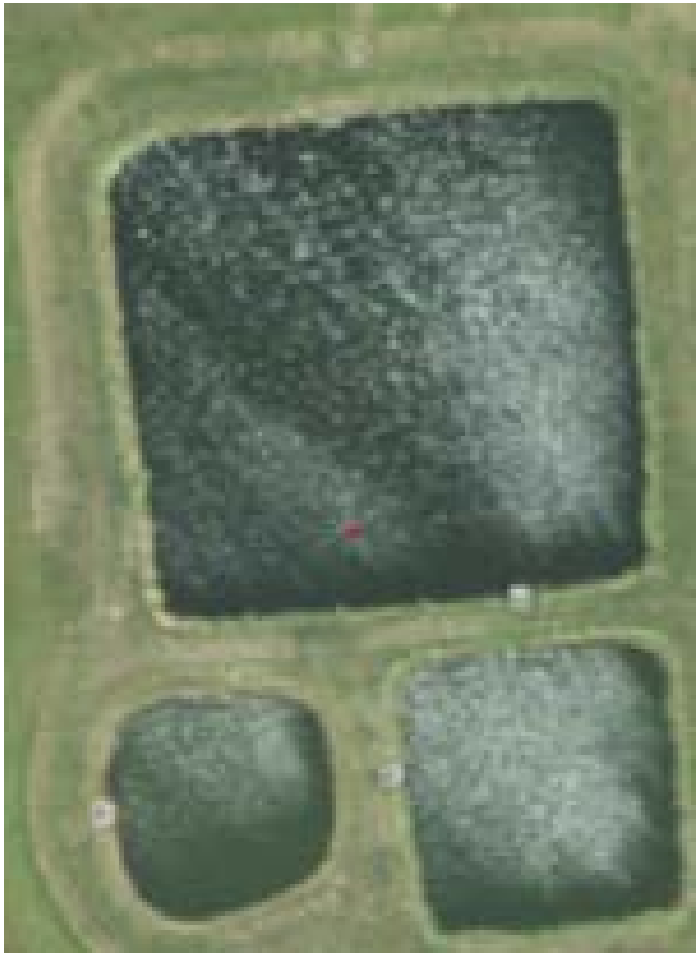
First have depth of
5 ft – 2 ft (bottom) = 3 ft.

Average Length / Width =
210 ft – 0.5 x 2 (sides) x 3 (slope) x 3 (depth) = 201 ft.

Volume is
201 ft (length) x 201 ft (width) x 3 ft (depth) = 121,203 cubic ft or 907,000 gallons.



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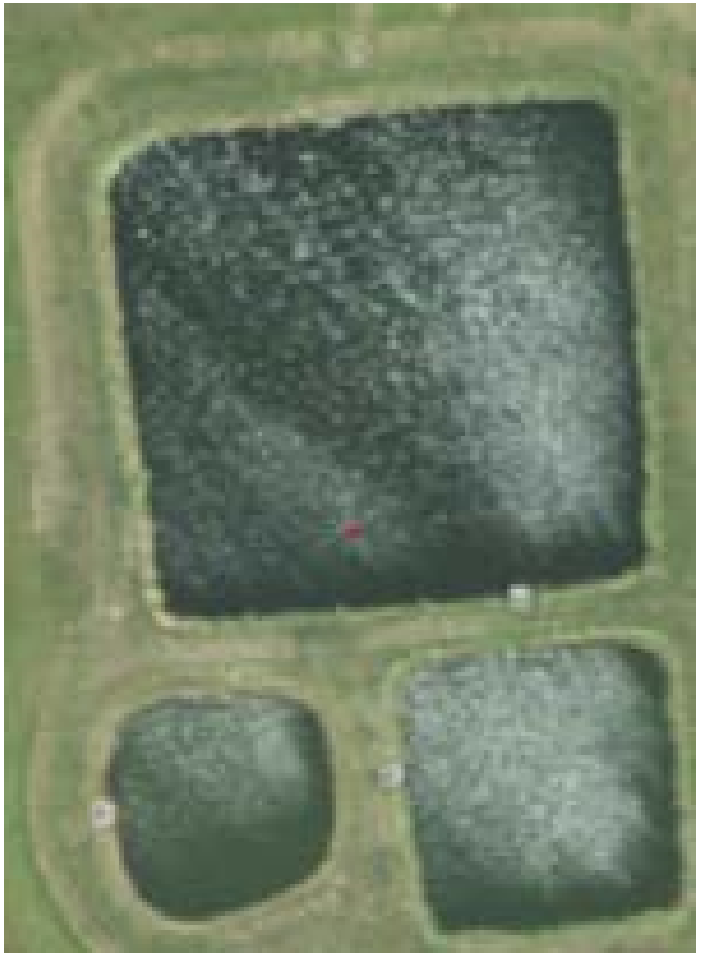
Storage Calculations:

Average length / width of 2nd cell is 107.5 ft with 3.5 ft depth
Volume: 40,447 cubic ft or 303,000 gallons

Average length / width of 3rd cell is 78 ft with 7 ft operating depth
Volume: 42,588 cubic ft or 319,000 gallons.



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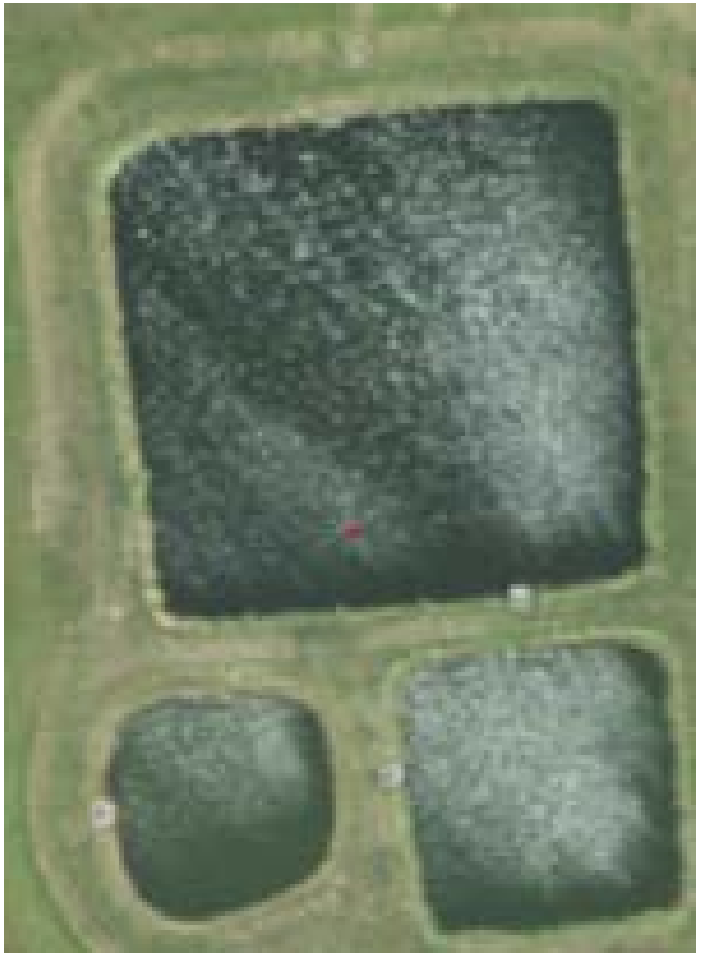
Total Dry Weather Storage is addition of three cells:

51 days (1st)
17 days (2nd)
18 days (3rd)
86 days

Lagoon has 120 days volume as a 17,800 gpd discharge lagoon, but that uses the entire depth.



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Dilemma

- Dry weather storage is only 86 days.
- Requirement is for 90 days including 1-in-10 Rainfall - Evaporation storage.
- What is the community's average daily flow?
  - Water meter readings
  - Daily flow measurement (influent or effluent)

Factors to consider

- What is the number of residents connected to the system?
  - Service connections x average people per connection
  - Census
- Inflow and Infiltration
  - Maintenance
  - Observation

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Recalculate Capacity

- Community only has 100 residents and lagoon was designed for 200.
- Community population has decreased by about 20 people in the past 25 years with no anticipation of growth.
- Recalculate with 100 residents with 10,000 gallons per day.

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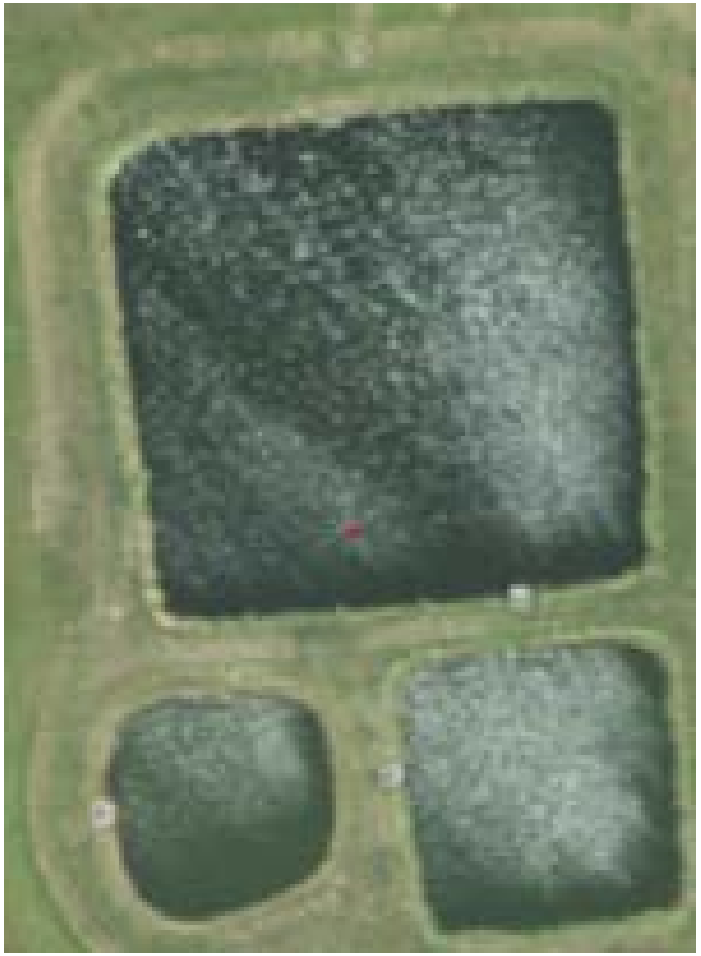
Total Dry weather flow (10,000 gpd) storage for the three cells is:

91 days (1st)
30 days (2nd)
32 days (3rd)
153 days

But this does not account for the 1-in-10 year wet weather flow.



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1-in-10 Wet Weather

90 day rainfall – evaporation assumed to be 9.0 inches for each lagoon cell

Cell One –	301,593 gallons or	3355 gpd
Cell Two –	109,956 gallons or	1222 gpd
Cell Three –	82,136 gallons or	913 gpd
Total -	492,685 gallons or	5489 gpd

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New Design Flow

- Dry Weather Design 10,000 gpd
- 1-in10 year Rain – Evap 5,489 gpd
- Design Flow 15,489 gpd

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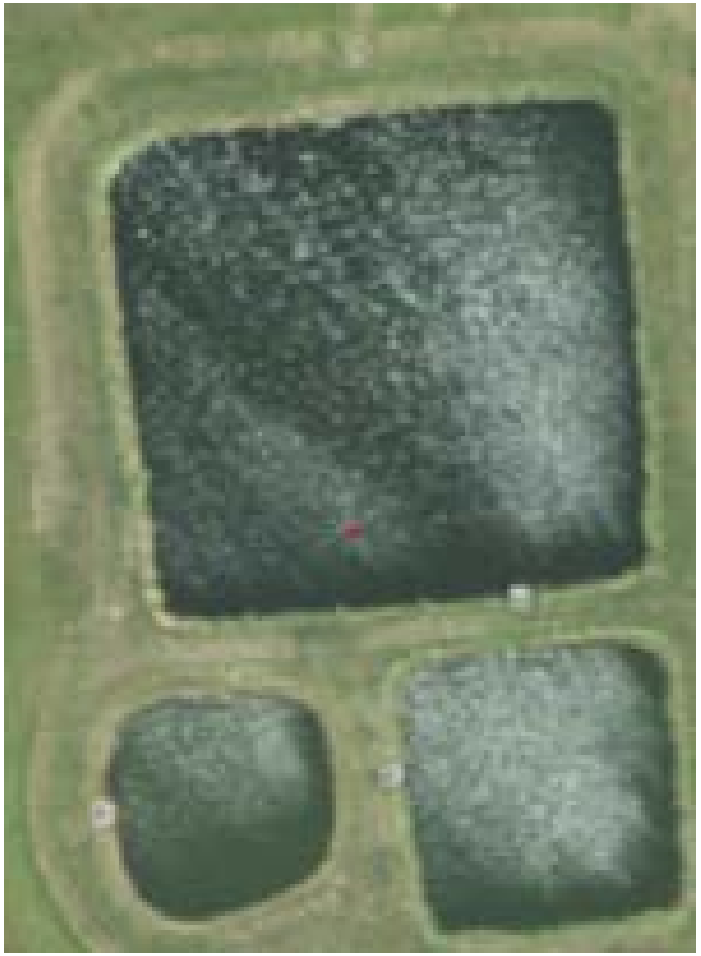
Total Design Flow (15,489 gpd) storage for the three cells is:

58 days (1st)
20 days (2nd)
21 days (3rd)
99 days

This 17,800 gpd lagoon meets the 90 day storage requirement for a dry weather design flow of 10,000 gpd.



Land Application Area

- Note that the flow to be irrigated per year is the dry weather design flow (10,000 gpd) plus the 1-in-10 year rainfall – evaporation for 365 days (not the 90 days used for storage) on the lagoon cells.
- The 1-in-10 year rainfall – evaporation for 365 days is assumed to be 19 inches.

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Land Application Flow

Design dry weather flow

10,000 gpd * 365 days = 3,650,000 gallons

1-in-10 yr. – 365 day R-E:

Cell One =	637,456 gallons
Cell Two =	232,129 gallons
Cell Three =	173,398 gallons
Total	4,692,983 gallons

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Land Required for Irrigation

- Application Rate = 24 inches per year = 2 feet
- Volume to Irrigate = 4,693,000 gallons
  = 627,400 cubic feet
- Area required = volume / rate =

  627,400 cubic feet / 2 feet =

  313,700 square feet / 43,560 ft^2 per acre =

  7.2 acres of effective area

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Setbacks

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

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Land Application Advice

- City buy property to have full control.
- Pump sized for 100 days of irrigation in the 1 – in -10 year scenario.
- Will pump treated wastewater for a mile or two, if necessary.
- Operation and Maintenance
  - Keep lagoon pumped down essential
  - Restrict public access

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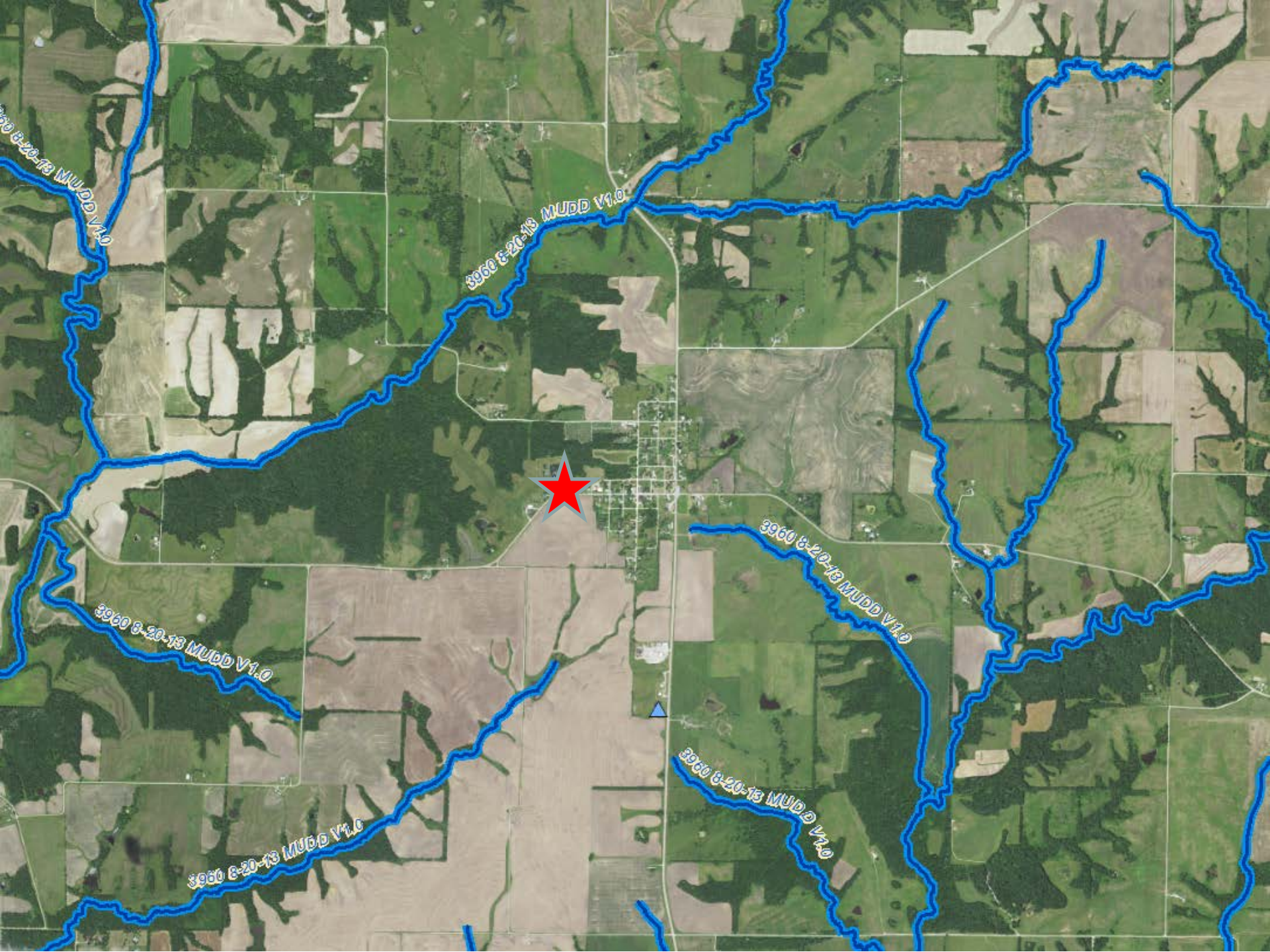
Why 100 Days for Land Application?

Year	= 365 days
– Weekends	– 104 days
– Storage period	– 90 days
– Weather	– 39 days
– Deferment*	– 10 days
– Harvest/Field Work	– 15 days
Total Days Remaining	= 107 days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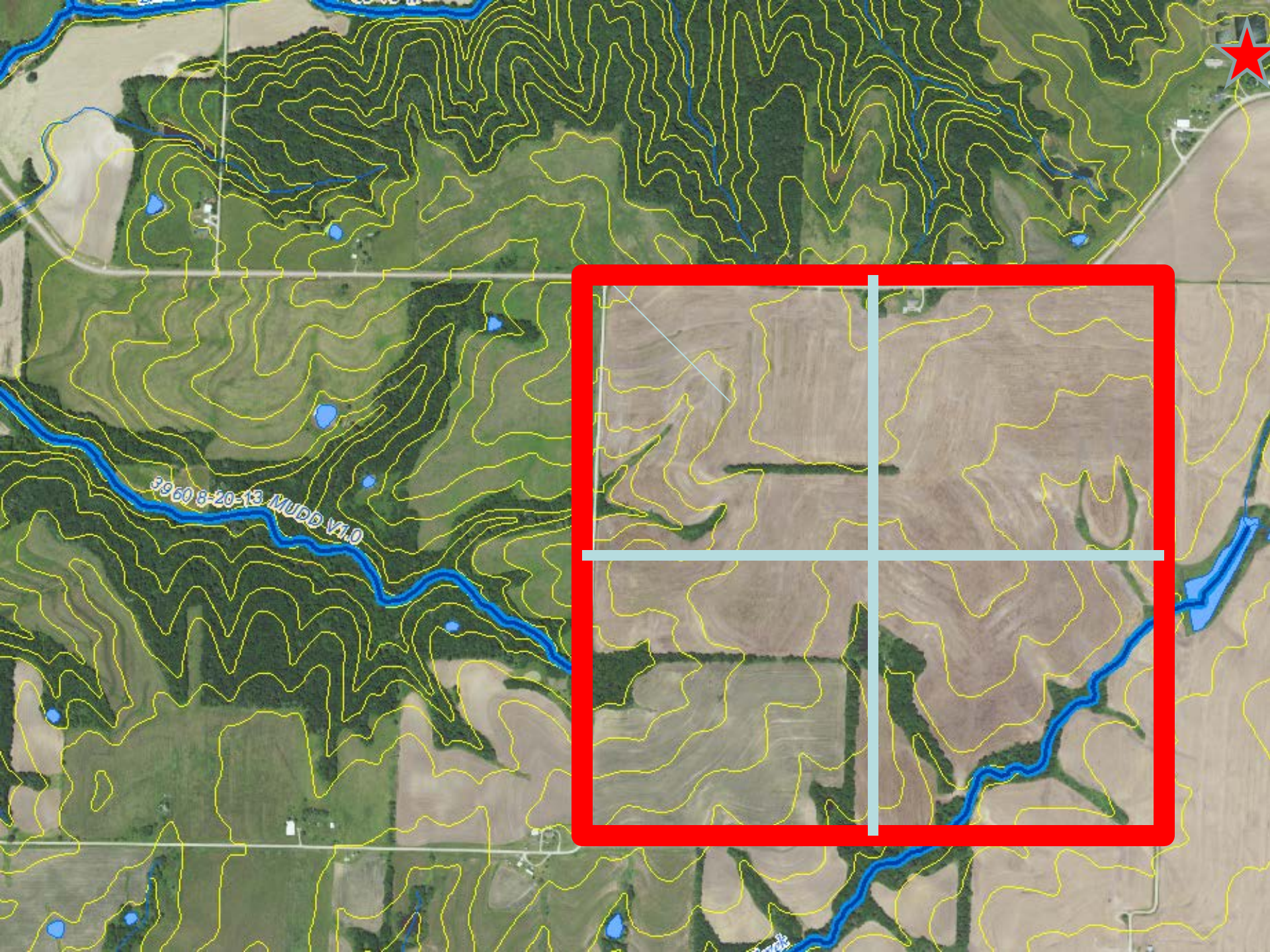
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Land Application Pump Rate

- Volume to Irrigate = 4,693,000 gallons
- Irrigate 100 days at 8 hours per day
- GPM = $\frac{(4{,}693{,}000\ \text{gal/yr})}{(100\ \text{days/yr})/(8\ \text{hrs/day})/60\ \text{min/hr})}$ =

- Minimum Pump Rate = 98 gpm

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Pump Sizing (GPM)

- Rule of Thumb (1 GPM per 100 gpd)
- 100 gallon per day design flow

$$\frac{100\ \text{gal}}{\text{day}} \times \frac{365\ \text{day}}{\text{year}} = 36{,}500\ \text{gallons/year}$$

- Rule of Thumb for Pump Sizing

$$\frac{1.0\ \text{gal}}{\text{min}} \times \frac{60\ \text{min}}{\text{hour}} \times \frac{8\ \text{hrs}}{\text{day}} \times \frac{100\ \text{d}}{\text{year}} = 48{,}000\ \text{gpy}$$

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Irrigation Design Decision

- 350 foot radius center pivot is the preferred alternative.
- This covers 8.8 acres, which is greater than the 7.2 required.
- The proposed pump is 200 gallons per minute, which is more than the 98 gpm required.

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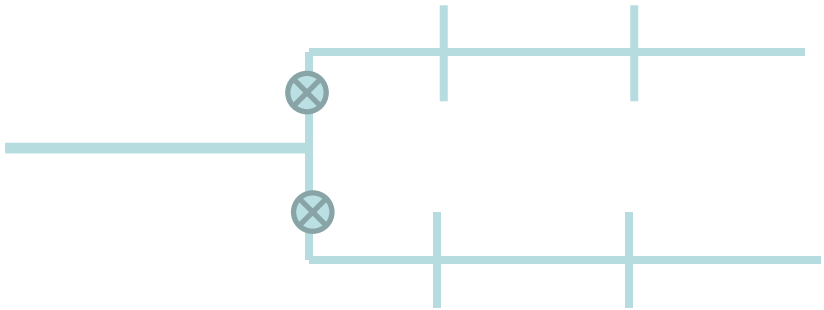
Irrigation Pump Selection

- Power source – Fuel or Electric
- Head Requirement – Elevation Change, Friction from Piping and Fittings, and Sprinkler Operating Pressure
- Pump Operating Efficiency



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Center Pivot

Pump Rate	200	gpm	
Length of Center Pivot	350	feet	including end gun throw distance if applicable
Sprinkler Head Throw Diameter	60	feet	
Design Application Rate	0.4	Inches/Day	
Velocity at end	5	ft/min	
Percentage Revolution	100	%	

Maximum Intensity (inches/hour)	0.92	at point 50% from center of pivot	
Land Ap Period	7.35	hours	
Depth (inches/day)	0.37	inches	
Area	8.83	Acres	
Volume Irrigated	88,202	Gallons/Day	
Irrigation Volume	4,668,370	Gallons/yr	
1 in 10 yr design land ap	52.93	days	<90 or check Work Days Tab

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Instantaneous Irrigation Rates

Dist from CP (feet)	Intensity (in/ hr)	Applic Time (hrs/day)	Applic Rate (in/day)
35	0.18	2.00	0.37
70	0.37	1.00	0.37
105	0.55	0.67	0.37
140	0.73	0.50	0.37
175	0.92	0.40	0.37
210	1.10	0.33	0.37
245	1.28	0.29	0.37
280	1.47	0.25	0.37
315	1.65	0.22	0.37
350	1.83	0.20	0.37

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Permitting Process

- Facility Plan
  - Summary of this presentation and more
- Construction Permit Application
  - Fee
  - Plans and Specifications
- Operating Permit Application
  - General (Non-POTWs)
  - Modification

Operating Permit for Land Ap System

Permitted Feature #001 – POTW – SIC #4952
The use or operation of this facility shall be by or under the supervision of a Certified "D" Operator.
Three-cell storage lagoon / wastewater is irrigated to the surface / sludge is retained in lagoon.
Design population equivalent is 100.
Design Flow is 15,489 gallons per day (Design Flow plus 10-year rainfall minus evaporation, does not account for inflow and infiltration)
Average design flow is 10,000 gallons per day (dry weather flows).
Design sludge production is 1.5 dry tons per year.

Legal Description:	SE ¼, Sec. 1X, T4xN, R1xW, Corn County
UTM Coordinates:	X = 58xxxx, Y = 42xxxxx
Receiving Stream:	Tributary to Turkey Creek
First Classified Stream and ID:	8-20-13 MUDD V1.0 (C) (3960)
USGS Basin & Sub-watershed No.:	10300102-XXXX

Storage Basin:
Maximum Operating Level: 1 foot of freeboard (storage basin water level in feet below the overflow level)

Storage volume (min to max water levels, in gallons):	Cell #1	Cell #2	Cell #3	Total
	907,000	303,000	319,000	1,529,000

Storage Capacity (in Days):
Design for Dry weather flows: 153 days
Design with 1-in 10 year flows: 99 days

AFT

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Permitted Feature #002 – Center Pivot Irrigation Field

Legal Description:	SE ¼, Sec. 1X, T46N, R1xW, Corn County
UTM Coordinates:	X = 58xxxx, Y = 42xxxxxx
Receiving Stream:	Tributary to Turkey Creek
First Classified Stream and ID:	8-20-13 MUDD V1.0 (C) (3960)
USGS Basin & Sub-watershed No.:	10300102-XXXX

Wastewater Irrigation Design Parameters:

Irrigation volume per year: 4,693,000 gallons (based on annual irrigation rate)
Minimum irrigation volume per year at Design Flow: 3,650,000 gallons
Irrigation areas: 8.8 acres at design loading
Irrigation rates: 0.5 inch/hour; 0.5 inch/day; 3.0 inches/week; 24 inches/year
Field slopes: less than five percent
Equipment type: Center Pivot
Vegetation: Corn
Irrigation rate is based on: Hydraulic loading rate

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Operating Permit Requirements

- Storage Basin (Lagoon) Operational Monitoring
  - Storage Basin Freeboard
    - measured once/month
  - Precipitation
    - measured daily
- Irrigated Wastewater
  - TKN & Nitrate if applying > 24 inches/year
  - Fecal Coliform if applicable (public use areas)

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Operating Permit Requirements

- Land Application Operational Monitoring
  - Irrigation Period (hours)
  - Volume Irrigated (gallons)
  - Application Area (acres)
  - Application Rate (inches)

Generally measured daily, reported monthly

Summarized Annual Report

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Special Conditions

- Emergency Discharge Monitoring
- Wastewater Irrigation System
  - Pumpdown and Irrigation Requirements
  - Slope and Set–Back Restrictions
  - Access, Grazing, and Harvesting Restrictions
  - Equipment Checks
  - Saturated or Frozen Soil Conditions Exclusion
  - Fence, Signs, Access Road, and Mowing
  - Operation and Maintenance Manual
  - Pumpdown Marker

No-Discharge Wastewater Treatment

No-Discharge Wastewater Treatment

The Missouri Clean Water Law is intended to conserve, protect, maintain, and improve the quality of Missouri's waters. In addition, the goal of the federal Clean Water Act is the elimination of all discharges. Therefore, the Missouri Department of Natural Resources encourages wastewater treatment systems to achieve no-discharge. Water quality standards and effluent limitations will only become more stringent in the future. While a no-discharge system may not be feasible for every wastewater system, it must be evaluated during the department's antidegradation, construction permit, and operating permit review processes.

Missouri Facts*

Did you know?

- 53 percent of publicly owned treatment works (POTWs) in Missouri have a design flow of 100,000 gallons per day or less and serve a population equivalent of 1,000 or less.
- Missouri has 861 discharging lagoon wastewater treatment facilities.
- Missouri has 147 no-discharge facilities.

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THANKS

Surface Land Application - Irrigation

No-Discharge Wastewater Treatment webpage:

http://dnr.mo.gov/env/wpp/no-discharge.htm

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