3M Settlement Project 1007 Update

East Metro Unit

Minnesota Pollution Control Agency

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December 2023

AECOM

Project 1007 Update: Agenda

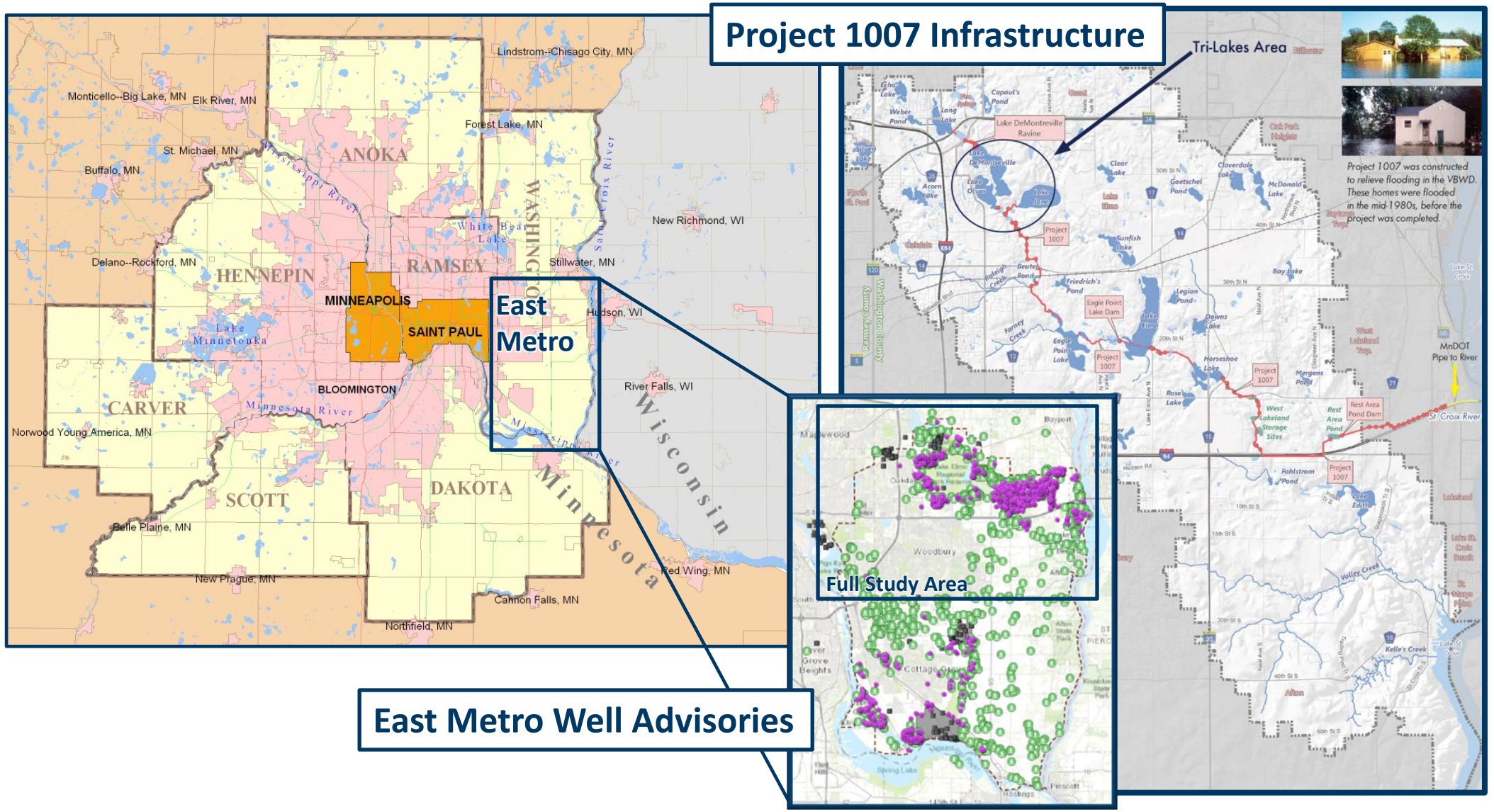
Project 1007 Update Agenda

- Site Area and Source Assessment
- Evolving Conceptual Site Model
- Particle Tracking
- Feasibility Study Process
- Example Area of Concern
- Solutions to Limiting the Spread
- SAFF Pilot Study
- Destruction Technologies

A pause for questions regarding the specific topic will be taken after each agenda item.

Project 1007 Area

AECOM



In the East Metro, >1,400 public and private wells currently have drinking water health advisories.

Project 1007, constructed in 1987, is a large flood control project for the Tri-Lakes Area. It is being evaluated for its role as a conveyance system for PFAS impacts in the East Metro.

To date, the Project 1007 Study Area is >120 miles^2 in size and includes ~100 monitoring wells and over 150 surface water samples.

PROJECT 1007

Feasibility Study

SETTLEMENT AGREEMENT: Conduct a ***Source Assessment*** and ***Feasibility Study*** regarding the role of the Valley Branch Watershed District's (VBWD) project known as Project 1007 (P1007) in the conveyance of per- and polyfluoroalkyl substances (PFAS) in the environment.

Feasibility Study

Source Assessment (SA)- The collection of investigation data to assess the extent of PFAS contamination and is intended to answer the following questions:

- Where is PFAS located and how is PFAS moving away from source areas?
- What are the key surface water and groundwater migration pathways that are contributing to the movement of PFAS in the environment?
- How investigation data is pieced together to form an accurate understanding of both historical PFAS movement and potential future PFAS movement.

Feasibility Study

Feasibility Study (FS)- The evaluation of potential clean-up options that are intended to enhance the quality, quantity, and sustainability of drinking water in the East Metro by ***stopping/reducing the spread of PFAS***. To achieve this, the data from the SA must have been of sufficient accuracy to:

- Identify Areas of Concern within the Project 1007 Corridor that should be the focus of potential clean-up actions that can stop/reduce the spread of PFAS
- Identify remediation technologies and combinations of remedial actions that will succeed in limiting the spread of PFAS
- Allow for ways to measure how the remedial actions, once implemented, are meeting a specific remedial action objective.

Source Area Assessment Work Completed to Date

Surface Water Investigation

- Site-Wide Confirmation Sampling
- Seasonal and Trigger-Event Sampling

Sediment Investigation

- Site-Wide Confirmation Sampling
- Focused Area Sampling
- Wetland Delineation Sampling

Ecological Risk Assessment

- Tissue Sampling of Aquatic and Vegetative Species

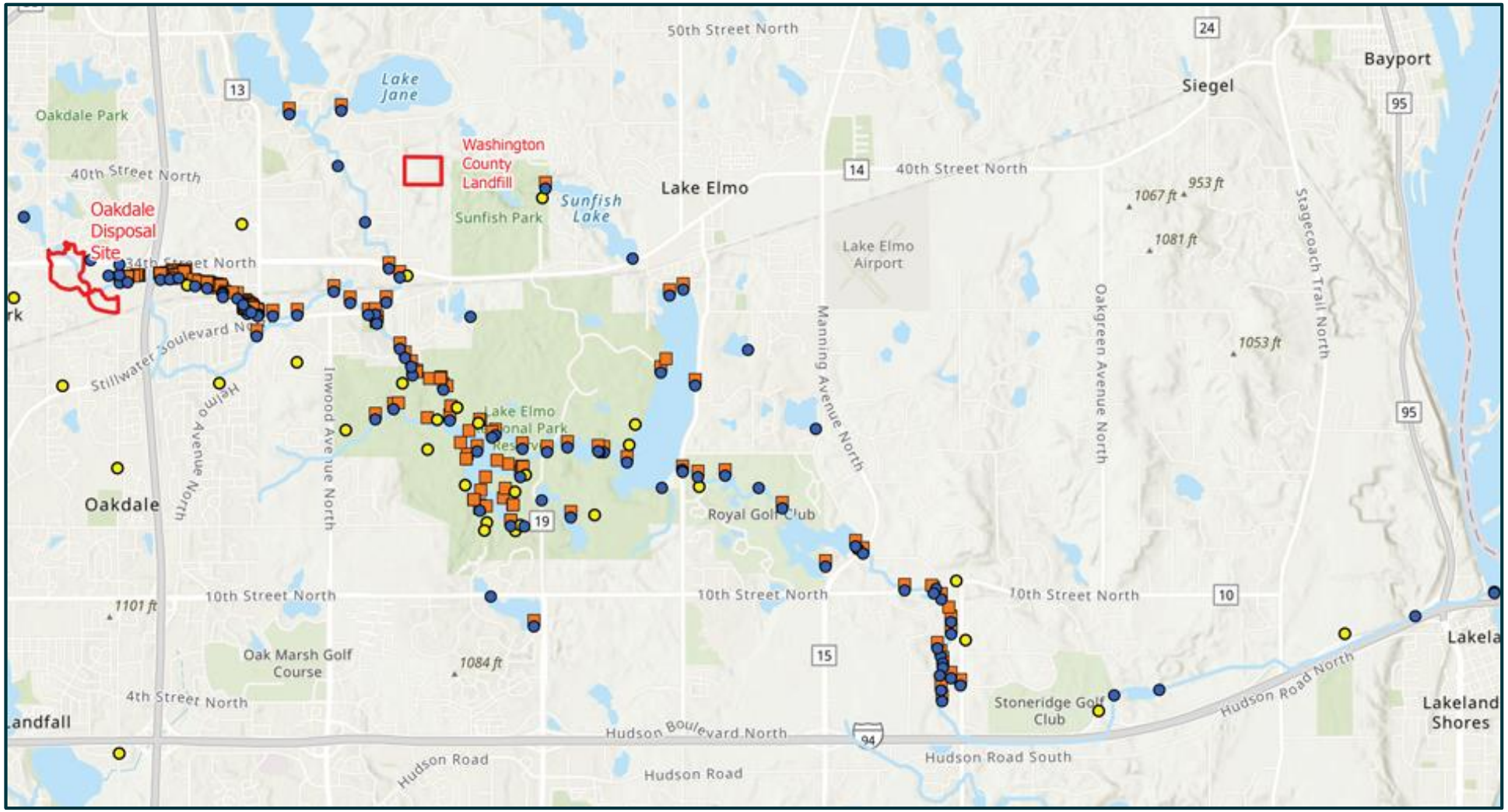
Groundwater Investigation

- Installation of Targeted Multi-Aquifer Well Nests
- Downhole Geophysical Logging
- Seasonal and Trigger-Event Well Sampling

Hydrogeologic Investigation

- Monthly Staff Gauging & Flow Measurements
- Monthly Well Gauging
- Monitoring Well Slug Testing
- Constant-Rate Aquifer Testing (Pump Test)

Source Area Assessment Work Completed to Date (cont.)



LEGEND

- Surface Water Sample Locations
- Sediment Sample Locations
- Multi-Aquifer Sampling and Well Nest Locations

Notes

Tissue samples were collected from existing surface water and sediment sample locations

Hydrologic measurements were collected from sampled surface water bodies

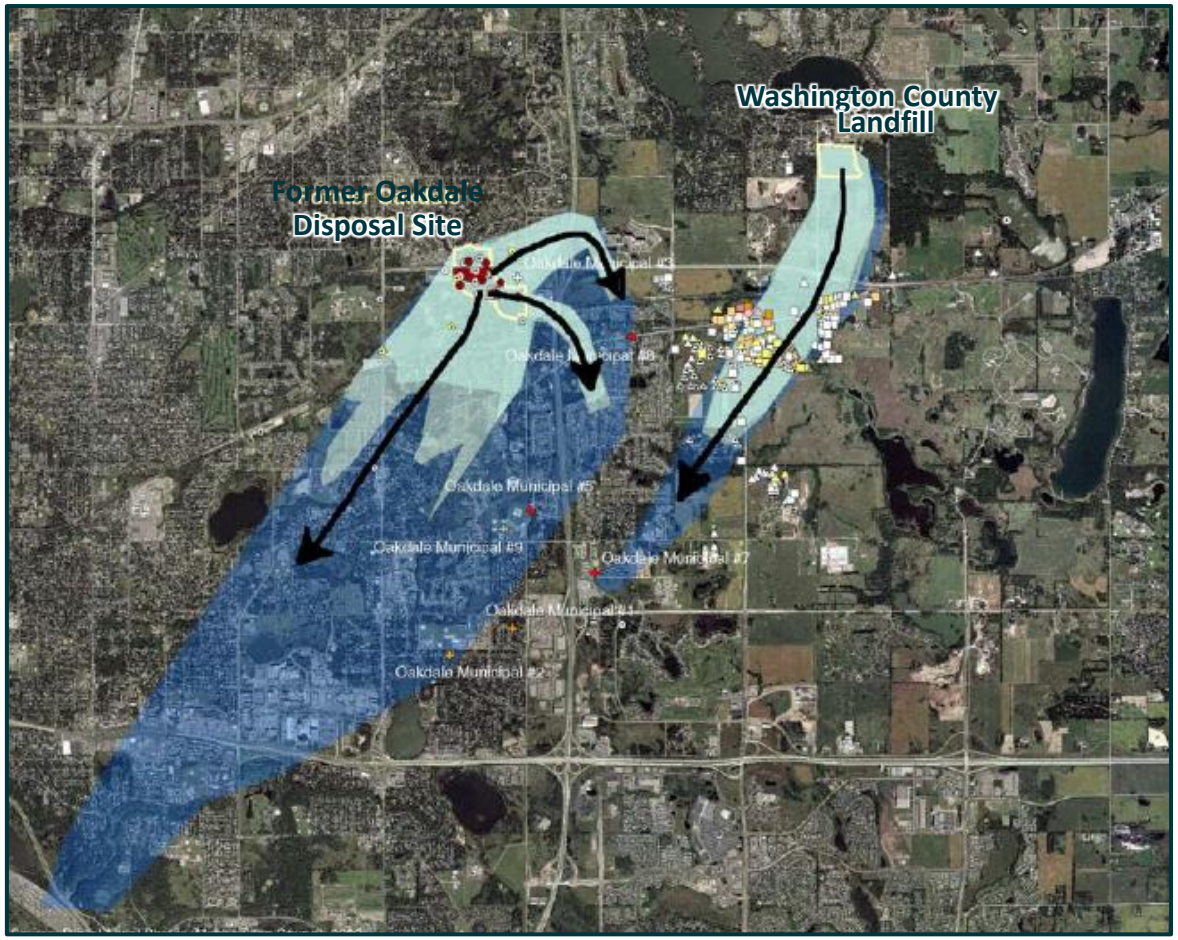
Hydrogeologic measurements were collected from the well network

Pause for Questions?

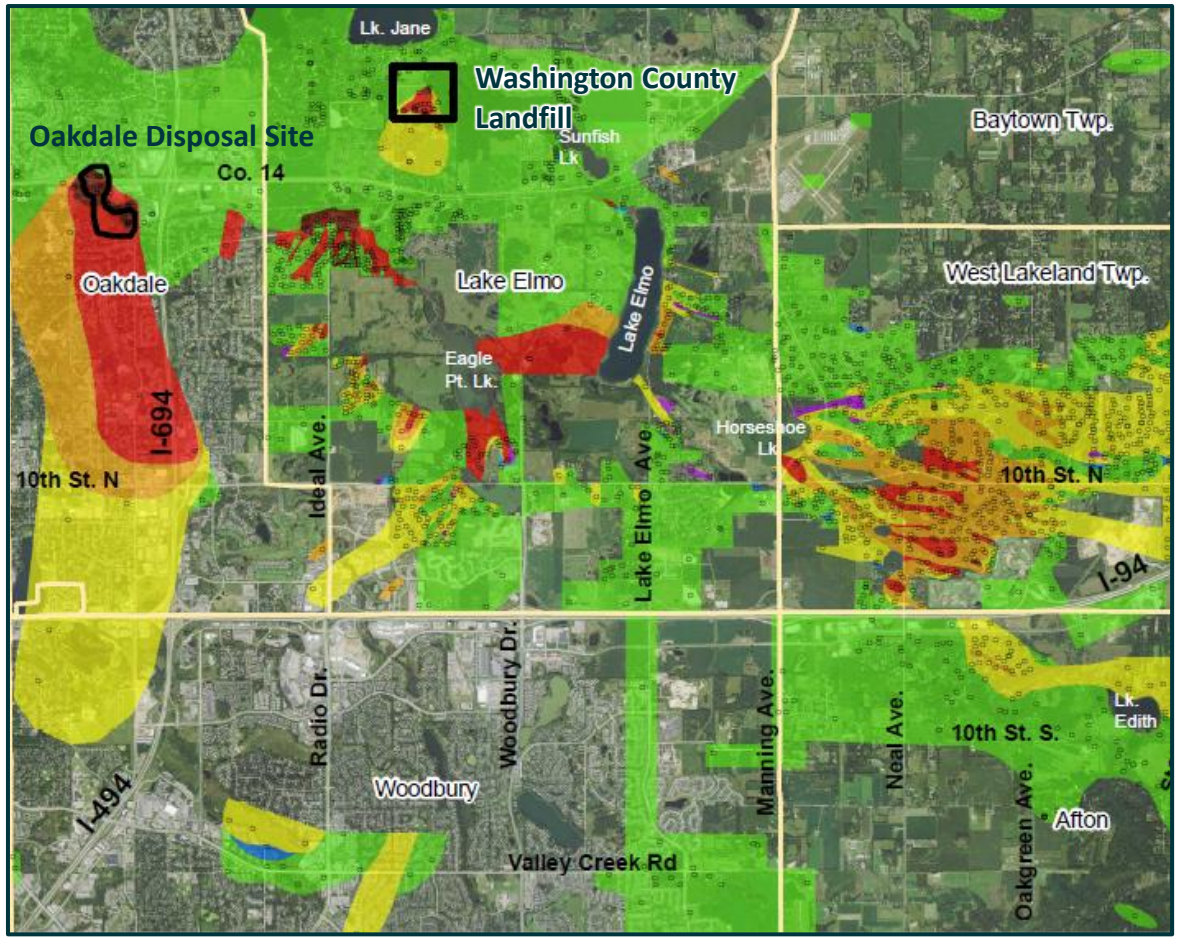
Source Area Assessment Work Completed to Date

Evolving Conceptual Site Models

2005: All Aquifer Plume Map (PFOS/PFOA)



2018: All Aquifer Plume Map (PFOS)



Evolving Conceptual Site Models

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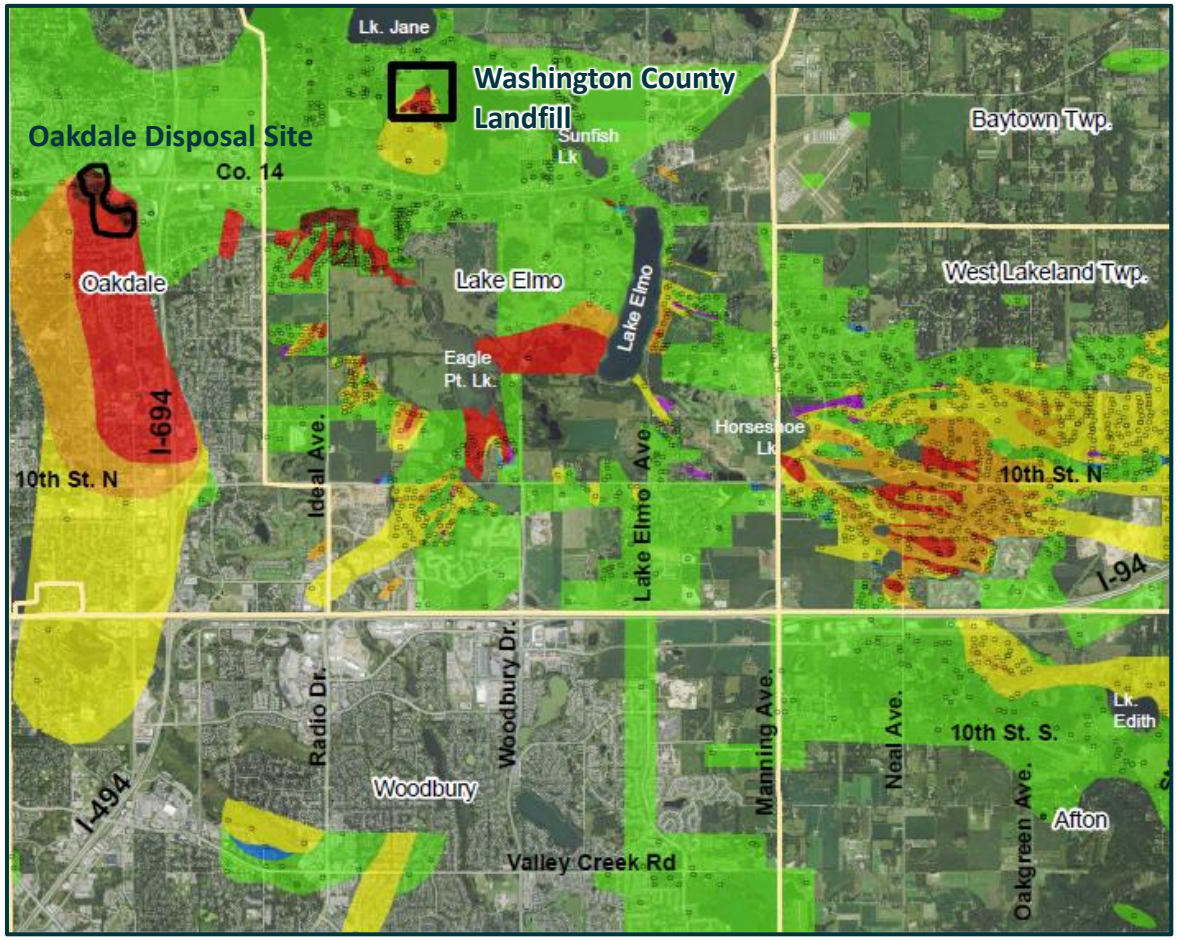
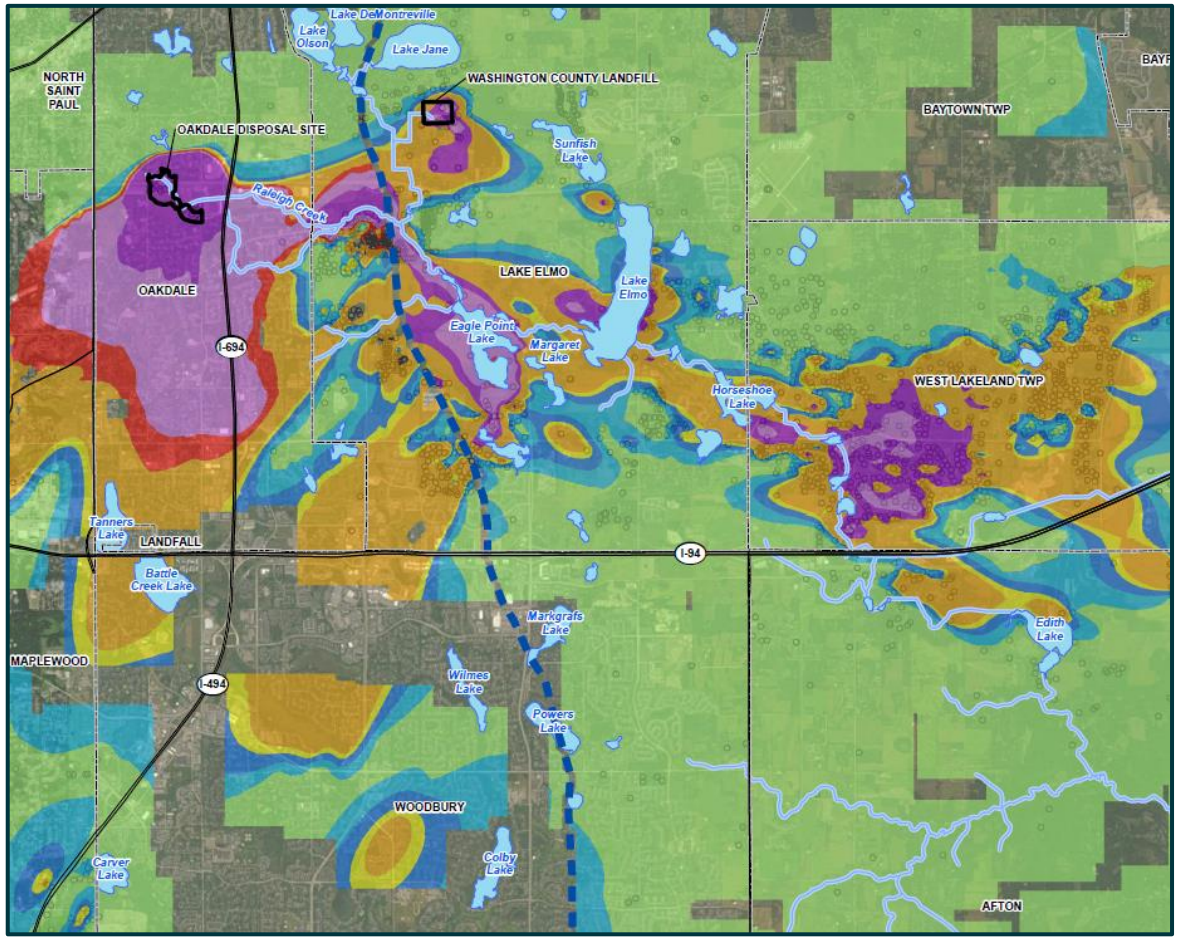
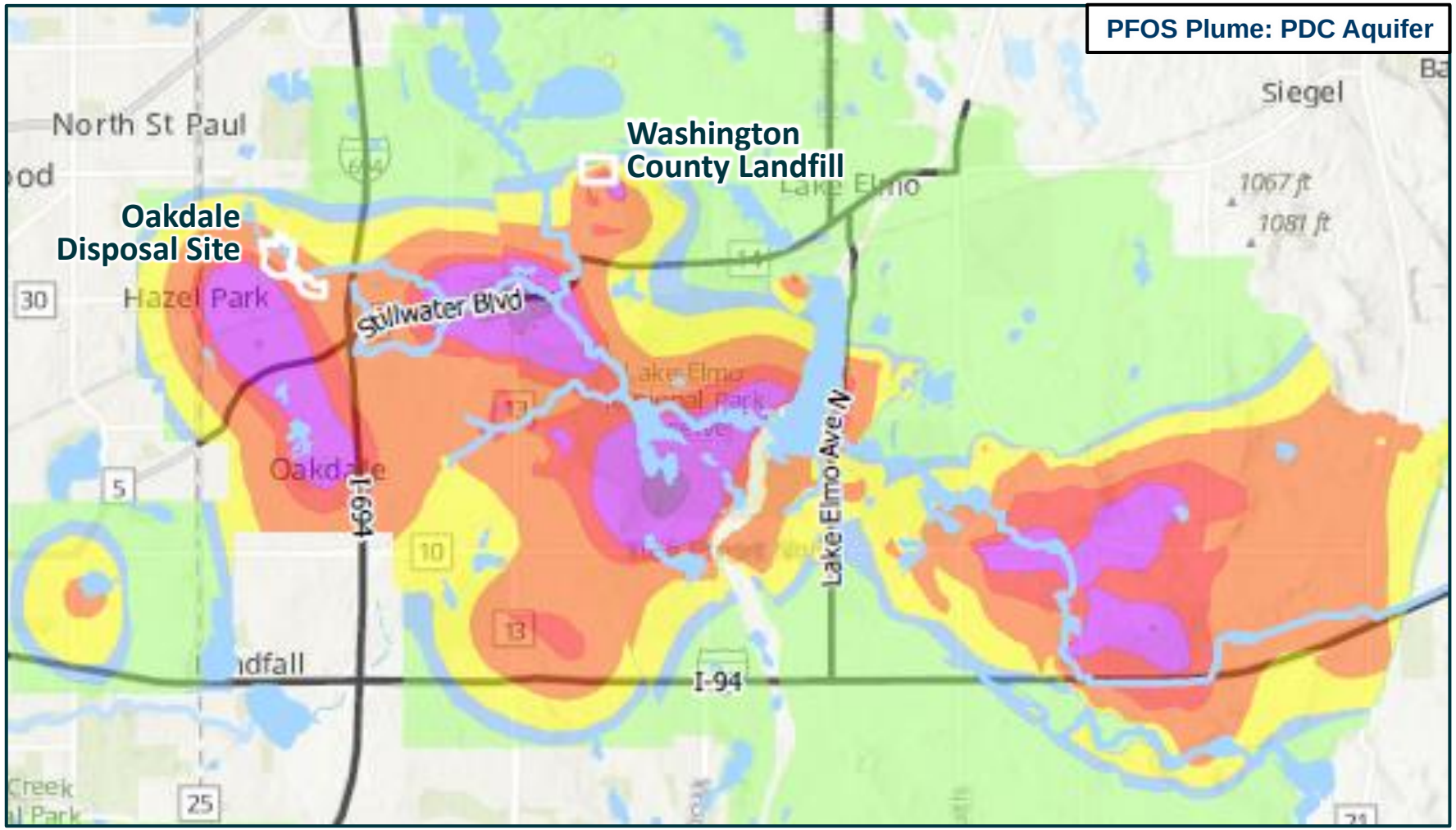


2021: All Aquifer Plume Map (PFOS)



Aquifer-Specific Plume Map: Prairie du Chien



Legend

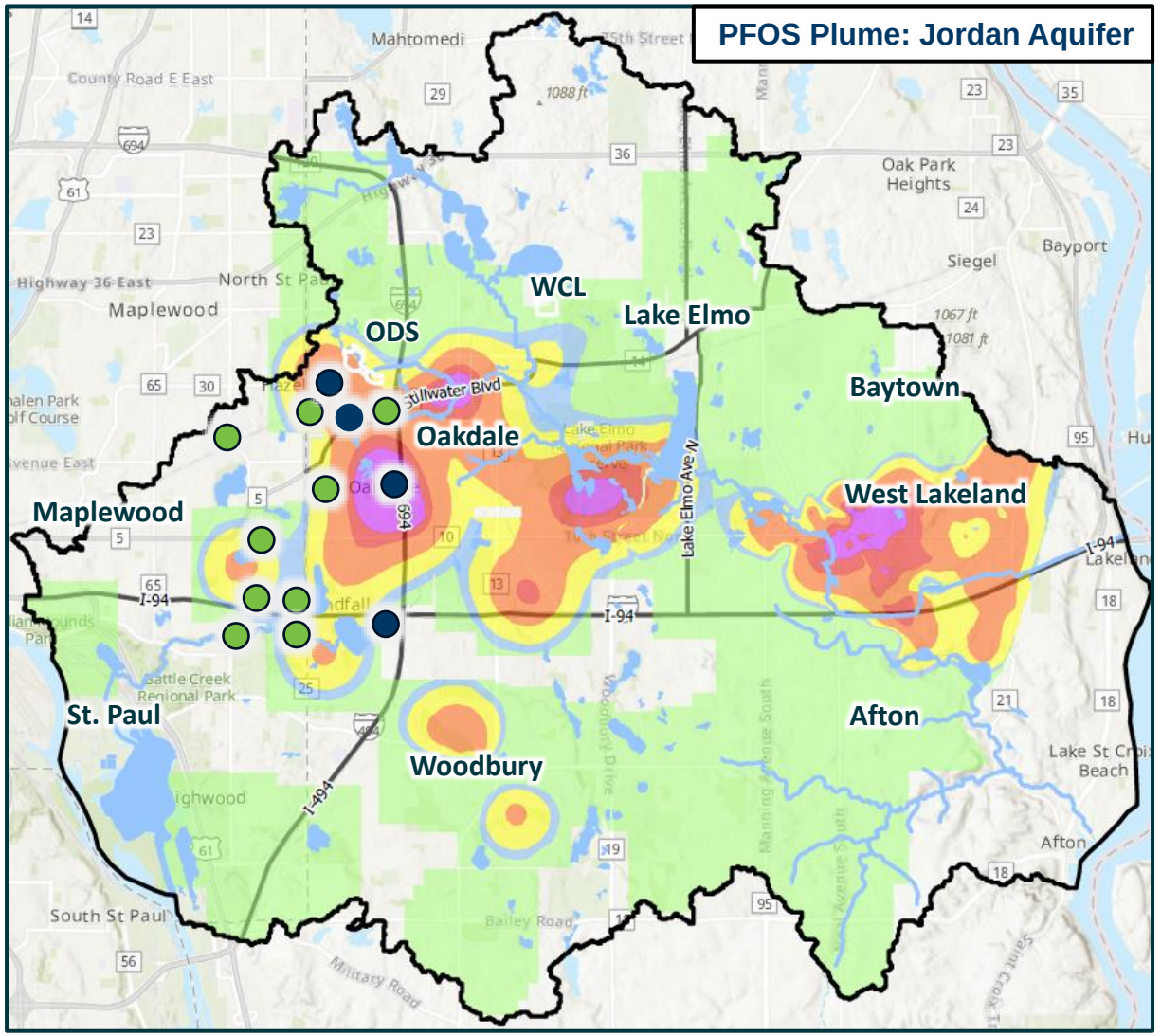
PFOS in Groundwater (PDC)

- >0.75 ppb
- 0.15-0.749 ppb
- 0.075-0.149 ppb
- 0.015-0.0749 ppb
- 0.004-0.0149 ppb
- <0.004 ppb
- Below Detection

Blank areas indicate insufficient well data to generate plume imagery (i.e., no wells within 0.75 miles).

PFOS Health-Based Value (HBV): 0.015 parts per billion (ppb)

Data Gaps: Planned 3M Work



Evolving Conceptual Model: 3D Visualization

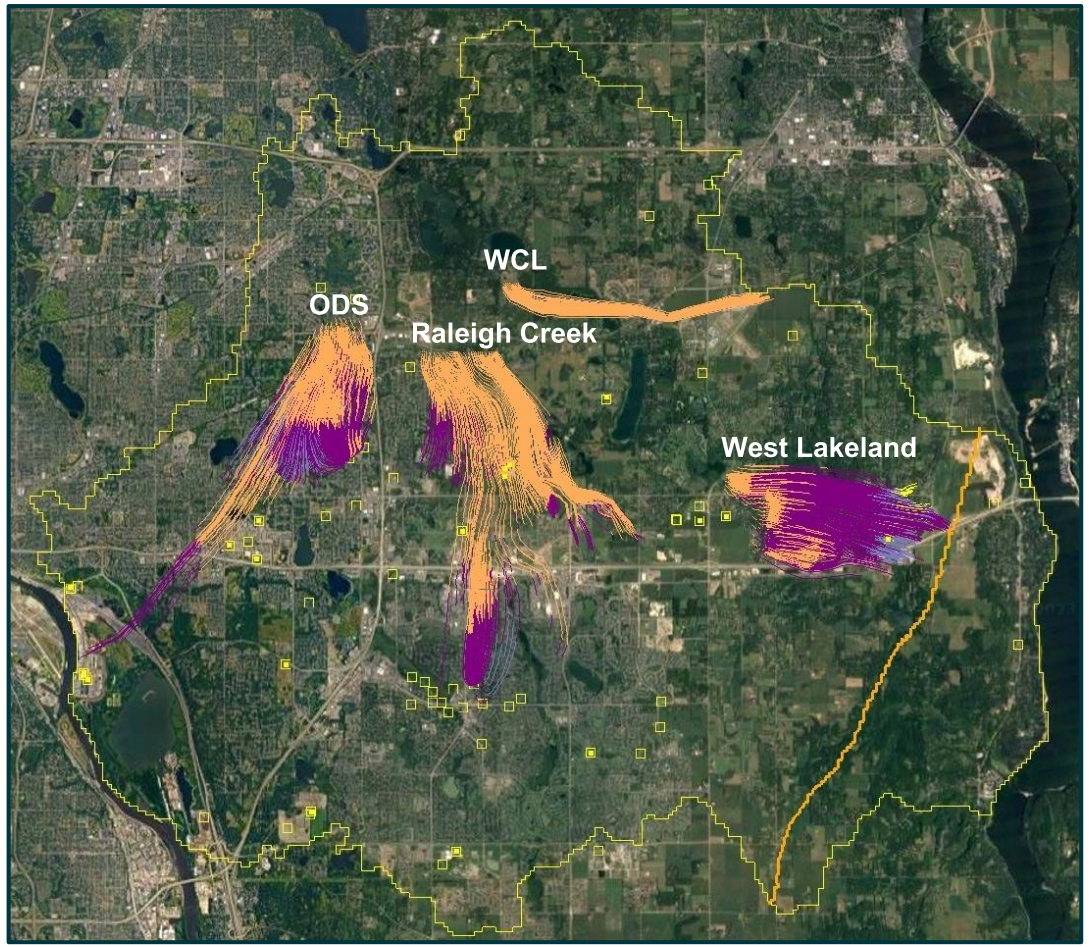
ODS and Raleigh Creek Impacted Areas

Pause for Questions?

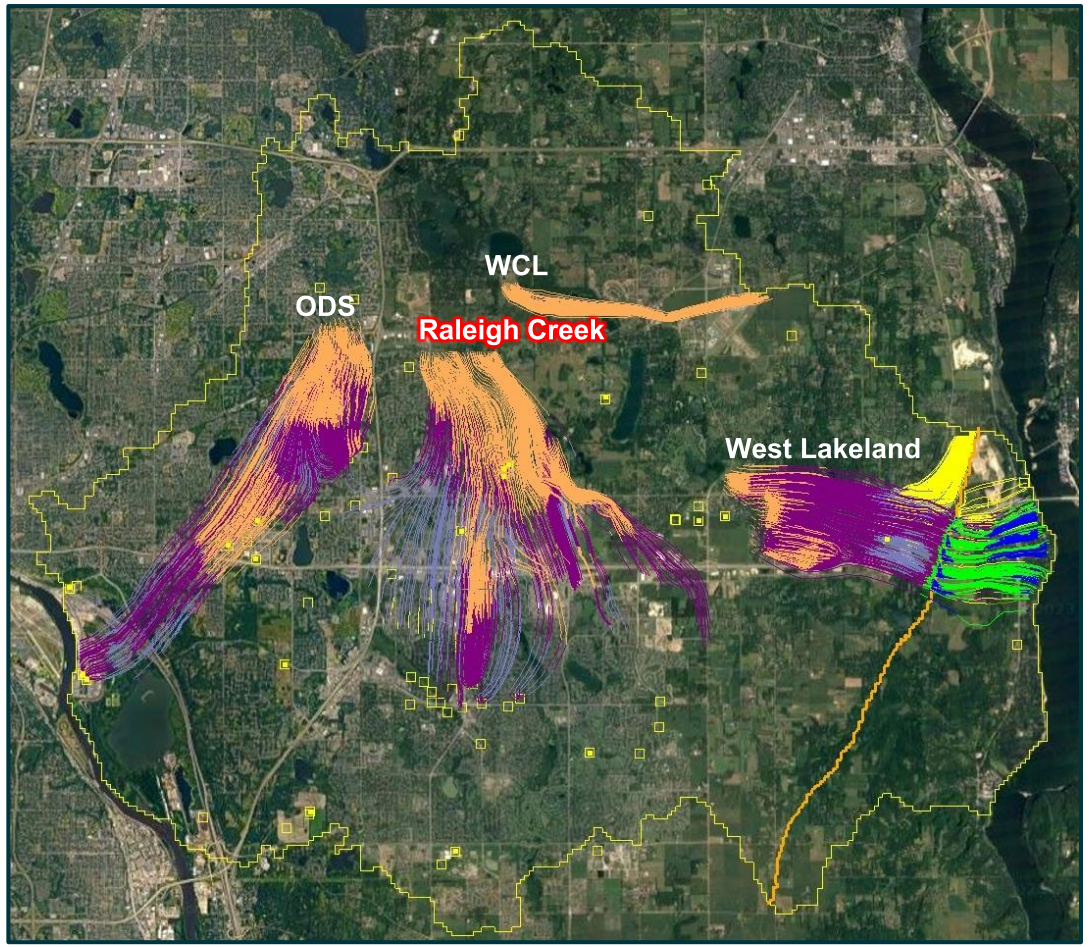
Plume Mapping and 3D Visualizations

Particle Tracking from Prairie du Chien Aquifer

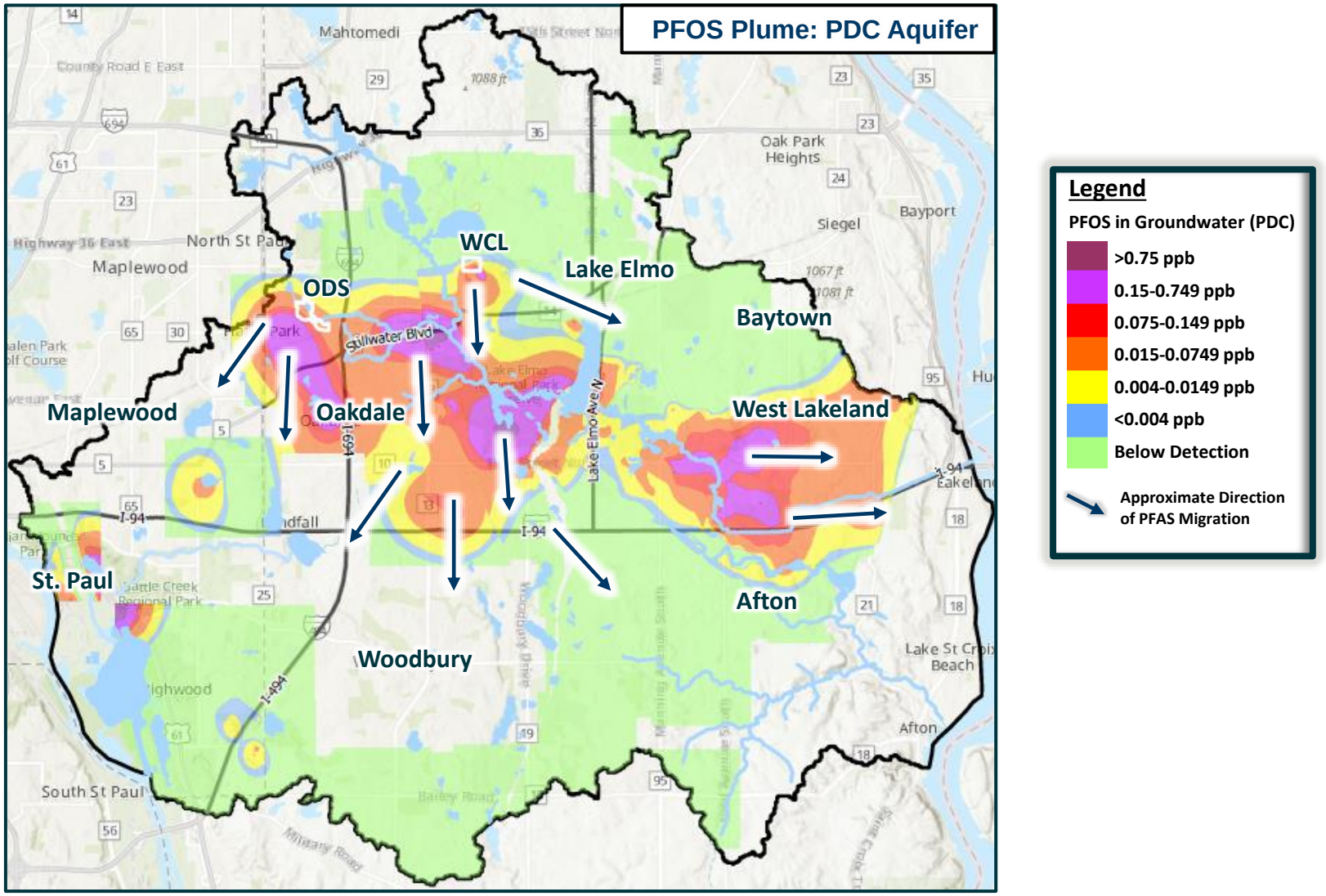
Groundwater Flow: 50 Years into Future



Groundwater Flow: 100 Years into Future



Particle Tracking: What Does this Mean?



Pause for Questions?

Particle Tracking and Plume Migration

Feasibility Study

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PROJECT 1007

Feasibility Study Process

✓ **Source Assessment (*2019-2023*)**

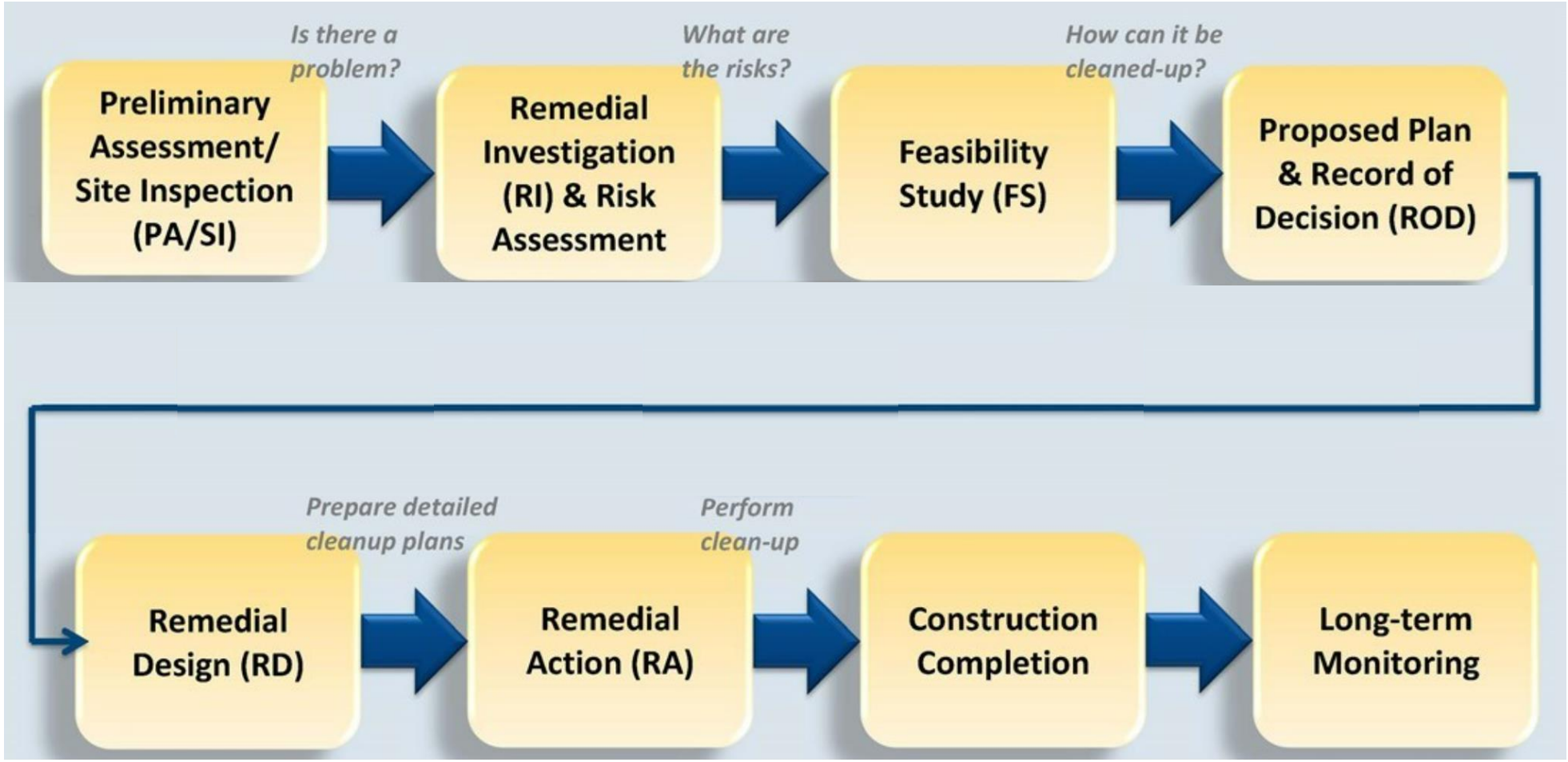
❑ **Feasibility Study (*2023-2024*)**

- ✓ Conceptual Site Model
- ✓ Areas of Concern
- ✓ Remedial Action Objectives
- ✓ Remedial Technology Evaluation and Screening
- ❑ Pilot/Treatability Studies
- ❑ Remedy Alternatives

❑ **Post-Feasibility Study (*2024+*)**

- ❑ Proposed Plan for Remedial Actions
- ❑ Remedial Design
- ❑ Remedial Action/Clean-up
- ❑ Additional Pilot Studies

Typical Superfund CERCLA Process



Pause for Questions?

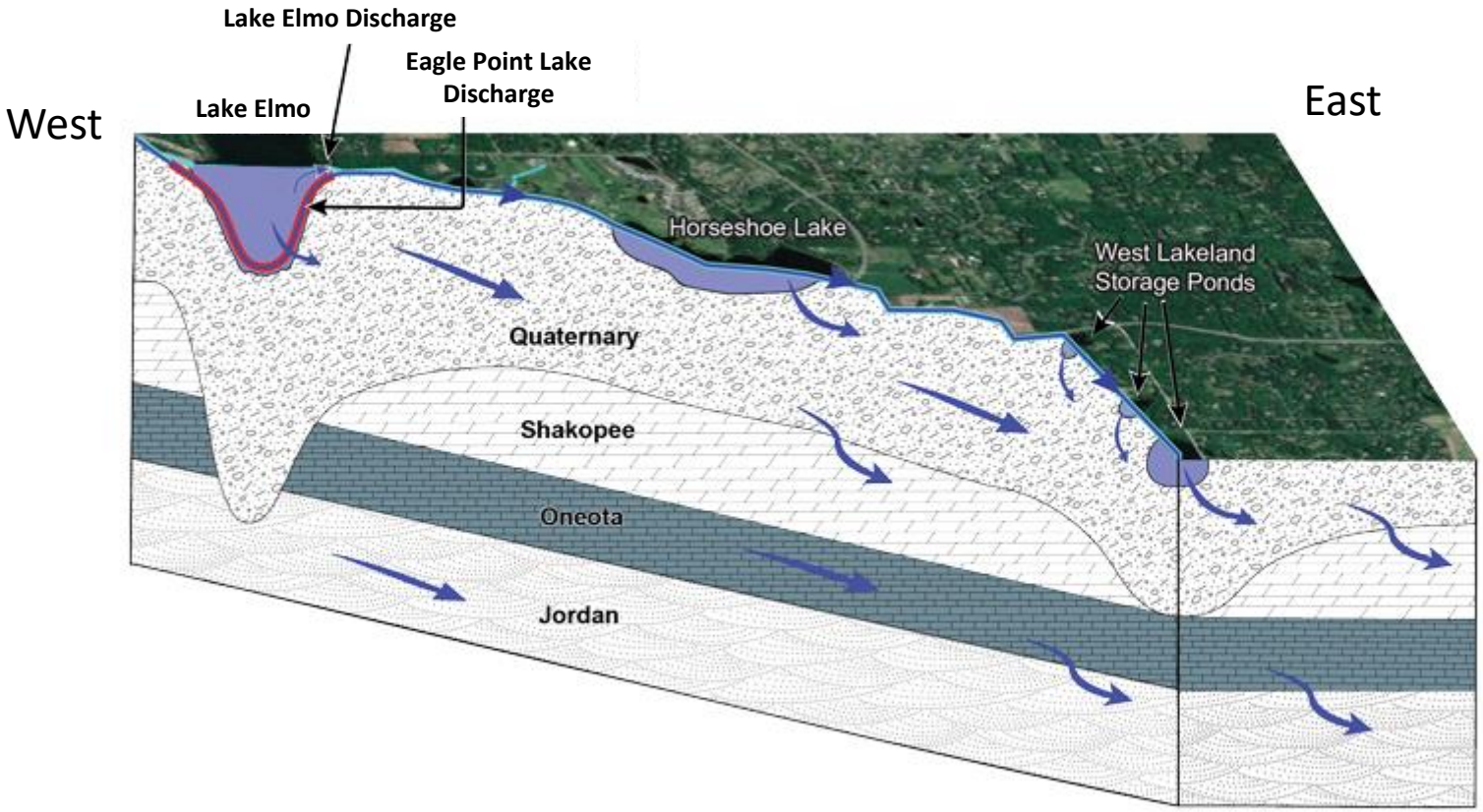
Feasibility Study Process

An Example Focus Area: West Lakeland Area

Where are PFAS Located?

An Example Focus Area: West Lakeland Area (cont)

How did it get there?



An Example Focus Area: West Lakeland Area (cont)

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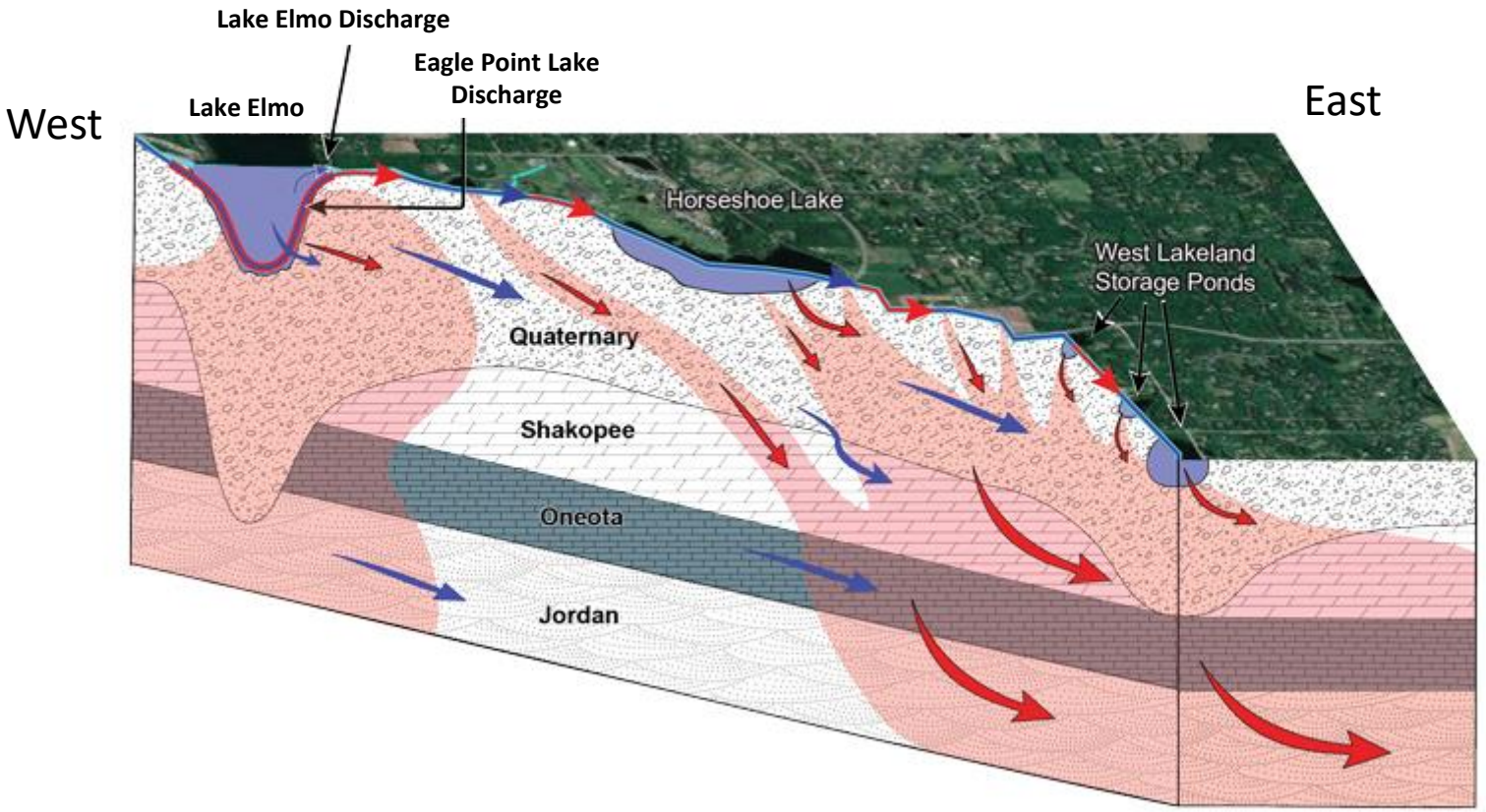
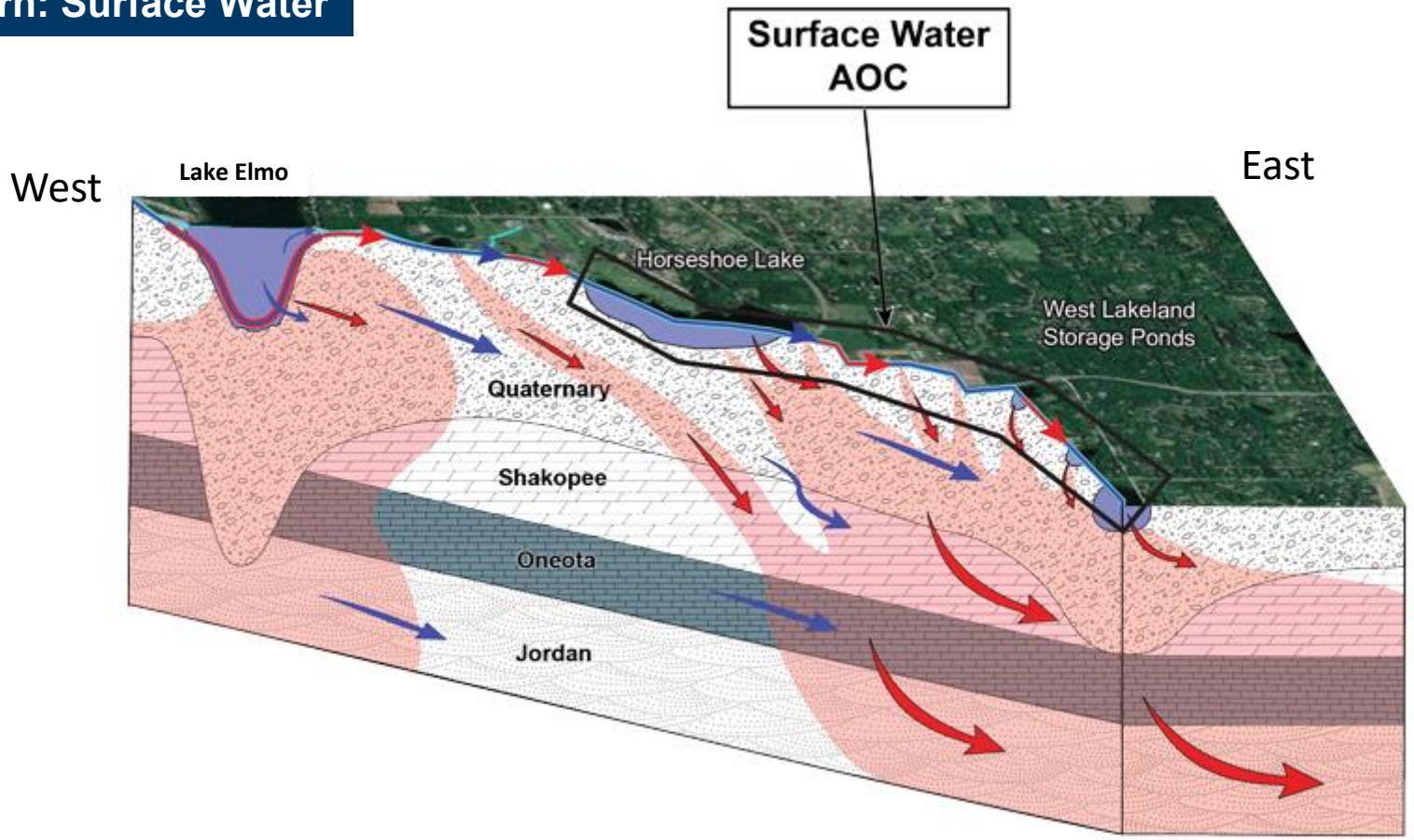


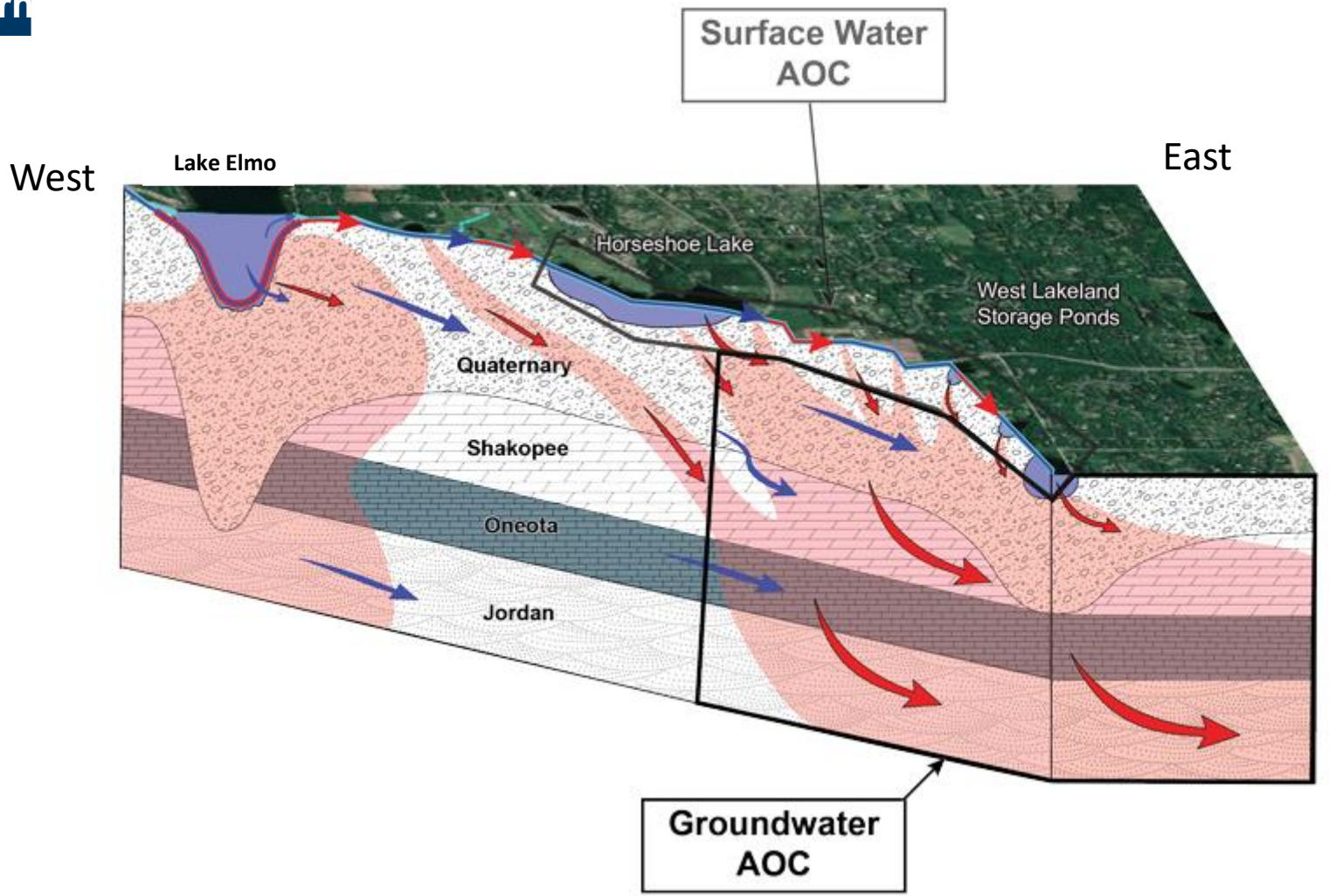
An Example Focus Area: West Lakeland Area (cont)

Areas of Concern: Surface Water



An Example Focus Area: West Lakeland Area (cont)

Areas of Concern



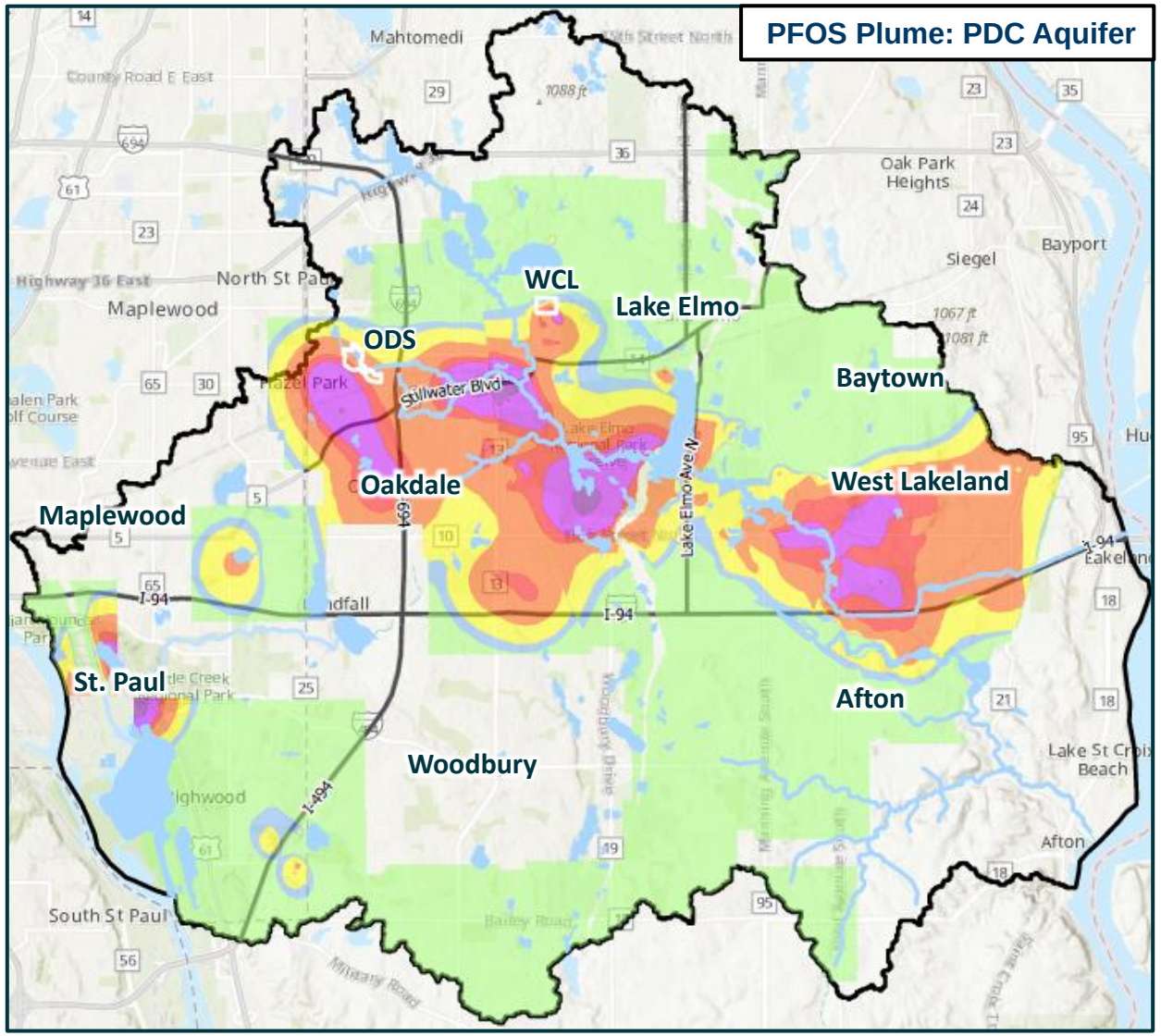
Pause for Questions?

Example Area of Concern: West Lakeland

Feasibility Study = Solutions Limiting PFAS Spread

Completion of the Feasibility Study and implementation of selected remedial actions are intended to:

- Aid in the long-term reduction of PFAS in the East Metro
- Reduce the continued spread of PFAS in surface water and groundwater
- Provide long term protection to drinking water supplies

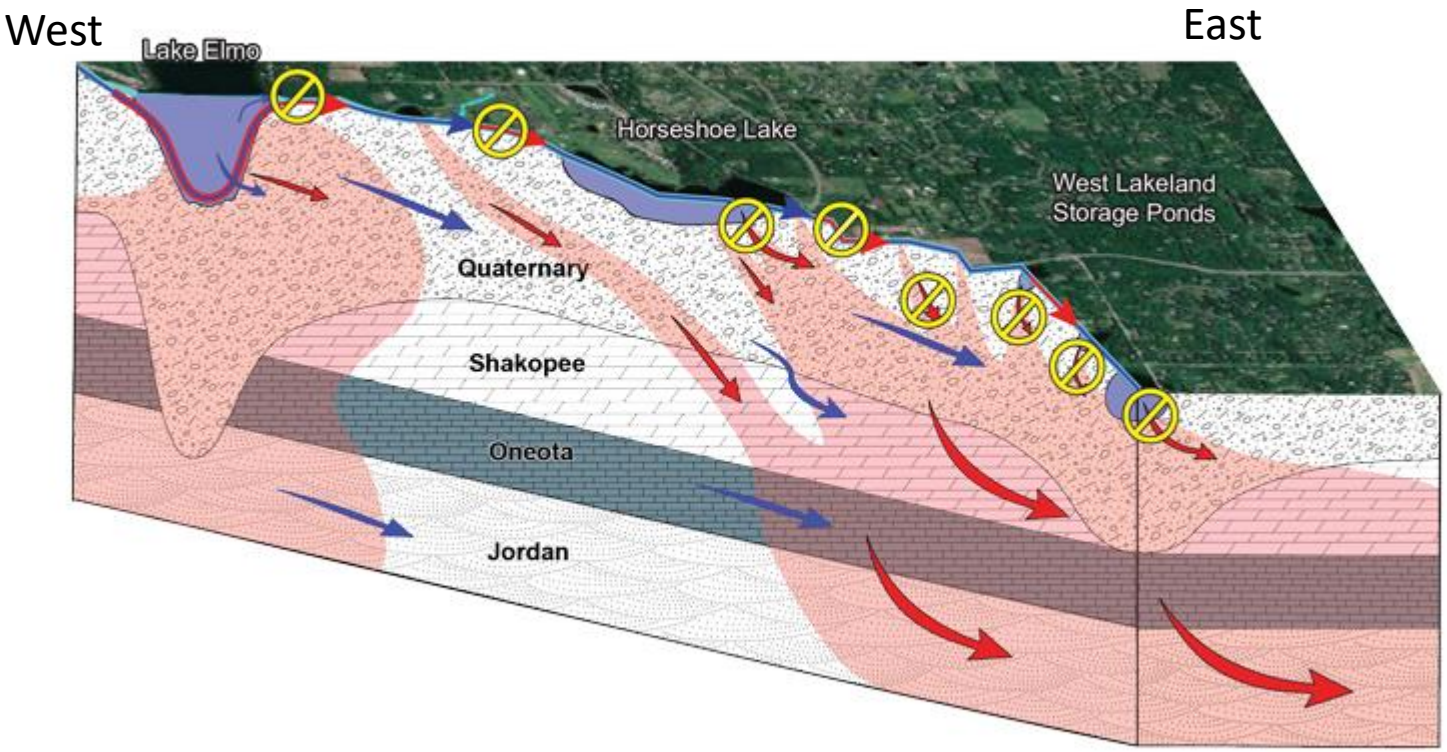


Localized Solutions Limiting PFAS Spread

Localized Remedial Actions

Target geographically small, yet significant migration pathways may be effective at limiting the spread of PFAS in both surface water and groundwater.

Surface Water Remediation



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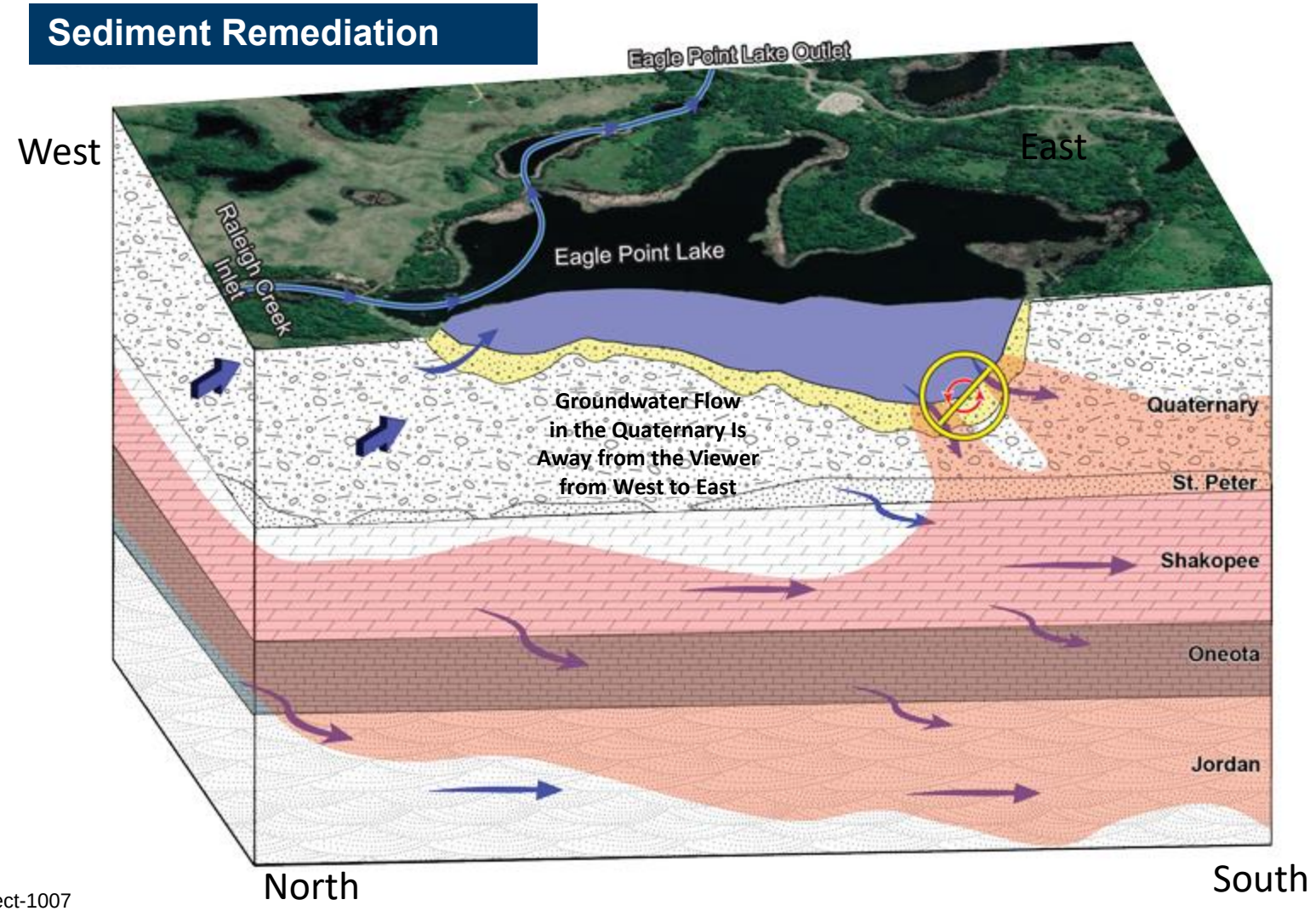
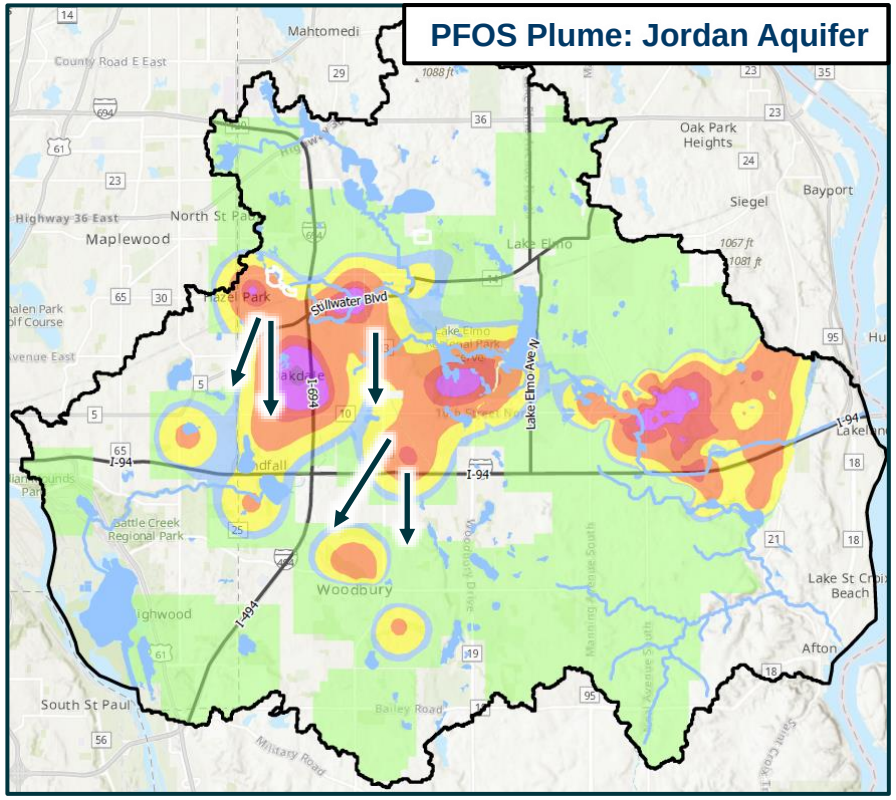
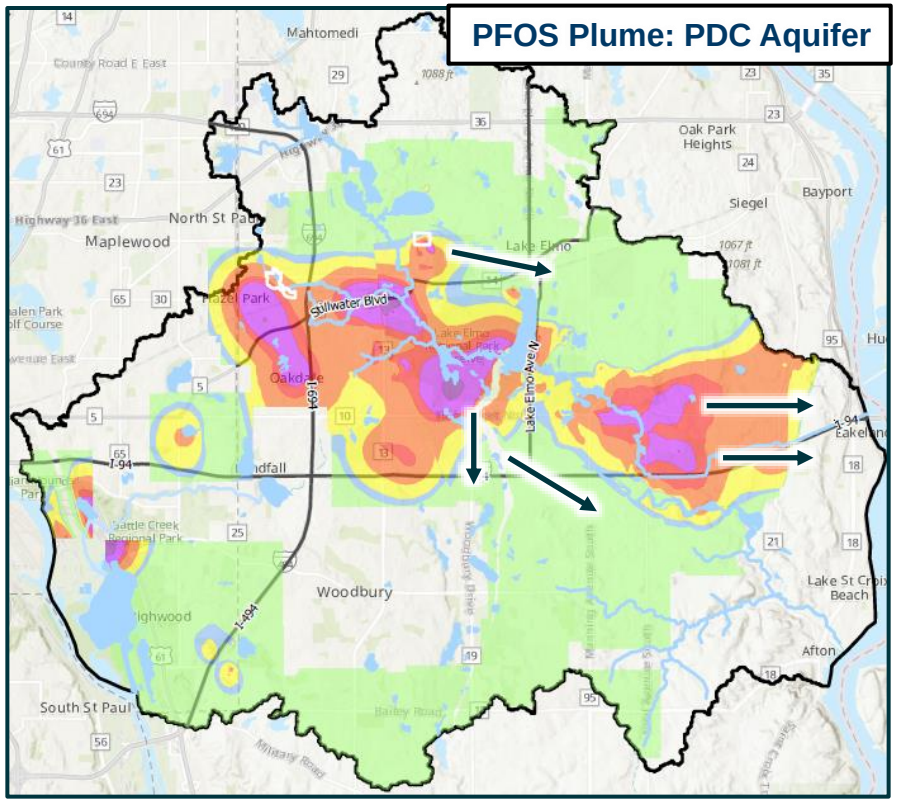


Regional Solutions Limiting PFAS Spread

Large scale remedial actions may also be need to limit the spread of PFAS in groundwater.

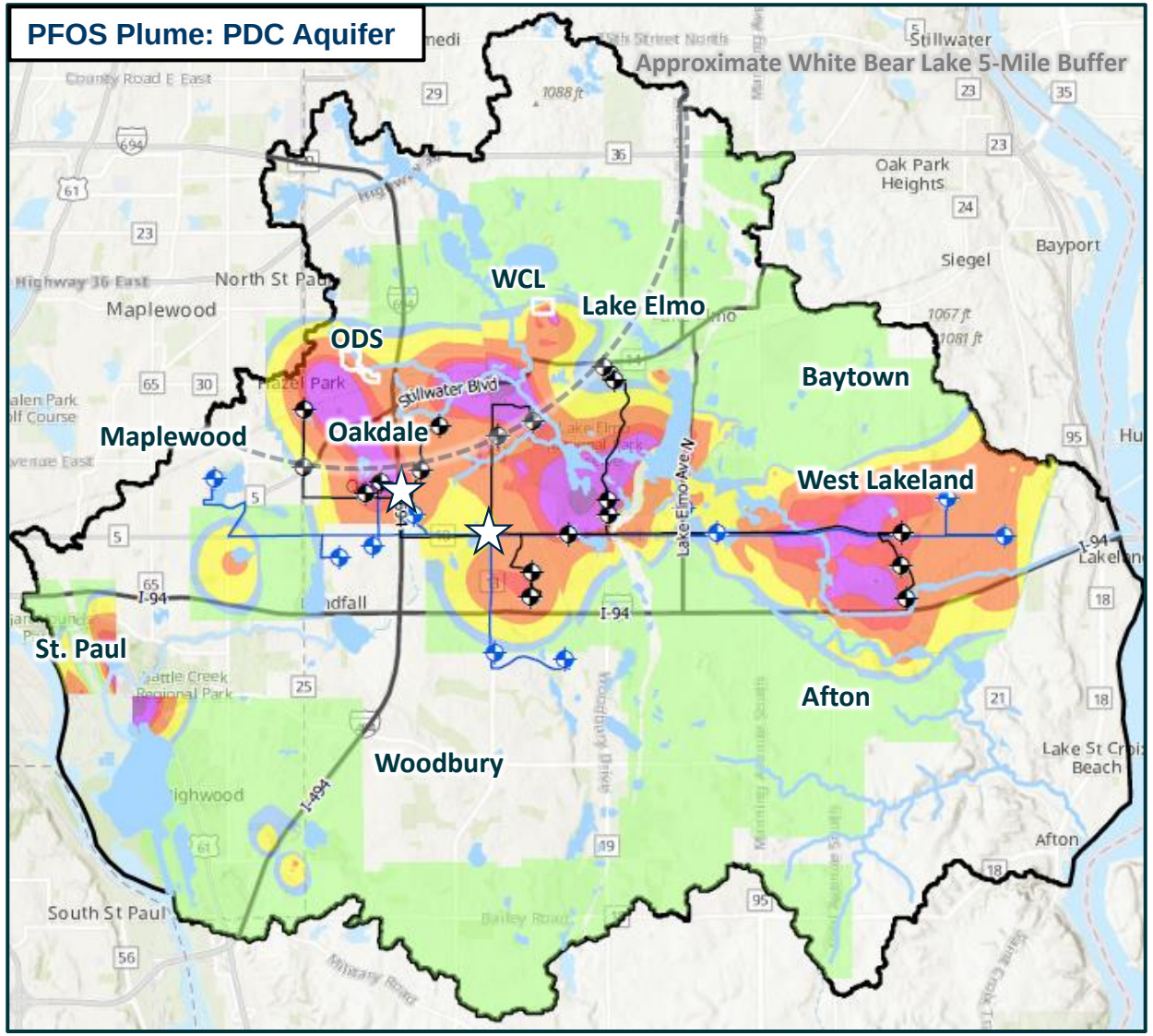


Need to reduce the contribution to existing PFAS contamination in communities and drinking water aquifers.



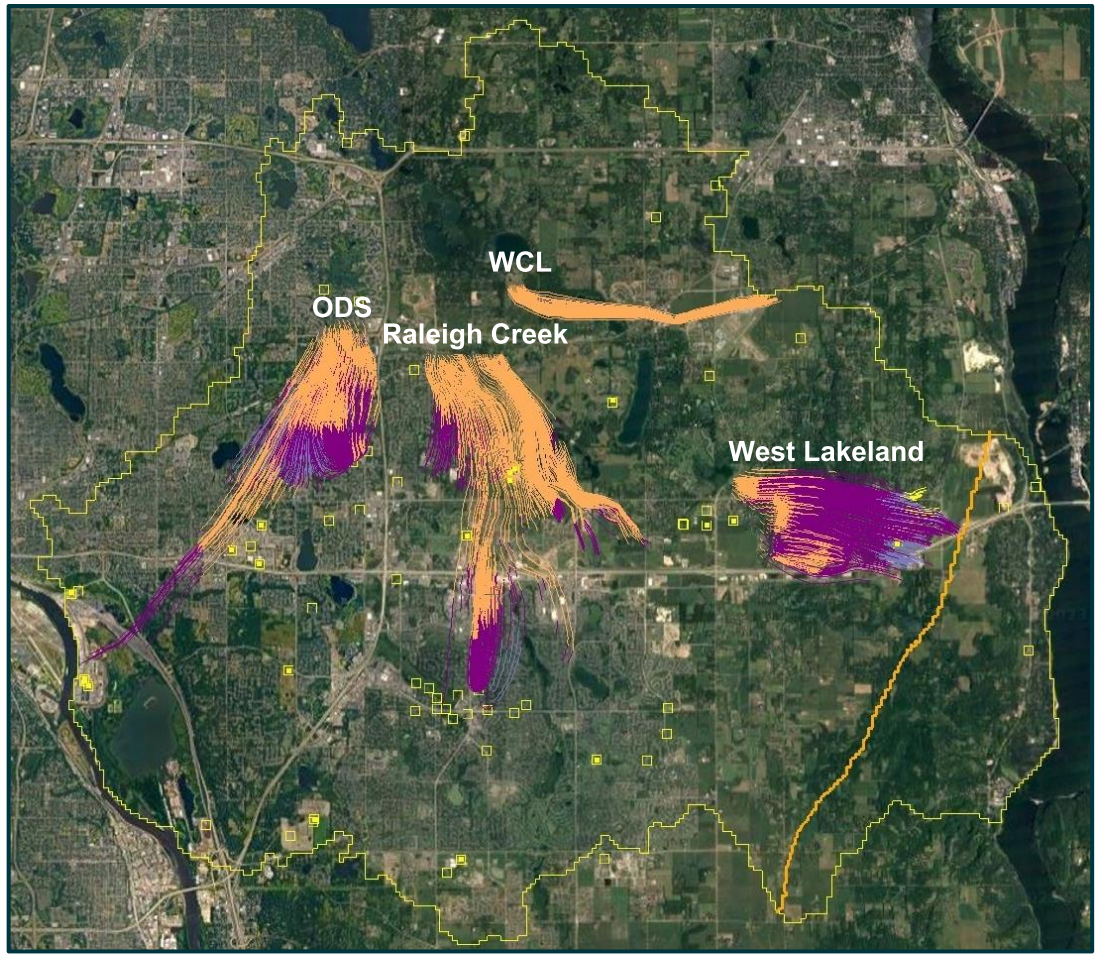
Need to limit the spread of PFAS into currently unimpacted communities and drinking water aquifers.

Remedial Option: Multi-Benefit Well Array (MBWA)

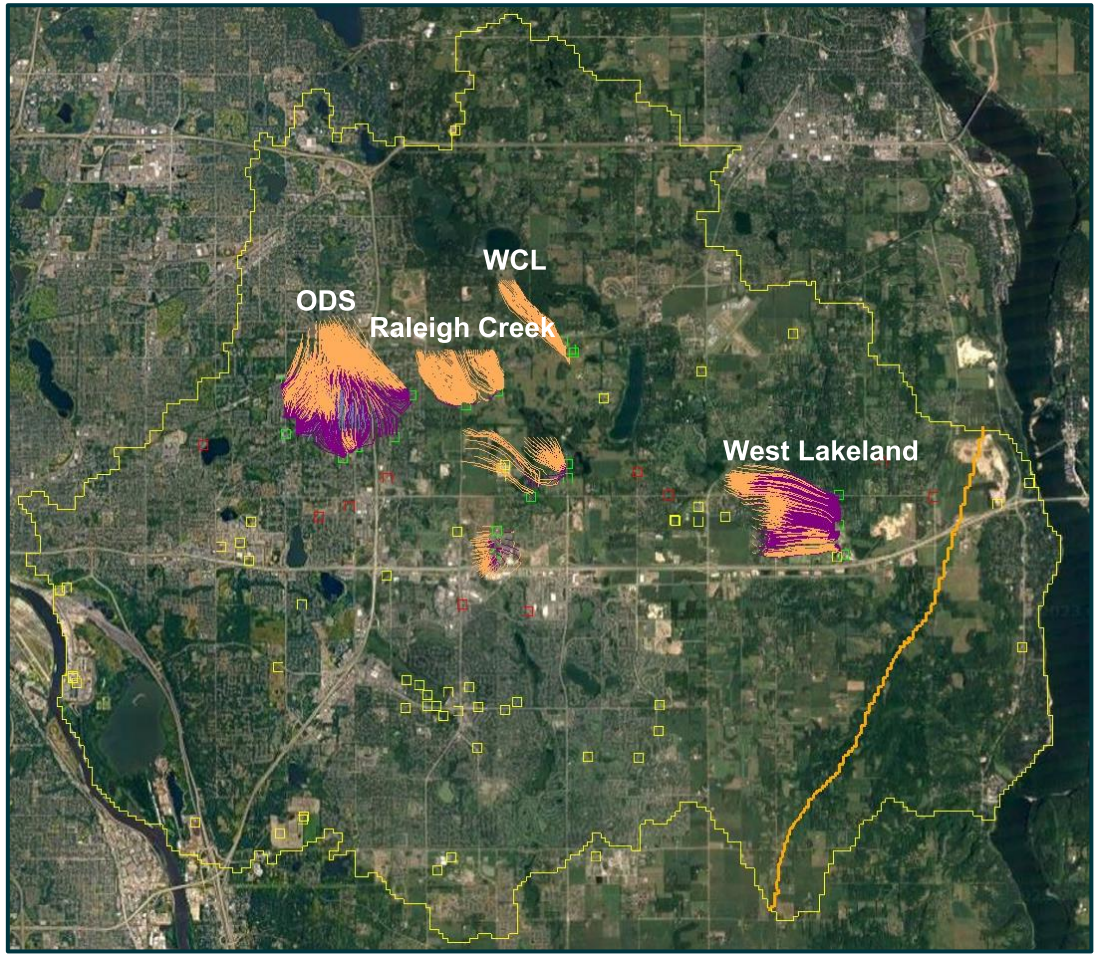


Particle Tracking from PDC Aquifer: MBWA

Current Conditions: 50 Years into Future



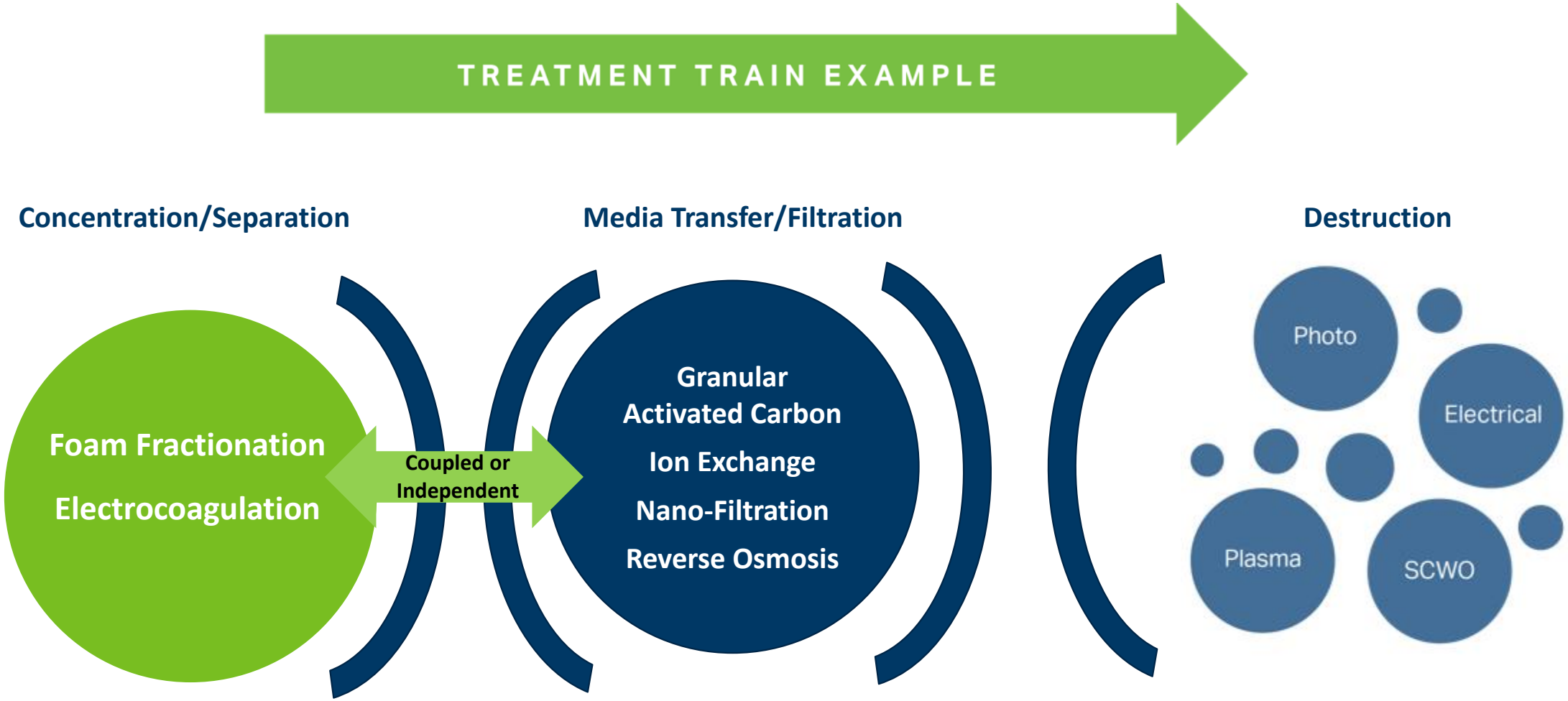
MBWA: 50 Years into Future



Pause for Questions?

Solutions to Limiting the Spread: Localized and Regional Approaches

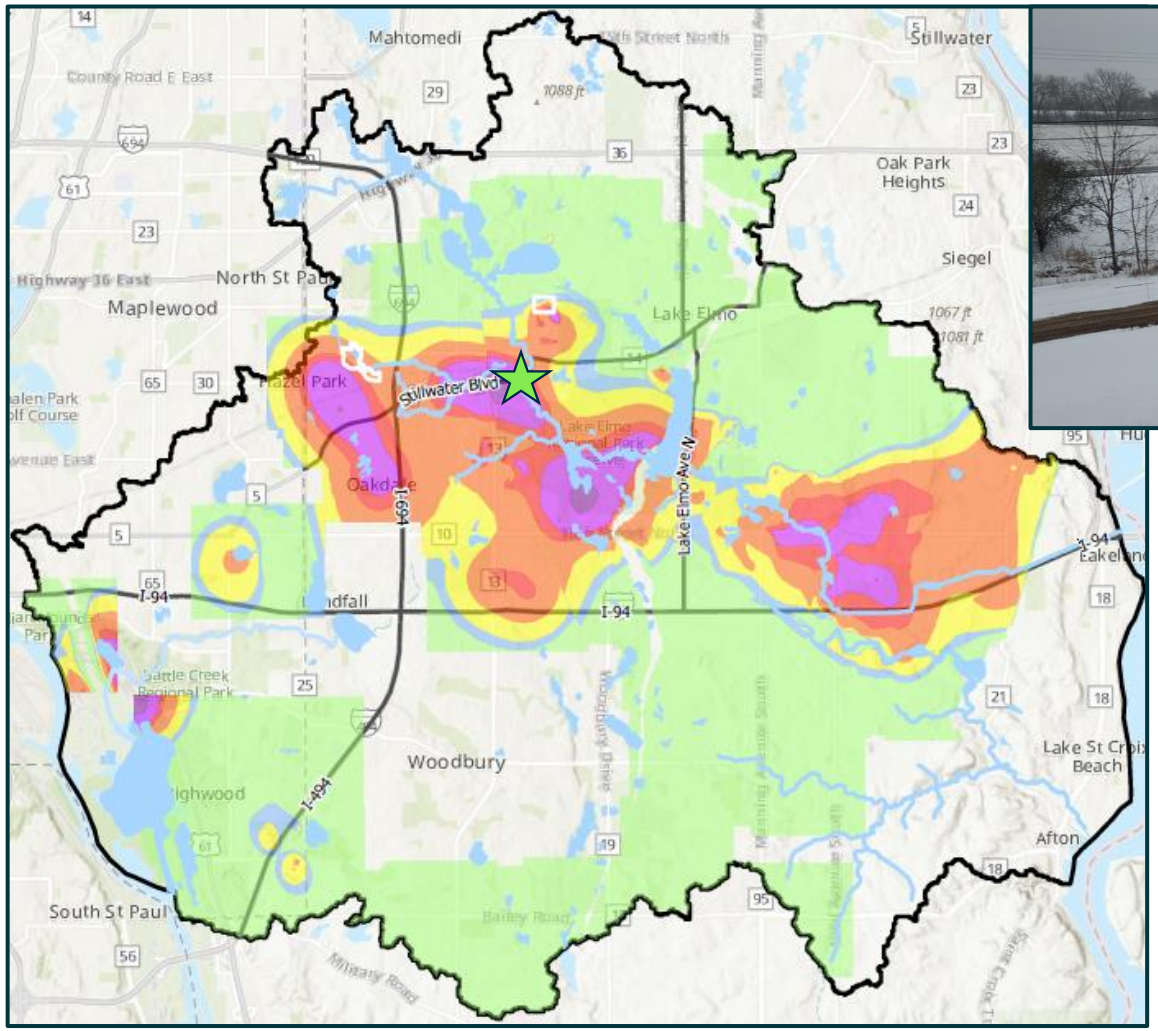
Remedial Treatment Train Example

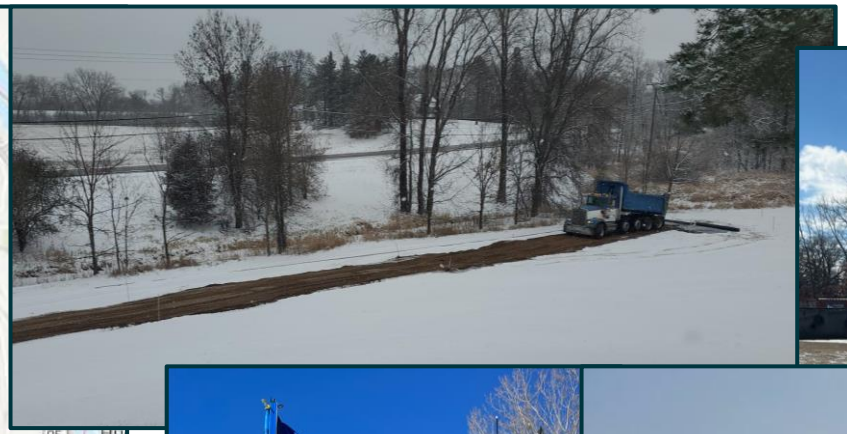


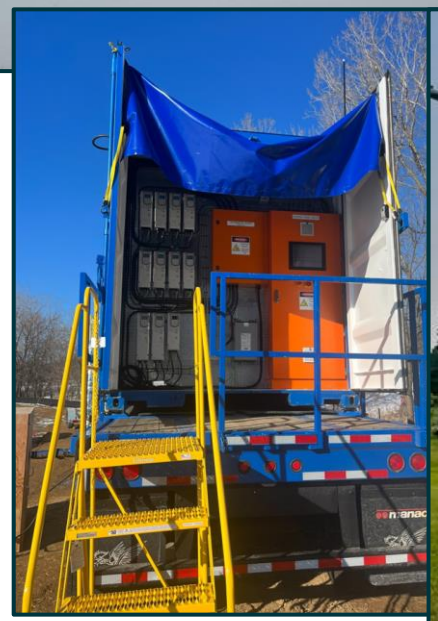
PROJECT 1007

Surface Activated Foam Fractionation (SAFF)

Pilot Study at Tablyn Park







SAFF Pilot Study

"Air in – PFAS out"

TWO STAGE PROCESS

Primary Fractionation

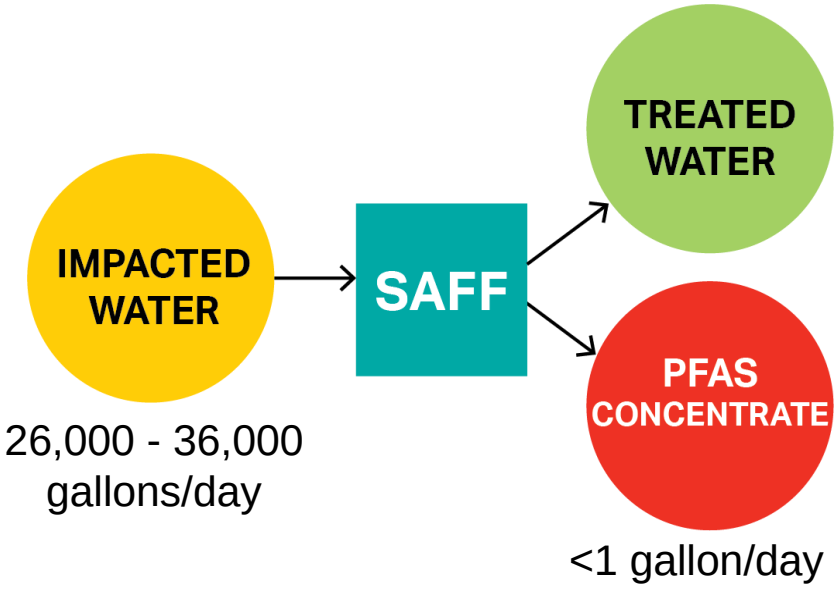
- Remove PFAS from surface water or groundwater
- **Goal:** Minimize effluent PFAS concentration

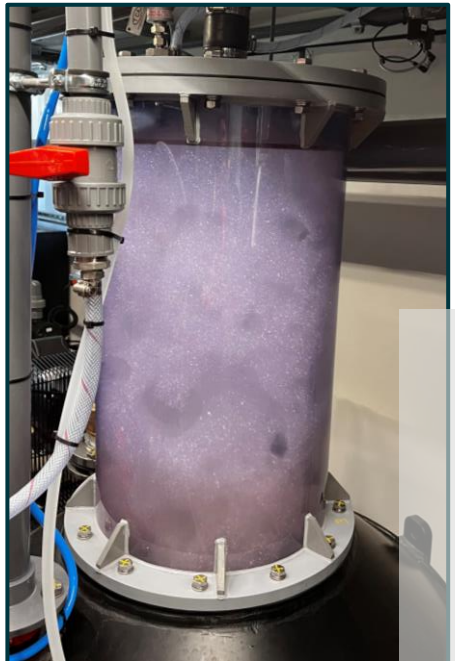
Secondary Fractionation

- Concentrate PFAS into a small volume for disposal or destruction
- **Goal:** Minimal volume with high PFAS concentrations

SAFF Pilot Study Summary of Results

Water Source	Influent PFOS (ng/L)	Effluent PFOS (ng/L) (% Removal)	Concentrate PFOS (ng/L)	Influent PFOA (ng/L) (% Removal)	Effluent PFOA (ng/L) (% Removal)	Concentrate PFOA (ng/L)
Raleigh Creek	2,940	2.9 (99.9)	6,540,000	903	0.836 (99.9)	2,440,000
Shakopee Aquifer	1,340	1.42 (99.9)		392	3.57 (99.1)	
Jordan Aquifer	0.92	Below Detection		26.5	4.95 (81.3)	





Key Takeaway

High PFOS and PFOA removal was achieved even with low foaming groundwater

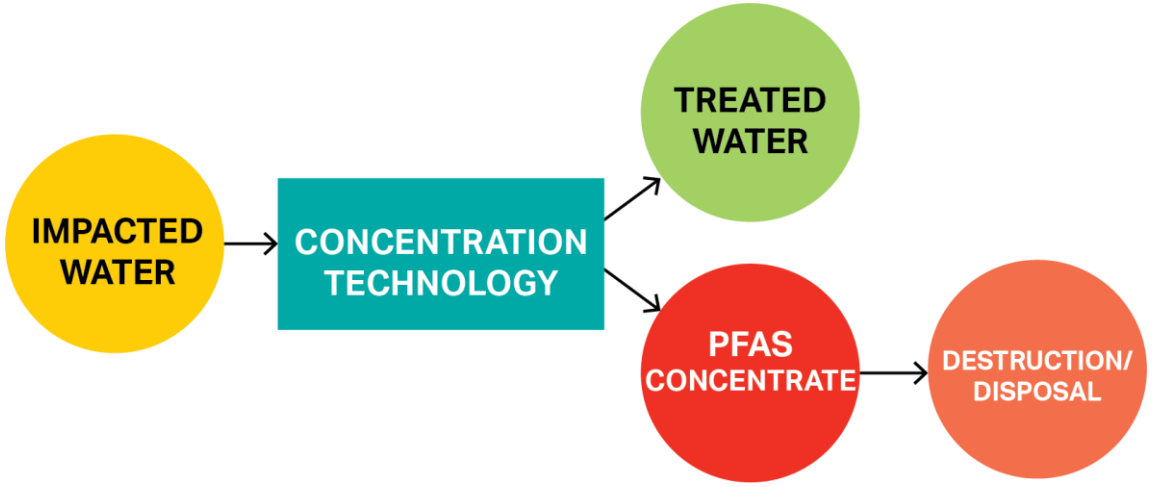
Pause for Questions?

Foam Fractionation Pilot Study and Results

PROJECT 1007

PFAS Destruction Technology Pilot Study

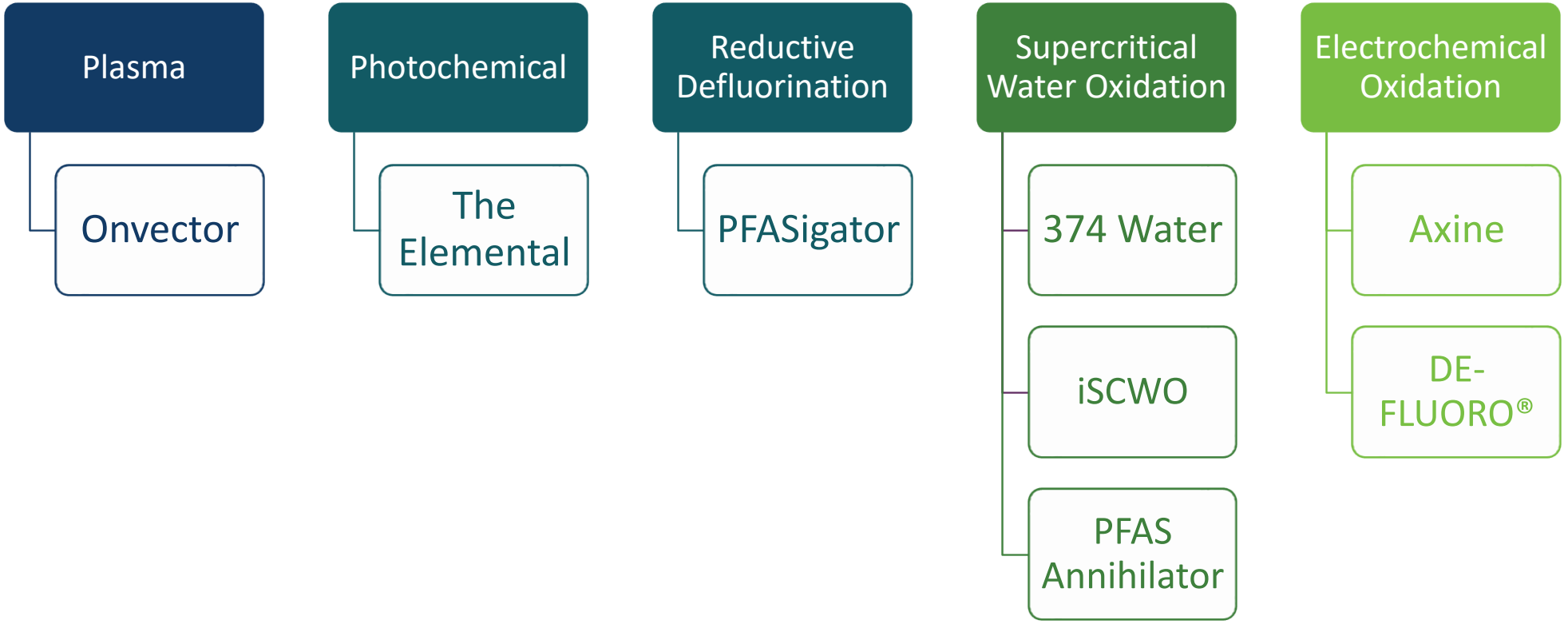
- Shipped PFAS concentrate to destruction technology vendors
- Bench scale testing ongoing to determine efficiency
- Results expected by the end of 2023
- Results to be incorporated into the feasibility study recommendations



Vendors will report the following

- Destruction efficiency of specific PFAS compounds
- Destruction efficiency of total organofluorine
- Energy consumption
- Required consumables
- By product formation

Destruction Technologies



Pause for Questions?

Destruction Technologies

PROJECT 1007

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PROJECT 1007

Questions?

Helpful Links

3M Settlement Page:

https://3msettlement.state.mn.us/projects/project-1007

Baseline Ecological Risk Assessment (BERA) Report:

https://3msettlement.state.mn.us/sites/3msettlement/files/2023-02/baseline-eco-risk-assessment-october-2021.pdf

SAFF Pilot Study Update Video:
https://www.youtube.com/watch?v=3DiJhtODkXA&ab_channel=MinnesotaPollutionControlAgency