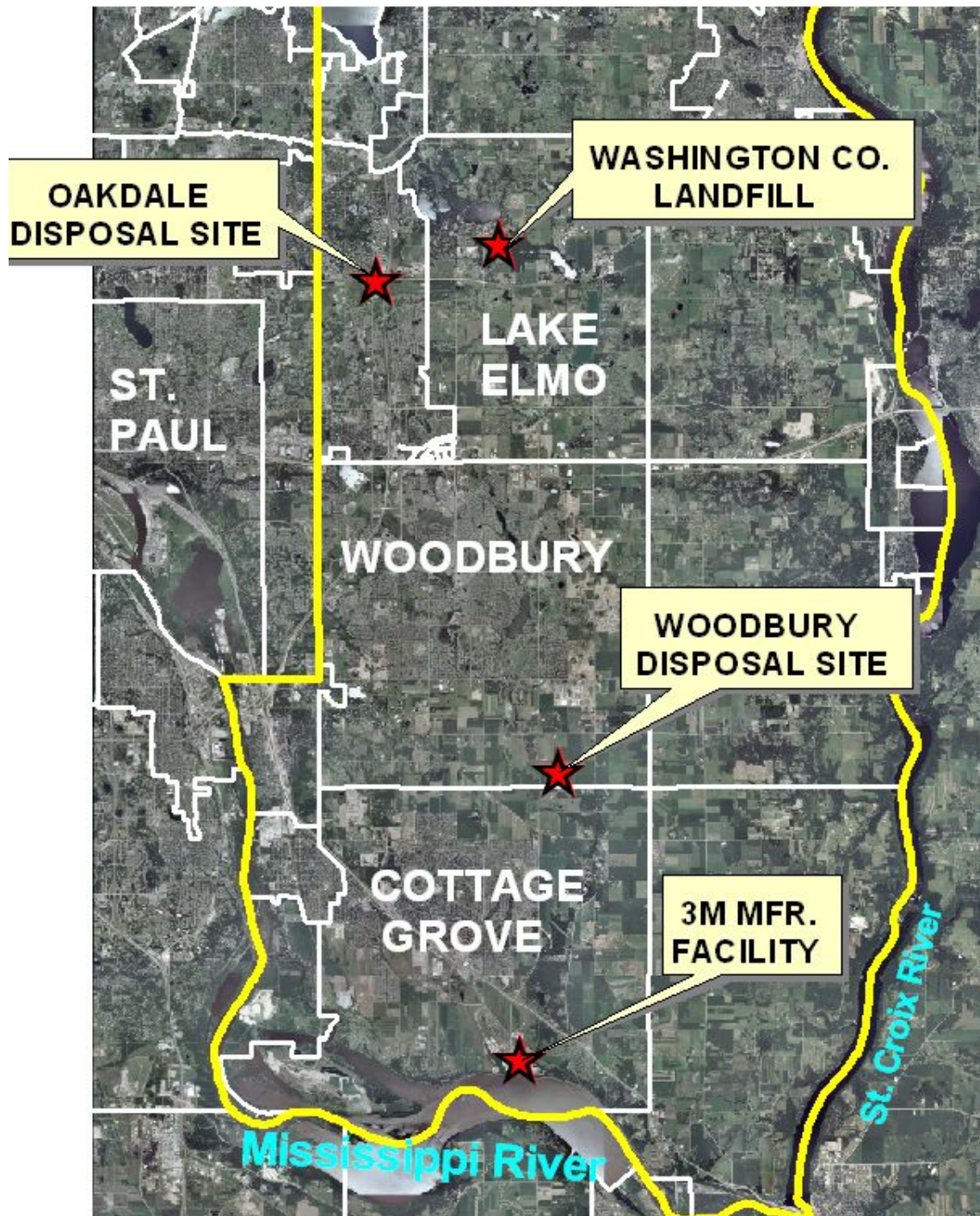


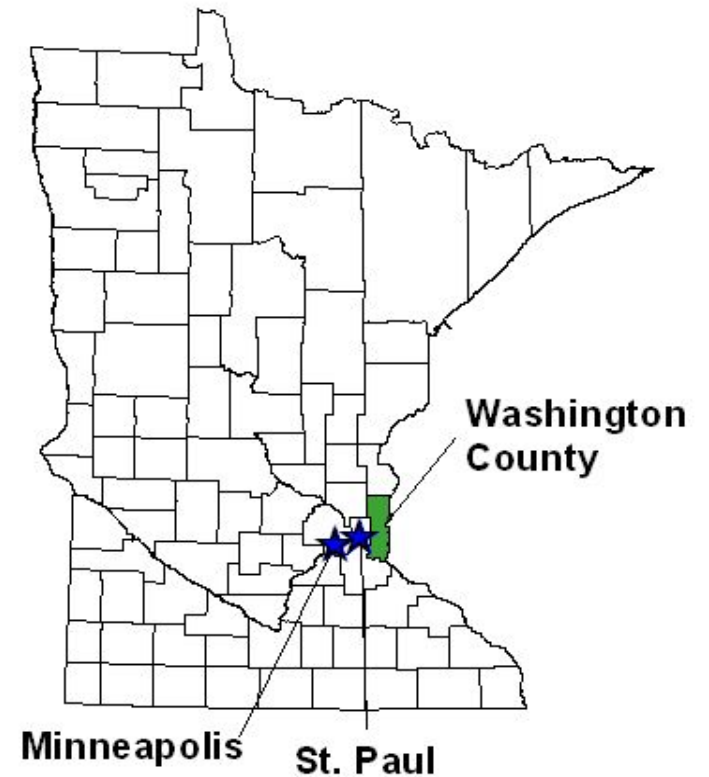
# *Water Sampling in South Washington County*



Ginny Yingling  
Minnesota Department of Health  
Environmental Health Division

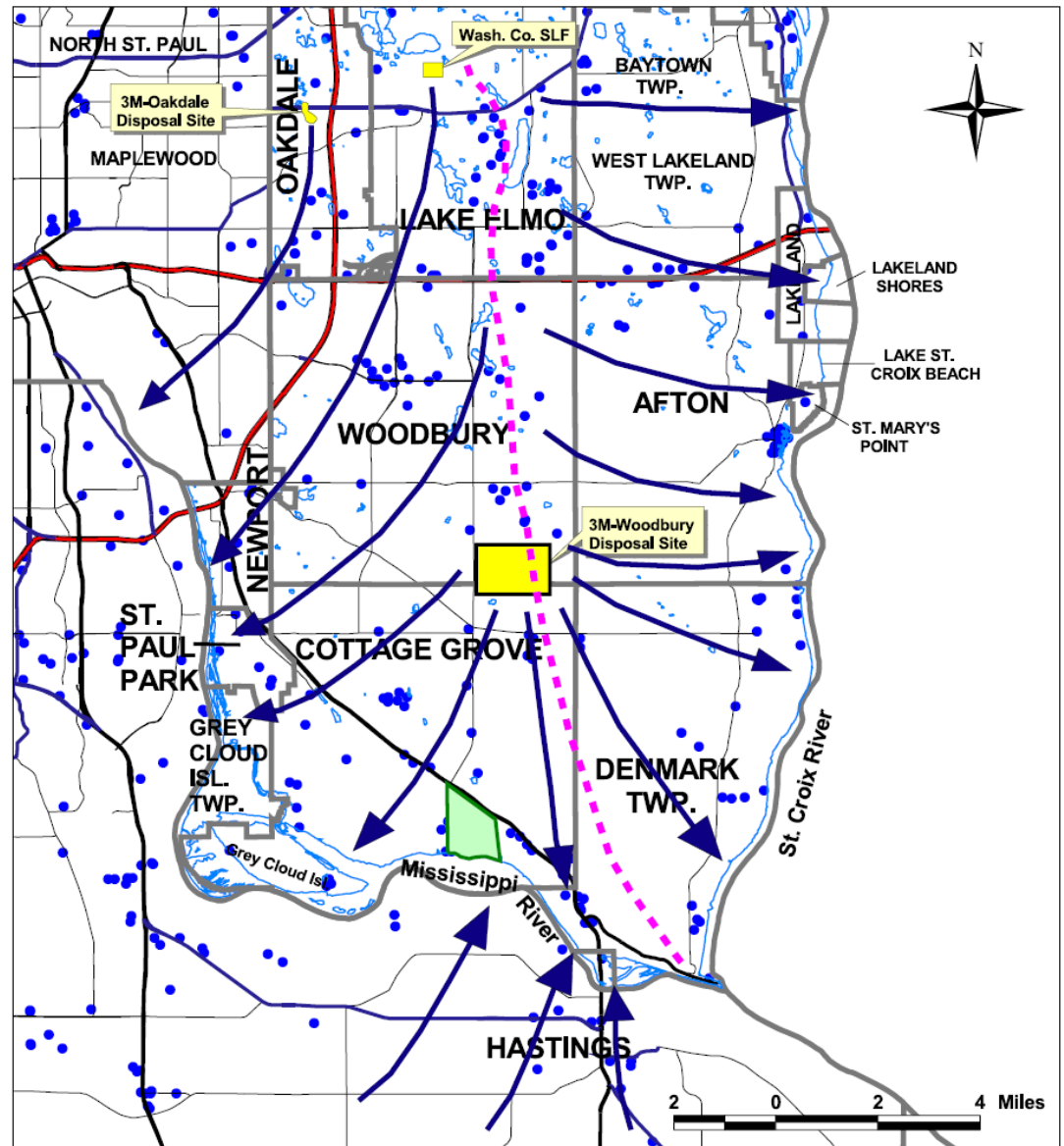


# LOCATION OF 3M SITES IN WASHINGTON CO. MINNESOTA



# Groundwater Flow


- A groundwater divide extends from north to south beneath the county
- East of the divide groundwater flows to the St. Croix River
- West of the divide groundwater flows to the Mississippi River
- Close to where the two rivers meet, the flow “fans out” toward either river
- Flow directions also controlled by bedrock structures and pumping wells



General Groundwater Flow in S. Washington Co.

- Regional groundwater divide
- Regional groundwater flow direction

**MPCA and MDH needed to develop a sampling plan to answer these questions as quickly as possible:**

- 1. Is anyone exposed above levels of concern?**
  - 2. How high are the PFBA levels?**
  - 3. How far and deep has the PFBA moved?**
- 

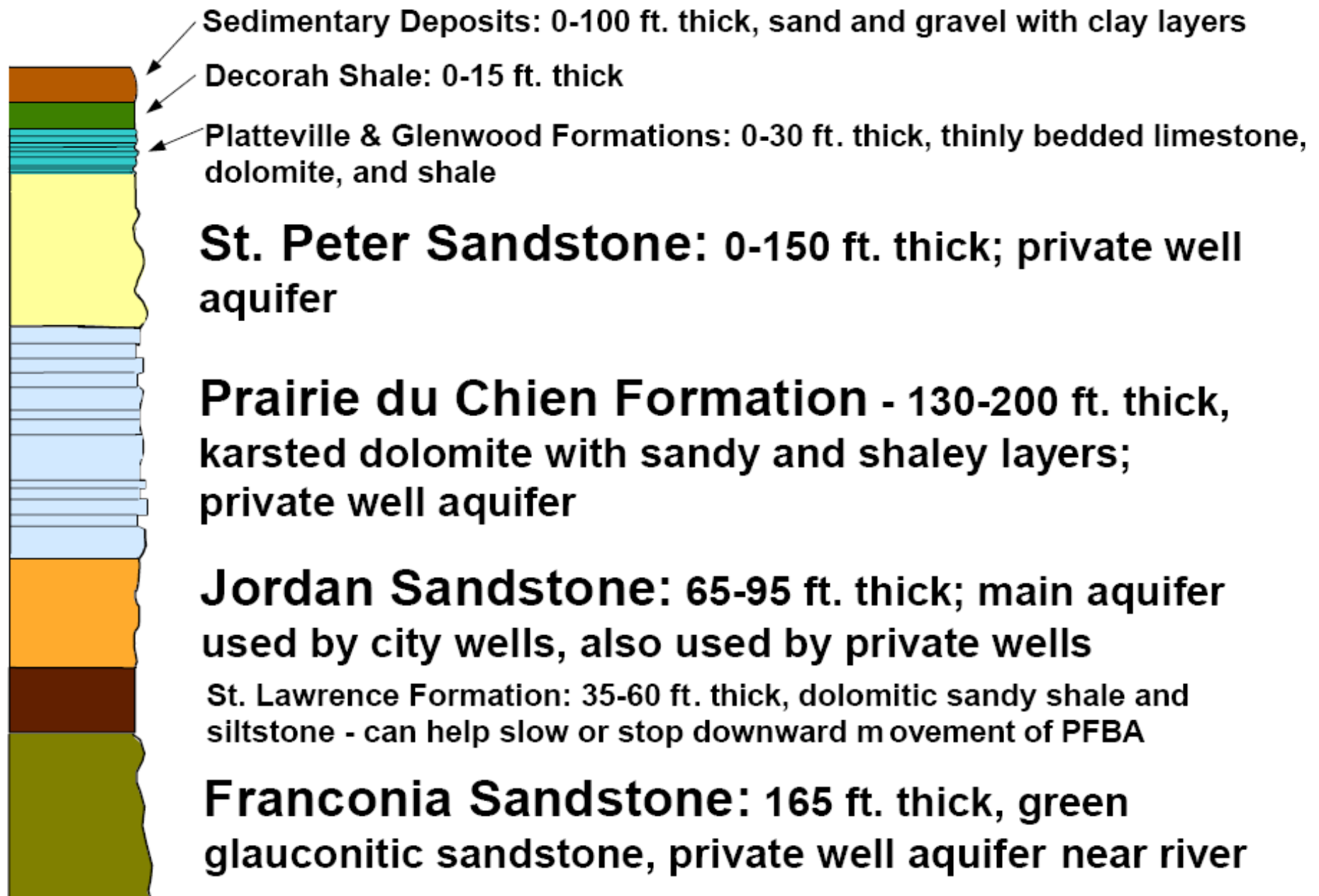
# 2007 Groundwater Sampling

- **Phase 1: January – May, 2007**
  - Locate high concentration areas
  - Determine how far and deep PFCs had gone
- **Phase 2: May – September, 2007**
  - Sample all wells in areas potentially above levels of concern ( $> 2$  ppb)
- **Phase 3: August 2007 – present**
  - Fill in gaps in understanding of PFC distribution

# 2007 Groundwater Sampling

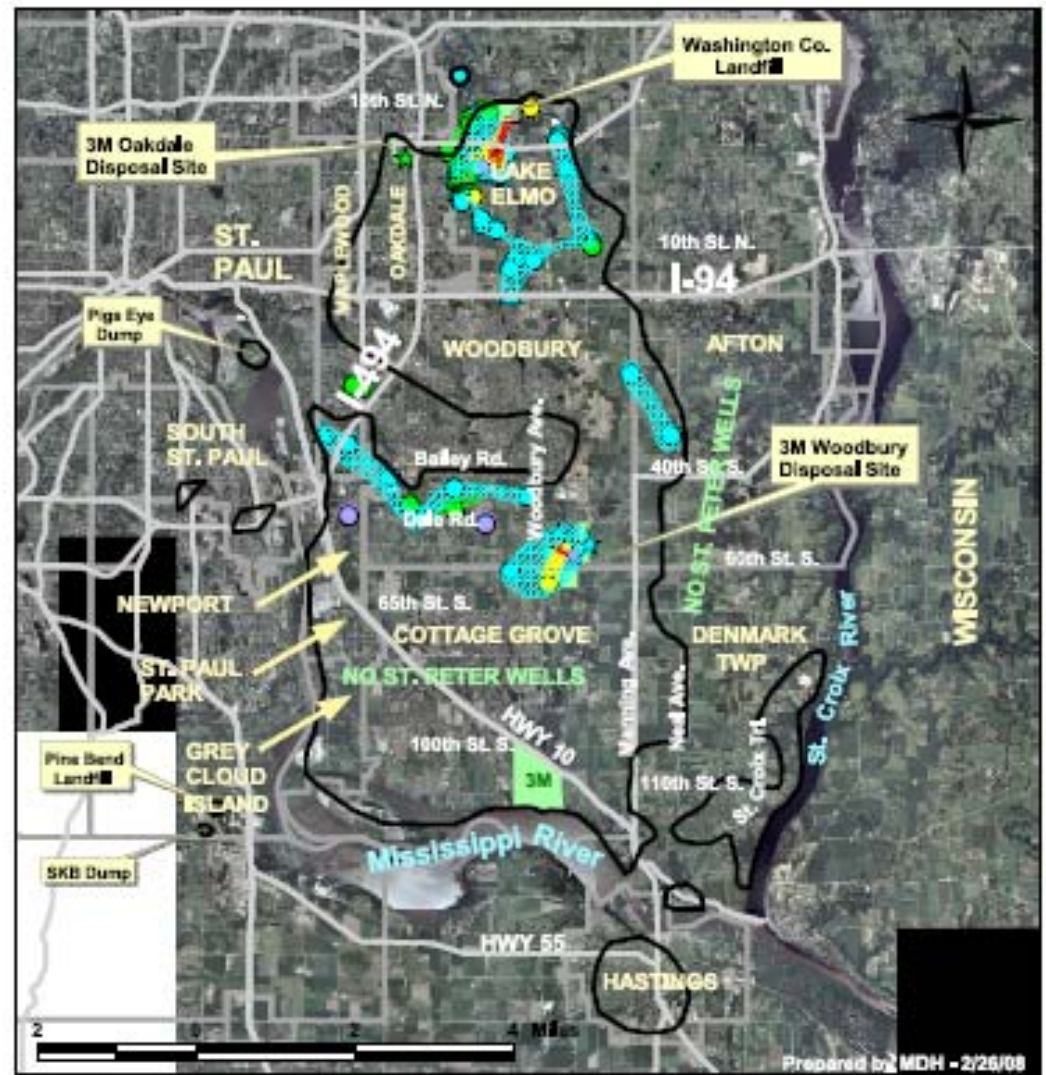
- Over 1,100 private wells sampled
- 70+ non-community public wells
- 50+ city wells (monthly)
  
- 705 private wells sampled this year have PFBA detections
  - 70 have PFOA
  - 7 have PFOS
  
- 28 homes in Cottage Grove and 13 in Lake Elmo were issued well advisories

# Bedrock Layers in South Washington Co.

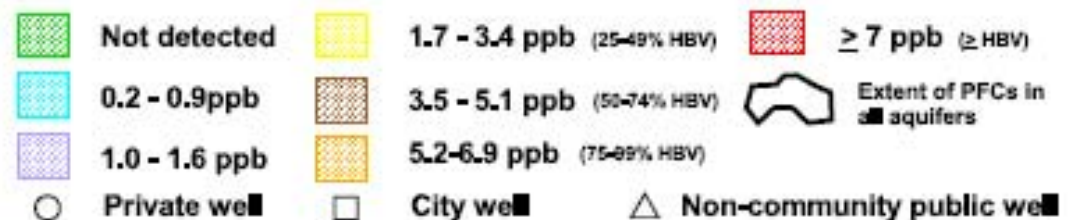


# St. Peter Sandstone

- High levels of PFBA generally found on or very near the disposal sites
- Most private wells have < 1 ppb PFBA
- Highest levels found in private wells in Lake Elmo: 12 ppb
- Very few St. Peter wells in southern and eastern portions of investigation area

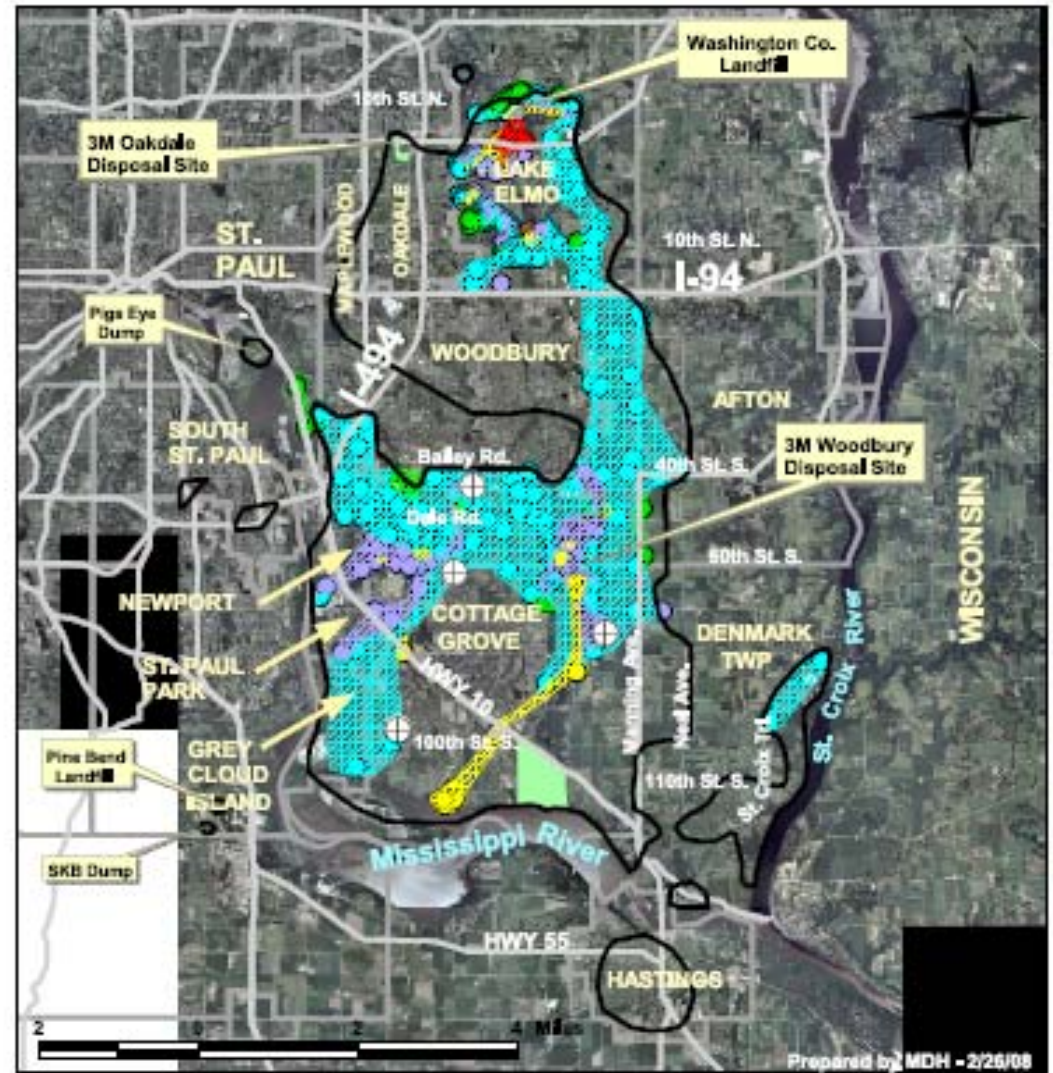


PFBA in St. Peter Sandstone Relative to All PFC Detections  
January 2008

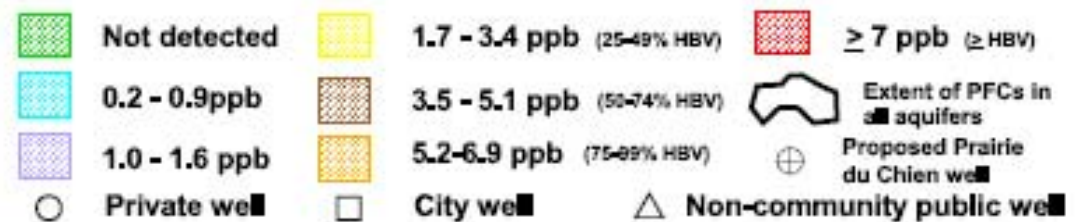


# Prairie du Chien

- Large area of aquifer has PFBA detections < 1 ppb
- Higher levels of PFBA follow trend of bedrock valleys (and to lesser degree, faults)
- Highest levels found in Lake Elmo private wells: 11.8 ppb
- Outstanding questions:
  - Why are higher PFBA levels present north of Woodbury disposal site?
  - How did higher levels of PFBA get into Newport area?

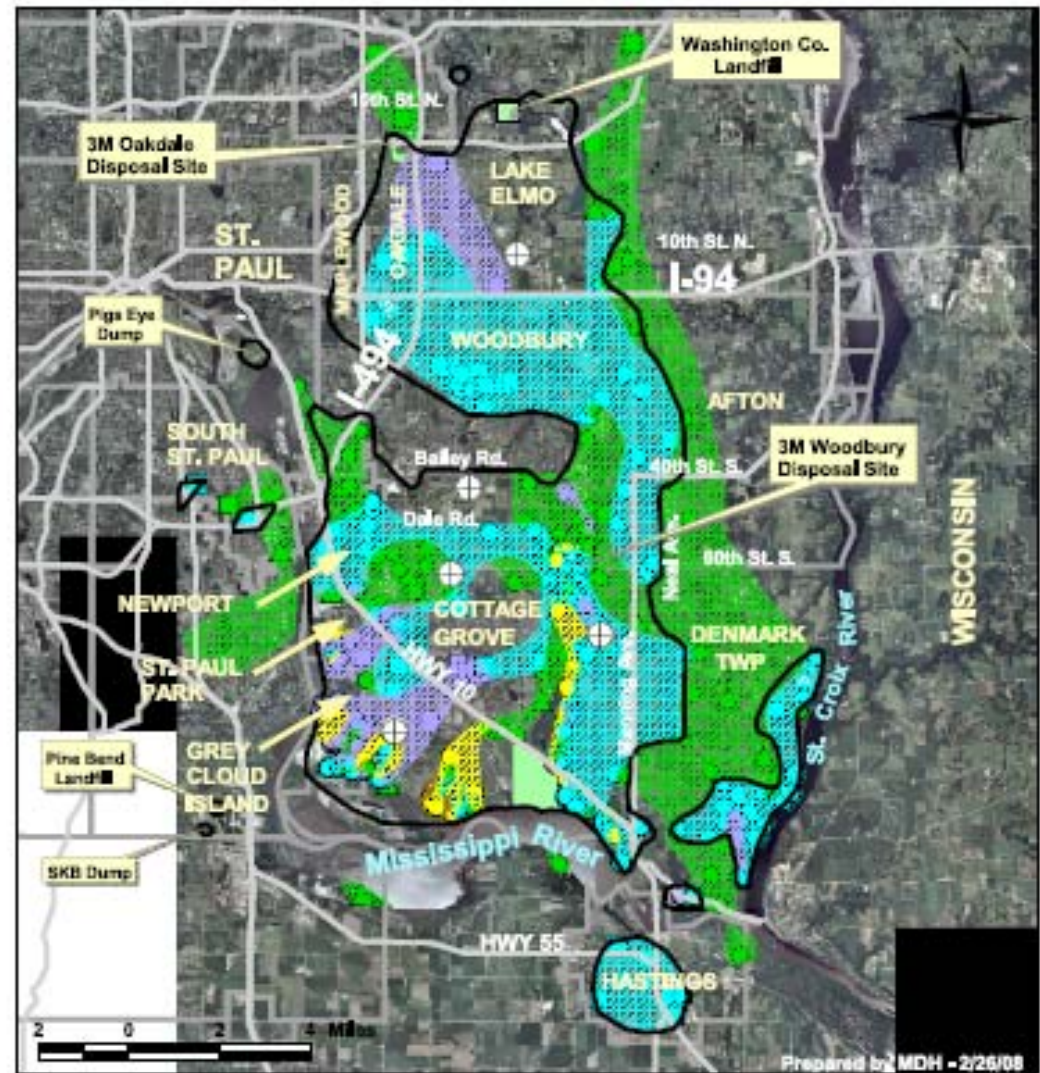


**PFBA in Prairie du Chien Relative to All PFC Detections  
January 2008**

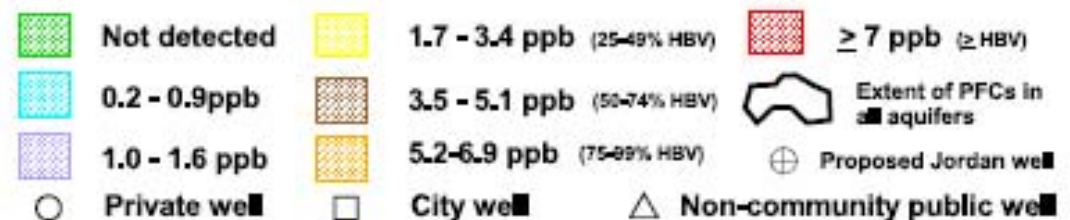


# Jordan

- Distribution of PFBA similar to Prairie du Chien
- Higher levels found along ravine and near river in Cottage Grove
- No private Jordan wells north of I-94
- Movement across faults may be cause of PFBA in Hastings and SE Denmark Township

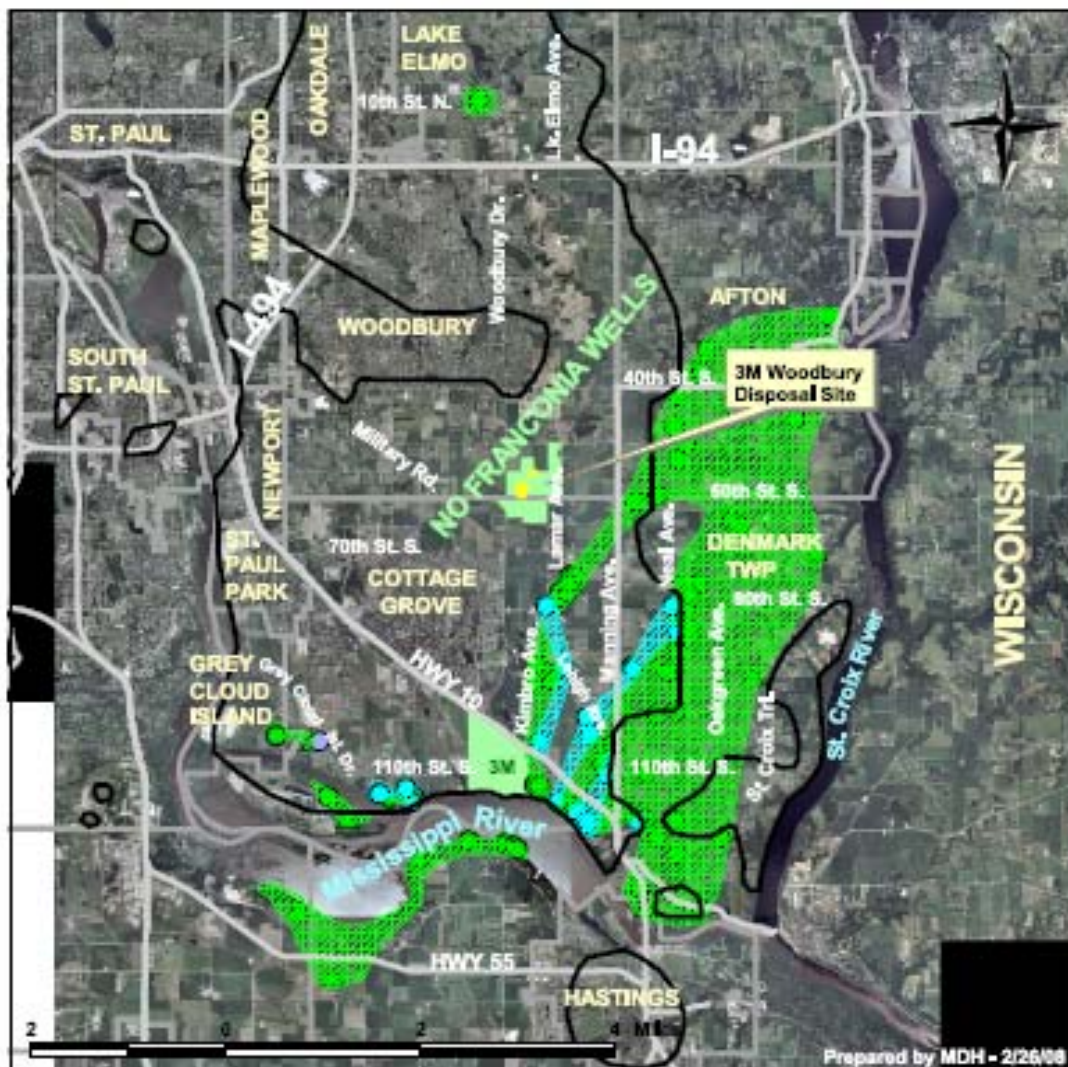


PFBA in Jordan Aquifer Relative to All PFC Detections  
January 2008

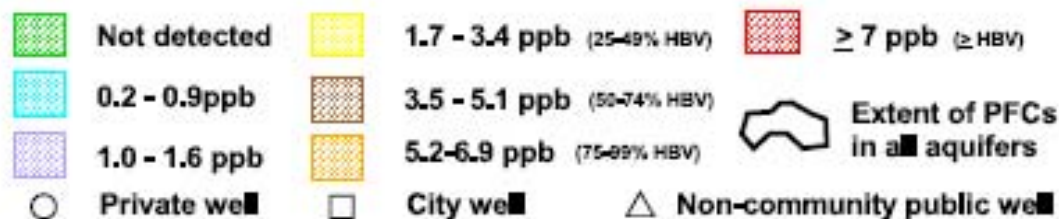


# Franconia

- Most wells have no PFC detections
- Low level PFBA detections appear to follow trend of faults
- Highest PFBA: 1.6 ppb
- Franconia used for drinking water mainly near Mississippi and St. Croix, where other aquifers are not viable

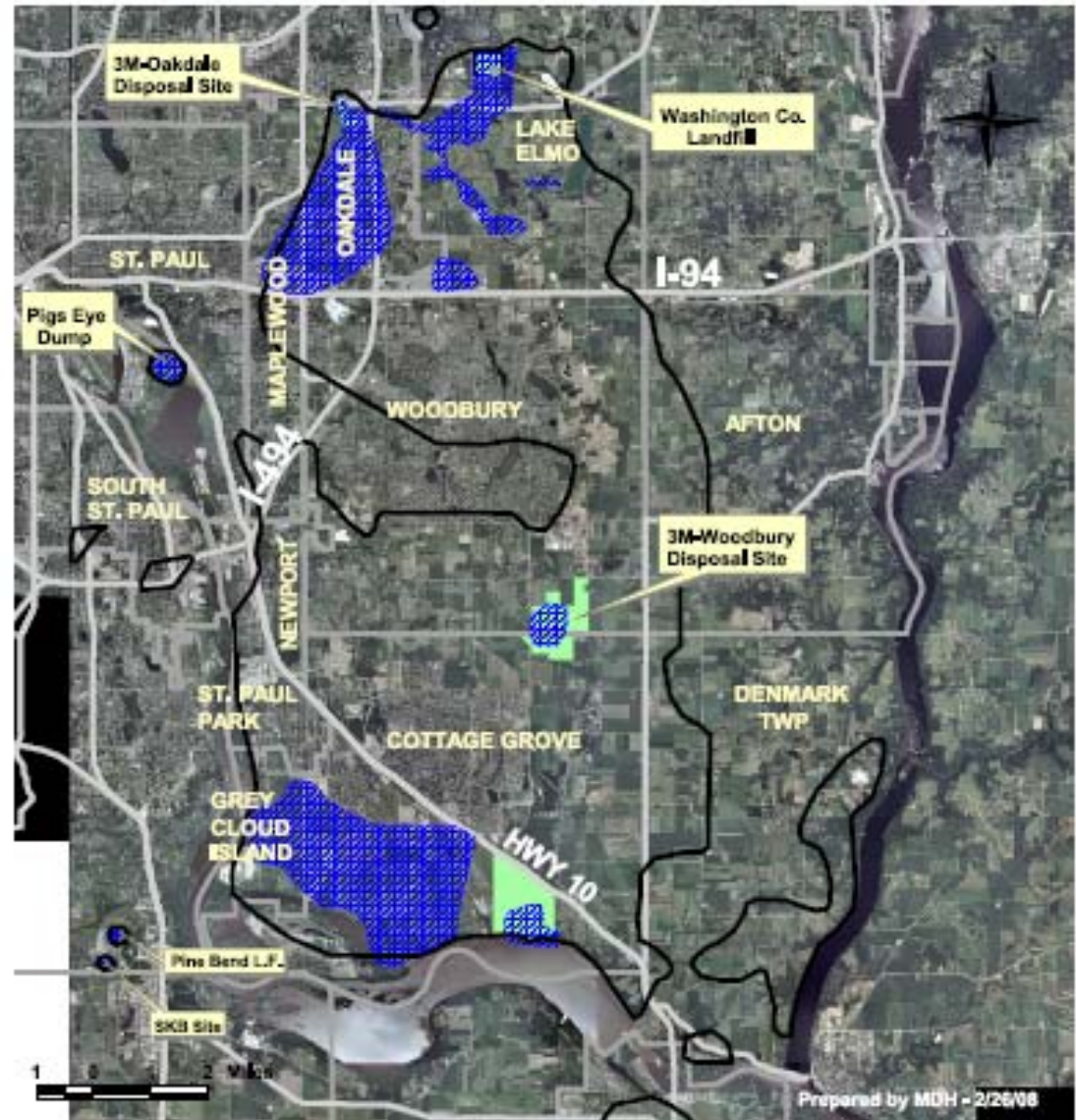


PFBA in Franconia Aquifer Relative to All PFC Detections  
January 2008



# Other PFCs

- PFOS and PFOA are found at all 3 disposal sites
- The only detections of PFOS or PFOA in private wells are:
  - North of I-94 – in Lake Elmo
  - Southwest of Hwy 10 – in Cottage Grove
- The only detections of PFOS or PFOA in city wells are in Oakdale



## PFOA and/or PFOS Detections

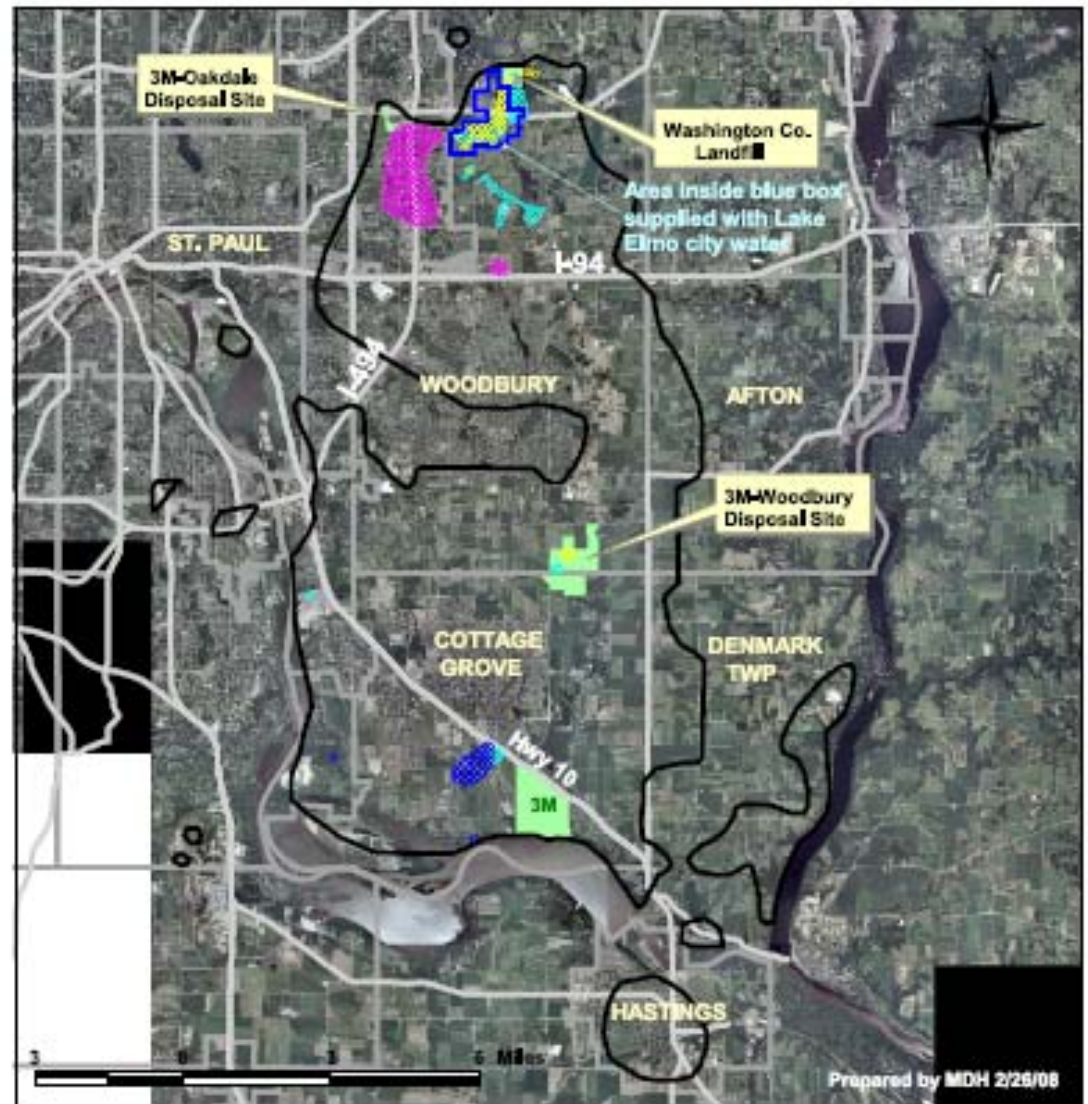


Areas where PFOA and/or PFOS have been detected in addition to PFBA

Note: PFCs detected at Pigs Eye Dump, Pine Bend Landfill and the SKB site are found in the shallow groundwater. Monitoring indicates the PFCs are contained on-site (Pine Bend and SKB) or discharge to surface water (Pigs Eye)

# What Does This Mean In Terms of Health Risk?

- MDH looks at the additive effects of PFOA, PFOS, and PFBA together
- Small areas of the drinking water aquifers exceed Health Based Exposure Limits for these combined concentrations
- Those areas are being addressed by treating city water (Oakdale) or providing alternate water supplies (Lake Elmo and Cottage Grove)



## Areas Where PFCs Exceed Health Based Exposure Levels



This figure shows the areas within each of the three major drinking water aquifers that exceed Health Based Exposure Levels for the combined concentrations of PFCs.

Extent of PFC detections in all aquifers

# What Does This Mean For City Water Users?

## ➤ Oakdale

- Water treatment system is keeping PFC drinking water concentrations below the health based exposure limits
- City is working plans to drill an additional well in an area without PFCs to replace one or more affected wells.

## ➤ Other Communities in Study Area

- All city water systems are well below the health based exposure limits

# What Does This Mean For Private Well Owners?

## ➤ **Lake Elmo**

- Most of the affected homes have been connected to city water.
- 25 wells still exceed the health based exposure limits, but already have treatment systems or alternate water supplies.
- Well advisories no longer needed for approximately 30 homes.

## ➤ **Cottage Grove**

- Only one additional well advisory needs to be issued.
- Well advisories no longer needed for approximately 20 homes.

# What Happens Next?

## ➤ Long-term Monitoring

- City wells (quarterly)
- Private wells (based on concentration and location within plume)

## ➤ On-going Investigations

- At disposal sites and 3M facility
- Southwest of Hwy 10
- In areas where no private or public wells are present

# How Long Will Sampling Continue?

**As long as it takes to:**

- **Ensure that public health is protected**
- **Determine how the contaminant plume(s) are behaving over time**
  - **Are they stable or changing?**
  - **Could more wells become contaminated?**
  - **Will other PFCs appear?**

# **What If I Want To Further Reduce My Exposure To PFCs?**

- **The state commissioned an independent evaluation of point-of-use treatment systems**
  - **That study will be discussed next**
- 