Perfluorochemicals in Minnesota

Senate Environment and Natural Resources Committee

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Helen Goeden, Ph.D. and James Kelly, M.S.

Environmental Health Division

Minnesota Department of Health

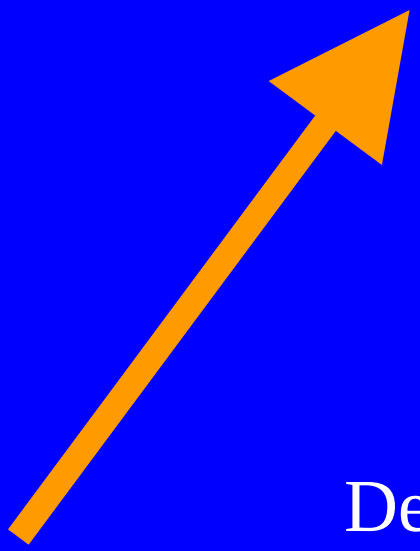
Perfluorochemicals (PFCs) - Background

- Used for many years in products that resist heat, stains, water, oil and grease
- Many other specialized industrial and commercial uses
- Unique chemical properties

PFCs: Environmental Fate

- Persistent in the environment
- Do not biodegrade or break down in water, air, or sunlight
- Move readily through groundwater and some soils
  - High solubility (1,000 ppm PFOA; 550 ppm PFOS)
  - Low adsorption rates, high desorption rates
- PFOS bio-concentrates in fish; PFOA does not
- PFCs have been found worldwide in animal & human blood

PFOS & PFOA Toxicity: Animal Studies



High

Death

Cancer – liver, thyroid*, testes**, pancreatic**, mammary (?)

Reproductive hormone (?)

Blood system effects**

Increased mortality in offspring

Developmental – growth & maturation delays

Subtle liver and thyroid* effects

Low

No discernible treatment-related effects

*PFOS ** PFOA

PFOS/PFOA: Human Data

- 3M Worker Studies (highly exposed)
  - Inconsistent but possible subtle hormone and liver effects, cancer (?)
  - Half life in the body of 4 to 6 years

PFCs Detected in Human Serum

PFHxA - - perfluorohexanoic acid ($C_5F_{11}COO$)

PFHxS - - perfluorohexanesulfonate ($C_6F_{13}SO_3$)

PFHpA - - perfluoroheptanoic acid ($C_7F_{13}COO$)

PFOA - - perfluorooctanoic acid ($C_8F_{15}COO$)

PFOS - - perfluorooctanesulfonate ($C_8F_{17}SO_3$)

PFOSAA - - N-ethyl perfluorooctanesulfonamidoacetate ($C_8F_{17}SO_2N[CH_2CH_3]CH_2COO$)

M570 - - N-methyl perfluorooctanesulfonamidoacetate ($C_8F_{17}SO_2N[CH_3]CH_2COO$)

PFNA - - perfluorononanoic acid ($C_9F_{17}COO$)

PFDA - - perfluorodecanoic acid ($C_{10}F_{19}COO$)

PFDS - - perfluorodecanesulfonate ($C_{10}F_{21}SO_3$)

PFUnA - - perfluoroundecanoic acid ($C_{11}F_{21}COO$)

Serum Levels in Human Populations

Population	PFOS (ppb)*	PFOA (ppb)*
Production Workers (3M Cottage Grove, year 2000)	440 (20 – 4,790)	850 (7 – 92,030)
Adults, Red Cross Blood Banks	34.9 (<4.2 – 1656)	4.6 (<1.9 – 52.3)
Children, 2 –12 yrs (23 states)	37.5 (6.7 – 515)	4.9 (<1.9 – 56.1)
Elderly Adults, 65-96 yrs	31 (<3.4 – 175)	4.2 (<1.4 – 16.7)

*Geometric Mean

MDH Screening Values
(Developed in 2002)

- Health Based Values for Groundwater
  - ➢PFOS – 1 ppb
  - ➢PFOA – 7 ppb

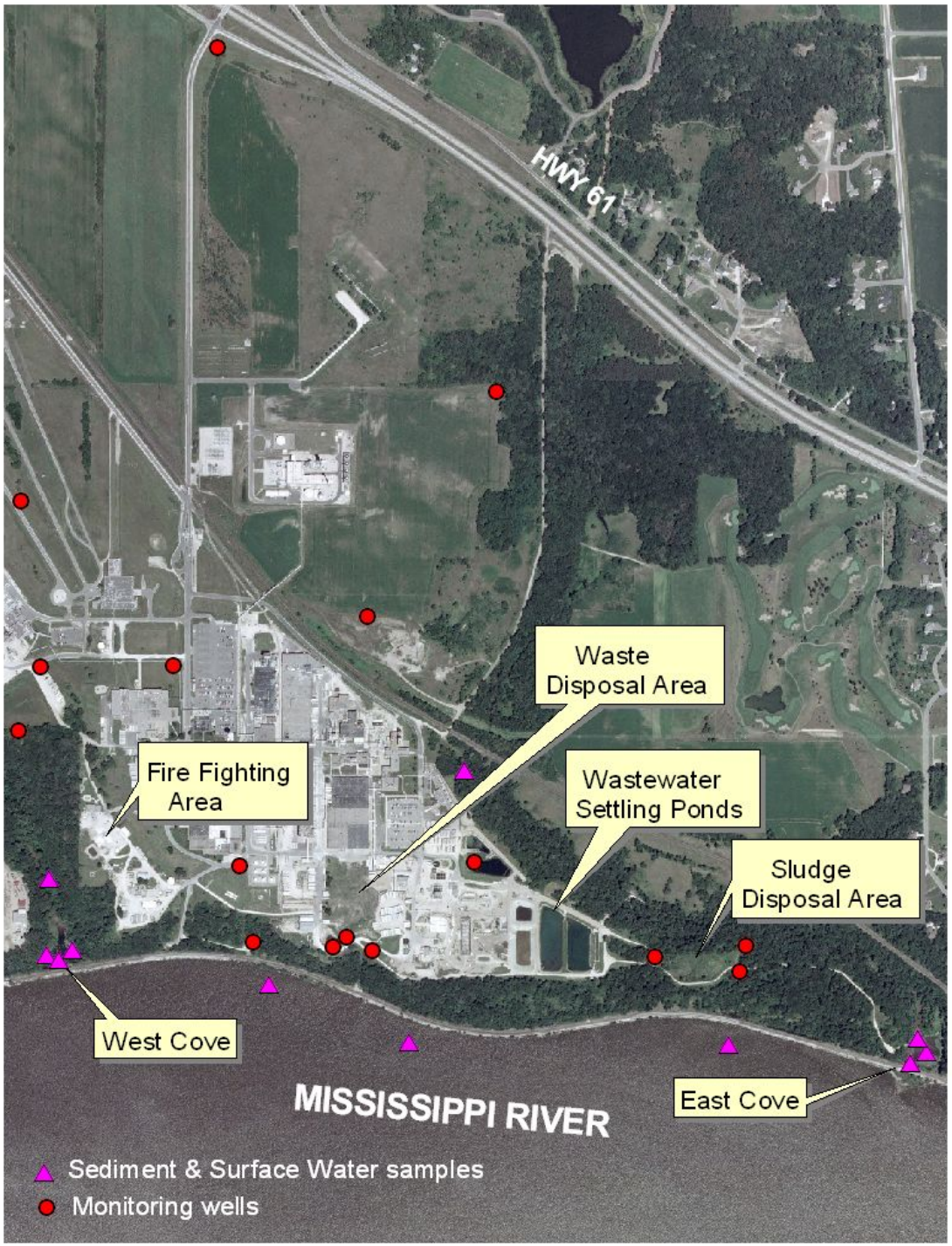
- *Based on subtle liver and thyroid effects*
- *Incorporated Uncertainty Factors (1,000 – 3,000)*
- *Used adult intake rates*
- *Incorporated 5-fold factor to address other exposure sources*

Draft EPA PFOA Risk Assessment

- **Incorporated information available as of June 2004**
- **Focused on potential for human health effects in the general US population**
- **The Draft assessment is NOT intended to provide final risk estimates but rather sought recommendation on EPA's approach. Key Issues:**
  - ***Cancer classification* –** Majority of Panelists recommend "likely" human carcinogen rather than "suggestive". Panel recommended additional study. Did not quantify cancer risk. Acknowledged that cancer may not represent most sensitive effect.
  - ***Selection of effects (e.g., liver toxicity) for evaluation of risk. Extrapolating from non-human species to humans.*** Data regarding most appropriate measure of dose (e.g., serum level or administered dose) is limited. Health effect data is limited. Selection of most appropriate effect and dose metric must await additional research. Until then use of multiple species and effects is appropriate.
- **Assessment will need to be revised as new information is generated**

Why Are PFCs An Issue in MN?: 3M Cottage Grove Facility

- PFC production began by the early 1950s
- PFOA was primary product; some PFOS and their precursors
- Wastes were disposed both on and off site
- 2000 - 3M announced phase-out of PFOA production worldwide by end of 2002
- Large scale investigations initiated by 3M and MPCA at areas of concern
  - Detections of PFCs in soil, groundwater, surface water, sediments, and fish tissue


HWY 61
Waste Disposal Area
Fire Fighting Area
Wastewater Settling Ponds
Sludge Disposal Area
West Cove
MISSISSIPPI RIVER
East Cove
Sediment & Surface Water samples
Monitoring wells

Current Fish Consumption Advice, Mississippi – Pool 2

- Based on mercury and PCB levels in fish
- Similar to General Statewide Fish Consumption Advice
- DNR has special regulations for Pool 2:
  - Catch & Release only: walleye, sauger, smallmouth bass and largemouth bass

Minnesota Statewide Fish Consumption Advice

	Panfish	Predators & Bottom Feeders	Large Predators
Women & Kids *	1 meal/wk	1 meal/mo	Do not eat
General Population	unrestricted	1 meal/wk	1 meal/wk

*Women who are or may become pregnant and kids up to age 15

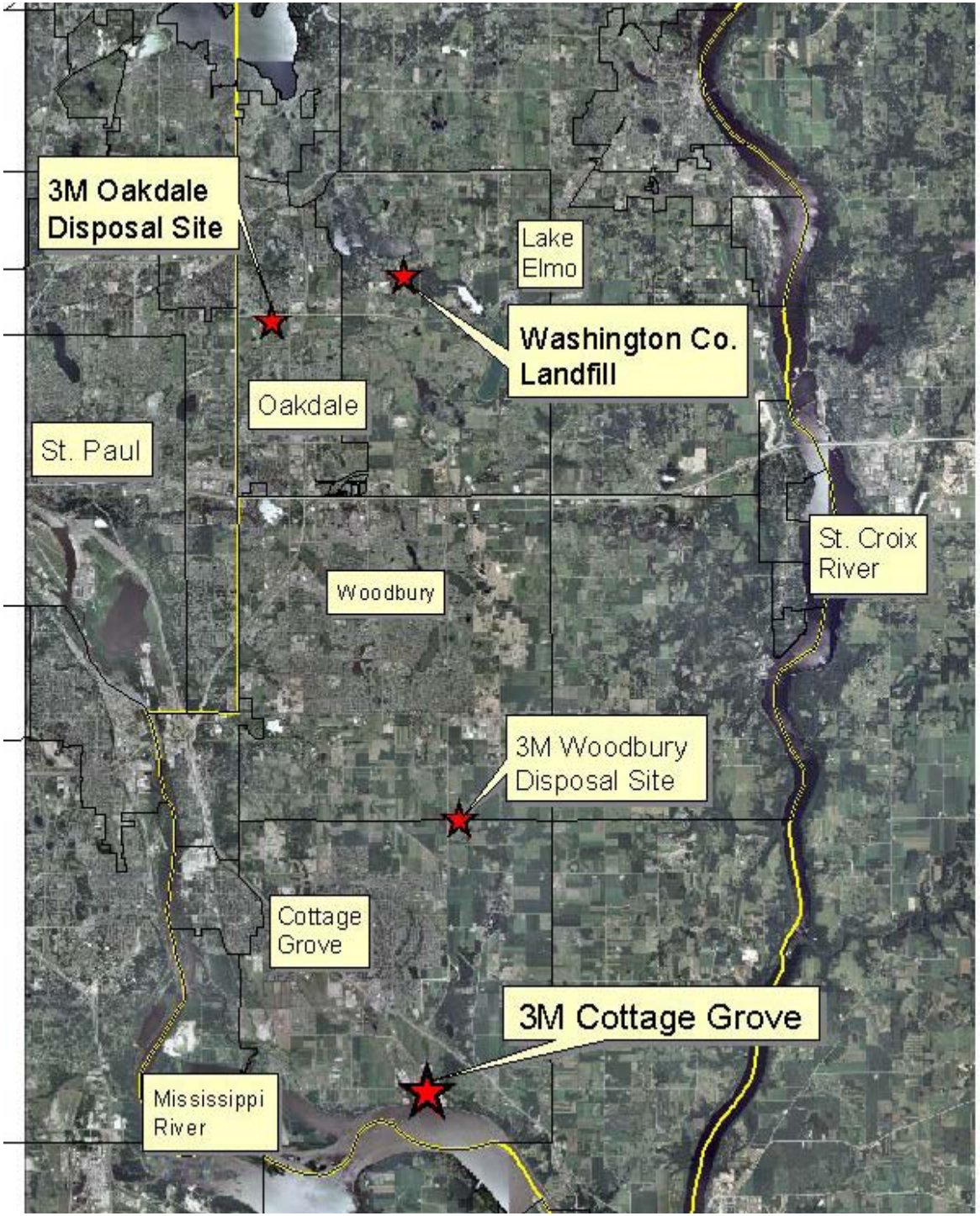
3M PFC Disposal Sites in Washington County

- **3M Cottage Grove Facility**
  - PFOA max. 1,863 ppb, PFOS 324 ppb in monitoring wells
- **Washington Co. Landfill**, Lake Elmo
  - PFOA max. 70 ppb, PFOS 1 ppb in monitoring wells
- **3M Oakdale Disposal Site**
  - PFOA max. 73 ppm, PFOS 13 ppm in monitoring wells
- **3M Woodbury Disposal Site**
  - 1-3 ppb of PFOA / PFOS in groundwater pump out

Other 3M PFC Disposal Sites

Other minor sites in the Twin Cities & greater MN being investigated by MPCA:

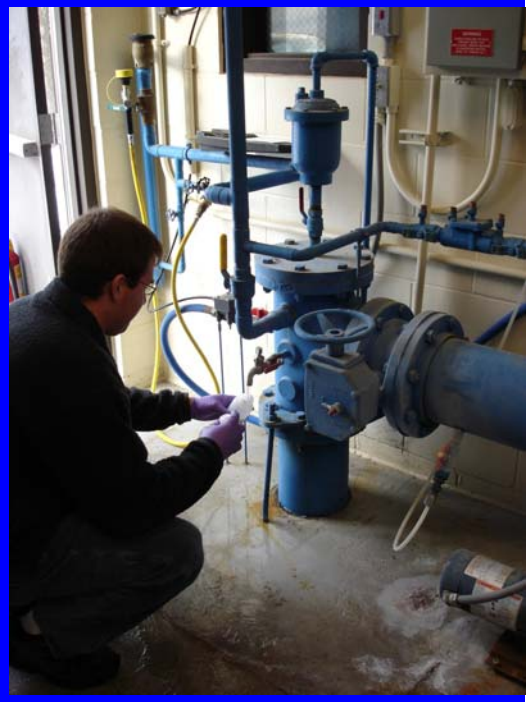
- **Pine Bend Landfill, Inver Grove Hts.**
  - Leachate: 12 PFCs; PFOA max = 0.08 ppb, PFOS max = 0.03 ppb
  - Gas Condensate: 12 PFCs; PFOA max = 0.08 ppb, PFOS max = 0.029 ppb
  - Groundwater: 8 PFCs; PFOA max = 0.001 ppb, PFOS max = 0.0001 ppb
- **Pig's Eye Landfill, St. Paul**
  - Groundwater: PFOA max = 51 ppb, PFOS max = 1.9 ppb
  - No direct groundwater receptors; discharges to Mississippi River
- **PCI, Shakopee**
  - Groundwater: PFOA max = 10.7 ppb, PFOS max = 0.8 ppb
- **ONYX Landfill, Buffalo**
  - Groundwater: no PFCs detected
- **SKB Facility, Rosemount**
  - Groundwater: PFOA max = 0.02 ppb, PFOS max = 0.004 ppb

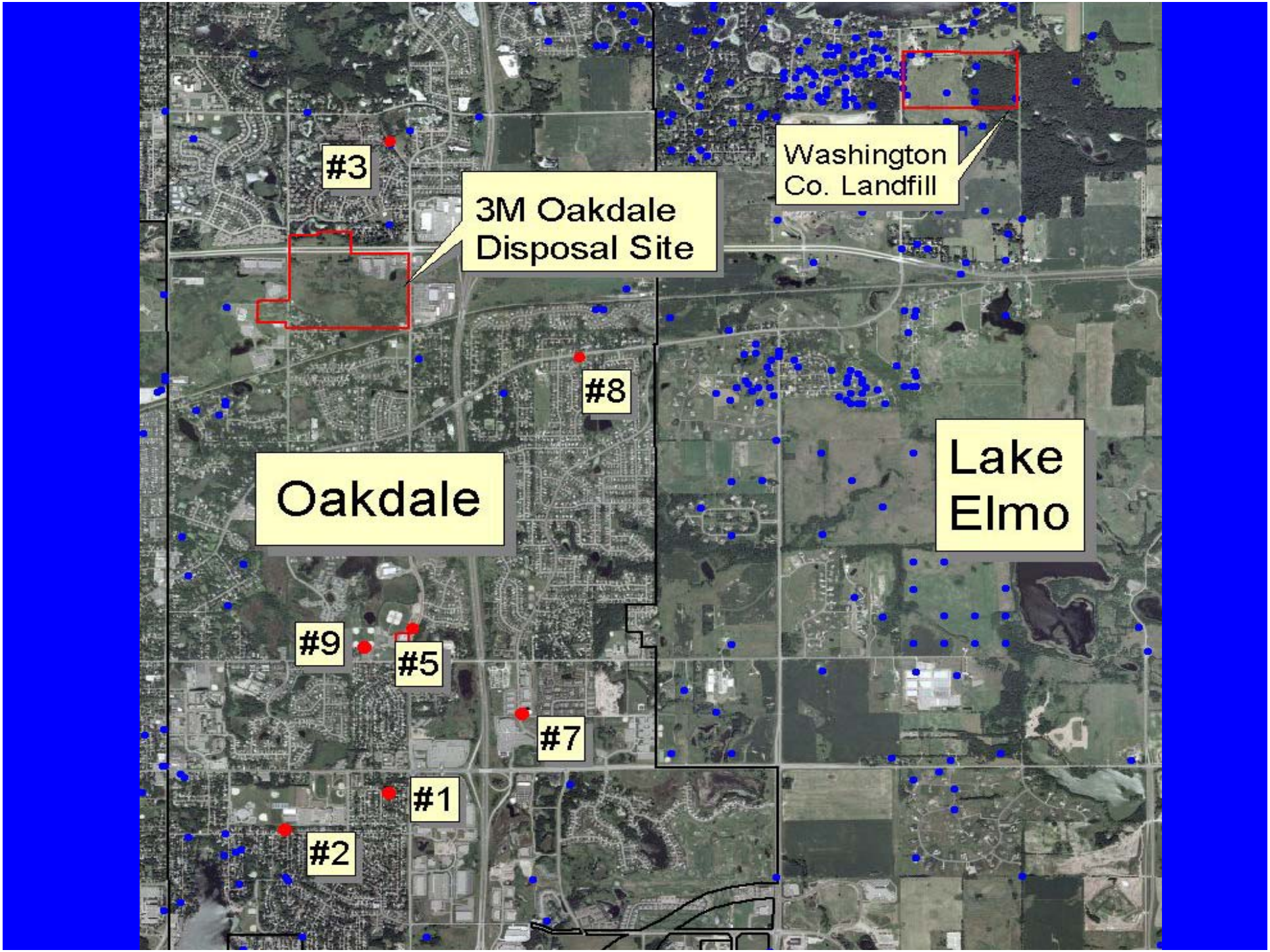


PFC Sites in Washington County, Minnesota

Water Supply Sampling near PFC Sites

- **Municipal wells**
  - Cottage Grove, Hastings, Lake Elmo, St. Paul, North St. Paul, and Woodbury: 30 wells, no PFCs detected
  - Oakdale: 7 wells, PFOS and PFOA detected in 6
- **Non-Community wells**
  - 22 wells in the Cottage Grove, Oakdale, Lake Elmo and Woodbury
  - No PFCs detected
- **Private wells**
  - Woodbury: 15 wells, no PFCs detected
  - Cottage Grove: 4 wells, no PFCs detected
  - Oakdale: 7 wells, PFOA detected in 1
  - Lake Elmo: 251 wells, PFCs detected in 83



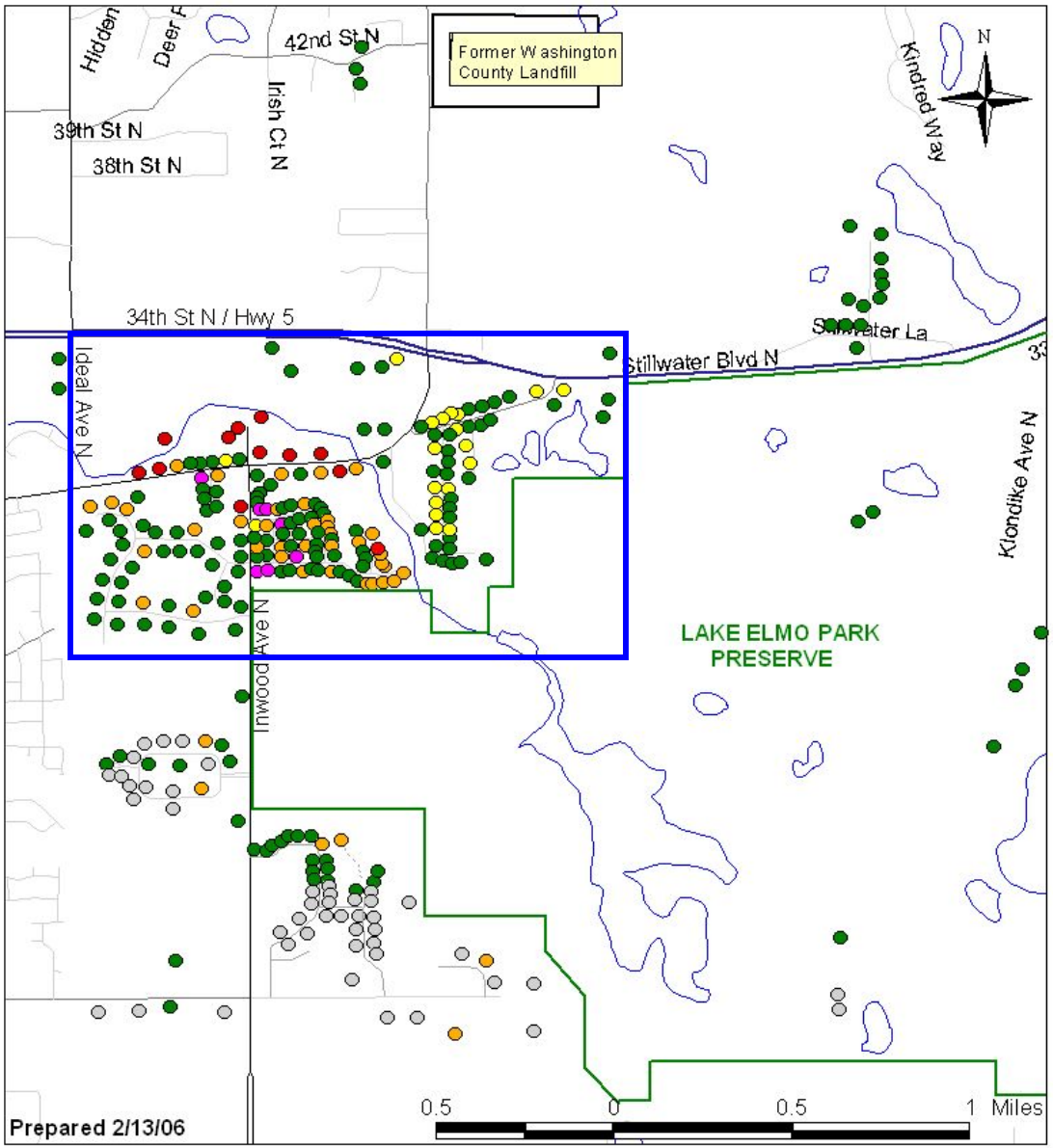

#3
3M Oakdale
Disposal Site
Washington
Co. Landfill
#8
Oakdale
Lake
Elmo
#9
#5
#7
#1
#2

Oakdale Well Data

- PFOS/PFOA consistently detected in 4 of 7 active city wells by MDH lab
  - Concentrations have remained relatively stable; monthly sampling
- Maximum of 1.4 ppb PFOS, 0.9 ppb PFOA in well #5
- Water from all wells mixes within city water system
- Wells with highest concentrations (#5, #8, #9) have been shifted to back-up status, to reduce contribution to system.
- City is working with 3M to install carbon filtration system on most contaminated well (#5) in 2006
- Seven private wells also sampled, one had 0.67 ppb PFOA

Lake Elmo Private Well Data

- 251 private wells have been tested by MDH
  - 50 more than once
- 12 have PFOS exceeding the HBV of 1 ppb
  - GAC filter systems installed, 100% removal rates
- 7 have combined PFOS and PFOA concentrations that exceed an additive health risk threshold
  - Also have GAC filter systems, 100% removal rates
- 64 have PFOS and/or PFOA concentrations below health based values
- 168 had no PFCs detected



PRIVATE WELL SAMPLING RESULTS - LAKE ELMO

- No PFCs
- Only PFOA, < HBV
- PFOS & PFOA, < HBV & HI
- PFOA & PFOA, > HI
- PFOS & PFOA, > HBV
- Not Sampled Yet

Ongoing Activities

- EPA
  - Draft Risk Assessment for PFOA - SAB Review 2/15/06
  - Development of toxicity values (IRIS process) for PFOA/PFOS is pending
  - Basic toxicological research
  - EPA PFOA Phase-out Initiative, 1/25/06 (95% reduction by 2010. Complete phase-out by 2015)
  - Working with industry to gather information on pathways of human exposure (e.g., product lifecycle investigations)

Ongoing Activities (cont)

- CDC is including perfluorinated compounds in NHANES
- NTP conducting class study of perfluorinated compounds
- NIEHS Ohio Community Study
  - 326 residents exposed through water supplies contaminated with PFOA; no effects observed
- Ohio/West Virginia: C8 (PFOA) Health Project
  - 70,000 residents exposed to PFOA in 6 water districts
  - Results in 3-4 years

Ongoing Activities (cont)

- MDH and MPCA
  - Continue to follow EPA activities
  - Reviewing toxicity data generated since HBVs were developed for possible revision of 2002 HBVs
  - Rule revision activities (e.g., changes to address higher water intake rates in infants and children)
  - MDH Laboratory development of analytical methods for additional PFCs
  - Ongoing site monitoring and investigations
  - Fish investigation and possible change in advisory

Conclusions

- A coordinated response by state, county, and local agencies and 3M has identified existing and potential PFC exposure pathways in Cottage Grove, Lake Elmo, and Oakdale.
- Interim measures in Lake Elmo have eliminated PFC drinking water exposures above Health Based Values.
- Planned measures in Oakdale and Lake Elmo will significantly reduce or eliminate PFC drinking water exposures by the end of 2006.
- Work continues to evaluate the magnitude and extent of PFC contamination in soil, surface water, groundwater, sediments, and fish.