

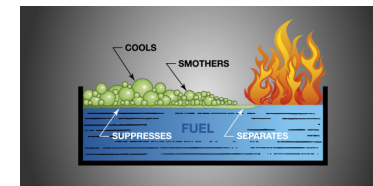
History and Current Status of PFAS Contamination in Kent County, Michigan

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Introduction to PFAS



For Leather



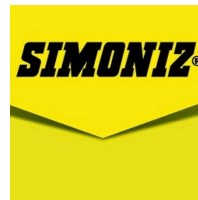
PFAS - Per- and Polyfluoroalkyl Substances

- 1000s of synthetic organic compounds used since 1940s that contain multiple Fluorine (F) atoms
- 2 most studied PFAS are **Perfluorooctanoic Acid (PFOA)** and **Perfluorooctane Sulfonate (PFOS)**

Wide range of industrial applications:

- Polymers and coatings (Scotchgard®, Teflon®, Gore-Tex®, Stainmaster®)
- Fire-fighting foams (AFFF - Aqueous Film Forming Foam)
- Metal plating, cosmetics, food packaging, electronic and semiconductor applications, oil/mining production,

Found globally, even in remote places – transport in air and biota



Area Geology

- Intersection of Lake Michigan and Saginaw Glacial Lobes. Meltwater sorting and transport of alluvial materials.
- Outwash and Channel Deposits. Horizontally bedded and cross bedded deposits of fine to coarse sand, pebbles, and cobbles forming a large terraced valley train system.
- **Complex and variable geology, permeable soils, rapid transit times**
- **Highly Productive and vulnerable aquifer system**



Larson et al 2000

Wolverine World Wide Rockford Tannery

- 1908-2010. Demolished in 2011. 15 acres
- Rogue River – National Scenic River and trout stream
- Bark and chromium tanning in the 1940s.
- Introduced Hush Puppies shoes with Scotchgard waterproofing in 1958
- Wastewater plant built in 1968
- Wastewater discharge to City of Rockford and later Grand Rapids
- City of Rockford drinking water intake downstream from the factory and upstream of wastewater discharge 1925-1999
- 3M notified WWW in 1999 that Scotchgard would be discontinued in 2002 due to environmental and health concerns.
- Tanning Process produces **850 kg solid waste per 1000 kg hides processed*** so off site disposal of industrial wastes was necessary

**Kanagaraj et al 2000*



MLive 2018

WWW Tannery 15+ years post Scotchgard usage

| | | |
|--------------------|---------|---------|
| P-2 | 4.7-9.4 | 8/31/17 |
| Total Amm = 48,000 | | |

| | | |
|---------------|---------|---------|
| P-2 | 4.7-9.4 | 8/31/17 |
| PFOA = 14,000 | | |
| PFOS = 30,000 | | |

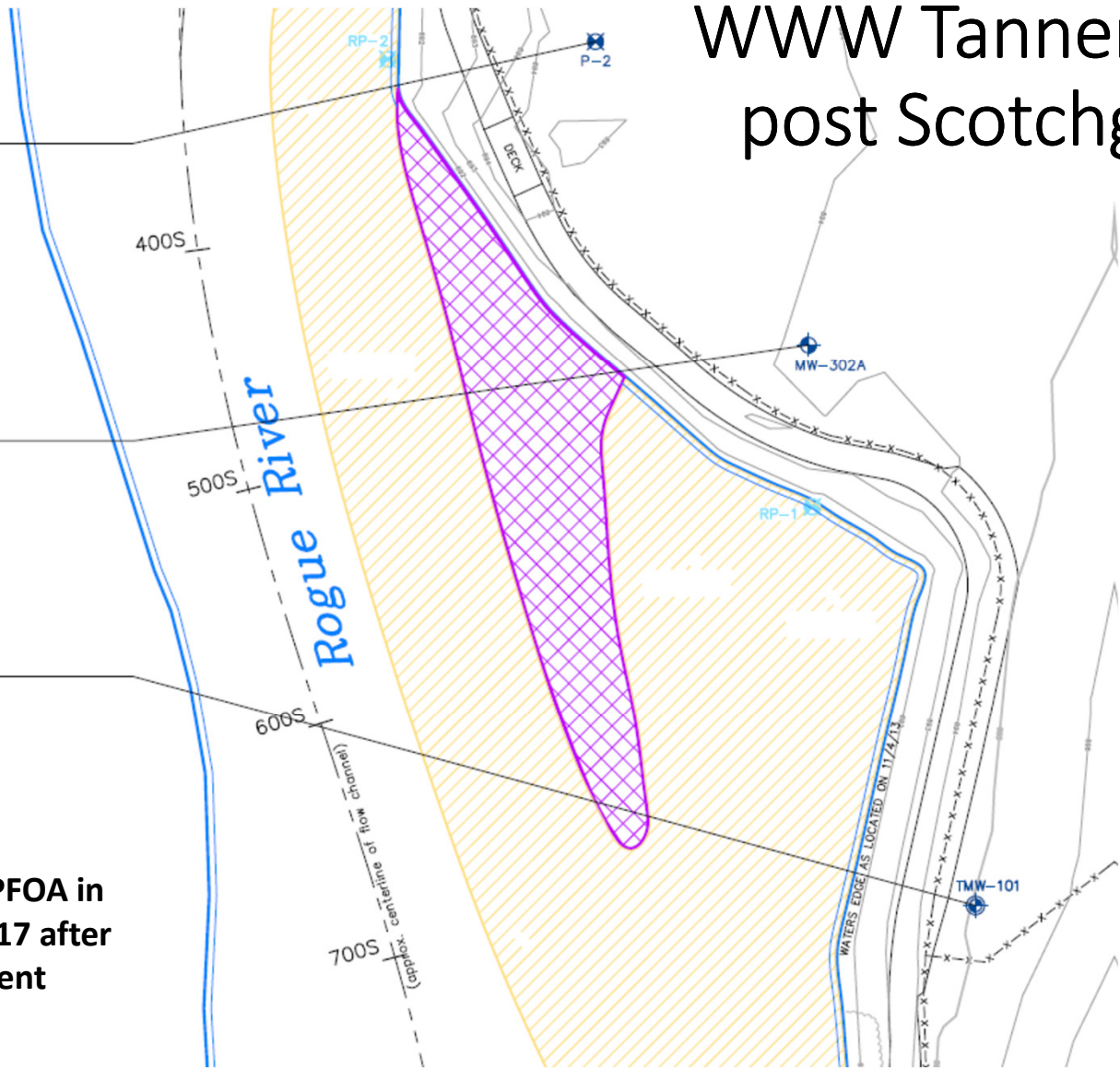
| | | |
|-------------------|---------|--------|
| MW-302A | 3.6-6.0 | 9/1/17 |
| Total Amm = 4,000 | | |

| | | |
|--------------|---------|--------|
| MW-302A | 3.6-6.0 | 9/1/17 |
| PFOA = 3,100 | | |
| PFOS = 9,600 | | |

| | | |
|------------------|----------|--------|
| TMW-101 | 5.7-10.5 | 9/1/17 |
| Total Amm = <100 | | |

| | | |
|----------------|----------|--------|
| TMW-101 | 5.7-10.5 | 9/1/17 |
| PFOA = 160,000 | | |
| PFOS = 330,000 | | |

10-16 ppt PFOS/PFOA in Rogue River in 2017 after major rain event



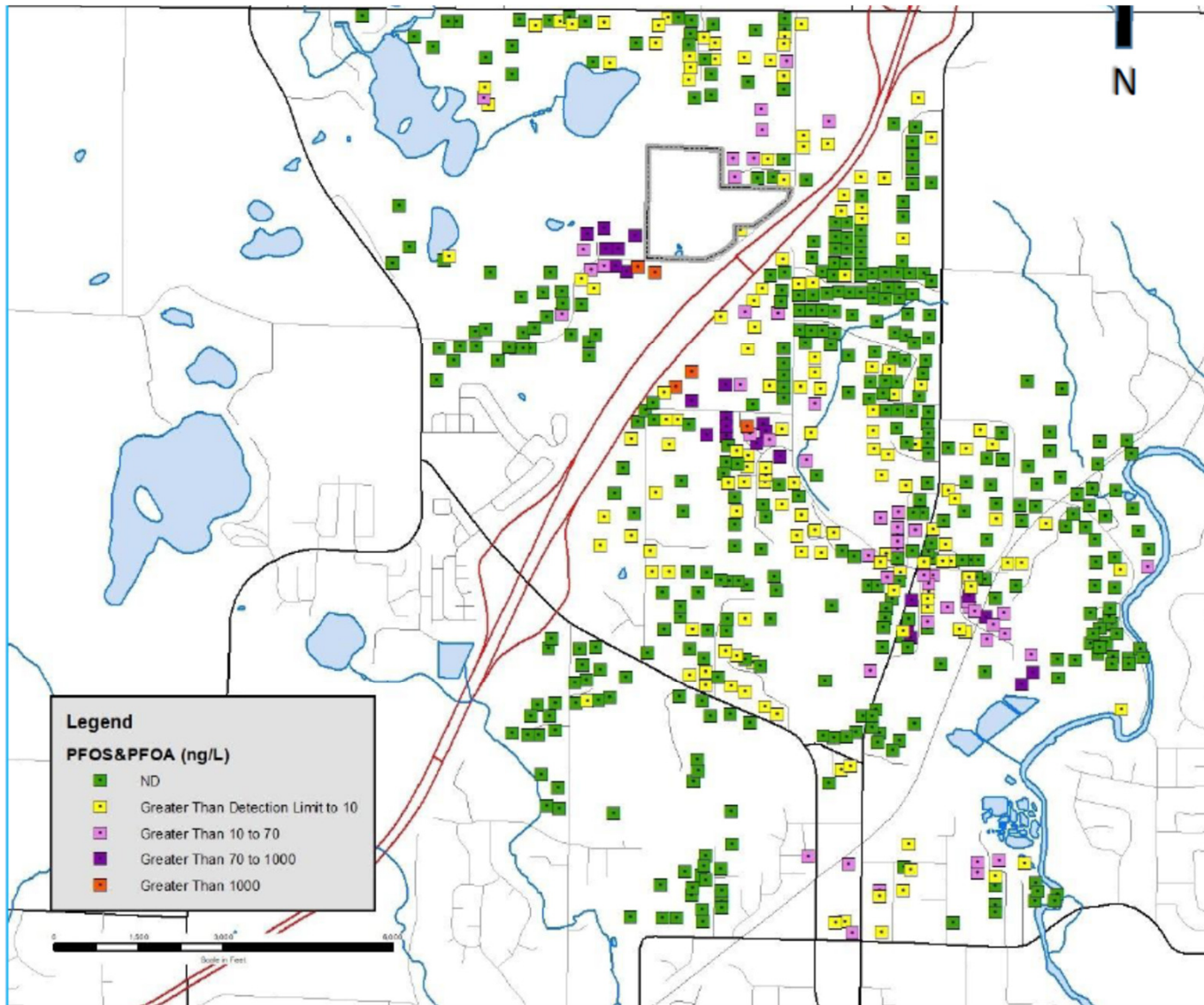
490,000 ppt PFOS/PFOA in groundwater near former Chemical Storage area

GZA, 2017

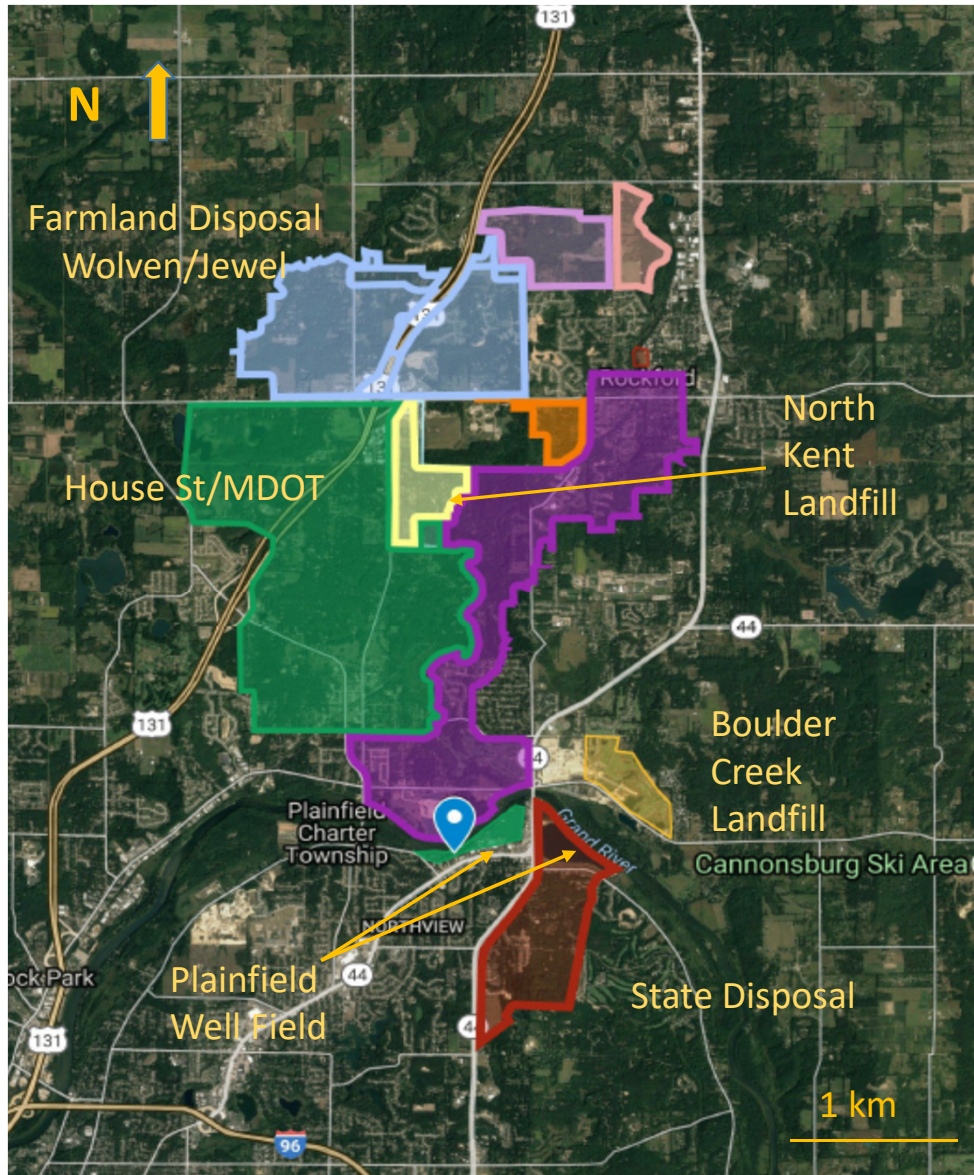
Solid Waste Disposal Areas

- **House Street – Permitted Site 1950s-1960s. PFAS contamination large groundwater plume. 656 wells tested; highest well 38,800 ppt (PFOA/PFOS), 233 had positive detections, 30 > 70 ppt.**
- **MDOT – Metals and VOCs 1940-??? Metals and VOCs**
- **Northeast Gravel/Boulder Creek Golf Course. Permitted Site 1970s electroplating, tannery, other industrial waste. Possible impact to Plainfield Township well field**
- **State Disposal –Permitted Site 1966 to 1976. Superfund Site Metals, VOCs. PFAS was found at levels in Plainfield Twp's municipal water supply wells at Versluis Lake (600-800 ppt), which were shut down in 2015. Versluis well field in operation since the 1980s.**
- **Pierson Landfill Permitted Site (Mecosta County) PFAS found in monitoring wells 2018**
- **Butterworth Landfill – Closed Superfund Site Grand Rapids ???**
- **Farmland application PFAS in Wolven/Jewel Areas 530 wells tested; highest well 58,930 ppt (PFOA/PFOS), 194 had positive detections, 67> 70 ppt.**
- **North Kent Landfill. Permitted Site. 41 wells tested, 3 positive for PFOS/PFOA, highest 58 ppt**
- **Other areas ??????**

House St Disposal Area



GZA, 2017



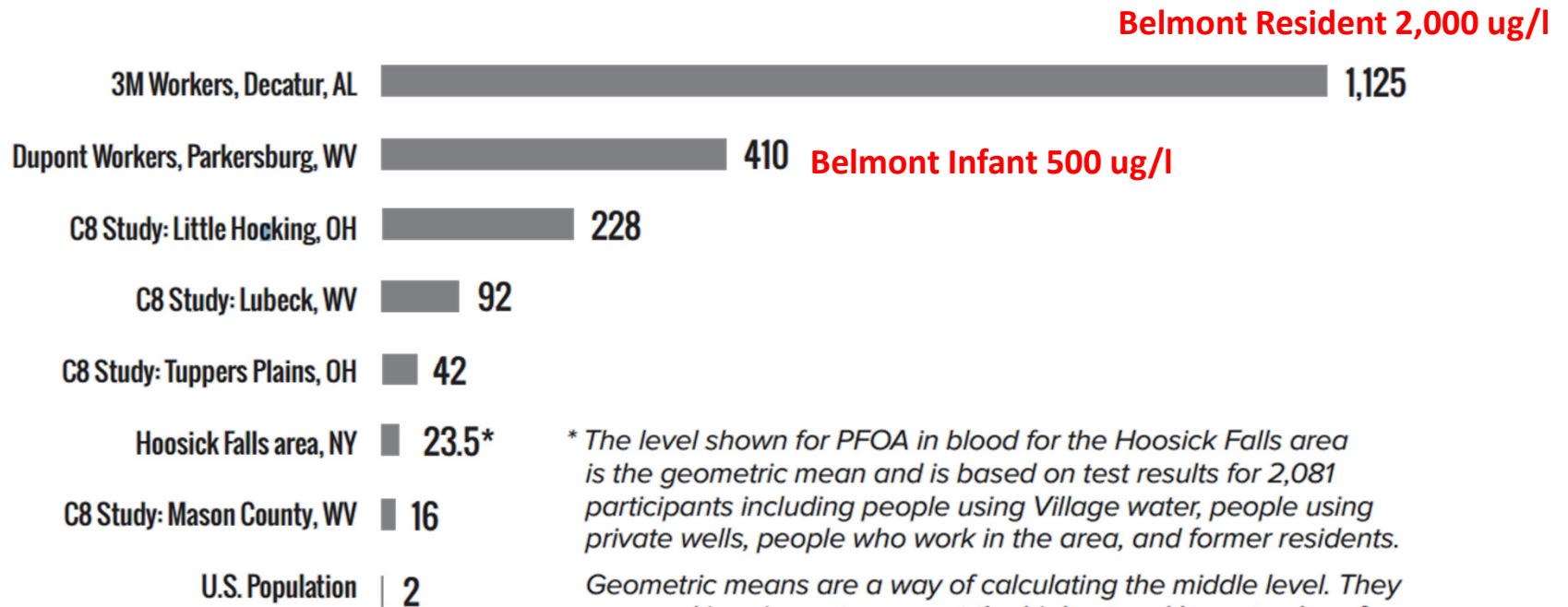
Rockford Area Plume

- Over 50 km²
- Rogue River affected up to Sparta 40 km
- Waste disposal sites, landfills, gravel pits, the Tannery, and farmland disposal of sludge
- Plainfield township groundwater supply wells 40,000 people
- Thousands of residential groundwater wells

Mlive, 2018

Average PFOA Levels in Blood ($\mu\text{g}/\text{L}$)

(<https://www.health.ny.gov/environmental/investigations/hoosick/docs/qandabloodtestingshort.pdf>)



* The level shown for PFOA in blood for the Hoosick Falls area is the geometric mean and is based on test results for 2,081 participants including people using Village water, people using private wells, people who work in the area, and former residents.

Geometric means are a way of calculating the middle level. They are used in science to prevent the highest and lowest values from distorting the average when rest of the data are close together.

Current Status

- MDEQ MPART website updates stopped in January 4, 2018
- Epidemiology Study proposed in 2017 and status unknown
- Extent of impact to area groundwater with respect to future municipal water supply unknown. Plainfield Township municipal water range 5-11 ppt PFOS/PFOA with an average of 8.5 ppt. Carbon filtration system approved.
- Impacts to fisheries and the environment unknown. MDEQ investigation in 2018.
- Public Advisory Council needed