



PFAS – Background & Monitoring

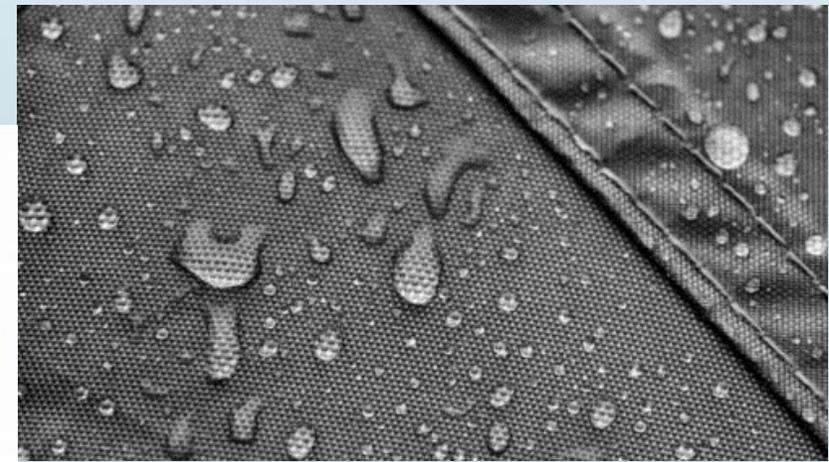
Joseph Grande, Water Quality Manager



**Madison
Water Utility**

What are PFAS?

- ▶ Per- and polyfluoroalkyl substances (PFAS)
- ▶ A group of man-made chemicals designed to repel water, oil, and grease
- ▶ Present in many consumer products



PFAS: Per- and polyfluoroalkyl Substances

- Includes 3000+ chemicals with a shared chemistry

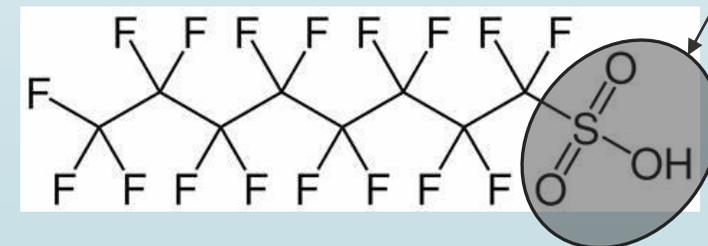
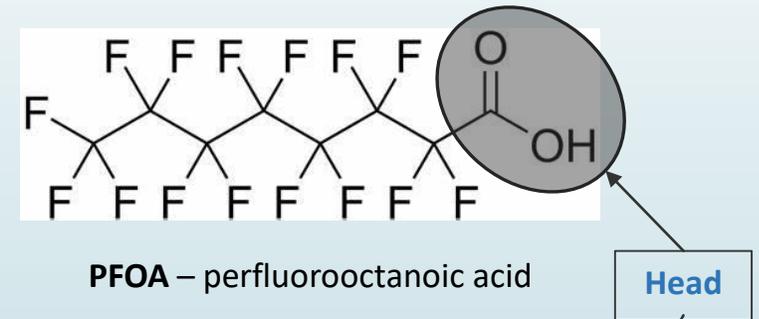
- ✓ Tail: Variable length carbon chain that is either fully or partially fluorinated
- ✓ Head: Variable chemical group

- High environmental risk

- ✓ Do not readily degrade
- ✓ Very mobile

- Potential human health risk

- ✓ Bio accumulative
- ✓ Long half-life in humans
- ✓ Can be toxic at low levels





PFAS: Environmental Sources

- ▶ Manufacturing & Industrial Sites
 - ▶ Chemical (PFAS) manufacturers
 - ▶ Secondary manufacturers: coating application
 - ▶ Textile & leather processors, paper mills
 - ▶ Plating facilities, metal finishers, wire manufacturers
 - ▶ Facilities using surfactants, resins, plastics, molds
- ▶ AFFF Use / Fire Training Areas
 - ▶ Commercial & civilian airports
 - ▶ Military bases
- ▶ Landfills
- ▶ Land Spreading – Biosolids



PFAS: Exposure Pathways

- ▶ Drinking water and soil from industrial areas with frequent PFAS manufacture, disposal, or use
- ▶ Indoor air or dust from consumer products treated with PFAS to resist stains
- ▶ Surface water or groundwater receiving run-off or seepage from areas where firefighting foam was often used (like military or commercial airfields)
- ▶ Fish from contaminated bodies of water
- ▶ Grease resistant food packaging and paper products



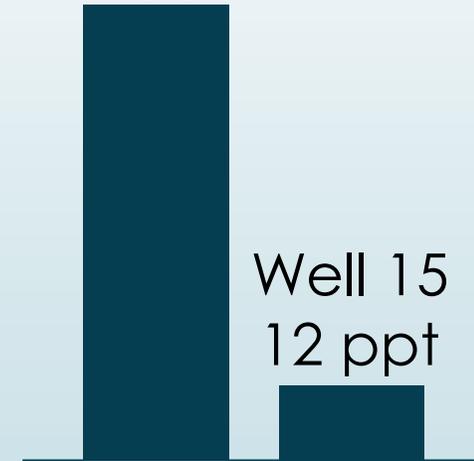
Potential Human Health Impacts

- ▶ Scientists are still learning about the health effects.
 - ▶ The more widely used substances, like PFOS, PFOA, perfluorohexane sulfonic acid (PFHxS), and perfluorononanoic acid (PFNA), have been studied more than other PFAS.
- ▶ Some, but not all, studies in humans have shown that certain PFAS may:
 - ▶ Affect growth, learning, and behavior of infants and older children
 - ▶ Lower a person's chance of getting pregnant
 - ▶ Interfere with the body's natural hormones
 - ▶ Increase cholesterol levels
 - ▶ Affect the immune system
 - ▶ Increase the risk of cancer
- ▶ Scientists are still learning about the effects of exposures to mixtures of PFAS.
- ▶ The science is very limited for the next generation/replacement PFAS.

Guidance: EPA Health Advisory Level

- ▶ Combined PFOA & PFOS
- ▶ Provides a margin of safety
- ▶ Emphasis on fetuses and breastfed infants
- ▶ Based on things like:
 - ▶ Body weight
 - ▶ Water consumption
 - ▶ Estimate of other PFA exposures

EPA Health
Advisory
70 ppt



ppt: part per trillion

Federal and State Drinking Water Guidelines

INDIVIDUAL PFAS COMPOUNDS

	PFOA	PFOS	PFHxS	PFHpA	PFNA	PFBA	PFBS	Gen-X
New Jersey	14	13			13			
California	14	13						
Minnesota	35	27	27			7000	2000	
New Hampshire	70	38	85		23			
North Carolina								140

SUMMED PFAS

	PFOA	PFOS	PFHxS	PFHpA	PFNA	PFBA	PFBS	Gen-X
Vermont	20							
Alaska	70						2000	
Connecticut	70							
Massachusetts	70						2000	
Maine	70							
Michigan	70							
New Hampshire	70							
Rhode Island	70							
US EPA	70							

Sources: www.asdwa.org/pfas/ Accessed 1/18/19
pfas-1.itrcweb.org Accessed 3/6/19



PFAS Monitoring

Madison Water Utility PFAS Monitoring

2012: EPA Method 537

6 types of
PFAS

Reporting limit:
10-90 ppt

Tested 4 wells
(6, 11, 14, 16)

Results:

No detections.

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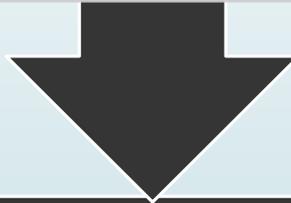
Madison Water Utility PFAS Monitoring

2015: EPA Method 537

6 types of
PFAS

Reporting limit:
10-90 ppt

Tested all wells
twice

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Results:

No detections.

Madison Water Utility PFAS Monitoring

2017: Modified EPA Method 537

6 types of PFAS

Reporting limit:
2 ppt

Tested 5 wells
(7, 15, 16, 18, 29)

Results:

Well 15

Total PFAS: 31 - 35 ppt

Well 16

Total PFAS: 2.4 - 2.6 ppt

Madison Water Utility PFAS Monitoring

2018: Modified EPA Method 537

12 & 18 types of
PFAS

Reporting limit:
2 ppt

Tested 2 wells
(15 *twice*, 16)

Results:

Well 15
Total PFAS: 37 - 42 ppt

Well 16
Total PFAS: 2.4 ppt

Madison Water Utility PFAS Monitoring

2019: Modified EPA Method 537

24 & 30 types
of PFAS

Reporting limit:
2 – 4 ppt

Test all 22 wells

Results:

PFOA + PFOS ranges from ND to 12 ppt

Total PFAS ranges from ND to 56 ppt

MADISON WATER UTILITY 2019 PFAS Testing

5/16/2019

Well PFAS Testing Results



LOW



TRACE



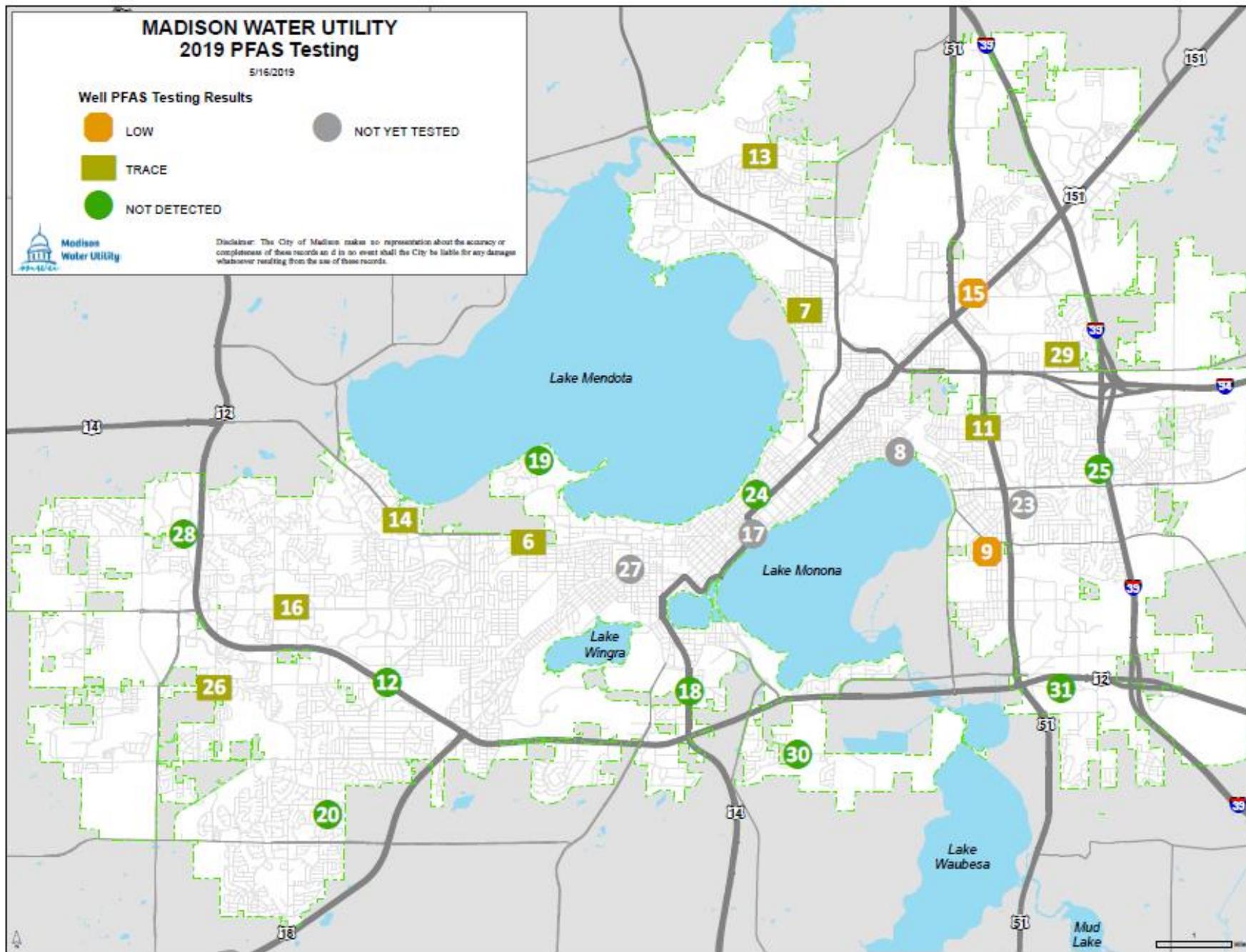
NOT DETECTED



NOT YET TESTED



Disclaimer: The City of Madison makes no representation about the accuracy or completeness of these records and it is an event shall the City be liable for any damages whatsoever resulting from the use of these records.

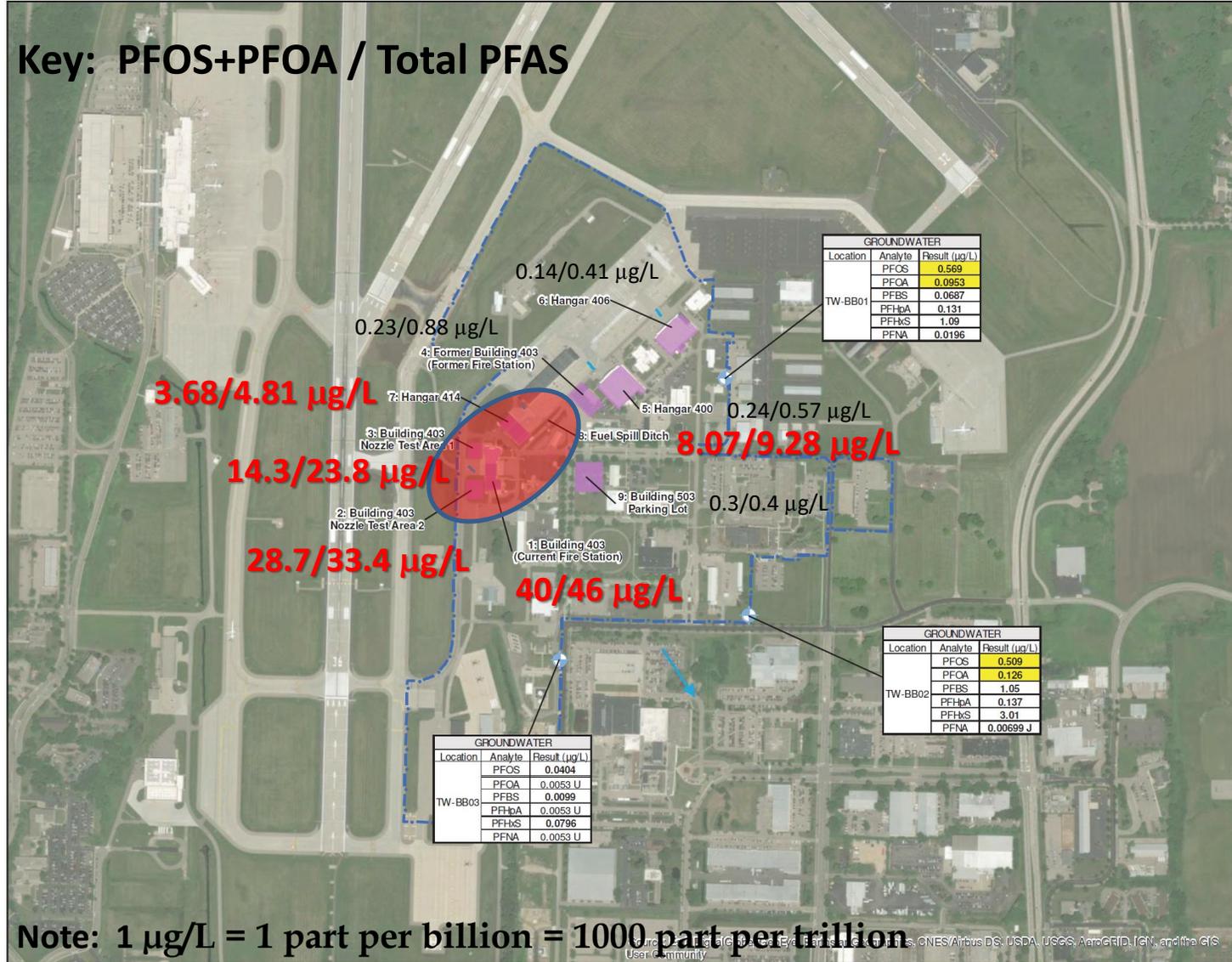




Known PFAS Source

Truax Field – Air National Guard Base

Key: PFOS+PFOA / Total PFAS



BASE BOUNDARY ANALYTICAL RESULTS
Truax Field Air National Guard Base
Madison, Wisconsin

Legend

- Temporary Monitoring Well
- Installation Area (approximate)
- Potential AFFF PFOS/PFOA PRL (approximate)
- Assumed Groundwater Flow

Notes & Sources

Notes:
AFFF = aqueous film forming foam
PRL = potential release location
PFC = perfluorinated compounds
PFOS = Perfluorooctanesulfonic acid
PFOA = Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
PFHxA = Perfluorheptanoic acid
PFHxS = Perfluorhexanesulfonic acid
PFNA = Perfluorononanoic acid

BOLD text indicates a detection
YELLOW highlighted cells indicate 0.07 µg/L Health Advisory Exceedance.

* Field duplicate value exceeded primary sample

Sources: Potential AFFF PFC PRLs and Installation Area datalayers obtained from Figure 2 of the Final Perfluorinated Compounds Preliminary Assessment Site Visit Report prepared by BB&E and dated February 2016.

0 317.5 635 Feet

FIGURE 9

amec foster wheeler
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Novi, MI 48377
(248) 926-4008



Next Steps



Next Steps – One Year

- ▶ Continue testing Madison drinking water wells
- ▶ WDNR – Fish tissue sampling and analysis
 - Revise fish consumption advisory(?)
- ▶ Soil and groundwater testing – Truax / Airport
- ▶ Water/sediment testing – Starkweather Creek
- ▶ Wait for DNR/DHS interim guidance for PFOA and PFOS (groundwater standard)

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Next Steps – Long Term

- ▶ Characterize extent of known contamination
- ▶ Evaluate treatment alternatives
- ▶ Clean up sources

Questions?



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www.cityofmadison.com/water/water-quality/water-quality-testing/perfluorinated-compounds