

ATC/MG&E Transformer Spill



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Initial Incident Overview

- July 19, 2019
- Transformer explosion at MGE Substation – Main St. (a few blocks E of capitol)
- Majority of 18,000 gallons of mineral oil in transformer spilled
- Secondary fire a mile away



MFD used 59g of Class A/B Foam (AFFF) mixed w/ 120,000 g of water. Entered storm sewer.



Failed Transformer & Oil Skimming



Absorbents on Main St.



- 120,000 g of water entered storm sewers
- High water in surrounding lakes “contained” PFAS, no rain
- Contractors/consultants: North Shore (ATC), AECOM (ATC) and SCS (MG&E)



Source: Madison West and Madison East, Wisconsin Quadrangles, 7.5 Minute Series, 1983.



Water Cleanup

- Oil “non-PCB” – 14,000g removed from oil/water separation
- 60,000g of water from cable vaults and nearby catch basins
- 80,000g of water from storm sewers
- 40,000g of water from later skimming, utility vault dewatering, & oil/water separation (installing replacement transformer)
- Boom placed/replaced at outfalls & storm sewer (reduced to sheen)
- Samples tested for DRO & PFAS to guide cleanup. Some PCB sampling.

Oil/Water/Foam Removal



Oil/Water/Foam Removal



Frac Tanks on Main St. (water storage)



Oil skimming next to transformer pad



Yahara River Outfall Monitoring/Boom Placement



Lake Monona Outfall Boom Placement



Soil

- Initial 60 to 80 cy of soil scraped from substation yard and perimeter
- Additional 300 cy of soil later excavated from foundation for new transformer
 - Can't find disposal location in WI
 - Being transported to US Ecology (PCB Cell) in Belleville, MI
- More soil possible pending additional sampling

Soil Excavation (Main St.)







Livingston Catch Basin: samples "LW1" & "LW2"

Main Street Substation

Blount Storm Culvert Access: sample "Blount"

PFAS-Contaminated Water

- AFFF Foam (FireAde) was initially believed to not contain PFAS, but SDS said:

Not Available	<1.2	proprietary foamer blend (water, amphoteric copolymer, amphoteric polymer, C6 fluorosurfactant, acrylic copolymer, propylene glycol, ethanol)
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- Later obtained Certificate of Analysis for foam
 - Reported 17 PFAS compounds
 - Reporting Detection Limit 20 ppt → cannot report below 20 ppt
 - PFHxA (C6) only detected analyte in Certification of Analysis (may be others below the reporting limit.....)

Perfluoroheptane sulfonate	ug/L	<0.020	<0.020	0.020
Perfluoroheptanoic Acid (PFHpA)	ug/L	<0.020	<0.020	0.020
Perfluorohexane Sulfonate (PFHxS)	ug/L	<0.020	<0.020	0.020
Perfluorohexanoic Acid (PFHxA)	ug/L	<0.020	0.088	0.020
Perfluoro-n-Octanoic Acid (PFOA)	ug/L	<0.020	<0.020	0.020
Perfluorononanoic Acid (PFNA)	ug/L	<0.020	<0.020	0.020

PFAS-Contaminated Water

- PFHxA (C6) was 88 ppt before dilution with storm sewer (based upon analysis). Storm water analysis was diluted.
- What about proprietary chemicals? Other PFAS compounds?
- Takes a week to get results
- Meanwhile, North Shore recovered foam from storm sewers pending results

Results

			Sample ID:	Catch Basin	Surface Water	Blount	LW
			Sample Date:	7/19/2019	7/19/2019	7/19/2019	7/19/2019
			Sampled By:	North Shore	North Shore	North Shore	North Shore
Abbreviation	Analyte	CAS Number					
4:2 FTS	4:2 Fluorotelomer Sulfonic Acid or 4:2 FTSA	757124-72-4	<4.7	-	<4.5	<4.7	
6:2 FTS	6:2 Fluorotelomer sulfonic acid	27619-97-2	230	790	45	80	
8:2 FTS	8:2 Fluorotelomer sulfonic acid	39108-34-4	19	21	1.9 J	2.5 J	
10:2 FTS	10:2 FTS	120226-60-0	1.5 J	1.1 J	0.28 J	0.87 J	
ADONA	ADONA	958445-44-8	<0.17	<0.18	<0.16	<0.17	
APFO	Ammonium Perfluorooctanoate	-	1.9	2.8	3.4	1.7 J	
DONA	DONA	919005-14-4	<0.16	<0.17	<0.16	<0.16	
EtFOSAA	EtFOSAA	4151-50-2	<1.7	-	-	-	
F-53B Major	F-53B Major	756426-58-1	<0.22	<0.22	<0.21	<0.22	
F-53B Minor	F-53B Minor	763051-92-9	<0.29	<0.30	<0.28	<0.29	
FOSA	Perfluorooctanesulfonamide	754-91-6	<0.32	<0.32	<0.30	<0.32	
GenX	HFPO-DA	13252-13-6	<1.4	<1.4	<1.3	<1.4	
NaDONA	NaDONA	-	<0.17	<0.18	<0.16	<0.17	
NEtFOSAA	N-ethylperfluorooctanesulfonamidoacetic acid	2991-50-6	<1.7	<1.8	<1.6	<1.7	
NMeFOSAA	N-methylperfluorooctanesulfonamidoacetic acid	2355-31-9	<2.8	<2.9	<2.7	<2.8	
PFBA	Perfluorobutanoic acid	375-22-4	4.3	14	9.5	1.8	
PFBS	Perfluorobutanesulfonic acid	375-73-5	0.33 J	0.71 J	1.8	0.21 J	
PFDA	Perfluorodecanoic acid	335-76-2	0.35 J	0.68 J	0.73 J	<0.28	
PFDoA	Perfluorododecanoic acid	307-55-1	<0.50	<0.51	<0.48	<0.50	
PFDos	Perfluorododecanesulfonic acid	79780-39-5	<0.41	<0.42	<0.39	<0.41	

6:2 FTS standards are 200 ppt (Canada) and 100 ppt (Denmark)

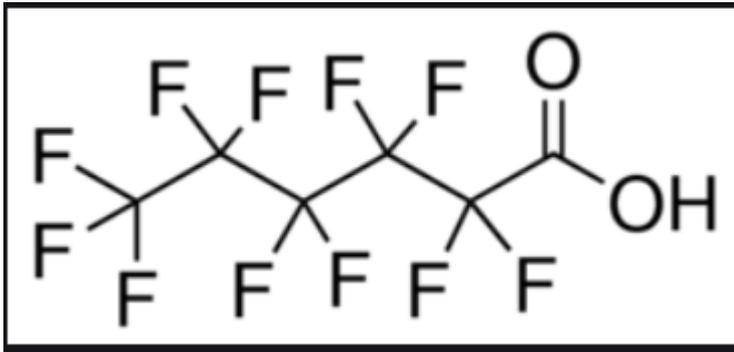
Most concentrations < 20 ppt (LOD in Certificate of Analysis)

Results

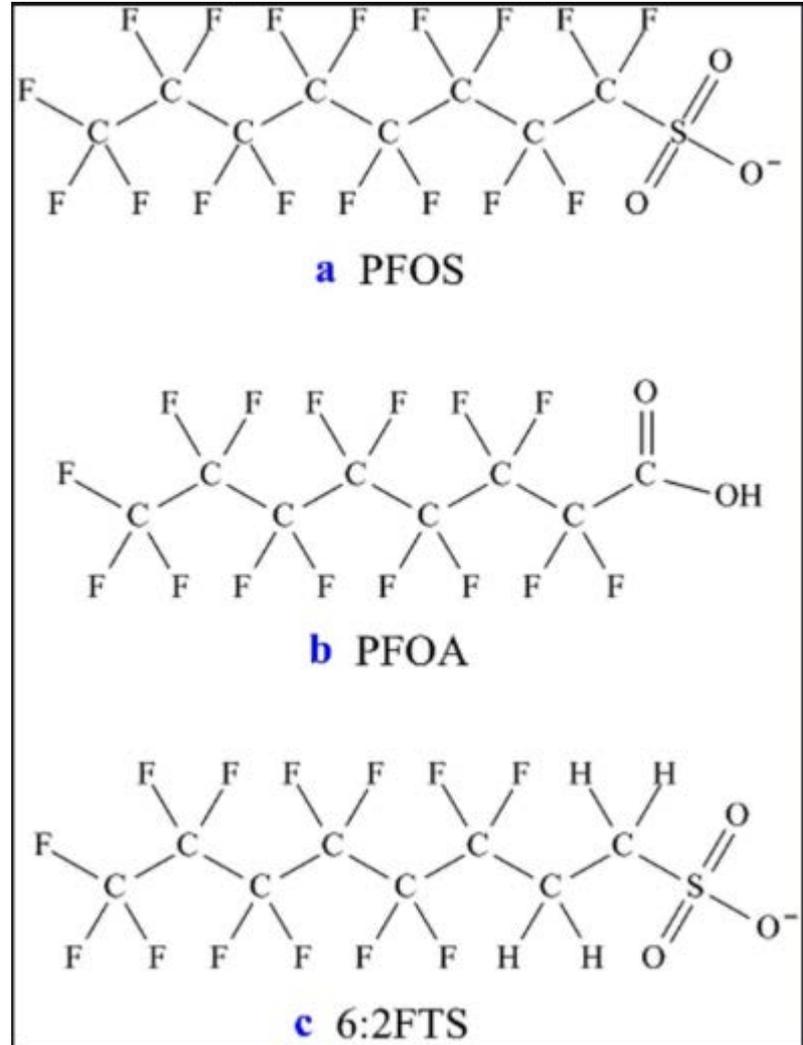
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Abbreviation	Analyte	CAS Number					
PFDS	Perfluorodecanesulfonic acid	335-77-3	<0.29	<0.30	<0.28	<0.29	
PFHpA	Perfluoroheptanoic acid	375-85-9	0.67 J	3.0	1.5 J	0.41 J	
PFHpS	Perfluoroheptanesulfonic Acid	375-92-8	<0.17	<0.18	<0.16	<0.17	
PFHxA	Perfluorohexanoic acid	307-24-4	7.0	26	3.9	6.3	
PFHxDA	Perfluoro-n-hexadecanoic acid	67905-19-5	<0.81	<0.83	<0.77	<0.81	
PFHxS	Perfluorohexanesulfonic acid	355-46-4	0.81 J B	1.9 B	4.4 B	0.40 J B	
PFNA	Perfluorononaic acid	375-95-1	0.43 J	0.60 J	0.55 J	<0.25	
PFNS	Perfluorononanesulfonic Acid	68259-12-1	<0.15	<0.15	<0.14	<0.15	
PFOA	Perfluorooctanoic acid	335-67-1	1.8	2.7	3.2	1.6 J	
PFODA	Perfluoro-n-octadecanoic acid	16517-11-6	<0.42	<0.43	<0.40	<0.42	
PFOS	Perfluorooctanesulfonic acid	1763-23-1	7 CL	13 CL	6.1	2.9 CL	
PFPeA	Perfluoropentanoic acid	2706-90-3	3.2	12	2.8	1.5 J	
PFPeS	Perfluoropentanesulfonic acid	2706-91-4	<0.27	<0.28	<0.26	<0.27	
PFTeA	Perfluorotetradecanoic acid	376-06-7	<0.26	0.60 J	0.44 J	<0.26	
PFTriA	Perfluorotridecanoic acid	72629-94-8	<1.2	<1.2	<1.1	<1.2	
PFUnA	Perfluoroundecanoic acid	2058-94-8	<1.0	<1.0	<0.95	<1.0	

Texas dw standard for PFHxA is 93 ppt

WI proposed ES is 20 ppt for PFOA/PFOS



PFHxA ($C_6H_{11}F_{11}O_2$) – 5 F-saturated Cs.



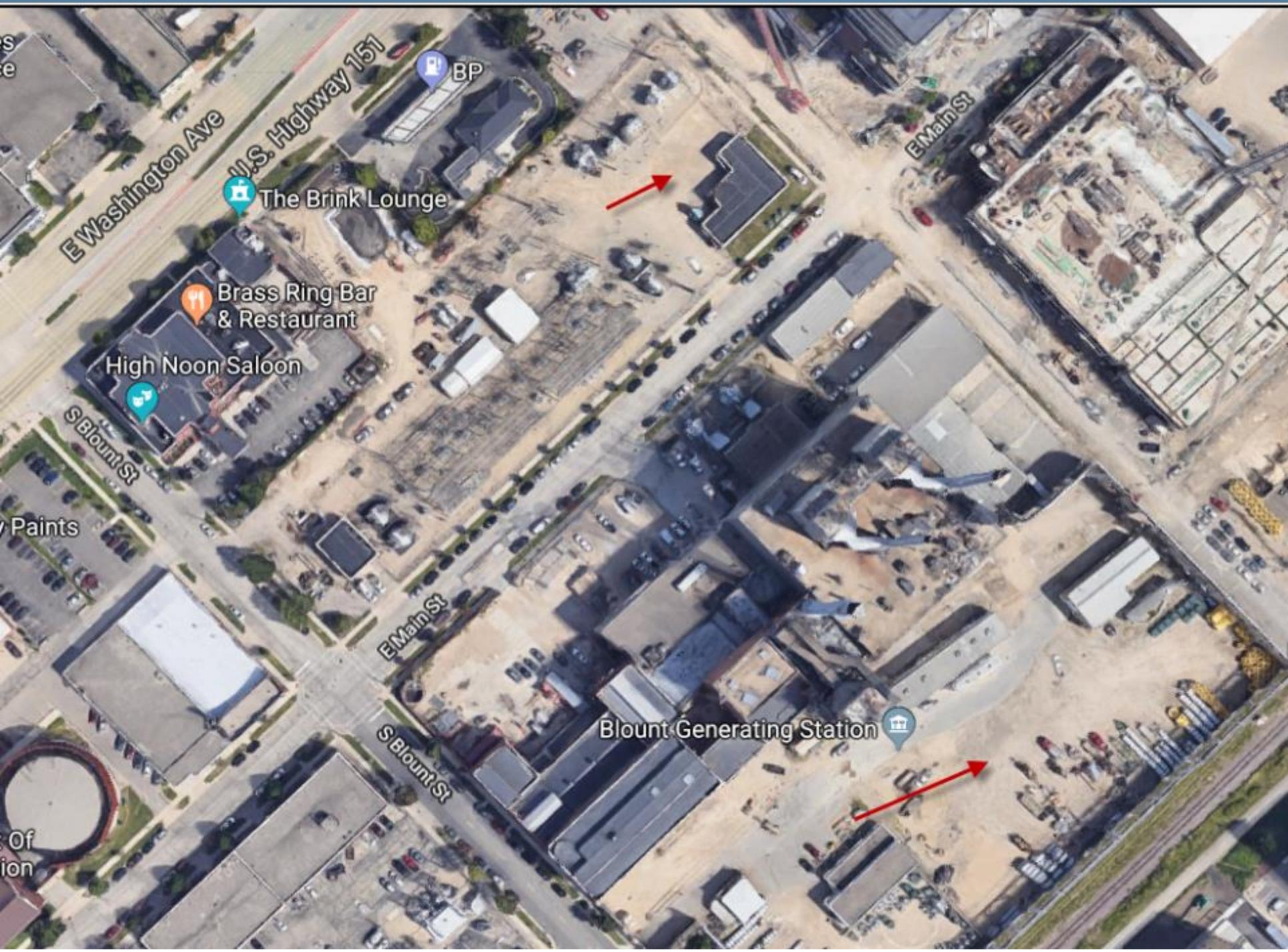
PFOS to 6:2 FTS: 8, 7, and 6 F-saturated Cs

PFAS-Contaminated Water

- 170,000 gallons of water (collected from storm sewers & utility vault) has been containerized.
- Stored in Frac tanks at MGE Coal Yard
- Being treated with GAC (zeolite+3 x 1,000 lb.).
- Then re-analyzed
- If ND, dispose at MMSD or Storm Sewer (WPDS Permit)

Work Plan for Future PFAS Sampling

- Soil Sampling (grid across substation)
- Storm Water (catch basins & outlets)
 - look for trends
- Groundwater (2 sumps & 1 temp well)
 - 3 quarterly rounds
- All samples analyzed for 36 PFAS compounds



E Washington Ave

U.S. Highway 151

E Main St

The Brink Lounge

Brass Ring Bar & Restaurant

High Noon Saloon

S Blount St

E Main St

S Blount St

Blount Generating Station



PFAS Disposal in Wisconsin

- Disposal difficult in WI, especially solids (WWTPs don't want leachate)
- Water treated
- “Effective Disposal Work Group” looking at various options
 - Solidification of liquids
 - Incineration
 - Other technologies (plasma, diamond-boron, etc.)

PFAS in AFFF in WI

- Working on a survey for airports and fire departments → where is foam used and stored in the state (late 2019/early 2020)
- Looking into options for AFFF disposal statewide
- Develop BMP's associated with foam usage to prevent or significantly reduce these types of events (e.g. find fluorine-free foam alternatives)