PFAS 101: Background, Regulations and Local Landfill Leachate Management

3:30 – 4:30 pm

PFAS 101: Background, Regulations and Local Landfill Leachate Management

PFAS: Nature and Magnitude in Wisconsin

Jim Baumann

Public Drinking Water
Wastewater Discharges
Municipal Biosolids

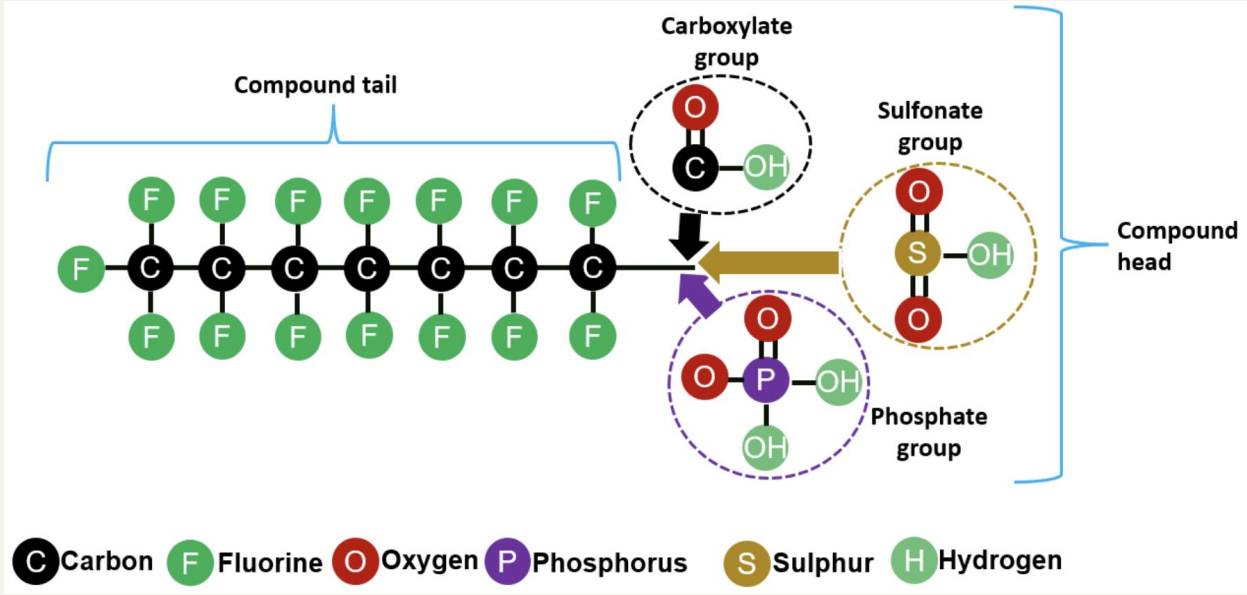
Poly- and Perfluoroalkyl Substances (PFAS)

alkyl = chain of carbon atoms

fluoro = many carbon atoms have fluorine attached

long carbon chain and very strong C-F bonds makes a very stable and desirable industrial compounds

170 to 400 PFAS compounds used by industry (EPA estimate)

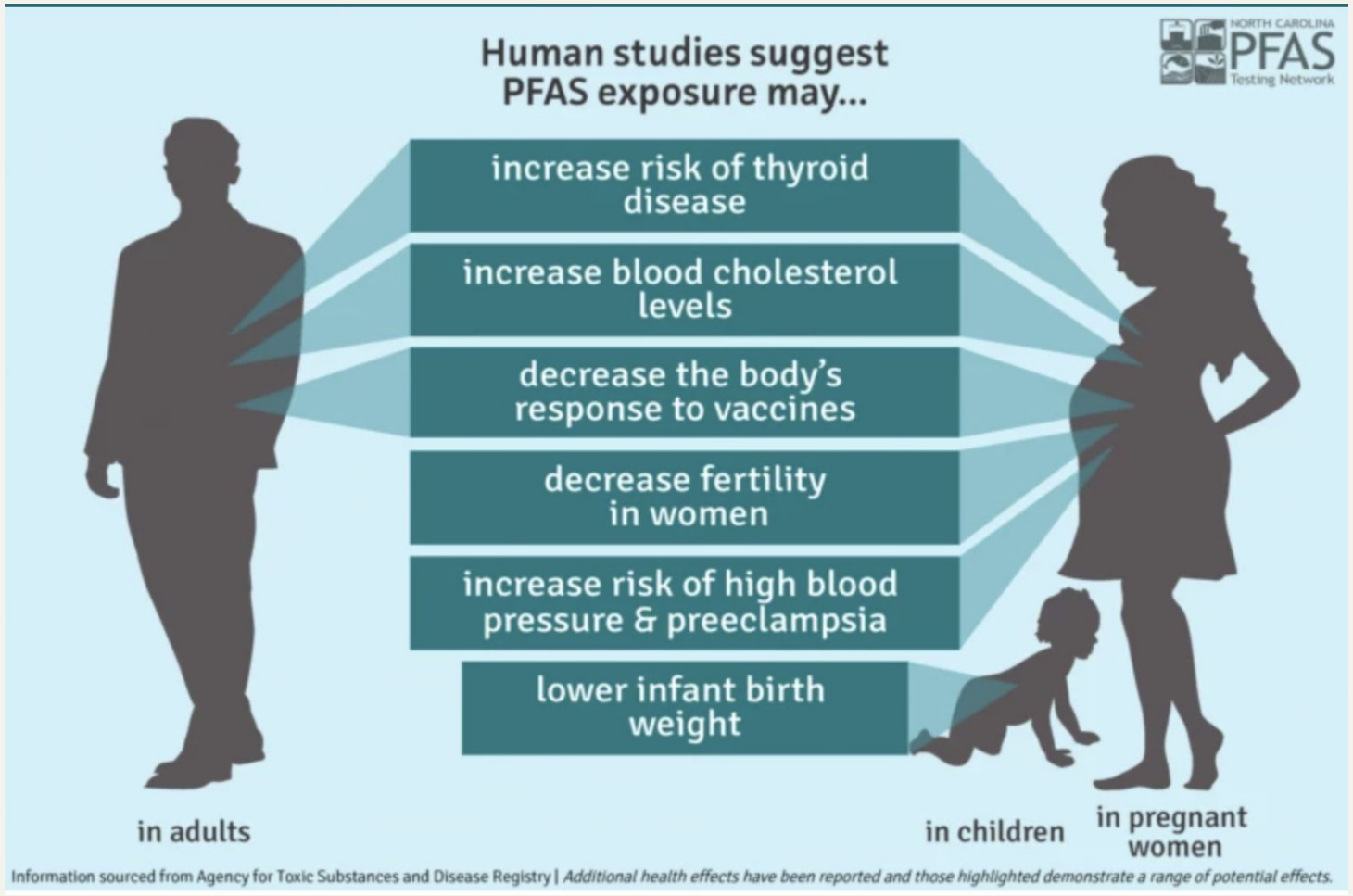


Source: Penn State Extension

Long carbon chains and C-F bonds cause very significant health concerns

Estimated Elimination Half-lives for Select Perfluoroalykls (ATSDR, US DHS)

PFAS	Chain Length	Time
PFOS	Long (8)	3.3 to 27 years
PFHxS	Long (6)	4.7 to 35 years
PFOA	Long (8)	2.1 to 10.1 years
PFNA	Long (9)	2.5 to 4.3 years
PFBS	Short (4)	665 hours
PFBA	Short (4)	72 to 81 hours



Source: Haw River Assembly

Decreased response of immune system identified for adolescents and infants in addition to adults.
Birth defects commonly found in early West Virginia study.
EPA draft biosolids guidance suggests greatest concerns may be effects on children

Introducing a Few PFAS: Part 1

POS, PFHxS and PFBS

- All in the same PFAS family
- All developed and manufactured by 3M in the U. S.
- All used in 3M Light Water aqueous fire-fighting foam
- 3M stopped making PFOS and PFHxS in 2002 (U. S. only)
- Use of 3M Light Water AFFF continued to at least 2016 and continues today
- PFOS used in chrome plating industry until 2018 (imported PFOS)
- Manufacturing of PFOS and PFHxS virtually banned internationally

Introducing a Few PFAS: Part 2

PFOA, PFNA and Gen X chemicals

- **PFOA** originally developed by 3M and “sold” to DuPont
  - Used on non-stick cookware coated food papers, textiles, cosmetics and many other things (mold release in aluminum cookware industry?)
  - Used in forming PFAS polymers, such as Teflon
  - Subject to phase out form 2006 to 2016
  - Virtually banned internationally
- DuPont developed **Gen X** chemicals to replace PFOA in polymer formation; used today
- **PFNA** used in plastics and other industries; subject to phase out

PFAS in Wisconsin Public Drinking Water Systems

- State and Federal Drinking Water Standards

PFAS	Maximum Contaminant Level (MCL) ng/L (ppt)
PFOA	4
PFOS	4
PFHxS	10
PFNA	10
Gen X chemicals	10
PFBS	2,000 as part of index

Wisconsin Public Drinking Water Systems

Standard Exceedances

- Over 1800 systems sampled
  - municipalities, subdivisions, mobile home parks, schools, day care centers, industries and businesses
- 111 (5%) had one or more exceedance
  - 49 municipalities
  - 20 mobile home parks, subdivisions, etc.
  - 19 schools and day care centers
  - 22 industries and businesses

Slide bullet text

ndards Exceedances in Public Water Systems

Municipal Examples
Marshfield
Mosinee East
Eau Claire
Saukville
Adams
West Bend
Rib Mountain
Brockway
Edgar
Pewaukee, Village
Pewaukee, City
Valders

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exceedances

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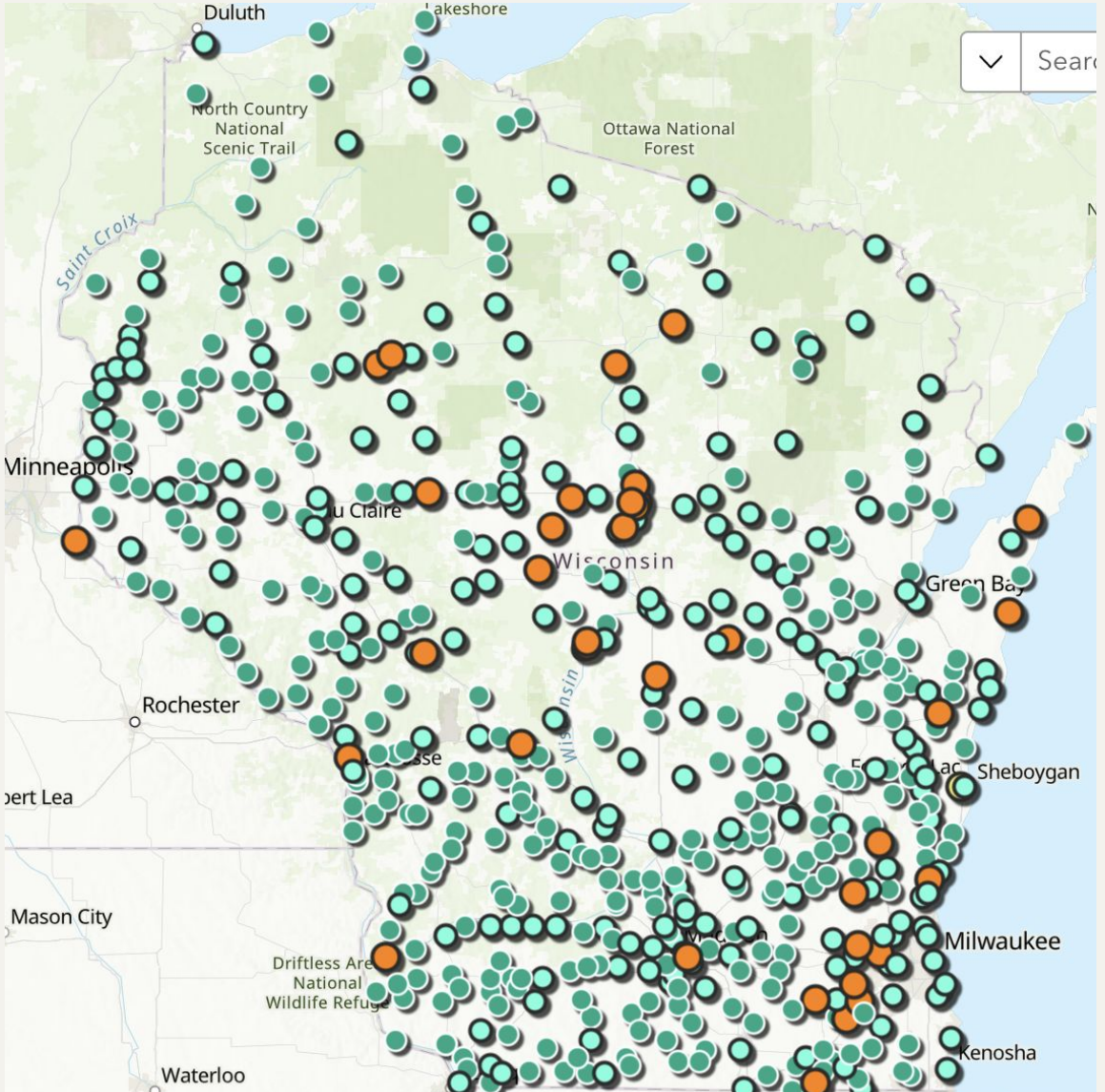
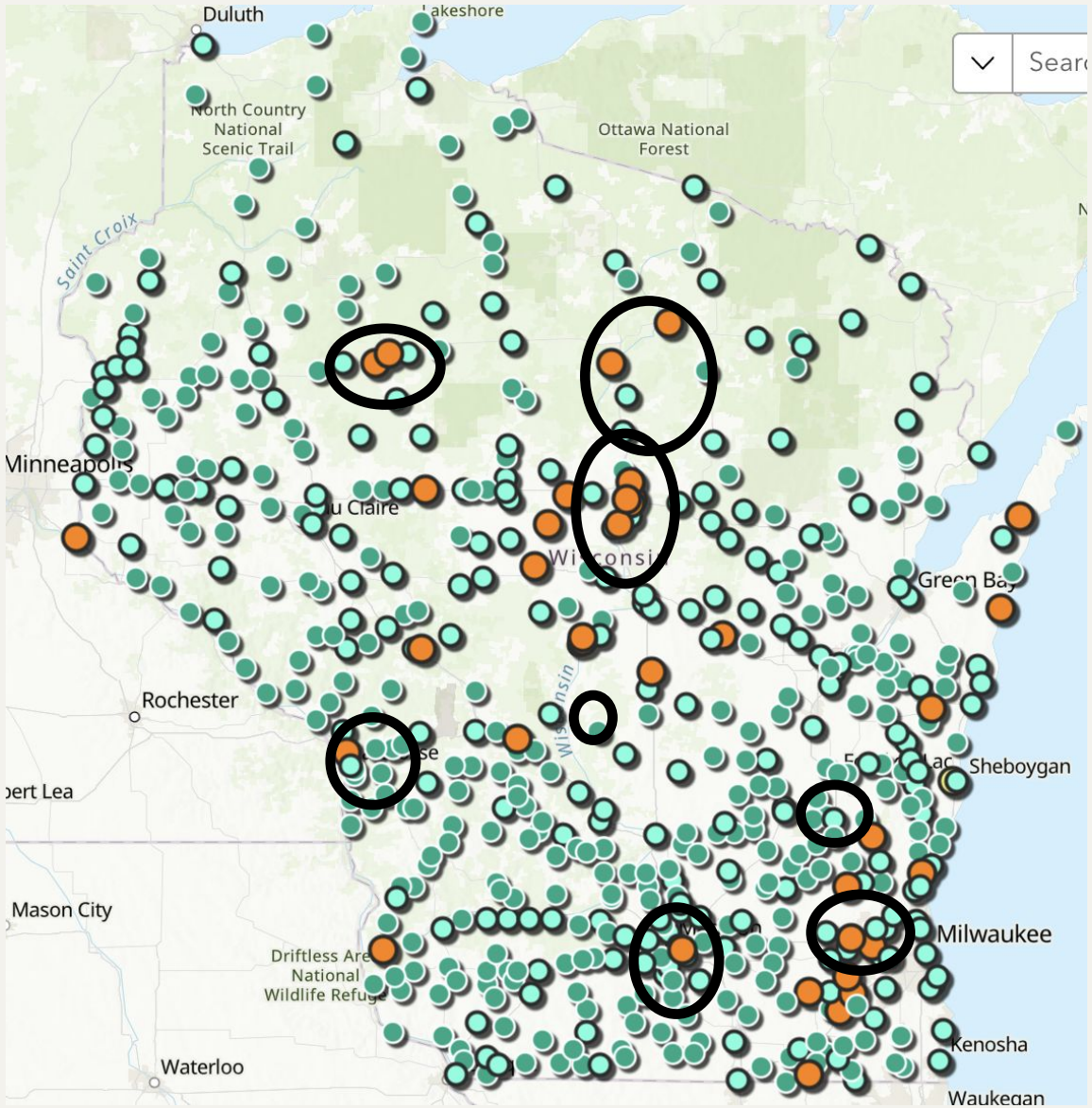


Wisconsin Public Drinking Water Systems

Top Group

Municipal Examples	Mobile Home Parks, Subdivisions	Schools, Day Care Centers	Businesses, Institutions
Marshfield	Willow Springs MHP (Sussex)	Pine River School (Merrill)	3M Greystone Quarry (Wausau)
Mosinee East	Hales Happiness (Hales Corners)	Minocqua-Hazelhurst	Fox Bros Piggly Wiggly (Hubertus)
Eau Claire	Westwind Estates (Adams Co.)	Little Dumplings (Oconomowoc)	Michels - Trenchless
Saukville	Maple Grove (Beaver Dam)	Anthony Acres (Mondovi)	Alliant Energy — Columbia
Adams	Willow Lane (Ladysmith)	Willow Springs (Menomonee Falls)	Grassland Dairy Office
West Bend			Veritas Steel (Wausau)
Rib Mountain			
Brockway			
Edgar			
Pewaukee, Village			
Pewaukee, City			
Valders			

Clusters


Duluth
Lakeshore
North Country
National
Scenic Trail
Ottawa National
Forest
Saint Croix
Minneapolis
Eau Claire
Wisconsin
Green Bay
Rochester
Wisconsin
Sheboygan
Mason City
Milwaukee
Driftless Area
National
Wildlife Refuge
Kenosha
Waterloo
Waukegan

Wisconsin Public Drinking Water Systems

PFAS	Maximum Contaminant Level (MCL) ng/L (ppt)	No. Exceedances
PFOA	4	53
PFOS	4	74
PFHxS	10	29
PFNA	10	2
Gen X chemicals	10	0
PFBS	2,000 as part of index	0

Source: Jim Baumann

Wisconsin Municipal and Industrial Wastewater Discharges

- Very hard to assess
  - Relatively few have been required to report discharges
  - Only PFOA and PFOS reported (other PFAS not reported)
  - Water quality standards — rivers, streams, lakes, etc.

PFAS	Standard	
PFOS	8 ng/L	
PFOA	20 ng/L	drinking water use
	95 ng/L	non-drinking water use

Wisconsin Municipal and Industrial Wastewater

- Municipalities
  - Dozens will have “reasonable potential” to exceed the PFOS standard
    - They will be required to develop PFOA and PFOS minimization plans
- Industries
  - Recycled paper, possibly meat packing (why?), possibly aquaculture
- In many cases, the PFOS in lining sewer pipes and slowly leaching into the treatment system

Municipalities with higher PFOS in Wastewater Discharge

Municipality	Industry or industries Listed	Comment
Nichols	Printing	Flexigraphic printing, laminating, packaging
Fort McCoy	Military base	Use of AFFF
Vesper	Food ingredients	Not sure how food ingredients result in PFOS discharge; perhaps other source
Osceola	None	????
Webster	Metal finishing	highly likely legacy situation
Brookfield	7 different industries	Permit does not describe the industries. The regional treatment plant also serves nearby communities, such as the city of Pewaukee and the village of Pewaukee with high PFOS in certain city wells.
Theresa	Cheese	PFOS from cheese production?
Oconto	None	????
Tony	None	Possibly water supply; concentrations match
Lomira	Printing	Very large printing operation
Salem Lakes	4 or 5	Includes metal and tool manufacturing
Colfax	None	????
Baldwin	Metal finishing	highly likely legacy situation
Peshtigo	None	????
Tomahawk	None	Does not match PFAS in water supply; water supply high in PFOA, but not in PFOS

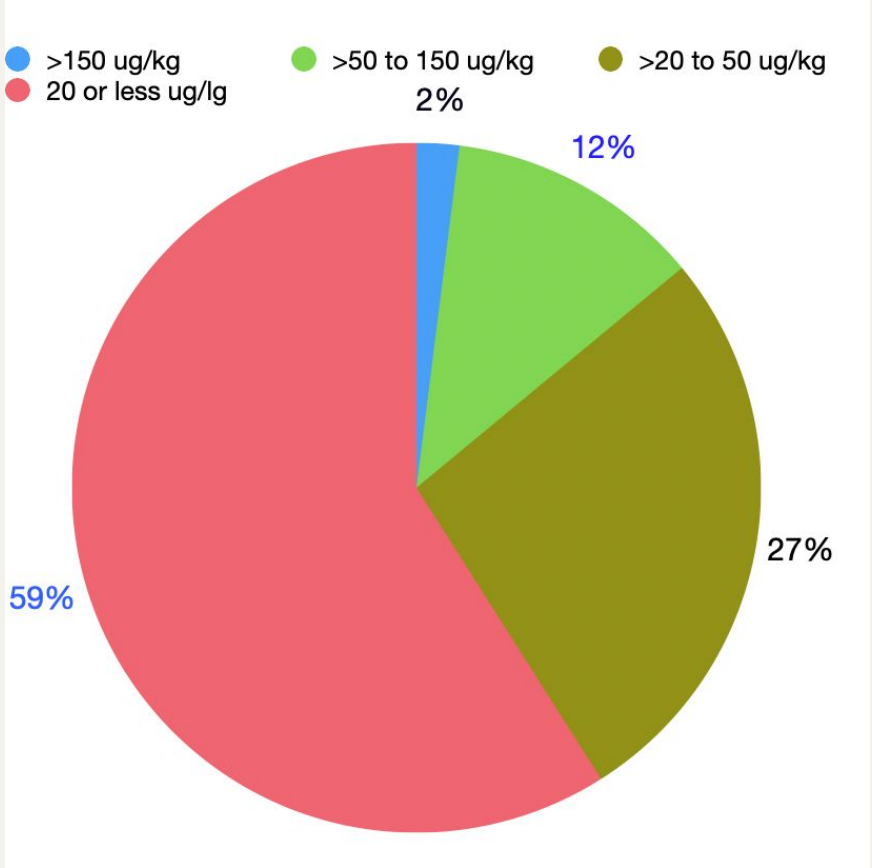
Municipal Biosolids

- Exceedingly complex topic
- No federal or state standards
  - Current EPA draft guidance reduces risk, but does not adequately protect
  - State interim guidance provides some level of risk reduction, but is not based on health or water quality concerns
- Looking at “first” steps in a process that will evolve over next decade

Wisconsin Municipal Biosolids

Using DNR's interim strategy

>150 ug/kg — no land spreading — 2%
>50 to 150 ug/kg — reduced rate/study — 12%
>20 to 50 ug/kg — (gray area) study — 27%
20 or less ug/kg — no restrictions — 59%



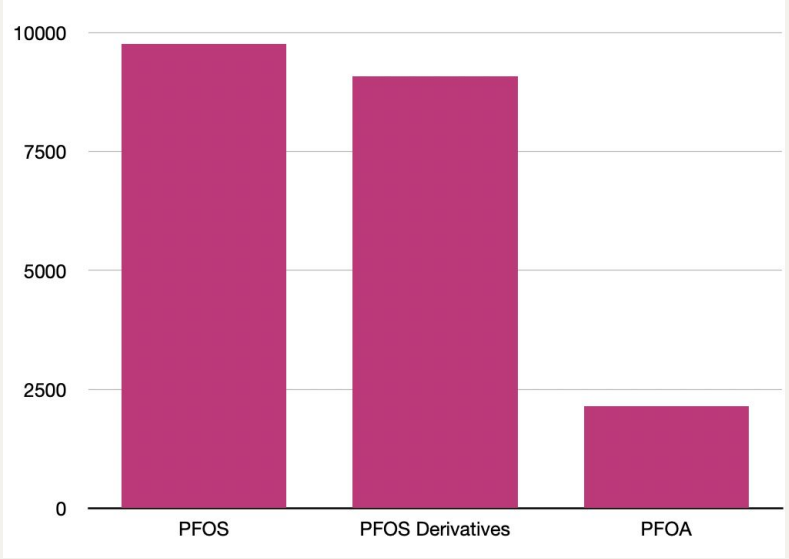
Source: Jim Baumann

Municipality	PFOS + PFOA ug/kg		Municipality	PFOS + PFOA ug/kg
Montello (2025)	4680		Necedah (2025)	63
Princeton	520		Adams	68
Junction City	207		Colby (2025)	65
Allentown	168		Sherwood (reed bed)	63
Cleveland	144		Orfordville	59
Thorp *	142		Markesan *	59
Fort McCoy	126		Mount Hope *	58
Westfield	115		Livingston (2024)	58
Gays Mills	102		Silver Lake	55
Stephensville	91		Valley Ridge (2024)	53
Beloit Town	86		Ashippun (2025)	53
Janesville (liquid)	82		Goodman	53
Cornell	81		Lancaster	52
Patch Grove	81		Onion River (2024)	51
Rib Lake	76		Fennimore	50
Rosendale	73			

Why are biosolids so complex

Closing Thoughts

- No standards
  - EPA's draft health risk assessment stated 1 ug/kg (ppb) could pose a risk
  - DNR's interim strategy uses 20 ug/kg and 50 ug/kg
- Biosolids contain many PFAS besides PFOA and PFOS
  - PFOS derivatives alone are equal in amount to PFOS
  - Some PFAS suspected in biosolids are not analyzed
- None of the PFAS used in today's industry are included in the DNR strategy



Source: Jim Baumann

Per and Polyfluoroalkyl Substances in Landfill Leachate

David Hagenbucher

Marathon County Solid Waste Director

- Wisconsin landfills are facing a growing challenge to manage leachate – the water that contacts garbage and requires treatment before discharge. This presentation explores the current issues and proposes solutions to this challenge.

Understanding the problem

- What is municipal solid waste?
- What is leachate?
- How did the PFAS get there?
- Why does it need to be treated?
- Who can treat it?

Widespread Rejection of Leachate

- 9 Local Treatment Plants refused leachate
- Growing fears of long-term liability
- Unwillingness to establish contracts

- **Discharge Limitations for WWTPs**
  - WDNR WY-23-19
    - PFOS = 8 ppt
    - PFOA = 20 ppt

- **Landfill Leachate**
  - PFOS = 300 ppt
  - PFOA = 2500 ppt

Marathon County Solid Waste Operations

- Municipal Government Enterprise – local disposal since 1980
- 1000 tons/day in 30-acre active landfill and two closed landfills
- 6 Loads of leachate per day/39,600 gallons
- Approximately 15,000,000 gallons/yr
- Annually $1,500,000 for leachate

hauling and treatment

- Approximately $7 per ton from waste

Biosolids Connection

- Current practice – biosolids from WWTPs spread on fields
- Some WWTPs need a home for Biosolids – landfills can help
- Future Disposal – If land application ends, landfills could work, but may not have the capacity, or may not want to help, given their own challenges with PFAS.

Regional and Wholistic Solutions

- Landfill will need to treat its own leachate without private or public treatment works – they are on their own
- Landfills can help with biosolids, but not without infrastructure
- Public sector evaluating options of regionalization and existing solid waste agreements play a critical role
- Cost effectiveness and economies of scale
- What treatment technologies make financial sense?

Small Scale Treatment Technologies

- Reverse Osmosis
  - High Capital, lower annual operating
- Ion Exchange
  - Targets specific compounds
- Foam Fractionation
  - Only effective on PFAS
- Granular Activated Carbon
  - Lowest Capital, requires post treatment options

Reverse Osmosis

- Complete on-site treatment – eliminates off site hauling
- Cost Efficiency – Eliminates nearly $0.10/gal or over $1 million annually
- Lower Operating Demands – requires less annual expenditure on staffing and maintenance among the options

Reverse Osmosis Financials

- $15 Million Capital Cost and investment to build
- Approximately $1.1 Million per year operating cost
- If fully funded through tipping fee increases, landfill could lose tonnage
- Landfill does not have reserves to fund this project – WDNR LOAN through the Clean Water Fund Program

Clean Water Fund Program

- Environmental loan with opportunity for principal forgiveness and fixed interest rate
- May 2025 – Public Comment Period
- June 2025 - Public Hearing
- July 2025 - Action to approve Application – County Board Resolution
- September 2025 - Intent to Apply
- 2025 and 2026 – Planning, Designing and Pilot
- September 2026 - Full Application Submittal
- January 2027 - Approval and Funding
- June 2027 through 2028 – Construction
- January 2029 – Full Operation

AB130 and AB131

- With the legislative changes that occurred in **AB 130 and 131**, the Marathon County landfill has a new legal requirement to treat its wastewater (leachate) for PFAS.
- *f. A municipal waste landfill, as defined in s. 289.01 (22), that disposed of PFAS-contaminated leachate at a publicly owned treatment works. This subd. 2. f. applies only if the municipal waste landfill installs and operates department approved leachate pretreatment to treat all leachate for PFAS* ***no later than December 31, 2032****, unless the municipal waste landfill demonstrates that pretreatment technology is not available or if, by December 31, 2032, the municipal waste landfill demonstrates to the department meaningful progress towards installation of leachate pretreatment.*

Key Considerations

- Tipping Fee up $5/ton for debt service
- Landfill tonnage likely to drop
- Recognize systemic nature of this issue
- Support regional solutions
- Address closed landfill leachate
- Coordinated regulatory approach

and ensure consistency

COUNTIES EXPOSURE

- Airports
    - Aqueous Fire Fighting Foam (AFFF)
- Landfills passive receivers
    - Leachate
- Other county operations
    - Product use
    - Fill material
- Biosolid spreading
    - impacts to soils and groundwater
    - agriculture
- Health Department
    - Public and private wells
    - Well sampling

TOOLS

- PFAS Trust Fund
- Safe Drinking Water Fund
- Clean Water Revolving Loan Fund
- Contaminants Of Emerging Concern
- Spills Law
    - Groundwater Standards
- Litigation
    - Site Specific – JCI TYCO
    - Multi-district Litigation

PFAS TRUST FUND GRANTS

- Community Grant $79,522,500
- Well Compensation $35,000,000
- Airports/Industrial Processors $5,250,000
- Program Support and Admin.* $11,820,900

* Ten positions are created in various programs

WELL COMPENSATION GRANT PROGRAM

Sliding Scale Financial Assistance

% County Median Income	% Assistance
< 100	100
100-199	80
200-299	60
300 +	25

Limits

Well construction/reconstruction	$30,000
Connect to existing private well	$16,000
Connect to public water system	$30,000
Treatment system	$10,000
Well Abandonment	$16,000

COMMUNITY GRANT PROGRAM

- Sampling private wells
- Treatment or new wells at public water system
- Creating a new or connecting to a public water system
- Sampling
  - Schools
  - Child care
  - High capacity irrigation wells
  - Soil on agricultural property
  - Wastewater, biosolids, solid waste, influent, industrial waste,
  - Municipally owned solid waste site

COMMUNITY GRANT PROGRAM

- Designing, purchasing and installing onsite leachate system and municipal landfill
- Investigate and design for immediate, interim or remedial action to restore air, land or water
- Conducting immediate, interim or remedial action to mitigate, treat, dispose of, or remove PFAS

Airport and Industrial Possessor Grant Program

$5.25 million in grants to:

- Assist airports with investigation and short-term to long-term actions to stop PFAS contamination from worsening
- Reimburse industrial possessors for required immediate and interim actions and voluntary remediation

LITIGATION

- Aqueous Film-Forming Foams Product Litigation multidistrict litigation began 2018
- 15,264 PFAS lawsuits
- More than 6,600 public water systems (PWS) have registered claims in the AFFF multidistrict litigation
- Municipal Water Systems have been awarded over $12 billion
- Next phase personal injury
- Airports and other facilities
- March 2026 Marathon County joined the lawsuit Baron & Budd P.C., Cassish, Sumich, Parsiola & Taylor LLC and Attoles Law S.C.

COUNTIES APPROACH TO PFAS

- PFAS contamination is variable
- Look at past and current practices and materials
- Define role
- Well sampling funds pass through municipality
    - Determine if you are sampling
    - Which department
    - 20% match

PFAS – Supply Chain Identification & Restrictions

- Two approaches being used to address PFAS supply chain
  - Direct product bans
  - Disclosure of “intentionally added” PFAS
- Common issues
  - What is a PFAS
  - What is “intentionally added”

Definitions of PFAS – State & Federal

- States
  - Broadest is Minnesota – “at least one fully fluorinated carbon atom”
  - Around 20 others – similar but some exclude certain types of PFAS
- Federal
  - Superfund – PFOS/PFOA
  - TSCA – two or more contiguous fluorinated carbon atoms
  - Patchwork – creates issues with supply chain management

Intentionally Added

- Minnesota provides key definition
  - Intent test – PFAS purposefully introduced to product
  - Function test – PFAS to accomplish a task
  - Presence test – PFAS permanently part of a product; not a temporary processing aid
- Other states explicitly cover degradation by-products that become PFAS

Direct Product Bans

- Most common approach used by states
  - Focus on high exposure” consumer bans
  - Range from cookware/food packaging, textiles, cookware, carpets, children’s items, personal care and fire-fighting foam

Total Category Bans

- Example – Minnesota, Maine and New Mexico
  - Future effective date – 2023 to 2040
  - Usually aimed at retail products
  - Exemptions for “currently unavoidable use”
- Step-down approaches being used to ban products between 2028 and 2032
- Again, a patchwork approach

Identification of PFAS Presence in Products

- Currently, Minnesota is most aggressive
  - Covers products manufactured after July 1, 2023
  - Initial reporting – September 15, 2026
  - Covers –
    - Products sold/distributed in Minnesota
    - Products sole online to Minnesota
  - Extensions to December 14, 2026
  - Legal challenge to Minnesota law – *Cookware Sustainability Alliance v. Kessler*
    - Federal District Court dismissed challenge
    - Not appealed

What Does This All Mean for PFAS in Supply Chain?

- Current regulation varies by state, creating patchwork of laws and bans
- Practically – manufacturers/companies typically do not make different type of same product for different states
    - State with most stringent ban will generally control how manufacturers react
    - Push for uniformity through federal law
- Meantime – Minnesota reporting requirement will give best picture of scope of PFAS in supply chain
- Voluntary efforts by companies to “substitute out” of PFAS

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