NSC Technical Subcommittee Call Minutes – September 19, 2023

Participation [by region]:

1: Catherine (Cathy) Beahm - **NH**
3: Luke Hershey, Carrie Wintersteen, Lee Ann Briggs & Jeremy Hancher – **PA** and Olivia Achuko - **DC**
4: LaTrina Williams – **MS**; Ryan Ariail – **SC**; Donovan Grimwood & Crystal Warren – **TN**; Griffin Jones – **FL**; Sherry Waldron – **GA** and Tony Pendola - **NC**
5: Kaitlyn Devries – **MI**; Emily Ohde & Maya Gilchrist – **MN**; Lisa Ashenbrenner-Hunt & Renee Bashel - **WI** and Chrystal Wagner & Mark Stoddard – **IN**
7: Abigail Crouse, Cris Brazzil & Mary Yesko Baker – **KS**; Jennifer Wittenburg, Jason Clay & Jordan Burrows - **IA** and Bob Randolph - **MO**
8: Eleanor Divver – **UT**; Kaitlin Urso & Jarrett Vigil – **CO**; Michael Gustafson – **MT**
9: Sydney Boogaard – **AZ**
10: Jim Plosay & Nattinee Nipataruedi - **AK**

EPA: Elnora Thompson
Presenter: Maya Gilchrist, MPCA
Unknown: Jesse Fairweather, Natalie Cota & Tamara Girard

Tech-Subcommittee: https://nationalsbeap.org/sbeap/resources/subcommittees/technical

** ***This presentation was recorded and will be posted on the National SBEAP YouTube channel at*** https://www.youtube.com/channel/UC5PupYpZ1W6IG8CtzCINK8Q **

Overview of "PFAS in the metal plating and finishing industry" published in December 2022

Maya Gilchrist, PFAS inventory Analyst, MPCA

The Minnesota Pollution Control Agency has been working to develop resources on potential sources of PFAS in high priority sectors. These are intended to support permitting programs, remediation project managers, technical assistance providers, and other professionals dealing with PFAS.

This presentation will provide an overview of this effort, summarize the pilot industry sector resource, "***PFAS in the metal plating and finishing industry***," and outline other relevant efforts to identify and reduce sources of PFAS in Minnesota.

Bio

Maya Gilchrist, PFAS Inventory Analyst
Minnesota Pollution Control Agency
Environmental Analysis and Outcomes Division
Water Assessment Section
Maya.Gilchrist@state.mn.us

Previously, she worked as a site assessment and remediation Geologist for an environmental consultant. She recently obtained an M.S. in Earth Sciences from the University of Minnesota and holds a B.S. in Environmental Science from Northeastern University.

Chat:

Nancy Larson - KS
Just to confirm my understanding, the metal fab NESHAP prohibited the PFAS foam suppresants, but it is in several other additives and still escapes the baths through air, land and water?

Catherine Beahm - NHDES
Do you have a link to the PFAS database tool you showed?

Tony Pendola - NC
Do you routinely see them on the SDS (safety data sheet) or could they be hiding in the TDS (technical support document) or direct request of the supplier?

Nancy Larson - KS
Is it correct that the MN based 3M was a major user of PFAS and is actively remediating? Can you speak to that?

Catherine Beahm - NHDES
Maya, does MN have any air regulations that have mandated controls or source reduction?

Nancy Larson - KS
Was there a 3M SEP that could help small businesses reduce PFAS in their operations?

Maya stated in a separate e-mail message later on September 19:

"Thank you again for the opportunity to speak with the SBEAP technical group this afternoon. Please see my slide deck attached.

The existing industry sector resources can be found under "PFAS in industry" here: https://www.pca.state.mn.us/air-water-land-climate/pfas-studies-and-reports. I'll be sure to share the PFAS desktop guide and searchable catalog once those are available online in the coming weeks.

To follow up on the question regarding 3M—more information about PFAS remediation activities associated with 3M can be found here: https://www.pca.state.mn.us/local-sites-and-projects/east-metro-3m-pfas-contamination"

Future topics:

- **October 17:** ECHO Notify & Climate and the Economic Justice Screening Tool, Tony Pendola, NC & Leena Divakar, KSU
- **November 21 or possible October 17:** Solar Panel Recycling, Donovan Grimwood, TN
- **December 19:** TBD – possibly cancel due to the holidays.
- **January 16, 2024**

Next Call: October 17, 2023

1 pm CDT (2 pm EDT) (3rd Tuesday of month)

PFAS industry sector resources

Maya Gilchrist | PFAS Inventory Analyst
September 19, 2023

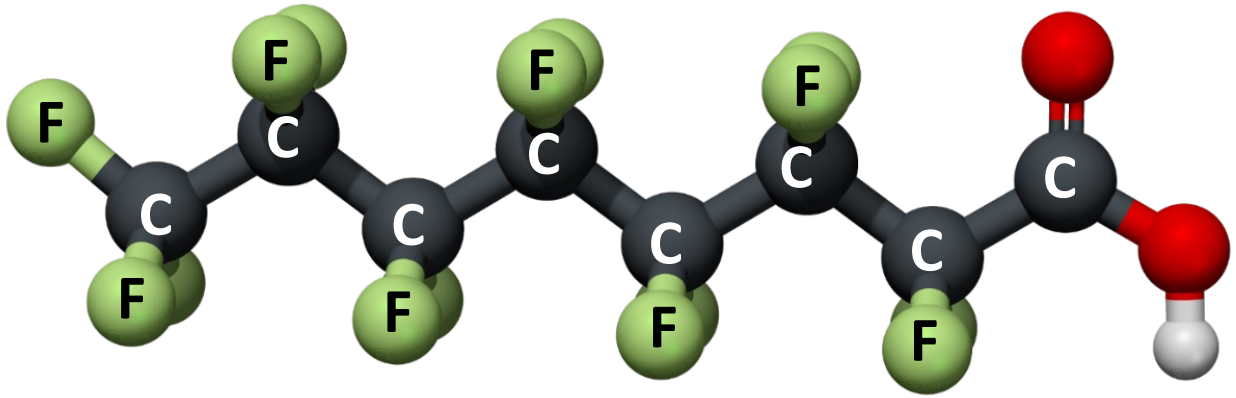
Agenda

1. Introduction to PFAS in Minnesota
2. Goals and applications for PFAS source research
3. Overview of industry sector resources
4. Key findings from pilot resource: PFAS in metal plating and finishing
5. Other relevant efforts in MN
6. Questions and discussion

What are PFAS?

PFAS = Per- and polyfluoroalkyl substances

- Chains of carbon-fluorine bonds: One of the strongest in organic chemistry
- Diverse class of compounds: Thousands of PFAS
  - MN definition: *Compounds containing at least one fully fluorinated carbon atom*
- Useful traits
  - Repel oil and water
  - Lower surface tension
  - Prevent combustion
  - Stable under harsh conditions
  - And many more…



Applications in industrial and commercial products

- Paper and food packaging
- Carpets, upholstery, apparel, and leather
- Firefighting foam and fire prevention
- Electronics
- Medical products
- Metal plating
- Oil and gas, pipe linings
- Pesticides and pesticide packaging
- Varnishes, paints, and adhesives

Minnesota's PFAS Blueprint supports a holistic and systematic approach to address PFAS that focuses on preventing and managing PFAS contamination and cleaning up contaminated sites.

https://www.pca.state.mn.us/air-water-land-climate/minnesotas-pfas-blueprint

MINNESOTA POLLUTION CONTROL AGENCY

Framework for addressing PFAS

1 Prevent

PFAS pollution wherever possible

2 Manage

PFAS pollution when prevention is not feasible or pollution has already occurred

3 Clean up

PFAS contaminated sites

MINNESOTA POLLUTION CONTROL AGENCY

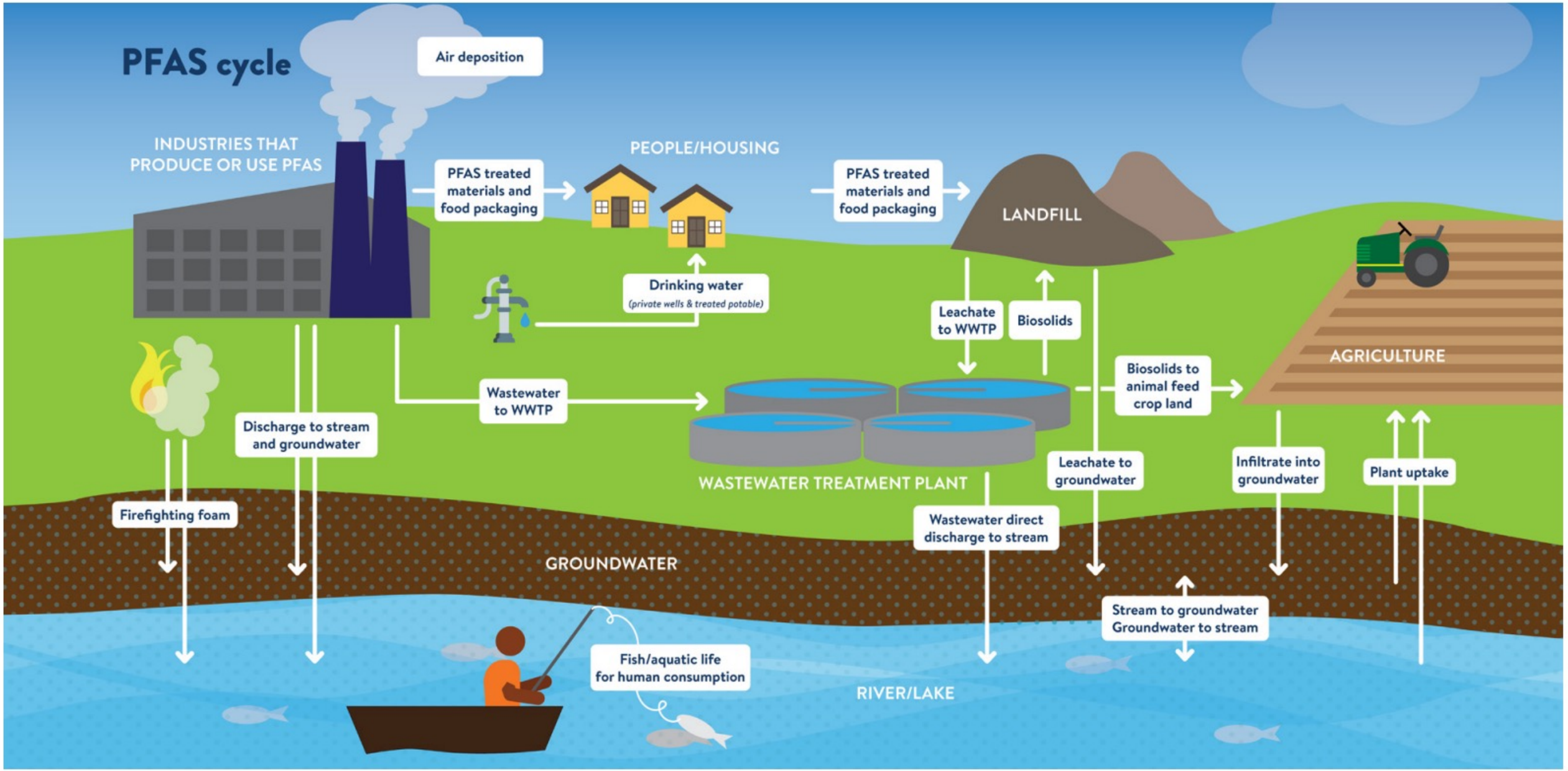


Image from *Minnesota's PFAS Blueprint*

Current initiative: Industry sector resources

Need:

Understand PFAS usage within sectors

Result:

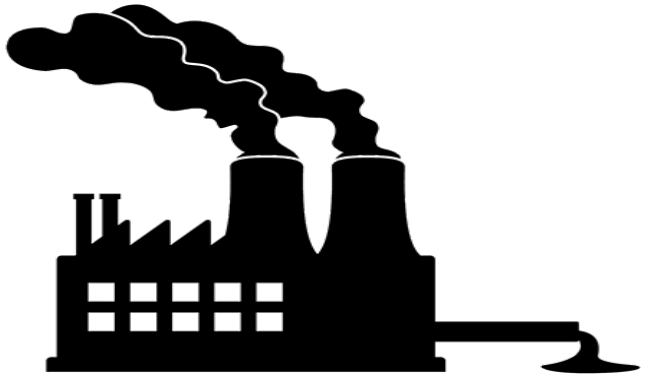
Industry summaries which detail PFAS usage across various processes

Applications:

- Remediation: Site investigations
- Industrial: Permitting requirements
- Municipal: Source identification
- Source reduction and technical assistance

Industry sector resources framework

Industry Overview



- What does this industry do?
- Why is this industry a PFAS concern?
- What is this industry's presence in Minnesota?

Industry subcategory #1 | Industry subcategory #2 | Industry subcategory #3

What processes use PFAS? ◆ What products used contain PFAS? ◆ Which PFAS are used?

How are PFAS released to the environment?

How can release be minimized?

Pilot sector: Metal finishing industry

Metal finishing…

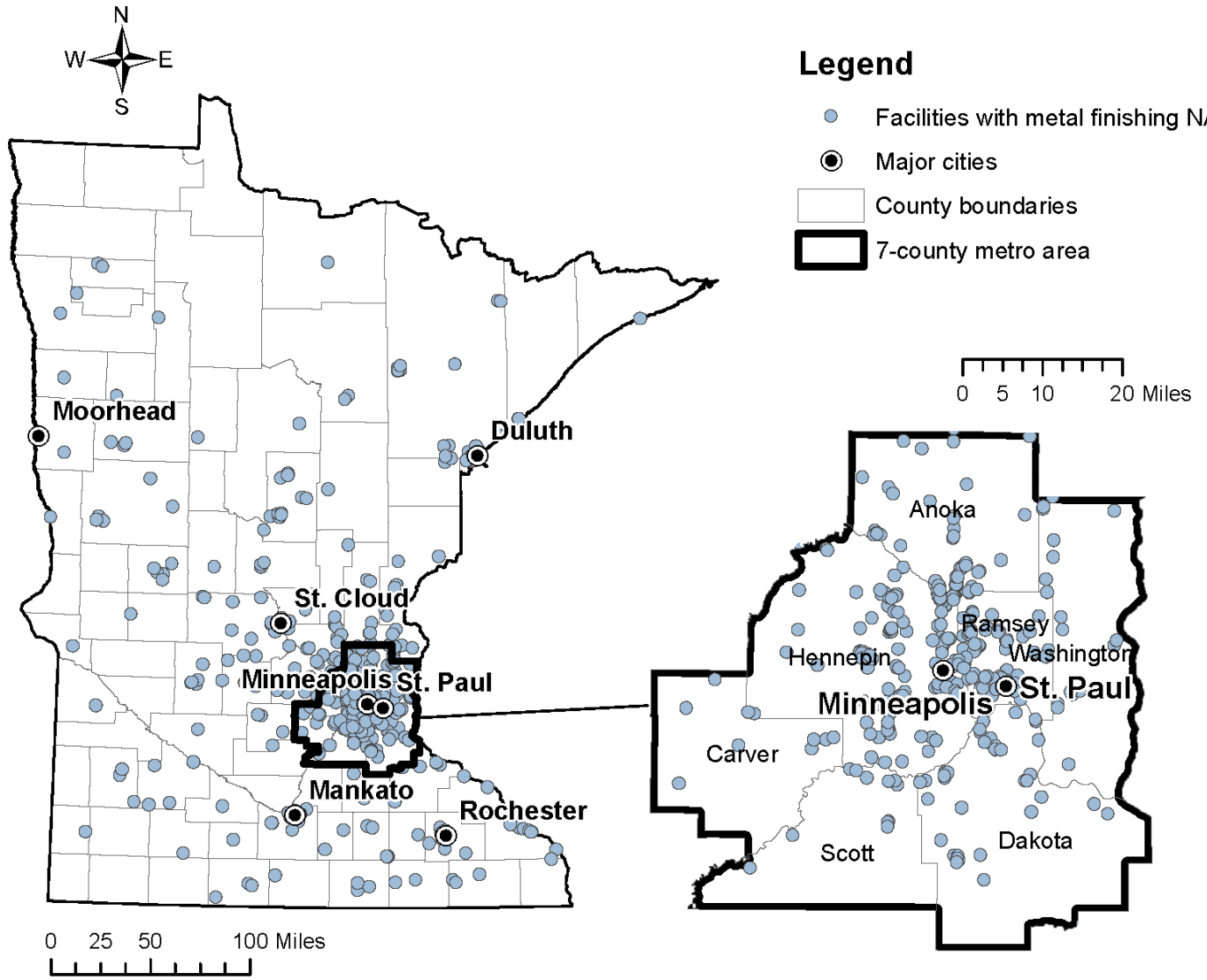
- Provides strength and durability to parts used across sectors including the automotive, aerospace, and furnishing industries
- Uses PFAS as additives to suppress fumes and improve product quality
- Includes chrome electroplating: the dominant source of PFAS in this sector
- Has applications for PFAS in many processes beyond chrome plating, such as plating with other metals, anodizing, etching, and cleaning

Metal finishing in Minnesota

Metal finishing facilities are a major industrial source of PFAS to WWTPs in other states

- Locations of facilities that may perform any of the following:

- Metal coating, engraving, and allied services
- Electroplating, plating, polishing, anodizing, and coloring
- Miscellaneous fabricated metal product manufacturing



Data: Data Axle, *Reference Solutions* database

Metal finishing: Key dates

1920s

Beginning of chrome plating with Cr(VI)

1954

First PFAS-based fume suppressant

1970s

Beginning of Cr(III)-based plating

1980s

Beginning of **PFOS**-based fume suppressants

1995

Final EPA chrome emissions rule

2007

SNUR for PFOS in metal plating and finishing

2012

Final rule to phase out PFOS in fume suppressants

2015

Compliance date for PFOS rule

PFAS in metal finishing: 1950s – present

Processes

- Electroplating
- Electroless plating
- Plating on plastics
- Anodizing
- Etching
- Conversion coating
- Powder coating
- Cleaning and degreasing
- Pickling
- Aluminum foil blocking

Products

- Wetting agents
- Fume suppressants
- Leveling agents
- Foam regulators
- Coating additives
- Deposition aids
- Water repellants
- Blocking agents
- Corrosion inhibitors
- Degreasing solvents
- Etch bath additives

Compounds

Commonly used today

- PFOS
- 6:2 FTS
- 6:4 FTS
- PFBS
- PFCAs
- PFSAs
- PFECHS
- PFPIA
- PTFE
- PVDF
- ECTFE

Commonly used in the past

Metal finishing: PFAS products and chemistries

MINNESOTA POLLUTION CONTROL AGENCY

Product names to look for

PFAS category	Chemical name	Abbreviation	Structural or molecular formula	CAS number	Use type	Product/trade names	Product type	Product function
Fluorotelomer-based substances	(n:2) Fluorotelomer sulfonic acids	6:2 FTSA	CnF2n+1 H2CH2SO3H	27619-97-2	Current	Fumetrol 21; Fumetrol 21 LF2	Fluorinated surfactant	Wetting agent/fume suppressant
Perfluoropolyether (PFPE) -based substances	Potassium 9-chlorohexadecafluoro-3-oxanonane-1-sulfonate	Cl-PFESAs	C8ClF16KO4S	73606-19-6	Current	F-53B	Fluorinated surfactant	Wetting agent/fume suppresssant
Perfluorosulfonic acids (PFSAs)	Perfluorooctane sulfonic acid	PFOS	C8HF17O3S	1763-23-1	Historical	Benchbrite CR; Clepo Chrome; HCA - 6.2; HCA - 4	Fluorinated surfactant	Wetting agent/fume suppressant
Perfluorosulfonic acids (PFSAs)	Tetraethylammonium perfluorobutanesulfonate; tetraethylammonium	PFBS	C12H19F9NO3S	25628-08-4	Historical	Bayowet FT 248	Fluorinated surfactant	Wetting agent/fume suppressant
Perfluorosulfonic acids (PFSAs)	Potassium perfluorooctane sulfonate	K-PFOS	C8F17KO3S	2795-39-3	Historical	FC 95	Fluorinated surfactant	Wetting agent/fume suppressant
Perfluorosulfonic acids (PFSAs)	Tetraethylammonium perfluorooctane sulfonate; tetraethylammonium heptadecafluorooctanesulfonate	NH4-PFOS	C16H20F17NO3S	56773-42-3	Historical	Fluorotenside-248; SurTec 960; FC-248; FT-248m; Fumetrol 140; Bayowet FT 248	Fluorinated surfactant	Wetting agent/fume suppressant
---	Poly(oxy-1,2-ethanediyl), alpha-hydro-omega-hydroxy-, ether with alpha-fluoro-omega-(2-	---	$(C_2H_4O)_x(CF_2)_yC_2H_5FO$	65545-80-4	Historical	Zonyl FSN	Fluorinated surfactant	Wetting agent/fume suppressant; dispersion product
Perfluoropolyether (PFPE) -based substances	Ethanesulfonic acid, 1,1,2,2-tetrafluoro-2-[(perfluoroalkyl)oxy]-, potassium salt (1:1)	---	C8F17KO4S	68136-88-9	Historical	F-53	Fluorinated surfactant	Wetting agent/fume suppressant

From *PFAS in the metal plating and finishing industry: Supplementary information*
https://www.pca.state.mn.us/air-water-land-climate/pfas-studies-and-reports

Environmental release pathways

Industrial wastewater

PFAS are discharged when plating and finishing baths are changed out

Air emissions

PFAS escape from baths and are emitted through vents

Solid waste

PFAS are in residual metal sludge

Products

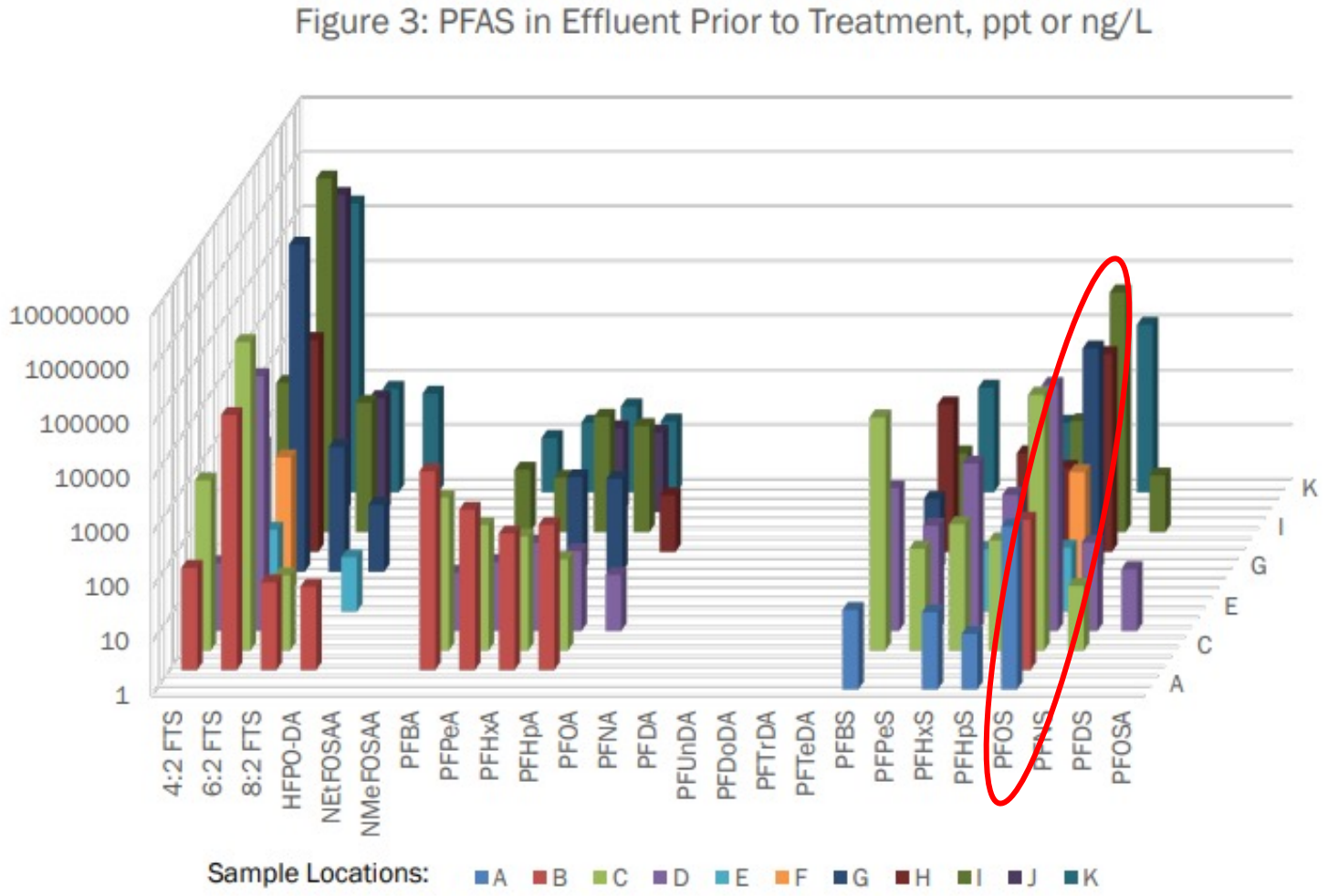
Nominal source


Discontinuing use of PFAS alone does not prevent emissions
PFOS emissions can continue to occur years after phase-out in products
Photo: FinishingandCoating.com

Legacy PFAS emissions from metal finishing

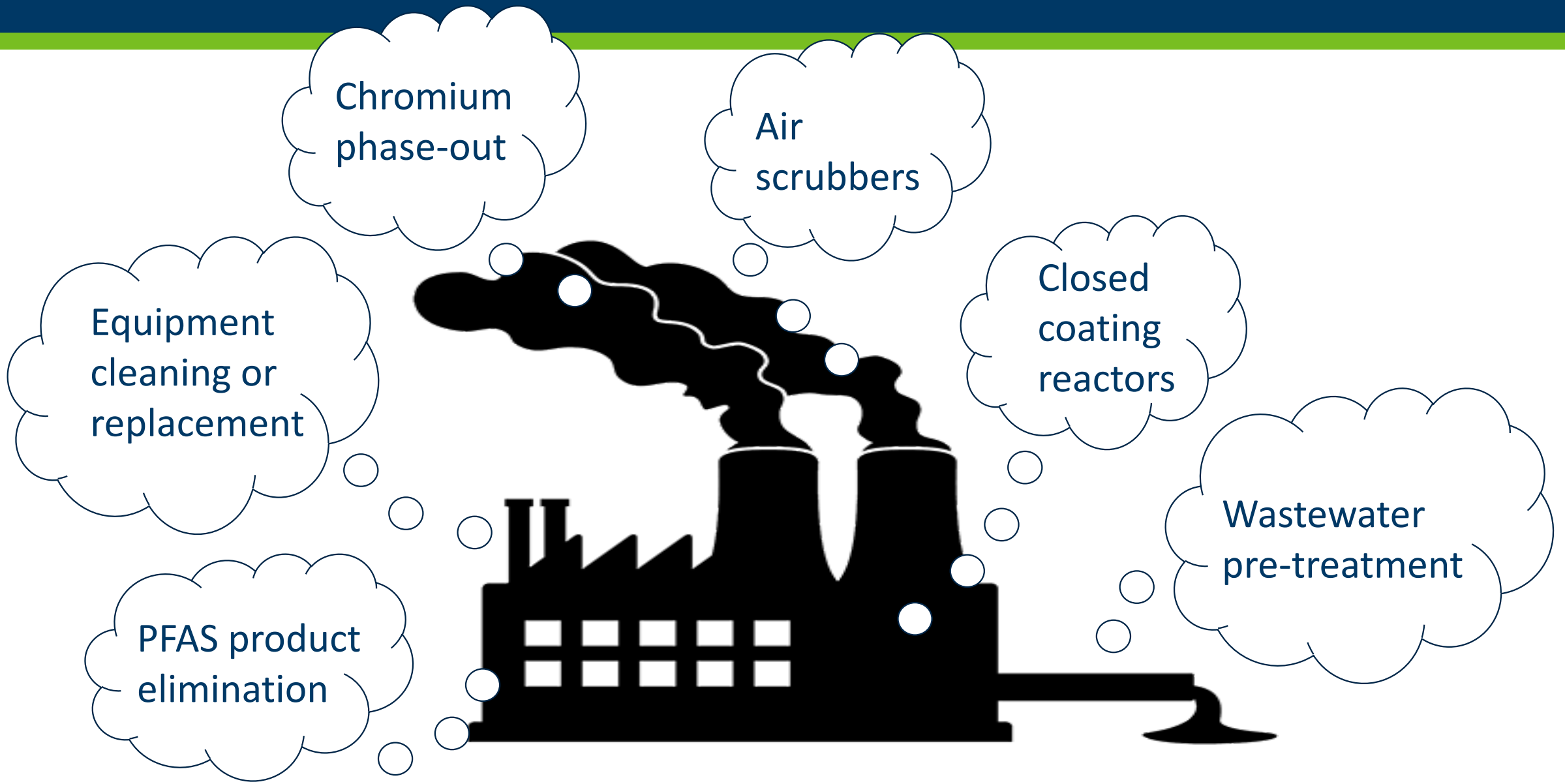
Chrome plating facilities in MI

- Only 6:2 FTS and 6:4 FTS found in fume suppressants currently in use
- Other compounds are legacy emissions or degradation products of compounds used historically

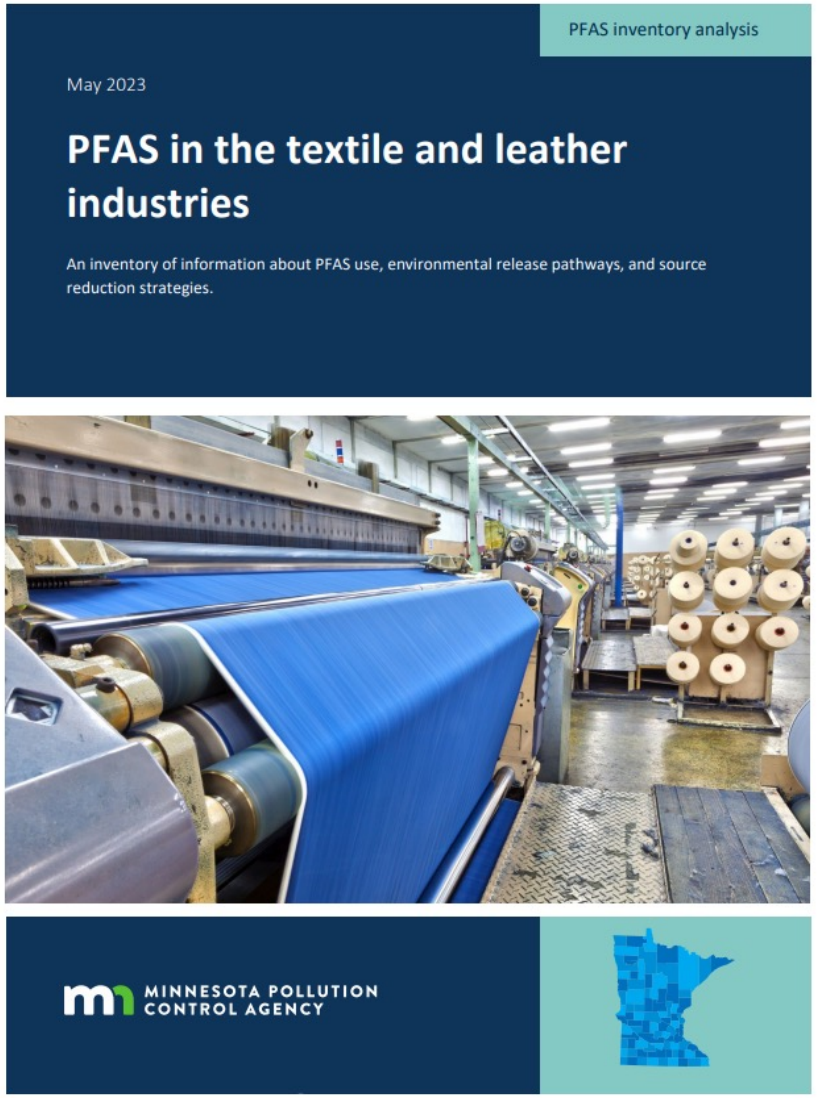


Michigan Department of Environment, Great Lakes, and Energy. (2020, June). *Targeted and Nontargeted Analysis of PFAS in Fume Suppressant Products at Chrome Plating Facilities.*

PFAS in metal finishing: Source reduction strategies

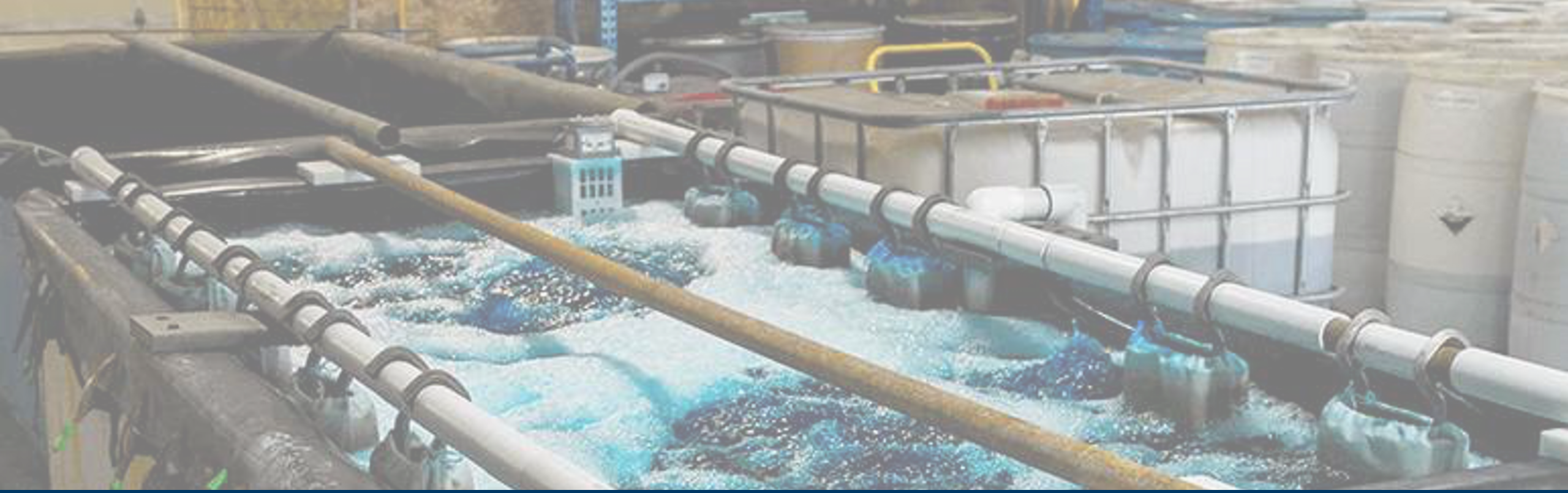


Publications and next steps



- Completed summaries published on MPCA's website: https://www.pca.state.mn.us/air-water-land-climate/pfas-studies-and-reports
- Additional sector resources based on program priorities and informational needs

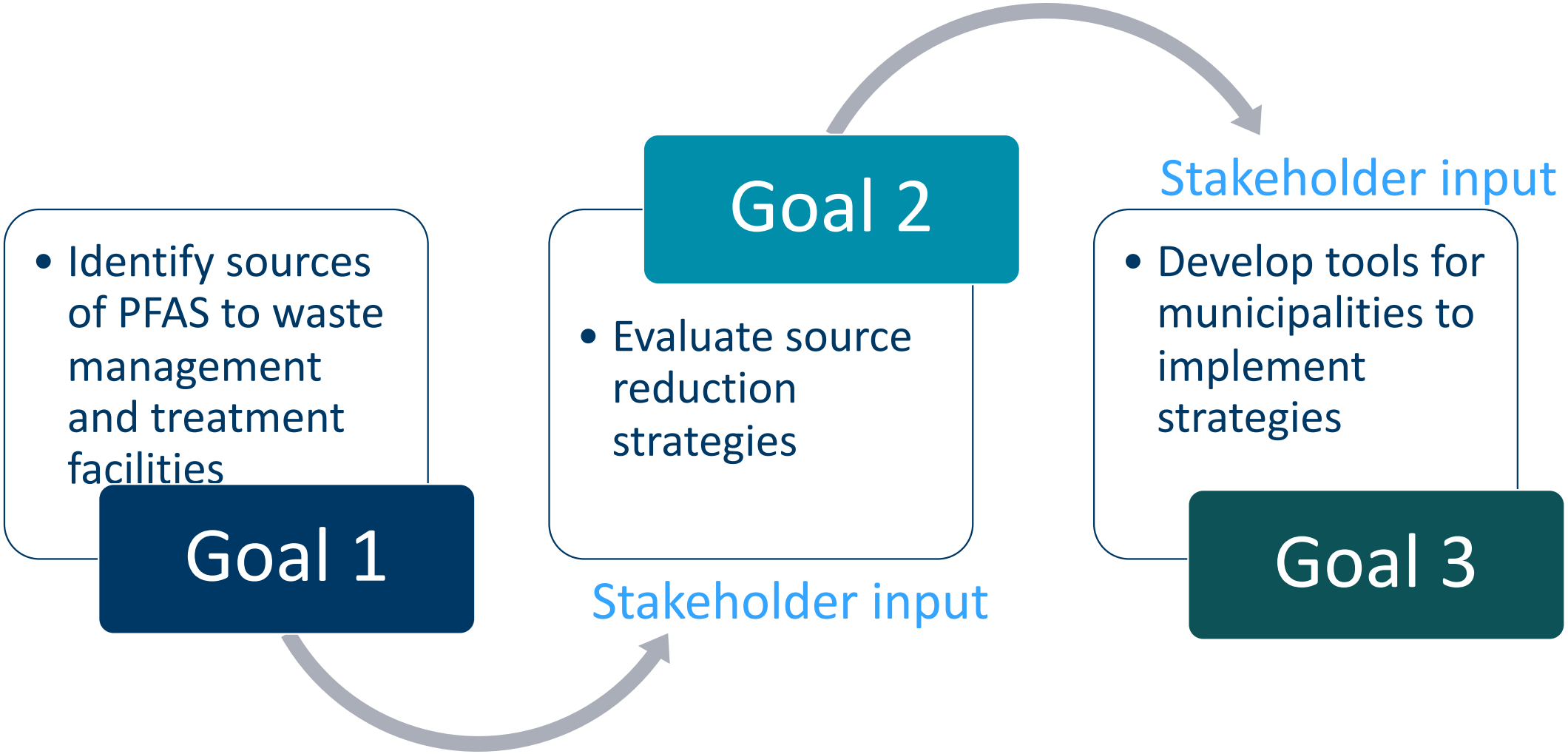
We learn more about sources of PFAS every day



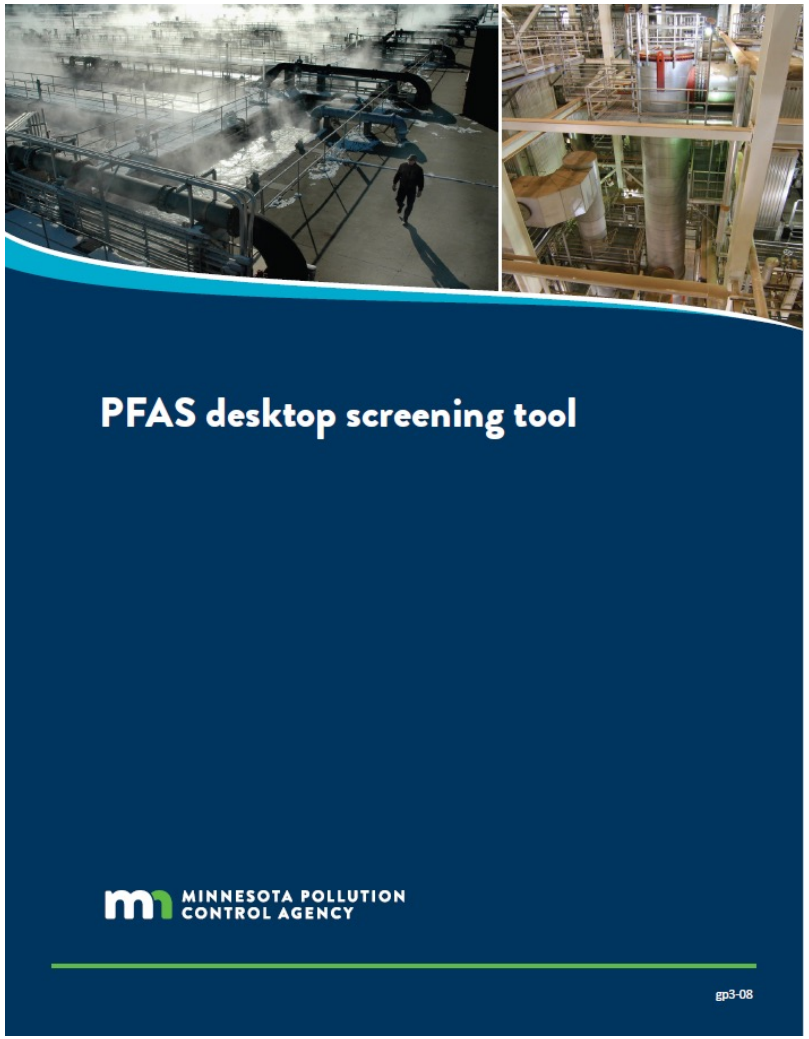
Other PFAS source identification and reduction work in MN

PFAS source evaluation and reduction project

Legislative initiative to reduce sources of PFAS to municipal WWTPs and solid waste facilities



PFAS source evaluation and reduction tools



Step 1: Check the box next to the applicable industry or activity, if listed

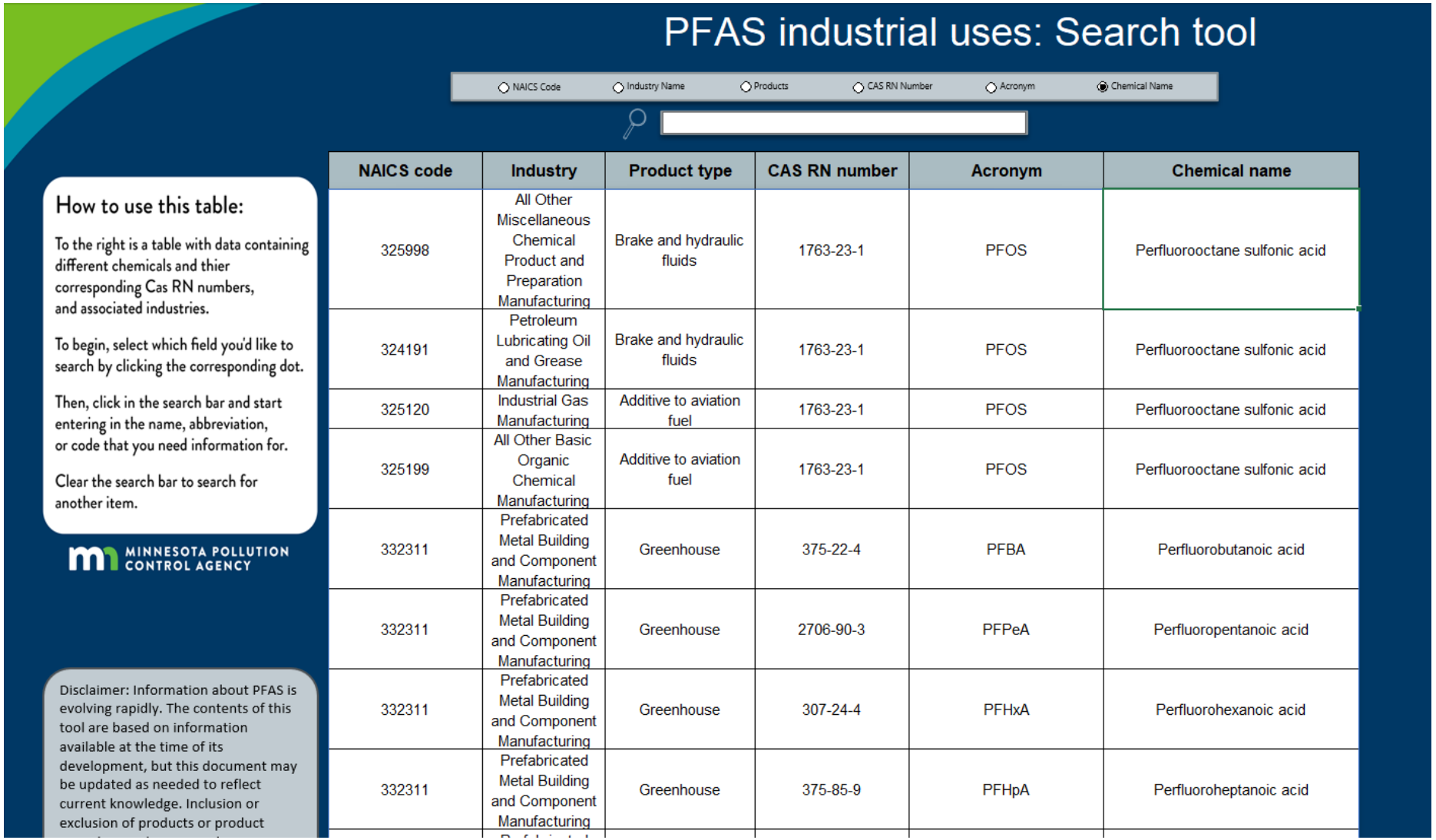
	INDUSTRY/ACTIVITY	POTENTIAL SOURCES
☐	Aqueous Film Forming Foam (AFFF), continued	AFFFs are used at airports, chemical manufacturing sites and in manufacturing industries that use these chemicals for accidents, testing, and training. AFFF examples include, but are not limited to: • FC-500F Light Water ATC AR AFFF 3 or 6 % (3M); • FC601AFP 1 or 3% AR-AFFF (Thunderstorm); • Fluoroprotein AR-AFFF (Chemguard); • ANSULITE 3% AFFF FP AFC3B-FP29 (ANSUL); • Arctic 3% AFFF and DB AFFF foam (Solberg); and, • WC2 – Also F-601B (Tyco).
☐	Cement Additives	PFAS can be used as an additive to cement to increase weather resistance and prevent shrinkage. They are also used in primer for coating cement mortar.
☐	Cosmetics and Personal Care	PFAS may be used in the cosmetics and personal care industry as emulsifiers, lubricants, or oleophobic agents. They can also be used in hair conditioning formulas and hair creams, and in foundation, moisturizer, eyeshadow, powder, lipstick, and shaving cream.
☐	Electronics Industry	PFAS can be used in the electronics industry in printed circuit boards, electroluminescent lamps and capacitors for use in cameras, cell phones, printers, touchscreens, scanners, satellite communication systems, radar systems, and more. They can also be used in fluorocarbon gases used for etching and chamber cleaning, including liquid crystal displays (LCDs), photovoltaic cells (PV), and semiconductors (including light-emitting diodes). PFAS can be used as lubrication on magnetic recording devices and within insulation of wiring. Perfluoropolyether (PFPE) is used as a heat transfer fluid. Wiring may include FEP. One example is wire manufacturing pulling lubricants (KrisTech). In the past, PFOA has been used in wire manufacturing.
☐	Etching	PFAS can be used as wetting agents in etch baths. Examples include but are not limited to: • Zonyl FSN (Dupont) and • FC series and FS Series (Tyco-Chemguard).
☐	Fire Training Facilities	Many fire training facilities use AFFFs that contain PFAS.
☐	Food Packaging	PFAS are sometimes used as non-stick chemicals for fast food wrappers, bags, liners, takeout containers, food trays, straws, pizza boxes, and other food packaging products. Note that as of January 1, 2024, PFAS use in food packaging will be prohibited in Minnesota. However, PFAS used historically at food packaging manufacturing sites may be ongoing sources of PFAS release.

Audience: Industrial users

Goals:

- Identify PFAS risk in business practices
- Provide resources for evaluating PFAS sources in operations, including SDS review

PFAS source evaluation and reduction tools



NAICS code	Industry	Product type	CAS RN number	Acronym	Chemical name
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	Brake and hydraulic fluids	1763-23-1	PFOS	Perfluorooctane sulfonic acid
324191	Petroleum Lubricating Oil and Grease Manufacturing	Brake and hydraulic fluids	1763-23-1	PFOS	Perfluorooctane sulfonic acid
325120	Industrial Gas Manufacturing	Additive to aviation fuel	1763-23-1	PFOS	Perfluorooctane sulfonic acid
325199	All Other Basic Organic Chemical Manufacturing	Additive to aviation fuel	1763-23-1	PFOS	Perfluorooctane sulfonic acid
332311	Prefabricated Metal Building and Component Manufacturing	Greenhouse	375-22-4	PFBA	Perfluorobutanoic acid
332311	Prefabricated Metal Building and Component Manufacturing	Greenhouse	2706-90-3	PFPeA	Perfluoropentanoic acid
332311	Prefabricated Metal Building and Component Manufacturing	Greenhouse	307-24-4	PFHxA	Perfluorohexanoic acid
332311	Prefabricated Metal Building and Component Manufacturing	Greenhouse	375-85-9	PFHpA	Perfluoroheptanoic acid

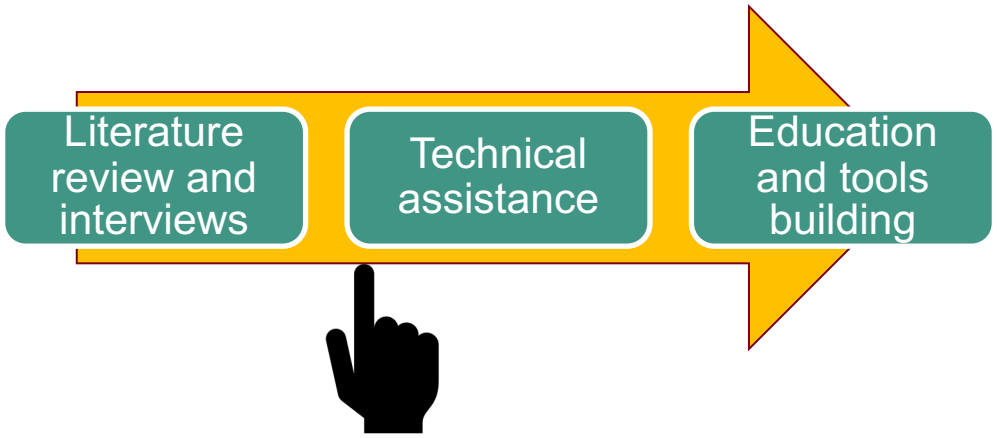
Audience: Municipal and industrial users

Goals:

- Identify industrial sources of specific PFAS chemicals
- Provide information in an easily accessible and updateable format

MnTAP PFAS Source Reduction Project

3 phase project



We're about right here

Goals

- Prevent PFAS Pollution
- Limit PFAS exposure from food

Actions

- Identify and share source reduction strategies
- Reduce emissions of PFAS through technical assistance
- Provide sector specific assessment guides to assist industry leaders

Helping Industry and WWTPs

3 Main Industries

- Metal Manufacturing and Fabrication
- Food and Beverage Manufacturing and Processing
- Chemical Manufacturing, Processing and Formulation

Creating Resources

GIS PFAS source mapping tool for WWTPs

- Provide city specific maps of potential sources PFAS
  - Uses NAICS codes to flag entities as potential sources

Industry-specific assessment guides

- Experience and research driven guidance
  - Where to look in operations
  - Alternatives to evaluate
  - Strategies to reduce
- Designed to support both industries and WWTPs identify and reduce PFAS sources

Minnesota Technical Assistance Program

Strengthening Minnesota businesses by improving efficiency while saving money through energy, water, and waste reduction

Find additional resources:

www.mntap.umn.edu

www.mntap.umn.edu/potw/pfas

For technical assistance or to participate in our project, please send an email:

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MINNESOTA POLLUTION CONTROL AGENCY