Waste Management Systems:
Receivers of PFAS Contaminated Materials

Waste Systems are Receivers of PFAS

Per and polyfluoroalkyl substances (PFAS) are a group of over 5,000 man-made fluorinated compounds that have been in production since the 1930's. Due to their unique ability to repel water, resist heat, and protect surfaces, PFAS are used in waterproof clothing and footwear, stain-free carpets, lotions, deodorants, and many other household items.

PFAS enter our homes through environmental contamination and consumer goods that have been manufactured or treated with PFAS. When materials containing PFAS are discarded, they cycle through our waste management systems and back into our environment.

Landfills, compost facilities, materials recovery facilities (MRFs), and waste water treatment facilities (WWTF), are not producers or original sources of PFAS. Instead, waste management facilities and WWTFs receive and manage PFAS contaminated waste and wastewater from households, businesses, and industry. Figure 1 below identifies sources, users, and receivers of PFAS.

SOURCES
- Industrial Manufacturers of PFAS

USERS
- Manufacturers
  - Clothing
  - Carpet
  - Food Containers
  - Fire Fighting Foam
- Consumers
- Fire Departments

RECEIVERS
- Waste Water Treatment Facilities
- Farms
- Waste Management Systems
  - Landfills
  - Compost Facilities
  - Recyclers

Figure 1: *Examples of sources, users, and receivers of PFAS.*

Figure 2: *PFAS do not readily break down and when discarded, they flow through our waste systems and into the environment.*

Flow of PFAS through Waste

Since PFAS are in such a wide array of consumer products, there is no easy way to control acceptance of these products at municipal solid waste (MSW) landfills, MRFs, and compost facilities. Furthermore, PFAS do not readily break down when discarded. Figure 2 illustrates how PFAS enter our homes, waste management systems, and ultimately our environment.

In landfills, PFAS are released from decomposing waste over time and have the potential to leave landfills in the form of leachate, or the liquid that is collected at the bottom of a landfill. Reducing levels of PFAS in landfill leachate is a challenge since the PFAS found in leachate today can be the result of products that were disposed of years ago. Treating PFAS in the leachate removed from landfills creates its own challenges since financial costs for treating or filtering landfill leachate prior to sending to a WWTF are high and treatment standards have not been promulgated in all states. Filtering and treatment also create by-products such as resins, filters, and membranes that contain PFAS and need to be disposed of as well.

Similar to studies showing decreasing levels of PFOA and PFOS (two of the most studied PFAS chemicals) levels detected in human blood,[7] there is a corresponding reduction of the compounds in landfill leachate over time.[2] This reduction correlates with the phase out of production of PFOA and PFOS in the United States, which indicates if we stop using these chemicals, levels in our waste systems and environment will decrease.

PFAS Levels In Context

The U.S. EPA has yet to establish an enforceable maximum contaminant level for PFAS but instead has established a drinking water health advisory (HA) for PFOA and PFOS of 70 parts per trillion (ppt). In comparison, levels of PFOA in household dust have been measured in excess of 140,000 ppt or over 2,000 times greater than the U.S. EPA HA.[10]

CONSIDER THIS 70 ppt = 70 seconds in 32,000 years

The waste management industry supports regulating these chemicals and sees protection of human health and the environment as a top priority. However, various factors including the concentrations of PFAS in our environment, lack of standardized sampling methods, continued use of these chemicals, and the patchwork of current regulatory standards (highlighted in Table 1) creates a concern that efforts and money could be more effectively spent on alternative approaches to managing health and environmental risks associated with PFAS. One alternative approach includes phase out and substitution of PFAS.

Examples of Source Reduction Efforts

The most practical way to control levels of PFAS in our environment is through broad source reduction efforts that involve eliminating these chemicals from consumer products. One example of this approach is the U.S. EPA's 1989 partial ban on asbestos-containing products. As a result of these regulations put in place to protect the public from exposure, there are only a very limited number of approved uses for asbestos today.[4]

Some states have adopted policies that ban PFAS in food packaging, firefighting foam, and single use plastic ware. Restrictions are also being considered for cosmetics and other products. Various states have also adopted regulations that create toxic chemical registries requiring manufacturers to report the use of these chemicals.[8]

Bearing the Costs

Unless actions are taken to hold manufacturers of these chemicals accountable, taxpayers, municipalities, and public utilities will be left bearing the costs for treatment and cleanup. One way this can be achieved is through extended producer responsibility which accounts for the environmental and disposal costs in the price of these products.

Additionally, several states have taken action and sued manufacturers of PFAS as illustrated in Figure 3. One case in the state of Minnesota was settled in 2018 for $850 million.[6] This suit and most others focus on known sites of contamination; however, New Hampshire is seeking compensation for state wide damages including money for treatment costs at WWTFs.[9]

For more information on how PFAS affect the Wisconsin solid waste industry, contact one of our industry partners:

Wisconsin Badger Chapter SWANA — Solid Waste Association of North America — swana-wi.org

AROW — Associated Recyclers of Wisconsin — recyclemorewisconsin.org

WCSWMA — WI Counties Solid Waste Management Association — wcswma.org/

Median concentrations of PFOA have been measured in excess of 140,000 parts per trillion (ppt) in household dust.[10]

Products like ski waxes and cosmetics have been found to contain over 2,000,000 ppt PFOA. [3][5]

While studies indicate levels of PFOA and PFOS in human blood have decreased since being phased out of use in the U.S., studies still show that more than 95% of adults have detectable PFAS concentrations in their blood. [1][7]

***Table 1:** The table below provides examples of states that have adopted drinking water standards for PFAS compounds. Different states are setting a range of limits for different subsets of compounds. This approach creates a patchwork of regulatory standards until the U.S. EPA sets a maximum contaminant level and establishes a standardized testing method.*

State (1)	Compounds	Limit/s (ppt)	Status
AK, CA,CO, DE, ME, NM	PFOA + PFOS	70	Approved drinking water standard
VT	PFOA, PFOS, PFNA, PFHxS + PFHpA	20	Approved drinking water standard
MN	PFOA/PFOS/PFBS PFBA/PFHxS	35/15/2,000 7,000/47	Approved Health Risk Limits and Health Based Values
MI	PFOA/PFOS	8/16	Pending drinking water standards (2019-35 EG)

(1) Does not include all states that are regulating PFAS in drinking water. Wisconsin DNR has listed 20 ppt as a threshold for recommended action in July 2019 letter to WWTFs but has not adopted a drinking water standard. [11]

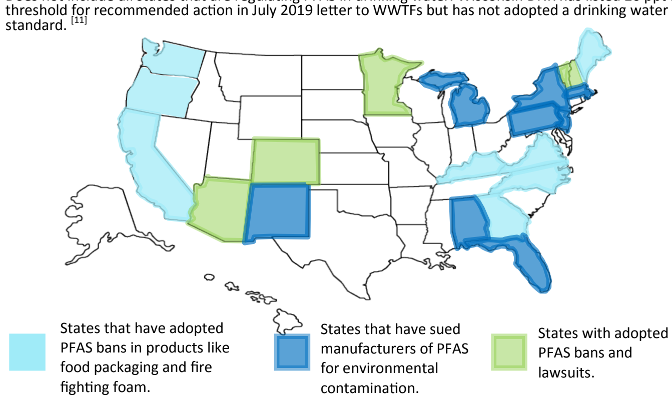

***Figure 3:** States that have taken action to reduce sources of PFAS and hold manufacturers accountable for environmental contamination.*

[1] Agency for Toxic Substances and Disease Registry (ATSDR), An Overview of Perfluoroalkyl and Polyfluoroalkyl Substances and Interim Guidance for Clinicians Responding to Patient Exposure Concerns on PFAS (2018) https://www.atsdr.cdc.gov/pfas/docs/pfas_clinician_fact_sheet_508.pdf

[2] Lang, Johnsie R., et al. "National Estimate of Per- and Polyfl uoroalkyl Substance (PFAS) Release to U.S. Municipal Landfill Leachate." (2017) Environmental Science & Technology, vol. 51, no. 4, pp. 2197–2205.

[3] Denmark, Ministry of Environment and Food, Risk assessment of fluorinated substances in cosmetic products (2018) https://www2.mst.dk/Udgiv/publications/2018/10/978-87-93710-94-8.pdf

[4] EPA Actions to Protect the Public from Exposure to Asbestos (2019) https://www.epa.gov/asbestos/epa-actions-protect-public-exposure-asbestos

[5] Kotthoff et. al., Perfluoroalkyl and polyfluoroalkyl substances in consumer products, Environmental Science and Pollution Research International (2015) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4592498/

[6] Minnesota 3M PFC Settlement (2019) https://3msettlement.state.mn.us/

[7] Olsen et. al., Per- and Polyfluoroalkyl Substances (PFAS) in American Red Cross adult blood donors (2017) https://www.sciencedirect.com/science/article/pii/S0013935117306916

[8] Safer States: PFAS in Food and Water (2019) http://www.saferstates.com/toxic-chemicals/pfas/

[9] State of New Hampshire Announces Historic Lawsuit, Actions to Protect Clean Drinking Water in New Hampshire (2019) https://www.governor.nh.gov/news-media/press-2019/20190529-drinking-water.htm

[10] Strynar, MJ and Lindstrom, AB, Perfluorinated compounds in house dust from Ohio and North Carolina (2008) https://nbci.nih.gov/pubmed18546718

[11] Wisconsin Department of Natural Resources. Per- and polyfluoroalkyl substances (PFAS) contamination. Per- and polyfluoroalkyl substances (PFAS) contamination. (2019) https://dnr.wi.gov/topic/contaminants/PFAS.html