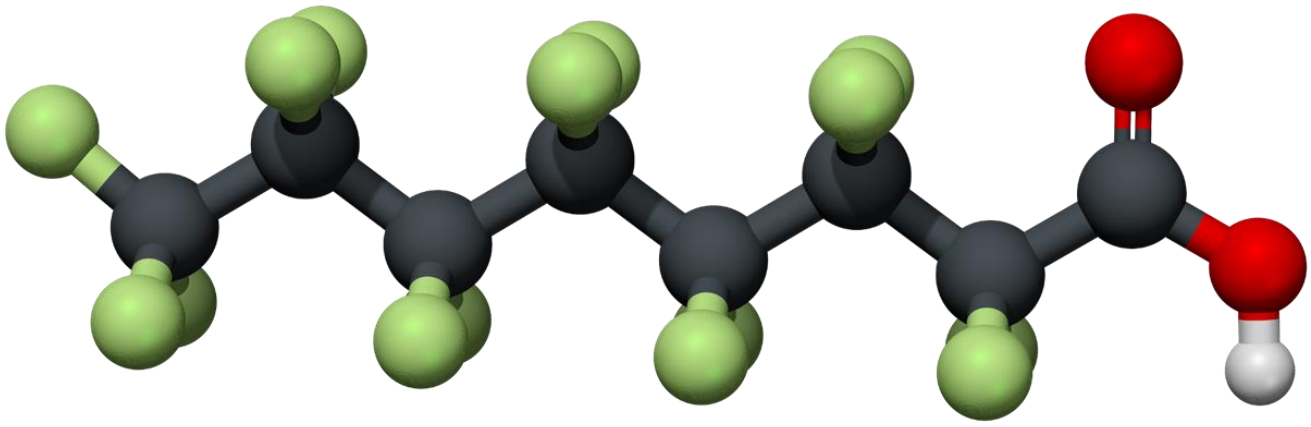
IOWA DEPARTMENT OF
NATURAL RESOURCES
LEADING IOWANS IN CARING FOR OUR NATURAL RESOURCES
KAYLA LYON, DIRECTOR

PFAS Action Plan



An example of a family of Perfluoroalkyl Substances: Perfluorooctanoic acid

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Overview

The Iowa Department of Natural Resources (DNR) has developed this action plan to protect the health of Iowa residents and the environment from a class of chemicals of emerging concern known as per- and polyfluoroalkyl substances (commonly referred to as PFAS). These chemicals were used in such products as non-stick coatings, carpet, clothing, fabrics for furniture, paper packaging for food, chrome plating, and some firefighting foams.

DNR takes the risks from these "forever chemicals" to human health and the environment very seriously. The existing body of scientific literature suggests that exposure to these compounds may result in health effects such as developmental defects in fetuses and infants as well as certain types of cancer. Based on sampling data to date, the presence of PFAS in drinking water in the state of Iowa is minimal. While other states have moved ahead with significant regulatory initiatives due to the high levels of known PFAS contamination in those states, the scope of the problem in Iowa appears to be lower at this point. However, in order to address this risk, DNR is moving forward with this action plan as a first step toward developing a comprehensive response plan.

This document outlines the initial steps the DNR will be taking to determine the extent of PFAS contamination in the state of Iowa. Once the scope of PFAS contamination is more clearly defined through sampling, DNR will notify those who may be at risk of exposure and will continue to work with stakeholders and fellow state agencies to minimize exposure to PFAS, minimize future releases of PFAS, and to remediate known PFAS contamination affecting drinking water supplies.

Before outlining the strategy and focus for the assessment phase of the action plan, it is useful to briefly review activity involving PFAS in Iowa, activity at the state level across the country, and activity at the federal level.

PFAS in Iowa

As of the date that this document was completed, there have been no detections of PFAS compounds in the finished drinking water of those public water supply systems in Iowa that have sampled for the compounds. This is good news, but it is far from certain that there will not be instances where the compound could be found in the future. This is one of the main drivers for the development of a proactive response plan. PFAS contamination—likely stemming from fire-fighting foam use—has been found in soil and groundwater at two Iowa Air National Guard (ANG) bases and the DNR is working with the facilities to assess and address the potential contamination of nearby drinking water supplies.

PFAS in other states

Many states are dealing with PFAS. Particularly in those states where manufacturing occurred using PFAS compounds, the levels of contamination are significant. In fact, some states are facing such significant levels of contamination that they have moved ahead on their own to implement drinking water standards in lieu of the level currently set by United States Environmental Protection Agency (EPA). For more information on these varied approaches to addressing PFAS at the state level, interested parties may wish to visit EPA's PFAS website [add link] which provides a state-by-state

summary of actions for the twenty or so states that have initiated regulatory action or developed a response plan.

PFAS at the federal level

The EPA has developed and is implementing a multi-pronged PFAS action plan. Recent developments include:

1. Moving forward with the Safe Drinking Water Act's drinking water standard setting process for PFAS chemicals. EPA expects to issue a regulatory determination for PFAS chemicals in the very near future.
2. Issuing a proposed advanced notice of proposed rulemaking that may result in PFAS chemicals being added to the list of chemicals subject to reporting requirements under the Toxic Release Inventory (TRI) program.
3. Proposing nationwide drinking water monitoring pursuant to Safe Drinking Water Act regulations.
4. Developing guidance for federal agencies and states addressing PFAS chemical cleanups.
5. Initiating the regulatory development process for listing certain PFAS chemicals as hazardous substances under CERCLA.
6. Developing and approving analytical methods for measuring PFAS compounds in the environment.

While all of these initiatives are moving forward, it may be some time before any of the regulatory initiatives are finalized.

PFAS work in Iowa

General History

As a chemical of emerging concern, PFAS compounds are a relatively recent addition. The compounds were discovered in the 1930's and manufacturing began in the 1940's. Commonly known subset chemicals of PFAS are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). PFAS is currently used as a coating on many consumer products such as stain resistant coating on carpets, non-stick coating on cooking utensils, pizza boxes, and microwave popcorn bags. The United States began phase-out of certain long-chained PFAS due to industry and regulatory concerns about the impact of PFOA and long-chain PFAS on human health and the environment. These included concerns about their persistence, presence in the environment and in the blood of the general population, long half-life in people, and developmental and other adverse effects in laboratory animals. In May 2000, 3M announced voluntary phase out of eight carbon-based chemicals. This phase out was completed in 2002.

The EPA began the PFOA Stewardship Program in 2006 because of concerns about the impact of PFOA and long-chain PFASs on human health and the environment. This program invited eight major companies in the PFAS industry to join in a global stewardship program to commit to reducing PFOA from facility emissions and product content by 95 percent no later than 2010, and to work toward eliminating PFOA from emissions and product content no later than 2015. Each of the eight companies expressed support for a global stewardship program addressing reductions in PFOA and related chemicals from both emissions and product content. Companies also noted their willingness to make a general commitment to continue to pursue research into the sources, pathways of exposure, and potential risks of these chemicals.

In 2007 the EPA issued Significant New Use Rules under the Toxic Substances Control Act that allows continued, low-volume use in specific industries/applications. In 2009 EPA established the provisional lifetime Health Advisory for PFOA and PFOS set at 400 and 200 nanograms per liter (ng/L or parts per trillion) respectively.

PFAS are manufactured globally. As the manufacturing of legacy compounds were phased-out in the United States, they were still manufactured in European and Asian countries. However, after 2017, only China is known to still manufacture PFOS.

In 2016 the EPA finalized the Lifetime Health Advisory (HA) for PFOA and PFOS to no more than 70 ng/L for either compound or the sum of both.

Status of Monitoring in Iowa

Monitoring of drinking water for PFAS compounds began in 2013. Iowa participated in the third EPA Unregulated Contaminant Monitoring Rule (UCMR) that lasted from 2013 through 2015. This program requires public water supplies serving more than 10,000 people and selected smaller systems to monitor for a group of contaminants that could be present and which have known adverse human health effects. The purpose of the UCMR is to provide data that is used to determine if a specific contaminant should be regulated on a national basis (e.g. MCL). Of the 57 public water supply systems sampled in Iowa as

part of UCMR 3 there were no detections above the laboratory reporting limit for the six compounds analyzed.

In 2018, the ANG completed site investigations of bases located at the Sioux City and Des Moines airports. Both reports indicated detections of PFAS compounds. At Sioux City, the Site Investigation Report suggested that private wells might be impacted by off-site migration of PFAS contamination. The DNR required sampling of raw water by the ANG from selected private and a public well prior to the next phase of work (Remedial Investigation). This work was completed in 2019 and the results of this testing indicated the raw water for all wells tested were either below detection or below the drinking water HA.

Additional work was also completed at the Des Moines ANG site at the request of the Des Moines Water Works (DMWW). This work was also completed in 2019 and indicated small impacts that could be attributed to stormwater runoff from the airport to the alluvium near where the DMWW extracts water. The PFAS concentrations in the DMWW gallery system were undetectable by the time the water entered the treatment plant.

The DNR continues to facilitate discussions on appropriate interim monitoring at both sites until the ANG can complete the next phase of work (Remedial Investigation).

The Department of Defense continues to initiate site investigations at other facilities in Iowa under its control. This work is either just beginning or is still in the planning stages. It should be noted that the Department of Defense has replaced all legacy (longer chain PFAS) firefighting foams in 2017 with foam that is made with shorter chain PFAS compounds which are considered more environmentally friendly.

The EPA is also including PFAS on the upcoming UCMR 5 to begin in 2021. The United States Geological Survey has collected surface water samples at 60 stream sites in Iowa. The results are not yet available from the USGS laboratory but this data will give the DNR a better understanding of the general background concentrations of the PFAS compounds in surface waters of Iowa.

Focus Area 1: Identify and Minimize Exposure of Iowans to PFAS

The current primary exposure pathway for health effects of individuals, in the general population, from PFAS, is through drinking water. Therefore, the initial steps of the DNR's Action Plan focuses on identifying water supplies that may be at risk and conducting sampling to verify. Future actions could include site investigations where contamination is suspected and clean-up of sites that are contaminated.

Initial Actions

A phased approach will be implemented to prioritize testing of public drinking water systems that have been identified as at risk, based on historical and current land uses, vulnerability to surficial contamination, and industrial use of PFAS in the vicinity. Similar to the public drinking water system evaluation, the DNR will identify and prioritize private wells at risk.

The general process for prioritizing public drinking water systems will be as follows:

1. Develop a PFAS Inventory:
    a. Identify the locations where activities and or businesses operate[d] that are known to use PFAS in their processes (i.e. airports, fire training areas, certain manufacturing sectors, etc).
    b. Validate the locations to determine if correct parcels are identified (i.e. corporate location versus manufacturing location) and the size of parcels.
2. Incorporate drinking water sources (surface water and groundwater) into the data set for comparison against the locations identified in the previous step. The DNR will determine potential exposure pathways based on geology, location of private wells, public water supply wells, wellhead protection areas and surface water intakes.
3. Develop a scoring system to score/rank each location.
4. Perform testing of source and finished water of at risk water supplies based on the scoring in the previous steps using EPA-validated laboratory methods for analysis.

A more detailed plan for the prioritization process will be developed as well as a protocol to outline response actions and next steps if PFAS is detected in public drinking water supplies.

Intermediate Actions

Currently, the only regulatory level is the HA for PFOA and PFOS. There are only two validated laboratory methods for the analysis of up to 29 PFAS analytes. These methods are only applicable to testing drinking water and groundwater. The EPA is currently working on validating laboratory methods for non-drinking water samples. After more scientific work has been completed to establish validated laboratory evaluation procedures and regulatory levels for media besides drinking water, future phases of evaluation of PFAS in the environment may include but is not limited to the evaluation of:

- Fish tissue
- Landfills
- Wastewater treatment facilities

- Biosolids land application sites
- Surface waters
- Initiation of site investigation at locations where contamination is suspected based on intensive PFAS use as a product or in manufacturing
- Ambient air monitoring at locations that used PFAS compounds.

Areas where evaluation may be recommended but outside the authority of the DNR includes:

- Identify and prioritize private wells at risk
- Dairy products, food and food packaging, other agricultural products and food service ware
- Worker exposure at facilities where PFAS are used as part of a manufacturing process.

Focus Area 2: Preventing or reducing future releases of PFAS

Pollution Prevention

Pollution prevention (P2) is any practice that reduces, eliminates, or prevents pollution at its source. Also known as "source reduction" or the “ounce-of-prevention” approach, pollution prevention seeks to reduce the amount of pollution produced, which means less waste to control, treat, or dispose of, and less hazards posed to public health and the environment.

The main pathways for future releases of PFAS to air, soil, surface water, and groundwater are from industrial and commercial processes, as well as the use of Aqueous Film Forming Foam (AFFF) that contain PFAS. AFFF is used to fight high-hazard Class B petroleum and flammable liquid fires. Examples of locations where this type of foam might be used include chemical plants, airports, bulk petroleum storage facilities, military facilities, and municipal firefighting response and training areas.

Numerous consumer products can also contain PFAS, including but not limited to carpeting, treated fabrics, cleaners, and waxes. Manufacturing, use, and disposal of these products may release PFAS to the environment and lead to human exposure.

Table 1. Potential major manufacturing sources of PFAS releases to the environment

Sector	Example Uses	References
Textiles & Leather	Factory- or consumer-applied coating to repel water, oil, and stains. Applications include protective clothing and outerwear, umbrellas, tents, sails, architectural materials, carpets, and upholstery.	Rao and Baker 1994; Hekster, Laane, and de Voogt 2003; Brooke, Footitt, and Nwaogu 2004; Poulsen et al. 2005; Prevedouros et al. 2006; Walters and Santillo 2006; Trudel et al. 2008; Guo et al. 2009; USEPA 2009a; Ahrens 2011; Buck et al. 2011; UNEP 2011; Herzke, Olsson, and Posner 2012; Patagonia 2015; Kotthoff et al. 2015; ATSDR 2015
Paper Products	Surface coatings to repel grease and moisture. Uses include non-food paper packaging (for example, cardboard, carbonless forms, masking papers) and food-contact materials (for example, pizza boxes, fast food wrappers, microwave popcorn bags, baking papers, pet food bags).	Rao and Baker 1994; Kissa 2001; Hekster, Laane, and de Voogt 2003; Poulsen et al. 2005; Trudel et al. 2008; Buck et al. 2011; UNEP 2011; Kotthoff et al. 2015; Schaider et al. 2017
Metal Plating & Etching	Corrosion prevention, mechanical wear reduction, aesthetic enhancement, surfactant, wetting agent/fume suppressant for chrome, copper, nickel and tin electroplating, and post-plating cleaner.	USEPA 1996; USEPA 1998; Kissa 2001; Prevedouros et al. 2006; USEPA 2009b; UNEP 2011; OSHA 2013; KEMI 2015; Danish EPA 2015
Wire Manufacturing	Coating and insulation.	Kissa 2001; van der Putte et al. 2010; ASTSWMO 2015
Industrial Surfactants, Resins, Molds, Plastics	Manufacture of plastics and fluoropolymers, rubber, and compression mold release coatings; plumbing fluxing agents; fluoroplastic coatings, composite resins, and flame retardant for polycarbonate.	Kissa 2001; Renner 2001; Poulsen et al. 2005; Fricke and Lahl 2005; Prevedouros et al. 2006; Skutlarek, Exner, and Farber 2006; van der Putte et al. 2010; Buck et al. 2011; Herzke, Olsson, and Posner 2012; Kotthoff et al. 2015; Miteni 2016; Chemours 2017
Photolithography, Semiconductor Industry	Photoresists, top anti-reflective coatings, bottom anti-reflective coatings, and etchants, with other uses including surfactants, wetting agents, and photo-acid generation.	SIA 2008; Choi et al. 2005; Rolland et al. 2004; Brooke, Footitt, and Nwaogu 2004; van der Putte et al. 2010; UNEP 2011; Herzke, Olsson, and Posner 2012

Table provided courtesy ITRC. History and Use of Per- and Polyfluoroalkyl Substances (PFAS)

Table 2. Types of Class B foams

Fluorinated foams (contain PFAS)	• Aqueous film-forming foam (AFFF):
	  ○ Legacy PFOS AFFF
	  ○ Legacy fluorotelomer AFFF
	  ○ Modern fluorotelomer AFFF
	• Alcohol-resistant aqueous film-forming foam (AR-AFFF)
	• Film-forming fluoroprotein foam (FFFP)
	• Alcohol-resistant film-forming fluoroprotein foam (AR-FFFP)
	• Alcohol-resistant fluoroprotein foam (FRAR)

Fluorine-free foams (do not contain PFAS)	• Protein Foam • Alcohol-resistant protein foam (AR-P) • Synthetic fluorine-free foam (FFF) • Synthetic alcohol-resistant fluorine-free foam (AR-FFF)

Table provided courtesy of ITRC and S. Thomas, Wood plc

The DNR will support initiatives that focuses on P2 and minimizing future releases of PFAS to the environment. Example strategies include collaborating with the State Fire Marshal and stakeholders to:

- Promote best management practices for AFFF storage and use
- Support surveys of existing AFFF stocks
- Support development of a take-back program to safely dispose of AFFF
- Sponsor P2 industry training workshops that promote best management practices and safe disposal of PFAS containing materials.

Focus Area 3: Education, Outreach, and Communication

Communicating to the public about PFAS presents a unique set of challenges. To concerned citizens, these risks are very personal. They are associated with the water they drink and the land they live on, so DNR notes the importance of empathizing and taking a narrow approach that focuses on the affected community.

Messaging may include:

- Regular communications through all outlets (email, web, conference calls, town meetings, and briefings with all key stakeholders).
- Consistent messaging across all parts of the agency that contains information about the contaminant and necessary health actions.
- Pre-meeting planning and involvement of local officials. DNR will work in conjunction with the military, Iowa Department of Public Health, counties, cities, and other departments to communicate prior to public meetings in which they discuss responses to potential questions.

Involvement of District and Field staff

While DNR notes the importance of working at the state and legislative levels, local DNR staff involvement is vital to successful communication.

For more information on this plan and other PFAS activities please see: www.Iowadnr.gov/PFAS