Per- and Poly-Fluorinated Alkyl Substances Chemical Action Plan (PFAS CAP) – 2019 Updates

Preliminary CAP Recommendations

In 2017, the Washington State departments of Ecology and Health shared draft PFAS CAP chapters with external parties for review and comment. Comments received are available online.
Ecology and Health are sharing CAP documents with interested parties prior to the May 15 2019 PFAS CAP webinar. Updates will be discussed during the April webinar. We expect to publish the entire Draft PFAS CAP around June 2019 followed by a 60-day comment period.

In May 2019, Ecology and Health will host a PFAS CAP webinar (May 15th) to:

- Briefly review activities underway: firefighting foam, food packaging, drinking water.
- Review updated/new chapters – comments will be accepted on the updated chapters. Responses will be provided after the 2019 public comment period (summer 2019).
- Discuss preliminary recommendations – requesting comments and suggestions from interested parties – due a week after the webinar.
- Submit comments online.

Quick summary of PFAS CAP efforts:

- PFAS CAP Advisory Committee and interested parties met in 2016, 2017 and 2018.
- September 2017 Draft PFAS CAP chapters posted:

Intro/Scope	Environment
Biosolids	Health
Chemistry	Regulations
Ecological Toxicology	Uses/Sources

- March of 2018, Ecology and Health published the Interim PFAS CAP.
- The 2019 updated PFAS CAP "chapters" to be posted (in the order we expect to post on the PFAS CAP website):

Biosolids	Chemistry
Ecological Toxicology	*Analytical methods (new)*
Environment	*Fate and Transport (new)*
Regulations	*Economic analysis (new)*
Uses/Sources	*Preliminary*
Health	*Recommendations (new)*

Questions - contact Kara Steward at kara.steward@ecy.wa.gov.

This document is posted on the PFAS CAP Website - https://www.ezview.wa.gov/?alias=1962&pageid=37105

Table of Contents

Draft PFAS CAP

PFAS (per- and polyfluorinated alkyl substances) are a group of over 4,700 synthetic organic chemicals. They are used in the manufacture of coatings, surface treatments, and specialty chemicals used in cookware, carpets, food packaging, clothing, cosmetics, and other common consumer products. PFAS also have many industrial applications and are an active ingredient in Class B firefighting foams (often called aqueous film-forming foam or AFFF, which is not used in this document). PFAS coatings resist oil, grease, and water. PFAS can withstand high temperatures and survive highly corrosive environments.

Chemical Action Plans (CAPs) identify the potential health and environmental effects of persistent, bioaccumulative, and toxic chemicals, and recommend actions to reduce or eliminate those impacts. Some PFAS have been identified as persistent, bioaccumulative and toxic. The Departments of Ecology (Ecology) and Health (DOH) developed this Draft CAP to recommend actions to address problems with PFAS. Development of the Final PFAS CAP will continue and should be complete in early 2020.

There are three laws in Washington that impact the use of PFAS[1]. PFAS is defined in those laws as "a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom."

This Draft PFAS CAP recommends actions to reduce PFAS exposure, use, and release in Washington. The draft recommendations address some of the more urgent public health and environmental concerns while considering feasibility, social impacts, and economic costs. Because new PFAS continue to be developed for use in products, we included proposals to evaluate and ensure their safety.

Why are we concerned about PFAS?

Ecology and DOH are concerned about the class of PFAS, including "short-chain" PFAS that manufacturers use to replace "long-chain" PFAS like PFOS and PFOA. Some short-chain PFAS appear to be less bioaccumulative in people than long-chain compounds, but publicly available data on their hazards is only available for a few of these substances. Like long-chain PFAS, many of the short-chain substances are extremely persistent or degrade into extremely persistent forms.

Short-chain PFAS also tend to be more water soluble and more mobile than the long-chain substances. This means they can move more easily through soil to contaminate groundwater or surface water. They are harder to remove from drinking water. The implications of the short-chain PFAS replacements on human and environmental health are unknown/uncertain. If environmental exposures to short-chain PFAS are found to pose health risks to people or the environment, mitigation will be difficult and expensive.

Therefore, the scope of this CAP includes the entire class of PFAS, degradation products, and available substitutes.

[1] https://app.leg.wa.gov/RCW/default.aspx?cite=70.75a&full=true
https://app.leg.wa.gov/RCW/default.aspx?cite=70.95g&full=true
https://app.leg.wa.gov/billsummary?BillNumber=5135&Year=2019&Initiative=false

PFAS concerns

1. PFAS use leads to long-lived perfluorinated breakdown products.

Many PFAS, such as those used for firefighting foam, degrade in the environment to form perfluoroalkyl acids (PFAAs). There are no known natural mechanisms that can break these PFAAs down. Any toxic or other hazardous effects caused by these chemicals will be with us for many decades

2. Some PFAS have been shown to have harmful health effects.

Animal studies show strong evidence of developmental toxicity, liver toxicity and immune toxicity for a several PFAAs. Available epidemiological studies suggest links between PFAA exposure and several health outcomes including increases in cholesterol levels, reduction in birth weight, reduction in immune antibody response to childhood vaccines and increases in rates of some cancers such as kidney and testicular.

3. Everyone in Washington is likely exposed to PFAS.

National surveys show that everyone tested had some PFAS in their blood. Exposure can occur from many sources. The most common sources are food, drinking water, and PFAS-containing consumer products. Some people, such as low-income populations, communities of color, and high consumers of fish and shellfish may have higher than average exposures because of their longer retention of household items such as carpets with phased-out PFAS, higher consumption of food in disposable packing, and higher consumptions of foods that bioconcentrate PFAAs.

4. PFAS is in Washington's environment.

In Washington State PFAAs have been detected in surface waters, groundwater, wastewater treatment plant (WWTP) effluent, freshwater and marine sediments, freshwater fish tissue, and osprey eggs. PFAA concentrations were highest in urban surface water and surface waters receiving minimally diluted WWTP effluent.

5. PFAS levels in some Washington drinking water supplies exceed recommended levels for public health protection.

PFAAs have been identified in seven drinking water systems in Washington. In some areas, drinking water samples exceeded the lifetime health advisory level set by the U.S. Environmental Protection Agency (EPA). PFAS-based Class B firefighting foam is believed to be the primary source of contamination at each of these areas.

6. Many consumer products in Washington contain PFAS.

PFAS is used in many applications. For most consumer products, the specific PFAS and amounts they contain, the potential for human PFAS exposure, and the release of PFAS to the environment from production, use, and disposal are poorly understood.

7. Analytical techniques to identify and measure individual chemicals are not available for the majority of PFAS compounds.

Lack of adequate information about the full spectrum of types and amounts of PFAS in products and the environment hampers the evaluation of the potential risks of PFAS use and exposure.

PFAS work happening now

Selected PFAS activities underway at DOH and Ecology are summarized in this section. These agency actions are proceeding using existing resources, agency costs are not included.

State drinking water rulemaking

The State Board of Health initiated rulemaking to consider setting a standard for PFAS in drinking water. Revisions to Group A Public Water Supplies (Chapter 246-290 Washington Administrative Code (WAC)) may include:

- Establishing a standard or advisory level for specific PFAS in drinking water.
- Requirements for monitoring, recordkeeping and reporting, follow-up actions, and other associated requirements for PFAS and other unregulated contaminants with established state advisory levels.
- Technical and editorial changes as needed.

The revisions are intended to improve public health protection by setting a regulatory standard for PFAS in Washington for Group A public water systems.

DOH will keep stakeholders and interested parties informed of the rule development through email, and posting information on the department's rulemaking website[2]. Stakeholders and interested parties will have the opportunity to provide comments throughout the rulemaking process, during the formal comment period, and at the board's public hearing.

DOH is in the process of reviewing toxicological data and recommendations for setting PFAS action levels in rule. DOH expects to complete this review and update the State Board of Health in June, and hold public workshops on the draft rule in July or August. The rulemaking schedule anticipates filing proposed rule language in October 2019 and rule adoption in January 2020[3].

The costs to DOH to support PFAS rule-making are being absorbed by DOH and conducted with existing resources. The costs to water systems to comply with water testing requirements and take action when drinking water exceeds state action levels will be developed as part of the rule-making process.

Voluntary drinking water testing

In 2018, the DOH Office of Drinking Water offered voluntary testing for PFAS in certain Group A water systems. The Office of Drinking Water identified water systems with production wells that were within a certain distance from a property that may have used PFAS containing firefighting foam. The systems notified of this voluntary testing opportunity included more than 300 Group A public and tribally owned water systems across the state. Many of these systems serve vulnerable/sensitive populations, including children, pregnant women, low-income, immigrant and refugee communities, or communities of color.

[2] https://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/RegulationandCompliance/RuleMaking
[3] https://www.doh.wa.gov/Portals/1/Documents/4200/PFAS-Timeline-12-2018.pdf

A total of 75 water systems accepted the offer of voluntary testing. Testing is intended to find drinking water systems with elevated levels of PFAS in order to take action to reduce PFAS levels in drinking water. This testing is currently funded for $235,000.

If a public water system finds high levels of PFAS, the Office of Drinking Water will ensure they provide public notice to their customers, including vulnerable/sensitive populations. The public notice will include what to do, what not to do, and the potential health effects of PFAS. If a system needs help communicating to customers, Office of Drinking Water will support them by providing resources, including translated materials, and assistance.

Office of Drinking Water will also inform the appropriate local health jurisdiction, and support their efforts to communicate public health messages to the community and those they regulate. This includes Group B water systems and private wells.

This voluntary testing has been delayed because of challenges with lab accreditation and contracting. DOH expects to have clarity on the path forward by June.

Firefighting law implementation

Firefighting Agents and Equipment law (Chapter 70.75A Revised Code of Washington (RCW)[4]) includes the following restrictions:

- Prohibits training use of PFAS-containing Class B firefighting foam for all users.
- Beginning July 1, 2020, prohibits manufacture, sale, and distribution of PFAS-containing Class B firefighting foam. Exemptions include federally required users, petroleum storage and distribution facilities or certain chemical plants.
- Requires manufacturers of PFAS-containing firefighting personal protective equipment to notify Washington State purchaser of the presence and purpose of PFAS.

Update: The following activities have been conducted by Ecology to implement the law.

- Developed an agency website to provide more information and outreach materials regarding the requirements of the law[5].
- Conducted outreach to manufacturers to explain the requirements and ensure compliance with the restrictions.
- Collaborated with state, local governments, and other firefighting foam users on the prohibition of the use of PFAS-containing Class B firefighting foam for training purposes and the purchase restriction that takes effect in 2020.
- Provided technical assistance to state, local governments, and other jurisdictions to help them purchase PFAS-free Class B firefighting foam.
- Consulted with the Department of Enterprise Services to develop state procurement preferences for state, local governments and other jurisdictions to purchase PFAS-free Class B firefighting foam alternatives.
- Contacted manufacturers of firefighting personal protective equipment to inform them of the requirement to notify purchasers of the presence of PFAS and requested copies of the notification.

[4] https://app.leg.wa.gov/RCW/default.aspx?cite=70.75A&full=true
[5] https://ecology.wa.gov/Waste-Toxics/Reducing-toxic-chemicals/Addressing-priority-toxic-chemicals/PFAS/Toxics-in-firefighting

Food packaging law implementation

The Packages Containing Metals and Toxic Chemicals law (Chapter 70.95G RCW[6]) includes the following restrictions:

- Prohibits PFAS in plant fiber-based food packaging, to take effect in January 2022.
- Requires Ecology to conduct an assessment to identify safer alternative products considering chemical hazard, performance, cost and availability, and exposure. Ecology must submit the findings for external peer review and publish the results in the Washington State Register.
- Ecology is required to report results to the legislature by January 1, 2020. The ban on PFAS food packaging could take effect as early as January 1, 2022.

Update:

- Following a competitive bid process, Ecology selected SRC, Inc. as the contractor to support the alternatives assessment (AA) development.
- A statement of work, deliverables, and timeline are available on the PFAS CAP website[7].
- SRC, Inc., and Ecology are working with a broad range of interested parties to gather the information needed to complete the assessment work. Ecology will request an external peer review and publish the results in the Washington State Register.

Interim PFAS CAP update

In April 2018 the Interim PFAS Chemical Action Plan[8] recommended the following actions to address immediate PFAS issues, research PFAS exposures and releases. Some of these actions are underway and summarized above, others are incorporated into these recommendations.

1. Ensure drinking water is safe

- Support rulemaking for state drinking standards – see above.
- Test drinking water wells – see above.
- Implement methods to reduce PFAS in drinking water– draft action 1.1.

2. Manage environmental PFAS contamination

- Develop PFAS cleanup levels for soil and groundwater – draft action 2.1.
- Identify methods to reduce exposure to contamination – draft actions 1.2 and 2.3.

3. Reduce risks to drinking water from firefighting foam

- Implement firefighting foam notifications and restrictions – see above.
- Survey firefighting foam users to identify high-risk sites – see above.
- Develop outreach on responsible firefighting foam use – see above.
- Replace PFAS-containing Class B firefighting foam in non-exempt uses – see above.

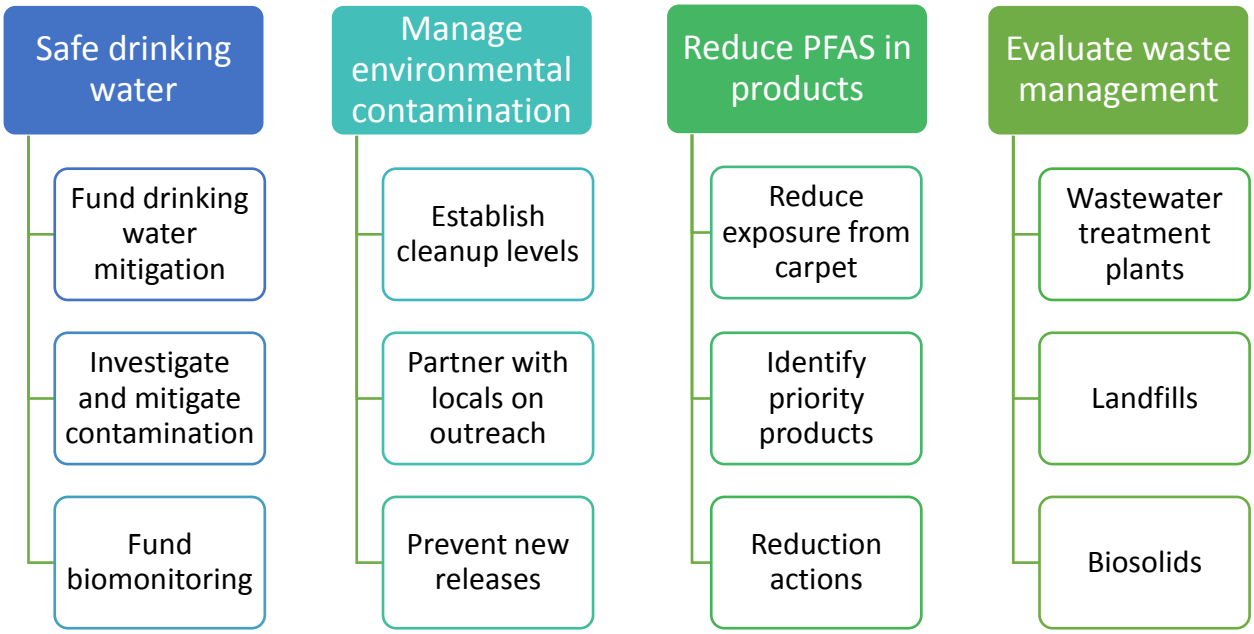
4. Investigate other sources of PFAS

- Identify sources of PFAS exposures and releases – draft actions 1.2, 2.3 and 3.0.
- Ensure firefighting personal protective equipment notifications – see above.
- Conduct alternative assessments – draft actions 3.2 and 3.3.

[6] https://app.leg.wa.gov/RCW/default.aspx?cite=70.95G&full=true
[7] https://www.ezview.wa.gov/?alias=1962&pageid=37105
[8] https://fortress.wa.gov/ecy/publications/summarypages/1804005.html

Chemical Action Plan Recommendations

Ecology and DOH's draft PFAS CAP recommendations address a broad range of concerns. Agency estimates for some actions are included. Other economic impacts, included in some recommendations, are detailed in the Economic Analysis Chapter. Additional resources and funding are required to implement the recommended actions.



1.0 Ensure drinking water is safe

Protecting public health by ensuring safe drinking water is a fundamental responsibility of the DOH Office of Drinking Water.

There are three types of drinking water systems in Washington:

- Group A water systems serve 85% of state residents.[9] They service more than 15 connections or more than 25 people. DOH primarily regulates these public water systems.
- Group B public water systems are smaller and serve 1.5% of state residents. The local health department usually oversees these systems. Group B systems have few testing requirements for continued operation.
- Private wells serve 13.5% of state residents. Private wells are only regulated in their design and installation, chemical testing is not usually required.

Most water customers in the state receive water from large Group A water systems that have been tested for PFAS. However less than 1% of all Group A systems have been tested for PFAS. The percentage of Group B and private wells tested for PFAS is even lower. A water test is required to determine whether PFAS are in drinking water because PFAS are tasteless and

[9] Statistics compiled from state population estimate of 7,655,361 people and drinking water data at https://www.doh.wa.gov/DataandStatisticalReports/EnvironmentalHealth/DrinkingWaterSystemData/DataDownload

odorless at levels of public health concern. Further, exposures to PFAS-contaminated water are disproportionately borne by populations experiencing cumulative impacts, health disparities, and environmental justice considerations.

The following additional actions are recommended to ensure drinking water is safe.

1.1 Identify funding for PFAS drinking water mitigation

Recommendation:

State agencies, the Washington State legislature, and local water systems should work together to fund PFAS drinking water mitigation that can be reimbursed when responsible parties are identified and costs recovered.

Why?

Without funding, public water systems and their ratepayers must absorb what can be a costly response. Funding would support water systems when they must:

- Investigate the source of contamination.
- Buy water from a neighboring system or install expensive filters on contaminated water sources.
- Maintain and monitor the new filtration systems.

When concentrations of PFAS exceed health advisory levels in a drinking water supply, timely mitigation may be needed to protect human health. PFAS mitigation creates an immediate cost to the water system.

The water system needs to explore ways to mitigate the problem in the near-term and long-term and may need to install an expensive filtration system to remove PFAS. The city of Issaquah, for example, spent more than $1 million to install a filter on the one PFAS-contaminated city well. Mitigation planning includes prioritizing and minimizing cost burdens for lower-income and under-resourced communities who are less able to mitigate the problem or absorb rising ratepayer costs.

Existing funding resources

Drinking Water State Revolving Fund is an EPA-funded loan program administered by DOH. The loans are used to:

- Improve drinking water infrastructure.
- Finance the cost of installing treatment or other infrastructure improvements over a number of years.

Drinking Water State Revolving Fund can provide emergency loans in the event a water system is issued a "Do Not Use" order as a result of PFAS contamination. The program recently funded a reservoir project for City of Spokane to allow Spokane to provide reliable water service to Airway Heights. Airway Heights has PFAS in their wells and is now relying on City of Spokane for its water.

U.S. Environmental Protection Agency (EPA) provides funding to DOH Office of Drinking Water for set-aside activities and source water protections. We can use these funds in limited circumstances to defray costs of additional water testing.

Other funding programs in the state could be tapped for loans or grants to help with costs of new infrastructure in response to PFAS contamination:

- Public Works Assistance Account overseen by Public Works Board.
- Community Development Block Grant overseen by Department of Commerce.
- Rural Development loans and grants overseen by the U.S. Department of Agriculture.

Public water systems can pursue reimbursement from potentially liable parties under the state Model Toxics Control Act (MTCA) when PFAS are declared hazardous substances under MTCA. Even under MTCA, water systems may have to carry costs long-term or permanently because:

- The process of identifying responsible parties and being reimbursed can take years.
- Responsible parties may be difficult, if not impossible, to determine.
- The potentially liable party could be a local entity under the same public administration as the water utility (for example, a local fire station).

In each of these cases, the costs borne by the water system would be long-term or permanent.

Cost

Initial investigation and mitigation costs at PFAS-contaminated sites have been reported in the millions of dollars. Filter maintenance and monitoring also require ongoing expenditures in addition to costs associated with investigating the source of the contamination.

Until we know the number of systems in the state that are impacted we are unable to estimate the funds needed to implement this recommendation.

1.2 Technical support for site characterization, source investigation and mitigation at contaminated sites.

Recommendation:

Ecology and DOH will continue to develop expertise and provide technical assistance and guidance to drinking water purveyors, local jurisdictions, and responsible parties that address PFAS contamination and conduct cleanup actions. Those actions include:

- Ecology will continue to collaborate with involved parties at PFAS contamination sites in the state. These efforts will help to better understand the sources, composition, and distribution of PFAS contamination in soil and water. Evaluation of appropriate cleanup actions and their costs will be informed by this work. This work is being done within Ecology's existing resources.
- DOH will continue to provide water systems with advice and assistance to understand the mitigation options and guide voluntary action on unregulated PFAS until the rulemaking for PFAS in drinking water is complete. Technical assistance has focused on public water systems near military bases with PFAS detections in groundwater. DOH continues to include local health departments in outreach and guidance. This work is being done within DOH existing resources.
- Ecology will look at targeting Safe Drinking Water Action Grants (a category of Remedial Action Grants for Local Governments) to help address PFAS-contaminated drinking water, once some of the uncertainties discussed above have been addressed.

- Ecology will investigate PFAS contamination in ground water and surface water. These efforts would support local health departments, cities, counties and other public entities in Washington when PFAS contamination is discovered. Initial investigation efforts could identify areas at high risk of contamination. This could include areas where trainings or firefighting activities used large quantities of PFAS-containing Class B firefighting foam, or where spills released the foam. Ecology could prioritize funding for site-specific assessments and groundwater testing. Funding for this action is estimated below.
- Obtain chemical identities from products and at contaminated sites to find chemical "fingerprints" useful in identifying source locations. Analytical methods may not yet be developed to obtain all the required data.

Why?

Technical assistance can help parties understand the advantages and disadvantages of different options that are available or under development to reduce levels of PFAS in water and soil.

Variation in environmental conditions and contamination sources make site characterization difficult. Each contaminated area has unique characteristics and the selection of appropriate actions will need to be based on local conditions. Evolving methodologies of cleanup combined with site-specific differences make cleanup cost estimation difficult.

Sources of PFAS contamination need to be investigated in order to stop the release and/or target clean-up efforts. The party or parties responsible for the source of contamination must be identified to recover costs of PFAS mitigation. Local water districts and governments often lack the expertise and resources to investigate sources of PFAS contamination. PFAS have unusual properties and research is ongoing about their movement through soils and aquifers.

Cost

To support PFAS investigations, resources were requested from the state legislature to:

- provide monitoring assistance to local jurisdictions when PFAS contamination is discovered and
- assist with investigations, including researching potential sources, collecting samples, possible installation of monitoring wells, and conducting laboratory analysis.

The resources for this support are three Ecology employees at a cost of $256,000 with an additional $380,000 for laboratory and field investigation costs.

1.3 Seek funding for biomonitoring to support impacted residents and help answer important health questions

Recommendation

DOH should seek funding to offer subsidized biomonitoring (for example, blood serum testing) for residents in impacted areas.

DOH should continue to find opportunities for Washington residents to participate in large epidemiological studies that will help answer important community and public health questions about PFAS exposure and health outcomes. For example, the Agency for Toxic Substances and Disease Registry's National PFAS Health Study will include Airway Heights as one of 8 sites in the study.

Why?

Biomonitoring helps people know their PFAS exposure level relative to national averages and could help residents connect to health information that becomes available in the future. Further health studies are needed to better understand the human health impacts of PFAS exposure.

Cost

Biomonitoring testing for residents at PFAS contaminated sites have been reported for several sites in the U.S. These costs averaged up to one thousand dollars per person tested. These activities will require additional funding through competitive grants.

2.0 Manage environmental PFAS contamination

PFAS have contaminated soil, groundwater, and surface water in specific locations in Washington. These contaminated areas may require a variety of responses to reduce exposure and protect human health.

Where PFAS have been found in drinking water supplies in Washington, PFAS-containing Class B firefighting foam used in firefighter training seems to be the primary source of contamination. Nationally, PFAS contamination has resulted from numerous sources including manufacturing, industrial processes, and improper waste disposal in addition to PFAS-containing Class B firefighting foam use.

2.1 Establish PFAS cleanup levels for soil and groundwater

Recommendation

- Ecology will develop cleanup levels, using existing authority under MTCA, for perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and, as appropriate, additional PFAS using the State Board of Health drinking water standards or advisories adopted in rule.
- Ecology will explore methods for investigation and cleanup of PFAS contamination.
- Ecology will provide information to interested parties about cleanup efforts.

Why?

Ecology establishes cleanup levels, which are concentrations of hazardous substances in the environment that are considered sufficiently "protective of human health and the environment under specified exposure conditions."

Cleanup levels are expected to protect people, vulnerable populations, animals, and plants from potentially harmful exposures to chemicals in the environment. They help determine which geographic areas and environmental media, such as soil or groundwater, are contaminated enough to require further evaluation and, possibly, cleanup actions. Currently, there are no federal or Washington State regulatory standards to determine whether a site with PFAS contamination requires cleanup, nor have best practices for conducting such a cleanup been established.

To support the investigation of PFAS groundwater contamination around the City of Issaquah, Ecology developed "investigatory levels" for PFOS and PFOA which, based on information

available at the time, were expected to be protective of human health and the environment. These were advisory values, not regulatory cleanup levels, and were formulated at a cost of approximately $42,000. Ecology anticipates an ongoing need to evaluate the rapidly expanding body of scientific information related to PFAS, and to develop regulatory cleanup levels for PFOS and PFOA, and possibly additional PFAS.

The costs of developing and evaluating methods for investigating and cleaning up PFAS contamination are currently difficult to estimate due to significant uncertainties in our understanding of:

- How most PFAS affect people, animals, and plants, and in what concentrations.
- How to best measure the types and amounts of PFAS in the environment.
- How PFAS move through the environment and change over time.
- How to best clean up environmental PFAS contamination, including consideration of protectiveness, feasibility, and cost.

Cost

The cost of formulating cleanup levels is expected to require one Ecology employee for three months for $42,000. At this time, an estimate of the cost to establish investigation and cleanup methods for PFAS is not available.

2.2 Partner with local organizations in communities with contaminated water or contaminated sites

Recommendation

Identify and distribute funding to local health departments or community-based/led organizations to address health equity in public communications and problem solving at contaminated sites. DOH has a new Community Engagement Guide that may be helpful to this effort.

Funded organizations would:

- Address potential health equity issues through a culturally and linguistically informed engagement.
- Find trusted messengers or platforms to deliver audience-tested risk communication messages to engage historically underserved and higher risk populations.
- Support direct engagement of impacted populations in finding their own solutions through collective action and decision-making.
- Engage the community throughout the course of the public health response, source investigation and site clean-up.
- Invite area residents to actively participate on advisory committees, in site information meetings, and in public decision-making about the course of remediation.
- Aim to remove participation barriers, by providing child care, reducing transportation costs, and planning for convenient meetings at times at familiar locations.
- When possible, provide appropriate compensation for participation of community advisors, particularly in areas with limited or low income populations.

Why?

When testing identifies a new community with PFAS in drinking water, it can be challenging to communicate effectively with residents in the area impacted.

Each community is unique and there may be:

- Cultural and language barriers to effective communication.
- Economic, systemic and social barriers to acting on public health advice.

These barriers disproportionally affect low income and other historically underserved and marginalized communities, including communities of color. During PFAS investigation process and mitigation, state agencies should collaborate with local leadership and organizations to strengthen community awareness and engagement.

Community-based and community-led organizations that directly serve and are rooted in these communities can offer meaningful and authentic engagement. For example:

- A recent $120,000 two year grant funded a local organization to provide educational materials and conduct outreach in a community impacted by industrial activities.
- A local church group in one affected community volunteered to distribute bottled water to elderly and disabled residents.

Costs

If PFAS are classified as hazardous substances under MTCA, community led public engagement would be eligible for funding through Ecology's Public Participation Grant program in the Contaminated Site Project category. Designated PFAS funds should be allocated specifically to PFAS-related impacts to communities. At this time, it is not possible to estimate the funding needed to support local outreach efforts.

2.3 Work to prevent PFAS releases from firefighting foam use and manufacturing processes

Recommendation

Ecology will work proactively with industry, manufacturers, and businesses to eliminate releases to the environment from the use of PFAS-containing Class B firefighting foam or other manufacturing processes using PFAS.

To address PFAS in Class B firefighting foam, Ecology would:

- Collaborate with users of firefighting foam to develop and share outreach materials and best management practices that address the proper use, storage, and disposal of PFAS-containing Class B firefighting foam.
- Ensure that industrial use of PFAS-containing Class B firefighting foam provides for containment procedures along with collection of this foam and contaminated soil/sediment for proper designation/disposal. Costs to industrial users to collect and dispose of released PFAS-containing Class B firefighting foam include plan development, employee training, methods for containment and disposal of waste.
- Assist state, and local governments, airport, industry, and fire districts with prioritizing the disposal and replacement of PFAS-containing Class B firefighting foam in communities with cumulative impacts, health disparities, and environmental justice considerations. Share information about PFAS-free Class B firefighting foam with users

of firefighting foam as information or research is available, including GreenScreen® certifications[10].

To address PFAS in industry or manufacturing, Ecology would:

- Review data from other states and countries to identify industrial or manufacturing uses of PFAS. Use this information to identify industries in Washington that use commercial quantities of PFAS.
- Reach out to these industries to discuss their use of PFAS, identify opportunities to switch to safer alternatives, implement best practices, and ensure proper waste management.

Why?

PFAS-containing Class B firefighting foam has been associated with drinking water contamination sites discovered in Washington State. Both the military and DOH have focused on firefighting foam release sites in their risk-based efforts to identify and mitigate PFAS in drinking water. Firefighting foam is not, however, the only likely source of PFAS in state drinking water. Other states that have implemented expanded testing for PFAS in drinking water have identified sources such as landfills, industrial waste stream sludges, manufacture of waterproof leather shoes, manufacture of parchment paper, taxidermy, textile coating, metal plating and finishing, car washes, and pulp and paper mills. More work is needed to identify PFAS use, sources, fate, transport, pathways of exposure, and effects on human health and the environment.

Cost

The estimated cost for Ecology to conduct research and outreach would require two employees working full-time for $160,000. Work would include development of guidance to prevent PFAS-containing Class B firefighting foam discharge to the environment by specifying methods of collection, treatment, and disposal. Additional costs of verifying compliance may be incurred, but details of enforcement costs are uncertain.

3.0 Reduce PFAS in products

PFAS are used in a wide variety of industrial, commercial, and consumer products. People can be exposed to PFAS in consumer products during product use or as PFAS accumulate in house dust and released into indoor air. Although PFOA and PFOS are not readily absorbed through skin, residues on hands can be absorbed if swallowed. Current efforts exist to reduce exposure to PFAS from firefighting foam and food packaging (Chapter 70.75A Revised Code of Washington (RCW) and Chapter 70.95G RCW). The previous section of this report provides an update on those implementation efforts.

An April 2019 law passed in Washington directs Ecology and DOH to take action on toxic chemicals in consumer products, including PFAS. PFAS is defined in this law as "a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom." The Pollution Prevention for Healthy People and Puget Sound Act of 2019 (Substitute Senate Bill

[10] http://theic2.org/article/download-pdf/file_name/2018-12_Per%20and%20Polyfluorinated%20Substances%20in%20Firefighting%20Foam.pdf

(SSB) 5135[11]) directs Ecology and DOH to protect human health and prevent the release of toxic chemicals. The Act requires Ecology to work with stakeholders, report to the legislature, and do four things on a repeating, five-year cycle:

- Identify at least five priority chemicals, based on hazard, exposure and impacts. The first priority chemicals identified are alkyl phenol ethoxylates, bisphenols, organohalogen flame retardants, phthalates, polychlorinated biphenyls, and PFAS.
- Identify consumer products containing those chemicals that are significant sources of exposure to people and sensitive species.
- Determine regulatory actions for the identified chemicals and products to reduce exposure to people and sensitive species.
- Adopt rules to implement regulatory actions, including reporting or restrictions on the use of a chemical in a product.

Following the process detailed in SSB 5135, Ecology and DOH will identify priority consumer products that are significant sources of PFAS exposure to people and sensitive species. As directed by the new law, regulatory actions to reduce exposures would then be identified and adopted in rule.

3.1 Reduce PFAS exposure from carpet and carpet care products

Recommendation

Conduct the research required by SSB 5135 to determine if PFAS-containing carpet and carpet care products are significant sources of PFAS (called a "priority consumer product" in SSB 5135):

- Identify and address information gaps in our understanding of the contribution of carpet and carpet treatment containing PFAS to exposure, including:
    - Volume of PFAS used in carpet and carpet care products;
    - Volume of carpet and carpet care products sold or present in Washington;
    - Potential for exposure people and the environment from carpet and carpet care products;
    - Presence of PFAS in the outdoor environment from use, disposal or decomposition of carpet and carpet care products;
    - Regulatory actions on PFAS in carpet and carpet care products by other jurisdictions; and
    - Availability and feasibility of safer alternatives.
- Request that carpet and carpet care manufacturers:
    - Identify the products containing PFAS;
    - Disclose product ingredients;
    - Disclose information regarding exposure and chemical hazard; and
    - Describe the amount and function of PFAS in carpet and carpet care products.
- Propose restrictions of PFAS-containing carpet and carpet care products when a safer alternative is available and the restriction will reduce a significant source of PFAS or protect sensitive populations or species. Propose actions to reduce legacy PFAS-

[11] http://lawfilesext.leg.wa.gov/biennium/2019-20/Pdf/Bills/Senate%20Passed%20Legislature/5135-S.PL.pdf

containing carpet and carpet care products remaining in homes, especially in low income households where items may be retained past their typical product lifespan.

- Implement a purchasing preference policy for PFAS-free carpet. Work with vendors on the state flooring contract to offer PFAS-free carpet on all state master contracts and all agency contracts. Purchasing PFAS-free carpet could result in increased costs to state costs.

Why?

According to EPA, commercial carpet-care liquids, treated floor waxes, treated food-contact paper, and thread-sealant tapes are likely the most significant sources of human exposure to nine PFAS in the U.S. Treated carpet in homes and offices can contribute to PFAS in indoor air and house dust where infants and children have high exposure to due through inhalation and ingestion of house dust. The California Environmental Protection Agency identified PFAS in carpet as a priority product-chemical combination.[12] In 2018, San Francisco adopted a comprehensive carpet regulation prohibiting the use of PFAS.[13]

Cost

The cost of this work is funded by the legislature for SSB5135. The effort to investigate carpet and carpet care products is included in the cost summary for actions 3.2 and 3.3.

3.2 Identify priority consumer products based on PFAS releases and exposures

Recommendation

Following process in SSB5135, determine which products are significant sources of PFAS or "priority consumer products." Review literature and conduct testing to enhance and refine the product list below. Using this research, prioritize the products with the greatest potential for human exposure to PFAS or environmental release of PFAS.

- Waterproofing and stain resistant treatments (spray-on) for carpets, textiles and furniture.
- Textiles: water resistant clothing and gear, stain resistant upholstery.
- Furniture: indoor and outdoor stain resistant, water repellant.
- Nonstick cookware and kitchen supplies (e.g. baking paper).
- Personal care products.
- Cleaning agents.
- Floor waxes and sealants.
- Ski waxes.
- Car wash products

Ecology and DOH will work with interested parties to identify priority consumer products (the first two sections are the requirements of SSB 5135):

- Priority consumer products would be identified by considering the following criteria:
  - The estimated volume of PFAS added to, used in, or present in the product;
  - The estimated volume or number of units of the product sold or present in the state;

[12] https://www.dtsc.ca.gov/SCP/carpets_and_rugs_containing_pfas.cfm
[13] https://sfenvironment.org/sites/default/files/policy/regulation_sfe-2018-01-ppo_gbrcbo.pdf

    - The potential for PFAS exposure by sensitive populations or sensitive species when the product is used, disposed of, or has decomposed;
    - The potential for PFAS to be found in the outdoor environment, with priority given to surface water, groundwater, marine waters, sediments, and other ecologically sensitive areas, when the product is used, disposed of, or has decomposed;
    - If another state or nation has identified or taken regulatory action to restrict or otherwise regulate PFAS in the product; and
    - The availability and feasibility of safer alternatives.
- Additional information requests may be sent to manufacturers to provide:
    - The volume of PFAS added to, used in, or present in the product;
    - The volume or number of units of the product sold or present in the state;
    - A list of products containing PFAS;
    - Disclosure of product ingredients;
    - Information regarding exposure and chemical hazard; and
    - A description of the amount and the function of PFAS in the product.
- Use the information gathered to prioritize product for action and identify research needs and information gaps.
- Test consumer products for PFAS.
- Conduct AAs on other priority product-chemical combinations.

Why?

PFAS exposure in the home occurs during product use and exposure to house dust containing PFAS. The greatest portion of the chronic exposure to PFAS for the general public, specifically to PFOS and PFOA, results from the intake of contaminated foods and contaminated drinking water. Other sources of exposure could occur from PFAS-containing products in the home and in some occupations. High PFAA levels were identified in ski waxes, leather samples, outdoor textiles and some baking papers. Studies of indoor air and house dust indicate exposure to PFAS from consumer products in the home like carpet care liquids, nonstick cookware, packaged fast food, and waterproof clothing. A large number of other consumer products may also contain PFAS ingredients including cleaning products, automotive products, stain-resistant upholstery, water proof clothing and gear, and personal care products including cosmetics and dental floss. Research is needed to understand the contribution product chemical combinations to human exposure.

Cost

The cost to conduct this work is included in the budget to implement SSB5135:

- Identify priority consumer products: two employees at Ecology for one year with DOH support at a cost of $400,000.
- Product AA: contract of $400,000 for each AA for PFAS in specific products with oversight by one employee at Ecology working quarter time for $50,000. The cost of the AA could vary depending on the product.
- Testing of consumer products: two employees working half-time for two years to complete each study, at a cost of $120,000 and $100,000 for laboratory analysis of product samples per year.

3.3 Implement reduction actions for PFAS in priority consumer products

Recommendation

For the products identified as priority consumer products, identify regulatory actions to reduce exposures and releases to the environment. Additional research, testing and investigation would be required to determine appropriate reduction actions.

Reduction activities that Ecology, DOH and external parties could identify:

- As required by SSB5135, propose restrictions of PFAS in priority consumer products when a safer alternative is feasible and available and the restriction will reduce a significant source of PFAS and the restriction will protect sensitive populations or sensitive species. Ecology could:
    - Determine that no regulatory action is currently required;
    - Require a manufacturer to provide notice of the use of PFAS; or
    - Restrict or prohibit the manufacture, wholesale, distribution, sale, retail sale, or use, or any combination thereof, of PFAS in a priority consumer product.
    - Adopt rules to implement these regulatory actions.
- Gather input from low income and other historically underserved and marginalized communities, including communities of color. Develop a list of ways to reduce exposure that include low cost and subsidized approaches. These may be particularly important measures to employ in communities with higher exposure from drinking water. No cost estimate is provided to conduct this evaluation or to develop exposure reduction recommendations.
- Establish a purchasing preference policy for PFAS-free products. Work with vendors to offer PFAS-free textiles, furniture, paints, and building supplies. Apply this policy to all state master contracts and all agency contracts. Purchasing PFAS-free products could increase state costs.
- Propose a ban on the import or sale of products in Washington containing phased-out long-chain PFAAs. Long-chain PFAAs include perfluorinated carboxylates (PFCAs) with eight or more fully fluorinated carbons (for example, PFOA) and perfluorinated sulfonates (PFSAs) with six or more fully fluorinated carbons (for example, PFHxS and PFOS), their salts, and precursor compounds capable of forming long-chain PFAAs

Why?

Actions need to be implemented to reduce levels of PFAS in or remove PFAS from products that result in human or environmental exposure. Removal of chemicals in consumer products have shown resulting reduction in indoor air and house dust. These actions have a direct impact on the contribution of product chemicals to human and environmental releases and exposures.

PFOS, PFOA and related long-chain PFAS compounds have been largely phased-out of U.S. production but are still produced in other countries. USEPA used voluntary phase-outs and Significant New Use Rules (40 CFR 721.9582) under the Toxic Substances Control Act (TSCA) rather than bans to reduce their use. With the exception of carpets and carpet treatment chemicals, it appears to be legal to import these long-chain substances into Washington State for specific commercial uses and to distribute and sell products containing these ingredients.

Cost

The cost to conduct this work is included in the budget to implement SSB5135:

- Determining reduction actions: two employees at Ecology with DOH support for one year at a cost of $500,000.
- Adopting restrictions in rule: four employees at Ecology with DOH support for two years at a cost of $1,250,000 per year.

4.0 Understand and manage PFAS in waste

PFAS are released from products used in homes, businesses, etc. These releases travel to wastewater treatment and disposal facilities. The PFAS entering and passing through these facilities could impact the environment. Investigating PFAS in Washington's wastewater, landfills, and biosolids is needed to determine PFAS concentrations and inform development of appropriate control actions.

4.1 Evaluate PFAS in wastewater treatment

Recommendation

Ecology should evaluate PFAS in wastewater treatment plan (WWTP) effluents and influent to develop a greater understanding of PFAS in discharges in Washington State:

- Ecology should develop a study design to sample PFAS in three different types of plants: WWTPs with secondary treatment, nutrient removal, and advanced solids removal. Sampling should include products of selected WWTP unit processes (for example primary and secondary clarifiers or dechlorination) to help differentiate removal efficiencies of the different treatment types.
- The study design should ensure that the WWTPs that are sampled receive industrial discharges that are likely to contain PFAS, or that have drinking water sources with known PFAS contamination.
- Ecology should identify industries that are likely to generate wastewater containing PFAS.
- Based on the information from the study, Ecology should consider additional monitoring requirements for WWTP dischargers. This should include consideration of whether EPA has developed approved analytical methods for PFAS suitable for WWTP effluent and a regulatory target (a nationally recommended water quality criterion for PFAS) for waters of the state.
- Based on this evaluation Ecology should require possible PFAS monitoring for some or all domestic and/or industrial WWTPs.

Why?

PFAS travel from homes, businesses, and industry sources to WWTPs. Once they enter the WWTP, PFAS may partition to different media (for example, solids and liquid), are subject to aerobic and anaerobic biological processes, and transform into terminal PFAS compounds that are resistant to further natural breakdown. Understanding how different wastewater treatment

technologies remove PFAS from the effluent stream and/or transform PFAS is important information that could assist with future design and operation of WWTPs.

Cost

Ecology would conduct this work over three years with one employee working halftime at an annual cost of $100,000 with an additional $350,000 for laboratory and field investigation costs. The cost to analyze for PFAS ranges from $1,000 to $1,500 per sample. Additional funding sources would be needed to conduct this work.

4.2 Evaluate PFAS in landfill leachate and air emissions.

Recommendation

Ecology would develop a study design to sample PFAS in landfill leachate and gas emissions at representative landfills to better characterize landfill leachate and investigate landfill air emissions.

- The study design would ensure sampling at representative landfills likely to contain PFAS.
- Identify disposed waste that are likely to generate PFAS releases to leachate or gas emissions.
- Determine whether landfill gaseous emissions are significant sources of PFAS.
- In cooperation with local health districts, Ecology would perform a one-time testing of leachate from 23 landfills.
- If warranted, Ecology would manage PFAS in landfill leachate by:
  - Consider additional monitoring requirements for landfills to test leachate for PFAS using information from the study mentioned above.
  - Potentially update the rule (Chapter173-350 WAC) to require PFAS testing of leachate and landfill monitoring.

Why?

Landfills contain a variety of waste including inert materials (like wood or ash), disposed consumer products, and a variety of organic waste and solvents. Decomposing waste and rainfall can create leachate that contains water, metallic ions, acids, and other contaminants including PFAS. These liquids are managed differently by different landfills, but have the potential to be a source of contamination, particularly if sent to wastewater treatment. Landfills are also sources of air emissions.

Cost

The cost to analyze for PFAS ranges from $1,000 to $1,500 per sample. Testing leachate from 23 landfills would cost $34,500. This would be a one-time cost to Ecology, to identify or refine landfill leachate PFAS knowledge.

There are 63 total landfills identified as operating in the state (limited purpose, inert waste, and municipal solid waste), testing leachate from 63 landfills would cost $94,500. Limited purpose and inert waste landfills are not required to collect leachate. Some limited purpose landfills may voluntarily collect leachate. These costs would increase if emissions of volatile PFAS from landfills were also tested.

The cost to update Chapter 173-350 WAC to add PFAS monitoring requirements could take two and a half years and cost upward of $1.1 million. Less complex rulemaking may take two years and cost upward of $260,000. These cost estimates include employee time and expenses, and will vary based on the degree of consultation with Ecology Assistant Attorneys General.

4.3 Evaluate Washington biosolids management

Recommendation

Establish biosolids and soil sample collection and handling methods for PFAS analysis.

- Accredit Washington labs for EPA validated analysis method(s).
- Use EPA validated analysis methods for biosolids and soils.
- Conduct credentialed third-party review of PFAS data.
- Compile analysis data with statistical review.
- Investigate land application sites where procedures mimic rates and practices under current state rule (Chapter 173-308 WAC).
- Evaluate realistic exposure pathways.
- Evaluate risk modeling with use of realistic input values

Ecology will collaborate with the municipalities that manage WWTP's to conduct this work.

Why?

Risk to human health and the environment from contaminants is based on toxicity, concentration, and pathway of exposure. The lack of fundamental PFAS concentration data characterizing Washington biosolids prevents accurate assessment of PFAS risk resulting from land application under the state biosolids program.

The recommendations work toward acquiring accurate and representative PFAS concentration data in Washington biosolids. Such data can contribute to inputs for models that evaluate contamination risk to human health and the environment:

Cost

It is not possible at this time to estimate the cost of this action.

Ecology will recruit a senior employee to lead the biosolids data gathering process. Ecology will also submit program funding requests for sampling and analysis to help with the expense along with our municipal partners.

List of acronyms

AA - alternatives assessment

CAP - chemical action plan

DOH – Washington State Department of Health

Ecology – Washington State Department of Ecology

EPA - U.S. Environmental Protection Agency

MTCA – Model Toxics Control Act

PFAA - perfluoroalkyl acid

PFAS - per and polyfluoroalkyl substances

PFOA – perfluorooctanoic acid

PFOS – perfluorooctane sulfonate

RCW – Revised Code of Washington

WAC – Washington Administrative Code

WWTP – wastewater treatment plant