



Vermont Agency of Natural Resources,
**Department of Environmental
Conservation**

PFAS Roadmap

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Executive Summary

PFAS stands for per- and polyfluoroalkyl substances and refers to a group of thousands of human-made chemicals. PFAS have been used in industry and consumer products since the 1950s because they are resistant to heat, water, oil, grease, and stains. PFAS are also very stable and persistent, meaning that once they are released into the environment, they do not break down and can build up in the environment, wildlife, and humans. For humans, exposure to PFAS may lead to adverse health outcomes.

In Vermont, PFAS contamination was initially discovered in 2016, when perfluorooctanoic acid (PFOA), one type of PFAS, was found in water supply wells in Bennington and North Bennington. Since this discovery, the Vermont Agency of Natural Resources' (ANR) Department of Environmental Conservation (DEC) has undertaken significant efforts to protect Vermonters from existing sources of PFAS by taking action to reduce or eliminate these exposures while investigating and identifying new exposure sources. Examples of this work include:

- Testing and remediating PFAS in Vermont's public water systems.
- Responding to known contaminated sites.
- Evaluating PFAS concentrations in Vermont's surface waters, wastewater treatment facilities, common household products, and agricultural inputs.

DEC's PFAS-related work over the past seven years has been significant and important to address PFAS contamination and protect Vermont residents. DEC has prioritized its data collection and



regulatory work considering currently available resources. In this update to the State's PFAS Roadmap, DEC lays out its continuing work to identify and reduce exposure to PFAS chemicals. Ultimately, successfully reducing exposure to PFAS chemicals will require Vermont to work closely with our regional and national partners to develop a consistent approach to phasing out PFAS from consumer products and industrial uses. Companion to this prioritization of effort, Vermont will evaluate our existing pollution prevention efforts and make recommendations to improve that program to assist businesses in finding safer alternatives to PFAS.

Finally, a key aspect of DEC's on-going PFAS work is to continue to engage and listen to Vermonters. We are investing resources in outreach to the public about PFAS and are developing ways to focus further outreach to communities that have been impacted by PFAS contamination. These efforts include:

- A PFAS Hotline which anyone can call to ask questions they have about PFAS and what Vermont DEC is doing to address contamination. The PFAS Hotline number is (802) 693-0206.
- Updating DEC's PFAS website, resources like this roadmap, and developing a publicly accessible PFAS database. The database will make information about PFAS, testing, contamination, and cleanup in the state easily accessible and understandable to all Vermonters.
- Using social media and traditional press like local news stations and newspapers to raise Vermonters' awareness about DEC's work on PFAS.
- Engaging with Vermonters regarding PFAS by holding a series of statewide public meetings on the revised PFAS Roadmap.



Acronym List

Acronym	Definition
AAFM	Vermont Agency of Agriculture, Food and Markets
AFFF	Aqueous Film Forming Foams, class of firefighting foam
ANR	Vermont Agency of Natural Resources
ARPA	American Rescue Plan Act
BIL	Bipartisan Infrastructure Law
CECF	Contaminants of Emerging Concern Special Fund
EPA	US Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EQ	Exceptional Quality, in reference to biosolids
DEC	Vermont Department of Environmental Conservation
GenX	Hexafluoropropylene Oxide (HFPO) dimer acid & ammonium salt
Health or VDH	Vermont Department of Health
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NEWMOA	New England Waste Management Officials Association
NEWSVT	New England Waste Services of Vermont, Inc.
NPL	National Priority List, also known as Superfund
NTNC	Non-Transient Non-Community, in reference to water systems
PCWS	Public Community Water Systems



POET(s)	Point of Entry Treatment Systems
POUT(s)	Point of Use Treatment Systems
PFAS	Per- and Polyfluoroalkyl Substances
PFBA	Perfluorobutanoic acid
PFBS	Perfluorobutane sulfonic acid
PFDA	Perfluorodecanoic acid
PFHpA	Perfluoroheptanoic acid
PFHxA	Perfluorohexanoic acid
PFHxS	Perfluorohexane sulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonic acid
PTFE	Polytetrafluoroethylene
TNC	Transient Non-Community, in reference to water systems
TOP	Total Oxidizable Precursor
TSCA	Toxic Substances Control Act
WWTF	Wastewater Treatment Facility
Unit	Definition
ng/L	Nanogram per liter
ppb	Parts per billion
ppt	Parts per trillion
ug/L	Micrograms per liter

Units note: ng/L and ppt are equivalent and may be used interchangeably; ug/L and ppb are equivalent may be used interchangeably.



Vermont's PFAS Roadmap

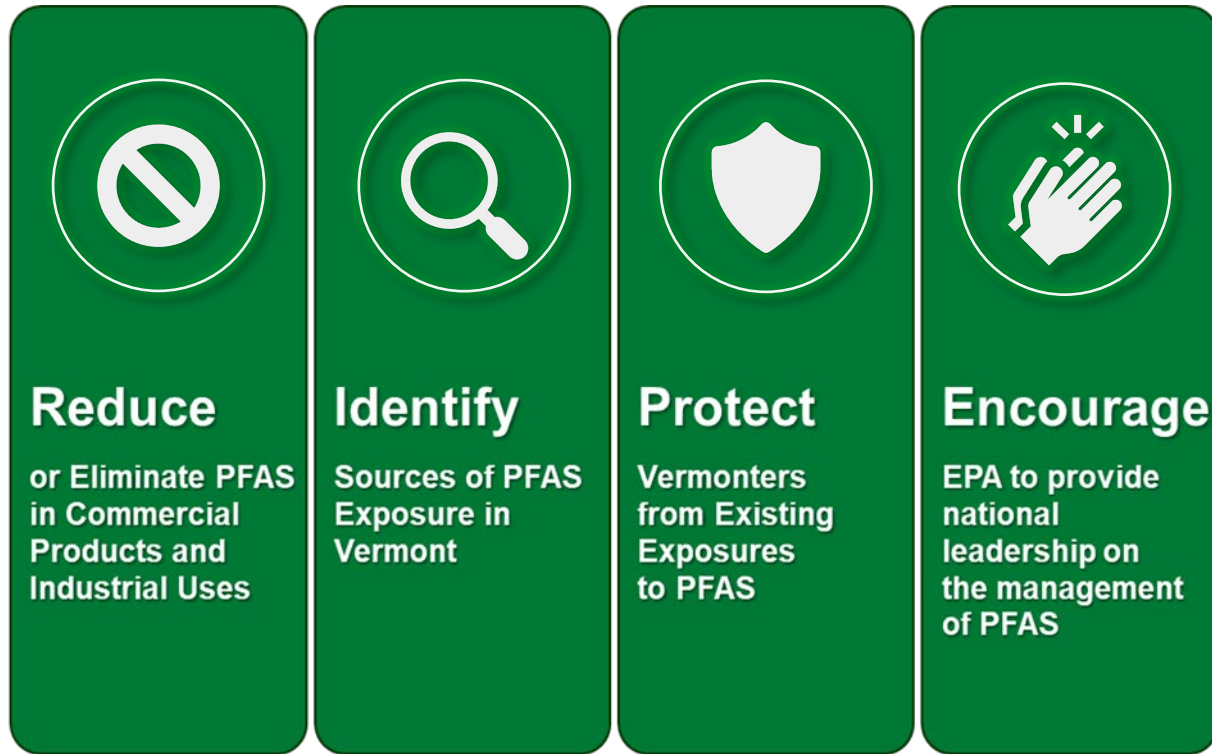


Figure 1: The State of Vermont's Agency of Natural Resources (ANR) has established four actions to address PFAS, otherwise known as per- and polyfluoroalkyl substances. ANR will Reduce or Eliminate PFAS in Commercial Products and Industrial Uses, Identify Sources of PFAS Exposure in Vermont, Protect Vermonters from Existing Exposures to PFAS, and Encourage EPA to provide national leadership on the management of PFAS. Each of these actions will entail work from across ANR's departments as well as work with other State of Vermont agencies.



Reduce or Eliminate PFAS in Commercial Products and Industrial Uses

Key Action Items

- ▶ Support the implementation of Act 36 to ban PFAS in certain products.
- ▶ Provide technical information to the General Assembly to inform discussions of how to reduce or eliminate PFAS in consumer products.
- ▶ In the continued absence of national leadership, support work on a regional approach to address labeling and the intentional addition of PFAS in products.

Mitigating PFAS exposure must include the identification and reduction or elimination of PFAS sources prior to their use and ultimate contamination of waste streams and our environment. Vermont has focused on banning specific products known to present a high level of risk.

Act 36: An act relating to restrictions on perfluoroalkyl and polyfluoroalkyl substances and other chemicals of concern in consumer products

In 2021, [Act 36](#) was adopted to ban PFAS from firefighting foam, food packaging, ski wax, residential carpets and rugs, and their aftermarket stain or water-resistant treatments. The sections of the bill banning PFAS in these products are outlined below.

Act 36: Firefighting Foam

A person, municipality, or state agency is prohibited from discharging class B firefighting foam that contains intentionally added PFAS. Further, by October 1, 2023, manufacturers of class B firefighting foam will be prohibited from manufacturing, selling, or distributing for sale or use class B firefighting foam where PFAS have been intentionally added. In addition, manufacturers that sell firefighting equipment to any person, municipality, or state agency must provide notice to the purchaser at the time of sale if the personal protective equipment contains PFAS.



Act 36: Food Packaging

The manufacture or sale of food packaging (with direct food contact) where PFAS have been intentionally added and are present in any amount is prohibited. DEC will also be conducting a study on the potential of PFAS contamination in food waste that is recycled to the land. For more details on this study, please review the section of this roadmap, “Investigate PFAS Occurrence in Food Wastes that are Recycled to the Land,” on page 16.

Act 36: Rugs and Carpets, Aftermarket Treatments, Ski Wax

The manufacture, sale, or distribution of residential rugs or carpets, aftermarket stain or water-resistant treatments for rugs or carpets, and ski waxes where PFAS have been intentionally added in any amount is prohibited.

Developing Legislation and Regulations that Address Intentionally Added PFAS in Certain Products

Regional PFAS Legislation

DEC is participating in a process established by the Northeast Waste Management Officials Association (NEWMOA) to develop model legislation that addresses intentionally added PFAS in all products. NEWMOA has completed a 60-day public comment period and will consider those comments prior to finalizing model legislation. The proposed legislation will require:

- Manufacturer notification for all PFAS-containing products.
- Phased in restrictions on the use of PFAS in products over a period of years with very limited exceptions.
- A requirement for the products that are not banned to be labeled.

This model legislation will allow New England States to coordinate efforts on identifying products with PFAS and to mitigate the impacts of PFAS contamination on human health, the environment, and public infrastructure.



Strengthen Existing Pollution Prevention Programs in DEC

PFAS is commonly used in commercial and industrial processes. In addition to our efforts to ban PFAS from many consumer products, DEC needs to provide additional technical support to businesses to determine less harmful substitutions for PFAS in existing processes. DEC has several existing pollution prevention efforts embedded within various Department programs. DEC has identified the need to increase coordination amongst existing pollution prevention programs as well as update our efforts to reflect modern regulatory best practices for chemical use reduction and prevention of regrettable chemical substitutions. Programs that fall into this category include:

- Promoting the reduction in the use of toxic chemicals and generation of hazardous wastes
- Elements of the pretreatment discharge program
- Elements of the hazardous waste management program

In addition to these programs in DEC, the State has numerous other toxics management programs that could benefit from increased coordination and modernization, including:

- [Emergency Planning and Community Right-to-Know Act](#) (EPCRA)
- Pesticide registration program
- Product bans on commercial products and children's products
- Programs to protect occupational health and safety programs to protect workers

DEC has also identified a need to evaluate and strengthen our existing pollution prevention programs to reduce the use of harmful chemicals in commercial and industrial processes, specifically the Toxic Chemical and Hazardous Waste Reduction program. To do this, DEC will evaluate successful programs in other jurisdictions and use them as a model to modify the program to reduce harmful chemical use, prevent regrettable substitutions, and educate the public on products that are less hazardous to human health and the environment.



Identify Sources of PFAS Exposure in Vermont

Key Action Items

- ▶ Test private water supplies to understand the statewide groundwater impacts from PFAS where no known source exists.
- ▶ Test the influent and effluent at all Vermont wastewater treatment facilities (WWTFs).
- ▶ Conduct a study to evaluate PFAS in recycled food waste and food packaging.

Investigate PFAS Occurrence in Private Water Supplies

Initially, DEC focused resources to sample and address PFAS releases impacting public water systems. While this was a logical place to start addressing PFAS impacts on drinking water, approximately 40% of Vermont residents drink water from private water supplies ([VDH, 2023](#)).

Private Well PFAS Testing Program

Over the Summer and Fall of 2023, the State has tested almost 500 private water supplies. The private water supplies tested were selected at random from our database of drilled wells and the results will be used to estimate the impacts of PFAS on water supplies when there is no known source. This testing program provides the following benefits to DEC:

- Provides greater understanding regarding PFAS in groundwater where there is no known source and helps to identify wells that require further action because they are contaminated with PFAS.
- Supports the State's analysis on whether private water supply testing should include a PFAS test.
- Supports the State's litigation against manufacturers of PFAS.

For private water supplies tested as part of this program that have PFAS detected above the State's maximum contaminant level (MCL), the Department plans to provide impacted homeowners with appropriate



treatment to address PFAS contamination. This could include connection to an existing public community water system, or, if connection to a public water system is not a viable option, a Point of Use or Point of Entry Treatment System (POUT/POET).

In addition, DEC plans to conduct investigations to locate other private water supplies near any contaminated wells identified through this initial testing program and, if identifiable, the source of PFAS contamination.

Where applicable, DEC will coordinate with other state departments and agencies, such as Vermont Department of Health (Health) and the Vermont Agency of Agriculture Food and Markets (AAFM), when PFAS is detected above the State's MCL in a residential well.

Implement Strategies to Address PFAS in Municipal Wastewater

Comprehensive Testing at Vermont's Municipal Wastewater Treatment Facilities

Vermont is dedicating \$1.25 Million dollars of American Rescue Plan Act (ARPA) funding for a two-phased project. The phases are as follows:

1. Quantify PFAS in municipal wastewater discharges.
2. Focus resources on identifying and reducing or eliminating PFAS sources in select communities.

Starting in the summer of 2023, DEC will sample quarterly at each of Vermont's 94 WWTFs for PFAS utilizing current analytical methods. Upon completion of phase one, the information obtained will be used to select municipalities for additional PFAS investigation. Phase two will involve collaboration with DEC and municipal officials to conduct targeted collection system sampling for PFAS to identify sources and mass loading to WWTFs. The findings of this investigation can also inform a statewide source reduction approach for implementation at other WWTFs. In addition, source characterization data may be used to identify reduction strategies for specific commercial and industrial users.



Industrial Discharge Monitoring Requirements

New permits, when applicable, or renewal of existing permits issued for the industrial direct and pretreatment discharges that the Agency determines may have significant levels of PFAS may be required to conduct quarterly PFAS sampling.

DEC will follow the EPA's development of [Effluent Guideline Final Plan 15](#). When finalized, these rules and findings will be incorporated in discharge permits.

Pretreatment Discharges from Metal Finishers

In 2020, DEC launched an EPA-funded pollution prevention project specifically for businesses within the metal finishing and aerospace industrial sectors. DEC targeted source reduction at these industrial sectors due to significant wastewater contamination identified in other states, such as Michigan, California, and Minnesota.

DEC worked with five businesses in the metal finishing sector to identify PFAS sources at their facilities and investigate and implement source reduction strategies to eliminate or minimize PFAS within their process wastewater discharges. DEC was also able to sample effluent and sludge at all 9 aerospace or metal finishing businesses that hold Pretreatment Discharge Permits.

The data collected indicates that use of PFAS-containing materials in aerospace and metal finishing facilities is minimized or contained sufficiently to preclude quantifiable levels of PFAS in their wastewater and associated sludges. The major source of PFAS identified in this project was a PFAS-containing mist suppressant to control fumes from chrome plating processes. DEC has identified PFAS-free mist suppressant alternatives and is developing an implementation strategy for trialing PFAS-free products. The final pollution prevention grant report has been sent to EPA and will be posted online. DEC will use the results of this work to create a scalable and replicable model for other businesses in the sector to follow.



Discharges to Wastewater Treatment Collection Systems from Various Sources

In 2021, DEC worked with the City of Essex Junction and Town of Middlebury to characterize residential, commercial, and industrial PFAS sources entering their WWTFs. Based on the limited data gathered in this [study](#), DEC found that:

- More PFAS, by mass, were measured in wastewater originating from residential communities than from commercial or industrial discharges in these municipalities.
- Industrial facility discharges contained unique PFAS but were not a significant source of PFAS to the WWTF, accounting for < 1% of the total mass of PFAS entering the WWTF.
- Using a total oxidizable precursor (TOP) assay technique allowed for the measurement of additional PFAS that would otherwise be unaccounted for when testing wastewater.
- The methodology used in this study may be a suitable model used by similar municipalities to identify sources of PFAS in wastewater generated by their communities.

Monitoring and Managing PFAS from Landfills

A broad sampling effort by DEC demonstrated that there are elevated levels of PFAS in collected landfill leachate. Those PFAS levels come from the [consumer products disposed of in the landfill](#) that leach out and end up in the leachate from the landfill, including carpet and furniture. That leachate contributes to PFAS in the effluent from wastewater treatment facilities where the leachate is sent for treatment. DEC required the New England Waste Services of Vermont, Inc. (NEWSVT) landfill to investigate [potential treatment options](#) and, in 2022, DEC issued a pretreatment permit to NEWSVT that required PFAS monitoring of:

- Landfill leachate
- WWTFs receiving landfill leachate
- Receiving water serving the WWTF



In addition, the permit requires the landfill to pilot test a leachate treatment or pretreatment system to remove PFAS and other pollutants from the leachate prior to sending it to a permitted WWTF for further treatment.

After completion of this pilot study and approval by DEC, it is anticipated full scale implementation and treatment for the entire volume of leachate will be required. DEC will evaluate the results of the pilot project at NEWSVT and determine whether it is appropriate to adopt a state technology based effluent limitation that would apply to other landfills that collect leachate.

Investigate PFAS Occurrence in Food Wastes that are Recycled to the Land

In 2023, DEC will evaluate PFAS and microplastic occurrence in food waste recycling streams, with a focus on reducing potential sources from food and beverage packaging. DEC will sample packaging and food residuals from Vermont food and beverage manufacturers and organics management facilities to determine the concentrations of PFAS and microplastics in compost and in anaerobic digestates attributable to food packaging.

The goal is to develop pollution prevention practices for food and beverage manufacturers and organics management facilities that will eliminate PFAS in packaging, thereby reducing contamination of food waste composts and anaerobic digestates. The information gained through this study will be shared with the AAFM, which is conducting similar research, for collaboration on how to best manage food waste while reducing potential PFAS contamination on Vermont farms.



Protect Vermonters from Existing Exposures to PFAS

Key Action Items

- ▶ Continue implementation of the Vermont PFAS Maximum Contaminant Level.
- ▶ Develop laboratory capacity in Vermont.
- ▶ Engage with impacted water systems to ensure maximum utilization of state and federal funding to address PFAS.
- ▶ Update drinking water standards based on EPA's regulation to establish national PFAS MCLs.
- ▶ Continue to identify and remediate PFAS contamination sources at sites across Vermont.
- ▶ Continue to evaluate the need for a Vermont Water Quality Standard based on expanded surface water and fish tissue testing.
- ▶ Develop an interim strategy to reduce risks associated with managing biosolids and residual materials that contain PFAS.
- ▶ Monitor potential discharges of PFAS from landfills, assess impacts to groundwater or water supplies, and provide treatment/remediation.
- ▶ Hold PFAS manufacturers accountable.

Public Drinking Water Systems

PFAS Maximum Contaminant Level

DEC administers the federal Safe Drinking Water Act in the State. As a part of that administration, DEC is required to adopt MCLs at least as stringent as EPA's levels. Currently, the EPA does not have an MCL for per- and polyfluoroalkyl substances (PFAS), however, DEC adopted an MCL of 20 ng/L (ppt) for five PFAS in drinking water:

- Perfluorooctanoic acid (PFOA)
- Perfluorooctanesulfonic acid (PFOS)



- Perfluorohexanesulfonic acid (PFHxS)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorononanoic acid (PFNA)

The sum of these five PFAS cannot exceed 20 ng/L in a public water system. DEC also established a Maximum Contaminant Level Goal (MCLG), a non-regulatory health-based value, of 0 ng/L in the [Vermont Water Supply Rule](#) for these compounds.

PFAS Testing

Following passage of [Act 21](#) in 2019, an act relating to the regulation of polyfluoroalkyl substances in drinking and surface waters, and revision of the [Vermont Water Supply Rule](#) in 2020, [Public Community Water Systems \(PCWS\) and Non-Transient Non-Community \(NTNC\)](#) public drinking water systems were required to conduct at least two rounds of sampling for 18 PFAS, with many sampling for a third time in 2023. The Vermont Water Supply Rule establishes the framework under which public drinking water systems sample PFAS, at a frequency based on the system's historic sampling results: either quarterly, annually, or once every three years.

There are approximately 410 PCWS and 250 NTNC water systems in Vermont and the systems required to sample for PFAS have completed their initial monitoring. Between July 1, 2019 and September 30, 2023, 38 PCWS and 30 NTNC systems had detections for at least one of the five Vermont-regulated PFAS compounds. This equates to approximately 10% of the PCWS and NTNC systems in the State.

Currently, Vermont does not have a lab capable of providing PFAS analysis within the state, so samples must be sent out for analysis and thereby compete with neighboring states or nation-wide for laboratory capacity. Lab capacity concerns are increasing as demand for PFAS testing nationwide also increases. DEC has identified development of lab capacity for PFAS analysis in Vermont as a key priority.

In total, 17 water systems exceeded the current Vermont PFAS MCL and have been directed to address PFAS contamination. PFAS testing data from public water systems are available to the public through DEC's [PFAS data website](#). The list of water systems exceeding the Vermont PFAS MCL, including the status to address PFAS, is in the following table.



The Water Supply Rule also provides authority for sampling at Transient Non-Community (TNC) public drinking water systems if sampling at other regulated systems identifies a geographic area of concern. Currently, DEC has directed 19 TNC systems, all located in Killington, to sample for PFAS.



Public Drinking Water Systems that Exceed Vermont’s PFAS MCLs and Current Status

Water System	Town	Status
Butternut Properties	Killington	Treatment installation complete
Chalet Killington	Killington	Treatment installation complete
Craftsbury Fire District 2	Craftsbury	New well - In progress
E Taylor Hatton	Morgan	New well - In progress
Fiddlehead Condominiums	Fayston	New well - Complete
Foundry	Killington	Treatment installation complete
Kids In The Country	Dover	New well - In progress
Killington Mountain Lodge	Killington	Treatment installation complete
Killington Mountain School	Killington	Treatment installation complete
Kvi 2500	Killington	Treatment installation complete
Leicester Central School	Leicester	Well repair - Complete
Moguls Sports Pub	Killington	Waiting for Alternatives Analysis
Mount Holly School	Mount Holly	Treatment and new well - In progress
Summit Lodge at Killington	Killington	Treatment installation complete
Northshore Mobile Home Park	Rockingham	Waiting for Alternatives Analysis
Thetford Academy	Thetford	Treatment installation complete
Woodbury Elementary	Woodbury	Waiting for Alternatives Analysis



Response and Remediation Based on Detected Levels of PFAS

PFAS Detected Below MCL

When a water system's PFAS levels are below the MCL, but above detection, the water system is required to sample more frequently to assist DEC in assessing compliance with the PFAS MCL. DEC has seen PFAS levels from the same source vary over time, meaning there likely will be more public drinking water systems to experience elevated PFAS levels than those identified in the previous table.

PFAS in drinking water is measured at extremely low concentrations requiring specific sampling procedures to ensure data quality and reliability. This is important due to the public health and economic impacts of the decisions made based on this data.

PFAS Detected Above MCL

When a sample from a public water system is above the MCL, a confirmation sample is required. The purpose of this sample is to confirm that PFAS in the water is reliably and consistently above the MCL.

Currently, when an exceedance of the PFAS MCL is confirmed, DEC works with the water system to implement a Do Not Drink notice, develop interim solutions, and create long-term solutions to permanently address PFAS contamination. DEC provides individual assistance to each impacted public drinking water system.

In 2019, DEC contracted with a consulting engineer to develop a [PFAS Response Plan](#) as a guide to affected drinking water systems. This guide provides a framework and process for a public water system dealing with PFAS contamination. The PFAS Response Plan is currently undergoing revisions by DEC and is anticipated to be complete following EPA finalizing federal drinking water regulations for PFAS. Additionally, DEC will be engaging with a small number of public water systems with existing treatment to perform a PFAS Treatment Efficacy Study. The study will include more frequent monitoring for PFAS and other chemicals to assess lifespan and efficacy of treatment equipment.

Funding for PFAS Response and Remediation

Vermont established a new fund known as the Contaminants of Emerging Concern Special Fund (CECF) for the purpose of providing grants to public water systems responding to or remediating emerging contaminants



in a public water supply. The Capital Construction and State Bonding Adjustment Act of 2020 and 2021 (Act 139 & Act 50) appropriated a total of \$1,050,000 of capital funds for the award of grants for engineering and construction related improvements for public water systems with concentrations of PFAS exceeding the MCL and on a Do Not Drink notice. Act 139 further authorized the use of \$50,000 of the appropriated funds for grants to reimburse any schools for costs incurred through the purchase of bottled water.

DEC developed specific criteria for the award of funds through the CECF:

- Public schools would receive 100% cost reimbursement.
- Private schools would receive 75% reimbursement.
- All other public water systems would receive 50% reimbursement for all design and construction costs.

The CECF fund has awarded approximately \$850,000 to public water systems for design and construction costs, and approximately \$88,000 for the reimbursement of bottled and bulk water expenses (Note: \$22,000 provided for bottled water at schools). Vermont will transition funding from CECF to the new EPA funding programs resulting from the Federal Bipartisan Infrastructure Law (BIL) for those water systems eligible to receive federal funding. The funding for public water systems will include two sources:

1. **State Revolving Fund Program**

This funding is intended to focus on PFAS but can be applied to any emerging contaminant that does not currently have a federal MCL. Vermont is slated to receive over \$7.5 million per year for five years, commencing in 2022. While these funds can be applied to any emerging contaminant, Vermont anticipates the primary use of these funds will be to address PFAS contamination at public water systems. This funding will be provided to water systems impacted by PFAS at 100% principal loan forgiveness for eligible systems, with at least 25% of the total amount going toward Disadvantaged Communities or public water systems serving a population of less than 25,000 people.



2. Emerging Contaminant Small or Disadvantaged Communities Grant Program

The focus of these funds will be on PFAS but can be applied to any emerging contaminant. The source will provide additional grants to public water systems impacted by emerging contaminants and prioritize assistance to small or disadvantaged communities. Vermont recently received allotments from EPA for two fiscal years combined totaling approximately \$18,900,000 in awards and intends to apply for these funds in 2023. This new grant program is under development and is anticipated to be launched soon.

In addition to these two funding sources for public water systems, DEC is utilizing EPA Pre-Remedial Grant funds to conduct an environmental investigation focused on identifying the degree and extent of PFAS contamination. Any time there is an exceedance of an MCL in a public water system, DEC initiates these investigations to identify the sources and potential responsible parties of PFAS contaminating groundwater and surface water with a focus on widespread contamination in the Killington area.

EPA's Proposed MCLs

While Vermont has been regulating PFAS in public drinking water since 2019, on March 14, 2023, the federal Environmental Protection Agency (EPA) proposed [National Primary Drinking Water Regulations](#) to establish legally enforceable MCLs for 6 PFAS in public drinking water. PFOA and PFOS are proposed to be regulated as individual contaminants at a level of 4 ng/L each. In addition to this proposal the EPA is also proposing to regulate four additional PFAS as a mixture, meaning the combined total of these four PFAS cannot exceed a hazard index of 1.0. A Hazard Index helps to account for the increased risk from mixtures of PFAS that may be found in contaminated drinking water. The four additional PFAS compounds proposed for regulation by EPA are:

- Perfluorononanoic acid (PFNA)
- Perfluorohexanesulfonic acid (PFHxS)
- Perfluorobutanesulfonic acid (PFBS)
- Hexafluoropropylene Oxide (HFPO) dimer acid & ammonium salt (GenX)



The proposed regulation included a 60-day comment period during which DEC, in coordination with The Vermont Department of Health (Health), filed [comments](#) on behalf of the State. EPA has indicated the final regulation is anticipated by the end of 2023 at the earliest.

DEC and Health are not planning to take emergency measures to adopt new advisories or standards and will make decisions using normal administrative processes. The two Departments are currently reviewing the supporting information published by EPA.

The EPA MCL framework is different from the framework currently used to regulate PFAS in Vermont's public water systems. The State will be evaluating these differences, including key areas such as the PFAS compounds proposed for regulation, how compliance with the standards is determined and public notification directives, including the State's requirement to issue a Do Not Drink notice after exceeding the MCL.

Investigating and Remediating Sites Contaminated by PFAS

The investigation and remediation of property contaminated by a release of PFAS is ongoing. DEC's introduction to PFAS contamination began through the investigation and response to PFAS contamination from two former Teflon fabric-coating facilities located in Bennington and North Bennington as well as a wire coating facility in Pownal. These investigations led to the discovery of widespread contamination in drinking water wells in these communities. These findings led the state to identify and investigate other potential industrial sources of PFAS, including:

- Wire coating facilities
- Semi-conductor manufacturers
- Battery manufacturers
- Electroplating facilities
- Carwashes
- Tanneries



PFAS at Airports and Fire Fighting Facilities

In addition to manufacturing sources, DEC also investigated locations where PFAS containing firefighting foam, known as Aqueous Film-Forming Foam (AFFF), was known to have been used.

- At the Southern Vermont Airport in Clarendon, the DEC tested for PFAS compounds and detected PFAS in 25 out of 77 wells.
- Ongoing remediation at the Air National Guard Facility at Burlington International Airport discovered significant PFAS contamination to soils and groundwater at the facility. The PFAS contamination has also been detected in a downgradient agricultural well at an active dairy farm. Additional investigation detected PFAS contamination in the nearby Winooski River.
- Many Vermont fire departments still had stocks of PFOS-containing AFFF, so in partnership with the Department of Public Safety, DEC initiated a firefighting foam takeback program.
- PFAS contamination was also found at the Vermont Fire Training facility in Pittsford and the fire training facility at IBM in Essex.

PFAS at Superfund Sites

DEC, with assistance from the EPA, has sampled groundwater and surface water at all the listed National Priority List (NPL) sites, also known as Superfund toxic waste sites, in the State. The following NPL sites had detections of PFAS:

- Bennington Landfill, Bennington
- Parker Landfill, Lyndon
- Pownal Tannery, Pownal
- Burgess Brothers Landfill, Bennington
- Former Jard Company site, Bennington
- Commerce Street, Williston
- BFI, Rockingham

These sites will continue to be monitored and additional work may be required as a part of the five-year planning process at Superfund Sites.



Adopting Water Quality Standards and Monitoring Surface Waters for PFAS

In February 2020, DEC released the report, [Deriving Ambient Water Quality Standards for the Emerging Chemicals of Concern: Per- and Polyfluoroalkyl Substances](#). The report describes the framework DEC uses to establish surface water quality standards, and how this framework may apply to the development of state-specific water quality standards to protect both human health and aquatic life from PFAS.

Water Quality Standards for PFAS

The report referenced above outlines anticipated challenges, data gaps, and costs associated with developing Vermont-specific standards for freshwater aquatic organisms in the absence of EPA-established PFAS criteria. To establish a numeric water quality standard for the Vermont-regulated PFAS, ANR would need to develop bioaccumulation factors for all Vermont-regulated PFAS as well as significant toxicity data for several of the Vermont-regulated PFAS including:

- Perfluorohexanesulfonic acid (PFHxS)
- Perfluoroheptanoic acid (PFHpA)
- Perfluorononanoic acid (PFNA)

These types of scientific and technical analyses are normally conducted by EPA and DEC has not been provided the significant resources required to complete this work independently.

As part of the EPA [PFAS Strategic Roadmap](#), EPA released draft ambient water quality criteria for aquatic life for PFOA and PFOS in April 2022. Once the EPA criteria are finalized, they could be incorporated into the Vermont Water Quality Standards. Given the tremendous resources required to derive water quality criteria for PFAS, EPA should lead this effort.

Monitoring Surface Waters and Fish Tissue for PFAS

DEC began monitoring for PFAS in surface waters and fish tissue in 2021 to evaluate the scope of impacts on aquatic resources. Common sources of PFAS include municipal wastewater treatment plants, airports, industrial



waste dischargers, and urban runoff. In this ongoing effort, monitoring locations are selected based on proximity to potential PFAS contributors. The [2021 Monitoring Report](#) and preliminary 2022 sampling results indicate that all surface water results to-date are below the Vermont drinking water maximum contaminant level. Surface water and fish tissue PFAS concentrations in all monitoring locations, to date, are low compared to results of national monitoring studies, and similar to concentrations from non-impacted water bodies in other regional studies conducted in Maine and New Hampshire.

Fish consumption advisories have been used in the past with other contaminants of concern to limit exposure to known contaminants. To date, there is no statewide PFAS fish advisory. EPA has established methods to advise Safe Fish-Eating Screening Levels for Vermont-regulated PFAS in fish. However, final toxicity values for the regulated PFAS have not been published by EPA. The ANR will continue to coordinate with the Vermont Department of Health (Health) to review monitoring data that may inform potential future advisories issued by Health.

Investigations and Response to PFAS in Wastewater Sludges

Investigating PFAS in Biosolids and Wastewater Sludges

DEC extensively has analyzed wastewater sludges for PFAS since 2016, including PFAS testing at six WWTFs that receive leachate from Vermont landfills and testing of all biosolids produced in Vermont. The study showed the presence of PFAS in all wastewater influent, effluent, and solids samples from these facilities. PFAS concentrations in sludges and biosolids averaged 24 ppb for regulated PFAS and 83 ppb for the sum of 24 PFAS compounds available via laboratory analysis.

In addition to analyzing PFAS in wastewater sludges, DEC required soil and groundwater testing at all permitted sludge or septage (material from a septic system) land application sites during 2019. Sixty-two certified land application fields were tested. Approximately 20% of all downgradient groundwater samples exceeded the Vermont groundwater enforcement standard of 20 ppt.



Permittees operating sites with PFAS above the groundwater enforcement standard were directed to halt land application, retest groundwater to confirm results, and identify and test any water supplies within a quarter mile of the site. PFAS testing of all drinking water supplies adjacent to permitted sites, to date, confirmed no PFAS impacts attributed to land application. DEC prohibited those sites with confirmed groundwater standard exceedances from applying wastewater sludges or septage and has required those permittees to develop site-specific corrective action plans pursuant to the [Groundwater Protection Rule and Strategy](#).

Responding to PFAS in Biosolids and Wastewater Sludges

In 2020, DEC implemented additional regulatory controls over biosolids management in Vermont via updated [Solid Waste Management Rules](#). The additions include:

- The establishment of a registry and approval for importation of Exceptional Quality (EQ)/Class A biosolids.
- PFAS testing requirements for all biosolids generated in or approved for import.
- All EQ biosolids generated in or approved for import to Vermont shall be accompanied with a product label indicating that the product may contain PFAS.
- Class B biosolids and stabilized septage land application permittees must complete routine PFAS testing for groundwater, soil, and crops at certified sites.

The current management options for wastewater sludge include incineration, landfilling, and land application as biosolids. All options carry the risk of discharges of PFAS to the environment.

- **Incineration**

Current research by the EPA suggests that sludge incineration does not reach temperatures high enough to destroy PFAS, therefore transferring PFAS to the atmosphere followed by deposition to land, surface waters and potentially to groundwater. Vermont does not currently export sludge for incineration.



- **Landfilling**

Landfilling sludge is limited by capacity and generates landfill leachate that contains high levels of PFAS, typically hauled to a wastewater treatment facility for disposal. Regionally, there are significant limitations on landfill capacity ([NEWMOA 2021](#)). In Vermont, only one active landfill remains with an estimated capacity of 20 years.

- **Land Application**

To mitigate risks associated with land applying biosolids that contain PFAS, DEC has developed an interim strategy in coordination with a work group comprised of staff from Health, AAFM, commercial residual managers, wastewater operators, and residuals and biosolids experts. DEC will also continue to assist AAFM to identify any potential adverse PFAS-impacts to agriculture resulting from land application of residual materials, including Class A and B biosolids, sludges, and septage.

Reducing the Impacts of PFAS from Landfills on the Environment

Investigation into environmental sources of PFAS related to both closed and operating landfills began with groundwater investigations in 2017 and progressed over the next several years to investigate sources of [PFAS within disposed waste](#) and the [relationship between landfill leachate management at wastewater treatment facilities and the corresponding effluent](#). This work continues, both for monitoring purposes and to move towards reducing the impacts of PFAS from these landfills on the environment.

Monitoring and Managing PFAS Contamination from Landfills

Vermont's unlined landfills continue to be monitored to assess trends and changes with their associated groundwater contamination. To date, DEC has discovered impacts from PFAS to residential drinking water supplies in connection with two permitted closed landfills. Point of entry treatment (POET) systems have been installed at these properties. Other closed landfills in the State are required to perform semi-annual groundwater monitoring and may include sampling of residential supplies within areas of concern to ensure there is no public health impact.

The New England Waste Services of Vermont operating landfill, in Coventry, VT, continues to pursue management options that will reduce



the impact on the environment from PFAS from their activities of both the unlined and lined landfills on the property.

There are two separate issues related to PFAS management at the landfill that are currently being managed at the facility. First, PFAS has been identified at low levels in groundwater underlying the facility. The groundwater table under the landfill is lowered through a series of underdrains which are either diverted to the leachate holding tank or flow into a field downgradient from the facility. NEWSVT has been required to treat groundwater from that underdrain prior to its release. Groundwater at the facility that is impacted by PFAS continues to be monitored to ensure the contamination does not migrate off the property.

PFAS is also present in leachate which is generated when rainwater or liquid waste comes into contact with waste located in the landfill. PFAS contained in various wastes in the landfill (i.e. furniture, carpets, and apparel) release PFAS into this leachate. The leachate in the landfill is collected and piped to storage tanks at the facility. ANR has required this leachate to be treated prior to being discharged at a publicly owned treatment works (i.e. wastewater treatment facility). Data collected during the operations of this system will support efforts to develop Technology-Based Effluent Limits or other treatment standard criteria, which may be used to reduce PFAS in landfill leachate, and ultimately improve the quality of discharges received by wastewater treatment facilities.

Additionally, DEC will continue to track federal progress in this area. The EPA's PFAS Strategic Roadmap will progress research and development within the areas of best practices of disposal and destruction of PFAS containing materials. In January 2023, the EPA announced through the [Effluent Guidelines Program Plan 15](#) that it will be undertaking rulemaking for the development of PFAS effluent guidelines and pretreatment standards for landfills. These guidelines will expand the research available for consideration and may better inform monitoring and managing PFAS contamination from landfills in the state.

Holding PFAS Manufacturers Accountable

The State of Vermont has initiated a major environmental action to protect Vermont's drinking water and natural resources by filing two separate lawsuits. The lawsuits seek to make Vermont whole by making those responsible for PFAS contamination pay to remove their toxic chemicals from Vermont's groundwater and other natural resources.



One lawsuit against 3M Company, EIDP, Inc. (DuPont) and related entities addresses PFAS contamination from the use of PFAS in consumer, household, and other commercial products, as well as in industrial uses. This case is currently in the discovery process in Vermont Superior Court, Civil Division, Chittenden Unit. A different lawsuit against 3M Company, DuPont and related entities and foam manufacturers addresses PFAS contamination from firefighting foam. This case is in multidistrict litigation in the United States District Court for the District of South Carolina along with thousands of other cases.



Encourage EPA to Provide National Leadership on the Management of PFAS

Key Action Items

- ▶ Establish surface water standards for the protection of human health.
- ▶ Advocate that EPA ban or restrict certain PFAS containing products using the Toxic Substances Control Act.
- ▶ Establish standards for classes of PFAS.
- ▶ Provide research on the health effects for additional PFAS compounds.
- ▶ Improve and expand methods for detecting PFAS compounds in environmental media.
- ▶ Provide guidance/regulation for the disposal and destruction of PFAS.

EPA's PFAS Strategic Roadmap

In October 2021, the US EPA published its [PFAS Strategic Roadmap: EPA's Commitment to Action 2021-2024](#). EPA's approach falls into several general categories that consider PFAS lifecycle, preventing PFAS from entering the environment, holding polluters accountable, science-based decisions, and prioritizing environmental justice. The EPA's goals are focused on three central directives:

1. Research to increase the understanding of PFAS exposures and toxicities, human health and ecological effects and effective interventions.
2. Restrictions to prevent PFAS from entering the environment.
3. Remediation to clean up PFAS contamination.

The EPA PFAS Strategic Roadmap also lays out many key actions that align with Vermont's and are as follows:

Source Reduction

- A review process of PFAS under the Toxic Substances Control Act to prevent resumed production or use of phased out PFAS and to ensure



new PFAS are safe before they enter commerce. This includes removal of exemptions and exclusions for toxic chemical reporting.

- Restrict PFAS discharges from industrial sources through a multi-faceted Effluent Limitations Guidelines program that leverage National Pollutant Discharge Elimination System permitting to reduce PFAS discharges by reducing discharges of PFAS at the source.
- Use enforcement tools to better identify and address PFAS releases at facilities.
- Establish a PFAS Voluntary Stewardship Program to challenge industry to reduce overall releases of PFAS into the environment.

Human Health and Environment

- Develop human health toxicity assessments under EPA's Integrated Risk Information System program.
- Undertake nationwide monitoring for PFAS in drinking water under the fifth Unregulated Contaminant Monitoring Rule.
- Establish a national primary drinking water regulation for PFOA and PFOS.
- Published health advisories for GenX and PFBS based on final toxicity assessment for these compounds and five additional PFAS – PFBA, PFHxA, PFHxS, PFNA, and PFDA.
- Publish final recommended ambient water quality criteria for PFAS for aquatic life and human health.
- Enhance data availability on PFAS in fish tissue to better assess the impacts of PFAS on the aquatic environment.
- Address PFAS air emissions to identify sources, develop emissions monitoring and mitigation technologies, and increase understanding of the fate and transport of PFAS air emissions.
- Finalize risk assessment for PFOA and PFOS in biosolids.

Hazardous Designation and Treatment/Destruction

- Propose to designate certain PFAS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to require reporting of PFOA and PFOS



releases, enhance the availability of data, and ensure agencies can recover cleanup costs.

- Initiate rulemaking under the Resource Conservation and Recovery Act to address PFAS.
- Evaluate and develop technologies for reducing PFAS in the environment to inform decisions on drinking water and wastewater treatment, contaminated site cleanup and remediation, air emission controls, and end-of-life materials management.
- Issue updated guidance on destroying and disposing of PFAS.

Testing Methods

- Develop improved analytical methods to update drinking water monitoring, expand PFAS monitoring in different environmental matrices, and to identify unknown PFAS in the environment.

Aligning EPA's and Vermont's PFAS Roadmaps

The rapidly evolving nature of the science and technology associated with PFAS requires DEC to continually engage with EPA as well as our municipal, state, and regional partners working on PFAS related issues. Supporting continuous learning within DEC and engagement with our partners is critical to make sure Vermont is staying current on the multi-faceted nature of PFAS-related issues and using this information to inform our strategy to reduce, identify, protect, and encourage as described in this roadmap. Vermont has established itself as a national leader in addressing PFAS contamination by beginning our work in 2016 and continuing to evolve our strategy as we learn more. We maintain a unique perspective to share with EPA and other partners, given our extensive experience working to address PFAS contamination and the small and rural character of our State.

The list below identifies some of DEC's work to build internal capacity, increase our expertise, and to collaborate with our partners.

1. DEC has expert technical staff that participate in numerous national committees working on PFAS related issues. These include:
 - Association of State Drinking Water Administrators PFAS Workgroup
 - Environmental Council of the States PFAS Caucus



- Interstate Technology Regulatory Council PFAS Update Team
 - Northeast Waste Management Officials Association PFAS Working Group and PFAS Source Reduction Policy Workgroup
2. DEC organizes several internal and external meetings to discuss PFAS related issues on a re-occurring basis. These include:
- Monthly coordination meetings between DEC programs working on PFAS related issues.
 - Quarterly coordination with the Vermont Department of Health
 - DEC Monthly PFAS meetings. These are open to other staff in other state agencies and feature rotating topics with expert presenters on the selected topic.
 - Coordination with Vermont's Congressional Delegation on PFAS related legislation on an as needed basis.
3. DEC submits comments on proposed EPA rules to ensure Vermont's perspective and unique challenges are considered. This includes:
- EPA's Proposed PFAS MCL



Vermont's PFAS Roadmap Summary



Reduce or Eliminate PFAS in Commercial Products and Industrial Uses

- Support the implementation of Act 36 to ban PFAS in certain products.
- Provide technical information to the General Assembly to inform discussions of how to reduce or eliminate PFAS in consumer products.
- In the continued absence of national leadership, support work on a regional approach to address labeling and the intentional addition of PFAS in products.



Identify Sources of PFAS Exposure in Vermont

- Test private water supplies to understand the statewide groundwater impacts from PFAS where no known source exists.
- Test the influent and effluent at all Vermont wastewater treatment facilities (WWTFs).
- Conduct a study to evaluate PFAS in recycled food waste and food packaging.



Protect Vermonters from Existing Exposures to PFAS

- Continue implementation of the Vermont PFAS Maximum Contaminant Level (MCL).
- Develop laboratory capacity in Vermont.
- Engage with impacted water systems to ensure maximum utilization of state and federal funding to address PFAS.



- Update drinking water standards based on EPA's regulation to establish national PFAS MCLs.
- Continue to identify and remediate PFAS contamination sources at sites across Vermont.
- Continue to evaluate the need for a Vermont Water Quality Standard based on expanded surface water and fish tissue testing.
- Develop an interim strategy to reduce risks associated with managing biosolids and residual materials that contain PFAS.
- Monitor potential discharges of PFAS from landfills, assess impacts to groundwater or water supplies, and provide treatment/remediation.
- Hold PFAS manufacturers accountable.



Encourage EPA to Provide National Leadership on the Management of PFAS

- Establish surface water standards for the protection of human health.
- Advocate that EPA ban or restrict certain PFAS containing products using the Toxic Substances Control Act (TSCA).
- Establish standards for classes of PFAS.
- Provide research on the health effects for additional PFAS compounds.
- Improve and expand methods for detecting PFAS compounds in environmental media.
- Provide guidance/regulation for the disposal and destruction of PFAS.