**Report to the Committee on the Environment and Natural Resources**
**131st Legislature, First Session**

# Status of Maine's PFAS Soil and Groundwater Investigation at Sludge and Septage Land Application Sites

***January 15, 2023***

Contact: Susanne Miller, Director
Bureau of Remediation and Waste Management
Phone: (207) 557-2700
Susanne.Miller@maine.gov

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 State House Station | Augusta, Maine 04333-0017
www.maine.gov/dep

## Executive Summary

This report is prepared in accordance with Public Law 2021, Chapter 478, *An Act To Investigate Perfluoroalkyl and Polyfluoroalkyl Substance Contamination of Land and Groundwater* ( P.L. 2021, c. 478), which, in part, directs the Department of Environmental Protection (Department) to develop and implement a program to evaluate soil and groundwater for perfluoroalkyl and polyfluoroalkyl substances (PFAS) and other identified contaminants at locations licensed or permitted prior to 2019 to apply sludge or septage. At this time, the Department has identified approximately 1,037 licensed "sites" for investigation. Since October 18, 2021, which was the effective date of P.L. 2021, c. 478, the Department has onboarded 17 new staff positions; established a prioritization methodology for the investigation of sludge land application sites and prioritized the sites into four tiers; and initiated a contracting process to select consultants to conduct investigations at septage and some sludge land application sites. Soil and groundwater investigations have been initiated at about 20 percent (%) of sludge and septage land application sites. Initial soil investigations have been completed at about 14% of the sites and initial groundwater investigations have been completed at about 15% of the sites.

A typical PFAS investigation consists of researching license files; developing sampling and analysis plans; sampling and testing soil at locations where land application occurred; determining which water supply wells may be at risk from land application; and sampling and testing at-risk water supplies. When water supplies exceed Maine's interim drinking water standard for the Sum of 6 PFAS (PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA), the Department coordinates the installation and maintenance of a filtration system. As of the end of 2022, the Department has sampled 1,525 wells and has initiated or completed the installation of 308 filtration systems.

From January 1, 2019 through November 15, 2022, the Department spent about $6 million dollars in PFAS-related expenditures including personnel costs. A marked increase in expenditures occurred in 2021 and has been steadily increasing thereafter. While the Department has developed a schedule to complete the investigation required by P.L. 2021, c. 478, it is not certain that this deadline will be fully met due to the magnitude and scope of the investigation. It is anticipated that most of the sites will have undergone an initial evaluation prior to the end of 2025, but it is likely that data evaluation and additional investigative work at some sites will still be necessary after that time. Long-term monitoring and maintenance of installed filtration systems will also be required.

This report provides the Joint Standing Committee on the Environment and Natural Resources with information about the Department's approach to this investigation, a summary of progress of the investigation, information relating to program funding and expenditures to date, and expectations and next steps to consider. As the Department's investigation is ongoing, any conclusions and recommendations are limited and considered preliminary.

# I. Introduction and Background

Per- and Polyfluoroalkyl Substances (PFAS) refer to a group of man-made chemicals widely used in consumer products and industrial settings. There are thousands of varieties of these chemicals and as early as the 1940's, PFAS[1] were widely in use. These chemicals were also historically used in firefighting foams due to their effectiveness at quickly extinguishing petroleum-based fires. Because they have a unique ability to repel oil, grease, water, and heat, PFAS are found in many products that consumers commonly use. For example, PFAS have been used to make non-stick cookware, stain-resistant carpets and furniture, water-resistant clothing, heat-resistant paper/cardboard food packaging (like microwave popcorn bags and pizza boxes), and personal care products. PFAS break down very slowly and are persistent in the environment. This means that PFAS may build up in people, animals, and the environment over time. Health agencies like the US Centers for Disease Control and Prevention (CDC) are actively assessing the health effects of low level, long-term exposure to PFAS, but have suggested that health impacts from PFAS may include[2] the following:

- Increased cholesterol levels;
- Changes in liver enzymes;
- Small decreases in infant birth weights;
- Decreased vaccine response in children;
- Increased risk of high blood pressure or pre-eclampsia in pregnant women; or
- Increased risk of kidney or testicular cancer.

PFAS have been found throughout Maine including but not limited to at agricultural sites, in public and private drinking water supplies, in surface waters, in landfills, in wastewater effluent, at sludge and septage spreading sites, and at remediation and cleanup sites. In general, PFAS can enter the environment through direct releases from specific PFAS-containing products (e.g., certain firefighting foams, and consumer product wastes such as food packaging), as well as from more generalized waste streams including sludge and septage, leachate, wastewater effluent, and air emissions. Many of these pathways are still being studied and evaluated to better understand how PFAS get into and move through the environment.

This report focuses on the Department's investigation into PFAS contamination resulting from the land application of sludge and septage. Since the late 1970's, the land application of sludge was commonly practiced in the United States and was encouraged under the US EPA's biosolids[3] program pursuant to 40 C.F.R. §503. This is, in part, largely because the application of biosolids at a

[1] PFAS used early on were mostly PFOA and PFOS. In the early 2000's, manufacturers of these specific began to phase-out these compounds, Fact Sheet: 2010/2015 PFOA Stewardship Program | US EPA.
[2] Taken from the US CDC website, November 2022; Potential health effects of PFAS chemicals | ATSDR (cdc.gov).
[3] In the context of this report, the Department is using the terms biosolids and sludge interchangeably.

controlled rate was known to enhance nutrient value at agricultural sites and for reclaiming and revegetating areas disturbed by mining, construction, and waste disposal activities.

The land application of sludge in Maine was licensed by the Department pursuant to the *Maine Hazardous Waste, Septage and Solid Waste Management Act*, 38 M.R.S §§ 1301 to 1319 and the Solid Waste Management Rules pursuant to *Beneficial Use of Solid Wastes*, 06-096 C.M.R. ch. 418 and *Agronomic Utilization of Residuals*, 06-096 C.M.R. ch. 419.[4] The land application of septage is regulated pursuant to *Septage Management Rules*, 06-096 C.M.R. ch. 420.[5] Licensing was required prior to land application to ensure that the activity complies with the applicable statutory and regulatory provisions relative to protecting public health, safety, and the environment. However, while licenses typically established limits for the concentrations of metals and other organic compounds, PFAS were not historically included or regulated in sludge and septage land application licenses.[6]

### What is Sludge and Septage?

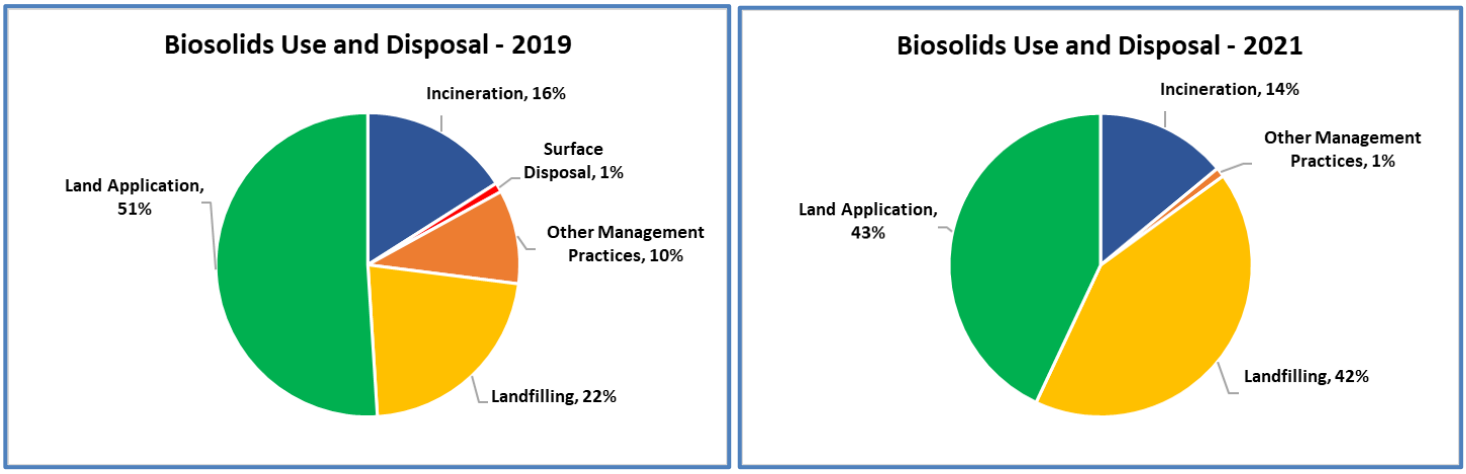
***Sludge*** *is a solid, semi-solid, or liquid waste generated from a wastewater treatment process as well as from dewatered septage. Wastewater is used water that can include substances such as domestic, commercial, and industrial waste; food scraps; fats, oils, and grease; soaps; and chemicals and can be generated by households, businesses, and industry. Wastewater treatment systems treat this used water so that it can be recycled back into the environment. Sludge is a byproduct that has been spread for decades on agricultural land as a way to supplement farmland with nutrients.*

***Septage*** *is a fluid mixture of sewage solids, liquids and sludge of domestic origin, which is collected in and removed from a septic tank system. Once a septic system is pumped out the septage must be disposed of. Land application of septage is the most common and economical way to utilize it. Typically, septage is land applied in areas that are more remote, but land-use development can later take place in those areas.*

While land application practices took place for several decades, as more information came to light about the potential for exposure to PFAS and for other reasons, land application practices began to shift even on a national scale, as illustrated in Figure 1. In 2019, 51% of biosolids was land applied while in 2021, 43% of biosolids was land applied on a national scale. Landfilling of biosolids increased from 22% in 2019 to 42% in 2021.

[4] The land application of sludge and sludge-derived products was prohibited by the Maine Legislature pursuant to Public Law 2021, Chapter 641. This became effective on August 8, 2022.
[5] The land application of septage is still authorized and has not been prohibited as of the date of this report.
[6] Maine identified that PFAS would need to be addressed moving forward for all licenses authorizing land application of sludge in a memo issued in 2019 by the Department. This memo did not address licenses relating to the land application of septage.

**Figure 1: National Biosolids Use and Disposal Data in 2019 and 2021 from US EPA's Biosolids Website[7]**




The potential for widespread PFAS impacts in Maine at agricultural sites was not realized until PFAS were discovered in a Kennebunk, Kennebunkport, and Wells Water District monitoring well, which led to the discovery of PFAS in a nearby dairy farm's well, milk, hay, and soil. This one investigation raised a series of questions about the soil-to-groundwater pathway, agronomic exposure pathways, and whether this was an isolated or more common occurrence. Since that time, many State of Maine agencies have become involved in efforts to better understand the scope of PFAS in Maine's environment by investigating, responding to, and reducing exposure to Maine citizens from PFAS.

As a result of this investigation, and new research about the potential for exposure to PFAS, Governor Janet Mills signed an Executive Order on March 6, 2019, for the creation of the Maine PFAS Task Force to review the prevalence of PFAS in Maine and submit a report of its findings. In January 2020, the Maine PFAS Task Force released its final report and recommendations, Managing PFAS in Maine, Final Report from the Maine PFAS Task Force. This Report, along with concerns from the Maine public, influenced Maine's 130th Legislature to establish several new legislative initiatives related to PFAS.[8] One of these new initiatives was Public Law 2021, Chapter 478, *An Act to Investigate Perfluoroalkyl and Polyfluoroalkyl Substance Contamination of Land and Groundwater* (P.L. 2021, c. 478), which became effective on October 18, 2021, and is the impetus for this report.

P.L. 2021, c. 478 requires the Department to develop and implement a statewide program to evaluate soil and groundwater for PFAS at all locations in Maine that were licensed to accept sludge

[7] The biosolids data used in these charts (2019 and 2021) were taken from US EPA's Biosolids Website.
[8] The 130th Legislature passed several pieces of legislation including, but not limited to the following: establishing an interim drinking water standard for PFAS and proposing a maximum contaminant level (MCL) on or before December 31, 2023 (Resolve 2021, Chapter 82); requiring the Department to conduct a soil and groundwater investigation (P.L. 2021, c. 478); revising the definitions under Maine's Uncontrolled Sites Law to include CERCLA pollutants and contaminants which can include PFAS (38 M.R.S. §1362(1)(H)); extending the statute of limitations for injury or harm arising from PFAS contamination (14 M.R.S §752-F); banning the land application of sludge and sludge derived products and requiring sampling of wastewater effluent (Public Law 2021, Chapter 641); evaluating management of PFAS at state-owned landfills (Public Law 2021, Chapter 172); restricting use of aqueous film-forming foam (AFFF) (38 M.R.S §424-C); reducing PFAS in food packaging (32 M.R.S §1733(3-B); and reporting of intentionally added PFAS in products (38 M.R.S §1614).

or septage for land application prior to 2019. The law also requires coordination between the Department and the Maine Department of Agriculture, Conservation and Forestry (DACF) in identifying active agricultural operations that are impacted by PFAS contamination.

This report is intended to meet 38 M.R.S. §1310 B-1(2)(C), which requires the Department to report on the use of the Land Application Contaminant Monitoring Fund and summarize the contamination identified. It also meets the requirement of P.L. 2021, c. 478, Section 2 (1) to identify any location(s) excluded from the investigation and the reason for the exclusion(s). This report is due to the Legislature biennially beginning January 15, 2023.

In addition to the above required information, this report will also provide an overview of the following:

- Establishment, structure, and rollout of the new PFAS program;
- Initial results obtained from the investigation;
- Program communications and coordination;
- Expenditures and costs of the program;
- What to expect during the next biennium; and
- Issues for the Legislature to consider.

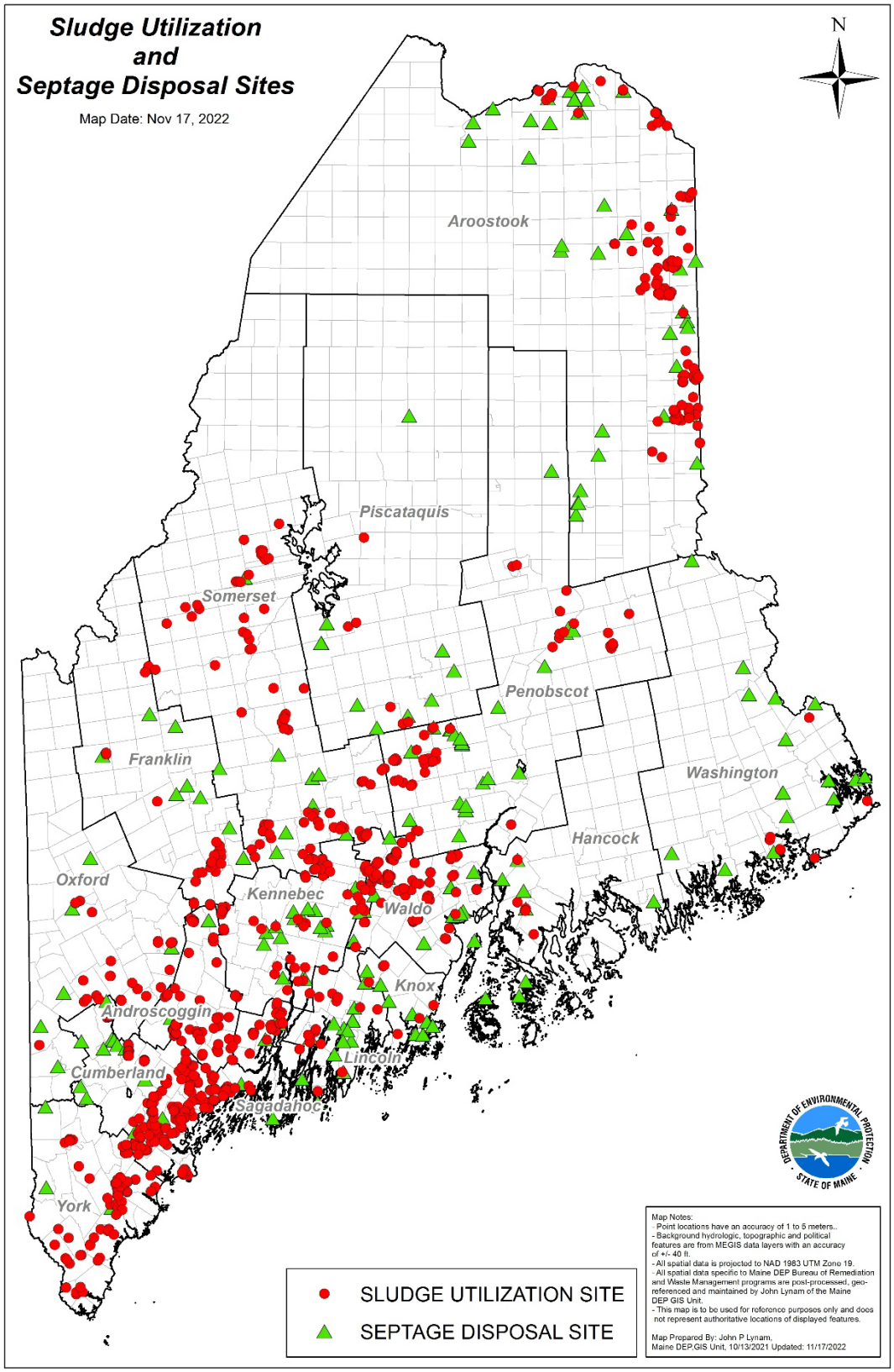
## II. Establishing and Implementing the New PFAS Soil and Groundwater Investigation

### 1. Requirements of P.L. 2021, c. 478

P.L. 2021, c. 478, Section 2 requires the Department to develop and implement a new program to evaluate soil and groundwater for PFAS contamination at all sites in Maine licensed prior to 2019 to land apply sludge or septage. A site typically includes multiple fields (i.e., agricultural land, pasture, or other land) and may also cross district, town, and county boundaries. Some sites may have different owners than when a license was first issued, requiring the identification of historical land use changes and practices. As an example, a site that was an active farm in 1986 may now be a small farm, a subdivision, a school, or a combination of all three. Moreover, some sites may have been utilized by multiple sludge or septage generators who land applied in the same location over several years. At the May 7, 2021, 130th Legislative Environment and Natural Resource Committee hearing on L.D. 1600 (which became P.L. 2021, c. 478), the Department testified that such an investigation would "require testing of approximately 700 sites,[9] with each site involving one or many parcels with potentially separate owners." See Figure 2.

[9] In revisiting this number at the end of calendar year (CY) 2022, it appears that there are still well over 700 sites statewide with the possibility that there may be as many as 1,037 or even more. It is difficult to confirm the exact number of sites without additional research as multiple generator licenses may cover the same or part of the same areas, but with different boundaries, years of use, frequency of use, etc. The number of sites is anticipated to evolve as staff continue their research of project files.

**Figure 2: Approximate Sludge and Septage Site Locations as of November 2022**



To begin the investigation, the Legislature first required the Department to establish criteria to prioritize each of the authorized land application sites based upon:

- The anticipated presence of high levels of PFAS in sludge or septage;
- The volume of sludge or septage land applied; and
- The proximity of land application to known receptors (i.e., drinking water wells).

Upon establishing criteria, the Legislature next required that the Department sample and analyze soil and groundwater at each of the identified sites. Sampling and analysis were to include all PFAS that may reasonably be quantified by a certified laboratory. While it is estimated that there are thousands of unique PFAS in existence,[10] most laboratories are only capable of analyzing for approximately 28 PFAS at this time. The laboratory method specified by the Department is US EPA Method 537.1, modified with isotope dilution.

If the Department's sampling evaluation identifies PFAS contamination[11] in private groundwater drinking water wells, the Department is authorized to use legislative funding pursuant to 38 M.R.S §1310 B-1 (2)(C) to ensure that residents using those wells have access to a clean source of drinking water (i.e., bottled water until installation of a filtration system). Also, where the Department's evaluation indicates contamination at an active agricultural operation, the Department must inform DACF of those findings so that the DACF can coordinate with farmers on the planning, future use of land, and sale and distribution of agricultural products from that land.

### 2. Early Implementation Steps and General Approach

Upon the July 2021 passage of P.L. 2021, c. 478, the Department immediately took several steps toward implementing the new program prior to the law's effective date of October 21, 2021. This was done to ensure that the actual investigation could start as soon as practically possible. Some of these early steps included:

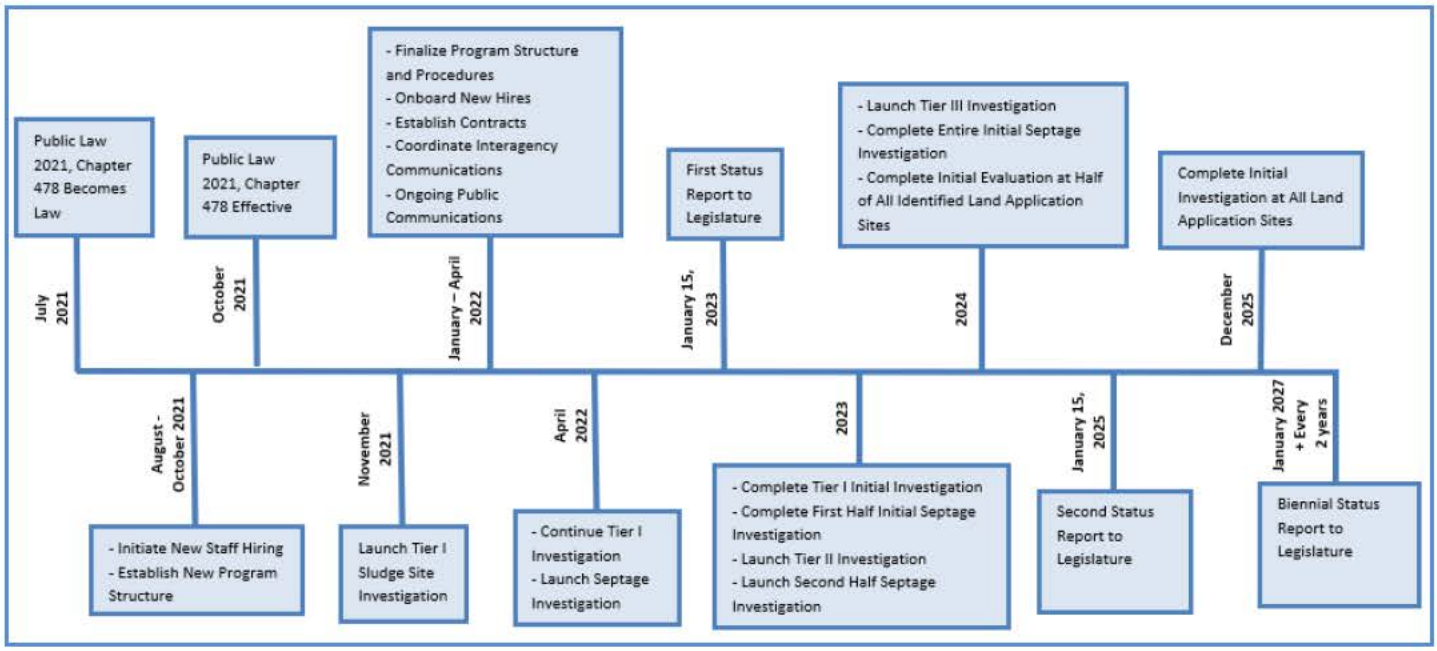
- Initiating the hiring process for 17 new positions[12] funded for the purpose of implementing the PFAS investigation (Appendix A);
- Identifying appropriate placement and organizational structure for new staff and integrating them into the ongoing PFAS work already underway;
- Establishing procedures and workflows for conducting the soil and water investigation to ensure consistent and accurate data collection;
- Creating a priority system for the statewide sampling program to include Tiers for sludge land application sites;

[10] The US CDC National Institute of Occupational Safety and Health estimates the existence of over 9,000 PFAS.
[11] The Department considers PFAS contamination in private drinking water wells to exceed Maine's interim drinking water standard of 20 parts per trillion (ppt) for the sum of 6 PFAS as set by legislation pursuant to Resolve 2021, Chapter 82. When PFAS contamination is found at farms, information is immediately communicated to the DACF for coordination. Unlike with drinking water, Maine does not have an enforceable standard for PFAS contamination in soil. This is discussed in further detail in Section II.4.G. of this report.
[12] These included eleven full time equivalents (FTEs) and six limited period positions (LPPs). One full time position was redirected to implementation of Public Law 2021, Chapter 477, *An Act To Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution.*

- Reviewing licensing files, obtaining contact information for current landowners, and commencing the scheduling of soil and water sampling to begin in late 2021;
- Developing contractual and financial mechanisms to support the investigation (i.e., provision of bottled water, installing and monitoring filtration systems, laboratory analysis, and additional consulting support);
- Coordinating with the DACF and other state agencies impacted and involved with the PFAS investigation including the Maine Center for Disease Control and Prevention (CDC) and the Maine Department of Inland Fisheries & Wildlife (DIFW);
- Preparing notifications to go out to public officials and communities prior to soil and water sampling taking place; and
- Updating information and creating new guidance for the public on the Department's PFAS website.

As the Department began to implement the new program, a preliminary timeline depicted in Figure 3 guided the overall program rollout.

**Figure 3: Initial Implementation Timeline for PFAS Soil and Groundwater Investigation**




Staff hiring and retention have been challenging due to the limited availability of qualified applicants and a competitive job market. One position was reclassified to align more appropriately to the operational needs of the investigation. Program staffing including staff retention and the number of staff needed to maintain momentum with an investigation of this magnitude is a concern for the Department.

### 3. Prioritizing Sample Sites

Per the legislative directive, the Department prioritized licensed sludge application sites into four Tiers (I, II, III, and IV) to designate an approximate schedule for conducting sampling

of PFAS in soil and groundwater at sludge land application sites (See Table 1). This information was released to the public in October 2021. To develop this prioritization system, Department staff performed a cursory review of all sludge application license files from the late 1970's through 2019[13] which included licenses, annual reports, correspondence, and other pertinent documents. Four decades of license files including thousands of records were carefully reviewed to identify locations of authorized land application sites, specific information about land ownership pertaining to these site locations, land application timeframes, volumes of sludge actually applied, frequency and duration of sludge application, and proximity or distance to the nearest private groundwater wells. Reviewing forty years' worth of licensing files was an enormous task and it became evident that there are inconsistencies and gaps in the files. This has been an ongoing challenge for the Department, with multiple staff continuing to attempt to locate and fill these information gaps. To prevent a delay of the entire investigation process, the Department opted to designate Tier IV sites as those where information was not available to confirm actual sludge application or not enough information was available to move forward. This was done so that further evaluation can occur to determine if investigation is necessary at these sites as specified in P.L. 2021, c. 478 Section 2 (1).[14] As staff continue to gather and locate the missing information, some land application sites in the Tier IV category may be moved to other tier levels and investigated sooner.

The extensive volume of information collected is an essential piece in understanding locations that may have the highest risk of PFAS exposure. The Department's tiered system aims to first address areas suspected to be at the highest risk while simultaneously working toward addressing areas with less anticipated risk as more information becomes available.

**Table 1: PFAS Sludge Land Application Investigation Tiered System**

| Tier | Volume Applied | PFAS Likely Present in Sludge | Proximity to Receptors Within ½ Mile |
|---|---|---|---|
| I | 10,000 cubic yards or more | x | x |
| II | Between 5,000 and 10,000 cubic yards | x | x |
| III | Under 5,000 cubic yards | x | x |
| IV | Sites where information gathered to date indicates that no sludge was land applied* | | |

**Additional research is needed to verify this information. Once verified, these sites may be placed in another tier as appropriate using the above criteria, or the Department will evaluate the necessity to conduct sampling in these locations.*

[13] Section 2 of P.L. 2021, c. 478 specifically requires the soil and groundwater investigation to address sludge land application sites authorized prior to 2019. This is because beginning in March 2019 the Department issued a memo requiring all licensed sludge generators previously authorized to land apply sludge or produce a sludge-derived product to sample sludge for PFAS, report results to the Department, and seek approval for land application based on those results.

[14] P.L. 2021, c. 478 Section 2 (1) states that "The department may exclude a location from evaluation under the program for good reason, including, but not limited to, upon a determination that no sludge or septage was actually applied at the location or that the location is no longer owned or controlled by the licensee or permittee and the department is unable to obtain authorization to evaluate soil and groundwater at the location."

By the end of summer 2022, the Department had completed most of the Tier I site investigations. Because the Department was ahead of schedule,[15] the investigations at Tier II sites commenced in August 2022. The Department anticipates continuation of its work on Tier I and Tier II sites throughout 2023, beginning sampling of Tier III sites in 2024. Table 2 below identifies the communities in Maine that currently have Tier I and/or Tier II sites within their boundaries and where investigations are already underway. This list of communities may change as the Department continues its investigations and gathers more information.

**Table 2: Locations[16] by Municipality/Territory of Tier I and/or II Sludge Land Application Sites[17]**

| | | | | |
|---|---|---|---|---|
| **Tier I** | • Albion<br>• Benton<br>• Bowdoinham<br>• Brooks<br>• Canaan<br>• Chelsea<br>• China<br>• Corinna | • Corinth<br>• Exeter<br>• Fairfield<br>• Fort Fairfield<br>• Hodgdon<br>• Holden<br>• Houlton<br>• Jackson | • Littleton<br>• Ludlow<br>• New Limerick<br>• Oakland<br>• Palermo<br>• Presque Isle<br>• St. Albans | • Sidney<br>• South Windham<br>• Thorndike<br>• Unity<br>• Unity Twp<br>• Westbrook<br>• Winn |
| **Tier II** | • Bald Mtn Twp<br>• Bowdoin College Grant West<br>• Brassua Twp<br>• Caratunk<br>• Chase Stream Twp<br>• Durham<br>• Frankfort<br>• Fryeburg | • Greenville<br>• Hartford<br>• Haynestown Pltn<br>• Hebron<br>• Hobbstown Twp<br>• Lewiston<br>• Long Pond Twp<br>• Machias<br>• Mayfield | • New Gloucester<br>• North Yarmouth<br>• Pierce Pond Twp<br>• Pleasant Ridge Pltn<br>• Raytown Twp<br>• Richmond<br>• Saco | • Sandwich Academy Grant<br>• Sangerville<br>• Turner<br>• T1R13WELS<br>• West Gardiner<br>• West Middlesex Grant Twp<br>• Whitefield |
| **Tiers I & II** | • Auburn<br>• Charleston<br>• Dayton | • Freedom<br>• Gorham<br>• Gray | • Knox<br>• Leeds | • Minot<br>• Skowhegan |

[15] A few remaining locations are being completed through contracted services rather than directly by Department staff. Some of the delays in completion of these sites were in part a result of laboratory capacity, and issues inherent in the state contracting process and its oversight.

[16] The names of communities are being used instead of site names or addresses in order to be sensitive to landowner or farm privacy concerns.

[17] Locations of Tier III and IV sites will be released as the Department shifts toward that part of the investigation which is anticipated for 2024. The list of these locations is a working draft, and the actual locations may change by the time that part of the investigation begins as more information is gathered from historic files. Some self-testing results have been received by the Department and DACF for Tier III locations (with approximately 5 farms providing self-testing information). The Department has in some cases investigated Tier III sites where Tier I or II sites are located in close proximity, or when property boundaries overlap, in order to be efficient with its resources.

Concurrently with the tiered approach described above, the Department is also investigating landfill sites where sludge amended topsoil was applied. In general, sludge amended topsoil consists of soil (i.e., sand, silt) that was amended with sludge or sludge-derived compost to promote a nutrient-rich vegetative growth. A preliminary list of landfill locations where sludge amended topsoil was used is identified in Table 3 below. This list also continues to be developed as staff review project files.

*Table 3: Municipalities with Landfill Sites that have Used Sludge Amended Topsoil*

| | | | | |
|---|---|---|---|---|
| Abbott | Belfast | Bowdoinham | Brewer | Cumberland |
| Dexter | Dover Foxcroft | East Millinocket | Fairfield | Falmouth |
| Farmington | Fort Fairfield | Freeport | Friendship | Hampden |
| Harrison | Lewiston | Milford | Norway | Portland |
| Saint Albans | Southwest Harbor | Stonington | Topsham | Unity |
| Vassalboro | Waldoboro | Waterville | Wayne | Westbrook |
| Yarmouth | | | | |

Because septage land application sites are managed and regulated differently than sludge application sites and there are significantly fewer septage application sites, these sites are not prioritized as part of the tiered system as described above. Some septage land application sites are tied to active licenses where the land application of septage is currently authorized to occur. Other licenses are historic, meaning that they have either expired or have been surrendered, and while land application is no longer occurring, it may have in the past. The investigation of septage land application sites began during the summer of 2022 in several communities throughout Maine as depicted in Table 4. It is anticipated that additional septage land application sites will be investigated in 2023 and that the overall septage investigation will be completed in early 2024.

*Table 4: Locations by Municipality/Territory of Septage Land Application Sites Under Investigation in 2022*

| County | Municipality/Territory |
|---|---|
| **Aroostook** | Benedicta, Blaine, Cary Plt, Castle Hill, Cross Lake Twp, Crystal, Dyer Brook, Eagle Lake, Easton, Fort Fairfield, Frenchville, Grand Isle, Haynesville, Houlton, Island Falls, Monticello, Nashville Plt, New Canada, Presque Isle, St. Agatha, St. John, Sherman, Stockholm, TD R2, T16 R9, Wallagrass, Washburn |
| **Penobscot** | Patten, Stacyville |
| **Washington** | Danforth |
| **Cumberland** | Baldwin, Bridgton, Casco, Gorham, Gray, Harrison, Naples, Raymond |
| **Oxford** | Andover, Bethel, Brownfield, Fryeburg, Lovell |
| **York** | Parsonsfield |
| **Androscoggin** | Livermore Falls |
| **Kennebec** | Albion, Belgrade, Canaan, Chelsea, Readfield, Vassalboro, West Gardiner, Windsor |
| **Sagadahoc** | Bowdoinham, Phippsburg |
| **Knox** | North Haven, Owls Head, Thomaston, Union, Warren, Washington |
| **Lincoln** | Bristol, Damariscotta, Newcastle, Nobleboro, Squirrel Island, Westport Island, Wiscasset |
| **Waldo** | Belfast, Frankfort, Freedom, Islesboro, Palermo, Searsmont, Swanville |

Some sludge and septage land application sites are being evaluated directly by Department staff, and others by outside environmental consultants to supplement staffing resources. Consultants have been utilized at both sludge and septage land application sites. Consultants are selected from Pre-Qualified Vendor Lists using a competitive bidding process that was developed in accordance with procedures approved by the Department of Administrative and Financial Services, Division of Procurement Services. A list of consultants used as of the date of this report and the nature of their work are presented in Appendix B.

### 4. Building the Investigation Process and Establishing Sampling Procedures

To meet the 2025 deadline of completing the investigation at all 700-plus licensed land application sites, the pace of the investigation needs to be efficient and thorough. In order to achieve both of these goals, the project was designed so that each site would have an initial investigation, and based upon those sampling results, a decision would be made as to whether a more in-depth investigation was required or if no further work was necessary. This project approach is the same for both sludge and septage land application sites.

Each site evaluation begins with assigning a project team of two to three staff typically including:

- A Project Leader, usually an Environmental Specialist, to manage the overall investigation and ensure all steps (see Table 5) are completed;
- A Geologist to develop a Sampling and Analysis Plan (SAP) to guide the collection of samples, lead the technical evaluation, and make conclusions based on site data; and
- A Geology Technician (GeoTech) to collect samples, record field parameters, arrange for laboratory analysis, and to assist with the preliminary evaluation of site results.

Additional key staff including chemists, engineers, GIS experts, and others support the project teams as needed. Several teams of staff work concurrently on multiple sites, at different stages of the investigations. Moreover, individual staff are typically assigned to more than one team working on different sites at various stages. Environmental consultants are also utilized to ensure that the work keeps up at an efficient pace.

Each project or site team will complete each step as outlined in Table 5 below – often sharing responsibilities based on resources, workloads, and individual strengths. Throughout this process the Department and DACF coordinate where landowners are engaged in agricultural operations.

| *Table 5: Procedural Steps for the PFAS Soil and Groundwater Investigation at each Sludge or Septage Land Application Site* |
|---|
| 1. Review historical license files including paper maps to determine where sludge or septage may have been land applied and coordinate with GIS and data experts to get information digitally mapped. |
| 2. Identify owners of land or homes near where land application occurred by comparing new location maps to property records including tax maps and other public resources. Understand |

| *Table 5: Procedural Steps for the PFAS Soil and Groundwater Investigation at each Sludge or Septage Land Application Site* |
|---|
| land use and ownership changes since the time of initial licensure. This typically requires some coordination with the DACF as agricultural land use and ownership has often changed. |
| 3. Develop the Sampling and Analysis Plan (SAP) using the above knowledge and incorporate environmental and hydrogeology factors to identify receptors most at risk. |
| 4. Reach out to all land and homeowners where sampling will take place (based on the SAP) to explain the purpose of sampling and to obtain permissions to access property and collect samples. Coordinate with the DACF for assistance in gaining access permissions for sampling at farms where landowners may have additional questions and concerns about how sample results could affect their farm operation. |
| 5. Schedule a time with each land and homeowner to collect samples. To efficiently utilize resources, additional sampling at nearby sites may be coordinated at the same time. |
| 6. Organize laboratory sample containers and gather field equipment. On sampling day, meet and talk with land and property owners, collect and label samples, and ensure that samples are stored properly. Gather pertinent field notes and data using electronic forms and GPS. |
| 7. Fill out laboratory chain of custody forms after the sampling event, organize and pack samples with ice in coolers, arrange for delivery to the laboratory or coordinate pick up by courier. |
| 8. Obtain sample results from the analytical laboratory and conduct data quality review. Upload sample results into the state's data management system (Environmental Geographic Analysis Database or EGAD). |
| 9. Contact land and homeowners to discuss and provide interpretation of results, and whether an alternate source of water is recommended. Coordinate with the DACF in communicating results to farmers where farmland or water on farms was sampled. |
| 10. Arrange and pay for bottled water and the eventual installation and maintenance of filtration systems[18] where samples exceed the state's interim drinking water standard. |
| 11. Upload sample coordinates and analytical data to the public GIS web map. |
| 12. Determine, based on the data collected from sampling at each site, if additional homes are at risk and need to be sampled, or if sampling conducted in accordance with the initial SAP was sufficient. If sufficient, the project team can begin investigating a new site. |

[18] When a filter system is required at an active, commercial farm and is used for both irrigation and drinking water, the Department and DACF share the costs for the system according to an agreed upon methodology.

## A. Soil and Groundwater Collection Methods

Sampling for PFAS in water and soil at so many locations requires tremendous planning and coordination. Ideally, sampling for soil would occur first and guide the Department's understanding of the potential impacts and need for groundwater sampling in the vicinity of a site. However, due in large part to weather and seasonal variation, staffing constraints, and timing of land and homeowner access approvals, the investigation has progressed differently. Soil and groundwater sampling may occur concurrently, or groundwater sampling may occur first.

## B. Soil Sampling

In order to collect soil samples that best represent the area in question (a licensed site where sludge or septage was authorized to be land applied), Department geologists develop a SAP (or review and approve a consultant's SAP) for each site which will identify where and how many samples should be collected. At each site, field staff collect multiple equal-sized portions of soil, place all the small portions in a clean, stainless-steel bucket or bowl, and mix the soils together before filling a soil jar that will be sent to the laboratory. This process is known as composite sampling.

## C. Agricultural Considerations

Composite sampling is an efficient method to use for a fast-paced statewide investigation and provides a general understanding of the scale of potential impacts at a site. The DACF will conduct composite sampling in areas outside of licensed spreading locations as well as conducting targeted sampling in areas both within and outside of spreading locations. Decisions regarding sampling methods and locations for sampling at active agricultural operations (i.e., farms) are based on farm-specific considerations. Farms often need many targeted samples that better represent PFAS impacts in specific areas where crops are produced, as it better indicates which fields may have impacts and cannot be used for agricultural operations or producing certain crops. The DACF provides this kind of one-on-one support to farms, and it is a resource intensive process. The DACF may also take co-located samples that include both soil and the crops that are grown within the soil being

sampled. Additionally, the DACF may also take samples of surface water (i.e., farm ponds) where the water is used for irrigation or for livestock use. It is critical to point out that the Department and DACF have somewhat different legislative directives and associated funding. The Department's directive is to investigate a very large number of specific site types in a relatively short timeframe, provide safe drinking water for private water supplies impacted by those sites, and begin to understand more about how PFAS impacts and moves through the environment. The DACF's focus is to ensure farming operations are evaluated on a case-by-case basis to address each farm's unique set of circumstances relating to sludge application history, rates and frequency of sludge application, current products, size of the farm operation, and more. The DACF works with each individual farm to identify impacts, contamination sources, and devise potential mitigation strategies for the farm to remain viable. While both the Department and DACF share results and coordinate throughout the entire process of the investigation, roles and outcomes for each agency are markedly different.

### D. Groundwater Sampling

Groundwater sampling is more straightforward than soil sampling. Water is usually sampled from the pressure tank which is the location closest to where raw water from the groundwater supply well enters the house and plumbing system. Where this cannot happen, water can be sampled from an outside spigot, or as a last resort, a kitchen or bathroom faucet. Typically, water is collected after first running it for several minutes to flush out any stagnant water. Bottles are supplied by the analytical laboratory. Once the sample is collected, the bottle is labeled, chain of custody forms are filled out, the samples are packaged on ice in coolers, and arrangements are made for shipment to the laboratory.

### E. Sampling Considerations

For both soil and groundwater sampling, special procedures need to be followed to ensure that samples are not cross contaminated with PFAS. Many consumer goods, such as water-resistant clothing, boots, gloves, cosmetics, or food packaging may contain PFAS and can contaminate samples, especially because PFAS is measured in the low parts per billion range for soils and low parts per trillion (ppt) range for water. In order to prepare for sampling events, the project team must make sure the sample area,

their clothing, and hands are free of any PFAS-containing materials. This may be difficult because many materials (e.g., certain types of tubing, plastic sample containers, and sampling tools) normally used in field and laboratory operations contain PFAS and cannot be used while sampling and analyzing for PFAS. All sampling equipment, including the bucket or bowl, measuring cup, or spoons, are cleaned with PFAS-free soap. Waterproof or water-resistant clothing cannot be worn even if it is raining, and clean disposable nitrile gloves are used to prevent contamination from the body and from clothing.

### F. Data Management

Once the project team has completed the initial sampling as described in the SAP, it may be several weeks before the analytical results are received from the laboratory. Because of the enormous influx of samples that laboratories are receiving across New England, many laboratories have longer than usual turn-around times in returning results. Project Teams need to be well organized to appropriately track each sample and ensure that the Department is in receipt of the results. Once the results are received, they are reviewed by Department chemists to ensure the data meets the Department's data quality objectives and standards and the requirements of 22 M.R.S. §567(1).[19] The results are then uploaded to EGAD. Field sampling parameters and GPS coordinates collected on a GIS smart phone application are uploaded to their proper directories and GIS. As mentioned previously, there are thousands of records that need to be organized, reviewed, edited, and uploaded to their appropriate locations.

### G. Interpreting Sample Results

Department scientists review the data and make a determination as to whether an expanded investigation is necessary, referred to as a "step-out investigation." Where PFAS concentrations in groundwater exceed Maine's interim drinking water standard[20] surrounding a land application site, the radius of investigation may be expanded. Step-out sampling may take a few extra weeks or in some cases may take years for sites that have more significant impacts. Not all sites will require step-out sampling. A determination that no further work is needed may be made when the concentration of PFAS in soil or water are non-detect or when water concentrations are below Maine's interim drinking water standard.

The interpretation of soil results is generally more challenging than water results. Currently, there are no legally enforceable standards for PFAS in soil in Maine or at the Federal level. Absent an enforceable standard for soil, the Department relies on

[19] 22 M.R.S. §567(1) states in relevant part, "certification is required of any commercial, industrial, municipal, state or federal laboratory that analyzes water, soil, air, solid or hazardous waste, or radiological samples for the use of programs of the department or the Department of Environmental Protection". The "department" referenced in this statute is the Department of Health and Human Services.

[20] Resolve 2021, Chapter 82, *Resolve, To Protect Consumers of Public Drinking Water by Establishing Maximum Contaminant Levels for Certain Substances and Contaminants*, established an interim drinking water standard of 20 nanograms per liter (equivalent to parts per trillion) of perfluorooctanoic acid, perfluorooctane sulfonic acid, perfluorohexane sulfonic acid, perfluorononanoic acid, perfluoroheptanoic acid and perfluorodecanoic acid, individually or in combination.

remedial action guidelines (RAGs) which are used as screening levels to determine appropriate levels for cleanup of contaminated sites, as well as screening levels for placement of secondary materials for Beneficial Use of Solid Wastes. These screening levels pertain to specific programs and must be used in context to the type of site and user.[21] *At this time, there are no legally enforceable standards for PFAS in soil or straightforward guidelines for PFAS in soil that apply to all site-specific situations.*[22] Once soil results are obtained, Department scientists review the data and compare PFAS concentrations to the function and use of the property (residential, industrial, agricultural, recreational, etc.). If the property is used as an agricultural operation, the Department will defer to the DACF to determine what those results mean for a farm.[23] Where the property is used by a resident concerned about health exposures to soil, or exposures for gardening, the Department will defer to the Maine CDC to provide assistance and communication about risks based on the particular exposure scenario.

As an investigation evolves, the scientific understanding of the hydrogeologic conditions of a site must be documented and may be modified as the investigation continues. During the investigation process, these findings as well as site-specific information are summarized in formal site documents to track the progress of an investigation. This process systematically ensures that the investigation is thorough and documented for the public record.

### H. Program Rollout, Ongoing Communications, and Coordination

Prior to conducting any sampling, the Department initiated contact with legislators, municipalities, and landowners. This was done by:

- Sending an electronic notification to legislators in communities where sampling was to take place;
- Sending letters to both municipalities and landowners outlining the process that would take place for collecting samples; and
- Calling landowners to follow up, answer general questions, and schedule sampling events.

As the process unfolded it became apparent that there was a gap in information reaching community leaders. Enhanced communications were therefore needed to ensure municipal officials could adequately answer questions from their constituency. To

[21] RAGs are developed in consultation with the Maine CDC, utilizing EPA's Regional Screening Levels (RSLs) when available, with the purpose of managing a contaminated site to ensure that the concentration of contaminants remaining after cleanup are tailored to the future use of the property. For example, RAGs include screening levels to protect residential users, park and recreational users, and construction workers. Using the appropriate guidelines, users would not be expected to experience adverse health effects based on a particular use. Risk screening levels for Beneficial Use are promulgated in the Department's Chapter 418, *Solid Waste Management Rules: Beneficial Use of Solid Wastes*, Appendix A and were also developed in consultation with the Maine CDC for scenarios where a waste or secondary material would be licensed to be reused for a specific purpose.

[22] Questions about the impacts of exposures to soil with PFAS are best addressed by the Maine CDC. Questions about the impacts of PFAS contaminated soils on agriculture and farms are best addressed by the Maine DACF.

[23] According to the DACF, farms identified with some level of PFAS contamination have ranged from organic produce farms to small livestock farms, to diversified farms (i.e., a variety of crops and/or animals), to small dairy farms.

address this issue, in summer 2022, beginning with the initiation of the septage land application investigation, Department staff called each city or town manager or official prior to sampling in a community or reaching out to landowners/homeowners. This phone call was then followed up with a letter outlining the investigation process and providing contact information. While this process was more time intensive, it directly addressed concerns from community leadership and decreased the volume of inquiries as a result. This process remains in place as the investigation continues.

Project teams also reach out to landowners and homeowners prior to each sampling event to obtain permissions to access homes and/or properties where samples are to be collected. In some instances, Department staff have been told up front that access is denied. In other cases, Department staff did not receive any responses despite at least three attempts to reach owners. Attempts to be reached usually include a combination of phone calls, letters, and as a last resort, a door knock (with a letter left in an envelope). In instances where landowners and homeowners were not responsive or denied access, project teams tracked information for purposes of this report, which is provided in further detail in Section III.4 below.

As each new phase of the investigation commenced, the Department added new information to its website for the public with the intent to provide updates on the PFAS investigation. At the same time, multiple Department staff simultaneously responded to new inquiries from the public. Most of these public inquiries related to questions about proximity of a sludge or septage land application site to their home/property, whether they should be concerned about exposures, when they will hear from the Department knowing an application site is in their community and requesting more information about the Department's investigation process. Inquiries from the general public started at a frenetic pace, sometimes taking up an average of ten or more hours per week per staff person, but this has slowed down significantly since the early days of the investigation, with most staff spending only an hour or so per week on new inquiries by the end of 2022.

While new public inquiries have slowed down, questions and data requests from organizations, groups, media, companies, and law firms have remained constant. These inquiries tend to take longer to address because there are usually several questions that include extensive data requests (sometimes requesting data that the Department does not have readily available). Some of these inquiries include Freedom of Access Act (FOAA) requests. Since 2021, the Department has received 29 FOAA requests related to PFAS. PFAS-related FOAA requests have required more resources than other FOAA requests, involving multiple staff and significant amounts of staff time.

One method to address inquiries has been to update the Department's website map of locations that may have been impacted by sludge and septage application. This website has been a work in progress throughout calendar year (CY) 2022 and continues to be updated and improved. As of late 2022, the Department overhauled its "Sludge and Septage mapper" to include sample results and site types beyond sludge and septage land application. The new map is called the Maine DEP PFAS Investigation Map and it now includes not only PFAS groundwater data using Maine's interim drinking water standard as a comparison point, but also includes information about where filtration systems were

installed, what kinds of environmentally regulated locations are near the sample locations, and also includes soil data for compounds for which the Department has screening levels (PFOA, PFOS, and PFBS).

As another way to get word out about Maine's soil and groundwater investigation, Department staff presented in front of approximately 20 statewide and sometimes further reaching public audiences during CY 2022.[24] In addition, during CY 2022, Department staff participated in several recurring meetings and discussions with several organizations, industry representatives, and other stakeholders to discuss various aspects of PFAS which are depicted in Table 6. These meetings were held with the intent of ensuring open communications, so stakeholders had ample opportunity to share information, provide insights, ideas, and coordination toward working together on issues pertaining to PFAS.

*Table 6: Organizations and Stakeholders with which the Department had Recurring Engagement during CY 2022 to Discuss PFAS Concerns*

| | | |
|---|---|---|
| Agricultural Services Provider Network * | Association of State and Territorial Solid Waste Management Officials (ASTWMO) | Agency for Toxic Substances and Disease Registry (ATSDR) |
| Defend our Health (DOH) | Environmental Coalition of States (ECOS) | Environmental Protection Agency (EPA) |
| Interstate Technology Regulatory Council (ITRC) | Landfill Operators and Owners | Maine Water Environment Association (MeWEA) |
| New England Interstate Water Pollution Control Commission (NEIWPCC) | New England Waste Management Officials Association (NEWMOA) | Septage Haulers and Handlers |
| Slingshot (formerly Community Action Works) | | |

** This network is facilitated by UMaine and includes several stakeholders in the Agricultural community including farms, Maine Farmland Trust, Maine Organic Farmers and Gardener's Association, and more.*

The Department also spearheaded efforts for recurring communication among state agencies involved with PFAS because the Department's soil and groundwater investigation is deeply intertwined with PFAS programs and initiatives administered by the other state agencies. These ongoing meetings occur monthly and allow for coordination on PFAS activities and programming. State agencies also meet monthly or more often to discuss advances and projects relating to treatment, disposal, and destruction technologies as well as sampling and data synchronization between agencies. Table 7 identifies state agencies typically involved in these ongoing communications and what their respective roles include.

[24] These presentations do not include those provided to the legislature, legislative committees, or any legislative advisory boards. Information provided to the legislature is in addition to the approximately 20 identified in the text above.

| *Table 7: Breakdown of State Programs and Their Roles Regarding PFAS 2022* | |
|---|---|
| Maine Department of Environmental Protection | • Statewide Soil and Water Evaluation (Sludge/Septage Sites)<br>• Testing of Contaminated Sites, Active/Closed Landfills, and Other PFAS Sources (Releases of AFFF at Fires or Fire Training Operations)<br>• Testing of Wastewater Treatment Plant Effluent, Fish, Shellfish, and Ambient Water<br>• Data Quality Review and Data Management Using Environmental and Geographic Analysis Database (EGAD)<br>• Selection of Laboratories for Funding to Provide In-state PFAS Analytical Capacity Pursuant to Request for Application (RFA)<br>• Determination of Pathways of PFAS in the Environment (Soil Background Study, Air Deposition Monitoring, etc.)<br>• Oversight of the Management of PFAS Waste Disposal<br>• Report to Legislature on Septage Land Application (January 2023)<br>• Treatment, Concentration, Disposal, Destruction of PFAS<br>• PFAS in Products and Food Packaging |
| Maine Department of Agriculture, Conservation and Forestry | • Provide Additional Sampling of Soil, Water, Manure, Inputs (e.g., feed and compost), Products (e.g., Milk, Beef and Hay) at Commercial Farms Identified from the Statewide Soil and Water Investigation and Farms that Report Results Through Self-Testing<br>• Conduct Ongoing Monitoring of Livestock Depuration and Reduction in PFAS-contaminated Products (e.g., Live Animal Blood/Serum/Tissue Sampling; Serial Milk Sampling)<br>• Review Sampling Data with Maine CDC to assess Risk and Anticipated Depuration Timeframes<br>• Manage Agricultural Data Utilizing EGAD<br>• Provide Financial and Technical Support for Impacted Farms<br>• Management of Agricultural Wastes<br>• Coordinate and Support Crop Uptake and Other Agronomic PFAS Research<br>• Facilitation of PFAS Fund |
| Maine Center for Disease Control and Prevention | • Communication of Health Risks and Exposure Pathways from PFAS<br>• Development of Fish and Wildlife Consumption Advisories in collaboration with IFW and DEP (fish advisories only)<br>• Review of Toxicological Data and Development of Screening Levels<br>• Required Testing for PFAS in Drinking Water at Community Water Systems and Non-Community, Non-Transient Schools and Daycares - PFAS Testing Results<br>• Regulation of Public Water Systems and Distribution Lines<br>• Establishment of a Maximum Contaminant Level for PFAS by June 1, 2024 |
| Maine Inland Fisheries and Wildlife | • Testing of Wildlife including Deer, Turkeys, and other Wildlife<br>• Management of Contaminated Harvested Wildlife |

| *Table 7: Breakdown of State Programs and Their Roles Regarding PFAS 2022* | |
|---|---|
| Bureau of General Services | • Management of State-owned Landfills<br>• Report to Legislature on PFAS Leachate Treatment at two State-owned Landfills (January 2023) |

Finally, it should be noted that the soil and groundwater investigation is but one PFAS-related effort undertaken by the Department. Several other programs interface with PFAS as a contaminant of concern including state and federal remediation sites, active and closed landfill operations, and redevelopment activities through the federal Brownfields and state Voluntary Response Action Programs. The Department also investigates discharges of AFFF and is working on the establishment of an AFFF discharge reporting system. The Department is currently leading a statewide sampling investigation of effluent at wastewater treatment facilities, with some limited surface water and fish tissue sampling. The Department is also implementing the PFAS in products reporting program and developing a rule to prohibit PFAS in food packaging.

## 5. Providing Clean Water[25] to Impacted Residents

Once sampling is completed, and results obtained, the Department's work is not yet complete. In locations where it is determined that private drinking water wells exceed Maine's interim drinking water standard and contamination is likely a result of the land application of sludge or septage, the Department works with homeowners to ensure that they have clean water to drink. In these circumstances, homeowners are provided with bottled water[26] until a filtration system can be installed and determined to be effective. The typical treatment system installation is a whole-house water filtration system consisting of a five-micron pre-filter, two 13-inch by 54-inch tanks containing granular activated carbon media, and a flow meter. Sampling ports are installed at locations before, between, and after each contactor unit to facilitate system sampling and monitoring. Certain water geochemistry (e.g., iron concentrations above 0.3 milligrams per liter) may necessitate the installation of a pretreatment system (i.e., water softener) to ensure that the PFAS treatment system operates effectively. If the Department and its contractor determine that such a pretreatment system is warranted, it is installed and maintained in conjunction with the PFAS treatment system. To ensure that the system is effective, the Department will sample the system one to three months after installation. If the system is working

[25] Clean water as it pertains to PFAS is defined as water that has tested below Maine's interim drinking water standard for PFAS.

[26] The Department tests bottled water prior to distribution to ensure it meets Maine's interim drinking water standard for PFAS.

effectively, bottled water will no longer be provided, and instead a schedule will be established for the monitoring and maintenance of the installed filtration system. All of this is paid for by the Department until such time as funds are no longer available.[27]

Not everyone in Maine will receive bottled water or a filtration system. Residents who have PFAS contamination as a result of a known source of PFAS will receive an alternate water source from the Department. These include locations such as licensed sludge and septage land application sites, or remediation-type sites, but specifically excludes contamination that might be caused by a homeowner's private septic system or other household products or activities. More information about how this is determined is provided on the Department's website in the document titled Information for Self-Testers.

Follow up activities regarding farms involve coordination with the DACF, as the needs for farms are different than other types of landowners and homeowners. DACF staff work with each individual farm to determine additional sampling needs, whether there is a likelihood of PFAS in agricultural products from the farm, whether a filtration system is needed for irrigation or farm-related water use, and more. The Department works with the DACF to coordinate costs related to needs at farms and the State pays for additional sampling and provision of clean water as needed.

# III. Results and Metrics

## 1. Progress of Investigation

Approximately 214 sites were currently under investigation as of December 1, 2022. This means that some level of engagement has occurred at these sites, but it does not mean that all the results have been received or that the investigation is complete. For purposes of determining whether an initial site investigation is complete for soil or groundwater, see Section II.4 pertaining to how the initial evaluation process is structured. A breakdown of investigation status is included in the progress table below (Table 8).

*Table 8: Number of Sites Under Investigation and Progress as of December 1, 2022*

| Type of Site | Total Number of Sites to Investigate | Initial Site Investigation Underway | Initial Site Investigation Complete for Soil | Initial Site Investigation Complete for Groundwater |
|---|---|---|---|---|
| Tier I Sludge * | 59 | 59 | 54 | 58 |
| Tier II Sludge | 44 | 28 | 13 | 19 |
| Tier III ** Sludge | 376 | 7 | 0 | 0 |
| Tier IV Sludge | 358 | 0 | 0 | 0 |

[27] More discussion of costs and funding is provided in Section IV of this report.

| | | | | |
|---|---|---|---|---|
| Sludge Amended Topsoil Sites | 33 | 26 | 11 | 14 |
| Septage Sites | 167 | 94 | 64 | 67 |
| Totals*** | 1,037 | 214 | 142 | 158 |

** The 15 sites from Fairfield were added into the Tier I category even though the start of this investigation preceded implementation of P.L. 2021, c. 478. There are 44 Tier I sites outside of Fairfield.*

*** The 7 sites identified here include results from self-testers who live in proximity to a site or are associated with a Tier I or II site being investigated.*

****The total number of sites to investigate is approximate and continues to evolve as the Department reviews project files.*

In addition to sampling conducted by the Department, several landowners (including farms) and homeowners have undergone their own self-testing of soil and/or water. As of December 16, 2022, the Department had received data from 22 self-testers. Three locations required installation of filtration systems and while several were near tiered sludge application sources, others were not near any confirmed sources of PFAS. It should also be noted that six of these self-testers were farms.

As of December 16, 2022, the DACF had engaged with[28] 56 farms to learn more about PFAS contamination:

- 34 farms are located on or are associated with[29] Tier I sludge application sites;
- 5 of the farms are located on or are associated with Tier II sludge application sites;
- 7 of the farms are located on or are associated with Tier III sludge application sites;
- 4 of the farms are located on or associated with Tier IV sludge application sites;
- No farms are located on or are associated with a septage application sites; and
- 6 farms are not associated with known sludge or septage land application sites.

Of the 56 farms identified above, 8 were self-testers.[30]

[28] The level of engagement between the DACF and farms varies as PFAS-impacts vary widely. Some farms are able to safely continue operations with no modifications and other farms may face considerable challenges, including ceasing commercial operation.

[29] PFAS contamination may occur at an otherwise uncontaminated farm location when feed or other products obtained from a Tier I land application site are used.

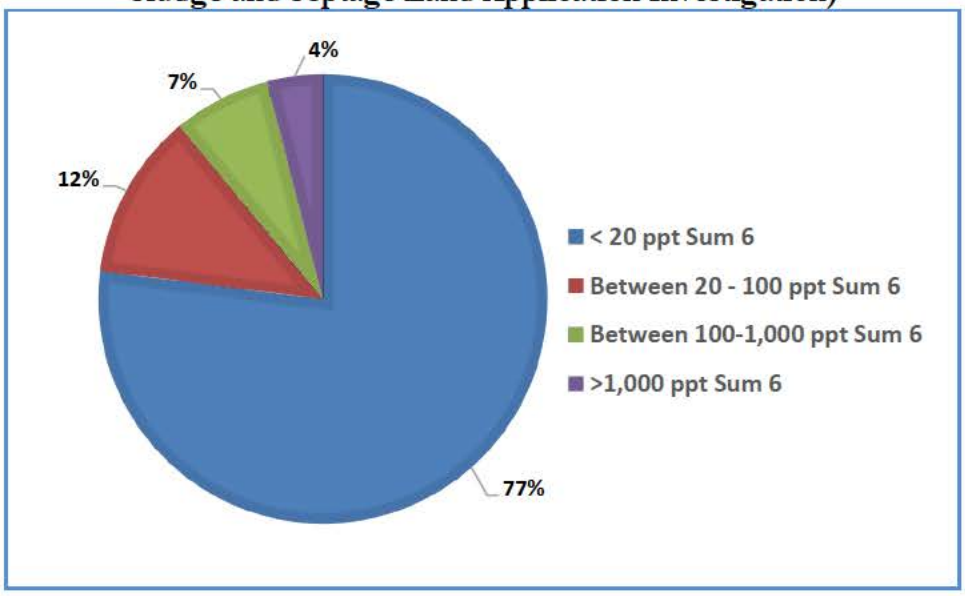
[30] Not all farms that self-test submit results to the Department. Therefore, the numbers of self-testers may differ for the Department than for DACF.

## 2. Groundwater Results

As of December 16, 2022, the Department has taken groundwater samples at 1,525 residences as part of the PFAS investigation. Of these samples, approximately 77% showed results lower than the Maine interim drinking water standard, meaning that a filtration system is not necessary for these residences at this time. The remaining 23% showed results that exceeded Maine's interim drinking water standard, meaning that residents in those locations were informed that they should obtain an alternative drinking water source (and that the state would pay for and provide this). Appendix C lists the total number of residential groundwater results in each community as compared to Maine's interim drinking water standard.

Of the 23% that exceeded the interim drinking water standard, 52% were below 100 ppt,[31] 29% were above 100 ppt, and just over 19% exceeded 1,000 ppt. When a residence receives a result exceeding 1,000 ppt, the Maine CDC is notified immediately by Department staff so that the CDC may contact the homeowner directly to discuss any concerns. Percentages are illustrated in Figure 4.

**Figure 4: PFAS Statewide Residential Groundwater Results by Percentage (Related to the Sludge and Septage Land Application Investigation)**




As of December 16, 2022, 280 filtration systems have been installed and 28 were pending.

[31] In this instance, the use of 100 ppt as a measure is not tied to toxicology information or policy but was chosen as a general rounded number to illustrate categorically statewide results.

### 3. Soil Results

As described in more detail in Section II.4.G. above, Maine does not have an enforceable standard for PFAS in soil. Instead, Maine has various screening levels that can be used to guide decision-making for soil cleanup purposes and for approval of beneficial use activities.

The Department has collected almost 400 soil samples for PFAS analysis as part of the investigation. As of the date of this report, none of the concentrations of PFOA, PFBS, and PFOS measured in soil at sludge and septage land application sites have exceeded the Department's soil screening residential RAGs. However, it should be noted that these screening levels are currently in the process of being updated to incorporate new toxicological information from US EPA and it is anticipated that the screening levels will be considerably lower than current levels. Additionally, three new compounds will be added - PFNA, PFHxS, and HFPO-DA. More information about these changes will be provided to the public through the Department's website as it becomes available.

### 4. Excluded Locations

Some PFAS soil and groundwater sampling locations were inaccessible due to landowners or homeowners denying access or being unresponsive to requests for access permission. This is not unexpected and occurs to some degree with many remediation-type investigations. The legislature recognized this might be an issue, addressing it in Section 2 (4) of P.L. 2021, c. 478. The law specifically states that the Department "may exclude a location from evaluation under the program for good reason, including, but not limited to, upon a determination that no sludge or septage was actually applied at the location or that the location is no longer owned or controlled by the licensee or permittee and the department is unable to obtain authorization to evaluate soil and groundwater at the location."

As part of the investigation as discussed in Section II.5 above, Department staff have tracked instances where access has been specifically denied or where homeowners were unresponsive. Residential sampling generally involves groundwater well sampling only, and not soil. Most of the sampling for soil takes place at farms, or land areas that were once farms. As of December 16, 2022, 66 residential homeowners denied access for groundwater well sampling and 145 did not respond to Department attempts to reach them.[32] For soil sampling, 20 landowners have denied access. Eleven of these landowners are associated with farm operations.[33] There are several reasons why a homeowner or landowner might be unresponsive or deny access, including residency in seasonal homes, feeling wary about the state coming onto their property or in their homes, general cautiousness about the PFAS program in general, or indifference to the investigation. Occasionally, the Department will hear from a homeowner after the initial sampling event, after they have spoken with a neighbor who participated in the

[32] This is approximately a 4% denial and 8% unresponsive rate.
[33] This is approximately a 9% denial rate for all landowners, and a 12% denial rate for farm landowners.

investigation. If they would like to have their groundwater sampled after the Department's initial investigation in the area, this is accommodated.

At the early stages of the investigation, many landowners, specifically farms, were hesitant to allow the Department to come onto their property to conduct soil sampling. There were several concerns expressed by farmers about how detections of PFAS could be perceived by the public and media, and how perceptions might impact their livelihoods. With significant effort from Department staff and support from the DACF, many farms began allowing sampling to occur, but not all. At this time eleven farms have denied access for soil sampling. When a farmer denies access, the Department respects this request and seeks support from the DACF. In some cases, the farm will do its own sampling or work with the DACF, as that agency is more aligned with farm-specific needs. In other cases, farmers have changed their minds and opted to allow the Department to come at a later time for soil sampling, and this is accommodated.

## 5. Preliminary Trends in Soil and Groundwater Data

Observations and evaluations will develop and change as data continue to be gathered and updated from the statewide soil and groundwater investigation. However, a review of the soil and groundwater data collected to date shows that the results are not consistent across all sites. For example, the Department has acquired soil and groundwater sampling data at all Tier I sites and a portion of Tier II sites and so far, the Tier I sludge application sites appear to be showing greater environmental impacts to soil and groundwater than Tier II sludge application sites. In general, data gathered to date from septage land application sites shows that these sites are less impacted than Tier I sludge sites. Below are some other preliminary observations relating to soil and groundwater data gathered by the Department.

### A. Soil Observations:

(1) The soil concentrations at sites, and the frequency of detections, are generally greater than concentrations and detection frequencies reported in the Department's April 2022 soil background study for PFAS. This is an indication that soil at the investigation sites is impacted by site activity.

(2) Ten PFAS (PFHxA, PFPeA, PFDOA, PFBA, PFHpA, PFUNDA, PFDA, PFNA, PFOA, and PFOS) were detected in soil in greater than 50% of the samples analyzed, and PFOA and PFOS are the only two PFAS detected in greater than 75% of the soil samples analyzed.

(3) Maine's current RAGs have Soil Leaching to Groundwater (LTG) remediation criteria for three PFAS (PFOA, PFOS, and PFBS). Leaching of contaminants from soil may increase contaminant concentrations in groundwater and site-specific conditions may cause the contamination plume to spread. The Department has developed RAGs as a screening tool, such that the RAGs are protective of groundwater and human health. Based on an evaluation of site data received to date, 36% of PFOA soil results, and 58% of PFOS soil results exceed Maine's current RAGs for LTG for these compounds, 1.7 part per billion (ppb) and 3.6 ppb respectively. This indicates that groundwater monitoring in the

vicinity of sites with exceedances of the RAGs for LTG should be conducted as is the Department's current practice.

(4) Generally, concentrations of PFAS in soil were less than 300 ppb with average concentrations for each parameter being less than 100 ppb. Soil samples reported PFOS, 8:2 FTS, and N-EtFOSAA having the highest maximum concentrations at 1,080 ppb, 2,180 ppb, and 1,510 ppb respectively. The mean concentrations of these three compounds in soil were 53.89 ppb (PFOS), 68.5 ppb (8:2FTS), and 77.25 ppb (N-EtFOSSA).

(5) In samples where PFBS was detected, the average concentration was approximately 1 ppb, and the maximum concentration was 10 ppb. The LTG and Residential RAG values for PFBS are orders of magnitude greater than the concentrations of PFBS detected to date.[34] Based on the data and current toxicity information, PFBS in soil is not likely a compound that will drive the Department's remediation efforts.

**B. Water Observations:**

(1) Significant PFAS contamination of water supplies have typically been observed in close proximity (i.e., within a tenth of a mile) to the licensed land application fields, and the boundary of the water supply contamination does not generally extend past a quarter of a mile from the land application sites.

(2) While there are observed fluctuations in groundwater concentrations, there are no obvious seasonal trends, nor are there any statistical upward or downward concentration trends in water supplies that have been monitored for at least a year.[35]

(3) While it is thought that contamination at sludge and septage land application sites may be influenced by variables such as volume of material applied, the type of material applied, and site-specific activities; the data have suggested that the geologic and hydrogeologic conditions at each location are also critical to understanding where significant groundwater impacts may occur. More data evaluation will need to occur for the Department to have a better and clearer understanding of this.

[34] Maine's current LTG RAG for PFBS is 7,100 ppb and Residential RAG for PFBS is 1,700,000 ppb.

[35] Because sampling takes place before the first filter, between the first and second filter, and after both filter canisters as part of routine monitoring of filtration systems, the Department has been able to compare ongoing samples taken before the first filter against samples taken before treatment was installed to determine if there have been any variations or trends since treatment of the water began.

# IV. Program Funding, Staffing, and Costs

## 1. Program Funding

The 130th Legislature provided funding for the implementation of the soil and groundwater investigation in Maine's 2021 budget under Public Law 2021, Chapter 398, *An Act Making Unified Appropriations and Allocations for the Expenditures of State Government, General Fund and Other Funds and Changing Certain Provisions of the Law Necessary to the Proper Operations of State Government for the Fiscal Years Ending June 30, 2021, June 30, 2022 and June 30, 2023.* Specifically, $20 million was provided for the treatment of drinking water, environmental testing, and management of contaminated wastes. In addition, funding was set aside for 11 full-time equivalent positions and 6 limited-period positions (2-year term) to establish and staff the new program. These positions are identified in Appendix A.

An additional $5 million was also provided for the treatment of drinking water, environmental testing, and management of contaminated wastes through Public Law 2021, Chapter 483, *An Act To Provide Allocations for the Distribution of State Fiscal Recovery Funds.*

In Section A-12 of the 2022 Supplemental Budget,[36] the 130th Legislature provided an additional $3.2 million in funding for enhancing PFAS laboratory capacity in Maine. This funding was provided specifically for the purpose of assisting laboratories with equipment and related purchases that will increase capacity for sample analysis of PFAS in Maine. Administered by the Department, it is anticipated that these additional funds will help ease the backlog in laboratory analysis for PFAS and may make access easier for self-testers in Maine. Two laboratories have been selected for an award (Katahdin Analytical Services and Bigelow Laboratory for Ocean Sciences). The state's Health and Environmental Laboratory separately received funding to purchase PFAS testing equipment and to establish three chemistry positions in Section A-17 of the Supplemental Budget.

## 2. Program Staffing

The Department has 10 full-time positions and 6 limited-period positions dedicated specifically to conducting the sludge and septage site investigation required by P.L. 2021, c. 478. Based on the scale of this investigation, additional positions are recommended in order to ensure that the Department maintains momentum with this investigation, properly tracks and evaluates the data, meets the legislatively mandated timeframes, be responsive to public inquiries for information and sampling requests, and meets other workload demands.

In order to make progress with this statewide initiative, the Department has had to consistently deny requests for sampling and investigative work in areas not considered at high risk for PFAS contamination. The Department also receives site investigation referrals from other agencies such as the Department of Health and Human Services' Drinking Water Program if they receive test results above Maine's interim drinking water standard. Department staff then make a determination whether there is a known or potential source

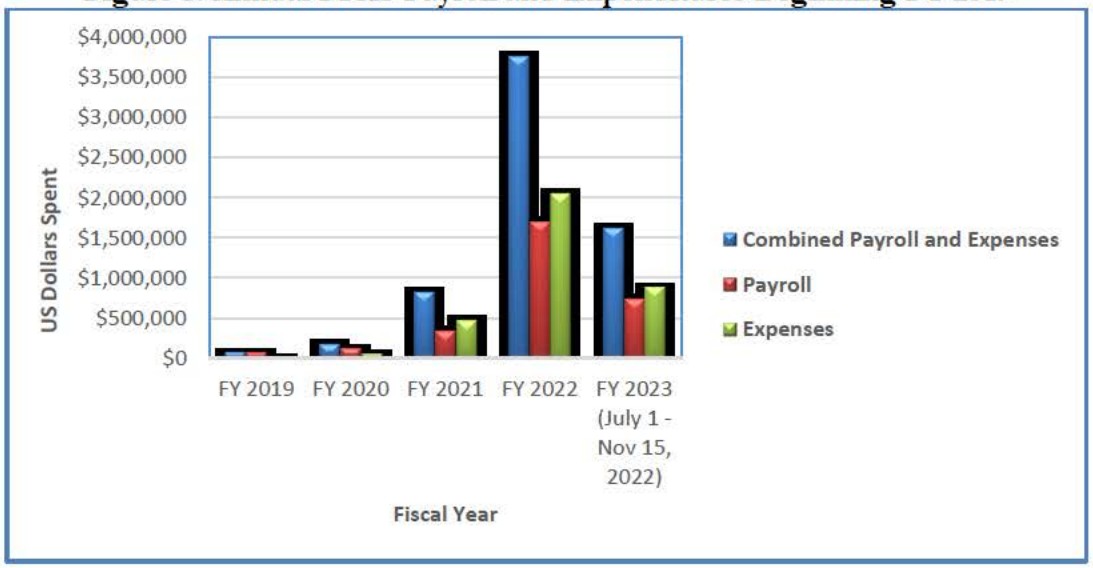
[36] See Public Law 2021, Chapter 635, *An Act To Make Supplemental Appropriations and Allocations for the Expenditures of State Government, General Fund and Other Funds and To Change Certain Provisions of the Law Necessary to the Proper Operations of State Government for the Fiscal Years Ending June 30, 2022 and June 30, 2023.*

and if further investigation is needed. In some instances, sites are referred to the Department's Uncontrolled Sites Program for investigation. The Department has also not been able to appropriately establish a program for AFFF discharge reporting, research AFFF alternatives, and provide education and outreach regarding AFFF use and disposal. Department staff are overextended and remain concerned with achieving the investigation deadlines and maintaining a high level of performance. Staff retention and morale are also of concern.

### 3. Costs and Expenditures

The Department has been formally tracking both payroll and other expenses since FY 2019. From July 1, 2018 through November 15, 2022, $5,996,985 has been spent. Each year more and more dollars have been spent on programming and activities relating to PFAS, with a marked increase beginning in FY 2021 and increasing thereafter. FY 2023 costs and expenditures are not complete or tabulated as the FY has not yet ended; however, in looking at values for the first five months it is anticipated that the dollar amounts will be similar to those of FY 2022 if not exceed them. Figure 5 below shows the total expenditures by year.

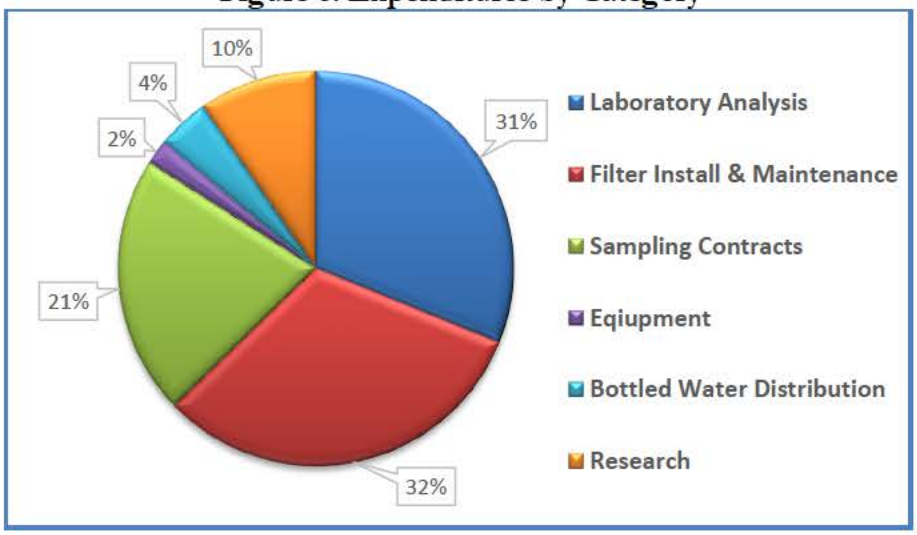
**Figure 5: Annual PFAS Payroll and Expenditures Beginning FY 2019**




Funds used for the PFAS investigation include a wide variety of expenditures other than payroll including the following: field equipment, field sampling, filter installation, sampling and ongoing maintenance, bottled water distribution, laboratory analysis, and research relating to PFAS management. Figure 6 below provides a breakdown of expenditures based on each category from January 1, 2019 through November 15, 2022 with the sum total being over $3,500,000. Sampling contracts include sampling for soil and groundwater at land application sites as well as sampling conducted as part of routine monitoring after filtration systems have been installed to ensure they are working properly. A further breakdown of contract recipients and roles is available in Appendix B. Research costs include costs relating to completing a soil background study for PFAS and research and pilot studies related to milk and agricultural waste management. Equipment costs include sampling equipment

(tubing, GPS units, meters, nozzles, coring equipment, stainless steel items, and decontamination equipment), ice and an ice machine, PFAS-free field gear, GPS units, outreach materials, bottled water, coolers, sediment filters, and a freezer for sample storage.

**Figure 6: Expenditures by Category**




A further breakdown showing average costs for purposes of understanding overall expenditures for the sampling, installation, and maintenance of filtration systems are included in Table 8 below.

*Table 8: Average Costs of Filtration System Installations Per Individual System*

| | |
|---|---|
| Filter System Installation (One time) | $3,400 |
| Pre-Treatment Systems (One time only as needed) | $3,500 |
| Sheds (One time only as needed) | $8,700 |
| Filter Changeouts* (Annual cost per changeout) | $1,500 |
| Routine Sampling ** (Annual cost) | $3,500 |

** The frequency of filter changeouts varies based on the levels of PFAS detected in a well and how the system is working. It can be as little as once a year, or as much as four times a year.*

*** This is dependent on contractor rates. Some are higher than this per residence, and some are lower. The frequency of sampling is determined once the system is confirmed to be working effectively and may be as frequent as monthly or as little as once or twice a year. Range of costs is between $2,500 to $4,500 per year.*

### 4. Anticipated Future Costs

As mentioned in Section 3 above, payroll and expenditure totals from July 1, 2018 through November 15, 2022 were $5,996,985. Because the bulk of the investigative work on PFAS in soil and groundwater and the furnishing of drinking water filtration systems began in FY 2021, evaluation of costs in FY 2021 through November 15, 2022 are a better baseline to project future investigation costs[37] Using the total amount spent from FY 2021 through November 15, 2022 ($5,730,494), the average estimated cost per site comes to approximately

[37] Work conducted in the Fairfield area communities began in the middle of 2020 before the passage of P.L. 2021, c. 478.

$26,778.[38] This does not include the costs of long-term maintenance and monitoring of drinking water filtration systems.

It is important to recognize that this dollar figure is likely a significant underestimation of total costs as the sites currently underway are not yet fully completed. In some cases, filtration systems may not yet have been installed,[39] sampling may not be complete, or systems may not have proven to be effective, and other additional work may still need to be conducted. The costs and resources needed for each individual site vary based on the size, scale, and scope of the site, so it is difficult to know if the high-cost sites outnumber the lower-cost sites, or what the ranges in costs per site actually are. Also, where the State is expected to continue to fund the ongoing filtration system maintenance and monitoring, those costs need to be estimated into the future. Finally, as indicated earlier in the report, the number of actual sludge land application sites may be as low as 700 or higher than 1,037. With all these considerations in mind, and assuming that the program continues to be implemented and structured as it is currently and using the average dollar amount above ($26,778) as a low range and doubling that amount ($53,556) as a high range (to account for additional expenses not yet incurred and inflation), the anticipated range of costs the Department estimates for the required investigation through 2025 are depicted in Figure 7 below. Figure 8 identifies ongoing average costs for maintenance using the number of filtration systems installed through December 16, 2022. It also identifies additional costs necessary if the state were to install filtration systems based on the regulatory uncertainties relating to the EPA Interim Health Advisory[40] and forthcoming draft MCL.[41]

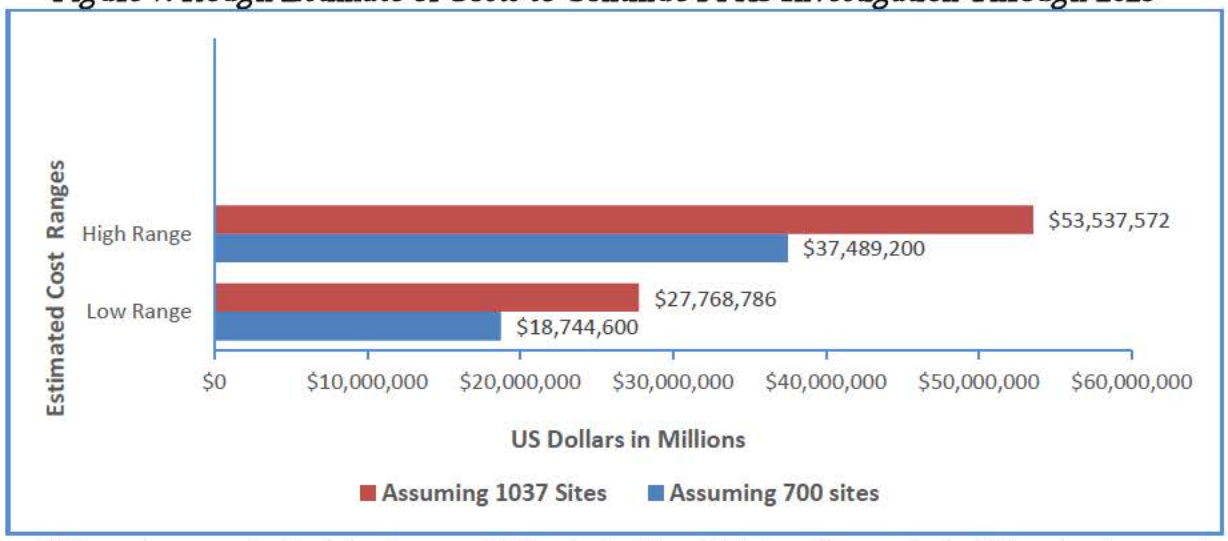
[38] $5,730,494 divided by 214 sites underway equals $26,778.

[39] Delays in installation of filtration systems due to contractor availability and supply chain issues have slowed down this part of the process.

[40] On June 15, 2022, US EPA issued interim updated drinking water health advisories for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) that replace those issued in 2016. The interim updated health advisory for PFOA is 0.004 ppt and the interim updated health advisory for PFOS is 0.02 ppt. In US EPA's fifth Unregulated Contaminant Monitoring Rule, the agency established minimum reporting levels for PFOA and PFOS at 4 ppt. This may mean that 4 ppt is used in lieu of the interim health advisory numbers for PFOA and PFOS, however, this is not certain, and is only being used as a measure for purposes of illustrating potential changes in projected costs.

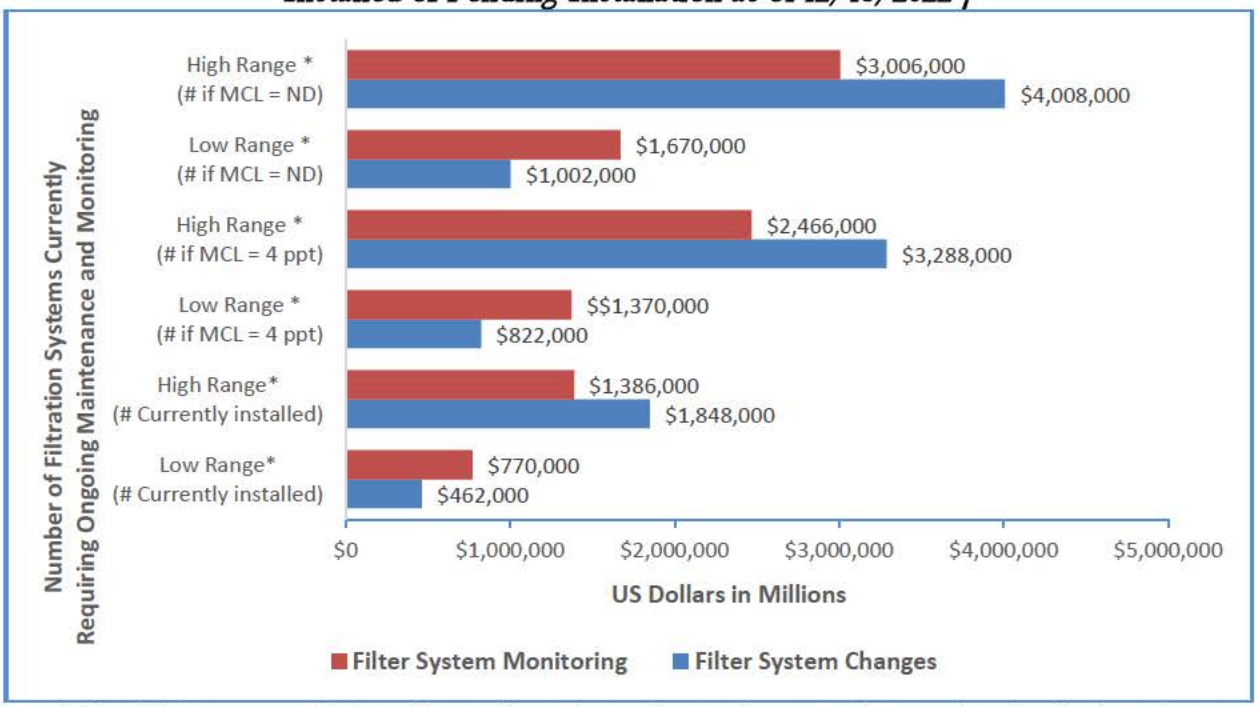
[41] EPA was expected to release a draft MCL for PFOA and PFOS by the end of 2022; however, it was not. The draft is anticipated to be released in early 2023. . Resolve 2021, Chapter 82 requires the Maine Department of Health and Human Services to propose an MCL on or before December 31, 2023. It should be noted that the state's interim drinking water standard is based upon a sum of six compounds, and the Federal MCL is unlikely to use the same sum of six approach. This means that projections on how this will impact private wells in Maine are not directly comparable and will require extensive review of all laboratory results received. However, for purposes of this report these levels are being used for purposes of illustrating potential changes in projected costs.

*Figure 7: Rough Estimate of Costs to Continue PFAS Investigation Through 2025 **




** These costs are a rough estimate based on current dollars spent and do not include ongoing annual costs of filter system changes and monitoring (sampling) which is depicted below in Figure 8. It is also important to point out that the $ figures in Figure 8 below are based on current data. As more data is received and more systems must be installed, those numbers will only increase.*

*Figure 8: Ongoing Costs for Maintenance and Monitoring of Filtration Systems Currently Installed or Pending Installation as of 12/16/2022 †*




*† This table does not account for future filter installations that may be required as new results come in from the soil and groundwater investigation – it only accounts for data collected through December 16, 2022, which includes systems already installed and systems pending installation. It also does not account for filter systems installed at sites with other contamination sources (e.g., sites near closed landfills, or other remediation type sites)*

** Low range of filter changes is based on once per year and high range is four times per year. Sampling is based on a low range of $2,500 per year; high range of sampling is based on $4,500 per year. Currently, there are 308 filtration systems installed or pending installation. If the MCL were to change to 4 ppt it is estimated that an additional 240 filtration systems would need to be installed based on data collected through December 16, 2022. If the MCL were to be Non-Detect (ND) – data collected through December 16, 2022 indicates an additional 120 systems would need to be installed (360 more than currently).*

# V. Next Steps

## 1. Site Investigation Progress

During 2023, Department staff will focus on the following activities:

- Finalizing Tier I initial sludge site evaluations and finishing up project reports and data review;
- Finalizing first half of septage application sites and finishing up project reports and data review;
- Continuing forward with Tier II initial sludge site evaluations;
- Continuing forward with any step-out investigations required after Tier I, Tier II, or septage initial evaluations are complete;
- Continuing forward with investigating sludge amended topsoil sites; and
- Commencing final half of septage land application sites.

During 2024, Department staff will focus on the following activities:

- Finalizing Tier II initial site evaluations and finishing up project reports and data review;
- Finalizing second half of septage application sites and finishing up project reports and data review;
- Commencing Tier III initial site evaluations; and
- Completing half of all initial site evaluations at land applications sites (~ 350-plus sites).

## 2. Data Management and Evaluation Progress

At this time, Department staff have been focused primarily on collecting data and uploading it to the Department's Environmental and Geographic Analysis Database (EGAD). During 2021 and 2022, over 150,000[42] new sample records were added to EGAD as a result of the PFAS investigation. This number does not include the data obtained by the DACF, CDC, and DIFW that the Department reviews and uploads into EGAD. Every record that goes into EGAD comes from the site investigation process and must undergo rigorous data quality review (for accuracy, reliability, and consistency) and then is uploaded into the database by Department staff. Once uploaded, the data can be extracted using queries that focus on specific criteria. Management and use of EGAD requires specialized expertise and knowledge, especially to compile and quality assure query results. Data extracted from EGAD is limited to the clarity of the parameters specified for a query as well as the accuracy of how it was entered into the system.

Unlike managing the storage and access to analytical results from the PFAS investigation, data related to tracking workflows and outreach have been limited to using multiple Microsoft® Excel spreadsheets, as a more comprehensive software package has not yet

[42] The Department considers one sampling record to comprise the test results for one compound (i.e., PFOA, PFOS).

become available for use by the Department.[43] This has been challenging for staff as tracking this enormous volume of information by spreadsheet is not efficient and conducive to finding information quickly or without an exhaustive review of multiple records and datasheets.

During 2023 and 2024, Department staff will continue to prioritize the creation of data systems that better track workflows, status of project completion, and investigation results. In addition, staff plan to begin evaluating the data and progress of the investigation on a statewide level to discern more about the scale and scope of PFAS in Maine's environment and determine any trends that may be inherent in the data. It is the Department's intention that more information will be available to identify and describe the story of PFAS contamination in Maine, as well as overall trends, by the time this report is completed for 2025.

# VI. Conclusions

## 1. Overall Progress of the Program and Meeting the Timeline

The Department now has a year of program implementation under its belt, which makes it more evident where the soil and groundwater investigation could be further supported with additional resources. More support is needed for project and site management (overseeing workflow at each of the over 700 site locations, and managing an overwhelming amount of information), data management services, contract and financial management, and the ability to evaluate trends and use information to better understand how PFAS is moving in the environment.

While the Department put a timeline in place to meet the 2025 deadline for completing the soil and groundwater investigation, it is not anticipated that this deadline will be fully met due to the scope of this investigation. For purposes of this report, the Department considers a site "complete" after the initial investigation when: the initial SAP is completed, all at-risk water supplies have been identified and sampled (when access is granted), and contamination in private water supplies is mitigated. It is expected that most of the sites will have undergone an initial evaluation prior to the end of 2025, but it is likely that additional investigative work at some sites will still be required.

This is for the following several reasons:

- There are significantly fewer Tier I and II sludge land application sites than Tier III and IV sites. It is estimated that there may be over 700 Tier III and Tier IV sludge land application sites compared to about 100 Tier I and II sites (See Table 8 above). This

[43] Department staff have been working with the Office of Information and Technology (OIT) to get more robust systems in place to track project workflows and manage data relating to PFAS. As getting new systems in place is a time-consuming process and data management systems were required from the onset of the investigation, Department staff have been working on their own to develop systems using existing technologies (Microsoft® Excel) and also by utilizing new platforms (Microsoft® Dynamics) to further this process. While OIT is working with multiple agencies including the Department to develop a statewide PFAS data management system, the expected completion date is not until summer 2023 at the earliest.

means more total time is necessary for the planning (researching files, identifying spreading locations, etc.) and investigation of these sites.

- Some landowners and homeowners have denied access or have been unresponsive. As indicated in Section III.4. above, the initial evaluation sampling at each site may not be completed because not all homeowners and landowners want PFAS testing at their homes or properties. As the investigation continues, some of those homeowners and landowners may change their minds, or subsequent owners may request assistance. It is anticipated this will extend the investigation beyond 2025.

- With a changing legal and regulatory landscape, drinking water standards may decrease or be different than what Maine is currently using in its investigation. As this number changes, it will have a significant impact on how the program continues to develop. The current pace of investigation will likely slow in order to address drinking water results that were previously below the current standard. Those locations will need to be identified and addressed with filtration systems and provided associated support. As mentioned earlier in the report, many Tier IV sites may take longer to coordinate and complete because many files do not have enough information to identify whether sludge application actually occurred or where sludge may have been applied. This makes identifying where to conduct sampling a challenge.

- Some sites will need a more in-depth evaluation to fully understand the extent of contamination. Further step-out investigations and data evaluation can take a significant amount of time, even years, depending on the scale and unique circumstances of the site.

- Finally, it should also be mentioned that even after the initial investigations are completed, ongoing maintenance and monitoring of filtration systems will need to be managed by Department staff until such time as alternative solutions for treating or providing drinking water are available, the Department no longer has funding available to administer this part of the program, or the Legislature determines that this part of the program is no longer necessary. It is therefore anticipated that investigations at some sites will continue for many years after 2025.

**2. Considerations for the Legislature**

The first year of this investigation has posed challenges to the Department and prompted several important questions surrounding program implementation. The following is a list of these considerations for the legislature.

A. The PFAS soil and groundwater investigation legislation requires sampling and installation of filtration systems to occur at residences impacted by the land application of sludge and septage. Other existing waste management and remediation statutes allow for sampling and installation of filtration systems to occur at residences impacted by landfills or other remediation type sites. However, a challenging situation occurs when residences are near these sites but are unlikely to be impacted by one of the known PFAS sources due to hydrogeological or other environmental constraints. In these situations, residents are not covered by

Department programs and may be confused and frustrated as a result. This is especially the case when one neighbor has been sampled and another is not. Currently, the Department is focusing all PFAS work on locations with a known source of contamination. If the Legislature would like to expand the investigation beyond the scope of known sources of PFAS, it will require significant additional funding and resources, and the additional sites should not take priority over investigation of sites with known sources of contamination. It is important to keep in mind that there may be as many as 370,000 private drinking water wells in Maine. Extrapolating out to all 370,000 wells the costs could come close to $1.5 billion dollars to ensure every private drinking water well in Maine is sampled for PFAS and where appropriate provided with filtration systems.[44]

B. Another challenge is posed by self-testers who may have low levels of PFAS contamination when the source of that contamination is not clear. Residential wells can be impacted from sources other than land application sites. Many home gardeners have purchased sludge-amended compost from commercial retailers or from farms that sold PFAS-impacted manure or compost. Septic drain fields located close to residential wells can contain PFAS from the household waste stream. Plumbing components may also contain PFAS that impact drinking water. The Department is not currently funded to provide filtration systems to homeowners impacted by residential activities.

C. Access to public water should be a consideration when evaluating mitigation of impacted private water supplies. In some cases, a main waterline may be located immediately adjacent to, or very near, a property with a contaminated water supply. In these instances, the Department is exploring options to install and connect a service line to provide public water to the impacted property instead of installing and maintaining a filtration system. This is evaluated on a case-by-case basis and is only proposed when there is a recognized cost and resource benefit to the Department and State. The Department does not currently have funding or mechanisms available to expand the scope of providing public water to impacted properties or communities (e.g., expansion of main waterlines and associated infrastructure to entire communities, installation and development of new public water systems and districts). While Maine's Drinking Water Program within the Department of Health and Human Services may have some funding available to assist with this process, the funding is likely not adequate to cover situations like this statewide.[45]

D. Some water supplies show detections of PFAS, but at concentrations less than Maine's interim drinking water standard. From a technical perspective, it may be prudent to establish routine monitoring of these drinking water supplies to determine if concentrations fluctuate upward such that the water supply is

[44] The cost of the PFAS investigation program to date has been $5,996,985 and that has covered the sampling of 1,525 wells and installation/maintenance/monitoring of 308 filtration systems. Using the average cost for each residence ($5,996,985 divided by 1,525 equals $3,932) and multiplying by 370,000, the result equals approximately $1.5 billion. This estimate does not include long-term maintenance and monitoring of treatment systems.

[45] The Town of Fairfield has evaluated costs for the extension and addition of new water lines for its community, with costs exceeding $40 million.

contaminated above the interim drinking water standard. Based on the water supply sampling data collected to date, this could include routine monitoring at over 100 water supplies throughout the state.

E. The EPA issued interim health advisories for PFOA and PFOS and is expected to release a proposed maximum contaminant level (MCL) for drinking water any day now. If that MCL is lower than the State's interim drinking water standard, residents with drinking water supplies above the proposed federal MCL may want the State to provide treatment of their water. Unless otherwise directed by the Legislature, the Department will continue to apply Maine's interim drinking water standard until either the State or EPA issues a final MCL.

F. Soil screening levels vary based upon use and function of the soil. The Department has a list of various screening levels as part of its RAGs and its Beneficial Use Program (Chapter 418). These screening levels will be updated in 2023 and are expected to decrease. While tested soil levels currently have not exceeded residential screening levels, it is anticipated that this will change once screening levels are updated. Where soil levels may exceed screening levels at residential property, gardens, or public recreational areas, there will likely be additional public concern. However, unlike with drinking water, there is no quick methodology or available technology to make soil safe and useable.

G. Based on regulatory uncertainty, costs of the program into the future are not easy to estimate. As the regulations appear to tighten, and the solutions for managing and treating PFAS are still unknown, the costs will continue to rise. With the PFAS investigation reliant on limited state funds, this can be difficult in terms of long-term planning, assuring the public that the state will continue to address PFAS, environmental impacts, and health concerns, including paying for and maintaining filtration systems into the future.

# Appendix A

## List of New Department Positions to Assist with Implementation of the PFAS Soil and Groundwater Investigation

"Public Law 2021, Chapter 398, *An Act Making Unified Appropriations and Allocations for the Expenditures of State Government, General Fund and Other Funds and Changing Certain Provisions of the Law Necessary to the Proper Operations of State Government for the Fiscal Years Ending June 30, 2021, June 30, 2022 and June 30, 2023, Section A-13,* Establishes 4 limited-period and 2 permanent Geology Technician II positions, 2 Planning & Research Associate II positions[46], one Environmental Engineer position, one Environmental Specialist II position, one limited-period and 2 permanent Environmental Specialist III positions, one Chemist I position, one limited-period GIS Coordinator position, one Certified Environmental Hydrogeologist position and one Public Service Coordinator I position to assist in the identification and management of perfluoroalkyl and polyfluoroalkyl substances, or PFAS, and provides funding for related All Other costs." One of the Environmental Specialist III positions is assigned to implementation of Public Law 2021, Chapter 477, *An Act To Stop Perfluoroalkyl and Polyfluoroalkyl Substances Pollution*.

[46] Based on operational needs, one Planning and Research Associate II position was reclassified to a Chemist I position.

# Appendix B

## Contractors[47] Assisting with Implementation of the PFAS Soil and Groundwater Investigation

| Nature of Work | Name of Contractor |
|---|---|
| **Septage Land Application Investigation** | • Campbell Environmental<br>• Fessenden Geo-Technical LLC<br>• Haley Ward Inc. |
| **Sludge Land Application Investigation** | • Fessenden Geo-Technical LLC<br>• Haley Ward Inc.<br>• Northeast Geophysical Services |
| **Filtration System Installation and Maintenance** | • C&M Enterprises<br>• Radon Control Systems Inc. (also d.b.a. as Air & Water Quality Inc.)<br>• Water Treatment Equipment Inc. |
| **Laboratory Analytical Services** | • Alpha Analytical Inc.<br>• Absolute Resource Associates LLC<br>• Battelle Memorial Institute<br>• Eurofins Eaton Analytical Inc.<br>• Katahdin Analytical Services<br>• Vista Analytical Laboratory Inc. |
| **Research** | • ACV Environmental<br>• Brown & Caldwell<br>• Sanborn Head |
| **Bottled Water Distribution** | • Northeast Coffee Company<br>• Oak Grove Spring Water<br>• Water Treatment Equipment Inc. |
| **Sampling of Filtration Systems after Installation** | • Fessenden Geo-Technical LLC<br>• Haley Ward Inc.<br>• St. Germain |
| **Training Support** | • Trihydro Corporation |

[47] This may not be a comprehensive list of contractors providing assistance to the Department. In addition, some vendors may subcontract their work to others.

# Appendix C

## Residential Groundwater Samples by Municipality/Territory Collected for the Sludge and Septage Land Application Investigation

**Maine PFAS Investigation**
**Preliminary Private Drinking Water Well Results by Municipality/Territory Associated with All Residential Samples Collected as Part of the Investigation into Sludge and Septage Land Application Sites ***
**As of December 21, 2022**

**** This table includes all PFAS residential groundwater data collected by the Department as part of the sludge and septage land application investigation. These sites may also include self-testers where a location is associated with the investigation and information is validated by the Department.***
***** In some instances multiple municipalities/territories are combined as data collected relates to specific sites that cross municipal/territorial boundaries.***

| Associated Municipality/Territory Based on Site | Total # Wells Sampled | # <20 ppt (Sum of 6) | # >20 ppt (Sum of 6) |
|---|---|---|---|
| Abbot | 1 | 1 | 0 |
| Arundel | 1 | 0 | 1 |
| Albion | 82 | 62 | 20 |
| Andover | 5 | 5 | 0 |
| Auburn | 21 | 21 | 0 |
| Belfast | 27 | 25 | 2 |
| Benton | 42 | 14 | 28 |
| Blaine | 1 | 1 | 0 |
| Bowdoinham | 28 | 28 | 0 |
| Bridgton | 10 | 10 | 0 |
| Brownfield | 8 | 8 | 0 |
| Buxton | 28 | 28 | 0 |
| Canaan | 10 | 5 | 5 |
| Cary Plantation | 1 | 1 | 0 |

## Maine PFAS Investigation
## Preliminary Private Drinking Water Well Results by Municipality/Territory Associated with All Residential Samples Collected as Part of the Investigation into Sludge and Septage Land Application Sites *
## As of December 21, 2022

**** This table includes all PFAS residential groundwater data collected by the Department as part of the sludge and septage land application investigation. These sites may also include self-testers where a location is associated with the investigation and information is validated by the Department.***

***** In some instances multiple municipalities/territories are combined as data collected relates to specific sites that cross municipal/territorial boundaries.***

| Associated Municipality/Territory Based on Site | Total # Wells Sampled | # <20 ppt (Sum of 6) | # >20 ppt (Sum of 6) |
|---|---|---|---|
| Charleston | 4 | 3 | 1 |
| Chelsea | 17 | 14 | 3 |
| China | 3 | 3 | 0 |
| Corinna | 42 | 31 | 11 |
| Corinth/Exeter/Charleston ** | 26 | 26 | 0 |
| Dayton | 65 | 62 | 3 |
| Dexter | 4 | 4 | 0 |
| Dover-Foxcroft | 5 | 5 | 0 |
| Durham | 16 | 16 | 0 |
| Fairfield | 437 | 270 | 167 |
| Fort Fairfield | 42 | 42 | 0 |
| Frankfort | 2 | 1 | 1 |
| Freedom | 9 | 9 | 0 |
| Freeport | 3 | 3 | 0 |
| Frenchville | 4 | 4 | 0 |
| Fryeburg | 2 | 2 | 0 |
| Gorham | 35 | 35 | 0 |
| Gray | 23 | 23 | 0 |

## Maine PFAS Investigation
## Preliminary Private Drinking Water Well Results by Municipality/Territory Associated with All Residential Samples Collected as Part of the Investigation into Sludge and Septage Land Application Sites *
## As of December 21, 2022

**** This table includes all PFAS residential groundwater data collected by the Department as part of the sludge and septage land application investigation. These sites may also include self-testers where a location is associated with the investigation and information is validated by the Department.***

***** In some instances multiple municipalities/territories are combined as data collected relates to specific sites that cross municipal/territorial boundaries.***

| Associated Municipality/Territory Based on Site | Total # Wells Sampled | # <20 ppt (Sum of 6) | # >20 ppt (Sum of 6) |
|---|---|---|---|
| Harrison | 5 | 4 | 1 |
| Hartford | 1 | 1 | 0 |
| Hobbstown Twp | 2 | 2 | 0 |
| Holden | 6 | 2 | 4 |
| Houlton/Littleton/Ludlow ** | 10 | 10 | 0 |
| Houlton/New Limerick/Hodgdon ** | 5 | 5 | 0 |
| Jackson | 21 | 11 | 10 |
| Knox | 5 | 3 | 2 |
| Knox/Brooks/Freedom ** | 23 | 18 | 5 |
| Knox/Brooks/Jackson ** | 13 | 10 | 3 |
| Knox/Thorndike ** | 50 | 37 | 13 |
| Leeds | 9 | 8 | 1 |
| Lewiston | 6 | 5 | 1 |
| Livermore Falls | 1 | 1 | 0 |
| Machias | 1 | 1 | 0 |
| Minot | 7 | 7 | 0 |
| Naples | 11 | 11 | 0 |
| North Haven | 1 | 1 | 0 |

## Maine PFAS Investigation
## Preliminary Private Drinking Water Well Results by Municipality/Territory Associated with All Residential Samples Collected as Part of the Investigation into Sludge and Septage Land Application Sites *
## As of December 21, 2022

**** This table includes all PFAS residential groundwater data collected by the Department as part of the sludge and septage land application investigation. These sites may also include self-testers where a location is associated with the investigation and information is validated by the Department.***

***** In some instances multiple municipalities/territories are combined as data collected relates to specific sites that cross municipal/territorial boundaries.***

| Associated Municipality/Territory Based on Site | Total # Wells Sampled | # <20 ppt (Sum of 6) | # >20 ppt (Sum of 6) |
|---|---|---|---|
| North Yarmouth | 16 | 16 | 0 |
| Oakland | 37 | 27 | 10 |
| Palermo/China ** | 26 | 22 | 4 |
| Phippsburg | 3 | 3 | 0 |
| Portland | 2 | 2 | 0 |
| Pownal | 1 | 1 | 0 |
| Presque Isle | 19 | 10 | 9 |
| Readfield | 7 | 7 | 0 |
| Richmond | 11 | 11 | 0 |
| Saco | 11 | 10 | 1 |
| Sangerville | 7 | 7 | 0 |
| Searsmont | 1 | 1 | 0 |
| Skowhegan | 18 | 16 | 2 |
| Sidney | 22 | 12 | 10 |
| St. Agatha | 1 | 1 | 0 |
| St. Albans | 17 | 14 | 3 |
| Southwest Harbor | 6 | 5 | 1 |
| Stacyville | 1 | 1 | 0 |

## Maine PFAS Investigation
## Preliminary Private Drinking Water Well Results by Municipality/Territory Associated with All Residential Samples Collected as Part of the Investigation into Sludge and Septage Land Application Sites *
## As of December 21, 2022

**** This table includes all PFAS residential groundwater data collected by the Department as part of the sludge and septage land application investigation. These sites may also include self-testers where a location is associated with the investigation and information is validated by the Department.***

***** In some instances multiple municipalities/territories are combined as data collected relates to specific sites that cross municipal/territorial boundaries.***

| Associated Municipality/Territory Based on Site | Total # Wells Sampled | # <20 ppt (Sum of 6) | # >20 ppt (Sum of 6) |
|---|---|---|---|
| Stonington | 8 | 8 | 0 |
| Swanville | 7 | 4 | 3 |
| TD R2 WELS | 1 | 1 | 0 |
| Topsham | 1 | 0 | 1 |
| Union | 3 | 2 | 1 |
| Unity | 58 | 44 | 14 |
| Unity TWP | 16 | 8 | 8 |
| Vassalboro | 8 | 8 | 0 |
| Waterville | 1 | 1 | 0 |
| Westbrook | 7 | 4 | 3 |
| West Gardiner | 11 | 11 | 0 |
| Whitefield | 4 | 2 | 2 |
| Windsor | 6 | 6 | 0 |
| Winn | 7 | 6 | 1 |
| **Totals** | **1,525** | **1,170** | **355** |