



The State of New Hampshire
Department of Environmental Services

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Robert R. Scott, Commissioner

June 5, 2023

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His Excellency, Governor Christopher T. Sununu
and the Honorable Council
State House
Concord, NH 03301

REQUESTED ACTION

Authorize Department of Environmental Services (NHDES) to enter into a **Sole Source** agreement with the U.S. Geological Survey (USGS), Pembroke, NH (VC# 175772-R003), in the amount of \$110,000 to perform a pilot study of Per- and Polyfluoroalkyl Substances (PFAS) infiltration to groundwater through selected soils in New Hampshire, effective upon Governor and Council approval through December 31, 2023. 100% Emerging Contaminants Funds.

Funding is available in the following account.

	<u>FY 2023</u>
03-44-44-444010-8873-102-500731	\$110,000
Dept. Environmental Services, Emerging Contaminants, Contracts for Program Services	

EXPLANATION

The purpose of this agreement is to fund a pilot study to determine the concentrations of PFAS moving through unsaturated soil to the underlying water table at sites not known to be impacted by PFAS contamination and to compare concentrations of PFAS mobilizing from soil to groundwater to better understand how relatively low concentrations of PFAS in soil affect groundwater quality across the state under various hydrologic conditions. The work will involve the evaluation of soil concentrations and underlying groundwater concentrations of PFAS at sites that have been evaluated for soil concentrations in previous studies. NHDES would like to enter into a **Sole Source** agreement with USGS for this study because of their unique capabilities and previous extensive experience conducting statewide studies with the most recent being a comprehensive PFAS soil investigation that this work is intended to supplement. USGS's extensive knowledge of New Hampshire soils, geology, and aquifers, along with their high-quality assurance standards, make them uniquely qualified to continue with this study.

The study is necessary to support NHDES's efforts to develop protective standards governing soil cleanup. Ultimately, such standards are vitally important to protecting groundwater and drinking water quality in New Hampshire. The study will result in an improved understanding of the results of the larger, comprehensive study looking at the occurrence and behavior of PFAS in New

www.des.nh.gov

PO Box 95, 29 Hazen Drive, Concord, NH 03302-0095

Telephone: (603) 271-2905 Fax: (603) 271-2456 TDD Access: Relay NH 1-800-735-2964

His Excellency, Governor Christopher T. Sununu
and the Honorable Council
Page 2 of 2

Hampshire soils and help to position NHDES to develop appropriate protective standards, thus advancing DES's mission to protect human health and the environment.

This agreement has been approved by the Department of Justice as to form, content, and execution. In the event that other funds are no longer available, General Funds will not be requested to support this contract.

We respectfully request your approval.

A handwritten signature in black ink, appearing to read "Robert R. Scott", is written over a horizontal line.

Robert R. Scott
Commissioner

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 6000000093
Agreement #: 23LGJFANH000016
Project #:
TIN #: 02-6000618

Fixed Cost Agreement YES[X] NO[]

THIS AGREEMENT is entered into as of the June 28, 2023, by the U.S. GEOLOGICAL SURVEY, New England Water Science Center, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the New Hampshire Department of Environmental Services party of the second part.

1. The parties hereto agree that subject to the availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation a study named Pilot Study of Per- and Polyfluoroalkyl Substances (PFAS) Infiltration to Groundwater Through Selected Soils in New Hampshire, herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50, and 43 USC 50b.

2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) include In-Kind-Services in the amount of \$0.00

- (a) \$0 by the party of the first part during the period June 28, 2023 to December 31, 2023
- (b) \$110,000 by the party of the second part during the period June 28, 2023 to December 31, 2023
- (c) Contributions are provided by the party of the first part through other USGS regional or national programs, in the amount of:\$0

Description of the USGS regional/national program:

- (d) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
- (e) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.

4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.

5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.

6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

8. The maps, records or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program, and if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at cost, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records or reports published by either party shall contain a statement of the cooperative relations between the parties. The Parties acknowledge that scientific information and data developed as a result of the Scope of Work (SOW) are subject to applicable USGS review, approval, and release requirements, which are available on the USGS Fundamental Science Practices website (<https://www.usgs.gov/about/organization/science-support/science-quality-and-integrity/fundamental-science-practices>).

Form 9-1366
(May 2018)

U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement
FOR
Water Resource Investigations

Customer #: 600000093
Agreement #: 22LGJFANH000014
Project #:
TIN #: 02-6000618

9. Billing for this agreement will be rendered quarterly. Invoices not paid within 60 days from the billing date will bear Interest, Penalties, and Administrative cost at the annual rate pursuant the Debt Collection Act of 1982, (codified at 31 U.S.C. § 3717) established by the U.S. Treasury.

USGS Technical Point of Contact

Name: Joseph Ayotte
Supervisory Hydrologist
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Pembroke, NH 03275-3718
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Customer Technical Point of Contact

Name: Amy Rousseau
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USGS Billing Point of Contact

Name: Melissa Shaffer
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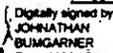
Customer Billing Point of Contact

Name: Amy Rousseau
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U.S. Geological Survey
United States
Department of Interior

New Hampshire
Department of
Environmental Services

Signature

JOHNATHAN BUMGARNER
By  Date: 05/11/2023
Name: Johnathan Bumgarner
Title: Director

Signatures


By _____ Date: 6/8/23
Name: Robert R. Scott
Title: Commissioner, NHDES

By _____ Date: _____

Name:

Title:

By _____ Date: _____

Name:

Title:



Pilot Study of Per- and Polyfluoroalkyl Substances (PFAS) Infiltration to Groundwater Through Selected Soils in New Hampshire

U.S. Geological Survey, New England Water Science Center

May 10, 2023

Background

Per- and polyfluoroalkyl substances (PFAS) are a diverse class of thousands of compounds that have been produced since the 1940s and are frequently found in the environment. Exposure to some PFAS has been associated with adverse human health outcomes. Many PFAS are hydrophobic surfactants that are chemically, thermally, and biologically stable at ambient conditions, which allows for a range of surfactant and non-stick applications. As in many areas, PFAS have been released to the environment in New Hampshire through several pathways including industrial releases, commercial uses, waste management applications (e.g., wastewater effluent, biosolids application), and from the use of Class B firefighting foams, including aqueous film-forming foams (AFFF). There is a high level of public concern over PFAS in New Hampshire following discoveries of drinking water contamination at the former Pease Air Force Base in 2014 and in several southern New Hampshire towns in 2016, which prompted statewide investigations of PFAS impacts to drinking water quality and the environment. Throughout this text, PFAS refers to the targeted compounds measured by a USGS contract laboratory (Table 1). The U.S. Geological Survey (USGS) has assisted NHDES with several studies aimed at better understanding concentrations of PFAS in shallow soils,¹ mobility potential in soils and biosolids,² and leaching to shallow groundwater at sites contaminated with PFAS.³

PFBA	Perfluorobutanoic acid
PFPeA	Perfluoropentanoic acid
PFHxA	Perfluorohexanoic acid
PFHpA	Perfluoroheptanoic acid
PFOA*	Perfluorooctanoic acid
PFNA*	Perfluorononanoic acid
PFDA	Perfluorodecanoic acid
PFUnA	Perfluoroundecanoic acid
PFDoA	Perfluorododecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFTeDA	Perfluorotetradecanoic acid
PFBS*	Perfluorobutanesulfonic acid
PFPeS	Perfluoropentanesulfonic acid
PFHxS*	Perfluorohexanesulfonic acid
PFHpS	Perfluoroheptanesulfonic acid
PFOS*	Perfluorooctanesulfonic acid
PFNS	Perfluorononanesulfonic acid
PFDS	Perfluorodecanesulfonic acid
PFDoS	Perfluorododecanesulfonic acid
4:2 FTS	1H,1H, 2H, 2H-Perfluorohexane sulfonic acid
6:2 FTS	1H,1H, 2H, 2H-Perfluorooctane sulfonic acid
8:2 FTS	1H,1H, 2H, 2H-Perfluorodecane sulfonic acid
PFOSA	Perfluorooctanesulfonamide
NMeFOSA	N-methyl perfluorooctanesulfonamide
NEtFOSA	N-ethyl perfluorooctanesulfonamide
NMeFOSAA	N-methyl perfluorooctanesulfonamidoacetic acid
NEtFOSAA	N-ethyl perfluorooctanesulfonamidoacetic acid
NMeFOSE	N-methyl perfluorooctanesulfonamidoethanol
NEtFOSE	N-ethyl perfluorooctanesulfonamidoethanol
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
11Cl-PF3OUDS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
ADONA	4,8-Dioxa-3H-perfluorononanoic acid
HFPO-DA*	Hexafluoropropylene oxide dimer acid
*part of USEPA draft Maximum Contaminant Levels (MCLs) for six PFAS recently published by the U.S. Environmental Protection Agency (4)	

Problem

The recent joint USGS/NHDES study of PFAS occurrence in shallow soils across New Hampshire¹ found detectable concentrations of PFAS in soil at every location (n = 100), despite targeting locations not known to be impacted by PFAS. There is an urgent need to understand

U.S. Geological Survey Proposal

whether recharge to groundwater contains significant concentrations of PFAS after infiltration through the soils. Specifically, there is a need to understand whether recharge concentrations exceed the draft Maximum Contaminant Levels (MCLs) for six PFAS (PFOA, PFOS, PFNA, PFHxS, PFBS, HFPO-DA) recently published by the U.S. Environmental Protection Agency.⁴ The results will be used to help NHDES evaluate appropriate PFAS concentrations for soil standards.

Objectives and Scope

The objectives of this pilot study are (1) to determine the concentrations of PFAS moving through unsaturated soil to the underlying water table at sites not known to be impacted by PFAS contamination; and (2) to compare concentrations of PFAS mobilizing from soil to groundwater to better understand how relatively low concentrations of PFAS in soil affect groundwater quality across the state under various hydrologic conditions.

Relevance and Benefits

The results of this study will provide NHDES with reliable and impartial information as the agency evaluates options for soil regulations. This project aligns with the following goals of the USGS Strategic Science Directions (Evenson and others, 2012): (1) “Advancing our understanding of processes that determine water availability” and (2) “Anticipating and responding to water-related emergencies and conflicts”

This proposal will produce data to evaluate impacts of soil PFAS contamination on water quality. Currently (2023), there is substantial widespread concern from citizens, scientists, and regulators over PFAS in the environment. The data set from this study will contribute to national needs to better understand the distribution and transport of PFAS in the environment.

Approach

U.S. Geological Survey Proposal

This pilot study will evaluate soil concentrations and underlying groundwater concentrations of PFAS at sites that have been evaluated for soil concentrations by our previous studies.¹ The goal is to better understand how shallow groundwater concentrations are impacted by PFAS in surficial soil. Sites (n=5) will be selected based on our previous work¹ and are in areas not known to have any direct PFAS impacts. Sites will be chosen based on characteristics such as PFAS concentration,¹ soil type, aquifer material, elevation, geographic location, and shallow groundwater table (< 6 feet below ground surface). At all five sites, soil samples will be collected at 0-6 inches depth; in addition, at one of the five selected sites, sampling of soil porewater will be done at two depth horizons by use of lysimeters. After selecting sites, the following steps will be completed:

- Obtain site access permission and Dig Safe clearance
- At lysimeter site:
 - Install porewater lysimeters at 2 different depths above the water table (shallow lysimeter: 12 inches below ground surface; deep lysimeter: dependent on-site water table depth)
 - Classify soils through the entire length of the boreholes where the lysimeters are installed.
 - Sample soil for PFAS, total organic carbon (TOC), and pH at 0-6 inches depth and at screened intervals of shallow and deep lysimeters,
 - Sample porewater from shallow and deep lysimeters after a significant precipitation event (approximately 0.25 inches or greater), and after a dry period of at least 7 days preferably with no or minimal precipitation (≤ 0.25 inches cumulatively).
 - Collect in-situ groundwater sample at the water table with temporary stainless-steel mini piezometers or drive-point piezometers during times of soil porewater sample collection. Groundwater field physicochemical parameters (pH, temperature, conductivity, dissolved oxygen) will be recorded during groundwater sampling if enough liquid is available.
- At non-lysimeter sites:
 - Sample soil for PFAS, TOC, and pH at top 6 inches (0-6 inches depth)

U.S. Geological Survey Proposal

- o Collect in-situ groundwater sample at the water table with stainless-steel mini piezometers, or drive-point piezometers after a precipitation event, and after an extended period of dry conditions (see above description). Groundwater field physicochemical parameters (pH, temperature, conductivity, dissolved oxygen) will be recorded during groundwater sampling if enough liquid is available.

Note that modified or alternative sampling techniques for groundwater, soil porewater, and soil may need to be utilized depending on site characteristics such as soil type and groundwater depth. Table 2a-c contains information on sample media and number of samples by sample type for (a) the lysimeter site; (b) the non-lysimeter sites; and (c) the project (from tables 2a and 2b).

Table 2a: Lysimeter Site (n=1)

Sample Medium	Number of samples:					
	PFAS	TOC	pH (solids) Field Physicochemical Parameters (aqueous)	QA/QC PFAS	QA/QC TOC	QA/QC pH (solids)
Soil: 0-6 inches	1	1	1	1	1	1
Soil: Shallow lysimeter	1	1	1	1	1	1
Porewater: Shallow lysimeter (for "wet" and "dry" conditions)	2	0	0	1	0	0
Soil: Deep lysimeter	1	1	1	0	0	0
Porewater: Deep lysimeter (for "wet" and "dry" conditions)	2	0	0	0	0	0
Shallow Groundwater (for "wet" and "dry" conditions)	2	0	2	0	0	0
Total	9	3	3 soil, 2 physicochemical parameters	3	2	2

Table 2b: Non-lysimeter Sites (n=4)

U.S. Geological Survey Proposal

	PFAS	TOC	pH (solids) Field Physicochemical Parameters (aqueous)	QA/QC PFAS	QA/QC TOC	QA/QC pH
Soil: 0-6 inches	4	4	4	1	1	1
Shallow Groundwater (for "wet" and "dry" conditions)	8	0	8	2	2	2
Total	12	4	4 soil, 8 physicochemical parameters	3	3	1 soil, 2 field parameters

Table 2c: Study Totals (including QA/QC)

	PFAS	TOC	pH (solids) Field Physicochemical Parameters (aqueous)
Total	27	12	10 soil, 12 physicochemical parameters

Quality Assurance/Quality Control

Quality control (QC) samples including equipment blanks and duplicates will be collected. Note that extensive QA/QC from our previous studies have validated the sampling protocols that we plan to implement here. However, QA/QC samples are still proposed and generally comprise >20% of sample totals.

Products

Products include (1) a USGS-approved cooperator presentation of preliminary findings to NHDES cooperators, (2) a USGS data release if no further study is requested, and, if requested, (3) a proposal based on the preliminary findings for implementing a larger randomized study by generalized soil type (as strata) that can characterize how low-level concentrations of PFAS in soil could affect modern groundwater across the state.

U.S. Geological Survey Proposal

Timeline

Task	Timeline in Months (M1 = Month 1, etc.)				
	M1	M2	M3	M4	M5
Secure site access	x	x			
Mobilization and sampling	x	x	x		
Data Review			x	x	x
Presentation				x	x
USGS Data Release*					x
*If pilot does not lead to larger follow-on study					

The above timeline begins when the Joint Funding Agreement is signed between NHDES and USGS. Additionally, laboratory turn-around time may impact the timeline.

Personnel

Employee	FY23 Budget
GS-11 Hydrologist	480
GS-7 Hydrologist	370
Data Management	16
Total	866

Budget

	Cost
USGS (labor, equipment, supplies, overhead)	\$90k
Analytical Expenses through USGS Contract Laboratory	\$20k
TOTAL COST	\$110k

References

1. Santangelo, L.M., Tokranov, A.K., Welch, S.M., Schlosser, K.E.A., Marts, J.M., Drouin, A.F., Ayotte, J.D., Rousseau, A.E., and Harfmann, J.L., 2022, Statewide survey of shallow soil concentrations of per- and polyfluoroalkyl substances (PFAS) and related chemical and physical data across New Hampshire, 2021: U.S. Geological Survey data release, <https://doi.org/10.5066/P9KG38B5>.
2. Tokranov, A.K., Welch, S.M., Santangelo, L.M., Kent, D.B., Repert, D.A., Perkins, K., Bliznik, P.A., Roth, D.A., Drouin, A.F., Lincoln, T.A., Deyette, N.A., Schlosser, K.E.A., and Marts, J.M., 2023, Solid/Water Partitioning of Per- and Polyfluoroalkyl Substances (PFAS) in New Hampshire Soils and Biosolids: Results from Laboratory Experiments at the U.S. Geological Survey: U.S. Geological Survey data release, <https://doi.org/10.5066/P9TKSM8S>.
3. Santangelo, L.M., Welch, S.M., Tokranov, A.K., Drouin, A.F., Schlosser, K.E.A., Marts, J.M., Lincoln, T.A., Deyette, N.A., and Perkins, K., 2023, Field-scale investigation of per- and polyfluoroalkyl substances (PFAS) leaching from shallow soils to groundwater at two sites in New Hampshire, 2021-2022: U.S. Geological Survey data release, <https://doi.org/10.5066/P92C21F6>.
4. Per- and Polyfluoroalkyl Substances (PFAS): Proposed PFAS National Primary Drinking Water Regulation. U.S. Environmental Protection Agency: <https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>. Accessed online May 5, 2023.