

**Strategic Environmental Research and Development Program
(SERDP)**

FY 2020 STATEMENT OF NEED

Environmental Restoration (ER) Program Area

**DEVELOPMENT OF ANALYTICAL METHODS TO ASSESS LEACHING
AND MOBILITY OF PER AND POLYFLUOROALKYL SUBSTANCES
FROM SOILS, SEDIMENTS, AND SOLID WASTES**

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop standard operating protocols to assess the potential for leaching and mobility of per and polyfluoroalkyl substances (PFAS) from solids, soils, and sediments (collectively referred to as “solids”). Rapid, accurate, and reproducible characterization of PFAS in solids is needed to aid in the screening, geochemical assessment, and disposal requirements of PFAS and PFAS-contaminated materials at military installations. Specific objectives include:

- Development of a standardized method, similar to the Synthetic Precipitation Leaching Procedure ([SW-846 Method 1312](#)), to assess the leachability and mobility of PFAS from solid matrices. Solids may include solid waste, concrete, biosolids, emergency response wastes, and other materials of commerce.
- Development of new or improved methods to evaluate sorption/desorption affinity of PFAS for specific solid materials of concern to the DoD (e.g., concrete, soils, construction debris, sediments).

The proposed methods must be able to provide repeatable and environmentally relevant measures of PFAS. The focus of this work should be for at least the USEPA 24 PFAS as shown in Table 1. Proposals may address one or more of the objectives listed above.

Successful proposals will be highly focused and show direct relevance to support decision-making for site investigation, source zone control, and possible stabilization/soil washing types of technologies. Methods developed should produce appropriate quantitation limits and report concentrations relative to the media sampled (e.g., ng/L) considering the EPA drinking water Health Advisory Levels (HALs) for perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) and relevant Federal and State regulations. Method development must follow the EPA’s method validation and peer review policies and guidelines ([EPA 2016](#)) and result in a written method that follows the EPA SW-846 method style guide ([EPA 2012](#)). The analytical methods used in testing the leaching method must meet the requirements for PFAS analysis in the Department of Defense Quality Systems Manual for Environmental Laboratories ([QSM 5.1](#)).

Table 1. Target PFAS Analyte List EPA SW 846 and CAS Numbers

Analyte Name	Acronym	CAS Number
Perfluorotetradecanoic acid	PFTreA	376-06-7
Perfluorotridecanoic acid	PFTriA	72629-94-8
Perfluorododecanoic acid	PFDoA	307-55-1
Perfluoroundecanoic acid	PFUnA	2058-94-8
Perfluorodecanoic acid	PFDA	335-76-2
Perfluorononanoic acid	PFNA	375-95-1
Perfluorooctanoic acid	PFOA	335-67-1
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorobutanoic acid	PFBA	375-22-4
Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluorononanesulfonic acid	PFNS	68259-12-1
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorooctanesulfonamide	PFOSA	754-91-6
Fluorotelomer sulfonic acid 8:2	FtS 8:2	39108-34-4
Fluorotelomer sulfonic acid 6:2	FtS 6:2	27619-97-2
Fluorotelomer sulfonic acid 4:2	FtS 4:2	757124-72-4
2-(N-Ethylperfluorooctanesulfonamido)acetic acid	NEtFOSAA	2991-50-6
2-(N-Methylperfluorooctanesulfonamido)acetic acid	NMeFOSAA	2355-31-9

2. Expected Benefits of Proposed Work

Addressing the research objectives described above will meet a critical need to support the development of site-specific assessments of PFAS leachability to water, as well as support remedial design and waste disposal of PFAS-containing solids at DoD sites. This will in turn lead to improved management of PFAS sites by facilitating more accurate and precise assessments of the extent of PFAS contamination.

3. Background

PFAS are present in AFFF used by the DoD and other organizations to extinguish hydrocarbon fires. Different AFFF formulations have been used, but all contain a complex mixture of PFAS, including those of greatest regulatory concern - the PFAAs and potential PFAA precursors ([Field et al., 2017](#); [ITRC, 2017](#)). EPA has recommended a Health Advisory Level for perfluorooctanoic acid (PFOA) and PFOS, and several states have promulgated standards for PFOA, PFOS, and some of the related PFAAs ([ITRC, 2018a](#)).

SERDP has been funding research on AFFF contamination for several years to improve PFAS analysis, to develop tools for assessing the fate of PFAS in the subsurface, and to evaluate the potential for in situ remediation. A recent SERDP & ESTCP-sponsored workshop identified a number of research needs, and proposers should view the [Workshop Report](#) to obtain additional detail concerning these discussions. PFOS is of particular concern to DoD, as it is the predominant PFAS in some AFFF formulations, and a significant dead-end metabolite in others, and therefore it is typically the predominant PFAS in AFFF-impacted groundwaters ([Anderson et al., 2016](#)). PFOS appears to be particularly resistant to destructive technologies, and like the rest of the PFAAs it is generally considered nonbiodegradable ([ITRC, 2018b](#)).

The military services are in need of methodologies to assess PFAS in solids, soils and sediments. Solids may include solid waste, concrete, biosolids, emergency response wastes, and other materials of commerce as well as soils and sediments. Currently, no single document or source exists for these procedures.

4. Cost and Duration of Proposed Work

The cost and time to meet the requirements of this SON are at the discretion of the proposer. Two options are available:

Standard Proposals: These proposals describe a complete research effort. The proposer should incorporate the appropriate time, schedule, and cost requirements to accomplish the scope of work proposed. SERDP projects normally run from two to five years in length and vary considerably in cost consistent with the scope of the effort.

Limited Scope Proposals: Proposers with innovative approaches to the SON that entail high technical risk or have minimal supporting data may submit a Limited Scope Proposal for funding up to \$200,000 and approximately one year in duration. Such proposals may be eligible for follow-on funding if they result in a successful initial project. The objective of these proposals should be to acquire the data necessary to demonstrate proof-of-concept or reduction of risk that will lead to development of a future Standard Proposal. Proposers should submit Limited Scope Proposals in accordance with the SERDP Core Solicitation instructions and deadlines.

5. Point of Contact

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For Core proposal submission due dates, instructions, and additional solicitation information, visit the [SERDP website](#).

6. References

Anderson RH, GC Long, RC Porter, and JK Anderson. 2016. Occurrence of select perfluoroalkyl substances at U.S. Air Force aqueous film-forming foam release sites other than fire-training areas: Field-validation of critical fate and transport properties. *Chemosphere* 150:678-685.

Field J, C Higgins, R Deeb and J Conder. 2017. FAQs Regarding PFASs Associated with AFFF Use at U.S. Military Sites. <http://www.dtic.mil/dtic/tr/fulltext/u2/1044126.pdf>.

Interstate Technology and Regulatory Council (ITRC). 2017. History and use of per- and polyfluoroalkyl substances (PFAS). https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use_11_13_17.pdf.

ITRC. 2018a. Regulations, guidance, and advisories for per- and polyfluoroalkyl substances (PFAS). https://pfas-1.itrcweb.org/wp-content/uploads/2018/01/pfas_fact_sheet_regulations_1_4_18.pdf.

ITRC. 2018b. Environmental fate and transport for per- and polyfluoroalkyl substances. https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_fate_and_transport_3_16_18.pdf.