UNIVERSITY OF MINNESOTA

Sponsored Projects Administration
200 Oak Street SE
450 McNamara Alumni Center
Minneapolis, MN 55455
612-624-5599

March 5, 2026

The Legislative-Citizen Commission on Minnesota Resources

RE: Proposal Title: "Trifluoroacetic Acid in Minnesota Waters: Levels and Formation "
University of Minnesota PI: Bill Arnold
Proposed dates: 7/1/2027-6/30/2028
Funding Requested: $338,000

Hello,

The above referenced proposal is hereby endorsed, and submitted, on behalf of the Board of Regents of the University of Minnesota.

The University of Minnesota is registered in the FDP FCOI Clearinghouse certifying it has an active and enforced Conflict of Interest policy that is consistent with the provisions of 42 CFR part 50, Sub part F, and 42 CFR part 94.

The University of Minnesota's frequently requested institutional information, including EIN, DUNS, and SAM information can be found on our website at https://research.umn.edu/units/spa/proposals/proposal-development/frequently-requested-institutional-information. The current negotiated F&A rate agreement can be found on our website at https://research.umn.edu/units/oca/fa-costs/fa-rate-agreements.

Information regarding the University of Minnesota's Annual Audits and Financial Reports can be found here: https://controller.umn.edu/annual-reports.

Questions concerning programmatic aspects of the project should be directed to the Principal Investigator. Those having to do with contract and budgetary matters should be directed to Christina Doherty by e-mail at doher170@umn.edu in the Office of Sponsored Projects Administration.

Sincerely,

Nicolas Allyn
Assistant Director
Sponsored Projects Administration
Authorized Organizational Representative

Agenda Item: 09b

Trifluoroacetic Acid in Minnesota Waters: Levels and Formation

William Arnold (CEGE, University of Minnesota) and William Pomerantz (Chemistry, University of Minnesota)

Trifluoroacetic acid (TFA), the smallest poly- and perfluoroalkyl substance (PFAS), has recently been revealed to be an abundant and prevalent environmental PFAS molecule. TFA represents a threat to Minnesota's water resources and wildlife, **but we do not have information about its presence or sources in Minnesota**. Additionally, humans may be exposed via drinking water and food, and recent evidence indicates that TFA is taken up by plants, which means it may both enter the food chain and represent a risk to crop yields.

TFA is persistent and highly mobile and may come from fluorochemical production facilities, the degradation of pesticides and pharmaceuticals, and degradation of fluorine-containing refrigeration compounds released in the atmosphere. Recent evidence suggests that TFA is globally distributed at levels that are surpassing longer chain PFAS, and rising levels of TFA represent a threat to environmental and public health. Nevertheless, there currently is inadequate data on TFA presence due to measurement challenges. Because numerous chemicals introduced into the environment can form TFA upon degradation via natural processes and during water or wastewater treatment, we need to know not only the TFA present, but also its potential to form. Only then can we assess the threat TFA poses to Minnesota's water resources and provide recommendations for controlling TFA levels.

The issue of TFA has only recently arisen because analytical techniques have just been developed (including one by our team) to reliably quantify TFA levels in environmental samples. Initial results suggest that TFA is widespread in water resources, and there are indications that TFA is impacting drinking water and is present in our food supply, including wheat, fruits, and vegetables. Based on archived samples of water and agricultural products, it appears levels of TFA are rising in both. We also have new understanding of the degradation pathways of other chemicals in the environment that lead to TFA. To assess risks and potential protective actions, we need to understand the extent of TFA in Minnesota waters, assess how much could form, and identify where TFA is most likely to be problematic.

We need to start these measurements in 2026 (rather than 2027 when current RFP funding would become available) given the likely ubiquity of TFA and its likely presence at concentrations hundreds to thousands of times greater than other PFAS. Current estimates are that TFA might make up 90% of PFAS present in the environment, but we have not been measuring this compound. Given the new information about TFA, we need to rapidly understand the scope of this problem in Minnesota.

Our proposed solution is to measure the current baseline levels of TFA in Minnesota's water resources, as well as the maximum amount that could form from the fluorinated chemicals present in the environment. Thus, *the goals of this emerging issues project are to 1) measure TFA levels in surface waters, groundwaters, wastewater, drinking water, and stormwater across the state, and 2) assess the TFA formation potential in these same samples.* To meet the first goal, we will conduct a broad survey by leveraging ongoing sampling of waters by agencies and scientists, other LCCMR teams, extension offices, as well as collection of drinking water samples, wastewater effluents, and precipitation. The amount of water needed to measure TFA is small (~50 mL, which is 20 times less that needed for other PFAS). Because of the small sample size and the fact that TFA is not readily degraded, sampling coverage can be enhanced by mailing out small plastic tubes. This also allows collaboration with citizen scientists for sample collection, using the University of Minnesota Driven to Discover (UMN D2D) booth at the Minnesota State Fair to connect with the public and broaden the reach and spatial coverage of

TFA measurements. Because there are numerous sources of TFA, it is important to have broad spatial coverage of surface waters, groundwater, and precipitation to understand what the likely sources are in different regions of Minnesota.

For the second goal, we will use the same set of samples, but they will be analyzed for TFA after exposing the water to heat and oxidizing conditions to convert the fluorinated parts of known water pollutants, such as pesticides and pharmaceuticals, into TFA. This will lead to a value for "TFA formation potential", which is the maximum levels to which humans, wildlife, or crops could be exposed. This information will allow assessment of which waters present the greatest risk and for which additional action may be needed with respect to treatment or suggestions for limitations on chemical use.

This work is urgently needed because as the smallest PFAS, TFA is highly mobile, expected to be present at much higher levels than "traditional" PFAS, and likely arises from numerous sources. A mapping effort is vital to assess baseline levels and hotspots to reveal the potential for impact on water resources, wildlife, and agricultural products. Additionally, because various water, wastewater, and other treatment practices rely on oxidation, we need to know what the potential TFA formation is in water that is treated for drinking water or discharged into the environment. TFA may serve as a dating marker in groundwater, which is of interest to the Minnesota Department of Natural Resources Groundwater Atlas program, and also an overall pollution tracer for fluorinated compounds. Additionally, knowing the extent and levels of TFA will allow future assessment of uptake and effects on crops.

Because of our team's past work on fluorinated chemicals, we have taken initial steps that will allow us to address the problem. We have developed a quantitative, rapid method for TFA quantification in water samples. We have also been communicating with partners that could help us collect samples across a broader coverage of Minnesota's landscape than we could do on our own. The next steps and proposed timeline are as follows:

July 1, 2026. Initiate sample collection and analyses; assess gaps where partners are not sampling; collect northern MN/Boundary Waters samples for minimally impacted site data.
December 2026. Begin TFA formation potential experiments to identify hotspots by March 2027.
April 2027: Resume sampling with emphasis on drinking water sources (surface and groundwater), water bodies impacted, wastewater effluents, and additional likely hotspots based on the 2026 assessment.
September 2027: Citizen engagement to collect samples via interactions at UMN D2D booth.
December 2027: TFA formation potential tests on additional TFA hotspots.
March 2028: Complete analyses of TFA samples.
June 30, 2028. Finalize assessment of TFA distribution, develop interactive map with TFA data and hotspots, assess sources, provide recommendations for minimizing TFA levels.

The key **findings** of this work will be 1) an assessment of the levels and distribution of TFA in Minnesota's water resources, and 2) the maximum potential for TFA formation during natural processing or engineered treatment of water. The **outcomes** facilitated will be assessments of 1) the threat that TFA poses to aquatic life, humans, and Minnesota's agricultural commodities; 2) the most likely sources of TFA to Minnesota's surface and groundwaters; and 3) what steps can and should be taken to minimize TFA levels in Minnesota's waters.

Attachment A:
Environment and Natural Resources Trust Fund Budget
Emerging Issues Budget Addendum
Legal Citation:
Project Manager: William Arnold
Project Title: Trifluoroacetic Acid Levels and Formation Potential
Organization: University of Minnesota
Project Budget: $338,000
Project Length and Completion Date: 2 years, 6/30/2028
Current Date: 17-Mar-26

BUDGET ITEM	Budget	Amount Spent	Balance	Justification for Generally Ineligible Expenses (if applicable)
Personnel (Wages and Benefits)	$262,801	$0	$262,801	
PI Arnold ($41,598, 27% fringe benefits, 6% FTE per year)	-	-	-	
co-PI Pomerantz ($18,079, 27% fringe benefits, 3% FTE per year	-	-	-	
Postdoctoral Researcher ($82,041, 21% fringe, 50% FTE per year)	-	-	-	
Graduate Student Researcher ($121,083, 44% fringe, 50% FTE per year)	-	-	-	
	-	-	-	
Services and Subawards				
Instrument time in UMN NMR center	$26,000	$0	$26,000	
Mass spectrometer maintenance (Agilent; 2% time per year)	$6,500	$0	$6,500	
	$0	$0	$0	
	$0	$0	$0	
	$0	$0	$0	
Equipment/Tools/Supplies				
Laboratory supplies (chemicals, glass ware, solvents, standards, vials, personal protective equipment)	$25,000	$0	$25,000	

Driven to Discover engagment, MN State Fair (vials, instructions, table fee)	$2,699	$0	$2,699	
	$0	$0	$0	
	$0	$0	$0	
	$0	$0	$0	
Capital Expenditures Over $5,000				
	$0	$0	$0	
	$0	$0	$0	
	$0	$0	$0	
Printing and Publication				
Publication fees	$8,000	$0	$8,000	
postage/shipping costs for sample vials	$2,000	$0	$2,000	
	$0	$0	$0	
Travel Expenses In Minnesota				
Mileage and hotel for sample collection, estimate 16 trips over two years with overnight hotel stay; registration at MN Water Conference for 2 people	$5,000	$0	$5,000	
	$0	$0	$0	
	$0	$0	$0	
Travel Expenses Outside Minnesota				
	$0	$0	$0	
	$0	$0	$0	
	$0	$0	$0	
Other				
	$0	$0	$0	
	$0	$0	$0	
	$0	$0	$0	
COLUMN TOTAL	**$338,000**	**$0**	**$338,000**	

SOURCE AND USE OF OTHER FUNDS CONTRIBUTED TO THE PROJECT	**Budget**	**Spent**	**Balance**	**Status (secured, pending, or potential)**

Non-State:	$0	$0	$0	
State:	$0	$0	$0	
In kind:	$182,520	$0	$182,520	secured, waived indirect costs

OTHER ENRTF APPROPRIATIONS AWARDED IN THE LAST SIX YEARS	**Budget**	**Spent**	**Balance**	**Amount legally obligated but not yet spent**
	$0	$0	$0	

Organization Description

The University of Minnesota (UMN) is one of the largest, most comprehensive, and most prestigious public universities in the United States. The College of Science and Engineering (CSE) at the University of Minnesota is ranked among the top engineering and science academic programs in the country. The college includes 12 academic departments, including the Department of Civil, Environmental, and Geo- Engineering (CEGE) and Department of Chemistry, offering a wide range of degree programs at the baccalaureate, master's, and doctoral levels. Researchers within the CSE and CEGE are on the leading edge of finding ways to solve some of the world's pressing environmental issues problems by protecting water resources, developing new forms of environment-friendly energy, and developing a strong national infrastructure. The College of Science and Engineering also offers students a rigorous, world-class education tailored to their interests and goals. CEGE at UMN is known for its pioneering work in analytical, computational, and experimental work to assess and solve environmental problems. We practice research excellence grounded in rigorous fundamentals for wide-ranging applications. The laboratories in CEGE and centralized research facilities have the necessary space and equipment to perform the proposed work.