Environment and Natural Resources Trust Fund

2021 Request for Proposal

General Information

Proposal ID: 2021-436

Proposal Title: Developing Strategies to Manage PFAS in Land-Applied Biosolids

Project Manager Information

Name: Summer Streets

Organization: Minnesota Pollution Control Agency

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Project Basic Information

Project Summary: This project helps municipal wastewater plants, landfills, and compost facilities protect human health and the environment by developing strategies to manage per- and polyfluoroalkyl substances (PFAS) in land-applied biosolids.

Funds Requested: $1,370,000

Proposed Project Completion: 2024-08-31

LCCMR Funding Category: Water Resources (B)

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project and In the Future

Narrative

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

Environmental contamination of PFAS is a widespread issue of concern, and concentrations commonly found throughout Minnesota pose known risks to human and ecological health. Elevated levels of PFAS have been measured in Minnesota municipal biosolids, landfill leachate, and compost contact water. While land application of these biosolids has benefits for farming, land application is a known source of PFAS to groundwater, soil, surface water, and crops. Human health can be impacted when PFAS-contaminated water and food is consumed by people. There is still a lot we don't know about how PFAS moves out of biosolids and into the environment and food supplies. This study will allow us to proactively manage biosolids in a way that prevents environmental contamination by PFAS.

What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.

Waste managers in Minnesota are already facing urgent concerns related to disposal of PFAS-contaminated wastes. They have an immediate need of tools to evaluate and manage PFAS in their land-applied waste streams. This project will focus on developing cost-effective, real world approaches for preventing, treating, disposal, and destruction of PFAS-contaminated land-applied wastes. This study will allow us to develop tools to proactively-manage biosolids in a way that prevents environmental contamination by PFAS.

The goals of this study are to:

1) Evaluate and characterize PFAS concentrations in land-applied biosolids.
2) Evaluate and characterize PFAS leaching from land-applied wastes into groundwater.
3) Evaluate and characterize PFAS uptake in feed crops.
4) Analyze alternative disposal and treatment options to develop tools for managing PFAS-contaminated waste streams.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

This project will give much-needed insight and understanding of: 1) the role land-applied wastes play in introducing PFAS to the environment; and 2) how those PFAS move once released. We will also develop cost-effective, practical tools to help municipalities manage their PFAS-containing wastes to prevent environmental contamination and protect human health.

Activities and Milestones

Activity 1: Controlled plot study to evaluate leaching of PFAS

Activity Budget: $360,000

Activity Description:
A two year field study will be conducted at the Rosemount Research and Outreach Center in Rosemount, MN. To our knowledge, biosolids have never been applied to this area. The soil at this site is classified as a loess-derived Waukegan silt loam, with a silt loam texture in the top 90 cm and a sand to gravel glacial outwash subsoil. This soil is typically used for row crop production in Minnesota.
Controlled plots will be used to evaluate leaching and plant uptake under environmentally relevant conditions.
A total of 8 treatments will be evaluated, including:
Control (inorganic fertilizer)
Biosolids ash
Dried biosolids
Anaerobically digested biosolids
Aerobically digested biosolids
Polymer-stabilized biosolids
Yard waste compost
Food/household compost

These eight amendments were chosen because they survey the general types of biosolids amendments that might be applied to fields in Minnesota in order to boost agricultural production. We also selected two commonly used composts that are widely used as soil amendments and that have been shown to contain PFAS.

Activity Milestones:

Description	Completion Date
Develop plan for controlled plot study prior to first summer growing season	2022-03-31
Two years of controlled plot studies	2024-06-30

Activity 2: Laboratory investigation of PFAS fate and transport, and identification of 325 novel PFAS compounds in relevant media

Activity Budget: $360,000

Activity Description:
An understanding of PFAS presence in, and movement through, biosolids will be achieved through a combination of targeted analysis (analogous to liquid chromatography-tandem mass spectrometry [LC-MS/MS]), high resolution mass spectrometry (HRMS) analysis, and laboratory column experiments. The latter will target a suite of biosolids that represent different waste inputs (e.g. yard waste vs. food waste, municipal vs. industrial) and biosolids treatment types. Results will be used to evaluate which PFAS are prevalent in biosolids and related media, evaluate trends in sorption of PFAS based on PFAS structure and geochemistry, and estimate the fraction of PFAS that may leach into the saturated zone. The overarching benefit of this work will be the generation of information that can be used to develop best management practices related to PFAS in biosolids, thus reducing overall risks to human health and the environment.

Activity Milestones:

Description	Completion Date
Laboratory leaching study	2022-12-31
Novel PFAS analysis	2024-06-30

Activity 3: Quantitative analysis of PFAS in land-applied wastes and relevant media

Activity Budget: $350,000

Activity Description:
Analysis of 32 PFAS compounds and their breakdown products in biosolids, ash, landfill leachate, compost, soil, water, and crops, to understand occurrence of PFAS in these wastes so that risk associated with land application can be characterized. Total oxidizable precursor (TOP) analysis will be performed to determine whether longer chain PFAS compounds that are present in these wastes can break down to PFOS and PFOA, two known PFAS compounds of concern. A total of 650 samples will be analyzed by SGS Axys Analytical Services.

Activity Milestones:

Description	Completion Date
Perform total oxidizable PFAS precursor analysis in soil	2024-06-30
Collect and analyze environmental samples	2024-06-30
Collect and analyze samples of land-applied biosolids for PFAS	2024-06-30

Activity 4: Developing PFAS management solutions for biosolids, landfills and compost

Activity Budget: $300,000

Activity Description:
The Request for Proposals (RFP) will encourage the state and national design community to apply for funds to complete an analysis of PFAS treatment and destruction options. The RFP contracting process will be managed by the MPCA contract staff, reviewed by MPCA engineers, and will comply with all state and federal regulations. The final candidate will be selected by a committee of MPCA engineering staff and municipal wastewater engineers under the guidance of the MPCA contract unit. Once the best candidate is selected, funds and necessary design information will be delivered to the contractor by the MPCA. The contractor will have 24 months to complete the deliverable.

Activity Milestones:

Description	Completion Date
1. MPCA completes administration of competitive RFP to identify project consultant	2022-03-31
Deliverable of best management practices report to MPCA	2024-06-30

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
SGS Axys Analytical Services, Ltd.	State contract lab providing PFAS analysis	Analysis of 32 PFAS compounds and their breakdown products in biosolids, ash, landfill leachate, compost, soil, water, and crops, to understand occurrence of PFAS in these wastes so that risk associated with land application can be characterized.	Yes
Dr. Jennifer Guelfo	Texas Tech University	Dr. Guelfo will conduct a laboratory investigation of PFAS fate and transport mechanisms to evaluate leaching of PFAS from biosolids and other wastes into the environment. A standardized soil leaching method will be established for comparison of PFAS leaching between sites and waste types. Non-targeted analytical techniques will be used.	Yes
Dr. Carl Rosen	University of Minnesota - Twin Cities	Dr. Rosen will conduct a two-year controlled field plot study to evaluate leaching of PFAS from land-applied biosolids in typical Minnesota field conditions. In both years, multiple soil, groundwater, and vegetation samples will be analyzed for PFAS and soil and crop health.	Yes

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?

This project will support the long-term implementation goals of Minnesota to ensure appropriate disposal of wastes in Minnesota and to safeguard drinking water for current and future needs. This is a one-time funding request and no additional future support is envisioned. The MPCA will use this information, in close collaboration with regulated parties, to develop permitting and policy decisions that protect human health and the environment from PFAS.

Project Manager and Organization Qualifications

Project Manager Name: Summer Streets

Job Title: Research Scientist

Provide description of the project manager's qualifications to manage the proposed project.

Summer Streets is a research scientist in the Environmental Analysis and Outcomes Division of the Minnesota Pollution Control Agency. She will be lead technical administrator for the project with responsibility for MPCA's portion of the study and overseeing management, project reporting, and contracting. Since 2008, Summer has successfully developed and conducted several complex studies on environmental contamination of PFAS in Minnesota. Staff in the Environmental Analysis and Outcomes Division have extensive experience studying environmental contamination, and managing large project budgets, including LCCMR-funded projects.

Organization: Minnesota Pollution Control Agency

Organization Description:

The Minnesota Pollution Control Agency (MPCA) monitors environmental quality, offers technical and financial assistance, and enforces environmental regulations. The agency finds and cleans up spills or leaks that can affect our health and environment. Staff develop statewide policy, and support environmental education.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount
Personnel								
							Sub Total	**-**
Contracts and Services								
University of Minnesota - Twin Cities	Professional or Technical Service Contract	A two-year controlled field plot study to evaluate leaching of PFAS from land-applied biosolids in typical Minnesota field conditions. In both years, multiple soil, groundwater, and vegetation samples will be analyzed for PFAS and soil and crop health.				0		$350,000
Texas Tech University	Professional or Technical Service Contract	Laboratory investigation of PFAS fate and transport mechanisms to evaluate leaching of PFAS from land-applied biosolids and other wastes into the environment. A standardized soil leaching method will be established for comparison of PFAS leaching between sites and waste types.Up to 325 novel PFAS will be identified.				0		$350,000
TBD	Professional or Technical Service Contract	The Request for Proposals (RFP) will encourage the state and national design community to apply for funds to complete an analysis of PFAS treatment and destruction options.				-		$300,000
SGS Axys Analytical Services, Ltd.	Professional or Technical Service Contract	Analysis of 32 PFAS compounds and their breakdown products in biosolids, ash, landfill leachate, compost, soil, water, and crops, to understand occurrence of PFAS in these wastes so that risk associated with land application can be characterized.				0		$350,000
							Sub Total	**$1,350,000**
Equipment, Tools, and Supplies								
	Tools and Supplies	Personal protection equipment	Some sampling requires contact with biosolids that may contain low levels of viruses. PPE including masks, gloves, goggles, boots, and coveralls will be					$5,000

			worn by samplers when coming into contact with biosolids.					
	Tools and Supplies	General sampling equipment and disposables including sample bottles, gloves, solvents, tubing, and other small sampling equipment as needed.	Basic sampling equipment needed to properly collect field samples following all QA/QC and personal safety protocol.					$10,000
							Sub Total	**$15,000**
Capital Expenditures								
							Sub Total	**-**
Acquisitions and Stewardship								
							Sub Total	**-**
Travel In Minnesota								
	Miles/ Meals/ Lodging	Travel to sampling location	Approximately 12 sampling trips in state by car, per Commissioner's plan.					$2,000
	Conference Registration Miles/ Meals/ Lodging	Conference presentation	Two MPCA staff presenting at up to two in-state conferences, each. All expenses per Commissioner's plan.					$3,000
							Sub Total	**$5,000**
Travel Outside Minnesota								
							Sub Total	**-**
Printing and Publication								
							Sub Total	**-**
Other Expenses								
							Sub Total	**-**
							Grand Total	**$1,370,000**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request

Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
State				
In-Kind	TBD	University of Minnesota overhead	Pending	$182,000
In-Kind	TBD	MPCA staff time equivalent to one FTE per study year.	Secured	$360,000
			State Sub Total	**$542,000**
Non-State				
			Non State Sub Total	**-**
			Funds Total	**$542,000**

Attachments

Required Attachments

Visual Component

File: 3cf35412-058.pdf

Alternate Text for Visual Component

PFAS containing wastes are sent to wastewater treatment plants, landfills, and compost facilities. Each of these waste conveyances produces its own solid or liquid waste that is often land applied (e.g., biosolids, leachate, compost and compost contact water, respectively). Land-applied wastes are often applied to fields where crops are grown for livestock feed. PFAS can be taken up by crops grown on these fields, and PFAS can move into groundwater and surface water following land application. In this study, we will measure a suite of PFAS in land-applied wastes, crops grown on field where these wastes are applied, and groundwater. We will also conduct lab and controlled field studies to help us understand how PFAS move in the environment so we can develop best management practices for waste managers.

Optional Attachments

Support Letter or Other

Title	File
Letter of Support from MCES	1da1f538-e29.pdf

Administrative Use

Does your project include restoration or acquisition of land rights?

No

Does your project have patent, royalties, or revenue potential?

No

Does your project include research?

Yes

Does the organization have a fiscal agent for this project?

No

Project 098-B: Developing strategies to manage PFAS in land-applied biosolids