**PROJECT TITLE: Developing strategies to manage PFAS in land-applied biosolids**

**I. PROJECT STATEMENT**

**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.**

Environmental contamination of PFAS is a widespread issue of global 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.

Waste managers in Minnesota are already facing urgent concerns related to disposal of PFAS-contaminated wastes. They need tools to evaluate and manage PFAS in their land-applied waste streams. This project will focus on developing cost-effective, real world approaches for prevention, treatment, and disposal of PFAS-contaminated land-applied wastes.

The goals of this study are to:

1. Analyze alternative disposal and treatment options and develop tools for managing PFAS-contaminated waste streams.
2. Evaluate and characterize PFAS concentrations in land-applied biosolids; leaching from those wastes; and subsequent movement of PFAS into water and food.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1 Title: Developing PFAS management solutions for biosolids, landfills and compost**

**Description:** We will identify real world, practical PFAS management solutions including pollution prevention, treatment, and disposal options that can be applied statewide. Engineering consultants with real world design experience will perform this work and will be selected through a competitive request for proposals (RFP).

**ENTRF BUDGET: $300,000**

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| **Outcome** | **Completion Date** |
| *1.* MPCA completes administration of competitive RFP to identify project consultant | March 2021 |
| *2.* Deliverable of best management practices report to MPCA | June 30, 2023 |

**Activity 2 Title: Quantitative analysis of PFAS in land-applied wastes and relevant media**

**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.

**ENTRF BUDGET: $346,805**

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| **Outcome** | **Completion Date** |
| 1. Collect and analyze samples of land-applied biosolids for PFAS | June 30, 2023 |
| 2. Collect and analyze environmental samples | June 30, 2023 |
| 3. Perform total oxidizable PFAS precursor analysis in soil  | June 30, 2023 |

**Activity 3 Title: Laboratory investigation of PFAS fate and transport, and identification of 325 novel PFAS compounds in relevant media**

**Description:** 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. Non-targeted analytical techniques will be used to identify 325 novel PFAS compounds.

**ENTRF BUDGET: $341,751**

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| **Outcome** | **Completion Date** |
| 1. Laboratory leaching study | Dec. 31, 2021 |
| 2. Novel PFAS analysis | June 30, 2023 |

**Activity 4 Title: Controlled plot study to evaluate leaching of PFAS**

**Description:** 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.

**ENTRF BUDGET: $350,000**

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| **Outcome** | **Completion Date** |
| 1. Develop plan for controlled plot study prior to first summer growing season | March 2021 |
| 2. Two years of controlled plot studies | June 30, 2023 |

**III. PROJECT PARTNERS AND COLLABORATORS:**

1. **Partners receiving ENRTF funding**

**Activity 1:** Minnesota-based consulting firm selected by competitive RFP.

**Activity 2:** SGS Axys Analytical Services is currently under state contract. This lab has been used by the state for over a decade and delivers high quality, dependable results.

**Activity 3:** Dr. Jennifer Guelfo at Texas Tech University is the leading expert in PFAS leaching from soils. She has PFAS measurement capabilities that are not possible in Minnesota without $1 million in new instrumentation.

**Activity 4:** Dr. Carl Rosen at the University of Minnesota has extensive experience in conducting controlled plot studies to evaluate crop agronomics.

**B. Partners NOT receiving ENRTF funding**

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| Name |  |  | Role |
| Municipalites,County Governments and EPA |  | Project partners |

**IV. LONG-TERM IMPLEMENTATION AND FUNDING:**

This project will develop pollution prevention, treatment, and disposal options that can be applied statewide. Long-term implementation of these strategies will safeguard drinking water and food supplies for current and future needs. This is a one-time funding request and no additional future support is envisioned.