

**Environment and Natural Resources Trust Fund  
2017 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 010-A**

Contaminants in Urban Soils: Understanding the Urban Environment

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**Category:** A. Foundational Natural Resource Data and Information

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**Total Project Budget:** \$ 1,000,000

**Proposed Project Time Period for the Funding Requested:** 4 Years, July 2017 - June 2021

**Summary:**

Urban soil chemistry profiles of ambient concentrations of chemicals of concern will be established. These will provide valuable tools to stakeholders striving to maintain the environmental health of their communities.

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**Sponsoring Organization:** U. S. Geological Survey

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**Location**

**Region:** Statewide

**County Name:** Statewide

**City / Township:**

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**Alternate Text for Visual:**

Human activities in urban areas may cause soil contamination. Understanding ambient concentrations of chemicals of concern in urban soils is critical to ensuring contaminated sites are remediated to levels that promote environmental and human health.

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



**PROJECT TITLE: Contaminants in urban soils: Understanding the urban environment**

**I. PROJECT STATEMENT**

This study will fill a critical knowledge gap by developing urban soil chemistry profiles for chemicals of concern (e.g. select organic and inorganic chemicals). These soil chemistry profiles will be used for ensuring the integrity and health of the urban environment. The work will include:

- Obtaining and analyzing soil samples from locations in different urban land use settings (e.g, industrial and residential),
- Developing a new urban soil chemistry profile, and
- Providing the urban soil chemistry profile to interested stakeholders and agency staff for further analysis outside of this proposal.

Urban soils are often contaminated by past activities posing environmental or human health risks. In some cases, contaminated soils are required to be remediated if they pose a potential environmental or human health risk. Soil reference values and background threshold values are important tools used to ensure contaminated sites are cleaned up to sufficient levels to promote human and environmental health.

During MPCA’s recent revision of soil reference values, it was determined that several contaminants have calculated soil reference values below natural soil background concentrations. Therefore, background threshold values, representing natural background concentrations, were derived using existing Minnesota natural soil background studies. During the soil reference value stakeholder input periods, stakeholders commented that background threshold values based on **natural background conditions are likely lower than existing ambient urban soil conditions**. However, there is insufficient data available to determine ambient background concentrations of the contaminants of concern in urban areas across Minnesota.

The urban soil chemistry profile developed in this study would provide MPCA staff with representative ambient concentrations for contaminants of concern in common urban land use settings. Ambient urban soil concentrations would later be used by MPCA, MDH and MDA agency staff to determine whether remediation of soil is required at Brownfield sites across the state. **The new urban soil chemistry profile will provide stakeholders with accurate urban soil background chemistry data to provide a better understanding of the environmental health of Minnesota’s urban soils.**

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1:** *Create database of existing urban soil chemistry data.*

**Budget: \$227,000**

Compile existing soil chemistry data into one database, which will be made available to the public. Existing soil chemistry data will be evaluated for applicability in describing ambient urban soil chemistry conditions for chemicals of concern. This database will be necessary to identify data gaps that can be fulfilled with the proposed project to create a more robust representation of urban soil chemistry profiles.

Outcome	Completion Date
1. <i>Compile and evaluate existing soil chemistry data provided by stakeholders</i>	<i>September 2018</i>
2. <i>Final report documenting robustness and applicability of existing soil chemistry data</i>	<i>June 2018</i>

**Activity 2:** *Collect and analyze urban soil samples.*

**Budget: \$526,000**

Collect and analyze soil samples from representative urban land use settings for laboratory analysis of organic and inorganic chemicals of concern.



**Environment and Natural Resources Trust Fund (ENRTF)**

**2017 Main Proposal**

**Project Title: Contaminants in urban soils: Understanding the urban environment**

<b>Outcome</b>	<b>Completion Date</b>
<i>1. Select sites, establish laboratory contract</i>	<i>June 2018</i>
<i>2. Obtain site access agreements for selected sites or alternate sites if access denied</i>	<i>September 2018</i>
<i>3. Collect soil samples from target sites/laboratory analysis for chemicals of concern</i>	<i>December 2018</i>

**Activity 3: Determine urban soil profile.**

**Budget: \$247,000**

Evaluate and analyze chemical data to describe typical urban soil profile.

<b>Outcome</b>	<b>Completion Date</b>
<i>1. Quality assurance/quality control evaluation of Activity 2 soil chemistry results and Activity 1 data compilation</i>	<i>December 2019</i>
<i>2. Conduct complete statistical analysis of soil chemistry results to develop soil chemistry profile (summary statistics and statistically significant differences) in soil chemistry concentrations in land use settings of interest</i>	<i>September 2020</i>
<i>4. Final report describing urban soil chemistry profiles.</i>	<i>July 2021</i>

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

Principal Investigators for this project are Sarah Elliott and Dr. Melinda Erickson, USGS, and Gary Krueger and Bonnie Brooks, MPCA. Overall project management, field activities, data analysis, and reporting will be provided by USGS. Additional USGS project personnel will include one hydrologic technician and one student employee. MPCA staff will identify sites for sampling, establish site access agreements, establish lab contract, and provide quality assurance/quality control evaluation of the chemical data. A contract lab will analyze soil samples. Additional project support will be provided by Minnesota Department of Health, Minnesota Department of Agriculture, University of Minnesota, Minnesota Geological Survey, and Minnesota Brownfields.

The MPCA will provide \$90,000 and USGS \$45,000 for the project to pay USGS indirect costs not covered by the ENRTF request. Additional in-kind support will be provided by the MPCA Brownfields Program and other staff. In-kind activities include assistance with gaining access to sample sites, coordinating efforts with stakeholders, and quality review of laboratory data. Minnesota Department of Health, Minnesota Department of Agriculture, University of Minnesota, Minnesota Geological Survey, and Minnesota Brownfields will also provide in-kind support assisting with site selection, development of sampling strategy, and data evaluation.

**B. Project Impact and Long-Term Strategy**

The new soil chemistry information will be applicable to urban areas across the State of Minnesota. The soil chemistry profiles will be invaluable to urban areas striving to maintain the environmental health of their cities. The information provided by this project will promote proper remediation of contaminated soils resulting in long-term impacts to the environmental and public health of urban communities.

**C. Timeline Requirements**

The project will be completed in 4 years. To fully take advantage of existing data, the first year of the project is largely dedicated to compiling and evaluating that data. Because the sources of those data will vary, detailed evaluation of those data will be required to determine the quality, applicability, and comparability of the data.

## 2017 Detailed Project Budget

**Project Title:** Contaminants in urban soils: Understanding the urban environment

### IV. TOTAL ENRTF REQUEST BUDGET 4 years

<b>BUDGET ITEM</b>	<b>AMOUNT</b>
<b>USGS Personnel:</b> Hydrologist/Project Manager (Sarah Elliott) (71% salary, 29% benefits) 30% FTE for 4 years. Manages, conducts, and supervises project including participating in stakeholder meetings, data analysis, publication writing.	\$ 150,000
<b>USGS Personnel:</b> Hydrologist (Melinda Erickson) (73% salary, 27% benefits) 20% FTE for 4 years. Conducts QA, analyzes data, leads publication writing, attends stakeholder meetings.	\$ 122,500
<b>USGS Personnel:</b> Hydrologic Technician (TBD) (74% salary, 26% benefits) 30% FTE for one year. Conducts sample collection and field activities.	\$ 50,000
<b>USGS Personnel:</b> Student or recent graduate employee (TBD): (81% salary, 19% benefits) 20% FTE for 4 years. Assists in GIS, data collection and field activities.	\$ 30,000
<b>USGS Personnel:</b> Studies Program Manager (TBD) (72% salary, 28% benefits) 5% FTE for 4 years. Project supervision, staff and other resource scheduling, quality control and technical support.	\$ 30,000
<b>USGS Personnel:</b> Administrative Assistant (69% salary, 31% benefits) Two people at 5% FTE for 4 years. Provide administrative support for funding agreements, cost accounting,	\$ 15,000
<b>USGS Personnel:</b> Groundwater, Water Quality, and GIS Technical Specialists (79% salary, 21% benefits). Three people each at 2% FTE for 4 years. Provides quality control, technical advice, report review and proposal reviews to ensure USGS technical standards	\$ 12,500
<b>USGS Personnel:</b> Database and IT support (73% salary, 27% benefits). Two individuals each at 4% FTE for 4 years. Provides database and Information Technology support to meet USGS standards and requirements	\$ 23,500
<b>Professional/Technical/Service Contracts</b> MPCA Personnel, Project Manager (Gary Krueger), Research Scientist (Bonnie Brooks), Research Scientist/Hydrologist (TBD) (75% salary, 25% fringe): Project management, including USGS Joint Funding Agreement and laboratory contract management. Coordination of stakeholder group. Coordination of electronic data into MPCA databases and data QA/QC. Establish site access agreements. This contract would be a direct appropriation to MPCA. 50% time for 4 years.	\$ 300,000
<b>Professional/Technical/Service Contracts</b> Contract laboratory for analysis of soil samples and quality control samples for broad suite of chemicals of concern at a cost of approximately \$1700 per sample for approximately 125 samples. This contract would be a direct appropriation to MPCA to manage.	\$ 250,000
<b>Professional/Technical/Service Contracts</b> USGS contract fee for USGS report preparation, editing and production (Science Publishing Network). This includes electronic publishing and distribution of report products.	\$ 10,000
<b>Equipment/Tools/Supplies</b> USGS field supplies and equipment for collecting soil samples from urban locations.	\$ 1,500
<b>Acquisition (Fee Title or Permanent Easements):</b>	NA
<b>Travel:</b> USGS personnel 6 weeks of travel (vehicle usage) to urban locations in Minnesota to collect soil samples. One week of travel to project, stakeholder, and scientific meetings within Minnesota, which may include overnight travel.	\$ 3,000
<b>Additional Budget Items:</b> Overnight shipping of soil samples from approximately 100 urban sample locations to contract laboratory location TBD.	\$ 2,000
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 1,000,000</b>

### V. OTHER FUNDS

<b>SOURCE OF FUNDS</b>	<b>AMOUNT</b>	<b>Status</b>
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b> USGS cooperative matching funds. Federal funds will cover a portion of USGS facility and other indirect costs not covered by ENRTF request, and travel to out-of-state scientific conference(s) to present study results.	\$ 45,000	<i>Pending</i>
<b>Other State \$ To Be Applied To Project During Project Period:</b> MPCA funding for USGS Joint Funding Agreement, in support of a portion of USGS facility and other indirect costs not covered by ENRTF request.	\$ 90,000	<i>Pending</i>
<b>In-kind Services To Be Applied To Project During Project Period:</b> MPCA, MDH, MDA staff time in support of project activities. MPCA waiver of agency overhead for ENRTF	\$ 200,000	<i>Pending</i>
<b>Funding History:</b> None	NA	
<b>Remaining \$ From Current ENRTF Appropriation:</b> None.	NA	

# Contaminants in urban soils: Understanding the urban environment

## Soil Sampling



## Laboratory Analysis



## Soil Chemical Profiles

Top5_LabID	Top5_Al	Top5_As
	wt. %	mg/kg
C-338081	4.97	6
C-338082	4.31	5.1
C-338083	0.29	6.9
C-338084	4.13	4.5
C-338086	3.37	1.7
C-338087	5.24	5.9
C-338088	4.17	2.7
C-338089	4.56	4.9
C-338090	5.35	3.1
C-338092	4.12	2
C-338093	5.04	7.2
C-338094	4.41	1.5
C-338095	4.39	2.6

## Clean Soils for Healthy Communities



Human activities in urban areas may cause soil contamination. Understanding ambient concentrations of chemicals of concern in urban soils is critical to ensuring contaminated sites are remediated to levels that promote environmental and human health.

Project Title: Contaminants in urban soils: Understanding the urban environment

**Project Manager Qualifications:**

**Sarah M. Elliott, Hydrologist, U.S. Geological Survey**

Education: **B.S.**, 2008, Environmental Science, Policy, & Management, University of Minnesota; **M.S.**, 2010, Water Resources Science, University of Minnesota

Employment: **Hydrologist**, 2009-Present, U.S. Geological Survey; **Water Quality Intern**, 2007, Minneapolis Park and Recreation Board

Research: Sarah's research focuses on the presence, distribution, and effects of organic contaminants in water, sediment, and soil. She has experience using several tools to assess the level of contaminants present in the environment and effects on aquatic biota and humans.

**Melinda L. Erickson, Hydrologist and Groundwater Specialist, U.S. Geological Survey**

Education: **B.S. cum laude**, 1990, Geological Engineering, University of Minnesota; **M.S.**, 1992, Civil Engineering, University of Minnesota; **Ph.D**, 2005, Water Resources Science, University of Minnesota

Employment: **Hydrologist and Groundwater Specialist**, 2009-Present, U.S. Geological Survey; **Adjunct Graduate Faculty**, Department of Bioproducts and Biosystems Engineering and Water Resources Science Graduate Degree Program; **Environmental Research Scientist**, 2006-2009, Minnesota Pollution Control Agency; **Hydrologist**, 1998-2000, Minnesota Department of Health; **Project Manager/Project Engineer**, 1993-1997, RETEC

Research: Dr. Erickson is a recognized regional expert in the area of geochemistry, fate, and transport of metals (e.g., arsenic, iron, manganese) and organic chemicals (e.g. petroleum fuels, endocrine active chemicals, and pharmaceuticals) in the upper Midwest environment.

**Organization Description:**

The U.S. Geological Survey serves the Nation by providing reliable scientific information to: describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.