



# Environment and Natural Resources Trust Fund

## 2023 Request for Proposal

### General Information

**Proposal ID:** 2023-238

**Proposal Title:** Leveraging Innovations in Data Analytics for Project Implementation

### Project Manager Information

**Name:** Brian Beck

**Organization:** Minnehaha Creek Watershed District

**Office Telephone:** (952) 471-8306

**Email:** bbeck@minnehahacreek.org

### Project Basic Information

**Project Summary:** Integrating local and statewide datasets into a 21st-century planning tool, widely called for by our communities, that forecasts the impacts of changing precipitation patterns and quantitatively compares cost-effective solutions.

**Funds Requested:** \$738,000

**Proposed Project Completion:** December 31, 2024

**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?**

Region(s): Metro

**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.**

Water systems throughout Minnesota were built for stable climate patterns that no longer exist. Extreme swings in precipitation are stressing our natural and built environments, impacting pollutant loading, stream erosion, wetland function, surface and groundwater interactions, habitat, and the safety of homes, public infrastructure, and businesses.

Watershed managers must help communities understand and adapt to these changes. However, the ability to do so is hampered by sparse and static historic data sets, which make it difficult to predict how specific areas will be impacted and quantitatively compare potential solutions.

Fortunately, advances in data science have made it affordable to collect exponentially more data and analyze it in more sophisticated ways. These advances allow water planners around the world to understand and predict changes with unprecedented accuracy and detail, allowing for more effective use of scarce public investment to address these issues. In Minnesota, data collection has outpaced the tools used to make sense of the information. Realizing the full potential of these advances requires new systems to integrate this data to identify existing issues, forecast future ones, and guide local decisions.

**What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.**

In partnership with the DNR, USGS, and Hennepin County, and with formal support from 14 federal, state, and regional agencies and local communities, the Minnehaha Creek Watershed District (MCWD) is proposing a pioneering program to maximize the value of recent public investments in data collection.

For example, MCWD has created a remote sensing network that collects more than 1 million data points per year about surface water levels, shallow groundwater levels, and pollutant loading. State leaders have invested in mapping the detailed topography of the state. Municipal partners have digitized data about their storm sewer systems.

MCWD wants to partner with LCCMR to develop a reproducible process that brings these disparate data sets together into a quantitative planning tool. Using advances in 2-dimensional modeling, these tools will be able to pinpoint, quantitatively evaluate and drive decisions on climate adaptation projects and policies.

Such a tool will be critical to the climate adaptation planning efforts as watershed managers and communities begin to understand the impact of changing precipitation patterns on our built and natural systems. The result will be more effective green and gray infrastructure solutions that protect and conserve the watershed's iconic water resources.

**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?**

- A single, continuously-updated tool that integrates previously-siloed public data sets to quantitatively compare proposed natural resource projects
- A high-resolution understanding of the balance of all surface and groundwater inputs and outputs in the system, to identify natural resources and public assets in need of protection
- Improved ability to predict the impact of changes in precipitation and land use, to enhance infrastructure planning
- Improved ability to quantify and compare the cost-effectiveness of potential conservation projects needed to address predicted impacts



## Activities and Milestones

### Activity 1: Building the External Data Information Processing System

**Activity Budget:** \$361,000

**Activity Description:**

Because land use and stormwater infrastructure are constantly changing, watershed managers face the recurring challenge of using tools that are not based on up-to-date information. Historically, the process of updating watershed models has been a time-intensive endeavor because all data collection and processing has been done manually. However, recent advances in data science have resulted in frameworks that automate complex data processing, which will dramatically reduce the cost of future model updates for MCWD and other public agencies throughout the state that could use this process as a template for enhancing and automating their own watershed model development.

MCWD will develop a reproducible data processing system that can incorporate publicly available datasets into a watershed modeling framework. Then, MCWD will work with technical experts to plan and build a GIS system that automatically updates based on changing landuse and infrastructure datasets to ensure the watershed model used for natural resource project identification is using the most current landscape and infrastructure information.

In addition, MCWD will use this automated process to identify and fill critical data gaps such as wetland volumes, stream channel surveys, and bridge surveys to improve the accuracy of the watershed planning tool.

**Activity Milestones:**

Description	Completion Date
Develop Automated Intake Processing System for Municipal Stormsewer Data	December 31, 2023
Collect Wetland, Channel, and Bridge Data for Model	June 30, 2024

### Activity 2: Building the 2D Watershed Model for Natural Resource Climate Adaptation Planning

**Activity Budget:** \$377,000

**Activity Description:**

MCWD will incorporate the data produced from the automated processing system developed in activity 1 into a high-resolution watershed model that can predict, in unprecedented detail, how water and pollutants will move through the system under current and predicted scenarios. The outcome from building the watershed model will be a tool that can help watershed managers meet their water quality, water quantity, and ecologic improvement goals.

Building this model will involve an iterative process to ensure that the automated processes developed in activity 1 can be incorporated into a high-resolution watershed planning tool. In addition, the consultant will use streamflow data collected by MCWD staff to calibrate the model to ensure it can accurately predict how water moves through the built and natural environment.

MCWD and the consultant will meet with local municipalities and engineers to communicate the use cases for the model to ensure it can be used by other entities to identify water quality, natural resource, and flood reduction projects.

**Activity Milestones:**

Description	Completion Date
Build and Calibrate Two Dimensional Watershed Hydrology and Hydraulics Model	November 30, 2024
Write Technical Report for Two Dimensional Watershed Model	December 31, 2024



## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Tim Cowdery	U.S. Geological Survey	Assist with identifying groundwater well monitoring locations, conducting groundwater data analysis, suggesting methods for incorporating groundwater data into the 2D model, and providing oversight on 2D model build.	No
Dan Lais	Minnesota Department of Natural Resources	Collect and analyze additional groundwater and surface water interactions to integrate this data, along with other datasets, into the development of a high-resolution two-dimensional (2D) watershed model.	No
John Evans	Hennepin County	Hennepin County will assist with data collection, assessing climate impacts, and providing input on the tools needed to effectively plan and adapt to changing hydrology, in partnership with our communities.	No

## 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 work be funded?**

This project will yield a sophisticated tool, drawing on state of the art data analytics, to enhance MCWD's organizational ability to partner with its member communities to identify, evaluate, and implement natural resource capital improvement projects that improve water quality, control water quantity, improve ecological integrity, and reduce flooding in the face of a changing climate. The products of LCCMR's investment are expected to help MCWD and its partners populate, focus, and prioritize capital improvement plans that will be funded locally. The long-term sustainment costs for maintaining the watershed tools will be borne by MCWD.

## Project Manager and Organization Qualifications

**Project Manager Name:** Brian Beck

**Job Title:** Research and Monitoring Program Manager

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

Education:

M.S. 2012 University of Minnesota-Duluth (Water Resources Science)

B.S. 2008 University of Minnesota Twin Cities (Environmental Science with emphasis on aquatic chemistry)

Mr. Beck is a water resource scientist with 11 years of experience quantifying the impact of landscape change on water quality and quantity at a municipal, watershed, and statewide scale. The focus of his academic and professional career has been obtaining data from disparate sources for data analysis and building quantitative tools to develop insights about complex aquatic systems. Mr. Beck's professional career in the private and public sector has been built upon developing deterministic and empirical water quality models such as P8, GWLF, HSPF, SWAT, PONDNET, CEQUAL, BATHTUB, and GLM to inform management decisions of water quality, water quantity, and ecological integrity.

Mr. Beck will oversee the development of the watershed-wide two dimensional (2D) model. He has extensive experience developing quantitative water quality models for cities, watershed districts, and the State of Minnesota for feasibility studies, watershed diagnostic assessments, and regional Total Daily Maximum Load studies. His blend of technical expertise in watershed modeling and understanding of local government will allow him to facilitate the interaction between watershed managers and technical consultants to ensure that the model is technically sound and can be used to inform watershed management decisions.

**Organization:** Minnehaha Creek Watershed District

**Organization Description:**

Minnehaha Creek Watershed District is a local unit of government responsible for managing and protecting the water resources in one of the largest and most heavily-used urban watersheds in Minnesota. MCWD's legal boundary encompasses about 178 square miles within the western Twin Cities metropolitan area and includes 29 communities. Of this area, about 148 square miles lie within Hennepin County and about 30 square miles lie within Carver County. To manage water resources and ecological integrity in this large area, MCWD has prioritized the need to bridge the governance gap between land use and water resource planning to achieve its goals of improving water quality, water quantity, ecological integrity, and thriving communities. MCWD's approach to bridging this gap is to understand the goals of others; apply sound science to creative solutions; and align investments, technical expertise, streamlined permitting, and collaborative planning.

## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
							Sub Total	-
<b>Contracts and Services</b>								
TBD through competitive bid	Professional or Technical Service Contract	The consulting engineer will provide technical support for data processing and model development.				2.44		\$738,000
							Sub Total	\$738,000
<b>Equipment, Tools, and Supplies</b>								
							Sub Total	-
<b>Capital Expenditures</b>								
							Sub Total	-
<b>Acquisitions and Stewardship</b>								
							Sub Total	-
<b>Travel In Minnesota</b>								
							Sub Total	-
<b>Travel Outside Minnesota</b>								
							Sub Total	-
<b>Printing and Publication</b>								

							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$738,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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## Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
<b>State</b>				
			<b>State Sub Total</b>	-
<b>Non-State</b>				
In-Kind	Minnehaha Creek Watershed District Tax Levy	Minnehaha Creek Watershed District staff will be contributing a total of 3790 hours of in-kind support for the project.	Secured	\$203,100
Cash	Minnehaha Creek Watershed District Tax Levy	MCWD will contract with the USGS to oversee the selection of groundwater sensor monitoring locations and the development of the 2D watershed model	Secured	\$10,000
			<b>Non State Sub Total</b>	<b>\$213,100</b>
			<b>Funds Total</b>	<b>\$213,100</b>

## Attachments

### Required Attachments

#### *Visual Component*

File: [61f1f181-ad1.pdf](#)

#### *Alternate Text for Visual Component*

The attached graphic demonstrates how the proposed tools will convert a variety of disparate data sources into usable information to inform natural resource management decisions. It demonstrates how data sources about our built and natural environment – soils, topography, wetlands, hydrology, groundwater, precipitation, land cover, future land use, and storm sewer — will be integrated into a 2-dimensional model that will predict how water moves through the landscape under a variety of scenari...

#### *Board Resolution or Letter*

Title	File
MCWD Board Resolution Placeholder for LCCMR Application	<a href="#">4e409351-013.pdf</a>

### Optional Attachments

#### *Support Letter or Other*

Title	File
USGS Letter of Support	<a href="#">de56a77b-280.pdf</a>
MN DNR Letter of Support	<a href="#">2f72934d-205.pdf</a>
Met Council Letter of Support	<a href="#">b0553570-10b.pdf</a>
Minnesota Cities Stormwater Coalition Letter of Support	<a href="#">69c682c6-fb2.pdf</a>
Hennepin County Letter of Support	<a href="#">306c750a-ab4.pdf</a>
EQB Letter of Support	<a href="#">da7c900a-a25.pdf</a>
Minneapolis Park and Recreation Board Letter of Support	<a href="#">0d2f38c5-2d0.pdf</a>
City of Edina Letter of Support	<a href="#">c31c2f7f-880.pdf</a>
City of Minneapolis Letter of Support	<a href="#">b03378ab-d1d.pdf</a>
City of Minnetonka Letter of Support	<a href="#">08497ccb-20c.pdf</a>
City of Mound Letter of Support	<a href="#">667fb967-295.pdf</a>
City of St. Louis Park Letter of Support	<a href="#">35e72525-f56.pdf</a>
City of Victoria Letter of Support	<a href="#">8164d10e-d55.pdf</a>
City of Wayzata Letter of Support	<a href="#">10977cbe-a91.pdf</a>

## Administrative Use

**Does your project include restoration or acquisition of land rights?**

No

**Does your project have potential for royalties, copyrights, patents, or sale of products and assets?**

Yes

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**

Yes

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**

No

**Does your project include original, hypothesis-driven research?**

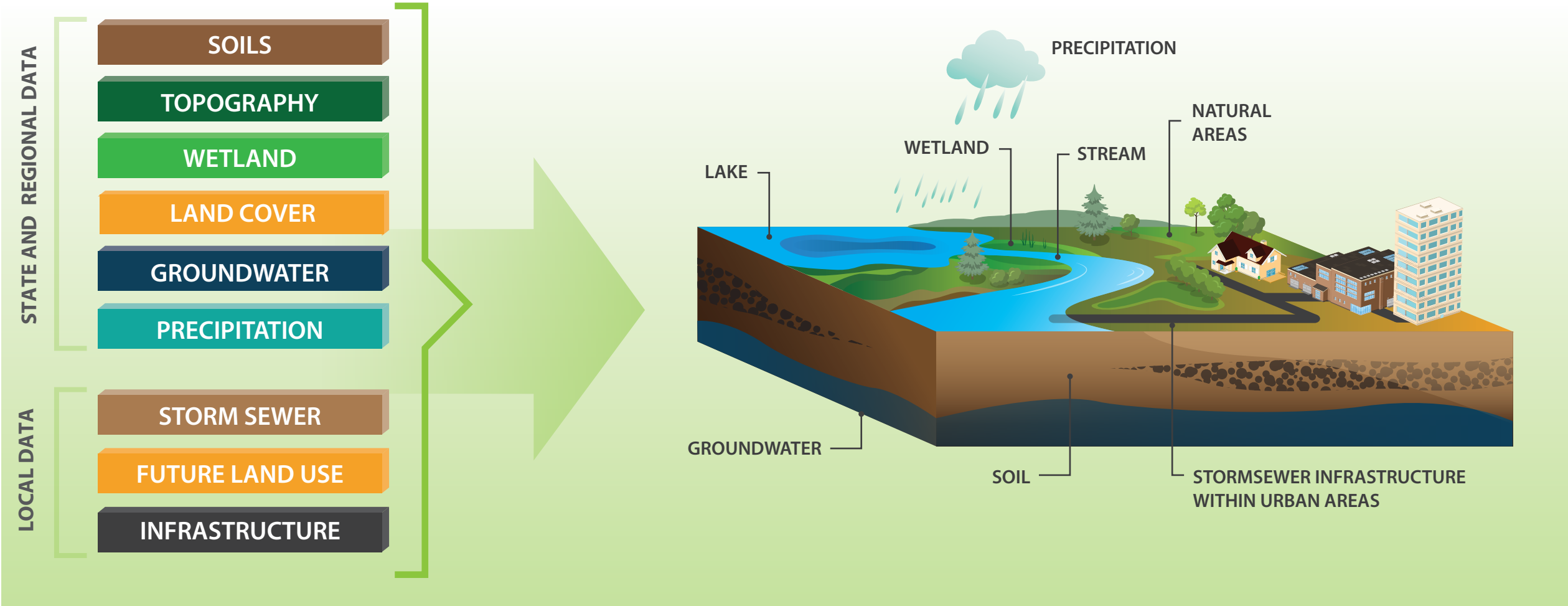
No

**Does the organization have a fiscal agent for this project?**

No

# Leveraging Innovations in Data Analytics for Project Implementation (Project #2023-238)

Summary: Integrating newly-available datasets into a 21st-century planning tool, widely called for by our communities, that forecasts the impacts of changing precipitation patterns and quantitatively compares the most cost-effective solutions.



## OUTPUTS

High-resolution understanding of complex watershed

Predict impact of changing climate

Identify natural resources most in need of protection

Quantitatively compare proposed projects

Improve flood forecasting and emergency response

4  
Partners

14  
Letters of Support

