



Environment and Natural Resources Trust Fund

2024 Request for Proposal

General Information

Proposal ID: 2024-211

Proposal Title: Open Living Database for Stormwater Costs and Benefits

Project Manager Information

Name: Nigel Pickering

Organization: Geosyntec Consultants, Inc.

Office Telephone: (612) 253-8214

Email: npickering@geosyntec.com

Project Basic Information

Project Summary: This project will collect data and create an open living database for stormwater treatment costs and benefits. The database will be easily accessible, inflation adjusted, and support future plug-in tools.

Funds Requested: \$300,000

Proposed Project Completion: June 30, 2026

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

Narrative

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

This project will address the issue of sparse regional data and poor access to available data for cost-effective stormwater treatment and maintenance. Contamination of downstream waters by stormwater runoff is a difficult and expensive problem to solve, so tools are needed to help decrease costs and increase effectiveness. Despite remediation and research efforts funded by the Minnesota Clean Water Fund (CWF) and the Minnesota Stormwater Research Council (MSRC), contamination of downstream waters by stormwater continues to plague the State.

Stormwater practitioners use Best Management Practices (BMPs) to treat stormwater contamination to an acceptable level. Cost effectiveness is frequently an important consideration for selecting BMP alternatives, but often they rely on outdated cost information to make their choices. Many cost estimates of stormwater BMPs have been developed nationally over several decades, but stormwater BMP costs for Minnesota were only updated last in 2007.

BMP co-benefits also need to be incorporated into the decision-making process. The recent CLASIC system includes both national costs and co-benefit data, however, CLASIC is not customized to Minnesota and does not fully represent regional differences in the State.

Better data means better planning, choices based on benefit/cost analysis, and better use of state and federal funds.

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.

This proposed project will collect and store current stormwater BMP costs for Minnesotan stormwater permittees and practitioners. The approach for this project will cover both pre-treatment and primary BMPs used in Minnesota. Our technical advisory committee will include Saint Anthony Falls Laboratory, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, watershed districts, and municipal stormwater permittees.

Collation of costs is a time intensive task that will involve scouring existing local reports and querying stormwater permittees and state agencies. Based on a review of past local and national work on costs and benefits, we will then design a standardized database and data entry approach that will accurately record BMP cost, maintenance costs and site characteristics. Our sampling design and online data entry platform should enable us to accurately collect cost data for at least 50 BMPs.

All data will be normalized by scaling metrics like cost per cubic foot or cost per unit area. We will use the Bureau of Labor Statistics to adjust for inflation costs. We will also customize the CLASIC approach on BMP benefits to better suit Minnesotan BMPs and conditions. Finally, we will develop one example online tool for life-cycle analysis of costs and benefits.

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 compile new data for stormwater costs and benefits into a living database, produce an open system to access the data, and develop an online application for evaluating lifecycle costs. The project will provide a solid backbone for future BMP cost/benefit work in Minnesota. Stormwater practitioners will use the data to estimate the total annual watershed restoration costs and benefits to meet a water quality or flood reduction target. Better access to cost and benefit data means more cost-effective and beneficial choices for stormwater permittees, better use of state/federal funds, and cleaner waters of the State.

Activities and Milestones

Activity 1: Database Design and Online Entry Form

Activity Budget: \$73,500

Activity Description:

With help from the Technical Advisory Committee (TAC), our team will prioritize and document all possible use cases for BMP cost data. The team will then research existing tools and cost databases and synthesize best practices and lessons learned from previous work. This knowledge base will be used to develop a cost database schema that meets user data needs and is flexible and extensible. The data will be publicly available via a free public application programming interface (API) as well as bulk download via a public server.

Data input with all the required fields in the appropriate format can be a time sink. Web applications can make it easier for users to provide data in a streamlined format with error checking. We aim to develop a simple web interface that will provide easy, intuitive forms for data submission. We will allow direct upload of larger datasets via structured Excel files which can be filled by the user and uploaded as bulk inputs to database. The web application will be open source, hosted by Geosyntec for the duration of the project, and can be cloned and self-hosted by anyone. Data entry forms will be designed to support modern browsers only.

Activity Milestones:

Description	Approximate Completion Date
Database design document	October 31, 2024
Public code repository with database schema	December 31, 2024
Description of data entry platform, API, and user tools	December 31, 2024
Web application for data entry	March 31, 2025

Activity 2: Collection of Cost and Benefit Data

Activity Budget: \$99,000

Activity Description:

This task will commence with a simple Quality Assurance Project Plan (QAPP). The research team will collect and synthesize cost and benefit data, management protocols and best practices from existing tools, publications, and past work. Data verification scripts will be developed for preliminary screening, flagging of data, and generation of summary statistics.

For access to cost information, we will leverage our partnerships with the TAC and user groups to establish the best data sources. This will be a targeted effort prioritizing the most relevant BMPs in current stormwater manuals using trained field staff. All costs will be normalized by using scaling metrics like construction cost per design volume or maintenance cost per unit area. Data extraction, transformation, and loading (ETL) scripts will be developed to streamline data collection and minimize transcription errors.

For benefits information, we will synthesize benefit data from the CLASIC model and other sources such as publications and past work. We will leverage our national partnerships to establish best source of available stormwater benefit data and synthesize the data. All benefits will be normalized by various scaling metrics like benefits per volume or area.

Activity Milestones:

Description	Approximate Completion Date
Scripts used to populate the database	May 31, 2025
Database populated with available cost data	August 31, 2025
Synthesis of available of stormwater benefit data	September 30, 2025
Database populated with available benefit data	November 30, 2025

Activity 3: Develop Tools for Data Extraction, Visualization and Analysis

Activity Budget: \$37,500

Activity Description:

For this task, we will develop several basic tools. An inflation tool will allow adjustment of the base costs from time of occurrence to current values. A data extraction tool will simplify the process of querying the database to extract only the desired data. A data visualization tool will be developed to check data suitability and potential errors by visualizing the data with easily understandable charts (box plots, bar graphs, etc.) and summary tables. One client application will be developed as an example of a modular family of analysis tools built to interact with the cost database. The client application will be a stormwater cost estimation tool to calculate BMP and pre-treatment life-cycle costs. This tool will allow stormwater managers to make better long-term investments in stormwater infrastructure. The client application will be modular to illustrate the ability to easily add future tools. Tools will target modern browsers with specific software requirements and bound the scope of the functionality for the tools.

Activity Milestones:

Description	Approximate Completion Date
Web-based tools for data extraction; visualization/analysis; and cost/benefit estimation	February 28, 2026

Activity 4: Project Management, Outreach and Reporting

Activity Budget: \$90,000

Activity Description:

The team will establish a Technical Advisory Committee (TAC) with experts from Saint Anthony Falls Laboratory, Minnesota Pollution Control Agency (MPCA), Minnesota Department of Natural Resources, watershed districts, and municipal stormwater permittees. The TAC will meet every three months while the full project team will meet monthly.

Leveraging our existing relationships, we will establish user groups consisting of stakeholders and early adopters. User group participants will be assembled from cities, counties, watershed districts/organizations, non-profits, consultants and interested members of the public. Active user groups will champion the tool by spreading the word, potentially helping with testing, and assisting with feedback.

A draft and final report will provide documentation of the project and the user guide to clearly explain the database and tools. Following the completion of the final report, Geosyntec will develop draft and final training slides, then conduct one two-hour workshop (recorded) on the newly developed cost database and associated tools for Minnesota.

Geosyntec will provide periodic updates to the LCCMR as contracted. The updates will include documentation of the TAC meetings, status of the tasks, discussion of unexpected issues and resolutions, and any results to date.

Activity Milestones:

Description	Approximate Completion Date
Proposed TAC members finalized	August 31, 2024
Identify user group members	September 30, 2024
Final Report and User Guide	May 31, 2026
One two-hour training webinar	June 30, 2026

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Andy Erickson	University of Minnesota	Local Technical Advisor, TAC member, contacts with stormwater permittees	Yes
Joanne Boettcher	Minnesota Pollution Control Agency	TAC member, collaborator, contacts with stormwater permittees	No
Noah Czech	City of Saint Cloud	TAC member, collaborator, local stormwater treatment costs (see letter of recommendation from St Cloud)	No
Robert Fossum	Capitol Region Watershed District	TAC member, collaborator, regional stormwater treatment costs (see letter of recommendation from CRWD)	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?

Geosyntec will initially host the online database as part of the project but seek future funding from the MPCA for hosting and training. The LCCMR could provide funds for the development of enhancements or future plug-in tools.

The results of this project will be disseminated by: 1) interacting closely with practitioners in our TAC; presenting the results at conferences including the Minnesota Water Resources Conference, the Minnesota Watersheds Conference, the Water Environmental Foundation Stormwater Summit and the WEFTEC conference; and, participating in webinars like the Minnesota Stormwater Webinar, the Minnesota Water Resources Webinar, and WEF invited webinars.

Project Manager and Organization Qualifications

Project Manager Name: Nigel Pickering

Job Title: Senior Water Resources Engineer

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

Ph.D., Agricultural Engineering, Cornell University, Ithaca, New York, 1990
 M.S., Agricultural Engineering, Cornell University, Ithaca, New York, 1982
 B.S., Agricultural Engineering, University of Natal, South Africa 1977
 Professional Engineer, Florida (51473), Minnesota (59980), Oregon (100879)

Dr. Nigel Pickering is a Senior Water Resources Engineer with 30+ years of experience roughly split between the academic, nonprofit, and consulting arenas. His expertise includes agricultural water quality, crop modeling, watershed monitoring and modeling, water resources planning, and stormwater design and modeling. He is proficient with numerous crop, hydrology/hydraulic, and water quality models including HEC-RAS, HydroCAD, BathTub, HSPF, and SWMM. He was instrumental in creating an early cost database for stormwater treatment costs that allowed scaling of treatment costs for developments of different intensities. He has worked on over 50 projects, published over 30 papers and 50 reports, has made over 50 presentations, and holds one patent for a rainwater recovery system. Nigel has managed many large, long-term projects with full oversight from start to finish. Because of his well-rounded career, he can think creatively and holistically about solving water-related problems.

Organization: Geosyntec Consultants, Inc.

Organization Description:

Geosyntec is a scientific and engineering consulting firm that helps clients solve challenging issues involving the environment, natural resources, and civil infrastructure. With 1,800 employees, the company has 90 offices worldwide with a local office in Minneapolis. Geosyntec has built a team of nationally recognized technical experts, with 65% having advanced technical degrees and 20% holding doctoral degrees. Within Geosyntec, we have about 200 Water and Natural Resources practitioners specializing in watershed planning, lake/wetland management, stormwater management, water/water quality modeling and monitoring, dams and levees, brownfields restoration, civil site design, and water resources permitting.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
Nigel Pickering / Senior Water Resources Engineer		Project Manager / Geosyntec			35%	0.22		\$86,200
Daniel Pankani / Senior Programmer/Engineer		Project Programmer / Geosyntec			35%	0.2		\$81,188
Aaron Poresky / Principal		Project Analysis / Geosyntec			35%	0.08		\$31,368
Harsh Anurag / Senior Staff Professional		Programming Support / Geosyntec			35%	0.16		\$44,995
Lena Nyblade / Staff Professional		Data Analysis and Support / Geosyntec			35%	0.16		\$40,594
Andy Erickson / Research Manager		Local Liaison and Advisor / UMN			35%	0.06		\$15,000
							Sub Total	\$299,345
Contracts and Services								
							Sub Total	-
Equipment, Tools, and Supplies								
							Sub Total	-
Capital Expenditures								
							Sub Total	-
Acquisitions and Stewardship								
							Sub Total	-
Travel In Minnesota								
	Other	1000 mi @ 0.655/mi	Field visits to gather stormwater data from MS4 permittees					\$655
							Sub Total	\$655

Travel Outside Minnesota								
							Sub Total	-
Printing and Publication								
							Sub Total	-
Other Expenses								
							Sub Total	-
							Grand Total	\$300,000

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
State				
			State Sub Total	-
Non-State				
			Non State Sub Total	-
			Funds Total	-

Attachments

Required Attachments

Visual Component

File: [af985526-4c7.pdf](#)

Alternate Text for Visual Component

Relationship between the living stormwater database and available tools that will result in better decision making....

Optional Attachments

Support Letter, Photos, Media, Other

Title	File
Letter of Support - City of St Cloud	9b7227a6-ed6.pdf
Letter of Support - Capitol Region Watershed District	74654104-871.pdf
Letter of Approval - Geosyntec	721416ee-4b7.pdf

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?

No

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

N/A

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

N/A

Does your project include original, hypothesis-driven research?

Yes

Does the organization have a fiscal agent for this project?

No

Does your project include the design, construction, or renovation of a building, trail, campground, or other capital asset costing \$10,000 or more?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services, as defined in Minnesota Statutes section 299C.61 Subd.7?

No