



Title:	Awarding Contract for 2D Watershed Model for Climate Planning	
Resolution number:	24-012	
Prepared by:	Name: Brian Beck Phone: 952-471-8306 bbeck@minnehahacreek.org	
Reviewed by:	Name/Title: MCWD Legal Counsel	
Recommended action:	Authorize contract execution for consultant services to build a 2D Watershed Model to support climate planning	
Schedule:	2/22/24: Award Contract Early March: Project Kickoff May 2025: Project completion	
Budget considerations:	Fund name and Code: Research and Monitoring-LCCMR Grant 5-5008-4320 Fund budget: \$738,000 Expenditures to date: \$5,367.38 Requested amount of funding: disclosed under separate cover	
Past Board action:	Res # 23-055	Awarding Contract for Watershed-wide Model Input Refinement
	Res # 23-038	Authorization to Release RFP for Watershed-wide Model Input Refinement
	Res # 22-076	Authorization to Award Contract for Stormwater Infrastructure Data Standardization
	Res # 22-038	Authorization to Submit Proposal to LCCMR for Development of 2D Watershed Model
	Res # 21-091	Authorization to Execute Contract for 2D Pilot Model
	Res # 21-051	Authorization to Execute Memorandum of Understanding (MOU) with the City of Edina
	Res # 21-024	Authorization to Submit Proposal to LCCMR for Development of a 2D Watershed Model

Background:

Climate Context

Climate change is measurably changing the distribution, frequency, and intensity of rainfall in Minnesota. Between 2013 and 2019, the MCWD experienced the wettest seven years ever recorded. Over the past 10 years, Minnesota has experienced both record flood conditions and statewide drought that has negatively impacted aquatic ecology, stressed stormwater infrastructure, and cost billions in property damage. To successfully adapt to the increasingly volatile extremes in weather, MCWD and communities must be able to identify what landscape interventions are needed, where they are needed, and how much investment is needed.

The first stage of the MCWD's Climate Action Framework is to "Understand and Predict" the impacts of climate change using new data sets and modeling to forecast scenarios, evaluate vulnerabilities, and make decisions about adaptation

strategies. These data will create a foundation for MCWD to engage with partner agencies in climate conversations and develop actionable plans for resilience at a system and community scale.

Modeling Needs

One of MCWD's principles is to "Rely on sound science to make credible, result-based decisions, and build trust", which requires decisions to be evaluated through a quantitative lens. One of the most common ways MCWD quantitatively assesses project and policy decisions is using watershed models. The District relies on multiple models, all constructed and designed to serve unique needs and answer specific questions. One critical model to the District's operations is its watershed-wide Hydrology and Hydraulic XP-SWMM model (XP-SWMM), which was developed in 2003. It was designed to characterize the total volume and pollutant runoff from the landscape and understand the impact of runoff on receiving water bodies. Over the years, this model has served as the District's day-to-day operational model and has been used to estimate pollutant loading, conduct creek flood forecasting, support floodplain management, aid permitting assessments, and provide boundary conditions to District partners. These uses are still needed and continue to be met today by the XP-SWMM model. However, a series of new questions surrounding localized impacts of climate change and potential adaptation strategies has been asked in recent years by policy makers, partner agency staff, and District staff that are beyond the limits of the XP-SWMM model. Thus, the District identified a need to build an additional watershed-scale modeling tool that would be designed to support long-range climate planning. To fund this work, the District secured a grant of \$738,000 from the Legislative-Citizen Commission on Minnesota Resources (LCCMR).

This new watershed-wide climate model will take advantage of available high-resolution public datasets to develop a granular representation of the physical watershed. This provides the opportunity to not only quantify runoff volumes, but also represent how water moves across the landscape via runoff, storm pipes, wetlands, best management practices, and surficial groundwater. With the understanding that the model would be used to holistically understand volume management across the 178 square miles, while also characterizing localized flooding issues, District staff worked to evaluate and identify modeling software that would best serve the District's needs. Key components identified during the evaluation included the ability to (1) model overland flow (2D surface), (2) incorporate detailed stormwater pipe networks (integrated 1D-2D model), and (3) integrate a realistic representation of the water table (integrated surface-water groundwater model). District staff ultimately narrowed down to two modeling software that met the most criteria to support MCWD's Climate Action Framework.

WORK TO DATE

Leading up to the watershed-wide model build, and while waiting to secure LCCMR funding, the District pursued three projects designed to (1) mitigate for technical challenges and risk points associated with a large scale 2D model build, (2) inform effective watershed-scaling, and (3) make measurable progress in areas of known work ahead of the model build. The status, objectives, and outcomes of this work are described below:

- Pilot Model Build (completed): The pilot model was designed to further evaluate the two selected model platforms (ICM and ICPR) and to address the technical challenge of incorporating numerous high-resolution datasets into a modeling tool, specifically the challenge of integrating the unique stormwater datasets from the 29 different communities within the District. The project successfully produced a scalable and automated framework to standardize and correct the pilot geography datasets. Both modeling platforms were built and evaluated across a variety of metrics relating to its core abilities and its functionality. On October 12, 2023, the Board of Managers accepted the project summary report and concurred with the findings and recommendation to select Interconnected Channel and Pond Routing Model (ICPR4) as the platform to best suit the District's climate planning needs.
- Stormwater Data Standardization (completed): This project built upon the automated workflow established in the pilot. The project gathered the stormwater infrastructure datasets from all the agencies and communities within MCWD's boundary and developed a deep understanding of each dataset's unique structure and naming conventions. Scripts were then developed to transfer each unique dataset into single standardized geodatabase format, referred to as MetroGIS. This project produced a comprehensive and standardized watershed scale stormwater infrastructure dataset to be used beyond just the upcoming model build.

- **Watershed-wide Model Input Refinement (closing out):** This work begins to draw on LCCMR funding and is actively ongoing. The scope includes three primary outcomes to (1) collect stream channel cross-section data on a subset of the District’s stream systems, (2) Refine the pilot model scripts to account for the range of issues and data gaps present within the watershed-wide stormwater dataset, in order to produce a model ready dataset, and (3) understand the number of culverts that require field surveying in the upper watershed. This project will be completed by the end of March 2024, which coincides with the beginning of the watershed-wide 2D model build.

Watershed-Wide Model Build:

The three projects discussed above have allowed MCWD to make continued progress toward the watershed-wide build, ahead of LCCMR funds that were made available in July of 2023.

Table 1 provides an overview of the Pilot Model Build and Watershed-Wide Model build work, which also includes the status of each project phase and funding source since the staff are simultaneously closing out the Watershed-Wide Model Input Refinement project and beginning the Watershed-Wide Model Build.

Table 1. Overview of past and future 2D model related work

Project	Project Phase	Status	Funding Source
Pilot Model Build	Phase 1: Developing Data Processing Automation System	Done	District \$258,700
	Phase 2: Model Evaluation	Done	
Watershed Wide Model	Prerequisite: Watershed Wide Stormwater Data Standardization	Done	District \$34,785
	Phase 1: Watershed-Wide Model Input Refinement	Closing Out	District and LCCMR funds
	Phase 2: Watershed-wide Model Build and Calibration	Current RFP Process	LCCMR funds

RFP Process:

Scope:

On December 28, 2023 the Board of Managers authorized the release of the RFP, with an anticipated budget range of \$580,00 to \$620,000, with a scope of work that included:

- **Data Discovery and Data Review:** *The consultant will perform an initial review of the available datasets necessary for the ICPR4 model. This includes, but is not limited to, evaluating stormwater infrastructure, stream channel cross-sections, and soils data, along with LiDAR and municipal hydrologic models. The goal is to identify critical issues or gaps that could impede a preliminary model build, focusing on ensuring data integrity and readiness for model development. The consultant will be tasked with reviewing the data on a watershed-wide scale.*
- **Development of the Model Approach:** *The consultant will conduct a series of workshops with District staff to align on the critical decisions for the model build. These decisions include 2D mesh resolution, groundwater zone construction, and other vital components of the model. The workshops aim to develop a shared understanding of the model build approach and document the decisions in a technical memorandum.*
- **Non-pipe Stormwater Dataset:** *This task focuses on developing strategies to characterize storage and hydraulic control structures within the watershed. It involves identifying methodologies for data gap identification, criteria for making assumptions, and strategies for data collection or mining. The task aims to enhance understanding of landscape storage for climate change planning.*
- **Review and Refinement of Programmatic Data Processing Scripts:** *The consultant will review and refine the District’s existing Python stormwater infrastructure scripts to integrate new datasets (layers, fields, and/or*

attributes) developed in Task 3. This includes developing new Python scripts to create a model-ready stormwater dataset, incorporating storage and hydraulic control structures. The process will be iterative, utilizing spatial analysis to ensure dataset quality, and critical assumptions will be clearly flagged.

- **Preliminary Model Build:** The preliminary model build will be based on currently available geographic data, aiming to identify key data gaps for further refinement. The consultant will lead the Lower Watershed Model and the MCWD will lead the Upper Watershed Model preliminary build. This task includes running initial model simulations, documenting data gaps or issues, and developing a prioritized list of data gaps.
- **Data Collection and Data Processing:** The focus of this task is to strategically address data gaps crucial to the hydrologic and hydraulic model's accuracy. The consultant, in partnership with the District, will prioritize data gaps based on their impact on model quality and budget considerations. A detailed plan will be outlined in a technical memorandum, specifying prioritized data for collection, data collection methods, and documentation strategies. This task also includes the data collection effort itself.
- **Model Build:** The model build involves integrating processed datasets into the ICPR4 models, conducting initial test runs, and applying a calibration strategy. The Upper Watershed Model will be built by District staff, and the Lower Watershed Model will be built by the consultant. The consultant will adjust the Lower Watershed Model to accurately reflect the watershed's hydrologic behavior and document the calibration process. A comprehensive Model Build Report for the Upper and Lower Watershed will be prepared by the District and the consultant, respectively. These reports will characterize critical aspects of the model build, data collection, and calibration results based on standardized model documentation developed by the consultant.

The RFP was posted to the District website and directly distributed to firms with known GIS and scripting abilities. The deadline for submittal was Wednesday, January 26. The District received proposals from three firms: HDR, Kimley-Horn, and Stantec.

Proposal Evaluations:

In the RFP, firms were advised that the District would select a consultant on the basis of proposed methodology, experience, and cost. The Board may consider these factors as it chooses and select a consultant for the work on the basis of its judgement.

The written proposal evaluated was conducted by three District staff. The team evaluated the firms based on the following:

- Project understanding
- Team composition and experience
- Methods and approach
- Cost

Due to the high-level of impact this work will have on the District's upcoming 2D climate model build, Staff pursued interviews with all three firms to stress-test their project understanding and better understand their proposed methods and scoping.

As an added measure of review, the two Board-appointed 2D Model project liaisons, Manager Hejmadi and Manager Miller, were provided the proposals and debriefed with staff in advance of staff's formal recommendation to the full Board of Managers.

Recommendation:

Based on staff's evaluation of proposals, interviews, and dialogue with MCWD Board Liaisons, staff is recommending that HDR be selected as the consultant and awarded the contract for services detailed in the HDR's proposal for Developing a 2D Watershed-Wide Model, which is provided under separate cover to the Board of Managers.

HDR's proposal, scope, and interview demonstrated a strong understanding of the work, its importance, and the anticipated challenges. HDR brings a strong project team with extensive experience building watershed-scale models using the model that MCWD has selected to support the Climate Action Framework (ICPR4). The area of HDR's that set them apart from the other submissions was their approach to collaboration with MCWD staff throughout the project. Developing a clear approach and decision-making framework is critical to the success of the project since model development hinges on transparent decision-making and documentation.

In accordance with Minnesota Statutes 13.591, subdivision 3(b), the submitted proposals will not be part of the public record until the contract has been executed. A copy of each of the submitted proposals will have been distributed to the Board of Managers, via email, for review prior to the February 22, 2024 meeting.

The work outlined in HDR's proposal will be funded through LCCMR grant funds. Detail on the allocation of these funds will also be provided to the Board of Managers, under separate cover, in conjunction with the proposals.

Next Steps:

Following authorization to award the contract, staff will work closely with HDR's project manager to finalize the scope of work and contract. Staff do not anticipate the scope of work needing much refinement. Project work is anticipated to kick-off in March 2024 and will be ongoing through May 2025.

MCWD staff are also working with the developer of ICPR4 (Streamline Technologies) and an academic expert in ICPR4 at Virginia Tech to serve as external advisors to the model build. MCWD will be requesting authorization to contract with these organizations at the March 28th board meeting.



RESOLUTION

Resolution number: 24-012

Title: Authorize contract execution for consultant services to build a 2D Watershed Model to support climate planning

- WHEREAS, climate change is measurably changing the distribution, frequency and intensity of rainfall in Minnesota;
- WHEREAS, a key pillar in Minnehaha Creek Watershed District's (District) climate action framework is to understand and predict the impacts of climate change using new data analytical and planning tools;
- WHEREAS, to support this strategy, the District has identified the need to develop a watershed-wide two-dimensional (2D) model that incorporates high resolution stormwater infrastructure and land surface data to improve its ability to inform current and future water resource management decisions in the face of climate change;
- WHEREAS, in June 2022, the Board of Managers authorized staff to submit a proposal for \$738,000 to the Legislative-Citizen Commission on Minnesota Resources (LCCMR) to develop a watershed-wide model;
- WHEREAS, in advance of the watershed-wide build, the District chose to pursue a pilot 2D model build to constrain the technical and relational risk associated with a large scale, high-resolution model build;
- WHEREAS, one of the technical challenges that the pilot model was designed to address is to identify a method to assemble, process, and incorporate unique stormwater infrastructure datasets from the multiple public agencies within the District;
- WHEREAS, in December, 2021, the Board of Managers authorized a contract with Kimley-Horn to deliver on the pilot model's scope of work that would result in an automated and repeatable process for transforming model input datasets, including stormwater infrastructure datasets (phase 1) and the evaluation of two different models, ICM and ICPR (phase 2);
- WHEREAS, phase one of the pilot model was completed and three key next steps were identified to position the District to utilize the automated framework and effectively construct the model: (1) standardize all of the stormwater infrastructure datasets within the District into the MetroGIS draft geodatabase transfer standard (MGIS), (2) refine the automated processes to account for issues and gaps within the watershed-wide stormwater infrastructure dataset, and (3) fill data gaps critical for the model build, such as channel cross-sections and culverts;
- WHEREAS, based on learnings from the pilot model and to advance work for the watershed-wide build, in July, 2023, the Board of Managers authorized a contract with Bolton & Menk for watershed-wide Model Input Refinement, which included three key elements: (1) acquiring stream channel cross-sections, (2) automated process refinement, and (3) culvert gap assessment, which work is scheduled to be completed shortly;
- WHEREAS, in August of 2022, the LCCMR recommended funding the project entitled "Leveraging Innovations in Data Analytics for Project Implementation" in the amount of \$738,000, and in May of 2023 the Minnesota legislature approved funding in the recommended amount;

WHEREAS, the RFP was posted to the District website and directly distributed to firms with known watershed-scale 2D modeling experience, which resulted in the receipt of three proposals;

WHEREAS, District staff evaluated the three proposals, submitted by Kimley-Horn, HDR, and Stantec, and interviewed representatives of those firms on project understanding, methods and approach, project team and experience, and cost;

WHEREAS in the course of its review District staff coordinated with Board-appointed 2D Model project liaisons Managers Hejmadi and Miller;

WHEREAS on the basis of its evaluation, staff recommends the selection of HDR, based on its strong project understanding, its experienced team, and its approach to collaboration with MCWD staff;

WHEREAS the Board of Managers finds that the evaluation has been thorough and properly structured, and that the work proposed by HDR is demonstrated to be competitive and within budget;

NOW, THEREFORE, BE IT RESOLVED that the Minnehaha Creek Watershed District Board of Managers authorizes the District administrator, on advice of legal counsel, to execute a contract with HDR for consultant services for Watershed-wide 2D Model Development, in accordance with the developed scope of work as the Administrator may refine it, and in an amount not to exceed the amount set forth in the proposal, and authorizes the Administrator to execute contract amendments in his discretion up to an additional 10 percent, in aggregate, of the contract amount.

Resolution Number 24-012 was moved by Manager _____, seconded by Manager _____. Motion to adopt the resolution ___ ayes, ___ nays, ___ abstentions. Date: 2/22/2024

Secretary Date: _____