Proposal for

Mississippi River Direct Drainage Project Prioritization Study

Prepared for the

Lower Mississippi River Watershed Management Organization

Submitted by Barr Engineering Co.
January 26, 2023

Table of contents

resourceful. naturally.
engineering and environmental consultants

BARR

January 26, 2024

Lower Mississippi River WMO
c/o: Joe Barten, Administrator
Dakota County Soil and Water Conservation District
4100 220th St. West Suite 102
Farmington, MN 55024

Re: Request for Proposals for the Mississippi River Direct Drainage Project Prioritization Study

Dear Mr. Barten,

On behalf of Barr Engineering Co., thank you for the opportunity to offer our services to assist with the Mississippi River Direct Drainage Project Prioritization Study. Our proposal in response to your request for proposals dated December 5, 2023, is enclosed and will remain valid for the following 90 days. We believe Barr will provide the Lower Mississippi River WMO with these key benefits:

- **Continuity and familiarity**. Our long-standing relationship and recent experience updating your watershed management plan give us a unique understanding of the physical characteristics of the watershed as well as your organizational goals and priorities. Our familiarity with the LMRWMO and your project partners will help us hit the ground running and ensure completion of the project within the desired timeframe. Our long history of collaboration will facilitate a meaningful feedback process and promote outcomes supported by all stakeholders.
- **Subwatershed assessment expertise**. Having completed many subwatershed assessments throughout Minnesota and Twin Cities metropolitan area watersheds, Barr has a well-qualified team ready to serve you. Our staff understand urban and suburban stormwater management drainage issues and have expertise identifying and evaluating potential solutions within developed landscapes.
- **Commitment to your success**. We understand that this project is important to you as you seek to take action to reduce pollutant loading to the Mississippi River. This project is one of the first major efforts identified in your 2023-2032 Watershed Management Plan and addresses a high priority resource. We are committed to your success and have developed a tailored work plan to deliver a high-quality study that meets your desired schedule and budget.

Our proposed approach is customized to our understanding of your expectations, our history with the Lower Mississippi River WMO, and our experience working on subwatershed analyses and drainage studies. We are enthusiastic about this opportunity and look forward to working with you. If you have any questions or need additional information, please contact principal in charge Janna Kieffer (jkieffer@barr.com; 952.832.2785) or project manager Greg Williams (gwilliams@barr.com; 952.832.2945).

Sincerely,

Janna Kieffer
Vice President, Principal in Charge

Greg Williams
Project Manager, Senior Water Resources Scientist

2. Proposer's team

2.1 Why choose Barr?

Barr provides engineering and environmental consulting services to clients across North America and around the world. We have been employee owned since 1966 and trace our origins to the early 1900s. Founded by a hydrologist, Barr has a long history of water resources work in Minnesota and the Twin Cities metropolitan area. Our engineers, scientists, and technical specialists work together to help clients develop, manage, process, and restore natural resources.

At Barr, we solve clients' problems as if they were our own. We'll bring to your project the insights and expertise we've gained from our work on thousands of projects—and a promise to do our best work on your behalf. We believe Barr is best positioned to assist the Lower Mississippi River Watershed Management Organization (LMRWMO) with its Mississippi River Direct Drainage Project Prioritization Study because:

Our history of subwatershed assessment and BMP implementation will yield a technical approach tailored to your project. Barr is a leader in urban/suburban stormwater management. We understand the sources of the problems and the challenges of finding solutions in a developed landscape. Our approach involves understanding the land use, topography, infrastructure, drainage patterns, and ecological resources within a target area. We then analyze the data to identify the critical problem sources and potential solutions. Solutions are tailored to each unique project location, leading to the longevity and resiliency of our restoration and retrofit projects. Barr has performed subwatershed assessments for numerous cities and watershed organizations with landscapes similar to yours, developing successful implementation plans that lead to projects.

Our experience in river-adjacent landscapes will create efficient project execution. With decades of experience working for watershed organizations and cities along the Mississippi, Minnesota, and St. Croix Rivers, our team is familiar with issues applicable to bluffs, ravines, and overland conveyances common to this study area. Our services include field investigations, assessments of erosion processes, evaluating and designing stream and ravine stabilization measures, and construction oversight. Although this study does not include project construction, our experience will promote feasible solutions that can be successfully constructed. Our stream and ravine projects within the Twin Cities metropolitan area have included:

Streams		Ravines
▪ Battle Creek	▪ Purgatory Creek	▪ Lilydale Regional Park (Lilydale/Saint Paul)
▪ Bluff Creek	▪ Raleigh Creek	▪ Battle Creek Regional Park (Saint Paul)
▪ Fish Creek	▪ Riley Creek	▪ Carver Ravine (Woodbury)
▪ Minnehaha Creek	▪ Shingle Creek	▪ DeMontreville Ravine (Lake Elmo)
▪ Nine Mile Creek	▪ Valley Creek	▪ Fish Creek Ravine (Maplewood, Saint Paul)
		▪ Lake Rebecca/County Road 42 (Hastings)
		▪ Mississippi River Bluff (Minneapolis)
		▪ Riley Creek Lower Valley (Eden Prairie)
		▪ West 110th Street Ravine (Bloomington)

Our familiarity with your organization and your needs will help ensure a customized approach to maximize value. Barr's familiarity with your organization and its goals and objectives will help us deliver a project that meets your desired outcomes. We understand this effort is a critical first step to using

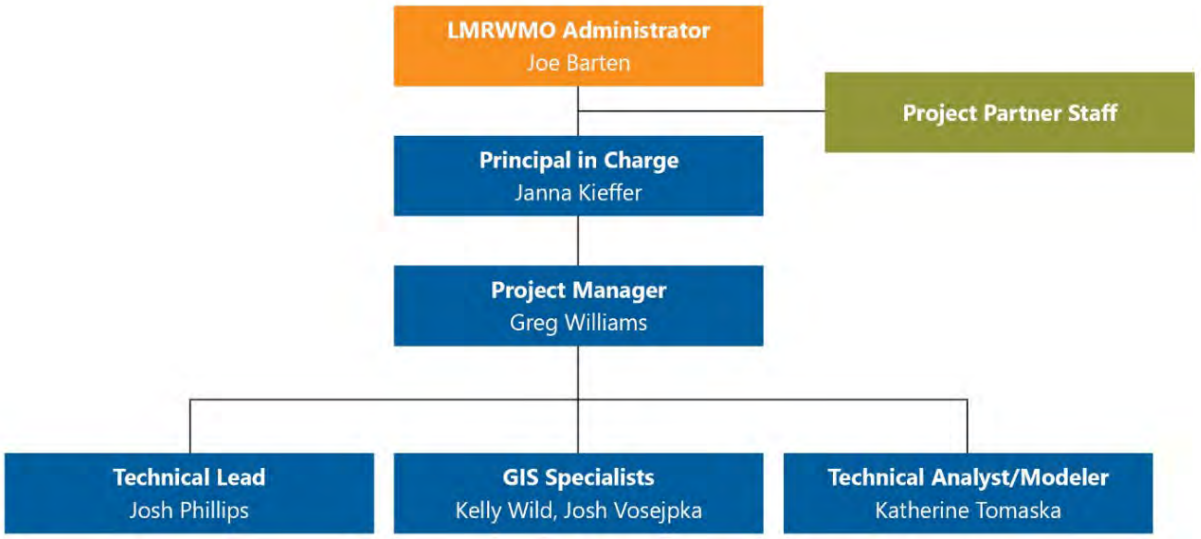
watershed-based implementation funding to implement projects to benefit the Mississippi River. Understanding the budget constraints, we have tailored our workplan to provide high value for the dollars spent while delivering a product you can use to achieve your goals in the coming years.

Analyses with an eye toward cooperative feasibility will help the LMRWMO and its partners implement solutions. Barr and the LMRMWO have a successful history of turning studies into projects. Barr completed the Cherokee Heights culvert analysis and erosion control feasibility study in 2015, which involved stormwater modeling analysis, evaluation and assessment of erosion issues, geotechnical modeling, and conceptual design of options to reduce peak flows. Then, Barr assisted the LMRWMO in securing funding and stabilizing the upper portion of Cherokee Heights ravine to improve water quality and protect Saint Paul parkland and visitors. Following the WRAPS study, Barr assisted the LMRMWO in securing grant funding and performing in-lake alum treatments to improve the water quality of Lake Augusta and Sunfish Lake. As a joint powers organization, we understand that successful projects are only possible through the collaboration of the LMRWMO and its member cities. Throughout this project, we will work with all members of the project team to develop solutions that are supported by all partners.

2.2 Project team members

Our project team was selected based on their expertise, prior experience, and availability to assist the LMRWMO with the Mississippi River Direct Drainage Project Prioritization Study. Below is an organizational chart showing the interrelationship of team members and key personnel, followed by brief bios for each team member summarizing their qualifications. Brief bios of project team members are included in *Section 4: Key Personnel*. Resumes are provided in *Attachment A*.

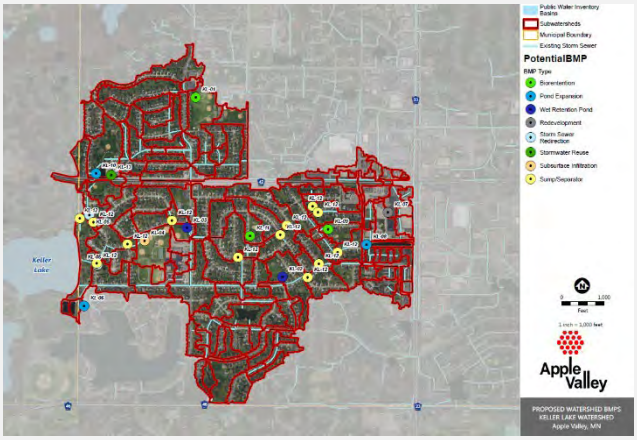
2.2.1 Organizational chart



3. Qualifications and experience

Below are similar projects completed by the Barr team within the last five years. For each project, we provided contact information for the client who is familiar with our key personnel and their work.

Keller Lake subwatershed analysis
Client: City of Apple Valley



The Keller Lake Total Maximum Daily Load (TMDL) assigned a phosphorus load reduction target of 130 lb/year to the City of Apple Valley. Barr completed a subwatershed analysis of the Keller Lake watershed on behalf of the City to identify specific project opportunities to reduce watershed phosphorus loading to Keller Lake.

Drawing from an existing (2001) P8 water quality model and more recent PCSWMM hydrologic and hydraulic model, Barr developed a new P8 model including 139 subwatersheds to characterize existing pollutant loading.

With an understanding of existing phosphorus loading and City priorities regarding BMP siting, Barr identified and evaluated 13 different project options. Barr provided project descriptions and design considerations (addressing project feasibility) for each of the project options. Barr also evaluated the pollutant reduction benefits of increased street sweeping in critical areas. Since completion of the subwatershed assessment, the City has carried at least one project option through additional design steps with construction planned to begin in 2024.

Reference: Jessica Schaum, Natural Resources Coordinator, City of Apple Valley, 952-953-2461, jschaum@cityofapplevalley.org

Erosion inventories of ravines and creeks
Client: Valley Branch Watershed District

Barr works with the Valley Branch Watershed District (VBWD) to perform routine inspections and maintenance of both stormwater infrastructure and several natural conveyance systems, including many large ravines along the bluffs of the St. Croix River. For over 20 years, Barr has performed field investigations to assess the physical condition of these natural conveyance systems and document observed erosion. New technology has allowed Barr staff to obtain georeferenced photos, notes, and measurements, and then utilize this information to estimate erosion or sediment transport rates using various models, formulas, or calculators.

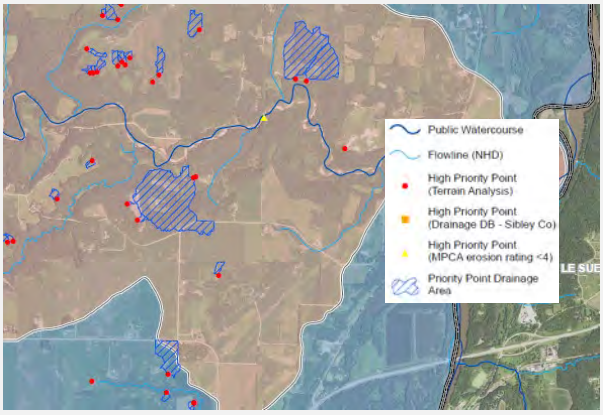
Barr has also completed supplemental work to prioritize sites according to the severity of the erosion and make recommendations for repairs and follow-up activities. To date, Barr has assisted the VBWD with the

design and implementation of at least 10 ravine stabilization projects and five stream stabilization or bank repair projects to reduce sediment and nutrient loading to downstream water bodies.

Reference: Ed Marchan, President, VBWD Board of Managers, 651-436-8627

Watershed-wide terrain analysis (in support of One Watershed, One Plan)

Client: Lower Minnesota River West Partnership



From 2021 to 2023, Barr developed a comprehensive watershed management plan for the Lower Minnesota River West partnership under the Minnesota Board of Water and Soil Resources' (BWSR) One Watershed One Plan (1W1P) framework. The plan includes a 10-year implementation schedule to address priority issues including sediment, nitrogen, and phosphorus loading from upland and near-stream sources.

As part of that work, Barr completed a watershed-wide desktop terrain analysis to identify locations recommended for implementation of best management practices (BMPs) to reduce stormwater volume and pollutant loading. Barr used geographic information system (GIS) data including topography, soils, and hydrology to identify priority project locations and the subwatershed areas tributary to those locations. We combined the priority project locations identified by terrain analysis with locations listed in county databases and locations identified by the Minnesota Pollution Control Agency to identify approximately 800 potential project locations over the 770-square-mile planning area.

The Lower Minnesota River West partnership will use the priority project locations to target and encourage implementation of BMPs on privately-owned land using grant funding. Recommended BMPs include streambank stabilization practices, water and sediment control basins, and others to reduce pollutant loading to downstream resources including the Minnesota River.

Reference: Jack Bushman, Client Project Manager, Sibley County Soil and Water Conservation District, 507-702-7077, Jack.Bushman@sibleyswcd.org

City of Chanhassen BMP retrofit assessment

Client: Riley-Purgatory- Bluff Creek Watershed District

Barr conducted a stormwater best management practice (BMP) retrofit assessment for the Riley-Purgatory-Bluff Creek Watershed District (RPBCWD) and the City of Chanhassen, Minnesota. The study provided a list of potential BMPs within the downtown area of Chanhassen that would provide stormwater treatment, volume reduction, and phosphorus load reductions for downstream water resources, including Rice Marsh Lake and Lake Riley.

Barr developed this rendering of a potential rain garden BMP in the downtown Chanhassen area to support stakeholder outreach to residents and

Barr performed a desktop assessment to help target BMP retrofit locations. The desktop assessment included reviewing available water-quality data; analyzing soil conditions, land use, and flow patterns within the study area; and building a water quality

model to quantify phosphorus loading and assess the effectiveness of potential BMPs. Using the desktop assessment to guide the work, Barr then completed a field assessment to inspect potential sites. We used an iPad and the ArcGIS Collector application to gather field notes, rough field measurements, and georeferenced photos of potential BMP locations.

During the study, Barr met periodically with the RPBCWD and the City of Chanhassen to review the potential BMP locations. Based on feedback from the city, Barr developed concept plans for two retrofit sites that met study criteria for stormwater treatment and that had the potential for implementation through site improvements or redevelopment, and developed a concept plan for a stormwater reuse system that could provide reclaimed stormwater for irrigation and public works use near the Chanhassen city hall. Barr developed renderings and planning-level cost estimates for the City of Chanhassen to inform its planning efforts and discussions with landowners of potential sites.

Reference: Terry Jeffery, District Administrator, 952-607-6512

Cherokee Heights Park sediment load reduction

Clients: Lower Mississippi River Watershed Management Organization, City of Mendota Heights, City of St. Paul, and City of West St. Paul

Barr assisted the cities of Saint Paul, Mendota Heights, and West St. Paul, and the Lower Mississippi River Watershed Management Organization with evaluating alternatives to reduce sediment loading to Pickerel Lake. We developed feasibility studies for several alternatives and the organizations selected one that entailed stabilizing an eroding ravine that was 250 feet long and installing two large hydrodynamic structures to remove total suspended solids.

Barr's selected design involved two hydrodynamic separators that were installed on existing storm sewer lines in Cherokee Heights Park to remove stormwater pollutants from a 70-acre watershed before the water traveled downstream toward Pickerel Lake. The hydrodynamic separators remove oils, trash, sediment, and nutrients. Barr estimates that the structures removes an average of 1.3 tons of sediment each year. The improvements were substantially completed in 2018.

Reference: Joe Barten, LMRWMO Administrator, 651-480-7784

Richfield citywide water quality modeling

Client: City of Richfield

The City of Richfield (city) requested assistance with development of a citywide water quality model. The key objectives for water quality development were to (a) evaluate the performance of existing water quality BMPs and (b) evaluate pollutant discharge loading related to regulatory requirements (e.g., TMDL, SWPPP, and Minnehaha Creek Watershed Deistic Plan requirements).

Barr worked with the city to review exiting stormwater and BMP information and proposed a plan to develop citywide water quality models using two unique models: P8 and the Barr-developed, GIS-based water quality model (GIS WQM). The P8 model was developed for the

purposed of regulatory compliance review, and the GIS WQM model was developed for rapid evaluation of BMP alternatives and as a water quality asset-management program. The water quality models were validated to water quality monitoring data collected at key locations throughout the city and were used for evaluating BMP performance, effective pollutant loading, and TMDL compliance.

In a follow-up project completed in 2021, Barr used the water quality models for various applications, including:

- Evaluation of pond performance of all ponds and wetland throughout the city. Results were used to develop a pond maintenance prioritization list.
- Development of a street sweeping prioritization strategy. Results from the GIS WQM were used to evaluate and prioritize street sweeping operations throughout the city.
- TMDL compliance modeling. Barr assisted the city in evaluating and tracking TMDL compliance for MS4 Part 2 Permit application reporting. This included evaluating pollutant loading and evaluating BMP implantation alternatives and compliance schedule for non-compliant TMDLs.

Michael Mckinney served as the project manager on this project. He led development of municipality-wide P8 and GIS WQM modeling as well as BMP implementation optimization evaluations.

Reference: Jordan Vennes, Former City of Richfield Water Resources Engineer, 952-563-4533, jvennes@BloomingtonMN.gov

Lake Susan subwatershed study

Client: Riley-Purgatory-Bluff Creek Watershed District

Barr completed a feasibility study to identify a stormwater treatment best management practice (BMP) that would efficiently remove phosphorus from Lake Susan while minimizing site impacts and changes to water surface elevations upstream of the BMP, and did not modify the high-traffic walking path adjacent to the site. The study included an evaluation of several innovative treatment system designs, including a woodchip bioreactor, spent lime reactor, and iron-enhanced sand filter.

Barr evaluated each design based on:

- potential to remove phosphorus from stormwater
- construction impacts on adjacent uplands and wetlands
- impacts on wetland water elevations
- construction and maintenance costs

Barr recommended the spent lime reactor as the system that would provide the highest phosphorus removal efficiency while also having the smallest construction footprint. We developed renderings to show how the proposed system could look as viewed from the walking path during construction and following site restoration. Barr worked closely with Riley-Purgatory-Bluff Creek Watershed District and City of Chanhassen staff throughout the feasibility study to verify that the recommended alternative could be permitted and constructed. The spent lime reactor is expected to remove 40 to 50 pounds of phosphorus per year from stormwater flowing into Lake Susan.

Reference: Terry Jeffery, District Administrator, 952-607-6512

4. Key personnel

Brief bios of each proposed team member are included below. Full resumes are provided in *Attachment A*.

Project team member bios

Janna Kieffer, PE · Principal in Charge
Vice President, Senior Water Resources Engineer · MS, Civil Engineering

Janna has 23 years of experience and serves as a principal, project manager, and technical expert for watershed management organizations and municipal clients. Her work encompasses watershed planning, hydrologic and hydraulic (H&H) modeling, water quality modeling, lake management studies, watershed and stormwater BMP assessments, engineering feasibility studies, and stormwater analyses for low-impact development sites. Janna has worked with the LMRWMO since 2008, including overseeing the LMRWMO's WRAPS project and Cherokee Heights drainage study and helping apply for and secure Clean Water Fund grants to address water quality in Thompson Lake, Sunfish Lake, Lake Augusta, and Pickerel Lake.

Greg Williams, PE · Project Manager
Senior Water Resources Engineer · MSCE, Civil and Environmental Engineering

Greg has 18 years of experience providing water resources services to watershed management organizations, cities, and industrial clients. He specializes in watershed management planning and H&H/water quality modeling of urban and rural watersheds. His experience enables him to synthesize input from clients and other stakeholders to find solutions to challenging problems related to water quality, hydrology, and resource management. Greg has served as engineer for the LMRWMO since 2015, helping update its 2023-2033 watershed management plan; helping apply for and secure Clean Water Fund grants to address water quality in Thompson Lake, Sunfish Lake, Lake Augusta, and Pickerel Lake; and updating H&H modeling and the allowable-flow cost breakdown for the Seidls Lake lift station project.

Josh Phillips, PE · Technical Lead
Civil Engineer · BS, Civil Engineering

Josh has more than eight years of experience in civil and water resources engineering. His projects involve stormwater management design, infrastructure inspection and maintenance, BMP retrofit design, permit reviews, and H&H modeling. Josh's work for watershed management organizations and districts includes civil design, permitting, cost estimating, and construction administration services for projects involving stabilization of natural conveyance systems, maintenance of stormwater infrastructure, and water quality improvements. He also works on feasibility studies, infrastructure inspections, permit reviews for development and redevelopment projects, and annual reporting.

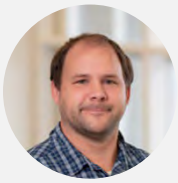
Katherine Tomaska, EIT (MN) · Technical Analyst/Modeler
Water Resources Engineer · BS, Bioproducts and Biosystems Engineering

Katherine joined Barr with a bachelor's degree in bioproducts and biosystems engineering from the University of Minnesota. She contributes to projects involving civil engineering H&H analysis, including hydraulic (HEC-RAS) models for stream design, floodplain mapping, and sediment transport, as well as model development for determining phosphorus and sediment load reduction. She also has experience conducting field erosion assessments.

Kelly Wild · GIS Specialist
Senior GIS Specialist · MS, Geographic Information Science

Kelly has more than 13 years of experience in cartography and GIS. She is skilled in cartographic design and has experience with several ArcGIS extensions (including Spatial Analyst and 3D Analyst) and software applications and scripts. She provides GIS support for flood control systems and green infrastructure projects as well as mapping and analysis of environmental cleanup sites and invasive plant species.

Josh Vosejpka · GIS Specialist
Senior GIS Specialist · MS, Geographic Information Science



Josh has 11 years of experience in GIS, with extensive experience in raster analysis and supporting hydrologic and hydraulic (H&H) modeling. Josh's project experience includes incorporating LiDAR, surveyed topography and bathymetry, and designed flood control features into existing and proposed digital elevation models (DEM). He uses these datasets in support of H&H modeling by performing hydro-conditioning, delineating drainage areas, and calculating flow parameters. Josh performs terrain analysis to identify areas of increased erosion risk, potential sinkhole locations, and develop inundation extents from modeled water surface elevations. He also performs remote sensing and aerial imagery analysis to extract impervious surfaces and water body features, as well as performing landcover classifications.

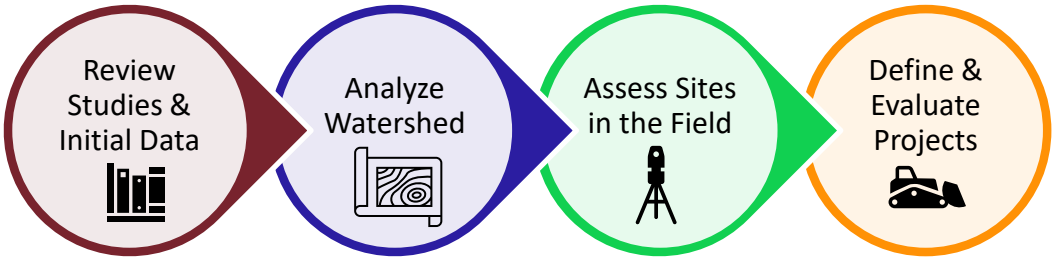
5. Work plan and budget

5.1 Project understanding

The LMRWMO seeks assistance in identifying and evaluating erosion concerns and opportunities for volume and pollutant reduction in areas of the watershed tributary to the Mississippi River. We understand that the Mississippi River direct drainage area is a priority for the LMRWMO due to the potential for pollutant loading from stormwater runoff to directly impact the river, which was identified as a priority resource in the 2023-2032 LMRWMO watershed management plan.

The Mississippi River direct drainage area covers a large area of about 16 square miles, nearly 20% of the LMRWMO. This study area includes portions of all LMRWMO cities except Sunfish Lake and a range of land uses and impervious densities. Stormwater runoff is routed to the river in a variety of ways, including overland drainage, ravines, storm sewers, and through existing BMPs. The study area has been characterized to varying degrees by city models constructed in different modeling platforms.. We will assess available models as relevant to the project goals (see *Section 5.2: Scope of Work*).

Barr's work assisting the LMRWMO to update its watershed management plan provides an overall understanding of the diverse areas of study and available technical resources. We anticipate that a comprehensive analysis appropriate to the project timeline and budget will require a high-level analysis followed by targeted, deeper investigation. Because of the size of the study area, decisions will have to be made to balance scope and depth of analysis. Our approach includes an iterative process of analysis, review, and decision making to focus project resources on the highest priorities. Barr has a strong working relationship with the LMRWMO and its members and will communicate decision points during project implementation so priorities are not overlooked.



This project will provide the LMRWMO with a prioritized list of project opportunities including stabilization and other stormwater treatment BMPs. The report will help focus future LMRWMO and city project efforts and better position the LMRWMO to leverage watershed-based implementation funding (WBIF) and competitive grants. Recommended projects will consider potential benefits as well as factors affecting project feasibility to promote successful implementation.

We understand that this project is funded largely through WBIF, which must be expended by the end of 2024. Our project schedule is designed to maximize stakeholder participation while meeting the required completion date. Our proposed scope is described in greater detail in the following sections.

5.2 Scope of work

Task 1: Project kickoff

As a first step, Barr staff will review existing data provided by the LMRWMO and member cities. This will include (but may not be limited to):

- Local water management plans.
- Natural resource inventories/studies.
- GIS storm sewer information from LMRMWMO member cities
- Existing hydrologic, hydraulic, and/or water quality models.
- Publicly available geospatial data.

Based on this initial data review, Barr will prepare a brief memorandum summarizing data gaps. We anticipate this will include one or more working figures showing data availability and known issues within the direct drainage study area. Barr will attend a kickoff meeting with the administrator and city staff to review the data summary, obtain relevant anecdotal information from staff, and follow-up on gaps. We understand some gaps may not be addressed during this project; however, a shared understanding of available data and how it will be used is necessary to deliver a work product that is valuable to all stakeholders.

At the kickoff meeting, we will also confirm stakeholder roles and planned feedback points throughout the project. We anticipate the kickoff meeting to be virtual to promote maximum attendance but will host or attend an in-person meeting as schedules allow. Barr will follow up with member city staff individually by email or with additional virtual meetings as needed to clarify information.

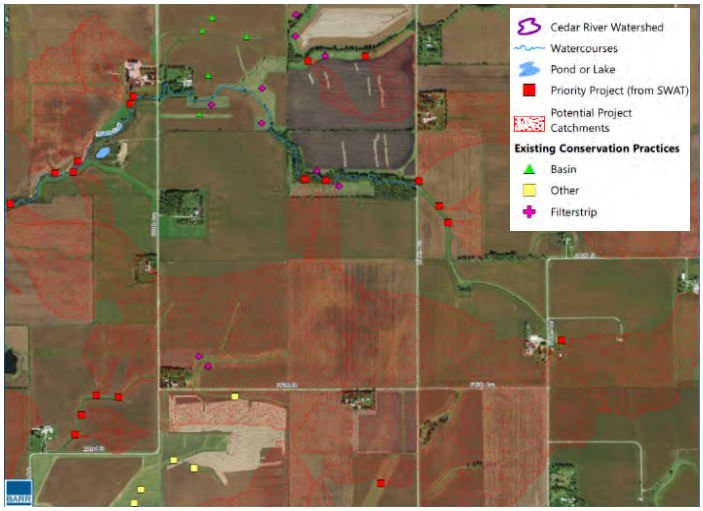
Task 2: Watershed analysis

Barr will perform a high-level watershed analysis to identify priority concern areas and target locations for more detailed analysis. The analysis will consider the available information identified in task one, a geospatial analysis of factors affecting the presence and significance of issues, and the feasibility of potential solutions (see table below).

Issue factors	Feasibility factors
▪ Topography (steep slopes) ▪ Known BMP locations/model results ▪ Large storm sewer outfall locations ▪ Impervious land use ▪ Highly erodible soils ▪ Karst geology	▪ Storm sewer infrastructure ▪ Public land ownership ▪ Public waters/ditches ▪ Trails/roads ▪ Wetlands ▪ Sensitive features ▪ Construction access

We will perform a "terrain analysis" using soils, hydrology, and topographic data to identify locations where there is high potential for erosion and where stabilization BMPs may be most effective. We will review existing storm sewer, watershed, and BMP data to identify priority watersheds where additional treatment may have the greatest advantage. Known issues and city-identified concerns will be incorporated into the watershed analysis.

The above analysis will be used to identify recommended priority watersheds and sites for more detailed review. Priority sites and watersheds may vary according to pollutant of concern (e.g., phosphorus versus sediment). We will provide a draft figure showing priority watersheds and sites to the administrator and stakeholders. We will host a virtual meeting with the administrator and city staff to receive feedback on the draft priority areas, including review of factors used in the analysis and resulting priorities. We will update the priority watershed/site analysis based on feedback and develop a second draft of figures to inform field reconnaissance and subsequent project tasks.



Example of BMP targeting using terrain analysis from the Cedar-Wapsipinicon One Watershed One Plan project.

We anticipate that this task will incorporate inputs and/or results of existing, available models. Updates to existing models/new modeling may be performed as part of Task 4 (analysis and prioritization). Our scope of work does not include modeling updates as part of the watershed analysis portion of the project.

Task 3: Field reconnaissance

Following the identification of priority areas in *Task 2*, Barr staff will perform field visits to these priority sites. The number of priority sites will be determined based on the results of tasks and discussion with the administrator and stakeholders. This proposed work plan and budget assumes up to four days of site visits. We will coordinate with stakeholders to access priority sites (e.g., private property), if needed.

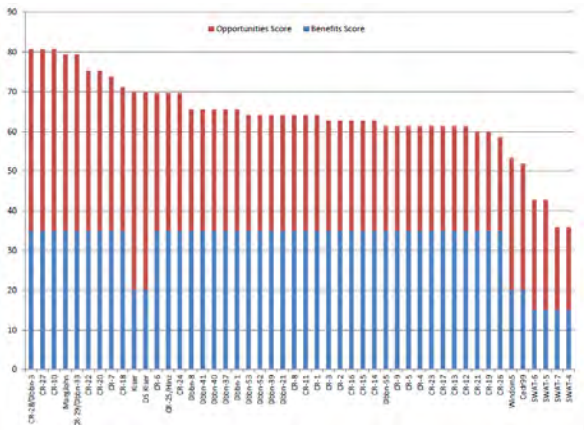
Field reconnaissance will include site visits to verify results of the desktop study and further evaluate BMP feasibility. Barr staff will invite stakeholder staff to attend and participate in site visits as availability and interest allows. We will prioritize visits to ravines and other vegetated locations prior to leaf out, if possible, to observe and document the sites before significant vegetation growth. The timing of site visits prior to significant vegetation growth has been an important aspect of similar projects in the past and is key to maximize value for the LMRWMO.

We will evaluate factors such as construction access, property ownership, disturbance of natural areas, and the presence of wetlands or other sensitive features. We will take photographs to characterize each site and collect georeferenced data where appropriate. We will obtain field measurements, such as ravine channel widths, bed materials, bank heights, bank angles, vegetative cover to calculate estimated erosion rates, as appropriate.

Barr will summarize the results of field reconnaissance of priority sites relative to critical feasibility factors. We will attend a meeting with the administrator and stakeholders to discuss the results of field reconnaissance. We recommend an in-person meeting but may meet virtually if schedules require. At this meeting, we will eliminate sites deemed infeasible based on collected data and will discuss ranking factors to be considered for prioritization (see *Task 4*).

Task 4: Analysis and prioritization

Following review of field reconnaissance and potential narrowing of the list of priority sites, Barr staff will perform additional technical analysis necessary to characterize each site in more detail. We anticipate this will include more detailed desktop review/assessment of sites to develop concept level designs/sizing, analysis of pollution reduction benefits, which may include basic modeling (e.g., MIDS calculator, BWSR calculator, RUSLE equations), and preliminary cost estimating.



BMP scoring developed for the Cedar River Watershed District based on factors related to project benefits (blue) and feasibility (red).

We will develop a draft prioritization framework based on ranking factors discussed with the administrator and stakeholders (see *Task 3*). Using this framework, we will score and rank potential BMPs with consideration for estimated benefits and costs and feasibility factors. Because many logistic and feasibility factors affect BMP constructability, we recommend a tiered ranking system versus a sequential ranking system. For example, "Level 1" projects would be prioritized over "Level 2" projects, but projects within "Level 1" would also be prioritized based on opportunities like partner funding, other work within the subwatershed, etc. Based on the initial results of prioritization, Barr staff may develop alternate rankings/scorings to reflect different criteria weighting (e.g., top projects overall, top sediment reduction projects, etc.).

We will document our prioritization framework and draft ranking(s) in a memorandum that will become part of the final report and provide a draft to the administrator and member cities for review. We will host a virtual meeting to receive feedback on the draft prioritization framework and results. We will revise the prioritization framework and project ranking based on feedback.

Task 5: Final deliverables

Barr staff will prepare a final report to document the results of the study and methods of analysis. We understand the LMRWMO and member cities will use this document to identify and prioritize projects and support applications for potential grants. The prioritized list of recommended projects will be the focus of the main report document. Details of each recommended project will be included as an appendix to the report.

Because the projects identified may be implemented over many years, clear documentation of assumptions, inputs, and methods is important to provide direction through potential stakeholder staff and LMRWMO Board of Manager turnover. The report will summarize the steps used in the analysis and stakeholder decision points. Iterations of priority projects/sites in map or tabular format will be included as an appendix.

A draft report outline is shown below:

- Executive summary.
- Scope and purpose.
- Results of project identification and prioritization.
- Methods of analysis.
    - Watershed analysis.

  - Field reconnaissance.
  - Concept design and evaluation.

- *Appendix A*: Recommended project details.
- *Appendix B*: Iterations of site review/analysis.

We will provide a complete draft of the report for administrator and stakeholder review and seek comments in written format (e.g., Microsoft Word document tracked changes). We will coordinate with the administrator to address comments on the draft report. Barr will prepare a final report by December 4, 2024, consistent with the planned schedule. Barr will provide supporting electronic files developed for the project to the Administrator including MS Excel files, GIS layers, records from field reconnaissance, drawings/CAD files, and modeling files (e.g., MIDS files).

Task 5b: Presentation to LMRWMO Board of Managers

We recommend that the results of the study be presented to the LMRWMO Board of Managers by Barr staff at a regularly scheduled meeting in December 2024 or early 2025. We understand a presentation will likely occur after December 13, 2024, and may not be eligible for WBIF grant funding. It could be funded by the LMRWMO's plan implementation budget or engineering budget.

Project schedule

We have prepared the following proposed schedule to allow delivery of the final report by December 4, 2024, and completion of all billable work no later than December 13, 2024. We understand these dates are connected to watershed-based implementation funding. The description of methods includes significant coordination with and feedback from stakeholders. Maintaining the proposed schedule will require timely review and feedback at key decision points.

Our proposed schedule is front-loaded to promote identification and field reconnaissance of priority ravine and bluff sites prior to significant vegetation growth. Depending on progress, we may perform initial field reconnaissance of known priority sites prior to completion of the watershed analysis.

Barr's proposed schedule

Task		Est. completion date
1.	Project kickoff (and initial data review)	February – March 2024
2.	Watershed analysis	March – May 2024
3.	Field reconnaissance	April – June 2024
4.	Analysis and prioritization	July – September 2024
5.	Final deliverables	October – December 2024
5b.	Presentation to LMRWMO Board of Managers (if requested)	To be determined

Project budget

We understand that the total project budget is based in part on available WBIF grant funds. Our proposed scope (omitting the recommended presentation in *Task 5b*) is developed to fit within that budget and carries an estimated cost of **$80,300**, as outlined in the table on the following page. A detailed breakdown of staff hours by task is provided as *Attachment B*.

Barr's proposed budget

Task		Est. hours	Labor subtotal	Expenses	Total cost
1.	Project kickoff (and initial data review)	53	$ 7,700	$0	$ 7,700
2.	Watershed analysis	124	$16,090	$0	$16,090
3.	Field reconnaissance	158	$20,875	$1,600	$22,475
4.	Analysis and prioritization	156	$22,120	$0	$22,120
5.	Final deliverables	84	$11,830	$0	$11,830
5b.	Presentation to LMRWMO Board of Managers (if requested)	TBD	TBD	$0	TBD
	Total	**575**	**$78,615**	**$1,600**	**$80,215**

6. Conflicts of interest

Barr does not believe there to be any conflicts of interest relevant to the Mississippi River Direct Drainage Project Prioritization Study.

Attachment A:
Resumes

Experience

Janna has 24 years of water resources management experience and serves as a client lead, project manager, and technical expert for municipal and watershed management organization clients. Her work includes performing H&H modeling, flood risk reduction studies, water quality modeling, lake management studies, BMP performance assessments, engineering feasibility studies, stormwater analyses for development sites, water resource permitting, and watershed management plans. Janna's projects include:

- Managing a culvert analysis and erosion control feasibility study of a steep ravine area in St. Paul for the Lower Mississippi River Watershed Management Organization, which included stormwater modeling, slope stability analysis, alternatives analysis, and facilitation of stakeholder participation.
- Serving as lead engineer for the Lower Mississippi River Watershed Management Organization, including attending monthly meetings, overseeing engineering feasibility studies, performing water quality studies and watershed management planning, and advising on watershed management activities.
- Conducting stakeholder involvement for a WRAPS and TMDL for the Lower Mississippi River Watershed Management Organization, including development of a resident survey and facilitation of meetings with citizens and technical stakeholders.
- Overseeing a flood risk and resiliency study for the Nine Mile Creek Watershed District, including updating the detailed H&H model for a 50-square mile watershed, calibrating the model to observed creek flows, determining flood elevations using Atlas 14 precipitation frequency estimates, evaluating potential flood impacts, and preparing flood-damage cost estimates.
- Conducting city-wide H&H modeling for the cities of Edina and Bloomington based on NOAA Atlas 14 precipitation frequency estimates. Analyses included XP-SWMM modeling, flood inundation mapping for multiple rainfall depth scenarios, identification of storm sewer system capacity restrictions, and assisting the cities with developing flood reduction and management strategies.
- Overseeing a H&H modeling analysis of the Nine Mile Creek, Purgatory Creek, and Bassett Creek watersheds within the city of Minnetonka, including updating the XP-SWMM models, simulating flood conditions based on updated NOAA Atlas 14 precipitation frequency estimates, determining 100-year flood elevations, identifying flood risk, and evaluating future infrastructure improvements to reduce flood impacts.
- Developing a climate change vulnerability assessment for Hennepin County, including mapping and data analysis to identify key vulnerabilities to residents, county operations, buildings, energy systems, transportation infrastructure, and natural resources. The assessment included focus on social vulnerability factors.
- Developing a detailed XP-SWMM H&H model of the Minnehaha Creek watershed within Minnetonka, including model calibration, simulating flood conditions based on updated NOAA Atlas 14 precipitation frequency estimates, determining 100-year flood elevations, identifying flood risk, and evaluating future infrastructure improvements to reduce flood impacts.
- Serving as lead engineer for the Nine Mile Creek Watershed District. Oversaw technical assistance related to implementation of the regulatory program, lake and

stream monitoring and data analysis, water quality studies, flood management, engineering feasibility studies, design and construction administration of capital improvement projects, watershed management planning, and other day-to-day watershed management activities.

- Overseeing a flood modeling and flood risk analysis in the Gleason Lake watershed in Plymouth, including development of an H&H model, identification and mapping of flood elevations and potentially impacted structures, and evaluation of planning-level flood mitigation options.
- Conducting feasibility studies for flood-prone areas in Edina, including detailed XP-SWMM modeling, evaluating improvement alternatives, and mapping flood risk.
- Overseeing development of the City of Minnetonka's 2021 water resource management plan. Updated city policies, stormwater treatment design standards, and other components to meet requirements of the Nine Mile Creek and Minnehaha Creek watershed districts.
- Providing stormwater management services to the city of Edina, including developing a comprehensive water resources management plan and subsequent update, developing and using XP-SWMM stormwater H&H models to identify and improve flooding issues, conducting P8 water-quality modeling, and providing FEMA review and appeal support.
- Developing a comprehensive XP-SWMM model of the Nine Mile Creek watershed for the Nine Mile Creek Watershed District. Work included collecting detailed hydrologic and storm sewer data from the cities of Hopkins, Bloomington, Edina, and Eden Prairie; compilation of data into GIS; and H&H modeling using XP-SWMM.
- Developing the Nine Mile Creek Watershed District's fourth-generation watershed management plan.
- Preparing a regional stormwater volume-reduction plan for the Centennial Lakes area in Edina, including development of concept-level infiltration system designs, stormwater modeling to quantify benefits, and completion of a cost-benefit analysis.
- Conducting a storm sewer failure risk analysis for the City of Minnetonka to identify pipes with the greatest failure risk, including likelihood and consequences, and to prioritize future inspections and replacement.
- Overseeing development of a subwatershed assessment for the City of Minnetonka to identify opportunities to install stormwater practices to improve water quality in downstream lakes and wetlands.
- Planning, securing funding for, and facilitating a series of climate change adaptation and community resilience workshops for communities in the Nine Mile Creek Watershed District.
- Serving as a key team member of the minimal impact design standards (MIDS) project team for the Minnesota Pollution Control Agency, including conducting a continuous hydrologic modeling analysis to support development of stormwater volume control standards, developing volume and pollutant crediting approaches for the MIDS calculator, preparing memoranda and report, and presenting information at MIDS stakeholder work group meetings.

- Overseeing the investigation of stormwater low impact development installations for the City of Calgary, including inspection, sampling, and analysis of 30 practices (bioretention areas, bioswales, and soil cells). The investigation also included development of an inspection scoring system, data analysis, and development of recommendations for improved performance of low-impact development practices.
- Preparing grant applications and successfully securing funding for several clients, including the Shell Rock River Watershed District, City of Minnetonka, and Lower Mississippi River Watershed Management Organization.
- Overseeing the annual water quality monitoring program for the City of Minnetonka, including preparing annual water quality monitoring reports.
- Conducting water quality studies for lakes in the Nine Mile Creek Watershed District, including Mirror Lake and Lake Cornelia in Edina, Normandale Lake in Bloomington, and the Holiday-Wing-Rose Chain of Lakes in Minnetonka. Work included performing water quality modeling and analyses, evaluating BMPs, developing cost estimates and lake management recommendations, and assisting with stakeholder involvement.
- Managing the development of a pond inventory and maintenance program for the City of Minnetonka. Project work included identifying stormwater ponds to be maintained by the city in GIS, assessing sedimentation in selected stormwater ponds, and identifying and prioritizing future maintenance activities for these stormwater ponds.
- Developing portions of the City of Minnetonka's 2008 local water management plan. Work included updating the city's stormwater treatment design standards to comply with those of the four involved watershed management organizations.
- Developing a city-wide impervious analysis for Minnetonka. Assessed the current state of imperviousness for various land uses to help with ordinance development.
- Completing nondegradation loading assessments and reports for the cities of Edina and Minnetonka to satisfy the MPCA's NPDES permit requirements. Work included quantifying the loading reductions from past and future BMPs using P8.
- Performing diagnostic feasibility studies for Earley and Twin lakes and Wood Pond in Burnsville. The studies are based on historical water quality data, the results of an intensive lake-water-quality monitoring program, and P8 computer simulations of existing and future land-use conditions using lake and watershed models calibrated to the data set. The studies include various water-quality components as well as macrophyte and fisheries evaluations. Using all these data, BMPs are prescribed to achieve the water quality goals established for the water bodies.
- Writing Ramsey-Washington Metro Watershed District's third-generation watershed management plan. Work included developing a strategic plan that highlights the district's goals, accomplishments, and future priorities and a resource inventory that summarizes the district's resources and plans on a subwatershed basis.

Education MS, Civil Engineering, Mississippi State University, 2002

BS, Engineering, Civil Specialty, Colorado School of Mines, 1998

Registration Professional Engineer: Minnesota, Michigan

GREG WILLIAMS, PE
Senior Water Resources Engineer

Experience

Greg has 18 years of experience providing water resource services to watershed management organizations, industrial clients, and diverse municipal clients. He specializes in H&H modeling of urban and rural watersheds, water quality modeling, and development of watershed management plans. His experience allows him to synthesize input from clients and other stakeholders to find solutions to challenging problems related to hydrology, water quality, and resource management, and the interrelated aspects of those fields. Examples of his project work at Barr include:

- Managing the 2023-2032 update of the Lower Mississippi River Watershed Management Organization's watershed management plan. Work included engaging citizen and technical advisory committees, classifying priority resources, setting measurable goals and implementation actions, and guiding the plan through agency review.
- Updating a storm water design manual for the South Washington Watershed District to assist developers in meeting stormwater management performance standards including nutrient reduction, volume reduction, and rate control.
- Assisting the Ramsey-Washington Metro Watershed District in assessing and updating its wetland management policies as related to stormwater management, surface water quality, and flood risk reduction.
- Managing the development of the Valley Branch Watershed District's 2025-2035 watershed management plan. Tasks include developing and facilitating a stakeholder engagement process, working with VBWD managers to prioritize issues and develop policy, writing subwatershed management plans to address priority resources, documenting the VBWD's implementation program, and guiding the plan through agency review.
- Managing development of a comprehensive watershed management plan for a partnership including the counties and soil and water conservation districts of Sibley, McLeod, and Nicollet under a state-developed One Watershed, One Plan framework. Work included broad stakeholder engagement and geospatial analysis to identify priority issues and natural resources, develop measurable goals, and create a targeted implementation program.
- Managing the development of the Bassett Creek Watershed Management Commission's 2025 watershed management plan. Tasks include creating a "gaps analysis" of the existing plan to identify key issues, working with a plan steering committee and commissioners to develop goals and policies, summarizing water resources data, documenting the BCWMC's implementation and capital improvement program, and guiding the plan through agency review.
- Writing portions of a stormwater manual for the City of Minneapolis. Work included documentation of erosion and sediment control, stormwater management, and modeling requirements.
- Developing a surface-water management plan for the Shell Rock River Watershed District and the City of Albert Lea. Work included documenting studies and analysis, summarizing goals and policies within the watershed, identifying cooperative roles and responsibilities, and discussing plan implementation.

- Contributing to portions of the Cedar River Watershed District's watershed management plan. Work included revising the district's goals and policies, developing cost estimates for the implementation plan, and collaborating with the district to create presentations for the public.
- Writing portions of the City of Minot's stormwater management ordinance and updating the city's existing stormwater management plan, including assessment of policies related to stormwater management and mitigation of flood risk.
- Writing portions of municipal stormwater management plans for several Minnesota cities. Tasks include inventorying water resources, assessing stormwater management issues, developing stormwater management policies, and developing implementation programs. Clients include the cities of Hastings, Lakeville, North St. Paul, Red Wing, St. Louis Park, and Willmar.
- Developing a cost allocation for improvements to a stormwater pond in Inver Grove Heights based on the allowable flow methods described in the Lower Mississippi River Watershed Management Organization's joint powers agreement.
- Performing a feasibility study for a levee extension project in South St. Paul. Tasks include facilitating stakeholder engagement, managing the collection of field data, designing optimal levee alignments, and assessing estimated cost and benefits.
- Developing and running P8 models to correlate phosphorus and total suspended solids removal to best management practice size, percent impervious area coverage, and soil type as part of the Minnesota Pollution Control Agency's minimal impact design standards (MIDS) project.
- Designing and optimizing performance of flood control structures for a proposed Fargo-Moorhead flood diversion project using complex HEC-RAS models.
- Developing and running HEC-RAS model for a FEMA flood map project in Olmsted and Carver counties in Minnesota, including several small streams and a 20-mile reach of the Crow River.
- Calibrating and performing quality control on HEC-HMS models developed to evaluate flood mitigation options for the Mouse River in North Dakota.
- Conducting a use attainability analysis for a chain of lakes in Minnetonka. Work included developing a P8 urban runoff model, water balance, and in-lake water quality models to evaluate management strategies.
- Writing portions of the Black Dog Watershed Management Organization's watershed management plan. Work included updating the WMO's goals and policies and summarizing major issues of concern to the WMO and its member cities.

Education

MSCE, Civil and Environmental Engineering, University of Washington, 2005

BCE, Civil Engineering, University of Minnesota, 2003

BA, English (writing), University of Minnesota, 2003

Registration

Professional Engineer: Minnesota

JOSH PHILLIPS, PE
Civil Engineer

Experience

Josh has eight years of experience in civil engineering with an emphasis in water resources. His projects include stormwater management and design, infrastructure inspection and maintenance, stormwater and land development permitting reviews, and feasibility assessments for water quality improvement projects. Specifically, Josh's work includes:

- Overseeing the assessment of natural conveyance systems to inventory erosion, identify and prioritize potential stabilization projects, and design, permit, and implement those stabilization projects using natural materials that blend into the surrounding environment.
- Performing feasibility studies to identify locations for potential stormwater-management best management practices (BMPs), such as tree trenches, rain gardens, stormwater ponds, and subsurface filtration or infiltration devices, as well as the design or retrofit design of these BMPs using low-impact development and green infrastructure principles.
- Performing infrastructure inspections, system operations, and maintenance, including observing, categorizing, and reporting on general system conditions, structural defects, and operation and maintenance items.
- Assisting with site design and performing on-site construction for stormwater design and land development projects, including demolition, excavation and grading, water and sewer utilities, stormwater utilities and management, retaining walls, subgrade preparation, paving, site restoration, and vegetation establishment.
- Reviewing development and redevelopment projects for compliance with stormwater standards and requirements, including floodplain management, rate control, volume control, water quality, and erosion and sediment control.

Education BS, Civil Engineering, North Dakota State University, 2015

Registration Professional Engineer: Minnesota

Certification Stormwater Pollution Prevention Plan Certified (May 2023)

NASSCO Pipeline Assessment Certification Program (June 2023)

NASSCO Manhole Assessment Certification Program (June 2023)

NASSCO Lateral Assessment Certification Program (June 2023)

Software HydroCAD, MIDS, P8

KATHERINE TOMASKA, EIT
Water Resources Engineer

Experience

Katherine joined Barr with a bachelor's degree in bioproducts and biosystems engineering from the University of Minnesota. She contributes to projects involving civil engineering and H&H analysis. Specifically, Katherine's responsibilities include:

- Assisting with stormwater planning.
- Conducting hydrologic runoff modeling and analysis.
- Conducting 1D and 2D hydraulic modeling
- Providing open-channel and pipe-flow design.
- Designing water control and stormwater treatment structures.
- Collecting hydrologic and water quality measurements.
- Performing construction observation, surveying, and materials testing.
- Developing plans and specifications, reports, and spreadsheets.
- Working with permitting agencies and public officials.
- Providing services related to GIS and CADD.

Prior to Barr, Katherine served as a research assistant at the University of Minnesota's Saint Anthony Falls Laboratory, where her work included developing a procedure to grow *Microcystis aeruginosa* to aid in harmful algal bloom remediation research and analyzing the impact of various clay treatments on algal growth.

During her internship at Barr, Katherine's tasks included:

- Creating channel cross sections in HEC-RAS to be used for modeling storm events near dam reservoirs.
- Following lab procedures to calculate phosphorous fractionation in pond sediments.
- Performing laser scan surveys to develop emergency response plans for properties at risk of flooding.
- Analyzing permits and as-built plans for stormwater pipes and significant best management practices, as well as creating GIS maps locating these features, to be used for model development.

As an intern at an environmental engineering consulting firm, Katherine gained experience:

- Assessing more than 600 gullies and pipe outfalls throughout the Lower Minnesota River Watershed District to report on the severity of erosion within district boundaries.
- Examining the causes of gullies and progression of erosion and denoting 18 high-priority regions for client review.

Education

BS, Bioproducts and Biosystems Engineering (Ecological and Environmental Engineering emphasis), University of Minnesota, 2022

Registration

Engineer in Training: Minnesota

Software

ArcGIS, HydroCAD, HEC-RAS (1D & 2D), XP-SWMM, PC-SWMM, AutoCAD

KELLY WILD
Senior GIS Specialist

Experience

Kelly has more than 13 years of experience in cartography and GIS. She is skilled in cartographic design and has experience with a number of ArcGIS extensions and software applications and scripts. She provides GIS support for flood control systems and green infrastructure projects as well as mapping and analysis of environmental cleanup sites and invasive plant species. Kelly's project experience includes:

- Serving as GIS lead for design of a flood control system for the Mouse River enhanced flood protection project. Responsibilities included implementing a GIS QA/QC process for both GIS staff and GIS users on the project, creating and organizing data from internal and external sources, revising data sets based on design changes, and creating maps showing current site features and the proposed impacts of design alignments.
- Providing GIS support for mobile data collection via ArcGIS Online and Collector. Responsibilities included creating and maintaining ArcGIS Online web maps for internal team use, creating additional web maps as needed for mobile data collection via the ESRI Collector App on iPads/mobile devices, and incorporating new/updated datasets as they become available.
- Providing GIS support for design of a flood control system for the City of Oslo, Minnesota. Responsibilities included creating and organizing data from internal and external sources, revising data sets based on design changes, and creating maps showing current site features and the proposed impacts of design alignments.
- Serving as GIS lead on a green infrastructure project along the light rail corridor for the Capitol Region Watershed District and City of Saint Paul, Minnesota. Worked with engineers to acquire necessary GIS data for planning and decision making. Developed interactive PDF documents showing project information at two intersections and allowing access to supporting documents using hyperlinks embedded in the PDF map.
- Using GIS to map locations of invasive plant species in Twin Cities lakes and to design herbicide treatment plans based on location of plant species and current lake volume.
- Serving as GIS lead for SEMCO Energy's Albion, Michigan, manufactured gas plant site. Tasks include maintaining GIS datasets to verify data quality, coordinating with CAD users to integrate design work with existing GIS data, displaying EVS modeling output data and analytical results on GIS figures to help visualize outstanding issues, and continually updating data sets based on changes in site conditions.

Education

MS, Geographic Information Science (MGIS), University of Minnesota, 2011

BS, Cartography/GIS and Geography, University of Wisconsin, 2008

Software

Spatial Analyst, 3D Analyst, Network Analyst, Adobe Illustrator and Flash, Map Info, Idrisi, ENVI, GeoDa, Python, Java, ActionScript, KML

JOSHUA VOSEJPKA
GIS Specialist

Josh has 11 years of experience in GIS, with extensive experience in raster analysis and supporting hydrologic and hydraulic (H&H) modeling. His project experience includes incorporating LiDAR, surveyed topography and bathymetry, and designed flood control features into existing and proposed digital elevation models (DEM). Josh uses these datasets in support of H&H modeling by performing hydro-conditioning, delineating drainage areas, and calculating flow parameters. Josh performs terrain analysis to identify areas of increased erosion risk, potential sinkhole locations, and develop inundation extents from modeled water surface elevations. He also performs remote sensing and aerial imagery analysis to extract impervious surfaces and water body features, as well as performing landcover classifications.

Josh's project work at Barr includes:

- Performed terrain analysis to identify areas of increased erosion potential for multiple projects including the Lower MN River 1W1P and the Zumbro River 1W1P projects.
- Developing Digital Elevation Models (DEMs) for the Mouse River enhanced flood protection project for the North Dakota State Watershed Commission. Created DEMs of existing conditions and proposed condition surfaces using LiDAR data, bathymetry, and proposed flood-protection features (levees, channels, overflows, etc.) using CAD-derived three-dimensional line work. Also conducted post-processing of HEC-RAS model results to identify flood-water inundation extents and impacts.
- Incorporating LiDAR, hydraulic break lines, surveyed bathymetry, and as-built contours to develop a 3D model of the Brainard Hydroelectirc Dam spillway which was later used to develop a physical model of the dam and spillway.
- Developing existing and proposed condition digital elevation models (DEM) for use in dam break models for the Shell Rock River Watershed District, Fountain Lake Restoration project.
- Developing digital elevation models for use in H&H models and using color-infrared aerial imagery to determine flood water extents for use in model calibration as part of the South Saskatchewan River flood study.
- Completing multiple tasks for the Minneapolis pipeshed and water-quality study including DEM creation incorporating building elevations and sewer pipelines.

Education

MS, Geographic Information Science, University of Denver, 2015

BS, Geography (Geographic Information Systems), Minnesota State University, Mankato, 2012

Attachment B:
Detailed cost breakdown by staff hours

Attachment B. Detailed cost breakdown by task and staff

staff	Kieffer, Janna	Williams, Sterling	Phillips, Josh	Tomaska, Katherine	Vosejpka, Joshua	Wild, Kelly				
2024 Rate ($/hr)	$ 210	$ 170	$ 150	$ 115	$ 115	$ 130				
task	estimated staff hours per task (hr)						total hours	labor subtotal [1]	expenses	total cost
Kickoff meeting (and initial data review)	4	12	11	12	2	12	53	$ 7,700	$ -	$7,700
Watershed Analysis	4	11	13	28	42	26	124	$ 16,090	$ -	$16,090
Field Reconnaissance	2	8	55	83	0	10	158	$ 20,875	$ 1,600	$22,475
Analysis and Prioritization	8	31	43	56	4	14	156	$ 22,120	$ -	$22,120
Final Reporting	6	18	14	38	0	8	84	$ 11,830	$ -	$11,830
total	**24**	**80**	**136**	**217**	**48**	**70**	**575**	**$ 78,615**	**$ 1,600**	**$80,215**