Final Abstract

Final Report Approved on April 23, 2025

M.L. 2020 Project Abstract

For the Period Ending June 30, 2024

Project Title: Quantifying New Urban Precipitation and Water Reality

Project Manager: Joe Magner

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Funding Source:

Fiscal Year:

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 04e

Appropriation Amount: $500,000

Amount Spent: $415,646

Amount Remaining: $84,354

Sound bite of Project Outcomes and Results

To understand flooding issues in this Minneapolis neighborhood, we assessed geology and hydrologic features around Lake Nokomis. We discovered perched conditions where native and fill soil provide high infiltration but low storage or dispersion capacity, making the area vulnerable during more frequent and extreme precipitation events fueled by climate change.

Overall Project Outcome and Results

Geology, hydrologic features, climate and to a lesser extent land use changed slowly in south Minneapolis, Minnesota. This study suggests that climate (precipitation) has changed quickly over a short period of time revealing hidden soil/hydrologic changes from a century ago. Both native and fill soil have experienced large water saturation changes over the past decade. Homeowners in the Lake Nokomis area have been frustrated with “wetness”. In a “wet year” we show rapid water table rise that can cause infrastructure damage. Results suggest that upland native or fill soil can have fast infiltration of precipitation but limited subsurface storage elasticity or dispersion of groundwater over perched conditions. Perched conditions are driven by fill soil over lacustrine silty-clay sediment and/or organic rich soil. Some homeowners may need to find an immediate engineering solution to avoid property wetness. The City of Minneapolis

will need to provide better communication about neighborhood soil conditions, underground pipe infrastructure, and climate change. With more rain comes more pollutant transport into Lake Nokomis following both surface and subsurface pathways. The USGS found surface and subsurface water exchange around Lake Nokomis. Water sampling found a measure of vulnerability for pollutants to enter Lake Nokomis during “wet” weather conditions. These results are validated with decades of data collected in the Shingobee watershed near Akeley Minnesota. State and local officials will need to plan for climate change mitigation given the magnitude, duration, and intensity of future precipitation.

Key take away messages:

- Geologic and soil conditions 100 years ago would have limited urban development around Lake Nokomis.
- Infrastructure damage can be directly related to the lack of subsurface soil particle elasticity in very discreet zones around Lake Nokomis.
- Specific engineering solutions will be required by homeowners and city owned infrastructure to meet the challenges of climate change.

Project Results Use and Dissemination

We did provide information to a broad Minnesota audience at the 2024 Water Resources Conference – see attached pdf with ENRTF logo.

We do have a published paper: Dhaliwal HK, Holmberg K, Vogel M, Hinz A, Radler B, Magner J., (2024). An Urban Lake Drainage Catena: Influences of terrain, soils, and precipitation. Glob J Earth Sci Eng.11: 36-52. DOI: https://doi.org/10.15377/2409-5710.2024.11.3.

The USGS report has been published: Livdahl, C.T., 2025, Groundwater budget for the surficial aquifer surrounding Lake Nokomis, Minneapolis, Minnesota: U.S. Geological Survey Open-File

Environment and Natural Resources Trust Fund

M.L. 2020 Approved Final Report

General Information

Date: May 1, 2025

ID Number: 2020-055

Staff Lead: Michael Varien

Project Title: Quantifying New Urban Precipitation and Water Reality

Project Budget: $500,000

Project Manager Information

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Project Reporting

Final Report Approved: April 23, 2025

Reporting Status: Project Completed & Additional Update Approved

Date of Last Action: April 23, 2025

Project Completion: June 30, 2024

Legal Information

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 04e

Appropriation Language: $500,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to better guide storm water management by evaluating the groundwater and surface water interactions contributing to high water tables and damage to home basements and underground infrastructure in urban areas.

Appropriation End Date: June 30, 2024

Narrative

Project Summary: Minnesota decadal increases in precipitation have increased runoff, groundwater recharge, and infrastructure damage. We will assess and define selected quaternary settings to better define hydrologic response to extreme changes.

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

In recent years Minnesota and specifically the Twin Cities Metro Area (TCMA) experienced significant extremes in meteorological and hydrological events. One issue is the phenomenon of high-water tables leading to home-basement and buried infrastructure damage in the Lake Nokomis area and other TCMA neighborhoods. High water tables can probably be attributed to significantly more precipitation than has occurred in the previous hundred years and a greater amount of impervious surface. Infrastructure impact includes water lines, sewer lines, and private residences, that were built during a period of relatively dry conditions compared to the current climatic conditions. In response to the higher precipitation and resulting surface runoff, most municipalities have begun adopting stormwater BMPs that not only reduce downstream flooding but also reduce negative water quality impacts. The application of these practices also may be causing higher water tables resulting in damage to above-ground and underground infrastructures, including roadways, and pipelines. To address this issue, it is necessary to better understand precipitation and groundwater response history from sentinel sites, the pathways of groundwater recharge not only within the TCMA region where new precipitation records were set from 2010-2020, but also at long-term meteorological, and hydrological record stations in Minnesota.

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.

Quantify meteorological, geologic, and hydrogeologic features and constraints that influence groundwater elevation including perched conditions in the Lake Nokomis area. The 43-year record of Shingobee Lake will be used as our climate driven lake-level, groundwater response to changes reference. Provide up-to-date information on the distribution and hydraulic properties of geologic materials from land surface to bedrock. Provide information on the physical container(s) for water and subsurface infrastructure to better protect and preserve future water resources, investigate reasons for high-water levels in the Lake Nokomis area in context with surrounding TCMA systems using hand-auger, mechanical, and geoprobe technology. Provide detailed evaluations of groundwater and surface water interactions and establish relations between precipitation and groundwater and surface water interactions in the Lake Nokomis and selected study areas using water-quality and quantity metrics, geochemical and stable isotope samples (end-member mixing analysis). Evaluate the effects of urban hydrologic management on lacustrine and groundwater-level responses to precipitation. Evaluations will be conducted using conventional hydrogeologic analysis techniques and groundwater models such as MODFLOW and/or the Metro Model, and/or other models such as hydrologic water balance models that include the detailed processes of infiltration, evapotranspiration, and snowmelt that predict over time.

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?

Improving our understanding of the hydrologic flow pathways, in a changing climate, on the land surface, and in the subsurface will be of key importance to providing guidance to municipalities. Given, more water uncertainty, there may be better ways to manage stormwater and the permitting of various land uses. Work in the TCMA and Shingobee Lake reference area will help us construct patterns of precipitation/groundwater change to help better design urban water storage systems while limiting the potential adverse environmental outcomes.

Project Location

What is the best scale for describing where your work will take place?

Region(s): NE

What is the best scale to describe the area impacted by your work?

Region(s): Metro

When will the work impact occur?

In the Future

Activities and Milestones

Activity 1: Define geologic system at selected study sites

Activity Budget: $71,183

Activity Description:
We will quantify geologic and hydrogeologic features and constraints that influence groundwater elevation at selected study sites including perched conditions in the Lake Nokomis area using the Shingobee Lake watershed data as a reference guide for data point acquisition. Provide up-to-date information on the distribution and hydraulic properties of geologic materials from land surface to bedrock. MGS staff will interpret bore-hole data collected by UMN, USGS, and driller. Provide information on the physical container(s) for water and subsurface infrastructure.

Activity Milestones:

Description	Approximate Completion Date
Interpret geologic data collected at study sites	September 30, 2023
Define hydraulic properties of geologic materials	December 31, 2023

Activity 2: Data collection at selected study sites, modeling and final report

Activity Budget: $428,817

Activity Description:
Quantify meteorological, geologic, and hydrogeologic features and constraints that influence groundwater elevation including perched conditions in the Lake Nokomis and the Shingpbee reference area. Provide information on the physical container(s) for water and subsurface infrastructure to better protect and preserve future water resources, investigate reasons for high-water levels in the Lake Nokomis area in context with surrounding Hennepin County systems using geoprobe technology (USGS will lead with UMN assistance). Provide detailed evaluations of groundwater and surface water interactions and establish relations between precipitation and groundwater and surface water interactions in the Lake Nokomis and Shingobee Lake areas using water-quality metrics, geochemical and stable isotope samples (end-member mixing analysis). Evaluate the effects of urban hydrologic management on lacustrine and groundwater-level responses to precipitation. These evaluations will be conducted using conventional hydrogeologic analysis techniques as well as applying groundwater models such as MODFLOW and/or the Metro Model, and/or other models such as hydrologic water balance models that include the detailed processes of infiltration and evapotranspiration, as well as snowmelt and soil freezing to predict water table response over time.

Activity Milestones:

Description	Approximate Completion Date
Define data collect methods and locations and place equipment	May 31, 2022
Develop water-level datasets at new study sites	December 31, 2023
Report documenting performance and unattended consequences.	June 30, 2024

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
John Nieber	UMN	Co-PI	No
Tony Runkle	UMN-MGS	Co-PI	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.
MGS will prepare maps that will be useful to TCMA residences. Presentations will be given at the annual Water Resources conference.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?
This work will be transferred to local state agencies where other funds can be used to continue the Sentinel effort. If our findings suggest immediate action is required we will work with the Legislature to craft language to expand the effort beyond the selected study areas.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	$ Amount	$ Amount Spent	$ Amount Remaining
Personnel										
Joe Magner		Project Principal Investigator			36.5%	0.9		$43,046	-	-
Graduate Research Assistant		3 Research Assistants, Bioproducts & Biosystems.			45%	3.6		$155,872	-	-
Undergraduate Research Assistant		2 Undergraduate Research Assistant,			0%	0.6		$16,000	-	-
Tony Runkel		Chief Geologist at MGS, borehole characterization, and direction to student geologists			31.8%	0.15		$10,762	-	-
Field Geologist		Technician, the work was performed with the help of UMN graduate students.			31.8%	0.3		$29,421	-	-
Managing Tech		Technician, overseeing geochemical & spatial analyses.			31.8%	0.6		$22,475	-	-
							Sub Total	**$277,576**	**$278,889**	**-$1,313**
Contracts and Services										
US Geological Survey	Sub award	USGS will provide geo-probe services for boreholes and piezometer installation and provide model expertise and guidance to UMN workers				1		$118,187	$70,520	$47,667
Professional Services	Professional or Technical Service Contract	The contract driller will be asked to install up 120 linear feet of well material.				0.05		$9,300	-	$9,300
Professional Services	Professional or Technical Service Contract	Lab analysis of water and soil samples using UMN labs in CFANS and CSE, and outside labs for QA/QC..				0.3		$9,000	$4,039	$4,961
							Sub Total	**$136,487**	**$74,559**	**$61,928**

Equipment, Tools, and Supplies										
	Equipment	Purchase of data loggers, pumps, sensors, batteries, enclosures, solar panels, wiring supplies, water sampling supplies, etc.	These items are essential for data collection.					$45,937	$34,213	$11,724
							Sub Total	**$45,937**	**$34,213**	**$11,724**
Capital Expenditures										
		Equipment: YSI multi-parameter probe - 2 @ $12,000	Collect real-time water data	X				$24,000	$23,722	$278
							Sub Total	**$24,000**	**$23,722**	**$278**
Acquisitions and Stewardship										
							Sub Total	**-**	**-**	**-**
Travel In Minnesota										
	Miles/ Meals/ Lodging	Vehicle rental for trips from BBE to TCMA sites ~ 1035 miles x $.58/mile	Domestic travel cost for visiting a field site and conducting field experiments.					$2,446	$1,446	$1,000
	Miles/ Meals/ Lodging	10 trips, 2 people travel by car to Shingobee Lake - 380 miles round trip X $.58/mile; meals $25/day X 10 days	Download data and provide equipment upkeep.					$3,554	$2,554	$1,000
	Conference Registration Miles/ Meals/ Lodging	4 people, for 2 years of registation for the annual MN Water Resources conference	Project information communications					-	-	-
							Sub Total	**$6,000**	**$4,000**	**$2,000**
Travel Outside Minnesota										
							Sub Total	**-**	**-**	**-**
Printing and Publication										

	Printing	Magner, report prep and graphic designer and journal publication	Report prep and graphic designer and journal publication					$10,000	$263	$9,737
							Sub Total	**$10,000**	**$263**	**$9,737**
Other Expenses										
							Sub Total	**-**	**-**	**-**
							Grand Total	**$500,000**	**$415,646**	**$84,354**

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Capital Expenditures		Equipment: YSI multi-parameter probe - 2 @ $12,000	Cap equipment did not change and fully used on the project **Additional Explanation :** This device provides insitu physical and geochemical measurements to capture the immediate response of groundwater to precipitation.

Non ENRTF Funds

Category	Specific Source	Use	Status	$ Amount	$ Amount Spent	$ Amount Remaining
State						
			State Sub Total	**-**	**-**	**-**
Non-State						
In-Kind	NA	Dr. John Nieber time will be covered by UMN because he is State funded. Dr. Runkle and technician time was provided as an in-kind contribution. Dr. Magner used his personal time to complete the Final report. This is estimated to be 20 hours.at $150/hour MNDNR provide a driller and rig as an in-kind contribution	Secured	$18,000	$18,000	-
			Non State Sub Total	**$18,000**	**$18,000**	**-**
			Funds Total	**$18,000**	**$18,000**	**-**

Attachments

Required Attachments

Visual Component

File: 4da75260-413.docx

Alternate Text for Visual Component

After further discussion with MGS, we have decided that the final report will have graphs and sketches and that no final map will be produced given the very small scale of work...

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
Example Report	83365422-e4f.pdf
Background	da1fe28c-6d3.pdf
Final Report	e37c1af4-085.pdf
Communication	13cc261b-f0d.docx
1st publication	6e279884-1ac.pdf
USGS Map	c5ec7e5a-2ab.pdf
WRC Power Point	d8981495-372.pdf
Final Abstract Recommendations Letter	7a12fcf2-a21.docx
Groundwater budget for the surficial aquifer surrounding Lake Nokomis, Minneapolis, Minnesota	b4041f83-70b.pdf

Media Links

Title	Link
MGS	https://cse.umn.edu/mgs

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

We reduced our geographic scope based on the reduction in funds

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

Yes

Do you understand that travel expenses are only approved if they follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the UMN Policy on travel applies.

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

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?

Yes, Sponsored Projects Administration

Work Plan Amendments

Amendment ID	Request Type	Changes made on the following pages	Explanation & justification for Amendment Request (word limit 75)	Date Submitted	Approved	Date of LCCMR Action
1	Amendment Request	• Budget • Other • Dissemination • Budget - Personnel • Budget - Printing and Publication • Budget - Professional / Technical Contracts • Budget - Capital, Equipment, Tools, and Supplies • Budget - Travel and Conferences • Budget - Non-ENRTF Funds Contributed • Attachments	Given that a no-cost extension is not possible, the USGS has concluded they will only spend $70,519.16 of the $118,187 because they do not have the human resources to perform certain tasks before June 30th, 2024. We had planned to hire a drilling contractor ($9,320), but MNDNR drilled the wells for the project pro bono. We will not spend publication $10,000 before 6-3-24. I request. Transfer $81,500 to personnel.	August 29, 2024	Yes	October 15, 2024

Additional Status Update Reporting

Additional Status Update October 30, 2024

Date Submitted: January 8, 2025

Date Approved: January 21, 2025

Overall Update
All done

Activity 1
This activity was previously marked complete.
(This activity marked as complete as of this status update)

Activity 2
This activity was previously marked complete.
(This activity marked as complete as of this status update)

Dissemination
12-31-24

Additional Status Update Reporting

Additional Status Update October 30, 2024

Date Submitted: January 8, 2025

Date Approved: January 21, 2025

Overall Update
All the work has been completed and disseminated

Activity 1
This activity was previously marked complete.
(This activity marked as complete as of this status update)

Activity 2
This activity was previously marked complete.
(This activity marked as complete as of this status update)

Dissemination
Information will be provided to the City of Mpls after Council member Koski holds a final meeting

Status Update Reporting

Final Status Update August 14, 2024

Date Submitted: August 29, 2024

Date Approved: October 15, 2024

Overall Update

Activity 1 was completed on time but only for surficial deposits to a depth of 30 feet and not to bedrock. Hydraulic properties were determined and bore-hole data is included in the Final report. Geological materials identified in Activity 1 had a major influence upon the out come of Activity 2. We learned that long-term data shows a lag-time for large aquifers, whereas, small aquifers in the Nokomis area respond very quickly to new rainfall additions because of the underlying lacustrine/organic soils. The USGS examined the surface water (Lake Nokomis) and groundwater exchange. The data suggest that higher precipitation in the region lead to higher lake levels and subsurface exchange with the surrounding wetlands. We applied a 1-D model calibrated with measured field data that help explain why groundwater perched and stored in homeowner yards. We did not use MODFLOW or the Metro Model because the scale of use was too large and did not link back to homeowner concerns. Sonde, geochemical and isotope data confirmed the unique dynamic associated surface and groundwater interactions from homeowner yards to Lake Nokomis. Overall, we accomplished the objectives defined in Activities 1 and 2. However, the amount of data collected was shorten.

Activity 1

This activity was previously marked complete on time as defined by activity milestones.
(This activity marked as complete as of this status update)

Activity 2

This activity was delayed because of administrative red-tape! However, in the end data was collected as described and completed by 6-30-24. More personnel time was required near the end of the project due to unforeseen changes in personnel that caused activity 2 delay. Non-ENRTF effort was used to prepare a Final report in July and August that includes an abstract, introduction, methods, results, discussion, summary, references and supportive appendices. Over the next several months Non-ENRTF effort will be focused on publishing the information collected and analyzed during the project.
(This activity marked as complete as of this status update)

Dissemination

Project partners have been informed of the completion of this ENRTF project. They will receive an e-copy of the Final report if requested. Council Member Koski (City of Mpls) has agreed to host a meeting at the Nokomis Community Center for UMN folks to explain their findings to the public. This meeting beyond the scope of work defined in the work plan, but important the Nokomis area residents.

Status Update Reporting

Status Update April 1, 2024

Date Submitted: August 29, 2024

Date Approved: October 15, 2024

Overall Update
We are on target to meet our outcomes by June 30-24. We have pulled in additional graduate student help to target specific tasks so that all activities will be completed within the next 3 months, except the finial report. We will need to schedule meetings in June to build in the Nokomis community - home owner understanding of what we did, how we did it and our plans to hand off our work to the City of Mpls.

Activity 1
This activity was previously marked complete.
(This activity marked as complete as of this status update)

Activity 2
Data collection will be complete in April, Graduate students are now focusing time on statistical analysis, previously we had not started the statistical analysis. We are meeting at least weekly and often twice a week to examine the data and tease out the work completed under Activity 1. Though we had technical help from MGS in Activity 1, Tony Runkle informed us that he put very little time into the project.

Dissemination
In May and June of 2024 we will begin reaching out to stakeholders to obtain feedback on products. Beyond June we plan to have an oral presentation of our work at the annual WRC. Joe Magner will reach out to various media and give interviews and statements about the project and key take-away messages for both the private citizens and the public agencies who have been engaged with the Nokomis water story.

Status Update Reporting

Status Update October 1, 2023

Date Submitted: September 29, 2023

Date Approved: January 17, 2024

Overall Update
We have completed Activity 1.Overall, we completed a number of Giddings soil probes around the Lake Nokomis area to a depth of 15' to get a sense of the sediment types in the area. Sediment consisted primarily of fine to medium-grained Mississippi River terrace sand with a few sites encountering Holocene peat and/or silt loam lacustrine sediment within the sand sequences. This information now needs to be written-up and placed in the final report.

Activity 1
The collected data will be mapped using GIS and cross-sections for the final report.
(This activity marked as complete as of this status update)

Activity 2
We are currently focused on Milestone 2 under Activity 2. Develop water-level datasets at new study sites
To quantifying the climatic change with water-level datasets around both Nokomis and Shingobee We have 12 new monitoring wells placed with level loggers and continuous water level monitoring. We have also completed 23 soil borings, so we have geologic strata data throughout the area. We have collected sonde parameters, water chemistry and isotope data at each of the monitoring wells as well. We are doing data analysis as we continue to monitor the wells and create more detailed maps of the area based on the soils we have found. The data suggests that some homeowners did not know that their basements were built into unsuitable material. We are trying to determine if and how we can model the hydrogeology. Our MODFLOW modeling has been on hold because our modeler was called to active military duty.

Dissemination
We do not have products to disseminate at this time. However, we do want to meet with some homeowners to get feedback on what we have discovered.

Status Update Reporting

Status Update April 1, 2023

Date Submitted: March 24, 2023

Date Approved: May 8, 2023

Overall Update
Quantify geologic and hydrogeologic features and constraints that influence groundwater elevation at selected study sites including perched conditions in the Lake Nokomis area. We have installed all wells and piezometers, organized data and will produce cross-sections in the next half year. We anticipate a large snowmelt and groundwater recharge event this spring. We need to obtain sensors and get them deployed ASAP. We have had delays from vendors because of supply chain issues, but hope to get equipment in the pipe soon. SHEAP data is being organized for statistical analysis this summer.

Activity 1
MGS staff will interpret bore-hole data collected by UMN, USGS, and driller. Provide information on the physical container(s) for water and subsurface infrastructure. This work is 60% complete as of March 31st, 2023. We should have this task completed by September 30th as planned. We intend to define hydraulic properties between April 1st and December 31st as show in the timeline

Activity 2
We have begun the development of a MODFLOW groundwater model for the Lake Nokomis area. Soil borings are being analyzed to estimate different layers to be used in the model. We have conducted duel-head infiltration testing to inform the model input from new precipitation during an active growing season. USGS will be making measurements to examine the lake/groundwater exchange beginning in April, 2023. We will not have a full year of data according to our December 31st, 2023 timeline. We will be requesting a no-cost time extension because of delays in getting the USGS portion of the study initiated. USGS staff retirement and permitting issues delayed this part of the project by 6 months.

Dissemination
We have stayed in contact with the City of Mpls, Park & Rec Board, MCWD, DNR and most importantly the spokeswoman for the neighborhood interest group. We have attend a local community event to highlight our work for neighborhood citizens. We plan to present a poster of our work at the Oct 2023 Water Resources Conference. UMN students have examined and discussed Lake Nokomis is selected classes

Status Update Reporting

Status Update October 1, 2022

Date Submitted: October 1, 2022

Date Approved: October 28, 2022

Overall Update

We have engaged with over 20 homeowners who live around Lake Nokomis, and several who live in the Shingobee watershed. We have installed 15 piezometers with data loggers on private property as requested by homeowners. We have gathered climate, lake and groundwater data in the Shingobee watershed. We have followed up with individual homeowners to explain soil profiles and why their basements might take in water. For some homeowners, land slope and gutters have been the primary source of their water problems. However, for most homeowners, the main problem is soil. Within 15-feet of the ground surface we found lake silt/clay and or organic muck soils. These soils conditions trap downward movement of rain water and create wet to saturated conditions below and around home foundations and wet spots in peoples yards. Homeowners have expressed gratitude to UMN staff who have performed work in their yards and now have a better understanding of why they had water problems. We have communicated with neighborhood groups, Mpls City Council member Koski and State Representative Greenman on our work and results. We have also expressed our frustration in working with Mpls city staff to address long-term effects of climate change.

Activity 1

We are on track to have better resolution of the geologic materials in the Lake Nokomis area. We have begun to develop a GIS map that shows sites we have conducted work/ visited. We have made several infiltration tests to gauge hydraulic properties. We hope to have the physical container of the area fully described by Oct of 2023. A student is organizing historic Shingobee data so we can perform statistical analysis of past precipitation and groundwater response.

Activity 2

We have encountered difficulty with the City of Mpls regarding the work of USGS. No monitoring wells have been installed yet because the City of Mpls nor the Mpls Park and Recreation Board have agreed to allow USGS to place wells for a time period beyond June 30th, 2024. We can pay for the well installation fees and abandonment costs, but that would only provide a little over one years of data. Given the Governors initiative for Climate Change, we had hoped for better cooperation. So far, the City and Park Board have refused to take on well ownership beyond June 30th, 2024. Someone at a higher level needs to weigh in on this matter soon. It is my understanding that communication will occur with elected officials and the City and Park Board. We have purchased the well materials and have a driller lined up to do the work, but need agreement for ownership beyond June 30th, 2024. We have also purchased equipment and plan to graph water level datasets by the end of the year.

Dissemination

Homeowners have had one-on-one visits and are letting neighbors know what we are finding.

Status Update Reporting

Status Update April 1, 2022

Date Submitted: March 26, 2022

Date Approved: March 28, 2022

Overall Update
COVID restrictions delayed the grant processing so we did not begin work until November 2021, Change in Minneapolis staff (key players in the response to this project) left City employment slowing our planning process. Nevertheless, the highlight of this reporting period was initial contact with neighborhood leaders, homeowners, and the Minnehaha Creek Watershed District. This time has focused on planning the details of Activity 1 and 2. Administratively, we set up pass-through funds to MGS, and began the sub-award contract to USGS. We have been exploring equipment and vendors and plan to make purchases within the next reporting period. Only limited funds have been spent for salary and fringe during this reporting period, but next reporting period will have contracts in place and the expenditure of funds on equipment.

Activity 1
PI planning occurred but no data collection, analysis, or map production was performed. We anticipate this will change with contracts in place during the next reporting period.

Activity 2
The PI's have meet several times to plan the data collect methods and we have decided that we will use current MGS maps and interviews with landowners to define the location of new boreholes. We plan to hire a contract driller to drill holes at locations the MGS and USGS agree to explore and place piezometers in locations the USGS decides to meet their objectives for the project. Some piezometers are in place and the USGS is analyzing, and managing the data.

Dissemination
We have reached out to key leaders in the Nokomis neighborhood and have let homeowners know that we are beginning a study to evaluate the concerns of homeowners. We have partnered with the Minnehaha Creek Watershed District to review materials they have created to explain the geology and history of the area.