

**Environment and Natural Resources Trust Fund**

# M.L. 2025 Final Work Plan

## **General Information**

**ID Number:** 2025-160

**Staff Lead:** Tiffany Schaufler

**Date this document submitted to LCCMR:** June 6, 2025

**Project Title:** Geologic Atlases for Water Resource Management

**Project Budget:** $1,260,000

## **Project Manager Information**

**Name:** Barbara Lusardi

**Organization:** U of MN - MN Geological Survey

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## **Project Reporting**

**Reporting Schedule:** July 1 / January 1 of each year.

**Project Completion:** June 30, 2028

**Final Report Due Date:** August 14, 2028

## **Legal Information**

**Legal Citation:** M.L. 2025, First Special Session, Chp. 1, Art. 2, Sec. 2, Subd. 03p

**Appropriation Language:** $1,260,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota, Minnesota Geological Survey, to continue to produce geologic atlas maps and databases to inform management of groundwater and surface water. This appropriation is to complete Part A, which focuses on the properties and distribution of earth materials to define aquifer boundaries and the connection of aquifers to the land surface and surface water resources.

**Appropriation End Date:** June 30, 2028

## **Narrative**

**Project Summary:** Geologic atlases provide maps/databases essential for improved management of ground and surface water. This proposal will complete current projects and start new projects to equal about 4 complete atlases.

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

Geologic atlases provide maps and databases essential for improved management of ground and surface water. This is foundational data that supports management of drinking water, domestic and industrial supply, irrigation, and aquatic habitat. County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Eco-Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process. The distribution of geologic materials defines aquifer boundaries and the connection of aquifers to the land surface and to surface water resources to enable a comprehensive water management effort. This proposal will complete current projects and start new projects to equal about 4 complete atlases.  
  
Atlases are complete or underway for 78 of the 87 counties in Minnesota with fieldwork to begin in Beltrami, Martin and Cottonwood counties this summer. This project continues an effort to complete county geologic atlas coverage statewide. The current spending rate of about $2 million per year (all sources) would allow about 3 new starts each year—a plan in which we start the 87th county in 2029 and completing the entire state in this format in 2033.

**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.**

A complete geologic atlas consists of Part A constructed by the Minnesota Geological Survey (MGS) and focused on geology and the County Well Index, and Part B constructed by the DNR Eco-Waters Division (funded separately) and focused on groundwater. Atlases enhance natural resource management and regulation, and facilitate wise use of water resources. They support: permitting, land use planning, wellhead protection, remediation, nutrient management, monitoring, modeling, and well construction. Atlas information is used by citizens, local government, counties, and state agencies (SWCDs, MDH, DNR, MPCA, MDA).   
  
Atlases begin with compilation of a database of subsurface information including well records. The county establishes accurate digital locations for these wells. Concurrently, geologists visit the project area to describe and sample landforms, and exposures of rock or sediment.   
  
An initial assessment of the geologic data is then completed to focus additional data gathering including shallow and deep drilling programs and geophysical, geochemical, and geochronologic surveys. Analysis of the data set is then completed and maps and associated databases are formalized and prepared for use in geographic information systems and distribution via DVD and web. Most of the products are also printed for use in the field, and by users who prefer this format.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state’s natural resources?**

This proposal will complete current projects and start new projects to equal about 4 complete atlases. Specific outcomes are as follows:  
1. Create database of well construction records to support the mapping, to document water use in specific aquifers, and to help resolve well problems  
2. Complete any unfinished ENRTF supported County Geologic Atlas projects in progress (ex; from 2021 appropriation)  
3. Make progress on maps of bedrock geology, surficial geology, subsurface Quaternary geology, bedrock topography, and thickness of glacial deposits  
Atlases support: permitting, land use planning, wellhead protection, remediation, nutrient management, monitoring, modeling, and well construction.

## **Project Location**

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

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

**When will the work impact occur?** In the Future

## **Activities and Milestones**

### **Activity 1: Initiate about 2 new county geologic atlases; continue existing projects—equivalent of about 4 atlases total**

**Activity Budget:** $1,050,000

**Activity Description:**Atlases begin with compilation of a database of subsurface information including well records. The local project partner establishes accurate digital locations for these wells. Concurrently, geologists visit the project area to describe and sample landforms, and exposures of rock or sediment.   
  
An initial assessment of the geologic data is then completed to focus additional data gathering including shallow and deep drilling programs and geophysical, geochemical, and geochronologic surveys. Analysis of the data set is then completed and maps and associated databases are formalized and prepared for use in geographic information systems and distribution via DVD and web. Most of the products are also printed for use in the field, and by users who prefer this format. The number of counties we can map with these funds will be affected by the size, geologic complexity, and data availability of the counties that are chosen.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Approximate Completion Date** |
| Conduct field work for counties in years 1 and 2 (surficial and bedrock) ~2 counties | June 30, 2028 |
| Drill/log cores for counties in years 2 and 3 (subsurface and bedrock) ~2 counties | June 30, 2028 |
| Collect bedrock data (seismic, drill logs, etc) (topography, depth to bedrock) (~3 counties) | June 30, 2028 |
| Compile and draft surficial, bedrock, topography and thickness maps (years 2-4)(~4 counties) | June 30, 2028 |
| Compile, draw, and process cross sections and sand models (subsurface geology; Sand Distribution models)(~4) | June 30, 2028 |

### **Activity 2: Compile, edit and print atlas plates**

**Activity Budget:** $150,000

**Activity Description:**In order to convey the meaning of the data we've collected, geologists must write text that describes the geologic framework of the county and why certain materials are important to map and identify. The associated text and figures help to add context to the map and associated data. Once all of the pieces for a particular plate are assembled (map, text, figures, data, etc.) they are submitted for internal and external review. Upon revision and acceptance, the pieces are edited and formatted to fit the page. Professional printing and posting the digital files are the final steps.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Approximate Completion Date** |
| Draft text and figures for plates (~4 counties) | June 30, 2028 |
| Submit materials for peer review, editing, and production (~4 counties) | June 30, 2028 |
| Print final CGA plates and process files for DVD and digital posting (~4 counties) | June 30, 2028 |

### **Activity 3: Create database of well construction records and other data to support the mapping.**

**Activity Budget:** $35,000

**Activity Description:**Geologists compile all of the data that has been gathered in a certain region in order to make the best map. Drilling records are by far the most numerous data available. Water-well records are required by the state and include a description of the materials that were drilled through. This information is vital to our geologists as they interpret and map the sediment and rock layers that may be buried and out of reach to sample. Well construction records are also used to interpret the depth to bedrock (and drift thickness) (plate 5 or 6), draw the cross sections that are used to create the Quaternary stratigraphy (plate 4) and sand distribution models (plate 5 or 6) of the County Geologic Atlases.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Approximate Completion Date** |
| Mentor county staff to locate water wells (pre-MGS field work) (~2 counties) | June 30, 2028 |
| Compile location data and collect subsurface data from other agencies; Enter stratigraphic interpretations (~3 counties) | June 30, 2028 |
| Update water well (CWI) database and compile CGA database plate (~4 counties) | June 30, 2028 |

### **Activity 4: Construct statewide geochemistry and geochronology database**

**Activity Budget:** $25,000

**Activity Description:**Identification of the glacial sediment layers is a key step to correlating those layers from place to place. This is important because geologic contaminants may be associated with specific sediments. In an effort to mitigate the effect of these contaminants in drinking water a driller needs to know the provenance of the glacial sediment, and how thick is the unit. Geochemical analyses of the sediments will help correlate the aquifers and delineate their extent. Identifying glacial aquifers is done as part of the Quaternary Stratigraphy and sand model distribution (plates 4 and 5 of the County Geologic Atlas). This is an ongoing effort whereby we analyze samples from current drilling and compare with samples from other parts of the state. Collecting and analyzing materials to determine their age is another step in correlating the glacial sediment layers.

**Activity Milestones:**

|  |  |
| --- | --- |
| **Description** | **Approximate Completion Date** |
| Collect samples from new or existing drill cores for analyses (ongoing) | June 30, 2028 |
| Compile and interpret results county by county stratigraphy (part of completed CGA)(~2 counties) | June 30, 2028 |
| Compile and interpret regional/statewide stratigraphy (ongoing) | June 30, 2028 |

## **Project Partners and Collaborators**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Organization** | **Role** | **Receiving Funds** |
| MN Counties | MN Counties | The counties are required to provide funds or in-kind service to help us build our database. Counties establish accurate well locations and identify specific project needs. | No |
| Vanessa Barrata | MN Dept. of Natural Resources-Ecological and Water Recources | A complete geologic atlas consists of Part A constructed by the Minnesota Geological Survey (MGS) and focused on geology and the County Well Index, and Part B constructed by the DNR Eco-Waters Division (funded separately) and focused on groundwater--water levels, water chemistry, and sensitivity. | 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.**Every atlas is produced in portable document format (PDF), as geographic information system files (GIS), and in printed form. The digital files are available as a DVD, and are also available from the University of Minnesota Digital Conservancy, and via link from the MGS web page http://www.mngs.umn.edu/county\_atlas/countyatlas.htm. Each project culminates with a meeting held in the project area to present the results to the county staff, and any other interested parties. At these meetings the products are described, access to the products is explained, and examples of applications of the products to common resource management situations are demonstrated. The printed copies are shared with the county, who in turn can distribute them to libraries, schools, townships, and other agencies. They are also distributed by the MGS map sales office. Products are also made available to earth science teachers and other educators for classroom exercises. Atlas products are also displayed and explained at educational events for Water well drillers, SWCD staff, and onsite sewage treatment system contractors.  
  
The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines

## **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?**Most atlases require 5-6 years to complete, so some projects started in this proposal may not be finished and will require additional funding. This funding level is sized to continue the overall funding of geologic atlases (Part A) that are currently underway while initiating about 2 new atlases for an equivalent of about 4 atlases total. At this pace, we estimate that we will complete statewide coverage by about 2032. Funds from this proposal may be applied, but are not limited to, the following counties: Swift, Lyon, Murray, Freeborn, Koochiching, Stevens, Traverse, Beltrami, Le Sueur, Itasca, Clearwater, Cottonwood, Marshall, and

## **Other ENRTF Appropriations Awarded in the Last Six Years**

|  |  |  |
| --- | --- | --- |
| **Name** | **Appropriation** | **Amount Awarded** |
| County Geologic Atlases - Part A | M.L. 2015, Chp. 76, Sec. 2, Subd. 03a | $2,040,000 |
| County Geologic Atlases - Continuation | M.L. 2017, Chp. 96, Sec. 2, Subd. 03a | $2,000,000 |
| County Geologic Atlases - Part A | M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03a | - |
| County Geologic Atlases - Part A, Mapping Geology | M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03n | $2,000,000 |
| Geologic Atlases For Water Resource Management | M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03a | $2,000,000 |
| Geologic Atlases for Water Resource Management | M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 03g | $3,092,000 |

## **Budget Summary**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Category / Name** | **Subcategory or Type** | **Description** | **Purpose** | **Gen. Ineli gible** | **% Bene fits** | **# FTE** | **Class ified Staff?** | **$ Amount** |
| **Personnel** |  |  |  |  |  |  |  |  |
| 16 Geologists |  | Create geologic maps; collect and interpret data, draw map, write text, draft figures , present results |  |  | 34% | 11.19 |  | $662,000 |
| 3 GIS/computer/web development specialists |  | Create GIS products leading to final print and digital versions of maps, cross sections and sand distribution models; finalize and archive GIS data; develop web accessible content |  |  | 37% | 1.92 |  | $114,000 |
| 2 field assistants |  | Assist geologists with collection and processing of geologic information in the laboratory, field and office |  |  | 34% | 0.63 |  | $38,000 |
| 3 Database specialists |  | Database development and support: database development for existing and new projects; train and supervise internal and external staff in well location; data collection of downhole geophysical data |  |  | 34% | 1.59 |  | $95,000 |
| 1 editor |  | Edit maps, text, and figures for publication; coordinates printing |  |  | 34% | 0.63 |  | $38,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$947,000** |
| **Contracts and Services** |  |  |  |  |  |  |  |  |
| TBD | Service Contract | Geochemical and geochronological analyses to support aquifer correlation and delineation; laboratories will be evaluated based on cost and capabilities in accordance with U of M purchasing rules Includes $500 for sample shipping. |  |  |  | 0 |  | $26,000 |
| TBD | Service Contract | Laboratory analyses not relating to geochemistry project outlined elsewhere; includes but not limited to thin sections, pollen counts, radiocarbon dates; laboratories will be evaluated based on cost and capabilities in accordance with U of M purchasing rules. Contracts or bids as necessary. |  |  |  | 0 |  | $6,000 |
| TBD | Service Contract | Rotary sonic test hole drilling (competitive bid). Generally 3-6 holes per county. Rotary sonic method yields 4" undisturbed core of unconsolidated deposits. Average hole cost is $16,500 but varies with depth. Depth corresponds to depth of bedrock surface. |  |  |  | 0 |  | $168,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$200,000** |
| **Equipment, Tools, and Supplies** |  |  |  |  |  |  |  |  |
|  | Tools and Supplies | Field and lab expendables (batteries, sample bags, distilled water); Giddings probe repairs and parts; maps, core boxes. None of these items will exceed $5,000 per unit. | These items are needed to collect, process, and store samples |  |  |  |  | $18,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$18,000** |
| **Capital Expenditures** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Acquisitions and Stewardship** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Travel In Minnesota** |  |  |  |  |  |  |  |  |
|  | Miles/ Meals/ Lodging | Vehicle rental as needed (weekly and mileage); meals; lodging; amounts cannot be calculated until specific project locations are known | Geologists must travel to each county in order to collect samples, identify rocks and sediment, interpret landforms, drill and log core, and to train county staff. In order to be most efficient, geologists may spend several days to weeks in the field. |  |  |  |  | $65,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$65,000** |
| **Travel Outside Minnesota** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
| **Printing and Publication** |  |  |  |  |  |  |  |  |
|  | Printing | Printing; awarded by price comparison; typically 100-300 copies of each of 6 plates (each 3' by 3' and four color) per county, current prices about $14,000 per county. Print run has been lowered as there are more online users. We are exploring options such as print-on-demand services to further reduce costs. | Map plates are best viewed on a printed page. Digital files are also made available (PDF, GIS, web browser) |  |  |  |  | $30,000 |
|  |  |  |  |  |  |  | **Sub Total** | **$30,000** |
| **Other Expenses** |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | **Sub Total** | **-** |
|  |  |  |  |  |  |  | **Grand Total** | **$1,260,000** |

### **Classified Staff or Generally Ineligible Expenses**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category/Name** | **Subcategory or Type** | **Description** | **Justification Ineligible Expense or Classified Staff Request** |

### **Non ENRTF Funds**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Specific Source** | **Use** | **Status** | **$ Amount** |
| **State** |  |  |  |  |
| Cash | MN Department of Natural Resources  Professional Services Contract Ad hoc: #3505 FY24 distribution: $250,000 FY25 distribution: $250,000 (pending)  We anticipate the contract will be renewed in 2025 for an additional 2 years at a similar funding level. | The MGS will work on the following program elements and associated activities during the biennium: 1) Completion and printing of the Part A portion of current atlas projects. 2) Continuation of current and new CGAs. 3) Initiation of preliminary work on new county geologic atlases, if funds are available. 4) Scientific drilling to augment county geologic atlas projects. Funds may be distributed to any or all categories above with at least $50,000 for item #4.: | Secured | $500,000 |
| Cash | Clean Water Funds  FY23 distribution: $450,000 FY24 distribution: $500,000 FY25 distribution: $500,000 (pending)  Balance as of March 1,2024 | Used to supplement other funding sources to complete County Geologic Atlases (Part A) for the entire state; funding to continue ongoing atlases and to start new atlas projects (including but not limited to database development, mapping, drilling, sample analyses, editing and production (print and digital files) | Secured | $760,000 |
|  |  |  | **State Sub Total** | **$1,260,000** |
| **Non-State** |  |  |  |  |
| In-Kind | Individual counties; value varies with the number of records and the size of the county; estimated to be $10,000 to $50,000 | Individual counties are required to establish accurate locations for water wells with construction records. This helps MGS build a database of geologic information that is vital to our mapping process. | Secured | $25,000 |
| Cash | USGS Statemap program USGS Great Lakes Geologic Mapping Coalition (estimate pending) $85,000 Funds listed are for CGA related work and are estimated based on current request and prior awards. | MGS competes for federal cost-sharing of geologic mapping through the STATEMAP Program, the Great Lakes Geologic Mapping Coalition, and the USGS Data Preservation Program. Each requires a 1:1 match of federal dollars with non-federal dollars. MGS has used these programs to fund map elements of geologic atlases, or improvement of databases utilzed in geologic atlas work. The figure provided is an estimate based on pending proposals. | Pending | $100,000 |
|  |  |  | **Non State Sub Total** | **$125,000** |
|  |  |  | **Funds Total** | **$1,385,000** |

**Total Project Cost: $2,645,000**

**This amount accurately reflects total project cost?**  
 Yes

## **Attachments**

### **Required Attachments**

#### ***Visual Component***

File: [1a8a34c8-b48.pdf](https://lccmrprojectmgmt.leg.mn/media/map/1a8a34c8-b48.pdf)

#### ***Alternate Text for Visual Component***

Status map showing the counties for which CGA is complete (52) or underway (26) and not yet been started (9).   
  
Funding graph showing 10-year spending history by sponsor. Estimate amount to complete the state (carry forward, pending, and proposed funding). Future funding is not specified by sponsor nor timeframe....

### **Supplemental Attachments**

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

|  |  |
| --- | --- |
| **Title** | **File** |
| MGS\_University of Minnesota support letter | [76ea696f-eb6.pdf](https://lccmrprojectmgmt.leg.mn/media/attachments/76ea696f-eb6.pdf) |

## **Difference between Proposal and Work Plan**

#### ***Describe changes from Proposal to Work Plan Stage***

Only minor changes to the text were made to clarify details of our continuing mapping program. Geochronology sampling has been noted in the geochemistry database section. It was also noted that MGS is exploring alternative print options, including on-demand print services for future CGA products.

## **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?**   
 N/A

**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?**   
 No

**Does the organization have a fiscal agent for this project?**   
 Yes, Sponsored Projects Administration

**Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing $10,000 or more or large-scale stream or wetland restoration?**  
 No

**Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?**  
 No

**Provide the name(s) and organization(s) of additional individuals assisting in the completion of this project:**

Barbara Lusardi, Minnesota Geological Survey, University of Minnesota

**Do you understand that a named service contract does not constitute a funder-designated subrecipient or approval of a sole-source contract? In other words, a service contract entity is only approved if it has been selected according to the contracting rules identified in state law and policy for organizations that receive ENRTF funds through direct appropriations, or in the DNR’s reimbursement manual for non-state organizations. These rules may include competitive bidding and prevailing wage requirements**  
 Yes, I understand