Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2016 Work Plan

Date of Report: May 29, 2016

Date of Next Status Update Report: January 1, 2017

Date of Work Plan Approval: June 7, 2016

Project Completion Date: June 30, 2019

Does this submission include an amendment request? No_

PROJECT TITLE: Surface Water Bacterial Treatment System Pilot Project

Project Manager: Brian Corcoran

Organization: Vadnais Lake Area Water Management Organization

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Location: **Ramsey County and Statewide**

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$500,000**
	Amount Spent:	**$0**
	Balance:	**$500,000**

Legal Citation: M.L. 2016, Chp. 186, Sec. 2, Subd. 04t

Appropriation Language:
$500,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with Vadnais Lake Area Water Management Organization to reduce bacteria and nutrient loads to Vadnais Lake, a drinking water supply reservoir, through implementation and evaluation of a subsurface constructed wetland as a best management practice for potential statewide use. The Vadnais Lake Area Water Management Organization must consider contracting with the University of Minnesota Department of Civil, Environmental, and Geo-Engineering to evaluate the effectiveness of the pilot treatment system so that it maximizes benefits and can be replicated elsewhere. This appropriation is available until June 30, 2021, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Surface Water Bacterial Treatment System Pilot Project

II. PROJECT STATEMENT:

In Minnesota today, there are over 500 waterbodies that are impaired due to elevated concentrations of fecal coliform bacteria (e.g., *Escherichia coli*) (http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/minnesotas-impaired-waters-and-total-maximum-daily-loads-tmdls.html). Reducing concentrations of fecal coliform bacteria in streams (particularly during storm events) has proven to be very difficult in urban settings and common engineering solutions (e.g., ultraviolet or reverse osmosis systems) are often prohibitively expensive. Thus, there is an urgent need for a cost-effective and innovative bacterial reduction best management practice (BMP). This project proposes to address the need by developing an experimental and subsurface constructed wetland (SSCW) BMP that can be used to improve water quality throughout the state. In addition to testing the effectiveness of the SSCW in reducing *E. coli* in Minnesota surface waters, the project will also be used to test the effectiveness of the SSCW design in reducing other common, problematic pollutants found in surface waters throughout the state: phosphorus, nitrates, pathogens, and polycyclic aromatic hydrocarbons (PAHs). The project will be located in Columbia Park, just west of Whitaker Pond in White Bear Township, MN. Whitaker Pond captures 640 acres of the primarily urban upper Lambert Creek Watershed (the watershed is currently impaired by *E.coli and total phosphorus*) and is typical of many urban streams throughout Minnesota.

The goals of the project are to test the effectiveness of three experimental treatment cells within the SSCW with varying treatment media and upland wetland vegetation (see description below) to remove the most problematic pollutants from stormwater. The specific objectives of the project are to determine the most effective SSCW design for removing *E. coli*, nutrients (phosphorus and nitrate), and PAHs from stormwater. The project will also be used to assess the potential for implementing SSCW technology in removing the most common pollutants from urban waterbodies throughout the state. The University of Minnesota will study the effectiveness of the project on pathogen removal. The outcomes of the project will be a peer-reviewed publication detailing the findings of the research project. Per our acceptance letter from the LCCMR dated October 23, 2015 we were asked to consider contracting with the University of Minnesota Civil, Environmental, and Geo-Engineering Department to evaluate the effectiveness of the pilot treatment system so that it maximizes benefit and can be replicated elsewhere. Dr. Tim La Para from the University of Minnesota Civil, Environmental, and Geo-Engineering Department has agreed to consult on the project and assist with the evaluation and effectiveness of the pilot treatment system through help and guidance with the final peer reviewed paper, monitoring plan and design along with evaluating the effectiveness of the system through two years of undergraduate monitoring for specific pathogens. Educational signage will be installed at the site to disseminate information on the LCCMR-funded BMP and how it improves water quality, and a fully implemented BMP that will be used to improve water quality in Lambert Creek. The project activities and methods discussed below will be used to achieve these goals.

Because the surface elevation of Whitaker Pond is roughly 10-15 feet lower than the proposed location of the 130-foot by 30-foot SSCW in Columbia Park, a packaged solar powered pump system will be used to move water at a rate of approximately 5 gallons per minute from the vault adjacent to Whitaker Pond up to a distribution manifold at the SSCW site. The distribution manifold will deliver pollutant-laden storm water to each of three 10 by 130 foot experimental cells. Each cell will consist of (from the bottom up) an impermeable liner, followed by layers of gravel, sand, sorption media (unique combinations of limestone, tire crumbs, high-iron sand, and sawdust), and growth media (expanded clay, vermiculite, and peat moss to promote plant growth). The total depth of each cell will be approximately 3 to 4 feet. The top of each cell will be planted with upland wetland plants (one of the three cells will have no vegetation and will serve as a control). The thickness of the media layers, the constituents comprising the sorption media, and the vegetation type will be varied for each of the three experimental cells producing three unique combinations to be tested for pollutant removal effectiveness.

Stormwater will flow from the distribution manifold through each of the three experimental cells from the bottom up, through each of the unique media combinations, and through an outlet at the far end of the cells that discharges to an unlined infiltration gallery for groundwater recharge. The infiltration gallery will consist of a buried gravel layer over native soils. A geotechnical investigation will characterize the local subsurface soils and identify the allowable treated water infiltration rates. The unique vertical up-flow pattern in the experimental cells will maximize pollutant removal while maintaining wetted conditions in the growth media to promote plant growth. A series of monitoring ports will be installed at the interfaces between the media in each experimental cell to determine the effectiveness of the media layers (as well as the overall effectiveness of each experimental cell) in removing different pollutants(*E. coli*, phosphorus, nitrate, pathogens and PAHs). Details of the study design and monitoring procedures are described in more detail in Activity 3 (Effectiveness Monitoring), below. The results of the research project will be assessed for pollutant removal efficiencies and applicability of SSCWs throughout the state. This information will be disseminated through a journal article that will be published on the research project, informational signage at the site, presentations at technical conferences, Webex presentations to technical and non-technical target audiences, and the VLAWMO website.

The project has broad implications for treating surface waters throughout Minnesota for removal of the most common stormwater pollutants and provides a unique approach for reducing bacteria, which is among the most common receiving water impairments throughout the state. The results of this research project will allow development of site-specific treatment wetlands that specifically target pollutants of a given waterbody (e.g., storm ponds with elevated PAH levels, bacteria from recreational streams or high phosphorus loading from watershed runoff) while minimizing the BMP footprint. This type of scalable BMP is particularly advantageous in urban settings with inherent space constraints where streams are frequently impacted by multiple pollutants. In addition, as opposed to typical treatment wetlands, this innovative design uses a unique sub-surface vertical up-flow system with a combination of aerobic and anaerobic media layers and vascular plants specifically designed for treating the most common pollutants found in stormwater (e.g., nutrients and PAHs). Moreover, the project will provide important empirical data on the effectiveness of this unique SSCW design in removing bacteria, pathogens and other common pollutants from stormwater and improving the quality of surface waters throughout the state.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of *[December 1, 2016]***:**

Project Status as of *[June 1, 2017]***:**

Project Status as of *[December 1, 2017]***:**

Project Status as of *[June 1, 2018]***:**

Project Status as of *[December 1, 2018]***:**

Project Status as of *[June 1, 2019]***:**

Project Status as of *[December 1, 2019]***:**

Project Status as of *[June 1, 2020]***:**

Overall Project Outcomes and Results: December 1, 2020

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Preliminary and Final Design and Permitting

Description: Complete subsurface investigation including soil borings and test pits to determine infiltration rates and characterize underlying soils. Finalize design plans and specifications and prepare bid documents.

Task 1 – Field Survey

The team will conduct a site topographic survey as needed to accurately represent field conditions. Horizontal and vertical controls for the project will be identified on the ground survey. On-site utilities and utility easements will be identified along with property boundaries in the vicinity of the project. Topography will be in one-foot contours. The coordinate system will be North American Datum of 1983 State Plane Minnesota South, and NAVD 88 Elevations. In addition to the basic surveying, the team will provide survey locations for:

- All major trees and shrubs that are native and invasive
- Locations for test pits and borings and monitoring wells required for Task 3

Surveying the location of trees and shrubs that are native and invasive will assist us in preparing the restoration construction plans where select invasive plants will be replaced with native plants. Native plant species will be incorporated into the restoration of the construction area and general vicinity of the project site.

Task 2 – Geotechnical & Hydrogeologic Characterization

The team will solicit proposals from geotechnical firms to provide the geotechnical professional services for the project. The following is a summary of the geotechnical and hydrogeologic characterization work to be done under this task:

- Characterize the infiltration capacity of the native soils in the SSCW's discharge area using American Society of Testing Materials (ASTM) methodology.
- Drill three soil borings by a limited access drilling rig into shallow groundwater estimated to be approximately 10 feet below grade. The soil borings will be completed as two-inch polyvinyl chloride (PVC) piezometers with 10 feet of 0.010-inch slot well screen. The piezometers will be completed as locking above-grade well boxes. The three piezometers will be installed around the perimeter of the SSCW so that groundwater elevation and flow direction can be consistently measured over time. The water level data will be tabulated and compiled to produce a groundwater flow map for the wetland area. Aquifer slug testing and data analysis can also be completed in one piezometer if needed to supplement the field and laboratory soil testing to estimate hydraulic conductivity of the native soils in the vicinity of the SSCW.
- Collect soil samples for field logging per ASTM D2488 (field classification per Unified Soil Classification System [USCS]), and collect laboratory samples for grain size, vertical hydraulic conductivity, and Atterberg limits/USCS classification per ASTM methodology.
- Prior to drilling, locate and map potential existing utility lines and related infrastructure in the area such as telephone, electric, water, cable, fiber optic, or natural gas and other lines.
- Prepare a summary report of the subsurface investigation summarizing the results and recommendations.

Task 3 – Construction Documents

The team will prepare all drawings, specifications, schedules, and cost estimates for the project. Concept drawings will be discussed in-person with municipal (White Bear Township, White Bear Lake) staff, with whom the team will discuss constructability and maintenance issues and provide recommendations. When directed,

construction documents for the final recommended project will be prepared. To support the development of the project construction documents, the team will:

- Prepare a detailed project description to facilitate permitting
- Prepare a 30% complete plan set for permitting
- Design pipe conveyances from existing storm water piping into new system
- Design a pump station for dry weather surface water withdrawal from Whittaker Pond
- Prepare 90% complete plan set for municipal review
- Prepare 100% complete plan set for bidding

Task 4 – Permit Coordination & Application

The Team will prepare permit applications for construction. The permitting schedule will be dependent on agency review time for the permit documents and agency availability for meetings and consultation. It is anticipated that the project will be required to comply with the following regulatory agencies, including the White Bear Township:

- U. S. Army Corps of Engineers – Section 404 Permit (as needed for the project)
- Minnesota Department of Natural Resources (MnDNR), Board of Water and Soil Resources and the local government unit – Wetland Conservation Act (WCA) permit (as needed for the project)
- MnDNR – Surface Water Appropriations Permit
- White Bear Township – Grading and Wetland Permit

Summary Budget Information for Activity 1:

ENRTF Budget: $ 101,500
Amount Spent: $ 0
Balance: $ 101,500

Outcome	Completion Date
1. Field Survey - Conduct a site topographic survey ($5,000)	August 30, 2016
2. Geotechnical & Hydrogeologic Characterization - Complete three soil borings and five infiltration test pits. Prepare subsurface investigation report. ($30,000)	August 30, 2016
2. Construction Documents - Complete design plans and specifications and produce procurement and bid documents. ($59,500)	January 31, 2017
3. Permit Coordination and Applications - Prepare permit (404 permit, dewatering, grading and etc.) applications for construction ($7,000)	April 1, 2017

Activity Status as of *[December 1, 2016]***:**

Activity Status as of *[June 1, 2017]***:**

Final Report Summary for Activity 1:

ACTIVITY 2: Construction Management and Construction of Treatment Cells.

Description: Select contractor and construct project.

Vadnais Lake Area Water Management Organization will solicit via competitive bid for the project engineering firm. The team will complete the following activities during the procurement and construction phase of the project.

- Conduct bid evaluation
- Prepare addenda(s), as required.
- Facilitate one pre-bid meeting, one preconstruction meeting, and regular site progress review meetings
- Address requests for information (RFIs)
- Review shop drawings
- Review and process submittals
- Conduct regular site visits during construction

We have assumed the construction phase will be 3.5 months in duration. To complete the activities listed above, the team will use the tools listed below that have proven to be effective in managing similar projects.

Project Coordination
Beyond the standard weekly and monthly emails and calls, the team will establish a hierarchical and peer based communication plan. This plan will encourage each manager and lead from each department to be in constant communication with their company counterpart, contractor etc. through an informal process on a potentially daily basis.

Project Meetings
Each meeting will include agendas and the proceedings will be documented. These meeting minutes will include attendees, items discussed, decisions, and action items. Minutes will be distributed to all attendees for review and agreement. The first order of business in each meeting will be to review the action items from the previous meeting to confirm that scheduled items have been completed.

Schedule
The team will develop a clear schedule for the project and monitor that schedule daily. Schedule metrics will be included in weekly and monthly reports. Should the schedule become an issue the team will alert the granting agency.

Progress Reports
Prior to each formal progress meeting, the team will produce a progress report that summarizes the status of each task, including budget, schedule analysis, work completed, work anticipated, future milestones, and potential deviations from those milestones of each task. The report will also itemize outstanding issues or questions that need to be resolved as the project progresses. We have assumed one site visit per week during construction. We have assumed the contractor will prepare the project SWPPP and complete the SWPPP inspections.

Final Report Summary for Activity 2:

Summary Budget Information for Activity 2:

ENRTF Budget: $ 321,400
Amount Spent: $ 0
Balance: $ 321,400

Outcome	Completion Date
1. Construction Administrations ($20,000)	September 1, 2017
2. Construction of the Subsurface Constructed Wetland (mobilization - $18,000, Wetland Area - $60,000, Infiltration area - $22,000, Pumps and Piping - $201,400)	September 1, 2017

Activity Status as of *[December 1, 2016]***:**

Activity Status as of *[June 1, 2017]***:**

Final Report Summary: December 1, 2017

ACTIVITY 3: Effectiveness Monitoring

Description: Finalize monitoring plan and perform long-term monitoring to assess system performance and pollution-reduction effectiveness for phosphorus, nitrates, polycyclic aromatic hydrocarbons and E. coli. Produce project report including summary of monitoring results. As requested, the project has secured the consulting assistance of Dr. Tim La Para, University of Minnesota Department of Civil, Environmental, and Geo-Engineering to evaluate the effectiveness of the pilot treatment system so that it maximizes benefits and can be replicated elsewhere.

Task 1 – Monitoring Plan

Following construction, the team will produce a detailed monitoring plan that details the steps involved in assessing the overall performance of the project and the effectiveness of the SSCW in reducing stormwater pollutants. The monitoring plan will include the methods for field work and sample collection, described sample handling and chain of custody procedures, define appropriate parameters required by the analytical laboratory, identify quality control and quality assurance (QA/AC) procedures to be followed in the field and laboratory, and discuss statistical analyses and reporting requirements. Monitoring plan will address the specific parameters to be sample, those being phosphorus, nitrates, E. coli and PAH's. A draft monitoring plan will be produced for the project, which will be reviewed by technical experts at the University of Minnesota, specifically Dr. Tim La Para who has agreed to be a consultant for the project, help with the final peer reviewed paper, monitoring plan and design. The University will be contracted to assess the effectiveness of the system in removing pathogens. Once edits and comments from reviewers have been incorporated into the draft monitoring plan, a final monitoring plan for the project will be produced. The monitoring plan will be produced and approved prior to any sample collection. Vadnais Lake Area WMO anticipates continuing monitoring of the project at least 5 years after final reporting in 2020.

Task 2 – Sample Collection and Analysis

Sample collection and analysis for assessing project performance and effectiveness will be conducted following the procedures detailed in the monitoring plan. The SSCW will contain a series of monitoring ports (where samples for phosphorus, nitrates, E. coli and PAH's will be taken) consisting of 2-inch PVC pipes inserted vertically into the SSCW at the interface of the various media layers (the top of the monitoring ports will be capped to prevent surface contamination and the bottom of the ports will be surrounded by a mesh material to prevent clogging). During construction, the monitoring ports will be placed in a series of monitoring arrays. Each array will consist of three PVC pipes installed at three locations within the SSCW: top of gravel layer, top of sand layer, and top of sorption media layer. There will be three arrays placed at the upstream, middle, and downstream ends of each experimental cell. In this way, each of the three experimental cells will have nine monitoring ports (27 monitoring ports overall for the project). During a monitoring event, samples from a given depth in an experimental cell will be collected and composited prior to analysis of chemical pollutants (nitrates, phosphorus, and PAHs). Separate samples will be collected for *E. coli* analysis and analyzed individually (not composited). A total of three post-construction monitoring events will be conducted.

BMP effectiveness will be determined by comparing pollutant concentrations in the untreated stormwater (prior to distribution into the treatment cells) to pollutant concentrations from samples collected from the 27 monitoring ports after treatment in the various media layers of each of the three experimental cells. This study

design will allow for a statistical assessment of the effectiveness of each of the media layers as well as each overall experimental cell in reducing pollutant concentrations in stormwater.

Task 3 – Reporting and Final Report Summary

The results of the effectiveness monitoring will be summarized in a report following QA/QC procedures, statistical analyses, and reporting requirements detailed in the monitoring plan. The report will assess the effectiveness of the project in reducing stormwater pollutants and will include an executive summary, introduction, materials and methods, results, and conclusions sections. A draft report will be produced for the project, which will be reviewed by Dr. Tim LaPara at the University of Minnesota, as well as LCCMR staff. Once edits and comments from reviewers have been incorporated into the draft report, a final report for the project will be produced.

Final Report Summary for Activity 3: December 1, 2020

Summary Budget Information for Activity 3:

ENRTF Budget: $ 77,100
Amount Spent: $ 0
Balance: $ 77,100

Outcome	Completion Date
1. Complete Monitoring Plan ($3,000)	March 1, 2018
3. Conduct sample collection and analysis ($37,100)	November 30, 2018
4. Produce Draft and Final Assessment Reports ($7,000)	March 29, 2019
5. University of Minnesota	March 29, 2019

Activity Status as of *[December 1, 2016]***:**

Activity Status as of *[June 1, 2017]***:**

Activity Status as of *[December 1, 2017]***:**

Activity Status as of *[June 1, 2018]***:**

Activity Status as of *[December 1, 2018]***:**

Activity Status as of *[June 1, 2019]***:**

Activity Status as of *[December 1, 2019]***:**

Activity Status as of *[June 1, 2020]***:**

ACTIVITY 4: Education and Outreach
Description: Install informational signage at the site. Distribute BMP information and performance results via conference presentations, webinars and an academic paper. The tasks and deliverables included in this Activity will be conducted by project participants as in-kind services.

Task 1 – Educational Signage at the Project Site

An informational graphic sign will be prepared for the project and installed at the project site. The project is adjacent to a soccer field, baseball diamond, and other recreational facilities at Columbia Park and the area receives substantial amounts of visitors from spring through fall. The signage will highlight the experimental design, objectives, and outcomes of the LCCMR-funded project, the anticipated improvement in water quality, and the benefits to the community.

Task 2 – Conference Presentations

After the results of the effectiveness monitoring have been analyzed, the research project will be presented at technical conferences that focus on stormwater and water resource issues. The presentations will highlight the objectives of the LCCMR-funded project, discuss the results of the SSCW BMP effectiveness monitoring in reducing levels of bacteria and other pollutants in stormwater, and identify areas throughout the state where the technology may be applied. The conference presentations are not part of the project budget and will be conducted as in-kind services by the project manager and other technical experts associated with the project.

Task 3 – Webinars

After the results of the effectiveness monitoring have been analyzed, the research project will be presented by project team members via webinars to individuals and entities throughout the state that might be interested in this BMP technology. Target audiences for the webinars will likely include cities, watershed districts, watershed management organizations, MN Department of Transportation (MnDOT), MN Pollution Control Agency (MPCA), and/or soil and water conservation districts (SWCDs). The format of the presentations will depend on the results of the research project and the target audience, but will likely highlight the objectives of the LCCMR-funded project, discuss the results of the SSCW BMP effectiveness monitoring in reducing levels of bacteria and other pollutants in stormwater, and identify areas within the jurisdiction of the target audience where the technology may be applied.

Task 4 – Peer-reviewed Journal Article

After the effectiveness monitoring has been completed and the final report for the project has been produced, the results of the research project will be used to prepare an article for submission to a peer-reviewed scientific journal for publication. The journal article will reflect the information in the final report for the project (see Activity 3, Task 3) and will be used to communicate the technical information gained from the project to the scientific community interested in stormwater treatment and water resources management.
Final Report Summary for Activity 4: December 1, 2020

Summary Budget Information for Activity 4:

ENRTF Budget: $ 0
Amount Spent: $ 0
Balance: $ 0

Outcome	Completion Date
1. Educational signage at the project site.	September 1, 2017
2. Present project and monitoring results at water resources related technical conferences (e.g., MN Water Resources Conference, MN Association of Watershed Districts, WEFTEC).	October and December 2018
3. Present project results via webinars targeted to entities within MN interested in implementing this BMP (e.g., cities, watershed districts, watershed management organizations, MnDOT, MPCA, SWCDs)	December 1, 2018
4. Prepare and submit academic paper to peer –reviewed journal.	July 1, 2020

Activity Status as of *[December 1, 2017]***:**

Activity Status as of *[June 1, 2018]***:**

Activity Status as of *[December 1, 2018]***:**

Activity Status as of *[June 1, 2019]***:**

Activity Status as of *[December 1, 2019]***:**

Activity Status as of *[June 1, 2020]***:**

V. DISSEMINATION:

Description: Disseminate information on the project, the results of the effectiveness monitoring, and the applicability of the technology for applications throughout the state.

Information about the project will be disseminated by the following means:

- Educational signage at the project site at Columbia Park
- Conference presentations that focus on stormwater and water resource issues
- Webinars to technical and non-technical target audiences that might be interested in this BMP technology
- Submittal of article on the results of the research project to a peer-reviewed scientific journal for publication.

These tasks that will be used to disseminate project information are discussed in Activity 4 above. In addition, to these tasks, information on the project will also be made available on the VLAWMO website at www.vlawmo.org.

Status as of *[December 1, 2016]***:**

Status as of *[June 1, 2017]***:**

Status as of *[December 1, 2017]***:**

Status as of *[June 1, 2018]***:**

Status as of *[December 1, 2018]***:**

Status as of *[June 1, 2019]***:**

Status as of *[December 1, 2019]***:**

Status as of *[June 1, 2020]***:**

Final Report Summary for Dissemination: December 1, 2020

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	$ Amount	Overview Explanation
University of Minnesota	$30,000	Pathogen monitoring, project consulting assistance
Professional/Technical/Service Contracts:	$470,000	Engineering firm will complete the engineering design, construction administration and data analysis. Additional services will be solicited via competitive bid for geotechnical, construction, and restoration services.
TOTAL ENRTF BUDGET:	**$500,000**	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than $5,000: N/A

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 0

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 0.4

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
Vadnais Lake Area WMO	$30,000	$	Staff Time to oversee project
State			
City of White Bear Lake	$2000	$	Maintenance of pump station
TOTAL OTHER FUNDS:	**$**	**$**	

VII. PROJECT STRATEGY:

A. Project Partners:

Project Partner	Responsibilities/Role
Vadnais Lakes Area WMO	Project owner and manager, conduct monitoring/prepare reports, disseminating funds and project information and results, conduct monitoring/prepare reports
White Bear Township	Property owner
St. Paul Regional Water Service	Provide design information and review
Ramsey County	
City of White Bear Lake	
University of Minnesota	Provide comments, review and assistance with design and monitoring of project, peer-review paper assistance and evaluation of effectiveness of project

B. Project Impact and Long-term Strategy:

The direct, long-term impact of this project will be to implement a novel, cost-effective BMP to reduce bacteria in drinking water supplied to East Vadnais Lake and aquifer recharge. BMP design and construction information and performance results will be disseminated to entities throughout the State so that they may implement this type of BMP to address elevated bacteria levels within their water resources.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	$ Amount
Vadnais Lake Area WMO for Burns & McDonnell to put together proposal to address impairment	November 2015	$14,800

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

Restoration

1. **Provide a statement confirming that all restoration activities completed with these funds will occur on land permanently protected by a conservation easement or public ownership. Land used for project is public land in White Bear Township.**

2. **Summarize the components and expected outcomes of restoration and management plans for the parcels to be restored by your organization, how these plans are kept on file by your organization, and overall strategies for long-term plan implementation. Any land disturbed by project construction will be restored to pre-construction conditions.**

3. **Describe how restoration efforts will utilize and follow the Board of Soil and Water Resources "Native Vegetation Establishment and Enhancement Guidelines" in order to ensure ecological integrity and pollinator enhancement. NA**

4. **Describe how the long-term maintenance and management needs of the parcel being restored with these funds will be met and financed into the future. Project cells will be planted with specific native vegetation for research purpose. Vegetation will be maintained per BWSR guidelines.**

5. **Describe how consideration will be given to contracting with Conservation Corps of Minnesota for any restoration activities. NA**

6. **Provide a statement indicating that evaluations will be completed on parcels where activities were implemented both 1) initially after activity completion and 2) three years later as a follow-up. Evaluations should analyze improvements to the parcel and whether goals have been met, identify any problems with the implementation, and identify any findings that can be used to improve implementation of future restoration efforts at the site or elsewhere. Status reports will include evaluations of the treatment cells including condition of native vegetation.**

IX. VISUAL COMPONENT or MAP(S):

X. RESEARCH ADDENDUM:

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than [*December 1, 2016*], [*June 1, 2017*], [*December 1, 2017], [June 1, 2018], [December 1, 2018], [June 1, 2019], [December 1, 2019], [June 1, 2020]* and [*December 1, 2020*]. A final report and associated products will be submitted between June 30 and August 15, 2021.

OVERALL PROJECT STATUS UPDATES:

Environment and Natural Resources Trust Fund
M.L. 2016 Project Budget

Project Title: Surface Water Bacterial Treatment System Pilot Project
Legal Citation: M.L. 2016, Chp. 186, Sec. 2, Subd. 04t
Project Manager: Brian Corcoran
Organization: Vadnais Lake Area Water Management Organization
M.L. 2016 ENRTF Appropriation: $ 500,000
Project Length and Completion Date: 3 Years, June 30, 2020
Date of Report: May 29, 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance				TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	**Preliminary and Final Design and Permitting**			**Construction Management**			**Effectiveness Monitoring**							
Professional/Technical/Service Contracts														
TBD (competitive Bid): Engineering Design,Construction Administration and Data Analysis	$71,500	$0	$71,500	$21,000	$0	$21,000	$10,000	$0	$10,000				$102,500	$102,500
TBD (competitive Bid): Geotechincal Services	$30,000	$0	$30,000										$30,000	$30,000
TBD (competitive Bid): Wetland Construction and Restoration Services			$0	$300,400	$0	$300,400							$300,400	$300,400
University of Minnesota							$30,000		$30,000				$30,000	$30,000
Monitoring Services							$37,100	$0	$37,100				$37,100	$37,100
COLUMN TOTAL	**$101,500**	**$0**	**$101,500**	**$321,400**	**$0**	**$321,400**	**$77,100**	**$0**	**$77,100**				**$500,000**	**$500,000**