



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2019 ENRTF Work Plan (Main Document)

Today's Date: 8-27-18, revised 10-18-18

Date of Next Status Update Report: March 1, 2020

Date of Work Plan Approval:

Project Completion Date: June 30, 2022

Does this submission include an amendment request? ___

PROJECT TITLE: Spring Biological Nitrate Removal to Protect Drinking Water

Project Manager: Troy Nemmers

Organization: City of Fairmont

College/Department/Division: Engineering/Public Works

Mailing Address: 100 Downtown Plaza

City/State/Zip Code: Fairmont, MN 56031

Telephone Number: 507-238-9461

Email Address: tnemmers@fairmont.org

Web Address:

Location: City of Fairmont, west shore of Hall Lake

Total Project Budget: \$175,000

Amount Spent: \$0

Balance: \$175,000

Legal Citation: M.L. 2019, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

I. PROJECT STATEMENT: The City of Fairmont, Minnesota’s drinking water supply is threatened by high nitrates in spring runoff. Because conventional bioreactors are ineffective during the spring, the City of Fairmont needs an alternative design – a spring-season biological nitrate removal system – to reduce the load of nitrates entering Hall Lake and the chain of lakes during this time-critical season that can provide reliably safe drinking water for its 10,000 residents.

Without an environmentally based mechanism to reliably reduce nitrate, the City of Fairmont would likely need to spend several million dollars to upgrade its drinking water treatment system. In 2016, the City was forced to issue a public health notice that Fairmont’s drinking water exceeded EPA’s maximum contaminant level (10 mg/L). High nitrates in drinking water can cause methemoglobinemia, or “blue baby disease”, which is lethal to infants. The City currently uses blending and mechanical treatment to attenuate high nitrate spikes, but the capacity of these tools is limited.

Fairmont’s drinking water comes from a chain of lakes fed by agricultural watersheds – the City’s surface water intake is on Budd Lake (see Figure 1). Dutch Creek is one of the largest tributaries to the Fairmont chain of lakes, with a watershed covering over 9,000 acres. Dutch creek is also a significant source of nitrate to the City’s drinking water supply. Data collected since 2000 show periodic high nitrate occurrences in Dutch Creek, with peaks over three times the EPA maximum contaminant levels. During warmer months of the year, natural nitrate removal processes in the lakes help to prevent nitrates from reaching the City’s drinking water. However, in the spring, when nitrates are more easily flushed out of the agricultural watersheds, the natural limnologic removal mechanisms are ineffective. Recent SWAT modeling completed for the MPCA and USEPA supports this seasonal variation¹. In fact, the results of the modeling suggest that both spring flushing and summer removal mechanisms are underestimated for the Dutch Creek watershed. This reinforces the need to better adapt nitrate removal technologies to work when nitrate removal is most needed – namely in the spring.

Fairmont is working with the University of Minnesota to evaluate a large passive nitrate removal system². The focus of this ENRTF-funded project will be to optimize a portion of the proposed plan to work more effectively during the spring season by employing passive solar technology and bioadaptation. The benefits of a new spring-season biological nitrate removal system over a conventional bioreactor system will be demonstrated at field-scale over the next three years.

II. OVERALL PROJECT STATUS UPDATES:

First Update March 1, 2020

Second Update September 1, 2020

Third Update March 1, 2021

Fourth Update September 1, 2021

Fifth Update March 1, 2022

Final Report between project end (June 30) and August 15, 2022

¹ *Dutch Creek and Hall Lake SWAT Modeling Report*, Prepared for Minnesota Pollution Control Agency and USEPA. Prepared by Tetra Tech, Updated March 13, 2018.

² *Dutch Creek Watershed Implementation Plan*

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1 Title: Design and Install nitrate removal system

Description: City of Fairmont public works (CFPW) staff will collaborate with the University of Minnesota Dept of Bioproducts and Biosystems Engineering (UMN-BBE) team to plan the design, implementation and performance evaluation of the nitrate removal system.

Specifically, CFPW and UMN-BBE will develop a request for proposal (RFP) and select a consulting engineering firm to design the system in concert with CFPW and UMN-BBE. That consulting engineering firm will develop plans, specifications, bid documents and a second RFP and select a contractor to construct the nitrate removal system. Once a contractor is selected, they will construct the nitrate removal system under the supervision of CFPW, UMN-BBE and the consulting engineer.

ACTIVITY 1 ENRTF BUDGET: \$95,000

Outcome	Completion Date
1. RFP and selection of engineering consultant	7-1-19
2. Detailed design, schedule, and bid package for contractors completed	8-15-19
3. Bidding and selection of construction contractor	9-30-19
4. Completed construction of nitrate removal system	11-30-19

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ACTIVITY 2 Title: Research and install cold weather bio-adaptation

Description: CFPW, UMN-BBE and the selected engineering consultant will work together to identify the materials needed to manage temperature and microbial response in the bioreactor. This activity will likely involve iteration to more closely target the desired nitrate treatment. A scaled performance design will be developed catch operation changes and adjustments needed to meet the project objectives.

ACTIVITY 2 ENRTF BUDGET: \$46,000

Outcome	Completion Date
1. Develop cold weather technology	8-1-19
2. Detailed design, schedule, and bid package for contractors completed	9-1-19
3. Bidding and selection of contractor	10-15-19
2. Install cold weather features on bioreactor	11-30-19

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ACTIVITY 3 Title: Operate and monitor bioreactor performance

Description: CFPW, UMN-BBE and the selected engineering consultant will work together to start the system in the spring of 2020. We anticipate multiple operational changes and adjustments will be necessary to create the optimal temperature and microbial response. CFPW and UMN-BBE will gather data from the site and regularly discuss the results with the entire team to successfully reduce nitrate entering Hall Lake.

ACTIVITY 3 ENRTF BUDGET: \$30,000

Outcome	Completion Date
1. Run start up trials	7-30-20
2. Complete performance evaluation of cold weather features	8-15-20
3. Make operational adjustments	ongoing
4. Collect performance data	6-1-22

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ACTIVITY 4 Title: Conduct statistical analysis and complete final project report

Description: CFPW, UMN-BBE and the selected engineering consultant will work together to interpret data and create charts and tables of the system performance. UMN-BBE will prepare a draft report for review and then complete the final report.

ACTIVITY 4 ENRTF BUDGET: \$4,000

Outcome	Completion Date
1. Gather and organize performance data and conduct statistical analysis	6-30-22
2. Prepare a draft report	6-30-22
3. Complete the final report	8-15-22

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Third Update March 1, 2021

Fourth Update September 1, 2021

Fifth Update March 1, 2022

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IV. DISSEMINATION:

Description: The final report will be presented to the City of Fairmont residents, at the MN annual Water Resources Conference and a national conference TBD.

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](#).

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V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than \$5,000: The materials and construction of the bioreactor with the cold weather technology is estimated to cost \$58,000.

Explanation of Use of Classified Staff:

Total Number of Full-time Equivalent (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours for entire duration of project: 670	Divide total personnel hours by 2,080 hours in 1 yr = TOTAL FTE: 0.32
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Total Number of Full-time Equivalent (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: 1000	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE: 0.48
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VI. PROJECT PARTNERS:

A. Partners outside of project manager’s organization receiving ENRTF funding: UMN-BBE: \$55,000, A selected engineering consultant: \$41,000

B. Partners outside of project manager’s organization NOT receiving ENRTF funding: Martin County SWCD, MPCA, MDA and MDH.

VII. LONG-TERM- IMPLEMENTATION AND FUNDING: To fund long term implementation, the City of Fairmont is applying for EPA Clean Water Act Section 319 funding. Section 319 funding is provided to help implement approved nonpoint source management programs. The outcome of this funding request is not known to date.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted March 1 and September 1 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2022

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

- A. Budget Spreadsheet**
- B. Visual Component or Map**
- C. Parcel List Spreadsheet**
- D. Acquisition, Easements, and Restoration Requirements**
- E. Research Addendum**

Attachment A:
 Environment and Natural Resources Trust Fund
 M.L. 2019 Budget Spreadsheet

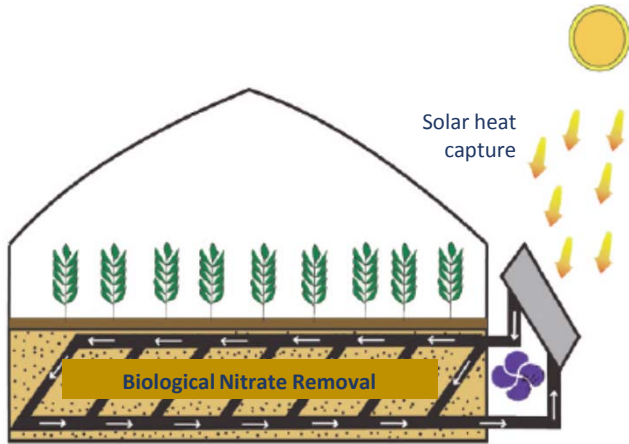


Legal Citation:
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 Project Title: Spring Biological Nitrate Removal to Protect Drinking Water
 Organization: City of Fairmont
 Project Budget: \$175,000
 Project Length and Completion Date: 3-yr; 6-30-22
 Today's Date: 8-27-18, rev 10-18-19, rev 11-2-18

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits)	\$ 20,000	\$ -	\$ 20,000
<i>City staff, 0.32 FTE for 3 year, All personnel costs will be reimbursed at 100% of salary. City staff fringe benefits will be calculated at 20% for reimbursement.</i>	\$ 20,000		\$ 20,000
Professional/Technical/Service Contracts			
<i>Contract with the University of Minnesota - contract/services will be negotiated with the Uof M as a partner on this project</i>	\$ 55,000	\$ -	\$ 55,000
<i>Contract with a selected engineering consultant - RFPs will be requested for this work to select an engineering consultant.</i>	\$ 41,000	\$ -	\$ 41,000
Equipment/Tools/Supplies			
NA	\$ -	\$ -	\$ -
Capital Expenditures Over \$5,000			
<i>These expenses will include the construction and installation costs for the cool weather bioreactor system and components. This contract will be awarded following a competitive bidding process.</i>	\$ 58,000	\$ -	\$ 58,000
Fee Title Acquisition			
NA	\$ -	\$ -	\$ -
Easement Acquisition			
NA	\$ -	\$ -	\$ -
Professional Services for Acquisition			
NA	\$ -	\$ -	\$ -
Printing			
NA	\$ -	\$ -	\$ -
Travel expenses in Minnesota			
<i>Mileage reimbursement will be requested in accordance with the Commissioner's plan. Travel expenses will include travel of City staff to participate in design, construction or post-construction meetings not held in the City of Fairmont.</i>	\$ 1,000	\$ -	\$ 1,000
Other			
	\$ -	\$ -	\$ -
COLUMN TOTAL	\$ 175,000	\$ -	\$ 175,000

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Balance
Non-State:	None	\$ -	\$ -	\$ -
State:	None	\$ -	\$ -	\$ -
In kind: City of Fairmont	Secured	\$ 10,000	\$ -	\$ 10,000

PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Balance
Current appropriation:	None	\$ -	\$ -	\$ -
Past appropriations:	None	\$ -	\$ -	\$ -



Source: Looboek, Kristi. *Solar-Powered Season Extension: High Tunnel Heating Research*. 2013



- Protecting drinking water from nitrate
- Innovative passive treatment

