



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

**Date of Report:** May 29, 2016

**Date of Next Status Update Report:** December 1, 2016

**Date of Work Plan Approval:** June 7, 2016

**Project Completion Date:** June 30, 2018

**Does this submission include an amendment request?** No

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**PROJECT TITLE:** Analyzing Alternatives for Municipal Wastewater Treatment

**Project Manager:** Scott Kyser

**Organization:** Minnesota Pollution Control Agency

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**Location:** Statewide

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**Total ENRTF Project Budget:**

**ENRTF Appropriation:** \$180,000

**Amount Spent:** \$0

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**Balance:** \$180,000

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

**Appropriation Language:**

\$180,000 the second year is from the trust fund to the commissioner of the Minnesota Pollution Control Agency to analyze alternatives for improved treatment of sulfate and salty parameters at municipal wastewater plants to inform the development and implementation of wild rice, sulfate, and other water quality standards. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

## **I. PROJECT TITLE: Analyzing Alternative for Municipal Wastewater Treatment**

### **II. PROJECT STATEMENT:**

The goal of this project is analyze alternatives for improved treatment of sulfate and salty parameters at municipal wastewater plants. This analysis will inform implementation of the wild rice, sulfate and other water quality standards.

The MPCA has begun the administrative process to revise the existing 10 mg/L wild rice sulfate standard to better reflect the complex biochemistry necessary to support wild rice. Currently there are few effluent limits in wastewater treatment plant (WWTP) permits derived from the existing wild rice sulfate standard. Although specifics about how a revised standard may be implemented are limited, more WWTPs are likely to have sulfate limits in the future.

Municipal WWTPs are not designed to remove sulfate or salty parameters from their wastewater. In order to remove sulfate or salty parameters, a treatment plant would need to upgrade or change their treatment processes. The proposed study will allow affected communities to better understand sulfate and salty parameter treatment alternatives and their costs before beginning pilot testing and design work.

A document that summarizes and critically evaluates potential sulfate and salty parameter treatment technologies would provide essential support to municipalities in Minnesota. If this information were made available municipalities they would not have to incur costs on hiring consultants to evaluate it on a project by project basis. It would also be useful to know how sulfate and the salty parameters (chloride, sulfate, salinity, dissolved materials, etc) could be effectively co-removed.

The treatment plant engineering design community has the best resources available to both critically evaluate sulfate and salty parameter treatment alternatives and their associated costs for municipal treatment plants. The design community possesses knowledge and costing experience that the MPCA does not have. MPCA would issue a competitive Request for Proposals (RFP) to solicit a sulfate and salty parameter treatment alternatives analysis that critically evaluates the applicability of sulfate treatment technologies and their costs for municipal utilities. At a minimum, the treatment alternatives in table 1 including source reduction will be evaluated for removal potential for both salty parameters and sulfate.

The MPCA believes there would be additional value in a more detailed “Case Analysis” exercise where the contractor would perform initial sulfate and salty parameter treatment plant design for a representative small, medium and large scale municipality. This approach would identify design concerns that could only come to light through the design process. Since a WWTP that simultaneously treats human waste and potentially removes sulfate and salty parameters to low levels has never been designed in Minnesota, this step would provide crucial implementation information. A “Case Analysis” exercise is common in federal EPA guidance documents for evaluating wastewater treatment technologies and provides critical insight.

### **III. OVERALL PROJECT STATUS UPDATES**

**Project Status as of December 1, 2016:** Update #1 to LCCMR

**Project Status as of May 1, 2017:** Update #2 to LCCMR

**Project Status as of December 1, 2017:** Update #3 to LCCMR

**Project Status as of May 1, 2018:** Update #4 to LCCMR

**Project Status as of June 30, 2018:** Final written report due to LCCMR.

**Overall Project Outcomes and Results:** A document that summarizes and critically evaluates potential municipal sulfate and salty parameter treatment technologies and their associated costs and implementation concerns for representative wastewater treatment plants.

#### **IV. PROJECT ACTIVITIES AND OUTCOMES:**

**ACTIVITY 1:** Administration of Sulfate and Salty Parameter Treatment Alternative RFP

**Description:** The RFP will encourage the state and national design community to apply for funds to complete an analysis of sulfate and salty parameter treatment options. The RFP contracting process will be managed by the MPCA contract staff, reviewed by MPCA engineers and out-state municipal wastewater engineers and will comply with all state and federal regulations. The final candidate will be selected by a committee of MPCA engineering staff and out-state municipal wastewater engineers under the guidance of the MPCA contract unit. Once the best candidate is selected, funds and necessary design information will be delivered to the contractor by the MPCA. The grantee will have ten months to complete the deliverable for activity 1. A presentation of likely feasible treatment alternatives to a panel of engineering experts will be required before activity 1 will be completed. The panel of experts will include UMN engineering and scientific faculty, MPCA staff and engineering experts from outside the MPCA. A written summary evaluating each alternative with the selection of a most feasible alternative for a municipal WWTP will be the deliverable for activity 1.

The selected party, will at a minimum, review the feasibility of the nine selected technology categories below in Table 1. The goal is to understand all preliminary advantages and disadvantages of each selected sulfate treatment approach in order to rank them and find the most feasible treatment technology. Feasibility will be defined as a holistic evaluation of the technology considering relative costs, design, operational, waste stream handling and other life-cycle analysis concerns. Eliminating a technology as being feasible is just as important as finding an alternative that is feasible. Each treatment alternative must also be evaluated as to whether it will additionally remove other 'salty parameters', but removing sulfate will be considered the primary goal of each alternative.

The selected party will be provided with four representative effluent sulfate treatment goals and four representative sulfate influent conditions to evaluate each alternative against. A given treatment technology might work well for certain scenarios (low influent sulfate, high effluent target) but not for others (high influent sulfate, low effluent target). The selected party will, to the extent possible, determine how each treatment technology would work across the range of provided treatment goals.

The MPCA has selected the treatment alternatives listed below but does not consider this list to be complete. The selected party will demonstrate having evaluated whether other treatment alternatives not listed might be feasible or whether linking several treatment alternatives in new ways might generate a new feasible alternative. The selected party must understand that the list below represents categories and that the specifics of the technologies within each category must be illuminated in the alternative analysis. This project should not involve collecting any water samples or physically evaluating treatment technologies at the bench or pilot scale; the goal is a white paper level analysis of feasibility.

Table 1. The minimum nine categories of sulfate treatment technologies required for review in activity 1

Sulfate Influent Source Reduction
Chemical Precipitation with Lime, Barium, Ettringite
Sulfate Ion Exchange
Nanofiltration, Reverse Osmosis and Associated Membrane Technologies
Electrodialysis
Activated Sludge Retrofit
Anaerobic Treatment Processes (Sulfate Digestion, Anammox & other Sidestream Unit Operations)
Constructed Wetlands
Permeable Reactive Barriers

**Summary Budget Information for Activity 1:**

**ENRTF Budget: \$ 100,000**  
**Amount Spent: \$ 0**  
**Balance: \$ 100,000**

Outcome	Completion Date
1. MPCA publically issues RFP	July 1, 2016
2. MPCA finalizes candidate selection and initiates project kickoff	November 1, 2016
3. Update #1 to LCCMR	December 1, 2016
4. Update #2 to LCCMR	May 1, 2017
5. Final alternative analysis and most feasible alternative due to MPCA allowing for changes based on panel input	September 1, 2017

**Project Status as of December 1, 2016:** Update #1 to LCCMR

**Project Status as of May 1, 2017:** Update #2 to LCCMR

**ACTIVITY 2: Sulfate and Salty Parameter Treatment Case Analysis**

**Description:** The candidate will select the most promising sulfate and salty parameter treatment technologies from Activity 1 and begin a preliminary design for three representative municipalities using the average wet weather flows described in the table below. The goal of design would be to unearth implementation concerns only discoverable through initial design and to get a better sense of costs and relevant implementation concerns. The information found in this preliminary design would be used to inform the final deliverable with respect to costs and design considerations.

Facility Size	Average Wet Weather Flow (MGD)	Sulfate Treatment Target
Small	0.5	Most Restrictive
Medium	2.5	Most Restrictive
Large	10	Most Restrictive

A facility plan level analysis as defined in the ten state standards (section 11; <http://www.10statesstandards.com/wastewaterstandards.pdf>) will be used as a guide to the level of analysis required for each facility size. Detailed design (sewering, electrical, structural, pumping, etc...), financing methods, construction schedules, population projections and environmental review will not be required. Unit operation train diagrams and general flow diagrams will be required. A conceptual understanding of the proposed WWTP design, operation and maintenance should be the goal of activity 2.

The contractor should also generally comment on whether new WWTP construction would be required for each scenario or whether a conventional activated sludge WWTP or pond could be retrofitted to treat sulfate. The MPCA will provide theoretical WWTPs specifications for retrofit considerations. The facility plan documents do not need to go into specific design of retrofitted plants; a general comment on the feasibility of retrofitting the representative WWTPs for treating sulfate is all that will be required.

It is not reasonable to expect the contractor to develop a facility plan for each of the various influent sulfate concentrations and treatment targets in activity 1 using the given budget. The facility plans will use the most restrictive treatment scenario (highest influent sulfate, lowest effluent target from activity 1) but the contractor will be required to generally comment on how well the treatment would scale in response to the other treatment scenarios. The facility plan will also consider whether this treatment will remove other salty parameters as a secondary goal. The same panel of experts from Activity 1 will review this project activity and provide recommendations for improvement as needed before final deliverable.

**Summary Budget Information for Activity 2:**

**ENRTF Budget: \$ 80,000**  
**Amount Spent: \$ 0**  
**Balance: \$ 80,000**

<b>Outcome (must match up)</b>	<b>Completion Date</b>
1. Selected contractor begins case analysis	September 1, 2017
2. Contractor presents final results to panel of review experts (See Partners, Page 6)	By May 1, 2018
3. Final report due to MPCA allowing for changes based on panel input	May 31, 2018
4. Final report deliverable to LCCMR	June 20, 2018

**Project Status as of December 1, 2017:** Update #3 to LCCMR

**Project Status as of May 1, 2018:** Update #4 to LCCMR

**Project Status as of June 30, 2018:** Final written report due to LCCMR.

**Final Report Summary:**

The final report will be a written document describing all of the results from activity 1 and activity 2. It will explain why each sulfate treatment alternative was eliminated as being feasible, why the most feasible treatment alternative was chosen and all associated costs and implementation concerns of that chosen treatment alternative.

**V. DISSEMINATION:**

**Description:** The final deliverable will be available on the MPCA webpage and will be disseminated electronically to the MPCA wastewater listserv and MPCA twitter page. The draft report after activity 1 will not be disseminated electronically.

MPCA webpage:

<http://www.pca.state.mn.us/index.php/water/water-types-and-programs/wastewater/index.html>

Twitter Site:

[http://twitter.com/MnPCA?ref\\_src=twsrc^google|twcamp^serp|twgr^author](http://twitter.com/MnPCA?ref_src=twsrc^google|twcamp^serp|twgr^author)

The selected contractor will be required to present the results of the report after completion of both activity 1 and activity 2 at MN conferences for wastewater engineers and environmental professionals. A list of recommended conferences to be presented at will be provided in the RFP.

**Project Status as of September 1, 2017:**

**Project Status as of May 1, 2018:**

**Project Status as of June 30, 2018:**

**VI. PROJECT BUDGET SUMMARY:**

**A. ENRTF Budget Overview:**

Budget Category	\$ Amount	Overview Explanation
Professional/Technical/Service Contracts:	\$180,000	Determining reasonable sulfate treatment alternatives and their associated costs
<b>TOTAL ENRTF BUDGET:</b>	<b>\$180,000</b>	

**Explanation of Use of Classified Staff:** MPCA will donate in-kind time to develop the RFP, select the contractor and monitor the progress of the project. No funds from the ENRTF will be used for MPCA staff funding.

**Explanation of Capital Expenditures Greater Than \$5,000:** None

**Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:** None

**Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:** 1.5 FTE for a registered professional engineer

**B. Other Funds:**

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
<b>Non-state</b>	None		
<b>State</b>	\$38,248	\$0	In-Kind FTE dollar equivalent for contracts unit and Engineering Review
<b>TOTAL OTHER FUNDS:</b>	<b>\$38,248</b>	<b>\$0</b>	

**VII. PROJECT STRATEGY:**

**A. Project Partners:** Review committee including engineers and scientists from the University of Minnesota, Met Council, Moorehead and Western Lake Superior Sanitary District.

**B. Project Impact and Long-term Strategy:**

In 2015, the MPCA began the administrative process to revise the existing 10 mg/L wild rice sulfate standard to better reflect the complex biochemistry necessary to support wild rice. Currently there are few effluent limits in wastewater permits derived from the existing wild rice sulfate standard. Although specifics about how a revised standard may be implemented are still in development, more municipal WWTPs are likely to have sulfate limits in the future.

This work will aid and inform the implementation of the wild rice sulfate standard. The project will provide accurate costs and implementation concerns for municipal WWTPs with regards to sulfate treatment. These costs and implementation concerns are absolutely essential for permitting WWTPs to comply with the wild rice sulfate standard.

The greatest benefit to this project is that it will provide a generalized sulfate preliminary design document for municipal WWTPs. This document will eliminate the need for municipal WWTPs to individually perform a sulfate treatment study, collectively saving municipal WWTPs hundreds of thousands of dollars in implementation costs!

**C. Funding History:**

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
No previous funding for this project.		\$0

**IX. VISUAL COMPONENT or MAP(S):** See attached

**X. RESEARCH ADDENDUM:** None

**XI. REPORTING REQUIREMENTS:**

Periodic work plan status update reports will be submitted no later than Aug 1 2016, January 31 2017, April 1 2017, November 29 2017 and May 1 2018. A final report and associated products will be submitted by June 30<sup>th</sup>, 2018.

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



**Project Title:** *Analyzing Alternatives for Municipal Wastewater Treatment*

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

**Project Manager:** *Scott Kyser*

**Organization:** *MPCA*

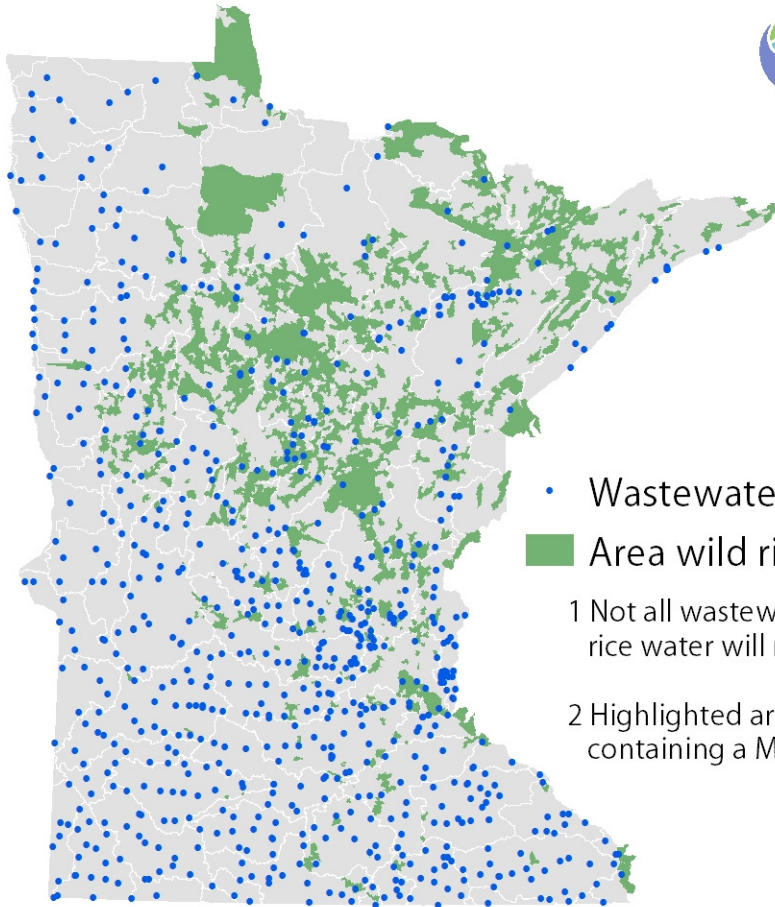
**M.L. 2016 ENRTF Appropriation:** \$ 180,000

**Project Length and Completion Date:** *2 Years, June 30, 2018*

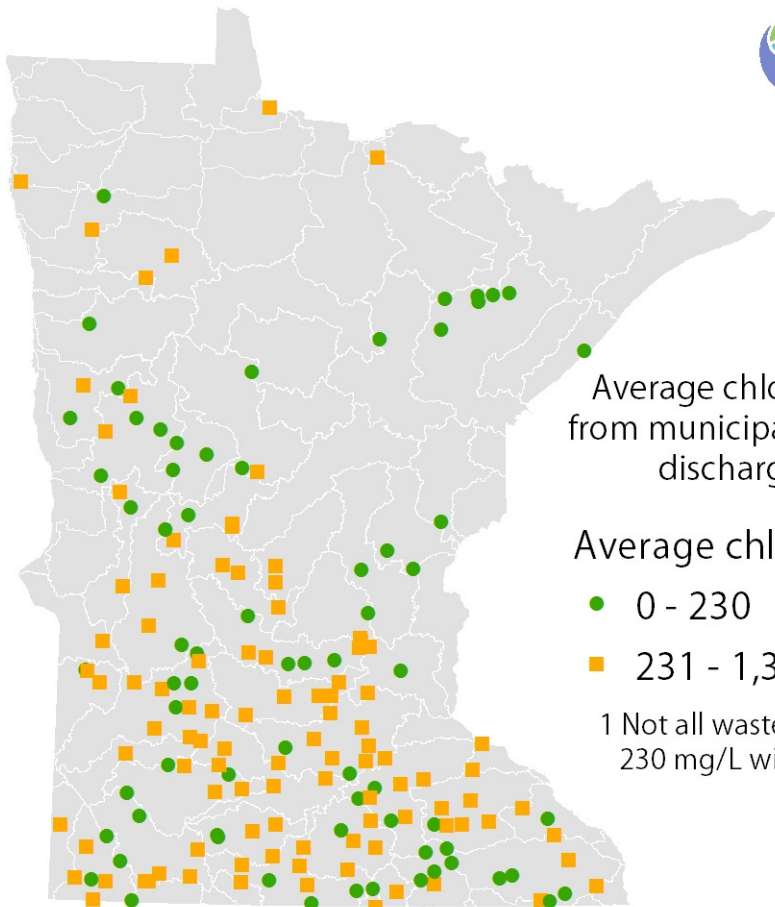
**Date of Report:** *May 29, 2016*

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	TOTAL BUDGET	TOTAL BALANCE	
<b>BUDGET ITEM</b>	<i>Administration of RFP and Sulfate and Salty Parameter Treatment Alternative Analysis</i>		<i>Sulfate and Salty Parameter Treatment Case Analysis</i>						
<b>Professional/Technical/Service Contracts</b>									
<i>A competitive RFP, focusing on the state and national design community, will be issued. The RFP will solicit proposals to analyse sulfate treatment alternatives, evaluate their pro and cons and determine treatment costs.</i>	\$100,000	\$100,00	\$80,000	\$80,000	\$80,000	\$0	\$180,000	\$0	
<b>COLUMN TOTAL</b>	\$100,000	\$100,00	\$80,000	\$80,000	\$80,000	\$0	\$180,000	\$0	





- Wastewater treatment facility
  - Area wild rice may be located
- 1 Not all wastewater facilities near a wild rice water will receive a sulfate limit.
  - 2 Highlighted areas are catchments containing a MDNR wild rice water.



Average chloride concentration from municipal NPDES wastewater discharges (2009-2014)

Average chloride conc. (mg/L)

- 0 - 230
- 231 - 1,300

1 Not all wastewater facilities over 230 mg/L will receive a chloride limit.

