Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2018 ENRTF Work Plan (Main Document)

Today's Date: December 15, 2017

Date of Next Status Update Report: January 31, 2019

Date of Work Plan Approval: 06/05/2018

Project Completion Date: June 30, 2021

Does this submission include an amendment request? No

PROJECT TITLE: Reduce Chlorides in Minnesota Waters by Evaluating Road-Salt Alternatives and Pavement Innovations

Project Manager: John S. Gulliver

Organization: University of Minnesota

College/Department/Division: St. Anthony Falls Laboratory

Mailing Address: 2 Third Ave SE

City/State/Zip Code: Minneapolis, MN 55414

Telephone Number: 612-624-4080

Email Address: gulli003@umn.edu

Web Address: http://stormwater.safl.umn.edu/

Location: Statewide

Total Project Budget: $400,000

Amount Spent: $0

Balance: $400,000

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 04c

Appropriation Language: $400,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota to investigate road-salt alternatives and pavement innovations to reduce lake, stream, and groundwater degradation caused by road-salt chlorides. This appropriation is available until June 30, 2021, by which time the project must be completed and final products delivered.

I. PROJECT STATEMENT:

This project will investigate road salt alternatives and pavement innovations that will reduce or eliminate the high flux of chloride from road salt into our environment and thus improve the water quality of our lakes, streams and groundwater.

Road salt impacts water quality, and will be a primary 21st century pollutant of concern in northern regions. Minnesota annually uses ~90 lbs per person of road salt (sodium chloride) to de-ice our roads and parking lots. Most of the sodium is trapped by the soil, but chloride is washed off of the streets or will move through the soil to receiving water bodies. We know from previous research that salt is accumulating to toxic levels in many lakes, streams and shallow groundwater. In the Twin Cities metropolitan area, for example, there are already 26 impaired lakes, 23 impaired streams and 1 impaired wetland for chloride. There is a strong possibility that lakes in urban Minnesota will become unable to support some of their fresh water organisms. Road salt alternatives and pavement innovations have the potential to provide similar road friction conditions while having less impact on the environment. We need to investigate the cost-effective application of these alternatives and pavement innovations now, to prepare for the near-future when a substitute for road salt is desired and needed.

The outcome of this project is to investigate and enhance strategies that improve water quality by evaluating road salt alternatives and pavement innovations to reduce the chloride load from road runoff. The methods and tools developed during this project will inform state, municipal and private entities using chloride –based salt on roads and parking lots. A feasibility matrix will be developed to summarize high level economic, environmental, time frame, implementation & maintenance challenges and benefits for alternate strategies.

A better understanding of road friction for road salt alternatives, combined with knowledge of environmental impacts and application and infrastructure costs will enable an improved decision-making process for public and private entities. City, county and MnDOT engineers will soon be making decisions about the best road salt alternative for their application. In addition, commercial entities are salting parking lots to reduce liability. This research could be used by the legislature to limit this liability if proper practices are used. The need for this research and the information it will generate is great, and the timing is urgent.

Input and advice from several agencies will be utilized to ensure that the goals of this research are met, and that the findings are useful to, and shared with, decision-makers in Minnesota. First, we have partnered with the Minnesota Pollution Control Agency (Brooke Asleson) for many years on the impacts of road salt. Second, we have enlisted the assistance of the Minnesota Department of Transportation (Steven Lund), who directs the maintenance and operation unit of the Metro District. Finally, we will seek advice from the members of the Stormwater Research Council, who participate and are involved in much of the stormwater research in Minnesota.

II. OVERALL PROJECT STATUS UPDATES:

First Update January 31, 2019
Second Update June 30, 2019
Third Update January 31, 2020
Fourth Update June 30, 2020
Final Update January 31, 2021

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Synthesize past and current investigations.
Description: Past and current investigations of road salt alternatives, pavement innovations and road friction studies will be reviewed. We are aware that there are substantial research needs here and that sufficient information will not be available for all alternatives, but this review will limit duplication of effort and maximize progress towards essential knowledge gaps.

ENRTF BUDGET: $40,000

Outcome	Completion Date
1. Synthesize past and current investigations	12/31/2018

Final Update January 31, 2019

ACTIVITY 2: Investigate water quality impacts of road salt alternatives in Minnesota.
Description: Information gathered in Activity 1 will be synthesized through the use of computer models to evaluate potential water quality impacts of road salt alternatives in Minnesota. Many of the non-chloride-based alternatives are organic compounds, which have a biological oxygen demand when released into the environment. The amount of such alternatives required for anti-icing and de-icing will be estimated from literature values, and computer models will then be used to determine the water quality impacts of these amounts on common water resources in Minnesota.

ENRTF BUDGET: $180,000

Outcome	Completion Date
1. Predict water quality impacts in Minnesota for some alternatives	09/30/2019
2. Select alternatives for laboratory testing	12/31/2019

First Update January 31, 2019
Second Update June 30, 2019
Final Update January 31, 2020

ACTIVITY 3: Conduct friction tests on pavement cores to select promising techniques.
Description: Blocks of several different pavement types will be treated with approximately 12 road salt alternatives and pavement innovations, and exposed to typical winter conditions in a climate-controlled room. The temperature, humidity, and ice cover will be controlled to make direct comparisons between alternatives. One of several road friction testers will be selected for these experiments and used to measure road friction in simulated winter conditions with pavement innovations and road salt alternatives. Ranking metrics will be developed based on cost and environmental impact of the alternatives, as well as road friction results for various simulated winter conditions.

ENRTF BUDGET: $180,000

Outcome	Completion Date
1. Laboratory road friction tests completed in various conditions for road salt alternatives	12/31/2020
2. Develop ranking metrics from cost and predicted road friction results for all alternatives	3/31/2021
3. Write report on laboratory results	6/30/2021

First Update January 31, 2019
Second Update June 30, 2019
Third Update January 31, 2020

IV. DISSEMINATION:

Description: Dissemination and transfer of new knowledge and technology will be directed towards homeowners, practitioners, regulatory units of government, and other interested stakeholders. The project team has a long history of providing training and dissemination of science through the Water Resource Center, the Erosion and Stormwater Certification Program and the MN Road Salt Applicator training. Information learned in this study will be incorporated into this and other certification curricula. The team is well-equipped to communicate and disseminate results and outreach will occur through a variety of established formats. The results will be incorporated into MPCA chloride reduction programming and policy.

Knowledge transfer will also occur through written and electronic communication streams including St. Anthony Falls Laboratory's UPDATES, a stormwater research newsletter distributed to over 2,400 subscribers and the University of Minnesota Extension Water Resources News published 4-6 times per year. The team will also seek to include information in the Minnegram and Confluence newsletters, published by the Water Resources Center. In addition, one or more journal articles will be submitted for publication from the results of this project.

The team is also well-equipped to engage in dialogue and collaboration with public entities including watershed districts, municipalities, counties, universities, the Minnesota Cities Stormwater Coalition, and statewide entities working on stormwater management. Finally, the team is able to collaborate and communicate with researchers and educators across multiple campuses spread throughout the state.

First Update January 31, 2019
Second Update June 30, 2019
Third Update January 31, 2020
Fourth Update June 30, 2020
Final Update January 31, 2021

V. PROJECT BUDGET SUMMARY:

A. Preliminary ENRTF Budget Overview: See attached budget spreadsheet

Explanation of Capital Expenditures Greater Than $5,000: A British Pendulum Tester or equivalent is required to complete the testing under activity 3.

Explanation of Use of Classified Staff: N/A

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

Enter Total Estimated Personnel Hours: 5166	Divide by 2,080 = TOTAL FTE: 2.5

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

Enter Total Estimated Personnel Hours: 930	Divide by 2,080 = TOTAL FTE: 0.45

B. Other Funds:

SOURCE OF AND USE OF OTHER FUNDS	Amount Proposed	Amount Spent	Status and Timeframe
Other Non-State $ To Be Applied To Project During Project Period:			
None	$	$	
Other State $ To Be Applied To Project During Project Period:			
None	$	$	
Past and Current ENRTF Appropriation:			
None	$	$	
Other Funding History:			
None	$	$	

VI. PROJECT PARTNERS:

A. Partners receiving ENRTF funding

Name	Title	Affiliation	Role
Peter T. Weiss	Professor	Valparaiso University	Visiting Professor to St. Anthony Falls Laboratory and subject matter expert.
Connie Fortin		Fortin Consulting	Subject matter expert.

B. Partners NOT receiving ENRTF funding

Name	Title	Affiliation	Role
Brooke Asleson	Water Pollution Prevention Coordinator	Minnesota Pollution Control Agency	State regulatory leadership coordinating issues related to the overall chloride management strategies underway at the MPCA

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

The long-term implementation of the results of this project include the dissemination of lessons learned, as described in section IV above. In addition, the project team is soliciting the Clear Road program for funds to match this effort, which would allow the project team to expand the research with field measurements and experiments of road salt alternatives in natural winter conditions. The project team is also pursuing opportunities to collect friction measurements of roadway surface throughout Minnesota, to better understand the friction of various pavements during winter conditions with, and without road salt applications. The information gained from this project will propel these future endeavors towards a robust understanding of road safety in cold Minnesota winters that also protects the environment from harmful anti-icing and de-icing chemicals.

VIII. REPORTING REQUIREMENTS:

- The project is for 3 years, will begin on July 1, 2018, and end on June 30, 2021.
- Periodic project status update reports will be submitted January 31 and June 30 of each year.

- A final report and associated products will be submitted between June 30 and August 15, 2021.

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2018 Budget Spreadsheet

Project Title: Reduce Chlorides in Minnesota Waters by Evaluating Road-Salt Alternatives and Pavement Innovations

Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 02, Subd. 04c
Project Manager: John S. Gulliver
Organization: University of Minnesota
College/Department/Division: St. Anthony Falls Laboratory
M.L. 2018 ENRTF Appropriation:
Project Length and Completion Date: 3 Years ending June 30, 2021
Date of Report: February 19, 2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Personnel (Wages and Benefits) - Overall	$276,169	$0	$276,169
Professor (J. Gulliver), Supervisory and Analysis, 6.7% FTE (75% salary, 25% benefits) each year for 3 years. (Total estimated amount $58,835)			
Professor (B. Wilson), Supervisory and Analysis, 1.9% FTE (75% salary, 25% benefits) each year for 3 years. (Total estimated amount $11,124)			
Professor (M. Marasteanu), Supervisory and Analysis, 1.9% FTE (75% salary, 25% benefits) each year for 3 years. (Total estimated amount $12,610)			
Research Associate (A. Erickson), Literature review, computer modeling, laboratory experiments, and analysis, 36% FTE (75% salary, 25% benefits) each year for 3 years. (Total estimated amount $108,067)			
Research Associate (M. Turos), laboratory experiments and analysis, 16.7% FTE (75% salary, 25% benefits) each year for 3 years. (Total estimated amount $44,939)			
Junior Engineer Trainee, Laboratory experiments, 4.8% FTE (100% salary) each year for 3 years. (Total estimated amount $3,935)			
Junior Scientist (A. Ketchmark), Experimental apparatus and laboratory experiments, 15% FTE (79% salary, 21% benefits) each year for 3 years. (Total estimated amount $ 36,659)			
Professional/Technical/Service Contracts			
Professional/Technical/Service Contracts: Contract with Peter Weiss (Visiting Professor) to provide oversight and expertise with laboratory experiments. 10% FTE (100% salary) each year 3 years.	$67,292	$0	$67,292
Professional/Technical/Service Contracts: Contract with Fortin Consulting to provide expertise and experience with data collection and analysis related to road salt alternatives. 4.8% FTE (100% Salary) each year for 3 years.	$32,136	$0	$32,136
Equipment/Tools/Supplies			

Equipment/Tools/Supplies: Supplies for experimental setup and analysis.	$15,000	$0	$15,000
Capital Expenditures Over $5,000: $9,000 for a British Pendulum Tester for laboratory experiments.	$9,000	$0	$9,000
Printing: Printing, Duplication, Binding.	$123	$0	$123
Travel expenses in Minnesota			
Travel: Collect information and pavement cores. 500 miles @ $0.56/mi	$280	$0	$280
COLUMN TOTAL	$400,000		$400,000