

**Environment and Natural Resources Trust Fund
2016 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 088-B

Surface Water Bacterial Treatment System Pilot Project

Category: B. Water Resources

Total Project Budget: \$ 991,600

Proposed Project Time Period for the Funding Requested: 5 years, July 2016 to June 2021

Summary:

Reduce bacteria and nutrient loads to Vadnais Lake, a drinking water supply reservoir, through implementation of a subsurface constructed wetland and its viability as a BMP for statewide use.

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Location

Region: Metro

County Name: Ramsey

City / Township: White Bear Township

Alternate Text for Visual:

Schematic of treatment system and location showing pump, platform, vault, distribution manifold, subsurface wetland and cross section of wetland

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



PROJECT TITLE: Surface Water Bacteria Treatment System Pilot Project

I. PROJECT STATEMENT

The objective of the Surface Water Bacteria Treatment System Pilot Project (Project) is to construct an experimental subsurface constructed wetland (SSCW) to reduce concentrations of fecal coliform bacteria in Lambert Creek (an impaired waterbody that supplies surface water to East Vadnais Lake which is used as a drinking water reservoir) and develop a cost-effective bacterial reduction best management practice (BMP) that can be used to improve water quality throughout the state. Currently, there are over 500 waterbodies in Minnesota 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>). One of the waterbodies that currently has elevated *E. coli* levels is Lambert Creek, a 25-square mile watershed in northeast Twin Cities Metropolitan Area. Reducing concentrations of fecal coliform bacteria in streams 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 BMP.

To achieve these goals, storm water (dry weather and wet weather flows) will be conveyed with a solar pump from Whitaker Pond at the base of an urbanized drainage in Lambert Creek to a SSCW located in a vacant lot adjacent to a soccer field in Columbia Park (see map). The SSCW will consist of three experimental cells, with each cell consisting of (from the bottom up) an impermeable liner, a layer of gravel, a layer of sand, a layer of sorption media and a layer of growth media. The sorption media in each of the three cells will have different combinations of sorptive materials that have been shown in other studies to reduce concentrations of fecal coliform bacteria and other constituents. Storm water from Whitaker Pond will enter the bottom of each of the cells, flow up through the filter media layers, then across the growth media at the top of the SSCW and out the far end where the treated water will discharge to groundwater via an infiltration trench. Monitoring ports will be installed at the interfaces between the media in each experimental cell to determine the effectiveness of the cells in removing *E. coli* and other pollutants from stormwater. The top of the SSCW will be planted with native plants, which will be irrigated with the treated storm water from the SSCW. The effectiveness of the SSCW and the treatment cells will be documented in a peer-reviewed journal and will be disseminated to the scientific community, regulators, and municipalities dealing with elevated pollutant levels in surface waters throughout the state.

The measurable, direct outcomes of the Project include improved water quality in Lambert Creek by reducing concentrations of *E. coli* (and other contaminants such as nutrients and PAHs), development of a cost-effective BMP for other impaired waterbodies throughout the state, conserves and sustains groundwater resources (through aquifer recharge), mitigates impacts from urban stormwater flows, and provides education and outreach opportunities to the local community on non-point sources of pollution and watershed stewardship.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Design

Budget: \$210,000

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.

Outcome	Completion Date
1. Complete three soil borings and five infiltration test pits. Prepare subsurface investigation report.	September 1, 2016
2. Complete design plans and specifications.	March 1, 2017
3. Produce procurement and bid documents.	May 1, 2017

**Environment and Natural Resources Trust Fund (ENRTF)****2016 Main Proposal****Project Title: Surface Water Bacteria Treatment System Pilot Project****Activity 2: Construction and post-construction monitoring.****Budget: \$745,600**

Select contractor and construct project. Finalize monitoring plan and perform long-term monitoring to assess system performance. Produce project report including summary of monitoring results.

Outcome	Completion Date
1. Complete construction.	November 1, 2017
2. Collect bacteria, nutrient and PAH samples 20 times per year for 3 years. Produce annual monitoring reports and publish on VLAWMO website.	Annually until Nov.1, 2020
3. Produce project report and publish on VLAWMO website.	July 1, 2021

Activity 3: Education and Outreach Development and Implementation**Budget: \$36,000**

Install informational signage at the site. Distribute BMP information and performance results via conference presentations, webinars and an academic paper.

Outcome	Completion Date
1. Educational signage at the Project site.	November 1, 2017
2. Present project and first year of monitoring results at three (3) water resources related technical conferences (i.e. MN Water Resources Conference, MN Association of Watershed Districts, WEFTEC).	December 1, 2018
3. Present project and first year of monitoring results via three (3) webinars targeted to entities within MN interested in implementing this BMP (i.e. cities, watershed districts, watershed management organizations, MnDOT, MPCA, SWCDs)	December 1, 2018
4. Prepare and submit academic paper to peer –reviewed journal.	July 1, 2021

III. PROJECT STRATEGY**A. Project Team/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	

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. Timeline Requirements

The duration of the entire project is five years from project kickoff in July, 2016. Construction will be completed within the first 1.5 years. Monitoring and dissemination of BMP information will occur in the latter 3.5 years.

2016 Detailed Project Budget

Project Title: *Surface Water Bacteria Treatment System Pilot Project*

INSTRUCTIONS AND TEMPLATE (1 PAGE LIMIT)

Attach budget, in MS-EXCEL format, to your "2016 LCCMR Proposal Submission Form".

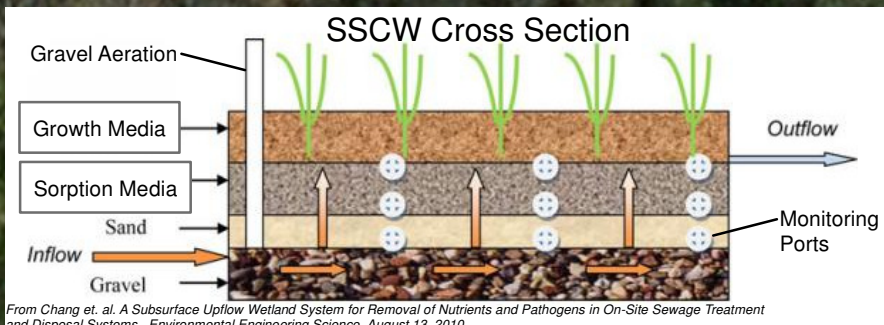
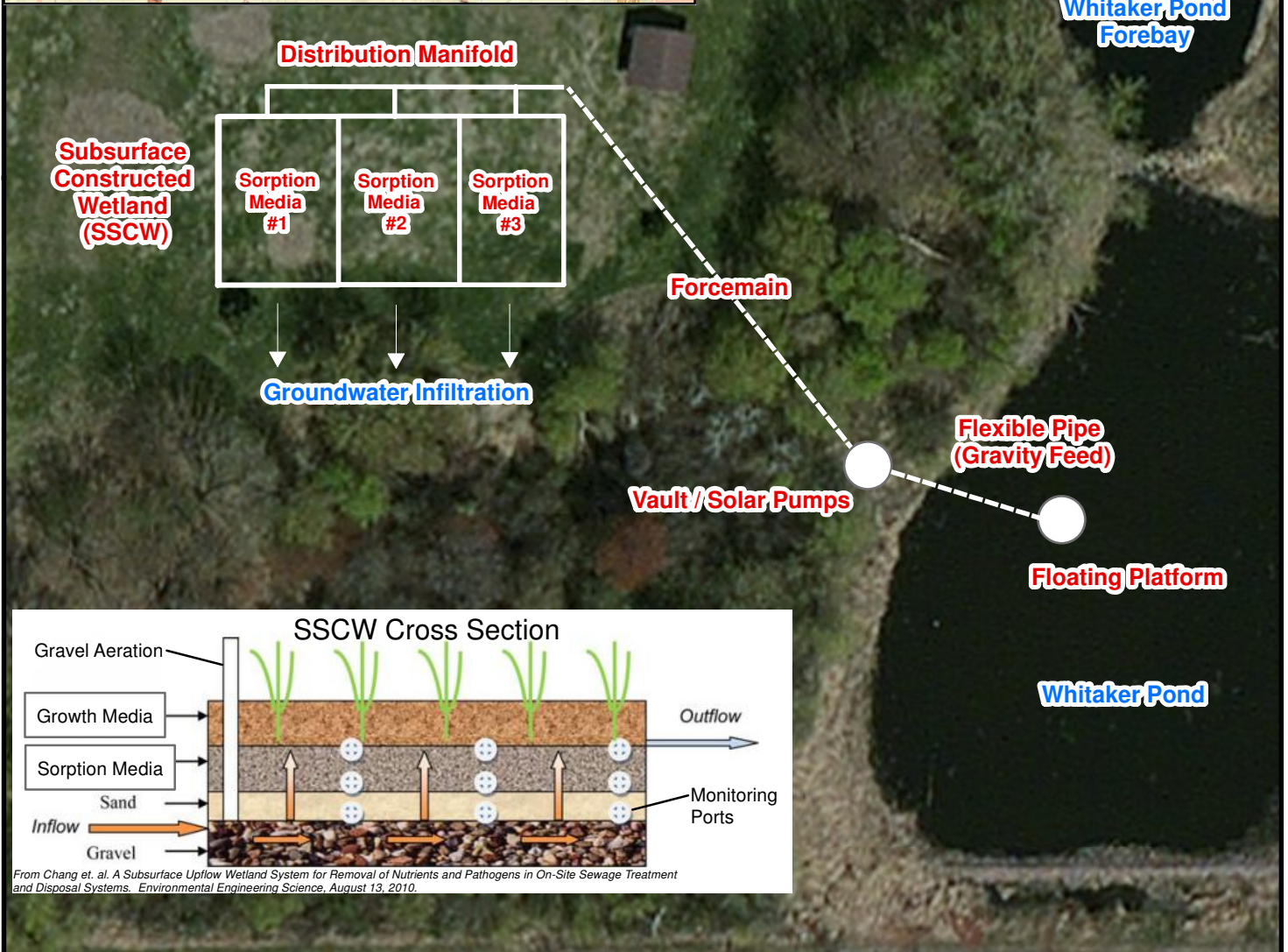
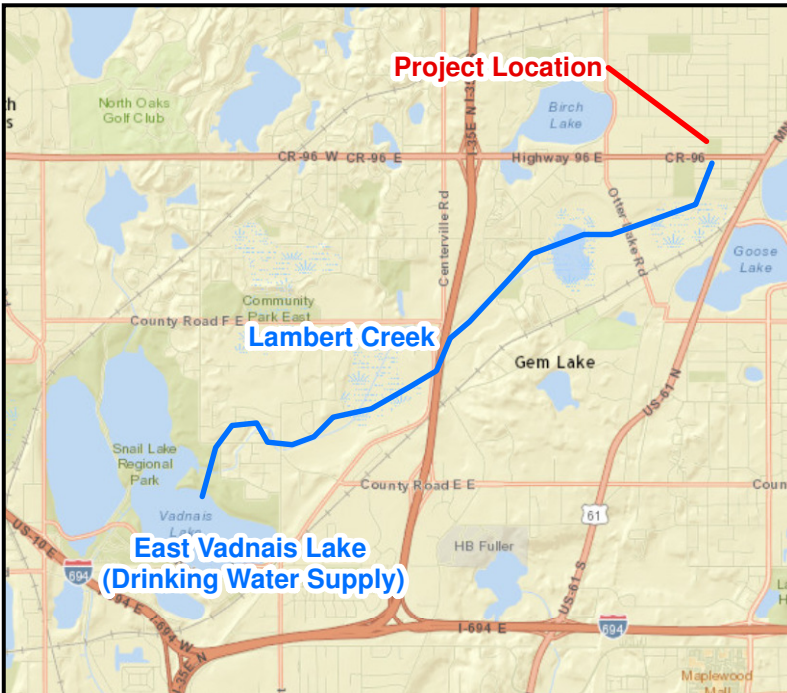
(1-page limit, single-sided, 10 pt. font minimum. Retain bold text and DELETE all instructions typed in italics. ADD OR DELETE ROWS AS NECESSARY. If budget item row is not applicable put "N/A" or delete it. All of "Other Funds" section must be filled out.)

IV. TOTAL ENRTF REQUEST BUDGET 5 years

BUDGET ITEM <i>(See "Guidance on Allowable Expenses", p. 13)</i>	AMOUNT
Personnel: N/A	\$ -
Professional/Technical/Service Contracts: Geotechnical Consultant = \$35K (Subsurface investigation) / Engineering Consultant (Design plans/construction observation = \$155K, conferences/webinars/academic paper = \$50K) = \$205K / Sign Contractor (Project signage) = \$4K / Utility, Earthwork Contractor = \$700K (Construct SSCW), Laboratory Analysis (Water quality sample analysis) = \$45,600	\$ 989,600
Equipment/Tools/Supplies: N/A	\$ -
Acquisition (Fee Title or Permanent Easements): N/A	\$ -
Travel: Travel to in-state conferences.	\$ 2,000
Additional Budget Items: N/A	\$ -
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 991,600

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

SOURCE OF FUNDS	AMOUNT	Status
Other Non-State \$ To Be Applied To Project During Project Period: N/A	\$ -	N/A
Other State \$ To Be Applied To Project During Project Period: N/A	\$ -	N/A
In-kind Services To Be Applied To Project During Project Period: VLAWMO Staff (\$100/hr) - 100 hrs for monitoring and reporting (\$10K), 80 hrs for preparing project report (\$8K), 50 hrs for conference presentations (\$5K), 50 hrs for webinars (\$5K), 240 hrs for academic paper (\$24K).	\$ 52,000	Secured
Funding History: \$25K of staff time and sampling costs for previous bacteria monitoring at project site.	\$ 25,000	Secured
Remaining \$ From Current ENRTF Appropriation: N/A	\$ -	N/A



From Chang et. al. A Subsurface Upflow Wetland System for Removal of Nutrients and Pathogens in On-Site Sewage Treatment and Disposal Systems. Environmental Engineering Science, August 13, 2010.



Surface Water Bacteria
 Treatment System Pilot Project
 White Bear Township, MN

Lambert Creek Bacterial Treatment System Pilot Project

Project Manager Qualifications

Development of grant application and work plans, administration of grant duties, maintain positive relationships with Grantor. Management of finances and reporting duties.

Preparation of information pertaining to project for distribution to project partners and public.

Coordination of stakeholder meetings and to maintain communication with partners, public, Technical Evaluation Commission and Board of Directors on project progress. Coordination and oversight of contract workers, management of budget, monitor project and address future maintenance needs.

Managed a 250k storm pond project in City of White Bear Lake which addressed nutrient and sediment issues. Managed a 110K Board of Water and Soil Resource Grant used for installation of water runoff BMP's for new watershed partners.

Organization Description

Vadnais Lake Area Water Management Organization (VLAWMO) was formed in 1983 to protect the Vadnais Lake watershed area in northern Ramsey County and a small portion of Anoka County, Minnesota. VLAWMO covers approximately 25 square miles in the northeast metropolitan area. The watershed encompasses the City of North Oaks and portions of the Cities of White Bear Lake, Gem Lake, Vadnais Heights, Lino Lakes, and White Bear Township.

VLAWMO's mission is to protect and enhance the water resources within the watershed. Activities we work on include water quality monitoring, education and outreach projects, wetland protection, and water quality enhancement projects

The watershed approach to protecting our vital water resources has become the primary approach across the country. Since water flows across political boundaries, partnerships among local governments, regional, state and federal agencies are vital. Because Vadnais Lake is used as the drinking water reservoir for the City of St. Paul VLAWMO often partners with the St. Paul Regional Water Service (SPRWS) on many water quality monitoring and improvement projects.