

**Environment and Natural Resources Trust Fund  
2011-2012 Request for Proposals (RFP)**

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**LCCMR ID: 167-F3+4**

**Project Title:** Protecting Minnesota's Aquifers: Zero-Discharge Ethanol Plant Wastewater Reuse

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**Category:** F3+4. Renewable Energy

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**Total Project Budget:** \$ \$1,892,900

**Proposed Project Time Period for the Funding Requested:** 2.5 yrs, July 2011 - Dec 2013

**Other Non-State Funds:** \$ 0

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**Summary:**

The project would assist existing ethanol plants in decreasing groundwater use and decreasing their waste stream discharge by developing a replicable plant improvements model to achieve zero-discharge of waste water.

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**Location**

**Region:** Statewide

**Ecological Section:** Statewide

**County Name:** Statewide

**City / Township:**

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

# 2011-2012 MAIN PROPOSAL

## PROJECT TITLE: Protecting Minnesota's Aquifers: Zero-Discharge Ethanol Plant Wastewater Reuse

### I. PROJECT STATEMENT

Minnesota's ethanol plants utilize approximately 4 gallons of water per 1 gallon of ethanol produced. Ethanol producers and other entities have expressed a need to find alternative sources of water recognizing the need to keep existing ethanol plants viable and reduce the impact upon Minnesota's ground water resources. Decreased water use preserves a Minnesota natural resource and also protects aquifers. By decreasing ethanol's water usage, the production of ethanol becomes more sustainable. The reduction of water by ethanol plants is one step in assisting to better the issues of available ground water and degradation of Minnesota's aquifers, especially in the Southwest portions of the State of Minnesota.

To address this issue, further studying of reusing the ethanol plants wastewater discharge appears to be the best solution. The goal of this Project is to show that ethanol's water balance ratio can be significantly reduced by treating and reusing on site waste streams before it is discharged into our natural resources.

This Project will differ from others by utilizing specific data from and applicable to existing Ethanol Plants in southern Minnesota as opposed to current models that utilize information taken from a broad geographical area. Plants ranging in size from 20 million to 100 million gallons of ethanol produced a year will be analyzed.

LCCMR funding will provide assistance to complete a feasibility and pilot study that examines wastewater reuse –and- provide some of the necessary resources and support for private industry in this region to implement the technologies identified in this project.

### II. DESCRIPTION OF PROJECT ACTIVITIES

#### Activity 1: Ethanol Wastewater Reuse Feasibility and Treatment Pilot Study Budget: \$842,900

This activity will have two phases. Phase I includes a feasibility study which will review aspects of the ethanol plant that are crucial in evaluating wastewater reuse. Elements that will be studied include raw water chemistry from the existing ground water supply, identification of the quality and quantity of the Ethanol Plants' existing water demands, review of the on-site water treatment processes currently operated by each plant, and review of wastewater discharge streams. Three to five ethanol plants will participate in the feasibility study, with plant sizes ranging from 20 Million Gallons of Ethanol produced per year to 100 million gallons of ethanol produces per year. This range of plant sizes will offer validity to the study. The evaluation will also include review of the unique water quality parameters for each water demand required by each plant. Based on analysis of available information, a planning wastewater reuse plan will be developed.

A wastewater reuse plan will include possible levels of capital cost, annual operation and maintenance (O&M) costs, and a total project life-cycle cost analysis. Opinions of cost will include treatment requirements, transmission pipelines, and management of the residual waste stream as regulated.

From this an Ethanol Plant Wastewater Reuse Feasibility Study component will be prepared that evaluates the feasibility of the developed wastewater reuse treatment. The study will document data, assumptions, analysis, and cost opinions associated with this treatment. Based on the technical and financial feasibility, the study will also outline the recommended next steps to advance the project. Recommendations will likely include expanded water quality analysis from all affected streams, as well as developing initial protocol for on-site demonstration and pilot testing of the recommended water treatment technology. The Feasibility study will also review each of the ethanol plants that participated in the study to determine the best location for implementation of the Phase II pilot study.

Phase II will incorporate a small scale pilot study will be implemented at one of the partner ethanol plants based on results from the Feasibility Study. A comprehensive pilot testing operation will employed to evaluate the technical and financial feasibility of on-site treatment of the process wastewater stream from the ethanol facilities for industrial reuse of the valuable water resource. The proposed pilot study protocol would involve the comprehensive analysis of a staged membrane process; including physical and chemical pretreatment processes; membrane filtration; and membrane separation processes. An adequate test duration (in the range of 3 to 6 months) would be selected to represent the complete range of seasonal and/or process treatment related variations in the water reuse supply parameters. The pilot study will include rental of process equipment and onsite testing of treatment and water reuse at the Pilot Study Facility. The comprehensive pilot program will be required to establish sustainable design and operating conditions, and guide a conservative design approach essential to insure long-term system reliability.

Outcome – Phase I	Completion Date
1. Conduct research on current water balance and chemistry of input and output water on Ethanol Plants	December 2011
2. Develop water reuse diagram	December 2011
3. Prepare cost estimates for treatment	December 2011
4. Prepare final Ethanol Plant Wastewater Reuse Feasibility Study	December 2011
Outcome – Phase II	
1. Implementation of Membrane Pilot Study to analyze reduction of waste water to potential zero Discharge at Selected Plant.	March 2012
2. Water Quality Data collection and analysis from Membrane Pilot Study	June 2012
3. Process Analysis from use of Reused Wastewater from Membrane Pilot Study	June 2012

**Activity 2: Implementation of Zero Discharge Technologies Budget: \$825,000**

If the Feasibility Study and Pilot Study are successful, three Ethanol Plants in Minnesota will implement process water reuse on each of their facilities utilizing funding as a partial equipment reimbursement for a treatment system. It is estimated that the LCCMR funding will cover approximately 15% of the implementation costs to initiate the projects. The remaining funding is anticipated to be obtained by each individual plant. The project includes construction of a water reuse system at each plant. Also included in the implementation will be working with regulators and permits and each plant to implement a reduction water use and wastewater discharge at each plant. The implementation will be conducted and results will be shared to encourage other ethanol plants desiring this technology can implement this technology into their process. The implementation will be a major step in a goal of zero discharge for each plant.

Outcome	Completion Date
1. Three Ethanol plants in Minnesota will put in place an action plan to reduce wastewater by construction of the proposed treatment facility as outline in the Feasibility and Pilot Studies. LCCMR Funds will cover approximately 15% of Equipment Reimburse for each facility	December 2013
2. Ethanol Plants will modify permits and work with State Regulatory Agencies on each individuals water reuse plan	On Going – No Funding Involved
3. SMAFE will share results with other Ethanol Plants throughout Minnesota	On Going – No Funding Involved

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

- Southern Minnesota Association of Food and Ethanol Employers (SMAFE) – Sponsor Organization
- Minnesota Department of Natural Resources (DNR) – Provide Review and Support of the Proposed System, also will provide liaison to other State Agencies
- Corn Plus Ethanol – Winnebago – Ethanol Plant that will participate in the study and participate in implementation if feasible.
- Heron Lake BioEnergy – Heron Lake – Ethanol Plant that will participate in the study and participate in implementation if feasible.
- Jackson County SWCD – Offer project support and review of study – Heron Lake BioEnergy is located in Jackson County.
- Ideation Consulting. – Will provide fiscal management assistance, project communication, media and community relations and workforce planning consultation.
- I&S Group, Inc. – Provide Design, Assistance with Project Administration, and prepare Feasibility and Pilot Study.

**B. Timeline Requirements**

It is anticipated that the Feasibility Study can be completed in 6 months (December 2011). The Pilot Study will be conducted over 3 to 6 months and completed by the end of June, 2012. Appropriations for the equipment reimbursement to the Ethanol Producers to achieve zero discharge will be completed by of the end 2013.

**C. Long-Term Strategy and Future Funding Needs**

The goal of this Project is to develop a wastewater reuse treatment for ethanol production that produces zero wastewater discharge. Implementation of the results of this Project can occur on multiple facilities throughout the state. Zero Discharge is rapidly becoming the industry standard for ethanol production we anticipate great interest in the implementation of this technology from the ethanol industry. Implementation of the zero discharge model (as defined by the pilot study) beyond this project will be funded by private industry with additional requests for support from various stakeholder groups (ie: Corn Growers Association of MN, Minnesota DNR, local economic development and county agencies, etc.).

## 2011-2012 Detailed Project Budget

### IV. TOTAL TRUST FUND REQUEST BUDGET 3years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel:</b> All personnel wages at the Ethhanol plants will be in-kind- est. \$102,00/for pilot facility. Est. \$306,000 for implementation phase. Estimated Total in-kind wages is \$408,000. * See Below in Other Funds	\$ -
<b>Contracts:</b>	
Contract with I&S Group for completion of the feasibility and pilot study and technical consultation of zero discharge model pilot projects.	\$ 512,900
Contract with Ideation Consulting to provide project fiscal management services, project communication and partner liaison, media and community relations, and workforce planning consultation.	\$ 104,400
<b>Equipment/Tools/Supplies:</b>	
Equipment rental for zero discharge membrane pilot study.	\$ 225,600
Equipment purchase for zero discharge implementation projects are currently Estimated to exceed \$2.8M/plant. This grant will provide a 12.5% equipment reimbursement allowance for 3 Ethanol plants.	\$ 1,050,000
<b>Acquisition (Fee Title or Permanent Easements):</b> <i>No Land Acquisition is planned. All facilities will be located on land currently owned by each Ethanol Plant</i>	\$ -
<b>Travel:</b> All travel expenses of Ethanol employees, project consultants and project partners will be provided as in-kind funds.	\$ -
<b>TOTAL ENVIRONMENT &amp; NATURAL RESOURCES TRUST FUND \$ REQUEST</b>	<b>\$ 1,892,900</b>

### V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
<b>Other Non-State \$ Being Applied to Project During Project Period:</b> Payment by 3 Ethanol Plants to Implement On-Site Waste Water Reuse after completion of Feasibility and Pilot Study. This is estimated at \$2,800,000 per plant with 12.5% reimbursed from LCCMR Funding.	\$ 7,350,000	<i>Pending Outcome from Feasibility and Pilot Study</i>
<b>Other State \$ Being Applied to Project During Project Period:</b> <i>Indicate any additional state cash \$ (e.g. bonding, other grants) to be spent on the project during the funding period. For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.</i>	\$ -	<i>Indicate: Secured or Pending</i>
<b>In-kind Services During Project Period:</b> <i>Indicate any in-kind services to be provided during the funding period. List type of service(s) and estimated value. In-kind services listed must be specific to the project.</i>	\$ 408,000	<i>* See Personnel above</i>
<b>Remaining \$ from Current ENRTF Appropriation (if applicable):</b> <i>Specify \$ and year of appropriation from any current ENRTF appropriation for any directly related project of the project manager or organization that remains unspent or not yet legally obligated at the time of proposal submission. Be as specific as possible. Describe the status of \$ in the right-most column.</i>	\$ -	<i>Indicate: Unspent? Not Legally Obligated? Other?</i>
<b>Funding History:</b> <i>Indicate funding secured prior to July 1, 2011 for activities directly relevant to this specific funding request. State specific source(s) of funds.</i>	\$ -	
<b>Other Funds Total</b>	<b>\$ 7,758,000</b>	



**PROJECT COORDINATOR, Sara Christiansen, SMAFE  
Zero Discharge Ethanol Plant Wastewater Reuse Project**

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During her 20 year career as a Social Scientist, Sara Christiansen has had the privilege to work with very diverse companies in many varying industries- such as Manufacturing, Marketing, Renewable Energy, Engineering, Agri-Business, Printing, Medical, and Social Services.

Sara excels at strategic planning and project management. Sara has vast experience working with professionals at all levels in an organization. Whether delivering a formal presentation to a room full of executives, or providing guidance to a project team; Sara's passionate style allows her to connect with all audiences in a way that energizes individuals to perform at a higher level.

Sara is currently the VP of Client Services at *Ideation Consulting* ([www.ideation-consulting.com](http://www.ideation-consulting.com)), a Minnesota Based Company which provides *Business Performance Solutions* to employers in many varying industries. We partner with our clients to implement Organizational Development Solutions, Talent Development Solutions, and Human Resource Solutions that proactively drive business results. We know that we can best serve our clients by establishing long-range strategic partnerships. We have a legacy of taking extreme pride in the improved success of each client and its individual employees.

Sara is also the Group Facilitator for the ***Southern Minnesota Association of Food and Ethanol Manufacturing Employers*** ([www.smafegroup.com](http://www.smafegroup.com)). SMAFE is a member-driven association of food and ethanol manufacturers that focuses on industry sustainability, company profitability, and talent development. We identify and leverage collaborative projects that will benefit our members, industries, communities, and environment.

Membership to SMAFE is free to all industry stakeholders.

Recently SMAFE developed and facilitated a leadership development program which was supported by a WIRED grant from the Minnesota Renewable Energy Marketplace-Alliance for Talent Development ([www.mnrem.org](http://www.mnrem.org)).



