Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Project Workplan

Doc Type: Contract

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Project Title: Greater Blue Earth River Basin TMDL Implementation

1. Project Summary:

Organization: Greater Blue Earth River Basin Alliance
Contractor contact name: Kay Gross
Title: GBERBA Administrative Coordinator
Address: 339 9th Street
Windom MN 56101
Phone: 507 831 1153 x3
Fax: 507 831 2928
E-mail: kay.clark@windomnet.com

Subcontractor(s)/Partner(s): N/A

Organization:
Project manager:
Address:

Phone:
Fax:
E-mail:

MPCA contact(s):

MPCA project manager: Paul Davis
Title: Southwest Watershed Project Manager
Address: 12 Civic Center Plaza, Suite 2165
Mankato, MN 56001
Phone: 507-344-5246
Fax: 507-389-5422
E-mail: Paul.A.Davis@state.mn.us

Project information

Latitude/Longitude: 43.865239, -95.117127
***County:** Blue Earth, Brown, Cottonwood, Faribault, Freeborn, Jackson, Le Sueur, Martin, Waseca, Watonwan
Start date: 03/01/2017 *(mm/dd/yyyy)* **End date:** 08/01/2020 *(mm/dd/yyyy)*
Total cost: $666,700.00
***Full time equivalents:** N/A

***Major watershed(s):**

☐ Statewide	☐ Kettle River	☐ Miss Rvr – GrandRpds	☐ Lower Rainy Rvr	☐ So Fork Crow River
☐ Big Fork River	☐ Lac Qui Parle River	☐ Miss Rvr –Headwaters	☐ Rainy Lake	☐ Lower St. Croix Rvr
☐ Upper Big Sioux Rvr	☐ Lake of the Woods	☐ Miss Rvr –LaCrescent	☐ Rapid River	☐ Upper St. Croix Rvr
☐ Lower Big Sioux Rvr	☐ Lake Superior – North	☐ Miss Rvr – Reno	☐ Red Lake River	☐ St. Louis River
☒ Blue Earth River	☐ Lake Superior – South	☐ Miss Rvr – Sartell	☐ Upper Red Rvr	☐ Red Rvr of the North Tamarac River
☐ Bois de Sioux River	☒ Le Sueur River	☐ Miss Rvr – St. Cloud	☐ Redeye River	☐ Thief River
☐ Buffalo River	☐ Leech Lake River	☐ Miss Rvr – Twin Cities	☐ Redwood River	☐ Two Rivers
☐ Cannon River	☐ Little Fork River	☐ Miss Rvr – Winona	☐ Rock River	☐ Upper/Lower Red Lk
☐ Cedar River	☐ Little Sioux River	☐ Miss Rvr – Lake Pepin	☐ Root River	☐ Upper Iowa River
☐ Chippewa River	☐ Long Prairie River	☐ Mustinka River	☐ Roseau River	☐ Vermilion River
☐ Clearwater River	☐ Red Rvr of the North Marsh River	☐ Nemadji River	☐ Rum River	☐ Upper Wapsipinicon River
☐ Cloquet River	☐ MN Rvr – Yellow Medicine River	☐ No Fork Crow River	☐ Red Rvr of the North Sandhill River	☒ Watonwan River
☐ Cottonwood River	☐ MN Rvr – Headwaters	☐ Otter Tail River	☐ Sauk River	☐ DesMoines Rvr Hdwtrs
☐ Crow Wing River	☐ MN Rvr – Mankato	☐ Pine River	☐ Shell Rock River	☐ Lower DesMoines Rvr
☐ E Fork DesMoines Rvr	☐ Lower MN River	☐ Pomme de Terre Rvr	☐ Snake River	☐ Wild Rice River
☐ Red Rvr of the North Grand Marais Creek	☐ Miss Rvr – Brainerd	☐ Rainy Rvr – Hdwtrs		☐ Winnebago River ☐ Zumbro River

2. Statement of Problems, Opportunities, and Existing Conditions

The Greater Blue Earth River Basin (GBERB) is comprised of the Blue Earth, Le Sueur, and Watonwan River major watersheds spanning 11 counties in southern Minnesota. The GBERB accounts for 2.05 million acres (excluding Iowa) with 88% dedicated to row-crop agriculture. Per the 2014 inventory of impaired waters, the GBERB has 29 listed impairments for fecal coliform bacteria, e. coli bacteria, and dissolved oxygen (Table 1). In addition, the GBERB contributes to the dissolved oxygen impairment in the lower reach of the Minnesota River near its confluence with the Mississippi River (Table 1). This project's purpose is to implement BMPs as identified in the Lower Minnesota River Dissolved Oxygen (DO) and GBERB Fecal Coliform Bacteria TMDLs in prioritized and targeted agricultural areas of the GBERB to work toward reaching load reduction goals.

The Lower MN River DO TMDL Implementation Plan addresses the increased biological oxygen demand (BOD) in the lower 22-mile reach of the Minnesota River. Upstream sources of phosphorus (P), including the Greater Blue Earth River Basin, coupled with periods of low-flow due to widespread artificial drainage has had a cascading-effect, where increased concentrations of P ultimately result in low DO. Unabated algal growth due to high P promotes algal growth and subsequent algal death and decay where oxygen use in the water column surpasses return. Adequate DO is imperative to riverine ecosystem health. The Lower MN River DO TMDL calls for a more stable flow regime throughout the summer months and a decrease in P from four major contributing sources: wastewater, sewage, stormwater, and agriculture. Hypoxia as a result of increased BOD can decrease fish survival, growth, reproduction, and activity.

Several stream reaches in the Greater Blue Earth River Basin are on the 303(d) impaired list for fecal coliform bacteria (Table 1); however, nearly all stream reaches are potential contributors. The GRBERB Fecal Coliform TMDL Implementation Plan identifies livestock, humans, pets, and wildlife as the major contributors of high fecal coliform bacteria levels in the GBERB. More specifically, the highest contributor of bacteria is from inadequately treated human waste and surface applied manure to agricultural land. The presence of high levels of fecal coliform bacteria has major implications on public health and recreation activities. The highest fecal coliform levels in the GBERB occur in the summer months, which temporally coincide with the impairments listed in the Lower MN Dissolved Oxygen TMDL.

Two specific agricultural BMPs will be implemented through this project: alternative tile intakes and cover crops. Surface drainage intakes provide a direct path for P and sediment to streams and rivers. Land-applying livestock manure near open surface drainage intakes also presents a means for fecal bacteria to impair waters. With approximately 2,817 square miles of agriculture land and an estimated 7 tile intakes per square mile (Lower MN Dissolved Oxygen TMDL Implementation Plan), there are approximately 19,718 tile intakes in the GBERB. Covering open tile intakes is an inexpensive, expeditious, and effective way to decrease P loading at the field scale and is also listed in the MN Nonpoint Pollution Program Plan to enhance water storage/hydrograph characteristics. A variety of tile intake best management practices exist (e.g. rock intakes, perforated risers, broom-intakes) to fit the need of local producers while achieving water quality goals. In addition, producers requesting cost-share to convert open tile intakes will be informed of the appropriate set-backs required while land-applying livestock manure around water features and open tile intakes.

Cover crops are a multi-faceted best management practice with a diversity of options and applications. However, they can be difficult to implement in a conventional/traditional cropping system without the aid of public financial assistance and professional technical assistance. Nonetheless, the "Soil Health Initiative" lead by the Natural Resources Conservation Service is making cover crops a viable management tool to many producers in Minnesota. Cover crops provide a cover for the soil during fallow periods in the growing season, limiting soil detachment by wind or water and preventing phosphorus-laden soil from reaching water resources. Cover crops can also be used to tie up nutrients (e.g from land applied manure) which

can be lost through drainage features, such as open tile intakes or subsurface drainage. Thirdly, cover crops can increase soil aggregate stability furthermore increasing water infiltration and mitigating the late season low base flow condition via groundwater recharge.

Areas for BMP implementation will be targeted based on several criteria (listed from high priority to low). The ability to identify high TP loading areas in the Le Sueur River Watershed using the HSPF model output from the newly accepted WRAPS Report will allow for further targeting in that watershed: 1) Locations that receive surface-applied livestock manure. 2) Fields with slopes >3% as identified in the Lower MN dissolved oxygen TMDL. 3) Proximity to impaired surface water features. Projects in targeted areas will be funded based on prioritization criteria: 1) Fields meeting the criteria of the Rapid Phosphorus Index Moderate Sensitivity Screening Tool. 2) Producers seeking certification through the Minnesota Agricultural Water Quality Certification Program (MAWQCP). Producers seeking certification through this program will be given priority because working with natural resource conservation professionals will promote whole-farm planning and cover crops and alternative tile intakes work best in concert with nutrient management and reduced tillage.

Table 1. 2014 inventory of impaired waters in the GBERB for fecal coliform (E. coli) and dissolved oxygen. Also included is the Lower Minnesota River impairment for dissolved oxygen (**bold**)

Impaired Reach name	Impaired Reach Description	Pollutant or stressor
Blue Earth River	Le Sueur R to Minnesota R	Fecal Coliform
Blue Earth River	Rapidan Dam to Le Sueur R	Fecal Coliform
Blue Earth River	W Br Blue Earth R to Coon Cr	Fecal Coliform
Boot Creek	Unnamed cr to T105 R22W S6, north line	*Escherichia coli*
Cedar Creek	Cedar Lk to Elm Cr	Fecal Coliform
Cedar Creek	T104 R33W S6, west line to Cedar Lk	Oxygen, Dissolved
Cedar Creek	T104 R33W S6, west line to Cedar Lk	Fecal Coliform
Center Creek	George Lk to Lily Cr	Fecal Coliform
Center Creek	Lily Cr to Blue Earth R	Fecal Coliform
Cobb River	T107 R26W S30, west line to Le Sueur R	*Escherichia coli*
County Ditch 3 (Judicial Ditch 9)	JD 9 to Maple R	*Escherichia coli*
Dutch Creek	Headwaters to Hall Lk	Fecal Coliform
Elm Creek	Cedar Cr to Blue Earth R	Fecal Coliform
Elm Creek	S Fk Elm Cr to Cedar Cr	Fecal Coliform
Judicial Ditch 3	Headwaters to Elm Cr	Oxygen, Dissolved
Judicial Ditch 3	Headwaters to Elm Cr	Fecal Coliform
Le Sueur River	CD 6 to Cobb R	*Escherichia coli*
Le Sueur River	Maple R to Blue Earth R	Fecal Coliform
Lily Creek	Headwaters (Fox Lk 46-0109-00) to Center Cr	Fecal Coliform
Little Cobb River	Bull Run Cr to Cobb R	Oxygen, Dissolved
Little Cobb River	Bull Run Cr to Cobb R	Fecal Coliform
Maple River	Rice Cr to Le Sueur R	Fecal Coliform
Rice Creek	Headwaters to Maple R	*Escherichia coli*
Unnamed creek (Little Beauford Ditch)	Headwaters to Cobb R	Fecal Coliform
Watonwan River	Butterfield Cr to S Fk Watonwan R	Fecal Coliform
Watonwan River	Headwaters to N Fk Watonwan R	Fecal Coliform
Watonwan River	N Fk Watonwan R to Butterfield Cr	Fecal Coliform
Watonwan River	Perch Cr to Blue Earth R	Fecal Coliform
Watonwan River, South Fork	Willow Cr to Watonwan R	Fecal Coliform
Minnesota River	**RM 22 to Mississippi R**	**Oxygen, Dissolved**

3. Goals, Objectives, Tasks, and Subtasks

Objective 1: Target and prioritize cover crop and alternative tile intake projects

Task A: Develop the grant policy document and conduct outreach in targeted focus areas and fund projects based on prioritization criteria

Focus areas:
1) Farms that receive surface-applied livestock manure
2) Farms with slopes >3% as identified in the Lower MN DO TMDL
3) Proximity to impaired water features (Table 1)

Prioritization criteria:
1) Fields meeting the criteria of the Rapid Phosphorus Index Moderate Sensitivity Screening Tool
2) Producers seeking certification through the Minnesota Ag Water Quality Certification Program

*The ability to identify high TP loading areas in the Le Sueur River Watershed using the HSPF model output from the newly accepted WRAPS Report will allow for further targeting in that watershed.

Responsible Party: GBERBA/SWCD Staff, producers seeking certification through the MAWQCP

Objective 1 Timeline: March 2017 – December 2019

Objective 1 Cost:	Grant Cash:	$ 79,000.00
	Match:	$ 37,700.00
	Total Cost:	$116,700.00

Objective 1 Deliverables: Grant Policy Document, BMP outreach materials, MAWQCP applications and assessments.

Objective 2: Implement cover crop and alternative tile intake best management practices.

Task A: Encumber funds according to the Grant Policy Document (developed in Objective 1) and approve payment for completed projects. Individual projects must be approved by the appropriate local SWCD Board of Supervisors, be reviewed by the GBERBA Technical Committee, and approved by the GBERBA Executive/Policy Board, and have the appropriate technical sign-off.

Responsible Party: SWCD staff and supervisors, GBERBA Technical Committee, Executive, & Policy Boards, GBERBA Coordinators.

Objective 2 Timeline: March 2017 – June 2020

Objective 2 Cost:	Grant Cash:	$300,000.00
	Match:	$225,000.00
	Total Cost:	$525,000.00

Objective 2 Deliverables: 3,000 acre-years of cover crops and 1500 alternative tile intakes.

Objective 3: Grant administration and reporting

Task A: Compile and submit monthly reports to the GBERBA Technical, Executive, and Policy Boards, and compile and submit

Subtask 1: Semi-annual MPCA Progress Reporting
Subtask 2: Elink reporting of completed projects
Subtask 3: Final MPCA report

Responsible Party: GBERBA Staff

Objective 3 Timeline: April 2017 – August 2020

Objective 3 Cost:	Grant Cash:	$21,000.00
	Match:	$ 4,000.00
	Total Cost:	$25,000.00

Objective 3 Deliverables: Semi-annual reports, Elink reports, and final report

3. Measurable Outcomes

According to the Ag BMP Handbook for Minnesota, alternative tile intakes have 70-95% sediment trapping efficiency and an effective life of approximately 10 years. This practice is popular with area producers because it not only prevents precious topsoil from clogging drain tiles, but it makes the intakes easier to operate around either by making them more visible with a riser pipe or burying them underground with a blind rock intake. If each intake on average costs $250 and saves 1 ton of sediment and 1 pound of phosphorus per year, over the life of the practice the cost per unit of pollution saved is $25/ton of sediment and $25 per pound of phosphorus. The Lower MN dissolved oxygen TMDL set a goal to convert 50% of the open tile intakes to an alternative design. Our goal is to cover 1500 open tile intakes, reducing sediment and phosphorus loading by 15,000 tons and 15,000 pounds in 10 years respectively, contributing 16% to the listed TMDL plan goal.

In the recent years, cover crop use in the GBERB is increasing, however many producers are still in the trial stage. Dunn et al. (2016, doi:10.2489/jswc.71.1.29) surveyed cover crop early adopters across the United States and found that trial and error was an effective way to learn about cover crops but that the cost of cover crops was inhibiting cover crop use in their area. Ensuring that the producer has a positive experience with cover crops by providing technical and financial assistance for the practice, we can increase the likelihood of continued use. Cover crops have many benefits, but armoring the soil with cover crops reduces sheet and rill erosion and ultimately reduces the loading of sediment and phosphorus to surface waters. Using RUSLE2 and the BWSR sheet and rill erosion calculator, aerially broadcasting seed into a standing corn crop with conservation tillage practices can reduce sediment by 6.7 tons and phosphorus by 19 pounds on 100 acres per year. Cover crops have also been shown to decrease nitrate leaching to groundwater and through subsurface drain tile. The Ag BMP Handbook of Minnesota references a study by Feyereisen et al. (2006) that showed a cover crop BMP nitrogen pollution reduction of an average of 6.6 pounds of nitrate per acre. Our goal for this project is to implement 3,000 acres of cover crops, reducing sediment by 201 tons, phosphorus by 570 pounds, and nitrates by 19,800 pounds. With an approximate cost installation cost of $50/acre, the estimated cost per unit pollutant reduced is $833/ton sediment, $263/pound phosphorus, and $7.58/pound nitrate.

Cover crop implementation will be evaluated by applying each producer's pertinent management information into RUSLE2 to determine the impact of cover crop on soil loss. Information from the before-and-after RUSLE2 calculations will be combined with the BWSR Sheet & Rill Pollution Reduction Estimator tool to determine the pollution reduction estimate for the project. Pollution reduction estimates for alternative intakes will utilize reduction rates outlined in the literature. Producers requesting cost-share for cover crops and/or alternative intakes through this grant will be encouraged (if not already) to enroll in the MAWQCP to address all issues on their farms; thus, the success of this project will be measured by the additional projects that are identified through outreach and education efforts of this work and the MAWQCP. Scheduled periodic progress on the project will be reported biannually and a final project report will submitted outlining accomplishments and learned experiences from the project.

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5. Gantt charts

6. Project Budget