Great Lakes Basin Program GLRI Project

Shiawassee River Erosion control Project

Sponsor: Shiawassee Conservation District
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Submitted Project:

II. Project Background

Erosion and Sediment Goal

*Estimate the total amount of **erosion**, in tons, your project will save.*

This project will save approximately 85 tons of soil from erosion per year as a result of implementation of structural BMPs to address streambank erosion occurring on streams contributing to the Shiawassee River Watershed. Additionally, approximately 480-3,300 tons of soil from erosion per year will be saved from the FGD Gypsum Incentive Program included in this proposal. This range of soil lost from erosion is dependent upon tillage and rotation systems in place prior to application of FGD Gypsum. The total amount of soil saved as from erosion resulting from implementation of this project ranges from **565 to 3,385 tons per year**. Total savings as a result of this overall project, including implementation of all BMPs and two-year FGD Gypsum Incentive Program, ranges from **1,810 to 7,450 tons of soil.**

(Determined utilizing NRCS RUSLE calculations and with technical assistance from NRCS).

*Estimate the total amount of **sediment**, in tons, your project will save.*

This project will save approximately 85 tons of sediment per year as a result of implementation of structural BMPs to address streambank erosion occurring on streams contributing to the Shiawassee River Watershed. Additionally, approximately 288-1,980 tons of sediment per year will be saved from the FGD Gypsum Incentive Program included in this proposal. This range of sediment lost is dependent upon tillage and rotation systems in place prior to application of FGD Gypsum. The total amount of sediment saved as a result of implementation of this project ranges from **373 to 2,065 tons per year**. Total savings as a result of this overall project, including implementation of all BMPs and two-year FGD Gypsum Incentive Program, ranges from **1,426 to 4,980 tons of sediment.**

(Determined utilizing MDNRE Pollutant Load Reduction calculations and with technical assistance from NRCS).

This project was funded by the Great Lakes Restoration Initiative, and is maintained through the Great Lakes Basin Program for Soil Erosion and Sediment Control at the Great Lakes Commission.

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*Describe the major **sources** of sediment in your watershed and the types of sources you will be reducing (cropland, streambank).*

Land use activities, from urban to agricultural, in the Shiawassee River Watershed are a significant contributor of sediment to Saginaw Bay and Lake Huron. Through the development of a state approved watershed management plan for the Mid-Shiawassee River Watershed, the highest priority sources of sediment were identified through a collaborative multi-agency and community effort. Priority sources of sediment described in the plan include streambank erosion, runoff from construction sites, agricultural field sheet/rill and gully erosion, parking lot runoff, remote stream crossings, road-stream crossings, broken field tiles and gravel road runoff (Shiawassee Conservation District 2002).

This proposal will specifically address sediment loss from cropland runoff sources through an incentive program that encourages the use of synthetic gypsum as a soil amendment to clay soils on cropland. The application of gypsum, calcium sulfate dehydrate, to fields has several positive impacts on cropland. When gypsum is applied to sodic soils and soils suffering from crusting and other structural problems, such as the clay soils that make up most of the project area, soil infiltration potential is improved (Agassi et al., 1981; Miller 1987). Enhanced infiltration occurs because calcium ions in gypsum displace excess sodium and other ions in the soil, which then become mobile and diffuse. The calcium ions reduce dispersion of soil particles by promoting the aggregation of clay particles thereby improving soil structure, stability and preventing soil crusting. Reduced crusting and enhanced particle aggregation allows for greater water infiltration and storage in soil, thus reducing runoff and erosion. These soil structural improvements also ease the emergence of seedlings and allow roots to penetrate further into the soil to take advantage of deep soil moisture (EPA March 2008). The application of gypsum further allows for an increase in soil nutrient availability to plant roots and ultimately improving overall soil quality. Improved soil infiltration and soil quality translates to a reduction in inputs required to grow crops resulting in less chemical fertilizers lost in runoff. Additionally greater soil quality and infiltration potential reduces the sediment load lost from cropland runoff and improves water quality delivered to watercourses.

Flue Gas Desulfurization (FGD) Gypsum is a synthetic material of identical chemical structure produced as a byproduct from coal-fired electric utilities. Because of its relatively high degree of purity, FGD Gypsum can be used as a substitute for mined gypsum in many uses, including agriculture, while also realizing important environmental benefits that result from recycling this byproduct material (EPA, March 2008). Research shows that using gypsiferous byproducts, also known as FGD Gypsum, is an effective method of controlling erosion by increasing water infiltration and would be a means to significantly reduce sediment in runoff water from agricultural fields.

Currently, the US Environmental Protection Agency (EPA) is proposing to regulate for the first time coal ash to address the risks from the disposal of the wastes generated by electric utilities and independent power producers. The proposed rule acknowledges that there are significant benefits that can be derived from the use of CCRs (Coal Combustion Residuals) in agricultural applications and that the EPA and the USDA's Agricultural Research Service are engaged in field studies, expected to conclude in late 2012. The proposed rule maintains the Bevill exemption for beneficial uses, and therefore would not alter the regulatory status of coal ash that is beneficially used in agricultural applications (Coal Combustion Residuals – USEPA Proposed Rule, June 21, 2010; http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/ccr-rule/index.htm). Throughout the span of this project, the most current EPA regulations which apply to the use of FDG Gypsum in agriculture will be followed.

It is projected that 3,000 acres of cropland will be enrolled in the FGD Gypsum incentive program for a period of two-years. Increased infiltration from the use of FGD Gypsum on these acres will reduce erosion of cropland soil approximately 480 to 3,300 tons per year depending on the pre-application tillage system in

place. This translates to savings of approximately 288 to 1,980 tons of sediment per year delivered to the Shiawassee River and Saginaw Bay Watersheds from cropland erosion sources.

Other sources of sediment will be addressed through this proposal including soil loss from the reach within the State Road Drain approximately 1,800ft upstream from its outlet into the Shiawassee River. This reach has a long history of severe and extensive erosion. State Road Drain was constructed in 1886 with a 100ft right-of-way of established in 1916. In 1914, 1943 and 1998 the channel was cleaned out, widened and deepened. The drain extends 4.3 miles from its outlet into the Shiawassee River to its upper terminus at the Miner Drain. Intermittent streambank erosion appears from the point at which the drain begins to meander away from the straightened channel approximately 1,800ft westward from the Chipman Road Bridge and the outlet at the Shiawassee River. Below the Chipman Road Bridge, elevation drops and streambank erosion becomes extensive. Bare streambanks tower 40ft over the channel bottom in this entire lower stretch. Down-cutting is also occurring and sediment deposits are randomly distributed throughout the stretch with a visible plume entering the Shiawassee River at the outlet.

As described in a 2001 MDEQ Hydrologic Assessment, most of the State Road Drain reach to be addressed has high banks with little possible floodplain and a channel bottom composed of a mix of clay, gravel, and boulders, completely lacking sand. The channel appears to have downcut to the clay, leaving larger rocks and gravel in the channel. Smaller gravels are not plentiful, an indicator of the high velocity of the stormwater through this reach. Near the mouth, the slope of the reach is much flatter and some deposition of the smaller gravels and sand is evident and extends downstream into the Shiawassee River. Approximately 4,000ft above Chipman Road, State Road Drain becomes highly incised and runs very straight for over two miles. The State Road Drain lower reaches have had approximately 124 years to adapt to changes in the flow regime caused by installation of this drain. Recent significant drain clean out may have increased peak flows downstream if flood flows are more efficiently conveyed through the reach. This report concluded that increased runoff volume or peak flows due to land use changes is not a cause of the streambank erosion below Chipman Road. The erosion may be caused by the recent drain clean out or the reach may still be adapting to the installation of the drain 124 years ago. The latter would be similar to a MDEQ assessment of the cause of the morphologic instability in the East Branch of the AuGres River. In both locations, the straightened channel, high streambanks, and maintenance of channelized drains limit the ability of the stream to reform meanders and floodplains. In the State Road Drain situation, the streambank erosion is worsened by heavy shade preventing establishment of thick stands of grasses and shrubs. Additional monitoring is suggested to determine the most practical restoration actions (Fongers, D. 2001).

In April 1976 a Watershed Plan and Environmental Impact Statement was developed for the State Road Drain Watershed which outlined proposed actions to alleviate flooding, impaired drainage and soil erosion for the purpose of conservation land treatment. Included in this Watershed Plan and Environmental Impact Statement were structural measures for flood protection and drainage, and grade stabilization structures in the lower end of the State Road Drain (Shiawassee County Soil Conservation District et al. April 1976). To date actions to address flooding and gully erosion have been implemented on a small scale in the upper portions of the State Road Drain, however no actions have been taken to address the severe erosion occurring in the lower 1,800ft of the drain reaching from just upstream of Chipman Road to the outlet at the Shiawassee River. This site delivers approximately 56 tons of soil per year directly to the Shiawassee River. A monitoring component is included in this proposal to assess hydraulic, hydrologic and velocity patterns and geomorphic analysis. This information will be used to develop a feasible stream rehabilitation action plan which will be implemented through the funding of this proposal.

Three projects are planned to address urban sources of sediment including one drain restoration project with the City of Owosso, one project with Baker College of Owosso and a project with a local landowner.

This project was funded by the Great Lakes Restoration Initiative, and is maintained through the Great Lakes Basin Program for Soil Erosion and Sediment Control at the Great Lakes Commission.

The Avery Drain flows through a city park and residential area in the City of Owosso. This drain is considered a priority to the City of Owosso providing drainage of a large residential region of the city to the Shiawassee River. The upper portion of this drain was established in the 1920s and consists of large cobblestone, cement blocks and weirs. These conditions accelerate streamflow and sediment delivery to downstream reaches and have resulted in streambank erosion and sedimentation in the lower portion of this drain. These eroding streambanks are adjacent to a widely utilized public recreational area which includes soccer fields regularly used by children and adults. Through this proposal, the Avery Drain eroding streambanks will be stabilized using rock riprap and native vegetation with installation of rock/check dams in the upper reaches as a mechanism to slow accelerated stream flow. Implementation of these practices will reduce approximately 2 tons of soil per year from being delivered to the Shiawassee River while providing safety to individuals who utilize the recreational area.

Baker College is the largest independent college in Michigan. The Owosso campus, opened in 1984, encompasses 33 acres within the Shiawassee River Watershed and is currently expanding to include additional educational facilities and parking areas. The campus contains a stormwater detention pond that drains 21 acres of impervious parking lots and buildings. The area around the detention pond is manicured turf grass offering little infiltration potential and intense stormwater flows from the adjacent areas have caused several gullies to form on the banks of the pond. Sediment from these gullies and debris from all contributing impervious surfaces continues to deposit in the pond. A visible amount of sediment-ridden stormwater is making its way to the low-set overflow catch basin in the pond that outlets to a tile that drains to the Shiawassee River. Presently maintenance is not occurring that would reduce sediment delivered to the stormwater detention pond. To address sediment lost in overflow from the stormwater pond, a native planting around the perimeter of the stormwater detention pond to slow runoff water is planned as well as elevation of the overflow catch basin and stabilization of gullies that have formed on the pond banks using geotextile fabric, vegetation, and rock riprap. To reduce sediment from contributing impervious surfaces, a sediment reduction plan will be developed for the entire catchment area that includes pavement sweeping, healthy lawn and garden procedures, native plant maintenance, and detention pond protection activities. These activities will reduce approximately 7 tons of soil per year from being delivered to the Shiawassee River while serving as an education tool, teaching community members and students about sediment reduction in the Shiawassee River.

Also included in this proposal is a source of sediment being lost from streambank erosion of a private drainage system at it's outlet into the Shiawassee River. Although the landowner landscapes the adjacent riparian area so that it is well vegetated and offers substantial buffer area, erosion has been occurring at this site for approximately 3 years. Streambanks erosion extends from the drain outlet at the Shiawassee River inward approximately 160ft with significant widespread lateral recession and soil loss. During high flows in the Shiawassee River (above 1,200cfs) the drain floods inward and water is retained up to the point where the streambank erosion begins. There is a considerable amount of sediment collected at the outlet and extensive vegetative overhang on the 14ft tall banks indicating severe and continuous soil loss. Proposed stabilization practices include structures to re-direct flow and reduce water velocity, as well as floodplain benches, streambank tapering and native vegetation to slow water flow and stabilize erosion. Stabilization of erosion at this site will reduce approximately 20 tons of soil per year from directly entering the Shiawassee River.

Addressing erosion from these known agricultural, urban and streambank sources of soil loss, approximately 2,968-4,660 tons per year of soil will be saved from entering the Mid-Shiawassee River Watershed and contributing to sedimentation of the Saginaw Bay and Great Lakes watersheds. Through the proposed agronomic/cover-based and engineering practices involved in this project, the health, water quality, fish and wildlife habitat, and recreational uses of the Shiawassee River, Saginaw Bay and Lake Huron will improve, ultimately improving the Great Lakes Watershed ecosystem and economy.

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Watershed/ Project Work Area

Name of your watershed plan and the agency that approved the plan.

Mid-Shiawassee River Watershed "Watershed Management Plan for Non-Point Source Pollution" Developed by the Shiawassee Conservation District, approved by the Michigan Department of Environmental Quality in 2002

*Watershed: list all **12 digit USGS HUC codes** that compromise your watershed. Contact Gary Overmier at the GLC if you need help.*

State Road Drain 12-digit HUC 040802030207
Middle Branch Shiawassee River 12-digit HUC 040802030206
Holly Drain 12-digit HUC 040802030203

*Describe the **Priority Areas** within the watershed where you are going to concentrate your efforts. List by area or narrative description of specific conditions.*

State Road Drain Watershed covers 13,789 acres of predominantly agricultural land use. The land use pattern is 2% Urban, 83% Agriculture, 5% Forest, 1% Wetland and 10% Other (i.e. open space, streams, residential, lakes, commercial services). Cropland, including corn, soybeans, and wheat requires adequate drainage and has resulted in an extensive network of maintained drains. Beneficial areas include randomly scattered woodlots and riparian floodplains.

Middle Branch of the Shiawassee River Watershed covers 22,323 acres of mostly urban land use and encompasses the growing cities of Owosso and Corunna. Suburban development and the expanding "business strip/mall" that connects the two cities are of special concern. The land use pattern is 60% Urban, 30% Agriculture, 8% Forest, 5% Wetland and 8% Other. The City of Owosso, with an area of 4.2 square miles, consists of 15-18% impervious surfaces making its impact on water quality an important issue. Beneficial areas include open spaces, woodlots and riparian floodplains.

Holly Drain Watershed covers 22,610 acres of mixed agricultural and urban land uses. Agricultural cropland includes corn, soybeans, wheat, hay and sod. The area also consists of a network of transportation routes including railroad tracks and Interstate-69 freeway. The land use pattern is 25% Urban, 47% Agriculture, 15% Forest, 8% Wetland and 5% Other. Condensed residential areas contain illicit septic connections and sewage lagoon discharges. Beneficial areas include woodlots and wetlands (Shiawassee Conservation District 2002).

How many acres are in the watershed?

Mid-Shiawassee River Watershed – 58,722 acres
State Road Drain – 13,789 acres
Middle Branch – 22,323 acres
Holly Drain – 22,610 acres

How many acres are in:

Agriculture including pasture landuse?
Mid-Shiawassee River Watershed = 49% ~28,742 acres
State Road Drain = 83% ~11,445 acres
Middle Branch = 30% ~6,670 acres
Holly Drain = 47% ~10,627 acres

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Forest including brushland landuse?

Mid-Shiawassee River Watershed = 23% ~13,225 acres
State Road Drain = 16% ~ 2,206 acres
Middle Branch = 21% ~ 4,688 acres
Holly Drain = 28% ~ 6,331 acres

Urban, suburban, industrial, commercial and rural residential landuse?

Mid-Shiawassee River Watershed = 33% ~19,323 acres
State Road Drain = 2% ~ 276 acres
Middle Branch = 60% ~ 13,394 acres
Holly Drain = 25% ~ 5,653 acres

U.S. ***Congressional District****(s) where project is located, as listed at www.house.gov/writerep/.*
David Camp, Michigan 4th
Mike Rogers, 8th District

III. Implementation

A written contract will be developed between the Shiawassee Conservation District and the landusers/landowners to fund conservation practices with GLBP funds. The contract will include among other items, the type, number and location of each practice to be installed as well as the cost-share/incentive rate to be paid for each practice. The signed contract will be used as proof of commitment of funding for reimbursement of your expenses.

Fill out all that apply:

A. Agronomic/Cover-based Practices installed by Landowners/Landusers with incentives paid for with this grant (ex. Cover Crops, conservation tillage, no-till.) *If you have more than three BMPAs, copy and paste BMPA1 section and change the number as appropriate.*

BMPA1
FGD Gypsum Application as Soil Amendment Cost-Share Incentive

Description:
A cost-share incentive program is included in this proposal to encourage the use and offset the cost of gypsum as a soil aggregate to clay particles to producers/landowners in the project area. Gypsum has been proven to decrease and prevent crust formation on soils surfaces and improve its water infiltration ability in previous studies on sodic or acidic soils (Agassi et al., 1981; Miller 1987). Targeted producers will be located within the three sub-watershed identified in the current approved watershed management plan with the potential of expanding this incentive to the sub-watershed that are a currently being added to the existing management plan pending Michigan Department of Natural Resources and Environment approval of the updated management plan in 2011. Specific cropland in the project area will be identified through the use of various mechanisms including the High Impact Targeting GIS tool, which classifies soils that are prone to sheet erosion in agricultural areas. Targeted producers will include those who apply for cost-share for no- or reduced- tillage systems through the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP), clients who participate with Ag Spectrum programs, producers who participate in the Michigan Water Stewardship Program (MWSP) and specific individuals who are known to suffer from extensive soil loss due to cropland runoff and poor soil infiltration.

The Shiawassee Conservation District (SCD) will partner with Scott Luchenbill, Maximum Farming Certified Specialist with Lukes Ag Solutions, division of Ag Spectrum, to promote and mange the FGD Gypsum incentive program. Scott will serve as the liaison with producers in the project area assisting in education and enrollment of the cost-share program. Scott will also assist landowners in procurement of FGD Gypsum, establishing application rates, soil testing to gage soil nutrient levels pre- and post-FGD Gypsum application, and serve as a point of contact for general technical assistance pertaining to the FGD Gypsum application on cropland. Cost-share payments will be distributed through the SCD. Scott and the SCD will be in communication throughout the span of this program to ensure the most successful outcome of the FGD Gypsum incentive program in the Mid-Shiawassee River Watershed.

By taking advantage of this short term incentive program, producers will be able to observe the real-time and immediate soil infiltration improvements and soil erosion reduction benefits as well as financial gains from enhanced crop yields directly resulting from application of FGD Gypsum. It is expected that the application of FGD Gypsum as a soil amendment will be sustained beyond the timeframe of this program for those producers who are involved with the incentive and additional use of FGD Gypsum encouraged for producers through word-of-mouth successes and demonstration activities. This incentive program will reduce approximately 480-3,300 tons per year of sediment in runoff water from agricultural fields significantly reducing the sediment load carried to the Shiawassee River, Saginaw Bay and Lake Huron ultimately improving the quality of the Great Lakes Watershed ecosystems.

Additionally, a FGD Gypsum-treated soil infiltration demonstration activity will be included at the Mid-Shiawassee River Watershed Sediment Reduction Project Kickoff Event scheduled for fall 2010 and at the SCD Annual Agricultural Field Day scheduled for late summer 2011. This simulator visibly demonstrates, in a controlled environment, water infiltration rates in soils that that have been treated with FGD gypsum with soil that have been not. The dramatic difference in infiltration and runoff rates can be visibly observed and measured and is crucial to encourage enrollment into the gypsum incentive portion of this project.

Check the quarters the task is to be started and completed:

Quarter	1	2	3	4	5	6	7	8	9	10	11	12
Start/Complete	x	x	x	x	x	x	x	x	x	x	x	x

Number of acres/units of BMP to be installed during project: 3,000 acres

Incentive method and rates: Enrollment into this cost-share incentive program will include targeted producers, who are currently, or transitioning to, a no- or reduced tillage system, as well as producers who apply for cost-share through Farm Bill Conservation programs, producers who participate in the MWSP, clients who participate with Ag Spectrum regional programs and specific producers who are known to suffer from soil loss due to cropland runoff and poor infiltration. Payment will be distributed annually for the second two years of the project at a rate of **$13 per acre per year**.

Expected soil savings in total tons: Range from 480 to 3,300 tons per year depending on tillage system; **total soil savings resulting from a two years of enrollment in the FDG Gypsum Incentive Program ranges from 960 to 6,600 tons of soil**.

B. Engineering Practices installed by Landowners/Landusers with Financial Assistance provided by this grant (ex. Grass Waterway, Streambank Stabilization.) *If you have more than three BMPEs, copy and paste BMPE1 section and change the number as appropriate. (NRCS equivalent or PE sign-off.)*
All projects will follow USDA-NRCS Standards and Specifications.

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BMPE1
State Road Drain Stream Rehabilitation Project

Description:
Extensive erosion and sediment loss will be addressed through a stream rehabilitation project undertaking at State Road Drain. The reach of State Road Drain included in this proposal has a long history of severe erosion. Intermittent streambank erosion appears from the point at which the drain begins to meander away from the straightened channel to Chipman Road and the outlet at the Shiawassee River. From Chipman Road to the drain outlet in the Shiawassee River, approximately 1,800ft, elevation drops and streambank erosion becomes extensive. Bare streambanks tower 40ft over the channel bottom in this entire stretch. Down-cutting is also occurring and sediment deposits are randomly distributed throughout the stretch with a visible plume entering the Shiawassee River at the outlet.

According to a 2001 MDEQ Hydrologic Assessment increased runoff volume or peak flows due to land use changes is not a cause of the streambank erosion below Chipman Road. The erosion may be caused by the recent drain clean out or the reach may still be adapting to the installation of the drain 120+ years ago. The latter would be similar to a MDEQ assessment of the cause of the morphologic instability in the East Branch of the AuGres River. In both locations, the straightened channel, high streambanks, and maintenance of channelized drains limit the ability of the stream to reform meanders and floodplain. In the State Road Drain situation, the streambank erosion is worsened by heavy shade preventing establishment of thick stands of grasses and shrubs. Additional monitoring is suggested to determine the most practical restoration actions (Fongers, D. 2001).

This project includes a monitoring component to assess hydraulic, hydrologic and velocity patterns and geomorphic analysis to develop a feasible stream rehabilitation action plan. Monitoring to assess for an implementation strategy will involve a partnership between the Shiawassee Conservation District and the Michigan Department of Natural Resources and Environment (DNRE) to conduct hydrologic, hydraulic and velocity measurements. Additionally, the SCD will hire FTC&H Inc. professional consultants to prepare a geo-morphologic assessment, evaluation of land use activities, identify BMPs and participate in meetings and coordination. An implementation plan is anticipated to be developed utilizing analyzed data gathered during through the first year of monitoring, which includes structural BMPs to address erosion on-site, and reduce the amount of runoff and slow stream flow from upland areas. Implementation will occur through a partnership with the Shiawassee Drain Commission and the SCD. NRCS will provide technical assistance throughout the span of the project.

Implementation practices are expected to be, to a lesser extent, similar to actions installed during the Whitney Drain project during 2007-2009. The Whitney Drain is a 3.8 mile diversion channel established in the 1920s when the East Branch of the AuGres River that was rerouted to reduce the severity of flooding from spring runoff in the City of AuGres, Michigan. Since the 1960s, all flow has been conveyed through the cut-off channel which directs flow east to Lake Huron before out-letting directly to the Saginaw Bay at Whitestone Point. While the drainage system functioned adequately over the years, flow characteristics worked constantly to return to a state of equilibrium representative of the channel's length and gradient prior to the diversion. These natural flow processes produced decades of erosion and down-cutting along the banks and channel bottom. Over time, the channel transformed from a narrow and shallow channel to a high-velocity watercourse carving new boundaries through the landscape. In some areas, the channel valley cut 32 feet deep and more than 150 feet wide and stream velocities commonly exceeded 4 to 7 feet per second. Severe erosion along the banks and bed was prevalent and the drain became a large contributor of sediment into Lake Huron (2010 Wade Trim). Comparable but on a smaller scale as the Whiney Drain project, the State Road Drain project will involve practices aimed at stabilizing the existing channel using variety of techniques, including rock riffles, riprap, native plantings, and selective log jam and dead tree removals. This adaptive management and natural

channel design approach will address the causes of the existing conditions rather than only fixing the damages associated with them.
Site-specific stabilization techniques possibly will include j-hooks, cross-vanes, floodplain benches and streambank tapering. J-hook and cross-vane rock structures of varying sizes and lengths will be constructed at appropriate locations to re-direct flow and reduce water velocity near actively eroding streambanks. Banks that have already eroded to near-vertical slopes will be tapered back or excavated creating floodplain benches. These floodplain benches will be established where the channel had meandered away from its original location and erosion was actively occurring.
Native vegetation will be planted extensively along the entire drain restoration. Plantings will consist of seed, portions of plants called "live stakes," and bare-root potted plants. Live stakes will be gathered and cut from within the project area to ensure the highest potential for survival and growth. Engineering services will be provided by the Michigan Department of Agriculture. Implementations of practices at the State Road Drain will reduce approximately 56 tons of soil per year.

Check the quarters the task is to be started and completed:

Quarter	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Start/Complete	*x*	*x*	*x*	*x*	*x*	*x*	*x*	*x*	*x*	*x*	*x*	*x*

Estimate number of acres/units of BMP to be installed during project:

8 J-hook rock structures, approximately 10,000cy rock riprap
3 Cross-vane rock structures, approximately 200cy rock riprap
4 Stretches of banks tapered back, 3,000 linear ft
Excavation 1,000cy
Spoil leveling 300cy
4 acres of critical area planting seeding
12 Live stake plants
20 Bare-root potted plants

Incentive method: cost-share *and rates:* 75% grant funds, 25% match through in-kind and cash sources

Expected soil savings in total tons: 56 tons of soil per year; practices are expected to last 10 years for a **total savings of 560 tons of soil**.

BMPE2
Smith Streambank Stabilization Project

Description:
Through this project, the Conservation District will partner with a local non-agricultural landowner to address streambank erosion occurring at an outlet on the Shiawassee River. Although the adjacent riparian area is well vegetated and offers substantial buffer area, erosion has been occurring at this site for approximately 3 years. Streambanks erosion extends from the drain outlet at the Shiawassee River inward approximately 160ft with significant widespread lateral recession and soil loss. During high flows in the Shiawassee River (above 1,200cfs) the drain floods inward and water is retained up to the point where the streambank erosion begins. There is a considerable amount of sediment collected at the outlet and extensive vegetative overhang on the 14ft tall banks indicating severe and continuous soil loss. Site-specific stabilization techniques will include j-hooks, cross-vanes, floodplain benches and streambank tapering. Native vegetation consisting of seed, portions of plants called "live stakes," and bare-root potted plants will be utilized as “soft-engineering” stabilization techniques. Live stakes will be gathered and cut from within the project area to ensure the highest potential for survival and growth are proposed to stabilize the erosion at this site. The SCD will hire FTC&H

Inc. professional consultants to prepare a geo-morphologic assessment of Smith Streambank Project site and assist in development of a BMP schedule. Engineering will be performed by a Professional Engineer to be hired by the SCD via competitive bid process. NRCS will provide technical assistance throughout the span of the project.
By stabilizing erosion at this location, approximately 20 tons of soil per year will be saved.

Check the quarters the task is to be started and completed:

Quarter	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Start/Complete		*x*	*x*	*x*	*x*	*x*	*x*					

Estimated number of acres/units of BMP to be installed during project:

3 J-hook rock structures, approximately 300cy rock riprap
1 Cross-vane rock structures, approximately 50cy rock riprap
2 Stretches of banks tapered back, 500 linear ft
2 acres of critical area planting seeding
6 Live stake plants
10 Bare-root potted plants
Excavation 300cy
Spoil leveling 50cy

Incentive method: cost-share *and rates:* 90% grant funds, 10% in-kind or cash match funds

Expected soil savings in total tons: 20 tons per year; practices are expected to last 10 years for a **total savings of 200 tons of soil**.

BMPE3
City of Owosso Avery Drain Stabilization

Description:
The Avery Drain flows through a City Park and residential area in the City of Owosso. This drain is considered a priority to the City of Owosso providing of a large residential region of the city draining to the Shiawassee River. The upper portion of this drain was established in the 1920s and consists of large cobblestone, cement blocks and weirs. These conditions accelerate streamflow and sediment delivery to downstream reaches and have resulted in streambank erosion in the lower portion of this drain. These eroding streambanks are adjacent to a widely utilized public recreational area which includes soccer fields regularly used by children and adults. Through this proposal, the Avery Drain eroding streambanks will be stabilized using rock riprap and native vegetation with installation of rock/check dams in the upper reaches to address accelerated stream flow. This project will be engineered and installed through a partnership with the City of Owosso. Implementation of these practices will save 2 tons of sediment per year delivered to the Shiawassee River while providing safety to individuals who utilize the recreational area.

Check the quarters the task is to be started and completed:

Quarter	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Start/Complete	*x*	*x*	*x*	*x*								

Estimated number of acres/units of BMP to be installed during project:

4 rock/check dams
10 linear ft of streambank stabilized with 20cy of rock riprap
0.5 ac of seeding

This project was funded by the Great Lakes Restoration Initiative, and is maintained through the Great Lakes Basin Program for Soil Erosion and Sediment Control at the Great Lakes Commission.

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Excavation 10cy
Spoil leveling 5cy

Incentive method: cost-share *and rates:* 75% grant funds, 25% match from in-kind and cash sources

Expected soil savings in total tons: 2 tons of per year; practices are expected to last 10 years for a **total savings of 20 tons of soil**.

BMPE4
Baker College Stormwater Detention Pond Rehabilitation

Description:
Baker College is the largest independent college in Michigan. The Owosso campus, opened in 1984, encompasses 33 acres within the Shiawassee River Watershed and has recently expanded to include additional educational facilities and parking areas. The campus contains a stormwater detention pond that drains 21 acres of parking lot and buildings. The area around the detention pond is manicured turf grass offering little infiltration potential and intense stormwater runoff has caused severe gullies to form on the banks of the pond. Sediment from these gullies and debris from all contributing impervious surfaces continues to deposit in the pond. A visible amount of sediment-ridden stormwater is making its way to the low-set overflow catch basin in the pond that outlets to a tile that drains to the Shiawassee River. Presently maintenance is not occurring that would reduce sediment delivered to the stormwater detention pond.

Proposed activities to rehabilitate the detention pond and encourage less sediment delivery to the Shiawassee River include, elevating the catch basin overflow, stabilizing gullies formed on the pond banks, planting native plants and developing a sediment reduction plan for the college that includes pavement sweeping, healthy lawn and garden procedures, native plant maintenance, and detention pond protection activities. This project will be engineered by a Professional Engineer hired by the SCD via competitive bidding process. Implementation will occur through a partnership with Baker College of Owosso. The structural aspect of this project will successfully save 7 tons of sediment per year and outreach efforts will have lasting effect toward reducing sediment issues in the Shiawassee River Watershed and beyond.

Check the quarters the task is to be started and completed:

Quarter	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Start/Complete	*x*	*x*	*x*	*x*								

Estimated number of acres/units of BMP to be installed during project:
For native plant buffer:
1.5 acre grass seed
30 flats wildflower plugs
50 cu yd topsoil
40 cu yd mulch
Volunteer planting
Signage
For Pond Bank Stabilization:
Excavation 50 cu yd
Rock riprap 15 cu yd
Geotextile fabric 20 sq yd
Spoil leveling 50 cu yd
Elevate catch basin

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Incentive method: cost-share *and rates:* 75% grant funds, 25% in-kind or cash match funds

Expected soil savings in total tons: 7 tons per year; practices are expected to last 10 years for a **total savings of 70 tons of soil**.

C. Agronomic/Plant-based Practices installed by Landowners/Landusers with the use of equipment purchased by this grant for which you retain ownership (ex. no-till planters or drills, residue management machines, mulchers.) *If you have more than two Equipments, copy and paste Equipment 1 section and change the number as appropriate. Cost-share on equipment*

Equipment
Two Solinst Gold Leveloggers, 15 foot range
One Solinst Gold Barologger
Direct Read USB Communication Package (includes Solinst software and Solinst Optical Cable)

Description:
Monitoring to assess for an implementation strategy at the State Road Drain site will involve a partnership between the Shiawassee Conservation District and the Michigan Department of Natural Resources and Environment (DNRE) to perform monitoring hydrologic, hydraulic and velocity measurements utilizing instruments listed below. A geomorphologic assessment will be prepared entirely by FTC&H professional consultants.

DNRE Hydrological Studies staff will specifically measure depth of flow (stage) for a period of one year. Depths will be monitored with in-stream pressure transducers and one barometric pressure transducer to compensate for barometric pressure changes. Depths (and temperature) will be recorded every 15 minutes at the start of the rehabilitation reach and at Chipman Road where stream power appears to be highest.

Discharge will be measured at each in-stream location to develop a stage-discharge rating curve each in-stream monitoring location. A minimum of three discharge measurements will be performed at each location. The discharge measurements will ideally span the range of monitored flow. If they don't, the rating curves will be extended for higher flows based on physical measurements of the stream. The stage-discharge rating curves will be used to convert the monitored stage to flow. The resulting hydrographs will be used to help develop and calibrate a hydraulic model, which would be used to design stabilization BMPs and support permit application requirements. The following equipment will be required to accomplish the task of depth of flow monitoring:

The **Levelogger Gold** is a self contained water level datalogger, which is completely designed, developed and manufactured in-house, in the tradition of all Solinst high quality products. The Levelogger Gold uses infra-red data transfer, providing the flexibility of simple wireline installation, or using a Direct Read Cable to surface. The Levelogger Gold includes a pressure transducer, temperature sensor, 10 year lithium battery (based on 1 reading per minute), and internal datalogger with a capacity of 40,000 temperature and groundwater level data points.

The **Barologger Gold** uses algorithms based on air pressure only. It measures and logs changes in atmospheric pressure, which are then used to compensate water level readings recorded by a Levelogger Gold.

The **Direct Read USB Communication** Package including optical cable and software which are required to download and analyze data collected by the Levellogger Gold and Barologger Gold.

Check the quarters the task is to be started and completed:

Quarter	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Start/Complete	*x*	*x*	*x*	*x*								

Number of acres equipment will be used on during project: 2ac

Incentive method and rates: n/a

Expected soil savings in total tons: see BMPE1 – *State* Road Drain Stream Rehabilitation Project

IV. Media Campaign

A. You will be required to conduct a kickoff event in the first quarter of the project. *You are specifically to invite, among others, all members of Congress who have a portion of their district within your watershed project boundaries, the media and the chair of the Great Lakes Commission delegation from your state. Describe how and what you will do to meet this requirement.*

The Shiawassee Conservation District Mid-Shiawassee River Watershed Sediment Reduction Project Kickoff Event will include a showcase of the current condition of each project site and virtual tour of each site, with an explanation of sediment loading contributions from each site and proposed BMPs to alleviate erosion issues and improve water quality of the Shiawassee River, Saginaw Bay and Lake Huron Watersheds. Also featured will be a demonstration of the water infiltration capacity of soil treated with FGD Gypsum compared to soil not treated with FGD Gypsum through a presentation of a version of the Norton Ladder Type Rainfall Simulator developed by the Boon County Soil and Water Conservation District in Indiana.

The Norton Ladder Type Rainfall Simulator is a spray boom that oscillates across a test plot at varying speeds to produce variable intensity storms. Scott McAfee and Darrel Norton designed the Norton Ladder Type Rainfall Simulator for use at the USDA National Soil Erosion Research Lab at Purdue University. Boxes around each nozzle regulate the spray for proper nozzle overlap and swath width. A clutch brake starts and stops the boom as regulated by a signal from the control box. A small gear motor drives the clutch brake and the boom. The four nozzles are supplied with water in sets of two; each set of nozzles has its own hose and pressure gauge to adjust for differences in elevation, hose orientation, etc. This simulator visibly demonstrates, in a controlled environment, water infiltration rates in soils that that have been treated with FGD gypsum with soil that has not been. The dramatic difference in infiltration and runoff rates can be measured and is crucial to the discussion of the application of gypsum to agricultural soils in the project area.

The event will be held at the Baker College Owosso Campus Welcome Center and Auditorium. Program materials will be provided to attendees including, a depiction of the Mid-Shiawassee River Watershed Project area, a description of individual projects involved in the program and information about the benefits of applying FGD Gypsum to agricultural soils to improve infiltration and reduce soil loss due to runoff. State Representatives, members of Congress, County Commissioners, County and City Officials, local media, local partners from NRCS, FTC&H, DNRE and MDA, watershed stakeholders, landowners, and Mid-Shiawassee River Watershed Sediment Reduction Project participants will be invited and recognized.

B. You are also required to establish an on-going outreach campaign. Describe your on-going outreach campaign strategy for:

Created to serve as stewards of natural resources, Michigan's Conservation Districts take an ecosystem approach to conservation and protection. Conservation Districts are referred to as “gateways” in their local communities. They provide linkages between land managers and a host of conservation service providers that include state, federal and local governments, and conservation organizations.

Conservation Districts across Michigan continually scan the needs of their local communities working in partnership with others involved in conservation to set local priorities, and develop action plans to solve natural resource problems. The Shiawassee Conservation District (SCD) has served communities in Shiawassee County and beyond in this capacity for the past 60 years providing the public a point of access when questions arise on how to manage natural resources. By offering sound conservation technical assistance, the SCD has become the leading source for citizens in managing their private lands for a cleaner, healthier Michigan.

Awareness of this and all District programs underlies the mission of the SCD, which is to provide for the care, informed usage, and protection of natural resources by creating awareness of conservation issues and by being a leader in providing innovative assistance. Since 1948, the SCD has successfully campaigned for conservation of our natural resources. These established tactics will continue and include the following measures for the Mid-Shiawassee River Watershed Sediment Reduction Project:

1. *The general public/media,*

The Conservation District will ensure all activities that occur throughout this project will be recognized and accomplishments highlighted through a watershed-wide promotion and outreach campaign. Outreach activities will include:

- Quarterly press releases in local newspapers with topics ranging from specific project profiles and updates on project activities, to general practices reducing non-point source pollutants such as sediment
- Articles and updates included in SCD newsletters on a bi-annual basis, newsletters are distributed to the SCD mailing list consisting of 4,000 recipients
- Participation in display events with an educational booth including SCD Annual Meeting, SCD Annual Agriculture Field Event, SCD Bi-Annual Tree Sale Fundraiser, Shiawassee County Fair, Owosso Home and Garden Expo and various educational workshops hosted by the SCD and partners
- Public Service Announcements and interviews with local radio station Z92.5fm, The Castle
- Providing information to adults and youth community members through group presentations at local schools, youth camps, community groups and other functions

2. *Landowners/landusers,*

The SCD is led by a locally elected 5 member board composed of local landowners and producers in Shiawassee County. Under the direction of this District board, the SCD strives to address the concerns and interests of landowner/landusers by encouraging these community members to participate in outreach activities that occur during the Mid-Shiawassee River Watershed Sediment Reduction Project. Landowners and landusers will be reached through direct mailings, phone calls, personalized invitations, and one-on-one with individuals who walk-in the Conservation District office and stop by educational booths at display events.

The SCD will continue to provide outreach to landowners and landusers regarding the Mid-Shiawassee River Watershed Sediment Reduction Project by conducting 3 workshops specific to activities involved in this program, including:

- Riparian landscaping for water quality
- Practices that address agricultural erosion
- Non-point sources of sediment and means to address stormwater runoff in urban areas

The SCD annually hosts an Agricultural Field Day Event during late summer. The 2011 Agricultural Field Day will focus on soil erosion and infiltration enhancement through use of gypsum as a soil amendment for clay soils. Highlighted will be a demonstration of the water infiltration capacity of soil treated with FGD Gypsum

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compared to soil not treated with FGD Gypsum through a presentation of Norton Ladder Type Rainfall Simulator developed by Dr. Darrel Norton from the USDA National Soil Erosion Research Lab at Purdue University. This will be an expanded version of the Rainfall Simulator Demonstration performed at the Mid-Shiawassee River Watershed Sediment Reduction Project Kickoff Event and will involve discussions led by the staff of the USDA National Soil Erosion Research Lab at Purdue University, including Dr. Darrel Norton.

Additionally the SCD will continually provide updates and general education to landowners/landusers through email listserv updates, SCD newsletters mailings, and one-on-one discussions with producers enrolling into Farm Bill programs and/or other District programs.

3. *Elected officials*

The SCD regularly attends and gives updates at monthly meeting of the Shiawassee Chapter of the Michigan Township Association (MTA), which are attended by elected officials and county and municipal agencies representatives. The Mid-Shiawassee River Watershed Sediment Reduction Project will become a regular component of these monthly updates. The SCD also holds monthly meetings with the SCD Board of Directors. A summary of monthly board meetings with current District activities is provided monthly to the Shiawassee County Commissioners, State Representatives and State Senators. Elected officials are sent personalized invitations and historically attend SCD events, including Annual Meetings, and Annual Agricultural Field Days. These practices of personalized invitations and continuous updates will be utilized to involve elected officials in activities occurring throughout the Mid-Shiawassee River Watershed Sediment Reduction Project.

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