June 2009



Whitney Intercounty Drain Improvement Project

Final Report
CMI #2004-012B

WadeTrim

Whitney Drain Improvement Project
Final Report

Tracking Code CMI #2004-0128

June 2009

This report has been prepared for submission to the Michigan Department of Environmental Quality (MDEQ) as required by the Whitney Drain Clean Michigan Initiative (CMI) Grant. It provides a description of the Whitney Drain watershed, project history, and project outcomes based on the studies conducted by Wade Trim, Inc., Wetland and Coastal Resources, Inc., and the Spicer Group, Inc. This report also covers the Best Management Practices (BMPs) that were identified and implemented as part of the CMI grant.

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Introduction

When the Whitney Drain was constructed in the late 1920s to alleviate spring floods that were occurring, dynamiting techniques and dredging were used to form the drain. Since it was last dredged nearly 50 years ago, the lower portion of the drain has undergone a physical transformation from a narrow drain to a high velocity body of water. As a result, the waterway has carved out new boundaries and the channel has widened to more than 150 feet, with stream velocities generally ranging from 4 to 7 feet per second. In addition, aggressive stream bank erosion has occurred, both by natural and human means, to the point where near vertical banks stand devoid of vegetation.

The *Saginaw Bay Remedial Action Plan* has identified the Whitney Drain as a major contributor of sediment to the Saginaw Bay. The high sediment content, which is due to highly unstable soils and eroding banks, has compromised fish migration, exposed public utilities, and twice threatened to washout Turner Road. Thus, the goal of the Whitney Drain Improvement Project was to stabilize the existing channel through a variety of techniques, including rock riffles, j-hooks, cross-vanes, and vegetative cover to substantially reduce the amount of sediment entering the river. Riprap, native plantings, and very selective log jam and dead tree removals were also techniques incorporated into this project, along with channel realignment and the construction of floodplain benches along the downstream portion of the drain.

This project was made possible with funding from the Michigan Department of Environmental Quality, Environmental Science and Services Division.

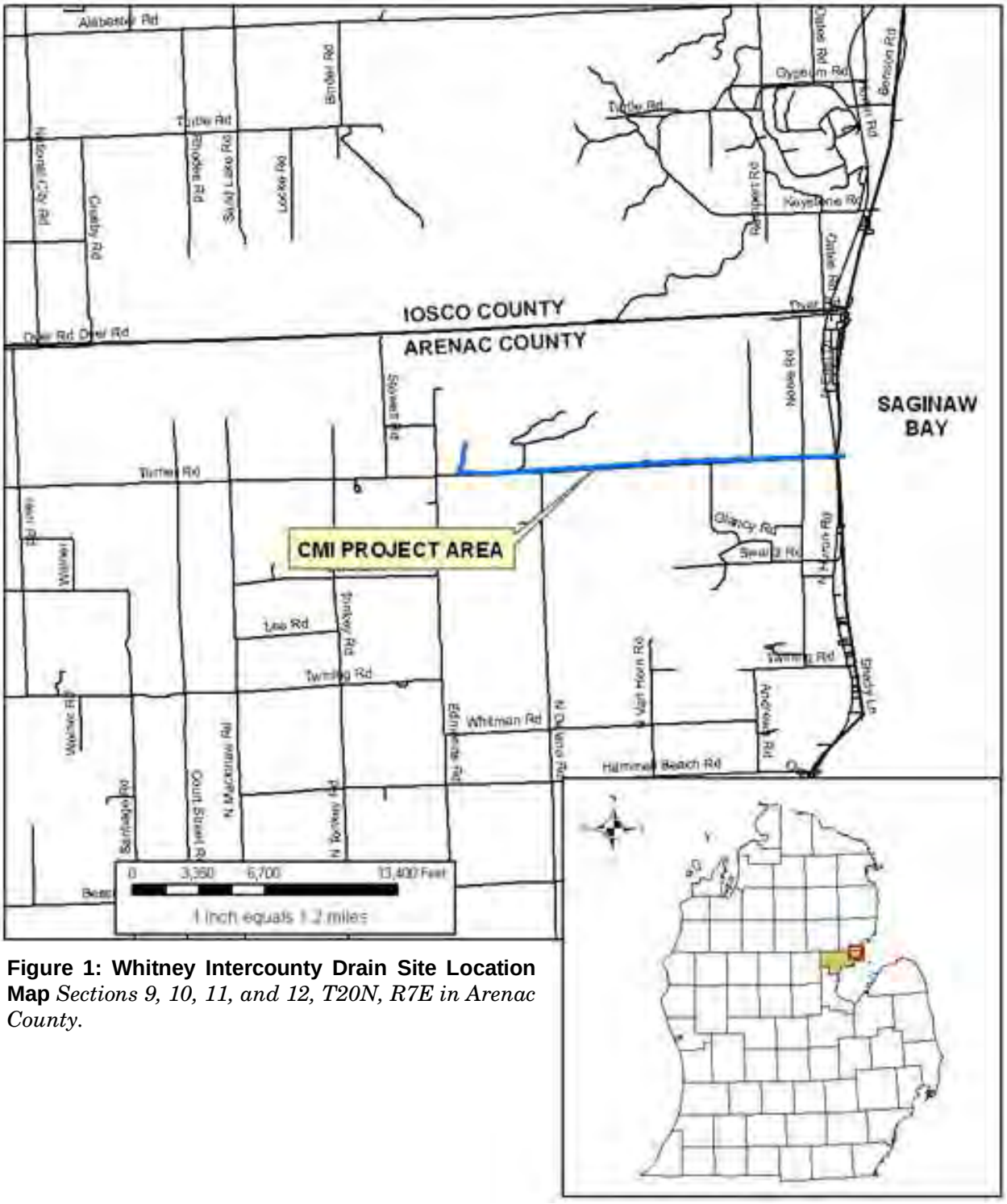

Figure 1: Whitney Intercounty Drain Site Location Map *Sections 9, 10, 11, and 12, T20N, R7E in Arenac County.*

Project Goals and Objectives

The Whitney Intercounty Drain carries the highest sediment load of any watershed in the Saginaw Bay region, contributing approximately 8,000 cubic yards annually prior to the drainage improvement project. Prior to construction, major sources of sedimentation included:

1. Bank erosion due to a higher velocity and steeper grade of the Whitney Drain, as compared to the original watercourse of the East Branch of the Au Gres River. Before the diversion in the 1920s, the River traversed roughly 12 miles, but the distance was reduced to less than 4 miles with the construction of the Drain.

2. Bank erosion due to foot traffic by fishermen and public access to the Whitney Drain. Foot traffic removed erosion controlling vegetation adjacent to the Drain, increasing bank instability by loosening soil and exacerbating erosion.

3. Bank erosion due to the installation of soil erosion control measures to protect Turner Road. When the Arenac County Road Commission deposited riprap along the Drain to stabilize roadside banks, it acted as a solid obstruction resulting in modified flow characteristics, which in turn led to excessive erosion on the opposite bank.

4. Bank erosion due to fallen trees. As the Drain banks degraded, tree roots were undercut and trees fell into the Drain, causing water course modifications within the Drain, contributing to subsequent stream bank erosion.

5. Sediment intrusion due to side inlets. BMPs had not been employed to restrict sediment from entering via side inlets into the Drain, resulting in increased sediment deposits. These deposits, which formed obstructions within the Drain, caused watercourse modifications within the Drain, contributing to subsequent stream bank erosion.

6. Streambed degradation. Due to channel undercutting, the sediment transport patterns within the Drain were altered, resulting in further erosion of the streambed and banks.

The poor water quality created by the excessive sediment loading decreased migration of many species of fish that historically use the East Branch of the Au Gres River for spawning to be compromised. Based on a comparison of local historical records, recent years have shown a decline in fish populations within the Whitney Drain, which in turn has allowed fewer fishermen to take advantage of a major fish migratory route.

Further problems with the Whitney Drain and associated bank erosion centered around public safety. Natural gas mains and water mains have been exposed by the eroding banks and stream bottom, and concerns over the water quality at the Saginaw-Midland Water System intake were common.

The goals of the Whitney Drain Improvement Project were to mitigate severe bank erosion, reduce sediment loading, and improve water quality. These were accomplished by incorporating natural and engineered restoration techniques included filling, grading, and realigning channel layout; installation of sedimentation and soil erosion control structures; general drain rehabilitation to stabilize the streambed in order to prevent further down-cutting; riprap placement; and tree removals to eliminate site-specific erosion.

Figure 2: Pre-Project Conditions *Example of severe bank erosion, log jams, and sediment bars in the downstream portion of the Whitney Drain.*

Best Management Practice (BMP) Summary

Turner Road "Bend" to Noble Road

Several alternatives were considered for channel stabilization within the Whitney. Due to a significant degree of entrenchment and constraints of the drainage easements, stabilization work focused on in-stream methods. Newbury Riffles (Riffles) were recommended to provide the desired grade control, habitat improvement, and bank protection. Riffles (Figure 3) have been used extensively throughout the United States and Canada and have proven to be effective on streams similar to the Whitney Intercounty Drain.

Riffle structures were designed with very specific requirements to reduce stream bank erosion by providing vertical control, centralizing the flow of water in the channel, and reducing velocities along the stream banks. Extending the structures up the bank further ensures stability of adjacent banks. Crest elevations of each structure were determined using site-specific critical depth calculations. Grade was controlled by utilizing a "step-down" method, where the crest elevation of a downstream riffle is the toe elevation of a riffle located immediately upstream.

Figure 3: Typical Rock Riffle within the Whitney Intercounty Drain *Example Rock riffle structure installed to stabilize the drain bottom by concentrating flow in the center of the channel.*

The locations of riffles were determined based on published data, case studies, and on existing characteristics of the Drain, including bank heights, bed slope, existing erosion problems, and existing riffles or pools with quality aquatic habitat.

The spacing of structures was designed to prevent head-cutting of the channel bed, thereby maintaining the channel slope over a long period of time. Spacing was adjusted to promote efficient flow through existing bridge crossings and to maintain existing pools and quality habitats within the project area.

Riffle structures provide a diversity of habitats that were limited within the Drain. Pools were created and are maintained by the crest elevations of adjacent structures and the concentration of flow in the center of the channel. In addition, the velocity distribution through the structures promote sorting of substrates downstream, thereby creating a riffle and glide area suitable for a variety of aquatic organisms.

Noble Road to US-23

Downstream of Noble Road, the Drain channel had tall, steep side slopes in excess of 25 feet deep. Significant property loss had resulted due to years of extensive erosion. The proposed design realigned the flow channel from meandering to straight, between the Noble Road and US-23 Bridge abutments. This channel was armored with riprap to prevent future meandering of the watercourse. Riffles were also installed every 200 feet to centralize flow and create habitat for migrating fish species.

A floodplain shelf, inundated during the one- to two-year or larger storm events, was constructed on either side of the new channel to create a two-stage floodplain. The floodplain was covered with erosion control blankets and the entire floodplain was seeded and planted with herbaceous and shrub species.

It should be noted that since reference streams were unavailable with similar drainage patterns, and there was no regional curve data to relate channel dimensions to drainage area for streams in Michigan, many of the design parameters for these improvements were based largely on data collection of existing conditions, historic conditions, expected hydrologic conditions, the goal of maintaining a stable channel, and published data. Using a regional curve for Wisconsin Natural Resources Conservation Service (NRCS), results of modeling and surveying, and sediment analyses, a “weight of evidence” approach was used to determine an appropriate dimension for proposed construction of the new channel. An appropriate cross sectional area for this channel was determined to be approximately 125 square feet, with a bank-full width of approximately 40 feet and mean depth of approximately 3 feet.

Implementation

The following in-stream structures, rehabilitation techniques, and bank protection methods have been implemented to maintain or enhance drain stability, and function to facilitate enhancement of spawning and fish habitats. These structures have been successfully applied in natural channel design for restoration, bank stabilization, grade control, irrigation diversions, bridge protection, and recreational activities along the Whitney Intercounty Drain.

In-Stream Structures

This downstream portion of the project incorporated eleven (11) riffle structures from the Turner Road "Bend" to US-23. Riffles were set into the bed with a crest elevation equal to the elevation of the downstream terminus of the next upstream riffle. Each structure was built on a rock foundation embedded at least 18 inches into the stream bed. Riffles were constructed of various size rocks to prevent movement downstream and down-cutting of the channel. Heavy riprap was used to complete the structure and standard riprap was used to fill gaps. Before and after photos of typical riffle structures are included in Appendix B.

Channel Relocation (Noble Road to US-23)

Approximately 1,200 feet of the existing channel was realigned and 1,600 feet of floodplain constructed within the downstream portion of the Drain through a process of cut and fill within this portion of the project area. Rock riprap was keyed into the Drain bottom and placed up the side of the channel to a height equal to the top of bank elevation.

A floodplain shelf was constructed from the top of the new channel banks outward to the sides of the existing valley. Immediately following construction, this constructed floodplain was covered with erosion control blankets and the entire floodplain was seeded and planted with herbaceous and shrub species. Approximately 3,600 plants and 0.75 acre of seed were installed on the floodplain and adjacent banks.

Rock Armoring (Turner Road "Bend" to Noble Road)

During initial investigations of the Drain, Engineers sought to re-define the flow channel of a sharp 90° bend near Turner Road. However, due to costs and environmental issues no realignment changes were made. Instead, the bend was heavily armored as part of the improvement project, using heavy riprap and geotextile fabric toed into the channel stream bed and brought all the way to the top of bank. This area was anchored using live stakes.

Tree Removal

A total of thirty-five (35) trees and/or log revetments were removed from the Drain utilizing CMI funding. In addition, several trees were cleared to gain access for construction equipment. Tree roots were left in place so they can continue to stabilize the soils and stream banks. Trees were offered to property owner, disposed of at an offsite location, or chipped onsite, depending on the size.

Figure 4: Channel Reconstruction *Example of armoring banks with rock and floodplain benches to prevent future erosion and naturalize the area.*

Figure 5: Live Stakes *Live stakes taken from within the project area to create a root base to help stabilize the rock riprap bank.*

Outcomes

Within the months following completion of construction, survival and growth of plants has been exceptional. Over 90% of the live stakes were living during inspections conducted in November 2008. Grasses planted for erosion control were thriving and will provide good protection against spring 2009 flows.

Two relatively large flow events have occurred since construction was completed; one in early September and one in late December. Follow-up inspections revealed that all BMPs functioned as designed and no movement of rock or structures resulted from high flows. Two areas of erosion were noted following the first storm event, but both appeared to be unrelated to construction activities or BMPs:

1. Bank slumping occurred near the most upstream riffle, possibly as a result of a tree that fell on the guardrail and fractured the upper bank; and,

2. The upper bank collapsed near Station 104+00, apparently as a result of storm water flowing off the roadway and into the Drain.

On May 18, 2009, a maintenance inspection of the CMI project area was conducted in accordance with the methodology and criteria set forth in the plan. Overall, BMPs have held up well over the course of two spring seasons. Despite several high-flow events and reports of heavy ice during the winter/spring of 2009, only two riffle structures show evidence of physical damage either on or around them. Damage to these two structures is limited to minor erosion at the land/water interface between the weir structure and bank. The crests and foundations of every riffle structure appear to be unchanged since original construction. Build-up of logs or other debris was surprisingly limited, and was not noted as a problem at any of the BMP sites or within the drain along Turner Road.

As noted above, vegetative plantings are thriving throughout most of the project area. Plantings installed in recent months are beginning to grow leaves; live stakes placed in drier areas have yet to develop leaves, but appear to remain viable based upon the observation of “green” wood under the bark. Several of the live stakes installed in 2008 have nearly doubled in size. Seeding of the floodplains, bank restoration and construction access areas is well established.

Addition Work

Additional construction activities were perform upstream of the CMI Grant area, including the installation of approximately 2,400 feet (1,900 square yards) of riprap was installed at nine (9) locations. Riprap was keyed into the Drain bottom and, at most sites, underlain with non-woven geotextile fabric. Minor earthwork had to be completed at several sites to create a stable slope and base for the riprap.

A total of 3,600 live stakes, including 580 bare root plants representing 5 native species, and one acre of seed were planted upstream of Turner Road to protect and enhance the stream bank, including both the right and left banks. Fifteen (15) trees were removed in the upstream portion of the Drain as well.

Thirteen (13) riffles and fifteen (15) cross-vanes were also constructed as part of the improvement project. Cross-vanes were constructed as grade control structures that decrease near-bank shear stress, velocity, and stream flow, but increases the energy in the center of the channel. Once constructed, these structures not only established grade control through the Drain, they also reduced bank erosion while maintaining channel capacity. Cross vanes improve stream habitat due to: 1) an increase in bank cover due to a differential raise of the water surface in the bank region; 2) the creation of holding and refuge cover during both high and low flow periods in the deep pool; 3) the development of feeding lanes in the flow separation zones (the interface between fast and slow water) due to the strong downwelling and upwelling forces in the center of the channel; and 4) the creation of spawning habitat in the tail-out or glide portion of the pool.

J-hooks, upstream directed, are gently sloping structures composed of riprap having been constructed in eighty-four (84) locations in the upstream portion of the Drain along the outside of the Drain at bends where strong downwelling and upwelling currents, high boundary stress, and high velocity gradients generate high stress in the near-bank region. These structures have been constructed to reduce bank erosion by reducing near-bank slope, velocity, velocity gradient, stream power, and shear stress.

Lessons Learned

The following are lessons learned as a result of the Whitney Intercounty Drain Improvement Project:

1. Winter construction proved to be effective at reducing, or altogether eliminating, sediment input from adjacent disturbed soils. The ground was frozen during the construction of all in-stream BMPs upstream of Noble Road, and while ice on the channel did slow construction, time and money were ultimately saved due to minimal restoration of disturbed soils following construction.

2. The ability to adapt the BMPs to specific locations due to actual field conditions created a more durable project. BMPs were used to address actual concerns present at the time of construction for a given location, especially if conditions had changed since the original fieldwork had been completed in years prior.

3. Selective tree removal versus traditional clear cutting methods along the Drain resulted in more stable banks and allowed for a more naturally aesthetic Drain. Furthermore, designated trees along the bank that were stable and not in fear of collapsing into the Drain were left in place to provide necessary habitat and shade for aquatic species.

4. Live stakes from the project area were used in lieu of purchasing them from a supplier. Dogwood, alder, and willow were available in great abundance within the Drain easement. Using local materials ensured the use of plants that have evolved under local growing conditions and reduced the time of exposure between cutting and transplant. Ultimately, greater survival and earlier growth are anticipated.

Long-Term Evaluation, Monitoring, and Maintenance

The following maintenance plan was developed to establish conditions under which the Whitney Intercounty Drainage Board (WDIB) will provide routine maintenance on BMPs installed in the project area:

The WIDB, or their agent, will conduct periodic visual inspections of the BMPs. All inspections are to be completed by personnel qualified to recognize problems and recommend maintenance. Maintenance activities will be determined on a site-specific basis. Visual inspections focus on signs of erosion and structural integrity of the BMPs (Appendix C). Field personnel will submit results of inspections to the WIDB within 48 hours of inspection. Visual inspections will be conducted according to the following schedule:

1. BMPs (including riffles, plantings, riprap, and two-stage channel) will be inspected monthly for the first 12 months after installation. Inspections will be conducted following precipitation events, when possible. After the first 12 months, inspections will be conducted twice a year for a period of 5 years.

2. If notified by local residents, the road commission, the township, or others that a BMP has failed or is endanger of failing.

If it is determined that the physical or functional integrity of BMPs has been altered, the WIDB will evaluate and perform the maintenance needed, as necessary (see attached maintenance recommendations and considerations for each BMP, including riffles, plantings, riprap, and two-stage channel). The WIDB will contact a qualified Contractor to perform required maintenance work. All BMPs are to be maintained in a functional state for the duration of this maintenance plan. Please note, no maintenance is necessary on vegetative plantings, other than ensuring at least 60% overall survival.

Project Contributors

The following organization's provided grant funding for the Whitney Intercounty Drain Improvement Project:

MDEQ's Clean Michigan Initiative (CMI)	$752,150
Saginaw Bay Watershed Initiative Network (WIN)	$28,000
Great Lake Commission[1]	$72,188

In kind, matching funds were also provided by:

Arenac County Drain Commissioner
Iosco County Drain Commissioner
Ogemaw County Drain Commissioner

[1]This grant was used for BMP construction within the upstream (non-CMI) portion of the Drain.

Appendix A

CMI Grant Agreement

STATE OF MICHIGAN
DEPARTMENT OF AGRICULTURE
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

DAN WYANT
DIRECTOR

April 20, 2005

Mr. Don Preuter
Arenac County Drain Commissioner

Mr. Gary Adams
Iosco County Drain Commissioner

Mr. Michael DeMatio
Ogemaw County Drain Commissioner

RE: Whitney Intercounty Drain – CMI Grant

Gentlemen:

Enclosed please find a copy of the signed CMI Grant agreement with the Michigan Department of Environmental Quality for the above referenced intercounty drain in the amount of $937,500. This agreement has been executed by Director Steven Chester and was dated April 8, 2005, received in my office April 15, 2005.

By copy of this letter to Wade Trim, you are now hereby authorized to proceed with the tasks identified in the grant proposal and to engage the respective subcontractors and consultants, including Wetland and Coastal Resources.

This is a momentous occasion and a long time coming and we are looking forward to the successful completion of the improvements to the Whitney Intercounty Drain. I look forward to meeting with you all at our next drainage board meeting currently scheduled for May 4 at Arenac County.

Sincerely,

Michael R. Gregg

Michael R. Gregg, Chair
Whitney Intercounty Drain Drainage Board

cc: David Bergdolt, P.E., Wade Trim
Tom Bennett, Wetland Coastal Resources
Fran Semenick, Supervisor, Whitney Township
Stacy Hissong, Hubbard, Fox, Thomas, White & Bengtson
Charlie Bauer, MDEQ, Bay City

Grant Information Summary Sheet

Project name: Whitney Drain Improvement Project
Tracking code: 2004-0128

Funding source: CMINPS
Grant type: watershed implementation project
Contract type: Cost Incurred

Contract start date: April 8, 2005 **Contract end date:** September 30, 2007
Reporting frequency: Quarterly

Grant amount: $937,500.00
Match amount: $324,110.20 **Percent match:** 26%
Total amount: $1,261,610.20

Organization: Iosco County/Whitney Intercounty Drainage Board
Federal ID Number: 3860005647
Address: PO Box 58
420 W. Lake
Tawas, MI 48764-0058
County: Arenac

Local Contact: Mr. Gary Adams
Phone: 989-984-1052
Fax: 989-362-9510
E-mail: ioscodrain@charterinternet.com

SWQ Project Administrator: Charlie Bauer
Phone: 989-686-8025
Fax: 989-686-8025
DEQ PA E-Mail: bauerc@michigan.gov
Address: MDEQ-WB
Saginaw Bay District Office
503 North Euclid Avenue Suite 1
Bay City, MI 48706-2965

GRANT AGREEMENT
BETWEEN
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AND
IOSCO COUNTY/WHITNEY INTERCOUNTY DRAINAGE BOARD

This grant Agreement is made between the Michigan Department of Environmental Quality, Environmental Science and Services Division, (hereafter "State") and the Whitney Intercounty Drainage Board represented by the Iosco County Drain Commission as the fiduciary agent (hereafter "Grantee"). The effective date of this Agreement is April 8, 2005 and the end date is September 30, 2007.

I. STATEMENT OF PURPOSE

The purpose of this Agreement is to provide funding for the **Whitney Drain Improvement Project** project. The State is authorized to provide grant assistance pursuant to Michigan's Water Pollution Prevention and Monitoring Act, PA 287 of 1998. Legislative appropriation of Clean Michigan Initiative funds for grant assistance is set forth in PA 52 of 2000 . This Agreement is subject to these Acts, rules promulgated pursuant to these Acts, and the terms and conditions specified in this Agreement.

II. PROJECT SCOPE

This Agreement and its appendices constitute the entire Agreement between the parties and may be modified only in writing and executed by the parties.

The scope of this project is limited to the activities specified in Appendix A including the project description, timetable, workplan, and budget, and such activities as are authorized by the State under this Agreement. Any change in Appendix A requires prior written approval in accordance with the terms and conditions in this Agreement. By acceptance of this Agreement, the Grantee commits to complete the project identified in Appendix A within the time period allowed for in this Agreement.

III. AGREEMENT PERIOD

This Agreement shall take effect on the date shown above. The Grantee shall complete the project specified in Appendix A in accordance with all the terms and conditions specified in this Agreement no later than the ending date shown above. The State shall have no responsibility to provide financial assistance to the Grantee for project work performed outside of the time period shown in XIX Compensation Clause, Section (c) of this Agreement.

IV. CHANGES

(A) The State may, at any time, by written order, make changes within the general scope of this Agreement in the services or work to be performed. If such changes cause an increase or decrease in the Grantee's cost or time required to perform any services under this Agreement, an equitable adjustment shall be made and this Agreement shall be modified in writing. The Grantee must assert any claim for adjustment under this clause in writing within 30 days from the date of receipt by the Grantee of the notification of changes unless the State grants additional time before the date of final payment.

(B) No services for which an additional compensation will be charged by the Grantee shall be furnished without the written authorization of the State.

V. AUDIT AND ACCESS TO RECORDS

The Grantee will be required to maintain all pertinent financial and accounting records and evidence pertaining to the Grant in accordance with generally accepted principles of accounting and other procedures specified by the State. The State or any of its duly authorized representatives shall have access, upon reasonable notice, to such books, records, documents and other evidence for the purpose of inspection, audit, and copying. The Grantee will provide proper facilities for such access and inspection. All records shall be maintained for a minimum of three years after Agreement termination or completion.

VI. SUBCONTRACTS

Any subcontractors, outside associates, or consultants required by the Grantee in connection with the services covered by this Agreement will be limited to such individuals or firms as were specifically identified and agreed to during work plan development, or as are specifically authorized in writing by the State during the performance of this Agreement. Any substitutions in or additions to such subcontractors, associates, or consultants will be subject to the prior written approval of the State.

VII. NON-DISCRIMINATION

The Grantee shall not discriminate against an employee or applicant for employment with respect to their hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment, because of race, color, religion, national origin, ancestry, age, sex, height, weight, marital status, physical or mental disability unrelated to the individual's ability to perform the duties of the particular job or position. The Grantee further agrees that any subagreement shall contain a nondiscrimination provision identical to this provision and binding upon any and all subcontractors.

VIII. COVENANT AGAINST CONTINGENT FEES

The Grantee warrants that no person or subcontractor has been employed or retained to solicit or secure this Agreement based upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees. For breach or violation of this warranty the State shall have the right to annul this Agreement without liability or in its discretion to deduct from the Agreement price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

IX. GRATUITIES

(A) If the State finds after a notice and hearing that the Grantee, or any of the Grantee's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise), to any official, employee, or agent of the State in an attempt to secure a subagreement or favorable treatment in awarding, amending, or making any determinations related to the performance of this Agreement, the State may, by written notice to the Grantee, terminate this Agreement. The State may also pursue other rights and remedies that the law or this Agreement provides.

(B) In the event this Agreement is terminated as provided in this paragraph the State may pursue the same remedies against the Grantee as it could pursue in the event of a breach of the Agreement by the Grantee. The State may also pursue as a penalty, in addition to any other damages to which it may be entitled by law, exemplary damages in an amount (as determined by the State) which shall be not less than three nor more than ten times the costs the Grantee incurs in providing any such gratuities to any such officer or employee.

X. PATENTS, COPYRIGHTS AND RIGHTS IN DATA

The Grantee agrees that any plans, drawings, specifications, computer programs, technical reports, operating manuals, and other work submitted or which are specified to be delivered under this Agreement or which are developed or produced and paid for under this Agreement are subject to the

rights of the State of Michigan and the State shall retain an irrevocable license to reproduce, publish and use in whole or in part and to authorize others to do so.

This clause shall be included in all subcontracts.

XI. GRANTEE RESPONSIBILITIES

(A) The Grantee understands that it is a crime to knowingly and willfully file false information with the State for the purpose of obtaining this Agreement or any payment pursuant to and that any such filing may subject the Grantee, its agents, and/or employees to criminal and civil prosecution. If the Grantee knowingly and willfully presents false information to the State for the purpose of obtaining this Agreement or any payment under this Agreement, the State may cancel this Agreement with no further liability whatsoever to the Grantee, and the Grantee, upon demand by the State, shall reimburse the State for all money received under this Agreement.

(B) The Grantee agrees to abide by all local, state, and federal laws and regulations in the performance of this grant.

(C) All local, state, and federal permits, if required, are the responsibility of the Grantee and issuance is not automatic. Award of this grant is not a guarantee of permit approval by the Department.

(D) The Grantee shall secure all personnel necessary to complete the project. All personnel shall be under the direct supervision of the Grantee. The Grantee shall make all payments required by law for workers' compensation insurance, social security, income tax, unemployment compensation, and all other taxes or payroll deductions as required by law.

(E) The Grantee shall be solely responsible to pay all taxes, if any, that arise from the Grantee's receipt of this grant.

(F) The Grantee shall purchase and use recycled materials and products to the maximum extent possible in performing the project. The State shall provide information and assistance to the Grantee regarding the use of recycled products in the project.

(G) The Grantee is responsible for the professional quality, technical accuracy, timely completion, and the coordination of all designs, drawings, specifications, reports, and other services furnished by the Grantee under this Agreement. The Grantee shall, without additional compensation, correct or revise any errors, omissions, or other deficiencies in his/her designs, drawings, specifications, reports, and other services.

(H) The Grantee shall perform the professional services necessary to accomplish the work required under this Agreement, in accordance with this Agreement and applicable State requirements in effect on the date of execution of the Agreement for this project.

(I) The State's approval of drawings, designs, specifications, reports, and incidental work or materials furnished hereunder shall not in any way relieve the Grantee of responsibility for the technical adequacy of his/her work. The State's review, approval, acceptance, or payment for any of the services shall not be construed as a waiver of any rights under this Agreement or of any cause of action arising out of the performance of this Agreement.

(J) The Grantee's obligations under this clause are in addition to the Grantee's other express or implied warranties under this Agreement or State law and in no way diminish any other rights that the State may have against the Grantee for faulty materials, equipment, or work.

(K) The Grantee shall request any changes to Appendix A in writing and receive written approval from the State prior to implementation.

XII. CONFLICT OF INTEREST

No member of the legislature, judicial or executive branch of State government or any local unit of government official shall benefit from this Agreement. No member of or delegate to Congress, or resident Commissioner shall be admitted to any share or part of this Agreement or to any benefit that may arise therefrom.

XIII. ASSIGNABILITY

The Grantee shall not assign or transfer any interest in this Agreement (whether by assignment or novation), without the prior written consent of the State; provided, however, that claims for money due or to become due to the Grantee from the State under this Agreement may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the State.

XIV. LIABILITY

(A) All liability, loss, or damage as a result of claims, demands, costs, or judgements arising out of activities to be carried out pursuant to the obligations of the Grantee under this Agreement shall be the responsibility of the Grantee and not the responsibility of the State if the liability, loss, or damage is caused by, or arises out of, the actions or failure to act on the part of the Grantee, any subcontractor, anyone directly or indirectly employed by the Grantee provided that nothing herein shall be construed as a waiver of any governmental immunity the Grantee has, as provided by statute or modified by court decisions.

(B) All liability, loss, or damage as a result of claims, demands, costs, or judgments arising out of activities to be carried out pursuant to the obligations of the State under this Agreement shall be the responsibility of the State and not the responsibility of the Grantee if the liability, loss, or damage is caused by, or arises out of, the action or failure to act on the part of any State employee or agent, provided that nothing herein shall be construed as a waiver of any governmental immunity the State, its agencies or employees has as provided by statute or modified by court decisions.

XV. INSURANCE

(A) The Grantee shall maintain such insurance as will protect them from claims which may arise out of or result from the Grantee's operations under this Agreement whether such operations be by themselves or by any Subcontractor or by anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable. The Grantee may be self-insured.

(B) The Grantee agrees to comply with the insurance and worker's compensation laws of the State of Michigan while engaging in all activities authorized under this Agreement.

XVI. FEES AND OTHER SOURCES OF FUNDING

The Grantee shall not seek nor obtain funding through fees or charges to any client receiving services for which the State reimburses the Grantee under this Agreement. The Grantee guarantees that any claims made to the State under this Agreement shall not be financed by any source other than the State under the terms of this Agreement. If funding is received through any other source, the Grantee agrees to delete from Grantee's billings or to immediately refund to the State, the total amount representing such duplication of funding.

XVII. DISCLOSURE OF INFORMATION

The Grantee agrees that his/her reports, project products, and conclusions are for the confidential information of the State and that he/she will not disclose these conclusions, in whole or in part, to any unauthorized person without the prior written consent of the State.

XVIII. QUALITY ASSURANCE/QUALITY CONTROL

No costs for monitoring and analysis may be incurred by any entity other than the State until a Quality Assurance Project Plan (QAPP) is approved by the State, in accordance with the Quality Assurance Document developed by the Department of Environmental Quality and any other applicable QAPP. If the QAPP element is approved, costs for monitoring and/or laboratory analysis shall be reimbursable.

XIX. COMPENSATION CLAUSE

(A) In accordance with the grant budget in Appendix A, the State shall pay the Grantee a total amount not to exceed **$937,500.00,** the amount of match committed by the Grantee is **$324,110.20,** for a total project cost of **$1,261,610.20.**

(B) The Grantee will receive payment for costs incurred for tasks included in the workplan, Appendix A. The Grantee must meet or exceed the match amount committed in order to receive the full amount of the grant award.

(C) Expenditures made by the Grantee for this project after **April 8, 2005** and through **September 30, 2007** are eligible for reimbursement under this Agreement. Expenditures made by the Grantee outside of this time period are not eligible for reimbursement under this Agreement.

(D) Quarterly Status Reports shall be submitted by the Grantee consistent with State fiscal year quarters. State fiscal years cover the period of October 1 to September 30. Quarters end December 31, March 31, June 30, and September 30. Reports are due 30 days after the quarter's end. Status Reports may only be submitted more frequently if agreed to in advance by the State and if the payment requested equals at least 8 percent of the grant award.

(E) The Grantee shall be responsible for the payment of all costs and expenses incurred in the completion of the project. In order to receive payment for the State share of eligible project costs, the Grantee must submit required reports and supporting documentation of eligible project expenditures paid or incurred, as specified by the State. All expenses must be incurred during the time period allowed for project completion as specified in this Agreement. ***All of the following*** shall be submitted by the Grantee, as part of the Status Report:

(1) A letter to the State's Project Administrator requesting payment for expenditures or costs incurred during that reporting period.

(2) A narrative status report which identifies work accomplished during the reporting period by task; work to be accomplished during the subsequent reporting period; problems, real or anticipated which should be brought to the attention of the Project Administrator, and a description of any significant deviation from the agreed-upon workplan, Appendix A.

(3) A financial status report submitted on a form provided by the State. This report must clearly identify the total payment requested for the billing period and equal the amount indicated on the payment request letter. All expenses included in the financial status report must be for items used only for the project funded by this Agreement.

(4) Five copies of any products produced during the reporting period – including newsletters and other related information/education materials.

(5) Any additional information required by the State.

(F) In accordance with the State fiscal year end, the Grantee must submit a Status Report requesting payment for expenditures through September 30, by October 31.

(G) An amount equal to 10 percent of the last year of the grant award, **$31,250.00** shall be withheld by the State until the final project documents are received and approved. The State will make final payment within 60 days of determination of project completion. As a condition of final payment, the Grantee shall deliver to the State a release of all claims against the State arising under this Agreement. Unless otherwise provided for in this Agreement or by State law, final payment under this Agreement shall not constitute a waiver of the State's claims against the Grantee. Release of final payment will not be made unless the match amount committed in this Agreement and identified above is met. *Final project documents shall include all products identified in the workplan as well as a final project report*, which meets the guidelines established by the State. Total expenditures are subject to audit and repayment of any overpayment of the State share if an audit determines that total project costs were not incurred as billed.

(H) Equipment is defined as any one item over $1,000.00 in value and is not reimbursable from grant funds. Equipment may be purchased by the Grantee and counted as part of the Grantee's match for this project.

XX. CANCELLATION

(A) This Agreement may be canceled by either party for the following reasons, upon 30 days written notice to the other party:

(1) Failure of the other party to fulfill its obligations under this Agreement; or,

(2) Violation of any material term or condition of this Agreement.

(B) In addition to the reasons specified above, the State may also cancel this Agreement for any of the following reasons upon 30 days written notice to the Grantee:

(1) Grantee provides false information to the State.

(2) Executive Order or other budgetary reduction.

(3) Lack of funding.

(C) The State may immediately cancel this Agreement without further liability if the Grantee, or any agent of the Grantee, or any agent of any subagreement is: convicted of a criminal offense incident to the application for or performance of a State, public, or private contract or subcontract; convicted of a criminal offense including but not limited to any of the following: embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property, attempting to influence a public employee to breach the ethical conduct standards for State of Michigan employees; convicted under State or federal antitrust statutes; or convicted of any other criminal offense which, in the sole discretion of the State, reflects on the Grantee's business integrity.

XXI. CLOSEOUT

(A) A determination of project completion shall be made by the State through the following:

(1) A financial audit and project review of this Agreement and all payment requests, financial reports, supporting documentation and narrative progress reports submitted by the Grantee.

(2) A site inspection, if applicable.

(B) The Grantee shall provide the State, within 30 days of the ending date, all outstanding financial, performance, and other reports available and required as a condition of the Agreement.

(C) The Grantee shall immediately refund to the State any payments or funds advanced to the Grantee in excess of allowable reimbursable billings.

(D) The Grantee shall provide the State with five (5) copies of the final report and acknowledge in the report that the project was made possible with funding from the Department of Environmental Quality, Environmental Science and Services Division.

XXII. AGREEMENT NOTICES

All notices shall be sent to the following addresses:

(1) Grantee Project Manager:

Mr. Gary Adams
Iosco County/Whitney Intercounty Drainage Board
PO Box 58
420 W. Lake
Tawas, MI 48764-0058

Ph: 989-984-1052
Fax: 989-362-9510
Email: ioscodrain@charterinternet.com

(2) State Project Manager:

Mr. Charlie Bauer
MDEQ – Water Bureau
Saginaw Bay District Office
503 North Euclid Avenue Suite 1
Bay City, MI 48706-2965

Ph: 989-686-8025
Fax: 989-686-8025
Email: bauerc@michigan.gov

It is the responsibility of each party to inform the other party of a change in address or representative.

XXIII. AUTHORIZED SIGNATURES

The individuals signing below certify by their signatures that they are authorized to sign this grant Agreement on behalf of their agencies and that the parties will fulfill the terms of this Agreement, including attached exhibits.

FOR THE STATE:

Authorized Signature

Steven E. Chester
Name

Director
Title

4-8-05
Date

FOR THE GRANTEE:

Michael R Gregg
Authorized Signature

Michael Gregg
Name

Chair, Intercounty Drainage Board
Title

April 1, 2005
Date

38-60005647-G
Federal Employer ID Number

Iosco
County

Remittance Address:

County of Iosco
PO Box 58
420 W. Lake
Tawas, MI 48764-0058

RECOMMENDED BY:

Amy A Brittle
Signature

Amy A Brittle
Name

Division Director
Title

4.5.05
Date

Appendix A
Whitney Drain Improvement Project
Tracking Code #2004-0128
Project Description

A. Statement of Water Quality Concerns/Issues

The East Branch of the AuGres River, also known as the Whitney Intercounty Drain or simply "the Whitney," is located in Sections 9, 10, 11, and 12, Town 20 North, Range 7 East, Arenac County. The Whitney Drain is the outlet for the East Branch of the AuGres River watershed, which covers approximately 150 square miles, or 95,930 acres. Current land uses within the watershed have been estimated at 61% forest, 36% agricultural, and 3% other uses, which include quarries, urban, and other water.

According to the Michigan Department of Environmental Quality, Water Division, and a February 1998 report from the University of Michigan entitled "The Impact of Watersheds on Tributary Water Quality in Saginaw Bay", the Whitney Drain carries the highest sediment bedload of any watershed in the Saginaw Bay region. By comparing the original configuration of the Whitney Drain to current conditions, sediment in the amount of approximately 500,000 cubic yards has been deposited in the Saginaw Bay. Recent figures have estimated current annual sediment deposit at approximately 8,000 cubic yards. The Saginaw Bay Remedial Action Plan has identified sediment as a major contributor to poor water quality in the Saginaw Bay region.

The primary problem with the Whitney Drain is the amount of sediment it contributes and transports into the Saginaw Bay. Major sources of sediment are listed below:

1. Bank erosion due to a higher velocity and steeper grade of the Whitney Drain, as compared to the original course of the East Branch of the AuGres River. The river traversed a 12-mile stretch before the diversion shortened the distance to just 3.5 miles.
2. Bank erosion due to fishermen and public access to the Whitney Drain. Foot traffic strips erosion controlling vegetation and loosens soil that washes directly into the Whitney.
3. Bank erosion due to installation of soil erosion measures to protect Turner Road. The Arenac County Road Commission has deposited rock riprap that acts as a solid obstruction, diverting water across the river, eroding the opposite bank.
4. Bank erosion due to fallen trees in the river. As the drain bank degrades, tree roots are undercut and fall into the drain. These trees divert water and cause streambank erosion.
5. Sediment intrusion due to side inlets. Best management practices have not been employed to restrict sediment from entering at these points. These locations contribute sediment, form obstructions, and divert water into riverbanks.
6. The unstable nature of the streambed, due to the grade and velocity created within the Whitney Drain, has altered sediment transport patterns and caused further erosion of the bed and banks.

Due to the poor water quality created by the sediment load, migration for the many species of fish that historically use this river for spawning has been compromised. Recent years have shown a decline in fish migration within the Whitney Drain. Historical records indicate that this is a major fish migratory route and a favorite destination of fishermen.

A further problem with the Whitney Drain and associated bank erosion is the concern over public safety. Natural gas mains and water mains have been regularly exposed by the eroding banks and stream bottom. Concerns also have been expressed over the water quality at the Saginaw-

Midland water system intake, approximately two miles south of the mouth of the Whitney, which also serves the Sims-Whitney Water Authority.

B. **Project Goals and Objectives**

The goal of the Whitney Drain Improvement Project is to incorporate improvements to reduce sediment load into this watercourse. Sedimentation in the way of erosion is the primary cause of the problems in the Drain. Solutions are intended to implement bio-engineered techniques on the upper bank of the drain and at side inlets and use more "traditional" practices at the bank toe (water/ soil interface). The objective of the project will be to incorporate improvements to stabilize erosion along the Whitney and implement procedures to monitor the results of the improvements well into the future.

The following outlines the intended improvements to achieve the goals and objectives set:

1. Bank erosion due to high velocity and steep grade. The project will incorporate different techniques in different areas to remedy this condition.

   The project will incorporate a pool and riffle system to stabilize the grade of the channel immediately above and below the Noble Road Bridge. A pool is defined as a calm, slow moving, flat graded section of watercourse, which in this case will mimic the same velocities of the river's original course. Riffles will be installed upstream and downstream of these pools to address the grade change necessary to reach the level of the Saginaw Bay. Riffles are defined as relatively short lengths of stream where velocities are higher and grade's steeper, serving to transition between pool areas. Riffles will be constructed of larger rock material to prevent movement downstream and down-cutting of the channel. The size of the rock and steepness of the grade will be such to allow easy passage of fish species through these areas.

   The project also anticipates using stream barbs and/or cross vanes to direct flows away from eroding banks in this severely eroded area. These structures extend into the drain to redirect currents away from erosion-prone streambanks. They are keyed into the bank and be pointed in the upstream direction, where they are set into the bed at a determined elevation. Such structures been used extensively throughout the United States to not only prevent erosion, but also to provide a place for sediment to settle and vegetation to take hold. There is also an added benefit of fish habitat associated with these structures.

   The locations of these grade stabilization techniques will be located based on the pool and riffle system the Whitney Drain has already begun to develop. Additional techniques may be incorporated as necessary based on final survey and review during the design phase.

   As a result of a site visit on December 20, 2003, it appears the reach above the Noble Road Bridge to the Turner Road "bend" is fairly stable and the need for a pool and riffle system is not necessary. Instead, this project anticipates using toe stabilization techniques through the use of rock on the drain bank. Rock riprap will be keyed into the drain bottom and placed up the side of the drain bank to a height equal to the bank full elevation of the design storm. Presently, the design storm is anticipated to be, at a minimum, a 10-year event with stabilization to a 25- or 50-year event if costs allow. The project included in this proposal allows for the installation of four stream barbs within this reach, as necessary in locations where erosion is severe. Their locations will be determined during the design phase of the project.

2. Bank erosion due to fishermen descending the banks into the river. This project will stabilize the upper portions of the bank through the use of bio-engineered techniques. The Whitney Intercounty Drainage Board and their designated engineer plan on meeting with the Michigan Department of Natural Resources (MDNR) to discuss possible cost-effective techniques that may withstand the intrusion of fishermen on the drain banks.

3. Bank erosion due to the installation of bank erosion prevention devices to protect either public utilities or improvements. The cause is due to the installation of rock riprap along the Turner Road side of the Whitney Drain. The rock diverts water to the opposite bank, thus causing severe erosion. This project will stabilize the toe of the Turner Road bank. This will be accomplished through placement of toe-stabilizing riprap to achieve consistency along this bank. Bio-engineered vegetative cover will be used above any of the toe stabilizing techniques to prevent further erosion.

4. Trees in the river due to bank undercutting. The remedy for this problem is simply to remove the trees. The only trees anticipated for removal are those "leaning" or in danger of falling into the channel. Others on the drain bank will only be cut as necessary for access by construction equipment. We also intend to cut the trees above ground and leave the root mass so they can continue to stabilize the soils. New tree growth can easily be monitored and maintenance performed, as necessary.

5. Improper side inlet practices causing channel redirection and bank erosion. Each side inlet will be reviewed and best management practices implemented to reduce sediment and erosion. Improvements in the way of deep-rooting grasses alone or in combination with rock riprap and other measures to reduce sediment and erosion will be used at each location.

6. Unstable streambed. The pool/riffle system, stream barbs and cross vanes described in Item 1 will provide grade stabilization by reducing velocity and will virtually eliminate streambed downcutting.

Due to the size of this drain and the high cost of implementing improvements, the Clean Michigan Initiative Non-Point Source Pollution Control Grant will be instrumental for reaching the goals and objectives listed above. In conjunction with the grant, a 25% match will be contributed by the prospective Counties involved. The main portion of the match will be through special assessment of property located within the Whitney Drain drainage district. Design phase of the project will employ those well acquainted with water quality issues and river dynamics. The Whitney Intercounty Drainage Board can assess up to two percent annually of the original construction cost for maintenance and repair. This will provide funding for future maintenance and modifications to the Whitney Drain system.

By reducing sediment entering the Whitney, we will improve water quality, both short-term and long-term. The impact of this project will improve water quality and thus fish migration for species previously abundant in the river. Improved water quality will mean more fish, fisherman, and as a result, more tourist dollars to boost the area economy. The maintenance program will help promote improved water quality within this drain system. In 1986, the Michigan Department of Natural Resources estimated indicated 500,000 anglers spent $18 million fishing in the nearby Saginaw Bay.

Controlling erosion will also benefit local utilities and public maintenance agencies. By stabilizing the Whitney, a future relocation of Turner Road will not be necessary, which has happened twice in the Drain's history. The Arenac County Road Commission incurs extensive costs annually to protect the motoring public along this road. Public utilities will also benefit in stabilization of the Drain. Natural gas pipelines and water mains have been exposed due to erosion. The cost to continually relocate or maintain these facilities is ultimately paid by the ratepayers.

The improvements to the Drain will complement and be instrumental in the ongoing water quality improvement efforts of the Michigan Department of Environmental Quality and other governmental agencies, both nationally and internationally to protect waters in the Lake Huron/Great Lakes basin. This being the highest contributor of sediment in this region,

addressing this source will take another step in improving the overall water quality of the Great Lakes.

C. Organizational Information

The Whitney Intercounty Drainage Board's mission is to explore, evaluate, and select a course of action that will cost-effectively attain the goals and objectives outlined above. The main goal is to find a feasible and maintainable project to stabilize the erosion of the Whitney Drain. They have public, local and state legislators, and private group support and funding for improvements to the Whitney Drain.

D. Partners and Related Funding

The Whitney Intercounty Drainage Board is overseen by one member of the Michigan Department of Agriculture and consists of the Arenac, Iosco, and Ogemaw County Drain Commissioners. Each represents their constituent's interests in the improvements planned for the Whitney Drain. These members will be in charge of scheduling and conducting meetings in accordance with the Michigan Drain Code. In addition, they will be required to prepare required mailings to the 8,000 parcel owners within the drainage district. Since the Drain Commissioners only course in securing funding is through assessment of those in the district, they have committed their individual districts to cover the 25% local match needed for the Clean Michigan Initiative Application. It is also the Whitney Intercounty Drainage Board's intent to contact citizens, sporting and other recreational organizations for a monetary commitment if this project is accepted.

E. Project Sustainability

The Whitney Intercounty Drainage Board can assess up to $2500.00 of the construction cost for annual maintenance of the project after completion. Semi-annual visual reviews (one in the spring and one in the fall) are planned to monitor the system. Photos will be taken during each review and compared to previous photos to determine problem areas. Maintenance will be scheduled or a consultant will be contacted to recommend repairs if a more serious problem is identified. It is anticipated the Michigan Department of Environmental Quality will continue to monitor sediment load in this waterway and the Department of Natural Resources to continue evaluating the fish populations.

The Whitney Drain is currently bordered on the south by Turner Road and on the north by woodlands, farmland, and state forests. Presently, no potential land use conflicts within the proposed project area have been identified.

E. Evaluation

Each of the Intercounty Drainage Board Members will be included as part of the evaluation process for the completed project and to monitor the project in the future. A bedload/sediment transport study can be done on the Whitney Drain and compared to previous results. Water intake tests, based on suspended solids, will be gathered and results compared to those taken prior to completion of this project.

We anticipate the Michigan Department of Natural Resources will continue to monitor fish populations and compare them with previous counts. However, it will take time for the fish to "rediscover" the Whitney as a migration route to the upper reach habitat for spawning.

Documentation outlining improvements implemented on the Whitney Drain will be collected and recorded. Since this is a unique solution for grade stabilization in Michigan, this information will be valuable in other areas requiring the same type of rehabilitation.

It is anticipated the Whitney Intercounty Drainage Board will meet semi-annually after each review of the Whitney Drain system. They will discuss and approve any needed maintenance. At the completion of the evaluation process, the information will be available for public and governmental use. A series of articles outlining project and specific improvements will be featured in the Pipeline Magazine. This information can easily be incorporated into public or private internet web pages and local interest group mailings. We anticipate holding seminars at the Michigan Association of County Drain Commissioners semi-annual conventions to disseminate the information to Drain Commissioners statewide.

F. Project Summary

The Saginaw Bay Remedial Action Plan has identified the Whitney Drain in Arenac County as a major contributor of sediment to the Saginaw Bay. The high sediment content due to highly unstable soils has compromised fish migration, exposed public utilities, and twice threatened Turner Road. The Whitney Drain Improvement Project's goal is to stabilize the grade and adjacent banks from historic erosion. The aim of these bank stabilization techniques will be to reduce bank erosion and velocities, thus significantly reducing sediment transport in this river. A pool and riffle system supplemented by stream barbs, cross vanes and vegetative cover will be implemented to substantially reduce the amount of sediment entering the river. The proposed techniques, unique to this region, will serve to stabilize the channel and grade, while protecting public improvements and creating and maintaining a desirable natural area.

Whitney Drain Improvement Project
Tracking Code #2004-0128
Work Plan

Scope of Work

This Work Plan includes tasks and best management practices (BMPs) identified within the WHITNEY INTERCOUNTY DRAINAGE BOARD (BOARD) Whitney Drain Project Watershed Management Plan approved by MDEQ. Arenac County will receive and manage all Grant Funds.

The primary tasks of this Work Plan are:

Upon completion and approval of construction plans for work associated with this Work Plan, bids will be sought for the implementation and installation of construction activities requiring large equipment. The BOARD and approved consultants will oversee the contractual work to ensure activities are completed in compliance with recommendations made by the BOARD, and the Michigan Department of Environmental Quality (MDEQ).

Detailed descriptions of the Work Plan tasks are provided below. All tasks will be funded using a combination of grant funds and matching funds (approximately 75% grant funds, 25% matching funds), unless otherwise noted. A brief description of the tasks, the responsible agency for each task and the percent of time required for completing each task are provide in the Table 1 of this contract. The time frame for completion of the various tasks outlined in this Work Plan is provided in Table 2. A detailed budget sheet, Proposed BMP Practices Sheet and Project Description are also attached.

TASKS

Task 1: Administration (7%)

A. **Provide overall administration.** The BOARD will provide overall administration of the project and will be the Project Manager for this grant.

B. **Provide accounting services.** Wetland and Coastal Resources (WCR) will provide accounting services for the project.

C. **Hold quarterly meetings.** The BOARD will hold quarterly progress meetings with sub consultants to review progress and provide direction. A representative of WADE-TRIM (WT), WCR, and appropriate sub-consultants performing assigned tasks will be present at each of these meetings.

D. **Submit quarterly reports.** The BOARD will submit quarterly reports that detail all activities implemented under the grant. WCR will assist the BOARD with preparation of quarterly reports. The BOARD will submit the quarterly reports to the MDEQ within 30 days after the end of each quarter. This task will also include submitting CMI post audit documentation.

E. **Identify subcontractors and submit contractor forms to MDEQ.** The BOARD, with assistance from WT, will be responsible for assigning work to the sub-consultant engineering and environmental firms. WT will also assist in developing contracts with subcontractors and the BOARD will submit a package of selected subcontractors to MDEQ for final review and approval.

F. **Identify volunteer and contractual labor.** WT, with assistance from WCR, will identify work to be completed by contractual labor, and if any work can be completed by volunteers.

G. **Provide draft final report to the MDEQ with before and after pictures of BMP sites.** The BOARD will provide a draft final report to the MDEQ for review 30 days prior to expiration of this contract. WT and WCR will assist the BOARD with preparation of the draft and final reports.

H. **Submit final report, fact sheet and release of claims no later then 30 days after the contract ends.** The BOARD will submit the final products to the MDEQ.
   - One copy of the final report to the PA; four copies to the Admin staff; electronic copies will also be submitted to the PA and the Admin Unit
   - A Final paper project fact sheet **and Final electronic project fact sheet**
   - Submittal of release of claims statement

I. **Distribute final report.** The BOARD will distribute the final report after MDEQ approval. **Funding for products and work performed after the contract deadline will not be reimbursed.**

<u>Task 2: Field Assessment and modeling (10%)</u>

A. **Preliminary site inspection.** WT and WCR will conduct a preliminary inspection of the Whitney Drain. This inspection will focus on identifying and prioritizing specific locations for BMP implementation.
B. **Survey contour and base mapping.** WT will survey contours and create base maps. Base maps will provide working models to be used for off-site planning, design, bidding and other miscellaneous applications. Aerocon will be contracted to provide aerial photos and base map guidance.
C. **Survey drain cross-sections.** With assistance from WCR, WT will survey the cross-sections. Cross sections are necessary for hydraulic and hydrologic calculations, BMP design, and accurate before-and-after comparisons.
D. **Soil investigation.** WT will be responsible for the collection of soil borings for geotechnical purposes to define soil stability when implementing intrusive BMPs. Loose soil will be collected in glass jars for sieve analysis. This data will be used for soil classification and estimated soil stability ratings.

E. **Plan and profile of the existing drain.** WT will survey and plot the plan view and profile of the drain. Existing plan and profile are important components of the design purposes. They will also be included on the base mapping.
F. **Hydrology/Hydraulics.** WT, WCR, Donald Roseboom (DR) and Chester Watson (CW) will collaborate to complete hydrologic and hydraulic analyses. Results of these analyses are critical for the design of in-stream structures.

Task 3: Preliminary design phase (18%)

A. **Preliminary plan.** WT, WCR, DR and CW will collaborate to complete a preliminary design plan. The preliminary plan will include plan, profile and cross sectional drawings for all proposed BMPs, construction plans and sequence, a complete monitoring and evaluation plan, and all other detailed information necessary to ensure successful completion of the project.
B. **Preliminary plan presentation.** The BOARD, WT and WCR will present the preliminary plan to the MDEQ for approval.

Task 4: Final design phase (2%)

A. **Final plan preparation and submittal to MDEQ for review.** The final plan will incorporate revisions and recommendations from the preliminary plan, and will be prepared and submitted by the BOARD, with direction from WT, WCR, DR and CW.
B. **Specification and bidding documents.** Specification and bidding documents will be prepared by WT and WCR.
C. **Pre-bid meeting.** WT will plan and conduct the pre-bid meeting.
D. **Bid opening.** The BOARD, with assistance from WT, will oversee the bid opening.
E. **Award recommendation.** The BOARD and WT will recommend award of contracts.

Task 5: Volunteer Coordination (1%)
All work performed by volunteers will serve as match funds for the project.

Task 6: Construction phase (58%)

A. **Construction contract administration.** WT will administer the construction contracts.
B. **Pre-construction meeting.** The pre-construction meeting will be planned and conducted by WT, with assistance from WCR. This meeting will include a brief presentation of final construction sequence, logistics and methodology.
C. **Construction survey stakeout.** WT, WCR, DR & CW will survey and stake all BMP location activities. Staking will be consistent with guidelines established with contractor.
D. **Project construction.** WT and WCR will oversee construction and WT will manage all project construction activities. All activities will be inspected by a representative of WT or WCR prior to final approval.
    1. **Channel restoration/reconstruction**
    2. **Install riffle zones**
    3. **Install barbs/cross vanes**
    4. **Taper banks**
    5. **Install rock rip rap**
    6. **Install erosion control blankets and vegetative plantings**
    7. **Install side inlet improvements**
E. **As-constructed plans.** WT will prepare all as-constructed plans.

Task 7: Evaluation and Maintenance of Completed Work (4%)
Work items completed under this task will serve as match funds for the project.

A. **Report and Identify Maintenance of structures and vegetative plantings.** WT and WCR will be responsible for reporting and recommending maintenance of the BMPs to ensure the BMPs are providing the functions for which they were installed. **This also includes a maintenance schedule for all BMPs.** Reports will include a detailed description of any BMP failures or potential problems, along with associated maintenance requirements. **The final report will include evaluations of the BMP performance.**

TABLE 1: Task Summary

Task No.	Task or Sub-Task - Description	Responsible Agency	Percentage of Time	Products
1	**Administration of grants (Engineering oversight, meetings, hearings, reports)**	WIDB/WCR	7	
A	Provide overall administration	WIDB		Completed project
B	Provide accounting services	WCR		Accounting reports
C	Hold quarterly meetings	WIDB		
D	Submit Quarterly Reports	WIDB w/WCR		Quarterly reports
E	Identify subcontractors and submit contractor forms to MDEQ	WIDB w/WT		MDEQ approval of contractors.
F	Identify volunteer and contracutal labor	WT/WCR		Commitment of labor
G	Provide draft final report, including maintenance reports, to MDEQ with before and after pictures of BMP sites	WIDB/WCR/WT		Draft final report
H	Submit 5 copies of final report, fact sheet and release of claims	WIDB		Final report
I	Distribute final report	WIDB		Final report
2	**Field data collection and modeling**	WT/WCR/DR/CW	10	Data for design work
A	Preliminary site inspection	WT/WCR		
B	Survey contour and basemapping	WT, AC		
C	Survey drain cross-sections	WT/WCR		
D	Soil Borings	WT		
E	Plan and profile of the existing drain	WT		
F	Hydrology/Hydraulics	WT/WCR/DR/CW		
3	**Preliminary design phase**	WT/WCR/DR/CW	18	Preliminary design
A	Preliminary plan	WT/WCR/DR/CW		
B	Preliminary plan presentation	WIDB/WT/WCR		
4	**Final Design Phase**	WIDB/WT/WCR/ DR/CW	2	Sealed engineering plans.
A	Final plan preparation and submittal to MDEQ for review	WIDB/WT/WCR/ DR/CW		
B	Specification and bidding documents	WT/WCR		
C	Pre-bid meeting	WT		
D	Bid opening	WIDB/WT		
E	Award recommendation	WIDB/WT		Written report.

TABLE 1: Task Summary

5	**Volunteer Coordination**	WT/WCR	1	
6	**Construction Phase**	WT/WCR	58	Implement BMPs
A	Construction contract administration	WT		
B	Pre-construction meeting	WT/WCR & contractor TBA		
C	Construction survey stakeout	WT/WCR		
D	Project construction			
1	Channel restoration/reconstruction	WT/WCR & contractor TBA		
2	Install riffle zones	WT/WCR & contractor TBA		
3	Install barbs/cross vanes	WT/WCR & contractor TBA		
4	Tapper banks	WT/WCR & contractor TBA		
5	Install rock rip rap	WT/WCR & contractor TBA		
6	Install erosion control blankets & vegetative plantings	WT/WCR & contractor TBA		
7	Side inlet improvements	WT/WCR & contractor TBA		
E	As-constructed plans	WT		
7	**Evaluation and maintenance of completed work**	WT/WCR	4	Develop evaluation procedures; provide report of needed maintenance for one year time period
A	Report and identify needed maintenance of structures and vegetative plantings	WT/WCR		

TOTAL **100**

WIDB (Whitney Intercounty Drain Board)
WT (Wade Trim)
WCR (Wetland and Coastal Resources)
DR (Donald Roseboom)
CW (Chester Watson)
AC (Aerocon)

Table 2: Summary Timeline

			2005										2006											
			Quarter 1			Quarter 2			Quarter 3			Quarter 4			Quarter 5			Quarter 6			Quarter 7		
No	Task or Sub-Task Description	Responsible agency	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	**Administration of grants (Engineering oversight, meetings, hearings, reports)**	WIDB/WCR	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
A	Provide overall administration	WIDB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B	Provide accounting services	WCR	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
C	Hold quarterly meetings	WIDB	X			X			X			X			X			X			X		
D	Submit Quarterly Reports	WIDB w/WCR	X			X			X			X			X			X			X		
E	Identify subcontractors and submit contractor forms to MDEQ	WIDB w/WT	X																				
F	Identify volunteer and contracutal labor	WT/WCR															X						
G	Provide draft final report, including maintenance reports, to MDEQ with before and after pictures of BMP sites	WIDB/WCR/WT																					
H	Submit 5 copies of final report, fact sheet and release of claims	WIDB																					
I	Distribute final report	WIDB																					
2	**Field data collection and modeling**	WT/WCR/DR/CW																					
A	Preliminary site inspection	WT/WCR	X																				
B	Survey contour and basemapping	WT	X	X																			
C	Survey drain cross-sections	WT/WCR	X	X																			
D	Soil Borings	WT	X	X																			
E	Plan and profile of the existing drain	WT	X	X																			
F	Hydrology/Hydraulics	WT/WCR/DR/CW	X	X	X																		
3	**Preliminary design phase**	WT/WCR/DR/CW																					
A	Preliminary plan	WT/WCR/DR/CW				X	X	X	X	X													
B	Preliminary plan presentation	WIDB/WT/WCR									X												
4	**Final Design Phase**	WIDB/WT/WCR/ DR/CW																					
A	Final plan preparation and submittal to MDEQ for review	WIDB/WT/WCR/ DR/CW									X												
B	Specification and bidding documents	WT/WCR									X	X	X										

WIDB (Whitney Intercounty Drain Board)
WT (Wade Trim)
WCR (Wetland and Coastal Resources)
DR (Donald Roseboom)
CW (Chester Watson)

Table 2: Summary Timeline

			2005										2006											
			Quarter 1			Quarter 2			Quarter 3			Quarter 4			Quarter 5			Quarter 6			Quarter 7		
No	Task or Sub-Task Description	Responsible agency	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
C	Pre-bid meeting	WT												X									
D	Bid opening	WIDB/WT														X							
E	Award recommendation	WIDB/WT														X							
5	**Volunteer Coordination**	WT/WCR												X									
6	**Construction Phase**	WT/WCR																					
A	Construction contract administration	WT														X	X	X	X	X	X	X	X
B	Pre-construction meeting	WT/WCR														X							
C	Construction survey stakeout	WT/WCR/DR/CW														X	X	X	X	X	X	X	X
D	Project construction																						
1	Channel restoration/reconstruction	WT/WCR & contractor TBA															X	X	X	X	X	X	X
2	Install riffle zones	WT/WCR & contractor TBA															X	X	X	X	X	X	X
3	Install barbs/cross vances	WT/WCR & contractor TBA															X	X	X	X	X	X	X
4	Tapper banks	WT/WCR & contractor TBA															X	X	X	X	X	X	X
5	Install rock rip rap	WT/WCR & contractor TBA															X	X	X	X	X	X	X
6	Install erosion control blankets & vegetative plantings	WT/WCR & contractor TBA															X	X	X	X	X	X	X
7	Side inlet improvements	WT/WCR & contractor TBA															X	X	X	X	X	X	X
E	As-constructed plans	WT																					
7	**Evaluation and maintenance of completed work**	WT/WCR																					
A	Report and identify needed maintenance of structures and vegetative plantings	WT/WCR																					

WIDB (Whitney Intercounty Drain Board)
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Table 2: Summary Timeline

			2007											
			Quarter 1			Quarter 2			Quarter 3			Quarter 4		
No.	Task or Sub-Task Description	Responsible agency	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	**Administration of grants (Engineering oversight, meetings, hearings, reports)**	WIDB/WCR			X	X	X	X	X	X	X	X	X	X
A	Provide overall administration	WIDB			X	X	X	X	X	X	X	X	X	X
B	Provide accounting services	WCR			X	X	X	X	X	X	X	X	X	X
C	Hold quarterly meetings	WIDB				X			X			X		
D	Submit Quarterly Reports	WIDB w/WCR				X			X			X		
E	Identify subcontractors and submit contractor forms to MDEQ	WIDB w/WT												
F	Identify volunteer and contracutal labor	WT/WCR												
G	Provide draft final report, including maintenance reports, to MDEQ with before and after pictures of BMP sites	WIDB/WCR/WT										X		
H	Submit 5 copies of final report, fact sheet and release of claims	WIDB												X
I	Distribute final report	WIDB												X
2	**Field data collection and modeling**	WT/WCR												
A	Preliminary site inspection	WT/WCR												
B	Survey contour and basemapping	WT												
C	Survey drain cross-sections	WT/WCR												
D	Soil Borings	WT												
E	Plan and profile of the existing drain	WT												
F	Hydrology/Hydraulics	WT/WCR/DR/CW												
3	**Preliminary design phase**	WT/WCR/DR/CW												
A	Preliminary plan	WT/WCR/DR/CW												
B	Preliminary plan presentation	WIDB/WT/WCR												
4	**Final Design Phase**													
A	Final plan preparation and submittal to MDEQ for review	WIDB/WT/WCR/ DR/CW												
B	Specification and bidding documents	WT/WCR												

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Table 2: Summary Timeline

			2007											
			Quarter 1			Quarter 2			Quarter 3			Quarter 4		
No.	Task or Sub-Task Description	Responsible agency	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
C	Pre-bid meeting	WT												
D	Bid opening	WIDB/WT												
E	Award recommendation	WIDB/WT												
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6	**Construction Phase**	WT/WCR												
A	Construction contract administration	WT												
B	Pre-construction meeting	WT/WCR & contractor TBA												
C	Construction survey stakeout	WT/WCR												
D	Project construction:	WT/WCR & contractor TBA												
1	Channel restoration/reconstruction	WT/WCR & contractor TBA												
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3	Install barbs/cross vanes	WT/WCR & contractor TBA												
4	Tapper banks	WT/WCR & contractor TBA												
5	Install rock rip rap	WT/WCR & contractor TBA												
6	Install erosion control blankets & vegetative plantings	WT/WCR & contractor TBA												
7	Side Inlet improvements	WT/WCR & contractor TBA												
E	As-constructed plans	WT					X							
7	**Evaluation and maintenance of completed work**	WT/WCR			X	X	X	X						
A	Report and identify needed maintenance of structures and vegetative plantings	WT/WCR				X	X	X	X	X	X			

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DEQ

Michigan Department of Environmental Quality
Environmental Science and Services Division

GRANT PROJECT BUDGET INFORMATION
(Authorized by 1994 P.A. 451)

Applicant Name: Whitney Intercounty Drain Board
Project Name: Whitney Drain Improvement Project
Tracking Code Number: 2004-0128

STAFFING NAME & TITLE	HOURS	RATE	GRANT AMOUNT	LOCAL MATCH AMOUNT	TOTAL
Arenac County Drain Commissioner	151.00	$ 15.00	$ -	$ 2,265.00	$ 2,265.00
Arenac County Drain Clerk	187.00	$ 8.00	$ -	$ 1,496.00	$ 1,496.00
Iosco County Drain Commissioner	198.00	$ 35.50	$ -	$ 7,029.00	$ 7,029.00
Iosco County Deputy Drain Commissioner	400.00	$ 13.50	$ -	$ 5,400.00	$ 5,400.00
Iosco County Deputy Drain Commissioner (O.T.)	28.00	$ 20.00	$ -	$ 560.00	$ 560.00
Ogemaw County Drain Commissioner	100.00	$ 15.00	$ -	$ 1,500.00	$ 1,500.00
		$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -
STAFFING Subtotal			$ -	$ 18,250.00	$ 18,250.00

FRINGE BENEFITS (not to exceed 40%) NAME & TITLE	RATE			
Arenac County Drain Commissioner	0.00%	$ -	$ -	$ -
Arenac County Drain Clerk	24.00%	$ -	$ 359.04	$ 359.04
Iosco County Drain Commissioner	0.00%	$ -	$ -	$ -
Iosco County Deputy Drain Commissioner	24.60%	$ -	$ 1,328.40	$ 1,328.40
Iosco County Deputy Drain Commissioner (O.T.)	24.60%	$ -	$ 137.76	$ 137.76
Ogemaw County Drain Commissioner	26.60%	$ -	$ 399.00	$ 399.00
		$ -	$ -	$ -
		$ -	$ -	$ -
		$ -	$ -	$ -
		$ -	$ -	$ -
FRINGE BENEFITS Subtotal		$ -	$ 2,224.20	$ 2,224.20
STAFFING AND FRINGE BENEFITS Subtotal		$ -	$ 20,474.20	$ 20,474.20

CONTRACTUAL SERVICES NAME	HOURS or UNITS	RATE			
Wade-Trim, Incorporated	2,423.00	$ 65.00	$ 118,125.00	$ 39,370.00	$ 157,495.00
Mr. Chester Watson, Phd - Colorado State or other	50.00	$ 130.00	$ 4,850.00	$ 1,650.00	$ 6,500.00
Mr. Donald Roseboom - Illinois State Water Survey or other	40.00	$ 130.00	$ 3,900.00	$ 1,300.00	$ 5,200.00
Wetland and Coastal Resources	542.00	$ 98.00	$ 35,075.00	$ 18,041.00	$ 53,116.00
Volunteers	170.00	$ 10.00	$ -	$ 1,700.00	$ 1,700.00
Aerocon	50.00	$ 100.00	$ 3,750.00	$ 1,250.00	$ 5,000.00
Stream channel restoration (contractor TBA)		$ -	$ 771,800.00	$ 235,000.00	$ 1,006,800.00
		$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -
CONTRACTUAL SERVICES Subtotal			$ 937,500.00	$ 298,311.00	$ 1,235,811.00

SUPPLIES, MATERIALS AND EQUIPMENT SUPPLIES & MATERIALS (itemize)	QUANTITY	COST			
Postage, Printing, and Advertising	1.00	$ 5,325.00	$ -	$ 5,325.00	$ 5,325.00
			$ -	$ -	$ -
			$ -	$ -	$ -
			$ -	$ -	$ -
			$ -	$ -	$ -
			$ -	$ -	$ -
			$ -	$ -	$ -
			$ -	$ -	$ -
			$ -	$ -	$ -
		$ -	$ -	$ -	$ -
SUPPLIES AND MATERIALS Subtotal			$ -	$ 5,325.00	$ 5,325.00
EQUIPMENT (any item over $1000)					
		$ -		$ -	$ -
		$ -		$ -	$ -
EQUIPMENT Subtotal				$ -	$ -
SUPPLIES, MATERIALS AND EQUIPMENT Subtotal			$ -	$ 5,325.00	$ 5,325.00

Michigan Department of Environmental Quality
Environmental Science and Services Division

GRANT PROJECT BUDGET INFORMATION
(Authorized by 1994 P.A. 451)

TRAVEL	MILES	RATE			
MILEAGE (not to exceed $.305/mile)		$ -	$ -	$ -	$ -
	NIGHTS	RATE			
LODGING		$ -	$ -	$ -	$ -
	QUANTITY	RATE			
MEALS		$ -	$ -	$ -	$ -
OTHER (itemize)	QUANTITY	RATE			
		$ -	$ -	$ -	$ -
		$ -	$ -	$ -	$ -
TRAVEL Subtotal			$ -	$ -	$ -
COST-SHARE Subtotal: (NPS Grants Only)			$ -	$ -	$ -
PROJECT Subtotal			$ 937,500.00	$ 324,110.20	$ 1,261,610.20
Project Subtotal Percentage Split			74.31%	25.69%	
INDIRECT RATE (not to exceed 20% Staffing and Fringe Benefits)		0 % RATE			
INDIRECT COSTS (Summarize Below)			$ -	$ -	$ -
TOTAL GRANT AND MATCH BUDGET			$ 937,500.00	$ 324,110.20	$ 1,261,610.20

SOURCES OF MATCH:	DOLLAR VALUE COMMITTED:		
Organization	In Kind	Cash	Total
Whitney Intercounty Drain Board	$ -	$ 240,325.00	$ 240,325.00
Arenac County Drain Commissioner	$ 2,265.00	$ -	$ 2,265.00
Arenac County Drain Clerk	$ 1,855.04	$ -	$ 1,855.04
Iosco County Drain Commissioner	$ 7,029.00	$ -	$ 7,029.00
Iosco County Deputy Drain Commissioner	$ 6,728.40	$ -	$ 6,728.40
Iosco County Deputy Drain Commissioner (O.T.)	$ 697.76	$ -	$ 697.76
Ogemaw County Drain Commissioner	$ 1,899.00	$ -	$ 1,899.00
Wade-Trim, Incorporated	$ 39,370.00	$ -	$ 39,370.00
Mr. Chester Watson, Phd - Colorado State or other	$ 1,650.00	$ -	$ 1,650.00
Mr. Donald Roseboom - Illinois State Water Survey or other	$ 1,300.00	$ -	$ 1,300.00
Wetland and Coastal Resources	$ 18,041.00	$ -	$ 18,041.00
Volunteers	$ 1,700.00	$ -	$ 1,700.00
Aerocon	$ 1,250.00	$ -	$ 1,250.00
Subtotal	$ 83,785.20	$ 240,325.00	
Total Match Must Equal Amount in Budget Sheet Above			$ 324,110.20

SOURCE OF O&M:

SUMMARY OF INDIRECT CHARGES:

DEQ

Michigan Department of Environmental Quality
Surface Water Quality Division

PROPOSED BEST MANAGEMENT PRACTICES SHEET

(Authorized by 1994 P.A. 451)

(Completion of this form is required of projects implementing best management practices, in order to receive grant consideration).

Organization Name: Whitney Intercounty Drainage Board
Project Name: Whitney Drain Improvement Project
Project Tracking Code: 2004-0128

SITE NAME/NUMBER	#	POLLUTANT SOURCE	PROPOSED SYSTEM OF BMPS	ESTIMATED COST/SITE OR TOTAL/SOURCE	GRANT FUNDS	LOCAL MATCH	OTHER FUNDS
Channel and Stream Bank Erosion	1	Sediment	Tree Removal/Clearing	$41,000	$41,000	$10,250	
			Major Bank Reconstruction, Grade Side Slopes (tapper banks)	$240,000	$240,000	$60,000	
			Minor Bank Reconstruction, Grade Side Slopes (tapper banks)	$90,000	$90,000	$22,500	
			Side Inlet Improvements	$50,000	$50,000	$12,500	
			Velocity and Grade Stabilization at Noble Road Bridge	$20,000	$20,000	$5,000	
			Grade Stabilization, Pool and Riffle	$110,000	$110,000	$27,500	
			Crest Rock for Riffles	$15,000	$15,000	$3,750	
			Stream Barbs/Cross Vanes	$46,000	$46,000	$11,500	
			Rock Riprap Toe Stabilization	$250,000	$81,800	$62,500	
			Upper Bank Vegetative Cover	$78,000	$78,000	$19,500	
					$771,800	$235,000	$1,006,800

$ values reflected as ☐ Cost Share ☑ Contractual on the budget sheet (check one)

Appendix B

Before and After Photographs of BMPS

Before - Station 21+80

After - Riffle

Before - Station 60+20

After - Riffle

Before - Station 68+00

After - Riffle

Before - Station 72+20

After - Riffle

Before - Station 82+50

After - Riffle

Before - Station 88+25

After - Riffle

Before - Station 90+00

After - Bank Stabilization

Before - Station 120+50

After - Riffle

Before - Station 130+50

After - Riffle

Before - Station 140+00

After - Riffle

Before - Station 159+25

After - Riffle

Before - Station 173+50

After - Riffle

Before - Station 188+50

After - Riffle

Before - 195+50

After - Bank Stabilization and Floodplain Creation

Live stakes placed in between the riprap for more stable root base

Appendix C

Monitoring and Maintenance Forms

BMP Inspection and Recommended Maintenance

BMP: _____ Station (Location): _____

Date: _____ Field Personnel: _____

Photo Number(s): _____

Observations: _____

_____

_____

_____

_____

_____

_____

Recommended Maintenance: _____

_____

_____

_____

_____

_____

_____

Maintenance to be completed by: _____

Date

Maintenance Complete: _____

Signature *Date*

BMP Inspection Checklist

In-Stream Structures:

- ☐ Photographs.
- ☐ Is there any excessive erosion of the banks or bed – enough to require immediate repair or follow-up inspection?
- ☐ Is there excessive sedimentation? Mid-channel or transverse bars?
- ☐ Is there head cutting?
- ☐ Do the stones appear to be in the correct position?
- ☐ Is there excessive build-up of logs or other debris?
- ☐ Does the structure appear to be functioning as intended?

Vegetative Plantings:

- ☐ Photographs.
- ☐ Estimate the percent survival of planted specimens.
- ☐ Do the plants appear to be thriving?

Two-Stage Channel:

- ☐ Photographs.
- ☐ Is there any excessive erosion of the banks or bed – enough to require immediate repair or follow-up inspection?
- ☐ Is there excessive sedimentation? Mid-channel or transverse bars?
- ☐ Is there head cutting?
- ☐ Is the riprap stable?
- ☐ Is there any exposed geotextile fabric?
- ☐ Does the floodplain appear stable?
- ☐ Is there evidence of recent inundation of the floodplain?
- ☐ Do the channel and floodplain appear to be functioning as intended?
- ☐ Are there any debris jams in the channel or floodplain?

WADETRIM

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Bay City, MI 48706
989.686.3100
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