INSPECTION PLAN
OPERATION AND MAINTENANCE PLAN
POST CONSTRUCTION MONITORING PLAN
AND
DESIGN REPORT

FOR THE

LAKE MANITOU ASSOCIATION, INC.
ROCHESTER, INDIANA

LAKE MANITOU, GRAHAM DITCH WETLAND PROJECT

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Property of
Lake and River Enhancement Section
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SECTION I

INSPECTION PLAN

A. Overall Description of Project

1. Project Location

The Lake Manitou, Graham Ditch Wetland Project is located approximately 2 miles east of the City of Rochester on the east side of Lake Manitou in Fulton County, Indiana. The project is specifically located on the Graham Ditch south of State Road 14, west of County Road 500 E. and north of County Road 50 S. The project and affected portion of Graham Ditch is approximately 3700 feet in length upstream from Structure #1 to 500 feet east. This structure is located approximately 1000 feet east (upstream) from County Road 400 East.

2. Project Description

The project involves constructing two earth embankments and sheet piling water control structures with rip-rap and gabion spillways in the Graham Ditch channel. The purpose of the structures is to re-establish normal pool and flood detention areas within an existing channelized wetland. The structures will provide approximately 4 acres of normal pool area and 32 acres of flood detention pool area. Earth embankment baffles will also be constructed across the ditch channel upstream of the structures to divert flood waters into the wetland flood detention area. Sediment basins will be constructed to assist with normal flow sediment removal in the existing ditch channel. The traps will also collect larger sediment during peak flows and help maintain the integrity of the wetland. All embankments and areas disturbed during construction will be seeded or planted with species suitable to the wetland area.

3. Inspector's Responsibility

The responsibility of the Inspector is to ensure the Contractor complies with the requirements of the project plans and specifications (Contract Documents). Specifically, that the materials furnished and the work installed meet the intent of the project plans and specifications.

B. Items of Work to be Inspected

The primary items of work to be inspected include the following:

1. Structures #1 & #2 - Sheet Piling, Draw-Down Structures, Geotextile Fabric, Gabions and Rip Rap

- Horizontal and vertical staking of sheet piling and draw-down structures.

- Installation of piling and draw-down structures to ensure correct alignment and elevations.

- Construction of draw-down structure to ensure water control structures do not leak.

- Confirm proper location and elevation of geotextile fabric, gabions and rip rap.

- Check on site bench marks.

2. Earth Embankment Construction

- Ensure horizontal and vertical staking of Structure #1 and #2 embankments and baffles.

- Ensure Contractor provides the specified compaction testing as the berms are being constructed.

- Verify that the Contractor is following proper erosion control procedures during construction of the berms.

- Confirm that the berms are properly seeded after construction.

- Verify the Contractor is conducting soil density testing in accordance with the requirements listed in the Project Manual.

3. Erosion Control

- Ensure that erosion control practices are installed and utilized as set forth in the Indiana Handbook for Erosion Control in Developing Areas.

- Ensure that all areas disturbed by construction activities have been restored and planted in accordance with either Specification Sections 14 or 15.

4. Other Items

- If damaged, all road surfaces used for equipment and machinery access are restored to original condition.

- Prior to final completion, the Contractor has adequately cleaned up the construction site.

With the exception of the installation of the steel piling, the inspection of the above items may be intermittent. Inspection of the installation of the sheet piling should be continuous to verify the piling is installed to the correct alignment and elevations.

C. Project Layout and Staking

The Contractor shall provide primary location staking for all structures, baffles and sediment basins. The Contractor shall be responsible for establishing on site bench marks and setting grade for structures, baffles and sediment basins.

The project was designed using an aerial topographic map as a base map. Preliminary horizontal control for construction was not established in the field. Existing property lines and topographic features must be used as reference for primary location staking. It is essential that a representative of the Engineer and Wetland Consultant be present during primary location staking.

The following locations are offered for general horizontal layout locations:

- **Structure #1** - Locate east of Hazel Winterrowd west property line.
- **Baffle #6** - Locate on channel approximately 500 ft. upstream from Structure #1.
- **Baffle #5** - Locate on channel approximately 550 ft. upstream from Baffle #6.
- **Baffle #4** - Locate on channel approximately 500 ft upstream from Baffle #5.
- **Sediment Basin #2** - Locate north of Baffle #4 between the north end of the baffle and the north bank of the wetland area.
- **Structure #2** - Locate between the points of high ground as indicated on the topography map.
- **Baffle #3** - Locate on channel approximately 450 ft. upstream of Structure #2.
- **Baffle #2** - Locate on channel approximately 400 ft. upstream from Baffle #3.
- **Baffle #1** - Locate on channel approximately 350 ft. upstream from Baffle #2.

- **Sediment Basin #1** - Locate in channel approximately 900 ft. upstream from Baffle #1.

D. Maintenance and Development of Record Drawing

It is the responsibility of the Contractor to develop and maintain Record ("As-Built") Drawings for the project. However, the Inspector should maintain his own set in clear readable order on the project site for the inspection by any interested party.

The Contractor shall keep one (1) copy of all project specifications, plans, addenda, modifications, supplemental drawings, shop drawings, and change orders at the project site in good order and annotated to show all changes made during the construction process.

The record drawings shall show all final elevations and dimensions, sizes and depths for buried sheets, members, structures, and all other information as necessary to constitute as-built records. These documents shall be kept daily by the Contractor and be made available to the Inspector and routinely checked by the Inspector for completeness and accuracy based on the Inspector's daily records and notes. It will be the Contractor's responsibility to furnish any and all information lost due to the Inspector's loss of these record drawings and vis-a-vis. In addition to other Contract requirements, retainage will be partially based on the Contractor's and Inspector's ability to maintain good as-built records, as determined by the Owner. Upon completion of the project these record "as-built" drawings together with any other annotated supplemental plans, drawings, sketches, etc. shall be delivered to the Owner for his final review and approval. If approved, the documents will be delivered to the Engineer for the Owner's record. If disapproved, they will be returned to the Contractor for corrections, as necessary.

E. List of Inspector's Equipment

All persons providing construction inspection services shall have available the following minimum list of equipment:

- Fiberglass or steel measuring tape (100').
- Notebook and/or daily inspection forms for recording Contractor's activities and progress. See **Appendix A.**
- Hand-held calculator.
- A two foot (minimum) level.
- Two (2) sets of Plans and Specifications - one set designated for recording as-built information.
- Access to a surveying level, tripod, and measurement rod in good working condition. Typically this can be supplied by the Contractor.

F. Recommended Qualifications of Inspectors

The inspector shall have the following minimum qualifications:

- Previous experience in inspecting civil engineering projects, in particular, the construction of soil embankments, sheet piling installation and general carpentry.
- Experience in the establishment of vertical and horizontal control or access to a qualified surveyor.
- Experience in the inspection and/or installation of erosion control materials.
- Above all, the Inspector must be completely familiar with the requirements of the Contract Documents.

SECTION II

OPERATION AND MAINTENANCE PLAN

A. Description of Operational Procedures and Maintenance Activities

The following are recommended methods and strategies for operating and maintaining the hydraulic control structures and sediment control basins designed for the lake enhancement project. The hydraulic control structures establish the water level of the constructed wetlands. The sediment control basins have been designed to require minimum operator attention and minimize long term maintenance.

1. Operational Procedures

The intent of the design of structures no. 1 and no. 2 is to reestablish normal pool water levels and to detain high storm water runoff flows in the wetland. Detention in the wetland reduces flow velocity through the original channel and allows for a reduction of suspended solids transported by storm runoff. Detention in the wetland also increases contact time between storm water and wetland vegetation, which contributes to a reduction of nutrients transported by high flows.

2. Maintenance Activities

The primary maintenance activities to be performed are as follows:

a) Inspect earth embankments for settlement, erosion damage, and animal damage.

b) Inspect drawdown structures for damage, leakage, or vandalism.

c) Inspect weirs for damage or obstructions such as tree limbs. Remove all obstructions from weirs and spillways.

d) Inspect riprap spillways for excessive stone displacement or erosion.

e) Periodically remove sediment from basins.

B. Projected Maintenance Schedule

1. Inspection of Rip-rap and Erosion Control Measures

All exposed rip-rap should be inspected for stability on an annual basis. Any riprap that is misplaced or that has been moved should be replaced (if possible with heavier stones). Where erosion has occurred, protective measures should be installed to minimize further erosion.

2. Periodic Removal of Sediment from Basins

a) Timing of Periodic Maintenance

The USDA Soil Conservation Service (SCS) recommends that a sedimentation basin have the trapped sediment removed when the basin has lost **50%** of its design volume.

The estimated frequency of periodic maintenance is based on statistical modeling calculations of when the sediment control basins will lose half of their designed volume from trapped sediments. These models were developed by the SCS based on empirical data from experimental sedimentation basins.

Various assumptions on variable conditions in the Lake Manitou watershed had to be made to estimate the sediment removal frequency. The sediment removal frequency and the assumptions used in the sedimentation rate calculations are provided in the following **Tables No. II-1 and No. II-2**.

Sedimentation Basin No. 1 is projected to be 50 percent filled with sediment in fifty one (51) years and Sedimentation Basin No. 2 is projected to be 50 percent filled in one (1) year. This allows the Lake Association to concentrate on plans for dredging Sedimentation Basin No. 2.

All estimated values represent existing conditions. The frequency can be reduced by the implementation of upstream watershed improvements. However, the use of existing conditions as a conservative "worst expected case" condition allows the Owner to plan manpower and budget conservatively. The actual time it takes for the basins to become 50% percent full of sediment may vary. However, for project planning and budgeting purposes it is recommended that the Lake Manitou Association use the Engineer's projected periodic maintenance estimate.

b) Sediment Removal Methods

There are three main methods of sediment removal: hydraulic dredging, drag-line dredging, and land based excavating with earth moving equipment. Any of which will remove the sediment. Due to the relatively small size of the basins, the use of land based equipment would be the most probable method. The Engineer suggests that the Owner solicit bids from qualified contractors to perform the sediment removal and let the bidding process dictate which is the most efficient method to use. The contractor should submit a Plan of Operation, detailing the specifics of their proposed operation, with their bid to perform the sediment removal and disposal.

TABLE NO. II-1
SEDIMENT REMOVAL FREQUENCY
SEDIMENTATION BASIN NO. 1
(GRAHAM DITCH)

Parameter	Value	Source
Crop Land Soil Loss	5 tons/acre/year	Fulton Co. SWCD
Acres Cropped Land	182 Acres	Fulton Co. SWCD
Sediment Yield Coefficient	0.2	SCS Area Office
Sediment Yield to Basin	182 tons/year	JFN Calculation
Sediment Density	100 lbs/ft3	NEH-3
Annual Sediment Load	0.1 acre feet/year	Fulton Co. SWCD
Volume of Basin	4.3 acre feet	TR-20
No. of Years to Fill Basin 50%	**51 Years**	**JFN Calculation**

TABLE NO. II-2
SEDIMENT REMOVAL FREQUENCY
SEDIMENTATION BASIN NO. 2

Parameter	Value	Source
Crop Land Soil Loss	5 tons/acre/year	Fulton Co. SWCD
Acres Cropped Land	4518 Acres	Fulton Co. SWCD
Sediment Yield Coefficient	0.2	SCS Area Office
Sediment Yield to Basin	4518 tons/year	JFN Calculation
Sediment Density	100 lbs/ft3	NEH-3
Annual Sediment Load	2.1 acre feet/year	Fulton Co. SWCD
Volume of Basin	2.8 acre feet	TR-20
Annual Sediment Accumulation	4518 tons/year	JFN Calculation
No. of Years to Fill Basin 50%	**1 Year**	**JFN Calculation**

C. Disposal of Dredged Spoil

1. Permitting for Dredging and Disposal of Spoil

Dredging operations will require a permit from the U.S. Army Corps of Engineers, since Lake Manitou is considered to be waters of the United States' under the Clean Water Act. This permit is required even when dredge spoil is disposed of on an upland site.

A permit should not be required from the Indiana Department of Environmental Management (IDEM) for land disposal of dredge spoil. Most lake sediments in rural areas have relatively low concentrations of substances regulated as hazardous waste. Therefore, the material can be disposed of in almost any upland site without acquiring an IDEM permit.

However, if hydraulic dredging is used, the method of disposal for dredged sediments involves the construction of a temporarily diked basin, on an upland site, to which the slurry is pumped. The temporary basin has a sluice gate with a pipe to dewater the basin after the sediments have settled out of the water column. The dewatering outlet can either be a pipe delivering water back to a ditch or the lake, or, the water can be discharged on the ground surface and allowed to drain back into a ditch or the lake via overland flow. Overland return flow has two advantages over piped return flow:

a) Overland return flow allowed to drain over vegetated land is further filtered of sediments prior to its discharge back into the Lake.

b) The discharge of return flows from a point source (pipe outfall) may require a temporary NPDES permit to discharge from the IDEM. There could be strict suspended solids limits in such a permit that would require more expensive treatment of the return water. This could involve either: applying a flocculent to the basin to precipitate (coagulate and settle) sediments from the basin water column; or, sizing the basin and timing the operation of the dredge such that the water is allowed longer residence time in the basin for increased sediment fallout. Increased basin sizing could make a temporary basin difficult to site and require a much longer pumping distance. However, if pipe flow is necessary, it will require a NPDES permit.

2. Disposal of Dredge Spoils

The availability and identification of disposal sites may ultimately dictate the method of dredging that will be required. If hydraulic dredging is to be performed a dewatering/disposal site must be designed with the appropriate size, containment and outlet structures. Preferably sediments should be disposed outside the watershed, or at least in an application protected from erosion and transport back into the lake. Sediment testing may be required if dredged material is used as

topsoil or other types of soil amendments.

Careful consideration must be given to disposal of excavated materials to minimize costs. An upland site is preferred. Disposal of hydraulically dredged material requires a dewatering and disposal site such as construction of a temporary basin(s), a dry pond or a water and sediment control basin. Disposal sites should be rotated, if possible, to minimize the wear and tear on roads if hauled by truck, or to allow adequate retention time if pumped.

Potentially, the deterred material removed from the lake will be in high demand locally as topsoil or a soil amendment by persons capable of self hauling.

The disposal of dredged material can account for half of the total cost of sediment removal operations. One option would be to leave the dredge spoil piled at an accessible site available to self-haulers for a giveaway program. The other option would be to have the contract documents require that the contractor is responsible for removal and disposal of all spoil.

D. Estimated O & M Costs per Year

Comparing costs are very difficult because of the highly variable disposal conditions that may be available. For example the cost of locating and constructing a dewatering facility for hydraulically dredged sediments plus any cost in removing the material after dewatering (if a give away program is not implemented) may be more or less expensive than loading, transporting, and disposing of sediments dredged via earth moving equipment or drag-lining. These costs are highly variable from Contractor to Contractor.

It is recommended that the owner advertise for bids from qualified, responsible contractors without specifying the precise type of equipment to be used. The bid documents may specify that the contractor is responsible for obtaining disposal sites and arranging the timing and operation of the sediment removal.

It is recommended that the Lake Manitou Association retain an engineer/consultant to assist in the disposal site selection, obtain permits, and to develop the contract documents and specifications for the sediment removal operation.

The following **Tables No. II-3 and II-4** present preliminary cost estimates for removing and disposing of sediment from each of the basins. The estimates are based upon using land based earth moving equipment and a two (2) mile round trip to the disposal site.

The estimated cost for Sedimentation Basin No. 1 is $24,475. If the basin is dredged every fifty one (51) years, the cost per year would be $445, in 1996 dollars. The estimated cost for Sedimentation Basin No. 2 is $14,185. If the basin is dredged every year, the annual cost would be $14,185, in 1996 dollars.

TABLE NO. II-3
SEDIMENT REMOVAL AND DISPOSAL COST ESTIMATE
SEDIMENTATION BASIN NO. 1
(GRAHAM DITCH)

Activity	No. of Units	Cost/Unit	Total
Equipment Mobilization	1 LS	$4,000 LS	$ 4,000
Sediment Removal	1,950 CY	$6.00/CY	$11,700
Transportation and Disposal	1,950 CY	$4.50/CY	$ 8,775
Total			$24,475

TABLE NO. II-4
SEDIMENT REMOVAL AND DISPOSAL COST ESTIMATE
SEDIMENTATION BASIN NO. 2

Activity	No. of Units	Cost/Unit	Total
Equipment Mobilization	1 LS	$5,000 LS	$ 5,000
Sediment Removal	970 CY	$6.00/CY	$ 5,820
Transportation and Disposal	970 CY	$4.50/CY	$ 4,365
Total			$ 14,185

SECTION III

POST CONSTRUCTION MONITORING PLAN

A. General

The post construction monitoring program for the Graham Ditch Wetland Project involves monitoring the effectiveness of the wetlands and sedimentation basins.

The post construction monitoring program should be integrated with the operation and maintenance activities discussed in **Section II.**

The following monitoring plan centers on monitoring the effectiveness of the wetlands and sediment basins in removing sediments and the nutrient phosphorus. Phosphorous is normally the limiting nutrient in aquatic systems. A secondary component of the monitoring plan is to inspect structures and monitor the succession of the wetland system.

A plan to monitor the success of lake enhancement projects must contain four key elements:

1) Qualified personnel to perform the monitoring;

2) Clearly defined monitoring objectives with a specific set of monitoring parameters;

3) A monitoring schedule;

4) A reporting format.

B. Qualified Personnel

Personnel monitoring the success of the wetlands and sedimentation basins after construction is complete should have the following qualifications:

- General knowledge of wetlands and wetland ecological functions.

- Familiarity with the design objectives to be achieved by the constructed wetlands and sedimentation basins.

- Familiarity with identification of wetland plant species, herbaceous vegetation, shrubs and trees.

- General familiarity with the watershed and soil types.

Persons qualified to perform part or all of the monitoring may include:

- Professional environmental scientists such as the staff of J. F. New and Associates, Inc.

- Fulton County Soil and Water Conservation District (SWCD) staff.

C. Monitoring Objectives And Recommended Inspection Parameters

The purpose of this monitoring program is to verify that the constructed wetlands and sedimentation basins are performing the water quality improvement functions they were designed to provide.

1. Visual Inspection

The visual inspection component of the monitoring program will involve three major components:

a. Inspection of the structural integrity of the sedimentation basins and hydraulic control structures (See Section II).

b. Inspection and assessment of the vegetative community in the wetlands.

c. Determination of the silt depth in both the sedimentation basins and wetlands.

For both the sedimentation basins and the hydraulic control structures a visual inspection of the **structural integrity** will be necessary. The project area will need to be inspected for the following:

- Human activity and vandalism, such as riding horses and off-road vehicles on embankments, destruction of outlet structures, etc.
- Animal activity, such as groundhog, beaver or muskrat burrowing.
- Erosion.
- Tampering with the stop logs on the hydraulic control structures.

Prompt reporting to Fulton County Sheriff or conservation law enforcement personnel of any illegal activity impairing the performance or integrity of the project area.

The wetlands will need to be inspected to **assess the vegetative community** which is an important indicator of their health and therefore their efficiency in removing nutrients. At least one on-site consultation will be held between a wetland scientist and the landscape contractor prior to the

implementation of the planting plan. Monitoring of the wetland will commence after one complete growing season has passed and continue for three years. Site visits will be made primarily between July 15 and September 15. The monitoring plan will observe the following guidelines:

a. A total of four permanently marked quadrats will be established in the treatment area. Two quadrats will be established in each wetland: one above the ordinary water line and one in approximately 2 feet of water. Percent cover will be estimated for all species encountered. Water depth will also be noted for each quadrat. Photographs will be taken of each quadrat.

b. Two permanent photographic stations will be set up at key vantage points to provide a panoramic visual documentation of wetland development around each wetland.

c. Wildlife use will be noted through informal surveys.

d. A general survey of the wetland will be made in order to note the presence of planted and volunteer species which were not present in the sample quadrats.

Finally, both the sedimentation basins and the constructed wetlands should be monitored to **determine the amount of silt build up**. The depth of silt in each structure should be recorded to assess the rate of silt accumulation. Silt can be measured by establishing a depth gage (aluminum or steel measuring devise on a wooden post permanently placed) with 0 being the bottom elevation of the basin. During each inspection, the recorded level should be at the top of the sediment.

2. Chemical Testing:

The following tests should be conducted to determine the performance of the constructed wetlands and sedimentation basins.

- Total Phosphorus (TP)
- Total Suspended Solids (TSS)

Many other parameters may be routinely measured in monitoring programs where ample funding and expertise are available. Most of these parameters are measured for reasons more academic than utilitarian. The 1988 EPA Lake and Reservoir Restoration Guidance Manual has a section on post monitoring of lake restoration projects. It is suitable for monitoring overall lake water quality improvement resulting from implementation of restoration practices. The Guidance Manual contains a table listing a sampling protocol for overall lake monitoring. If information on additional parameters are deemed necessary, J. F. New and

Associates, Inc. staff are available to work with the Lake Association to redefine monitoring objectives and professionally perform or supervise the monitoring activities.

D. Monitoring Schedule and Sampling Locations

The monitoring should be performed on a seasonal basis, with consideration given to interpreting the results of the chemical parameters. In different seasons, natural surface waters are expected to exhibit different chemical characteristics. This should be kept in mind when results are being analyzed. Therefore, results should not be compared between different seasons.

Visual inspection of the structural integrity of the project site should occur on a routine basis and as often as possible.

Chemical samples should be taken ahead of the sedimentation basins and from the effluent of the constructed wetland. The sample should be taken from water representative of the average influent and either the average effluent or the well mixed water in the downstream portion of the constructed wetland.

Following is the recommended annual monitoring schedule and the parameters to monitor:

TABLE III-1
MONITORING SCHEDULE

Monitoring Parameter	Spring (April)	Summer (July)	Fall/Winter (Nov.-Feb.)
Vegetation Mapping		x	
Structural Inspection	x	x	x
Total Phosphorus	x	x	x
Total Suspended Solids	x	x	x

The monitoring program should be implemented as soon as the wetlands are filled to capacity and fully operational.

While the wetlands are expected to begin performing their intended purpose immediately, in-lake recycling of nutrients from main lake sediments will keep the phosphorus levels in the main lake water column high for several more years.

E. Sample Collection/Analysis

Within 24 hours of the end of approximately a one and one half (1 1/2) inch rain event, when sediment is being transported from the watershed to the sedimentation basins.

A laboratory, such as Environmental Monitor Services in Indianapolis (phone (317) 253-2439) or Envirocorp in South Bend (phone (219) 287-2282), can be contracted to perform the analytical chemistry services. The laboratory chosen for the analytical chemistry will typically supply sample containers for the collection and storage of water samples.

Water can be analyzed for TP and TSS at relatively reasonable rates. For example, TP samples analyzed to detection limits of one tenth of a part per billion (0.1 ug/1) are usually performed for $28 per sample. TSS, measured in parts per million, can be analyzed at $14 per sample. Therefore, the annual cost for laboratory testing would be approximately $300, including sample shipping costs.

Water quality entering the first sedimentation basin should be compared to the water quality leaving the last hydraulic control structure.

F. Reporting Format

The reporting of field measurements and observations should be done on standard forms made up by the person designated responsible for the monitoring and reporting of results. Care should be taken so that data from monitoring the constructed wetlands effectiveness can be used in a comparison to overall lake water quality post-monitoring results. An annual report based on the results of each year's inspection will be filed with the Corps of Engineers each monitoring year. The report will include:

1. Tables listing percent frequency and estimated percent aerial cover for all species encountered in each quadrat.

2. Photographs from each photographic station. A discussion of the developing community structure and diversity of the restored wetland.

3. A description of the hydrology within each planting zone and a determination if that hydrology level is consistent with the mitigation plan.

4. A discussion of observed wildlife usage.

5. A description of remedial plantings (if any) and reasons for unacceptable mortality.

6. Comparison of previous year(s) data with current year to document trends toward a more mature and diverse wetland system.

7. Recommendations for any repairs, enhancements, or additions to the structures or plantings will be included.

All field data sheets should be copied and stored in a three ring binder for annual compilation and analysis. Results of each monitoring should be tabulated so that comparisons between monitoring inspections are presented in only a few tables.

Results from the testing labs also need to be tabulated and included as part of the reporting format.

SECTION IV

DESIGN REPORT

A. Location

The Lake Manitou, Graham Ditch Wetland Project is located approximately 2 miles east of the City of Rochester on the east side of Lake Manitou. The project lies in the N 1/2 of Section 14, Township 30 North, Range 3 East, Rochester Township, Fulton County, Indiana. The Graham Ditch flows into Lake Manitou approximately 1/4 mile downstream (west) from the project area and the project area extends 3700 ft. upstream (east) of the Structure #1 water control structure to County Road 500 East. Structure #1 is located approximately 1000 feet upstream (east) of County Road 400 East.

The drainage area for the discharge point is approximately 7 square miles. The land use in the contributing watershed is primarily agricultural.

B. Project Objective

The Lake Manitou Association, Inc. has proposed an enhancement system to improve the quality of water entering Lake Manitou. The treatment system consisting of two sediment basins and two detention areas is necessary to reduce the amount of sediment and nutrient loading occurring in the lake. The lake enhancement system will be constructed in the Graham Ditch channel and its adjacent floodway.

The concept behind detaining water in a wetland detention area or sedimentation basin is to reduce the suspension and transportation energy of moving waters. Water in motion has the capacity to scour and transport fine sediments (silts and clays) long distances before deposition. While a basin that has an inflow and an outflow cannot hold water motionless, the energy can be reduced sufficiently to facilitate the fallout of sediment from the water column.

Additionally, the wetland detention area will remove nutrients from the runoff through uptake by the wetland plant species and the bacteria they support.

The following concepts were considered are for optimal sedimentation basin and/or wetland detention area.

- Significantly reduce the horizontal velocity of the water column.

- Reduce velocities of the inflow water velocity as it enters the basins to encourage sheet flow, rather than turbulent, channelized flow.

- Encourage the uniform distribution of flow throughout the entire volume of the wetland detention area.

- Maximize contact of water with the substrate and vegetation in the wetland systems to facilitate efficient nutrient uptake.

- Store as much water as possible, for as long as possible, from the largest feasible storm event.

- Structural stability and longevity. Resistance to hydraulic stress and erosive scour.

- Reduction of operation and maintenance costs.

- Maximize safety of the system operation, maintenance and monitoring personnel and the general public.

- Optimize the sites for wildlife habitat suitability, if within construction budget.

- Minimize construction costs.

C. General Project Description

The project involves constructing two earth embankments and sheet piling water control structures with rip rap and gabion spillways in the Graham Ditch channel. The purpose of the structures is to re-establish normal pool areas and flood detention areas within an existing channelized wetland area. The structures will provide approximately 4 acres of normal pool area and 32 acres of flood detention pool area. Earth embankment baffles will also be constructed across the ditch channel upstream of the structures to divert flood waters into the wetland flood detention area. Sediment basins will be constructed to assist with normal flow sediment removal in the existing ditch channel. The traps will also collect larger sediment during peak flows and help maintain the integrity of the wetland. All embankments and areas disturbed during construction will be seeded or planted with species suitable to the wetland area.

D. Hydrology and Hydraulics

1. Hydraulic Model - Assumptions and Criteria

The Indiana Department of Natural Resources, Division of Water completed determination of the separate water discharges and the hydrographs of different storms, of the Graham Ditch in Section 14, Township 30 N., Range 4E., at a point 200 feet east of the west section line in Fulton County in July 1988. The drainage area is 6.96 square miles. The peak discharges are as follows:

Storm (year)	Discharge (cfs)	Time to Peak (hrs)
100	400	14.70
50	300	15.00
10	150	15.50
5	100	15.80
2	50	16.50

The objective is to construct a wetland at the Graham Ditch Site which is designed to reduce water flow velocities in the ditch and increase detention and contact time within the wetland system. The objectives of the design are to reduce nutrient laden suspended solids through the use of sediment basins and detention within the wetland. The wetland should also biologically remove dissolved nutrients, contaminants, and COD from the flow in the Graham Ditch.

The proposed conditions model was developed assuming final construction of the lake enhancement project. The model represents water control structures that were only present in the effective flow areas of the flood waters.

2. Study Results

The pond routing analysis was performed using Haestad Methods Pond-2 (Detention Pond Design & Analysis). The first dike and weir structure (Structure #1) that is proposed in the channel will create a normal water pool elevation of 782.0 and have a normal pool area of 3.50 acres. The routing analysis is as follows:

Storm (year)	Peak Outflow (cfs)	Time to Peak (hrs)	Pool Elevation (ft.)	Area (ac)
100	369.57	16.10	784.59	17.58
50	259.38	16.70	784.02	16.66
10	136.21	16.80	783.42	10.88
5	84.18	16.80	783.10	6.04

The second dike and weir structure (Structure #2) that is proposed in the channel will create a normal water pool elevation of 784.0 and have a normal pool area of 0.83 acres. The routing analysis is as follows:

Storm (year)	Peak Outflow (cfs)	Time to Peak (hrs)	Pool Elevation (ft.)	Area (ac)
100	378.71	15.30	787.01	14.17
50	261.87	15.70	786.50	12.01
10	139.08	16.20	785.84	8.27
5	86.33	16.10	785.48	4.92
2	32.56	16.90	784.96	1.75

3. Conclusions

The effects of the proposed lake enhancement conditions were analyzed and compared to the existing conditions of the Graham Ditch. Based on the results of the comparison the flow velocities will be reduced, which will reduce nutrient laden suspended solids within the wetland. The design is an economical, natural low maintenance method of treating the waters of the Graham Ditch prior to discharge into Lake Manitou.

E. Structural Stability analysis

1. Steel Sheet Piling

Given the simple nature of the designed sheet piling weirs there is no structural foundation supporting weight. The only structural considerations involved in the designs of the weirs are the depth to which the sheet piles are to be driven into the earth. The depth below the ground surface to drive the steel sheet pilings were based on the stability characteristics of the soil strata in the project sites. Because of the nature of the soils, the limiting factor to the stability of sheet piling was the minimum depth to which sheeting was to be driven rather than the strength of materials. The materials specified are typically used in much more severe applications.

2. Earth Embankments

The embankments have been designed with 3:1 side slopes as recommended in the SCS Technical Field Guide for earthen berms. The top width of the berms has been set at 8 to 10 feet to allow for easy construction equipment access. The earthen berms, except those located adjacent to the hydraulic control structures, will be stabilized with appropriate vegetation. The vegetation will anchor into the berm and hold the soil in place. At the outlet locations, the earthen berms will be stabilized with gabions and rip rap on the upstream and downstream sides of the structures. This will prevent scouring and undermining of the toe of slope from erosive discharge forces.

F. Environmental Concerns

1. Wetlands

Due to the nature of the proposed projects, it is necessary to construct portions of the projects in jurisdictional wetlands. However, the projects should prove to be beneficial to the wetland ecosystems since they are designed to enhance the area and volume of the existing wetlands. This will provide more of each functional value

currently provided by the existing wetlands. Applications for permits from the U.S. Army Corps of Engineer's for construction activity in the wetland areas will be made.

2. Threatened or Endangered Species

According to the Indiana Department of Natural Resources, no threatened or endangered species of plants or animals are known to exist in the proposed project locations.

3. Operation and Maintenance Activities

The future O&M dredging of the wetland basins may cause temporary damage to aquatic benthic (ditch or lake bottom) community. However, based on several studies done on other dredging projects the negative impacts are short lived with the benthic community recovering completely within a few seasons. The impacts may be mitigated by closing the slide gate and forcing the water leaving the sedimentation basins during the dredging process into the constructed wetlands. Sediment escaping the basin will be settled out in the wetlands.

Given the heavy sedimentation of the subject areas, the construction or operations and maintenance projects will not be disturbing a high quality benthic community or a sand/gravel substrate.

G. Land Rights

The type of property rights acquisitions for the construction or long term operation of the designed structures, whether as easements, lease arrangements or outright purchases, has not been determined by the Lake Manitou Association, Inc. This summary will need to be revised once final property acquisition has been completed.

H. Special Items/Materials Required

1. C-LOC Corrugated PVC Sheet Piling

The sheet piling specified in the plans is C-LOC C-L-4500 PVC Sheet Piling. The sheet piling is available from: C-LOC Retention Systems, Inc., P.O. Box 180283, Utica, Michigan 48318. Phone 317 731-9511. These sheet piling are commonly used as retaining walls along waterways in Michigan. These sheet piling panels can be handled by hand and driven with a jackhammer, thus eliminating the need for heavy equipment in sensitive wetland areas.

I. 0 & M Considerations That Have Affected Design

1. Stop Log Openings

The weirs have been designed with the stop log outlet structures in them to facilitate the complete draining of the basins for O&M purposes a well as for access for wildlife habitat enhancement projects in the future. Wood stop logs were specified in these openings rather than a synthetic material so, if the logs proved difficult to remove the operator has the option of using a chain saw to remove the planks.

The use of stop logs was preferred over a gate, since it may be as long as ten years between operating events. The likelihood of a gate becoming inoperable over this period of time in the given environment was very high. Stop logs are simple and long lived.

2. Steel Sheet Piling

This material was chosen over an earthen dam for several reasons. The optimal design for the structures were low head weirs rather than a dam with a single point discharge outlet structure. This allowed more even distribution of the residence time of water moving through the constructed wetland systems.

Based upon the soil borings, suitable materials for an earthen dam are not readily available on-site. Additionally, because of the instability of the soils, the dam would have to be armored with rip-rap for its entire length. This considerably increases the initial construction costs, and the cost of operating and maintaining the structures.

The purpose of Structures No. 1 and No. 2 is to establish normal pool water levels and detention of peak stormwater flows within the wetland area. Baffles are designed across the existing channel to distribute peak flows throughout the flooded wetland.

Structures No. 1 and No. 2 each consist of a low earth dam and a P.V.C. sheet piling weir. The earth dam is protected from erosion by gabions and riprap at the weir. The P.V.C. weir is designed with a timber stop log draw down structure. Baffles consist of earth embankments. Materials were chosen for economy and ease of construction.

3. Stop Log Openings

The weirs have been designed with the stop log outlet structures in them to facilitate the complete draining of the basins for O&M purposes as well as for access for wildlife habitat enhancement projects in the future. Wood stop logs were specified in these openings rather than a synthetic material so, if the logs proved

difficult to remove the operator has the option of using a chainsaw to remove the planks.

The use of stop logs was preferred over a gate, since it may be as long as ten years between operating events. The likelihood of a gate becoming inoperable over this period of time in the given environment was very high. Stop logs are simple and long lived.

J. Engineer's Estimated Costs For The Project Construction Phase

The following **Table No. IV - 1** and **Table No. IV - 2** provide cost estimates for both the construction portion and the engineering and inspection services to be provided during the project construction phase.

TABLE NO. IV-1
CONSTRUCTION PHASE I COST ESTIMATES

Item/Task	No. of Units	Cost/Unit	Total Costs
1. Structure #2	1 LS	$18,100	$18,100
2. Baffle #1	1 LS	$ 3,250	$ 3,250
3. Baffle #2	1 LS	$ 3,250	$ 3,250
4. Baffle #3	1 LS	$ 3,250	$ 3,250
5. Baffle #4	1 LS	$ 1,920	$ 1,920
6. Sediment Basin #1	1 LS	$13,600	$13,600
7. Sediment Basin #2	1 LS	$ 6,750	$ 6,750
8. Draw Down Structure	1 LS	$ 1,250	$ 1,250
9. Wetland Plants/Seeding	1 LS	$ 8,500	$ 8,500
SUBTOTAL			**$59,870**
10. Mobilization	1 LS	$ 5,987	$ 5,987
TOTAL CONSTRUCTION COSTS			**$65,857**
11. Construction Engineering			$ 5,000
12. Inspection			$ 8,000
13. Administration			$ 4,000
TOTAL CONSTRUCTION PHASE COSTS			**$82,857**

TABLE NO. IV-2
CONSTRUCTION PHASE II COST ESTIMATES

Item/Task	No. of Units	Cost/Unit	Total Costs
1. Structure #1	1 LS	$21,200	$21,200
2. Baffle #5	1 LS	$ 1,920	$ 1,920
3. Baffle #6	1 LS	$ 2,840	$ 2,840
4. Draw Down Structure	1 LS	$ 5,700	$ 5,700
9. Wetland Plants/Seeding	1 LS	$ 8,500	$ 8,500
SUBTOTAL			**$40,160**
10. Mobilization	1 L.S.	$ 4,016	$ 4,016
TOTAL CONSTRUCTION COSTS			**$44,176**
14. Construction Engineering			$ 5,000
15. Inspection			$ 8,000
16. Administration			$ 4,000
TOTAL CONSTRUCTION PHASE COSTS			**$61,176**

APPENDIX A

APPENDIX A

DAILY INSPECTION REPORT

J. F. New & Associates, Inc.

Environmental Engineers/Biologists/Planners/Consultants
Walkerton/Indianapolis, Indiana

PG.___ OF ___

REPORT NO. ___

PROJECT NAME: _____

PROJECT NO. _____ DAY: _____ DATE: _____
DAYS ALLOWED: ____ DAYS REMAINING: ____ TEMP; MAX: ___(F°), MIN: ____(F°)

WEATHER CONDITIONS: _____

CONTROLLING OPERATION: _____

WORK PERFORMED BY CONTRACTOR:

CONTRACTOR'S MANPOWER AT SITE:

CONTRACTOR'S EQUIPMENT AT SITE:

VISITORS TO SITE:

SIGNATURE: _____
Inspector

APPENDIX B

DEPARTMENT OF THE ARMY PERMIT

Permittee: Lake Manitou Association, Incorporated

Permit Number: 199500073

Issuing Office: U.S. Army Engineer District, Louisville

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: To improve the water quality in Lake Manitou in accordance with the attached plans.

Project Location: On Graham Ditch on the east side of Lake Manitou in Fulton County, Indiana

Permit Conditions:

General Conditions:

1. The time limit for completing the authorized activity ends on May 31, 1998. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification from this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished with the terms and conditions of your permit.

Special Conditions:

a. That straw bale barriers, silt fencing, and/or other approved methods of erosion control be implemented throughout construction.

b. That all construction equipment be refueled, repaired and any required routine service be done at an upland site away from Graham Ditch and any existing wetland areas.

c. That a wetland monitoring report be submitted once per year for a period of 3 years documenting the wetland vegetation, hydrology, rate of vegetative growth, and any measures to further enhance the wetland development. The reports must be submitted by November 30 of each year after construction completion.

d. That the construction of Structure Number 1 and Baffles 5 and 6 are prohibited.

Further Information:

1. Congressional Authorities. You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measure ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give you favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Robert N. Weaver
(PERMITTEE) President, Lake Manitou Assoc, Inc

May 22, 1995
(DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

RALPH GRIECO
COLONEL, CORPS OF ENGINEERS

(COMMANDER AND DISTRICT ENGINEER)

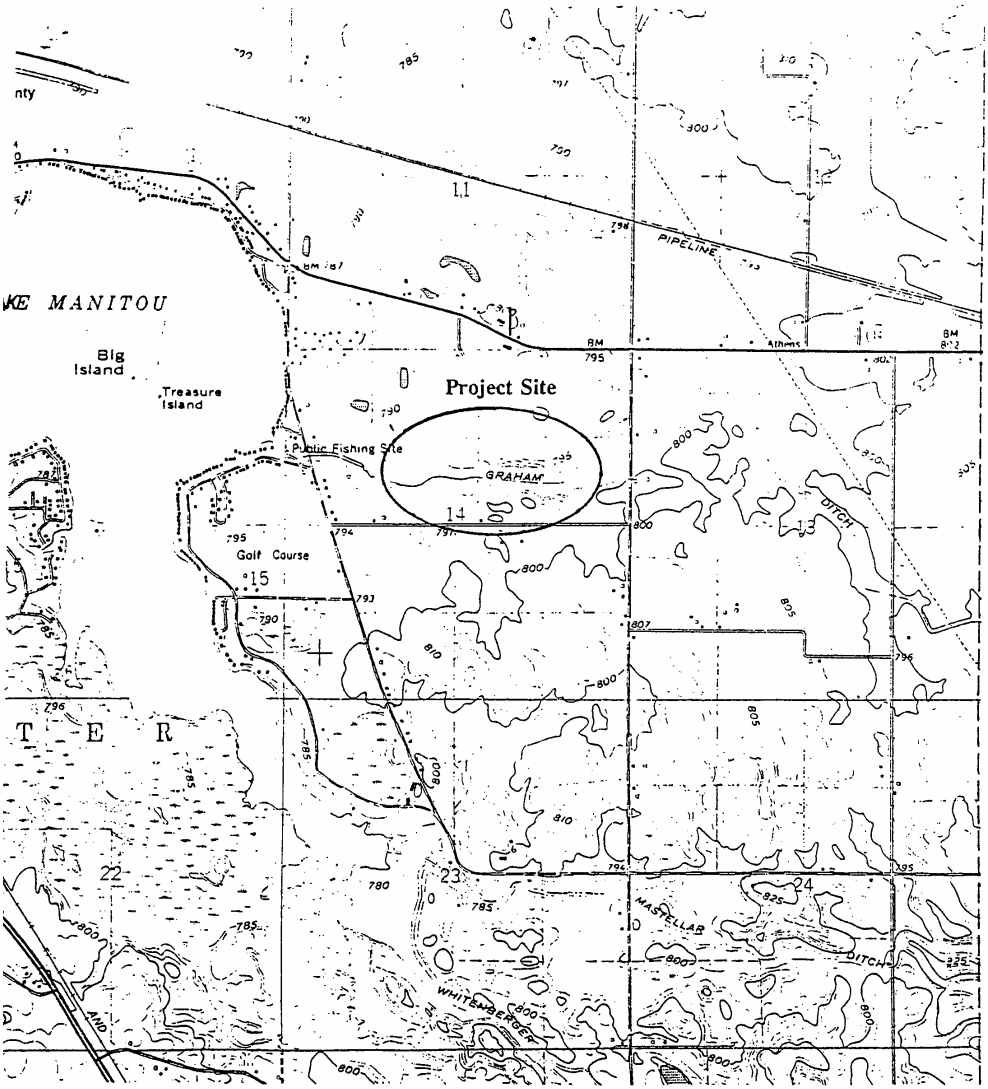
6-1-95
(DATE)

Lee Anne Devine
BY: Ms. Lee Anne Devine
Project Manager
Regulatory Branch

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE)

(DATE)



RPOSE: Individual Permit

TUM: MSL

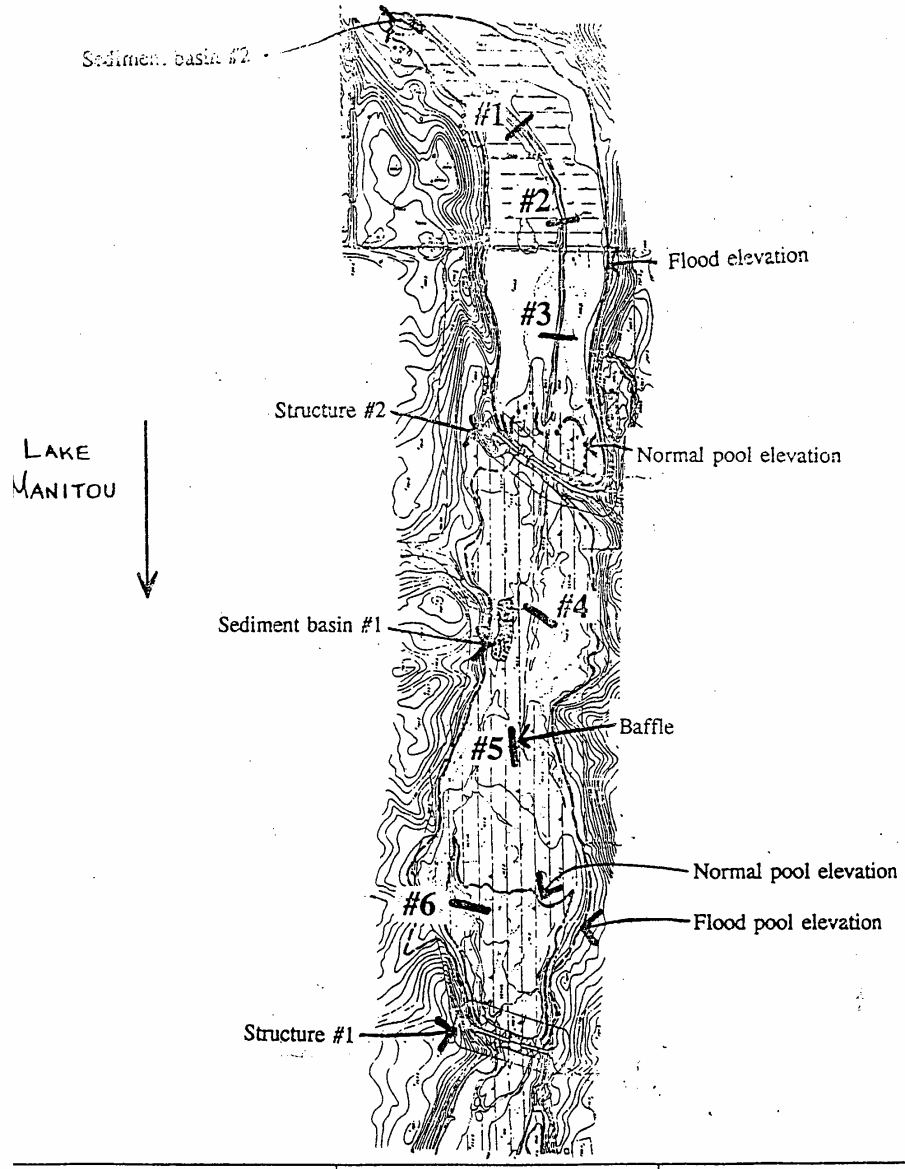
USGS Topographic Map

Scale: 1" = 2000'

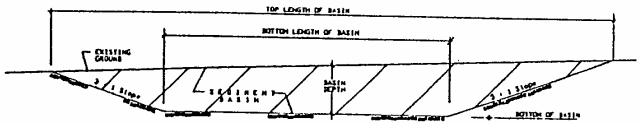
Lake Manitou Association Inc.
P.O. Box 376
Rochester, Indiana 46975

PROPOSED: Water Quality Enhancement Project

IN: Wetlands in Graham Ditch
AT: Graham Ditch
COUNTY: Fulton County
STATE: Indiana
APPLICATION BY: Lake Manitou Ass. Inc.
AGENT: J.F. New & Associates, Inc.
SHEET 1 OF 12 DATE: 1/10/95

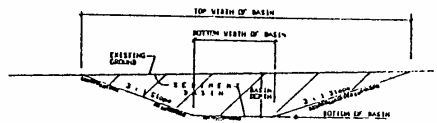


RPOSE: Individual Permit TUM: MSL North	Site Plan showing the location of baffles Not to Scale Lake Manitou Association Inc. P.O. Box 376 Rochester, Indiana 46975	PROPOSED: Water Quality Enhancement Project IN: Wetlands in Graham Ditch AT: Graham Ditch COUNTY: Fulton County STATE: Indiana APPLICATION BY: Lake Manitou Ass. Inc. AGENT: J.F. New & Associates, Inc. SHEET 2 OF 12 DATE: 1/10/95



TYPICAL LONGITUDINAL SECTION

Scale: NTS



TYPICAL CROSS SECTION

Scale: NTS

SEDIMENT BASIN DESIGN DATA TABLE

BASIN NO.	TOP WIDTH	TOP LENGTH	BASIN DEPTH	BOTTOM WIDTH	BOTTOM LENGTH	REMARKS
1	74'	224'	4'	50'	200'	3 : 1 slopes
2	62'	112'	7'	20'	70'	3 : 1 slopes

SEDIMENT BASIN SECTIONS

PURPOSE: INDIVIDUAL PERMIT

DATUM: MSL

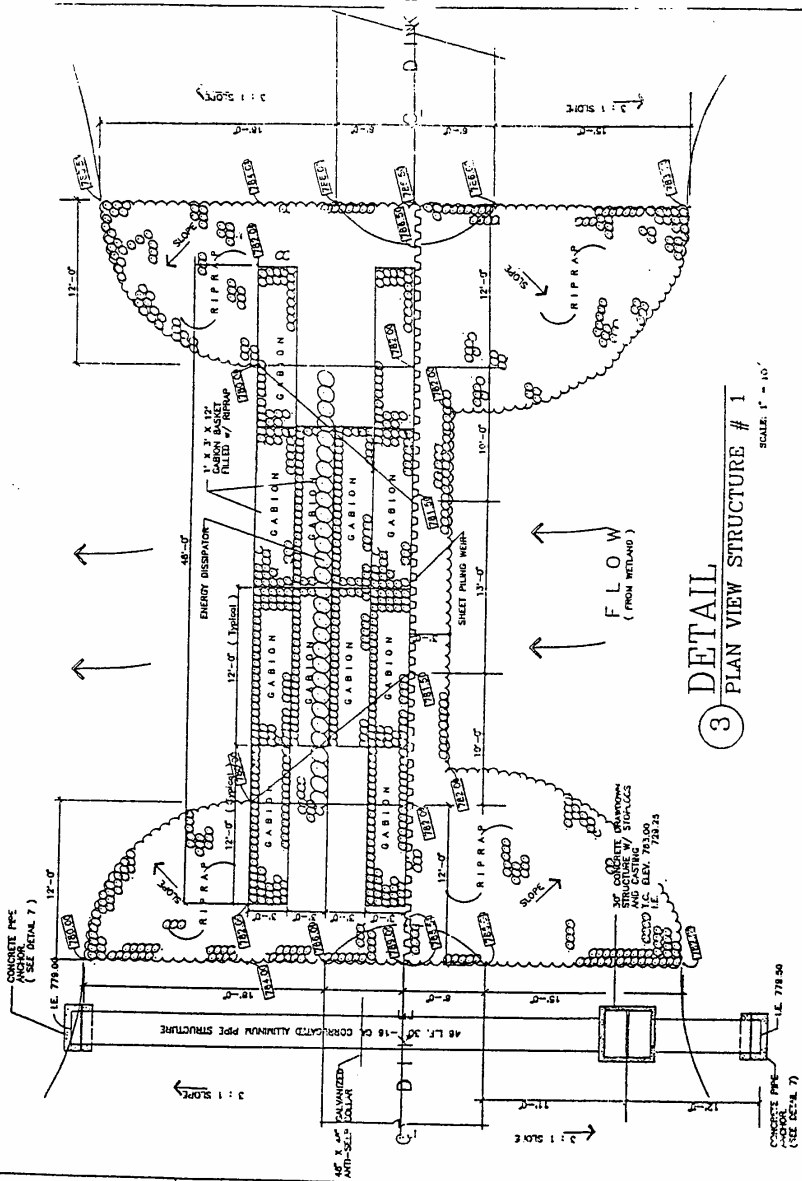
SEDIMENT BASIN SECTIONS

SCALE: NS

Lake Manitou Association, Inc.
P.O. Box 376
Rochester, Indiana 46975

PROPOSED: Lake Enhancement Project

IN: Wetlands
AT: GRAHAM DITCH
COUNTY: FULTON
STATE: Indiana
APPLICATION BY: LAKE MANITOU ASSOCIATION
AGENT: J.F. New & Associates, Inc.
SHEET 3 OF 12 DATE: 1/10/95



RPOSE: INDIVIDUAL PERMIT

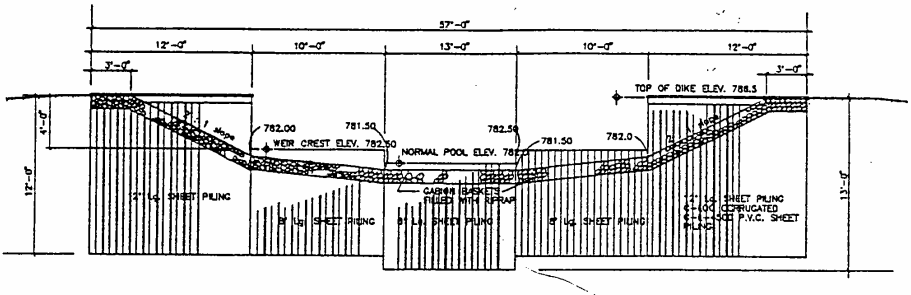
TUM: MSL

PLAN VIEW STRUCTURE #1
SCALE: 1" = 10'

Lake Manitou Association, Inc.
P.O. Box 376
Rochester, Indiana 46975

PROPOSED: Lake Enhancement Project

IN: Wetlands
AT: GRAHAM DITCH
COUNTY: FULTON
STATE: Indiana
APPLICATION BY: LAKE MANITOU ASSOCIATION
AGENT: J.F. New & Associates, Inc.
SHEET 4 OF 12 DATE: 1/10/95



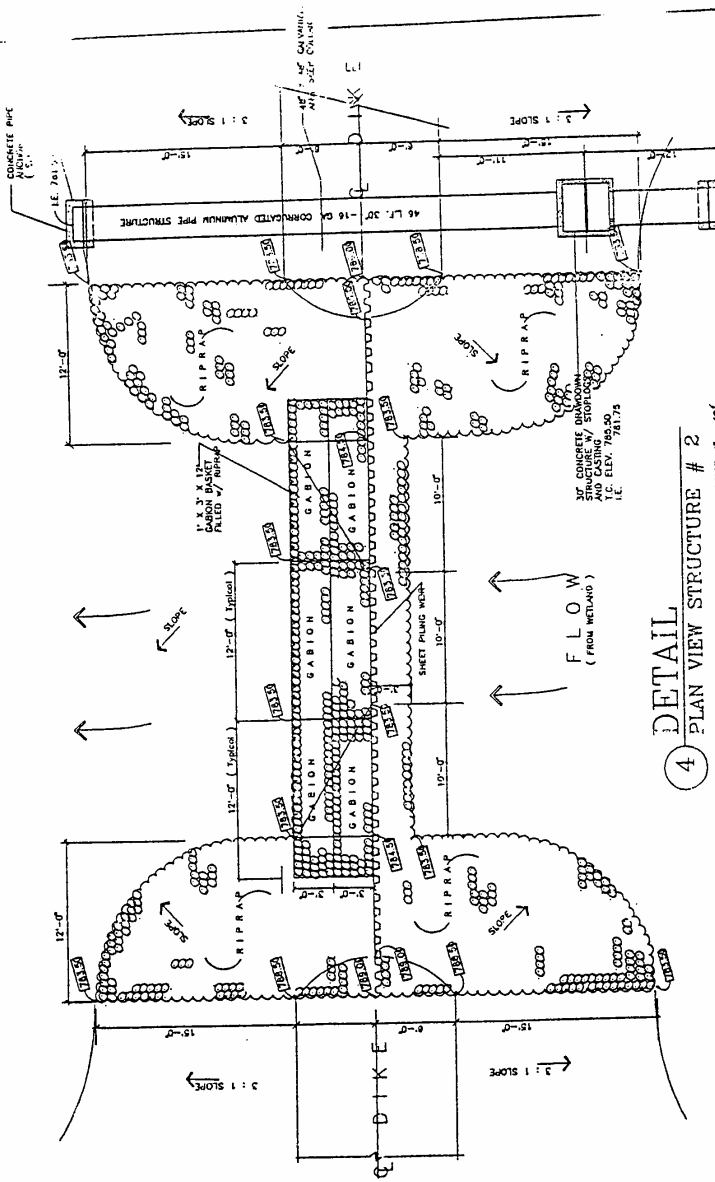
1 SECTION – STRUCTURE # 1

DOWNSTREAM ELEVATION OF SPILLWAY

Scale: 1" = 10'

780.5

RPOSE:INDIVIDUAL PERMIT TUM: MSL	SECTION STRUCTURE #1 DOWNSTREAM ELEVATION OF SPILLWAY SCALE: 1" = 10' Lake Manitou Association, Inc. P.O. Box 376 Rochester, Indiana 46975	PROPOSED: Lake Enhancement Project IN: Wetlands AT: GRAHAM DITCH COUNTY: FULTON STATE: Indiana APPLICATION BY:LAKE MANITOU ASSOCIATION AGENT: J.F. New & Associates, Inc. SHEET 5 OF 12 DATE: 1/10/95



PURPOSE: INDIVIDUAL PERMIT

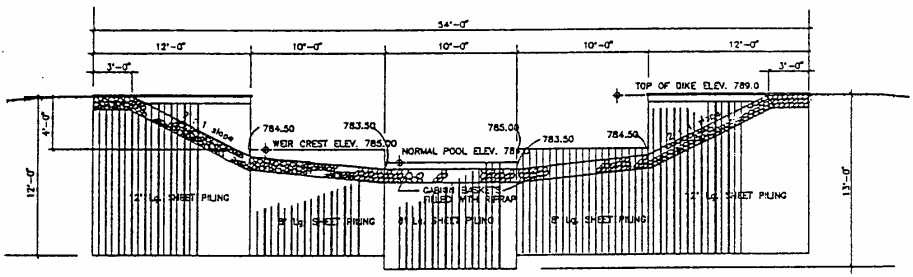
DATUM: MSL

PLAN VIEW STRUCTURE #2
SCALE: 1" = 10'

Lake Manitou Association, Inc.
P.O. Box 376
Rochester, Indiana 46975

PROPOSED: Lake Enhancement Project

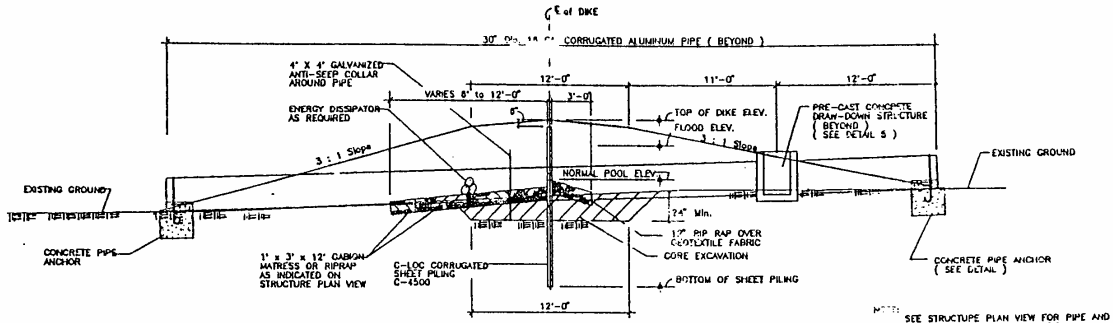
IN: Wetlands
AT: GRAHAM DITCH
COUNTY: FULTON
STATE: Indiana
APPLICATION BY: LAKE MANITOU ASSOCIATION
AGENT: J.F. New & Associates, Inc.
SHEET 6 OF 12 DATE: 1/10/95



(2) SECTION – STRUCTURE # 2

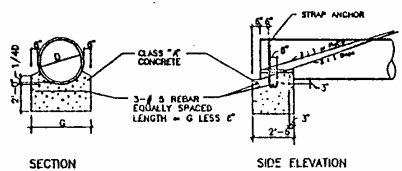
DOWNSTREAM ELEVATION OF SPILLWAY

PURPOSE: INDIVIDUAL PERMIT DATUM: MSL	SECTION STRUCTURE #2 DOWNSTREAM ELEVATION OF SPILLWAY SCALE: 1" = 10' Lake Manitou Association, Inc. P.O. Box 376 Rochester, Indiana 46975	PROPOSED: Lake Enhancement Project IN: Wetlands AT: GRAHAM DITCH COUNTY: FULTON STATE: Indiana APPLICATION BY: LAKE MANITOU ASSOCIATION AGENT: J.F. New & Associates, Inc. SHEET 7 OF 12 DATE: 1/20/95



⑥ SECTION
TYPICAL SECTION OF DIKE AND STRUCTURE

SCALE: 1" = 10'



⑦ DETAIL
CONCRETE PIPE ANCHOR

SCALE : N.T.S.

PURPOSE: INDIVIDUAL PERMIT

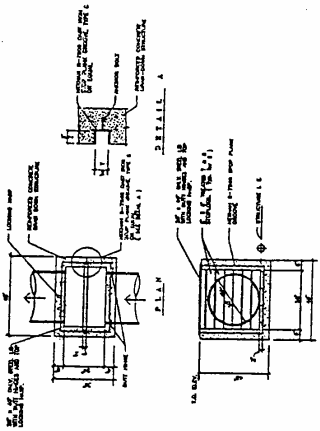
DATUM: MSL

TYPICAL SECTION OF DIKE AND STRUCTURE
DETAIL CONCRETE PIPE ANCHOR
SCALE: NS

Lake Manitou Association, Inc.
P.O. Box 376
Rochester, Indiana 46975

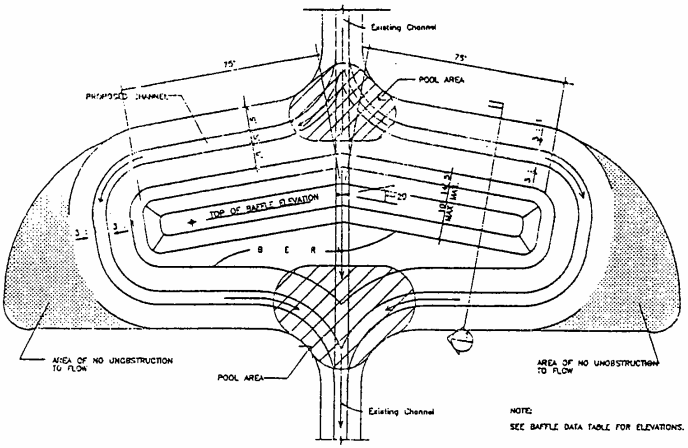
PROPOSED: Lake Enhancement Project

IN: Wetlands
AT: GRAHAM DITCH
COUNTY: FULTON
STATE: Indiana
APPLICATION BY: LAKE MANITOU ASSOCIATION
AGENT: J.F. New & Associates, Inc.
SHEET 8 OF 12 DATE: 11/12/95



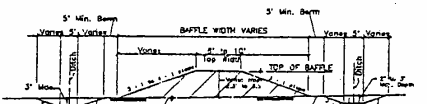
5 DETAIL
DRAW-DOWN STRUCTURE

'OSE:INDIVIDUAL PERMIT	SEDIMENT BASIN SECTIONS	PROPOSED: Lake Enhancement Project
IM: MSL	SCALE: NS	IN: Wetlands AT: GRAHAM DITCH COUNTY: FULTON STATE: Indiana APPLICATION BY:LAKE MANITOU ASSOCIATION AGENT: J.F. New & Associates, Inc. SHEET 9 OF 12 DATE: 1/10/95
	Lake Manitou Association, Inc. P.O. Box 376 Rochester, Indiana 46975	



NOTE:
SEE BAFFLE DATA TABLE FOR ELEVATIONS.

BAFFLE PLAN VIEW
SCALE: 1" = 50'



NOTE:
SEE BAFFLE DATA TABLE FOR ELEVATIONS.

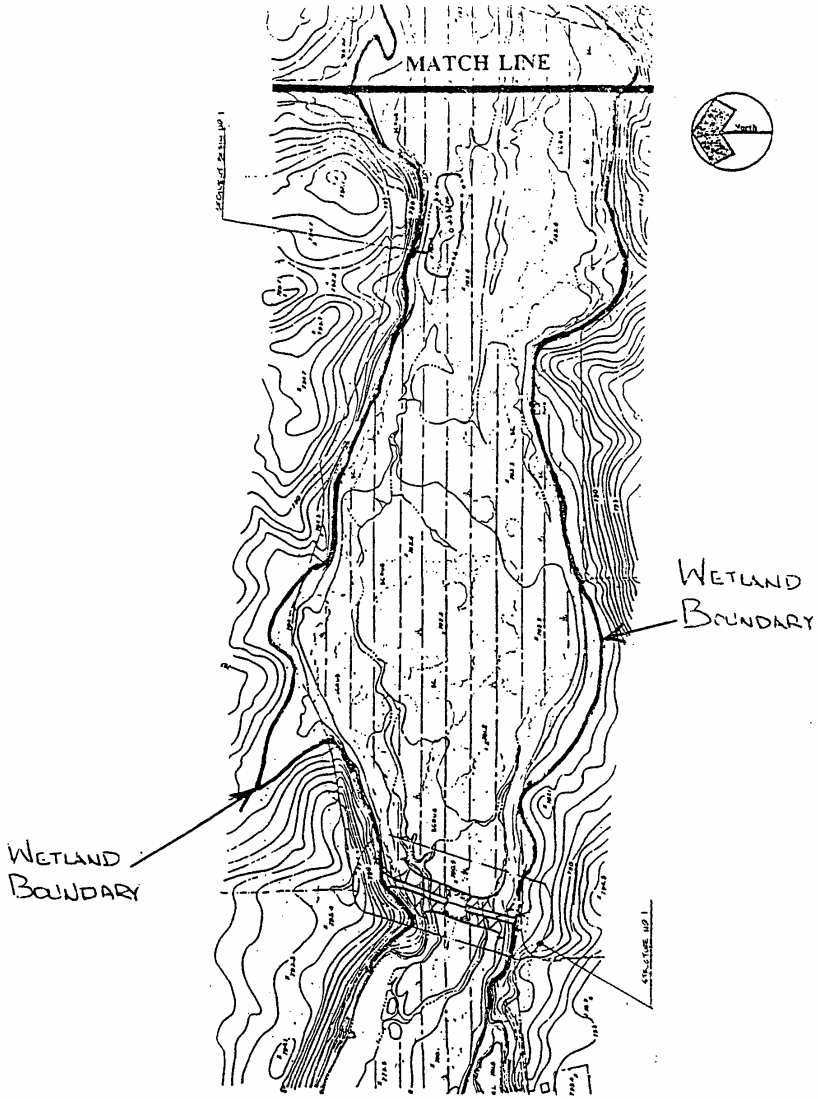
SECTION - TYPICAL CROSS SECTION

BAFFLE DESIGN DATA TABLE

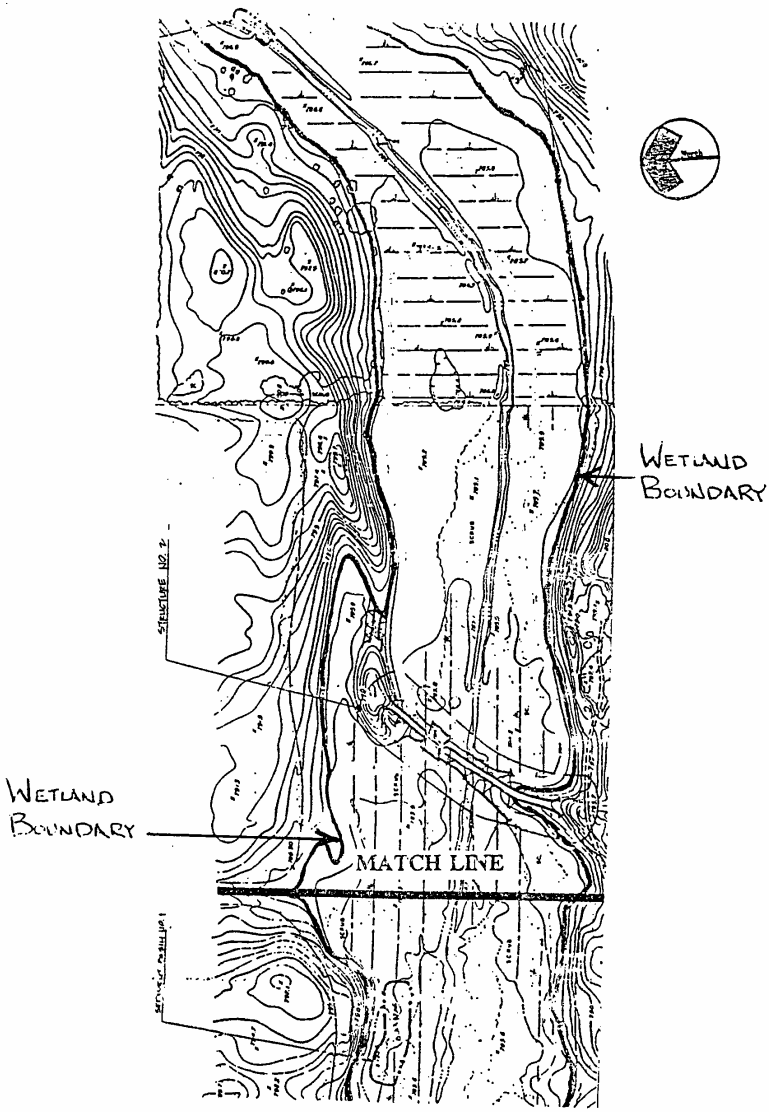
BAFFLE NO.	TOP ELEV.	TOP WIDTH (FT)	BAFFLE HEIGHT (FT)	EXISTING GROUND ELEVATION	BAFFLE SIDE SLOPE	DITCH ELEVATION	DITCH SLOPE	DITCH DEPTH (FT)
1	789.00	10	3.5	785.5	+/- 4 : 1	782.5	3 : 1	3.0
2	789.00	10	3.5	785.5	+/- 4 : 1	782.5	3 : 1	3.0
3	789.00	10	3.5	785.5	+/- 4 : 1	782.5	3 : 1	3.0
4	786.00	8	2.5	783.5	+/- 4 : 1	781.5	3 : 1	2.0
5	786.00	8	2.5	783.5	+/- 4 : 1	781.5	3 : 1	2.0
6	785.50	8	3.5	782.0	+/- 3 : 1	778.5	3 : 1	2.5

BAFFLE SECTIONS AND DETAILS

OSE: INDIVIDUAL PERMIT M: MSL	BAFFLE SECTIONS & DETAILS SCALE: NS Lake Manitou Association, Inc. P.O. Box 376 Rochester, Indiana 46975	PROPOSED: Lake Enhancement Project IN: Wetlands AT: GRAHAM DITCH COUNTY: FULTON STATE: Indiana APPLICATION BY: LAKE MANITOU ASSOCIATION AGENT: J.F. New & Associates, Inc. SHEET 10 OF 12 DATE: 11/10/95



PURPOSE: Individual Permit DATUM: MSL	Wetland Delineation West Section Scale: NS Lake Manitou Association Inc. P.O. Box 376 Rochester, IN 46975	PROPOSED: Water Quality Enhancement IN: Wetlands in Graham Ditch AT: Graham Ditch COUNTY: Fulton Co. STATE: Indiana APPLICATION BY: Lake Manitou Association Inc. AGENT: J.F. New & Associates, Inc. SHEET 11 OF 12 DATE: 1/4/95



RPOSE: Individual Permit TUM: MSL	Wetland Delineation East Section Scale: NS Lake Manitou Association Inc. P.O. Box 376 Rochester, IN 46975	PROPOSED: Water Quality Enhancement IN: Wetlands in Graham Ditch AT: Graham Ditch COUNTY: Fulton Co. STATE: Indiana APPLICATION BY: Lake Manitou Association Inc. AGENT: J.F. New & Associates, Inc. SHEET 12 OF 12 DATE: 1/4/95

Fulton County Drainage Board

COURTHOUSE

815 Main Street
Rochester, Indiana 46975-1546

Telephone:
(219) 223-3492

June 13, 1995

Mr. John B. Richardson, Project Manager
J. F. New & Associates, Inc.
708 Roosevelt Road
P. O. Box 243
Walkerton, IN 46574

Re: Lake Manitou Enhancement Project in Graham Ditch

Dear Mr. Richardson:

The final permit plans for the above named project from the Corps of Engineers, Indiana Department of Environmental Management, and Indiana Department of Natural Resources have been reviewed by the Fulton County Drainage Board. In conjunction with our previous agreement with Lake Manitou Association, Inc. (a copy of which is attached for your records) and the above mentioned permits, the Fulton County Drainage Board hereby gives its approval for the proposed work.

If you need further authorization from the Drainage Board beyond this letter, please do not hesitate to contact us. Thank you for your cooperation in this matter.

Very truly yours,

FULTON COUNTY DRAINAGE BOARD

Richard A. Powell, President

Stephen L. Hartzler

Kenneth Gentry

Enclosure

cc: Bob Weaver, Lake Manitou Association, Inc.

COPY

FILED
APR 10 1995
FULTON COUNTY DRAINAGE BOARD

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE FULTON COUNTY DRAINAGE BOARD
AND
THE LAKE MANITOU ASSOCIATION, INC.

AGREEMENT:

This agreement is entered into by and between the Fulton County Drainage Board (FCDB) and the Lake Manitou Association, Inc. ("LMAI"), and is executed pursuant to the terms and conditions set forth herein. In consideration of those mutual undertakings and covenants, the parties agree as follows:

WHEREAS, the Fulton County Drainage Board (FCDB) has jurisdiction over the regulated Drains in Fulton County.

WHEREAS, the Graham Ditch is one of the regulated Drains over which the Fulton County Drainage Board (FCDB) has jurisdiction.

WHEREAS, the Lake Manitou Association Inc. (LMAI) is currently preparing a Lake Enhancement Program which involves said Graham Ditch and the LMAI has requested that permission be given to proceed with said projects.

WHEREAS, meetings of representatives of both groups have taken place, including a public hearing called by the FCDB.

WHEREAS, as a result of those meetings, the FCDB agrees that the project be approved as presented, with the following stipulations.

GENERAL TERMS:

1. The LMAI shall be responsible for maintenance and cleaning out of the sediment basins in the project, as needed with the parties agreeing to make an annual check of the sediment basins. However, in order to help defray the expenses of cleaning out the sediment basins, the FCDB shall make available up to $1500.00 from the General Drain Improvement Fund specified under Section 36-9-27-44

(c) of the County Drainage Board Manual, if such funds are available and if FCDB & LMAI reach an agreement that such cleaning out is necessary.

2. In conjunction with the project construction, the FCDB shall provide for the initial cleaning out of the existing open ditch, on a straight grade, from elevation 783.50 at structure #2, to the South boundary line of the Zerbe property. Thereafter the LMAI shall be responsible for maintaining the open ditch in the same condition as when the project construction is initiated including cleaning out if necessary.

3. The LMAI shall be responsible for maintenance of the project and the areas affected by the project, which shall be defined as Graham Ditch between where it enters into Lake Manitou and the South boundary line of the Zerbe property. Maintenance shall include, but not be limited to, removing deposit formations, bank failures, and/or such other deterrents to the flow. This shall include obtaining proper permits from agencies as required and performed with the approval of the FCDB.

4. The LMAI shall furnish the FCDB with copies of the agreements they have made with land owners relative to the project.

5. The FCDB shall perform maintenance that may be required upstream from the South boundary line of the Zerbe property, and in doing so will use temporary sediment traps and temporary sediment screens to minimize loose material from moving downstream while performing activities associated with said maintenance.

6. The FCDB shall do such investigation and inquiries in the area to determine if there are laterals that empty directly into the ditch and the LMAI shall take steps as necessary to assure that those laterals remain functional. If a lateral becomes non-functional then a determination of the cause shall be made to see if LMAI and/or the project is responsible for causing a lateral to not be functional. LMAI shall only be responsible for putting the lateral back into a functional state to the extent LMAI or the project is responsible. This shall only pertain to the areas affected by the project, which shall be defined as Graham Ditch between where it enters in to Lake Manitou and the South boundary line of the Zerbe property.

COMPLETE AGREEMENT

This Memorandum of Understanding is the sole and complete agreement between the parties, and no terms exits as to the rights and obligations of either party that are not included herein.

MEMORANDUM OF UNDERSTANDING APPROVAL

FULTON COUNTY DRAINAGE BOARD

BY: _____
Richard A. Powell

_____
Stephen L. Hartzler

_____
Kenneth Gentry

LAKE MANITOU ASSOCIATION, INC.

BY: _____
President

_____
Secretary/Treasurer

FILED
APR 10 1995
FULTON COUNTY DRAINAGE BOARD

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We make Indiana a cleaner, healthier place to live

Evan Bayh
Governor
Kathy Prosser
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

March 24, 1995

VIA CERTIFIED MAIL Z 339 822 518

Colonel Ralph Grieco
U.S. Army Corps of Engineers, Louisville District
P.O. Box 59
Louisville, Kentucky 40201-0059

Attention: Ms. Lee Anne Devine, CEORL-OR-FN

Dear Colonel Grieco:

Re: Section 401 Water Quality Certification
Lake Manitou Association, Inc.
J.F. New and Associates, Inc.
Public Notice 199500073
Fulton County

Office of Water Management staff have reviewed Public Notice 199500073, dated February 17, 1995, regarding the construction of silt traps, earthen dams, and baffles to disperse the flow of Graham Ditch upstream of Lake Manitou to allow for sediment deposition. A total of 4.69 acres of jurisdictional wetland will be impacted by this project.

Based on the available information, it is the judgment of this office that the proposed project will not cause a significant impact to water quality provided that conditions set forth by the State are incorporated into the project. Therefore, subject to the following conditions, the Office of Water Management hereby grants Section 401 Water Quality Certification:

1. Physical disturbance of soils and existing vegetation, especially woody stems and native aquatic species, will be limited to that which is absolutely necessary to achieve the purpose of the project.

2. The contractor performing the actual operations must comply with Section 311 of the Federal Clean Water Act and with 327 IAC 2-6 (formerly Indiana Stream Pollution Control Board Regulation 330 IAC 1-6-1) concerning spills of oil and hazardous materials.

3. Deposition of dredged or excavated materials and all earthwork operations will be carried out in such a manner that soil erosion and sediment runoff to any nearby watercourse are controlled and minimized. The use of straw bale barriers, silt fencing, or an earthen berm around disturbed areas is recommended to prevent soil from leaving the construction site. Areas used for deposition of dredged materials should be provided with temporary dikes or bulkheads for separation and retention of solids. Vegetative cover should be established on dredged or excavated material as soon as possible.

4. All erosion control structures and devices will be regularly monitored and maintained, especially after precipitation events, until all soils disturbed by construction activities have been permanently stabilized.

Granting of Section 401 Water Quality Certification does not relieve the applicant from the responsibility of obtaining any other permits or authorizations that may be required for this project or related activities from IDEM or any other agency.

This decision may be appealed in accordance with IC 4-21.5, the Administrative Orders and Procedures Act. The steps that must be followed to qualify for review are:

1. You must petition for review in a writing that states facts demonstrating that you are either the person to whom this decision is directed, a person who is aggrieved or adversely affected by the decision, or a person entitled to review under any law.

2. You must file the petition for review with the Technical Secretary of the Water Pollution Control Board at the following address:

Technical Secretary
Water Pollution Control Board
100 North Senate Avenue
P.O. Box 6167
Indianapolis, Indiana 46206-6167

3. You must file the petition within eighteen (18) days of the mailing date of this decision. If the eighteenth day falls on a Saturday, Sunday, legal holiday, or other day IDEM offices are closed during regular business hours, you may file the petition the next day IDEM offices are open during regular business hours. The petition is deemed filed on the earliest of the following dates: the date it is personally delivered to the Technical Secretary, the date that the envelope containing the petition is postmarked if it is delivered by the United States mail, or the date it is shown to have been deposited with a private carrier on the private carrier's receipt, if sent by private carrier.

Note that if a petition for review is granted pursuant to IC 4-21.5-3-7, a person may obtain notice of any prehearing conferences, preliminary hearings, hearings, stays, and orders disposing of the proceedings without intervening in the proceedings by

providing the Technical Secretary with a written request that: (1) describes the subject of the notice with reasonable particularity; and (2) is delivered to the Technical Secretary at the above address within seven (7) days of receipt of the notice.

If you have any questions regarding this decision, please contact Heidi Kuehne of my staff at 317/243-5149.

Sincerely,

John L. Winters
Acting Assistant Commissioner
Office of Water Management

cc: Lake Manitou Association, Inc. VIA CERTIFIED MAIL
J.F. New & Associates, Inc. VIA CERTIFIED MAIL
David Hudak, USFWS
Louise Clemency, USEPA
Mike Neyer, IDNR
Steve Jose, IDNR

APPLICATION: FW-16,580/DR-257

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

CERTIFICATE OF APPROVAL OF CONSTRUCTION IN A FLOODWAY

ICANT:
e Manitou Association, Inc.
. Box 376
nester IN 46975

AGENT:
J.F. New & Associates, Inc.
David P. Whittlesey
708 Roosevelt Road
Walkerton IN 46574

AM:
nam Ditch
ke Manitou Inlet)

AUTHORITY:
IC 13-2-22, 310 IAC 6-1, 6-2
IC 13-2-11.1, IC 13-2-15

ECT DESCRIPTION:
pplicant proposes to enhance the water quality of Lake Manitou by constructing 2 sheet piling weir structures, 6 earthen es, and 2 sediment traps. It is proposed to maintain the wetland pool elevations at 782.0 and 784.0 feet, N.G.V.D., ctively, at the downstream and upstream structures. Details of the project are shown on plans received at the Division of on January 17, 1995.

ECT LOCATION:
pwnstream weir structure will be located approximately 1,000' and 2,800' east of the Bessmore Park Road bridge and the eam sediment trap will be about 4,500' east of the bridge,
ar Rochester, Rochester Township, Fulton County
ection 14, T. 30N, R. 3E, Rochester Quadrangle
oordinates: Downstream = 4554350 North, 570250 East, Upstream = 4544450 North, 571300 East

ORIZATION AND APPEAL NOTICE:
signed document constitutes the issuance of a permit by the Natural Resources Commission, or its designee, subject to the ions as stated on the pages entitled "General Conditions" and "Specific Conditions". This permit or any of the conditions it contains may be appealed by applying for administrative review. Such review is governed by the Administrative Orders ocedures Act, IC 4-21.5, and by the Department's rules relating to adjudicative proceedings, 310 IAC 0.6. In order to an appeal, a written petition must be filed within 18 days of the mailing of this notice. It should be addressed to:

Mr. Stephen L. Lucas, Director
Division of Hearings
Room W272
402 West Washington Street
Indianapolis, Indiana 46204

tition should contain specific reasons for the appeal and indicate the portion(s) of the permit to which the appeal pertains. appeal is filed, the Natural Resources Commission will make the final agency determination following a legal proceeding ted before an Administrative Law Judge.

1 16, 1995

John N. Simpson, PE
Director
Division of Water

s prepared by: Jimmy Yee & Scott McClarney

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

GENERAL CONDITIONS

This permit must be posted and maintained at the site of the permitted activity until the project is complete.

If any archaeological artifacts or human remains are uncovered during construction, federal law and regulations (16 USC 470, et seq.; 36 CFR 800.11, et al) and state law (IC 14-3-3.4) require that work must stop and that the discovery must be reported to the Division of Historic Preservation and Archaeology within two (2) business days.

This permit should not be construed as a waiver of any local ordinance or other state or federal laws.

This permit does not relieve the permittee of the responsibility of obtaining additional permits, approvals, easements, etc. as required by other federal, state, and local agencies. These agencies include, but are not limited to:

U.S. Army Corps of Engineers, Louisville District
Indiana Department of Environmental Management
Fulton County Drainage Board
Local city or county planning and zoning commission

This permit does not relieve the permittee of any liability for the effects which the project may have upon the safety of life and property of others.

This permit may be revoked by the Department for violation by the applicant of any condition, or applicable statute or rule.

This permit shall not be assignable or transferable without the prior, written consent of the Department.

The Department shall have the right to enter upon the site of the permitted activity for the purpose of inspecting the authorized work.

The receipt and acceptance of this permit by the applicant shall be considered as acceptance of all "General" and "Specific" conditions contained therein.

APPLICATION: FW-16,580/DR-257

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES

SPECIFIC CONDITIONS

1) other than those measures necessary to satisfy the "General" and "Specific" conditions, there shall be no deviation from the information received at the Division of Water on the following date(s) without the prior written approval of the Department of Natural Resources:

   Information received: January 17, 1995

2) this approval shall become void if construction has not been initiated within 24 months from March 16, 1995

3) seed and mulch all disturbed areas not protected by other methods

4) maintain functional erosion and sediment control measures until all disturbed areas are stabilized

5) control erosion and sediment on land adjacent to the floodway to prevent resulting sedimentation of the channel or floodway

6) seed and protect all 3:1 or steeper slopes with erosion control blankets when they are not protected by other structural methods

7) minimize and contain within the project limits all tree and brush clearing and provide the opportunity to utilize cleared trees of firewood and timber size

8) revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue) and legumes upon completion

9) clean sediment traps whenever they reach 50% of their capacity

10) do not leave felled trees, brush, or other debris in the floodway