


Manistique River Area of Concern

Manistique, Michigan

Remedial Action Plan Update

February 20, 1996



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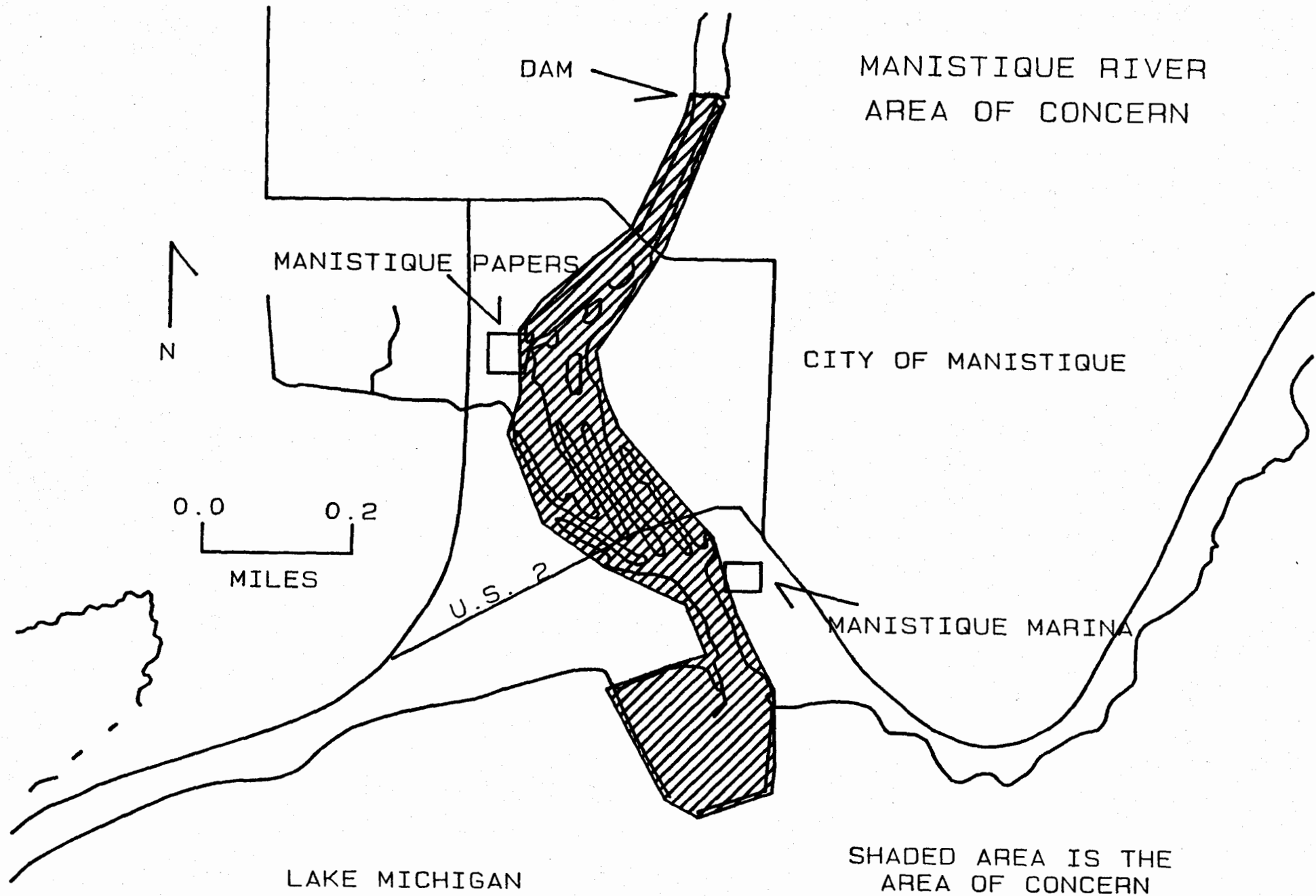
PREFACE

Preparation of this Remedial Action Plan Update for the Manistique River Area of Concern was coordinated by the Surface Water Quality Division of the MDEQ. Input was provided by the Public Advisory Council and the agency representatives. Intended audiences are the local community in Manistique and the federal, state, and local government agencies that are working to restore beneficial uses of the Manistique River. A chronology of document development is in Appendix C.

This document is an update of the Remedial Action Plan prepared in 1987. It lists beneficial use impairments, recommends actions necessary to restore the Area of Concern ecosystem, and records remedial actions completed or in progress. These are the three components of Remedial Action Plans from Annex 2 of the 1987 amendments to the Great Lakes Water Quality Agreement.

Additional information about the Area of Concern including detailed sampling results, descriptions of the area, and all state, local, federal documents related to remedial actions are available at either the Manistique Public Library or from the appropriate contacts listed in Appendix A.

In October, 1995, the Michigan Department of Natural Resources was split into two departments, Natural Resources and Environmental Quality. The new Department of Environmental Quality (MDEQ) has state programs and staff related to environmental regulatory programs. The Department of Natural Resources (MDNR) retains the natural resource management programs for the state. Throughout this document, The MDNR is referred to when historical information is presented. The appropriate current department (MDNR or MDEQ) is referred to for future work.



MANISTIQUE RIVER
AREA OF CONCERN

DAM

MANISTIQUE PAPERS

CITY OF MANISTIQUE



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MILES

U.S. 2

MANISTIQUE MARINA

LAKE MICHIGAN

SHADED AREA IS THE
AREA OF CONCERN

EXECUTIVE SUMMARY

The Manistique River flows southwest through Schoolcraft County in Michigan's central Upper Peninsula, discharging into Lake Michigan at Manistique. The Area of Concern is the last 1.7 miles of the river, from the dam in Manistique to the mouth of the harbor at Lake Michigan.

A Remedial Action Plan was initially written by the Michigan Department of Natural Resources (MDNR) in 1987. This Remedial Action Plan described problems known at the time and identified actions and studies needed to further define and remediate those problems. However, the Remedial Action Plan was written before the 1987 amendment to the Great Lakes Water Quality Agreement that outlined new guidelines for Remedial Action Plans. These guidelines include identifying which, if any, of 14 potential beneficial use impairments exist in the Area of Concern. This update reflects these requirements and updates the Remedial Action Plan to include recent information on the Area of Concern. Recommendations for additional actions required to restore beneficial uses are included.

The Public Advisory Council and the agency representatives used the beneficial use impairment guidance in Annex 2 of the 1987 amendments to the Great Lakes Water Quality Agreement to assess the ecosystem in the Area of Concern. They have identified 5 beneficial use impairments in the Area of Concern. These are:

- *Restriction on fish and wildlife consumption
- *Degradation of benthos
- *Loss of fish habitat
- *Restrictions on dredging activities
- *Potential restrictions on body contact

These beneficial use impairments result from 3 basic problems in the Area of Concern:

- *PCB contaminated sediment
- *Effects of the dam and flume on fisheries management goals
- *One combined sewer overflow

Remediating these 3 problems will restore beneficial uses in the Manistique River Area of Concern ecosystem. Remedial actions recommended include:

- * Remediation of PCB contaminated sediments. This will be completed under authority of US EPA Superfund program by US EPA and the potentially responsible parties.
- * Construction of a fish and sea lamprey trap and fish lock system below the dam for fisheries management purposes.
- * Completion of the combined sewer overflow elimination plan.

- Establishment of a permanent group of citizens and government agency personnel to guide pollution prevention and resource conservation in the Area of Concern for long-term protection of the Manistique River ecosystem.

Some key remedial actions are under way now:

Extensive discussions from 1993-1996 led to a decision for remediation of PCBs at Manistique. Contaminated sediments at the site are to be dredged by EPA with hydraulic dredging, including diver assisted dredging as necessary. Disposal of material with high levels of PCBs will be in a special landfill located out of the state. The remediation is scheduled to be completed by the fall of 1997.

The Manistique River Watershed Partnership has initiated plans for extending activities to the entire watershed, including the Area of Concern.

Plans for modifications to the dam and flume are in progress, including short-term provisions for fisheries management concerns.

The city and the MDEQ are working on upgrades to the city sewer system and have approved a plan to eliminate the last combined sewer overflow pipe.

REMEDIAL ACTION PLAN UPDATE

Introduction

The Great Lakes Area of Concern Program

The Manistique River from the dam in town to the mouth of the harbor at Lake Michigan is one of 42 Areas of Concern on the Great Lakes. The Area of Concern program is part of the Great Lakes Water Quality Agreement between the U.S. and Canada that requires a Remedial Action Plan be written to address restoration and protection of an ecosystem using beneficial use impairments as a guide. Remedial Action Plans are joint efforts between Federal and State agencies and the stakeholders in Areas of Concern to identify problems, to prepare and implement remedial action recommendations, and to report successes. Once these three general components of remedial action have occurred and results indicate that beneficial uses have been restored, the site can be de-listed by the federal government.

Michigan's Area of Concern Program

Michigan has 14 Areas of Concern on the Great Lakes and the upper connecting channels. Remedial Action Plans updates in Michigan are prepared by stakeholders, concurrently addressing all 3 components of remedial actions (problem identification, implementation of actions, and reporting of successes). These updates document results of studies, actions taken, successes for ecosystem restoration, and recommendations for the future.

A Public Advisory Council in the Manistique River Area of Concern was established in 1993 and consists of 13 individuals representing a variety of interests in the community. Agencies are represented by 12 state and federal staff that have an interest in management of the ecosystem of the Area of Concern (membership lists on p.2).

Remedial Action Plans are approved by members of the Public Advisory Council and the agency representatives. Public Advisory Council members have a responsibility to reflect the needs of the stakeholder groups each represents in the approval process. MDNR and MDEQ agency representatives approve the Plan for the divisions that each represents. Remedial actions approved by the Public Advisory Council and by the agency representatives are implemented as funding and time resources are available.

The approved update is forwarded to the MDEQ Office of the Great Lakes, which in turn forwards it to the International Joint Commission of the U.S. and Canada for an external review.

Manistique River Area of Concern History

The Manistique River is located in Schoolcraft County in Michigan's central upper peninsula. The river flows from the northeast and discharges into Lake Michigan at the City of Manistique. The Area of Concern begins at the dam in Manistique and extends downstream to Manistique Harbor, a total length of approximately 1.7 miles.

A Remedial Action Plan was initially written by the Michigan Department of Natural Resources (MDNR) in 1987. This Remedial Action Plan described problems known at the time and identified actions and studies needed to further define and remediate those problems. However, the Remedial Action Plan was written before the 1987 amendment to the Great Lakes Water Quality Agreement that outlined new guidelines for Remedial Action Plans. These guidelines include identifying which, if any, of 14 potential beneficial use impairments exist in the Area of Concern.

Impacts to the biota were first noted in the mid-fifties. These impacts were attributed primarily to deposits of wood fibers and waste from sawmill and papermill operations, and sanitary waste from the City of Manistique. Later studies also identified chemical wastes as contributing to the degradation.

Polychlorinated Biphenyl (PCB) and heavy metal contamination of the sediments within the Area of Concern were first identified in the mid-seventies. Carp collected from the Manistique River within the Area of Concern have tissue concentrations of PCBs that exceeded the Food and Drug Administration and Michigan Department of Public Health 2 ppm action level. A consumption advisory is currently in effect for carp caught below the dam in Manistique, advising anglers not to eat these fish due to elevated levels of PCBs in the tissue.

Heavy metals found in the sediments, at concentrations that place the sediments the heavily polluted category according to dredge spoil disposal guidelines, are lead, zinc, cadmium, chromium, and copper (MDNR, 1987). Remediation of the PCBs will also remediate problems with the heavy metals in sediments.

PCBs are a class of chlorinated hydrocarbons that are very persistent, bio-accumulate, and are suspected of being toxic to some aquatic animals at low levels. They may cause birth defects or cancer in some organisms. PCBs were produced for use in a variety of industries from the late 1930s to the early 1970s because they conduct heat but not electricity, they are not flammable, and they can exist in a variety of forms from solids to oils. There are theoretically 209 different PCB compounds. Various mixtures of these compounds were sold under the trade name Aroclor. A phase-out of use due to human health concerns began in the late 1960's and they were eventually banned from production by the U.S. EPA in 1977.

Numerous types of industry have been located within the Manistique River Area of Concern in the past, especially sawmills (MDNR, 1987). There are currently only two point source dischargers; Manistique Papers, Inc. and the Manistique Wastewater Treatment Plant. Both facilities possess National Pollution Discharge Elimination System permits and currently comply with permit provisions.

Over the past 15 to 20 years a number of actions have taken place that have resulted in improvements within the Area of Concern. In 1977, the Manistique Waste Water Treatment Plant upgraded to secondary (biological) treatment. At about the same time, Manistique Papers, Inc. also upgraded its wastewater treatment facilities to provide secondary treatment of process wastewater from its paper making operations. These improvements greatly reduced oxygen demanding loads to the Manistique River and also reduced or eliminated the discharge of toxicants (metals and organic) and materials such as wood fibers and paper. In 1986, at the request of the Michigan Department of Natural Resources, Manistique Papers, Inc. placed an erosion barrier along the west bank of the main river channel upstream from U.S. 2 to control erosion of PCB contaminated soils located there (see Appendix D) (MDNR, 1987).

A Remedial Action Plan was first prepared for the Area of Concern in 1987. This plan summarized information available to date, and recommended further studies to better define the problems. These recommended studies were:

- further sampling of the river and harbor for PCBs (completed in 1993)
- fish contaminant monitoring with caged fish (completed in 1990)
- additional benthic surveys of the river and harbor (not done to date)

The 1987 Remedial Action Plan documents all the data available through 1987 and forms an important connection in the network of events that will lead to eventual remedial action in the Area of Concern. The document will not be summarized in detail in this update, since this update focusses on actions taken since the 1987 Remedial Action Plan and on actions still needed. The 1987 Remedial Action Plan is available from the Surface Water Quality Division of the MDEQ (MDNR, 1987).

This Area of Concern is a Michigan Act 307 site due to the PCB contamination of sediments. The Site Assessment Model score of 44 on a scale of 0-48 gives this site a state ranking of 22 out of 2736 sites statewide (1994). The site scores high because PCBs are persistent, toxic, bio-accumulative, and occur at high concentrations (up to 120 ppm) near the surface (top 3" at one site).

This Area of Concern is also a site of U.S. EPA Superfund activity. Removal actions are currently underway and will continue using the Superfund Accelerated Clean-up Model. It is designed to allow for more expedient remedial action than is typical at a Superfund site by concurrently accomplishing normally separate steps. This site was one of the first 3 in Michigan nominated by the MNDR for the U.S. EPA to consider use of the accelerated model.

Beginning in 1993, U.S. EPA has identified several potentially responsible parties for the PCB contamination. Two of these (Manistique Papers, Inc and Edison Sault Electric) have worked with consultants and U.S. EPA to complete extensive sampling in the river and harbor for PCBs. They produced ecological and human health risk assessments, and an Engineering Evaluation/Cost Analysis for the site in 1994. These are available from U.S. EPA Region V or at the Manistique Public Library.

Sampling conducted in June and December 1993, April 1994 and May, June and July 1995, included most of the navigation channel, along with other harbor and upstream locations. Cores were generally taken to bedrock. Sampling in the navigation channel showed surface (0" to 3") concentrations of PCBs with a peak value of 120 ppm and an average of 16 ppm. PCB concentrations up to 810 ppm were found at depths of 3" to 2'. Average PCB concentrations in the navigation channel at this depth were 73 ppm. At the 2' to 6' depth, in an area just north of the US 2 highway bridge on the west side of the river, maximum PCB concentrations were 2510 ppm. In the navigation channel, contaminated sediments at depths of 2' to 4' had a maximum PCB concentration of 700 ppm and average of 180 ppm. It is estimated that there are about 54,000 yd³ of material in the harbor contaminated by levels of PCBs exceeding 50 ppm, covering 13 acres. There are approximately 8 tons of PCBs in the river and harbor sediments (U.S. EPA, 1994 and 1996).

A temporary weighted plastic cover was placed over an area of PCB contamination just downstream from the city marina. This 110' by 240' cover protects a spot where PCBs were found up to 120 ppm at the surface. EPA completed this time-critical "removal" action in November, 1993 because the site is considered a possible source of PCBs to Lake Michigan, especially if a major flooding event were to scour the PCB contaminated bottom sediments. The cover was inspected in the fall of 1994 and found to be intact and in-place with some gas bubbles and a misplaced anchor (1 out of 32) the only problems.

Sampling included analysis for oil and grease. Sediments in the navigation channel were found to be contaminated with oil and grease, with an average value in the samples of 2900 ppm and a maximum of 8900 ppm (U.S. EPA, 1994). Guidelines for disposal of dredge spoils classify sediments with over 2000 ppm grease/oil as heavily polluted.

Discussions between the community, the potentially responsible parties, and EPA throughout 1994, 1995, and 1996 led to a final determination by EPA regarding remediation for PCB contaminated sediments. EPA decided to dredge North Bay, an area mostly north of the U.S. 2 highway bridge on the west side of the river, by hydraulic dredging, including diver-assisted dredging. Work there began in the fall of 1995. De-watered PCB contaminated sediments are being disposed of at a PCB disposal facility (regulated by the Toxic Substances Control Act). Clean sediments are being disposed of at an in-state sanitary landfill. Treated water from dredging is being returned to the river after analysis indicates it to be clean. The action in this area will be completed by summer, 1996. A total of approximately 17,000 cubic yards of material will be removed from the North Bay area.

Dredging in 1995 demonstrated that only 3% of the solids from the removed materials needed to be disposed at a landfill regulated by the Toxic Substances Control Act. This volume reduction greatly reduces disposal costs. In addition, dredging in the North Bay area demonstrated that turbidity and associated release of PCB contaminated material to the river could be successfully controlled. Based on these results, EPA determined that it would continue the dredging operation on down the river and dredge all the contaminated sediments at the site. Plans are to finish dredging the North Bay area in the spring and summer of 1996. Dredging of the

navigation channel and harbor would then occur in 1997. A total of about 104,000 cubic yards of sediments will be dredged from the Area of Concern.

All areas where PCB concentrations are higher than 10 ppm at any depth will be remediated. A map showing the areas to be dredged is in Appendix D.

There is much greater detail on the history of the Manistique River Area of Concern in the 1987 Remedial Action Plan (MDNR, 1987). The Engineering Evaluation/Cost Analysis completed for the site has all the data for PCB sampling results, except for the 1995 U.S. EPA sampling results, which are in the Administrative Record. Addresses for contacts to obtain these documents are in Appendix A.

THE MANISTIQUE RIVER AREA OF CONCERN ECOSYSTEM

Ecosystem Description

Geographical

The Manistique River rises in Manistique Lake in Luce County and flows 73 miles southwestward across Schoolcraft County to Manistique, where it empties into Lake Michigan. Most of the river's major tributaries flow southeastward across the county until they join the main stream. The largest tributary, Indian River, flows eastward into Indian Lake and then to the Manistique River just north of Manistique. The Manistique River basin drains the majority of Schoolcraft County and portions of Luce, Mackinac, Alger and Delta Counties, a total area of 1450 square miles.

The Manistique River is impounded 1.4 miles above Lake Michigan. The dam was built in 1919 to provide water to Manistique Papers, Inc. and for hydroelectric power production. At the dam, water is diverted to Manistique Papers via a 1000 yard long concrete flume. The dam and flume are no longer needed for water or power generation. The flume is deteriorating and currently is only partially filled with water. The only significant change in river slope from its origin to Lake Michigan is through Manistique alongside the flume where the river bed elevation drops 26 feet.

Further downstream, the river is divided into several channels by man-made islands of slab wood and sawdust. These were created in the early 1900s as boat channels and docks for loading of lumber. In 1967 one of the boat channels was diked at the upper and lower ends and used as a lagoon for settling wastewater created by the paper de-inking process at Manistique Papers, Inc. By 1972, the lagoon was no longer in use and was later dredged and filled and paper storage sheds were built on the site.

Schoolcraft County, at 1229 square miles, is the second largest county in the State of Michigan in land area. The majority of the county land area (98%) is undeveloped (ie., forest, wetland) with the remainder residential/commercial/institutional (.3 percent), industrial (0.01 percent), extractive (0.15 percent), and agricultural (1.7 percent). More than 50% of the land in Schoolcraft County is owned by state and federal governments.

The Area of Concern comprises approximately the last 1.7 miles of the Manistique River, from the dam in town to the mouth of the harbor at Lake Michigan.

Physical

The city of Manistique encloses the Area of Concern, so the entire area is developed to some extent. The east side of the river and harbor is primarily residential, business and park area. A major portion of the shoreline above U.S. 2 Highway is the site of a former salvage yard; below U.S. 2 the shore is primarily dockage (public marina and private commercial fishing) or concrete breakwater. The West shoreline above U.S. 2

Highway is owned primarily by Manistique Papers, Inc. a specialty paper mill that currently uses recycled magazines for raw material. Below U.S. 2 Highway is additional dockage (with a private marina and the former Ann Arbor Car Ferry Dock), the city waste-water treatment plant, a boat launch and the breakwaters.

The region of Schoolcraft County along the Lake Michigan shoreline and including the Area of Concern is fairly level and characterized by low sandy or gravelly ridges alternating with swales and swamps. Soils surrounding the Area of Concern are primarily sand underlain by limestone and dolomite.

The substrate of Lake Michigan beyond the Manistique Harbor is primarily gravel and coarse sand at the harbor mouth. Coarse to medium sand at the 15 m contour and medium to fine sand at the 30 m contour.

Lake Michigan at the Manistique River is classified as oligotrophic; low nutrients with clear, cold water.

The Manistique River substrate is primarily rock and cobble in the faster flowing stretches i.e., along the Manistique Papers, Inc. flume. Below Manistique Papers, the substrate in the flowing channels is primarily sand, while the substrate in the dead end channels is primarily silt. Channel B also contains paper sludge deposits of fine particulates, such as clay, resulting from the discharge of Manistique Papers treated process water to this location until 1986. The substrate below the channels is a combination of sand and silt with some gravel, cobble and slab wood (MDNR, 1987). The deposition zones in the river and harbor continue to accumulate silt, primarily from erosion of bank materials in the upper watershed due to forestry practices (MDNR, 1995).

Surveys conducted by MDNR in 1976, 1978 and 1985 document that the substrate in the Manistique Harbor has been altered due to accumulation of sawdust and wood chips over the sandy lake bottom. These materials originated primarily from lumber-making and paper-making (from wood pulp) that occurred on the lower Manistique River. With the closing of the sawmills, and improved wastewater treatment and the switch from pulpwood to all recycled magazines as raw material at the paper mill, the discharge of these woody materials has been eliminated (MDNR, 1987).

Biological

The relatively undeveloped watershed of the Manistique River with its forests, wetlands, lakes, and streams supports a wide variety of fish and wildlife: The Fox River is a tributary with an outstanding trout fishery; Seney National Wildlife Refuge with its waterfowl, eagles, and fisheries is within the watershed; and Big Manistique Lake at the source of the river is the 7th largest inland lake in Michigan. Forest types within the watershed include northern coniferous, cedar swamp, aspen stands, oak-maple-birch deciduous, and same-aged forest-products coniferous stands. This variety of habitats supports a corresponding variety of wildlife in the watershed. Recreational fishing, hunting and many other outdoor activities are important in Schoolcraft County.

The most significant problem with water quality in the watershed above the Area of Concern is non-point source pollution from historical forestry activity erosion run-off. This run-off results in locally heavy deposits of sediments that affect fish habitat and also in fine silts being deposited downstream in the Area of Concern.

Aquatic habitat in the Area of Concern below the dam supports a seasonal variety of sports fish including northern pike, yellow perch, channel catfish, smallmouth bass, rockbass, walleye, chinook salmon, coho salmon, pink salmon, brown trout and steelhead. The area along the flume where the river drops about 26 feet over shelves of limestone and gravel bars is a spawning location for many fish species. The remaining length of the river and harbor is basically at the level of Lake Michigan and is not considered an important area for fish spawning.

The Manistique River currently has the largest run of sea lamprey on Lake Michigan. The U.S. Fish and Wildlife Service has a trapping control program for lamprey to reduce the number that spawn in the river. The dam at the head of the Area of Concern blocks sea lamprey (and other migratory fish such as salmon) from traveling up the river.

Land habitat in the Area of Concern is primarily sandy beach, low shrubs, and developed sites. This can be used by shorebirds and gulls. In addition, bald eagles forage along the shoreline in the vicinity of the Area of Concern. Waterfowl habitat is available primarily on the eastern shore of the river near U.S. 2, where the dead end channel creates a marsh. Waterfowl have also been observed along the river shoreline and around the islands created by the boat channels. There is little available wildlife habitat elsewhere in the Area of Concern, since the entire site lies within the City of Manistique and the shoreline and nearby areas are relatively developed.

Greater detail for the geographical, physical, and biological aspects of the Area of Concern can be found in the 1987 Remedial Action Plan and in the Engineering Evaluation/Cost Analysis (1994).

Aquatic Ecosystem Evaluation Using the Great Lakes Water Quality Agreement Beneficial Use Impairments

Annex 2 of the 1987 amendment to the Great Lakes Water Quality Agreement lists 14 beneficial use impairments to be evaluated in each Area of Concern. The Public Advisory Council and the agency representatives have reviewed the beneficial use impairments in the Manistique River Area of Concern. A survey of community citizens, MDNR reports, U.S. EPA reports, and U.S. Army Corps of Engineers reports were used for reference materials in determining the use impairments. Results for the community survey are in Appendix B.

Following is a list of the 14 beneficial use impairments as applied to the Manistique River Area of Concern. There are 5 that are listed as impaired, and 9 that are listed as either not impaired or in need of further study.

1. Restrictions on Fish and Wildlife Consumption

Listing

Guideline: When contaminant levels in fish or wildlife populations exceed current standards, objectives or guidelines, or public health advisories are in effect for human consumption of fish or wildlife. Contaminant levels in fish and wildlife must be due to contaminant input from the watershed.

**Status at
Manistique
River:**

Impaired.

The Michigan Department of Public Health has issued a carp consumption advisory (no consumption) due to PCB levels above 2 ppm in the fish tissue (Michigan Fishing Guide, 1995). PCBs are available to fish in Manistique and are at concentrations of greater than 50 ppm at the surface in several areas of the river and harbor (MDNR, 1990 and U.S. EPA, 1993). There is also a general consumption advisory for carp for all of Lake Michigan, since PCBs are available to fish in other areas, including Green Bay. There are no restrictions on consumption of wildlife in the Area of Concern.

2. Degradation of benthos (river bottom)

Listing

Guideline: When the benthic macroinvertebrate community structure significantly diverges from un-impacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when toxicity (as defined by relevant, field validated bioassays with appropriate quality assurance/quality controls) of sediment-associated contaminants at a site is significantly higher than controls.

**Status at
Manistique
River:**

Impaired

The 1987 Remedial Action Plan identified substrate impairment and existence of pollution tolerant benthic organisms in the river and harbor below the artificial channels. The main problems with substrate impairment are wood fibers from a variety of historical lumber and paper-making sources. There are no current discharges of wood fiber.

No studies of effects of PCB contamination on benthic life have been conducted specifically for the Manistique River.

Ontario has published benthic effect guidelines for PCB contaminated sediments. These are not used in the U.S., but can provide an indication of potential effects. PCB contamination of surficial (top 3") sediments in the navigation channel is above the Ontario Provincial Sediment Guidelines "Severe Effect Level" in the benthos at 5 locations for sampling conducted in 1993. All sites from the 1993 sampling where PCBs were detected have contamination above the "lowest effect level" of the Ontario Guideline (U.S. EPA, 1994; Ontario Ministry of Environment and Energy, 1993).

3. Loss of Fish and Wildlife Habitat

Listing

Guideline: When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a perturbation in the physical, chemical or biological integrity of the Area of Concern, including wetlands.

**Status at
Manistique
River:**

Impaired

The presence of the dam and flume impact fish habitat and fisheries management goals. The dam is outside the boundaries of the Area of Concern, but impacts water level control and fish passage in the Area of Concern. The flume from the dam to the paper mill is no longer used by the mill but still carries part of the river flow. It is in deteriorated condition and modifications to the flume are part of the considerations for renewal of the dam safety permit.

The MDNR Fisheries Division has indicated that low water flow (50 cubic feet per second) in the river channel below the dam along the flume reduces fish spawning habitat. Water level control above the dam is also a concern, but the river there is outside the Area of Concern (MDNR, 1995).

The dam and flume presently block sea lamprey and salmon from migrating up the river, a positive impact to the Manistique River fisheries. There are fish species that could be desirable to have pass the dam, including sturgeon. Continued control of certain migratory species is a critical part of fisheries management plans for the Manistique River (MDNR, 1995).

The negative effects of wood fibers in the benthos on invertebrate and fish habitat is documented in the 1987 Remedial Action Plan.

4. Restrictions on Dredging Activities

Listing

Guideline: When contaminants in sediments exceed standards, criteria or guidelines such that there are restrictions on dredging or disposal activities.

**Status at
Manistique
River:**

Impaired

The U.S. Army Corps of Engineers uses the U.S. EPA dredge spoil disposal criteria for determination of disposal options of contaminated sediments. Sediments contaminated with PCBs over 10 ppm are not disposed of in open water. Disposal of sediments with from 1-10 ppm PCBs is determined on a site-specific basis. Other sediment contaminants at Manistique that exceed open-water dredge spoil disposal criteria include lead, zinc, cadmium, chromium, copper, barium, and oil/grease (MDNR, 1987).

The Corps has not dredged the navigational channel since 1967, in part due to lack of demand, and in part due to contamination of the sediments. In 1969, the Corps adopted a 12 foot maintenance depth for Manistique Harbor due to virtual cessation of commercial waterborne traffic. At the request of a local business in the mid 1980s, the Corps evaluated sediments for dredging to restore the 18-19 foot project depth. The presence of PCBs at a concentration of greater than 50 ppm was found in the navigation channel during the 1988-89 sampling, prohibiting the Corps from open water disposal of dredge spoils (U.S. EPA, 1994).

The Corps did not evaluate the economic viability of commercial shipping at Manistique Harbor. A study commissioned by Manistique Papers, Inc. and Edison Sault Electric in 1994 concluded that the relatively small size of the harbor and the shallow water depth limited by bedrock renders the harbor obsolete for modern deep draft commercial Great Lakes shipping (Greenwood, 1994). However, the business that originally requested dredging in the mid-1980's (referenced above) has continued to express interest in shipping by deeper draft vessels in the harbor.

The depth of the harbor boat channel was ranked last out of a list of 18 problems considered by respondents on a mail survey sent to a sample of Manistique residents in 1994 (Appendix B).

5. Potential Restrictions on body contact (or beach closings)

Listing

Guideline: When waters, which are commonly used for total body contact or partial body contact recreation, exceed standards, objectives or guidelines for such use.

Status at
Manistique
River:

Impaired

There are no swimming beaches in the Area of Concern, but body contact with the water could occur wherever there is access to the water. This beneficial use is impaired only because there is one remaining combined sewer overflow in the Area of Concern, on the east side of the river just below the city marina. Two other combined sewer overflows, one to Lake Michigan and one on the west side of the river above U.S. 2, have been closed.

During severe storm events or periods of high run-off, raw sewage may be discharged from the remaining combined sewer overflow, causing exceedance of state water quality criteria for body contact (MDNR, 1987).

6. Degradation of Fish and Wildlife Populations

Listing

Guideline: When fish and wildlife management programs have identified degraded fish or wildlife populations due to cause within the watershed. In addition, this use will be considered impaired when relevant, field validated, fish or wildlife bioassays with appropriate quality assurance/quality controls confirm significant toxicity from water column or sediment contaminants.

Status at
Manistique
River:

Further study may be required

The Michigan Department of Natural Resources, Wildlife Division, has recommended studies of resident wildlife populations for effects of contamination. Need for this further study will be evaluated after completion of remediation work in progress for the PCB contamination and planned long-term monitoring of results.

Fish populations are impaired due to loss of habitat, especially for spawning. Since any population problems are due to habitat loss and not to water quality, this is being addressed by actions related to the loss of habitat impaired beneficial use listed earlier.

7. Bird or Animal Deformities or Reproductive Problems

Listing

Guideline: When wildlife survey data confirm the presence of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. eggshell thinning) in sentinel wildlife species.

**Status at
Manistique
River:**

Further study may be required

The Michigan Department of Natural Resources (Wildlife Division) has recommended studies of resident wildlife to determine if contaminants are causing reproductive problems or deformities. Need for this further study will be evaluated after completion of remediation work in progress for the PCB contamination and planned long-term monitoring of results.

8. Degradation of Aesthetics

Listing

Guideline: When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor (e.g. oil slick, surface scum).

**Status at
Manistique
River:**

Not impaired

Water entering the Area of Concern from the upper reaches of the Manistique River is clean, with no visible deposits or unnatural color. No significant change occurs from the discharges in the Area of Concern, so aesthetics remain un-impaired. The east side of the harbor is being developed as a park and a boardwalk by the community. This aesthetically pleasing area is a heavily used recreational site.

9. Tainting of Fish and Wildlife Flavor

Listing

Guideline: When ambient water quality standards, objectives or guidelines for the anthropogenic substance(s) known to cause tainting are being exceeded or survey results have identified tainting of fish or wildlife flavor.

**Status at
Manistique
River:**

Not impaired

No formal studies have been conducted. However, reports from anglers indicate no recent tainting of fish caught in the Area of Concern. Contaminants likely to cause tainting are no longer present at Manistique.

10. Fish Tumors or Other Deformities

Listing

Guideline: When the incidence rates of fish tumors or other deformities exceed rates at un-impacted control sites or when survey data confirm the presence of neoplastic or pre-neoplastic liver tumors in bullheads or suckers.

**Status at
Manistique**

River: Not impaired

No formal studies have been conducted. However, no unusual or increased incidences of tumors or other deformities have been reported in the fish caught in the Area of Concern.

11. Eutrophication or Undesirable Algae

Listing

Guideline: When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity, etc.) attributed to cultural eutrophication.

**Status at
Manistique**

River: Not impaired

There is no evidence of extensive, excessive algae growth or eutrophication in the Area of Concern.

12. Restrictions on Drinking Water Consumption or Taste and Odor Problems

Listing

Guideline: When treated drinking water supplies are impacted to the extent that: 1) densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances exceed human health standards, objectives or guidelines; 2) taste and odor problems are present; or 3) treatment needed to make raw water suitable for drinking is beyond the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e., settling, coagulation, disinfection).

Status at
Manistique
River: Not impaired

There are no drinking water intakes in the Area of Concern.

13. Added Costs to Agriculture or Industry

Listing
Guideline: When there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including, but not limited to livestock watering, irrigation and crop spraying) or industrial purposes (i.e. intended for commercial or industrial applications and non-contact food processing).

Status at
Manistique
River: Not impaired

Industrial uses of water in the Area of Concern do not have added costs for pre-treatment due to contamination.

14. Degradation of Phytoplankton and Zooplankton Populations

Listing
Guideline: When phytoplankton or zooplankton community structure significantly diverges from un-impacted control sites of comparable physical and chemical characteristics. In addition, this use will be considered impaired when relevant, field validated phytoplankton or zooplankton bioassays (e.g. Ceriodaphnia: algal fractionation bioassays) with appropriate quality assurance/quality controls confirm toxicity in ambient waters.

Status at
Manistique
River: Not impaired

No recent formal studies have been conducted. However, water quality in the river has no known problems that would impact plankton. Phytoplankton production may be affected by the brown color from the naturally-occurring tannin in the river water.

Ecosystem Restoration for the Manistique River Area of Concern

Ecosystem restoration objectives for the Manistique River Area of Concern are based on restoration of the beneficial use impairments and associated ecosystem management goals. An important element of the restoration work is that it be consistent with a community vision for future use of the river and harbor (Public Advisory Council, 1994). The community desires a recreational focus for use of the waterfront areas in town. A new boardwalk from the city marina down the Lake Michigan shore to the east and development of shore-front parks is reflective of the community vision for this area.

Details of goals and implementation of remedial actions for the five beneficial use impairments applicable to the site follow in the sections below.

1. Restrictions on Fish and Wildlife Consumption

**Delisting
goal:**

In general, when contaminant levels due to sources in the Area of Concern in fish and wildlife populations do not exceed current standards, objectives or guidelines, and no public health advisories are in effect for human consumption of fish or wildlife due to causes within the watershed.

In Manistique, when there is no difference between Manistique and other areas for PCBs already in fish, and when PCBs are not available to fish (post-remediation) in the Area of Concern, this beneficial use will be restored.

Objective: Eliminate PCB availability to fish in the Area of Concern.

**Remedial
Actions:**

Dredging of PCB contaminated sediments in part of the Area of Concern is being conducted as a removal action under authority of the U.S. EPA Region V Superfund program. Hydraulic dredging, including diver-assisted dredging, is being used in Manistique in North Bay, one of the dead-end channels on the west side of the river just above the U.S. 2 bridge. Approximately 10,000 cubic yards of material have been removed to date. An additional estimated 7200 cubic yards will be removed beginning May or June 1996. Dredged material is being de-watered, with the water returned to the river and the partially dried sediments hauled by train car to a landfill approved for high level PCB waste under the Toxic Substances Control Act. This action will be completed by spring, 1996.

Following completion of the North Bay dredging, EPA will remove the temporary cover placed over sediments just downstream from

the city marina on the east side of the river and conduct hydraulic dredging there. Processing the contaminated sediments may include addition of hydrocycloning or elutriation column to reduce volume. The current water treatment plant, with associated water treatment and contaminated sediment drying and shipping is expected to used.

The navigation channel and harbor will be dredged with the same process in 1997. A total of approximately 104,000 cubic yards of sediments will be removed from the Area of Concern.

A map showing the areas to be dredged is in Appendix D.

Documents with full particulars for these actions are available in the Manistique Public Library or from the U.S. EPA Office of Superfund (see list of contacts in Appendix A).

Schedule: Remediation of PCB contaminated sediments began the fall of 1995 and is expected to continue through fall of 1997.

**Responsibility/
Funding:**

Remediation is being conducted under authority of the U.S. EPA Superfund program. The Potentially Responsible Parties are providing a substantial portion of the funds. Total cost of the project is estimated to be \$14,809,000.

**Evaluation/
Monitoring:**

A statistically-based comparison between Manistique and other northern L. Michigan tributaries for PCB levels in fish tissue can be used to establish whether Manistique is different from other areas in the need for consumption advisories.

Caged fish studies already completed and those planned for the future as part of PCB remediation monitoring will assist in determining PCB availability to fish in Manistique.

Monitoring effectiveness of the remediation work will consist fish contaminant monitoring, ambient water monitoring, and benthic life monitoring. The complete monitoring program established for the remediation work is available in the Manistique Public Library or from the U.S. EPA Office of Superfund (see list of contacts in Appendix A).

2. Degradation of Benthos

Delisting goal:

In general, when the benthic macroinvertebrate community structure does not significantly diverge from un-impacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when toxicity of sediment-associated contaminant is not significantly higher than controls.

In Manistique, establishment of a clean, non-sawdust substrate in the dredged areas that supports a healthy population of native organisms will restore this beneficial use.

Objective:

Reduce or eliminate availability of sawdust, woodchips, and PCBs in surficial sediments of the river and harbor area to establish better substrate for the benthic community.

Remedial Actions:

The EPA Superfund action in the Manistique River will result in mitigation of some of the problem, since little sawdust or PCBs will remain on the surface in areas that are remediated. Remediating contaminated sediments will address about 19 acres of river and harbor that have sawdust on the bottom.

Schedule:

Dredging sediments in the river and harbor is scheduled to be completed by fall, 1997.

**Responsibility/
Funding:**

Remediation of PCB contaminated sediments that have sawdust on the surface is being done under authority of the Superfund program.

**Evaluation/
Monitoring:**

The monitoring program planned for post-dredging is expected to demonstrate establishment of a clean substrate for native species in remediated areas.

3. Loss of Fish and Wildlife Habitat

Delisting goal:

In general, when the amount and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals has been achieved and protected.

In Manistique, this beneficial use will be restored when the management plan for a coldwater fishery below the dam and control of fish passage at the dam are not impaired due to water quantity issues.

Objectives:

Provide suitable habitat to support restoration and maintenance of a coldwater fishery below the dam. Maintain sea lamprey and salmon passage control at the dam.

**Remedial
Actions:**

Modifications to the dam and flume in Manistique have been proposed because the flume is no longer needed or used and is in deteriorated condition. Fisheries management goals in Manistique are closely tied to dam and flume operation, since the structures were built in the original river channel and have greatly reduced fish habitat. These structures also block sea lamprey and salmon from migrating up the river. Renewal of the dam safety permit is currently in progress, and proposed modifications will take into account fisheries management goals, noted in the following.

The Fisheries Division of the MDNR has proposed an increase in flow in the river channel that parallels the paper mill flume from a minimum of 50 cubic feet per second to 250 cubic feet per second. The increased flow would re-water gravelly areas and rocky ledges that make good fish spawning and benthic invertebrate habitat in that section of river.

A lake sturgeon restoration program for the Manistique River is in the planning phase. A trapping station is proposed for below the dam, with a lock system through the dam to allow sturgeon to re-establish an anadromous population in the river.

The U.S. Fish and Wildlife Service has a trapping station for sea lamprey in the Area of Concern just below the dam. The Service has planned an expansion of the sea lamprey control program to completely block all (approximately 30,000) lamprey from passing the dam and to increase the number trapped from 60% (18,000) to 80% (24,000). This is the same trap as planned for the lake sturgeon program.

Schedule:

The dam safety permit is in the final stages of review with the Land and Water Management Division of the MDNR. Activities could start in 1997.

**Responsibility/
Funding:**

Manistique Papers, Inc. is the owner of the dam and flume, with responsibility for operation, maintenance and modifications.

**Evaluation/
Monitoring:**

Populations of lake sturgeon can be directly counted in the proposed trapping system by the MDNR Fisheries Division. Sea lamprey numbers, both trapped and un-trapped, can also be directly measured for evaluation of trapping effectiveness by the U.S. Fish and Wildlife Service.

Improvement in fish populations will be evaluated using surveys by the MDNR Fisheries Division.

**On-going stocking
program:**

Though not specifically part of remedial actions for the Area of Concern, the Fisheries Division of the MDNR will continue with the on-going program stocking of 100,000 chinook salmon and 8,000 steelhead each year. A study of chinook salmon completed in 1994 by the MDNR Fisheries Division could determine the ratio of stocked to wild salmon in the river system and evaluate the stocking program.

4. Restrictions on Dredging Activities

**Delisting
goal:**

In general, when contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.

In Manistique, when there are no restrictions on dredging to the authorized navigation channel depth, this beneficial use will be restored.

Objectives:

Eliminate restrictions on disposal of dredged material, using the U.S. EPA open water dredge spoil disposal criteria levels.

**Remedial
Actions:**

Remove contaminated sediment in the navigation channel by dredging. EPA Superfund program activity for remediation of PCB contaminated sediments in the Area of Concern will effectively address all contaminants that currently restrict dredging.

Schedule:

Dredging began in the fall of 1995 and is planned to be completed by the fall of 1997.

**Responsibility/
Funding:** None required.

**Monitoring/
Evaluation:** Monitoring of sediment deposition over the dredged area will be part of the monitoring program set up under the Superfund action in Manistique. Any future dredging by the U.S. Army Corps of Engineers will be preceded by sampling of the sediments to be removed to make sure they can be disposed of in open water.

5. Potential Restrictions on Body Contact (or beach closings)

**Delisting
goal:** In general, when waters, which are commonly used for total body or partial body contact recreation do not exceed standards, objectives, or guidelines for such use.

In Manistique, closing the one remaining combined sewer overflow will restore this beneficial use. There have been no beach closings due to this potential overflow, since there are no swimming beaches in the Area of Concern.

Objective: Elimination of the remaining combined sewer overflow.

**Remedial
Actions:** The National Pollution Discharge Elimination System regulatory authority is addressing this impaired use through the national pollution discharge elimination system permit that the city of Manistique wastewater treatment plant has with the MDEQ.

This remedial work is already mostly completed. The city sewer system has been improved and modified to close 2 of the 3 overflow pipes. Untreated sewage now goes into the Area of Concern only in rare, extreme run-off events. The remaining pipe will be closed as part of the program in place to finish sewer improvements. Complete details of the MDEQ-approved plan are available from the city or the MDEQ (see list of contacts in Appendix A). When final actions for closing the combined sewer overflow are in progress, potential restrictions on body contact will no longer be a beneficial use impairment.

Schedule: A study of flow in the sewer system related to the remaining combined sewer overflow pipe started in the summer of 1995. This 1 year study by the city will help determine the best alternatives for final closure. Dates for the final closure are negotiated as part of the city's

wastewater discharge permit referred to earlier.

**Responsibility/
Funding:**

Improvements to the city sewer system are paid for by users.

**Monitoring/
Evaluation:**

All work on the city sewer is subject to National Pollution Discharge Elimination System permit compliance monitoring.

Further Study

There are 2 beneficial use impairments that may need further study to determine extent of impairments, if any. These studies will not be needed if post-remediation monitoring programs document that PCBs are no longer available to the biota in Manistique and that fish populations are meeting management goals.

Potential Beneficial

Use Impairments: 1. Degraded fish and wildlife populations.

2. Bird or animal deformities or reproductive problems.

**Further
Studies:**

Sentinel resident wildlife in the Area of Concern may need to be sampled to determine incidence of deformities, reproductive problems or population problems due to contaminants in the Area of Concern.

Certain fish populations (such as lake sturgeon) may be impaired due to the loss of fish habitat. This does not require further study at Manistique right now, and will be addressed by actions taken for the loss of habitat.

**Research
Needs:**

MDNR Wildlife Division has suggested a sampling plan for the potential wildlife studies. The plan is based on collection and autopsy of resident mammals to determine if growth or reproductive abnormalities are present. PCB concentrations in tissue would be determined at the same time. The estimated cost of this sampling and analysis is \$12,000. No funding sources have been identified to date.

**Remedial
Action:**

Remediation of the PCBs in the river and harbor will lower potential PCB exposure of wildlife and directly address these 2 potential beneficial use impairments. There will be

no need for further study if remedial action on PCB contaminated sediments and on habitat restoration are successful, as evaluated by monitoring programs.

ECOSYSTEM CONSERVATION AND POLLUTION PREVENTION

Actions recommended or reported in this Remedial Action Plan Update will effectively restore the Manistique River Area of Concern ecosystem through restoration of beneficial uses and the meeting of use goals. However, pollution prevention and watershed conservation for the Manistique River should continue as an on-going collaboration between community groups and appropriate government agencies. Prevention of future pollution from both point sources and non-point sources will maintain water quality in the Manistique River and eliminate need for further remedial action and associated costs.

One example of an existing collaboration for conservation is the Manistique River Watershed Partnership, initiated a few years ago to work with river management issues in the watershed above the Area of Concern. The Partnership has been active in restoration of fish and wildlife habitat in the watershed through stream-bank stabilization actions. As the Area of Concern moves toward restoration of beneficial uses and de-listing, the Partnership will be extending the scope of its activity to the entire watershed and to include other actions in addition to stream-bank stabilization. For example, a master plan for the harbor area is under consideration. Efforts to put in place long-term funding for the work of the Partnership and the transition to Partnership leadership for conservation of the entire Manistique River watershed have been initiated.

A work-group of the Public Advisory Council has initiated planning for de-listing the Manistique River Area of Concern. The basis for their planning is the set of objectives for restoration of the beneficial use impairments. This group will be working with the state and federal governments to move forward in the de-listing process as remedial actions are completed in the Manistique River and monitoring results indicate that problems have been solved.

Chronology for Area of Concern Actions

Winter, 1996

Continuation of 1 year combined sewer overflow monitoring study

Spring, 1996

Continuation of dredging in the North Bay area

Continuation of 1 year combined sewer overflow monitoring study

Summer, 1996

Continuation of dredging in North Bay area

Completion of combined sewer overflow monitoring

Fall, 1996

Completion of dredging in the North Bay Area

Completion of dam safety permit and plans for dam and flume

Spring, 1997

Initiation of dredging for navigation channel and harbor

Initiation of work on dam and flume

Continuation of work on final combined sewer overflow closure

Summer, 1997

Continuation of dredging in harbor and navigation channel

Continuation of work on dam and flume

Completion of work on combined sewer overflow

Fall, 1997

Completion of dredging

Initiation of monitoring program for PCB remediation

Completion of work on dam and flume

Winter-Summer, 1998

Continuation of PCB monitoring program

Fall, 1998

Evaluation of PCB monitoring results

Winter, 1999

Delisting the Area of Concern

LITERATURE CITED

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- Manistique Papers, Inc., et.al., 1994. Manistique river and harbor: comments for the administrative record file. Manistique Papers, Inc. and Edison Sault Electric Company, Manistique, MI 49854. Sections 1-10.

SELECTED LIST OF REFERENCE LIBRARY MATERIALS

Manistique Public Library

Engineering Evaluation/Cost Analysis, June, 1994

Streamlined Human Health Risk Assessment for Manistique Harbor, June, 1994

Accelerated Qualitative Ecological Risk Assessment for Manistique Harbor, April, 1994

1987 Remedial Action Plan, October, 1987

National Pollution Discharge Elimination System Permits for Manistique Papers, Inc. and the Manistique Waste-Water Treatment Plant

Great Lakes Water Quality Agreement, as amended, November, 1987

U.S. EPA Administrative Record File Materials 1993-present

U.S. EPA Dredge Spoil Disposal Criteria, 1977

List of Appendices

- A: Contacts: Pages 35-38
- B: Community survey results: Pages 39
- C: Chronology of Remedial Action Plan Update development: Pages 40-41
- D: Maps

Appendix A: Contacts

State Programs

Michigan Department of Environmental Quality

**Environmental Assistance Division: information about
all MDEQ Environmental programs**

800-662-9278
517-335-4729 FAX

Fish Contaminant Monitoring Program

Contact: Bob Day
Michigan DEQ
Surface Water Quality Division
P.O. Box 30273
Lansing, MI 48909
517-335-3314
517-373-9958 FAX

Land and Water Management Programs and Permits

Contact: Craig Outwater
Michigan DEQ
Land and Water Management Division
RR #4, Box 796
Newberry, Michigan 49868
(906) 293-5131
(906) 293-8728 FAX

Remedial Action Plan Program

Contact: Roger Eberhardt
Michigan DEQ
Surface Water Quality Division
2nd Floor Knapp's Building
300 S. Washington
P.O. Box 30273
Lansing, Michigan 48909
(517) 335-1119
(517) 373-9958 FAX

National Pollution Discharge Elimination System Permits

Contact: Jack Rydquist
Michigan DEQ
Surface Water Quality Division
1990 U.S. 41 South
Marquette, Michigan 49855
(906) 228-6561
(906) 228-5245 FAX

Waste Management Programs

Contact: Rob Schmeling
Michigan DEQ
Waste Management Division
1990 U.S. 41 South
Marquette, Michigan 49855
(906) 228-6561
(906) 228-5245 FAX

Part 201 (former Act 307) Contaminated Site Programs

Contact: Scott Schaefer
Michigan DEQ
Environmental Response Division
RR #4, Box 796
Newberry, Michigan 49868
(906) 293-5131
(906) 293-8728 FAX

Michigan Department of Natural Resources

Wildlife Management Programs/Natural Features Inventory

Contact: Ray Perez
Michigan DNR
Wildlife Division
RR #4, Box 796
Newberry, Michigan 49868
(906) 293-5131
(906) 293-8728 FAX

Fisheries Management Programs

Contact: Steve Scott
Michigan DNR
Fisheries Division
RR #4, Box 796
Newberry, Michigan 49868
(906) 293-5131
(906) 293-8728 FAX

Michigan Department of Public Health Programs

Contact: John Hesse
Michigan Dept. of Public Health
Health Risk Division
P.O. Box 30195
Lansing, Michigan 48909
(517) 335-8353
(517) 335-9434 FAX

Federal Programs

U.S. Fish and Wildlife Service

Sea Lamprey Control Programs

**Contact: Terry Morse
U.S. Fish and Wildlife Service
1924 Industrial Parkway
Marquette, MI 49855
906-226-6571
906-226-3632 FAX**

U.S. Environment Protection Agency Programs

Superfund Program

**Contact: Jim Hahnenberg
U.S.E.P.A. Region V
77 West Jackson
Chicago, Illinois 60604
(312) 353-4213
(312) 353-5541 FAX**

U. S. Army Corps of Engineers

Operations and Maintenance Programs

**Contact: Bob Erwin
U.S. Army Corps of Engineers
Detroit District
P.O. Box 1027
Detroit, MI 48231
313-226-6863**

Local Programs

**Manistique Public Library
Manistique High School
Cedar St.
Manistique, MI 48954
906-341-8194**

City of Manistique

**Contact: Al Housler, City Manager
City Hall
300 N. Maple Ave.
Manistique, MI 49854
906-341-2290**

Schoolcraft Co. Economic Development Corp.

**Contact: James Anderson, III
Schoolcraft Co. Economic Development Corp.
131 1/2 Cedar St.
Manistique, MI 49854
906-341-5126**

LMAS District Health Department Programs

**Contact: Mark McCune
LMAS District Health Dept.
P.O. Box 247
Manistique, MI 49854
906-341-4112
906-341-5979 FAX**

Manistique River Watershed Partnership

**Contact: Bob Panek
Manistique River Watershed Partnership
RR #1 Box 1743
Manistique, Michigan 49854
(906) 341-6447**

Central Upper Peninsula Planning and Development Commission

**Contact: Peter VanSteen
C.U.P.P.A.D.
2415 14th Avenue South
Escanaba, Michigan 49829
(906) 786-9234**

Manistique Sportfishing Association

**Contact: Bill Rogers
Manistique Sportfishing Association
RR #1 Box 1305-A
Manistique, Michigan 49854
(906) 341-5130**

Harbor Advisory Committee

**Contact: Meg Wnuk
Harbor Advisory Committee
118 S. 2nd St.
Manistique, Michigan 49854
(906) 341-2636**

Schoolcraft Soil Conservation District

**Contact: Roger Quist
Schoolcraft Soil Conservation District
Schoolcraft County Courthouse
Manistique, Michigan 49854
906-341-8215**

Appendix B: Survey Results

Survey Question # 4. Community Survey Results: Winter, 1994

Problem Name	No Problem	Minor Problem	Major Problem	Total Score	Rank
sawdust	17	25	29	83	3
sewage	24	26	16	58	7
PCBs	12	19	32	83	1
fish contamination	12	23	28	79	4
shoreline access	32	25	12	49	9
fish taste	25	19	11	41	14
game fish stocking	23	20	12	44	13
fish abnormalities	24	24	11	46	11
water odor	20	27	15	57	8
cleanliness of water for swimming	13	19	32	83	2
algae growth	19	27	10	47	10
snags on river bottom	8	23	26	75	5
fish cleaning waste	24	25	10	45	12
scenic views	43	29	4	37	16
fish habitat quantity	25	23	8	39	15
paper mill waste	20	29	22	73	6
seasonal water levels	35	22	5	32	17
depth of harbor boat channel	35	15	6	27	18

Ranking

Rank was determined by assigning a score of 0 to the "no problem" category, a score of 1 to the "minor problem" category, and a score of 2 to the "major problem" category. The number of responses in each category was then multiplied by the assigned score. A total for each problem was determined by adding both of the "minor problem" and "major problem" category scores. Ties in total scores were broken by examining the number of responses in the no problem, minor problem, and major problems categories.

Number of Respondents = 79

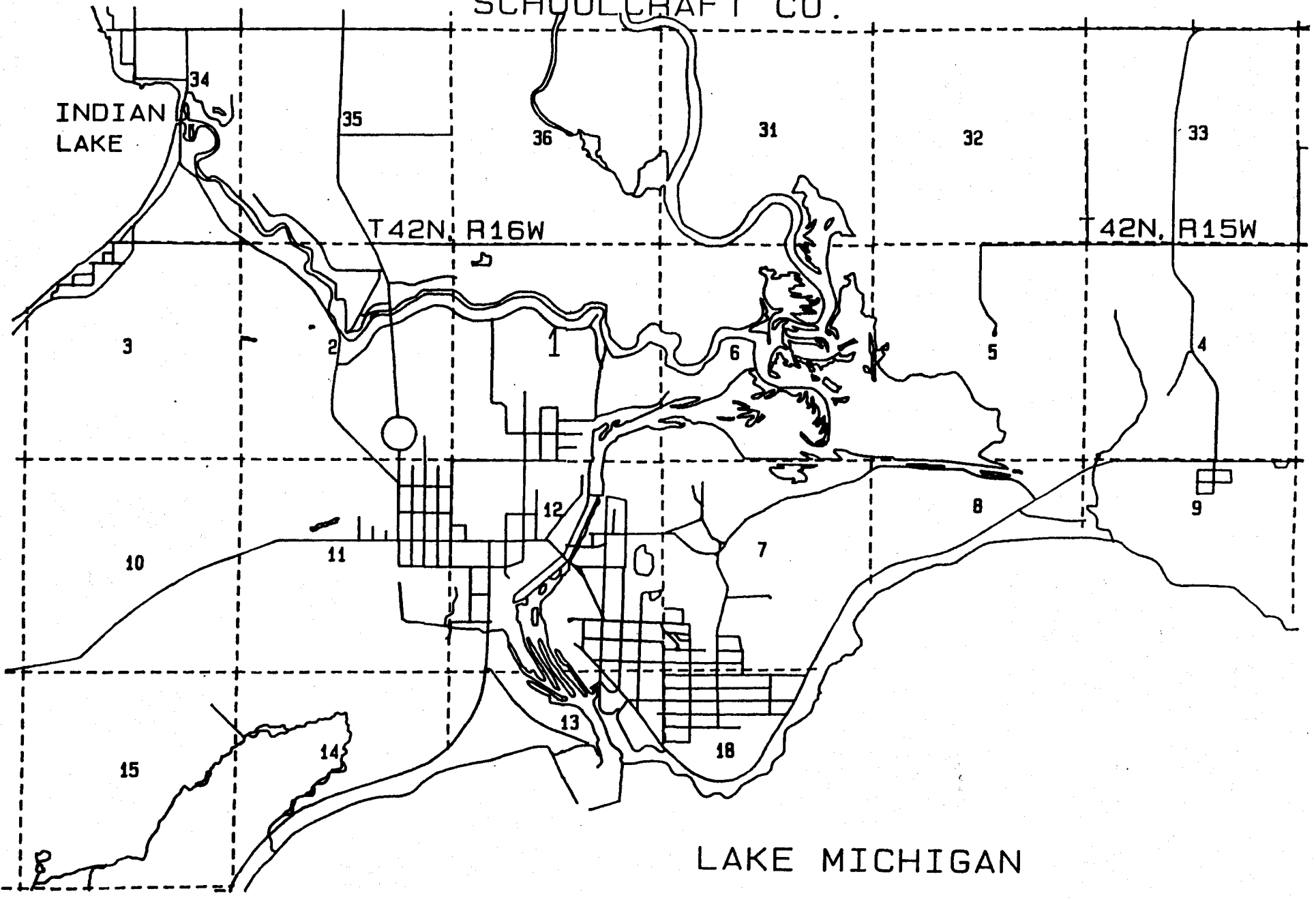
Appendix C: Chronology of RAP Document Development

Manistique River Area of Concern Record of Remedial Action Plan Update Development April, 1993 to March, 1996

- Apr, 1993 Public meeting in Manistique about AOC and initiation of development on updated Remedial Action Plan
- Jul, 1993 First organizational meeting of newly formed Public Advisory Council and agency representatives
- Aug, 1993 Public Advisory Council and agency representatives meeting about results of June, 1993 PCB sampling in the river and harbor
- Sep, 1993 Public Advisory Council meeting to discuss organization and development of community survey for input to the Remedial Action Plan
- Jan, 1994 Community survey on beneficial use impairments distributed by mail to a random sample of Manistique residents
- Feb, 1994 Public Advisory Council meeting to elect officers and discuss Public Advisory Council goals
- Mar, 1994 Public Advisory Council meeting to discuss Public Advisory Council mission statement and results of community survey
- Apr, 1994 Public Advisory Council meeting to discuss community survey results and preliminary determination of beneficial use impairments. Beneficial use impairment chart distributed to agency representatives for comment
- Aug, 1994 Public Advisory Council meeting to discuss EPA's proposed Response Action Recommendation
- Sep, 1994 Public Advisory Council and agency representatives meeting with EPA representatives and Potentially Responsible Party representatives on proposed PCB remediation. Public Advisory Council responds in writing to EPA proposal.
- Oct, 1994 Remedial Action Plan goals and objectives completed. Remedial Action Plan Update outline completed and distributed for comments to Public Advisory Council and agency representatives
- Nov, 1994 First discussion draft of the Remedial Action Plan Update completed and distributed to the Public Advisory Council
- Dec, 1994 First complete draft of the Remedial Action Plan Update finished and distributed to the Public Advisory Council and key DNR staff
- Jan, 1995 Public Advisory Council meeting to discuss draft Remedial Action Plan Update
- Mar, 1995 Remedial Action Plan Update revised and sent to Public Advisory Council and agency representatives for comments. Combined Public Advisory Council and agency representatives meeting for discussion of comments.

- Apr, 1995 Revised draft of the Remedial Action Plan Update prepared and put on hold pending the outcome of PCB remediation discussions
- May-
Oct, 1995 Seven Public Advisory Council meetings for discussions and presentations about PCB remediation with consultants, EPA, and Interagency Review Team.
- Dec. 1995 Draft Remedial Action Plan revised based on agreements reached for PCB remediation
- Jan. 1996 Revised draft Remedial Action Plan distributed to the Public Advisory Council and agency representatives for comment. Public Advisory Council meeting for discussion of revisions.
- Mar. 1996 Final revision of Remedial Action Plan based on final EPA determination for PCB remediation and comments on January draft.
- Jan. 1997 Remedial Action Plan Update distributed to the community at a public meeting and sent to the MDEQ Office of the Great Lakes for forwarding to the International Joint Commission.

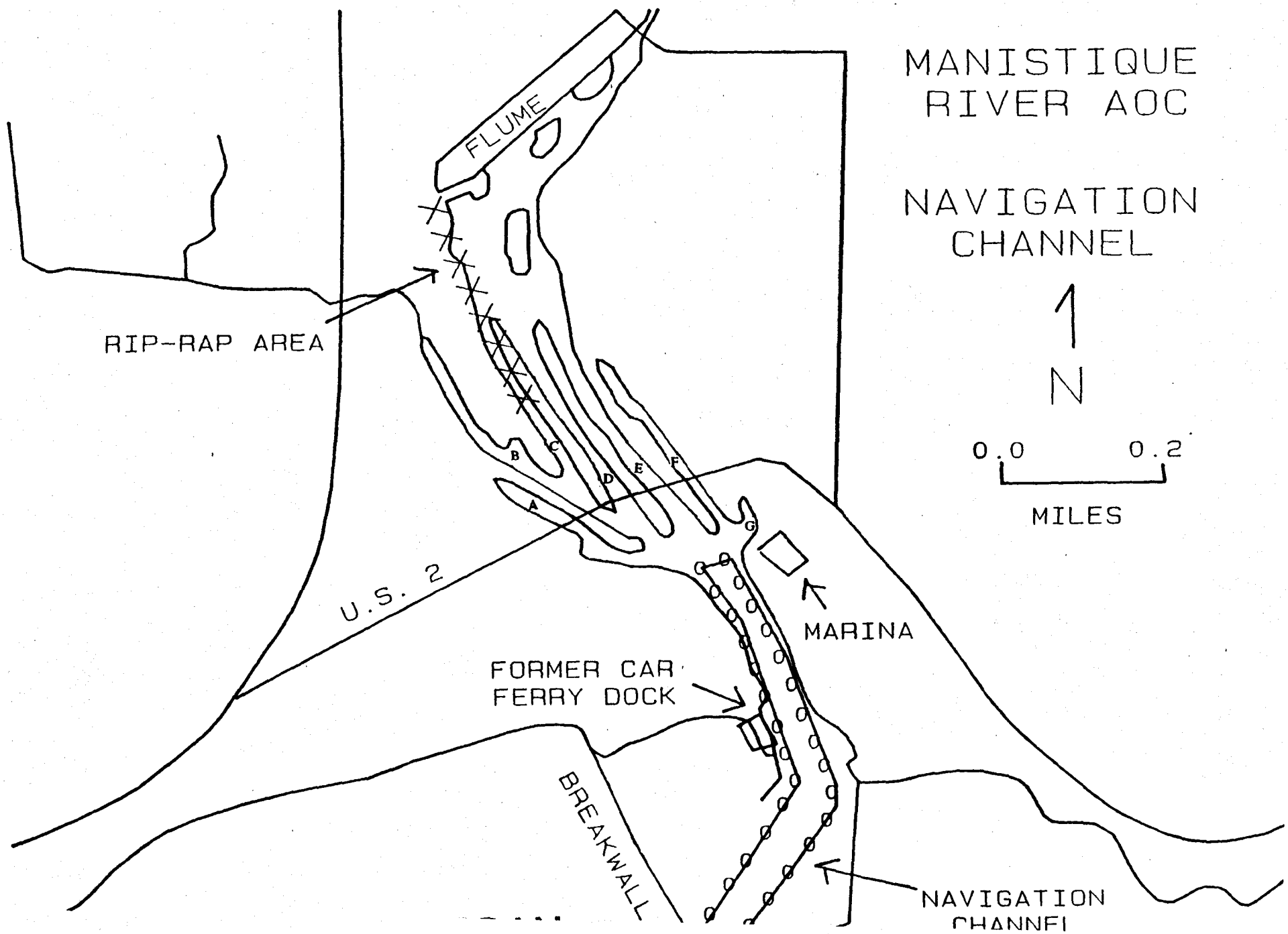
MANISTIQUE, MICHIGAN
SCHOOLCRAFT CO.



LAKE MICHIGAN

MANISTIQUE RIVER AOC

NAVIGATION CHANNEL



RIP-RAP AREA

FLUME

U.S. 2

FORMER CAR FERRY DOCK

BREAKWALL

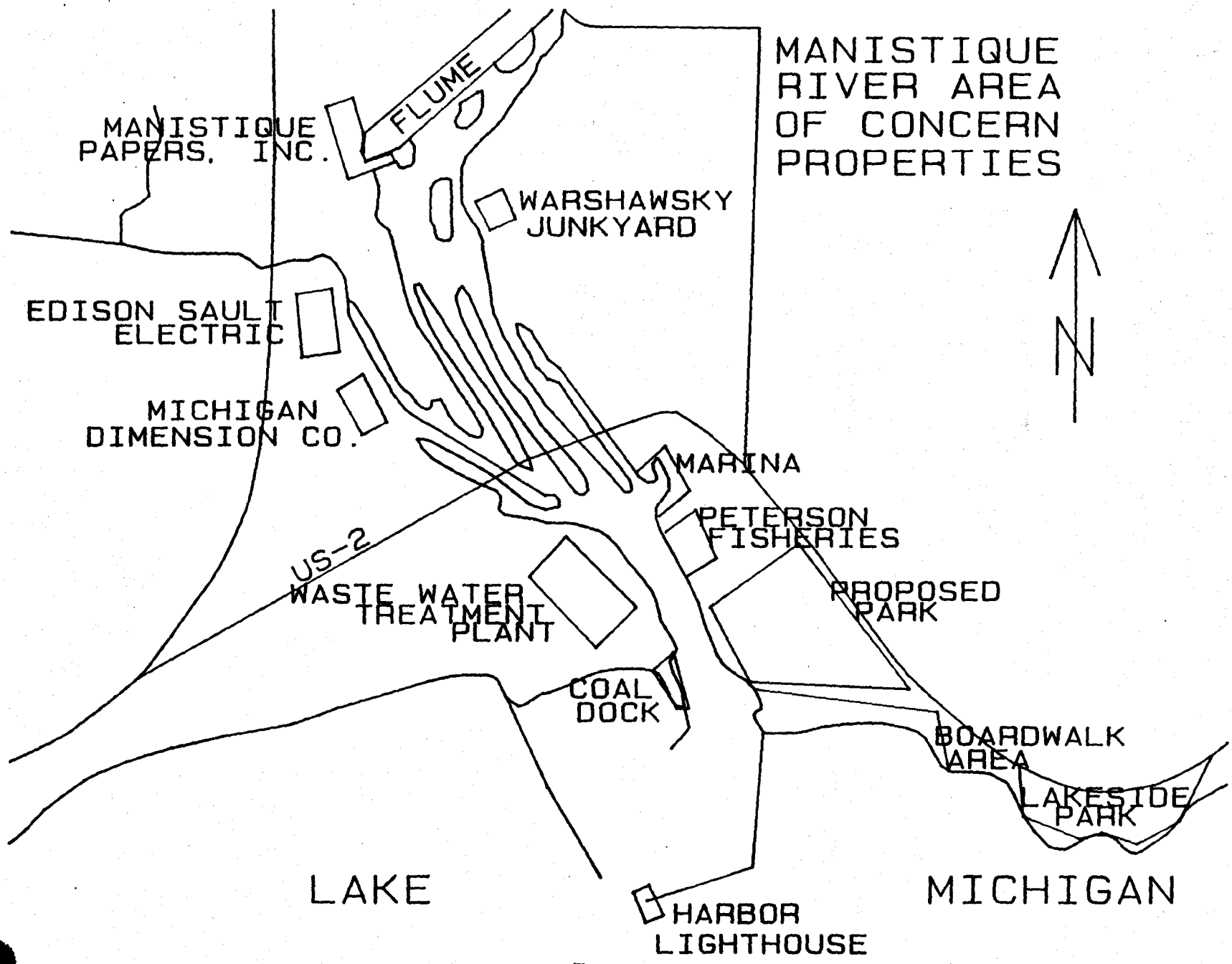
MARINA

NAVIGATION CHANNEL

B C D E F

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MANISTIQUE
PAPERS, INC.

FLUME

MANISTIQUE
RIVER AREA
OF CONCERN
PROPERTIES

WARSHAWSKY
JUNKYARD

EDISON SAULT
ELECTRIC

MICHIGAN
DIMENSION CO.

MARINA

PETERSON
FISHERIES

US-2
WASTE WATER
TREATMENT
PLANT

PROPOSED
PARK

COAL
DOCK

BOARDWALK
AREA

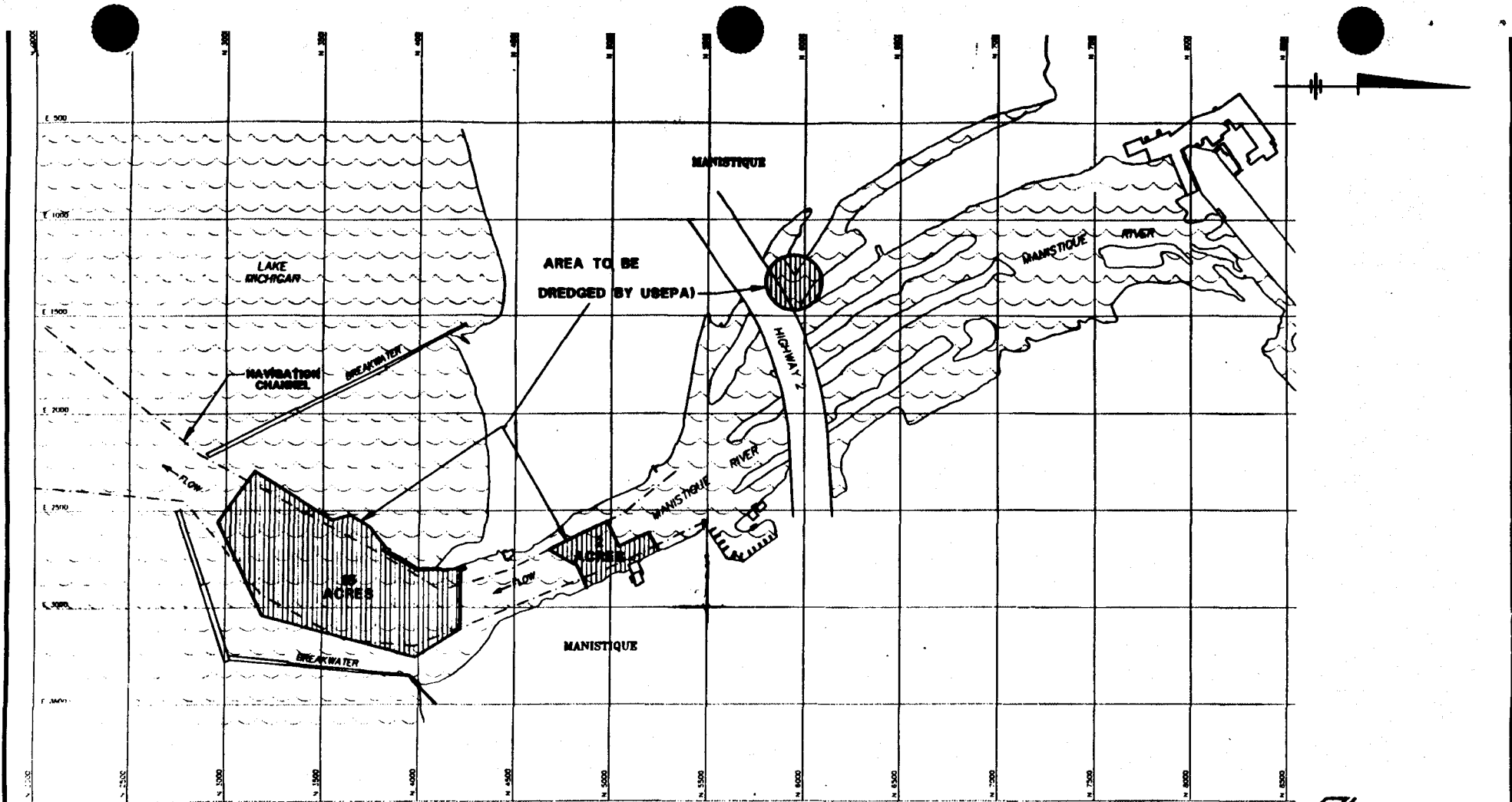
LAKESIDE
PARK

LAKE

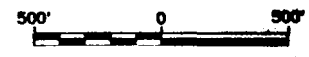
HARBOR
LIGHTHOUSE

MICHIGAN





L. CH - C. DT - AREA - ALL. RT
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B/L

BLASLAND, BOUCK & LEE, INC.
 ENGINEERS & SCIENTISTS

MANISTIQUE RIVER/HARBOR
 RESPONSE ACTION WORK PLAN

**LOCATION OF
 USEPA DREDGING AREA**