

Moving Mud

Remediating Great Lakes Contaminated Sediments



**A Report on the Sediment Assessment and Remediation Program
in the Great Lakes Basin**



Great Lakes National Program Office

April 1997

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A Report on the Sediment Assessment and Remediation Program in the Great Lakes Basin

by

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ACKNOWLEDGEMENTS

I would like to thank Environmental Scientists *Callie Bolattino* and *Marc Tuchman* of the GLNPO Sediment Assessment and Remediation team for the valuable comments, suggestions, and encouragement that they offered throughout the project. I would like to recognize the *Grantees* for their creativity and hard work which provided the basis for this report, and for their interest and critical reviews during the project. Thanks also go to GLNPO Technical Assistance and Analysis Branch Chief *David Cowgill* and Computer Specialist *Darlene Funches* for their suggestions and help in assembling the final product.

INTRODUCTION

From 1993 through 1996, the Great Lakes National Program Office (GLNPO) of the U.S. Environmental Protection Agency (USEPA) awarded \$5,272,711 in grants for 34 projects to 14 State, Tribal, and Federal agencies and educational institutions to address contaminated sediments throughout the Great Lakes.

The sediment grants program provides funding, technical support, and vessel support to assist contaminated sediment work in priority geographic areas, known as Areas of Concern (AOCs), in the Great Lakes. The 31 AOCs on the U.S. side of the basin are locations where beneficial uses are impaired for any one of 14 designated criteria. To address these beneficial use impairments, each AOC developed a Remedial Action Plan (RAP). All RAPs written to date have identified contaminated bottom sediments as a significant problem that must be addressed to attain beneficial uses. GLNPO's emphasis and ultimate objective is to foster the remediation of contaminated sediments at these AOCs. The grants program was developed with the intention of continuing the efforts of the Assessment and Remediation of Contaminated Sediments (ARCS) Program, which was administered by GLNPO from 1987 to 1993.

This document is a synopsis of GLNPO's sediment grants program. The focus is on the 34 projects that have been initiated since fiscal year 1993. Included is a tabulation of grant recipients and monetary distribution, a summary of each of the projects, and a look ahead to the future of sediment assessment and remediation in the Great Lakes.

In part because of the 34 projects, significant progress has been made towards the restoration of clean sediments in the Great Lakes:

- Much more is known about the nature and extent of the sediment contamination at many AOC's, setting the stage for future actions, including mass balance modeling and remediation.
- New assessment technologies, such as hydroacoustic profiling, are being researched.
- Remedial treatment technologies are being evaluated.
- With the support of our FY 1996 remediation demonstration grants, full-scale remediations are being designed and demonstrated.

Section II - Background Information

- Strong community partnerships between government, private industry, and citizens groups are being formed to plan for and carry out remediation actions.
- Actual remediation, or 'moving mud' - which in this document is used to refer to several options, including dredging and capping - will soon be a reality at many Areas of Concern.

GLNPO's Sediment Assessment and Remediation Team has created this document as a yardstick, to measure not only where we have been, but how far we have to go. We congratulate our grantees for the ingenuity and dedication that they have exhibited. We hope that this document not only highlights the great work taking place right now, but serves as a catalyst for new and fresh ideas and a renewed effort to restore clean sediments, one of the building blocks of a healthy and vibrant Great Lakes ecosystem.

BACKGROUND

Contaminated sediments first began to be noticed as a serious environmental problem in the early 1970's. Increases in the concentrations of the pesticide DDT and a group of chemicals known as polychlorinated biphenyls (PCBs) were noticed in the tissues of Great Lakes fish. Although these chemicals had been banned for several years, concentrations in the tissues of fish and other animals were actually beginning to increase. While some of the increase was found to be from airborne contaminants, research also directed attention to the role of contaminated sediments.

Contaminated sediments have been created by decades of industrial and municipal discharges, combined sewer overflows, and urban and agricultural non-point source runoff. Buried contaminants posing serious human and ecological health concerns can be resuspended by storms, ship propellers, and bottom-dwelling organisms. Many of these small bottom-dwellers ingest toxins as they feed in the mud. As larger animals eat these smaller animals, the toxins move up the food chain, their concentrations getting higher, often thousands of times higher. Fish at the top of the Great Lakes food chain such as lake trout and salmon can be considered unsafe to eat in some areas because of the heavy concentrations of toxic substances in their tissues. Fish-eating birds, including the bald eagle, may suffer low reproductive rates or produce offspring with birth defects.

Scientific research has confirmed the significance of bottom sediments as an ongoing source of contaminants to the Great Lakes. A study of PCBs in Green Bay found that greater than 90 percent of the ongoing PCB contamination

in Green Bay sport fish came from contaminated bottom sediments, both within the bay and in the Fox River. Monitoring of Lake Superior during the past decade suggests a similar conclusion - that the release of PCBs from the bottom sediments is the dominating source of food web contamination (USEPA, 1994).

This link between contaminated sediments and water quality provides the basis for the GLNPO sediment program. The *Federal Water Pollution Control Act Amendments of 1972* declare as a national goal that all waters of the United States be made clean enough for fishing and swimming. The *Clean Water Act of 1977* seeks to secure "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and out of the water." The *1978 Great Lakes Water Quality Agreement* has specific relevance to GLNPO's mission. The purpose of the *Agreement* is to "restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes basin ecosystem." This charges the USEPA, and GLNPO in particular, with the responsibility to ensure protection and restoration of Great Lakes habitats.

Although contaminated sediments were recognized as a serious environmental threat at the time that these laws and documents were being drafted, the information necessary to successfully address the problem did not exist. In an attempt to focus efforts on the issue of contaminated sediments, Congress, in the 1987 amendments to the Clean Water Act, authorized GLNPO to coordinate and conduct a five-year study and demonstration project relating to the appropriate treatment of toxic pollutants in bottom sediments. To fulfill the requirements of this Congressional mandate, GLNPO initiated the Assessment and Remediation of Contaminated Sediments (ARCS) Program. ARCS was an integrated program for the development and testing of remedial action alternatives for contaminated sediments.

The ARCS Program had the following objectives:

- Assess the nature and extent of bottom sediment contamination at selected Great Lakes AOCs;
- Demonstrate and evaluate the effectiveness of selected remedial options; and,
- Provide guidance on contaminated sediment problems and remedial alternatives in the AOCs and other locations in the Great Lakes.

Section II - Background Information

The efforts of many researchers were directed toward developing and demonstrating sediment assessment and cleanup approaches that were scientifically sound, and technologically and economically feasible.

Major findings and recommendations of the ARCS Program included the following:

- Use of an integrated sediment assessment approach, incorporating chemical analyses, toxicity testing, and benthic community surveys, is essential to define the magnitude and extent of sediment contamination at a site;
- Risk assessment and modeling activities are valuable techniques for evaluating the impacts of contaminated sediments;
- Numerous treatment technologies are effective in removing or destroying sediment contaminants; and,
- Broad public outreach and education are critical in any sediment assessment and remediation study.

The information gained and tools developed during the ARCS Program for assessing sediment contamination and for making remediation decisions are included in a series of 45 documents that are available from GLNPO. A complete listing and full text or abridged versions of these documents can be found on GLNPO's World Wide Web homepage, <http://www.epa.gov/glnpo/>. To obtain a hard copy of one or more of the ARCS documents, please contact:

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Great Lakes National Program Office
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*Phone 312-886-7474
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The information contained in these documents is now being applied to projects addressing contaminated sediment problems in Areas of Concern across the Great Lakes.

PRESENT PROGRAM

The U.S. Environmental Protection Agency's commitment to cleaning up contaminated sediments remains strong. Region 5's Agenda for Action lists contaminated sediments as one of six priorities for FY 1996 and 1997. In order to focus on the problem and to continue the work begun under the ARCS Program, GLNPO established the Sediment Assessment and Remediation Team in 1994. The mission of the Team is to reduce and prevent the impacts of contaminated sediments on the Great Lakes ecosystem.

The Team's goals include the following:

- 1) Perform and provide support for sediment assessments throughout the Great Lakes.
- 2) Provide support for sediment-based mass balance modeling activities.
- 3) Provide support for sediment-based risk assessments.
- 4) Provide technical support toward the selection and implementation of remedial alternatives.
- 5) Foster partnerships among Great Lakes stakeholders to promote sediment clean-up activities.
- 6) Have an active involvement in the setting of policy and direction for the Great Lakes contaminated sediment program.

In order to accomplish these goals, the Team works cooperatively with States, EPA Regions and other Federal agencies to help address contaminated sediment problems around the Great Lakes basin. We actively coordinate with the Region 5 Sediment Team and RAP and LaMP activities to ensure resources are brought to bear on the most pressing contaminated sediment problems.

We have also created a GLNPO Sediment Database, which will contain all of the sediment chemistry, toxicity, and benthos data generated as part of GLNPO-funded projects. The database, built in Microsoft Excel, employs a standard data reporting format for both field and laboratory data. This information will be available for dissemination to anyone interested.

One of the major resources that GLNPO provides is the services of the R/V *Mudpuppy*. The *Mudpuppy* is a 32-foot flat-bottom boat specifically designed for sediment sampling in shallow rivers and harbors. First used

For more info
on the
R/V *Mudpuppy*

check out
GLNPO's homepage:

<http://www.epa.gov/glnpo/>

during the ARCS Program, the *Mudpuppy* is now available to grantees for use during their projects, and to date has been used to perform sediment assessments at 19 Great Lakes locations (Figure 1).

Figure 1. Locations of R/V *Mudpuppy* sediment assessments



The sediment grants program is a major tool used by GLNPO to address contaminated sediments. From 1993 through 1996, the Sediment Assessment and Remediation Team provided \$5,272,711 in grants and Interagency Agreements for 34 projects to 14 State, Tribal, and Federal agencies and universities to assess and remediate contaminated sediments throughout the Great Lakes. Helping to bridge the gap between assessment and remediation, our FY 1996 funding included a specific focus on remediation demonstration grants.

New projects are solicited each year when GLNPO issues to the Great Lakes community a Funding Guidance document which includes a request for preproposals. Contaminated sediments is one of the program areas that is targeted for financial support. Award criteria for sediment grants vary from year to year based on discussions with partners, results of previously-funded activities, and a desire to encourage innovative ideas. As site work progresses and assessments are completed, many AOCs are nearing the remediation phase. In keeping with this, current priorities for potential sediment projects can be considered in the following order: (1) on-the-ground cleanup, (2) remedial design, and (3) field work and assessment.

Evaluations also consider:

- support from the local RAP committee;
- availability of other funds to support the work; and,
- likelihood that remedial measures, including enforcement, will result.

OVERVIEW OF SEDIMENT PROJECTS, FISCAL YEARS 1993 - 1996

Key information is provided here about the projects undertaken in the last four years. Summaries of the 34 projects are contained in an appendix, in which the projects are numbered in an alphabetical order based on their location and/or project title. Each summary contains several information categories, which are described and tabulated here. Further inquiries about particular projects can be directly addressed to either the grantee contact or the GLNPO project officer.

Table 1 contains project information for FY 1995, the last year of full funding. Table 1 shows the number of preproposals received and dollars requested.

TABLE 1. PREPROPOSALS, BY REQUESTING ORGANIZATION, RECEIVED BY GLNPO FOR CONTAMINATED SEDIMENTS PROJECTS IN FY 1995.

<u>Federal Agency</u>		<u>State Agency</u>		<u>Tribe</u>		<u>Local</u>	
NBS	3	IL	2	Fond du Lac	1	University	8
USFWS	1	MI	4			NGO	2
		MN	2				
		NY	5				
		OH	2				
		WI	5				
4		20		1		10	

Total number of preproposals: 35

Total dollars requested: \$4,714,171

NBS = National Biological Service (now part of the U.S. Geological Survey)

USFWS = United States Fish and Wildlife Service

Section IV - Overview of Sediment Projects, Fiscal Years 1993 - 1996

Table 2, which also contains information from FY 1995, shows the number of projects actually funded and dollars awarded.

TABLE 2. CONTAMINATED SEDIMENTS PROJECTS (BY GRANTEE) FUNDED BY GLNPO IN FY 1995							
<u>Federal Agency</u>		<u>State Agency</u>		<u>Tribe</u>		<u>Local</u>	
NBS	1*	IL	1*	Fond du Lac	1	University	3
USACE	4**	MI	1				
		MN	1				
		NY	1				
		OH	1				
		WI	2				
5		7			1		3

* = NBS and IL funded for same project; counted only once in Total number of projects

** = Three projects funded to USACE to support work requested by MDEQ; fourth project filled a research gap left by the ARCS Program.

Total number of projects funded: 15

Total dollars awarded: \$1,985,820

NBS = National Biological Service (now part of the U.S. Geological Survey)

USACE = United States Army Corps of Engineers

MDEQ = Michigan Department of Environmental Quality

Table 3 gives the number of new projects and total dollar amounts allocated for each of the four years (FY 1993-1996) of the GLNPO sediment grants program. The relatively low number of new projects in FY 1996 reflects the specific focus on remediation demonstration grants which have a higher dollar amount per project.

TABLE 3. NUMBER OF NEW PROJECTS AND TOTAL DOLLAR AMOUNTS FOR GLNPO CONTAMINATED SEDIMENTS FUNDING ASSISTANCE, FY 1993-1996.		
	New Projects	Total Dollars
1993	5	\$797,800
1994	10	\$1,470,991
1995	15	\$1,985,820
1996	4	\$1,018,100
	34	\$5,272,711

Section IV - Overview of Sediment Projects, Fiscal Years 1993 - 1996

Grantee

Table 4 lists all grantees receiving FY 1993-1996 GLNPO sediment funding.

**TABLE 4. AGENCIES AND ORGANIZATIONS RECEIVING FY 1993-1996
GRANT ASSISTANCE DOLLARS FROM GLNPO (13 TOTAL)**

Fond du Lac Tribe
 Illinois Environmental Protection Agency
 Michigan Department of Environmental Quality
 Michigan State University
 Minnesota Pollution Control Agency
 National Biological Service (now part of the U.S. Geological Survey)
 National Oceanic and Atmospheric Administration
 New York State Department of Environmental Conservation
 Ohio Environmental Protection Agency
 U.S. Army Corps of Engineers
 University of Michigan
 University of Minnesota-Duluth
 University of Wisconsin
 Wisconsin Department of Natural Resources

Table 5 displays the distribution of the 34 projects among the 14 recipients.

**TABLE 5. CONTAMINATED SEDIMENTS PROJECTS (BY GRANTEE) FUNDED BY
GLNPO DURING FY 1993-1996**

<u>Federal Agency</u>		<u>State Agency</u>		<u>Tribe</u>		<u>Local</u>	
NBS	1*	IL	1*	Fond du Lac	2	Michigan St. Univ.	1
NOAA	1	MI	2			U. of Michigan	1
USACE	8	MN	3			U. of Minnesota-Duluth	1
		NY	4			U. of Wisconsin-Madison	1
		OH	3				
		WI	6				
10		19		2		4	

* = NBS and IL funded for same project; counted only once in Total number of projects

Total number of projects funded: 34

Total dollars awarded: \$5,272,711

NBS = National Biological Service (now part of the U.S. Geological Survey)

NOAA = National Atmospheric and Oceanic Administration

USACE = United States Army Corps of Engineers

Section IV - Overview of Sediment Projects, Fiscal Years 1993 - 1996

Award Amount

Table 6 shows the dollar distribution among grantees for FY 1993-1996. Award amounts ranged from \$61,463 - \$500,000; the average award amount was \$155,000. Grantees are required to provide a 5% match; any dollars leveraged above 5% are noted in the project summary.

TABLE 6. GLNPO ASSISTANCE DOLLARS (BY GRANTEE) ALLOCATED FOR CONTAMINATED SEDIMENTS PROJECTS DURING FY 1993-1996

<u>Federal Agency</u>		<u>State Agency</u>		<u>Tribe</u>		<u>Local</u>	
NBS	\$ 40,000	IL	\$100,000	Fond du Lac	\$270,000	Michigan St. Univ.	\$ 96,000
NOAA	\$148,100	MI	\$325,000			U. of Michigan	\$101,353
USACE	\$873,000	MN	\$733,000			U. of Minn.-Duluth	\$ 92,000
		NY	\$641,725			U. of Wisc.-Madison	\$ 61,463
		OH	\$860,000				
		WI	\$931,070				
\$1,061,100		\$3,590,795		\$270,000		\$350,816	
20%		68%		5%		7%	

Total number of projects funded: 34

Total dollars awarded: \$5,272,711

NBS = National Biological Service (now part of the U.S. Geological Survey)

NOAA = National Atmospheric and Oceanic Administration

USACE = United States Army Corps of Engineers

Table 7 shows the distribution of projects and dollar amounts by Great Lakes Basin.

TABLE 7. GLNPO-FUNDED CONTAMINATED SEDIMENTS PROJECTS AND DOLLARS BY GREAT LAKE BASIN DURING FY 1993-1996

<u>Lake Basin</u>	<u># of Projects</u>	<u>Total Dollars</u>
Ontario	5	\$703,188
Erie	12	\$2,096,767
Huron	3	\$219,816
Michigan	10	\$1,124,029
Superior	8	\$1,374,763

Note: Projects involving more than one lake basin are included for as many lake basins as applicable.

Project Timetable

The average project length is two years. For field projects, the first requirement of the project is creation of a quality assurance project plan (QAPP), which describes in detail the sampling design and laboratory analysis methods. This plan must be approved by sediment and quality assurance personnel from GLNPO. Aside from development of the QAPP, project activities generally include execution of the scope of work (e.g., the actual assessment or remediation), compilation of any data results, and production of a final report.

Project Location

Most contaminated sediments projects are local in scope, focusing on a harbor or stretch of river. This is true for 33 of the 34 projects discussed in this document. The exception, project #4, has a Great Lakes Basin-wide scope.

Partners

Many projects involve agencies or groups which act as partners to the grantee by providing technical advice or assisting with activities such as field sampling and data analysis. Table 8 provides a list of these partners.

TABLE 8. CONTAMINATED SEDIMENTS PROJECT PARTNERS, FY 1993-1996

Ashtabula River Partnership	Rensselaer Polytechnic Institute
City of Toledo	Sediment Contamination Workgroup of the St. Louis River RAP
Clinton River PAC	University of Minnesota-Duluth
Fox River Coalition	University of Wisconsin Department of Civil and
Gencorp, Inc.	Environmental Engineering
Grand Valley State University	University of Wisconsin Sea Grant
Great Lakes Protection Fund	University of Wisconsin-Superior
Heidelberg College	U.S. Army Corps of Engineers, Detroit District
Maumee RAP Group/Team	USEPA Region 5
Michigan Department of Environmental Quality	White Lake PAC
Ohio Environmental Protection Agency	Wisconsin Department of Natural Resources

Narrative

Each summary contains a brief descriptive section which provides background information, highlights the purpose of the project, and often states the project goals and objectives.

Table 9 shows the projects, represented by project #, grouped into five categories based on the type of work performed. Because sediment contamination at many AOCs was uncharacterized when the funding program started, the first few years have been dominated by assessment projects. Beginning in FY 1996 with the addition of the two remediation projects, we expect the ratio of assessment:remediation projects to continue to decrease in the coming years as AOCs are characterized and actions move toward remediation.

**TABLE 9 - CONTAMINATED SEDIMENT PROJECTS (REPRESENTED BY PROJECT #),
GROUPED BY CATEGORY. REFER TO APPENDIX FOR PROJECT NAME AND NARRATIVE**

Assessment	2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 27, 28, 31, 32, 33, 34
Bench Scale/ Treatability and Feasibility	29
Data Management	23
Remediation	1, 22
Technical Research, Remedial Design, or Development	4, 8, 11, 26, 30

Data Results

Twenty-five of the thirty-four projects include field sampling in their scope of work. For these 25 projects, a synopsis of the current state of the data results is provided. When the data results have been finalized, they are sent to the GLNPO Sediment Team and entered into the GLNPO Sediment Database, which will contain all of the sediment chemistry, toxicity, and benthos data generated as part of GLNPO-funded projects. The data is then made available for dissemination to any interested parties.

Environmental Results/Products

Table 10 lists some of the environmental results and publications produced from the projects.

TABLE 10. PARTIAL LIST OF ENVIRONMENTAL RESULTS AND PRODUCTS FROM
SEDIMENT PROJECTS, FY 1993-1996.

Realized and anticipated results of the funded projects include:

- Assessment of depositional sediment toxicity on the benthic community;
- Detailed site information which will enable the formulation of remediation decisions;
- Detailed assessments required to make decisions about contaminated sediment management;
- Development of a geographic information system which will enhance sediment management decisions;
- Enhanced ecological restoration and economic development opportunities;
- Fostering of scientifically sound decision making on the selection and implementation of sediment remedial alternatives;
- Generation of information needed to evaluate human health risks attributable to contamination;
- Incorporation of project data into a geographic information system;
- Increased awareness of contaminated sediment issues in the Great Lakes;
- Increased emphasis on stormwater control as well as remediation of certain sediment deposits;
- Production of data to be used as part of a mass balance modeling effort;
- Promotion of sediment clean up activities in the Great Lakes basin;
- Reduced risk to humans and biota from contaminated sediments; and,
- Reduced contaminant loadings to the Great Lakes.

Documents produced to date include:

- Assessment of Mercury Contamination in the Sediments of Six Reservoirs on the Lower St. Louis River, Minnesota*
- Final Remediation Investigation Report for the Hayton Area Remediation Project, Volumes I-III*
- Oswego River Sediment Study*
- Site Characterization Report, Feasibility Study Report, and Results of Aerobic Biodegradation Screening Treatability Study for the Newton Creek System*
- Survey of Sediment Quality in the Duluth/Superior Harbor: 1993 Sampling Results*

LESSONS LEARNED

As our funding program has moved forward, discussions with our grantees have yielded valuable information as to what some of the hurdles are for remediation of contaminated sediments and restoration of a clean benthic environment. While assessments at several AOCs have been completed, the move to the next steps - remedial design and actual remediation, or 'moving mud' - has not been easy. We recognize these difficulties and have focused our efforts on providing assistance in order to bridge these gaps.

We believe that one of the primary keys to achieving successful remediation at any site will be the development of a strong and committed partnership of stakeholders. These individuals and organizations must be able to pool their resources and expertise as well as cooperate to overcome their differences. The Ashtabula River Partnership is a prime example of how a community has organized itself around a common goal of contaminated sediment remediation. We are encouraged by their dedicated efforts thus far, and we hope to soon see many other communities following their lead.

Recommendations for Future Efforts

GLNPO's Sediment Assessment and Remediation Team recommends that these goals be focused on in the future to address the contaminated sediment problem in the Great Lakes:

- Keep the momentum going toward 'moving mud' - toward actual remediation at more and more Great Lakes sites.
- Expand the list of Great Lakes sites requiring assessment and possible remediation by looking to sites outside of Areas of Concern.
- Develop and promote new and innovative techniques for assessing contaminated sediments.
- Build a strong partnership of committed, cooperative individuals and organizations.
- Be creative and innovative in securing financial resources for sediment projects.

- Strive to make remedial designs not only effective, but also efficient and practical.
- Facilitate the communication of successful remedial activities to other groups and partnerships both in the Great Lakes basin and elsewhere.

Much progress has been made since the inception of the ARCS Program 10 years ago. Anticipating the next 10 years, we look forward to supporting the continuing and renewed efforts of our grantees as we all strive to reduce and prevent the impacts of contaminated sediments on the Great Lakes ecosystem.

As our grants program continues and our database expands, we want to make sure we remain on the right track. Feedback from our partners and from the community is invaluable in helping us to do this. What are your thoughts and opinions about GLNPO's Contaminated Sediments Program? What questions do you have? How can the program be improved?

We urge you to communicate with us.

Access our World Wide Web site: <http://www.epa.gov/glnpo/>

or contact: *Marc Tuchman, Sediment Assessment and Remediation Team Leader:*
Phone 312-353-1369
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E-mail tuchman.marc@epamail.epa.gov

REFERENCES

Clean Water Act. 1977.

Federal Water Pollution Control Act Amendments. 1972.

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Lake Michigan Federation. Cleaning Up Contaminated Sediments: A Citizen's Guide. 1995.

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Water Quality Act of 1987.

#1 - ASHTABULA RIVER REMEDIATION PROJECT

(FY1996 - IAG - DW96947775-01-0)

U.S. Army Corps of Engineers

Contact: Brian Troyer, Project Manager
U.S. Army Corps of Engineers, CENB-PP-PM
Buffalo District
1776 Niagara Street
Buffalo, NY 14207-3199
716-879-4316
716-879-4355 FAX

Technical Contact: Steve Golyski, Technical Manager
U.S. Army Corps of Engineers, CENCB-PE-PT
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716-879-4228
716-879-4355 FAX

Award Amount: FY1996 - \$500,000 (\$250,000 each from GLNPO and Region 5 Water Division)

Dollars Leveraged: \$500,000 through Ashtabula River Partnership

Project Timetable: October 1, 1996 - September 30, 1999

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: Ashtabula, Ohio

Partners: Ashtabula River Partnership, Ohio EPA

Narrative: The Ashtabula River and Fields Brook have been contaminated with PCBs, PAHs, VOCs and heavy metals. The Ashtabula River Partnership (ARP), comprised of private citizens and groups, government officials, and business and industry leaders, was formed to explore the effective remediation of the contaminated sediments in the Ashtabula River and Harbor. The goal of the ARP is to look beyond traditional approaches in order to determine a comprehensive solution for remediation of the contaminated sediments not suitable for open lake disposal.

This project will involve the development of a detailed design for an upland disposal facility for dredged contaminated sediments classified as TSCA and non-TSCA in conformance with the Comprehensive Management Plan and Environmental Impact Statement in order to obtain the Ashtabula River Partnership goal for complete sediment remediation.

Status: ongoing

Environmental Results/Products: Successful remediation of the Ashtabula River and Harbor will ultimately enhance ecological restoration and economic development opportunities in Ashtabula County.

Section VII - Appendix

#2 - CLINTON RIVER, MICHIGAN SEDIMENT ASSESSMENT

(FY1994 - IAG - DW96947710-01-0)

U.S. Army Corps of Engineers

Contact: Jim Galloway
U.S. Army Corps of Engineers
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313-226-6760
313-226-7095 FAX

Award Amount: FY 1994 - \$159,304 (IAG total \$221,000 for Clinton River and Muskegon/White Lakes (projects #16/#33) combined)

Project Timetable: September 1, 1994 - September 30, 1995

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Clinton River watershed, Oakland and Macomb Counties, southeast Michigan

Partners: Michigan Department of Environmental Quality

Narrative: The Clinton River drainage encompasses 1968 km² in southeast Michigan, primarily in Oakland and Macomb Counties. Contaminated sediments in the Clinton River have contributed to its designation as both a Great Lakes Area of Concern and a Michigan Act 307 site. Sedimentation has been documented as a serious problem throughout the watershed as a result of both agriculture and urban/suburban development, but little is known about contaminants associated with these sediments.

The project has two objectives:

- to determine which contaminants present a problem; and,
- to identify areas of contamination.

This study will be used to determine potential "hot spots", and will provide data to prioritize these zones and aid in designing benthic community and further sediment characterization studies over the next three to five years.

Status: closed out

Data Results: The lower river, from Mt. Clemens to the river mouth at Lake St. Clair, was the most contaminated area of the study. The highest observed concentrations of several heavy metals, including Cr (340 mg/kg), Ni (162 mg/kg), and Zn (761 mg/kg), and an elevated concentration of Pb (233 mg/kg), occurred in this area. PCB concentrations were also highest in this area, with recorded levels of 8.52 mg/kg and 3.4 mg/kg. Three sites in the area had PAH concentrations above 195 mg/kg, the highest level being almost 280 mg/kg. Concentrations throughout the upper watershed were generally not elevated, although Big Beaver Creek had an elevated PAH concentration (248 mg/kg) and a site in Pontiac had the highest observed Pb concentration, 320 mg/kg.

Environmental Results/Products: This study provided information being used in a fiscal year 1995 study (project #3) designed to better delineate contaminant areas and determine any sites which require immediate or future remediation.

#3 - CLINTON RIVER, MICHIGAN SEDIMENT SUPPORT

(FY1995 - IAG - DW96947740-01-0)

U.S. Army Corps of Engineers

Contact: Jim Galloway
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313-226-6760
313-226-7095 FAX

Award Amount: FY1995 - \$150,000 (IAG total \$225,000, for Clinton River and Trenton Channel (project #27) combined)

Project Timetable: July 31, 1995 - December 31, 1996

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: Clinton River, Michigan

Partners: Michigan Department of Environmental Quality, Clinton River PAC

Narrative: Contaminated sediments in the Clinton River have contributed to its designation as both a Great Lakes Area of Concern and a Michigan Act 307 site. A FY 1994 IAG (project #2) served as a preliminary assessment of sediments throughout the Clinton River watershed.

The goal of this FY 1995 IAG is to conduct comprehensive assessments of sediments within specific areas of the river in order to further define locations of extensive contamination.

There are three main objectives:

- to better define the areas of contamination in the 4 zones previously determined to be notably contaminated (Zone 1, Pontiac; Zone 2, Mainstem Clinton River from Rochester to confluence with Red Run Drain; Zone 3, Red Run Drain; and Zone 4, Lower River);
- to determine on a site specific basis if contamination is attributable to historic or ongoing sources and to identify ongoing sources; and,
- to determine sites which require immediate or future remediation.

Status: ongoing

Data Results: Several sites along the lower river, below Mt. Clemens, had elevated heavy metal concentrations. The highest concentrations, all in mg/kg, included the following: cadmium, 28; chromium, 400; lead, 400; nickel, 190; and zinc, 940. The highest PAH concentrations occurred in the upper river watershed, including levels of 342 mg/kg at a site near Auburn Heights and a concentration of 113 mg/kg near Moravian Road.

Environmental Results/Products: The project will provide detailed site information which will enable the formulation of remediation decisions.

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#4 - COSTS AND BENEFITS OF CLEANING UP GREAT LAKES SEDIMENT IN AREAS OF CONCERN (FY1995 - GL985062-01-0)

University of Wisconsin

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608-263-5133
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Award Amount: FY1995 - \$61,463

Dollars Leveraged: \$296,000 (\$232,000 from Great Lakes Protection Fund and \$64,000 from U.W. Sea Grant)

Project Timetable: May 1, 1995 - December 31, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Great Lakes Basin

Partners: Great Lakes Protection Fund, University of Wisconsin Sea Grant, University of Wisconsin Dept. of Civil and Environmental Engineering

Narrative: In order to build upon USEPA-ARCS and Environment Canada's demonstration program results, more information and tools are needed to estimate the benefits and costs of cleaning up contaminated sediments.

The goal of this project is the presentation of a decision framework with tools and training that can be used by Remedial Action Plan (RAP) developers for making sediment remediation choices in Great Lakes Areas of Concern (AOCs).

Specific project objectives include:

- to develop an economic analysis approach to benefits and costs of sediment remediation;
- to investigate significant cost factors and uncertainties in selected remediation technologies;
- to investigate cost-saving, cooperative remediation strategies; and,
- to develop supporting computer software.

Status: ongoing

Environmental Results/Products: A framework of methodologies for estimating benefits and costs of remediation options will be introduced to decision-makers and those who influence decisions regarding sediment remediation.

**#5 - SURVEY OF SEDIMENT QUALITY IN THE DULUTH/SUPERIOR HARBOR (DULUTH PHASE I)
(FY1993 - GL995383-01-0)**

Minnesota Pollution Control Agency

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Minnesota Pollution Control Agency
Water Quality Division
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612-297-4068
612-297-8683 FAX

Award Amount: FY1993 - \$217,500

Project Timetable: October 1, 1993 - September 30, 1995

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: St. Louis River Area of Concern, Duluth/Superior Harbor (Duluth, MN/Superior, WI)

Partners: Wisconsin Department of Natural Resources, Sediment Contamination Workgroup of the St. Louis River RAP

Narrative: The project was designed to fulfill the critical need for a sediment survey of the St. Louis River estuary, including the Duluth/Superior Harbor. Certain sediments within the AOC were known to contain elevated concentrations of PCBs, PAHs, and heavy metals. However, the distribution and historical record of contaminants and potential toxicity of the contaminated sediments was poorly understood. Most historic data were collected near shipping channels to support dredging operations. In addition, most data were outdated due to higher detection limits and less stringent quality assurance/quality control.

The project goal was to define general areas within the AOC where sediment contamination and toxicity appeared to be elevated. The estuary contains several known or suspected areas of high sediment contamination. The project, by simultaneously analyzing areas known to be contaminated, as well as unknown sites, was intended to provide a consistent framework for prioritizing remedial sediment activities within the AOC. At each of 40 sites, sediment cores were collected for chemical analyses, and sediment toxicity tests were conducted on surficial Ponar samples.

Status: closed out

Data Results: The highest concentrations of PAHs, heavy metals, and 2,3,7,8-TCDD were found in sediments near the USX Superfund site. Elevated levels of PAHs and metals were also located near the discharge from the Western Lake Superior Sanitary District (WLSSD). The highest levels of PCBs occurred near the WLSSD discharge; elevated levels were also found at USX and at two slips in the outer harbor. Most contaminant concentrations followed an approximately chi-square distribution (i.e., there were many samples with low-end concentrations and relatively few samples with elevated levels). This was especially true for lead and zinc. Seven sites were toxic in the Microtox test, whereas 21 sites were mutagenic to the bacterium, *Photobacterium phosphorum*. Three sites were acutely toxic to the midge, *Chironomus tentans*, including the Unnamed Creek outfall at USX.

Environmental Results/Products: This project was an integral part of a continuing effort to assess sediment contamination and toxicity in the St. Louis River AOC. Information collected was essential in planning for Phase II (project #6) of the study. This survey highlighted areas within the Duluth/Superior Harbor that had elevated levels of sediment contamination and/or toxicity (hot spots) and suggested contaminants and endpoints of concern for each site. A final report, "Survey of Sediment Quality in the Duluth/Superior Harbor: 1993 Sampling Results", will be made available to the public in early 1997.

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#6 - SEDIMENT ASSESSMENT OF HOTSPOT AREAS IN THE DULUTH/SUPERIOR HARBOR (DULUTH PHASE II)

(FY1994 - GL995636-01-0)

Minnesota Pollution Control Agency

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Award Amount: FY1994 - \$310,500 (St. Louis River sediment portion of MPCA cluster grant)

Project Timetable: August 26, 1994 - September 30, 1997

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: St. Louis River Area of Concern, Duluth/Superior Harbor (Duluth, MN/Superior, WI)

Partners: Wisconsin Department of Natural Resources, Sediment Contamination Workgroup of the St. Louis River RAP

Narrative: This study is Phase II of the St. Louis River Sediment Assessment. The 40 sites surveyed during Phase I in 1993 (project #5) were evaluated according to the degree of contamination and toxicity observed. Eight locales were selected as hotspots, and Kimball's Bay was selected as a clean reference site. The USX and Interlake/Duluth Tar Superfund sites, as well as Hog Island Inlet, were excluded from the survey due to separate investigations at these sites.

The goal is to perform a detailed sediment assessment at sites identified as toxic and/or contaminated in the 1993 survey in the Duluth/Superior Harbor and St. Louis River and, as a result of the assessment, to develop a sediment management plan for these sites. Contaminants of concern and their measurement were tailored to each site.

The objectives are to:

- determine pollutant distribution within hotspots identified in the 1993 survey;
- perform toxicity tests at each of the sites, at a frequency of at least 50% of the sites where contaminants were measured;
- perform a benthic community assessment at each site; and, integrate chemistry, toxicity, and benthic community assessment data to determine a sediment management plan for impacted areas.

Status: ongoing

Data Results: The highest normalized PAH profile concentrations were found at Minnesota Slip, followed by Slip C, and the vicinity of the Western Lake Superior Sanitary District (WLSSD). The highest mercury concentration (3.9 mg/kg) was observed at a WLSSD site, and overall, the area surrounding WLSSD had the most widespread mercury contamination. The highest levels of simultaneously extractable metals (SEM), when normalized for Acid Volatile Sulfides (AVS), were found at Howard's Bay; lead was particularly high at this site.

Four samples from three different sites were acutely toxic to the amphipod, *Hyalella azteca*. Two samples from different sites were acutely toxic to the midge, *Chironomus tentans*. For 42% of the samples tested, the *C. tentans* results were inconclusive due to poor control survival.

The benthological community structure was dominated by tubificid oligochaetes, chironomids, and the polychaete *Manayunkia speciosa* (at selected sites). The highest mean abundance recorded for oligochaetes was at Minnesota Slip. Mean values of total abundance and taxa richness were low at Kimball's Bay, indicating that this site was not a suitable control site. Mouthpart deformities in chironomid larvae were recorded at six sites, four of which were in the vicinity of WLSSD.

Integration of the sediment chemistry, toxicity data, and benthological community structure data are pending.

Environmental Results/Products: This survey will provide the detailed assessments required to make decisions about contaminated sediment management. Results will be used to target sites for sediment management activities, such as site remediation or point/nonpoint source contaminant controls. A report, *Sediment Assessment of Hotspot Areas in the Duluth/Superior Harbor*, will be available to the public in 1997.

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#7 - EASTERN LAKE ONTARIO DRAINAGE BASIN SEDIMENT STUDY (FY1995 - GL985137-01-0)

New York State Department of Environmental Conservation

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Award Amount: FY1995 - \$314,004

Project Timetable: September 25, 1995 - September 24, 1997

GLNPO Project Officer: Debbie Siebers 312-353-9299

Project Location: Eastern Lake Ontario drainage basin, including Black River

Narrative: Previous studies have indicated that the Black River is the top contributor of PCBs to Lake Ontario. Elevated levels of total PCB's and heavy metals, including mercury, cadmium, and lead, have been reported in water column and sediment samples from the Black River and its tributaries. However, comprehensive sediment data for the study area is not currently available.

The goal of the study is to evaluate sediments in the Eastern Lake Ontario drainage basin. Emphasis will be placed on validation of suspect data included on the National Sediment Inventory and the study of contaminated sediment deposits identified as impacting water quality by the NYSDEC Priority Water Problem (PWP) list.

Study objectives are:

- to provide information on levels of contamination and toxicity of bottom sediments in the tributaries to the Eastern Lake Ontario drainage basin; and,
- to conduct bioaccumulation studies on the sediments of the Black River and Eastern Lake Ontario tributaries.

Status: ongoing

Data Results: should be available in 1997 (sampling started in late 1996; will be completed in late spring or early summer, 1997)

Environmental Results/Products: The study will provide information on levels of contamination and toxicity of bottom sediments in selected Eastern Lake Ontario tributaries.

#8 - DESIGN OF A SEDIMENT TREATMENT PLANT AT ERIE PIER CONFINED DISPOSAL FACILITY (CDF) (FY1995 - GL985132-01-0)

University of Minnesota - Duluth

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Award Amount: FY1995 - \$92,000

Project Timetable: October 1, 1995 - December 31, 1996

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: St. Louis River Area of Concern, Duluth/Superior Harbor (Duluth, MN/Superior, WI)

Partners: U.S. Army Corps of Engineers, Detroit District

Narrative: The project will provide the necessary information for the design of a facility to treat dredge material produced and prolong the life of the Erie Pier Confined Disposal Facility (CDF). The CDF is nearing its capacity and additional space is required for storage of dredge materials either by construction of a new facility or by extending the life of the one currently in use.

Project objectives include:

- conduct a sampling program to determine the size consist and chemical composition of the sediment stored in the CDF, especially the northeastern section which contains the finest-grained material from the washing operation. The information will be used to design and to make a more accurate cost estimate for the treatment facility;
- investigate the possibility of creating a secure area within the CDF for the storage of highly polluted dredge material which may be removed from the harbor in the future; and,
- develop a cost estimate for the construction of a secured lined compartment within the CDF for the storage of more highly contaminated sediment which could be generated in the area from Superfund sites, etc.

Status: Ongoing

Data Results: incoming

Environmental Results/Products: Economic savings from increased capacity of existing confined disposal facility.

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#9 - SURVEY OF Hg IN SEDIMENT CONTAMINATION - LOWER ST. LOUIS RIVER RESERVOIRS: FOND DU LAC PHASE I (FY1993 - GL995478-01-0)

Fond du Lac Tribe

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Fred Vande Venter, Aquatic Scientist
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218-879-4146 FAX

Award Amount: FY1993 - \$70,000

Project Timetable: October 1, 1993 - September 30, 1995

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: St. Louis River system reservoirs, Duluth region, Minnesota

Partners: University of Minnesota-Duluth, University of Wisconsin-Superior

Narrative: The St. Louis River, the largest U.S. tributary to Lake Superior, has been identified by the IJC as an Area of Concern, in part due to the presence of toxic contaminants in fish tissue and negative impacts on the benthic community. Mercury (Hg) levels in walleye are elevated at various locations along the lower St. Louis River, with the highest values occurring near and within six small reservoirs. As a result of past industrial practices and discharges, the sediments have accumulated contaminants, including Hg, behind the reservoir dams. A preliminary survey of Hg concentrations as a function of depth in cores from three reservoirs showed a significant peak in Hg levels in some strata. Results of a study on mercury in fish along the lower St. Louis River have demonstrated the likelihood that sediments in the lower river reservoirs may influence mercury residues in fish.

This project was a follow up to a preliminary sediment survey of the lower St. Louis River reservoirs. The goal was to conduct a more detailed study to assess sediment mercury contamination and its importance in bioaccumulation, resuspension, and transport. Investigations consisted of two components: 1) a mercury-in-sediment cores survey; and 2) a mercury-in-benthos survey that included measuring mercury in the corresponding surface sediments.

Status: closed out

Data Results: Thirty samples had mercury concentrations above 1.3 ug/g (ppm). Two of the three highest concentrations were from Scanlon Reservoir (2.5 and 3.4 ug/g). Elevated concentrations were also observed in Knife Falls Reservoir (2.2 ug/g) and in 2 samples from Forbay Reservoir (1.9 ug/g). The most widespread contamination appears to be in Thompson Reservoir, where 5 of the 10 highest concentrations, including 2.6 ug/g and 2.2 ug/g, were found. Also, 21 of the 30 samples with concentrations above 1.3 ug/g were from 14 cores taken from Thompson Reservoir.

Environmental Results/Products: The information on mercury contamination in these reservoirs has been very useful in showing the need for mitigating those areas where high levels of this contaminant are at or near the surface. Current research to develop practical mercury mitigation technology is using some of the knowledge gained in this study. A project report, *Assessment of Mercury Contamination in the Sediments of Six Reservoirs on the Lower St. Louis River, Minnesota*, has been published and is available.

#10 - MITIGATION OF SEDIMENT CONTAMINATION IN RESERVOIRS ON THE LOWER ST. LOUIS RIVER : FOND du LAC PHASE II (FY1995 - GL985025-01-0)

Fond du Lac Tribe

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Award Amount: FY1995 - \$200,000

Project Timetable: October 1, 1995 - September 30, 1997

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: St. Louis River system reservoirs, Duluth region, Minnesota

Partners: University of Minnesota-Duluth, University of Wisconsin-Superior

Narrative: This project is Phase II of the study of mercury sediment contamination in reservoirs along the lower St. Louis River. Phase I (project #9) was a detailed sediment assessment of the reservoirs.

The objectives of Phase II of the study include:

- to physically characterize sediment cores collected during Phase I in terms of carbon content and particle size;
- measure mercury concentrations in three taxa of benthos to determine biological uptake;
- measure water current velocity and direction to help assess mercury transport;
- collect baseline physical, chemical, and biological data from Fond du Lac Reservation lakes for a future mercury mitigation study; and,
- field test specific methods and technologies targeted to the uptake and bioaccumulation of mercury.

Status: ongoing

Data Results: data collection began in the fall of 1996 and will continue in 1997

Environmental Results/Products: Information collected will be used to determine the need and locations for sediment remediation.

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#11 - DESIGN AND ENGINEERING OF A REMEDIAL OPTION IN THE FOX RIVER (FY1995 - GL985130-01-0)

Wisconsin Department of Natural Resources

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Award Amount: FY1995 - \$100,000

Dollars Leveraged: \$150,000 from Fox River Coalition (including WDNR)

Project Timetable: September 25, 1995 - September 24, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Lower Fox River, Wisconsin

Partners: Fox River Coalition

Narrative: The Green Bay Mass Balance and Fox River PCB Transport Studies, conducted between 1989 and 1992, indicated that contaminated sediment in the Fox River is the major source of PCBs, approximately 95% of the total load, to Green Bay. At least 85% of the estimated total PCB mass in the river is located downstream of De Pere and will serve as a major long term source of PCBs to Green Bay and Lake Michigan. The Green Bay Mass Balance Study identified 34 contaminated sediment deposits in 32 miles of the Lower Fox River upstream of De Pere.

Two deposits are the focus of remedial investigation and feasibility studies currently underway. Upon completion of these studies, a remediation site and remediation technique will be selected that is consistent with an overall Lower Fox River cleanup strategy. The two deposits under consideration are Deposit POG located in Little Lake Butte des Morts and Deposit N located near Kimberly, WI. Deposit POG is approximately 77 acres containing an estimated 300,000 yd³ of sediment in excess of 50 ppb PCB, and an estimated 720 Kgs of PCB and 81 Kgs of Hg. Deposit N is approximately 3 acres containing an estimated 8,500 yd³ of sediment in excess of 50 ppb PCB, and an estimated 120 Kgs of PCB and 6 Kgs of Hg.

The project **objective** is to accomplish the final pre-remedial activity including engineering design, plans and specifications and development of bidding documents necessary to remove, treat, and/or isolate a mass of PCB in the Lower Fox River.

Status: ongoing

Environmental Results/Products: The project will result in a document which the Fox River Coalition and Wisconsin Department of Natural Resources can use to obtain bids for contracting a sediment remediation project.

**#12 - ASSESSMENT OF PCBs IN SEDIMENT IN THE LOWER FOX RIVER
(FY1995 - GL985143-01-0)**

Wisconsin Department of Natural Resources

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608-264-9220
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Award Amount: FY1995 - \$135,000

Project Timetable: September 1, 1995 - September 30, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Lower Fox River, Wisconsin

Partners: Fox River Coalition

Narrative: The Green Bay Mass Balance and Fox River PCB Transport Studies, conducted between 1989 and 1992, indicated that contaminated sediment in the Fox River is the major source of PCBs, approximately 95% of the total load, to Green Bay. At least 85% of the estimated total PCB mass in the river is located downstream of De Pere and will serve as a major long term source of PCBs to Green Bay and Lake Michigan. Although the above studies provided some information on the PCB distribution in the sediment, more accurate estimates of contaminated sediment volume and PCB mass are required to make sound remediation decisions.

This project has the following **objectives**:

- Further define and quantify PCB sediment distribution downstream of De Pere Dam to Green Bay.
- Estimate the mass and volume of PCB contaminated sediments and develop maps of PCB distribution in the Lower Fox River.
- Provide data to enable further refinement of PCB transport models for the Lower Fox River.
- Provide further basis for making sound management decisions throughout the Fox River to Green Bay.
- Support the Fox River Coalition's effort to prioritize and remediate contaminated sediment hotspots in the Fox River.
- Implement a Green Bay Remedial Action Plan recommendation for developing a clean up strategy for the Lower Fox River contaminated sediments.

Status: ongoing

Data Results: 25 samples had PCB concentrations at or above 30 mg/kg. Two of the three highest concentrations (91 and 400 mg/kg) occurred in a core taken just upstream of the Fort Howard Turning Basin, within three feet of the surface. Other hot spots included downstream of the Fort Howard Paper Co. intake gate (130 mg/kg), in the Leicht Transfer and Storage boat slip area (90 mg/kg), and sites approximately 0.3 miles upstream of the WI Central RR bridge (57 mg/kg), and approximately 0.4 miles downstream of Ashwaubenon Creek (63 mg/kg). While most contamination occurred in core segments from depths greater than 3 feet, elevated concentrations were observed in surficial samples (10-30 cm depth) from sites just upstream of the Fort Howard Turning Basin (91 mg/kg), offshore of the Brown County Fairgrounds driveway loop (47 mg/kg), and about 0.25 miles downstream of the DePere Dam, near the Voyager Park lock entrance (43 mg/kg). A concentration of 31 mg/kg was found in both the 10-30 and 0-10 cm core segments from a site approximately 0.5 miles upstream of the WI Central RR bridge.

Environmental Results/Products: The information generated will assist in prioritizing sediment sites for remediation.

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#13 - ASSESSMENT OF CONTAMINATED SEDIMENTS IN LAKE MICHIGAN AOCs - HAYTON AREA REMEDIATION PROJECT/MANITOWOC

(FY1994 - GL995681-01-0)

Wisconsin Department of Natural Resources

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Award Amount: FY1994 - \$126,000

Project Timetable: August 1, 1994 - September 30, 1996

GLNPO Project Officer: Debbie Siebers 312-353-9299

Project Location: Hayton Area Remediation Project (HARP), Calumet County, Wisconsin

Narrative: Past studies by the USEPA and WDNR identified the presence of PCB contamination in fish, surface waters, and sediments of the Hayton Millpond area in Calumet County, Wisconsin. The project study area, referred to as the Hayton Area Remediation Project (HARP), has been selected by the WDNR as a priority sediment remediation demonstration site.

The project objectives were as follows:

- to determine the extent of contamination at the study area;
- to determine if PCBs are entering the study area from ongoing external sources;
- to investigate historical sources of PCBs to the study area;
- to interview local residents and evaluate anecdotal evidence of PCB discharges; and,
- to assemble sufficient information to identify potentially responsible parties.

For the remedial investigation the project area, nearly eight stream miles, was divided into four study units, that include one soil area and three sediment units: 1) Upper Pine Creek, Jordan Creek, and Drainage Ditches; 2) Lower Pine Creek and South Branch Manitowoc River; and 3) Hayton Millpond.

Status: completed; will not be closed out until other 2 projects (#15 and #25) under same grant are also completed

Data Results: The highest sediment PCB concentrations (804-2300 mg/kg) occurred in the Upper Pine Creek, Jordan Creek, and Drainage Ditches study unit in an area known as the "old ditch". These elevated concentrations indicate that this area is an active source of PCBs to the Millpond. The distribution of contaminants throughout the study area also suggest that contaminants may have initially entered the system through the storm sewer drainage system in the northeast section of the City of New Holstein.

Environmental Results/Products: The results of this project delineate the areal and volumetric extent of sediment contamination in the HARP study area. These results also provided the basic information needed to evaluate human health risks attributable to the contamination as well as information needed to establish site remediation priorities. The *Final Remediation Investigation Report for the Hayton Area Remediation Project, Volumes I-III*, is available to the public.

**#14 - MAUMEE RIVER AOC CONTAMINATED SEDIMENT SURVEY
(FY1994 - GL995648-01-0)**

Ohio Environmental Protection Agency

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Technical Contact: Brent Kuenzli
Ohio EPA
Northwest District Office
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Award Amount: FY1994 - \$250,000

Project Timetable: October 1, 1994 - September 30, 1997

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: Maumee River, Ohio

Partners: Maumee RAP Group

Narrative: The Maumee River Area of Concern (MAOC) includes that portion of the lower Maumee River which flows through Lucas County to its confluence with, and including, Maumee Bay and the nearshore waters of Lake Erie from the Ohio-Michigan state line to Crane Creek State Park in Ohio. This study will address the general extent of sediment contamination in depositional areas of the lower reaches of Swan, Duck, and Otter Creeks and the Ottawa River, as well as in the lower Maumee River and selected sites in Maumee Bay.

While other studies have concentrated on surficial sediments from the more upstream reaches of the tributaries of the Maumee River, this study will focus on areas where the most concentrated and widespread deposits of contaminants in the AOC are likely to occur. The **primary goal** will be to add a significant amount of information to the RAP database.

Objectives to be met include:

- helping the RAP community in evaluating levels of contamination in the sampled waterways; assisting the RAP community in preliminary prioritization of pre-remedial actions, such as dredging of contaminated sediments;
- determining pollutant types and concentrations in the study area to relate effects to known sources of contamination in upstream areas of the AOC; and,
- providing screening data needed as evidence of historical contamination patterns in the AOC.

Status: ongoing

Data Results: The highest recorded concentrations, in mg/kg, of several heavy metals were found in Swan Creek: chromium, 829; copper, 508; lead, 841; and zinc, 1150; the highest recorded cadmium concentration (9.6 mg/kg), was found at sites in both Swan Creek and the Maumee River. Elevated levels of heavy metals and PCBs were found at several sites in the Maumee River, where the highest nickel concentration (292 mg/kg) and the highest PCB concentration (348 mg/kg) were found.

Environmental Results/Products: Analysis of the data from this work should help to delineate contamination hot spots and allow for a sediment quality triad evaluation approach. The project activities, which represent a continuation and extension of the effort already begun in the MAOC, will give a much more complete picture of the nature, extent, and severity of sediment contamination in the MAOC. Project data will be published in a report due out in early 1997.

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#15 - ASSESSMENT OF CONTAMINATED SEDIMENTS IN LAKE MICHIGAN AOCs - MILWAUKEE ESTUARY SEDIMENT STRATEGY IMPLEMENTATION (FY1994 - GL995681-01-0)

Wisconsin Department of Natural Resources

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Award Amount: FY1994 - \$156,000

Project Timetable: August 1, 1994 - September 30, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Milwaukee River system/estuary

Narrative: Nonpoint sources of toxics to the Milwaukee Estuary are proving to be important. Plans for contaminated sediment cleanup must be integrated with strategies to identify and reduce nonpoint sources of toxic substances. This project is designed to provide additional information on the impact of upstream and urban nonpoint sources on sediment contamination and project the mass balance movement of sediments and contaminants through the Milwaukee River system. If such sources can be minimized or eliminated, then work can begin on remediating the contaminated sediments themselves.

The project objectives are to:

- assess continued transport of PCB into Milwaukee Harbor from the Milwaukee River;
- assess continued mass transport of RAP bioaccumulating pollutants of concern in tributaries to the Kinnickinnic, Menomonee and Milwaukee Rivers, Lincoln Creek and Crestwood Creek; and,
- recommend and prioritize actions to eliminate continuing sources and remediate contaminated sediments.

Status: ongoing

Data Results: incoming

Environmental Results/Products: The project will ultimately lead to increased emphasis on stormwater control as well as remediation of certain sediment deposits. Reports will be produced on PCB transport in the Milwaukee River and bioaccumulative substances in urban tributaries to the Milwaukee, Menomonee, and Kinnickinnic Rivers. Sediment core data and semi-permeable membrane device data will be incorporated into the Milwaukee sediment GIS database.

#16 - MUSKEGON LAKE SEDIMENT ASSESSMENT
(FY1994 - IAG - DW96947710-01-0)
U.S. Army Corps of Engineers

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U.S. Army Corps of Engineers
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Award Amount: FY1994 - \$61,696 (Muskegon Lake and White Lake (project #33) combined; IAG total \$221,000 for Muskegon/White Lakes and Clinton River (project #2) combined)

Project Timetable: September 1, 1994 - September 30, 1995

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Muskegon Lake, Michigan

Partners: Michigan Department of Environmental Quality

Narrative: Muskegon Lake, located on the east shore of Lake Michigan, has been designated as an AOC due to a number of water quality problems including contaminated sediments and nutrient enrichment. Previous studies have shown that historical municipal and industrial discharges to the lake have resulted in elevated concentrations of many heavy metals. In response to the need for more current data and confirmation of a suspected sediment "hot spot" in Muskegon Lake, a sediment sampling survey was conducted in the vicinity of the Division Street stormsewer discharge.

Project objectives were as follows:

- collect sediment cores to determine contaminant concentration and vertical profiles;
- characterize the areal extent of contaminants of concern;
- determine the necessary levels of remedial action and agency involvement, and develop an implementation time table

Status: closed out

Data Results: Elevated heavy metal concentrations were found at many sites, especially near the Hartshorn Marina. This area had the highest recorded concentrations (all in mg/kg) for Cd (52.4), Cu (2660), Pb (741), and Zn (1690). The highest concentrations of As, 86 mg/kg, and Cr, 258 mg/kg, were found north of the stormsewer outfall; for Hg, 13.2 mg/kg, in front of the stormsewer outfall; and Ni, 103 mg/kg, at a site west of the Marina. It is worth noting that in front of the stormsewer outfall the Hg concentration of 13.2 mg/kg exceeded the Effects Range Median (ER-M) value by more than a factor of 10, and the Cd, Cu, Pb, and Zn concentrations referred to above exceeded their respective ER-M values by more than a factor of 5.

Environmental Results/Products: This study, by determining the location and extent of contaminant hotspots, provided information which can be used to plan and implement remediation actions.

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#17 - NEWTON CREEK SYSTEM SEDIMENT CONTAMINATION SITE CHARACTERIZATION

(FY1993 - GL995443-01-0)

Wisconsin Department of Natural Resources

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Bureau of Water Resources Management
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Madison, WI 53707-7921
608-264-9220
608-267-2800 FAX

Award Amount: FY1993 - \$218,300

Project Timetable: October 1, 1993 - September 30, 1995

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Newton Creek system, Superior, Wisconsin

Narrative: The Newton Creek system has been identified as one of five sites in the St. Louis River System Area of Concern that is known to have particularly elevated concentrations of contaminants in sediment. The Newton Creek system includes the surface water environment encompassing Newton Creek Impoundment, Newton Creek, Hog Island Inlet, Superior Bay at the inlet mouth, and all floodplain, overflow areas, and wetlands associated with these water bodies. The focus of this study was on the sediment and floodplain soil of the Newton Creek system.

The **primary objective** of this study was to characterize the contamination of sediments in the Newton Creek system to support the evaluation of and, if necessary, the preliminary design of sediment remediation in the system.

The 1993 portion of the study concluded that sediments of the Newton Creek system are:

- significantly contaminated with a variety of pollutants;
- toxic to aquatic organisms; and
- unsupportive of a healthy benthic macroinvertebrate community.

The 1994 portion of the study was designed specifically to:

- better define areas and depths of sediments and floodplain soils that may require remediation;
- indicate if solid wastes generated by remediation would be subject to hazardous waste management requirements; and
- acquire additional information on biological impacts in the Newton Creek system.

Status: closed out

Data Results: Diesel range organic (DRO) concentrations are highest in Newton Creek Impoundment, where they exceed 10,000 µg/g at four of five open water sampling locations. The highest concentrations of metals, including lead, chromium, and mercury, are found in Newton Creek Impoundment, some areas of Newton Creek, and in Hog Island Inlet, near either the western portion or near the mouth of Newton Creek.

Environmental Results/Products: The study led to the *Site Characterization Report* which described prioritization and preliminary design of remedial options. A *Feasibility Study Report* was completed which included five remedial alternatives. The potential effectiveness of land application, one of the five alternatives, was evaluated in the report *Results of Aerobic Biodegradation Screening Treatability Study for the Newton Creek System*. Based on the findings of this study, WDNR recommends that areas of Newton Creek Impoundment, Newton Creek, and Hog Island Inlet be considered for remediation. These areas recommended for remediation include a volume of "soft sediment" estimated as 19,900 cubic yards in place.

#18 - NEW YORK ERIE CANAL
(FY1996 - GL985364-01-0)
New York State Canal Corporation

Contact: John Dergosits
New York State Canal Corporation
200 Southern Boulevard
P.O. Box 189
Albany, NY 12201-0189
518-471-5020
518-471-5023 FAX

Award Amount: FY1996 - \$120,000

Project Timetable: October 15, 1996 - June 30, 1998

GLNPO Project Officer: Debbie Siebers 312-353-9299

Project Location: Erie Canal, New York State

Partners: Rensselaer Polytechnic Institute

Narrative: Data collected by both the New York State Canal Corporation (NYSCC) and the New York State Department of Environmental Conservation (NYSDEC) have shown that sediments within the Erie Canal contain variable levels of contaminants. Additional sediment collection and evaluation is required to define the exact upstream and downstream contaminant boundaries, the likely sources of dioxin/furan, PCB, and heavy metal contamination and the general time horizons of the contaminant discharge.

The project **goal** is to identify and quantify the character of sediments in the Erie Canal between its confluence with the Niagara River in North Tonawanda, New York and its junction with the Genesee River near Spencerport, New York.

Status: ongoing

Data Results: incoming

Environmental Results/Products: Characterization of sediment contamination will allow for future activity to be focused on areas most in need and will provide preliminary information concerning the need for remediation.

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#19 - OHIO REFERENCE SITE SEDIMENT CHARACTERIZATION (FY1995 - GL985203-01-0)

Ohio Environmental Protection Agency

Contact: John F. Estenik
Ohio Environmental Protection Agency
Division of Surface Water, Wetlands Program
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Columbus, OH 43215-1099
(614) 644-2866
(614) 644-2329 FAX

Award Amount: FY 1995 - \$110,000

Project Timetable: October 1, 1995 - September 30, 1997

GLNPO Project Officer: Callie Bolatino 312-353-3490

Project Location: Ohio's Lake Erie Basin

Partners: Heidelberg College, USEPA Region 5

Narrative: The Ohio Environmental Protection Agency (OEPA) has developed numeric biocriteria (i.e., biological) State Water Quality Standards for five Ohio Ecoregions. Ecoregional reference sites within Ohio's four Lake Erie Areas of Concern (AOCs) drainage basins have not been adequately assessed physically and chemically for sediment contamination.

Sediment samples will be collected for physical and chemical assessment from three site categories:

- upstream from Ohio's four Lake Erie AOCs (lower Maumee River, lower Black River, lower Cuyahoga River, and lower Ashtabula River);
- ecoregional (biocriteria sites) reference samples within the four Lake Erie AOCs from three ecoregions: Huron Erie Lake Plain, Erie/Ontario Lake Plain, and Eastern Corn Belt Plains. These sample locations are unimpacted and should have low contaminant concentrations present;
- EMAP reference samples selected by randomizing sampling site location selection as a basis for evaluating all sediment site data and for a comparison to OEPA historical and future sediment data; these sites should also have low contaminant concentrations.

Project objectives include:

- to determine if sources exist outside the AOC for pollutants of concern identified in the AOC;
- to update and provide a significant expansion of parameters possibly affecting beneficial use impairment;
- to refine a list of critical pollutants of concern; and,
- to evaluate the impact of nonpoint source pollutant contribution.

This project is part of a larger effort which includes more extensive collection of ecoregional (biocriteria sites) samples. Support for the larger effort includes funding from one other grant and state funding (total funding for the study, including GLNPO: ~\$300,000).

Status: ongoing

Data Results: incoming

Environmental Results/Products: The project will enable OEPA to determine how much contamination in the Lake Erie AOCs may be originating from discrete upstream sources or from diffuse "background" sources.

#20 - OLCOTT HARBOR SEDIMENT STUDY

(FY1993 - GL995405-01-0)

New York State Department of Environmental Conservation

Contact: Bruce Garabedian
New York State Department of Environmental Conservation
50 Wolf Road, Room 305
Albany, NY 12233-3502
518-457-0729
518-485-7786 FAX

Award Amount: FY1993 - \$92,000

Project Timetable: October 1, 1993 - December 31, 1995

GLNPO Project Officer: Diane Dennis-Flagler 312-886-4012

Project Location: Olcott Harbor, New York

Narrative: Olcott Harbor is at the mouth of Eighteenmile Creek which is an Area of Concern (AOC). Elevated dioxin levels have been found in sediments behind the Newfane Dam and elevated levels of heavy metals have been detected in sediments of Eighteenmile Creek. There is, however, a significant lack of ambient data to fully characterize the extent of the problem in Olcott Harbor.

The project goal is to provide a screening characterization of contaminant levels in the sediments of Olcott Harbor. Both surficial samples and sediment cores will be collected, and some cores will be radioisotope dated in order to identify recent deposition.

Status: ongoing

Data Results: incoming

Environmental Results/Products: Data will be used to assess depositional rates and evaluate the toxicity of sediments on the benthic community. The study results will also be used in the development of a Remedial Action Plan for the Eighteenmile Creek Area of Concern.

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#21 - OSWEGO RIVER SEDIMENT STUDY

(FY1994 - GL95660-01-0)

New York State Department of Environmental Conservation

Contact: Bruce Garabedian
New York State Department of Environmental Conservation
50 Wolf Road, Room 305
Albany, NY 12233-3502
518-457-0729
518-485-7786 FAX

Award Amount: FY1994 - \$115,721

Project Timetable: September 6, 1994 - December 31, 1995

GLNPO Project Officer: Diane Dennis-Flagler 312-886-4012

Project Location: Oswego River, New York

Narrative: The Oswego River and Harbor have been designated as an Area of Concern due to past industrial and municipal discharges which have contaminated the water column and bottom sediments. Data generated from the sediment study will be used to characterize the nature and extent of all potential contaminants in the Oswego AOC. Sediment toxicity and biological impairment, if any, will also be characterized. Sediment cores will be collected for chemical analysis and surficial samples will be collected for toxicity testing.

The sampling plan includes coverage of the Oswego River upstream of the AOC, a region for which very little information currently exists documenting benthos conditions. Information from these upstream sites will be necessary to adequately evaluate remediation measures, if necessary, in the AOC as natural transport mechanisms move contaminated sediments from upstream sites into the AOC.

Status: closed out

Data Results: The highest levels of contamination were detected in two cores collected at Battle Island. Extremely high levels of total PAHs (>27,000 ug/kg) were detected, as well as high concentrations of lead (764 mg/kg), mercury (1.5 mg/kg), silver (1.6 mg/kg), and zinc (277 mg/kg), and relatively high concentrations of dioxin (266 ug/kg), furan (29 ug/kg), and mirex (135 ug/kg). Battle Island is just downstream from Armstrong World Inc., which had already been suspected to be the source of high mirex concentrations.

Environmental Results/Products: Results will allow for the assessment of depositional rates and evaluation of sediment toxicity on the benthic community, as well as the prioritization of necessary remediation measures in the AOC.

**#22 - OTTAWA RIVER REMEDIATION PROJECT
(FY1996 - GL985333-01-0)**

Ohio Environmental Protection Agency

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Ohio Environmental Protection Agency
Division of Emergency and Remedial Response
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Columbus, OH 43215-1099
614-644-3065
614-644-3250 FAX

Award Amount: FY1996 - \$500,000

Project Timetable: September 30, 1996 - September 29, 1998

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Ottawa River, Ohio/Maumee Bay Area Of Concern

Partners: GenCorp Inc., City of Toledo, Maumee RAP team

Narrative: Sediments in the Unnamed Tributary of the Ottawa River are believed to be the primary source of PCB contamination to the Maumee Bay area. The highest levels of PCBs in sediments (2500 ppm) in the Maumee River basin were found in the Unnamed Tributary. These sediments are resuspended during rainfall events and transported downstream to the Ottawa River, Maumee Bay, and ultimately to Lake Erie.

Project objectives include:

- final assessment and interim action to prevent resuspension of sediments into the Ottawa River;
- remediation of contaminated sediments, which may involve removal and
- disposal of sediments or onsite treatment to remove or destroy PCB contamination;
- confirmation of remediation by sampling;
- final site restoration; and,
- followup sampling of sediment, fish tissue, and water to show risk reduction.

In partial fulfillment of the first objective, a detailed assessment of the Unnamed Tributary was undertaken in late 1996 in order to determine the extent of the PCB contamination.

Status: ongoing

Environmental Results/Products: Removal of the hot spot of highly contaminated PCB sediments from the Unnamed Tributary will achieve definite risk reduction for both the Ottawa River and Maumee Bay, as well as Lake Erie.

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#23 - DESIGN AND DEVELOPMENT OF SAGINAW RIVER GIS (FY1995 - IAG - DW96947741-01-0)

U.S. Army Corps of Engineers

Contact: Jim Galloway
U.S. Army Corps of Engineers
ATTN: CENCE-EP-E
P.O. Box 1027
Detroit, MI 48231
313-226-6760
313-226-7095 FAX

Award Amount: FY 1995 - \$57,000

Project Timetable: August 21, 1995 - August 31, 1997

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: Saginaw River, Michigan

Partners: Michigan Department of Environmental Quality

Narrative: This project will focus on providing sediment data management and technical assistance in pursuit of sediment remediation for the Saginaw River. The need for a data management system for the Saginaw River Area of Concern (AOC) is critical because of the considerable amount of data collected by various researchers. The need to compare many of these studies and determine trends is vital to any future decision-making.

The goal of this project is to develop a database and geographic information system (GIS) which will provide means for importing and reporting contaminated sediment sampling data for the Saginaw River AOC. This will involve the compilation of previously collected sediment data in digital or hardcopy form and the transfer of this data into a standard database format. The intention is to give the participants involved in the Saginaw River Remedial Action Plan (RAP) the access to this sediment data management system in an attempt to encourage data analysis and promote remedial discussions.

Status: ongoing

Data Results: Project involves database development and not sample collection.

Environmental Results/Products: The development of a Saginaw River GIS which will be used to enhance sediment management decisions in the Saginaw River AOC.

**#24 - USE OF CONGENER-SPECIFIC PCBs TO DISTINGUISH AMONG SOURCES OF PCBs INPUT INTO THE SAGINAW RIVER AND SAGINAW BAY
(FY1995 - GL985191-01-0)**

University of Michigan

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University of Michigan
Ann Arbor, MI 48109-2099
313-763-3183
313-747-2748 FAX

Award Amount: FY 1995 - \$101,353

Project Timetable: September 29, 1995 - August 31, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Saginaw River, Michigan

Narrative: Sediments in the Saginaw River, a Great Lakes Area of Concern, have been contaminated by many toxic substances, including PCBs. Characterization of the PCBs using congener-specific analyses is important to elucidate food chain relationships, identify the more toxic contaminants, and determine the sources of PCBs within the Saginaw River using the congeners as unique signatures from the various sources of PCBs in the river system and airshed.

The project goal is to determine the transport and sources of PCBs in the Saginaw River watershed.

Specific objectives include:

- document representative PCB concentrations and congener-specific patterns in the sediments of the 4 major tributaries of the Saginaw River and at locations within the Saginaw River;
- document how the PCB concentrations and patterns change during rain events as a water mass moves downstream; and,
- determine the consistency in the congener-specific signature of air-deposited PCBs in the watershed.

Status: ongoing

Data Results: incoming

Environmental Results/Products: The data can be used in models to elucidate the transport of PCBs throughout the river system, including determination of possible deposition sites in the Saginaw River.

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#25 - ASSESSMENT OF CONTAMINATED SEDIMENTS IN LAKE MICHIGAN AOCs - SHEBOYGAN RIVER FOOD CHAIN AND SEDIMENT CONTAMINANT ASSESSMENT

(FY1994 - GL995681-01-0)

Wisconsin Department of Natural Resources

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Wisconsin Department of Natural Resources - WT/2
Bureau of Watershed Management
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Madison, WI 53707-7921
608-266-7790
608-267-2800 FAX

Award Amount: FY1994 - \$195,770

Project Timetable: August 1, 1994 - September 30, 1996

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Sheboygan River, Wisconsin

Narrative: Contaminated sediment has been identified as a major contributor of toxics to the Sheboygan AOC. Although actions to address remediation have been initiated for the lower segment of the river, management decisions relating to contaminated sediment remediation need to assume a broader focus. This broader focus should benefit the river from its upper reaches, which are reflective of background conditions, downstream to the harbor.

The project goal is to develop linkages of contaminant transfer pathways between sediment, the water column and the food chain within the Sheboygan River AOC.

The project objectives are to:

- provide baseline information for the Sheboygan River RAP long-term trend monitoring in order to gauge the effectiveness of future remedial actions and delist pertinent impaired beneficial uses;
- determine the bioavailability of toxic substances and bioaccumulation of PCBs through the food chain in the AOC;
- provide information to evaluate spatial and media distribution of PCB congeners in the AOC and the availability to aquatic communities; and,
- provide information about the distribution, bioavailability, and bioaccumulation of PAHs and heavy metals in the river.

Status: ongoing

Data Results: Highly elevated concentrations of PAHs were found in a core taken near Camp Marina, just south of the island. The core segment between the depths of 3-5 feet had over 3,400 ppm total PAHs. Elevated concentrations of PCBs were found at many sites, including over 14,750 ppb just downstream of the Rochester Park Launch and over 10,500 ppb at a site above the Riverbend Dam, just downstream of Rochester Park Island.

Environmental Results/Products: By determining the contribution, composition, and distribution of contaminants associated with river sediments, the project will provide a basis for making management decisions throughout the river from its upper reaches to the harbor.

**#26 - SEDIMENT REMEDIATION SCOPING PROJECT IN THE ST. LOUIS RIVER AOC - SLIP C
(FY1995 - GL985131-01-0)**

Minnesota Pollution Control Agency

Contact: Judy Crane
Minnesota Pollution Control Agency
Water Quality Division
520 Lafayette Rd. N.
St. Paul, MN 55155-4194
612-297-4068
612-297-8683 FAX

Award Amount: FY1995 - \$100,000 (Sediment Remediation portion of MPCA cluster grant)

Project Timetable: October 1, 1995 - September 30, 1998

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: St. Louis River Area of Concern, Duluth/Superior Harbor (Duluth, MN/Superior, WI)

Partners: Sediment Contamination Workgroup of the St. Louis River Remedial Action Plan

Narrative: Sediment contamination has been documented in the Duluth/Superior Harbor area of the St. Louis River Area of Concern. Sediment assessments were performed in 1993 and 1994 (projects #5 and #6). These assessments provided a framework for prioritizing sediment remediation activities within the AOC.

The goal of this sediment remediation scoping project is to implement a hotspot management plan at one site in the Duluth/Superior Harbor that will have the end result of a remediation action. The original site selected, Grassy Point/Hibbard Power Plant, has recently been changed to Slip C, by Superwood. A new Scope of Work and Quality Assurance Project Plan (QAPP) are currently being prepared for the Slip C site.

The specific objectives of this project are to:

- delineate the extent and depth of contamination of sediments in Slip C;
- develop sediment remediation options for Slip C; and,
- develop an updated sediment management plan for this site.

Information on historical and current sources of contamination to Slip C, as well as historical and current land use patterns for the area surrounding Slip C, are being obtained. A random sampling grid will be used to collect sediment samples for visual analysis. Within these sites, samples for chemical analyses will be selected on a non-random basis, in order to tie the most visual types of sediment with levels of particular contaminants (e.g., PAHs, mercury, PCBs, toxaphene, ammonia). Sediment sampling will be conducted by early summer, 1997.

Status: ongoing

Data Results: data not yet collected

Environmental Results/Products: Information and experience gained during this project will be available for use in future remediation scoping projects at other Duluth/Superior Harbor locations. Remediation studies could lead to the enforcement or establishment of protective permits to limit further point source contamination of sediments.

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#27 - CHARACTERIZATION OF TRENTON CHANNEL SHORELINE SEDIMENTS (FY1993 - GL995960-02-0)

Michigan Department of Environmental Quality

Contact: Art Ostaszewski
Michigan Department of Environmental Quality
Surface Water Quality Division
Hollister Building
PO Box 30473
Lansing, MI 48909-7973
517-335-4491
517-373-9958 FAX

Award Amount: FY1993 - \$200,000

Project Timetable: October 1, 1993 - March 31, 1996

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Trenton Channel of Detroit River, Michigan

Narrative: Sediments in the Trenton Channel of the lower Detroit River, a heavily industrialized area and a major navigation route, have been identified as one of the most severely contaminated areas in the entire Detroit River Area of Concern. The need has been identified to better delineate "hot spots" in the Trenton Channel.

The USEPA and Michigan Department of Natural Resources (MDNR) jointly established a work group to focus research and remediation activity in the Trenton Channel. The work group objective is to develop effective processes for assessing and remediating contaminated sediments in large river systems. The goal of this project is to characterize the Trenton Channel shoreline sediments.

To meet this goal, precursory sediment data will be collected to:

- define the magnitude and extent of sediment contamination; and,
- identify "hot spots".

Status: ongoing

Data Results: Elevated levels of PCBs and several heavy metals were observed at many stations. Hot spots include Black Lagoon, where elevated concentrations were observed for Cd (30 ug/g), Hg (7.8 ug/g), Pb (574 ug/g), Ni (206 ug/g), and Zn (3320 ug/g). The area near Monguagon Creek is highly contaminated by Cd (40 ug/g), Cr (500 ug/g), Hg (11 ug/g), Ni (251 ug/g), and PCBs (12.3 ug/g). Other hot spots were Firestone Steel (10 ug/g Hg) and the north channel of Elizabeth Park (10.3 ug/g PCBs).

Environmental Results/Products: The information collected will be used to help prioritize areas in the Trenton Channel for remediation. Successful application of sediment remediation technology for the Trenton Channel could result in an expansion of this effort for the entire Detroit River.

#28 - TRENTON CHANNEL SEDIMENT SUPPORT

(FY1995 - IAG - DW96947740-01-0)

U.S. Army Corps of Engineers

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U.S. Army Corps of Engineers
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Detroit, MI 48231
313-226-6760
313-226-7095 FAX

Award Amount: FY1995 - \$75,000 (IAG total \$225,000 for Trenton Channel and Clinton River (project #3) combined)

Project Timetable: July 31, 1995 - December 31, 1996

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: Trenton Channel of Detroit River, Michigan

Partners: Michigan Department of Environmental Quality

Narrative: Sediments in the Trenton Channel of the lower Detroit River, a heavily industrialized area and a major navigation route, have been identified as one of the most severely contaminated areas in the entire Detroit River Area of Concern. A FY1993 study (project #27) characterized channel shoreline sediments by collecting precursory sediment data for model development, model components and hot spot identification. Surficial samples collected in 1993 and 1994 revealed sediment depositional zones severely contaminated with heavy metals, including mercury, in upstream portions of the Trenton Channel.

The goal of this Interagency Agreement (IAG) is to conduct comprehensive assessments of sediments within three specific areas of the channel in order to determine the depth and degree of contamination and provide technical assistance in pursuit of sediment remediation for the Trenton Channel. The project also involves collection of a third year of monitoring data near the Elizabeth Park Marina to determine trends in benthic community response and sedimentation following dredging in the Trenton Channel. This information will help validate model predictions and give an indication as to the degree of contaminated sediment being deposited in the lower Trenton Channel as a result of upstream sources. The information will also assist in the development of remedial designs for other areas of extensive contamination within the Trenton Channel.

Status: ongoing

Data Results: Twenty stations were sampled in the Upper Trenton. Sites with high levels of organic and heavy metal contamination included Firestone Steel, Nicholson South Boat Slip, and Allied Fuel Oil Slip. Concentrations in these area were: mercury, 20 ppm; PCBs, 20 ppm; lead, 580 ppm; copper, 630 ppm; cadmium, 35 ppm; PAHs, 200 ppm; and oil and grease, 71,000 ppm. The results of this study, along with the other research studies of the Trenton Channel Project, indicate that the majority of the Trenton Channel contamination is found in depositional zones along the Michigan mainland shore and is primarily associated with industrial sources that are no longer present.

Environmental Results/Products: The information collected will be used as part of a mass balance modeling effort for the Trenton Channel. Successful application of sediment remediation technology for the Trenton Channel could result in an expansion of this effort for the entire Detroit River. The work performed under this grant could also be adapted to similar Areas of Concern such as the St. Clair River or the St. Mary's River.

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#29-BENCH SCALE FEASIBILITY/TREATABILITY STUDY IN TRENTON CHANNEL (FY1995 - GL985207-01-0)

Michigan Department of Environmental Quality

Contact: Art Ostaszewski
Michigan Department of Environmental Quality
Surface Water Quality Division
Hollister Building
PO Box 30473
Lansing, MI 48909-7973
517-335-4491
517-373-9958 FAX

Award Amount: FY1995 - \$125,000

Project Timetable: October 1, 1995 - September 30, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Trenton Channel of Detroit River, Michigan

Narrative: Sediments in the Trenton Channel of the lower Detroit River, a heavily industrialized area and a major navigation route, have been identified as one of the most severely contaminated areas in the entire Detroit River Area of Concern. Existing work in the Trenton Channel includes re-investigation of zones of contamination to determine depth of contamination (projects #27 and #28) and the development of advanced survey techniques (hydroacoustic profiling) to assess sediment contamination (project #30).

The objective of this project is to collect sediment from Trenton Channel contaminated sites for bench-scale evaluation of remedial treatment technologies. Using the Remediation Guidance Document developed by the ARCS Program as a guide, feasibility evaluations and treatment technologies would be assessed for contaminated sites in the Trenton Channel.

Status: ongoing

Environmental Results/Products: Anticipated study products include:

- a Site Review Report identifying the zones of contamination in the Trenton Channel;
- an Applicable Treatment Technology Review; and,
- a Final Report evaluating aspects of treatment effectiveness, costs, options, and applicability.

#30 - HYDROACOUSTIC PROFILING IN TRENTON CHANNEL, MI

(FY1995 - IAG - DW96947730-01-0)

U.S. Army Corps of Engineers

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U.S. Army Corps of Engineers
Waterways Experimental Station
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Vicksburg, MS 39180-6199
601-634-2869
601-634-3694 FAX

Award Amount: FY1995 - \$120,000

Project Timetable: May 1, 1995 - September 30, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Trenton Channel of Detroit River, Michigan

Narrative: This study is an investigation into the applicability of hydroacoustic profiling in the mapping of bottom sediments. Results of a preliminary acoustical sediment survey conducted in 1994 identified the need to optimize the equipment for use in shallow water (2-30 ft.) and in sediment areas which exhibit a high degree of sediment heterogeneity.

The goal of this project is to determine the appearance of the sediment strata in the near shore area of Trenton Channel and to determine the soft sediment-hardpan boundary to enable the calculation of sediment volume.

Project objectives are:

- conduct a hydro-acoustic survey to determine the proper spatial hydroacoustic sampling rates;
- determine if statistical processing can be obtained to relate this data to general survey procedures; this will allow future use of hydroacoustic techniques to minimize closely-spaced coring and expensive core analysis;
- map sediment distribution by physical type at depth for use in sediment resuspension modeling; and,
- calculate the volume and location of soft sediment in the study area.

Status: ongoing

Data Results: No sediment data collected.

Environmental Results/Products: Project results will be used to help develop a cost effective and rapid means of mapping the distribution of sediments in harbors and rivers which is required to facilitate the remediation decisions facing environmental managers.

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#31 - TRACE LEVEL PCB CONCENTRATIONS IN TRENTON CHANNEL (FY1994 - GL995664-01-0)

Michigan State University

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Department of Fisheries and Wildlife
Pesticide Research Center
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Michigan State University
East Lansing, MI 48824-1222
517-353-2000
517-432-1984 FAX

Award Amount: FY1994 - \$96,000

Project Timetable: September 13, 1994 - April 1, 1996

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: Trenton Channel of Detroit River, Michigan

Partners: Michigan Department of Environmental Quality

Narrative: Sediments in the Trenton Channel of the lower Detroit River, a heavily industrialized area and a major navigation route, have been identified as one of the most severely contaminated areas in the entire Detroit River Area of Concern. Sediment contamination in the Trenton Channel has been extensively characterized through the course of many studies, including projects #27 and #28. Plans for sediment remediation are currently being made. Prior to remediation, it must be determined if there are still any point or non-point sources of critical pollutants, including PCBs, to the Detroit River and Trenton Channel.

Project objectives include:

- determine congener-specific and total concentrations of PCBs in the water column of the Trenton Channel, Detroit River, and vicinity;
- determine the effect of storm-driven resuspension events on the concentrations of PCBs in the nearshore vicinity of the Trenton Channel;
- determine seasonal differences in the concentrations of PCB congeners in the water;
- estimate annual loadings of PCBs to the Trenton Channel;

Status: ongoing

Data Results: incoming (no sediment samples; water samples and semipermeable membrane devices (SPMD) only)

Environmental Results/Products: The knowledge gained from this project will allow for the calibration of mass transport models and a better description of the seasonal and weather-related loading of concentrations of PCBs in the Trenton Channel.

**#32 - WAUKEGAN HARBOR AOC USE IMPAIRMENT REASSESSMENT 1995
(FY1995 - GL985226-01-0 and DW14947756-01-0)**

Illinois Environmental Protection Agency and United States Geological Survey

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Award Amount: FY1995 - \$100,000 (to IEPA) and FY1995 IAG - \$40,000 (to USGS)

Project Timetable: October 1, 1995 - September 30, 1997

GLNPO Project Officer: Callie Bolattino 312-353-3490

Project Location: Waukegan Harbor, Northeast Illinois, Lake Michigan

Narrative: Waukegan Harbor was listed as an Area of Concern (AOC) based on contamination by PCBs. Sediment and water sampling in 1990 helped identify areas in need of remediation. In 1993, USEPA announced the completion of a harbor dredging project which removed 1,000,000 pounds of PCBs from the harbor and adjacent property.

The primary goal of this study is to provide an update to previous studies in the area and to assess the status of previously listed use impairments. Data collected will provide the basis for de-listing if improvements are sufficient.

Specific objectives include:

- the use of sediment core samples to provide a detailed analysis of present sediment conditions which can be used for future dredging and disposal determinations.
- the use of sediment and water chemistry and sediment bioassay analysis to establish a data set as
- the basis for the use impairment assessment.
- the evaluation of fish contaminant samples in relation to annual fish consumption advisories.

Status: ongoing

Data Results: incoming

Environmental Results/Products: Study information will be provided to the Illinois Interagency Fish Contaminant Work Group, the Great Lakes states, and the public. Data will be entered into the USEPA STORET database. The project will provide information useful to the Lake Michigan Mass Balance model presently under development.

Section VII - Appendix

#33 - WHITE LAKE, MICHIGAN SEDIMENT ASSESSMENT

(FY1994 - IAG - DW96947710-01-0)

U.S. Army Corps of Engineers

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Award Amount: FY1994 - \$61,696 (White Lake and Muskegon Lake (project #16) combined; IAG total \$221,000 for White/Muskegon Lakes and Clinton River (project #2) combined)

Project Timetable: September 1, 1994 - September 30, 1995

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: White Lake, Michigan

Partners: Michigan Department of Environmental Quality

Narrative: White Lake, a 2,570 acre drowned river mouth located on the east shore of Lake Michigan, has been designated as a Great Lakes Area of Concern (AOC) due to a number of water quality problems including contaminated sediments and nutrient enrichment. Previous studies have shown that historical municipal and industrial discharges to the lake have resulted in elevated concentrations of many heavy metals. In response to the need for more current data and confirmation of a suspected sediment "hot spot", a sediment sampling survey of White Lake, Michigan was conducted.

Project objectives were as follows:

- collect sediment cores to determine contaminant concentration and vertical profiles;
- characterize the areal extent of contaminants of concern;
- determine the necessary levels of remedial action and agency involvement, and develop an implementation time table.

Status: closed out

Data Results: Arsenic, chromium, and mercury were consistently found at very high levels, while lead, nickel and zinc were also found at elevated levels but in a more inconsistent and less dramatic pattern. The major amount of contamination was located directly adjacent to the Whitehall Leather Company property in the vicinity of their lagoons, where the highest concentrations of As (569 mg/kg), Cr (14,300 mg/kg), and Hg (16.7 mg/kg) were all found.

Environmental Results/Products: Results from this study better delineated contaminant hotspots and were used to help plan for further biological characterization of the area which was conducted in October of 1996.

**#34 - PRELIMINARY INVESTIGATION OF WHITE LAKE NEAR WHITEHALL TANNERY
(FY1996 - IAG - DW13947766-01-0)**

National Oceanic and Atmospheric Administration

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National Oceanic and Atmospheric Administration
Great Lakes Environmental Research Lab
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Award Amount: FY1996 - \$148,100

Project Timetable: August 15, 1996 - December 31, 1997

GLNPO Project Officer: Marc Tuchman 312-353-1369

Project Location: White Lake, Michigan

Partners: Michigan Dept. of Environmental Quality, Grand Valley St. Univ., White Lake PAC

Narrative: White Lake is a Great Lakes Area of Concern located on the eastern shore of Lake Michigan. Elevated levels of heavy metals have been found in the northeastern section of the lake in previous studies, including Project #33. The elevated metal concentrations are located near the Whitehall Leather Tannery (Tannery Bay). The current extent of sediment contamination in the area outside of Tannery Bay is unknown with respect to spatial and vertical distribution. In addition, since previous studies focused only on chemical contamination, the biological impacts of the heavy metal contamination have not been evaluated.

Project objectives are to:

- determine the extent of sediment contamination in eastern White Lake, including the Tannery Bay area.
- determine the abundance and diversity of benthic invertebrates in the Tannery Bay area;
- evaluate the toxicity of sediments from sites in the Tannery Bay area;
- evaluate the bioaccumulation of metals from sediments in the Tannery Bay area.

Status: ongoing

Data Results: data collection was initiated in October 1996 and will be completed in August 1997

Environmental Results/Products: The investigation will provide information necessary for the development and evaluation of remediation alternatives for the Tannery Bay area.

USEPA'S Great Lakes National Program Office will make *Moving Mud* available on the Internet in May, 1997. See the Sediment Assessment and Remediation Team's section of GLNPO's home page:

URL: <http://www.epa.gov/glnpo/sediment/movemud/>

For additional copies of this document, please contact:

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