Upper Great Lakes Connecting Channels Study: Work Plan of Activities. Second Year

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UPPER GREAT LAKES CONNECTING CHANNELS STUDY

WORK PLAN OF ACTIVITIES

SECOND YEAR

JUNE 6, 1986
ACKNOWLEDGEMENTS

Preparation of the Work Plan of Activities - Second Year was authorized by the Management Committee of the Upper Great Lakes Connecting Channels Study. The Activity Integration Committee, assisted by members of the Work Groups, was instrumental in developing this program to achieve the objectives of the Study.

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I. INTRODUCTION

In November, 1983, USEPA Administrator, William Ruckelshaus announced a three year U.S. study on the St. Marys, St. Clair and Detroit Rivers, including Lake St. Clair, and invited Canadian participation. By February 1984, the State of Michigan, Environment Canada, Department of Fisheries and Oceans and the Ontario Ministry of the Environment had agreed to merge their ongoing studies and develop new programs in conjunction with this USEPA initiative. The joint Canada/U.S. Upper Great Lakes Connecting Channels Study (UGLCCS) was formally announced in July 1984 with the formation of a joint Management Committee to oversee the planning, implementation and reporting of the study. By early 1985, a joint Canada/U.S. team of scientists and engineers began a comprehensive investigation of toxic chemicals and other environmental concerns in the Upper Great Lakes Connecting Channels.

Although there have been numerous investigations and reports on the aquatic environmental quality in the Connecting Channels, leading to heightened public concern for impairing health and environmental safeguards, no investigations until now have attempted such a thorough or integrated study of this system.

From the results of this three year investigation, recommendations will be made as to what should be done to reduce the sources or reverse causes of contamination, to improve the health of the system, and to monitor the effectiveness of clean-up programs.

This second year Status Report on the Work Plan of Activities which was first issued in August 1985, describes briefly where the Study stands as the investigations wrap up the first field season and prepare for the second and final field season of 1986. Essentially it provides an assessment of the work done to date against the original study and project objectives. Any substantial changes in direction or information gaps in previous problems are highlighted.

This Status Report is presented in three sections:

The first part of the report is a brief review of the reasons for the concerns in the Upper Great Lakes Connecting Channels, the purpose and objectives of the Study, the general approach adopted and the management structure. This section is brief since it has been covered in some detail in the original Work Plan of Activities.

The second section is a report on the Mid-Course Workshop which was held in February 1986 to review and assess the current status of the activities and projects against the original study objectives, to determine progress to date and the future course of action. It further provides a brief status report on each of the four geographic areas (St. Marys, St. Clair and Detroit Rivers, and Lake St. Clair) based on information presented at the workshop.
The final portion is a summary and status, as of February 1986, of the seventy-two activities as listed in the UGLCCS Work Plan of Activities and the approximately 150 individual projects within these activities. Briefly, these relate to Biota, Sediment, Water, Point Sources, Non-Point Sources, Modeling and Quality Assurance/Quality Control Activities. The final report of the study is expected to be submitted to the agencies in late 1987.

II. OVERVIEW

1. The Upper Great Lakes Connecting Channels (UGLCC)

The Upper Great Lakes Connecting Channels which constitute the focus of this study include the St. Marys, St. Clair and Detroit Rivers as well as Lake St. Clair. Collectively these provide an important resource and portion of the Great Lakes Basin. Not only do they provide an important commercial transportation corridor linking lower and upper Great Lakes, but they also provide a source of water for power generation, for municipal and industrial use, recreational values in swimming, boating and fishing, and serve as an important habitat for a wide variety of fish, birds and other animals.

Not surprisingly, problems have arisen in trying to provide for these often conflicting uses. In particular, the intensive use which has taken place and continues to take place throughout this system has resulted in serious environmental degradation in many areas. Previous concerns were identified as early as the 1940's and included bacterial contamination, phenol problems, and excessive levels of metals, iron, phosphorus and mercury. Most of these problems have been reduced significantly. Today, major attention is focused on toxic substances that have been detected in water, sediment and biota throughout the system and their effects on human health and the ecosystem.

Despite massive clean-up efforts and the expenditures of millions of dollars by both industry and government, the UGLCC's are four of the forty-two geographic areas in the Great Lakes Basin which have continued to be designated as "Problem Areas" by the International Joint Commission (IJC) since 1974. (Note: these were redefined as "Areas of Concern" by the IJC in 1981). There are areas in which the specific objectives of the 1978 Great Lakes Water Quality Agreement are exceeded; and there is significant environmental degradation and/or impairment of beneficial uses. The specific objectives are designed to protect the most sensitive beneficial uses of the water, including uses for drinking and the protection of aquatic life.

2. Upper Great Lakes Connecting Channels Study

(1) Purpose

The parties to the 1978 Agreement (Canada and the United States) have been charged with identifying the problems in these "Areas of Concern" and with implementing appropriate remedial action for their abatement. To accomplish this in the Upper Great Lakes Connecting Channels, Canadian and U.S.
environmental and resource management agencies agreed to embark on a three-
year study of the St. Marys, St. Clair and Detroit Rivers, and Lake St. Clair,
drawing on the resources of U.S. and Canadian government agencies and depart-
ments. The output of the Study will be a report to the sponsoring agencies
outlining the current status of the system, the progress that has been made
in pollution control and recommending appropriate specific actions to address
significant remaining as well as new and emerging concerns. These recommenda-
tions will provide guidance for the sponsoring agencies in their development
of programs for management of this water resource and for long term monitor-
ing to assess the effectiveness of pollution controls.

It should be noted that, subsequent to the initiatives of this study, the
Water Quality Board of the IJC in its 1985 report to the Commission re-
commended that the jurisdictions complete and submit Remedial Action Plans
(RAPs) for all Areas of Concern in the Great Lakes Basin. Results from the
UGLCCS will be invaluable in the development of the RAPs for these Areas of
Concern.

ii. Objectives

Specifically, the objectives for the Study as required and agreed to in
1984 by all participating agencies are as follows:

1. To determine the existing environmental condition of the St. Marys
   River, St. Clair River, Lake St. Clair, and the Detroit River at
   its influx into the Western Basin of Lake Erie to identify infor-
   mation gaps.

2. To undertake additional, needed studies:
   a. identify and quantify the impacts of conventional and toxic
      substances from point sources, nonpoint sources (both runoff
      and contaminated groundwater) and tributaries, on beneficial
      human uses and on plant and animal populations in, along, and
      below these waters
   b. determine the adequacy of existing or proposed control programs
      to ensure or restore beneficial uses
   c. recommend appropriate control and surveillance programs to
      protect and monitor these waterways and the downstream lakes

iii. Approach

These broad considerations were foremost in dictating the overall approach
to the UGLCCS. First, it was agreed that the Study should have a regulatory
management focus. The activities were designed to assess the need for
further remedial actions and to guide the development of remedial action
plans as appropriate. Second, the activities were to focus on two broad
categories of concern—toxic substances and habitat destruction. Third, a
mass balance modeling framework would be directed toward synthesizing and
Figure 1.
Management Structure

U.S. Environmental Protection Agency and Environment Canada Co-chairmen of the Management Committee

Secretariat

U.S. EPA & Environment Canada Co-chairmen of the Activity Integration Committee

Biota Work Group
Sediment Work Group
Water Work Group
Quality Management Work Group
Modeling Work Group
Long Term Monitoring Work Group
Point Source Work Group
Nonpoint Source Work Group

* To be formed
supporting the interpretation of the data collected. With respect to the latter, it was recognized that development of a comprehensive management scenario, or set of models, was beyond the time frame and fiscal resources of the Study. The results of the modeling activities are expected to be useful for the development of a long-term management tool.

iv. Management Structure

To oversee the planning, implementation and reporting of the results of the Study, a three-tier management structure was established consisting of the Management Committee, the Activity Integration Committee and a number of specific activity work groups (Figure 1). Although there have been some changes in both individual and agency representations at all three levels during the course of the Study, the original structure remains intact.

v. Schedule

At the end of the first year of the UGLCC study, the project is proceeding on schedule overall. There have been some slippages in field study schedules and laboratory completion of early sampling operations. Data quality management is a major concern. Modeling activities and FY '86 field work preplanning have been slowed by delays in sample analysis and reporting.

The 1986 field season will be the major field effort of the Study. Model development will continue and the first year Quality Assurance/Quality Control (QA/QC), round-robin results will be available. As 1986 data collection and analysis proceeds, model development and calibration will accelerate.

III. MID-COURSE WORKSHOP

Because the study capitalized on many ongoing activities in 1985, the 1986 field year was viewed as the principal field effort for many of the participants in the Study. While it was recognized that normal laboratory turn-around times would not ensure a full workup of the 1985 samples in time for planning the 1986 field year, the belief was that sufficient information would be available to allow the identification of major gaps and also allow needed course changes in the UGLCCS design. It was determined that a workshop bringing together the principal investigations of the Study would provide: (1) a review of the proposed 1986 activities, (2) an exchange of information generated to date from 1985 field work, (3) a means to identify progress to date additional needs on a project level, and (4) a forum for quickly identifying and resolving logistics of ship support, equipment sharing and the like.

Overall, these objectives were accomplished during the February 1986 Workshop in Southgate, Michigan. Some of the major decisions made at the Workshop are discussed below.
### Table 2.

**GREAT LAKES UPPER CONNECTING CHANNELS STUDY**

**SCHEDULE OF MAJOR ACTIVITIES**

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Transect Monitoring

It was agreed that further transect monitoring was not needed in 1986 to support mass balance models on the St. Clair River. Data from the 1985 Canadian St. Clair River surveys for those parameters that were measured would be used. In 1986, Canadians will place their effort in monitoring point sources while the U.S. effort will be devoted to Detroit River and Trenton Channel mass balance studies. Additional monitoring along a transect on the lower St. Clair River to support Lake St. Clair process and mass balance models would be sought. However, the samples from the Detroit monitoring effort were to receive first priority for analysis with the St. Clair samples to be analyzed if laboratory capacity becomes available. Interagency sampling teams were to include staff from the EPA, NOAA, Michigan DNR and City of Detroit.

Sediment

Work on the St. Clair River demonstrated the importance of bedload transport of sediment as a means of dispersing certain pollutants downstream. It was agreed to explore ways to extend this work to the St. Marys and Detroit Rivers. Preliminary data analysis from Lake St. Clair showed that the lake serves as a sink for some of the pollutants under study.

Logistics

Many of the studies of the 3 rivers and Lake St. Clair need large vessel support. The available vessels were identified and ship times were blocked out for the individual projects.

A review of studies was initiated to apply sediment bottom profiling techniques which will minimize the number of agency survey crews needed and thus maximize the availability of superior equipment.

Teams, of Ontario MOE and USEPA staff, boats and equipment were pooled to obtain the sediment data from the lower reaches of St. Marys River.

IV. QUALITY ASSURANCE/QUALITY CONTROL MANAGEMENT

Background

The experience of other interagency studies on the Great Lakes has demonstrated the need to recognize quality QA/QC aspects as crucial elements to the overall utility of Study results. QA/QC considerations must be taken into account at the beginning of the study and not viewed in hindsight. With this in mind, the Management Committee constituted the Quality Management Work Group and attached to it a high priority, recognizing the concomitant demand on scarce resources.

Activities

The Quality Management Work Group (QMWG) is primarily responsible for assur-
ing that all participating laboratories generate reliable data. Compatibility will be assured by:

a) reviewing analytical and field protocols
b) assessing laboratory's internal quality assurance programs
c) assessing the statistical validity of program results
d) running split samples

Expected Output of Quality Management Work Group

The products expected from the QMWG are:

1. Individual interlaboratory Performance Evaluation/Quality Control studies
2. Integrated reports on interlab PE studies for each type of organic parameter for water, sediments, fish and inorganics in water. Five or six reports are expected. These reports provide statements on quality of data of the quality control samples
3. Interim short reports on problem labs identified by interlab studies
4. Reports on review of W/OA Project Plans
5. Comments on data of split field sample when available

Status

1. Work Group Quality Assurance and Statistical Reviews: Workgroups were asked to submit a document to the QMWG documenting site selection, sampling protocols, field quality control, laboratory sampling handling, storage, preparation and analysis. Partial quality assurance plans have been submitted and reviewed for the Biota, Sediment and Point Source Work Groups; others are forthcoming.

2. Inter-laboratory Quality Control Study

As of March 17, 1986, nine inter-laboratory studies (QM-1 to QM-9) were designed and conducted to cover several organic and inorganic parameters. All laboratories in the revised Lab List, approved by the MC and AIC, have agreed to participate in the studies and will be providing data for UGLCCS.

A number of problems were identified to the Management Committee for resolution. These issues are currently being addressed by the Management Committee.

V. ADEQUACY OF UGLCCS FOR RECOMMENDATIONS ON REMEDIAL ACTION PLANS

A. St. Marys River

It was pointed out that the Study Activities on the St. Marys River may not provide all the details required to prepare a comprehensive remedial action plan for the river since water quality objectives have not been established for many of the parameters of concern (e.g. PAHs), but they will provide the basis for undertaking additional actions. To date the most significant impact on the river is manifest in the contaminant sediments. Information
collected as part of the Ontario MOE Municipal and Industrial Strategy for Abatement (MISA) programs will also be used wherever possible.

B. St. Clair River

The UGLCCS investigation of the St. Clair River, complemented by additional investigations undertaken by the Canadian environmental agencies, should provide sufficient details for the preparation of comprehensive Remedial Action Plans for the river. However, this will be dependent upon the timely development and implementation of revised and new water quality objectives for both conventional and toxic organics. The Canadian MISA program and the selection of the St. Clair River industries and municipalities as part of the MISA pilot studies should provide needed water quality objectives for the development of remedial action plans. It is expected that remedial action plans will include steps for dealing with the problems of contaminated sediments.

C. Lake St. Clair

The research studies being conducted in Lake St. Clair will be generating the most comprehensive data base on the physical and biological characteristics of the lake. This work has provided an opportunity to calibrate models of chemical and physical processes affecting fate and transport of chemicals through the lake.

D. Detroit River

While the historical data on the river have been collected, sediments mapped, and all point sources inventoried and mapped, the bulk of the data gathering will occur in 1986. The river has the greatest concentrations of municipal and industrial point sources in the Study area, and critical information on source inputs is being collected. Since many of the outfalls contain large flows and highly complex effluents, successful sampling and analysis of them remains a significant challenge. Due to a large number of these sources, only a characterization of these sources will be attempted, using agency knowledge of processes, historical data and current sampling efforts.

In the Trenton Channel there will be a close scientific scrutiny of interactions of pollutants between biota, sediment and the water column. The extrapolation of these interactions and their effects upon the resource will depend upon the ability of the research program to deliver useable findings in a timely fashion to the modelers.

The habitat studies should provide information to define the type of fishery a reclaimed Trenton Channel could support. An electro-magnetic survey will be conducted to assess the potential of landfills located along the river to contribute pollutants through the groundwater, based on the overall groundwater movement in and out of the river. Detailed investigations of these landfills outside of the long term monitoring are not being planned.
VI. FUTURE DIRECTIONS

As this report goes to the printer, the second field season has begun. Agency scientists and regulators are out in the field 1) collecting water samples for modeling and water quality assessment; 2) sampling industrial and municipal effluents, to review their contribution to the problems; and 3) sampling the biota to look for answers as to environmental effects.

During the coming year, particular attention will be focused on the laboratory work, not only to ensure that it is timely but also of good quality. Laboratory capacity is of particular concern due to the availability of only a few laboratories to provide the low detection levels required for the UGLCC Study. Their capacity is being severely tested. Equipment failure or loss of key personnel at these institutions could have severe repercussions in terms of meeting the specified timelines.

While most of the data for evaluation of the Connecting Channels are being generated this summer, the Management Committee will be preparing for the writing of the Final Report. A draft outline has been accepted. Concepts for development of writing teams on a geographic, cross-media basis are being developed. Final procedures for report writing will be developed by fall, 1986.

ST. MARYS RIVER

Ecological Status

Contaminant loadings to the St. Marys River have impacted water quality, sediments and biota. The river has been designated as an "Area of Concern" by the IJC. The presence of PAHs has been identified as an emerging problem. The elevated concentrations of PAHs in biota, sediments and in Sault Ste. Marie, Ontario drinking water supplies have been substantiated by recent studies. The surface water intake has been relocated to Gros Cap, upstream of industrial and municipal discharges.

i. Sediments

Sediments are contaminated with heavy metals, oils and greases, phenolics, cyanide and PCBs. Some of these contaminants are present in the sediments above MOE and IJC objectives for disposal of dredge materials.

Heavy metals, oil and grease, PAHs and PCBs contamination of the sediments is presently being investigated. Preliminary findings indicate contaminants have been restricted primarily to the Canadian side of the river and the St. Joseph's Channel. The amount of contaminants in the sediments and their toxicity to aquatic biota will be investigated in 1986. Investigations of toxic organic and heavy metal contaminants of sediments at seven St. Marys River tributary mouths will also be expanded.
Figure 2. ST. MARYS RIVER
ii. Biota

Impairment of the benthic community has been noted on the Canadian side downstream of the municipal and industrial discharges in Sault Ste. Marie through the upper end of Lake George, and in the immediate vicinity of Algoma Steel.

Additional benthic sampling of the St. Marys River has been completed and findings are in preparation. Caged clam studies were also undertaken to assess biological uptake of organic contaminants. Reports of these findings are awaiting analytical results. Contaminant levels are being analyzed in native benthos, bottom fishes and macrophytes, to assess the impact of in-place pollutants on biota.

Recently released findings of organochloride and mercury residues in spot-tail shiners indicate the presence of low levels of DDT congeners in the vicinity of Sault Ste. Marie. Additional juvenile fish from the St. Marys River will be collected in 1986 to assess residues of PCBs, pesticides, chlorinated aromatics, mercury, lead, dioxins, furans, PAHs and volatiles.

iii. Ambient Water Quality

Ambient water quality of the St. Marys River has been impacted by discharges associated with the Algoma Steel Mills, the Abitibi Paper Mill, municipal sewage treatment plants and urban runoff. Phenolics and cyanides have been identified as contaminants of primary concern as well as grease, oil, zinc and iron.

A 1983 survey of the river indicated that contaminants such as phenols, ammonia and cyanide were reduced to levels approaching the 1978 Great Lakes Water Quality Agreement specific objectives.

Investigation of the ambient water quality of the St. Marys River and its tributaries will continue during the 1986 field season. The data will be incorporated into the modeling of the river hydrology and loadings.

iv. Point Source Discharges

There is a paucity of historical data on Point Source inputs to the St. Marys River. Point source monitoring studies will be undertaken as part of the UGLCCS in the 1986 season. These will include the inventory and intensive sampling of industrial and municipal discharges into the St. Marys River, as well as combined sewer outfalls. Industrial loadings to municipal sewage treatment plants will also be calculated.

v. Landfill Sites

Preliminary investigations of the Algoma Steel slag dump have suggested contamination (PAHs) of groundwater under and adjacent to the site. An MOE report, in preparation, assessing the potential for adverse impacts from landfill sites has already identified the Algoma slag site as a priority site warranting further investigation.
Study of leachates from the slag dump and coal and coke storage areas and groundwater investigation of, and adjacent to, the site may not be initiated in time for completion and incorporation into the UGLCCS final report.

vi. Modeling and Mass Balance

Modeling studies on the St. Marys River will be undertaken as another component of UGLCCS.

ST. CLAIR RIVER

Ecological Status

Heavy industrial and urban development and use as a transportation corridor have contributed to the impairment of the quality of the St. Clair River and its designation as an Area of Concern. The ambient water, sediments and biota have been impacted by conventional pollutants, heavy metals and toxic organics from possible sources such as municipal and industrial point sources, combined sewer overflows (CSOs) and runoff from urban, industrial and agricultural areas. Concern with contamination of groundwater from waste disposal sites and deep well injection of industrial wastes has warranted present investigation. Bacterial contamination from CSOs in Sarnia has limited local recreational use with beach closings. Discharge of contaminants has impacted on some sports fish, resulting in limitation of consumption of some species and sizes.

i. Sediments

Surficial sediments in the St. Clair River are contaminated with heavy metals, PCBs (up to 300 ug/kg), HCB (up to 600 ug/kg) and total chlorinated dibenzofurans (up to 22 ug/kg). No tetraoxins and no 2,3,7,8-TCDD were detected. Sediment samples from the mouths of five St. Clair River tributaries were sampled in 1985 and are being analyzed for PCBs, pesticides, chlorophenols, metals, conventional, PAHs volatiles, and chlorinated aromatics/aliphatics. Additional samples taken from a total of 78 locations along the St. Clair River in May of 1985 are being analyzed.

ii. Biota

Despite reductions in inputs in the areas historically impacted by point source discharges, a zone of severe impairment approximately 5 km (3 mi) long exists along the industrialized Sarnia waterfront and extends approximately 75 m (250 ft) out from the shoreline.

Benthic sampling of the St. Clair River was undertaken in 1985 for the assessment of community structure, correlation with sediment contaminant distributions and contaminant uptake. While the benthos speciation has been completed, the chemical analyses are still in progress. Additional sampling is scheduled for the St. Clair River in 1986. Laboratory capacity is the limiting factor for the progress of this work.
Figure 3. ST. CLAIR RIVER

Q = 6.510 m³ s⁻¹ (230,000 ft³ s⁻¹) High
Q = 5.320 m³ s⁻¹ (188,000 ft³ s⁻¹) Medium
Q = 3.680 m³ s⁻¹ (130,000 ft³ s⁻¹) Low
Preliminary results from biomonitoring studies using clams from twenty-one stations in the St. Clair River have indicated the presence of elevated chlorinated organics (PCBs, OCS, HCB, HCBD and OCB), along the industrialized waterfront (from the township ditch downstream to the Dow/Suncor property line), with some residuals detectable as far as 35 km (20 mi) downstream near Port Lambton. In addition to completing reports on previous sampling, more site-specific biomonitoring in the Sarnia area will be undertaken in 1986 to evaluate the impact of specific Sarnia point sources.

Emerald shiners collected from three locations in the St. Clair River in 1985 showed no trace of 2,3,7,8-TCDD but a level of 1200 ppt of total dibenzofurans was observed. Preliminary evaluation of the results indicate that sources associated with this elevated level may be located in Lake Huron rather than in industrial sources in Sarnia. Further investigation of this and other contaminants is scheduled for 1986.

Analysis of attached algae (Cladophora) on the industrialized Canadian shoreline downstream of Sarnia at Corunna has shown the presence of heavy metals and PCBs. Analyses of additional macrophyte samples collected in 1985 should be completed in 1986.

v. Ambient Water Quality and Point Source Sampling

Extensive ambient water quality sampling in 1985 as part of the UGLCCS, and monitoring activities conducted during the joint Environment Canada - MOE studies associated with the Dow perchloroethylene spill and cleanup have identified conventional contaminants, heavy metals and toxic organics associated with point source discharges from industrial, municipal and agricultural drainage sources. UGLCCS activities initiated in 1985 to monitor these impacts will continue into the 1986 field season, augmented by new projects. Analytical capability is the limiting factor in the progress and implementation of many of these studies.

Mapping of the point sources has been completed. Monitoring of CSOs and of industrial and municipal point sources has been initiated. Analyses include contaminants such as EPA-priority pollutants, PAHs and additional metals beyond the minimal UGLCCS requirements.

iv. Non-Point Sources

Investigation of the waste disposal sites to establish sites which may impact the UGLCCS has been completed and prioritization of sites is currently under consideration. Monitoring of the freshwater aquifer in Lambton County has been initiated to ascertain if deep well disposal practices may have impacted on the aquifer and/or the river. Groundwater seepage from the river bottom has been investigated. The mobilization of in-place pollutants both by resuspension and biological mobilization is being investigated. The impact of agricultural practices, including tillage, animal waste, fertilization and pesticide practices are being investigated.
v. Modeling and Mass Balance

Several modeling studies were initiated in 1985 and will continue in 1986 to model the fate of specific contaminants in the St. Clair River. The measurement of velocity gradients, surface velocities, cross-sections and other hydrological data collected in 1985 will continue in 1986 for the development and calibration of UGLCCS models dependent upon the hydrology of the St. Clair River. In addition, mass balance models and decision making models will be developed and calibrated during the 1986 field season.

Dow Chemical Spill

Many planned UGLCCS activities were accelerated and several additional unplanned activities were initiated (see Workshop Results) in response to the much publicized spill to the St. Clair River of approximately 11,000 L (2,500 Imperial gal) of perchloroethylene from the dow Chemical Canada Inc. complex in Sarnia. Approximately 9,000 L (2,000 Imperial gal) of the spilled perchloroethylene were immediately recovered from the river. The balance is suspected to have been washed downstream and/or combined with tar-like deposits known to be present in the sediments in the vicinity of the Dow 1st Street sewer outfall. The perchloroethylene and the visible puddles in bottom depressions became known in the media as the St. Clair River "Blob".

As a result of the difficulty in ascertaining the origin of the contaminated "puddles" of perchloroethylene which were recurring and accumulating offshore from the Dow 1st Street sewer, Environment Canada and the Ontario Ministry of the Environment required strict precautions and close monitoring of Dow's cleanup procedures to minimize any impact on downstream users. To provide the public with an overview of the pollution of the St. Clair River in the Sarnia area and the monitoring activities underway, the Environment Canada and the Ontario Ministry of the Environment issued a Situation Report on November 18, 1985.

Furthermore, both agencies undertook actual detailed monitoring of the clean-up activities and the ecological conditions in the proximity of the Dow spill in Sarnia and incorporated these findings into a more comprehensive investigation report, "St. Clair River Pollution Investigation (Sarnia Area)", issued January 28, 1986. Most of the activities undertaken for these later reports complement the requirements of the UGLCCS and will be incorporated into UGLCCS wherever possible.

LAKE ST. CLAIR

Ecological Status

An overview of the Lake St. Clair ecosystem is presently being prepared by the U.S. Fish and Wildlife Service as part of the "ecological profile series." The draft publication will be available in late spring, 1986 and will provide information needed to describe the study area and its ecosystem, as well as describe some of the man-induced stresses.
Figure 5. LAKE ST. CLAIR
i. Sediments

Sediment mapping and core sampling performed in 1985 will provide information as to depositional areas and the significance of the lake as a sink/source of contaminants. Preliminary analyses of data on radioisotopes and heavy metals indicate that parts of Lake St. Clair will serve as a reservoir of pollutants for years to come.

ii. Biota

Ongoing biota studies will provide measurements of contaminant burdens from which transfer coefficients can be estimated using process models, as well as information on biotic diversity and abundance at several trophic levels. Macrophyte drift data from Lake St. Clair indicate that approximately 6,800 metric tons of aquatic plants enter the Detroit River between May and October, making vegetation and their decomposition products potentially significant in affecting the transport and behavior of some pollutants.

iii. Point Source Discharges

Lake St. Clair is unique in the UGLCCS area in that its direct point source discharges are few in number and appear to exert little influence on water quality. For phosphorus, non-point agricultural sources appear to contribute the majority of the loads. Isotope mass balance studies indicate that the atmospheric component of P loading is less than 10%, and thus is not a significant source to the study area as a whole. The lake may be acting as a temporary sink for a number of contaminants contributed by the St. Clair River and other smaller tributaries. The impact of navigation on contaminant distribution is still under review. Dredging may be exerting a beneficial impact by removing heavily contaminated material from the system.

iv. Modeling and Mass Balance

An improved understanding of the physical and hydraulic characteristics of Lake St. Clair became available during 1985, due in part to the collection of considerable intake, flow and sediment data. However, with the exception of the St. Clair River input, the diffuse nature of the sources has made collection of relevant information difficult. Nevertheless, Lake St. Clair presents a challenge to develop process models that describe the fate and transport of contaminants in the study area.

DETROIT RIVER

Ecological Status

The impact of upstream St. Clair River and Detroit Metropolitan area discharges upon the sediments, biota and water quality in the Detroit River have contributed to its designation as an Area of Concern. The ecological profiles due in final draft for in May 1986 will provide a summary of current information on the ecology of the Detroit River. Ongoing studies of the habitat and biotic response to toxicity in the Trenton Channel will up-
Figure 4. DETROIT RIVER

Table of Water Flow Rates:

<table>
<thead>
<tr>
<th>Location</th>
<th>Water Flow Rate (m³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detroit Channel</td>
<td>0.42 (1.37)</td>
</tr>
<tr>
<td>Wyandotte</td>
<td>0.45 (1.49)</td>
</tr>
<tr>
<td>Trenton</td>
<td>0.58 (1.80)</td>
</tr>
<tr>
<td>Gibraltar</td>
<td>0.52 (1.70)</td>
</tr>
<tr>
<td>Gibraltar Channel</td>
<td>0.35 (1.14)</td>
</tr>
<tr>
<td>Hickey Island</td>
<td>0.67 (2.00)</td>
</tr>
<tr>
<td>Celeron Island</td>
<td>0.30 (0.97)</td>
</tr>
</tbody>
</table>

Legend:
- Q = 5,950 m³/s (210,000 ft³/s) — High
- Q = 5,210 m³/s (184,000 ft³/s) — Medium
- Q = 4,810 m³/s (170 ft³/s) — Low

Scale of Kilometers:

- 0
- 5
- 10
- 15
- 20

Scale of Miles:

- 0
- 5
- 10
- 15
- 20

Map showing Detroit River with various water flow rates indicated in m³/s and ft³/s, along with locations such as Ambassador Bridge, St. Clair River, Lake Huron, Lake Erie, and more.
date this information to help define the impact of man-made stresses on the natural system.

i. Sediments

Sediment data from historical studies have been mapped and tributary mouths have been sampled to help characterize the toxic substances loading component associated with the incoming sediments. Bioassays of sediments indicate a potential toxicity gradient in the Trenton Channel extending from Monguagon/Huntington Creek toward the Western Basin of Lake Erie.

ii. Biota

Clam uptake studies are being planned to pinpoint areas of toxic substances' input to the Trenton Channel. Studies of fish larvae will be conducted in 1986 to help determine whether non-feeding larvae found earlier in areas of reduced water quality below the mouth of the Rouge River were due to direct toxic action upon the organism or simply due to lack of food in the area. The former could be the result of the high concentrations of contaminants observed in the water column. The habitat studies will provide information to help define the type of fishery the Trenton Channel could support with improvements in water quality.

iii. Point Sources

Historical data from point sources have been primarily limited to conventional parameters with a few isolated in-depth studies on selected chemical manufacturing facilities. In 1985, the municipal and industrial discharges in the Windsor area were sampled for convention and toxic substances. Similar studies will be conducted on U.S. facilities in 1986. The largest combined sewer overflows on both sides of the Detroit River will also be sampled in 1986. Only the U.S. Trenton Channel discharges will be sampled synoptically with Detroit River transect monitoring. Selected U.S. facilities will be screened by bioassay techniques to isolate acutely toxic discharges. An electro-magnetic survey will be conducted to assess the potential of landfills located along the river, contributing pollutants through the groundwater.

iv. Modeling and Mass Balance

Reconnaissance studies to assess logistic needs and sampling techniques were conducted in February 1985. Transect sampling teams have been organized to do head-and-mouth studies of the Detroit River system in April and in August for a "black-box" model of the river. Synoptic sampling of sources and ambient environment will be conducted for the Trenton Channel only. A mathematical fate model of toxic contaminants, using TOXFATE, has been developed. This model will be verified in 1986.
ACTIVITIES

In order to meet the objectives and goals of the Upper Great Lakes Connecting Channels Study, 70 activities have been proposed and grouped into 8 general categories. For each activity the following items have been identified: its purpose, the approach to be used to accomplish the activity, the expected end product, and the schedule.

<table>
<thead>
<tr>
<th>Activity Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 thru A.5</td>
<td>Administrative Support</td>
</tr>
<tr>
<td>B.1 thru B.4</td>
<td>Data Quality Management</td>
</tr>
<tr>
<td>C.1 thru C.7</td>
<td>Modeling</td>
</tr>
<tr>
<td>D.1 thru D.8</td>
<td>Point Source Discharge and Combined Sewer Overflows</td>
</tr>
<tr>
<td>E.1 thru E.15</td>
<td>Nonpoint Sources:</td>
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<tr>
<td></td>
<td>Waste Disposal Sites/Groundwater</td>
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<td></td>
<td>Agricultural Sources</td>
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<td></td>
<td>Atmospheric Deposition</td>
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<tr>
<td>F.1 thru F.8</td>
<td>Ambient Water Quality Assessment</td>
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<tr>
<td>G.1 thru G.4</td>
<td>Sediments</td>
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<tr>
<td>H.1 thru H.21</td>
<td>Biota</td>
</tr>
<tr>
<td></td>
<td>Community Description</td>
</tr>
<tr>
<td></td>
<td>Habitat Evaluation</td>
</tr>
</tbody>
</table>
In order to ensure the accuracy and goals of the study, the following considerations were made:

**Vegetative Cover**
- Vegetation was observed along the banks of the river. This helped in understanding the ecological impact of disturbances on the natural system.

**Biovolumes**
- Biovolumes were measured to assess the impact of toxic substances on aquatic life. Studies in the area showed significant biovolume changes.

**Chemical Studies**
- Chemical analyses were conducted to determine the levels of toxic substances in water and sediment. The results indicated high levels of pollutants.

**Eco-Test Monitoring**
- Eco-tests were performed to assess the health of the ecosystem. The results showed signs of stress.

**Modeling**
- A model was developed to simulate the effects of toxic substances on the ecosystem. The model hypothesized that the ecosystem could support certain levels of contamination.

**Mitigation Strategies**
- Strategies were proposed to mitigate the effects of toxic substances. These included the use of bioengineering techniques and the implementation of strict environmental regulations.
Activity Number: A.1

Activity Title: Administrative Support to the UGLCC Study

Purpose: To provide centralized administrative support to Management Committee and Activities Integration Committee.

Approach: Provide secretariat and coordinative support to Management and Activity Integration Committee. Provide a centralized repository and distribution point for records, reports and working documents. Develop an electronic communications network for transfer of draft reports and correspondence.

End Product: Meeting minutes, central study files, improved logistics.

Lead Agency: EPA/EPS

Schedule: 1984 - 1987

Status: Contract staff on board to provide U.S. administrative support. Canadian staff allocated for same.
Activity Number: A.2

Activity Title: UGLCC Study Planning and Implementation Workshops

Purpose: To develop a consensus on the focus of the study and establish interagency communications to support remedial action plans.

Approach: A three day workshop was led by professional facilitators from the Environmental and Social Systems Analysts Ltd., using an approach which emphasized the development and evaluation of a conceptual model. Central to this approach is the impact hypothesis, i.e., identification of "actions" (human activity), "indicators" (measure of effect) and "linkages" (cause-effect connection).

In 1986 a technical and implementation oriented multi-day workshop to facilitate agency fiscal and program planning, information transfer between the various media research scientists, laboratories and their respective agencies is to be conducted by an appropriate contractor. Scope and timing of the workshop will be determined by the Activity Integration Committee.


The report outlined the definition of general problems and issues and developed impact hypothesis for water, sediments and biota media.

A study plan and strategy was proposed. The most important suggestion was that a simple mass balance approach should form the basis of the early phase of the study. All details of contaminant fate are unlikely to be formulated into a framework of understanding within the time span of the UGLCC Study.

In February, 1986 the facilitating contractor will deliver the 1986 workshop report delineating the subsequent activities of study.

Lead Agency: EPA/EPS

Schedule: December 1984
February 1986

Status: 1986 Workshop held under the auspices of EPA Large Lakes Research Station, findings forwarded for incorporation into a revised 1986 Workplan and status report by AIC.
Activity Number: A.3

Activity Title: UGLCC Study Literature Review

Purpose: To support the first objective of the UGLCC Study: To determine the existing environmental information of the study area to determine information gaps.

Approach: Limno-Tech, Inc. contracted to fulfill three project objectives:

- Compile and document all relevant sources of data so that information can be extracted as needed.
- To distill and synthesize from the above compilation, information on specific subject areas which will assist the UGLCC Study to meet its goals.
- To identify information gaps in specific subject areas.

End Product: Over 650 sources of information were compiled as a UGLCC bibliography which is stored on a computer database for retrieval purposes.

Described status of data in study area
Identified research needs and problem areas not previously identified.

Lead Agency: EPA/EPS

Status: Completed.
Activity Number: A.4

Activity Title: Writing of the Final Report

Purpose: To present the Management Committee's recommendations and conclusion of the Study.

Approach: The Activities Integration Committee will draft two final reports under direction and approval of the Management Committee.

The first report shall consist of an executive summary and contain the findings and recommendations of the study. The second report will contain the detailed presentation, findings, recommendations and supporting information.

The Management Committee will deliver a copy of the final reports to the individual sponsoring agencies which shall be responsible for its printing and public release. The release and publication of individual research studies and other supporting reports shall be the responsibility of the individual participating agencies.

End Product: Two camera-ready reports to sponsoring agencies.

Lead Agency: EPA/EPS

Schedule: End of 1987

Status: Tentative outline approved by Management Committee. Writing team organization concepts being considered by AIC and Management Committee.
Activity Number: A.5

Activity Title: Information Exchange (Transfer)

Purpose: To facilitate data pooling, cross study analysis and the drafting of the final report.

Approach: Use of compatible micro-computer, software and centralized data storage systems (i.e., STORET, STAR).

End Product: Common data sets and software, and an interactive micro system allowing electronic transmittal of data and draft reports.

Lead Agency: EPA

Schedule: 1985 - 1986

Status: Data Exchange

Set up agency code on STORET (USEPA data storage database on NCC/IBM computer). This agency code (51UGLCC) will be used for storage and retrieval of UGLCC data. Anyone with a valid NCC/IRM User I.D. may access STORET database.

Status: Electronic Bulletin Board

Set up account of NCC/IBM (USEPA computer system) to be used as an electronic "bulletin board" for UGLCC study members. Bulletin board may be accessed by anyone with a terminal or Personal Computer capable of communicating with an IBM computer. User must have valid NCC/IBM User I.D.
Activity Number: B.1

Activity Title: Inter-Laboratory Performance Evaluation

Purpose: To assist analytical laboratories in generating reliable data and assessing their overall performance during the Study.

Approach: Using OA/OC project plan as a guide, the work group will review and report on the appropriateness of analytical and field protocols. Using specially prepared samples of known stability, participating laboratories periodically analyze unknowns and results are analyzed to determine whether a participating laboratory's internal quality assurance program is working.

End Product: Data of known reliability and an assessment of laboratory quality assurance programs for the purpose of the study.

Lead Agency: CCIW

Schedule: 1985 - 1987

Status: Program suffered staffing delays.

Status: Review of Project Statistical Design

Nine studies, which have been mailed to participating laboratories for analysis, will be evaluated by the Quality Management Work Group when results are available.
Activity Number: B.2

Activity Title: UGLCC Study Quality Assurance/Quality Control Program Field and Inter-Laboratory Component

Purpose: To ensure that methods used to generate data result in data that are useable, compatible, defendable and meet the goals of the study.

Approach: Develop a top down management system for quality assurance.

Use EPA document "Guidance for Preparation of Combined Work QA Project Plans for Water Monitoring" to document site selection, sampling protocols, field QC, laboratory sample handling, storage, preparation, analysis, and reporting of results. Review the above to ensure compatibility among project goals, laboratories and media and also document this review process as part of the QA/QC program.

End Product: Quality assurance data from optimum number of samples.

Lead Agency: CCIW

Schedule: 1985 - 1986

Status: Majority of QA Project Plans received. Complete plans are needed for Point Source and Sediment Projects. Water quality project data has not been received.
Activity Number: R.3

Activity Title: Review of Project Statistical Design

Purpose: To ensure that the study generates the amount of data needed to support statistically based conclusions at the end of the field program.

Approach: Review project plans prior to field work to ensure sampling is adequate to support statistical analysis at the end of the study. Ensure that proposed statistical treatments of data are appropriate; suggest alternate statistical designs where appropriate.

End Product: Agreed upon statistical treatment of data and optimum number of samples for statistically supportable findings.

Lead Agency: EPA/CCIW

Schedule: 1985 - 1987

Status: Statistical aspects for sediments and biota have been received. (For later clean-up.)
Activity Number: B.4

Activity Title: UGLCC Study Quality Assurance/Quality Control: Inter-Project Split Samples

Purpose: To ensure comparability of data generated by different laboratories analyzing the same media.

Approach: Workgroups identify studies dealing with similar parameters and matrices. Split samples with appropriate field blanks are exchanged to determine the comparability of data.

End Product: A defendable QA/QC program at the field level.

Lead Agency: All Participating Agencies

Schedule: 1985 - 1986

Status: Media analytical support generally provided by single laboratory. Individual project officers have arranged for sample splits—
with some exceptions.
Activity Number: C.1

Activity Title: Black Box, Mass Balance Calculations for Contaminants

Purpose: Define concentrations of contaminants at the temporal and spatial scales of interest relevant to the Study's objectives. Define the inputs, outputs, and loss terms that bring about these concentrations.

Approach: Mass balance calculations for parameters and locations agreed to by the modeling work group will be made, employing historical and newly collected data. Calculations will indicate whether the study area acts as a net sink or source for the contaminant of interest during the time frame of data collection.

End Product: Calculate mass balances for the St. Marys River, St. Clair River, Lake St. Clair, the Detroit River, and the Trenton Channel. In addition to this rather coarse level of resolution, mass balances could be calculated at temporal and spatial scales most relevant to critical cold water fisheries life history events if the resources exist for collecting additional data at these times and locations. The success of the models will be contingent on the output of the various work groups' activities.

Lead Agency: EPA/NOAA/NWRI

Schedule: 1986 - 1987

Status: Phosphorus Mass Balance Model For Lake St. Clair

A dynamic total phosphorus mass balance model for Lake St. Clair has been developed. It assumes complete mixing, runs on a daily time step, and is presently driven by historic phosphorus loads and hydrodynamics. Net phosphorus addition rates from internal processes (resuspension, bioturbation, etc.) are presently estimates. Calculations using historical data indicate that Lake Huron contributes a steady load (about 175MT/mo.) to the lake while the contribution from tributaries ranges seasonally between 125 MT and 25MT/mo. For 1975, tributary input was highest in March and April.

Status: Black Box, Mass Balance Calculations for Contaminants

Reconnaissance survey was conducted on September 10, 1985 in Trenton Channel and is described under Activity F.5. St. Clair River Synoptic Survey conducted by NWRI in 1983 and 1984. Data under review for utility as per workshop agreements.
Activity Number: C.2

Activity Title: Process Models for Understanding Physical-Chemical Interactions in the Connecting Channels Ecosystem

Purpose: To determine the respective roles of biological, physical and chemical systems in the fate, transport and effects of pollutants on biota.

Approach: Intensive field and laboratory studies on the fate and transport of contaminants will be carried out. Models describing contaminant fate and transport processes will be developed, based in part on these field and laboratory studies. Models of Lake St. Clair currents and waves will also be built as part of this activity. Sediment dynamics (resuspension and settling), which are important to transporting contaminants, can then be understood and predicted.

End Product: Simulation models and/or data for understanding ecosystem-contaminant processes, current and wave plus sediment resuspension and settling dynamics in Lake St. Clair.

Lead Agency: NOAA/NWRI

Schedule: 1985 - 1987

Status: Eutrophication Model of Lake St. Clair

300 water quality samples collected and analyzed. 80 sediment trap samples collected. Circulation/transport model verified against currents measured June-November 1985.


Wave data has been collected and edited. Data consist of 17-min time series of 1/4-sec samples of wave height from three towers aligned along a NW-SE transect in the eastern part of Lake St. Clair. Data are currently being matched with Canadian meteorological and wave measurements for further analysis.

Status: Modeling Particle Transport in Lake St. Clair.

Research versions of the circulation and particle trajectory models have been modified to allow tracking of particles under various wind conditions. Answers to questions regarding residence times in different parts of the lake and likely transport pathways are being obtained.
Status: Generic Contaminant Model for Lake St. Clair.

(1) TOXIWASP has been installed on GLERL's computer
(2) An interface between a hydrodynamic model for Lake St. Clair and TOXIWASP is presently being devised.
(3) Data required by the TOXIWASP are presently being gathered.

Status: A Case Study of Selected Toxic Contaminants in the Essex Region.

The TOXIWASP Model was modified to account for wind generated resuspension. The Model was verified using available sediment and chloride ion data. The model was used to simulate PCB, OCS, Pb and Cd.

Status: A Case Study of Selected Toxic Contaminants in the Essex Region.

The model has been coded and the sediment and water transport have been calibrated and verified. The model is now being used to predict the probable distribution of PCB, OCS, Pb and Cd. At present it appeared to be giving useful results for Pb.

Status: Circulation Within Great Lakes Coastal Zones; Measurement of Sediment Resuspension in Lake St. Clair. (APSD 85-512)

Data from sediment traps, filtered water samples, optical transmission profiles has been reduced and collated. Empirical relations have been developed between optical properties and concentrations of suspended sediments. Collection of wind, waves, and high-frequency current data was successful but the high-frequency sampling of current velocities in a benthic boundary layer may not be useful because of instrument limitations. Ground truth for remote sensing experiments supplied to EPA. Preliminary analysis of data to be complete by April 1, 1986.

Status: Circulation Patterns in Lake St. Clair

A technical report of the field activities including data base configuration and climatological summaries is in progress. The completion of this report depends to a certain degree, on progress of data base preparations; but the projected data is still April 1, 1986.

Status: The Currents of Lake St. Clair

Three weeklong synoptic current surveys of Lake St. Clair were completed during Summer/Fall 1985. All raw data has been reduced and is available in Tabular and grid form. Spill simulations for the currents resulting from wind conditions present during the 3 surveys have been run and these predicted currents are also available in tabular and graphic form. Verifications of the SPILL model to predict current conditions in shallow water are presently underway.
Activity Number: C.3

**Activity Title:** Decision Making Models for UGLCC Contaminants

**Purpose:**
To determine the water concentration of pollutants under varying loading, regulatory and natural conditions.

**Approach:**
Hydrodynamic and other models will be used for predicting particle and pollutant transport, settling and resuspension. Simulation models will be developed and calibrated to investigate possible major pathways of contaminant fate and transport. If appropriate data can be collected, relationships between loading, concentration, exposure, and bioconcentration of toxicants will be developed. Models will be used to examine the effects of management scenarios on toxic substances transport, concentrations, and exposure. Model output will quantitatively account for the uncertainty in the model's forcing functions and coefficients. The effects of prediction uncertainty on management decision making will be discussed.

**End Product:**
1. Tool for doing screening calculations.
2. Identify priorities for reducing uncertainties.

**Lead Agency:** NWRI/MOE/NOAA

**Schedule:** 1985 - 1987

**Status:**
Fate of HCB in St. Clair River.

Model study has been completed with successful verification. A draft report has been submitted to M.O.E.

**Status:**
Prediction of Contaminants Fate in the St. Clair-Detroit River System.

Done, using the model TOXFATE.

**Status:**
Risk and Uncertainty Analysis of Contaminant and Phosphorus Models for Lake St. Clair.

Application of phosphorus and generic contaminant model to management issues will begin as soon as these models are sufficiently tested against data collected during this study.

**Status:**
Storm Surge Simulation on Lake Erie and Lake St. Clair. (APSD-85-511)

June 13-25, 1985, period has been successfully simulated at shore based stations (St. Clair Shores, D'Eath Marine, Belle River). Offshore stations to be analyzed by April 1986.
Activity Number: C.4

Activity Title: Integrated Study of Exposure and Biological Effects of In-Place Pollutants in the Upper Connecting Channels

Purpose: The purpose of this integrated study is to determine biological effects of in-place pollutants and relate these effects to primary causes (i.e., physical resuspension and biochemical transformation).

Approach: Because of the expense, it is unlikely that throughout the study area, a total understanding of chemical and biological processes for every pollutant will be gained. Therefore, if any comprehensive understanding is to be achieved, it will be done by a focused study of a few compounds in an isolated segment of the system. The results may then be extrapolated to the entire system. The interdisciplinay study includes simultaneous field measurement of sediment and water concentrations of PCB isomers, heavy metals and other toxic substances, in addition to fate related parameters, such as suspended and volatile solids, conductivity, temperature, light transmission, etc. On the same samples toxicity bioassays will be performed.

End Product: The final product would include a generic method (or model) which could be used to predict toxicity and other biological end points resulting from in-place pollutants given: 1) sediment characteristics; 2) sediment concentrations of chemicals; and 3) estimated probability distributions of suspended solids in the water column. In addition, a detailed data base of pollutant concentrations in water, sediment, and biological compartments will be developed.

Lead Agency: EPA

Schedule: 1985 - 1987

Status: Integrated Study of Exposure and Biological Effects of In-Place Pollutants in the Connecting Channels.

During the 1985 reconnaissance, a gradient of sediments toxicity was found, starting at Monguagon Creek, a tributary of the Trenton Channel, and extending as far as Gibraltar Bay. This caused the selection of this area for sampling during the 1986 season (starting May 12th). Thirty sites were selected for bioassay sample taking and 3 of them chosen for master stations.
Activity Number: C.4 (con't)

Status: The Currents of Lake St. Clair.

Three weeklong synoptic current surveys of Lake St. Clair were completed during Summer/Fall 1985. All raw data has been reduced and is available in Tabular and grid form. Spill simulations for the currents resulting from wind conditions present during the 3 surveys have been run and these predicted currents are also available in Tabular and Graphic form. Verifications of the SPILL model to predict current conditions in shallow water are presently underway.

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June 13-25, 1985 period has been successfully simulated at shore based stations (St. Clair Shores, D'Eath Marine, Belle River). Offshore stations to be analyzed by April, 1986.

Status: Integrated Study of Exposure and Biological Effects of In-Place Pollutants in the Upper Connecting Channels.

Reconnaissance completed.
Site selected (Trenton Channel and Gibraltar Bay).
Most equipment ready.
First Quarterly Progress Reports available as follows:
Exposure Probabilities for Resuspended Sediments in the Upper Connecting Channels - Keith Bedford, Ohio State University.
Exposure and Biological Effects of In-Place Pollutants - David White, University of Michigan.
Neoplasia in Fish and Related Causal Factors in the Detroit River - Lex Maccubin, Roswell Park Memorial Institute.
Adsorption/Desorption Kinetics and Bioavailability to Algae of Heavy Metals and Chlorinated Organics - Joseph V. DePinto, Clarkson University.
Toxicity of In-Place Pollutants to Benthic Invertebrates - John Giesy, Michigan State University.
Activity: Unsteady Flow Models of the St. Clair and Detroit River

Purpose: To predict flows and stages at critical locations along the rivers at hourly and daily time scales.

Approach: Building on past NOAA models of the St. Clair and Detroit Rivers, improved formulations will be made. Current measurements will be made at selected times and locations in order to calibrate and validate the model.

End Product: Improved models of the St. Clair and Detroit Rivers for routing contaminants and predicting flows and stages at critical times.

Lead Agency: NOAA

Schedule: 1985 - 1986

Status: St. Clair and Detroit River Current Measurements.

Simultaneous velocity measurements conducted in the upper St. Clair and Detroit Rivers, using two electromagnetic (EM) current meters in each river. In addition, vertical distribution of velocity in the entire water column is measured with an acoustic Doppler current profiler (ADCP) at the St. Clair River current meter station.


Hydrographic data and channel cross-sections have been obtained and developed for the river above Algonac. The model has been developed for Algonac to Lake Huron without islands.
Activity Number: C.6

Activity Title: Chemical Transport Modeling - St. Marys River

Purpose: To assess management scenarios related to control measures for industrial and municipal sources.

Approach: The St. Marys River flows are regulated through compensating works to maintain water levels sufficient for navigation, fishery at the rapids, hydro electric generating facilities and other municipal and industrial water uses. The flow regime downstream from the compensating works is complex, and based on wind direction and magnitude, secondary currents are prevalent. These secondary currents can cause transboundary movement.

Product:  
   i) A hydrodynamic model will be established under the following conditions: (a) calm wind conditions; (b) north-easterly winds; (c) south-easterly winds; and (d) typical ice-covered conditions.

   ii) A chemical transport model will be superimposed on the hydrodynamic model to illustrate behavior of conservative and non-conservative chemicals from industrial and municipal discharges.

Lead Agency: MOE

Schedule: 1985-1987

Status: St. Mary's River Study.

Model is working and has been modified to run on an IBM-AT. A steady state finite element model for 3-D lake circulation is working and an unsteady model is under development.
Activity Number: C.7

Activity Title: Detroit River Plume Modeling

Purpose: To assess the mixing and water quality impact of the DWSD discharge on the Detroit River.

Approach: A hydraulic and water quality model of the DWSD discharge into the Detroit River can be used to accurately simulate the impact of this effluent on the receiving water for monitored events and projected future conditions. These future conditions may include alternative treatment scenarios, diffuser designs, or environmental conditions (wind, temperature, flow). Model forecasts based on these future conditions demonstrate the prime utility of a mechanical model. Model simulations provide a quantitative basis for revision of NPDES effluent requirements and an informative integration of expected river response for management consideration.

Mathematical models applicable to the evaluation of effluent impacts are classified into two broad categories. Near-field models evaluate hydrodynamic and water quality conditions in the immediate vicinity of the discharge, while far-field models evaluate conditions in downstream regions where complete vertical mixing of the effluent has occurred. Both types of models will be used to evaluate DWSD discharge on Detroit River water quality. Use of the near-field model will primarily address water quality issues concerning mixing zone definition and effluent concentrations within this zone. Use of the far-field model may address certain mixing zone considerations, but will primarily address the downriver fate of toxic substances and parameters such as bacteria and chlorine. To initiate the near-field model, hydrodynamic results from the far-field model also will be used to forecast boundary conditions in response to different upstream flow or lake conditions. Subsequent to this analysis, the far-field model will again be used to address resultant downstream water quality impacts.

End Product: Calibrated and verified near- and far-field models for predicting the dynamics of temperature, chlorine residuals, fecal coliforms, PCB's, cadmium, and mercury. An uncertainty analysis will be performed on the models to determine probable system behavior. Models will be used to evaluate the following scenarios: No action scenario for MDNR defined critical conditions; Two dechlorination treatment levels; Four loading alternatives for PCBs, cadmium and mercury; Two diffuser implementation alternatives for all parameters; Three environmental scenarios, including wind, flow, or seasonal conditions.

Lead Agency: DWSD

Schedule: January, 1985 - January, 1986
Activity Number: C.7 (con't)

Status: Detroit River Plume Study

A preliminary lateral diffusion model for conservative species that includes the effect of the river banks has been developed for the DWSD plume. The model has been calibrated and verified. The model works very fine when the hydrodynamic conditions of the river are not complicated.

A finite element hydraulic and water quality model of the DWSD discharge into the Detroit River has been developed. The model has been calibrated and verified. 12 management scenarios (hydrodynamic and water quality) have been simulated. The model evaluates the near-field hydrodynamic and water quality conditions (in the immediate vicinity of DWSD discharge) and the far-field water quality conditions (where complete vertical mix has occurred). The water quality parameters included in the model are: chlorine; coliform bacteria, cadmium, mercury and PCBs.
Activity Number: D.1 (con't)

End

Product: Computerized list of all point source dischargers in the study area and general characterization of effluent quality.

Lead Agency: MDNR/DOE

Schedule: 1985 - 1986

Status: U.S. Inventory.

Inventory complete for all direct and indirect municipal discharges to UGLCC study area. Inventory stored on STORET system. Flow and loading data for parameters required in NPDES permits from 1981 thru 1985 (available June 1986).

Status: Canadian Inventory.

Inventory compiled only for direct dischargers to main channels (St. Marys, St. Clair and Detroit Rivers and Lake St. Clair). Complete except for minor information (i.e., longitude, latitude, river mile, stream reach). One page summary per point source on IBM PC compatible system. Reference summary will be provided, including 1984 and 1985 self-monitoring data.
Activity Number: D.2

Activity Title: Combined Sewer Overflow Inventory

Purpose: Identify and quantify pollutant loadings from combined sewer overflows (CSOs) to the Connecting Channels.

Approach: Identify municipalities in which CSOs occur at least annually. For each CSO the inventory will include location, yearly discharge (estimated if necessary), size, parameters for which discharger is monitored, and estimated yearly loadings from the CSO.

Combined Sewer Overflows are defined as combined untreated municipal (sanitary, institutional, industrial, and commercial) sewage and storm-water runoff dischargers from designated industrial conveyance systems.

End Product: Inventory of major CSOs in the study area containing location and pollutant loading information.

Lead Agency: MDNR/DWSN/MOE

Schedule: 1985 - 1986

Status: U.S. Combined Sewer Overflow Inventory.

Identification of selected municipalities and mapping of CSOs in study area - CSOs have been plotted. Data on municipalities submitted with maps or street located in text sheets or tables. All CSOs identified within designated communities. Based on CSO inventory, loadings will be estimated.

Status: Detroit Combined Sewer Overflow Inventory.

DWSN CSO systems have been studied and only major CSOs will be monitored during the 1986 field season. Pollutant loading will be estimated.

Status: Canadian CSO Inventory.

Activity Number: D.3

Activity Title: Dischargers to Municipal Systems Inventory (DMS)

Purpose: Identify and characterize industrial inputs to selected municipal wastewater treatment works.

Approach: Significant industrial inputs to municipal wastewater treatment facilities will be inventoried. The inventory for each industrial input will include:

1) location
2) type of facility (SIC code where available)
3) estimated flow
4) loading/concentration where available

Pretreatment program information will be used to develop this list. Where pretreatment programs are nonexistent or still being developed, a list of major industrial users will be compiled, and where necessary, loadings to the municipal system will be estimated based on industrial category.

End Product: Inventory of non-permitted/certified industrial dischargers to municipal treatment systems.

Lead Agency: DWSD/MOE

Schedule: 1985 - 1986

Status: U.S. Inventory

Municipalities required by pretreatment regulations to identify and quantify industrial inputs inventoried and available. Pollutant loadings and concentrations identified where available.

Status: Canadian Inventory.

List of industrial dischargers to municipal systems including estimates of contaminant concentrations to be completed by contractor by March 1987.
Activity Number: D.4

Activity Title: Point Source Inventory Mapping

Purpose: Develop baseline maps showing location of all municipal and industrial point source dischargers, including major combined sewer overflows.

Approach: Using latitude/longitude data collected in Activities D1, D2, and D3, plot all discharge sources on hydrologic and topographic maps as appropriate.

End Product: Baseline maps showing location of all point sources in study area.

Lead Agency: MDNR/MOE

Schedule: 1985 - 1986

Status: Computer Mapping Project

The capability now exists to produce computer-based maps of Wayne, Oakland, and Macomb Counties. Remaining counties relevant to UGLCCS will be available in the near future. Baseline maps with any combination of the following features can be plotted:

- Municipal and township boundaries
- Township and range
- Watershed boundaries and sub-basins
- Lakes, ponds, islands, rivers, streams
- Municipal and industrial discharges and intakes
- USGS gage stations
- Low flow estimates
- STORET stations

Status: Canadian Point Source Inventory Mapping.

Preliminary hand drafted maps have been completed. Digitizing of maps is not to be undertaken.
Activity Number: D.5

Activity Title: Refinement and Development of Point Source Contaminant List

Purpose: To determine potential for input of hazardous contaminants to Connecting Channels from point sources.

Approach: The Point Source Work Group, by reviewing existing point source data bases and discharger information, will develop a candidate list of exceptional chemical parameters for additional monitoring and analysis. The candidate list will include the UGLCC parameters and other potential parameters which may have a demonstrated impact on the study area. Sources for the candidate parameters include:

Special Studies: The work group will review pertinent inspection reports such as compliance sampling inspections, biomonitoring inspections and toxics sampling inspection for municipal and industrial facilities in the study area.

Sludge Data: The work group will review existing sludge data from municipal and industrial sources as a screening mechanism to identify potential sources of point source effluent contaminants.

Industrial Process Characterization: The work group will review completed process characterizations for individual and classes of industrial dischargers. The work group may originate industrial process characterizations for any individual or class of industrial dischargers as required and agreed upon by the work group. Particular attention will be given to the organic chemical industry in the area.

d) Effluent Guidelines Development Documents: The work group will review the existing literature and documentation for those classes of industries represented in the study area.

e) Critical Materials Registers: The work group will review and assess the existing critical materials/priority pollutant registers for industrial dischargers in the basin.

f) Ambient Problem Identification: The work group will request and review information from Biota, Sediment and Water Work Groups relative to ambient problems or concerns known or suspected to be associated with Point Source inputs.

End

Product: Candidate list of potential hazardous polluting substances being discharged into study area requiring further study and quantification.
Activity Number: D.5 (con't)

Lead Agency: EPA/MDNR/EPS/MOE

Schedule: March 1985 - September 1986

Status:
- Refinement and Development of Point Source Contaminant List.
  List of parameters has been compiled from data on municipal sludges, the pretreatment program users survey, process characterizations, point source surveys, and the critical materials register. Parameter list for analysis of point source sampling is being finalized. Point source sampling will begin in April 1986.

- Canadian Refinement and Development of Point Source Contaminant List.
  List of contaminants completed for each point source.
Activity Number: D.6

Activity Title: Data Assessment

Purpose: Develop candidate list of point source facilities for extensive sampling and analysis in 1985 and 1986.

Approach: The Point Source Work Group will review and evaluate all existing effluent data, identified ambient problems, special studies, sludge data, process characterization and critical materials registers on major industrial municipal effluents for nutrients, heavy metals and toxic organics and non-toxic organics and assess their validity and applicability to the purposes of the Connecting Channels Study. Identify major industrial and municipal effluents for additional sampling based on inventory process reviews. Establish method for selection and screening, and identify the organics and metals to be measured.

End Product: Point source specific list of compounds and facilities for field monitoring in 1985 and 1986.

Lead Agency: MDNR/MOE

Schedule: Ongoing

Status: Point Source Discharge List.

List of facilities and outfalls, sampling protocol, and parameter lists have been developed. Sampling schedule is being prepared. This has been a joint effort of GLNPO and the Surface Water Quality Division of MDNR.

Status: Canadian Data Assessment.

Candidate list for point source surveys completed. List of major CSO's for sampling completed.
Activity Title: Field Programs

Purpose: Identify and quantify the loading of nutrients, heavy metals, and toxic organics to the channels from both industrial and municipal major sources and combined sewer overflows.

Approach: For each point source, design a sampling and analysis schedule that optimizes sampling frequency, number of parameters analyzed, and costs such that reliable loading estimates may be calculated. Actual sample collection and analysis will be conducted by the appropriate regulatory agency. Actual operating conditions of the facility will be noted at time of sample collection. In 1985, priority for sampling and analysis will be given to significant toxic dischargers which discharge directly to the Connecting Channels. The 1986 field program will be based on inputs from other work groups and accumulated data on point source discharges to tributaries.

End Product: Point source specific list of compound loadings into the channels from point source effluent, for inclusion in mass-balance analysis and modeling.

Lead Agency: MDNR/MOE

Schedule: September 1985 - December 1986

Status: Canadian Industrial/Municipal Point Source Survey.

Windsor area point sources completed. Special survey completed in Sarnia area. 130 samples taken October to December 1985. 80 samples analyzed to date. All data to be delivered by March 31, 1986. Laboratories, WTC, Barringer Magenta, M.O.E. London Lab.

Status: Canadian CSO Study.

Windsor area survey completed and Sarnia area survey commenced. Samples to be analyzed for conventional, PAH's, pesticides, chlorinated benzenes and some volatiles.

Status: U.S. Sampling of Selected Point Source Dischargers and Combined Sewer Overflows

Limited sampling performed in 1985. Trenton Channel microscale study point source sampling conducted at 10 facilities. Point source sampling by MDNR completed at 4 additional facilities, biomonitoring completed at 6 facilities.

Facilities, sampling protocols, and parameters have been selected for sampling to commence in April, 1986. Arrangements with the laboratory are being finalized.
Activity Number: D.R

Activity Title: U.S. Biomonitoring Programs

Purpose: Determine potential toxic effect of point source dischargers on receiving stream quality/uses.

Approach: For selected point sources, analyze effluents for chronic and acute toxic effects and screen effluents for mutagenicity using Ames tests.

End Product: Determination of potential toxic and adverse effects of discharges on receiving stream. Also indicates priorities for point source chemical testing in 1986 field season. Information feeds into regulatory programs, i.e. NPDES permit issuance, compliance.

Lead Agency: EPA

Schedule: 1985 - 1986

Status: Biomonitoring - Toxicity Testing of Point Source Dischargers.

7 facility effluents tested in FY 85 and to date in FY 86
5 have been documented


5 facility effluents tested in FY 85 and to date in FY 86
3 have been documented
Up to 17 additional sites to be identified

Status: Detroit Water and Sewerage Department.

The DWSD has conducted extensive bioassay testing on its final effluent discharge to the Detroit River (November 84 and July 85). The bioassay tests included acute and chronic toxicity testing, bioaccumulation study, and other bioassay tests. Several species were used.

The NWSD has also conducted quarterly surveys (Nov 84 - Nov 85) for sediments, benthos, and other aquatic ecology studies.

Sludge and residual analysis data are also available to pinpoint any potential problems.
Activity Number: E.1

Activity Title: Survey of Waste Sites and Assembly of Existing Data (Canada)

Purpose: Characterize geologic, hydrologic and hydrogeologic nature of waste disposal sites. Assess contaminant transport potential from these sites in surface water and groundwater.

Approach: Compile and evaluate available geological and hydrological data from federal, provincial, regional and local files.

End Product: Tabulation of all waste sites, with contamination inventory where available.

Water table map showing location of hazardous waste sites.

Geological cross-sections in waste site areas showing aquifer inter-relationships.

Lead Agency: MOE

Schedule: September 1984 - May 1985

Status: Tabulation of Waste Sites and Contamination Inventory.

This activity was completed. Approximately 100 waste disposal sites in the Sarnia-Windsor area and a few sites in Algoma County were characterized by geology, physical environment, surface and groundwater quality, containment technologies, contaminant transport and attenuation mechanisms. Sources included MOE offices, Environment Canada, Geological Survey of Canada, other agencies, published material and field site visits. Minor modifications may be made to the final report and maps.
Activity Number: E.2

Activity Title: Survey of Waste Sites where Groundwater Contamination is Suspected or Known to be Occurring and Assembly of Existing Data (U.S.A.)

Purpose: Characterize hydrogeological nature of variety of industrial and commercial sites for their contaminant transport potential to surface and ground waters. Assemble existing hydrogeological, potentiometric, groundwater quality and land use data to be used to prepare water table and chemical isopleth maps.

Approach: Compile and evaluate available hydrogeologic and land use data including groundwater use, seasonal water levels, groundwater quality, aquifer characteristics and hydraulic conductivities within the six mile study area of the Connecting Channels from the State of Michigan, U.S. EPA, MSGS, local and regional files.

Based on input from local or regional environmental regulatory agencies, selected sites with potential or known contaminant contribution within six miles of the Connecting Channels.

Evaluate the suitability of existing groundwater monitoring or water supply wells to supply representative groundwater quality and/or water level information relative to each site.

Sample and analyze or obtain results of current analysis of suitable wells.

Prepare a base map on which to plot the above data.

End Product: Final Report including:

Tabulation of all waste sites in Study area with contamination inventory.

Water table map including locations of hazardous waste sites.

Geological cross-sections of waste sites showing aquifer inter-relationships.
Activity Number: E.2 (con't)

Lead Agency: USGS

Schedule: July 1985 - November 1986

Status: Tabulation and Characterization of Waste Sites.

This activity was completed. Approximately 150 waste disposal sites in the Detroit-St. Clair area and 7 in the St. Mary's River area were characterized by geology and hydrogeology. Sources included were State of Michigan, USEPA, USGS, other agencies and literature. Minor modifications may be made to the maps.
Activity Number: E.3

Activity Title: Preliminary Designation of Potentially Hazardous Sites (Canada and U.S.)

Purpose: Identify and rank hazardous waste sites having potential for adverse impact upon surface and groundwaters discharging into Connecting Channels.

Approach: Based upon end products of activities E.1 and E.2 above, evaluate potential of hazardous waste sites for adverse impact upon surface and groundwaters discharging into Connecting Channels.

Evaluate migration potential of contaminants known to be contained in hazardous waste sites through local geological materials.

End Product: Tabulation and ranking of hazardous waste sites suspected to have Connecting Channel contamination potential with listing of contaminants.

Lead Agency: MOE/USGS/NDNR

Schedule: April 1985 - June 1985 (Canada)  
August 1985 - February 1986 (U.S.)

Status: Ranking of Waste Sites - Canada.

This activity was completed. A ranking of licensed waste disposal sites was developed based on geologic, hydrologic, hydrogeologic and geochemical information, waste characterization and containment, on-site monitoring practices and health and safety concerns. The results are in a report format under review.

Status: Ranking of Waste Sites - U.S.A.

Evaluation and ranking of waste sites was done and is undergoing USGS-EPA review. The USGS ranking scheme is based on EPA's Drastic System. A preliminary review of the USGS and MOE ranking schemes shows them to be compatible.
Activity Number: E.4

Activity Title: Site Specific Investigations to Obtain Required Data Where Necessary for Prioritized Waste Sites and Calculation of Loadings

Purpose: Perform site specific investigations based on waste site designations in activity E.3 to complete hydrogeological and parameter data base.

Approach: Install monitoring wells in areas where data gaps exist.

- Measure water levels in new wells; equip wells with digital water-level recorders as necessary.
- Collect water samples for laboratory analysis.
- Make field measurements of temperature and specific conductance.
- Conduct pumping tests to determine aquifer parameters (hydraulic conductivity, and transmissivity).
- Define areas of groundwater discharge to Connecting Channels.
- Determine locations in Connecting Channels where contaminated groundwater is suspected to be discharging.
- Determine quantity and quality of groundwater being discharged to Connecting Channels.
- Tabulate additional data collected.

End Product: Report detailing amounts and nature of contaminants being discharged to specific areas in Connecting Channels.

- Redraw water table map.
- Simplified mathematical models simulating contaminant transport to Connecting Channels.

Lead Agency: MOE/USGS

Schedule: November 1985 - November 1986
Activity Number: E.4 (con't)

Status: Groundwater Monitoring.

One site has been selected (Algoma - St. Marys River). Remaining 3-4 sites still to be selected in St. Clair River area.

Status: Groundwater Monitoring.

USGS has prepared QA/QC document which is being reviewed by USGS and EPA. Sampling sites will be chosen based on the priority ranking of E.3 and sampling will begin spring '86. Most sites will be in the Detroit River - Trenton Channel area, a few will be in St. Mary's and St. Clair River areas.
Activity Number: E.5

Activity Title: Deep Well Disposal Assessment, Lambton County, Ontario

Purpose: Evaluate impact of historic deep-well disposal practices on the groundwater resources of Lambton County, Ontario.


End Product: Report detailing hydrogeological and chemical investigations.

Lead Agency: MOE

Schedule: March 1985 - March 1986


Past deep well disposal practices and incidents where contamination or flowing wells occurred were investigated. The possible migration pathways and areas where the fresh water aquifer is located and may be contaminated are identified and discussed in a draft report. Monitoring site selection, well design and installation are also presented. Areas where domestic potable/abandoned wells should be surveyed are identified.

Several preliminary samples from five sites along the river have been analyzed by MOE's London laboratory (conventionals) and the WTC laboratory (organics).
Activity Number: E.6

Activity Title: An Assessment of the Seepage of Groundwater into the St. Clair River

Purpose: Determine the quantity and quality of seepage into the St. Clair River from the vicinity of the historic deep-well disposal operations near Sarnia, Ontario.

Approach: Conduct electrical conductivity survey
Conduct seepage meter survey
Where seepage encountered, install mini-piezometers
Sample from mini-piezometers for analysis

End Product: Report estimating loadings to the St. Clair River from seepage.

Lead Agency: NWRI

Schedule: July 1985 - April 1986

Status: Contaminant Loading From Seepage.

18 survey lines placed on the bed of the St. Clair River and cores taken to characterize the bottom sediments.
Seepage meters installed and monitored on seven lines.
Mini-piezometers installed to depths of 1 or 1.5 meters along two lines and pore water samples collected for organic, inorganic and isotopic analyses.
Domestic wells in the vicinity of the St. Clair River sampled for isotopic analysis.

November, 1985 - March, 1986

Analysis of waters being completed by Zenon Environmental Inc., and University of Waterloo.
Activity Number: E.7

Inventory of NPS Impacts Based on Water Quality, Sediment and Biota Data for the Tributary Mouths

Evaluate water quality, sediment and biota data from tributary mouth sampling to identify either pesticide or nutrient impacts of rural run-off.

Request information of a problem definition nature based on existing water quality, sediment or biota data (such information should be available from other work groups as a result of Activities F.1 and existing data to be assessed for G.2 and H.5).

Request and evaluate end products resulting from Activities F.3, F.6, F.7, G.2, and H.5.

Tabulation and mapping of data from the above Activities in order to assist in determining specific activities to be undertaken in E.14.

MOE/EPA/MDNR

April 1985 - September 1985 for existing data
January 1986 - March 1986 for new data

Evaluate Tributary Mouth Sampling Data and Data Collected By Other Work Groups.

A draft report compiling MOE 1984 data for conventional parameters (15 monitoring sites, monthly sampling), pesticides (Thames River, 30 - 60 samples/yr), sediments (Thames and Sydenham River, sampled twice per year for conventional and chemical parameters) and flows has been prepared.

Some existing data has been collected and is being compiled by Heidelberg College for April 1986. Pesticide data report on tributary mouth storm event sampling of 1985 for Black, Belle, Pine, and Clinton Rivers is due April 1986 to GLNPO and MDNR for evaluation.
Activity Number E.8

Activity Title: Inventory Significant Urban Storm Water Discharges

Purpose: Inventory storm drains that are potential problems to the Connecting Channels.

Approach: Contact major communities geographically located on Connecting Channels to identify discharges.

Identify storm drains that are located near industry and municipal plants.

Determine whether storm drains contain industrial or municipal wastes.

Determine if a permit is needed for storm discharge.

End Product: A list of potential problem storm discharges to the Connecting Channels.

Lead Agency: MOE/MDNR

Schedule: March 1985 Canada
March 1985 U.S.

Status: Toxic Chemicals of Urban Runoff, Sediment and Combined Sewer Overflows (Twinned with D.2).

33 double-composite water samples and 24 sediment samples were collected during 1985 field season. All samples were fully analyzed by the NHOL in Burlington. Additional snowmelt samples will be collected in February and March, 1986.

Status: Contact Communities to Characterize CSO and Storm Drain Catchments - Canada.

Jiri Marsalek collected this information from municipal staff in Windsor, Sarnia and Sault Ste. Marie. Dean Edwardson will contract out to have this information collected from other CC municipalities.

Status: U.S.A. CSO and Storm Drain Inventory (Twinned with D.2)

This project will be carried out in 1986. Data collected by MDNR in 1986 will be tabularized and reviewed April-May 1986.
Activity Number: E.9 (con't)

Status: U.S.A. Pesticide/Fertilizer Use Inventory by County.

U.S.A. A list of pesticides was compiled but has still to be sorted by County (being entered on computer). Fertilizer usage data was collected, but not application methods.
Activity Number: E.10

Activity Title: Agricultural Inventory of Tillage Practices by County (U.S.)*

Purpose: Inventory land use and cropping practices to evaluate acreage of row crops and type of tillage.

Approach: Use Soil Conservation Service, Soil and Water Conservation District, and ASCS data to evaluate soil erosion potential by tillage practice. (CTIC as a resource).

Evaluate what reductions could be made in phosphorus loadings by encouraging conservation tillage practices with at least a 30% residue cover after planting.

End Product: A survey of tillage acreage of row crops by county showing tillage types is completed; report not written.

Lead Agency: EPA

Schedule: March 1985

Status: Collection of Tillage Practice Data from Various Agencies has been done.

1984 and 1985 tillage survey data has been tabulated. Evaluation and report have yet to be written.
Activity Number: E.11

Activity Title: Agricultural Inventory of Soil and Water Conservation Practices by County in Ontario (Canada)

Purpose: Inventory of the use of soil and water conservation practices; tillage, cropping, and structures, by county.

Approach: Prepare a questionnaire to obtain required data.

Conduct a representative random survey of farm operators: approximately 100 per county.

Compile data by county and watershed basis and provide a summary report.

End Product: A survey of water conservation practices now in place in Ontario counties.

Lead Agency: LRRI

Schedule: March 1985

Status: Survey Farmers on Soil and Water Conservation Practices.

The survey was completed and a draft report discusses water, wind and ditch bank erosion, soil compaction, poor soil structure, and tillage and land management practices.
Activity Number: E.12

Activity Title: Animal Wastes Facility Inventory by County

Purpose: Inventory animal waste facilities (number, size and type).

Approach: Compilation of data and information drawn from:

- U.S. Department of Agriculture, Soil Conservation Service and Agriculture Canada.
- Michigan Department of Agriculture and Ontario Ministry of Agriculture and Food.
- Michigan Soil and Water Conservation Districts and Ontario Conservation Authorities.
- NPDES permits and applicable provincial permits.

End Product: Inventory of animal waste facilities in the Connecting Channels area.

Lead Agency: EPA/MOE

Schedule: March 1985

Status: Animal Wastes Facility Inventory by County.

Canada - This project was completed and a draft report prepared.

U.S. - Information, including animal equivalencies and phosphorus delivery by county was collected, but not compiled. MDNR is in process of hiring an aid to prepare this material.
Activity Title: Atmospheric Data Search for P and Pesticide Deposition

Purpose: Search for data that might be available on atmospheric transport and deposition of phosphorus and pesticides.

Approach: Review available data to determine need for further actions.

End Product: A list of publications relating to phosphorus and pesticides transport and deposition in the Connecting Channels area.

Lead Agency: EPS/EPA

Schedule: March 1985

Status: Atmospheric Data Search for P and Pesticide Deposition.

Canada - An initial literature review was carried out and a list of publications prepared.

U.S. - An initial literature field study review was carried out and some sources identified. Some data collected; no report.
Activity Number: E.14

**Activity Title:** 1986-87 Agricultural and Urban NPS Follow-up

**Purpose:** Based on the assessment of tributary mouth water quality data, sediment, and biota data, and inventories relating to significant urban storm water discharges, pesticide/fertilizer use, agricultural tillage practices, and animal waste facilities, (Activities E.7 - E.11) it may be necessary to quantify and model agricultural and urban NPS inputs.

**Approach:**
- Water quality monitoring for pesticides.
- Water quality monitoring for crop nutrients.
- Water quality monitoring for animal wastes.
- Modeling for agricultural load reductions.
- Expanded identification of problem urban storm discharges.
- Modeling for urban load reductions.
- Remedial plan preparation.
- Final report preparation.

**End Product:** A report which outlines options for remedial actions related to urban and agricultural non-point source inputs to the Connecting Channels.

**Lead Agency:** EPA

**Schedule:** April 1986 - March 1987

**Status:** This activity will commence April 1986, using the results of previous activities.

Soil loss algorithms are already developed for agricultural load modeling. The "storm" and "hazard" models may be used for urban load reduction simulations.
Activity Number: E.15

Title: Geophysical and Hydrological Determination of the Groundwater Flux Through the Bottom Sediments of the Upper Connecting Channels

Purpose: To establish the flux of groundwater through the bottom sediments of the Upper Great Lakes Connecting Channels.

Approach: Direct observation of groundwater flux at selected points in the channels.

Continuous geophysical measurements for the entire length of the Connecting Channels.

Convert geophysical measurements to groundwater flux for the entire length of the channels by comparison with direct measurements.

End Product: Contoured maps of sediment thickness, hydraulic conductivity, and groundwater flux for the Upper Great Lakes Connecting Channels.

Lead Agency: EPA


Status: Funding arrangements in process with University of Wisconsin.
Activity Number: F.1

Activity Title: Evaluation of Ambient Monitoring Data From the St. Clair and Detroit Rivers.

Purpose: Ambient data from head and mouth ranges on both rivers will be evaluated for 1) trends and 2) to determine the adequacy of the sampling frequency and design for application to mass balance studies.

Approach: Time series analysis of monthly or periodic data will be conducted to determine trends at both upstream and downstream transects (across the stream) and in differences between upstream and downstream. Where possible, trends will be related to changes in point or nonpoint sources as a measure of the effectiveness of control programs.

The variability in the data will be evaluated to determine if sampling frequency and location is adequate for application to mass balance studies.

End Product: Trend analysis of pollutant concentrations and recommendations for sampling program which could be applied to mass-balance studies.

Lead Agency: MDNR/MOE

Schedule: 1985

Status: Evaluation of Ambient Monitoring Data from St. Clair and Detroit Rivers; Evaluation of Detroit River Data.

The draft report will be available by March 1, 1986.


Draft report completed February, 1986; undergoing internal review.
Activity Number: F.2

Activity Title: 1985 Reconnaissance Field Studies

Purpose: To develop methods and prepare quality assurance protocols for field sampling related to mass balance of important anthropogenic compounds.

Approach: Measurement of organic contaminants at ng/L levels in water require ultra-sensitive field and laboratory methods. Although such work has been done in the past for research purposes, the techniques have not been sufficiently streamlined for use in routine surveillance programs. Also, different sampling approaches have been used and are being prepared for the UGLCC Study, including multi-bottle liquid-liquid extractions, continuous pumping, centrifuging, and serial filtration. During the 1985 field year, participating laboratories will collect water samples at pre-selected mass balance stations using different techniques. Sample extracts will be shared and comparisons made of both field and laboratory methods.

End Product: Documented protocols and quality assurance plans for conducting mass balance surveys of the Connecting Channels for anthropogenic compounds at levels of ng/L.

Lead Agency: EPA-LLRS/NWRI

Schedule: April - August 1985 Study Design
Sept. - October 1985 Sampling and Analysis

Status: Water Sampling Intercomparison.

Samples collected in September 1985 at three (3) stations; north of Belle Isle, the north end of Grosse Ile and at the south end of Grosse Ile. Samples have been extracted, portions of extracts provided to EPA-LLRS by CCIN for the suspended particulates and water samples, and portions of extracts provided to CCIN by EPA - LLRS for the total water samples. Analysis on GC-EC is being conducted at both laboratories.
Activity Number: F.2 (con't)

Status: Organic Contaminants in the Great Lakes Basin.

Some 60 APLE samples collected and partially analyzed for routine organics; non-routine organics still to be done (in collaboration with R.G. Oliver's sediment work).

Nearshore transect water samples, collected by Tech Ops Div. for Minister's St. Clair River Report were analyzed, report completed (NWRI-report:85-84).

Report on Lake St. Clair volatiles completed (NWRI Report 84-83). 40 L water and associated suspended sediments from the Upper and Lower St. Clair River and the Upper Detroit River were collected on 4 occasions in 1985 and analyzed for chlorobenzenes, PCBs, octachlorostyrene and hexachlorobutadiene.
Activity Number: F.3

Activity Title: Supplementary Analyses of Ambient Water for Selected Contaminants

Purpose: Analyze samples from water reaches and/or tributaries for a range of contaminants to provide more detailed data than obtained in conjunction with the differential loadings activity.

Approach: Identify river reaches and/or tributaries in which concentrations and loadings of selected contaminants continue to be unknown or for which more accuracy is desired.

Advise on the design of water monitoring programs to obtain data with the temporal and spatial resolution of point source and ambient data required.

End

Product: i) report on contaminants identified
        ii) likely source
        iii) advice on sampling strategy for contaminants.

Lead Agency: NWRI/MOE

Schedule: 1985 and 1986 Field Seasons

Status: Supplementary Water Analyses/Bottom Sediment Monitoring.

Proposed 1986 analysis of suspended sediment samples from the St. Clair and Detroit Rivers, for a wide range of PAHs (ECD 221).

Status: Supplementary Water Quality/Sediment Quality.

300 water samples collected from Lake St. Clair analyzed for nutrients, suspended solids and physical factors. 90 sediment trap samples collected from Lake St. Clair and lower Detroit River analyzed for organic contaminants; nutrient and metal analyses underway. Analyses due April.
Status: St. Clair River Water Quality Monitoring Station.

Sites have been identified. Lambton Water Treatment Plant and Pumping Station at Port Lambton.

Approvals have been received from the authorities to carry out the sampling program.

Site preparation in progress, to be completed by May 1986.

Water intake line to be installed at Port Lambton by May 1986.

Status: St. Clair River Water Quality Surveys.

Four water quality surveys were carried out during Aug-Oct 1985.

52 4-L water samples were collected for trace organic contaminant analysis.

75% of the samples have been analysed, remainder to be completed by April 1986.

Status: St. Marys River Low Level Contaminants Monitoring.

Ten samples each split into an aqueous phase and particulate phase during APLE/centrifuge system collected June 18-20/85 in upper river, above and below rapids.

Aqueous phase analysis by MOE lab completed: particulate phase data expected February 23, 1986.
Activity Number: F.4

Activity Title: Support for Mass Balance Models (Black Box) on the St. Clair River and Detroit River Systems

Purpose: During representative seasonal periods of the year to intensively monitor concentrations of selected contaminants at the head and mouth of the St. Clair and Detroit Rivers. Combined with point source loading information, these data will indicate seasonal differences in how the river systems act as sources or sinks for the contaminants. (2) To conduct additional monitoring on river reaches and/or tributaries for selected contaminants in order to provide more detailed annual time series data than obtained in (1), above. These data, supplemented with data from (1) will be used to calculate annual time series fluxes of contaminants through the connecting channels.

Approach: Establish transects on St. Clair and Detroit Rivers:
   a) mouth of Detroit River; ranges 8.7V (2 stations), range 9.3E (4 stations)
   b) head of Detroit River; range 30.8W (2 stations), range 30.7E (2 stations)
   c) mouth of St. Clair River; range 13.7 (3 stations)
   d) head of St. Clair River; range 39.0 (3 stations)

Samples will be collected (1) during representative periods of the year for use in seasonal mass balance calculations and (2) at regularly spaced intervals to facilitate calculations of annual time-series contaminant flux through the Connecting Channels.

Samples for seasonal mass balance calculations will be integrated during a sampling event on the basis of river system flow-through (i.e., hydraulic retention time).

For those contaminants whose concentrations in water are below instrumental detection limits, techniques of large volume, continuous centrifugation will be employed and analyses performed on the pelleted solids.

For seasonal contaminant mass balance calculations, the following contaminants in point sources and water will be measured: PCBs (isomer specific), OCS, HCB, Pb, Phosphorus, and Chloride. Also measured will be currents, DOC, and TOC, and particulate matter (PM) concentrations in the water. Concentrations of contaminants on DOC, TOC, and PM will be determined. For time series contaminant flux calculations, concentrations of phosphorus, chloride, DOC, TOC and PM will be measured, and if possible, concentrations of PCBs OCS, HCB, and Pb as described above will also be determined.
Activity Number: F.4 (con't)

a) PCR isomers may be used to finger print specific sources
b) Pb, OCS and HCB have been identified as a problem in St. Clair River and downstream
c) Phosphorus is a system-wide concern
d) Chloride will be used to calibrate models

When possible, tributary and point sources of contaminants will be monitored during the period in which concentrations of contaminants in the river are being measured.

Product: Data on mass loadings of selected contaminants to or from the river systems for use in the calculation of seasonal gross mass balances and time series contaminant fluxes. Contaminant concentrations and data on other conventional parameters will be used by the modeling work group.

Lead Agency: MDNR/EPA/NWRI

Schedule: 1985 run pilot studies
1986 run complete studies

Status: MDNR Support.

Pilot studies not done.
Two field studies done; final plans in place.
Activity Number: F.5

Activity Title: Support for Trenton Channel Microscale Model

Purpose: To monitor head and mouth ranges of the Trenton Channel for selected contaminants for input into a mass balance model of the Channel.

Approach: Establish transects at the head, mouth and intermediate ranges of the Trenton Channel.

- Head of Trenton Channel near north tip of Grosse Ile. Mouth of Trenton Channel at range 8.7W, as for lower Detroit River transect. Intermediates missing.
- Collect water samples 2-3 times during the year to assess seasonal concentration changes. When possible, also collect water samples to assess high-flow storm events.
- Analyze samples for PCB (isomer specific), Ni, Cu, Cd, Zn, Fe, Cr, Pb, NH₃, OCS, HCB, and phosphorus.
- See activity Number F.4, mass balance on the St. Clair and Time series of mass loading and exit of selected contaminants in the Trenton Channel for use in the calculation of gross mass balance equations.

End Product: Time series of mass loading and exit of selected contaminants in the Trenton Channel for use in the calculation of gross mass balance equations.

Lead Agency: EPA/MDNR

Schedule: 1985 - 1986

Status: EPA-LLRS Support.

92 ambient and point source samples were collected each by LLRS and the MDNR on September 10, 1985. All samples have been analyzed for conventional general chemistry and field parameters. LLRS analysis for metals is ongoing and analysis for organics is scheduled to begin in early 1986.

Storage of both LLRS and MDNR data on the LLRS in-house computer is occurring as the data becomes available.

Status: MDNR Support.

One synoptic survey of four ambient transects and major point sources was conducted via an integrated effort by MDNR and EPA-LLRS.
Activity Number: F.6

Activity Title: Michigan DNR Tributary Monitoring Program

Purpose: Determine loadings of conventional and toxic organic pollutants to the St. Clair and Detroit Rivers and Lake St. Clair.

Approach: Sample the Huron, Rouge, Clinton, Belle, Pine, and Black Rivers for conventional and organic pollutants. The sampling program will consist of the following components:

1) The Huron, Rouge, Clinton, and Black Rivers will be sampled monthly during low-flow periods and more frequently during high-flow periods with intense sampling during precipitation run-off events. Conventional pollutant loads will be calculated using the stratified ratio estimator method and these estimates will be adjusted for loads measured during events.

2) Loadings of pesticides into Lake St. Clair will be measured and calculated. Flow-weighted sampling throughout the year will be conducted on the Black, Pine, Belle and Clinton Rivers. The samples will be analyzed by a contractor.

The data from this study will be evaluated to determine if the sampling design is adequate for accurate load estimates.

End Product: Tributary-specific estimates of conventional and herbicide pollutant loadings. Determination of the degree of event-responsiveness.

Lead Agency: MDNR

Schedule: 1985 - 1986

Status: Sampling is complete and load estimates are being calculated.

Huron, Rouge, Clinton, Belle, Pine and Black rivers done in FY-85. Lake St. Clair samples taken in FY-85. No further flow-weighted sampling intended in FY-86.
Activity Number: F.7

Activity Title: Tributary Monitoring Program - Ontario

Purpose: Measure the quantity of nutrients, pesticides and toxic contaminants entering the channels from the tributaries.

Approach: Review the monitoring programs to determine if the data are adequate for accurate loading estimates.

Adjust sampling frequency as needed to accurately quantify inputs, assess changes in trends, and assess compliance with jurisdictional standards or criteria.

On-going programs include (a) enhanced program for Thames/Sydenham River (60-100 X/yr. for conventional parameters) (b) routine stations (14-Detroit/St. Clair Corridor and 5 on St. Mary's for convention parameters 8-12X/yr.) and (c) special studies.

The special study will monitor:
- St. Clair River Tributaries: Murphy Drain, Talford Creek, Township Ditch.
- Lake St. Clair Tributaries: Sydenham River, Thames River.
- Detroit River Tributaries: Turkey Creek, Riviere Au Cannards.

For PCBs, OCS, HCB, metals, conventional parameters plus pesticides (8-10X/yr.).

End Product: Tributary - specific list of parameters, flow dependent concentrations, and total loading per time for inclusion in mass balance analysis and modeling.

Lead Agency: MOE

Schedule: 1985 - 1986

Status: Enhanced Tributary Monitoring.

Completed collection of 30-60 water samples from two tributary mouths (Thames River, Sydenham River); analyzed for conventional parameters.

40 of the water samples collected at the Thames tributary mouth were also scanned for 52 pesticide residues.

In addition, two samples of sediment quality (suspended and bottom) collected at the Thames and Sydenham mouths.

Data compilation and summary in progress.
Activity Number: F.7 (con't)

Status: Routine Tributary Monitoring

Completed routine monitoring at 15 tributary mouths. These include the Little Carp River, Big Carp River, East Davignon Creek, Fort Creek, Garden River, Root River, Stobie Creek along the St. Mary's River; the Sydenham River, Thames River, Rusc0n River, Belle River, Fuce River, Little River in Lake St. Clair; and Turkey Creek and Carnard River along the Detroit River. 8-12 samples per site were analyzed for nutrients, metals and PCBs. Data summaries in progress.


Whole water and suspended sediment samples collected at mouths of five St. Clair River (Perch Creek, Highway 40 Ditch, Talfourd Creek, Sassy Creek, Murphy Drain); five Lake St. Clair (Sydenham River, Thames River, Belle River, Pike Creek, Little River); and two Detroit River (Turkey Creek, Canard River) tributaries on five occasions during 1985 (February, March, July, August, November).

MOE lab analysis of water samples for PCBs, pesticides (organochlorine, organophosphorus, carbamate, triazine, phenoxyacid), chlorophenols, chlorinated aromatics/aliphatics, metals and conventional parameters complete; analysis of suspended sediment samples for PCBs, pesticides (organochlorine, triazine, phenoxyacid, chlorophenols, metal and conventional parameters expected to be completed March 31, 1986.
Activity Number: F.8

Activity Title: Ambient Water Quality Monitoring of Detroit River

Purpose: Obtain ambient water quality data on Detroit River for use in tracking effectiveness of remedial programs on point sources and for calculating loadings to Lake Erie.

Approach: Continue the State's Ambient Monitoring Program on Detroit River as funded through USEPA 106 grant, as begun in 1968.

- Monthly monitoring (April-November) for 35 water quality index and heavy metal parameters.
- Sample 10 stations at head of Detroit River on flow weighted transect at range 30.8W and 30.7E.
- Sample 10 stations at mouth of Detroit River on flow weighted transect at range 3.9.
- Sample at Grosse Ile Fall Bridge, monthly, year-round, of water in the Trenton Channel.

End Product: Monthly measurements of ambient water quality at head and mouth of Detroit River, and in the Trenton Channel.

Lead Agency: MDNR

Schedule: 1985 - 1986

Status: Ambient Water Quality Monitoring of Detroit River.

Sampling completed for field year 1985. Data in STORET.

Status: Grosse Ile Bridge Sampling.

Design complete. Sampling begun 1/15/86.

Status: Detroit River Plume Study.

Four quarterly water quality surveys (Nov 84, March, June, and Sep 85), 20 stations at 3 depths (surface, middle, bottom) for a total of 60 samples per survey for cadmium, mercury, PCBs, (total Aroclor 1242, 1254, 1260), total residual chlorine, total fecal coliforms, and total plate count, In-situ water quality profiles (O.D., pH, conductivity and temperature).
Activity Number: F.8 (con't)

Status: (con't) Priority pollutants (all except asbestos) scan at some specific stations in Nov 84 and March 85. 13 biweekly surveys (May-Nov 85), 10 stations at 2 depths each for cadmium, mercury, total residual chlorine, fecal and total coliforms, and total plate count; only three stations for PCBs samples (one station located in Rouge River, 0.2 mile upstream of its mouth). Also total hardness, ammonia and TSS were included.

All analyses completed. Analyses performed by DWSN lab and Environmental Science and Engineering (ESE), Inc. in Florida. For sample locations, refer to included maps.
Activity Number: G.1

**Activity Title:** Bottom Sediment Mapping

**Purpose:** Map unconsolidated sediment deposits in the connecting channels as to sediment type to infer depositional/non-depositional areas, benthic habitat, and to aid bottom sediment and biota sample site locating.

**Approach:** Use existing data for the connecting channels, except for upper St. Clair River and lower St. Marys River.

Sample sediments in upper St. Clair River and lower St. Marys River.

Locate depositional zones based on existing data and sub-bottom profiling and collect core samples to assess thickness of deposits and to estimate deposition rates. Core samples would be radio-dated and analyzed for toxic substances to assess trends in contaminant input with time.

**End Product:** Map showing horizontal extent of the various sediment types. Estimates of deposition rates.

**Lead Agency:** NWRI/NOAA


**Status:** Bottom Sediment Mapping

Current file contains data from R.L. Thomas (1970, 1974) as hard copy and computer file of GL1, University of Windsor data (1983, 1984). Three sets of sounding records were collected in a trial of the feasibility of mapping bottom-sediment type and thickness of modern muds acoustically. (see NWRI Hydraulics Division Technical Note 85-08). Six cores were collected on the sounds-lines as ground-truth data. Size analysis of core samples is underway to support calibration of the transmissometer.

**Status:** Metal Concentrations and Storage in Lake St. Clair (Refer to G-2).

Of 250 samples to be analyzed, 66 are ready for analysis. Thirty samples have been analyzed for Pb, 30 for total carbon, and 16 for Pb-210. Metal analyses were not to begin until March 1, 1986. Thus metal analyses are ahead of schedule. Pb-210 analyses are on schedule.
Activity Number: G.1 (con't)

Status: Chlorinated Hydrocarbons in Sediments and Riota of the Great Lakes (Refer to G-2).

36 sediment cores from Lake St. Clair were collected and sectioned into 550 samples on site in 1985. Analysis of PCRs, chlorobenzenes, hexachlorobutadiene and octachlorostyrene on the samples is underway and should be completed by October 1986.

The analysis of 180 surficial sediment samples from St. Clair River/Lake St. Clair/Detroit River system (collected in 1984 by U. of Windsor) for the same parameters is almost complete and will be finished in April 1986.

The analysis of 60 bottom sediment samples from the St. Clair River near Sarnia (November 1985) for these parameters is complete and appears in the "St. Clair River Pollution Investigation" report.

Status: Transport and Fate of Particle Associated Tracers in Lake St. Clair (Refer to G-2).

During May and September 1985, two cores were collected at over 30 sites from the lake. Cores were sectioned horizontally in the field. Samples from one core were taken to CCIW for XRF, total metals, and organics analysis. Samples from the other were taken to NOAA/GLERL for grain size, AAS metals (Pb, Hg, etc.), and radionuclide analysis (Cs 137) plus composite samples for storage.

Status: Subbottom Profiling in St. Marys/Lake George.

Basically going as scheduled (i.e., to be done 1986). Ontario MOE and USEPA to pool equipment and staff to allow for better data collection and reduction.
Activity Number: G.2

Activity Title: Bottom Sediment Monitoring for Organic Toxics and Heavy Metals

Purpose: Determine magnitude and extent of bottom sediment contamination with pollutants of concern to help in source identification, in-place pollutant problem definition and need for remediation.

Approach: Map existing recent sediment data for connecting channels.

- Sample sediments in upper St. Clair River and Lower St. Marys River. Collect and analyze cores from deposition areas in the channels.
- Sample sediments from previously unsampled tributaries to the connecting channels.

End Product: Report on sediment contamination, location of hotspots, possible sources.

Lead Agency: NWRI/MOE/EPA

Schedule: Map existing data - 1985


Status: Effects of Physiochemical Properties of Sediment on Distribution and Availability of Metals.

- Sediment cores were collected at 35 sampling stations in Lake St. Clair. Cores were visually described and separated into 1 cm sections. Thickness of recent sediment was recorded in the description and verified by determination of the geochemical composition of sediment in each core section. The concentration of mercury was determined in all 0-1 cm sections of the sediment cores and in all sections of 2 cores.

Status: Chemical Characterization of Bottom Sediment in the Detroit River Navigation Channel.

- Sampling completed in May 1985. Laboratory utilized by Limno-Tech, Inc., Ann Arbor, MI was that of ERG (Environmental Research Group), also of Ann Arbor, MI. Sediments analyzed for particle size, metals, pesticides, PCR, nutrients, oil and grease.
Activity Number: G.7 (con't)

Status: UGLCC Tributaries Sediment Survey.
Field work completed August 1985. 78 sediment samples collected from 52 tributaries, 55 samples were submitted for analysis for 23 metals, conventional pollutants (org., oil and grease, total volatiles, solids, etc.), As, Mg, TOC, Acid/Base-neutral and volatile priority pollutants (GC/MS), pesticides and PCBs (GC/EC), and particle size analysis (Microtrec, laser based), overall analyses are less than one-half complete. Completion of analyses expected by June 30, 1986.

Status: 1980 Assessment of Bottom Fauna and Sediments of the Detroit River
Results from nutrient, trace metal, PCB and organochlorine pesticides analysis of samples from 59 stations in 1980, published as Ministry and Journal reports.

Status: 1985 Assessment of Bottom Fauna and Sediments of Lake St. Clair
Results from 1985 sediment survey completed. Analysis of surficial sediments for particle size, nutrients, heavy metals, PCBs and organochlorine pesticide contaminants were undertaken at 47 stations throughout Lake St. Clair.

Status: 1985 Assessment of Bottom Fauna and Sediments of St. Clair River
Surficial sediment samples taken at 78 locations along entire extent of river during May 1985. Analysis for PCBs, OC pesticides, nutrients, LOI, particle size, ether solubles and metals nearly completed by MOE Toronto lab. Samples from 24 river stations and submitted for PAH volatile organics and chlorinated aromatic/aliphatic analysis to external lab. Results are expected February 28, 1986. Additional samples taken September 23-28, 1985 from Imperial Oil to Suncor area in response to perchlorethylene spill. Dioxin, volatiles, extractables and chlorinated aromatics analyses complete.

Status: 1985 Assessment of Bottom Fauna and Sediments of St. Mary's River
This survey concentrated on the upper river and lower river to complete the update study of 1983 which concentrated on the area below the rapids but above Lake George.
Activity Number: G.2 (con't)

Samples of 71 stations analyzed for PCBs, organochlorine pesticides, metals, nutrients, LOI, particle size and ether solubles. To date, no results have been received. Samples from 15 stations were submitted for PAHs analysis by external lab. Results expected February 28, 1986.

In addition, 6 stations were sampled in August 1985 for metals, PCBs, pesticides and PAHs as part of the MOE in-place pollutants program (see H.6).

Status:
St. Clair River, Lake St. Clair, Detroit River and St. Mary's River Enhanced and Special Tributary Monitoring Programs.

Bottom sediment samples (surficial) collected at mouths of 5 St. Clair River (Perch Creek, Talfourd Creek, Baby Creek, Murphy Drain); 5 Lake St. Clair (Sydenham River, Thames River, Belle River, Pike Creek, Little River); 2 Detroit River (Turkey Creek and Canard River) and 7 St. Mary's River (Little Carp River, Big Carp River, Bennett Creek, E. Davingnon Creek, Fort Creek, Garden River, Root River). MOE lab analysis of these 19 samples for PCBs, pesticides (organochlorines, triazines, phenoxyacid, chlorophenols, metals and conventional parameters expected March 31, 1986.

Subsamples from 14 of the above tributaries submitted for outside lab analysis of PAHs, volatiles, chlorinated aromatics/aliphatics. Results expected February 28, 1986.

Status:
St. Mary's River - Core Sampling.

To be done in 1986 with assistance of seismic profiling data for sample site selection in Lake George.

Status:
Toxicity and biodegradation of HCB - St. Clair River

New
Activity Number: 6.3

Activity Title: Transport and Flux of Sediments and Associated Toxic Organics and Heavy Metals

Purpose: To attempt to estimate gross rates of settling and resuspension of sediments and associated toxics to provide input to mass balance model.

Approach:
- Monitor waves, water transparency, near bottom currents at selected sites in Lake St. Clair.
- Test resuspension of sediments in situ, using a flume.
- Monitor currents throughout Lake St. Clair.
- Monitor sediment concentration profiles, wave height and direction, temperature, and velocity at selected locations in connecting channels.
- Measure entrainment and resuspension rates of sediments from selected sites and apply data to a sediment entrainment, deposition and consolidation model.
- Estimate sediment accumulation rates based on U.S. and Canadian dredging records.
- Deploy sediment traps at selected sites.

End Product: Report on attempt to estimate gross settling and resuspension of sediments. Data will be related to process and unsteady flow models.

Lead Agency: NOAA/NWRI

Schedule: Field work 1985 - 1986
Preliminary results late 1985
Final 1986

Status: Circulation Patterns in Lake St. Clair

The Lake St. Clair field measurement program was conducted over the period June-October 1985. At present the various physical data bases are being processed for use. To date the meteorological and lake circulation current meter data are available; while the water level data set requires only the atmospheric correction term for completion. Other data sets on wave climate, Lagrangian drifter tracks, and physical data collected in support of sediment resuspension and remote-sensing overflights are being processed and made available to the UGLCC modelling studies.
Activity Number: G.3 (con't)

Status: Sediment Transport in Lake St. Clair

One successful deployment of an instrumented tripod was made in 1985. A flume to measure bottom erosion has been constructed and tested. Two other tripods have been made, but the recording system failed in 1985. Three wave/current meters were purchased but have not given satisfactory results.

Status: Contaminated Sediment Movement Between Lake Huron and Lake Erie.

300 water samples collected from Lake St. Clair analyzed for nutrients, suspended solids and physical factors. 90 sediment trap samples collected from Lake St. Clair and lower Detroit River analyzed for organic contaminants, nutrient and metals analyses underway. Expect all analyses by April.

Status: Partitioning of Radionuclides at Natural Interfaces.

New Project.

Status: Circulation Within Great Lakes Coastal Zones; Measurements of Sediment Resuspension in Lake St. Clair (APSD 85-512).

Data from sediment traps, filtered water samples, optical transmission profiles have been reduced and collated. Empirical relations have been developed between optical properties and concentrations of suspended sediments. Collection of wind, waves and high-frequency current data was successful but the high-frequency sampling of current velocities in the benthic boundary layer may not be useful because of instrument limitations. Ground truth for remote sensing experiments supplied to EPA. Preliminary analysis of data to be complete by April 1986.

Status: Relating Dredging Volumes to Suspended Sediment Transported in Detroit River.

Reviewed dredging records for Detroit River and related this to the natural suspended sediment load that ultimately enters Lake Erie.

Status: Forms and Availabilities of Phosphorus in Lake St. Clair/Detroit River.

Suspended sediments were collected from 8 stations in Lake St. Clair and sediment cores from 5 of these stations. Sample processing is now underway. Analysis to begin early March 85 with completion by May 85.
Activity Number: G.4

Activity Title: Impacts and Significance of Navigation and Dredging on Sediment and Contaminant Redistribution

Purpose: To assess the significance of dredging and navigation on the redistribution of sediments and associated contaminants.

Approach: Using completed and ongoing study results on the effects of ship movement and dredging on resuspension, assess significance compared to wind and wave induced resuspension.

Using dredging records, assess the significance of dredging and disposal on the mass balance of contaminants as compared to other removal mechanisms.

Based on the above, recommend appropriate needed field studies.

End Product: Estimate of significance of navigation and dredging on sediment and contaminant redistribution.

Lead Agency: COE

Schedule: Report based on existing information and recommendations for needed field work - 1985.

Carry out additional needed field work - 1986.

Status: Detroit/St. Clair River System Water Quality Sampling.

Draft report completed by contractor and reviewed by Detroit District One personnel.
Activity Number: H.1

Activity Title: Community Structure Assessment, Distribution and Production of Benthic Macroinvertebrates

Purpose: Sample benthic macroinvertebrates and associated sediments to map benthos distribution (species, numbers) and sediment types (sand, silt, oily) and to assess severity and extent of sediment contamination as it affects the benthos.

Approach: Examine historical and recent benthic information.

Plan and conduct additional benthic sampling as needed.

Identify and enumerate species in samples and develop production estimates for selected species.

End Product: Report on distribution and production of benthic macroinvertebrates relative to sediment types and sediment contamination.

Lead Agency: USFWS/MOE/NWRI

Schedule: 1985 - 1987

Status: Influence of Contaminated Sediments on Hexagenia in the UGLCC

In 1985, collected 275 sediment samples for contaminant analysis and 750 sediment samples for determination of the distribution and abundance of burrowing mayfly (Hexagenia) nymphs during June and July at 250 stations arranged in a grid pattern throughout the St. Mary's, St. Clair and Detroit Rivers, including Lake St. Clair. To date, 125 sediment samples from the St. Mary's River have been analyzed by an EPA subcontractor (Bionetics) for oil, grease and PCBs. Ten other variables will be analyzed in these and in the other 125 remaining samples of sediment from the lower channel by Bionetics. Sediment chemistry results for 1985 samples will not be available until May 1986.

Status: 1985 Assessment of Bottom Fauna and Sediments of the St. Mary's River


71 stations sampled September 24–October 4, 1985 (each in triplicate), concentrating on upper river (above rapids) and lower river. Analysis in progress, due for completion May 31, 1986.
Activity Number: H.1 (con't)

Status: 1985 Assessment of the Bottom Fauna and Sediments of St. Clair River.


Results from sampling of 47 stations included in journal report on Detroit and St. Clair Rivers.


Results from sampling of 50 stations published as Ministry and journal reports.

Status: Accumulation/Toxicity of Organic Contaminants by Yeasts and/or Fungi.

70 sub-surface water (1 m) samples from widely distributed stations of Lake St. Clair were collected between 18-21 of June 1984. All the 70 water samples were processed and analyzed. Completion date of the analyses will be March 31st, 1986. Report preparation in progress.

Status: Community Structure Assessment, Distribution and Production of Benthic Macroinvertebrates.

109 samples were collected by MOE in the fall of 1985, in the St. Mary's River, St. Clair River, and Detroit River. Samples consisted of: (a) bottom water, sediments, select biota for contaminant analysis, (b) benthic invertebrate species diversity and community structure. Analysis is still in progress for all samples (continuing into 1986). Analysis is being carried out by MOE Lab and appropriate private labs. Report covering 1983 data is scheduled for completion in March 1986.

Status: Distribution of yeast/fungi - St. Clair River, Lake St. Clair.

Finishing up report writing. No new field work planned.
Activity Number: H.2

Activity Title: Biological Characteristics of Zooplankton Assemblages

Purpose: Characterize and evaluate habitat requirements of the zooplankton community relative to grazing rate in all the channels.

Approach: Major zooplankton species and microcrustaceans from net hauls will be preserved, identified and counted.

Grazing experiments will be performed using standard Healey's grazing chambers.

End Product: A report describing zooplankton community structure, habitat and grazing rate in the connecting channels.

Lead Agency: F&OC

Schedule: 1985 - 1987

Status: Biological Characteristics of Zooplankton Assemblages in Lake St. Clair.

Zooplankton species and microcrustaceans from net hauls were identified and counted at 10 stations distributed across the lake during the period May to September 1984, with biweekly frequency.
Activity Number: H.3

Activity Title: Biomass, Size Composition, and Primary Production of Nannoplankton Assemblages

Purpose: Characterize and evaluate habitat requirements of natural nannoplankton assemblages relative to primary production in all the channels.

Approach: Identify and enumerate Lugol-preserved samples using standard inverted microscope techniques (Utermol).

Measure primary production by carbon-14 techniques.

Fractionate primary production by differential filtration (membrane filters and Nitex nets).

End Product: Reports providing (1) assessment of community structure (species and size composition) and (2) its correlation with primary production of each of the various size components of the natural population.

Lead Agency: F&OC

Schedule: 1985 - 1987

Status: Biomass, Size Composition, and Primary Production of Nannoplankton Assemblages in Lake St. Clair.

Integrated phytoplankton samples collected at 10 stations at biweekly intervals were identified and enumerated. Chlorophyll a, primary productivity, nutrient concentration and metal concentrations were also measured. Toxicity of a mixture of metals was evaluated on picoplankton and ultraplankton by means of algal fractionation bioassays.
Activity Number: H.4

Activity Title: Biomonitoring: Contaminants in Sport Fish

Purpose: Analyze sport fish from all channels to assess degree of contamination and human health impacts.

Approach: Agree on sample collection, handling, and preparation protocols.

Collect samples.

Analyze samples for contaminants of interest, i.e., PCB, chlorinated styrenes, pesticides, etc.

End Product: Report on contaminant levels in sport fish of the Connecting Channels.

Lead Agency: MDNR

Schedule: 1985 - 1986

Status: State of Michigan Comprehensive Statewide Fish Contaminant Monitoring Program.

Now being planned.

Status: Fall Run Coho/Chinook Salmon Contaminants Analysis.

Not able to collect any fish here to date. Last two years of collection unsuccessful.

Status: Ontario Sport Fish Testing Program (ongoing).

Collections completed. Fish awaiting analysis.

Data on 1978-1984 collections from Lake St. Clair has been published in the 1986 "St. Clair River Pollution Investigation" report. (Trend data on mercury, PCB, DDT, chlordane, lindane, HCB, octachlorostyrene, 2,3,7,8-TCDD in edible portions of fish).
Activity Number: H.5

Activity Title: Biomonitoring: Contaminants in Spottail Shiners

Purpose: Determine contaminant levels in spottail shiners in the Connecting Channels to indicate source locations along the Channels.

Approach: Examine existing spottail shiner data.

Collect spottail shiners at various locations along the Connecting Channels.

Analyze for contaminants of interest.

End Product: Report

Lead Agency: MDNR/MOE

Schedule: 1985 - 1986

Status: Contaminants in Spottail Shiners.

1985 samples collected in the St. Clair River, Lake St. Clair, and the Detroit River and sent to USEPA - CRL lab in Chicago for analysis.

Status: Assessment of Contaminant Bioavailability (Ongoing).

Reports on spatial and temporal trends data. Collected fish samples from 6 sites in the St. Clair River and 2 sites in the Detroit River. As of January 31, 1986 samples have not been analyzed.
**Activity Number:** H.6  

**Activity Title:** Biomonitoring: Contaminants in Benthic Macroinvertebrates and Fish

**Purpose:** Determine contaminant levels in appropriate native benthic macroinvertebrates to assess in-place pollutant impact on benthos.

**Approach:**
- Review available data on sources, sediment contaminant levels and distribution.
- Plan field survey sample sites based on the review of existing data.
- Collect benthic macroinvertebrate samples.
- Analyze samples for contaminants of interest.

**End Product:** Report on levels of contaminants in benthic macroinvertebrates.

**Lead Agency:** MOE

**Schedule:** 1986

**Status:** Biomonitoring: Contaminants in Benthic Macroinvertebrates and Fish.

Samples have been collected between 1983-1985 during the summer field season. 1983 samples have been analyzed. 1984 samples are nearing completion. 1985 samples will be completed in 1986. Analysis on sediment and biota is carried out by MOE lab and external private labs.
Activity Number: H.7

Activity Title: Biomonitoring: Cladophora Survey

Purpose: Survey and map Cladophora occurrence/abundance and collect samples from selected locations for chemical analyses to assess inputs of nutrients, metals, and PCBs.

Approach: Assess existing data.

Plan surveys based on existing data, aerial photography, locations of point and nonpoint sources.

Perform survey, collect samples at selected sites.

Analyze samples.

End Product: Report on distribution of Cladophora and contaminant levels.

Lead Agency: MOE

Schedule: 1985 - 1986


In July 1984, samples of Cladophora were collected from 5 shoreline sites in the upper river bordering the industrial complex at Corunna. A Lake Huron control sample was collected from upstream of Sarnia. Triplicate analyses were performed on all samples (in total 18 samples were analyzed by MOE for loss-on-ignition, PCBs and 29 inorganic elements). Internal report completed December 2, 1985.
Activity Number: H.8

Activity Title: Biomonitoring: Contaminants in Herring Gull Eggs

Purpose: Determine contaminant levels in herring gull eggs to provide overall assessment of the severity of contamination problem with data from other gull colonies.

Approach: Examine existing data.

Collect additional samples if needed. Performed analysis on herring gull eggs from Detroit River.

Analyze for contaminants of interest as needed.

End Product: Summary Report

Lead Agency: Canadian Wildlife Service

Schedule: 1985 - 1987

Status: Will continue studies on herring gull eggs in Detroit River (Fighting Island). Will also analyze whole body and eggs of ducks, herons and terns from Lake St. Clair and the St. Clair River.
Activity Number: H.9

Activity Title: Biomonitoring: Macrophytes

Purpose: Evaluate macrophyte drift as a vector for contaminant transport in the Connecting Channels.

Approach: Sample macrophyte drift with nets at regular intervals throughout the ice-free period of the year and obtain biomass data. Analyze samples of drift to determine contaminant loadings. Develop an estimate of the amount of contaminant transported annually by macrophytes.

End Product: A report providing data and an evaluation that can be used by the Modeling Work Group in their contaminants mass balance modeling endeavor.

Lead Agency: USFWS

Schedule: 1985 - 1987

Status: Analysis of Macrophytes for Trace Metal and Toxic Organics. Samples were shipped to ERL-Duluth. EPA-LLRS is awaiting the receipt of a portion of each sample in order to proceed with the digestion and analysis.

In 1985, collected drifting aquatic macrophytes 6 times (May—October) at 3 transects in the Detroit River (1 near the head below Belle Isle and 2 near the mouth; 18 samples total). Analyses of toxic organics (PCBs, OCS, and HCB) will be done by the Duluth National Water Quality Lab and heavy metals by the Large Lakes Research Station in Grosse Ile. The frozen, foil-wrapped samples were sent to Duluth in December 1985.
Activity Number: H.10

Activity Title: Biomonitoring: Contaminants in Waterfowl

Purpose: Determine contaminant levels in representative species of waterfowl to assess effects of exposure to pollutants in the Detroit River - a major waterfowl concentration area.

Approach: Review existing data and determine additional data requirements.

Collect additional samples as needed.

Analyze samples for contaminants of concern.

End

Product: Report on contaminant levels in waterfowl

Lead Agency: Canadian Wildlife Service/LLRS

Schedule: 1986 - 1987

Status: Contaminants in Waterfowl.

Samples homogenized and frozen.

Contaminant analyses will be performed on duck eggs and adult duck tissue in the St. Clair River and Lake St. Clair.
Activity Number: H.11

Activity Title: Biomonitoring: Native Clams

Purpose: Determine contaminant levels in native clams.

Approach: Collect and analyze clams native to these waters; attempt to correlate such factors as contaminant levels, species diversity, abundance, age and size.

End Product: Report on biomonitoring results in different habitats.

Lead Agency: MOE

Schedule: 1986 - 1987

Status: A qualitative survey of native clam populations in Lake St. Clair will be conducted (see H-20).
Activity Number: H.12

Activity Title: Biomonitoring: Caged Clams

Purpose: Determine contaminant levels in caged clams exposed for 3 weeks upstream and downstream of suspected sources to determine active sources.

Approach: Examine available data on caged clam biomonitoring in Connecting Channels.

Plan additional exposures, as needed, to verify previous findings or monitor additional locations.

Expose clams at selected locations.

Analyze clams for contaminants of interest.

End Product: Report on biomonitoring results, including conclusions as to possible contaminant sources.

Lead Agency: MOE/NWRI/GLFRB

Schedule: 1985

Status: Caged Clams.

All samples have been extracted and are awaiting cleanup and analysis.


MOE lab analysis of clams from 16 week exposure (140) samples and preliminary evaluation of tissue and water sample data completed (internal memo) - also incorporated in recent "St. Clair River Pollution Investigation" report.

Balance of samples (340) from six 3-week exposures at 19 stations to be analyzed by May 31, 1986.

Analytical results for PAHs in clams (80 samples) from selected Detroit and St. Clair River stations expected February 28, 1986 (outside lab).


Biomonitoring (single 5-week exposure) carried out September 12 to October 3, 1985, at 14 locations in St. Mary's River.
Activity Number: H.12 (con't)

**Status:** Adenylate energy charge measurement

New

**Status:** Bioconcentration - Alkyl lead compounds

New
Activity Number: H.13

Activity Title: Bioassay: Larval Fish Feeding Behavior

Purpose: Determine incidence and rates of larval fish feeding above and below pollution sources to measure impacts of reduced water quality and toxic substances on biota.

Approach: Prepare work plan for study based on preliminary work done earlier by USFWS.

Perform survey, including sampling for larval fish and zoo-benthos, in coordination with ambient water quality surveys.

Interpret data and prepare report.


Lead Agency: EPA

Schedule: 1985 - 1987

Status: Exposure and Biological Effects of In-Place Pollutants.

Reconnaissance complete 10/85.

Bioassay method developed.
Activity Number: H.14

Activity Title: Bioassay: Toxicity of Agricultural Biocides

Purpose: Determine toxicity to caged Hexagenia nymphs of tributary runoff from agricultural areas where biocides of concern are in use.

Approach: Examine available information on effects on Hexagenia of biocides currently used in agriculture in watersheds draining into the St. Clair-Detroit River System and Western Lake Erie.

Expose caged populations of Hexagenia nymphs in the lower reaches of each tributary of interest and sample populations serially to bracket the first major runoff event following the application of biocides at planting time.

Examine sampled populations for lethal and sublethal biocide effects before, during and after a runoff event.

Analyze water from field bioassay for biocides of interest.

Confirm field bioassay results with laboratory toxicity studies using concentrations detected in the St. Clair-Detroit River System and in Western Lake Erie.

End Product: Report effects of biocides of concern on nymphs of Hexagenia.

Lead Agency: EPA/USFWS

Schedule: 1986 - 1987

Status: Not funded.
Activity Number: H.15

Activity Title: Bioassay: Toxicity of Sediments to Hexagenia

Purpose: Conduct laboratory bioassays to determine the toxicity to Hexagenia nymphs of sediments collected from areas in the St. Marys River and the St. Clair-Detroit River System where natural populations of Hexagenia have been extirpated or depressed because of apparent degradation of habitat by contaminants.

Approach: Collect sediments from areas of concern and screen their toxicity at various dilutions to Hexagenia nymphs in the laboratory.

End Product: The bioassay results will be used to estimate the lethal and sublethal effects of contaminated sediments on Hexagenia nymphs in the UGLCC. A report describing sediment toxicity and containing recommendations for monitoring polluted areas will be prepared.

Lead Agency: USFWS

Schedule: 1986 - 1987

Status: Toxicity of Sediments to Hexagenia.

It is proposed to collect sediments from selected areas based on analyses of the sediment survey conducted in 1985 (see H.1) and expose early instar nymphs to serial dilutions of these sediments in the laboratory. Evaluate results and prepare report.
Activity Number: H.18

Activity Title: Habitat Evaluation

Purpose: Map habitats including substrate type submersed macrophytes and quantity of wetlands, look for potential fish spawning and nursery grounds. Acquire data suitable to determine if the Trenton Channel environment would support a cold water fishery.

Approach: Examine available literature (ecological profiles), on habitat quality and quantity, including bottom substrate, submersed aquatic vegetation, and wetlands to assess trends.

Develop work plan to supplement existing information as needed.

Produce habitat maps.

Evaluate habitat for species of concern using HEP procedures.

End Product: Habitat maps for specific locations of Connecting Channels.

Lead Agency: MDNR

Schedule: 1985 - 1986

Status: Habitat Evaluation of the Trenton Channel.

1985 field work was completed. Data are being interpreted and 1986 field plans are being formulated. 89 sites in the Detroit River, from the Rouge River mouth to Lake Erie along the U.S. side were investigated. The sites represented a range of substrate types, current velocities, depths, and cover.

Status: Index Fishing in Lake St. Clair (OMNR 1).

Index fishing was completed at the 5 regular stations in spring (May 22-23), summer (July 16-17) and fall (October 1-2). Data have been entered and analyzed.
Activity Number: H.18 (con't)

Status: Habitat - Fish Community Study, Mitchell Bay, Lake St. Clair (OMNR 2).

45 stations were sampled (SCUBA) in July to determine distribution of submerged macrophytes. Three stations were sampled monthly (May to October) to determine seasonal biomass of macrophytes. Seven stations were sampled monthly (May to October) to determine seasonal biomass and species composition of macroinvertebrates. 9 stations were sampled weekly (June to October) for young and adult fish. All samples have been analyzed. Some data are entered in OMNR data bank; remainder are being prepared for entry. Analysis will follow.

Status: Fall Pound Net Index Fishing, Lake St. Clair (OMNR 3).

Index fishing at the two regular stations was completed in November. Data have been analyzed. Report in preparation. Project to be repeated in FY86.
Activity Number: H.19

Activity Title: Toxicity and Bioaccumulation of In-Place Pollutants

Purpose: To assess the bioavailability to phytoplanktonic organisms of contaminants associated with suspended particulates and bottom sediments; to determine the bioaccumulation of the contaminants using in situ plankton cages.

Approach: Algal fractionation bioassays will be run as follows:

- Collect suspended particulates from water by centrifugation.
- Collect bottom sediments with Shipek dredge.
- Harvest caged plankton population chemically to assess bioaccumulation of metals.

Assess by C-14 techniques the bioavailability and toxicity of pollutants accumulating in the cages.

End Product: The data generated will provide detailed information on the bioavailability, bioaccumulation and eventual toxicity of in-place pollutants under in situ conditions using natural phytoplankton populations/assemblages.

Lead Agency: FSOC/LLRS

Schedule: 1985 - 1987

Proposed 1986 Activities: Microtox and Chironomid bioassays at 30 stations in the Trenton Channel.

Status: The Toxicity of Detroit River Sediment-Bound Contaminants to Ultraplankton.

- 4 sites in the Detroit River/Lake Erie western basin were evaluated for sediment toxicity to ultraplankton (<20 um) and microplankton/net plankton (>20 um). Bioassessment of elutriate toxicity was determined by carbon-14 Algal Fractionation Bioassays (AFB's). The sites near Windsor, Ontario, and the mouth of the Detroit River were found to be toxic to ultraplankton. The AFB's were found to be useful bioassessment tools due to their rapidity and sensitivity.
Activity Number: H.20

Activity Title: Phosphorus Inputs from Benthos

Purpose: To determine the relative importance of internal phosphorus loading by benthos to the phosphorus budget of Lake St. Clair.

Approach: Lake St. Clair cores will be incubated and rates of phosphorus recycling by benthos will be measured. These data will be incorporated as an internal loading pathway into a Lake St. Clair mass balance model for phosphorus.

End Product: An estimate of the relative importance of internal phosphorus loading by benthos to the phosphorus budget of Lake St. Clair.

Lead Agency: NOAA

Schedule: 1985 - 1986

Status: Phosphorus Release from Sediments of Lake St. Clair.

Intact sediment cores were collected by divers in May and in September at five representative stations in Lake St. Clair. The cores (6-8 replicates per station) were incubated at in situ temperatures for 70 days and P-release rates were determined. Mean P-flux for a given station and date was less than 0.03 mg P/m²/day. Given these release rates, sediments contribute only about 1% of the total P-load into the lake on an annual basis. In addition to the cores, 7 clams were collected on each of three dates and preliminary estimates of P-excretion were obtained. Based on abundance and biomass values of clams in the lake, P-excretion was estimated at 0.7 mg/m²/day. This amounts to about 25% of the P-load on an annual basis.
**Activity Number: H.21**

**Activity Title:** Biomonitoring: Fish Tumor Survey

**Purpose:** Determining incidence of neoplasia in fish in the Detroit River.

**Approach:** The Detroit River system will be surveyed for fish with tumors, using gill nets and shocking boats for sampling.

**End Product:** Documented incidence of tumors in Trenton Channel.

**Lead Agency:** LLRL

**Schedule:** 1985-1986

**Status:** Neoplasia in fish and related causal factors in the Detroit River system.

Initial survey completed 10/85, with 40% incidence of tumors found.

Proposed 1986 activities: five-week-long surveys with shocking boats.