LAKE ONTARIO TOXICS MANAGEMENT PLAN

(Draft Update)
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A Report by the Lake Ontario Secretariat

Charles Zafonte, Chief
Niagara Frontier Program Office
Environmental Protection Agency

Michael Goffin
Environment Canada

Gerry Mikol
Great Lakes Section
New York State Department of
Environmental Conservation

Tom Coape-Arnold
Great Lakes Section
Ontario Ministry of
the Environment

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* Material in these tables is current to April 1990. The tables will be updated through November 1990 by the time of the Coordination Committee meeting in February 1991.

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I. Introduction

On February 4, 1987, the Four Parties (Environment Canada, the Ontario Ministry of the Environment, the United States Environmental Protection Agency, and the New York State Department of Environmental Conservation) signed a Declaration of Intent that included a commitment to develop a Toxics Management Plan for Lake Ontario. Shortly thereafter, the Four Parties formed a Lake Ontario Toxics Committee, under the direction of the existing policy-level Coordination Committee, to develop the Lake Ontario Toxics Management Plan (LOTMP).

On January 28, 1988, at an open public meeting in Niagara Falls, New York, the Lake Ontario Toxics Committee presented a draft LOTMP to the Coordination Committee. At that meeting, the Coordination Committee directed the Lake Ontario Toxics Committee (renamed the Lake Ontario Secretariat) to:

- Pursue an aggressive public outreach effort to ascertain the public's views on the draft Plan; and
- Continue its efforts to develop supplemental information and data to improve the LOTMP.

The initial public outreach effort was completed, and with supplemental information and data, was reflected in the February 1989 LOTMP and its accompanying Public Responsiveness Document. This process is being repeated, with some improvements, for this 1990 Update of the LOTMP.

From the beginning, it has been the intent of the Four Parties to meet the commitments in the Declaration of Intent by:

- Aggregating existing, readily available information;
- Defining a logical approach to gathering additional, essential information;
- Developing a management framework within which to make commitments for the cleanup of the lake;
- Proceeding directly to implementation whenever possible; and
- Establishing increasingly stringent commitments to toxics control, over time, as our level of understanding improves.

The LOTMP was prepared in order to begin a more substantive dialogue aimed at defining the toxics problem in Lake Ontario, and developing and implementing the specific joint actions and separate agency actions required to eliminate that problem. This is the first regular status report and update of the LOTMP.

II. Scope

A. Geographic Scope

Appendix I provides an overview of the characteristics of Lake Ontario and the Lake Ontario Basin.

The LOTMP addresses the toxics problems encountered in the open waters of the lake:

- Nearshore areas and embayments are considered part of the lake,
- Tributaries, including the Niagara River, are treated as inputs to the lake, and
- The St. Lawrence River is treated as an output from the lake, and is, therefore, outside the scope of the Plan.

The Lake Ontario drainage basin is shown in Figure 1.

B. Programmatic Scope

The LOTMP includes a description of the major existing and developing programs to control toxics in the United States and Canadian portions of the Lake Ontario drainage basin, and also includes commitments for the full implementation of these programs. This is the baseline against which the need for further controls on inputs of toxics will be evaluated.

The task of defining further required controls on toxic inputs must first occur in aggregated form. That is, the LOTMP must focus initially on defining the aggregated impacts of such inputs as the Niagara River, other tributaries, atmospheric deposition, direct discharges, and releases from sediments. Next, the LOTMP will determine the level to which these aggregated inputs must be controlled in order to meet plan objectives. Once this has been accomplished, the responsible jurisdictions will be asked to define, on a source-specific basis, how the aggregated input reduction targets will be achieved.

III. The Toxics Problem in Lake Ontario

Appendix II describes the toxics problem in Lake Ontario in relation to chemical-specific standards and criteria, and in relation to direct objectives and indicators of ecosystem and human health. The chemical-specific descriptions are now fairly well developed.

Ecosystem-based objectives have been finalized for the lake; indicators for these objectives are now being developed.

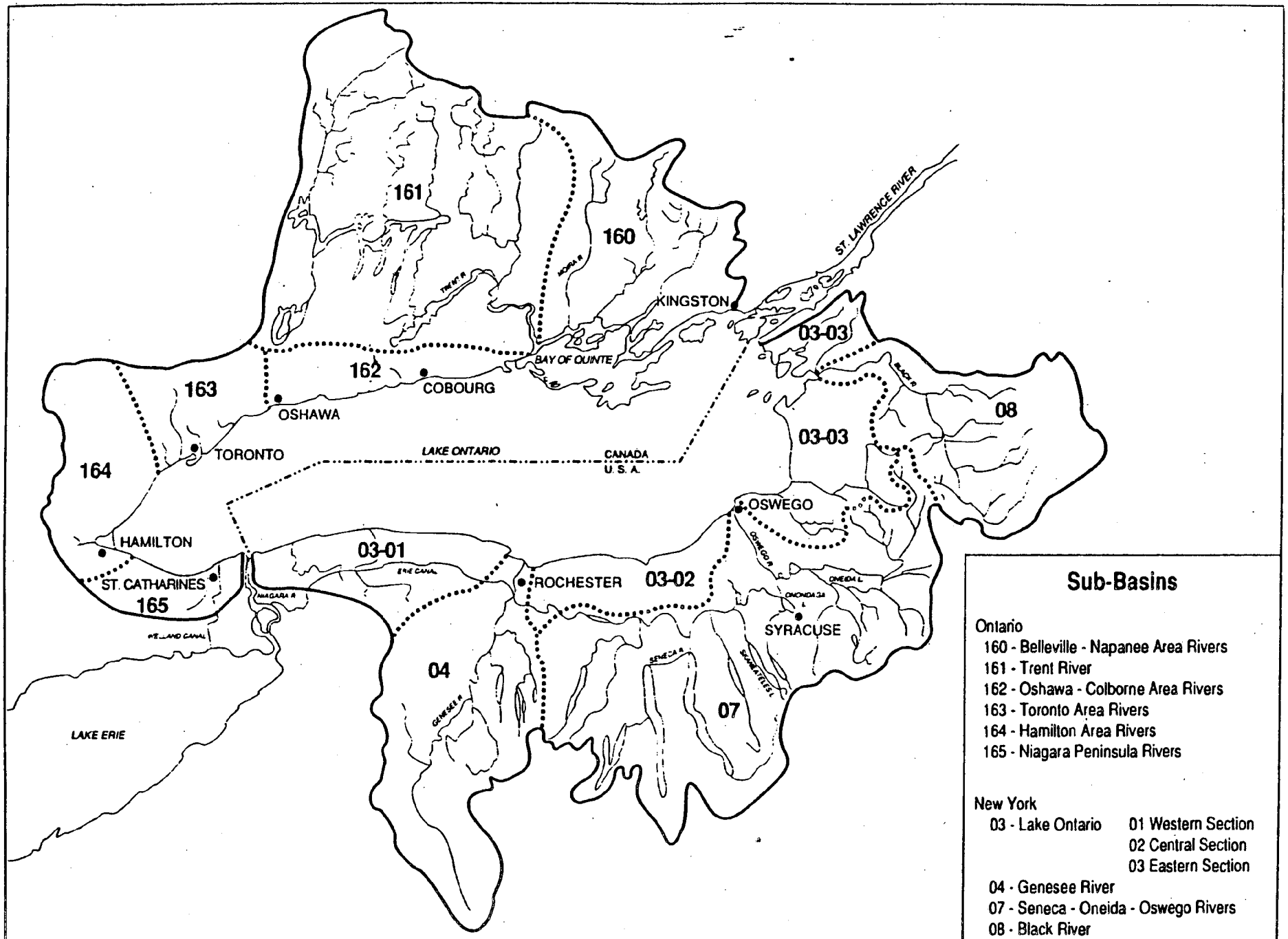

Figure 1. Lake Ontario Basin and Major Sub-Basins

A. Impact on Human Health

Toxics in Lake Ontario are a human health concern.

- Certain toxics bioaccumulate in some Lake Ontario sportfish to levels that make them unsuitable for unrestricted human consumption. The edible portions of fish tissue in larger specimens of some Lake Ontario sportfish, most frequently salmon and trout:
  - Exceed Canadian and/or U.S. standards for PCBs, mirex, chlordane, dioxin, and mercury, and;
  - Exceed more stringent, but unenforceable, EPA guidelines for hexachlorobenzene, DDT and metabolites, and dieldrin.
- Hexachlorobenzene, DDT and metabolites and dieldrin are also found in the ambient water column at levels above standards and criteria designed to protect human health.
- No toxics, however, are found in drinking water at levels above standards designed to protect human health.
- Information is accumulating that toxics in Lake Ontario may play a role in inducing developmental and neurological human health impacts at lower concentrations than those related to carcinogenic effects (Colborn et al. 1990).
- Generally accepted direct indicators of the impact of toxics in Lake Ontario on human health are not currently available. One of the main tasks of the Ecosystem Objectives Work Group, through its Human Health Objectives technical committee, will be to begin to develop such indicators for Lake Ontario.

B. Impact on Other Biota

Toxics in Lake Ontario are also a biotic health concern (see Appendix II for a detailed discussion).

- They bioaccumulate in fish to levels that make them unsafe for consumption by wildlife. The toxics that exceed NYSDEC unenforceable guidelines for protection of piscivorous wildlife are: PCBs, dioxin (2,3,7,8 - TCDD), chlordane, mirex, dieldrin, DDT and metabolites, mercury, and octachlorostyrene.
- PCBs are found in the ambient water column at levels above standards and criteria designed to protect aquatic life.

- There has been some evidence presented that toxics are linked to birth deformities and reproductive failure in piscivorous birds (Colborn et al. 1990).

- The levels of toxics in the lake have been reduced over the past two decades. There is a question whether the lingering adverse biotic impacts are linked solely to toxics.

C. Trends

There is clear evidence that levels of some problem toxics in Lake Ontario biota have been reduced over the past two decades. For example:

- The levels of PCBs, mirex, DDT and metabolites, dieldrin and hexachlorobenzene in herring gull eggs taken from Lake Ontario colonies from 1974 to 1989 show significant declines; and

- The levels of PCBs in lake trout, brown trout and coho salmon collected since 1975 also show significant declines.

By contrast, the trends in the levels of mirex in Lake Ontario sportfish are not clear. In addition, there is concern that the levels of problem toxics in lake biota may be stabilizing, but at unacceptably high levels.

D. Ecosystem Objectives

The LOTMP called on the Ecosystem Objectives Work Group (EOWG) of the Binational Objectives Development Committee, established by Canada and the United States in response to the Great Lakes Water Quality Agreement, to develop ecosystem objectives for Lake Ontario. The first indicators of ecosystem health for any of the Great Lakes were designed for Lake Superior. However, the Lake Ontario Secretariat determined that the focus of the Lake Superior indicators was too narrow for effective use in implementing the LOTMP. The Secretariat concluded that it would be necessary to design objectives specific to Lake Ontario (see Appendix II).

After extensive discussion and a public workshop, EOWG submitted a report to the Secretariat in May 1990, proposing a framework for Lake Ontario ecosystem objectives with three overarching goals:

- The Lake Ontario ecosystem should be maintained, and as necessary restored or enhanced, to support self-reproducing diverse biological communities.

- The presence of contaminants shall not limit the use of fish, wildlife and waters of the Lake Ontario basin by humans and shall not cause adverse health effects in plants and animals.

- We as a society shall recognize our capacity to cause great changes in the ecosystem and we shall conduct our activities with responsible stewardship for the Lake Ontario basin.

To attain these goals, EOWG also recommended five specific ecosystem objectives. Three of these objectives meet the goals of the LOTMP:

Aquatic Communities

The waters of Lake Ontario shall support diverse healthy, reproducing and self-sustaining communities in dynamic equilibrium, with an emphasis on native species.

Wildlife

The perpetuation of a healthy, diverse and self-sustaining wildlife community that utilizes the lake for habitat and/or food shall be ensured by attaining and sustaining the waters, coastal wetlands and upland habitats of the Lake Ontario basin in sufficient quality and quantity.

Human Health

The waters, plants and animals of Lake Ontario shall be free from contaminants and organisms resulting from human activities at levels that affect human health or aesthetic factors such as tainting, odor and turbidity.

The EOWG also proposed the following two additional ecosystem objectives:

Habitat

Lake Ontario offshore and nearshore zones and surrounding tributary, wetland and upland habitats shall be of sufficient quality and quantity to support ecosystem objectives for health, productivity and distribution of plants and animals in and adjacent to Lake Ontario.

Stewardship

Human activities and decisions shall embrace environmental ethics and a commitment to responsible stewardship.

The EOWG has established technical subcommittees to develop quantitative indicators for each objective. These five subcommittees began work in the fall of 1990. At the time of the next LOTMP update, this section will include a discussion of the indicators and a proposed workplan and schedule for indicator development.

IV. The Plan to Address the Toxics Problem in the Lake

A. Goal and Objectives

The goal of the Lake Ontario Toxics Management Plan is a lake that provides drinking water and fish that are safe for unlimited human consumption, and that allows natural reproduction, within the ecosystem, of the most sensitive native species, such as the bald eagle, osprey, mink and river otter.

In order to achieve this goal, the Plan includes four objectives:

- Reductions in toxic inputs[1] driven by existing and developing programs,
- Further reductions in toxic inputs[1] driven by special efforts in geographic areas of concern,
- Further reductions in toxic inputs[1] driven by lake-wide analyses of pollutant fate, and
- Zero discharge.

Many of the activities carried out to fulfill these objectives will be undertaken concurrently.

B. Objective 1: Reductions in Toxic Inputs Driven by Existing and Developing Programs

Appendix IV provides a description of the major existing and developing programs to control toxics in the United States and Canadian portions of the Lake Ontario drainage basin. The purpose of Appendix IV is to provide a status report that can serve as the basis for additional commitments; the additional commitments and their current status are presented in Table I. As discussed in the section above on Trends, implementation of the programs described in Appendix IV has resulted in substantial

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[1] In this context, inputs refers to toxic chemical inputs from the Niagara River and other Lake Ontario tributaries, the atmosphere, direct municipal and industrial discharges, releases of toxic chemicals from sediments, and to all other sources of toxics to Lake Ontario water column and biota.

reductions in the levels of some problem toxics in the lake over the past two decades. It is anticipated that full implementation of these programs, in accordance with the schedules shown in Table I, will further reduce the input of toxics to the lake. Load reduction estimates associated with this objective will be included in Plan updates, and will provide a baseline to evaluate the need for further reductions.

C. Objective 2: Further Reductions in Toxic Inputs Driven by Special Efforts In Geographic Areas of Concern

Remedial Action Plans (RAPs) will be completed for seven Areas of Concern in the Lake Ontario basin designated in the Great Lakes Water Quality Agreement: Eighteenmile Creek, Rochester Embayment, Oswego River, Bay of Quinte, Port Hope, Toronto Waterfront, and Hamilton Harbour. To the extent that the Plan identifies additional Areas of Concern, they will be brought to the attention of the individual jurisdictions for appropriate action. The actions taken to address the toxics problems in these Areas of Concern will contribute to the elimination of the toxics problem in the open waters of the lake.

Appendix V provides a description of ongoing RAP planning efforts. Table II contains commitments for the completion of the RAPs. RAPS are completed in three stages:

- Stage 1 Problem definition
- Stage 2 Selection and implementation of remedial and regulatory measures
- Stage 3 Restoration of beneficial uses.

Stage I reports for five of the six RAPs in the Lake Ontario Basin: Oswego Harbor, Metro Toronto, Bay of Quinte, Port Hope, and Hamilton Harbour, were completed in 1990. Completion of the RAPs will assist in implementing the LOTMP. Each RAP should quantify the loadings of LOTMP priority toxics from each Area of Concern and develop remedial actions to reduce these loadings. As critical pollutants in the LOTMP change through updated categorization, they should also be addressed in each RAP. The New York RAPs are taking this approach, and Ontario has committed to do likewise.

Timetables for full implementation of the RAPs will be included in LOTMP updates. As the plans are completed, load reduction estimates from the RAPs will also be included in Plan updates.

As a part of the continuing categorization process for the lake, the Lake Ontario Secretariat will refer data that may reflect a local toxic impact in an Area of Concern to the appropriate RAP for evaluation and, if needed, inclusion in the remediation plan.

The LOTMP recognizes the Niagara River as one of the most significant sources of toxics to the lake. The Four Parties have developed and are implementing the Niagara River Toxics Management Plan (NRTMP). The Four Parties have also committed to achieve a 50% reduction in the Niagara River loadings of persistent toxic chemicals of concern by 1996. Since implementation of the NRTMP will also contribute to the elimination of the toxics problem in Lake Ontario, Table II incorporates the NRTMP and thus the ongoing Niagara River RAP activities, in the LOTMP by reference. In addition, the Four Parties have taken a number of specific steps to coordinate the Niagara River and Lake Ontario planning efforts. These include the use of a single Coordination Committee to provide policy direction for both plans, and the use of three joint Niagara River/Lake Ontario technical committees to carry out critical elements of the plans.

D. Objective 3: Further Reductions in Toxic Inputs Driven by Lake-Wide Analyses of Pollutant Fate

As shown in Appendix II, the toxics problem in Lake Ontario can be characterized on a chemical-by-chemical or ecosystem basis. The chemical-by-chemical approach is most useful in moving quickly to implementation in the context of existing law and regulation; the ecosystem approach is most useful as a check on the effectiveness of the chemical-by-chemical approach.

As a first step in implementing the chemical-by-chemical approach to toxics control in Lake Ontario, the Lake Ontario Toxics Committee developed a categorization system to prioritize toxics for action. The categories are shown in Table III.

In order to implement the system for categorizing toxics, the Lake Ontario Toxics Committee (now Lake Ontario Secretariat) established an ad hoc Toxics Categorization Workgroup. For Category I chemicals, the Workgroup reviewed available ambient water column and fish tissue data in relation to applicable standards, criteria and guidelines. As shown in Table IV, ambient data were available for forty-two chemicals:

- Five (5) chemicals exceeded enforceable standards in the water column, fish tissue or both (Category IA);
- Four (4) chemicals exceeded more stringent, but unenforceable, criteria or guidelines in the water column, fish tissue or both (Category IB);
- Seventeen (17) chemicals were found only at levels at or below the most stringent standard, criterion or guideline (Category IC);

- Two (2) chemicals were analyzed with detection limits too high to allow a comparison with standards, criteria or guidelines (Category ID); and

- Twelve (12) chemicals had no standards, criteria or guidelines with which to compare the available ambient data (Category IE).

- Categorization for two (2) chemicals iron and aluminum was deferred until the Binational Objectives Development Committee developes criteria for these two metals that take into consideration site-specific influences on their toxicity.

Ambient Lake Ontario data were, however, not available for most chemicals. As a first step in implementing the chemical-by-chemical approach for these chemicals, the Workgroup looked at point source data, sediment data, tributary water column data and data for other biota as the basis for establishing evidence of presence in, or input to the lake:

- As shown in Table V, one hundred (100) additional chemicals showed evidence of presence or input (Category IIA); and

- There is no evidence of presence or input of any other chemicals (Category IIB).

The categorization system relies heavily on ambient water column and fish tissue data because ambient standards and criteria are available for these media. Ambient data for other media (e.g., sediment data) play no role at this time in the categorization process because there are no standards or criteria for these media. The system, however, is flexible enough to use these other ambient data as standards and criteria become available. EPA is currently developing a agency-wide sediment management strategy. One of the goals of this strategy is the development of EPA sediment quality criteria. Sediment criteria documents are planned for 22 compounds by FY 92.

Toxics are categorized in order to provide a logical basis for determining appropriate actions. As summarized in Table VI, differing actions are appropriate for chemicals in differing categories.

- For toxics that exceed enforceable standards, we will enhance and implement control programs.

- For toxics that exceed unenforceable criteria, we will develop enforceable standards.

- For toxics that are found at levels equal to or less than the most stringent criteria, no short-term water quality-based actions are required.

- For toxics that were analyzed with detection limits too high to allow a comparison with standards and criteria, we will analyze using a more sensitive analytical protocol or a surrogate monitoring technique.

- For toxics that have no standards or criteria with which to compare available ambient data, we will develop standards and criteria.

- For toxics for which there is evidence of presence in or input to the lake, but no ambient data, we will develop ambient data.

- For toxics for which there is no evidence of presence in or input to the lake, no short-term water quality-based actions are necessary.

The additional standards development and data collection activities described in Table VI are being pursued on a priority basis, as appropriate.

Since categorization of toxics plays a central role in directing the actions in the LOTMP, the categorization will be updated every other year to reflect new data and to reflect changes in standards and criteria. In addition, we will improve the reliability of the categorization by comparing, to the extent possible, both water column and fish tissue data with water column and fish tissue standards, respectively. The first updated categorization for Lake Ontario will be available by June 1991. It will be developed using the refined categorization process presented by the Niagara and Lake Ontario Secretariats to the Coordination Committee in September 1990.

Based on the 1988 categorization of toxics, the LOTMP focuses priority attention on nine of the eleven chemicals that have been found to exceed standards or criteria (PCBs, dioxin (2,3,7,8-TCDD), chlordane, mirex, mercury, DDT and metabolites, octachlorostyrene, hexachlorobenzene, and dieldrin).

Although iron and aluminum were included in the list of toxics in the 1989 update of the LOTMP, action on these toxics has been deferred, since the Four Parties have determined that:

- The criteria for iron and aluminum may not be reliable indicators of toxicity. No single number is ideal because of the variety of forms of these metals that may be present in ambient waters; and

- We are not yet in a position to differentiate between loads of these metals originating from natural and anthropogenic sources.

The Four Parties will request the Binational Objectives Development Committee to evaluate the existing criteria for aluminum and iron and develop criteria for these two metals that take into consideration site-specific influences on toxicity.

In order to deal effectively with all these chemicals, we need to know their sources and we need to know their fate in the ecosystem.

Appendix III identifies and ranks the major municipal, industrial and tributary inputs to the lake. The municipal and industrial sources have been ranked based on wastewater flow. Tributaries have been ranked based on flow, wastewater flow in the tributary basin, and number of waste disposal sites in the tributary basin.

Appendix III's preliminary conclusion is that the most significant potential sources of toxics in Lake Ontario are:

- The Niagara River (including the entire Great Lakes drainage basin upstream of the Niagara River);
- Atmospheric deposition;
- Inputs from ten other Lake Ontario tributaries:
  - Hamilton Harbour (Ontario)
  - Oswego River (New York)
  - Genesee River (New York)
  - Twelve Mile Creek (Ontario)
  - Welland Canal (Ontario)
  - Eighteenmile Creek (New York)
  - Black River (New York)
  - Trent River (Ontario)
  - Humber River (Ontario)
  - Don River (Ontario)
- Inputs from fifteen municipal (twelve in Ontario and three in New York) and two industrial facilities (one in Ontario and one in New York) discharging directly to the lake.

These conclusions are, however, quite general. We need to quantitatively define the total load, by source, of the nine priority toxics. Table 9 in Appendix III presents a first estimate of these loads. Table 9 also presents loading estimates, by source, for the six Category IIA toxics that exceed water column standards in the Niagara River (five polynuclear aromatic hydrocarbons (PAHs) and tetrachloroethylene); these six

toxics will receive priority consideration for ambient monitoring in Lake Ontario. The LOTMP also includes commitments by the Four Parties to improve the loadings estimates for Lake Ontario through:

- Development of a methodology to estimate nonpoint source loadings based upon existing data sources;
- Development of chemical-specific loadings from hazardous waste sites along the Niagara River;
- A field investigation to improve estimates of radionuclide levels from Canadian sources in the ambient water of the lake;
- Development of estimates of historic lake loadings;
- A field investigation of ambient levels of toxics in the lake; and
- Collection of improved data on tributary loadings.

In addition to knowing the sources of the nine priority toxics, we also need to know their fate in the Lake Ontario ecosystem. Mathematical models have been developed to relate the toxic inputs reflected in the loadings matrix to system responses such as the levels of toxics in the water column, sediment and biota. These mathematical models will provide one of the bases for load reduction targets that will achieve standards, and will be used to estimate the time required to achieve standards.

A preliminary Lake Ontario mass balance model was submitted by the Fate of Toxics Committee in April 1990. This model has already been used to evaluate the impact of projected Niagara River toxic load reductions on achieving standards in Lake Ontario. Preliminary load reduction targets and estimates of their reliability will be available in 1991; final load reduction targets are projected, based on agency experience, to be available by 1994. The load reduction targets will build upon the reductions that have been and will be achieved through existing and developing pollution control programs.

The presumption of the LOTMP is that attainment and maintenance of standards will be adequate to ensure that toxics do not interfere with the attainment of ecosystem objectives. As a check on the effectiveness of the chemical-by-chemical approach to toxics control, and as a first step towards establishment of an ecosystem-based approach, the Lake Ontario Secretariat:

- Has, through EOWG, developed ecosystem objectives for Lake Ontario; and

- Has requested EOWG to develop:

  - specific indicators of the ecosystem objectives; and

  - a plan to monitor the attainment of these objectives to provide feedback on the effectiveness of the chemical-by-chemical approach.

The planned actions for further reductions in toxic inputs driven by lake-wide analyses of pollutant fate are shown in Table VIIA.

E. Objective 4: Zero Discharge

There are limits to how effective current end-of-pipe control programs can be in further reducing pollutant discharge. We must give greater consideration to opportunities for source reduction. This will enable us to move towards our objective of zero discharge of toxics to Lake Ontario.

Appendix IV contains brief introductions to some of the more significant zero discharge-related activities currently being undertaken in the United States and Canada. In the United States these include:

- The development of more stringent technology-based limits for direct and indirect industrial discharges that take advantage of advances in technology;

- The evaluation of emerging technologies for the reduction, stabilization or destruction of hazardous waste under the Superfund Innovative Technologies Evaluation (SITE) program;

- The requirement that hazardous waste treatment, storage and disposal facilities perform waste minimization reviews; and

- Requirements for the retesting of active ingredients in commercial pesticides.

In Canada, zero discharge-related activities currently being undertaken include:

- The development of stringent technology-based limits for direct and indirect industrial discharges that take advantage of improved treatment technologies;

- The development of waste management programs related to reduction, reuse, recycling and recovery (4Rs) for municipal and industrial wastes;

- The development of household hazardous waste collection programs;

- The implementation of the pesticides management components of the "Food Systems 2002" Program;

- Research programs aimed at developing innovative techniques to control hazardous contaminants;

- Implementation of the Canadian Environmental Protection Act; and

- The initiation of the Environmentally Friendly Products Program.

Table VIII includes a number of commitments to leverage zero discharge-related activities occurring at the Federal, State and Provincial levels to move us towards the objective of zero discharge to Lake Ontario. In particular, the Four Parties have developed Pollution Prevention proposals to encourage waste minimization in both the U.S. and Canadian sides of the Niagara River and Lake Ontario Basins (see Table VIII; Appendix X).

The key objectives of the U.S. plan are to:

- Determine how industrial facilities located in the Niagara River/Lake Ontario basin can better apply pollution prevention techniques to reduce their releases of toxic chemicals to air, land, and water; and

- Develop a joint industry/governmental initiative on pollution prevention.

The key objectives of the Canadian plan are to:

- Facilitate and highlight government-industry cooperation in achieving source control and zero discharge of toxic substances under the LOTMP;

- Increase industry and municipal awareness of existing nonregulatory programs of MOE and EC that support source control and attainment of zero discharge;

- Identify opportunities for partnership or information sharing leading to the development and implementation of pollution prevention projects; and

- Provide a visible means of documenting and tracking progress of specific commitments made to source control and zero discharge within the Lake Ontario/Niagara River geographic context.

The Secretariat will coordinate the two plans to ensure consistency and maximize technology transfer between the two countries.

V. Costs

In controlling toxics, the LOTMP, thus far, relies on existing and developing programs not initiated as part of this planning effort. For this reason, the plan has not yet imposed incremental costs on the regulated community.

With completion of the preliminary mass balance model for the lake, we have concluded that, for certain toxics, the 50% Niagara River reduction commitment may not be sufficient to meet the most stringent ambient criteria in Lake Ontario. Once this has been quantified with greater confidence, the NRTMP will evaluate alternative controls and will estimate their costs and benefits.

VI. Management Structure

The management structure for the Lake Ontario Toxics Management Plan is shown in Figure 2.

- The Lake Ontario Coordination Committee will continue to provide policy direction during implementation and revision of the LOTMP.

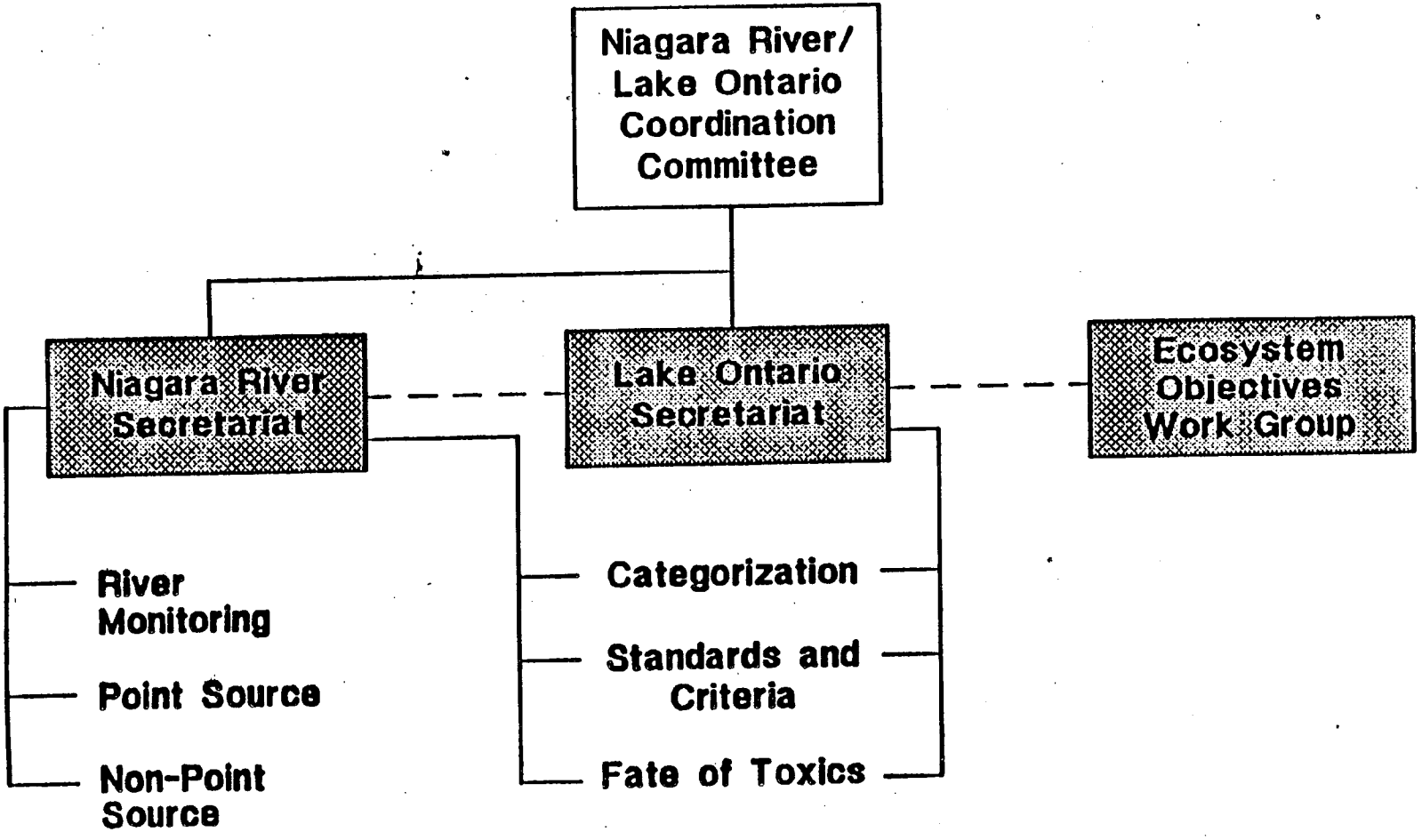
- The Lake Ontario Secretariat continues day-to-day operating responsibility for the implementation and revision of the LOTMP.

- An Ecosystem Objectives Work Group was established by Canada and the United States; as described in Appendix VI, EOWG developed ecosystem objectives for Lake Ontario. It is now undertaking the task of designing quantitative indicators to monitor progress in meeting those objectives.

- A joint Niagara River/Lake Ontario Categorization Committee was formed to maintain and refine the chemical-by-chemical categorization of toxics in the Niagara River and Lake Ontario; the charge to the committee is included as Appendix VII. A categorization report for the Niagara River was submitted to the Secretariat in June 1990. Based upon the findings and recommendations contained in the report, the Niagara River and Lake Ontario Secretariats submitted a report to the Coordination Committee outlining Four Party and individual agency actions that would respond to the recommendations in the Categorization Committee report. At its September 19, 1990 meeting, the Coordination Committee adopted the recommendations of the

Figure 2

MANAGEMENT STRUCTURE



Secretariats. The Categorization Committee is expected to complete its report on the categorization for Lake Ontario by June, 1991.

- A joint Niagara River/Lake Ontario Standards and Criteria Committee was formed to ensure that a consistent set of adequately protective, legally enforceable standards are available for the Niagara River and Lake Ontario; the charge to the committee is included as Appendix VIII. A report from the Committee on Standards and Criteria in the Niagara River and Lake Ontario was submitted in March 1990. Based upon the findings and recommendations contained in the report, the Niagara River and Lake Ontario Secretariats submitted a report to the Coordination Committee outlining Four Party and individual agency actions that would respond to the recommendations in the Standards and Criteria Committee report. At its September 19, 1990 meeting, the Coordination Committee adopted the recommendations of the Secretariats.

- A joint Niagara River/Lake Ontario Fate of Toxics Committee was formed to develop mathematical models relating toxic inputs to river and lake responses; the charge to the Committee is included as Appendix IX. A final report on a Level 1, mass-balance model for Lake Ontario was submitted to the Lake Ontario Secretariat in November 1990. At the next meeting of the Coordination Committee, the Four Parties will evaluate the model and determine what next steps should be taken based on the committee's report.

VII. Public Involvement

A. Objectives

The objectives of the LOTMP public involvement process are:

- To ensure that all sectors of the population affected by the LOTMP, including the public, interest groups, industrial associations, municipalities, news media and elected officials, are informed of the LOTMP and its progress; and

- To provide for the involvement of these groups in the implementation phases of the LOTMP, in formulating changes or modifications to the LOTMP as the work progresses, and also in the preparation of regular updates to the plan.

B. Planned Meetings

Public consultation relies heavily on open public meetings of the Coordination Committee, on citizen participation in technical committees, Secretariat participation at RAP meetings, and on binational workshops.

1. Coordination Committee Meetings

- The Coordination Committee manages both the Niagara River and Lake Ontario plans, conducting regular business meetings in public.

- Documents to be discussed at Coordination Committee meetings are, to the extent possible, distributed to the public well in advance of the meetings.

- Each meeting begins with presentations to the public on the issues to be addressed at the meeting.

- Each meeting includes a public question and comment period.

- The Coordination Committee then begins its business deliberations. Questions and comments from the public related to the deliberations of the committee will be welcomed at the conclusion of each agenda item.

- Meeting agendas focus on either the Niagara River or Lake Ontario. The location of Lake Ontario meetings will be rotated about the Lake Ontario basin on both sides of the international boundary.

- There may be occasions when it will be necessary to conduct executive sessions closed to the public. These will be limited to discussions leading to resolution of issues that are sensitive due to associated enforcement or litigation or which bear on international relations in a manner requiring clearances or approvals through diplomatic channels and protocols.

- The Four Parties will reimburse one representative from each relevant RAP area to attend Coordination Committee meetings and workshops.

2. Technical Committee Meetings

- The Lake Ontario Secretariat has established (jointly with the Niagara River Secretariat) three technical committees:

- Standards and Criteria,
- Categorization, and
- Fate of Toxics,

to assist them in preparing the plan updates and in making recommendations to appropriate agencies.

- o All technical committee meetings are open to the public. Although the public at large is not specifically invited to attend committee meetings, the committees are to consider how the committee will accommodate possible attendance by members of the public.

- o All technical committees include public members. Public members are full committee members.

- o Final committee products, and drafts undergoing review beyond the committee members, are public documents. Copies will be made available to meet all reasonable requests.

3. Remedial Action Plan Meetings

- o The Lake Ontario Secretariat will request that Lake Ontario issues be placed on the agenda of RAP Citizens Advisory Committee meetings as relevant issues arise. This takes advantage of an existing process bringing together an already identified, concerned public, including all stakeholders. It builds on the fact that work being undertaken in Areas of Concern is an integral part of the LOTMP, and addresses an often-voiced concern regarding coordination of the RAPs and Lake Ontario planning efforts.

- o Activities surrounding the LOTMP should not detract from the focus on Areas of Concern at RAP meetings.

- o Articles on the LOTMP will be included in RAP newsletters.

- o Secretariat members will schedule annual visits to RAP sites.

4. Binational Workshops

- o Issue-oriented workshops will feature invited specialists working in a public forum on such topics as developing indicators for ecosystem objectives for Lake Ontario. This is one component of the LOTMP in which public participation was clearly seen as essential to ensure that the affected cross section of interests is properly considered.

- Additional binational workshops will be held as the need arises to discuss issues of lakewide interest.

C. LOTMP Status Report and Update Workshops

- Lake Ontario status reports will be prepared annually, updates will be prepared biennually.
- Initial draft documents shall be transmitted to the public for review and comment.
- Binational workshops will be held prior to the Coordination Committee meetings to review draft Lake Ontario status reports and draft Plan updates.
- Final draft documents, including a draft Public Responsiveness Document, shall be completed and made available to the public.
- The Coordination Committee shall approve the documents, with changes as necessary.
- Final documents shall be available for distribution to the public.

D. Technical Reports and Data

A bibliography is maintained of the technical reports and data developed during the implementation of the LOTMP. The bibliography and its updates are distributed via mailing lists. In addition, relevant educational and informational materials will be incorporated into this bibliography as they are developed and become available to the Secretariat. The Bibliography is included in this 1990 Update of the LOTMP.

Repositories where this information is available are:

UNITED STATES

U.S. Environmental Protection Agency
Public Information Office
Carborundum Centre
345 Third Street, Suite 530
Niagara Falls, New York 14303
(716) 285-8842

New York State Department of Environmental Conservation Regional Offices:

NYSDEC - Region 6
317 Washington Street
Watertown, New York 13601
(315) 785-2244

NYSDEC - Region 7
7481 HenryClayBoulevard
Liverpool, New York 13088
(315) 428-4497

NYSDEC - Region 8
6274 E. Avon-Lima Road
Avon, New York 14414
(716) 226-2466

NYSDEC - Region 9
600 Delaware Avenue
Buffalo, New York 14202
(716) 847-4550

University Libraries:

SUNY Brockport
Drake Library
Brockport, New York 14420

Collection Division Office
Butlers Library
SUNY Buffalo
1300 Elmwood Avenue
Buffalo, New York 14222

Science and Engineering
Library
Capen Hall
SUNY Center Buffalo
Buffalo, New York 14214

Archives Moon Library
SUNY Environmental Science
and Forestry
Syracuse, New York 13210

Penfield Library
SUNY Oswego
Oswego, New York 13126

Not-for-profit Organizations

Atlantic States Legal
Foundation, Inc.
658 West Onondaga St.
Syracuse, New York 13204
(315) 475-1170

CANADA

Great Lakes Environment
Office
Environment Canada
25 St. Clair Avenue, East
Toronto, Ontario
M4T 1M2
(416) 973-8632

Communications Branch
Ontario Ministry of the
Environment
135 St. Clair Avenue, West
Toronto, Ontario
M4V 1P5
(416) 323-4571

MOE Regional Office
Central Region
7 Overlea Blvd.
Toronto, Ontario
M4H 1A8

MOE Regional Office
South Eastern Region
Kingston Region
133 Dalton Avenue
Kingston, Ontario
K7L 4X6

MOE Regional Office
West Central Region
Hamilton Regional Office
12th Floor
119 King Street, West
Hamilton, Ontario
L8N 3Z9

Intergovernmental
Relations Office
Ontario Ministry of the
Environment
135 St. Clair Avenue, West
Toronto, Ontario
M4V 1P5
(416) 323-5097

International Joint
Commission
100 Ouellette Avenue
Windsor, Ontario
N9A 6T3

International Joint
Commission
100 Metcalfe Street
Ottawa, Ontario
K1P 5M1

Regional Municipality of
Niagara
P.O. Box 1042
Thorold, Ontario
L2V 4T7
(416) 685-1571

University Libraries

Queens University
Kingston, Ontario
K7L 3N6

University of Toronto
Toronto, Ontario
M5S 1A4

McMaster University
Hamilton, Ontario
L8S 4L6

E. Contact Network

The Four Parties continue to identify the publics that should be reached through a contact network. The concept includes a focus on key groups having established networks, by providing extra communication or more detailed information, while keeping all other interested parties up to date on progress. It promotes special efforts to involve industry, municipal governments, organized labor and governmental agencies, and facilitates coordination with related activities such as those carried out on the Niagara River and in other Areas of Concern.

- The U.S. Environmental Protection Agency has taken the lead in preparing and maintaining a mailing list for the interested parties in the United States, and Environment Canada has prepared and maintains a similar list for Canada.

- The mailing lists are used to distribute notices of meetings, reports and other materials.

- The mailing lists are updated periodically to ensure that all those interested are being reached. Updating will be done through a notice to those on the original mailing lists requesting information on any additions, deletions or other changes. Citizen members will review the mailing lists for comprehensiveness.

F. Modification

The Public Involvement section of the LOTMP will be reviewed at the time of each update, and will be modified, as necessary, based upon feedback received from the public. The revision of the Public Involvement section of this LOTMP was based on a Public Involvement Workplan that was completed and submitted to the Secretariat in April 1990 (see Appendix XI).

Bibliography

1) Ecosystem Objectives Work Group. 1990. Ecosystem Objectives for Lake Ontario. Report to the Lake Ontario Secretariat.

2) Endicott, D.D., W.L. Richardson, T.F. Parkerton, and D.M. Di Toro. 1990. A steady state mass balance and bioaccumulation model for toxic chemicals in Lake Ontario. Report to the Lake Ontario Fate of Toxics Committee.

3) Metro Toronto. 1989. Strategy for improvement of Don River water quality-summary report.

4) New York State Department of Environmental Conservation (NYSDEC). February 1989. Nonpoint Source Assessment Report.

5) New York State Department of Environmental Conservation. 1990. Oswego River Remedial Action Plan, stage I.

6) Niagara River Secretariat. 1990. Niagara River Toxics Management Plan, 1990 revision.

7) Niagara River/Lake Ontario Categorization Committee. 1990. Categorization of toxic substances in the Niagara River. Report to the Niagara River Secretariat.

8) Ontario Ministry of the Environment. 1989. Data Report-1988 for Cornwall/Massena reach of the St. Lawrence River.

9) Ontario Ministry of the Environment. 1990. Environmental Conditions and problem definition-Bay of Quite RAP.

10) Ontario Ministry of the Environment. 1990. Environmental Conditions and problem definition-Port Hope RAP.

11) Ontario Ministry of the Environment. 1990. Environmental Conditions and problem definition-Toronto Waterfront RAP.

12) Ontario Ministry of the Environment. 1990. Environmental Conditions and problem definition-Hamilton Harbour RAP.

13) Ontario Ministry of the Environment. 1990,. Protocols for handling farm pollution incidents.

14) Ontario Ministry of the Environment. 1990 Annual Report-Spills Action Centre.

15) Standards and Criteria Committee. 1990. Standards and Criteria Committee Report to the Secretariats.

16) _____ (in press). Present status and temporal trends of organochloride contaminants in young of the year spottail shiner from Lake Ontario. Canadian Journal of Fisheries and Science.

Table I

Planned Actions Driven By Existing And Developing Programs

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA. Actions in the United States					
IA1. Direct Industrial Discharges					
IA1a. Complete the process of ensuring that all major permits in the Lake Ontario basin include Best Available Technology Economically Achievable (BAT) limitations for toxic pollutants and also include more stringent water quality-based limits as required to meet ambient water quality standards. (As shown in Appendix IV, all but 2 of the 37 major permits in the basin currently include these limits.)					
i. Issue revised SPDES permit for Harrison Radiator	Final Permit	EPA/NYSDEC	Draft Permit: Completed Public Notice: Completed Final Permit: 3/31/89 with A.O.	Harrison Radiator has contested its water quality-based limits. An Administrative Order (A.O.) will be issued with a schedule to come into compliance	Final permit issued in conjunction with Administrative Order on 7 February 1989; both became effective on 1 March 1989. The facility is in compliance with the permit.
ii. Issue revised SPDES permit for Crucible	Final Permit	EPA/NYSDEC	EPA Review: 3/31/89 P.N. of Tentative Decision: 6/30/89	Crucible has submitted a Fundamentally Different Factors (FDF) variance request which must be evaluated by EPA/DEC	In light of limited resources and competing needs, EPA has concentrated its FDF review efforts on the organic chemical industry. Thus action on Crucible is still pending.
iii. Re-issue, as they expire, SPDES permits for all major dischargers	Final Permits	NYSDEC	Continuous	Each permit is issued for five years. When reviewed, the permit is revised to include technology based limits consistent with the most current BAT effluent guidelines, where applicable and to include water quality-based limits, if necessary. Most permits have been through more than one such cycle.	Ongoing activity.

Table 1
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA1b. Seek 100% compliance with Final Effluent Limits on the part of major permittees in the Lake Ontario basin. (As shown in Appendix IV, all but 4 of the 37 major permittees in basin were in compliance as of 6/30/88.)					
i. Return significant non-compliers to compliance or take formal enforcement action	Improved compliance	NYSDEC/EPA	Continuous	The tool used to track compliance is the Quarterly Non-Compliance Report (QNCR). If a permittee shows on a QNCR as being in significant non-compliance (see 40 CFR 123.45) EPA or DEC must either bring the non-complier into compliance by the time the next QNCR is issued, or take formal enforcement action against the non-complier	There were no permittees in significant Noncompliance (SNC) based on the 3rd quarter, 1989 QNCR Report. The 4th quarter, 1989 report is due 1 June 1990.

Table
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA2. Indirect Industrial Discharges					
IA2a. In areas of the basin where EPA is the control authority for the pretreatment program, ensure that Significant Industrial Users (SIUs) comply with categorical pretreatment limits. (As shown in Appendix IV, all nine SIUs that fall in this category failed to provide EPA with the required demonstration of compliance.)					
i. Issue Administrative Orders against the nine SIUs that have failed to provide EPA with the required demonstration of compliance	Nine Administrative Orders	EPA	Completed		
ii. Evaluate responses to AOs	Nine evaluations	EPA	Completed		The evaluation revealed that there were only seven SIUs, none of which are now in SNC.
iii. Initiate follow up enforcement actions, as appropriate	Follow-up enforcement actions, as appropriate	EPA	None required	See Appendix IV for resolution	

Table 1
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
A2b. In areas of the basin covered by local approved pretreatment programs, audit or inspect each program annually to determine effectiveness. (As shown in Appendix IV, there are 14 approved programs in the basin)					
i. Audit or inspect each approved local pretreatment program annually	14 Audits or Inspections	EPA/DEC	Annually		All fourteen programs were inspected in 1989
ii. Transmit deficiency letters or take enforcement actions, as necessary	Letters and enforcement actions, as necessary	EPA/DEC	Continuous	Appropriate action selected based on 1A2bi	Of the fourteen programs that were audited or inspected, tw were in Significant Noncompliance: -City of Watertown, and -Onondaga County. Two orders were issued to the City of Watertown: - A Clean Water Act Sec.309(a Administrative Order seekin injunctive relief, and - A Clean Water Act Sec.309(g Administrative Penalty Orde seeking a civil penalty. The City has complied with th terms of the Sec. 309(a) orde and is now no longer in Sig- nificant Noncompliance. In addition, in response to the 309(g) order, the City has agreed to pay a $50,000 civi penalty for past violations. On 25 September 1989, a Se 309(a) Administrative Order w issued to Onondaga County f its failure to adequate implement its federally approv Industrial Pretreatment Progra Since that order was issued, the have been additional violatior further enforcement action currently being considered. Furth EPA enforcement action is plann

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA3. Municipal Discharges					
IA3a. In accordance with the National Municipal Policy all municipal discharges were to be in compliance with the Final Effluent Limits (FEL) by 7/1/88, or have judicially enforceable schedules to meet FEL. (As shown in Appendix IV, 33 of the 39 major municipal discharges in the basin currently meet FEL, leaving 6 as requiring judicially enforceable orders). Of the 6 remaining facilities, 4 already have signed Judicial Orders and the remaining 2 are expected to.					Currently 37 of 39 major dischargers have achieved Final Effluent Limits (FEL). The remaining dischargers are covered by judicial orders to achieve compliance.
i. Canastota: Construction of new wastewater treatment facility	Enforceable Municipal Compliance Plan	NYSDEC	Completed	Facility under construction. Judicial Order issued. Final Compliance extended to 10/2/89	Achieved FEL on 1 May 1989.
ii. Fulton: Upgrade of existing wastewater treatment facility	Enforceable Municipal Compliance Plan	NYSDEC	Completed	Facility is being upgraded. Judicial Order issued. Final Compliance extended to 3/31/90	Achieved FEL on 31 March 1990.
iii. Seneca Falls: Upgrade existing wastewater treatment facilities	Enforceable Municipal Compliance Plan	NYSDEC	Completed	Facility is being upgraded. Judicial Order issued. Final Compliance extended to 10/1/89	Achieved FEL on 1 October 1989
iv. Wetzel Road: Correction of dry weather overflows of raw sewage within collection system	Enforceable Municipal Complisnce Plan	NYSDEC	Completed	Judicial Order issued. Oak Orchard diversion to be completed by 6/1/89 with other final corrective work by 1/1/90	All work completed; achieved FEL on 19 Jan. 1990.

Table 1
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
v. Syracuse Metro: Elimination of dry weather overflows of raw sewage within collection system	Enforceable Municipal Compliance Plan	NYSDEC	7/1/88	Judicial Order has been agreed upon by both Onondaga and NYSDEC; expected to be signed shortly	The Judicial Consent Order was signed on 31 January 1989. A Municipal Compliance Schedule containing all the elements of a Municipal Compliance Plan is incorporate as Appendix A of the order.
iv. Leroy: Upgrade of existing waste facilities	Enforceable Municipal Compliance Plan	NYSDEC	Completed	Facility will be upgraded. Judicial Order issued and and Final Compliance extended to 1/1/91	On schedule to achieve FEL.
IA3b. Re-issue, as they expire, SPDES permits for all major municipal discharges	Re-issued Permits	NYSDEC	Upon permit expiration	Permits are issued for five year periods. When a permit is received for renewal it is revised to include FEL based upon either secondary treatment or water quality-based limits	This effort is ongoing.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA4. Hazardous Waste Treatment, Storage and Disposal (TSD) Facilities					
IA4a. Seek 100% compliance with permit conditions or interim status requirements. (As shown in Appendix IV, four of the eleven land disposal facilities in the basin are currently out of compliance.)					Currently ten of the eleven facilities in the basin are in compliance.
i. Ensure compliance of Philips ECG with approved closure plan	Compliance	EPA/NYSDEC	Philips will demonstrate clean closure within three years of certification approval date	Violation: Illegal operation of surface impoundment due to loss of interim status- 11/85 Action: Final order signed 10/86 required closure plan and financial assurance Status: All documents required by the final order have been submitted -Closure plan public-noticed 9/30/87 -All waste has been removed from the surface impoundments -Closure plan approved 11/87 -Physically closing surface impoundments now. Sampling analysis showed no metals contamination. Additional sampling and analyses for organics was performed in October 1988 to determine if clean closure is possible. Analytical results are under review.	NYSDEC is now lead agency for this facility. The surface impoundments were physically closed in January 1990 and the facility is in compliance with the consent order. Review of analytical results of 10/88 water sampling indicated need for further sampling, which is scheduled to begin in October 1990. If no significant differences from the 1988 results are found, clean closure of the facility will be certified. If significant differences are found, a post-closure permit will be needed. Final certification of closure is anticipated in April 1993

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
ii. Finalize formal enforcement order against Transelco and ensure compliance with final order	Compliance	EPA/NYSDEC	If Transelco signs the consent order compliance will achieved by 6/89	Violation: Illegal operation of a surface impoundment Action: Draft consent order sent to Transelco 12/85, no agreement reached Status: Amended draft consent order sent to Transelco 8/88	USEPA is now the lead for this facility. A consent order was signed in September 1989 and the facility is scheduled to achieve compliance by December 1990. The consent order requires soil sampling to ensure clean closure of surface impoundments. Results from the sampling study are expected in December 1990. If the study shows additional contamination, a post-closure permit will be needed. A post-closure plan was submitted in August 1987. The date of final closure is dependent on the results of the sampling program.
iii. Ensure compliance of LCP with approved closure plan	Compliance	EPA/NYSDEC	Physical closure to be complete by 5/89	Violation: Inadequate ground water monitoring and closure deficiencies Action: Final order signed 5/86 Status: Public notice of closure plan 12/87. Closure plan approved 9/88. Closure implementation stalled due to increase in cost by contractor. Entire facility has been closed since 6/88.	This facility is in compliance. Physical closure of the facility was completed in June 1989. A Certificate of Physical Closure was submitted to NYSDEC in December 1989 and is under review.
iv. Ensure compliance of Van De Mark with approved closure plan	Compliance	EPA/NYSDEC	Closure certification submitted 11/87	Violation: Ground water monitoring and closure plan violations Action: Final order signed 6/14/85 Status: Facility has completed closure of its landfill. Closure certification accepted 10/88.	The facility is in compliance. NYSDEC received the application for post-closure certification in April 1989. The application is currently under review and scheduled to be issued by September 1990.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
iv. Issue final closure approval and post closure permit to FMC	Final closure and post closure permit	EPA/NYSDEC	Land disposal units ceased operation 11/88; closure activities initiated	The facility will close three surface impoundments as disposal units. Releases to ground water detected Post closure permit required; RFI and groundwater assessment to be implemented	Two of the three surface impoundments were closed: in October 1988, and in September 1989. The third impoundment will be closed by August 1990. Monitoring associated with the post-closure permit will continue for three years after closure of the third impoundment.
v. Issue final closure approval and post closure determination for GMC-Harrison Radiator	Final closure and post closure determination	EPA/NYSDEC	Complete closure 12/88; Post closure permit determination 4/89	The facility will close five waste piles. Plans are to remove all wastes. Additional ground water monitoring is needed for post closure determination.	All five waste piles were physically closed and all wastes removed by December 1988. An extensive monitoring system is being installed as part of the post-closure requirements. This work has resulted in an extension of the deadline for the post-closure permit determination until April 1990.
vi. Complete RCRA Facility Assessment for George Robinson & Co. and corrective action as needed	Complete RFA for solid waste limits (SWMUs)	EPA/NYSDEC	Complete RFA 6/89	An operating permit is not needed. RCRA SWMUs include four surface impoundments. Past SWMU activities will be evaluated. Based on the conclusions of the RFA, corrective action will be taken as necessary.	Based on statewide priorities, the deadline for action on the RFA was extended until June 1990.
vii. Issue final closure approval and post closure permit to Van de Mark	Final closure and post closure permit	EPA/NYSDEC	Final closure 3/88 Post closure permit 9/89	Closure activities have recently been completed for the landfill. Groundwater contamination has been detected. Additional ground water monitoring to continue for the next 18 months.	This facility was physically closed in March 1988. The groundwater monitoring program continues as scheduled. The post-closure permit application is under review. Due to the need to complete the monitoring program, the post-closure permit deadline has been extended to September 1990.

Table I
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
e. Van de Mark (cont.)				DEC called in Post-closure permit 9/88. 8/88 DEC inspection of cap showed no signs of seepage on landfill slopes. Sampling wells quarterly	
IA4b. Make final permit decisions on all existing land disposal facilities. (As shown in Appendix IV, there are 11 land disposal facilities in the Basin)					
i. Issue final closure permit to Black & Decker (US) Inc.	Final closure and post closure permit	EPA/NYSDEC	Final physical closure 10/88; Post closure permit 3/89	The facility closed its surface impoundment and sludge drying bed and shut down all operations at this site. Post closure permit requirements being developed	This facility was physically closed in October 1988. Public notice of the draft post-closure permit was given in January 1990. The permit requires the facility to initiate a corrective action program to address releases at the facility. An extensive monitoring system is being installed as part of the post-closure requirements. In addition, an interim corrective measures investigation was necessary. These steps resulted in an extension of the post-closure permit deadline to June 1990.
ii. Issue final closure permit to LCP Chemicals	Final closure and post closure permit	EPA/NYSDEC	Closure plan approval 9/88; Post closure permit 9/89	The facility has stopped usage of surface impoundments. Closure plan approved 9/88. Post closure permit requirements being developed. RCRA facility assessment is under review.	This facility was physically closed in June 1989. The post-closure permit is under review. An extensive monitoring system is being installed as part of the post-closure requirements. In addition, an interim corrective measures investigation was necessary. These steps resulted in an extension of the post-closure permit deadline until September 1990.
iii. Issue final closure approval to Specialty Metals Division-Crucible Inc.	Final closure	EPA/NYSDEC	Closure plan approved 5/86	The facility is in the process of closing its landfill. Closure will be completed 12/89	This facility was physically closed in February 1989. The post-closure permit is under review. An extensive monitoring system was installed as part of the post-closure requirements. An interim corrective measures investigation was also necessary. These steps resulted in an extension of the post-closure permit deadline until September 1990.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
viii. Issue final closure approval and post closure permit to General Motors - Fisher Guide	Final closure and post closure permit	EPA/NYSDEC	Closure plan approval 12/88 RFA - 5/89	The facility will be closing two surface impoundments which managed PCBs. PCB contamination has been detected. A RCRA facility assessment will be completed by 5/89, with corrective activities to be taken as needed	The closure plan was approved in December 1988. The first phase of the RCRA Facility Assessment was completed on schedule in May 1989. The second, and final phase will be completed in May 1990.
ix. Issue final closure approval to Philips ECG	Final closure	EPA/NYSDEC	Final physical closure 9/88	Philips is not operating a LDF at this time due to EPA's denial of permit application 12/86. A closure plan for tanks and containers, surface impoundments, and an incinerator has been approved. Facility assessment phase of the corrective action program complete 6/88. Facility investigation is necessary.	This facility was physically closed in September 1988. The facility investigation is underway with a December 1990 deadline.
x. Issue final closure approval to Transelco-(Div. of Ferro Corp.)	Final closure	EPA/NYSDEC	Closure approval 12/88	The surface impoundment is not operating. Closure plan submitted 8/87. Enforcement is determining regulatory status of this facility.	This facility was physically closed in June 1989. Groundwater sampling will continue until December 1990 to determine if clean-closure has been accomplished or if post-closure monitoring will be necessary.
xi. Issue permit to SCA Chemical Services, Inc.	HSWA/RCRA permit	EPA/NYSDEC	Final HSWA permit issued 11/88 NYSDEC Part 373 permit to be issued in March 1989	The facility hazardous waste management activities consist of disposal in a landfill, storage and treatment in surface impoundments, treatment in tanks, and storage in tanks and containers.	The final HSWA permit was issued in September 1989. The RCRA facility investigation plan soil sampling program called for in the HSWA permit was completed in November 1989. The reports on the sampling program are being submitted for review throughout 1990. The NYSDEC Part 373 permit was issued in August 1989. The corrective action program called for in the September 1989 consent order is continuing.

Table 1
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
ii. SCA Chemical Services, Inc. (cont.)					The HSWA permit imposes upon SCA the requirements to implement an approved RCRA facility investigation plan in its assessment of contamination on the site that may have resulted from past or present operations. The facility changed corporate name to CWM Chemical Services, Inc., in October 1988. A 3008(h) consent order was issued by EPA in 8/88 to initiate corrective action program.
IA4c. Make final permit decisions on all existing incinerator facilities in the basin					
i. Issue operating permit to Seneca Army Depot	Final permit	EPA/NYSDEC	Final permit-11/89	The facility operates a popping furnace to destroy unserviceable ammunition. Corrective action program is in the assessment stage which will identify releases from solid waste management units	This facility has ceased operations. Development of the corrective action program to retrofit the facility to comply with incinerator standards will be addressed in an interagency agreement among EPA, NYSDEC, and the US Army. This agreement has been drafted and should be finalized by September 1990. Completion of the agreement and lack of EPA standards for popping facilities, resulted in extending the final permit deadline until September 1990. Completion of the action plan also depends on A106 funding.
ii. Eastman Kodak	Final permit	EPA/NYSDEC		Permit issued 3/6/86	Facility hazardous waste management activities consist of a chemical waste incinerator, 37 waste solvent storage tanks, and three waste container storage areas. The EPA HSWA permit requires Kodak to implement a RCRA facility investigation of its inactive Weiland Rd. landfill and other on and off-site contaminated areas.
IA4d. Make final permit decisions on all existing storage and treatment facilities in the basin.					
i. Issue final permit decision for all listed facilities by Nov. 8 1992.	Final permit determination	EPA/NYSDEC	11/8/92	Storage and treatment facilities are listed below	All facilities are on schedule to meet the 8 November 1992 statutory deadline.

Table 1
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS

Storage and Treatment Facilities

EPA RCRA I.D. #	Facility	EPA RCRA I.D. #	Facility
NYD000631994	University of Rochester	NYD002233997	Camden Wire Co.,Inc.
NYD000691162	Cheesebbrough Ponds	NYD002234763	W.R. Grace - Evans Chemetics Div.
NYD000818781	Brooks Ave. Tank Farm RGEC	NYD002231272	General Electric Co., Auburn Plant
NYD001317072	Carrier Air Conditioning	NYD006977086	Roth Bros. Smelting Corp.
NYD010779569	Auburn Plastics Inc.	NY4572024624	Bell Test Center
NYD013277454	Solvents and Petroleum Services, Inc.	NY0214020281	Fort Drum - Dept. of the Army
NYD002116192	Van De Mark Chemical Co., Inc.	NYD043815158	Akzo Chemic America
NYD002231355	Prestolite Motor Division	NYD057770109	N.E. Environmental SVCS
NYD002207744	Bausch & Lomb Frame Center	NYD059385120	General Electric
NYD002207751	Bausch & Lomb Optics Center	NYD980593487	Lowville Pesticide Storage Site
NYD002209013	Southco Inc.	NYD980593024	Camden Wire Co., Inc.
NYD002210920	Garlock Inc. Div. of Colt Ind.	NYD980593024	GMC Harrison Rad. Div. Wastewater Trt.
NYD002211324	Xerox	NYD075806836	McKesson Envirosystems
NYD002215226	GMC Delco Products	NYD079703120	Garlock Inc., Div. of Colt Industries
NYD002215234	GMC Rochester Products Div.- Lexington Ave.	NYD095577342	Industrial Oil Tank & Line Cleaning
NYD002215341	Stuart-Oliver-Holtz, Inc.		
NYD002220804	Olin Corp.		
NYD002225878	Residual Fuel Storage Tank		
NYD002227973	Construction Materials Product Division		
NYD002230092	Cambridge Filter Corp.		

IA4e.	Review and approve closure plans.	See comment column of IA4b, c, and d	See status column of IA4b, c, and d.
IA4f.	Initiate corrective action programs through 3008(h) Administrative Orders.	See comment column of IA4b, c, and d	See status column of IA4b, c, and d.

Table I
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE*	COMMENTS	STATUS
IA5. Inactive Hazardous Waste Sites **					
IA5a. Cleanup of the Seven Existing National Priorities List (NPL) Sites					
i. Cleanup of the Byron Barrel and Drum site	RI/FS RD RA	EPA	Report: 7/3/89 6/30/90 6/30/92		The Remedial Investigation/Feasibility Study (RI/FS) was completed 23 July 1989. The Record of Decision (ROD) establishing responsibilities for cleanup and outlining the conceptual remedial engineering design for reclaiming the site was published 29 September 1989. The detailed remedial engineering desig (RD) should be completed by 30 June 1991. The actu time required to implement the remedial action (RA) will be influenced by the RD. For planning purposes, EPA estimates two years from the completion of the RD, in this case, t 30 June 1993, to complete the RA.
ii. Cleanup of the Clothier Disposal Site (Ox Creek)	RI/FS RD RA	EPA/DEC EPA EPA	Report 11/30/88 6/30/89 12/31/89		RI/FS completed on 30 November 1988 ROD published on 28 December 1989. RD expected by 30 September 1990. RA to be completed by 30 September 1992.
iii. Cleanup of FMC Corp-oration Site	RI/FS RD RA	DEC	Report: 3/31/90 9/30/91 3/31/93	This is a State-lead enforcement case. DEC negotiated an order with FMC Corp to undertake the output actions	This is a state-led effort. The RI/FS is expected by July 1990.
iv. Cleanup of the Fulton Terminals Site	RI/FS RD RA	DEC EPA EPA	Report: 3/31/89 9/30/89 6/30/90	No known impacts on Oswego River	RI/FS completed on 6 July 1989. ROD published on 29 September 1989. RD expected on 31 March 1991. RA to be completed by 31 March 1993.
v. Cleanup of the Pollution Abatement Services Site (Wine Creek)	RA	DEC	12/31/89		Contamination outside the bentonite barrier surrounding this site was discovered. A study to determine the extent of the contamination is underway and will be completed by 31 March 1991. Based on the

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
v. Pollution Abatement Services Site (cont)					findings of this study, a new RI/FS and RD will be needed and additional RA work required. The new RI/FS will be completed by June 1991. Work on the new RD will begin in 1992; the RA is scheduled to begin in late 1993 with an anticipated completion in 1995.
* These deadlines are the best possible estimates for completion of the outputs based on currently available information. The possibility of slippages exists based on availability of new information.					
** The sites specified below, although located in the Lake Ontario Basin, may have little impact or no impact at all on Lake Ontario.					
vi. Cleanup of the Sinclair Refinery Site	RI/FS RD RA	EPA	Report: 12/31/88 9/30/90 12/31/92	PRP takeover	This site was divided into two components. Landfill: RI/FS completed in March 1985 ROD published in September 1985 Refinery: RI/FS completed in May, 1990 ROD expected in September 1990 RD expected by November 1991 RA completed by September 1993.
vii. Cleanup of the Volney Landfill Site	RD RA	EPA	12/31/89 12/31/90		Some of the data used in the initial RI/FS were invalidated necessitating additional sampling. On 29 September 1989, this additional sampling confirmed the validity of the remedy called for in the ROD, published 31 July 1987. The RD is now expected by 30 June 1991, with RA completed by 30 June 1993.
IA5b. Evaluation of additional sites for inclusion on the NPL	NPL Update	EPA/DEC	Ongoing Activity	EPA and DEC are currently investigating inactive hazardous waste sites in the Lake Ontario Basin for possible inclusion on the NPL	This activity is ongoing; no new sites were added to the NPL from the Lake Ontario Basin.
IA5c. Inventory all existing or potential hazardous waste sites in drainage basin area to Lake Ontario	Inventory Update	EPA/DEC	Ongoing Activity		This activity is ongoing

Table I
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ACTION	INPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA6. Combined Sewer Overflows					
IA6a. Plan and construct CSO abatement facilities to address CSO-related water quality violations (As shown in Appendix iV, 2 of 13 combined systems in the Lake Ontario basin are associated with water quality violations)					
i. Construct abatement facilities: Monroe County-Frank Van Lare STP	Completion of Construction/ Compliance	Monroe County	Jun., 1994	The following schedule for completion of interim segments is included in construction grant documents: Project Dewey-Eastman Jun., 1990 State-Mt. Hope Nov., 1992 Mt. Hope-Rosedale June., 1993 Transfer & Diversion Aug., 1993 Interceptors Lexington North Mar., 1994 Seneca Norton II Jun., 1994	The Dewey-Eastman segment was completed on schedule. The remaining work is continuing on schedule
ii Develop CSO abatement plan for Onondaga County-Syracuse Metro	CSO/Abatement Plan	Onondaga County, NYSDEC	Jan., 1992		A judicial order was signed in January 1989 requiring a program, beginning in the first quarte of 1989, to reduce extraneous flow through an o going county-wide enforcement program against il egal sump pumps and downspouts. A management con ference has been convened to develop a plan for the remediation of Onondaga Lake. This plan will, among other things, outline CSO abatement requirements
IA6b. At renewal of SPDES permits, incorporate water quality based effluent limits into permits where CSOs are causing use impairments in the receiving waters	Re-issued Permits	NYSDEC	As permits expire		This effort is ongoing

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA7. Stormwater Discharges					
IA7a. Pursue increased regulation of stormwater discharges in accordance with the schedule in the Water Quality Act of 1987					
IA7ai. Industrial and Large Municipal Stormwater Systems					
1. Issue application regulations	Regulations	EPA	February, 1989		Proposed regulations were issued in December, 1988. Final Regulations will be issued August, 1990.
2. Submit permit applications	Applications	Prospective permittees	February, 1990		Permittees are submitting applications under the draft regulations pending publication of final regulations; the deadline for permit issuance will be established in the final regulations
3. Issue permits	Stormwater permits	DEC	February, 1991		This effort is dependent on final regulations.
4. Achieve compliance with permit limitations	Compliance	Permittees	February, 1994		This effort will commence as permits are issued.
IA7aii. Small Municipal Stormwater Systems					
1. Submit permit applications	Applications	Prospective permittees	February, 1992		This effort remains on schedule.
2. Achieve compliance with permit limitations.	Compliance	Permittees	February, 1996		This effort remains on schedule.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA8. Other Nonpoint Sources					
IA8a. Identify waters that will not meet water quality standards due to nonpoint source pollution	Nonpoint Source Assessment Report pursuant to Sec. 319(a) of the Clean Water Act	NYSDEC	March, 1989	Preliminary Nonpoint Source information was submitted as part of New York's Water Quality Assessment Report pursuant to Sec. 305(b) of the Clean Water Act. The final report should be submitted by March 1989.	EPA approved the NYSDEC report on 18 July 1989
IA8b. Prepare Nonpoint Source Management Program	State Nonpoint Source Management Program pursuant to Sec. 319(b) of Clean Water Act	NYSDEC	June, 1989	Will provide overview of State nonpoint source and four year strategic plan. The final program should be submitted by June 1989	EPA approved the NYSDEC program on 4 January 1990
IA8c. Implement State Nonpoint source program	Implementation actions	NYSDEC, with other agencies as appropriate	Schedule to be developed pursuant to Sec. 319(b) of the Clean Water Act	Plan will target impacted waters on a watershed-by-watershed basis or address nonpoint sources on a statewide basis; specific actions and annual implementation milestones will be identified	The NYSDEC grant application for Section 319 implementation funds was approved on 1 March 1990. These funds will be used for the first year of the four year nonpoint source management program.
IA8d. Administration of the Pesticide Control Program	Pesticide registration; commercial pesticide applicator certification	NYSDEC	Ongoing	Pesticides are registered and permits are required for the distribution, sale, purchase, possession or use of "restricted use" products; all commercial applicators must be certified. The Cooperative Extension Service also provides technical information and advice to farmers on pesticide use	This effort is ongoing.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA9. Air Toxics					
IA9a. Determining Impact of air sources on Lake Ontario	Develop comprehensive emission inventories	NYSDEC EPA	In progress	Expand Air Guide-1 Continued technical & Section 105 support to State programs	NYSDEC revision of Air Guide-1 was completed November 1989. EPA technical and section 105 support to NYSDEC is ongoing. There are no current plans for expansion of monitors of chemical compounds. EPA has plans to install a new air monitor in the Lake Ontario basin.
	Ambient air monitoring in vicinity of Great Lakes	GLNPO	In progress	Addition of other toxic compounds of concern and and increase size of monitoring network	
IA9b. Controlling air toxics	Operate air toxics program in NYS	NYSDEC EPA	Operating	Continued operation Continued Section 105 grant support	This program is ongoing. EPA Region II has approved NYS funding for FY-91
IA9c. Define how atmospheric concentrations enter Lakes	Refine transport equations to better handle dry deposition and flux of atmospheric contaminants into Great Lakes	GLNPO	In Progress	Use procedures similar to those described by Strachan & Eisenreich to quantify impact on Lake Ontario	This work is ongoing in conjunction with the University of Minnesota and Argonne National Lab. A final report is expected March 1991.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA10. Oil and Hazardous Material Spills					
IA10a. Implement oil bulk storage regulations	Registration, testing and inspection of oil storage facilities	NYSDEC	Ongoing		
IA10b. Maintain spill inventory data base	Identification of accidental spill dates and locations	NYSDEC	Ongoing		
IA10c. Implement hazardous substance bulk storage regulations	Registration of hazardous material storage facilities	NYSDEC	7/89		The registration program compiles information on installation, maintenance and monitoring of bulk storage facilities. The registration was completed on 15 July 1989.
IA10d. Implement Section 313 of SARA	Reporting of toxic chemical releases in a publicly accessible data base	EPA	6/89		The database came on line in April 1990 Subscription information is available to the public and government agencies via an EPA hotline. EPA has plans to also make the database available through terminals installed in selected libraries in the region.

Table 1
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA11. Dredging and Dredged Material Disposal					
IA11a. Identify all active dredging locations and open water dredged material disposal areas	Map of Disposal Areas	U.S. Army Corps of Engineers (CE)	Ongoing	Most areas identified; update as needed	
IA11b. Adopt appropriate acceptable levels for identified contaminants of concern in Lake Ontario sediments proposed for open water disposal	List of contaminants and criteria for use in guidelines	CE/EPA	March 1990	CE/EPA to establish workgroup to meet this and subsequent commitments. The workgroup will include representatives from CE, EPA, DEC and will include other experts, as appropriate. This output dependent on development of a Level I model of pollutant fate by the Fate of Toxics Committee	Adoption of the list is awaiting final review by an interagency workgroup. Final action expected by June 1990.
IA11c. Develop testing protocol to be implemented in CE permit application reviews	Guidelines for standardized permit review	CE/EPA	Nov. 1990	Permit applications to CE are joint applications to CE/DEC	This program is on schedule for November 1990 completion.
IA11d. Investigate existing conditions in and surrounding open water disposal sites	Development and completion of special studies, surveys.	CE/EPA	Ongoing	Studies to evaluate existing conditions could be accomplished as part of study projects currently planned, or to be developed	
IA11e. Determine the suitability of continued use of the existing disposal sites in view of existing contaminant loading and increase in bottom elevations.	Development and completion of special studies, surveys	CE/EPA	Ongoing	Studies to evaluate existing conditions could be accomplished as part of study projects currently planned, or to be developed.	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA11f. Identify operational procedures that will minimize adverse effects (e.g. capping)	Identification of existing and potential measures	CE/EPA/DEC	Ongoing	An interagency workgroup will incorporate information from study projects in assessment of operational procedures	
IA11g. Identify areas ("hot spots") from which dredged material is unsuitable for open lake disposal	Maps	CE	Mar. 1990	Dependent on IA11b	Some "hot spots" have been delineated. Complete coverage is dependent on final adoption of the "list of contaminants" (see IA11b above). The complete inventory is expected to be available in June 1990.
IA11h. Investigate alternative disposal methods, including contained upland or lake sites	Identification of alternatives to open lake disposal	CE/EPA	Ongoing	Study projects planned or to be developed will provide additional information for review	
IA11i. Develop decision framework for evaluation of alternative disposal methods	Decision-making framework	CE/EPA/DEC	Ongoing		

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA12. Solid Waste					
IA12a. Implement new Part 360 of Title 6, NYCRR, in the Lake Ontario Basin, as described in the 1987-88 update of the New York State Solid Waste Management Plan					
IA12ai. Reduce by 8 to 10% the tonnage of the solid waste stream	Reduction in weight and volume of solid waste stream	NYSDEC	December, 1997		This effort is ongoing. Current statewide reduction is estimated at 4%.
IA12aii. Reduce and recycle 50% of the solid waste generated in the Lake Ontario Basin	Reduction/recycling up to 50% of current waste stream	NYSDEC	December, 1997	This initiative includes the 8 to 10% reduction described in IA12ai	This effort is ongoing. Current statewide reduction is estimated at 10%.
IA12aiii. Install additional capacity in the operating waste-to-energy facilities so as to enable such facilities to handle 50% of the current waste stream	Additional waste to-energy facilities capacity	Local communities/ NYSDEC	December, 1997		This effort is ongoing. The proposed Onondaga County facility is in the early phases of the permitting process.
IA12iv. Reduce number of landfills operating in the Basin	Closure of approximately 230 of the landfills that were in operation as of June, 1987	NYSDEC	December, 1997	Landfills will be used only for disposal of wastes that cannot be reduced, recycled, reused, or combusted in waste-to-energy facilities.	This effort is ongoing. There are currently 77 operating landfills in the Lake Ontario basin, 28 are under permit. Of these 28, 24 are under consent order to close by 1997.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA12av. Phase out incineration where feasible	Closure of 322 municipal, institutional, and private incinerators	NYSDEC	December, 1997	This applies to facilities using combustion with little or no energy recovery, as opposed to full-scale waste-to-energy systems	EPA is scheduled to issue its own incinerator regulations during the last quarter 1990. NYSDEC has decided to delay issuing its own incinerator regulations until EPA's are published. This delay is not expected to affect the 1997 deadline.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA13. Sludge Disposal					
IA13a. Continue present program activities in regard to waste-water treatment plant sludge, as outlined in Sections B & D of Appendix IV	Sample POTW sludges for identification of corrective measures for releases of hazardous waste	USEPA/ NYSDEC	Continuing		An annual sludge sampling program has been underway since 1983 and is ongoing.
IA13b. Review Part 360 solid waste regulations pertaining to sludge disposal activities following promulgation of federal regulation 40 CFR Part 503	Incorporate federal regulation into State regulation	NYSDEC	Not yet determined		A final 40 CFR 503 is still in preparation by EPA. NYSDEC published an updated Part 360 on 31 December 1988. When EPA promulgates its final 40 CFR 503, expected in 1992, NYSDEC will review Part 360 for consistency.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA14. Ambient Water Monitoring					
IA14a. Conduct ambient water quality monitoring (intensive basin study) in selected basins					
IA14ai. Study of Basin 01 (Lake Erie-Niagara River)	Report on Basin Study	NYSDEC	December, 1989	Underway. Will provide data on the Niagara River input to Lake Ontario	This study was completed 1 May 1990.
IA14aii. Study of Basin 04 (Lake Ontario tributaries)	Report on Basin Study	NYSDEC	December 1991		This study is ongoing
IA14aiii Basin 05 (Genesee River)	Report on Basin Study	NYSDEC	December, 1991		This study is ongoing
IA14aiv. Study of Basin 07 (Seneca-Oneida-Oswego Rivers)	Report on Basin Study	NYSDEC	December, 1991		This study is ongoing
IA14av. Study of Basin 08 (Black River)	Report on Basin Study	NYSDEC	December, 1991		NYSDEC currently is monitoring the Black River at Watertown for PCB, PAH, and organochlorine pesticides. Once this ongoing monitoring program is concluded, the Intensive Basin Study can begin. The study phase of the Intensive Basin Study is now scheduled to begin in 1991. The report will be available in 1993.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA14b. Fish Contaminant Surveillance					
IA14bi. Collect selected fish species specimens for examination for contaminant concentration	Report on toxic substances in fish	NYSDEC	March, 1990	For contaminant trend surveillance	Sampling was completed in 1989. Data analysis began in March 1990. The final report is expected in June 1990.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA15. Stream Classification					
IA15a. Re-classifications of the waters of the Genesee River Sub-Basin	Amended stream classifications	NYSDEC	1989	Stream classifications are published in Title 6, Chapter X of the New York Codes, Rules and Regulations (NYCRR)	Completed
IA15b. Re-classification of the waters of the Lake Ontario (proper) Sub-Basin	Amended stream classification	NYSDEC	1990	Stream classifications are published in Title 6,Chapter X of the New York Codes, Rules and Regulations (NYCRR)	On schedule
IA15c. Re-classification of the Seneca-Oneida-Oswego River Sub-Basin	Amended stream classifications	NYSDEC	1990	Stream classifications are published in Title 6,Chapter X of the New York Codes, Rules and Regulations (NYCRR)	On Schedule
IA15d. Re-classification of the Black River Sub-Basin	Amended stream classifications	NYSDEC	1990	Stream classifications are published in Title 6, Chapter X of the New York Codes, Rules and Regulations (NYCRR)	On Schedule

Table 1
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IA16. Potable Water					
IA16a. In accordance with the Safe Drinking Water Act amendments of 1986, all public water supply systems are to be in compliance with regulated drinking water contaminants					
IA16ai. National Primary Drinking Water Regulations					
1. Basic monitoring for all 13 CPWs (as shown in Table 1 of Appendix IV)	Compliance	Purveyors/ NYSDOH	Ongoing	Monitoring is required for certain microbiological, inorganic, organic and radiological contaminants (as shown in Table 2 of Appendix IV)	
IA16ii. Organic Contaminants					
1. Begin monitoring for 8 regulated VOCs and up to 51 unregulated organics at: Brockport Village, Monroe County Water Authority, Metropolitan Water Board, and Oswego City	Monitoring Results	Purveyors/ NYSDOH	December 31, 1988	CPWs serving greater than 10,000 persons must complete monitoring by December 1988	Monitoring completed; no violations; resample in 1991.

Table I
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
2. Begin monitoring for 8 regulated VOCs and up to 51 unregulated organics at: Albion Village, Ontario Town Water District, and Williamson Water District	Monitoring Results	Purveyors/ NYSDOH	December 31, 1989	CPWs serving populations between 3,300 and 10,000 complete monitoring by December 31, 1989	Albion Village Monitoring complete; no violations, resample in 1992 Ontario Town Monitoring complete; no violations resample in 1992. Williamson Monitoring complete one violation found for methylene-chloride. Tests are on-going to determine if lab contamination of samples was responsible for the violation. Followup testing will be needed.
3. Begin monitoring for 8 regulated VOCs and up to 51 unregulated organics at: Lyndonville Village, Sodus Village, Sodus Point Village, Wolcott Village, Sackets Harbor Village, and Chaumont Village	Monitoring Results	Purveyors/ NYSDOH	December 31, 1991	CPWs serving less than 3,300 persons must complete monitoring by December 31, 1991	Sodus Village Monitoring complete; no violations resample in 1992 Sodus Point " Wolcott Village " Chaumont Village Monitoring complete; results available September 1990 Lyndonville Monitoring complete in June 1990; available December 1990.
IA16aiii. Additional Drinking Water Standards					
1. Review and revise existing drinking water standards, as necessary	Revised Drinking Water Standards	EPA	continuous		

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
1B. Actions in Canada					
1B1. Industrial Discharges (both direct to the Lake and tributaries).					
1B1a. Implement the Municipal-Industrial Strategy for Abatement (MISA) Program for industrial dischargers. In June 1986, the Ontario Ministry of the Environment announced "The Municipal-Industrial Strategy for Abatement" (MISA) Program. The program is being developed in consultation with Environment Canada, industries, interest groups and the general public. Joint technical committees (MOE, EC and Industrial Associations) for each sector will recommend practical and effective requirements for each regulation. Monitoring regulations for each industrial sector will be submitted for public review prior to their promulgation. In the Lake Ontario Basin there are five organic chemical industries, nine pulp and paper mills, three iron and steel mills, three petroleum refineries three metal mining and refining, two inorganic chemical facilities, two electric power generating stations and one metal casting operation. All dischargers are required to control wastes by operating treatment facilities under Certificate of Approval or Control Order. The present situation of compliance and remedial actions for these industrial discharges is shown in Appendix IV.					
i. Organic Chemicals: Bakelite Thermosets Ltd. Borg-Warner Chemicals Celanese Canada Ltd. Dupont Canada Ltd. Domtar Wood Preserving Inc.	Final Permit	MOE	Public Notice '88 Monitoring Reg. '89 Compliance Reg.1990-91	Domtar Wood Preserving, Inc. was issued a Control Order on March 19, 1988 to install treatment systems for wastewaters, surface collection and leachate collection systems	Public notice completed October 1988; Monitoring Regulation promulgated April 1988; Compliance Regulation on schedule for 1991-2
ii. Iron and Steel: Dofasco Stelco LASCO	Final Permit	MOE	Public Notice '89 Monitoring Reg. '89 Compliance Reg. 1991-92	Iron and steel mills are in compliance with heavy metal requirements	Public notice completed February 1989 Monitoring Regulation promulgated, May 1989; Compliance Regulation on schedule for 1991-92

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
vi. Metal Mining & Refining: Eldorado Nuclear Limited (Port Hope, Port Granby & Welcome sites)	Final Permit	MOE	Public notice '89 Monitoring Reg. '89 Compliance Reg. 1991-1992	Effluent quality limits are set in Atomic Energy Control Board License	Public notice completed, August 1989 Monitoring regulation promulgated, December 1989; Compliance regulation now scheduled for 1992.
vii. Inorganic Chemicals: Exolon Washington Mills Ltd.	Final Permit	MOE	Public notice '89 Monitoring Reg. '89 Compliance Reg. 1991-1992	They are in compliance with MOE effluent guidelines Washington Mills Ltd. installed a filter system to remove suspended solids	Public notice completed, August 1989 Monitoring regulation promulgated, December 1989; Compliance regulation now scheduled for 1992.
viii. Electric Power Generating Stations: Ontario Hydro- Pickering Ontario Hydro- Lakeview	Final Permit	MOE	Public notice '89 Monitoring Reg. '89 Compliance Reg. 1991-1992	In compliance with the objectives of wastewater guidelines of Ontario	Public notice completed, August 1989 Monitoring regulation promulgated, December 1989; Compliance regulation now scheduled for 1992

Table 1
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB3. Municipal Discharges					
IB3a. As part of the MISA program all municipal discharges will be subject to Limits Compliance Regulation by Dec. 1991. As shown in Appendix IV, all the Ontario sewage treatment plants are currently required to comply with controls for only the conventional parameters. There are 31 sewage treatment plant facilities in the Lake Ontario basin. All of the facilities are secondary treatment plants (activated sludge and continuous phosphorus removal).					
1. Municipal Plants: Toronto Main, Humber, Highland Creek, North Toronto Oakville Southwest & Southeast Hamilton Hamilton, Burlington Dundas South Peel Clarkson, Lakeview St. Catharines Port Weller, Port Dalhousie Oshawa Harmony Creek #1&2 Whitby Corbett, Pringle Creek #1&2 Bay of Quinte Belleville, Cobourg Trenton, Port Hope, New Castle, Napanee Grimsby, Peterborough	Final Permit	MOE/EC	Public notice. '89 Monitoring Reg. '89-'90 Compliance Reg. 1990-1991-1992	As part of MISA, an intensive sampling program was completed in 1987 where 40 municipal wastewater facilities were sampled (influent, effluent, sludge) for: PCBs, dioxins, PAHs volatiles and heavy metals These plants are: Toronto (Facilities) York-Durham, Oakville, Clarkson, Lakeview, Hamilton, Burlington, Grimsby, Whitby, and Kingston.	Monitoring regulation will not be promulgated Compliance Regulation will be promulgated in 199 Treatment plants larger than 4,540 m3/day, serve more than a population of 10,000, or receive wastes from significant industrial dischargers are required to implement a sewer use control program starting in 1991.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
B4. Waste Disposal Sites - Active and Closed Sites					
a. Obtain site specific information, in order to assess potential hazard to humans and environment	Site specific report	MOE	On-going	-No compiled information on compliance is available. -Each landfill site is handled on a case-by-case basis as problems are discovered. -In many cases, actions constitute monitoring of the environment to determine existing or potential impact. - Reports will be used to identify actions required.	No problem landfill sites identified to date in the Lake Ontario Basin.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
I85. Combined Sewer Overflows					
I85a. Plan and construct CSO Abatement Facilities to Address CSO - Related Water Quality Violations					
i. Develop a comprehensive implementation plan to improve water quality in the St. Catharines area receiving waters. City of St. Catharines	A phased implementation plan to reduce CSO, STP bypass and improve stormwater quality	City of St. Catharines; City of Thorold; Regional Municipality of Niagara; Ministry of the Environment	November, 1989		The implementation date for the plan is now June 1990.
ii. Develop CSO and STP abatement alternatives to reduce CSO and STP bypasses in the Regional Municipality of Hamilton-Wentworth	Sizing of CSO storage facilities to reduce CSO and and STP bypass. Study will be used in a future comprehensive implementation plan to improve water quality to Hamilton Harbour	Regional Municipality of Hamilton-Wentworth Ministry of the Environment	March, 1990		Database created for CSO modeling. SWM IV computer model being revised due to rainfall runoff continuity errors. Project expected to be complete by June 1990.
iii. Develop, install and evaluate a computerized system for reducing the number and volume of CSO	Reduce CSO being discharged to Cootes Paradise	Regional Municipality of Hamilton-Wentworth Ministry of the Environment	December, 1990		This project is continuing on schedule. Summer rainfall data has been collected. Algorithms and real-time control model currently being developed.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
iv. Construct CSO storage facility. Regional Municipality of Hamilton-Wentworth	72,000m3 CSO storage facility. Reduces overflow to one event per year for a 2000 acre drainage area	Regional Municipality of Hamilton-Wentworth. Ministry of the Environment	Completed		Performance evaluation for structure is now being carried out.
v. Develop a comprehensive implementation plan to improve water quality in the Kingston area receiving waters. City of Kingston	A phased implementation plan to reduce CSO, STP bypass and improve stormwater quality	City of Kingston/Ministry of the Environment	December, 1990		This effort is continuing on schedule. Summer monitoring has been carried out. Receiving water pollutant transport model has been developed. Land based models are now now being developed.
vi. TAWMS (Toronto Area Watershed Management Strategy)- A study of water quality (Don River, Humber River and Mimico Creek) to provide base line data to guide future studies. Metro Toronto	Humber River Water Quality Management Plan Don River Water Quality Management Plan	Metro Toronto/ Ministry of the Environment/ Area municipalities	Completed 1989		Negotiations are underway for stormwater quality quality ponds demonstration project.
vii Develop CSO and STP abatement alternatives for Humber STP sewer drainage area: Metro Toronto	Evaluation of Viable Control Alternatives	Metro Toronto/ Ministry of the Environment	September, 1988		Detailed engineering designs are being developed for capacity increase and CSO abatement in Black Creek area.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
viii. Develop CSO and STP abatement alternatives for the Main STP sewer drainage area: Metro Toronto	Evaluation of Viable Control Alternatives	Metro Toronto/ Ministry of the Environment	December 1989		The evaluation has been completed
ix. Construct stormwater and CSO storage tanks (2000m3 and 16000m3). City of Toronto	Reduction of CSO and storm-water discharges to Toronto beach areas	Metro Toronto/ Ministry of the Environment	Not yet determined		2,000 m3 tank completed in Spring 1990 16,000 m3 tank completion is yet to be determined

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
I.B6. Stormwater Discharges					
a. Municipalities to prepare Master Drainage Plans that include stormwater quality controls	Master Drainage Plan	Municipalities	Voluntary	Ontario has announced its "Urban Drainage Management Program for New Development". The program will be initially voluntary for three years	UDMP Guidelines for Urban Drainage Design and Erosion and Sediment Control are now in effect.
b. Developers to prepare stormwater management plan	Stormwater Management Plan	Developers	Voluntary	Technical guidelines for drainage design and and sediment control have been released	Ministry of the Environmental and Ministry of Natural Resources draft "Interim Stormwater Quality Control Guidelines" released for public review in 1989.
c. Developers to include stormwater management controls during construction of new development	Stormwater Management Works	Developers	Voluntary Some municipalities already have active programs	Program indirectly controls toxics through control of sediment	This activity is ongoing
d. Develop a comprehensive implementation plan to improve water quality in the St. Catharines receiving waters. City of St. Catharines	A phased implementation plan to reduce CSO, STP bypass and improve stormwater quality	City of St. Catharines City of Thorold Regional Municipality of Niagara Ministry of the Environment	November, 1989		Phased implementation plan expected in June 1990.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
e. Develop a comprehensive implementation plan to improve water quality in the Kingston area receiving waters. City of Kingston	A phased implementation plan to reduce CSO, STP bypass and improve stormwater quality	City of Kingston/ Ministry of the Environment	December, 1990		Summer monitoring was completed. Receiving transport model developed. Land-based models currently being developed
f. TAWMS (Toronto Area Watershed Management Strategy)-	Humber River Water Quality Management Plan	Metro Toronto/ Ministry of the Environment	Completed		Negotiations are underway for stormwater quality ponds demonstration projects. "Strategy for improvement of Don River Water Quality- summary report" released in September 1989.
A study of water quality (Don River, Humber River and Mimco Creek) to provide base line data to guide future studies. Metro Toronto	Don River Water Quality Management Plan		1989		

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB. Other Nonpoint Sources					
a. Land Stewardship Program	Farmers to prepare integrated farm management plans	OMAF	1990-but-voluntary to farmers	-Farmers must file farm management plans with OMAF to receive grant monies to carry out remedial plans.	All funds are committed; farmers plans and projects are approved for the 1990 cropping season. Eight thousand farmers received grants
b. Ontario Soil Cons. and Environmental Protection Assistance Program (OSCEPAP)	Improved waste management and soil erosion control on farms	OMAF, MOE	1991-but-voluntary to farmers	-MOE enhances OMAF $4.5M by $1M annually -program to become a joint ministry program	All grants were paid by 31 March 1990. Approximately 5,000 farmers received grants. MOE enhances OMAF by $500,000 annually.
c. Rural Beaches	Remedial Action Plans	Conservation Authorities	CAs to participate voluntarily but must develop RAPs within 3 years of study initiation	-Agreements with Otonabee Metro. Toronto & Niagara Peninsula CAs presently in existence -Program has a 10 year lifespan & presently in year 3.	This activity is ongoing in year five
d. Abatement	Resolution of farm pollution problems	MOE Regional Staff	NONE	-MOE & OMAF have developed a set of protocols for determining inter-ministry responsibilities in resolving problems	Farm pollution protocols have been established for the Regional OMAF/MOE staff. The document is titled "Protocols for Handling Farm Pollution Incidents" and was released in February 1990
e. Drainage Design and Construction	Reduced sediment and erosion problems with drains	Municipalities	None-voluntary	-Inter-ministerial committee issued new guidelines for the construction of drains built under the Drainage Act.	This activity is ongoing.
f. Pesticide Management	1)registration of pesticides, education and licensing of applicators 2)Food systems 2002 for 50% reduction in pesticide	MOE OMAF	None-voluntary 2002	-annual licensing of pesticide applicators -routine monitoring for 54 pesticides at river mouth stations -development of fate & pathway models -Commences Apr. 1/88 -Program consists of education -delivery and research.	MOE activity is ongoing Food Systems 2002 is proceeding on schedule. Eight staff have been hired, training and research programs are on schedule.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB8. Air Toxics					
a. Revision to the current Regulation 308	New Regulation	MOE	1989/1990		A detailed outline of the new regulation has been drafted and is undergoing internal Ministry review
b. Monitoring Atmospheric Deposition through six monitoring stations	The whole Ontario network to be integrated with the New York State monitoring stations	MOE/EC	1989/1990		A detailed plan now exists for the integration of Ontario, Environment Canada and USEPA monitoring, under Annex 15 to the Great Lakes Water Quality Agreement

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
189. Spills					The first annual report from the Spills Action Centre was released in March 1990
a. The Ontario Ministry of the Environment investigates nature and extent of environmental damage by each spill, evaluates adequacy of clean-up, enforces legislated responsibilities imposed on dischargers	Every person having control of a pollutant that is spilled and every person who spills shall notify the Ministry and other persons that may be affected Cleanup of spilled materials	MOE	Ongoing		

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB10. Dredging and Dredged Material Disposal					
a. Identify all active dredging locations and open water dredged material disposal areas	Maps of disposal areas	MOE	Ongoing		Ongoing and available for each region
b. Develop MOE sediment quality objectives and dredging and dredged soil disposal guidelines to take into consideration biological effects	Guidelines to be applied to dredging projects	MOE	1989/1990		Draft currently under agency review.
c. Identify areas (hot spots) from which dredged spoil is unsuitable for open Lake disposal	Maps of hot spots	MOE	Ongoing		Site identification ongoing for RAPS. Information continuously available through RAP teams.
d. Investigate alternative disposal methods, including confined or land disposal	Identification of alternatives to open Lake disposal	MOE	Ongoing		Ongoing in cooperation with Environment Canada.

Table 1
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB11. Solid Waste					
a. Ontario Regulation 309 for Waste Management is currently under review to establish more stringent requirements for Solid Waste Management	Stringent requirements related to standards in the location and operation of an incineration site, a dump site and sites designated for organic soil conditioning	MOE	Ongoing		Amendments to section 8 of Ontario Regulation 3 including categorization of landfill sites an revised operational standards have been complet Promulgation is pending subject to availabili of additional MOE resources. Amendments to Ontar Regulation 309 provisions for handling fly ash a are under review.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB12. Sludge Disposal					
a. Continue MOE's program for monitoring 14 parameters (11 of which are metals) in sludge to be disposed of on agricultural land	The 14 parameters provide information about metals and nutrients added to soil in sewage sludge	MOE	Ongoing	Parameters are 11 metals phosphorus, suspended ammonium and nitrate nitrogen	This effort is ongoing. "total solids" has been added as a fifteenth parameter
b. Monitor hazardous contaminants in sludge generated from municipal facilities as part of the MISA program	Review need for standards for sludge used on agricultural lands and set standards for organic chemicals in sludge when necessary	MOE, OMAF* and MOH** (through sludge utilization committee)	Ongoing		The committee has established a "research and standards subcommittee" to review needs.
c. Determine if sludges comply with standards for organic contaminants for sludges used on agricultural lands		MOE, OMAF, MOH	ongoing		To be implemented as and when standards are developed

* OMAF - Ontario Ministry of Agriculture and Food
** MOH - Ministry of Health

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IB13. Ambient Water Monitoring					
IB13a. Conduct Ongoing Ambient Water Quality Monitoring					
i. Provincial Water Quality/ Quantity Monitoring Network	Loadings and complete data files are provided to the IJC annually	MOE	Ongoing	32 stations scanned for 58 pesticide and industrial parameters, and metals in the Lake Ontario drainage basin	Ongoing
ii. Enhanced Tributary Monitoring Program	Loadings and complete data files are provided to the IJC annually	MOE	Ongoing	5 Lake Ontario tributaries monitored for enhanced precision of annual contaminant load estimates (40-100 event-oriented samples/ stn/yr). Suspended bed sediments sampled annually for trace metals, organochloride pesticides	Ongoing
IB13b. Conduct Ongoing Monitoring of Biota					
i. Fish Contaminant Monitoring Program	Annual publication "Guide to Eating Ontario Sport Fish"	MOE/MNR	Ongoing	36 locations, for 22 species of fish for up to 24 parameters including PCBs, mirex, dioxin, organochlorine pesticides, mercury, heavy metals; part of the largest continuous contaminants data base on biota in the world.	Monitoring completed at 20 sites in 1989. Report produced annually.
ii. Juvenile Fish Contaminants Surveillance	Data summaries provided to the IJC biannually. Journal paper on Lake Ontario currently under preparation	MOE	Ongoing	Contaminant residue data are available for 22 sites, and temporal trend data in excess of 10 year intervals exist for 5 Lake Ontario sites Analytical parameters total about 60 individual compounds	Paper "Present status and temporal trends of organochlorine contaminants in young of the year spottail shiner from Lake Ontario" will will be published in the Canadian Journal of Fisheries and Science.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
iii. Near-shore Cladophora Monitoring	Data summaries provided to agencies upon request	MOE	Ongoing	1 control site monitored for PCBs, organochlorine pesticides, chlorophenols, chlorobenzenes	Sampling occurs annually
iv. Long Term Sensing Sites	Interpretive Report	MOE	Ongoing Commencing 1988 First Report 3 Qtr., 1990	2 long-term sites for PCBs, organochlorine pesticides, chlorophenols, chlorobenzenes	Awaiting data from 1988 sampling event
IB13c. Conduct Site-specific Studies					
i. Hamilton Harbour Sediment Inputs and Bioassessment	Interpretive Report	MOE	3rd Qtr., 1990	10 sources and mouth of ship canal, for whole water, effluent and suspended sediments	Ongoing and on schedule. Sampling will be repeated this year.
ii. Toronto Main STP Impact Assessment	Interpretive Report	MOE	4th Qtr., 1989	Large volume water, suspended sediments for metal and organic contaminant analysis. Input for the development of new discharge regulations	Second draft reviewed and on schedule. "Toronto main STP MISA Pilot Site Study-component Report water quality", September 1989.
iii. Toronto Waterfront: Inventory and assessment of contaminants assessment of contaminants associated with suspended particulates	Interpretive Report	MOE	3rd Qtr. 1989	Suspended particulate samples collected by centrifuge and sediment traps near river and STP inputs; analyzed for trace metals and PCB/organochlorine pesticides	In progress, "Component Report-Suspended sediment sampling at sources and in Lake Ontario", July 1990.
iv. Metro Toronto Waterfront-Trace contaminant inputs from CSO's and storm sewers	Interpretive Report	MOE	3rd Qtr., 1990	Sampling of 44 outfalls for heavy metals and organic contaminants on at least 2 occasions; resampling of 25 outfalls for 3 more events	Final draft report to be submitted by September 1991.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
v. Port Hope Harbour: Contaminant Loading Study	Interpretive Report	NWRI (enhanced funding by MOE)	2nd Qtr., 1989	Assessment of particle-associated contaminant (PCBs, metals, radionuclides) from Eldorado Nuclear discharge	Draft report completed. Additional sampling completed March 1990. Subsequent report to be completed September 1990.
vi. Bay of Quinte Toxic Contaminants Study	Interpretive Report	MOE	4th Qtr., 1989	Water, sediment, biota sampled from 20 stations in the bay for heavy metals, organic contaminants	Modelling study is ongoing. Draft will be completed in April 1990
vii. St. Lawrence River Mass Balance Study	Interpretive Report	MOE	1st Qtr. 1990	Whole water and suspended sediment fraction at 5 locations in the St. Lawrence River for heavy metals, PCBs, organochlorine pesticides, PAHs chlorophenols, chlorobenzenes	Draft "Data Report-1988-for Cornwall/Masena reach of St. Lawrence River" March 1990. Data released through RAP teams August 1989.

note: Canadian federal ambient monitoring programs have been described in Appendix IV. A detailed schedule of these activities was unavailable for inclusion in this table. The results will, however, be discussed in the next update of the Lake Ontario Plan.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
1814. Drinking Water Surveillance Program					
a. Monitoring of all drinking water supplies in Lake Ontario Basin	To date 48 Municipalities on Lake Ontario are being monitored for raw and treated drinking water. At each location 160 parameters are analyzed, including Pesticides, organics, trihalomethanes, volatiles chlorinated organics and dioxin and furans. Corrective actions immediately undertaken if poor quality noticed	MOE	Ongoing	The plants using Lake Ontario as a water source serve the following locations: Brimsby, Hamilton, Burlington, Mississauga (Lakeview and Lornepark), Toronto (R.L. Clark, R.C. Harris, Easterly), Oshawa, Deseronto and Belleville Raw and treated waters of each plant, at each location are tested for several conventional and priority pollutants	Trenton and Kingston were added to the list of municipalities to be monitored. Monthly samples are being taken of raw, treated and distributed water. Reports from 1988 are complete. Work will begin on the 1989 reports as soon as data analysis is complete.
b. Review existing Drinking Water Stanards and revise as necessary	Stringent water quality standards	MOE/EC	Ongoing		Ontario Drinking water objectives were revised in early 1990, and have been sent out for comment. Publication is expected in mid-1990.

Table II

Planned Actions Driven by Special Efforts
in Geographic Areas of Concern

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IIA. Develop and implement plans to address problems in identified Areas of Concern					
IIA1. Implement the U.S.-Canada Niagara River Toxics Management Plan (NRTMP)	See NRTMP	Four Agencies	See NRTMP		See attachment on status of Niagara River Toxic Management Plan
IIB. Develop Remedial Action Plans to address identified Areas of Concern in the Lake Ontario Basin					
IIB1. Develop RAP for Eighteen mile Creek	RAP	NYSDEC	1992	For submittal to IJC	On schedule for 1992 completion
IIB2. Develop RAP for Rochester Embayment	RAP	NYSDEC	March, 1991	For submittal to IJC	On schedule for 1991 completion
IIB3. Develop RAP for Oswego River	RAP	NYSDEC	September 1990	For submittal to IJC	Each Remedial Action Plan is completed in two stages. - Stage I of the Oswego River RAP was completed April 1990. - Stage II is on schedule for completion in September 1990.
IIB4. Develop RAP for Bay of Quinte	RAP	MOE/EC	3 Qtr. 1989	IJC Stage II Report Target	Stage I report "Environmental Conditions and Problem Definition" submitted to IJC, fourth quarter 1990. Stage II Report is targeted for third quarter 1991 completion. Remedial options are currently under assessment by agencies and the public.

Table II
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
IIB5. Develop RAP for Port Hope	RAP	MOE/EC	2Qtr., 1989	IJC Stage II Report Target	Stage I report submitted to IJC in January 1990. Stage II report on schedule for third quarter 1991 completion.
IIB6. Develop RAP for Toronto Waterfront	RAP	MOE/EC	4th Qtr., 1990	IJC Stage II Report Target	Stage I report submitted to IJC in February 1990. Stage II report on schedule for first quarter 1992 completion
IIB7. Develop RAP for Hamilton Harbour	RAP	MOE/EC	3rd Qtr., 1989	IJC Stage II Report Target	Stage I report submitted to IJC in October 1989. Stage II report on schedule for third quarter 1991 completion
IIC. Implement Remedial Action Plans	To be defined	To be defined	To be defined		This effort to be defined

Table III

Categories of Toxics

I. Ambient Data Available

A. Exceeds enforceable standard

B. Exceeds a more stringent, but unenforceable criterion

C. Equal to or less than most stringent criterion

D. Detection limit too high to allow complete categorization

E. No criterion available

II. Ambient Data Not Available

A. Evidence of presence in or input to the lake

B. No evidence of presence in or input to the lake

Table IV

Categorization of Toxics Based on Ambient Data
(Category I Toxics)

Chemical	Fish Tissue	Water Column	Summary
PCBs*	A	A	A(FT, WC)
dioxin* (2,3,7,8-TCDD)	A	D	A(FT)
chlordane	A	C	A(FT)
mirex* (mirex + photomirex)	A	NI	A(FT)
mercury*	A	NI	A(FT)
DDT + metabolites*	B	B	B(FT, WC)
octachlorostyrene	B	NI	B(FT)
hexachlorobenzene*	B	B	B(FT, WC)
dieldrin*	B	B	B(FT, WC)
hexachlorocyclohexanes (including (lindane + alpha-BHC)	C	C	C(FT, WC)
heptachlor/ heptachlor epoxide	C	C	C(FT, WC)
aldrin	C	NI	C(FT)
endrin	C	C	C(FT, WC)
1,2-dichlorobenzene	NI	C	C(WC)
1,3-dichlorobenzene	NI	C	C(WC)
1,4-dichlorobenzene	NI	C	C(WC)
1,2,3-trichlorobenzene	NI	C	C(WC)
1,2,4-trichlorobenzene	NI	C	C(WC)
1,3,5-trichlorobenzene	NI	C	C(WC)
1,2,3,4-tetrachlorobenzene	NI	C	C(WC)
copper	NI	C	C(WC)
nickel	NI	C	C(WC)
zinc	NI	C	C(WC)
chromium	NI	C	C(WC)
lead	NI	C	C(WC)
manganese	NI	C	C(WC)
toxaphene*	D	NI	D(FT)
cadmium	NI	D	D(WC)
pentachlorobenzene	E	C	E(FT)
polyfluorinated biphenyls	E	NI	E(FT)
dioxins (other than	E	NI	E(FT)

2,3,7,8-TCDD)			
polychlorinated dibenzofurans*	E	NI	E(FT)
heptachlorostyrene	E	NI	E(FT)
tetrachloroanisole	E	NI	E(FT)
pentachloroanisole	E	NI	E(FT)
chlorophenyl-[chloro (trifluoromethyl) phenyl]methanone	E	NI	E(FT)
1,1'-(Difluoromethylene) bis-dichloro-mono (trifluoromethyl)- benzene	E	NI	E(FT)
pentachlorotoluenes	E	NI	E(FT)
endosulfan	E	NI	E(FT)
nonachlor (cis + trans)	E	NI	E(FT)

A - Exceeds enforceable standard
B - Exceeds a more stringent but unenforceable criterion
C - Equal to or less than most stringent criterion
D - Detection limit too high to allow complete categorization
E - No criterion available

NI- No data available after initial review by the TCW
FT- Based on fish tissue data
WC- Based on water column data
* - IJC critical pollutant

Table V

Toxics for Which There is No Ambient Data
But for Which There is Evidence of Presence In
or Input to the Lake

(Category IIA Toxics)

halogenated alkane

methylene chloride
dichloro(trifluoromethyl)-
a-a-difluoro diphenyl-
methane
trichlorofluoromethane
dichloromethane
dichlorobromomethane
dibromochloromethane
trichloromethane
1,2-dichloropropane

halogenated alkenes

endosulfan sulfate
hexachlorobutadiene
cis-1,3-dichloropropene
trans-1,3-dichloropropene

aldehydes

endrin aldehyde

chlorinated ethanes

1,1-dichloroethane
1,2-dichloroethane
1,1,1-trichlorethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
hexachloroethane

chlorinated ethylenes

1,1-dichloroethylene
trans-1,2-dichloroethylene
trichloroethylene
tetrachloroethylene

ketones

isophorone

phthalate esters

diethyl phthalate
di-n-butyl phthalate
di-n-octyl phthalate
butylbenzyl phthalate
bis(2-ethylhexyl) phthalate
dioctyl phthalate

haloethers

4-bromophenylphenyl ether
pentachlorophenylmethyl ether
tribromoanisole
dibromochloroanisole
bromodichloroanisole

hydrocarbons

benzene

styrenes (alkenylbenzenes)

hexachlorostyrene
pentachlorostyrene

phenols

bromophenol
dibromophenol
tribromophenol
pentachlorophenol

ethers

diethyl ether

amines

benzidine
simazine
atrazine
diethylatrazine
desethylatrazine
tribromoaniline
dibromochloroaniline

nitro and nitroso compounds

nitrobenzene

polynuclear aromatic hydrocarbons

phenanthrene
anthracene
fluoranthene
pyrene
chrysene
perylene
coronene
benzo(a)pyrene*
benzo(e)pyrene
benzo(b)fluoranthene
benzo(j)fluoranthene
benzo(k)fluoranthene
benzo(b)chrysene
benz(a)anthracene
dibenz(a,h)anthracene
benzo(g,h,i)perylene
ideno(1,2,3-cd)pyrene

hydroxy compounds

tribromocresol

pesticide active ingredients

methoxychlor
2,4,5-trichlorophenoxyacetic acid

alkylbenzenes

toluene
tribromotoluene
ethylbenzene
sec-butylbenzene
n-propylbenzene

dialkylbenzenes

p-xylene
m-xylene
o-xylene

trialkylbenzenes

1,2,4-trimethylbenzene
1,3,5-trimethylbenzene

other substances

silvex
dachtal

metals

barium
antimony
beryllium
molybdenum
silver
strontium
selenium
tin
titanium
thallium

non-metals

cyanide

metal containing compounds

butyltin
dibutyltin
methyltin
dimethyltin
tributyltin
alkyl-lead*

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*IJC critical pollutant

Table VI
Differing Actions by Category

Category	Action
I. Ambient data available	Early Implementation
A. Exceeds enforceable standard	o Construct a preliminary loadings matrix o Construct preliminary models of chemical fate o Establish preliminary load reduction targets to meet existing standards. o Establish a preliminary plan to achieve load reduction targets. o Implement selected, high-priority components of the preliminary plan.
	Full Implementation
	o Ensure that a consistent set of adequately protective, legally enforceable standards are available. o Refine the preliminary loadings matrix, the preliminary models of chemical fate, and the load reduction targets. o Finalize the plan to achieve load reduction targets. o Implement the plan.
B. Exceeds a more stringent, but unenforceable criterion	o Ensure that a consistent set of adequately protective, legally enforceable water quality standards are available o Move toxic to Category IA or IC, as appropriate. o Concurrently construct a preliminary loadings matrix and preliminary models of chemical fate in order to avoid delays in the event that chemicals are moved to Category IA.

Table VI (Continued)
Differing Actions by Category

Category		Action
C.	Equal to or less than most stringent criterion	o No short-term water quality actions are necessary o Review as criteria change
D.	Detection limit too high to allow complete categorization	o Use more sensitive analytical method or surrogate monitoring technique o Move to Category IA, B, C, or E, as appropriate.
E.	No criterion available	o Develop criterion, as necessary o Move to Category IA-D as appropriate
II.	Ambient data not available	
A.	Evidence of presence in or input to the lake	o Monitor in ambient environment, as appropriate. (Priority will be given to the six chemicals that exceed water quality standards in the Niagara River at Niagara-on-the-Lake.) o Move to Category IA-E as appropriate.
B.	No evidence of presence in or input to the lake	o No short-term water quality based actions are necessary o Review as criteria change.

Table VI (Continued)
Differing Actions by Category

Category	Action
All Categories	o Categorization, as appropriate, based on water column <u>and</u> fish tissue data in relation to water column <u>and</u> fish tissue standards, and criteria respectively. o Use ambient data for other media (e.g. sediment) for Category I categorization as standards and criteria for these media become available. o Review categorization periodically to reflect new data, and to reflect changes in standards, and criteria.

TABLE VIIA

PLANNED ACTIONS DRIVEN BY LAKE-WIDE ANALYSES OF POLLUTANT FATE: 1990 UPDATE

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
Sorting: Maintain a current categorized list of toxics in the lake				
I. Address Lake Ontario categorization issues raised in the Niagara River Categorization Report	Charge to Categorization Committee	Lake Ontario Secretariat	Aug. 1990	Included in the 1990 update.
II. Use a comprehensive set of ambient data to update the categorized list of toxics	Updated list of toxics categorized to determine appropriate action	Categorization Committee	June 1991; biennially thereafter	List will be updated biennially to reflect most current data and criteria
	Report recommending collection of additional ambient data to support Category I Categorization	Categorization Committee	June 1991; biennially thereafter	The Categorization Committee will attempt to develop definitive Categorizations as described in Table VI.

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
Taking Action: take differing actions based on category of toxics				
IA. Ambient data available; exceeds an enforceable standard				
IA1. Early implementation, where possible, based on incomplete information				
a. Assess loadings matrix	Revise loadings matrix as appropriate	Fate of Toxics Committee	Ongoing	Appendix III contains preliminary loadings matrix; the Fate of Toxics Committee will work to improve it.
b. Identify obvious need for control programs based on loadings matrix and Level I model	Possible control programs for early implementation	Coordination Committee	June 1991	
c. Implement obvious control programs	Improved program to reduce toxics in Lake Ontario	Four Agencies	Dependent on Ib above	

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IA2 Improved implementation, based on more complete information				
a. Define fate of priority toxics in Lake Ontario				
i. Select most appropriate model for analysis of Category I priority toxics	Final Level I model	Fate of Toxics Committee	Jan. 1991	Models must account for essential system characteristics (Appendix IX). Requires convening a peer review panel by the Fate of Toxics Committee
ii. Calibrate Level I model with existing ambient and loadings data	Improved Level I model	Fate of Toxics Committee	March 1991	Data to be provided to FOTC by River Monitoring and Categorization committees by Dec. 1990
iii. Develop a methodology for estimating nonpoint source loadings to the lake.	Four Party methodology specific to Lake Ontario Basin	Four Agencies	Jan. 1991	Conduct a workshop to solicit expert views on the draft methodology.
iv. Apply this methodology to Lake Ontario	Nonpoint source loading estimate by category	Nonpoint Source Committee	Sept. 1991	Secretariat needs to establish a committee to do this work.

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
v. Investigate use of historic loadings data, e.g. from frozen fish samples	Possible correlation of historic loadings and sediment core concentrations	Fate of Toxics Committee	Sept. 1991	
vi. Determine ambient radio-nuclide levels for Canadian sources in Lake Ontario.	Ambient database for determining whether followup action is needed	Four Parties		
vii. Provide improved loading estimates as basis to model load reductions to meet standards	Improved estimates of loadings	Four Parties Committees	Sept. 1991	Improved loadings estimates supported by iii-vi, above
viii. Estimate loadings needed to achieve standards and criteria; assess reliability of estimates	Estimates of reductions needed to achieve standards and criteria, with confidence limits	Fate of Toxics Committee	Oct. 1991	Based on model selection (refer to IA2ai above)

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
ix. Develop proposed research and monitoring program to refine Level I models.	Research and monitoring program design.	Fate of Toxics Committee	Sept. 1991	Design based on sensitivity analyses developed using Level I models (Implementation of the program, 1992-4 is a Four Party responsibility.
x. Run fully calibrated and verified model against standards and criteria	Definitive estimates of loadings reductions needed to meet standards and criteria	Fate of Toxics Committee	1994; Dependent on ix, above and on substantial funding	Requires implementing full research and monitoring program. The 1994 date is an estimate based on experience with the Green Bay Mass Balance Study.

IA2b. Ensure that a consistent set of adequately protective, legally enforceable standards are available for priority toxics.

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
i. Report on differences in standards among four agencies and adequacy of standards to meet goals of LOTMP. Recommend ways to resolve and improve standards, as needed.	Recommendations on improving standards and criteria for priority toxics	Four Agencies	Sept 1990	The Standards and Criteria Committee has prepared a report identifying where agencies differ on standards, and where individual standards are lacking or may not be adequate to meet the goals of the LOTMP. The Secretariat will make recommendations in these areas to the Coordination Committee for revision and development of standards based on this report.
ii. Develop consistent and adequate enforceable, standards for priority toxics.	New and revised enforceable standards	Individual agencies (EPA, MOE, NYSDEC, and EC).	Depends on i above	
iii Adopt revised standards	Adequate enforceable standards for priority toxics for the Four Parties	Individual agencies (EPA, MOE, NYSDEC, and EC).	Dependent on ii, above	

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
c. Evaluate and select alternative water quality-based control programs for Category IA toxics.				
i Select alternative water control programs for Category IA toxics.	Water quality-based control programs for toxic loadings reductions	Four Agencies	Dependent on having definitive estimates of needed loadings reductions (IA2ax) and adequate enforceable standards (IA2biii)	Support provided by Fate of Toxics Committee
ii. Implement selected water-quality based control programs for priority toxics.	Implemented programs to reduce toxic loadings to Lake Ontario	Four Agencies	Dependent on ii, above	
IB. Ambient data available; exceeds a more stringent, but unenforceable criterion				
1. Ensure a consistent set of adequately protective and legally enforce-able standards are available.	Charge to Standards and Criteria Committee; action memo to Coordination Committee	Lake Ontario Secretariat	Sept. 1990	

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
2. Recommend additional enforceable standards, as appropriate	Recommendations specific to each of the four agencies	Standards and Criteria Committee	March 1991; bi-annually thereafter	
3. Develop and adopt additional enforceable standards	Additional enforceable standards to drive reductions in toxic loadings to the lake	Individual agencies	Dependent on 2, above	
4. Recategorize toxics to category IA or IC, as appropriate.	Refined categorization of toxic chemicals	Categorization Committee	June 1991	
IC. Ambient data available; equal to or less than most stringent criterion				
1. Review categorization of toxics as criteria improve and as ambient data are updated	A current set of categorized toxics	Categorization Committee	June 1991; bi-annually thereafter	The committee will produce an annual report including categorization of all toxics.

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
ID. Detection limit too high to allow complete categorization				
1. Identify toxics that require improved monitoring; and recommend solutions	Identified sampling or analytic deficiencies in monitoring of toxics, and recommended solutions	Categorization Committee	June 1991; and bi-annually thereafter	
2. Develop and use protocols and surrogate monitoring techniques, and recategorize toxics	Improved ability to categorize toxics	Four agencies	Dependent of 1, above	
IE. No criterion available				
1. Recommend development of standards and criteria as appropriate	Report	Standards and Criteria Committee	June 1991; and bi-annually thereafter	

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
2. Develop criteria and standards and move to category IA-D as appropriate.	Additional standards and criteria; refined categorization	Four agencies	Dependent on 1 above	
IIA. Ambient data not available; evidence of presence in or input to lake				
1. Recommend toxics for priority consideration	Report recommending toxics for additional monitoring	Categorization Committee	June 1991; bi-annually thereafter	
2. Monitor for these priority toxics	Basis for refined categorization of toxics	Four agencies		
3. Move to category IA-IE based on the results	Refined categorization of toxics	Categorization Committee	June 1991; bi-annually thereafter	
IIB. Ambient data not available; no evidence of presence in or input to lake				
1. No short-term actions are necessary	Recategorize as new evidence becomes available	Categorization Committee		

TABLE VIIA cont'd

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
Assessing: Use an ecosystem approach as a check on the effectiveness of the chemical-by-chemical approach to toxics control in Lake Ontario; establish ecosystem objectives with appropriate quantitative indicators to achieve and maintain the chemical, physical and biological integrity of Lake Ontario.				
I. Adopt Ecosystem Objectives	Ecosystem Objectives	Four Agencies	Feb. 1991	The Ecosystem Objectives Work Group (EOWG) filed a final report outlining objectives for the lake. The Secretariat will recommend objectives for adoption by the Coordination Committee.
II. Initiate development of ecosystem objective indicators	Charge to EOWG	Lake Ontario Secretariat	Feb. 1991	
III. Develop quantifiable ecosystem indicators	Quantifiable indicators for each objective	EOWG; other Objectives Committees	To be determined by Dec. 1990	The EOWG has established committees to develop quantifiable indicators for each objective. The committees are scheduled to hold their first meeting in October 1990.

Table VII
Planned Actions Driven by Lake-Wide Analyses of Pollutant Fate

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIA. Maintain a current categorization of toxics in the Lake					
VIIA1.Expand the list of toxics based on readily available existing information	Expanded list of toxics	Lake Ontario Toxics Committee	Completed	Report available: "Categorization of Toxics in Lake Ontario", July 18, 1988	
VIIA2. Maintain a current categorized list of toxics in the Lake	Updated list Report recommending the collection of additional ambient date to support Category I Categorization	Categorization Committee Categorization	July, 1989	The Categorization Committee will issue a comprehensive update biennially The Secretariat will evaluate data from the River Monitoring Committee in alternate years to deter in any revisions to the current categorization is needed. The Committee will attempt to develop definitive categorizations as described in Table VI.	Since the Niagara River is the largest tributary to Lake Ontario, the Four Parties assigned highest priority to to the categorization of toxics for the River. This decision resulted in a delay in categorization of toxics for Lake Ontario. The categorization report for the River was completed in June 1990. Table VIIA includes a revised deadline for the completion of a categorization update for Lake Ontario.
VIIB. Take differing actions based on category					
VIIB1. Category IA: Ambient data available; exceeds enforceable standard					
VIIB1a. Early implementation, where possible, based on incomplete information					
i. Assess loadings matrix	Revised loadings matrix, as appropriate	Fate of Toxics Committee	December, 1989	Appendix III contains a preliminary loadings matrix; the Fate of Toxics Committee will attempt to improve it.	The Four Parties have committed substantial resources to develop improved loadings estimates for Lake Ontario. The Fate of Toxics Committee (FOTC) has developed a preliminary mass-balance model to relate loadings of toxics to the Niagara River and Lake Ontario to water column and fish tissue and sediment levels in the river and lake. The committee has identified, and the Four Parties have undertaken, several efforts by which the Lake Ontario loadings matrix can be improved: - an ongoing effort to develop a methodology to to develop nonpoint source loadings -an ongoing effort to develop chemical by chemical

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIII.1ai. cont'					methodologies and estimates of loadings from waste sites - a commitment to a field investigation to improve estimates of radionuclide loadings from Canadian sources - an ongoing effort to develop estimates of historic loadings in the lake - a commitment to develop a full scale investigation to determine current ambient levels of toxics in the lake.

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
ii . Select obvious control programs based on best professional judgement	Select control programs for early implementation	Lake Ontario Toxics Committee	March, 1990	Obvious control program will focus on significant sources of priority toxics, and will be influenced by Level I modelling (see VIIb1bic output)	The Plan update includes a selection of "obvious control programs" that were influenced and based on the output of the current mass balance model. As the loadings matrix and thus the model output is refined, additional control measures will be identified.
iii. Implement obvious control programs	Implemented programs	Four Agencies	Dependent on VIIB1aii outputs		
VII91b. Full implementation based on more complete information					
VIIB1bi. Define fate of priority toxics in Lake Ontario					
a. Develop proposed conceptual models of pollutant fate for all priority toxics (Categories IA and IB)	Proposed conceptual models	Fate of Toxics Committee	March, 1989	Models must account for essential system characteristics as discussed in Appendix IX	The FOTC submitted a final report on April 6, 1990 that includes an EPA-developed, Level I mass-balance model of pollutant fate. Environment Canada (EC) is producing a separate conceptual model. The EC modelling Report is expected in July 1990.
b. Select appropriate conceptual models incorporating peer review recommendations	Final conceptual models	Fate of Toxics Committee	June, 1989	Requires the convening of a peer review panel.	The EPA model has already been peer reviewed. The Fate of Toxics Committee will empanel a peer review team to conduct a comparison of the EPA and EC models and make recommendations concerning a final version of the Level I model. The team is expected to complete its review by November 1990.
c. Develop preliminary (Level I) models based on existing database	Level I models	Fate of Toxics Committee	January, 1990	Level I models will influence selection of control programs for early implementation (See VIIB1aii outputs). The models will be used to estimate the reductions in loadings necessary to achieve standards and criteria, and to assess the reliability of those estimates.	Based on the recommendation of peer review team, the FOTC will proceed to make revisions in the Level I model. The FOTC will then proceed to calibrate the Level I model, using existing data, by December 1991.

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
d. Develop proposed research and monitoring program to refine the Level I models	Research and monitoring program	Fate of Toxics Committee	March, 1990	Design based on sensitivity analyses developed using Level I models	Due to the need for a comparative review of the EPA and EC models, development of the monitoring program design by the FOTC has been delayed. A preliminary work plan including data quality objectives, a preliminary quality assurance management plan and budgets reflecting varying levels of effort will be available by June 1991. A final work plan is scheduled to be completed by December 1991, prior to a scheduled 1992 field season.
e. Develop refined models and use them to specify the reductions in loadings necessary to achieve standards and criteria	Refined models	Fate of Toxics Committee	1994	Requires implementation of research and monitoring program. The 1994 deadline is an estimate based on the Green Bay Mass Balance Study. The deadline is subject to change based on the results of activity VIIB1bid	This effort is a follow up of Level I modelling and calibration.
VIIB1bii. Ensure that a consistent set of adequately protective, legally enforceable standards are available for priority toxics.					
a. Report on differences in standards among agencies and recommend ways to resolve them	Report recommend stardards reconciliation	Standards and Criteria Committee	July, 1989	As shown in Appendix II, the standards and criteria for priority toxics are not always consistent among jurisdictions	The Standards and Criteria Committee issued a draft report in January 1990. The final report was completed in March 1990.
b. Develop and adopt revised standards	Consistent enforceable standards for priority toxics	Individual	Dependent on VIIB1biia		The Lake Ontario Secretariat has reviewed the report from the Standards and Criteria Committee and has prepared follow up recommendations concerning standards for review by the Coordination Committee.
VIIBiii.Evaluate and select alternative water quality based control programs for priority toxics	Selected control programs for full implementation	Lake Ontario Toxics Committee	Dependent on VIIB1bi and	Support provided by Fate of Toxics Committee	With the revised standards developed, the Lake Ontario Secretariat will prepare recommendations for alternative water quality-based control programs

Table VII
-continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIB1biv. Implement the selected water quality-based control programs for priority toxics	Implemented Program	Four Agencies	Dependent on VIIB1biii outputs		This is an ongoing effort, dependent on outputs developed in VIIB1biii above.
VIIB2. Category IB: Ambient data available; exceeds a more stringent, but unenforceable criterion					
VIIB2a.Ensure that a consistent set of adequately protective, legally enforceable standards are available	Report recommending toxics for standards development	Standards and Criteria	July, 1989		A final report by the Standards and Criteria committee, address ing this issue was submitted in March 1990.
VIIB2b. Develop and adopt revised standards	Consistent standards	Individual agencies	Dependent on VIIB2a output		The Lake Ontario Secretariat has reviewed the report from the Standards and Criteria Committee and has prepared recommendations concerning revision of standards for review by the Coordination Committee
VIIB2c.Move toxic to category IA or IC, as appropriate	See VIIA2				Action in this area will be dependent on any revised standards developed in VIIB2b above.
VIIB3. Category IC: Ambient data available; equal to or less than most stringent criterion					For this action item, as well as those under VIIB4, B5, B6, and B7, implementation will be delayed due to the decision of the Four Parties to place first priority on completing categorization for the Niagara River. The work on the Niagara River will be helpful to Lake Ontario categorization. The Niagara is the largest single tributary to the lake, and much of the information gained concerning new monitoring and analytic techniques (B4) development of new standards and criteria (B5), toxics needing additional monitoring (B6), and tracking additional toxics of concern (B7) developed

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIB3 cont'					for the River will be directly applicable to Lake Ontario. The final categorization report for Lake Ontario is scheduled for June 1991.
VIIB3a. Review as criteria change	See VIIA2				

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIB4. Category ID: Detection limit too high to allow complete categorization					See VIIB3
VIIV4a. Develop a report identifying toxics that require a more analytic protocol or a surrogate monitoring technique	Report	Categorization Committee	July, 1989		
VIIB4b. Develop and use new protocols and surrogate monitoing techniques	Improved ability to categorize toxics	Four Agencies	Dependent on VIIB4a output		
VIIB4c. Move to Category IA,B,C or E, as appropriate	See VIIA2				
VIIB5. Category IE: No criterion available					See VIIB3 above
VIIB5a. Recommend the development of standards and criteria	Report	Standards and Criteria	July, 1989	Input to be provided by Categorization Committee	See VIIB2a above
VIIB5b. Develop criteria or standards	Criteria or standards	Four Agencies	Dependent on VIIB5a		
VIIB5c. Move to Category IA-D, as appropriate	See VIIA2				

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIB6. Category IIA: Ambient data not available; evidence of presence in or input to the Lake					See VIIB3
VIIB6a. Develop a report recommending toxics for priority consideration for additional monitoring	Report	Categorization Committee	July, 1989	Priority has already been assigned to six Category IIA toxics that exceed water column standards in the Niagara River	
VIIB6b. Monitor priority toxics	Report	Four Agencies	Dependent on VIIB6a output		
VIIB6c. Move to Category IA-IE, as appropriate	See VIIA2				
VIIB6d. Revise N.Y.S. tributary monitoring to include all Category IA and IB chemicals except dioxin	Report on loadings	NYSDEC	March, 1992		NYSDEC currently monitors all but three of the IA and IB priority pollutants in its Rotating Intensive Basin Study Program
VIIB7. Category IIB: Ambient data not available; no evidence of presence in or input to the Lake					See VIIB3 above
VIIB7a. No short-term water quality-based actions are necessary					
VIIB7b. Review as new evidence becomes available	See VIIA2				

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIC. Use an ecosystem approach as a check on the effectiveness of the chemical-by-chemical approach to toxics control in Lake Ontario, and as a first step towards establishment of ecosystem objectives to achieve and maintain the chemical, physical, and biological integrity of Lake Ontario					
VIIC1. Develop ecosystem objectives	Initial ecosystem objectives	Ecosystem Objectives Work Group (EOWG)	February, 1990	An Ecosystem Objectives Work Group will be established in February, 1989. Ecosystem objectives will cover human health and the health of biota and their predators.	The Ecosystem Objectives Working Group (EOWG) for Lake Ontario submitted a final report to the Secretariat in May 1990. The report presented five ecosystem objectives for the lake (objectives for aquatic communities, wildlife, human health, habitat, and stewardship), the rationale for each objective, and potential indicators for some objectives. A Human Health Objectives Working Group, separate from EOWG, has been proposed to address developing human health objectives (Ref. EPA letter dated 7 March 1990 to Paul Bertram and Trevor Reynoldson).
VIIC2. Define a program of research to support the development of improved ecosystem objectives	Report	Ecosystem Objectives Work Group	February, 1990		A draft workplan for monitoring ecosystem objectives in being developed by EOWG prior to submitting it to the Secretariat.
VIIC3. Update Ecosystem Health section for Appendix II, "Toxics Problem in Lake Ontario"	Revised Appendix II	Lake Ontario Secretariat	August 1990		This section will be revised in the next Plan Update.
VIIC4. Monitor progress towards the attainment of the ecosystem objectives	Annual Status	Lake Ontario Secretariat	Annually after the establishment of the ecosystem objectives		The monitoring program will be designed after the objectives are finalized (See VIIC1 above). Once the monitoring program is established, this will be an annual, ongoing activity.

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIC5. Provide feedback on the effectiveness of the chemical-by-chemical approach	Annual Reports	Lake Ontario Secretariat	Annually after the establishment of the ecosystem objectives	The rebuttable resumption of the LOTMP is that attainment and maintenance of chemical-by-chemical standards will be adequate to ensure that toxics do not interfere with the attainment of ecosystem objectives. This rebuttable presumption will be re-evaluated annually.	This will be an ongoing, annual activity

Table VIII

Planned Actions Associated with Zero Discharge

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIA. Zero Discharge Commitments in the United States					
VIIA1. Direct and Indirect Industrial Discharges					
VIIIA1a. Develop five year workplan for review and revisions of existing BAT and NSPS effluent guidelines	Workplan	EPA	3/89		The workplan was completed on 2 January 1990
VIIIA1b. Review all BPJ guidelines and revise as required by evolving technology on a five year cycle	Revised BPJ guidelines within five year interval	DEC	1/94		This work is on schedule
VIIIA1c. Develop five year workplan to develop BAT and NSPS effluent guidelines° for industrial categories for which they do not currently exist.exist	Workplan	EPA	3/89		The workplan was completed on 2 January 1990.
VIIIA1d.Recommend the inclusion of industrial categories in the five year BAT/NSP workplan based on their contribution of toxic chemicals to Lake Ontario	Letter with recommendations to EPA-HQ	LOTC	3/89		EPA review of all Ontario Basin discharges has been completed. EPA reported on 3 July 1989 that, based on its review, there was no need to include new industrial categories in the BAT/NSP workplan

Table VIII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIA2. Inactive Hazardous Waste Sites					
VIIIA2a. Annual solicitation of proposals from private companies developing waste reduction technologies	Announcement in Commerce Business Daily	EPA	9/88 1/89		The announcements were published on schedule
VIIIA2b. Choose sites and firms to demonstrate technologies	Demonstrate technology and evaluate applicability for media and pollutant remediation	EPA	Ongoing		This effort is ongoing
VIIIA2c. Assess areas and chemicals of concern in Basin for potential as SITE demonstration	Recommendation to SITE program manager	EPA/NYSDEC	3/88		No candidates have yet been identified
VIIIJA3. Hazardous Treatment, Storage and Disposal Facilities					
VIIIA3a. Develop technical assistance documents (TADS) for waste minimization	Technical assistance documents	EPA/NYSDEC	1988-1995	EPA TADs being developed on long-term schedule. NYSDEC manual due 3/89.	Preparation of EPA technical assistance documents is ongoing. The NYSDEC manual was published in March 1989.

Table VIII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIA3b. Implement rule on pretreatment of hazardous waste prior to land disposal	Pretreatment of waste from electroplating, steel and other industries	EPA	Immediate		The last of three sections of the land ban rule was completed in May 1990.
VIIIA3c. Develop regulations requiring submission of Waste Reduction Impact Statements	Regulations	NYSDEC	6/89		The regulations were promulgated in May 1990. They became effective in March 1991.
VIIIA4. Pesticides					
VIIIA4a. Implement testing program for commercial pesticide active ingredients	Testing of 600 chemicals	EPA	Nine years from enactment of legislation		This effort is ongoing to a 1998 deadline
VIIIA4b. Identify pesticides that are a problem in Lake Ontario and request early action on restrictions	Recommendation letter to EPA	LOTC	12/89		Chlordane, Mirex, DDT and Dieldrin are already banned. Hexachlorobenzene (Lindane) is not banned but restricted in its use.

Table VIII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIA5. Toxic Substances Control					
VIIIA5a. Implement Comprehensive Assessment Information Rule (CAIR) of TSCA in support of risk assessment and further regulatory action	Collect import, manufacturing, and process data on toxic chemicals	EPA	Ongoing		Nineteen chemicals are now on the CAIR list. No new chemicals will be added pending revision of the Rule; scheduled for November 1990. Once Once the revision is completed, additions to additions to the CAIR list will be evaluated.
CIIIA5b. Assess need for data on toxics of concern in Lake Ontario	Letter to EPA requesting amendment to CAIR list to include toxics of concern	LOTC	12/89		The need for data has not been identified. Adding toxics to the CAIR list may be valuable future option. Once the CAIR rule has been revised, the Standards and Criteria Committee will evaluate toxics of concern for recommendations to CAIR.
VIIIA5c. Support program needs for toxics effects data through TSCA Testing Priorities Committee	Collect testing, analytical, and treatment data on toxic chemicals	EPA	Ongoing		
VIIIA5d. Assess need for data on toxics of concern in Lake Ontario	Letter to EPA requesting exposure, analytical and treatment data	LOTC	12/89		Recommendations will be based on input in VIIIA5b

Table VIII
-continued-

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIA6. Toxic Substances Control					
VIIIA6a. Develop household hazardous waste disposal program in Basin and increase community awareness	Provide technical assistance to local program sponsors	NYSDEC	Ongoing		
VIIIA6b. Develop procedure for establishment of a permanent waste collection station	Manual on permitting, construction, and operation of a collection station	NYSDEC	9/89		The manual was completed in August 1988

Table VIII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIB. Zero Discharge Commitments in Canada					
VIIIB1. Implement the Municipal-Industrial Strategy for abatement (MISA) Program for: i-Direct Industrial and Municipal Discharges ii-Indirect Discharges	Effluent Limit Regulations for for 9 industrial sectors and the municipal sector; Effluent Limit Regulation for industrial discharges to municipal systems	MOE	See Tables IB1 and IB2		See Tables IB1 and IB2
VIIIB2. Implement Projects under the Comprehensive Waste Management Funding Program: -Municipal 4 Rs Program -Industrial 4 Rs Program -Household Hazardous Waste Program		MOE	Ongoing	The 4Rs are: reduction, reuse, recycling and recovery	The Comprehensive Waste Management Funding Program is being reviewed as part of the overall plan for waste management in Ontario
VIIIB3. Implement Pesticides management components of "Food Systems 2002"	50% reduction in Pesticides use	Ontario Ministry of Agriculture and Food (OMAF)	2002		Over 11,500 farmers attended education courses. MOE agreed training will be mandatory by 1991. At least 425 courses for 11-12,000 farmers are planned for 1990/91. A total of $2.1 million of $3.9 million in research funds are allocated and projects are underway
-Ontario Pesticides Education Program	Farmer Education Programs	MOE/OMAF	Ongoing		
-Research-Integrated Pest Management	Solicited Research Program	MOE/OMAF	Ongoing		

Table VIII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS	STATUS
VIIIB4. Fund and conduct research programs and technology development	Industrial process change to reduce loadings Innovative technology to enhance reduction, recycling, recovery and reuse of waste materials	NOE	Ongoing		
VIIIB5. Implementation of the Canadian Environmental Protection Act	A new regulatory framework	Environment Canada	To be established	Implementation of CEPA will include: The development of a comprehensive regulatory scheme to control toxic substances at each stage of the life cycle from development and manufacture through transport, distribution, use and storage and to their ultimate disposal as waste The creation of a "living" list of priority substances subject to ongoing assessment for health and environmental impacts and control actions including regulatory restrictions. The imposition of a requirement on industry to supply the data necessary to allow for evaluation and assessment before materials are permitted to enter Canada.	Implementation of a Canadian Environmental Protection Act will include: authority to control introduction into Canadian commerce of substances new to Canada; authority to obtain information on and require testing of both new substances and substances already existing in Canadian commerce; provision to control all aspects of the life cycle of toxic substances from their development, manufacture or importation, transport, distribution, storage , and use, their release into the environment at various phases of their life cycle, and their ultimate disposal as waste; provision to create guidelines, codes and regulations for environmentally sound practices as well as objectives to set desireable environmental quality levels. This activity is ongoing.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

(INFORMATION UNCHANGED FROM 1989 LOTMP)
(PLEASE REFER TO THAT DOCUMENT)

Appendix I
Lake Ontario and the Lake Ontario Basin
Lake Ontario Toxics Management Plan

LAKE ONTARIO

TOXICS MANAGÉMENT PLAN

Appendix II
Toxics Problem In Lake Ontario
23 November 1990

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TABLES

(A) INTRODUCTION

The purpose of Appendix II is to present a characterization of the toxics problem in Lake Ontario. Consistent with existing law and regulation, it is most useful to present this characterization on a chemical-by-chemical basis in terms of exceedances of enforceable standards. However, as a check on the effectiveness of the chemical-by-chemical approach, it is also essential to present this characterization on an ecosystem basis in relation to ecosystem objectives.

The 1989 LOTMP presented the first, in-depth, chemical-by-chemical categorization of toxics in the lake. Then in June 1990, the Niagara River/Lake Ontario Categorization Committee submitted a final report on categorization of toxic substances in the Niagara River (Categorization Committee, 1990). Although this report dealt specifically with categorization of the toxics in the Niagara River, the Niagara River and Lake Ontario Secretariats prepared the followup report "Categorization of Toxic Substances in the Niagara River" outlining Four Party and individual agency actions that would respond to the recommendations in the Categorization Committee Report. At its September 19, 1990 meeting on the Niagara River Toxics Management Plan Status Report and Update, the Coordiantion Committee adopted the recommendations of the Secretariat. Although these recommendations were primarily directed at the Niagara River, they will also affect the categorization of toxics for Lake Ontario. Major recommendations adopted by the Coordination Committee can be found in the revised charge to the Standards and Criteria Committee (Appendix VII).

The status of the chemical-by-chemical categorization of toxics in the lake is summarized in:

- Part B of this Appendix, "Criteria, Standards and Other Yardsticks" which discusses measures used (standards and criteria) by the Categorization Committee to categorize toxics.
- Part C2 of this Appendix, "A Chemical-by-Chemical Assessment of Lake-Wide Conditions" which discusses the categorization system and summarizes the committee's conclusions.

The Categorization Committee will update the Lake Ontario categorization by June, 1991.

There is, as yet, no agreement on quantifiable measures that can be used in assessing the toxics problem in Lake Ontario on an ecosystem basis. For this reason the Plan calls for the establishment of such ecosystem objectives and indicators that can be used in assessing the health of the Lake Ontario ecosystem. The Ecosystem Objectives Work Group of the Binational Objectives Development Committee, proposed,

and the Lake Ontario Secretariat recommended adopting, five ecosystem objectives for Lake Ontario. Part C1 of this Appendix, "Ecosystem Health" has been revised in light of this report.

(B) CRITERIA, STANDARDS AND OTHER YARDSTICKS

Any discussion of the "Toxics Problem in Lake Ontario" first requires some agreement about what constitutes a problem (i.e., what one person perceives as a problem may not be considered as a problem by others). Problem definition, therefore, requires use of common measures by which problems are to be identified. Use of common measures does not ensure agreement over what is, or is not, a problem, but the use of common measures does ensure mutual understanding of how a decision was reached.

The intent of water quality laws and regulations in the United States and Canada is to protect beneficial uses of aquatic resources and prevent toxic discharges into the environment. The measure of protection, or problem prevention, currently used by regulatory agencies is expressed as a number, or concentration, variously referred to as a standard, objective, criterion, or guidance value. These concentrations thus represent the enforceable or recommended (depending upon their regulatory status) upper limit at which a toxic substance should be present in the environment. Exceedance of these upper limits at some frequency is, therefore, by definition, a measure for problem identification that has immediate meaning and applicability for regulatory agencies.

The currently enforceable toxic limits for the ambient waters and fish tissue in Lake Ontario are the Ontario Ministry of Environment's Water Quality Objectives and New York State Department of Environmental Conservation's Water Quality Standards and Guidance Values (Table 1). These toxic limits are used as the basis for enforcement against dischargers of toxics.

In addition to the enforceable limits mentioned above, the Great Lakes Water Quality Agreement of 1978 (GLWQA) established objectives for several types of toxics intended to "protect the recognized most sensitive use in all waters." These objectives are referred to as the IJC Objectives. Also, the U.S. Environmental Protection Agency, Environment Canada, the New York State Department of Environmental Conservation, and the Ontario Ministry of the Environment have proposed new or additional criteria or objectives that are recommended for protection of various uses. These proposed criteria or objectives are not enforceable by law since they have not been through the review process required for adoption by the regulatory agencies. Tables 2, 3, 4 and 5 summarize the existing enforceable standards and objectives (as presented in Table 1) plus all recommended criteria or objectives which, although not enforceable by law, represent current best scientific judgment regarding potential effects or risks due to toxicity or carcinogenicity. These toxic limits are use- and media-specific and cover such aspects as human

health and aquatic life protection in the water column (Tables 2 and 3), in fish tissue (Table 4), and in sediments (Table 5). As large and complex as this array of toxic limits is, it is still not all-inclusive since Tables 2 through 5 list only those chemicals that have standards or proposed objectives from more than one agency.One objective of the Lake Ontario Toxics Management Plan focuses on the attainment and maintenance of ambient levels of toxics that will not cause adverse impacts on human health and the ecosystem. Adoption of the toxics limit that protects the most sensitive use (i.e., the most stringent criterion) would ultimately provide protection of all uses, while greatly simplifying the vast array of standards, objectives, criteria, and guidance values currently used by regulatory agencies. Accordingly, Table 6 identifies the most stringent criteria applicable to the ambient water column of Lake Ontario, and Table 7 summarizes the most stringent criteria applicable to fish tissue, which, in total, represent the concentrations in water or fish currently considered adequate to protect the most sensitive use of Lake Ontario's aquatic resources.

Thus, for the purposes of the LOTMP, Table 1 summarizes the measures against which toxic substances will be compared for category IA (exceeds enforceable standard), and Tables 6 and 7 are the yardsticks for categorization as IB (exceeds more stringent, but unenforceable criterion) or as IC (equal to or less than most stringent criterion).

In March 1990 the Standards and Criteria Committee provided a report on water quality and fish tissue standards and criteria for the Niagara River and Lake Ontario (Standards and Criteria Committee, 1990). In that report, the Committee evaluated:

- The water column criteria of the Four Parties, both those developed for the protection of aquatic resources, and those developed for the protection of human health; and
- The fish tissue criteria of the Four Parties, both those developed for the protection of wildlife, and those developed for the protection of human health.

The Committee then:

- recommended that all criteria should be based solely on the prevention of all adverse health effects, and that for carcinogenic substances, criteria should be based solely on not exceeding negligible risks;
- recommended that criteria for the protection of aquatic life and wildlife consumers of aquatic life should consider effects on reproduction;

- concluded that differences among the agencies in protection objectives, methodologies and management policies for establishing criteria are significant factors for existing differences among agency criteria;

- recommended that criteria-setting agencies adopt similar objectives, methodologies, and policies.

Based upon the findings and recommendations contained in the Standards and Criteria Committee report, the Niagara River and Lake Ontario Secretariats submitted a report to the Coordination Committee outlining Four Party and individual agency actions that would respond to the recommendations in the Standards and Criteria Committee report. At its September 19, 1990 meeting on the Niagara River Toxics Management Plan update and status report, the Coordination Committee adopted the recommendations of the Secretariats. Two key recommendations adopted by the Committee include:

- A committment from Environment Canada and the Ontario Ministry of the Environment to work with Health and Welfare Canada to develop water column criteria for the protection of human health, including fish consumption pathways; and

- A committment from NYSDEC to pursue development of human health criteria, based on fish consumption for DDT, dieldrin and PCBs.

Other recommendations adopted by the Coordination Committee can be found in the revised charge to the Standards and Criteria Committee (Appendix VIII).

Since criteria development and standard setting are an ongoing process, it must be recognized that, in response to new scientific knowledge, many of these numbers will be amended and additional standards and criteria developed. As this occurs, the LOTMP will provide a review and possible re-categorization of affected toxic substances.

(C) AMBIENT LAKE CONDITIONS

1. ECOSYSTEM HEALTH

a) System-level effects

In the process known as biomagnification, toxics are concentrated by the organisms consuming them and are magnified many times as they pass along the food chain. It is through this process that compounds such as mirex and dioxin, which normally are not detected in open lake waters, even using state-of-the-art techniques, can appear in the flesh of lake trout and some other species in amounts above standards. Knowledge of the lake food chains and biomagnification patterns is, therefore, essential to an understanding of ecosystem-

level effects of toxics. It is also essential to an understanding of why more stringent water quality standards and criteria may need to be developed to protect the Lake Ontario's ecosystem health. D.M. Whittle (1987) of the Canada Department of Fisheries and Oceans indicated that "The invertebrate forage base serves as the source for subsequent bioaccumulation and biomagnification of toxic contaminants in the Lake Ontario ecosystem. Netplankton, zooplankton (Mysis relicta), and benthic invertebrates (Pontoporeia hoyi) form the first three steps in food chain contaminant biomagnification and serve as biological surrogates for the measurement of persistent toxic chemicals in the water column." As shown in Figure 1, "mean bioconcentration factors for organochlorine compounds such as PCB or DDT are 10^4 within the aquatic food chain. This factor may increase to 10^5 with the inclusion of organic contamination accumulation data from herring gull populations which represent the highest trophic level. Similarly trace metals are also rapidly bioconcentrated within the food chain with factors exceeding 10^3 for mercury."

In addition, sediments are a likely source of toxics to the food chain. Fox et al. (1983) reported open-lake sediment PCB concentrations to be in the range 0.260 to 0.840 ppm. Fox also examined invertebrates living in and upon these sediments (oligochaetes and amphipods, respectively). The oligochaetes were found to contain 0.93 to 5.3 ppm of PCBs; the amphipods were found to contain 2.6 to 17 ppm of PCBs. These organisms are an important source of food for juvenile lake trout.

b) Effects on populations and individuals

Concentrations of PCBs, DDT and metabolites, dieldrin, chlordane, dioxin, mirex and octachlorostyrene in Lake Ontario sportsfish exceed NYSDEC's fish flesh criteria for piscivorous (fish-consuming) wildlife. In their review of the effects of toxics on Great Lakes biota, Colburn et al.,(1990) identified six impacts to Lake Ontario wildlife that may be attributable to toxics:

Population declines,
Reproductive failures,
Metabolic changes,
Birth deformities,
Hormonal changes, and
Cancerous tumors.

For some of these impacts, such as cancerous tumors, and birth defects there is a growing body of research supporting a correlation with toxic chemicals. For other impacts, such as the role of toxics in population declines, additional research will aid in establishing the relative causal role of toxics compared to other environmental factors.

c) Measures of Ecosystem Health

i. Ecosystem Objectives

The GLWQA as amended in 1987 established, for the first time, ecosystem health indicators for use in Lake Superior and called for similar indicators in the remaining lakes. The established indicators for Lake Superior are:

> "with respect to Lake Superior, lake trout and the crustacean Pontoporeia hoyi shall be used as indicators:
>
> Lake Trout
>
> - productivity greater than 0.38 kilograms/hectare;
> - stable, self-producing stocks;
> - free from contaminants at concentrations that adversely affect the trout themselves or the quality of the harvested products.
>
> Pontoporeia hoyi
>
> - the abundance of the crustacean, Pontoporeia hoyi, maintained throughout the entire lake at present levels of 220-320/m^2 (depths less than 100 m) and 30-160/m^2 (depths greater than 100 m)".

The focus of the Lake Superior indicators of ecosystem health is too general for effective use in a Lake Ontario toxics management plan. While some basic indicators may be common to both lakes, specific objectives will be required for Lake Ontario, tailored to it individual characteristics.

The Lake Ontario Toxics Management Plan calls for the establishment of ecosystem objectives for Lake Ontario. These have been developed by the Ecosystem Objectives Work Group of the Binational Objectives Development Committee which was established by Canada and the United States in response to the GLWQA. In May 1990, the Ecosystem Objectives Work Group submitted a report to the Lake Ontario Secretariat proposing three goals setting a framework for the ecosystem objectives (Ecosystem Objectives Work Group, 1990):

- The Lake Ontario ecosystem should be maintained and as necessary restored or enhanced to support self-reproducing diverse biological communities.

- The presence of contaminants shall not limit the use of fish, wildlife and waters of the Lake Ontario basin by humans and shall not cause adverse health effects in plants and animals.

- We as a society shall recognize our capacity to cause great changes in the ecosystem, and we shall conduct our activities with responsible stewardship for the Lake Ontario basin.

To attain these goals, the Committee recommended five ecosystem objectives:

Aquatic Communities
The waters of Lake Ontario shall support diverse healthy, reproducing and self-sustaining communities in dynamic equilibrium, with an emphasis on native species.

Wildlife
The perpetuation of a healthy, diverse and self-sustaining wildlife community that utilizes the lake for habitat and/or food shall be ensured by attaining and sustaining the waters, coastal wetlands and upland habitats of the Lake Ontario basin in sufficient quality and quantity.

Human Health
The waters, plants and animals of Lake Ontario shall be free from contaminants and organisms resulting from human activities at levels that affect human health or aesthetic factors such as tainting, odor and turbidity.

Habitat
Lake Ontario offshore and nearshore zones and surrounding tributary, wetland and upland habitats shall be of sufficient quality and quantity to support ecosystem objectives for health, productivity and distribution of plants and animals in and adjacent to Lake Ontario.

Stewardship
Human activities and decisions shall embrace environmental ethics and a commitment to responsible stewardship.

The Lake Ontario Secretariat recommends that the Coordination Committee adopt these ecosystem objectives, and that the Work Group be charged with developing the appropriate indicators, giving special emphasis to developing indicators for those aquatic community, wildlife, and human health objectives and indicators that most directly meet the goals of the LOTMP.

The Ecosystem Objectives Work Group has established five technical committees to design quantitative indicators for each objective. In November 1990 the Work Group and the technical committees will meet to develop a workplan and review progress, schedules, activities, and membership of each of the technical committees. At the time of the next LOTMP update, this section will identify the indicators that have been developed and present a workplan for development of quantitative indicator levels and indicator monitoring.

ii. Toxicity to Wildlife

Piscivorous waterbirds have proven a reliable, sensitive, integrating indicator for detecting net toxic effects and ecosystem-wide changes (Kurita et al., 1987). One of the most demonstrable effects of toxics on the Lake Ontario ecosystem was first described in the work of Gilbertson (1974) in which he reported severe reproductive failure of Scotch Bonnet Island herring gull colonies. Breeding success for the colonies averaged 0.12 fledged young per adult mating pair, about one-tenth the success rate for herring gulls found along the New England Coast. On the same island in 1973, Gilbertson and Hale (1974) found the mean number of eggs hatched was only 16%. The mean breeding success was 0.06 fledged young per adult pair. Gilbertson (1974) found the eggs on Scotch Bonnet Island to be thin and highly contaminated (PCBs over 800 ug/g and DDE over 200 ug/g). These values were the highest of any gull eggs on the Great Lakes and very high when compared to the Gulf of St. Lawrence (14.1 ug/g DDE) and the Bay of Fundy (32.1 ug/g DDE).

Teeple (1977) assessed the breeding failure of herring gulls on Brothers Island in eastern Lake Ontario. Here again the gull population was experiencing reproductive problems. The mean number of eggs hatched per egg laid was a low 23% with a breeding success of 0.06 to 0.18 fledged young per adult pair. Further study by Fox et al. (1975) and Gilman et al. (1977) found that reproductive failure of herring gulls in the Great Lakes was mostly restricted to Lake Ontario. These study results support earlier information linking toxic chemical contamination to both deformities and reproductive failures. They further suggest that effects of toxic contamination are even more pervasive than previously believed.

To a degree, the situation has improved. By 1977-8, Weseloh et al. (1979) reported the breeding success of the Scotch Bonnet Island colonies to have improved to an average of 1.05 fledged young per adult pair. This improvement corresponds to declining levels of PCB and, presumably other controlled toxic substances in the lake Kurita et al. 1987).

While there are no specific studies of the effects on mink of eating Lake Ontario fish, mink populations are known to have declined within six kilometers of the lake shoreline (Skinner, 1986). Hornshaw et al. (1983) studied the effects of feeding the following to mink: carp and white suckers from Saginaw Bay, yellow perch scraps from

Lake Erie, whitefish skeletons from Lake Michigan, and alewives from Green Bay. Mink growth and furring were normal in all cases. However, mink fed carp failed to reproduce, and mink that were fed the other fish (excluding alewives) showed reduced reproductive performance relative to control groups. Only the alewife diet supported reproduction and kit survival comparable to the controls.

iii. Toxicity To Fish

One of the only known recent attempts to evaluate the health of open-lake fishes was performed by Wolfe (1987). This researcher collected 136 lake trout at Charity Shoal, Lake Ontario. The examination of these fishes found that they were infested with several types of parasites. Except for this, the trout were in good condition and had abundant fat stores in their abdominal cavities. There were no gross abnormalities present, nor anything visible that could be attributed to Lake Ontario toxics.

Lake trout have not had natural reproductive success in past years (Pearce, 1988). The lake trout population had seriously declined in the 1940s due to overfishing and lamprey predation. By the early 1950s, the lake trout had disappeared from the lake. Fishery agencies annually collect over 650,000 lake trout eggs from Lake Ontario which are hatched, reared to yearling size, and stocked to develop a new Lake Ontario strain of lake trout. Efforts to restore lake trout began in 1973, but there has been no significant natural reproduction. The reasons for this are not known, but the effects of toxics and the lack of suitable spawning habitat are on the list of suspected causes. Within the last few years, the New York State Department of Environmental Conservation has reported finding viable lake trout fry on known spawning shoals in eastern Lake Ontario.

d) Human Health Effects

Toxics in Lake Ontario biota are a human health concern and pose a tangible human health risk. Humans are positioned at the top of both the terrestrial and aquatic food webs, and, as such, they risk being exposed to the persistent toxic substances that build up in food resources.

i. Drinking Water

Toxic chemicals have not been found in Lake Ontario drinking water at levels above standards designed to protect human health.

ii. Ambient Water Column

PCBs, DDT and metabolites, and Dieldrin occur in the Lake Ontario water column at ambient concentrations above standards and criteria designed to protect human health at the 10^{-6} cancer risk level.

iii. Fish Consumption

Because of bioaccumulation, the level of certain toxics in fish is high relative to the levels in water. Therefore, although fish consumption is low relative to water consumption, total exposure of humans to Lake Ontario toxics through fish consumption is much higher than through water consumption. Sonstegard (in Health of Aquatic Communities Task Force, 1986) calculated that the amount of bioaccumulated toxics ingested in consuming a single kilogram of fish from Lake Ontario is equivalent to consuming 3.3 million kilograms of the lake's water, which represents more than twenty lifetimes of drinking lake water.

The 1990 report from the Categorization Committee on the Niagara River confirmed that edible portions of fish tissue in larger specimens of some Lake Ontario sportsfish, primarily salmon and trout, exceed either Canadian or U.S. (NYSDEC and FDA) enforceable standards for PCBs, Mirex, Chlordane, Dioxin, and Mercury; and exceed more stringent, but unenforceable EPA guidelines for Hexachlorobenzene, DDT and metabolites and Dieldrin.

Fishing advisories began on Lake Ontario in 1970 with the discovery of bioaccumulated mercury and DDT. Later (in the mid-1970s) more advisories were imposed with the discovery of bioaccumulated PCBs and mirex. The advisories were revised in the early 1980s to reflect improvements in fish flesh contaminant levels and to permit the monthly consumption of some Lake Ontario fishes. Levels of PCBs and mirex have declined in salmon and larger rainbow trout, to the point where consumption advisories have now been lifted in Ontario. For the first time in a number of years there is no Province of Ontario advisory against the consumption of Lake Ontario coho salmon up to 55 cm in length or rainbow trout up to 75 cm, for children under 15 years of age or women of child bearing age (1990 Guide to Eating Ontario Sportfish). However, the discovery of dioxin in fish ranging from 0.002 to 0.162 ng/g is a source of concern. The current New York State and Province of Ontario fish consumption advisories applicable to Lake Ontario are included as Tables 8 and 9.

A study of the effects of contaminated Great Lakes fish on humans was performed in 1973 and 1974 by the Michigan Department of Public Health and reported by Humphrey (1976). This study compared a population that consumed high quantities of PCB-contaminated Lake Michigan sport fish with a control group. The high fish consumption group showed higher blood levels of PCBs.

One method used to evaluate the potential problem caused by the ingestion of contaminated fish is the use of risk assessment. Connor (1984) used an EPA risk assessment methodology to assess the risk to consumers of large quantities of contaminated fish. The calculation showed a 10 to 100 times greater cancer risk from fish consumption than from drinking water.

Sonzogni and Swain (1984) suggested that those who consumed large quantities of contaminated Lake Ontario or Lake Michigan fish may have a small but elevated risk of developing cancer as compared to consumers of more average quantities of fish. This was based on conservative extrapolations of animal cancer studies.

2. A CHEMICAL-BY-CHEMICAL ASSESSMENT OF LAKE-WIDE CONDITIONS

a) Categorization of Toxics Based on Levels in the Ambient Water Column and Fish Tissue

As a first step in implementing the chemical-by-chemical approach to toxics control in Lake Ontario, the Lake Ontario Toxics Committee developed a system for categorizing toxics. The categories are shown in Table 10.

In order to implement the system for categorizing toxics, the Lake Ontario Toxics Committee established an ad hoc Toxics Categorization Workgroup now the Lake Ontario Categorization Committee. For Category I chemicals, the Workgroup reviewed available ambient water column and fish tissue data in relation to applicable standards, criteria and guidelines (Lake Ontario Toxics Categorization Workgroup, 1988). As shown in Table 11, ambient data were available for forty-two chemicals:

- Five (5) chemicals exceeded enforceable standards in the water column, fish tissue or both (Category IA);
- Four (4) chemicals exceeded more stringent, but unenforceable criteria or guidelines in the water column, fish tissue, or both (Category IB);
- Seventeen (17) chemicals were found at levels at or below the most stringent standard, criterion or guideline (Category IC);
- Two (2) chemicals were analyzed with detection limits too high to allow a comparison with standards, criteria or guidelines (Category ID); and
- Twelve (12) chemicals had no standards, criteria, or guidelines with which to compare the available ambient data (Category IE).

Ambient Lake Ontario data were, however, not available for most chemicals. As a first step in implementing the chemical-by-chemical approach for these chemicals, the Workgroup looked at point source data, sediment data, tributary water column data and data for other biota as the basis for establishing evidence of presence in, or input to the Lake.

- As shown in Table 12, 100 additional chemicals showed evidence of presence or input (Category IIA) and

- There is no evidence of presence or input of any other chemicals (Category IIB).

Although iron and aluminum were included in the list of toxics in the 1989 LOTMP, action on these toxics has been deferred, since the Four Parties have determined that:

- The criteria for iron and aluminum may not be reliable indicators of toxicity. No single number is ideal because of the variety of forms of these metals that may be present in ambient waters; and

- We are not yet in a position to differentiate between loads of these metals originating from natural and anthropogenic sources.

The Binational Objectives Development Committee will be charged by the Coordination Committee to develop ambient standards for iron and aluminum for Lake Ontario and the Niagara River.

The categorization system relies heavily on ambient water column and fish tissue data because ambient standards and criteria are available for these media. Ambient data for other media (e.g., sediment) do not play a role in the categorization process because there are no standards or criteria for these media. The system, however, is flexible enough to use these other ambient data as standards and criteria become available.

NYSDEC's fish flesh criteria for piscivorous (fish-consuming) wildlife are listed in Table 13. Comparison of levels of toxics in Lake Ontario sportfish with these criteria confirms that PCBs, DDT and metabolites, dieldrin, chlordane, dioxin (2,3,7,8-TCDD), mirex and octachlorostyrene exceed these criteria.

Having completed its categorization report for the Niagara River, the Categorization Committee is now taking up the task of updating the categorization for Lake Ontario. The Categorization Report for Lake Ontario is scheduled for June 1991.

b) Ambient Water Column, Fish Tissue, and Avifauna

Ambient Water Column

There is a paucity of usable data on the levels of toxics in the open-lake water column; no trend assessment has been developed at this time. There are many reasons for this information shortfall:

- Many of the compounds of concern exist at levels below the analytical limits of detection;

- Past collection and measurement techniques were frequently designed to meet the needs of specific studies and the resultant data are inappropriate for trend assessment; and

- The cost of obtaining open-lake data is high.

Fish Tissue

In order to put exceedances of fish tissue standards and criteria in perspective, it should be noted that:

- Not all fish were found to contain contaminant levels of concern to human health. For example, bullhead and yellow perch, two important commercial sportfish, meet requirements necessary to be sold on the open market.

- The small and medium-sized fish in affected species often contain levels of contaminants below legal action levels (levels at or above which fish can not be sold for human consumption).

- Initial efforts to ban the use of some toxics and shut off known point sources of toxics have resulted in reduced contaminant levels in many affected species.

Biomonitoring data collected in Lake Ontario over a number of years does provide valuable information concerning the general trend in toxic contaminant levels. There is clear evidence that the levels of some problem toxics in Lake Ontario biota have been reduced over the past two decades.

Concentrations of a number of contaminants measured in fish tissue samples collected from Lake Ontario decreased between the early 1970s and the early 1980s, but have equilibrated in recent years. The decrease in concentrations coincides with improved industrial practices, more stringent regulations and restrictions on the manufacture and use of many organochlorines (Figure 2a-s, This data is from Canadian sampling programs (Fig. 2s), New York State sampling data will be available for the final update).

Data on PCBs from Coho salmon of the Credit River in Ontario are indicative of this trend (Figure 2a). Although these fish spawn in the river, they reside predominantly in the open lake, and are, therefore, reflective of lake-wide conditions. The data, which span 1972-88 show a statistically significant decline in PCB levels from 10.2 ppm in 1972 to less than 2.0 ppm in 1978. This, however, remains well above the most stringent Four Party fish tissue criterion: 0.0025 ppm (EPA, Standards and Criteria Committee Report, 1990 (SCCR)) Although PCB concentrations in Credit River coho continued downward through the 1980s, the trend was no longer statistically significant and the general concern is that levels are stabilizing.

Data collected between 1977 and 1988 for PCB, mirex, mercury, dieldrin, DDT and p,p'-DDE concentrations in Lake Ontario rainbow smelt and lake trout show a trend similar to that described for Credit River coho (Fig. 2b-h):

- Concentrations of total PCBs in lake trout decreased between 1977 and 1981, and from 1983 to 1984 (Fig. 2b). Since 1984, levels have remained more or less constant. A similar trend has been followed by concentrations of PCBs in rainbow smelt. Despite the decrease in concentrations, levels of PCBs in both species remains above the most stringent criterion (see PCB criteria above)[1].

- Mirex is found mainly in the Niagara River, Lake Ontario and the St. Lawrence River. Concentrations fell significantly after a ban on production introduced in the mid 1970s but have since shown little change (Fig. 2c). Concentrations in Lake Ontario lake trout decreased in 1980 and 1984 and reached a low of 0.06 ppm in 1986 before rising again in the 1987 and 1988 samples. Concentration decreases in rainbow smelt reached 0.01 ppm between 1984 and 1986 and again have shown some increase in 1987 and 1988. These values are below the most stringent Four Party criterion: 0.1 ppm (MOE/NYSDEC, SCCR).

- The trend in mercury concentrations in fish shows considerable variation, possibly due to fluctuations in background levels (Fig. 2d). Mercury levels in lake trout have been consistently above the most stringent Four Party criteria: 0.1 ppm (NYSDEC-for protection of Wildlife, Standards and Criteria Committee Report, 1990). Concentrations in rainbow smelt have decreased and are consistently below the most stringent Four Party criterion: 0.1 ppm (for protection of wildlife-NYSDEC, SCCR).

- Dieldrin levels in Lake Ontario lake trout peaked in 1979 and decreased sharply in 1980 (Fig. 2e). Recent data show no definite trend. Similarly there is no obvious recent trend in rainbow smelt data. Concentrations in both trout and smelt exceed the most stringent Four Party criterion: 0.33 ppb (EPA, SCCR).

- The concentrations of DDT and its main metabolite, p,p'-DDE, show considerable year-to-year variation, but an overall decrease in samples of both lake trout and rainbow smelt

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[1]Fish tissue concentrations for PCBs (here), dieldrin, DDT, and dioxin (presented below) are for whole fish. The corresponding standards are for fillets, and thus are not directly comparable. Revisions to make the fish tissue data directly comparable to the standards will be included in the final update.

collected between 1977 and 1985 (Fig 2f-g). The decrease coincides with the restrictions on the use of DDT imposed in both Canada and the U.S. in the early 1970s. Since 1985, levels appear to have equilibrated or increased. Levels of DDT in Lake Ontario lake trout remain above the most stringent Four Party criterion: 0.0013 ppm (EPA, SCCR).

- Concentrations of 2,3,7,8-TCDD (dioxin) in Lake Ontario lake trout have shown considerable fluctuation, with no obvious trend (Fig. 2h). Hyde Park, the major source of dioxin to Lake Ontario, is a hazardous waste site in the United States that leaks contaminants to the Niagara River. It is scheduled for full containment by 1992. Dioxin levels in lake trout and rainbow smelt remain well above the most stringent Four Party criterion: .000000065 ppm (EPA, SCCR).

Compared to the fish species discussed above, spottail shiners are indicators of local, rather than lakewide, conditions. However, similar trends have been found in these fish (Fig. 2i-r):

- Data from spottail shiners collected from the Niagara River at Niagara-on-the-Lake, Twelve-mile Creek, and the Humber River, all major tributaries to Lake Ontario, all show an overall decline in levels of PCB, mirex, chlordane, DDT, and Hexachlorobenzene (HCB) during the late 1970s and lack of a significant trend in the 1980s.

- Concentrations of PCBs in spottail shiners collected from Niagara-on-the-Lake and Twelve-mile Creek have decreased since 1975, but have levelled off in recent years (Fig. 2i-j). PCB concentrations seem to be stabilizing above the most stringent Four Party criterion (see PCB criteria above).

- Mirex concentrations in spottail shiners show a similar decrease through the late 1970s, but have fluctuated since (Fig. 2k-l). Current levels are below the most stringent Four Party criterion (see Mirex criteria above).

- The pattern of DDT concentration in spottail shiners was similar to that described for lake trout and rainbow smelt described above through the 1970s (Fig. 2m-n). Conversely, there has been no particular trend in the 1980s, and DDT levels in spottail shiners are currently above (Niagara on the Lake samples) or near (Humber River samples) the most stringent Four Party criterion (see DDT criteria above).

- Spottail shiner data for Chlordane and HCB are limited but show similar patterns; an overall decline in the 1970s for Chlordane (Fig. 2p-q), and in the early 1980s for HCB (Fig. 2r). Concentrations of both chemicals were measured at or above the most stringent Four Party criteria for these chemicals: .0065 ppm, chlordane, .0063 ppm, hexachlorobenzene (EPA, SCCR).

Avifauna

Herring Gulls are also a useful indicator of trends in toxic chemical present in Lake Ontario at low concentrations. The Herring Gull is at or near the top of most Great Lakes aquatic food chains and stays within the basin year round. Its diet is predominantly fish (alewife and rainbow smelt) and through biomagnification, toxics present in the waters of Lake Ontario are concentrated in the gulls and passed from the female gull to her eggs. Data on toxics from Lake Ontario Herring Gull eggs show a trend similar to that for fish tissue. Herring Gull eggs collected from colonies in the eastern basin of Lake Ontario at the headwaters of the St. Lawrence (Snake Island), and from the Toronto waterfront (Mugg's Island) between 1974 and 1989 show significant declines in the concentrations of PCBs, DDE, mirex, HCB, dieldrin, and TCDD in the early 1970s followed by a levelling off and lack of trend throughout most of the 1980s (Figure 3a-f).

Since 1974, total PCB levels in Herring Gull eggs have decreased. However the rate of decline lessened after 1986 (Fig. 3b). DDE levels have followed a similar pattern, with levels stabilizing at approximately 5 ppm (Fig. 3b). Mirex, which is present in Lake Ontario Herring Gull eggs at levels an order of magnitude higher than found in the other Great Lakes, underwent a significant decrease between 1974-78, but has now apparently levelled off at 1 ppm (Fig. 3c). HCB residues in Herring Gulls eggs showed a steady decline until recent years when concentrations levelled out at 0.1 ppm (Fig. 3c). Dieldrin shows a similar pattern (Fig. 3d). TCDD levels in eggs collected from eastern Lake Ontario (Scotch Bonnet Island) decreased significantly from 2000 ppt in 1971 to 204 ppt in 1982. Data for eggs collected from Snake and Mugg's islands show a continuing decrease in levels between 1981 and 1984, however, levels have been constant since 1984, and no change in TCDD levels is shown in data for Hamilton Harbour eggs collected between 1984 and 1988 (Fig. 3d).

Eggs collected from the Niagara River Herring Gull colony (located above the falls) have also shown declines in concentrations of PCBs, DDE, mirex, HCB, dieldrin and TCDD, from the 1970s, but there has been little change detected in recent years (Fig. 3e-f). Total PCB levels in Niagara River Colony Herring Gull eggs have decreased since 1979, as have HCB concentrations. DDE data available since 1981 also shows a decline until recent years. Mirex and Dieddrin data shows considerable fluctuation, but little evidence of a trend in data since 1979, while TCDD data covering the period 1981 to 1989 shows an overall decrease in residue concentrations in eggs from 87 ppt to 18 ppt, but considerable fluctuation since 1983.

c) Finished Drinking Water

i. United States

On the United States side of Lake Ontario there are thirteen Community Public Water Supply Systems (CPWSs)[1] that utilize Lake Ontario as a raw water source. They are: the villages of Lyndonville, Albion, Brockport, Sodus, Sodus Point, Wolcott, Sackets Harbor and Chaumont, Oswego City, the Monroe County Water Authority, the Ontario Town Water District, the Williamson Water District and the Metropolitan Water Board

As discussed more fully in Appendix IV, all thirteen plants are currently in compliance with all applicable drinking water standards.

The Safe Drinking Water Act, as amended in 1986, put EPA on a rigorous schedule to develop 83 drinking water standards by June 1989 (now scheduled for completion in 1992) and has imposed significantly increased monitoring requirements on CPWSs. These additional standards and monitoring data will allow improved assessments of toxics in Lake Ontario potable drinking water beginning in 1992.

ii. Canada

The Drinking Water Surveillance Program (DWSP) currently monitors ~~eleven~~ plants that utilize Lake Ontario as a raw water source (Grimsby, Hamilton, Burlington, Lakeview, Lorne Park, R.L. Clark, R.C. Harris, Easterly, Oshawa, Deseronto and Belleville). TORONTO ISLAND FILTRATION PLANT?

Drinking water quality in Ontario is evaluated against provincial objectives as outlined in the publication, "Ontario Drinking Water Objectives." This publication contains health-related maximum acceptable concentrations for thirty substances. In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference Information may be used. As discussed more fully in Appendix IV, none of the eleven Lake Ontario water treatment plants currently produce drinking water that exceeds objectives or guidelines.

1- A CPWS is defined in the Safe Drinking Water Act as "a system for the provision to the public of piped water for human consumption, if such system....serves at least fifteen service connections used by year-round residents or regularly serves at least twenty-five year-round residents."

d. Sediment

i. Existing Data

Sediments play a major role in the transport, burial and mobilization of toxic chemical contaminants in the Great Lakes. Characteristics of sediment-toxic contaminant interaction in Lake Ontario include:

- Chronology - analysis of sediment cores provides a profile over time and space of deposition of adsorbed toxic chemical contaminants;
- Burial - undisturbed sediments will eventually remove associated persistent chemical contaminant burden from the ecosystem (assuming the sources have been curtailed);
- Removal - removal of contaminated sediment can eliminate this source of associated persistent toxic chemicals;
- Mobilization - resuspension and bottom feeding by benthic invertebrate organisms can mobilize contaminants bound to sediments; and
- Dredging - open-lake disposal of contaminated dredge sediment can provide a renewed source of biologically available toxic contaminants.

The role of sediments as a source of chemical contaminants to the aquatic environment is poorly understood. Consequently, work on developing criteria and standards applicable to sediments is still underway.

There are criteria designed to assess dredged materials for open-lake disposal. Lake Ontario sediment data quality measurements obtained by Mudroch et al. (1985), Kizlauskas et al. (1984) and Onuska et al. (1983) showed exceedances of MOE, EPA and IJC guidelines for PCBs, cadmium, chromium, copper, iron, lead, mercury, nickel, zinc and arsenic (Table 14). However, these criteria were developed as a guide for determining appropriate disposal techniques for dredged materials, not for ambient water quality evaluation and/or ecosystem risk assessment.

Work has been done by Pavlou et al. (1987) towards developing preliminary sediment risk criteria based upon existing water quality standards and criteria, the sediment adsorption coefficients for chemicals, and the organic content of sediment. Using these preliminary criteria, exceedances of median values for Lake Ontario data sets were found for PCBs, DDT and aldrin/dieldrin. In addition, occasional measurements for 2,3,7,8-TCDD and mirex also exceeded these preliminary criteria (Table 15). The Fate of Toxics Committee has developed a mass balance model that predicts the fate of some

toxics in Lake Ontario sediment. This model will be used in conjunction with the efforts of the Standards and Criteria Committee to determine the need for sediment criteria.

ii. Relationship Between Levels in Sediment and Levels in Biota

Trend analysis shows that levels of persistent toxic contaminants in biota have decreased over the past decade, and that the decline has recently tended to level off. The continuing impairment of beneficial lake uses, despite a significant reduction in toxic discharges, may be attributed in part to sediment contamination. Many of the persistent, hydrophobic contaminants are associated with suspended and bottom sediments and are bioavailable. Bioaccumulation of these water-insoluble materials has been correlated more closely with sediment contamination than with levels in the dissolved phase of the water column. Knowledge of the concentrations of these chemical constituents helps to assess toxicity of sediment-associated contaminants.

While burial in the bottom sediment, decay, and out-of-basin transport are ultimate means for self-purification in the lake, these processes may take a considerable amount of time, during which the associated contaminants are recycled throughout the ecosystem. The possible effects include:

- Physical resuspension of settled sediment, making it and any associated contaminants available for uptake by aquatic organisms;
- Transport of contaminated sediments from "hotspots" (e.g., Areas of Concern) into the open lake;
- Chemical release of adsorbed toxicants into the water column, thereby promoting bioavailability; and
- Alteration of the contaminant chemical species associated with the sediment, making it either more biologically available and/or more harmful to aquatic biota.

Research is needed to better define these and other effects. The Fate of Toxics Committee mass balance model, once calibrated and verified, will aid in determining the pathways of toxics among sediment, water column, and biota. Efforts will also be made to establish mechanisms and times for ultimate burial (e.g., the time required for 50% of a sediment-associated contaminant to be removed from circulation within the ecosystem).

iii. Trends

Measured concentrations of contaminants in bottom sediments can be used to map the degree and spatial distribution (dispersion) of sediment contamination. Relating these data to sediment accumulation facilitates estimation of historical and present loads to the lake. When coupled with appropriate limnological information, an assessment

can be made of the significance of the major river inputs as sources of contaminants associated with sediment to Lake Ontario.

Contaminants bound to fine-grained sediment contributed by Lake Ontario tributaries are distributed throughout well-defined basins in the lake. These depositional basins are the product of littoral drift patterns and related physical processes characteristic of the lake. Trends over time are established by determining sedimentation rates and estimating a sediment budget for the lake (Kemp and Harper, 1976). This information is related to measured contaminant burdens in sediment cores correlated with time using various dating techniques.

Concentrations of metals in recent surface sediments have been compared with concentrations in the pre-colonial sediments (Murdoch et al., 1988). The concentration ranges were generally wider in surface sediments than for the pre-colonial sediments, and levels overall in the surficial layer were elevated for cadmium, copper, chromium, iron, nickel, lead, zinc and, particularly, mercury. When compared to the MOE dredge material disposal guidelines, pre-colonial concentrations for cadmium, copper, chromium, nickel, lead and zinc are in the same order of magnitude as the guideline values. For iron and mercury, the guideline values are several orders of magnitude greater than the measured pre-colonial levels.

Thomas (1983) found a pattern of contaminant burden, represented by industrial chemical residues of chlorinated benzenes, PCB, mirex; hexachlorobutadiene and octachlorostyrene, corresponding closely to production statistics for these materials over the past few decades. A decrease in the sediment burdens of these contaminants over the past twenty years is indicative of decreased loadings commensurate with bans, restrictions and reduced production.

3. AREAS OF CONCERN

As defined in the GLWQA, there are seven Areas of Concern (AOC) within the Lake Ontario Basin (Figure 4):

- Hamilton Harbour,
- Metro Toronto,
- Port Hope,
- Bay of Quinte,
- Oswego River,
- Rochester Embayment, and
- Eighteenmile Creek.

A summary of the problems in these AOCs, as contained in the IJC's 1987 Great Lakes Water Quality Report, is presented in Table 16. More complete definition of the nature and extent of these problems will be included in the RAP submissions to the IJC. The status of RAP development is described in Appendix V.

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TABLE 1.

WATER QUALITY STANDARDS AND OBJECTIVES WITH REGULATORY BASIS
APPLICABLE TO LAKE ONTARIO

AGENCY:		NYSDEC							NOE		FD
MEDIUM:	CARCIN	WATER				WATER			WATER	FISH TISSUE	FISH TISSU
PROTECTED USE:		AQUATIC LIFE				HUMAN HEALTH			AQUATIC LIFE	HUMAN HEALTH	
CRITERION:		ACUTE TOX	CHRONIC TOX	BIOCCUM	FOOD TAINT	TOXICITY	CARCINOGENICITY	AESTHETICS			
COMPOUND / UNITS:		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ppm	ppm
ALUMINUM			100								
ACENAPHTHENE	N							20			
ACRYLONITRILE	Y						0.07 f				
ALDRIN	Y						0.002 f				
ALDRIN + DIELDRIN	Y			0.001					0.001		
ANTIMONY	N					3 f					
ARSENIC	Y		190 e			50 i					
BARIUM	N					1000 i					
BENZENE	Y			6 f			1 f				
BENZIDINE	Y		0.1 e				0.02 f				
BERYLLIUM	Y		1100 b,e			3 f					
CHROMIUM	N		1.13 b,e			10			0.2		
CARBON TETRACHLORIDE	Y						0.4 f				
CHLORDANE	Y			0.002 f			0.02 f		0.06	0.3	
CHLORINATED BENZENES	Y		5		50			20			
MONOCHLOROBENZENE	N		5		50			20	15		
DICHLOROBENZENE	N		5		50						
1,2									2.5		
1,3								20	2.5		
1,4								30	4		
TRICHLOROBENZENE			5		50			10			
1,2,3									0.9		
1,2,4									0.5		
1,3,5									0.65		
TETRACHLOROBENZENE								10			
1,2,3,4									0.1		
1,2,3,5									0.1		
1,2,4,5	N								0.15		
PENTACHLOROBENZENE	N								0.03		
HEXACHLOROBENZENE							0.02 f		0.0065		
CHLOROFORM	Y						0.2				
CHROMIUM			207 b,e			50 i			100		
CHROMIUM (HEX)	N		11 e								
COPPER	N		12 b,e			200 i			5		
CYANIDE	N		5.2 e			100 i			5		
DDT	Y		0.001 e				0.01		0.003	5	
DEMETON	N		0.1								
DIAZINON			0.08						0.08		
DIBUTYL PHTHALATE	N					50 f,h					
DICHLOROETHANE 1,2	Y						0.8				
DICHLOROPHENOL 2,4	N							0.3	0.2		
DICHLOROPROPANE	N					50 f,h					
DIELDRIN	Y		0.001 e				0.0009				
DIETHYL PHTHALATE	N					50 f,h					
DIMETHYL PHTHALATE	N					50 f,h					

E 1. CONTINUED

WATER QUALITY STANDARDS AND OBJECTIVES WITH REGULATORY BASIS
APPLICABLE TO LAKE ONTARIO

AGENCY:		NYSDEC							NOE		FDA
MEDIUM:	C	WATER				WATER			WATER	FISH TISSUE	FISH TISSUE
PROTECTED USE:	A R C I N	AQUATIC LIFE				HUMAN HEALTH			AQUATIC LIFE	HUMAN HEALTH	
CRITERION:		ACUTE TOX	CHRONIC TOX	BIOACCUM	FOOD TAINT	TOXICITY	CARCINOGENICITY	AESTHETICS			
COMPOUND / UNITS:		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ppm	ppm
DIOXIN (2378-TCDD)	Y			0.000001						0.00002	0.00005 0.00001 c
DIPHENYLHYDRAZINE	N						0.05 f				
ENDOSULFAN	N		0.009 e						0.003		
ENDRIN	N		0.002 e			0.2 i			0.002		
ETHYLBENZENE	N					50 f,h					
FLUORANTHENE	N					50 f,h					
HEPTACHLOR	N								0.005		
HEPTACHLOR EPOXIDE	N		0.001 e				0.009		0.001		0.3
HEXACHLOROBENZENE	N						0.02 f				
HEXACHLOROBUTADIENE	Y	10	1				0.5				
HEXACHLOROCYCLOHEX			0.01 e				0.02 f				
HEXACHLOROCYCLOPENTADIENE	N	4.5	0.45					1			
IRON	N	300	300			300 i			300		
ISOPHORONE	N					50 f,h					
LEAD	N		3.2 b,e			50 i			25 b	1	
LINDANE	Y								0.01		
MALATHION	N		0.1 e						0.1		
MANGANESE	N					300 i					
MERCURY	N		0.2 e,f			2 i			0.2	0.5	1
METHOXYCHLOR	N		0.03 e			35 i			0.04		
METHYLEX	N		0.001 e				0.04 f			0.1	0.1
METHYLNAPHTHALENE	N							10			
NICKEL	N		96 e						25		
NITRATES	N					10000 i					
NITROBENZENE	N							30			
NITROSODIPHENYLAMINE	Y					50 f,h					
PARATHION	N		0.008						0.008		
PCB	Y		0.001 e				0.01		0.001	2	2
PENTACHLOROPHENOL	N		0.4						0.5		
PHENOL	N				5 **	1 i					
SELENIUM	N		1			10 i			100		
SILVER	N		0.1			50 i					
HYDROGEN SULFIDE	N		2					50 f			
TETRACHLOROETHANES	N										
1,1,2,2	Y						0.2 f				
TETRACHLOROETHYLENE	Y			1			0.7 f				
THALLIUM	N	20	8			4 f					
TOLUENE	N					50 f,h					
TOXAPHENE	Y		0.005 e				0.01 f		0.008		5
TRICHLOROETHANES	Y										
1,1,1	N					50 f,h					
1,1,2	Y						0.6				
TRICHLOROETHYLENE	Y			11 f			3 f				

TABLE 1. CONTINUED

WATER QUALITY STANDARDS AND OBJECTIVES WITH REGULATORY BASIS
APPLICABLE TO LAKE ONTARIO

AGENCY:		NYSDEC							NCE		FDA
MEDIUM:	CARCIN	WATER				WATER			WATER	FISH TISSUE	FISH TISSUE
PROTECTED USE:		AQUATIC LIFE				HUMAN HEALTH			AQUATIC LIFE	HUMAN HEALTH	
CRITERION:		ACUTE TOX	CHRONIC TOX	BIOACCUM	FOOD TAINT	TOXICITY	CARCINOGENICITY	AESTHETICS			
COMPOUND / UNITS:		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ppm	ppm
TRICHLOROPHENOLS											
2,3,5										18	
2,3,6										18	
VINYL CHLORIDE	Y						0.3 f				
ZINC	N		30			300 i				30	

NOTES:
b Hardness dependent criteria. Value presented is based on 100 mg/l.
e Value based on EPA published criterion.
f Value presented is guidance value only. NY regs provide authority for use use of guidance values when a standard does not exist for a given water classification. NY will initiate rulemaking to adopt standards for all guideline values except the 50 ug/l general organic guideline value.
h 50 ug/l individual organic chemical; "general organic guideline value."
i Value based on regulations for drinking water supplies or sources.
* Fish tissue level for dioxin adopted by the State of New York
** Total nonchlorinated phenols: 1 ug/l for total chlorinated phenols.
§ NYSDEC value for chlorobenzene.

SOURCES OF INFORMATION:

NYSDEC Ambient Water Quality Standards and Guidance Values. Division of Water Technical and Operational Guidance Series (1.1.1). New York State Department of Environmental Conservation.

NCE Wells, David L. March 15, 1987. Ontario Ministry of the Environment Aquatic Contaminant Regulatory Tools. OMOE, Water Resources Branch.

FDA FDA Action Levels

TABLE 2.

EXISTING WATER QUALITY STANDARDS, OBJECTIVES, CRITERIA AND GUIDANCE VALUES FOR PROTECTION OF HUMAN HEALTH AND APPLICABLE TO LAKE ONTARIO

MEDIUM:		WATER							
PROTECTED USE:	C A	HUMAN HEALTH							
EXPOSURE ROUTE:	R	DRINKING WATER						FISH CONSUMP	WATER+FISH CONSUMP
CRITERION:	C	TOXICITY		CARCINOGENICITY		AESTHETICS			
AGENCY:	I N	NYSDEC	IJC	NYSDEC	IJC	NYSDEC		EPA	EPA
COMPOUND / UNITS:	?	ug/l	ug/l	ug/l	ug/l	ug/l		ug/l	ug/l
ACRYLONITRILE	Y			0.07 f				0.65 c	0.058 c
ALDRIN	Y			0.002 f				0.000079 c	0.000074 c
ALDRIN + DIELDRIN	Y				0.001				
ANTIMONY	N	3 f						45000	146
ARSENIC	Y	50 i	50 i m					0.0175 c	0.0022 c
BARIUM	N	1000 i							1000
BENZENE	Y			1 f				40 c	0.66 c
BENZIDINE	Y			0.02 f				0.00053 c	0.00012 c
BENZO(A)PYRENE	Y	0.002 f			0.01 i				
BERYLLIUM	Y	3 f						0.117 c	0.0068 c
CADMIUM	N	10							10
CARBON TETRACHLORIDE	Y			0.4 f				6.94 c	0.4 c
CHLORDANE	Y			0.02 f				0.00048 c	0.00046 c
CHLORINATED BENZENES	Y					20			488
DICHLOROBENZENE	N							2600	400
1,3						20			
1,4						30			
TETRACHLOROBENZENE						10			
1,2,4,5	N							48	38
CHLOROFORM	Y			0.2				15.7 c	0.19 c
CHROMIUM		50 i	50 i m						
CHROMIUM (HEX)	N								50
CHROMIUM (TRI)	N							3433000	170000
CYANIDE	N	100 i							200
2,4-D		100 i							100
DDT	Y			0.01				0.000024 c	0.000024 c
DIBUTYL PHTHALATE	N	50 f,h						154000	35000
DICHLOROETHANE 1,2	Y			0.8				243 c	0.94 c
DICHLOROPHENOL 2,4	N					0.3			3090
DIELDRIN	Y			0.0009 f				0.000076 c	0.000071 c
DIETHYL PHTHALATE	N	50 f,h						1800000	350000
DIMETHYL PHTHALATE	N	50 f,h						2900000	313000
DIOXIN (2378-TCDD)	Y							1.4 E -8 c	1.3 E -8 c
DIPHENYLHYDRAZINE	N			0.05 f				0.56 c	0.042 c
ENDRIN	N	0.2 i							1
ETHYLBENZENE	N	50 f,h						3280	1400
FLUORANTHENE	N	50 f,h						54	42
HEPTACHLOR	Y			0.009				0.00029 c	0.00028 c
HEXACHLOROBENZENE	Y			0.02 f				0.00074 c	0.00072 c
HEXACHLOROBUTADIENE	Y			0.5				50 c	0.45 c
HEXACHLORCYHEX				0.02 f					
TECH	Y							0.0414 c	0.0123 c
ALPHA	Y							0.031 c	0.0092 c
BETA	Y							0.0547 c	0.0163 c
HEXACHLORCYPENTDIENE	N					1			206
IRON	N	300 i							300
ISOPHORONE	N	50 f,h						520000	5200

TABLE 2. CONTINUED

EXISTING WATER QUALITY STANDARDS, OBJECTIVES, CRITERIA AND GUIDANCE VALUES FOR PROTECTION OF HUMAN HEALTH AND APPLICABLE TO LAKE ONTARIO

MEDIUM:		WATER						
PROTECTED USE:	C	HUMAN HEALTH						
	A							
EXPOSURE ROUTE:	R	DRINKING WATER					FISH CONSUMP	WATER+FISH
CRITERION:	C	TOXICITY		CARCINOGENICITY		AESTHETICS		
AGENCY:	I	NYSDEC	IJC	NYSDEC	IJC	NYSDEC	EPA	EPA
COMPOUND / UNITS:	N ?	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
LEAD	N	50 i						50
LINDANE	Y						0.0625 c	0.0186 c
MANGANESE	N	300 i					100	50
MERCURY	N	2 i					0.146	0.144
METHOXYCHLOR	N	35 i						100
MIREX	N			0.04 f				
NITRATES	N	10000 i						10000
NITROBENZENE	N					30		19800
NITROSODIPHENYLAMINE	Y	50 f,h					16.1 c	4.9
PCB	Y			0.01			0.000079 c	0.000079 c
PHENOL	N	1 i						3500
SELENIUM	N	10 i						10
SILVER	N	50 i						50
TETRACHLOROETHANES	N							
1,1,2,2	Y			0.2			10.7 c	0.17 c
TETRACHLOROETHYLENE	Y			0.7			8.85 c	0.8 c
THALLIUM	N	4 f					48	13
TOLUENE	N	50 f,h					424000	14300
TOXAPHENE	Y			0.01 f			0.00073 c	0.00071 c
TRICHLOROETHANES	Y							
1,1,1	N	50 f,h					1030000	18400
1,1,2	Y			0.6			41.8 c	0.6 c
TRICHLOROETHYLENE	Y			3 f			80.7 c	2.7 c
VINYL CHLORIDE	Y			0.3 f			525 c	2 c

NOTES:
c Human health criteria for carcinogens reported for 3 risk levels. Value presented is 10 -6 risk level (negligible risk)
f Value presented is guidance value.
h 50 ug/l individual organic chemical; "general organic guideline value."
i Value based on regulations for drinking water supplies or sources.
m Accepted and incorporated into amended GLWQA, 1987.
s NYSDEC value for chlorobenzene.

SOURCES OF INFORMATION:

NYSDEC Ambient Water Quality Standards and Guidance Values. Division of Water Technical and Operational Guidance Series (1.1.1). New York State Department of Environmental Conservation.

IJC 1987 IJC Science Advisory Board Report. Table 2. Great Lakes Water Quality Agreement Specific Objectives - Basis, Reference and Status.

EPA Water Quality Criteria. Water Quality Criteria Summary. January 2, 1987. U.S. EPA, Office of Regulations and Standards, Washington, D.C.

TABLE 3.

EXISTING WATER QUALITY STANDARDS, OBJECTIVES AND CRITERIA FOR PROTECTION OF AQUATIC LIFE AND APPLICABLE TO LAKE ONTARIO

MEDIUM:		W A T E R								
PROTECTED USE:	CAR	A Q U A T I C L I F E								
CRITERION:	CIN	NOT CATEGORIZED AS ACUTE VS CHRONIC		ACUTE TOXICITY		CHRONIC TOXICITY		BIOACCUMULATION		FOOD TAINT
AGENCY:		MOE	LJC	EPA	NYSDEC	EPA	NYSDEC	NYSDEC	LJC	NYSDEC
COMPOUND / UNITS:	?	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
ALUMINUM							100			
ALDRIN	Y			3						
ALDRIN + DIELDRIN	Y	0.001						0.001		
ARSENIC	Y						190 e			
ARSENIC (TRI)				360		190				
ARSENIC (PENT)				850		48				
BENZENE	Y			5300 a				6 f		
BENZIDINE	Y	*		2500 a			0.1 e			
BERYLLIUM	Y			130 a		5.3 a	1100 b,e			
CADMIUM	N	0.2	0.2 Daphnid repro a	3.9 b		1.1 b	1.13 b,e			
CHLORDANE	Y	0.06	0.06 Fathead lethality a	2.4		0.0043		0.002 f		
CHLORINATED BENZENES	Y			250 a		50 a	5			50
DICHLOROBENZENE	N			1120 a		763 a	5			50
1,2		2.5								
1,3		2.5								
1,4		4								
TRICHLOROBENZENE							5			50
1,2,3		0.9								
1,2,4		0.5								
1,3,5		0.65								
PENTACHLOROBENZENE	N	0.03								
CHROMIUM		100					207 h,e			
CHROMIUM (HEX)	N			16		11	11 e			
CHROMIUM (TRI)	N			1700 b		210 b				
COPPER	N	5	5 Fish reproduction a	18 b		12 b	12 b,e			
CYANIDE	N	5	5 Fish behavior	22		5.2	5.2 e			
DDT	Y	0.003		1.1		0.001	0.001 e		0.003	
DEMETON	N					0.1	0.1			
DIAZINON		0.08	0.003 Invert lethality (mean)				0.08			
			0.1 Invert lethal (1/30 days)							
DICHLOROETHANE 1,2	Y			118000 a		20000 a				
DICHLOROPHENOL 2,4	N	0.2		2020 a		365 a				
DIELDRIN	Y			2.5		0.0019	0.001 e			
DIOXIN (2378-TCDD)	Y			0.01 a		0.00001 a		0.000001		
ENDOSULFAN	N	0.003		0.22		0.056	0.009 e			
ENDRIN	N	0.002	0.002 Stonefly lethality a	0.18		0.0023	0.002 e			
GUTHION	N	0.005	0.005 Invert lethality a			0.01				
HEPTACHLOR	N	0.001	0.001 Stonefly lethality a	0.52		0.0038	0.001 e			
HEXACHLOROBUTADIENE	Y			90 a	10	9.3 a	1			
HEXACHLOROCYCLOPENTADIENE	N			7 a	4.5	5.2 a	0.45			
IRON	N	300	300 Algae toxicity a		300	1000	300			
LEAD	N	2-25	5 Neurotox tocut	82 b		3.2 b	3.2 b,e			
LINDANE	Y	0.01	0.01 Stonefly lethality a	2		0.08				
MALATHION	N	0.1				0.1	0.1 e			
MANGANESE	N									
MERCURY	N	0.2	0.2 Fish reproduction a	2.4		0.012	0.2 e,f			
METHOXYCHLOR	N	0.04	0.04 Invert effects a			0.03	0.03 e			
MIREX	N		0.005 Crustacean lethality			0.001	0.001 e			

TABLE 3. CONTINUED

EXISTING WATER QUALITY STANDARDS, OBJECTIVES AND CRITERIA FOR PROTECTION OF AQUATIC LIFE AND APPLICABLE TO LAKE ONTARIO

MEDIUM:		W A T E R								
PROTECTED USE:	CAR	A Q U A T I C L I F E								
CRITERION:	C	ACUTE VS CHRONIC NOT SPECIFIED		ACUTE TOXICITY		CHRONIC TOXICITY		BIOACCUMULATION		FOOD TAINT
AGENCY:	I	MOE	LJC	EPA	NYSDEC	EPA	NYSDEC	NYSDEC	LJC	NYSDEC
COMPOUND / UNITS:	N ?	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
PENTACHLOROPHENOL	N			2300 a		620 a				
NICKEL	N	25	25 Daphnid reprod m	1400 b		160 b	96 e			
PARATHION	N	0.008	0.008 Invert lethality m	0.065		0.013	0.008			
PCB	Y	0		2		0.014	0.001 e			
PHENOL/CHLORINATED	N	0.5	0.4 Fish growth	20 d		13 d	0.4			
SELENIUM	N	100	1 Fish survival (assays)	260		35	1			
SILVER	N		0.1 Fish development	4.1 b		0.12	0.1			
HYDROGEN SULFIDE	N		2 Fish development m			2	2			
THALLIUM	N			1400 a	20	40 a	8			
TOXAPHENE	Y	0.008	0.008 Trout reprod m	0.73		0.0002	0.005 e			
VINYL CHLORIDE	Y									
ZINC	N	30	30 Fish reproduction m	120 b		110 b	30			

NOTES:

a Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observed Effect Level.
b Hardness dependent criteria. Value presented is based on 100 mg/l.
d pH dependent criteria. Value presented is based on pH 7.8.
e Value based on EPA published criterion.
f Value provisional is guidance value only.
m Accepted and incorporated into amended GLWQA, 1987.
s NYSDEC value for chlorobenzene.

SOURCES OF INFORMATION:

MOE Wells, David L. March 15, 1987. Ontario Ministry of the Environment Aquatic Contaminant Regulatory Tools. OMOE, Water Resources Branch.

IJC 1987 IJC Science Advisory Board Report. Table 2. Great Lakes Water Quality Agreement Specific Objectives - Basis, Reference and Status.

EPA Water Quality Criteria. Water Quality Criteria Summary. January 2, 1987. U.S. EPA, Office of Regulations and Standards, Washington, D.C.

NYSDEC Ambient Water Quality Standards and Guidance Values. Division of Water Technical and Operational Guidance Series (1.1.1). New York State Department of Environmental Conservation.

TABLE 4.

EXISTING AND PROPOSED STANDARDS, OBJECTIVES AND ACTION LEVELS FOR FISH TISSUE APPLICABLE TO LAKE ONTARIO

MEDIUM:		FISH TISSUE								
PROTECTED USE:		HUMAN HEALTH			AQUATIC LIFE: FISH HEALTH	AQUATIC LIFE: BIRDS & MAMMALS				QUANTIFICATION LIMIT
EXPOSURE ROUTE:	CARCINI?	FISH CONSUMPTION				FISH CONSUMPTION BY BIRDS & MAMMALS				
CRITERION:						NON-CARCINOGENIC		1/100 CANCER RISK		
AGENCY:		MOE	LJC	FDA	LJC	NYSDEC	LJC	NYSDEC		LJC
COMPOUND / UNITS:		ppm	ppm	ppm	ppm	ppm	ppm	ppm		ppm
		EDIBLE PORTION			WHOLE FISH	WHOLE FISH		WHOLE FISH		
ALDRIN + DIELDRIN	Y		0.3 a			0.12		0.022		
ALDRIN				0.3						
DIELDRIN				0.3						
ARSENIC					1 Potential fish tumors					
BENZO(A)PYRENE										
PAH						0.5		0.57		
CHLORDANE	Y	0.3		0.3		1.3				
TRICHLOROBENZENE						0.2	1 Bird eggshell thinning	0.27		
DDT	Y	5		5		0.000003		.0000023		0.00001
DIOXIN (2378-TCDD)	Y	0.00002		0.00005		0.025				
ENDRIN	N		0.3 a			0.2		0.21		
HEPTACHLOR	Y		0.3 a	0.3		0.33		0.2		
HEXACHLOROBENZENE	Y					1.3		4.5		
HEXACHLOROBUTADIENE	Y					0.1		0.51		
HEXACHLORCYHEX						14.1				
HEXACHLOROETHANE										
LEAD	N	1								
LINDANE	Y		0.3 a				0.5 Bird behavior			
MERCURY	N	0.5		1		0.33		0.37		
MIREX	N	0.1		0.1		0.02				
OCTACHLOROSTYRENE						0.11	0.1 Mink reproduction	0.11		
PCB	Y	2		2		2				
PENTACHLOROPHENOL	N				3 Fish survival					
SELENIUM	N									
TOXAPHENE				5						

NOTES:

a Accepted and incorporated into amended GLWQA, 1987.

SOURCES OF INFORMATION:

MOE Wells, David L. March 15, 1987. Ontario Ministry of the Environment Aquatic Contaminant Regulatory Tools. MOE, Water Resources Branch.

LJC 1987 LJC Science Advisory Board Report. Table 2. Great Lakes Water Quality Agreement Specific Objectives - Basis, Reference and Status.

FDA FDA Action Levels

NYSDEC Newell, Arthur J., David W. Johnson, and Laurie K. Allen. July 1987. Niagara River Biota Contaminant Project: Fish Flesh Criteria for Piscivorous Wildlife.

TABLE 5.

EXISTING GUIDELINES, STANDARDS AND OBJECTIVES FOR SEDIMENTS APPLICABLE TO LAKE ONTARIO

MEDIUM:		SEDIMENT			
CRITERION:	CARC	DREDGING			FISH HEALTH
AGENCY:	CIN	MOE	EPA #	IJC *	IJC
COMPOUND / UNITS:	?	ppm	ppm	ppm	ppm
ARSENIC	Y	8	3	3.3	
BARIUM	N		20		
BENZO(A)PYRENE					1 Fish tumors
CADMIUM	N	1	6	2.5	
CHROMIUM		25	25	48	
COPPER	N	25	25	50	
CYANIDE	N	0.1	0.1		
IRON	N	10000	17000		
LEAD	N	50	40	106	
MANGANESE	N		300		
MERCURY	N	0.3	1	0.65	
NICKEL	N	25	20	52	
PCB	Y	0.05	1	0.077-0.089	
SELENIUM	N			1	5 Fish survival - ecosystem effects
ZINC	N	100	90	192	

NOTES:

Lower end of concentration range designated as "moderately polluted" except for cadmium, which is lower end of "heavily polluted" range.

* Average concentrations (dry weight) of surficial constituents in Lake Ontario

SOURCES OF INFORMATION:

MOE Wells, David L. March 15, 1987. Ontario Ministry of the Environment Aquatic Contaminant Regulatory Tools. OMOE, Water Resources Branch.

EPA Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments. April, 1977. U.S. Environmental Protection Agency, Region V, Chicago, Illinois.

IJC - Dredging International Joint Commission. 1982. Guidelines and Register for Evaluation of Great Lakes Dredging Projects. Report of the Dredging Subcommittee to the Water Quality Programs Committee of the Great Lakes Water Quality Board.

IJC - Fish Health 1987 IJC Science Advisory Board Report. Table 2. Great Lakes Water Quality Agreement Specific Objectives - Basis Reference and Status.

TABLE 6.

EXISTING AND PROPOSED WATER QUALITY CRITERIA, STANDARDS, GUIDELINES OR OBJECTIVES WHICH PROTECT THE MOST SENSITIVE USE (MOST STRINGENT CRITERION)

	CARC	CRITERIA ug/l		AGENCY	PROTECTED USE (AQUATIC OR HUMAN HEALTH)
ALUMINUM		100		NYSDEC	AQ
ACRYLONITRILE	Y	0.058	c	EPA	HH
ALDRIN	Y	0.000074	c	EPA	HH
ANTIMONY	N	3	f	NYSDEC	HH
ARSENIC	Y	0.0022	c	EPA	HH
BARIUM	N	1000	i	NYSDEC; EPA	HH
BENZENE	Y	0.66	c	EPA	HH
BENZIDINE	Y	0.00012	c	EPA	HH
BENZO(A)PYRENE		0.002	f	NYSDEC	HH
BERYLLIUM	Y	0.0068	c	EPA	HH
CADMIUM	N	0.2	m	MOE; IJC	AQ
CARBON TETRACHLORIDE	Y	0.4	c,f	NYSDEC; EPA	HH
CHLORDANE	Y	0.00046	c	EPA	HH
CHLORINATED BENZENES*	Y	5		NYSDEC	AQ
CHLOROFORM	Y	0.19	c	EPA	HH
CHROMIUM	N	2		DOE	AQ
CHROMIUM (HEX)	N	11	e	NYSDEC; EPA	AQ
CHROMIUM (TRI)	N	210	b	EPA	AQ
COPPER	N	2		DOE	AQ
CYANIDE	N	5		MOE; IJC	AQ
DDT	Y	0.000024	c	EPA	HH
DEMETON	N	0.1		NYSDEC; EPA	AQ
DIAZINON		0.08		MOE;NYSDEC	AQ
		0.003		IJC	AQ (Mean)
DIBUTYL PHTHALATE	N	35000		EPA	HH
		50	f,h	NYSDEC	Ind organic
DICHLOROBENZENE	N	5		NYSDEC	AQ
1,2		2.5		MOE	AQ
1,3		2.5		MOE	AQ
1,4		4		MOE	AQ
DICHLOROETHANE 1,2	Y	0.8		NYSDEC	HH
DICHLOROPHENOL 2,4	N	0.2		MOE	AQ
DIELDRIN	Y	0.000071	c	EPA	HH
DIETHYL PHTHALATE	N	350000		EPA	HH
		50	f,h	NYSDEC	HH
DIMETHYL PHTHALATE	N	313000		EPA	HH
		50	f,h	NYSDEC	HH
DIOXIN (2378-TCDD)	Y	1.3 E -8	c	EPA	HH
DIPHENYLHYDRAZINE	N	0.042	c	EPA	HH
ENDOSULFAN	N	0.003		MOE	AQ
ENDRIN	N	0.002	m	MOE; IJC ;EPA	AQ
ETHYLBENZENE	N	1400		EPA	HH
	N	50		NYSDEC	Ind organic
FLUORANTHENE	N	42		EPA	HH
GUTHION	N	0.005	m	MOE; IJC	AQ
HEPTACHLOR	Y	0.00028	c	EPA	HH
HEXACHLORCYHEX		0.02	f	NYSDEC	HH
TECH	Y	0.0123	c	EPA	HH
ALPHA	Y	0.0092	c	EPA	HH
BETA	Y	0.0163	c	EPA	HH

TABLE 6. CONTINUED

HEXACHLORCYPENTDIENE	N	0.45		NYSDEC	AQ
HEXACHLOROBENZENE	Y	0.00072	c	EPA	HH
HEXACHLOROBUTADIENE	Y	0.45	c	EPA	HH
HYDROGEN SULFIDE	N	2	m	IJC;EPA;NYSDEC	AQ
IRON	N	300	m	MOE; IJC; EPA;	NYAQ, HH
ISOPHORONE	N	5200		EPA	HH
		50	f,h	NYSDEC	Ind organic
LEAD	N	2	b	DOE	AQ
LINDANE	Y	0.01		MOE; IJC	AQ
MALATHION	N	0.1		MOE; EPA;NYSDEC	AQ
MANGANESE	N	50		EPA	HH
MERCURY	N	0.012		EPA	AQ
METHOXYCHLOR	N	0.03	e	EPA;NYSDEC	AQ
MIREX	N	0.001	e	EPA;NYSDEC	AQ
NAPHTHALENE	N	10		NYSDEC	HH Aesthetics
NICKEL	N	25	m	MOE; IJC	AQ
NITRATES	N	10000	i	NYSDEC; EPA	HH
NITROBENZENE	N	30		NYSDEC	HH Aesthetics
NITROSODIPHENYLAMINE	Y	4.9	c	EPA	HH
PARATHION	N	0.008	m	MOE;IJC;NYSDEC	AQ
PCB	Y	0.000079	c	EPA	HH
PENTACHLOROBENZENE	N	0.03		MOE	AQ
PENTACHLOROPHENOL	N	0.4		IJC;NYSDEC	AQ
PHENOL	N	1	i	NYSDEC	HH
SELENIUM	N	1		IJC;NYSDEC; DOE	AQ
SILVER	N	0.1		IJC;NYSDEC	AQ
TETRACHLOROBENZENE	N	10		NYSDEC	HH Aesthetics
TETRACHLOROETH 1122	Y	0.17	c	EPA	HH
TETRACHLOROETHYLENE	Y	0.7		NYSDEC	HH
THALLIUM	N	4	f	NYSDEC	HH
TOLUENE	N	14300		EPA	HH
		50	f,h	NYSDEC	Ind organic
TOXAPHENE	Y	0.0002		EPA	AQ
TRICHLOROBENZENE		5		NYSDEC	AQ
1,2,3		0.9		MOE	AQ
1,2,4		0.5		MOE	AQ
1,3,5		0.65		MOE	AQ
TRICHLOROETHANES					
1,1,1	N	18400		EPA	HH
		50	f,h	NYSDEC	Ind organic
1,1,2	Y	0.6	c	NYSDEC; EPA	HH
TRICHLOROETHYLENE	Y	2.7	c	EPA	HH
VINYL CHLORIDE	Y	0.3	f	NYSDEC	HH
ZINC	N	30	m	MOE; IJC;NYSDEC	AQ

NOTES:

a Insufficient data to develop criteria. Value presented is the LOEL - Lowest Observable Effect Level.
b Hardness dependent criteria. Value presented is based on 100 mg/l.
c Human health criteria for carcinogens reported for 3 risk levels. Value presented is 10 -6 risk level (negligible risk).
d pH dependent criteria. Value presented is based on pH 7.8.
e Value based on EPA published criterion.
f Value presented is guidance value only.
h General organic guideline value.
i Value based on regulations for drinking water supplies or sources.
m Accepted and incorporated into amended GLWQA, 1987.
s NYSDEC value for chlorobenzene.

TABLE 7.

EXISTING AND PROPOSED CRITERIA, STANDARDS OR OBJECTIVES FOR FISH TISSUE WHICH PROTECT THE MOST SENSITIVE USE (MOST STRINGENT CRITERION)

	CARC	CRITERIA ppm	AGENCY	PROTECTED USE (AQUATIC OR HUMAN HEALTH)
ALDRIN + DIELDRIN	Y	0.022 j	NYSDEC	AQ
ALDRIN	Y	0.0000022 k	EPA	HH
DIELDREN	Y	0.00037	EPA	HH
ARSENIC	Y	0.000097	EPA	HH
BENZO(A)PYRENE		1	IJC	AQ
PAH		0.00093	EPA	HH
CHLORDANE	Y	0.0068	EPA	HH
TRICHLOROBENZENE		1.3 l	NYSDEC	AQ
DDT	Y	0.0013	EPA	HH
DIOXIN (2378-TCDD)	Y	0.00000007	EPA	HH
ENDRIN	N	0.025 l	NYSDEC	AQ
HEPTACHLOR	Y	0.0031	EPA	HH
HEXACHLOROBENZENE	Y	0.0064	EPA	HH
HEXACHLOROBUTADIENE	Y	1.3 l	NYSDEC	AQ
HEXACHLORCYHEX	Y	0.0023	EPA	HH
LEAD	N	1	MOE	HH
LINDANE	Y	0.3 m	IJC	HH
MERCURY	N	0.5 m	MOE; IJC	AQ
MIREX	N	0.1	MOE; FDA	HH
PCB	Y	0.0025	EPA	HH
PENTACHLOROPHENOL	N	2 l	NYSDEC	AQ
SELENIUM	N	3	IJC	AQ
TOXAPHENE	Y	0.0096	EPA	HH

NOTES:

j NYSDEC proposed objective based on 1/100 cancer risk to fish-eating birds and mammals.

k All EPA numbers are 10 -6 cancer risk levels (negligible risk) in edible portions of fish, corresponding to water quality criteria for 10 -6 cancer risk from fish consumption only.

l NYSDEC proposed objective based on non-carcinogenic effects on fish-eating birds and mammals.

m Accepted and incorporated into amended GLWQA, 1987.

SOURCES OF INFORMATION:

MOE Wells, David L. March 15, 1987. Ontario Ministry of the Environment Aquatic Contaminant Regulatory Tools. OMOE, Water Resources Branch.

IJC 1987 IJC Science Advisory Board Report. Table 2. Great Lakes Water Quality Agreement Specific Objectives - Basis, Reference and Status.

NYSDEC Table of proposed 'Fish Flesh Criteria, Residues and Risk for 19 Organochlorine Chemicals or Chemical Groups.'

Table 8

New York State Fish Consumption Advisories for Lake Ontario

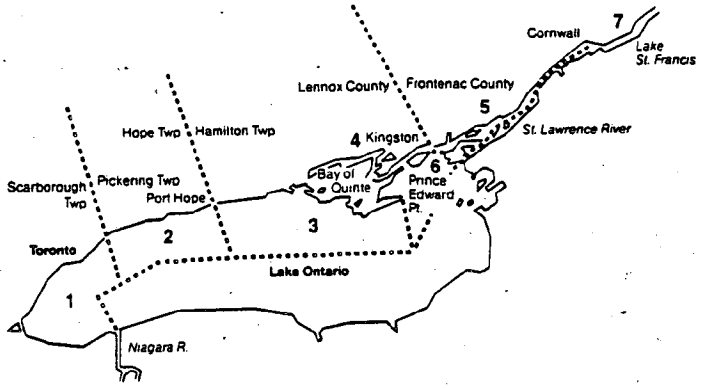
Lake Ontario

American Eel	Eat none
Channel Catfish	
Lake Trout	
Chinook Salmon	
Coho Salmon over 21"	
Rainbow Trout over 25"	
Brown Trout over 20"	
Carp	Eat no more than one meal per month
White Perch	
Smaller Coho Salmon	
Smaller Rainbow Trout	
Smaller Brown Trout	

The recommendations are based on evaluation of contaminant levels in fish and wildlife.

New York State Fishing, Small Game Hunting, Trapping Regulations Guide. 1988-1989. New York State Department of Environmental Conservation. 98 pp.

Lake Ontario
Lac Ontario



Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces)

Water Body / Cours d'eau	Fish Species / Espèces de poisson	15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (>30)
Queenston-Whirlpool *Continued/Suite*	Muskie[7] / Maskinongé[7]							◆		
	Northern Pike[3,7] / Brochet[3,7]						◆	◆	◆	◆
	White Sucker[5,8] / Meunier noir[5,8]			◆	◆	◆	◆			
	Coho[3] / Saumon coho[3]							◆	◆	◆
	Rock Bass[2,7] / Crapet de roche[2,7]	◆	◆							
	Smallmouth Bass[3,7] / Achigan à petite bouche[5,7]	◆	◆	◆	◆	◆				
	White Perch[2] / Bar-perche[2]		◆	◆	◆					
	Brown Bullhead[3] / Barbotte brune[3]			◆	◆					
	Redhorse Sucker[5] / Suceur rouge[5]			◆	◆	◆	◆			
	Rainbow Smelt[2,8] / Éperlan arc-en-ciel[2,8]	◆								
	Lake Trout[5,8] / Truite de lac[5,8]						◆	◆	◆	
	Channel Catfish[5] / Barbue de rivière[5]				◆	◆	◆	◆	◆	
	Freshwater Drum[5] / Malachigan[5]		◆	◆	◆	◆				
	White Bass[5] / Bar blanc[5]			◆	◆					
	Chinook[5] / Saumon chinook[5]						◆	◆	◆	◆
Lake Ontario #1 / Lac Ontario N° 1 **Niagara-on-the-Lake to Port Weller / Niagara-on-the-Lake à Port Weller** 4315/7910 Niagara R.M./Mun. reg. de Niagara	Lake Trout[2] / Truite de lac[2]			◆	◆	◆	◆	◆		
	Rainbow Smelt[2] / Éperlan arc-en-ciel[2]	◆								

Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces)

Water Body / Cours d'eau	Fish Species / Espèces de poisson	15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (>30)
(Upper) Niagara River / Rivière Niagara (tronçon sup.) **Fort Erie** 4254/7855 Niagara R.M./Mun. reg. de Niagara	Rainbow Smelt[2,8] / Éperlan arc-en-ciel[2,8]	◆								
	Freshwater Drum[5] / Malachigan[5]		◆	◆	◆	◆	◆			
	Yellow Perch[5] / Perchaude[5]	◆								
	Rock Bass[5] / Crapet de roche[5]	◆	◆							
	White Bass[5] / Bar blanc[5]	◆								
	Smallmouth Bass[3] / Achigan à petite bouche[5]	◆	◆	◆	◆					
	Rainbow Trout[5] / Truite arc-en-ciel[5]				◆	◆				
	Redhorse Sucker[1] / Suceur rouge[1]	◆	◆	◆	◆	◆	◆	◆		
Miller Creek/Ruisseau Miller 4256/7857 Niagara R.M./Mun. reg. de Niagara	Smallmouth Bass[5,7] / Achigan à petite bouche[5,7]	◆	◆	◆	◆	◆				
	Yellow Perch[2,7] / Perchaude[2,7]	◆	◆	◆						
	White Sucker[2,7] / Meunier noir[2,7]		◆	◆	◆	◆	◆			
	Rainbow Trout[2,7] / Truite arc-en-ciel[2,7]			◆	◆	◆				
between Fort Erie & Dufferin Island / entre Fort Erie et l'Île Dufferin 4300/7902 Niagara R.M./Mun. reg. de Niagara	Yellow Perch[5,8] / Perchaude[5,8]	◆	◆	◆						
	Rainbow Trout[5,8] / Truite arc-en-ciel[5,8]				◆	◆	◆			
	White Sucker[5,8] / Meunier noir[5,8]	◆	◆	◆						
(Lower) Niagara River / Rivière Niagara (tronçon inf.) **Queenston-Whirlpool** 4307/7904 Niagara R.M./Mun. reg. de Niagara	American Eel[5,7] / Anguille d'Amérique[5,7]						◆	◆	◆	◆
	Rainbow Trout[5,7,8] / Truite arc-en-ciel[5,7,8]			◆	◆	◆	◆	◆	◆	◆
	Yellow Perch[5,7,8] / Perchaude[5,7,8]	◆	◆	◆	◆					
	Walleye[7] / Doré[7]						◆			

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Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces)

Water Body / Cours d'eau	Fish Species / Espèces de poisson	15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (>30)
Jordan Harbour to Port Weller / Du havre Jordan à Port Weller 4312/7919 Niagara R.M./Mun. reg. de Niagara	Brown Trout[5,7,8] / Truite brune[5,7,8]					◆	◆	◆	◆	◆
	White Bass[2,7,8] / Bar blanc[2,7,8]		◆	◆	◆	◆				
	Brown Bullhead[2,8] / Barbotte brune[2,8]	◆	◆	◆	◆	◆				
	Gizzard Shad[2] / Alose à gésier[2]				◆	◆				
	Yellow Perch[2] / Perchaude[2]	◆	◆	◆	◆					
	Channel Catfish[2,8] / Barbue de rivière[2,8]			◆	◆	◆	◆	◆	◆	
	Coho[2,7,8] / Saumon coho[2,7,8]			◆	◆	◆	◆	◆		
	Lake Trout[2,7,8] / Truite de lac[2,7,8]					◆	◆	◆	◆	
	Rainbow Trout[2,7,8] / Truite arc-en-ciel[2,7,8]				◆	◆	◆	◆	◆	◆
	Freshwater Drum[2,8] / Malachigan[2,8]		◆	◆	◆	◆	◆			
	Carp[2,8] / Carpe[2,8]					◆	◆	◆	◆	◆
	Northern Pike[2,8] / Brochet[2,8]					◆	◆	◆	◆	
	Rainbow Smelt[5,8] / Éperlan arc-en-ciel[5,8]	◆								
	White Perch[2,8] / Bar-perche[2,8]	◆	◆							
Burlington Bay, Hamilton Harbour / Baie Burlington, Port d'Hamilton 4317/7950 Hamilton-Wentworth R.M. Mun. reg. d'Hamilton-Wentworth	Rainbow Smelt[5] / Éperlan arc-en-ciel[5]	◆								
	White Perch[5,8] / Bar-perche[5,8]	◆	◆	◆	◆					
	Brown Bullhead[5] / Barbotte brune[5]	◆	◆	◆	◆	◆				
	Carp[5] / Carpe[5]		◆	◆	◆	◆	◆	◆	◆	◆
	Northern Pike[5] / Brochet[5]						◆	◆	◆	
	Black Crappie[5] / Marigane noire[5]	◆	◆	◆	◆					

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Water Body / Cours d'eau	Fish Species / Espèces de poisson	Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces) 15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (> 30)
Burlington Bay, Hamilton Harbour / Baie Burlington, Port d'Hamilton *Continued/Suite*	White Sucker[5] / Meunier noir[5]									
	Yellow Perch[5] / Perchaude[5]									
	White Bass[5] / Bar blanc[5]									
	Channel Catfish[5] / Barbue de rivière[5]									
	Brown Trout[5,8] / Truite brune[5,8]									
	Freshwater Drum[5] / Malachigan[5]									
Burlington Beach / Plage Burlington 4318/7948 Hamilton-Wentworth R.M. Mun. reg. d'Hamilton-Wentworth	Rainbow Smelt[2] / Éperlan arc-en-ciel[2]									
Lake Ontario #1 / Lac Ontario N° 1 **Bronte Creek/Ruisseau Bronte** 4324/7943 Halton R.M./Mun. reg. d'Halton	Chinook[2,7,8] / Saumon chinook[2,7,8]									
	Rainbow Smelt[5,8] / Éperlan arc-en-ciel[5,8]									
	Coho[2,7,8] / Saumon coho[2,7,8]									
	Rainbow Trout[2,8] / Truite arc-en-ciel[2,8]									
	Brown Trout[2] / Truite brune[2]									
Credit River/Rivière Credit 4333/7935 Peel R.M./Mun. reg. de Peel	Chinook[5,7,8] / Saumon chinook[5,7,8]									
	White Sucker[3] / Meunier noir[3]									
	Coho[5,7,8] / Saumon coho[5,7,8]									
	White Bass[2] / Bar blanc[2]									
	Rainbow Trout[5,8] / Truite arc-en-ciel[5,8]									
	Lake Trout[6,7,8] / Truite de lac[6,7,8]									
	Brown Trout[5,8] / Truite brune[5,8]									
Marie Curtis Park / Parc Marie Curtis 4334/7934 Etobicoke	White Sucker[2] / Meunier noir[2]									
Long Branch 4335/7932 Toronto	White Sucker[2] / Meunier noir[2]									
	Lake Trout[2] / Truite de lac[2]									
Humber River mouth / Embouchure de la rivière Humber 4338/7928 Toronto	Brown Trout[2] / Truite brune[2]									
Humber Bay area / Région de la baie Humber 4337/7927 Toronto	Rainbow Smelt[5,7] / Éperlan arc-en-ciel[5,7]									
	Lake Trout[2,7] / Truite de lac[2,7]									
	White Sucker[5,7] / Meunier noir[5,7]									
	Rainbow Trout[2,7] / Truite arc-en-ciel[2,7]									
Hearn Generating Station - Outer Harbour / Centrale électrique Hearn - Port extérieur 4339/7920 Toronto	Carp[2] / Carpe[2]									
	White Bass[5] / Bar blanc[5]									
	White Perch[5] / Bar-perche[5]									
	Yellow Perch[5] / Perchaude[5]									
	Rainbow Trout[5] / Truite arc-en-ciel[5]									
	Brown Trout[5] / Truite brune[5]									
	Gizzard Shad[5] / Alose à gésier[5]									
	Northern Pike[5] / Brochet[5]									
	Rainbow Smelt[5,7] / Éperlan arc-en-ciel[5,7]									
	Walleye[2,8] / Doré[2,8]									
Oshawa area / Région d'Oshawa 4350/7849 Durham R.M./Mun. reg. de Durham	Rainbow Trout[2,8] / Truite arc-en-ciel[2,8]									
	Coho[2] / Saumon coho[2]									
	Chinook[2] / Saumon chinook[2]									
Wilmot Creek/Ruisseau Wilmot 4354/7836 Durham R.M./Mun. reg. de Durham	Rainbow Smelt[5] / Éperlan arc-en-ciel[5]									
Ganaraska River / Rivière Ganaraska **Port Hope** 4357/7818 Hope Twp./Canton d'Hope Northumberland Co. Cté de Northumberland	Rainbow Smelt[5] / Éperlan arc-en-ciel[5]									
	Rainbow Trout[5,7,8] / Truite arc-en-ciel[5,7,8]									
	Brown Trout[5,8] / Truite brune[5,8]									
Lake Ontario #3 / Lac Ontario N° 3 **Gage Creek/Ruisseau Gage** 4357/7816 Hope Twp./Canton d'Hope Northumberland Co. Cté de Northumberland	Rainbow Smelt[2,8] / Éperlan arc-en-ciel[2,8]									
Presquile Point / Pointe Presquile 4400/7741 Brighton Twp./Canton de Brighton Northumberland Co. Cté de Northumberland	Walleye[2,8] / Doré[2,8]									
Presquile Bay/Baie Presquile 4401/7742 Northumberland Co. Cté de Northumberland	Largemouth Bass[2] / Achigan à grande bouche[2]									
	Yellow Perch[2] / Perchaude[2]									
Salmon Point/Pointe Salmon 4351/7715 Athol Twp./Canton d'Athol Prince Edward Co./Cté de Prince Edward	American Eel[2] / Anguille d'Amérique[2]									
Gravelly Bay/Baie Gravelly 4355/7657 Prince Edward Co./Cté de Prince Edward	Walleye[5,8] / Doré[5,8]									

Water Body / Cours d'eau	Fish Species / Espèces de poisson	Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces) 15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (>30)
Lake Ontario #4 **Lac Ontario N° 4** **Bay of Quinte/Baie de Quinte** **General/Général** 4409/7723 Hastings & Prince Edward Cos Cités d'Hastings et de Prince Edward	Walleye[2] Doré[2]				◁	◁	◁	◁	◁	◁
	Northern Pike[2] Brochet[2]						◁	◁	◁	◁
	Largemouth Bass[2] Achigan à grande bouche[2]		◁	◁	◁	◁	◁	◁		
	Brown Bullhead[2] Barbotte brune[2]			◁	◁	◁	◁	◁		
	American Eel[2] Anguille d'Amérique[2]						◁	◁	◁	◁
	Channel Catfish[2] Barbue de rivière[2]		◁	◁	◁	◁	◁	◁		
	White Bass[5] Bar blanc[5]	◁	◁	◁						
	Smallmouth Bass[6] Achigan à petite bouche[6]	◁	◁	◁	◁	◁				
Bay of Quinte/Baie de Quinte **Trent River mouth** **Embouchure de la rivière Trent** 4406/7734 Sydney Twp./Canton de Sidney Hastings Co./Cté d'Hastings	Walleye[5,8] Doré[5,8]			◁	◁	◁	◁	◁	◁	
	Yellow Perch[2,8] Perchaude[2,8]	◁	◁							
	Smallmouth Bass[2,8] Achigan à petite bouche[2,8]		◁	◁	◁	◁				
Bay of Quinte/Baie de Quinte **Trenton to Belleville** **De Trenton à Belleville** 4410/7725 Hastings & Prince Edward Cos. Cités d'Hastings et de Prince Edward	Walleye[2] Doré[2]				◁	◁	◁	◁	◁	
	Yellow Perch[1] Perchaude[1]	◁								
Bay of Quinte/Baie de Quinte **Belleville, Telegraph Narrows, Long Reach** **Belleville, détroits Telegraph, tronçon Long** 4410/7705 Hastings & Prince Edward Cos. Cités d'Hastings et de Prince Edward	Walleye[2] Doré[2]				◁	◁	◁			
	Largemouth Bass[2] Achigan à grande bouche[2]			◁	◁	◁				
	Carp[2] Carpe[2]							◁	◁	◁
Bay of Quinte/Baie de Quinte **Hay Bay/Baie Hay** 4410/7656 Lennox & Addington Co. Cté de Lennox et d'Addington	White Perch[2,7] Bar-perche[2,7]	◁	◁	◁	◁					
	Yellow Perch[2,7] Perchaude[2,7]	◁	◁							
	Gizzard Shad[2] Alose à gésier[2]				◁	◁				
	Walleye[2] Doré[2]			◁	◁	◁	◁	◁	◁	◁
	Northern Pike[2] Brochet[2]							◁	◁	◁
Keith Shoal, Adolphus Reach **Banc Keith, tronçon Adolphus** 4402/7659 N. Marysburgh Twp. Canton de N. Marysburgh Prince Edward Co./Cté de Prince Edward	Walleye[5,8] Doré[5,8]				◁	◁	◁	◁	◁	
Picton Bay/Baie Picton 4402/7707 Prince Edward Co./Cté de Prince Edward	Rainbow Smelt[3] Éperlan arc-en-ciel[3]	◁								
Bay of Quinte, Glenora to Upper Gap **Baie de Quinte, de Glenora à Upper Gap** 4403/7657 N. Marysburg Twp Canton de N. Marysburg Prince Edward Co./Cté de Prince Edward	American Eel[2] Anguille d'Amérique[2]							◁	◁	◁
	Whitefish[2] Grand corégone[2]					◁	◁			
Lake Ontario #6 **Lac Ontario N° 6** **Prince Edward Bay, Long Point** **Baie Prince Edward, Pointe Long** 4357/7657 S. Marysburg Twp. Canton de S. Marysburg Prince Edward Co./Cté de Prince Edward	American Eel[2] Anguille d'Amérique[2]						◁	◁	◁	◁
Nearshore, North Channel **Près de la rive, chenal nord** 4412/7644	Walleye[2] Doré[2]						◁	◁	◁	
	Yellow Perch[2] Perchaude[2]		◁	◁						
	Northern Pike[2] Brochet[2]								◁	◁
	Smallmouth Bass[2] Achigan à petite bouche[2]			◁	◁	◁	◁			
	Chinook[2,8] Saumon chinook[2,8]							◁	◁	◁
	Brown Trout[2,8] Truite brune[2,8]					◁	◁	◁	◁	
Main Duck Island **Île Main Duck** 4356/7537 Prince Edward Co. Cté de Prince Edward	American Eel[2,8] Anguille d'Amérique[2,8]						◁	◁	◁	◁
	Lake Trout[2,8] Truite de lac[2,8]					◁	◁	◁	◁	◁
Lower Gap 4410/7635 Frontenac & Lennox & Addington Cos. Cités de Frontenac, et de Lennox et d'Addington	Whitefish[2,8] Grand corégone[2,8]						◁	◁	◁	
	Yellow Perch[2] Perchaude[2]	◁	◁	◁						
	Walleye[2] Doré[2]					◁	◁			
	Northern Pike[1] Brochet[1]							◁	◁	◁
	Rainbow Smelt[1] Éperlan arc-en-ciel[1]	◁	◁							
Reeds Bay/Baie Reeds 4408/7628 Wolfe Island Twp./Canton de Wolfe Island Frontenac Co./Cté de Frontenac	American Eel[3,7] Anguille d'Amérique[3,7]								◁	◁
St. Lawrence River **Fleuve Saint-Laurent** **Lake Ontario #6** **Lac Ontario N° 6** **Traverse Shoal and Amherst Island area** **Haut-fond Traverse et environs de l'Île Amherst** 4403/7645 Prince Edward & Lennox & Addington Cos. Cités de Prince Edward et de Lennox et d'Addington	Rainbow Smelt[3] Éperlan arc-en-ciel[3]	◁								
Lake Ontario #5 **Lac Ontario N° 5** **Landon's Bay/Baie Landon** 4421/7804 Leeds Co./Cté de Leeds	Channel Catfish[3] Barbue de rivière[3]						◁	◁	◁	
	Smallmouth Bass[2,8] Achigan à petite bouche[2,8]		◁	◁	◁	◁				
	Northern Pike[4] Brochet[5]						◁	◁	◁	◁
	Brown Bullhead[6] Barbotte brune[6]	◁	◁	◁	◁					
Grenadier Island area **Environs de l'Île Grenadier** 4424/7552 Leeds Co./Cté de Leeds	Northern Pike[5,8] Brochet[5,8]						◁	◁	◁	◁
	White Sucker[5,8] Meunier noir[5,8]						◁	◁		
	Smallmouth Bass[5,8] Achigan à petite bouche[5,8]				◁	◁	◁			
	Brown Bullhead[2] Barbotte brune[2]		◁	◁						
Lily Bay/Baie Lily 4434/7544 Elizabethtown Twp. Canton d'Elizabethtown Leeds Co./Cté de Leeds	Yellow Perch[5,8] Perchaude[5,8]	◁	◁	◁						
	Northern Pike[5,8] Brochet[5,8]						◁	◁	◁	◁
	Smallmouth Bass[5,8] Achigan à petite bouche[5,8]		◁	◁	◁	◁				
	White Sucker[5,8] Meunier noir[5,8]			◁	◁	◁	◁			
	Brown Bullhead[5,8] Barbotte brune[5,8]		◁	◁	◁					
	Carp[5,8] Carpe[5,8]							◁	◁	◁
	Pumpkinseed[1] Crapet-soleil[1]	◁								
Blue Church Bay, Maitland **Baie Blue Church, Maitland** 4438/7537 Augusta Twp./Canton d'Augusta Grenville Co./Cté de Grenville	Northern Pike[5,8] Brochet[5,8]						◁	◁	◁	◁
	White Sucker[5,8] Meunier noir[5,8]						◁	◁	◁	
	Smallmouth Bass[5,8] Achigan à petite bouche[5,8]			◁	◁	◁				
	Yellow Perch[5,8] Perchaude[5,8]	◁	◁	◁						
	Carp[5,8] Carpe[5,8]							◁	◁	◁
	Brown Bullhead[5,8] Barbotte brune[5,8]		◁	◁	◁	◁				

Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces)
15-20 (6-8) 20-25 (8-10) 25-30 (10-12) 30-35 (12-14) 35-45 (14-18) 45-55 (18-22) 55-65 (22-26) 65-75 (26-30) > 75 (>30)

Water Body / Cours d'eau	Fish Species / Espèces de poisson	Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces) 15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (>30)
Johnstown 4444/7528 Edwardsburgh Twp Canton d'Edwardsburgh Grenville Co./Cte de Grenville	White Sucker[5,8] Meunier noir[5,8]					●	●			
	Northern Pike[5,8] Brochet[5,8]					●	●	●	●	
	Brown Bullhead[5,8] Barbotte brune[5,8]		●	●	●	●				
	Yellow Perch[5,8] Perchaude[5,8]	●	●	●	●					
	Carp[5,8] Carpe[5,8]							●	●	●
	Pumpkinseed[1] Crapet-soleil[1]	●	●							
Iroquois below dam **Iroquois en bas du barrage** 4450/7519 Matilda Twp./Canton de Matilda Dundas Co./Cte de Dundas	Yellow Perch[2] Perchaude[2]	●								
	Northern Pike[2] Brochet[2]					●	●	●	●	●
	Brown Bullhead[2] Barbotte brune[2]	●	●							
	Carp[4] Carpe[4]					●	●	●		
	Black Crappie[2] Marigane noire[2]	●	●	●						
	White Sucker[2] Meunier noir[2]	●	●	●	●	●				
Morrisburg 4454/7511 Williamsburg Twp. Canton de Williamsburg Dundas Co./Cte de Dundas	Northern Pike[2] Brochet[2]				●	●	●	●	●	●
	White Sucker[2] Meunier noir[2]			●	●	●	●	●		
	Black Crappie[2] Marigane noire[2]	●	●	●	●					
	White Perch[2] Bar-perche[2]	●	●	●	●					
	Yellow Perch[2] Perchaude[2]	●	●	●	●					
	Brown Bullhead[2] Barbotte brune[2]	●	●	●	●					
	American Eel[2] Anguille d'Amérique[2]								●	●
	Carp[2] Carpe[2]						●	●		
Upper Canada Migratory Bird Sanctuary **Sanctuaire d'oiseaux Upper Canada** 4457/7504 Williamsburgh Twp. Canton de Williamsburgh Dundas Co./Cte de Dundas	Northern Pike[5,8] Brochet[5,8]						●	●	●	●
	White Sucker[6] Meunier noir[6]		●	●	●	●	●			
	Smallmouth Bass[5,8] Achigan à petite bouche[5,8]		●	●	●	●				
	Yellow Perch[6] Perchaude[6]	●	●	●	●	●				
	Brown Bullhead[6] Barbotte brune[6]	●	●	●	●					
	Walleye[5,8] Doré[5,8]			●	●	●	●	●		
Lake St. Lawrence **Lac St. Laurent** 4456/7504 Osnabruck Twp./Canton d'Osnabruck Stormont Co./Cte de Stormont	Northern Pike[5,8] Brochet[5,8]				●	●	●	●	●	●
	Yellow Perch[5,8] Perchaude[5,8]	●	●	●						
	Smallmouth Bass[5,8] Achigan à petite bouche[5,8]	●	●	●	●	●	●			
	Walleye[5,8] Doré[5,8]				●	●	●	●		
	White Sucker[5,8] Meunier noir[5,8]			●	●	●				
	Brown Bullhead[1] Barbotte brune[1]	●	●	●						
Lake Ontario #7 **Lac Ontario N° 7** **Cornwall Island/Île Cornwall** 4500/7445 Stormont Co./Cte de Stormont	Brown Bullhead[2,8] Barbotte brune[2,8]	●	●	●						
	Yellow Perch[2,8] Perchaude[2,8]	●	●	●						
	Northern Pike[2,8] Brochet[2,8]				●	●	●	●	●	
	Black Crappie[2] Marigane noire[2]	●								
	Walleye[1] Doré[1]				●	●	●			

Water Body / Cours d'eau	Fish Species / Espèces de poisson	Fish size in centimetres (inches) / Longueur du poisson en centimètres (pouces) 15-20 (6-8)	20-25 (8-10)	25-30 (10-12)	30-35 (12-14)	35-45 (14-18)	45-55 (18-22)	55-65 (22-26)	65-75 (26-30)	> 75 (>30)
Île Saint Régis 4501/7438 Stormont Co./Cte de Stormont	Brown Bullhead[2,8] Barbotte brune[2,8]		●	●	●					
	Northern Pike[2,8] Brochet[2,8]				●	●	●	●	●	
	Channel Catfish[2,8] Barbue de rivière[2,8]					●	●	●	●	
	Redhorse Sucker[2,8] Suceur rouge[2,8]				●	●	●			
	Yellow Perch[2,8] Perchaude[2,8]	●	●							
	Walleye[2,8] Doré[2,8]				●	●	●	●		
Raisin River/Rivière Raisin 4508/7430 Glengarry Co./Cte de Glengarry	Walleye[2] Doré[2]				●	●	●	●		
Lake St. Francis **Lac St. François** 4508/7425 Glengarry Co./Cte de Glengarry	Walleye[5,8] Doré[5,8]				●	●	●	●	●	●
	Northern Pike[5,8] Brochet[5,8]			●	●	●	●	●	●	●
	Yellow Perch[5,8] Perchaude[5,8]	●	●	●	●					
	Sturgeon[2] Esturgeon de lac[2]						●	●	●	●
	Channel Catfish[2] Barbue de rivière[2]				●	●	●	●		
	White Sucker[2] Meunier noir[2]				●	●	●	●		
	Pumpkinseed[2] Crapet-soleil[2]	●								
	Brown Bullhead[2] Barbotte brune[2]		●	●	●					
	Smallmouth Bass[5,8] Achigan à petite bouche[5,8]			●	●	●	●			

Table 10

Categories of Toxics

I. Ambient Data Available

A. Exceeds enforceable standard

B. Exceeds a more stringent, but unenforceable criterion

C. Equal to or less than most stringent criterion

D. Detection limit too high to allow complete categorization

E. No criterion available

II. Ambient Data Not Available

A. Evidence of presence in or input to the Lake

B. No evidence of presence in or input to the Lake

Table 11

Categorization of Toxics Based on Ambient Data
(Category I Toxics)

Chemical	Fish Tissue	Water Column	Summary
PCBs*	A	A	A(FT, WC)
dioxin* (2,3,7,8-TCDD)	A	D	A(FT)
chlordane	A	C	A(FT)
mirex* (mirex + photomirex)	A	NI	A(FT)
mercury*	A	NI	A(FT)
iron	NI	A	A(WC)
aluminum	NI	A	A(WC)
DDT + metabolites*	B	B	B(FT, WC)
octachlorostyrene	B	NI	B(FT)
hexachlorobenzene*	B	B	B(FT, WC)
dieldrin*	B	B	B(FT, WC)
hexachlorocyclo-hexanes (including (lindane + alpha-BHC)	C	C	C(FT, WC)
heptachlor/ heptachlor epoxide	C	C	C(FT, WC)
aldrin	C	NI	C(FT)
endrin	C	C	C(FT, WC)
1,2-dichlorobenzene	NI	C	C(WC)
1,3-dichlorobenzene	NI	C	C(WC)
1,4-dichlorobenzene	NI	C	C(WC)
1,2,3-trichlorobenzene	NI	C	C(WC)
1,2,4-trichlorobenzene	NI	C	C(WC)
1,3,5-trichlorobenzene	NI	C	C(WC)
1,2,3,4-tetra-chlorobenzene	NI	C	C(WC)
copper	NI	C	C(WC)
nickel	NI	C	C(WC)
zinc	NI	C	C(WC)
chromium	NI	C	C(WC)
lead	NI	C	C(WC)
manganese	NI	C	C(WC)

toxaphene*	D	NI	D(FT)
cadmium	NI	D	D(WC)
pentachlorobenzene	E	C	E(FT)
polyfluorinated biphenyls	E	NI	E(FT)
dioxins (other than 2,3,7,8-TCDD)	E	NI	E(FT)
polychlorinated dibenzofurans*	E	NI	E(FT)
heptachlorostyrene	E	NI	E(FT)
tetrachloroanisole	E	NI	E(FT)
pentachloroanisole	E	NI	E(FT)
chlorophenyl-[chloro (trifluoromethyl) phenyl]methanone	E	NI	E(FT)
1,1'-(Difluoromethylene) bis-dichloro-mono (trifluoromethyl)- benzene	E	NI	E(FT)
pentachlorotoluenes	E	NI	E(FT)
endosulfan	E	NI	E(FT)
nonachlor (cis + trans)	E	NI	E(FT)

A - Exceeds enforceable standard
B - Exceeds a more stringent but unenforceable criterion
C - Equal to or less than most stringent criterion
D - Detection limit too high to allow complete categorization
E - No criterion available

NI- No data available after initial review by the TCW
FT- Based on fish tissue data
WC- Based on water column data
* - IJC critical pollutant

Table 12

Toxics for Which There is No Ambient Data
But for Which There is Evidence of Presence In
or Input to the Lake

(Category IIA Toxics)

halogenated alkanes

- methylene chloride
- dichloro(trifluoromethyl)-a-a-difluoro diphenyl-methane
- trichlorofluoromethane
- dichloromethane
- dichlorobromomethane
- dibromochloromethane
- trichloromethane
- 1,2-dichloropropane

halogenated alkenes

- endosulfan sulfate
- hexachlorobutadiene
- cis-1,3-dichloropropene
- trans-1,3-dichloropropene

aldehydes

- endrin aldehyde

chlorinated ethanes

- 1,1-dichloroethane
- 1,2-dichloroethane
- 1,1,1-trichlorethane
- 1,1,2-trichloroethane
- 1,1,2,2-tetrachloroethane
- hexachloroethane

chlorinated ethylenes

- 1,1-dichloroethylene
- trans-1,2-dichloroethylene
- trichloroethylene
- tetrachloroethylene

ketones

- isophorone

phthalate esters

diethyl phthalate
di-n-butyl phthalate
di-n-octyl phthalate
butylbenzyl phthalate
bis(2-ethylhexyl) phthalate
dioctyl phthalate

haloethers

4-bromophenylphenyl ether
pentachlorophenylmethyl ether
tribromoanisole
dibromochloroanisole
bromodichloroanisole

hydrocarbons

benzene

styrenes (alkenylbenzenes)

hexachlorostyrene
pentachlorostyrene

phenols

bromophenol
dibromophenol
tribromophenol
pentachlorophenol

ethers

diethyl ether

amines

benzidine
simazine
atrazine
diethylatrazine
desethylatrazine
tribromoaniline
dibromochloroaniline

nitro and nitroso compounds

nitrobenzene

polynuclear aromatic hydrocarbons

phenanthrene
anthracene
fluoranthene
pyrene
chrysene
perylene
coronene
benzo(a)pyrene*
benzo(e)pyrene
benzo(b)fluoranthene
benzo(j)fluoranthene
benzo(k)fluoranthene
benzo(b)chrysene
benz(a)anthracene
dibenz(a,h)anthracene
benzo(g,h,i)perylene
ideno(1,2,3-cd)pyrene

hydroxy compounds

tribromocresol

pesticide active ingredients

methoxychlor
2,4,5-trichlorophenoxyacetic acid

alkylbenzenes

toluene
tribromotoluene
ethylbenzene
sec-butylbenzene
n-propylbenzene

dialkylbenzenes

p-xylene
m-xylene
o-xylene

trialkylbenzenes

1,2,4-trimethylbenzene
1,3,5-trimethylbenzene

other substances

silvex
dachtal

metals

barium
antimony
beryllium
molybdenum
silver
strontium
selenium
tin
titanium
thallium

non metals

cyanide

metal containing compounds

butyltin
dibutyltin
methyltin
dimethyltin
tributyltin
alkyl-lead*

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*IJC critical pollutant

Table 13

Fish Flesh Criteria for Piscivorous Wildlife

Chemical(s)	Concentration in Fish (mg/kg)	
	Toxicity Based Criteria	Carcinogen Based Criteria
PCBs	0.11	0.11
DDT, DDE and DDD	0.2	0.27
Aldrin and dieldrin	0.12	0.022
Chlordane	0.5	0.37
2,3,7,8-TCDD	0.000003	0.0000023
Endrin	0.025	-
Heptachlor and heptachlor epoxide	0.2	0.21
Mirex	0.33	0.37
Hexachlorobenzene	0.33	0.2
Hexachlorocyclohexanes	0.1	0.51
Hexachlorobutadiene	1.3	4.5
Hexachloroethane	14	-
Octachlorostyrene	0.02	-
Trichlorobenzenes (sum)	1.33	NC
Pentachlorophenol	2.0	NC
2,3,4,6-Tetrachlorophenol	0.67	-

NC = Not carcinogenic
- = Insufficient data

From: Newell, A.J., D.W. Johnson, and L.K. Allen. 1987. Niagara River Biota Contamination Project: Fish Flesh Criteria for Piscivorous Wildlife. Tech. Rept. 87-3, Division of Fish and Wildlife, NYS Dept. of Environmental Conservation, Albany. 182 pp.

TABLE 1

OPEN LAKE SEDIMENT COMPARISON TO DREDGING GUIDELINES

MEDIUM: SEDIMENT

PARAMETER	RANGE OF VALUES	JURISDICTION MOE	EPA#	IJC*	GUIDELINES EXCEEDED
PCB	0.005 - 0.280ppm Depositional 0.001 - 3.60ppm Non-Depositional	0.05ppm	1ppm	0.077p-0.089ppm	1,2,3
CADMIUM	0.1 - 6.2ppm Depositional 0.1 - 20.6ppm Non-Depositional	1ppm	6ppm	2.5ppm	1,2,3
CHROMIUM	8.0 - 133ppm Depositional 3.7 - 500ppm Non-Depositional	25ppm	25ppm	48ppm	1,2,3
COPPER	35 - 56ppm Depostional 2.1 - 200ppm Non-Depositional	25ppm	25ppm	50ppm	1,2,3
IRON	20000 -96200ppm Depositional 2900 - 83100ppm Non-Depositional	10000ppm	17000ppm	10000ppm	1,2,3
LEAD	7 - 285ppm Depositional 1.8 - 287ppm Non-Depositional	50ppm	40ppm	106ppm	1,2,3
MERCURY	0.40 - 3.95ppm Depositional 0.01 - 7.76ppm Non-Depositional	0.3ppm	1ppm	0.65ppm	1,2,3
NICKEL	29 - 99ppm Depositional 4 - 160ppm Non-Depostional	25ppm	20ppm	52ppm	1,2,3
SELENIUM	No Data	-	-	1ppm	-
ARSENIC	0.2 - 17ppm Depositional 0.2 - 2.4ppm Non-Depositional	8ppm	3ppm	3.3ppm	1,2,3
ZINC	87 - 3507ppm Depositional 6 - 1120ppm Non-Depositional	100ppm	90ppm	192ppm	1,2,3

KEY: 1 = Ontario Ministry of Environment 2 = Environmental Protection Agency 3= International Joint Commission
Lower end of EPA concentration range designated as "moderately polluted"
* Average concentration (dry weight) of surficial constituents in Lake Ontario
For further information see Text

TABLE 15

POTENTIAL CRITERIA FOR CONTAMINANTS IN SEDIMENTS OF LAKE ONTARIO AND CONCENTRATIONS OF CONTAMINANTS IN SEDIMENTS

CONTAMINANT	AWQS/C (ug/l)	Koc	Organic* Carbon (%)	Sediment Criterion (ug/kg)	Concentrations in Lake Ontario Sediment (ug/kg)
PCB	0.001	42,500	0.03	1.3	89**
2,3,7,8-TCDD	0.0000001	3,730,268	0.03	0.1	0.017 (ND-0.499)***
Mirex	0.001	286,227	0.03	8.6	1 to 10**
DDT	0.001	248,000	0.03	7.1	22**
Chlordane	0.001	54,354	0.03	3.3	-
Aldrin/Dieldrin	0.001	68,911	0.03	2.1	2.8**

* - 3% was selected as a typical organic carbon content of Lake Ontario sediment.

** - From Thomas (1983); all data except mirex are means presented by author; for mirex, data are the range where mirex detected.

*** - from Gradient Corp., (1987); median value of about 0.127 ug/kg, range of not detected to 0.499 ug/kg, n=32.

Table 16

A Summary of Water Quality Problems Identified in Areas of Concern

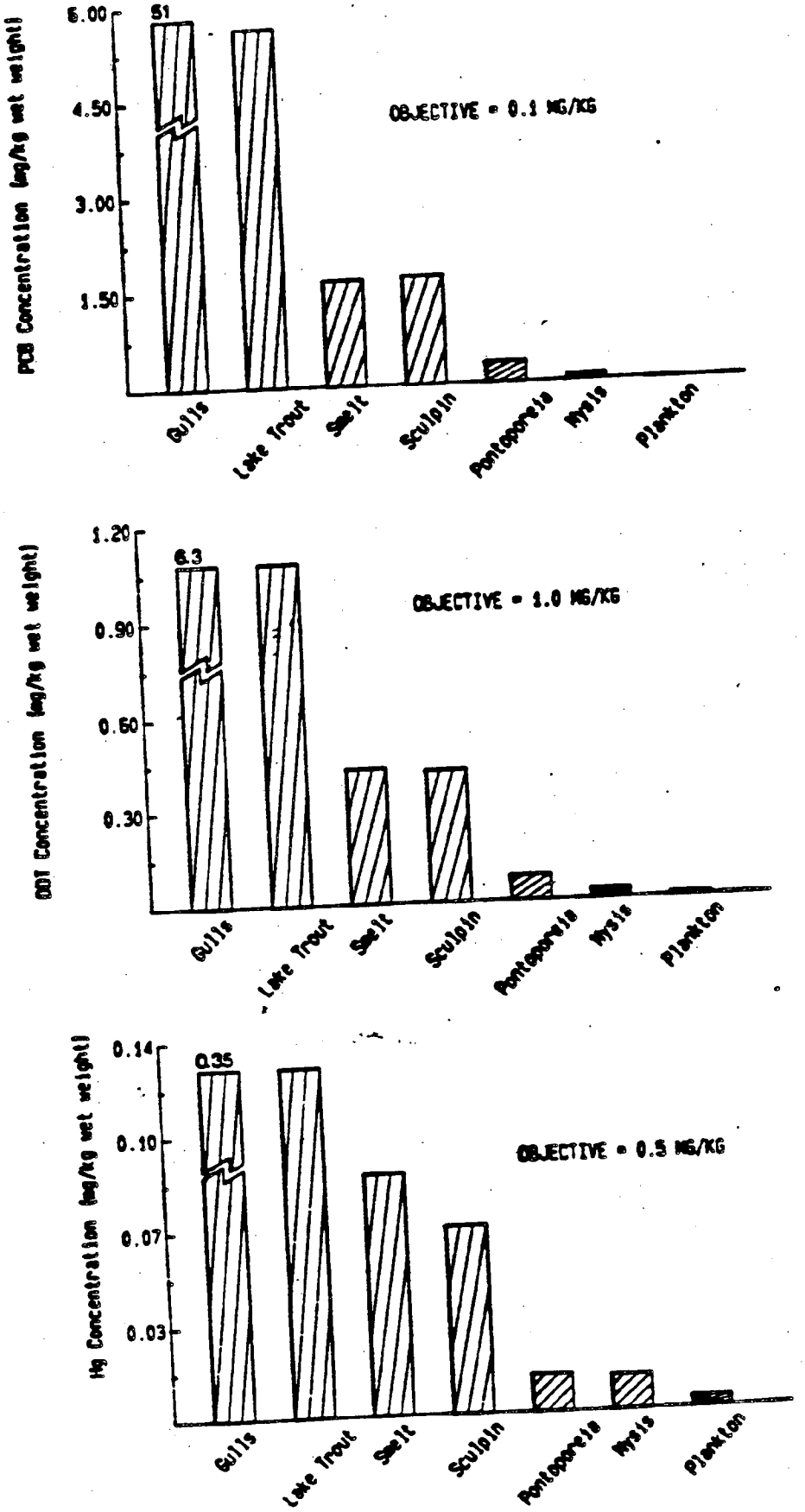
	Hamilton Harbour	Toronto Waterfront	Port Hope	Bay of Quinte	Oswego River	Rochester Embayment	Eighteenmile Creek
Toxics in Water	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Toxics in Sediment	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Advisories on Fish	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fish Tumors[1]	Yes	Yes	No	No	No Data	No Data	No Data
Impacted Biological Community	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1- In many cases, where fish tumors have been found, further work is warranted to determine the extent of the problem and the causative factor. In other cases, fish tumors have been directly linked to contamination by polynuclear aromatic hydrocarbons.

From: Great Lakes Water Quality Board. 1987 Report on Great Lakes Water Quality. Report to the International Joint Commission. 236 pp.

Figure 1

BIOMAGNIFICATION OF PCB, TOTAL DDT AND MERCURY THROUGH THE LAKE ONTARIO FOOD CHAIN.



LAKE ONTARIO

CREDIT RIVER
PCB

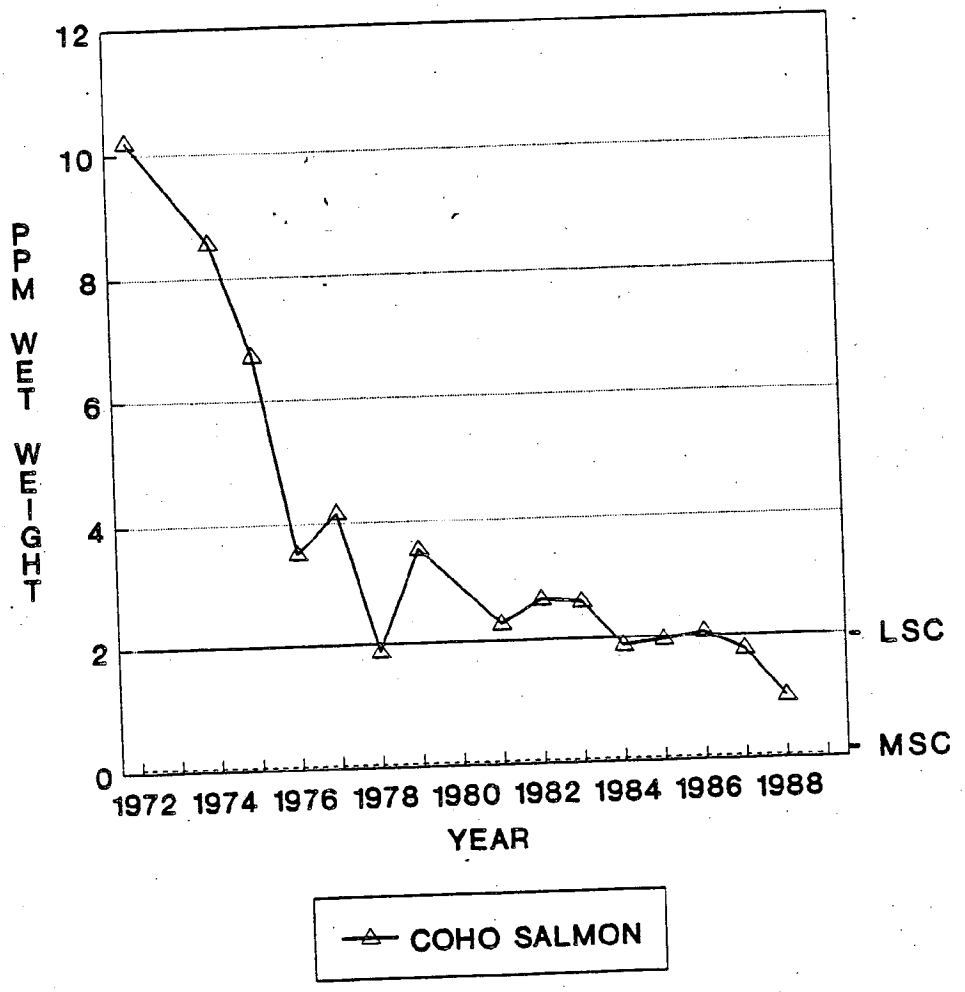


Figure 2a

Concentrations of total PCBs in lean dorsal muscle tissue of coho salmon from the Credit River, Lake Ontario.

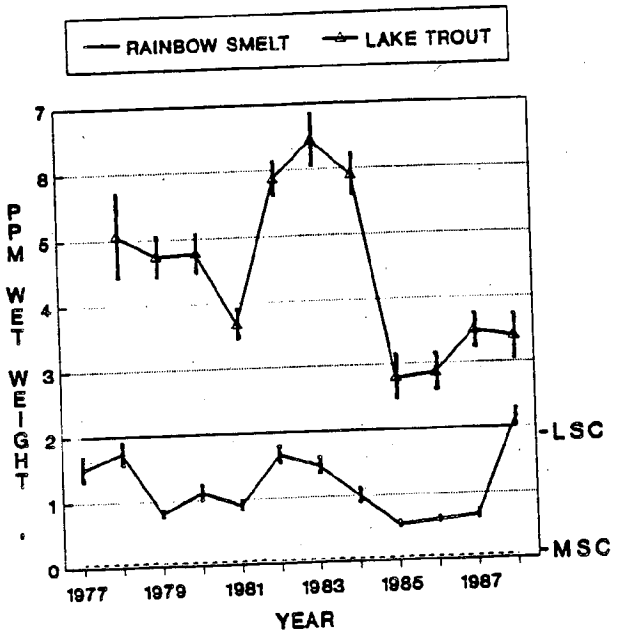
LSC: Least Stringent Criteria applicable
2.0 ppm - DEC / MOE

MSC: Most Stringent Criteria applicable
0.0025 ppm - EPA

Source: Ontario Ministry of Natural Resources & Ontario Ministry of the Environment, (unpublished data)

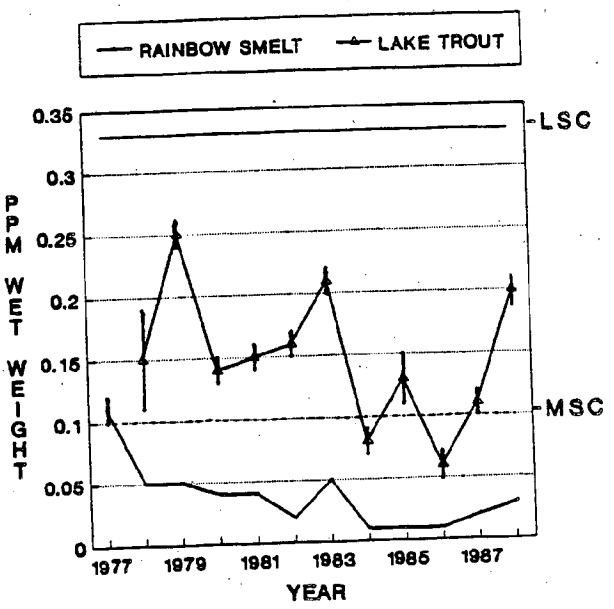
LAKE ONTARIO

PCB
Figure 2b



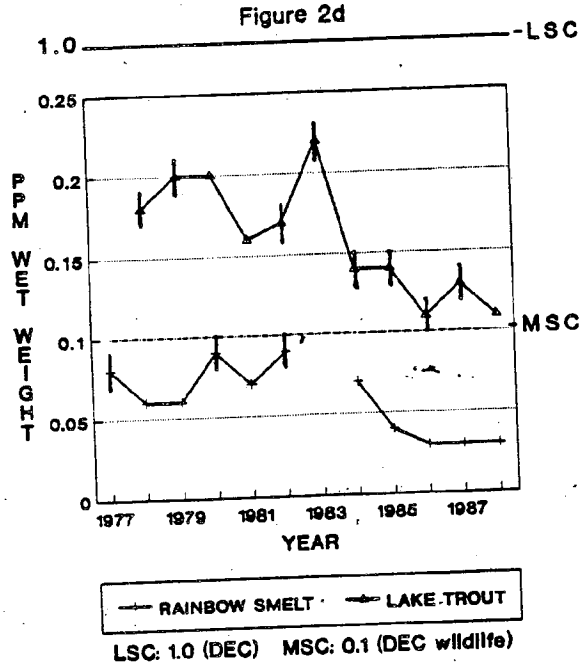
LSC: 2.0 (DEC/MOE) MSC: 0.0025 (EPA)

MIREX
Figure 2c



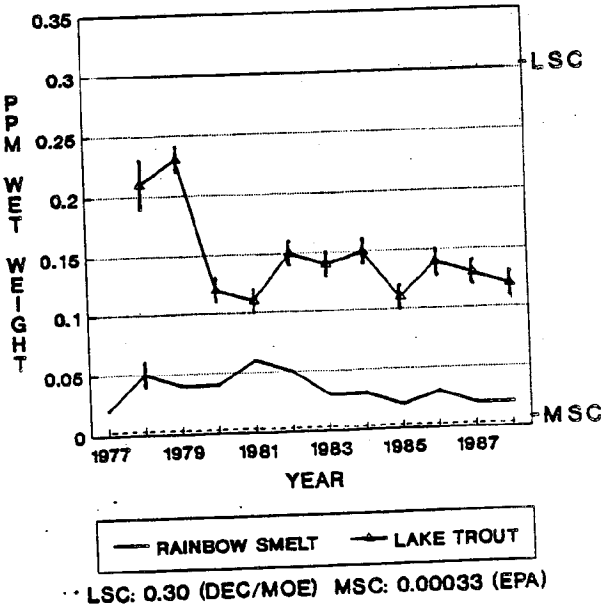
LSC: 0.33 (DEC) MSC: 0.10 (DEC/MOE)

MERCURY
Figure 2d



LSC: 1.0 (DEC) MSC: 0.1 (DEC wildlife)

DIELDRIN
Figure 2e



LSC: 0.30 (DEC/MOE) MSC: 0.00033 (EPA)

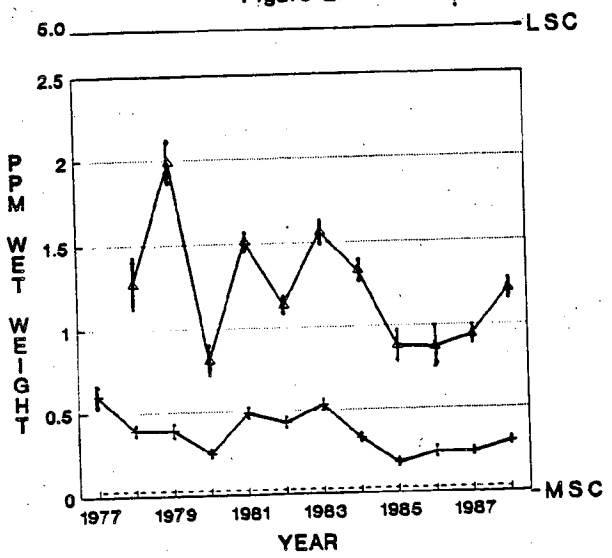
Mean concentrations of contaminants (ppm wet weight +/- standard error) in whole rainbow smelt and lake trout (age 4+) from Lake Ontario.

LSC = Least Stringent Criteria applicable
MSC = Most Stringent Criteria applicable

Source: Department of Fisheries & Oceans

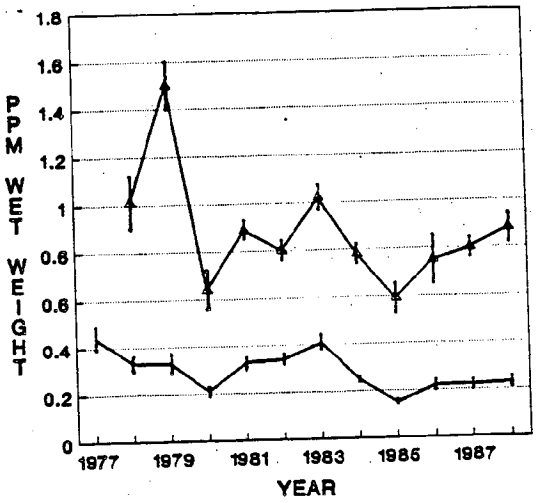
LAKE ONTARIO

DDT
Figure 2f



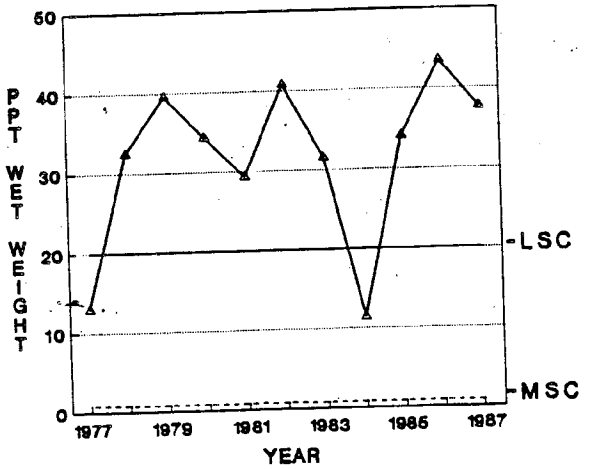
LSC: 5.0 (DOE/MOE) MSC: 0.0013 (EPA)

p,p'-DDE
Figure 2g



Mean concentration of contaminants (ppm wet weight +/- standard error) in whole rainbow smelt and lake trout from Lake Ontario.

2,3,7,8-TCDD
Figure 2h



LSC: 20.0 (MOE) MSC: 0.065 (EPA)

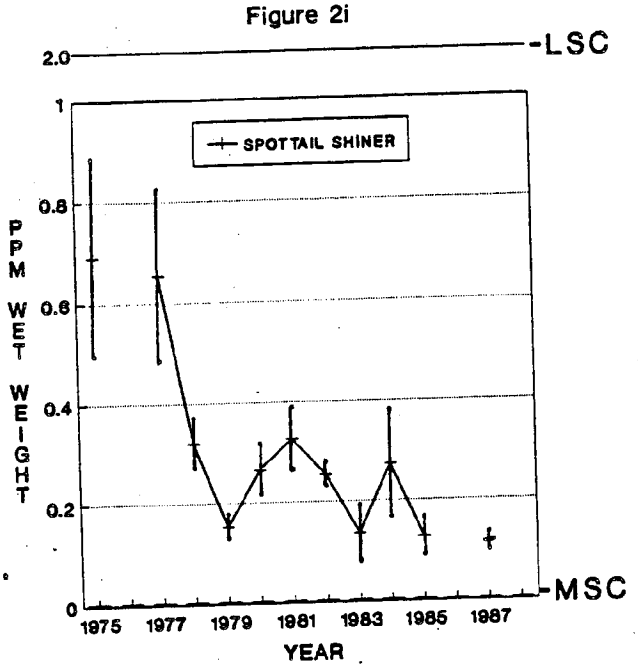
Mean concentrations of TCDD (ppt wet weight) in whole lake trout (age 4+) from Lake Ontario.

LSC = Least Stringent Criteria applicable
MSC = Most Stringent Criteria applicable

Source: Department of Fisheries and Oceans

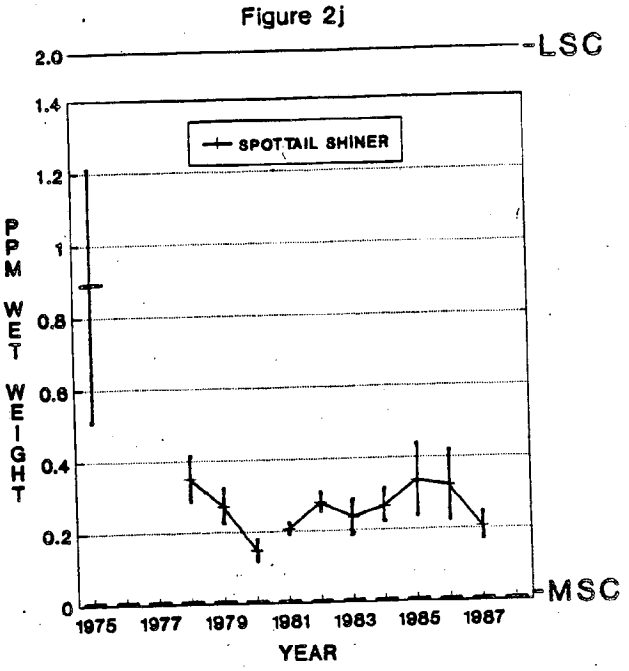
LAKE ONTARIO

PCB
NIAGARA ON THE LAKE
Figure 2i



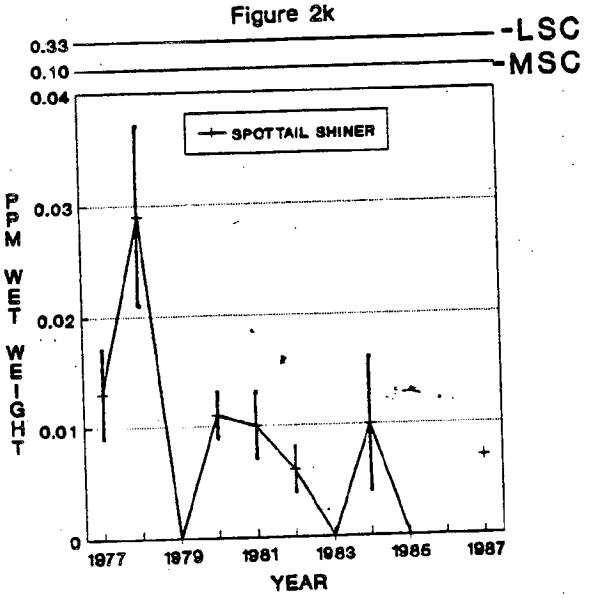
LSC: 2.0 (DEC/MOE) MSC: 0.0025 (EPA)

PCB
TWELVE MILE CREEK
Figure 2j



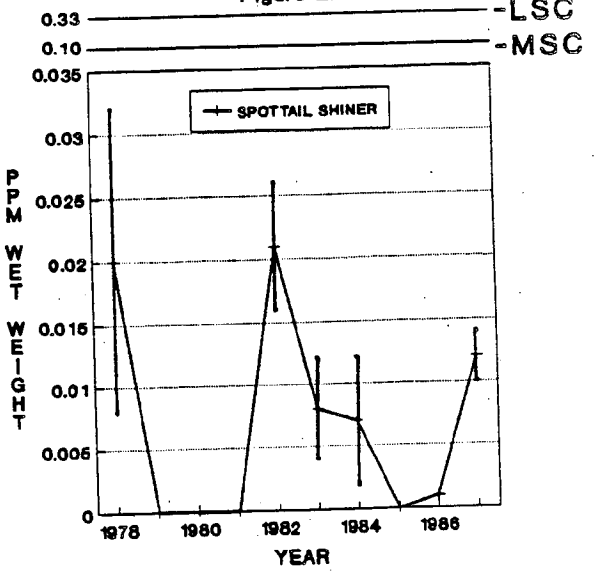
LSC: 2.0 (DEC/MOE) MSC: 0.0025 (EPA)

MIREX
NIAGARA-ON-THE-LAKE
Figure 2k



LSC: 0.33 (DEC wildlife)
MSC: 0.10 (DEC/MOE)

MIREX
TWELVE MILE CREEK
Figure 2l



LSC: 0.33 (DEC wildlife)
MSC: 0.10 (DEC/MOE)

LSC = Least Stringent Criteria applicable
MSC = Most Stringent Criteria applicable

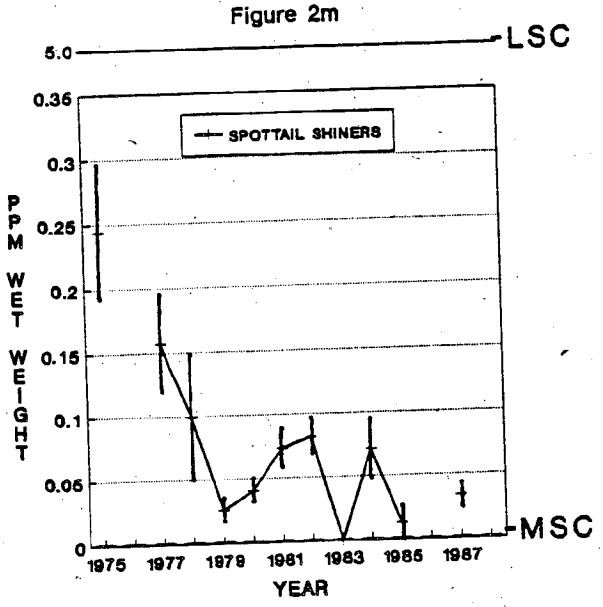
Mean concentrations of contaminants (ppm wet weight, +/- standard deviation) in young-of-the-year spottail shiners.
PCB data are from four sites on Lake Ontario.
Mirex data are from two sites on Lake Ontario.

Note: 1979-81 and 1981 mirex levels are below detectable limits.

Source: K. Suns, in press

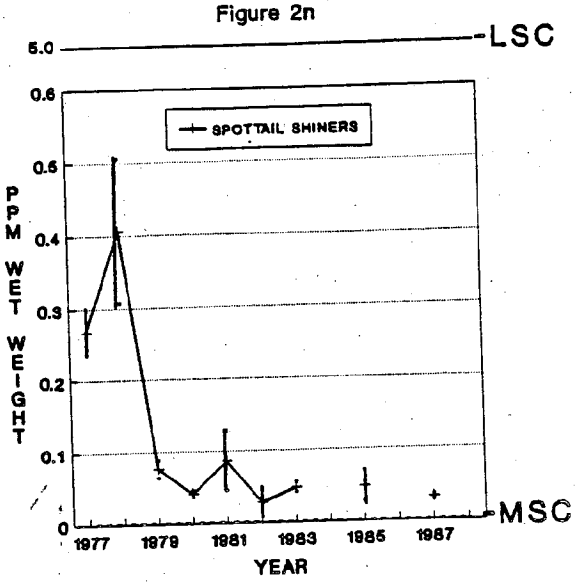
LAKE ONTARIO

DDT
NIAGARA-ON-THE-LAKE
Figure 2m



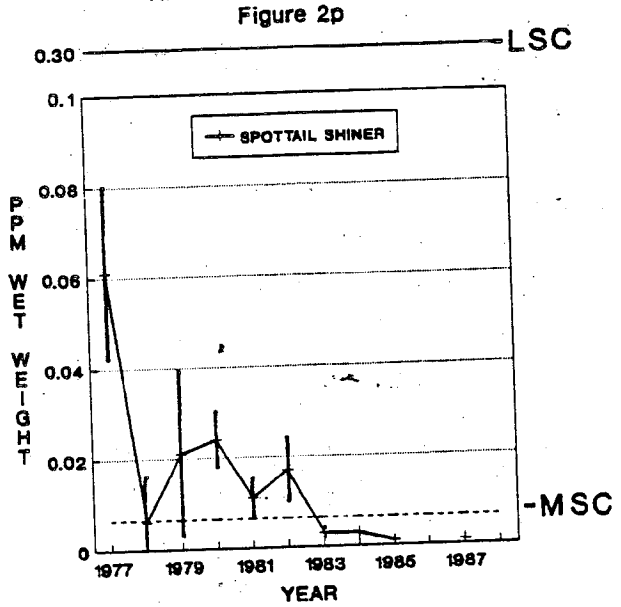
LSC: 5.0 (DEC/MOE)
MSC: 0.0013 (EPA)

DDT
HUMBER RIVER
Figure 2n



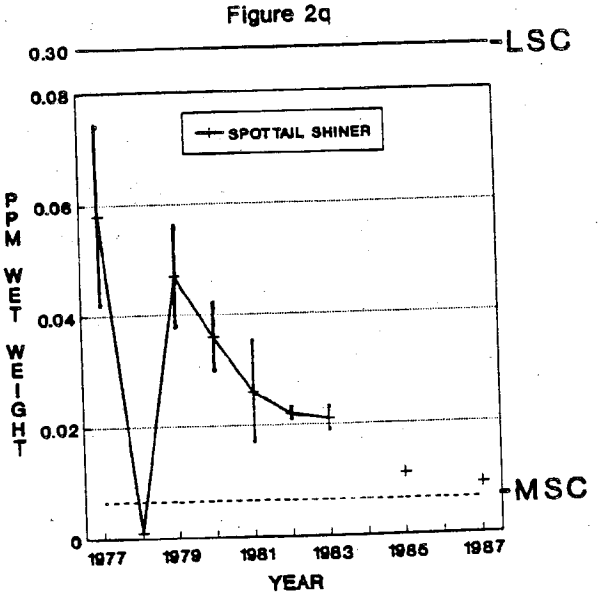
LSC: 5.0 (DEC/MOE)
MSC: 0.0013 (EPA)

CHLORDANE
NIAGARA-ON-THE-LAKE
Figure 2p



LSC: 0.30 (DEC/MOE)
MSC: 0.0065 (EPA)

CHLORDANE
HUMBER RIVER
Figure 2q



LSC: 0.30 (DEC/MOE)
MSC: 0.0065 (EPA)

LSC = Least Stringent Criteria applicable
MSC = Most Stringent Criteria applicable

Mean concentration of contaminants (ppm wet weight +/- standard deviation) in young-of-the-year spottail shiners.

DDT data are from three sites on Lake Ontario.
Chlordane data are from two sites on Lake Ontario.

Source: K. Suns, in press

LAKE ONTARIO

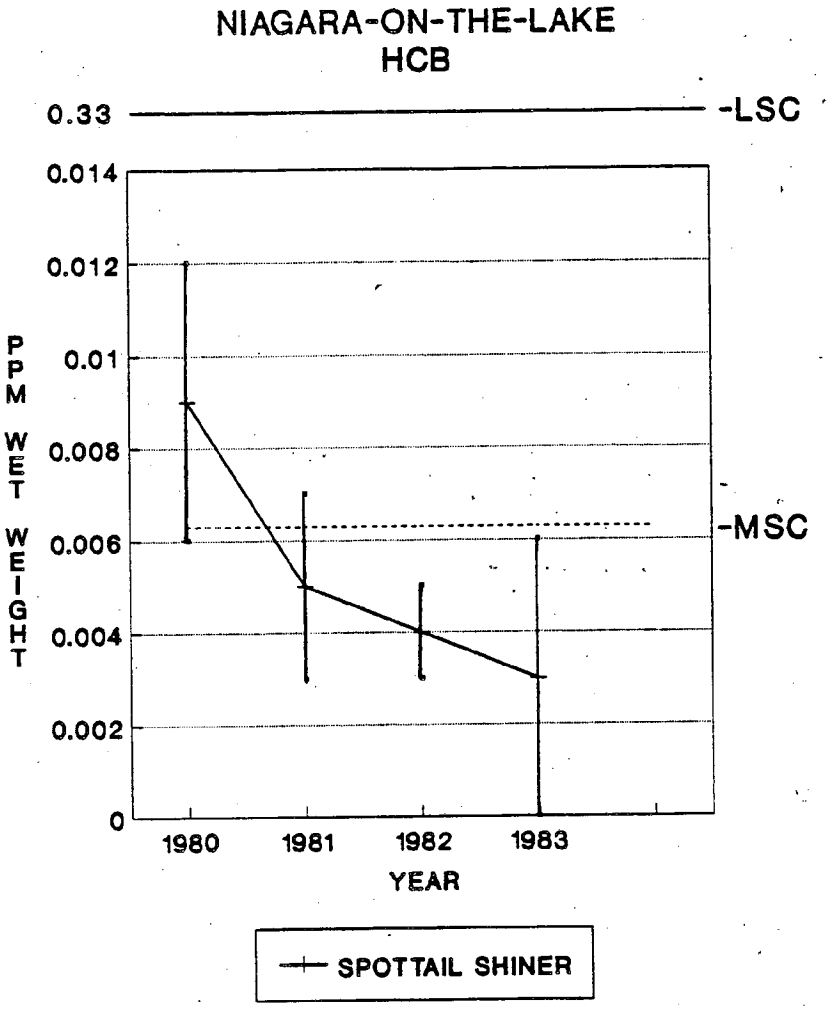


Figure 2r

Mean concentrations of HCB (ppm wet weight +/- standard deviation) in young-of-the-year spottail shiners from Niagara-on-the-Lake.

LSC = Least Stringent Criteria applicable
MSC = Most Stringent Criteria applicable

Source: K. Suns, in press.

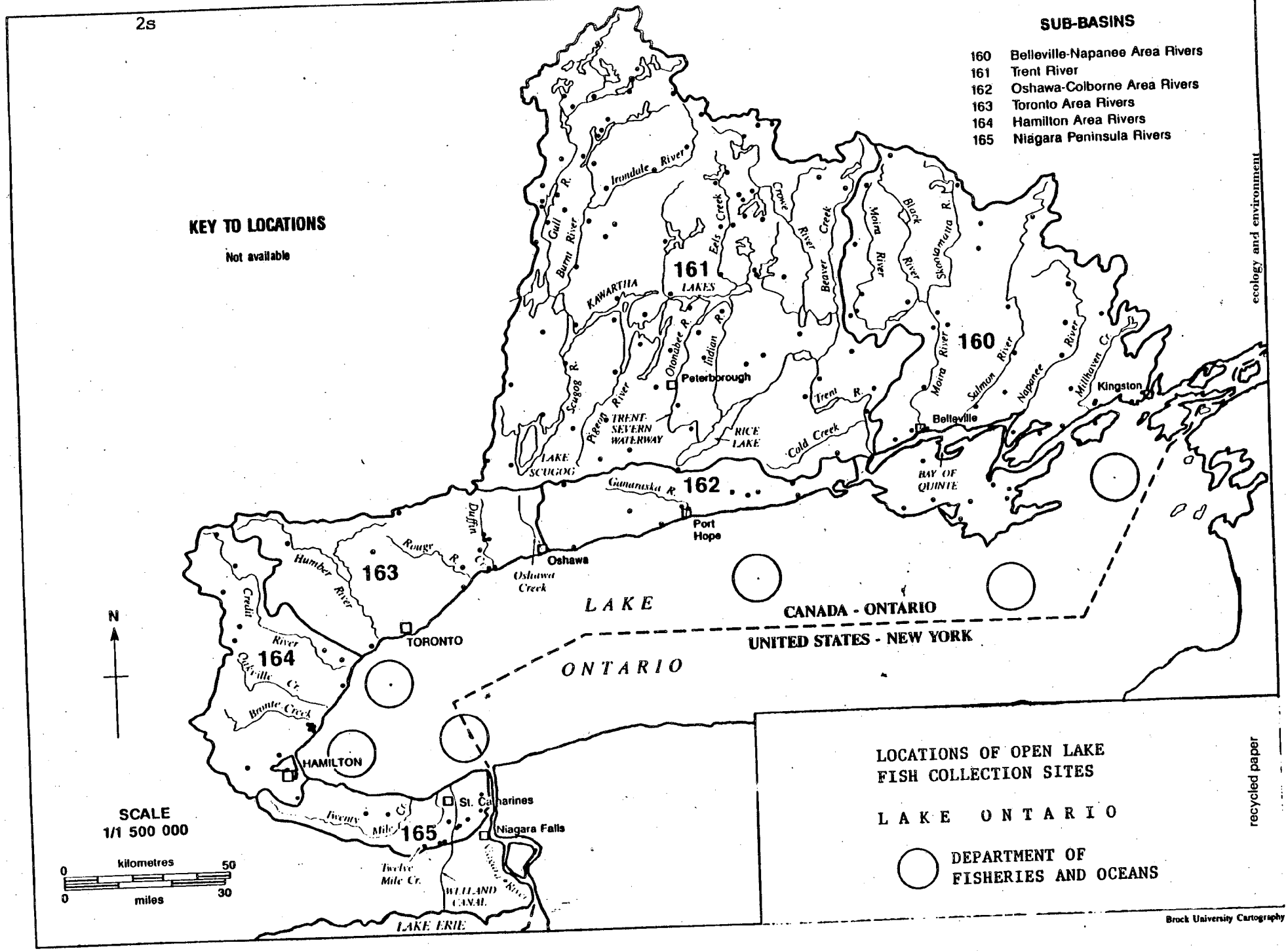
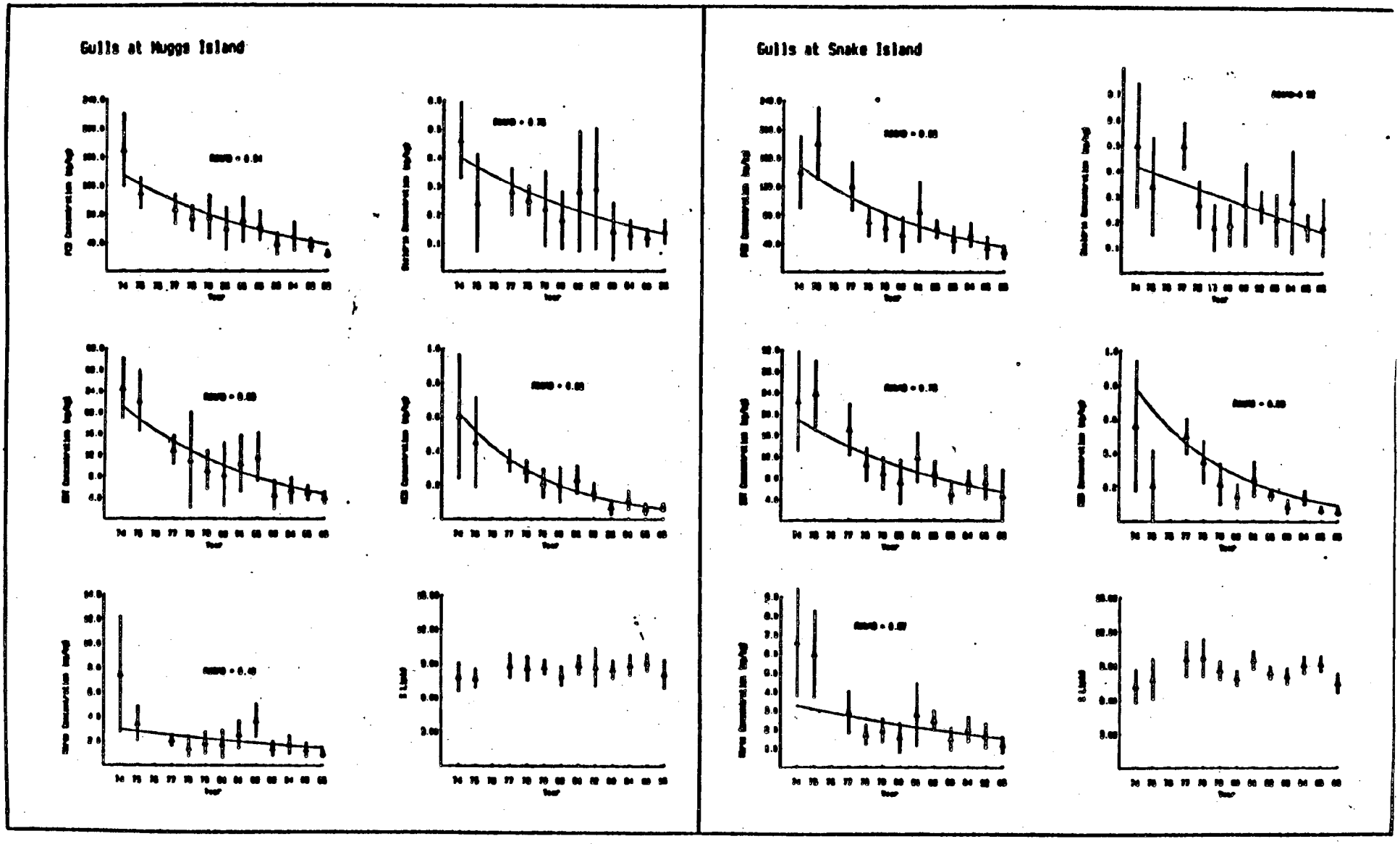

SUB-BASINS
160 Belleville-Napanee Area Rivers
161 Trent River
162 Oshawa-Colborne Area Rivers
163 Toronto Area Rivers
164 Hamilton Area Rivers
165 Niagara Peninsula Rivers
KEY TO LOCATIONS
Not available
161
LAKES
160
162
163
164
165
Irondale River
Gull R.
Burnt River
KAWARTHA
Eels Creek
Crowe River
Beaver River
Moira River
Black River
Skootamatta R.
Otonabee R.
Indian R.
Peterborough
Scugog R.
Pigeon River
TRENT-SEVERN WATERWAY
LAKE SCUGOG
RICE LAKE
Trent R.
Cold Creek
Belleville
Moira River
Salmon River
Napanee River
Millhaven Cr.
Kingston
BAY OF QUINTE
Gunanoque R.
Port Hope
Duffin Cr.
Rouge R.
Oshawa
Oshawa Creek
Humber River
TORONTO
Credit River
Oakville Cr.
Bronte Creek
HAMILTON
St. Catharines
Twenty Mile Cr.
Niagara Falls
Twelve Mile Cr.
WELLAND CANAL
Niagara River
LAKE ERIE
LAKE ONTARIO
CANADA - ONTARIO
UNITED STATES - NEW YORK
N
SCALE
1/1 500 000
kilometres 0 50
miles 0 30
LOCATIONS OF OPEN LAKE
FISH COLLECTION SITES
LAKE ONTARIO
DEPARTMENT OF
FISHERIES AND OCEANS
ecology and environment
recycled paper
Brock University Cartography

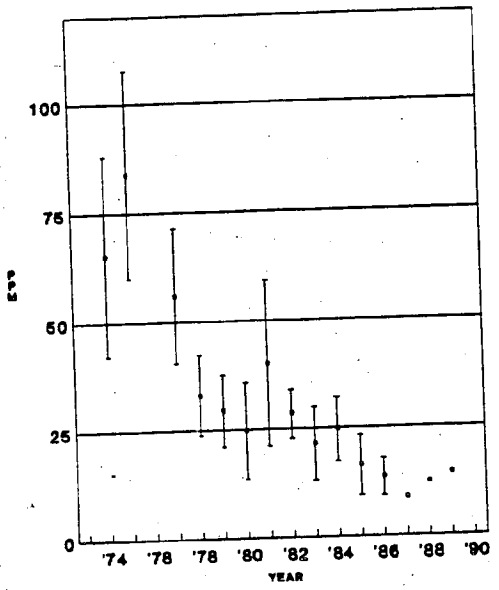
FIGURE 3a ORGANOCHLORINE CONTAMINANT AND LIPID CONCENTRATIONS IN HERRING GULL EGGS TAKEN FROM TWO COLONIES ON LAKE ONTARIO, 1974-1986.



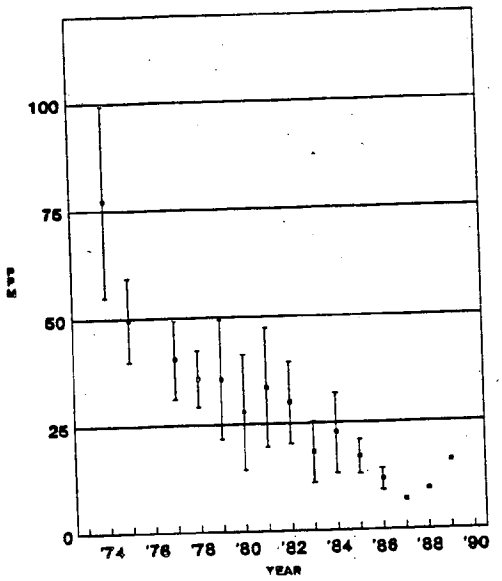
WET WEIGHT CONCENTRATION ± STANDARD DEVIATION. SOURCE: Great Lakes Water Quality Board. 1987 Report on Great Lakes Water Quality. Report to the International Joint Commission. 236 pp.

LAKE ONTARIO

Σ PCB CONCENTRATIONS

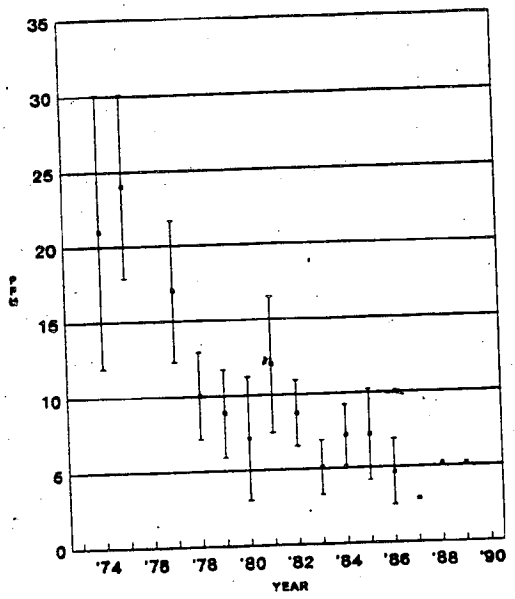


SNAKE ISLAND

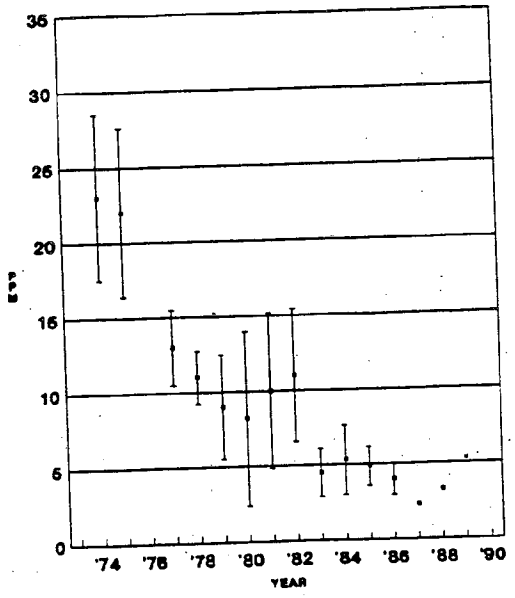


MUGG'S ISLAND

DDE CONCENTRATIONS



SNAKE ISLAND



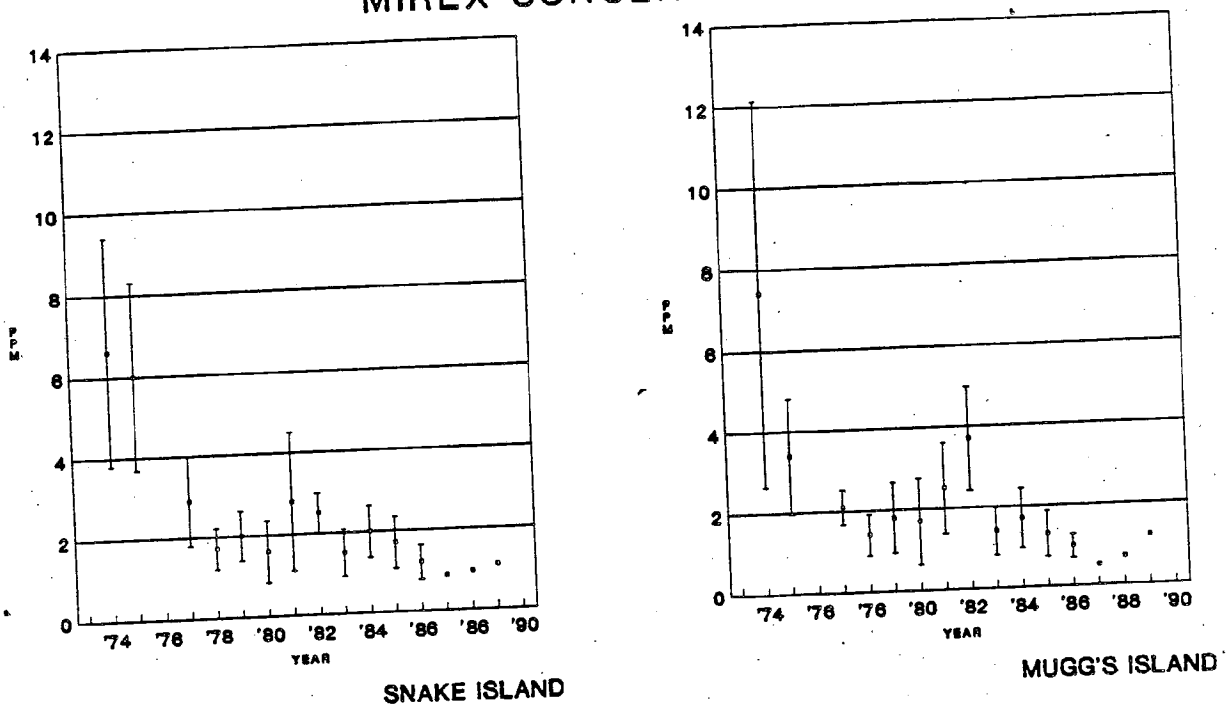
MUGG'S ISLAND

Figure 3b. Mean Σ PCB (see text) and DDE concentrations in herring gull eggs from Lake Ontario Snake and Mugg's Island colonies (ppm, wet weight). Means with standard deviation are based on samples of 9-11 eggs; means without S.D. are based on one sample of a 10 egg pool.

Source: D.V. Weseloh (Canadian Wildlife Service)

LAKE ONTARIO

MIREX CONCENTRATIONS



HCB CONCENTRATIONS

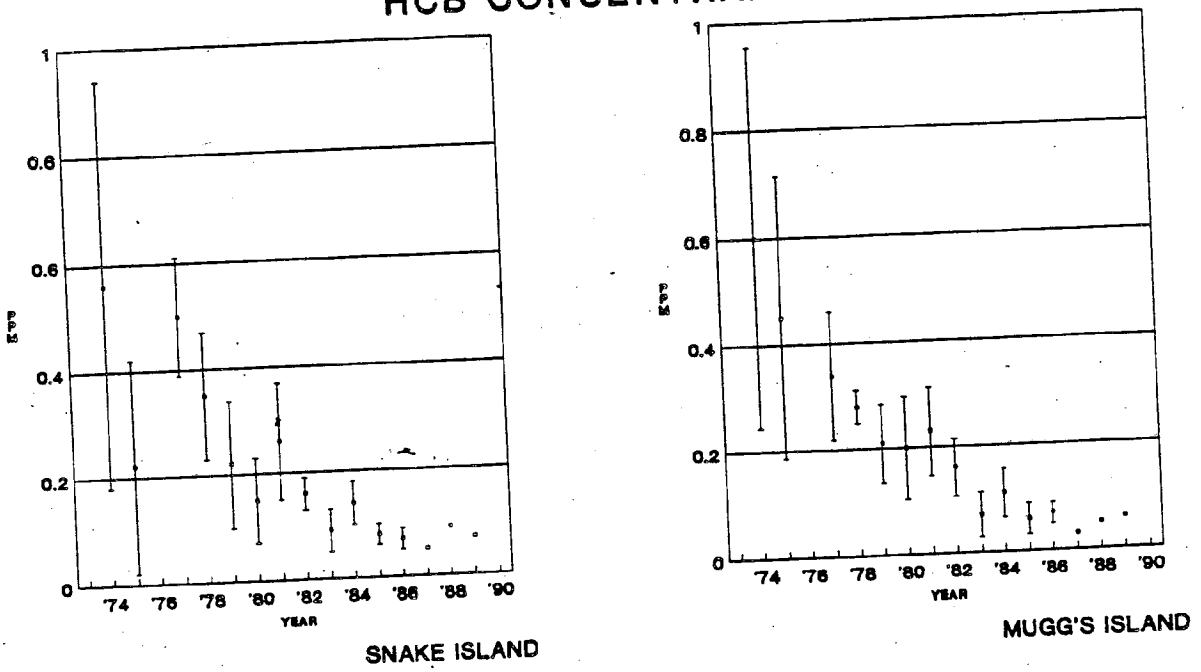
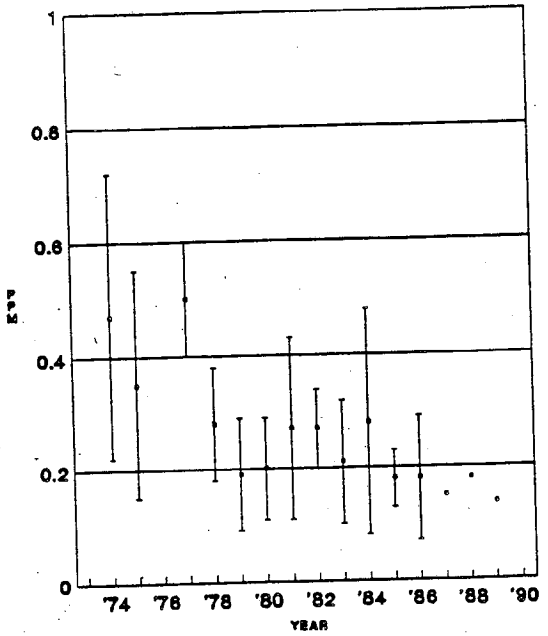


Figure 3c. Mean mirex and HCB concentrations in herring gu eggs from Lake Ontario: Snake and Mugg's Island colonies (ppm, wet weight). Means with standard deviations are based on samples of 9-11 eggs; means without S.D. are based on one analysis of a 10 egg pool.

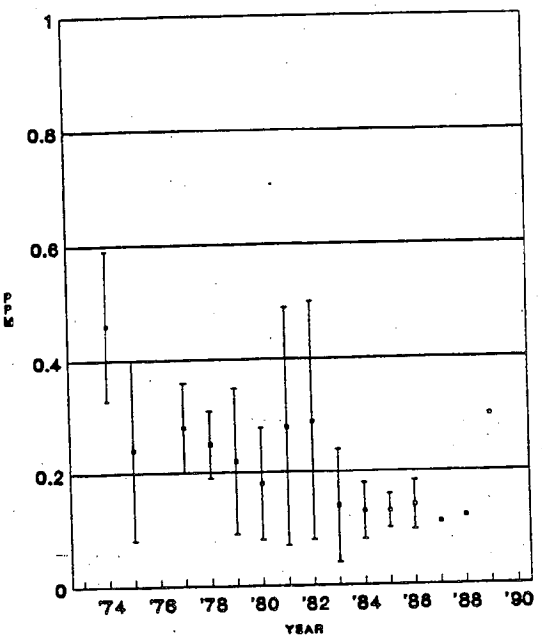
Source: D.V. Weseloh (Canadian Wildlife Service)

LAKE ONTARIO

DIELDRIN CONCENTRATIONS

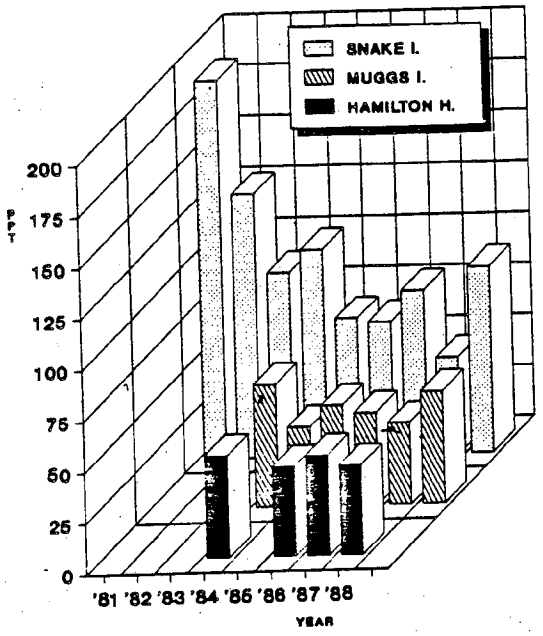


SNAKE ISLAND

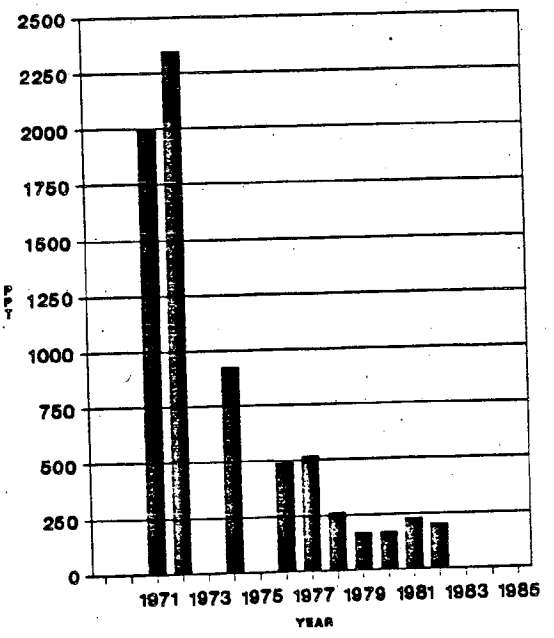


MUGG'S ISLAND

TCDD CONCENTRATIONS



HAMILTON H., MUGG'S I., SNAKE I.



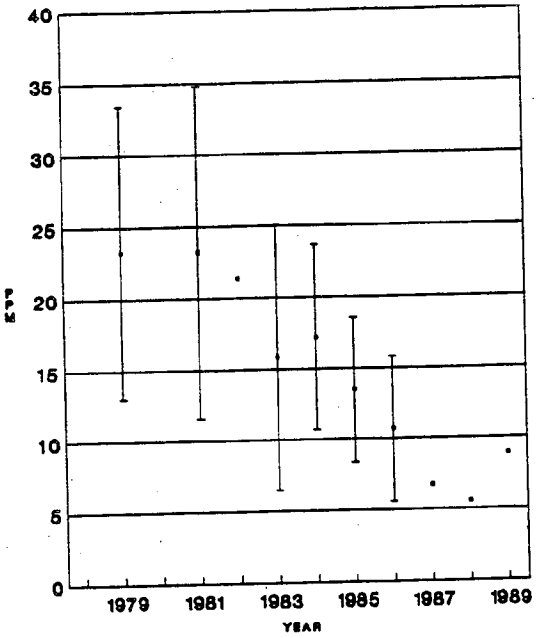
SCOTCH BONNET ISLAND

Figure 3d. Mean dieldrin and TCDD concentrations in herring gull eggs from Lake Ontario colonies (ppm, wet weight) for dieldrin and ppt for TCDD). Means with standard deviations are based on samples of 9-11 eggs; means without S.D. are on one analysis of a 10 egg pool.

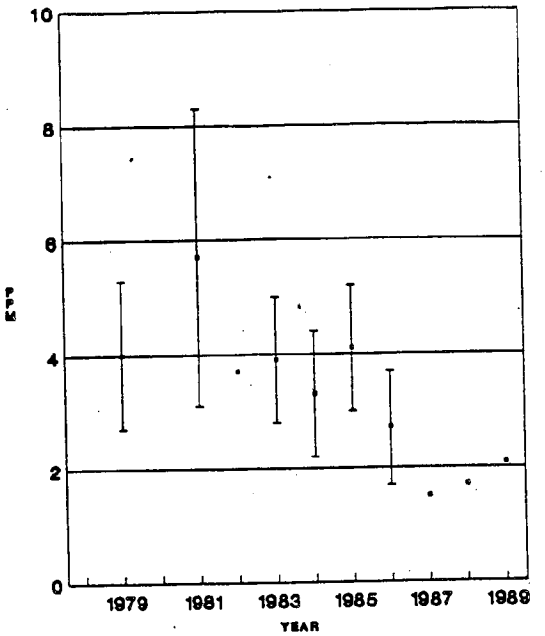
Source: D.V. Weseloh (Canadian Wildlife Service) for dieldrin data and R. J. Norstrom (CWS) for TCDD data.

NIAGARA RIVER

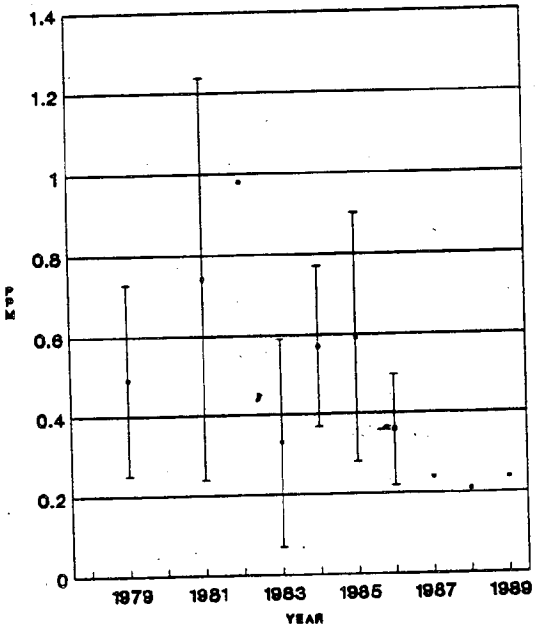
Σ PCB CONCENTRATIONS



DDE CONCENTRATIONS



MIREX CONCENTRATIONS



HCB CONCENTRATIONS

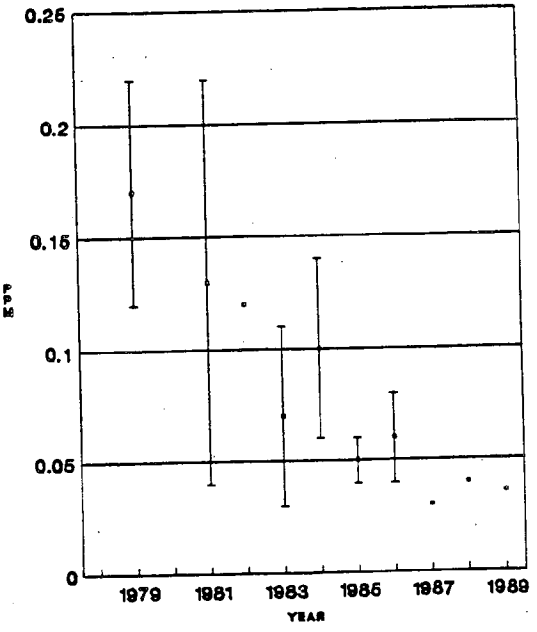
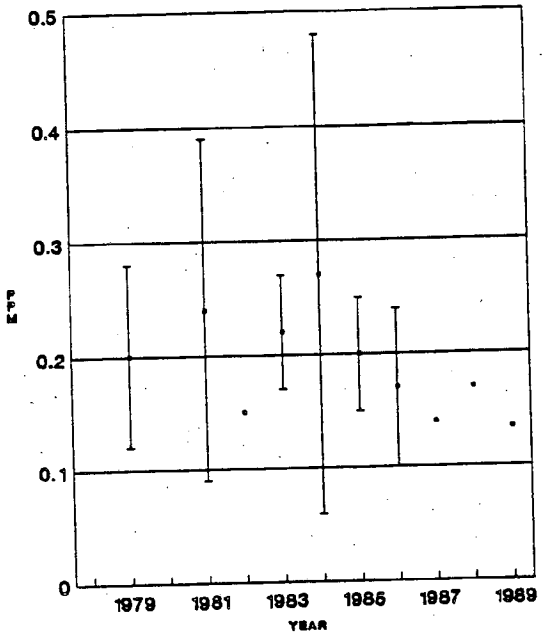


Figure 3e. Mean organochlorine contaminant concentrations herring gull eggs from the Niagara River colony (ppm, wet weight). Means with standard deviations are based on samples of 9-11 eggs; means without S.D. are based on one analysis of a 10 egg pool.

Source: D.V. Weseloh (Canadian Wildlife Service)

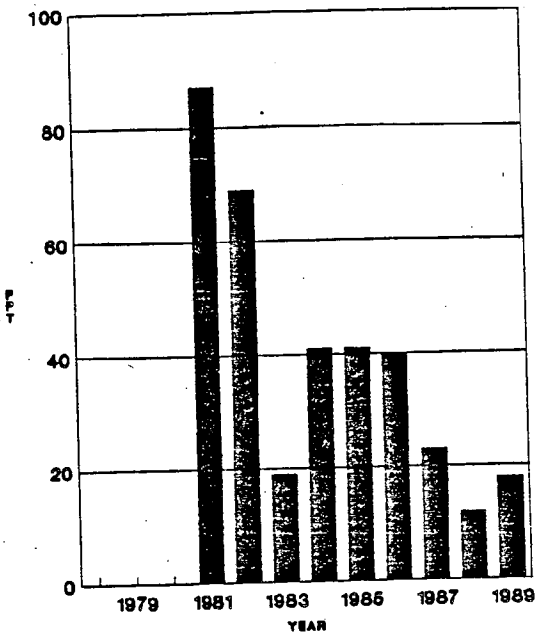
NIAGARA RIVER

DIELDRIN CONCENTRATIONS



NIAGARA RIVER

TCDD CONCENTRATIONS

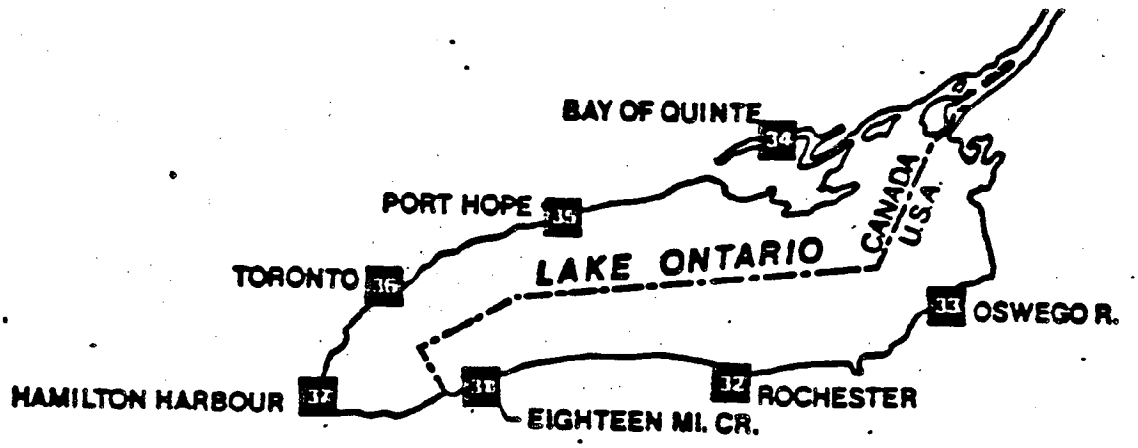


NIAGARA RIVER

Figure 3f. Mean dieldrin and TCDD concentrations in herring gull eggs from the Niagara River colony (ppm, wet weight for dieldrin and ppt for TCDD). Means with standard deviations are based on samples of 9-11 eggs; means without S.D. are based on one analysis of a 10 egg pool.

Source: D.V. Weseloh (Canadian Wildlife Service) for dieldrin data and R. J. Norstrom (CWS) for TCDD data.

Figure 4. Areas of Concern In Lake Ontario



MAP REF. NO.	AREA OF CONCERN	JURISDICTION	CATEGORY
31	Eighteen Mile Creek	NY	4
32	Rochester Embayment	NY	4
33	Oswego River	NY	3
34	Bay of Quinte	ON	4
35	Port Hope	ON	3
36	Toronto Waterfront	ON	3
37	Hamilton Harbour	ON	3

International Joint Commission. In Press. Appendix B: 1987 Report on Great Lakes Water Quality, Report of the Surveillance Subcommittee to the Great Lakes Water Quality Board, David E. Rathke and Gil McRae, eds. Windsor, Ontario.

Kemp, A.L.W. and N.S. Harper. 1976. Sedimentation rates and a sediment budget for Lake Ontario. J. Great Lakes Res. 2(2): 324-340.

Kizlauskas, A.G., D.C. Rockwell, and R.E. Claff. 1984. Great Lakes National Program Office Harbor Sediment Program, Lake Ontario, 1981: Rochester, New York, Oswego, New York, Olcott, New York. EPA 905/4-84-002.

Kurita, H., J.P. Ludwig, and M.S. Ludwig. 1987 (Sept.). Results of the 1987 Michigan Colonial Waterfowl Monitoring Project on Caspian Terns and Double-Crested Cormorants; Egg Incubation and Field Studies of Colony Productivity, Embryonic Mortality and Deformities. Ecological Research Services, Inc.

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LAKE ONTARIO

TOXICS MANAGEMENT PLAN

(INFORMATION WILL BE UPDATED FOR THE FINAL LOTMP)

Appendix III
Toxics Loadings to Lake Ontario
Lake Ontario Toxics Management Plan

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

(INFORMATION UNCHANGED FROM 1989 LOTMP)
(PLEASE REFER TO THAT DOCUMENT)

Appendix IV
Existing Programs
Lake Ontario Toxics Management Plan

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix V

Geographic Areas of Special Concern

APPENDIX V - Geographic Areas of Special Concern

Within the Great Lakes Basin, specific areas have been identified as exhibiting particular problems stemming from one or more forms of pollution. Not surprisingly, these areas have tended to be associated with the more industrialized and more densely populated urban centers around the Basin. The nature of such problems has altered over time as technological evolution expanded the body of knowledge surrounding water quality. Significant progress has been made in remediating some of the problems but as answers were being found to these, new and more complex issues were emerging.

The Great Lakes Water Quality Agreement sets out objectives, jurisdictional standards, criteria and guidelines respecting the designated beneficial uses of Great Lakes waters. Locations where these limiting measures of water quality have been exceeded are designated Areas of Concern under the Agreement and are consequently subject to extraordinary measures for remediation and rehabilitation. Problems in Areas of Concern are, at present, predominantly those attributed to toxic chemical contamination. In addition to causing use impairment, this form of pollution may also cause loss of both habitat and biological diversity in some locations.

At present, 42 sites around the Great Lakes Basin have been designated as Areas of Concern by the International Joint Commission under the Agreement. Seven of these are found in the Lake Ontario Basin. They are:

On the Canadian side of Lake Ontario

- Bay of Quinte
- Port Hope Harbour
- Metro Toronto
- Hamilton Harbour

On the United States side of Lake Ontario

- Eighteenmile Creek
- Rochester Embayment
- Oswego River

In addition, the international connecting channels to Lake Ontario, binational in responsibility, have been designated Areas of Concern. They are:

- Niagara River
- St. Lawrence River

The Great Lakes Water Quality Agreement calls for the agencies to alleviate water use impairments in these areas through development and implementation of action programs specifically

designed to bring about the necessary improvements. Such programs are known as Remedial Action Plans (RAPS) and are characterized by a logical sequence of activities for problem identification and resolution.

Remedial Action Plans derive from two key realizations:

- the recognition that disparate programs often focussed on specific problems without due attention being paid to overlapping responsibilities and consequences, and
- the need to involve, in a coordinated manner, the multiplicity of jurisdictions and interests represented within these Areas of Concern.

Figure 1 illustrates the general approach followed in developing a RAP for a designated Area of Concern. It identifies the stepwise, ecosystem-driven process undertaken in addressing specific use impairments, particularly those occurring as the result of toxic chemical contamination. Figure II is a representation of the process by which the various jurisdictions and interests are integrated in developing and carrying out a RAP.

It is intended that the RAP process become an integral component of the LOTMP. This will become more apparent as the Plan assumes the identity of a lakewide management plan (LAMP) under Annex II of the Great Lakes Water Quality Agreement. There is a clear need for very close coordination between RAP activities and initiatives undertaken as the result of implementation of the LOTMP. For at least the first year the RAPs, having an already well established program of public consultation involving a majority of the interested and affected Lake Ontario Basin community, will serve as the communications vehicle for the LOTMP. This focus will ensure that the necessary coordination takes place as well as guide the LOTMP towards the GLWQA and its attendant negotiated provisions for remediation and jurisdictional accountability. This ensuing direction will facilitate identification of new potential "hotspots" and provide the mechanism for rapid and effective agency response. It will also aid in ongoing assessment, allowing agencies to measure progress and determine when remediation is complete, use impairment has been eliminated and beneficial uses restored. These areas may then be "delisted", allowing jurisdictions to refocus their energies on other problems.

On the Canadian side of Lake Ontario, RAPs are being developed under the auspices of the Canada-Ontario Agreement Respecting Great Lakes Water Quality (COA). The Agreement is overseen by a joint review board and provides the mechanism for cooperative federal/provincial effort in areas of mutual responsibility. A RAP is considered complete when the COA Board of Review approves its submission to the Water Quality Board of the International

Joint Commission. Summaries of recent progress on the Canadian RAPs are given at the end of this appendix.

On the U.S. side of the lake, the New York State Department of Environmental Conservation has assumed responsibility for preparing RAPs for Eighteenmile Creek, Rochester Embayment and Oswego Harbor. Most of the work in preparing the Rochester Embayment RAP will be undertaken by Monroe County. The Department is assisted by the USEPA and will submit RAPs directly to the International Joint Commission when they are completed. Summaries of progress on the New York RAPs are given at the end of this appendix.

Remedial Action Plans are to be submitted to the IJC for review and comment at three stages. First, when a definition of the problem has been completed; second, when remedial and regulatory measures are selected; and finally, when monitoring indicates that identified beneficial uses have been restored. The following timetable summarizes the planned development stages of the IJC Areas of Concern on the Canadian side of the Lake.

CANADIAN AREAS OF CONCERN ON LAKE ONTARIO

REMEDIAL ACTION PLAN STATUS - OCTOBER 1990

LOCATION	IJC Stage I Report Date	IJC Stage II Report Target
	Quarter	Quarter
Hamilton Harbour	submitted October 1989	3rd qtr 1991
Metro Toronto	submitted February 1990	1st qtr 1992
Port Hope Harbour	submitted January 1990	3rd qtr 1991
Bay of Quinte	submitted October 1990	3rd qtr 1991

Following is a summary of the status of the seven RAPs for Areas of Concern around Lake Ontario. Common to all of them is the need for commitments to develop estimates of the AOCs' loadings of LOTMP priority toxics to Lake Ontario.

Hamilton Harbour

The Stage 1 RAP Report, assessing environmental conditions and problem definition, was submitted to the International Joint Commission (IJC) in October 1989 and approved as meeting the requirements for Stage 1. A draft Stage 2 RAP Report should be completed in early 1991.

A requirement of the Stage 2 Report is a surveillance plan, which was initiated in September 1989. A workshop was held in March 1990 to review and evaluate monitoring requirements for the harbour; a summary of recommendations for the surveillance plan was included in a report released in May 1990.

Workshops were held in June and July 1989 to develop a consensus on preferred remedial options. Based on the results of the workshops, the RAP Team prepared a draft "Preferred Options Report, which was released in January 1990. Agency positions on this document are currently under development.

The Implementation Committee of the Hamilton Harbour Stakeholders developed an implementation structure for inclusion in the "Preferred Options Report". It has been recommended that this model be endorsed by the COA Review Board as the formal institutional arrangement throughout the implementation period. The structure includes: an agency group, BAIT (Bay Area Implementation Team) and the principal consultative organization, BARC (Bay Area Restoration Council). The BAIT's membership consists of implementing agencies, and the BARC's membership consists of the current stakeholder group. Both BARC and BAIT will link closely together but report independently to COA.

Studies being carried out in Hamilton Harbour include:

- A bacteria survey to establish whether potential swimming sites identified by the RAP meet local health requirements,
- A biological assessment of sediment inputs to the harbour to characterize suspended sediment,
- Surveys of water quality to detect changes due to nutrient abatement activities at STPs,
- Water circulation studies to determine the degree of mixing between segments of the Harbour and to provide data for hydrodynamic models,
- Sediment sampling to delineate PAH sediment contamination and assist in the development of remedial actions,
- A strategy to minimize the escape of effluent solids from final clarifiers at the Dundas STP (1990),
- Stepfeed control strategies initiated at Woodward Ave STP, to be completed in 1991/92, and

- Characterization of toxic contaminant emissions from the Skyway STP (1990).

Containment of contaminated sediment in Windermere Basin commenced in 1989, to be completed in 1991. During the dewatering phase in 1990, measures were taken to prevent disruption of nesting birds and their exposure to sediments in the confinement cells.

In February 1990, Environment Canada met to discuss clean-up options for contaminated sediment in Hamilton Harbor. In March 1990, a workshop was held by Environment Canada to develop a strategy for clean-up of contaminated sediments using Hamilton Harbor as a model.

In June 1990, a draft report entitled "Assessment of the Coal Tar Contamination Near Randle Reef, Hamilton Harbor" was released by the National Water Research Institute for review.

Remediation of combined sewer overflows, including construction of a holding tank for Chedoke Creek CSO will begin in 1991. A project to monitor and enhance tertiary treatment at the Dundas STP is ongoing and will enhance filtration efficiency and minimize discharge of suspended solids and phosphorus.

A joint study amongst industry, Environment Ontario (MISA), and Environment Canada's Wastewater Technology Centre to assess certain existing treatment technologies, and to identify the potential for new technologies, started in 1990.

The steel industry continues to implement measures designed to reduce contaminant loading to the harbour. Installation of a blast furnace water recycling system at DOFASCO has been completed as part of a program to reduce loadings of phenols, ammonia and suspended solids.

Results from water clarity studies in Hamilton Harbour and Cootes Paradise in 1989 indicate that the Harbour Secchi disk depth improved 40 cm to a seasonal mean of 200 cm in 1989 (previous Secchi disk depths since 1975: 100-160 cm). Chlorophyll concentrations declined, suggesting that improved water clarity was due to reduced algal biomass.

The Board of the Royal Botanical Gardens approved a project to restore the marsh in Cootes Paradise, subject to certain conditions. Restoration is anticipated to start this winter once all other approvals have been received. A technical workshop was held in September 1990 to develop a more detailed strategy for restoration of the marsh both for wildlife and fish populations.

Metro Toronto

The State 1 RAP Report, assessing environmental conditions and problem definition, was submitted to the IJC in March 1990. A draft Stage 2 RAP Report is scheduled for completion in mid-1991.

The Public Advisory Committee developed water use goals for the Metro Toronto RAP in July 1989, and distributed them to all involved municipalities for comment. Several municipalities have endorsed the goals in principle. The Public Advisory Committee continues to meet on a monthly basis and is currently reviewing the draft "Options Discussion Paper" which was completed in March 1990. The Technical Advisory Committee has also undertaken a detailed review and assessment of the "Options Discussion Paper".

Public consultation efforts include: mailing the Executive Summary of the Options Discussion Paper to all on the RAP mailing list (1200 individuals and groups), joint RAP and Public Advisory Committee briefings on the Options Paper (April 1990), local briefing sessions in the RAP area, and a RAP presentation to the Royal Commission hearings on Health and Environment (May 1990). The Royal Commission on the Future of the Waterfront has designated staff to act as observers on both PAC and RAP teams.

Surveys have been completed on fish communities, fish habitats, sediments, and biomonitoring. Reports on the fish surveys are anticipated to the complete in August 1990. A report on sediment conductivity mapping is expected in July 1990. Toxic contaminant levels will supplement this information in the winter of 1991.

Contaminant loading surveys were conducted in 1988 and 1989. A preliminary report on dry weather toxic organic loadings from storm sewers in expected in October 1990. Wet weather contaminants surveys, as assess toxic organic loadings from storm and combined sewers across the waterfront, are planned in 1990 for Etobicoke and Scarborough, and in 1991 for the City of Toronto.

Port Hope Harbour

The Stage 1 RAP Report, assessing environmental conditions and problem definition, was completed in August 1989 and approved as meeting the requirements of Stage 1 by the IJC in April 1990. Currently the RAP Team is preparing the Stage 2 report which will include details regarding the in-place and removal options. A monitoring and surveillance plan to assess the effectiveness of clean-up should be complete by January 1991.

Studies are ongoing to determine contaminant loadings to sediments from present day sources (CAMECO) into the Harbour. A detailed loading study which was undertaken in 1990 will permit

the assessment of any continuing impacts once the contaminated sediments are removed. Contamination by uranium, thorium, radium, radioactive lead, heavy metals, and PCBs, occurs in 90,000 m^3 of sediment in the Harbour. This contamination is attributable to historic waste management practices at the adjacent radium and uranium refining operation.

It has been proposed that the existing harbour not be used as a small craft harbour and that a new harbour be developed. This proposal was endorsed by the public advisory component of the RAP, the Environmental Advisory Committee. If the harbour is no longer used for small craft boating, remedial options other than removal of contaminated sediments can be considered.

The Low-Level Radioactive Waste Management Office (LLRWMO) of Atomic Energy of Canada Limited has developed options for sediment removal. Options include dredging, capping and isolating the material. The Port Hope Municipal Council proposed that the option of stabilization and isolation of the sediments be considered. Pilot projects demonstrating sediment removal have been completed. Removing sediment is contingent upon establishing a suitable disposal facility.

The RAP Team will continue to liaise with LLRWMO in the identification and selection of an acceptable method for cleaning up the harbour.

Bay of Quinte

The Stage 1 RAP Report, assessing environmental conditions and problem definition, has been completed and was submitted to the IJC in October 1990. The draft RAP or Stage 2 Report is projected to be completed in 1991. The RAP team produced an options discussion document, "Time to Decide", which was released in September of 1989 and is currently undergoing agency review.

The Public Advisory Committee (PAC) has completed their review of "Time to Decide". In April 1990 they released a report which identifies their preferred remedial actions and makes recommendations for additional action and other aspects of implementation. PAC recommendations include establishment of a maximum allowable phosphorus loading in the Quinte watershed. Their report is the culmination of an extensive three-year public education and consultation program. The PAC has also produced a video with the RAP Team called "Time to Decide".

Other initiatives of the PAC include: completion of their water use goals in October 1989, and a draft implementation structure for the Bay of Quinte RAP. The PAC has had ongoing discussions with the COA RAP Steering Committee regarding continued public involvement, sharing of responsibilities, and creation of a permanent joint agency/public implementation steering committee.

A toxics fate and transport model for the evaluation of remedial options for PCBs, PCPs, and arsenic has been developed and will be expanded to include a wider range of contaminants. The eutrophication model developed for the Bay is also under further development to improve its linkages to fish communities.

Attention has been focused on remediation of waste disposal sites. An illegal liquid waste disposal site is undergoing investigation, assessment of remedial measures and legal action in Ameliasburg. Over 70 drums were excavated. A second illegal waste disposal site has been found in Trenton.

UNITED STATES AREAS OF CONCERN ON LAKE ONTARIO

REMEDIAL ACTION PLAN STATUS

LOCATION	STATUS	SCHEDULED COMPLETION
Oswego River	In progress	1990
Rochester Embayment	Started, November 1988	1991
Eighteenmile Creek	Not yet underway	1992

Oswego River

The Oswego River Area of Concern, located at the entrance into Lake Ontario of the largest sub-basin tributary to the Lake, is the recipient of drainage from 5122 square miles of land.

IJC-identified problems in this Area of Concern are conventional pollutants, heavy metals, and contaminated sediments.

In 1985, Science Applications International Corporation assembled key data source documents for the Area of Concern. The Corporation then assessed the sufficiency of the documents and identified additional data needs.

New York's water pollution control program has resulted in adequate treatment for all the point source discharges in the drainage basin tributary to the Oswego River Area of Concern. Such sources include the cities of Syracuse, Fulton, and Oswego, in addition to major communities in the upper reaches of the Basin.

In connection with heavy metals and contaminated sediments, a series of samples was collected and analyzed by the U.S. Corps of

Engineers in May, 1987 (The Oswego Harbor is maintained and dredged by the Corps.). NYSDEC collected a sample of sediment from the mouth of the river in 1987. This information is available for review and assessment by the RAP participants in their development of the Plan.

A committee of citizens from the local area was organized in April, 1987 and has held monthly meetings since. Their accomplishments have included defining desired use, publishing newsletters to inform people about the Oswego Area of Concern, and conducting public meetings.

The Stage I Report for the Oswego River RAP was completed in February 1990. It was formally transmitted to the IJC for review. The State II RAP was started early this year. Several data deficiencies noted in the Stage I RAP are high priorities for the project. Proposals to collect data would directly improve the knowledge of impacts of the Oswego River on Lake Ontario. High priority proposals for the implementation phase of the RAP include a study of Mirex sediment contamination as a source to Lake Ontario, and PCB and Dioxin source investigations and evaluations.

Rochester Embayment

The Remedial Action Plan for the Rochester Embayment started in 1985 with a three-step gathering of information by the Science Applications International Corporation, a consultant employed by USEPA. The result of that effort was the assembly of key source documents, assessment of the sufficiency of the information, and identification of additional data needs.

Problems in the Area of Concern, according to the IJC, stem from conventional pollutants, heavy metals, toxic organics and contaminated sediments.

Past water pollution control efforts have resulted in management of all point source discharges in the area tributary to the Rochester Embayment. The County of Monroe is presently in the midst of a combined sewer overflow abatement project that will result in adequate treatment of all of Rochester's storm drainage through transmittal to the Van Lare Wastewater Treatment Plant.

The Irondequoit Basin (Irondequoit Creek and Bay) is a tributary to the Area of Concern. Monroe County is implementing a water quality management program for the Irondequoit Basin. This program integrates management of nonpoint sources of pollution from urban and agricultural areas and management of in-place pollutants in Irondequoit Bay. The management plan integrates findings of the Irondequoit Bay Clean Lakes Program, the Irondequoit Basin Nationwide urban Runoff Program, and the NYSDEC

Irondequoit Basin Agricultural Runoff Study. Implementation of the plan to date includes:

- Application of 924,000 gallons of alum to Irondequoit Bay to bind accumulated phosphorus in deep bay muds, and thereby preclude its availability as a nutrient;

- Continuation and expansion of a water quality monitoring program in association with the U.S. Geological Survey. This includes research of the modification of an existing detention basin to improve water quality, monitoring of groundwater, and monitoring of a wetland system that could be further used for stormwater treatment; and

- Institution of a construction site erosion control program in cooperation with the Soil and Water Conservation District. This includes the hiring of an erosion control technician who reviews site plans and construction sites for erosion control compliance.

In 1985, the Monroe County Department of Health conducted the Genesee River Sediment Toxics Study, an activity to identify the types and toxicity of sediment at the mouth of the river, which is the prime component of the Area of Concern.

NYSDEC, in 1987 and 1988, collected additional sediment samples from the lower portion of the Genesee River.

An award of $241,150 of Clean Water Act 205j funds has been made to Monroe County to assist NYSDEC in the preparation of the Rochester Embayment Remedial Action Plan. Watershed plans for each of the watersheds that flow to the embayment are being prepared as part of this effort. A detailed workplan has been prepared and contract preparation is underway. A kick-off public meeting was held in November, 1988.

The Stage I RAP for the Rochester embayment was started in 1989. A public advisory committee was established along with several subcommittees to address specific portions of the problem identification phase of the RAP. Information on the LOTMP was presented to the RAP Citizen Advisory Committee at a monthly meeting. Input was sought on the integration of the RAP into the Plan as well as what types of information are needed to proceed with development of Stage 1.

Eighteenmile Creek

The International Joint Commission identified problems in the Eighteenmile Creak Areas of Concern as being the result of conventional pollutants, heavy metals, and contaminated sediments.

Past contamination of the creek was due to municipal discharges from the city of Lockport and the hamlet of Newfane, and to various discharges from Harrison Radiator (near Lockport) and various industries located along the stream between the city and the lake. Abatement of this pollution has been achieved through control of point sources in the drainage area, primarily through upgrading at Lockport and consolidation, treatment, and discharge to Lake Ontario of the effluents in and around Newfane.

In 1987 and 1988, NYSDEC collected sediment samples from the harbor at Olcott and from the creek upstream of dams located at Burt and at Newfane. Prior sampling had been conducted by USEPA and the Corps of Engineers. High sediment metal concentrations were noted behind the two dams.

AT the present time, efforts are being concentrated in the other five New York Areas of Concern, with the RAP for this area being delayed until the rest are substantially completed. It is envisioned that work on this Remedial Action Plan will get underway in 1991 and be completed by 1992.

FIGURE I. REMEDIAL ACTION PLANS - GENERIC TASKS

o Environmental Data Base o

o Identification of Pollution Sources o

o Identification of Restoration Goals and Objectives o

o Remedial Action Requirements o

o Identification of Preferred Options o

o Draft Remedial Action Plan (including implementation schedule) o

o Cooperative Agency Approvals o

o Agency Release for Public Review and Comment o

o Preparation of Final RAP (including implementation schedule) o

o Final Agency Approvals o

o Transmission of RAP to the IJC by the Agencies o

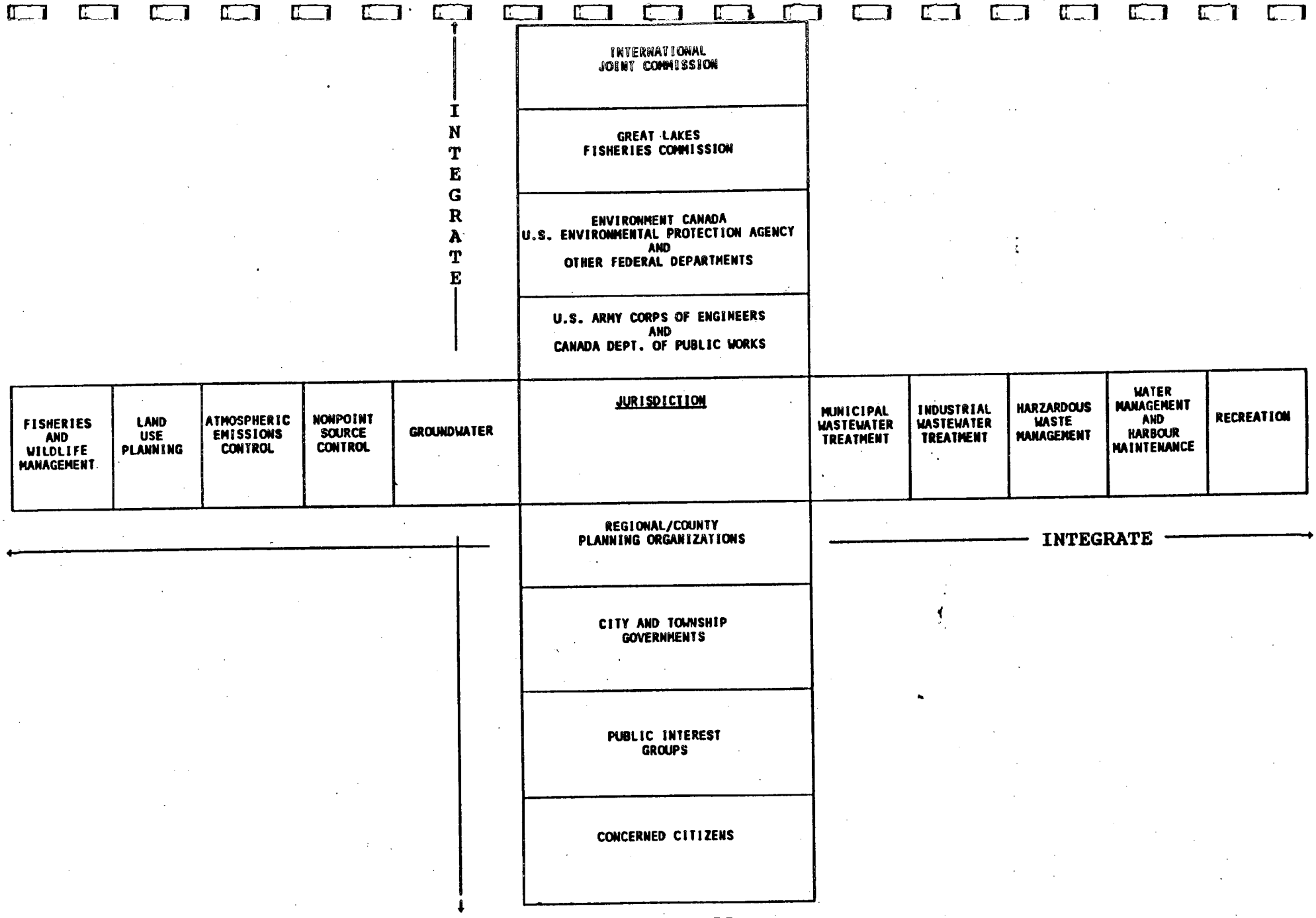

FIGURE II

A TWO DIMENSIONAL SCHEMATIC DIAGRAM WHICH DEPICTS THE NEED TO INTEGRATE THE RESPONSIBILITIES OF DIFFERENT AGENCIES, ORGANIZATIONS AND PROGRAMS UNDER THE UMBRELLA OF A REMEDIAL ACTION PLAN

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix VI
Recommendation to
Ecosystem Objectives Work Group

Recommendation

- The EOWG will review and develop appropriate biotic health and human health indicators as yardsticks for measuring attainment of the goals of the LOTMP, and ecosystem objectives that support that goal.

- The indicators that EOWG will develop will be tied as closely as possible to the LOTMP goals and priority toxics. In order of preference, the indicators will relate cause and effect between indicators and:

  - individual priority toxics
  - families of chemicals
  - toxics overall

- The EOWG will provide indicators to the Secretariat for review as each indicator is developed.

- The EOWG will recommend appropriate programs to monitor indicators of ecosystem health and to evaluate progress towards attainment of ecosystem objectives.

- The EOWG will, by February 1991, provide the Secretariat with a schedule and workplan for the development of the indicators.

- Identify gaps in knowledge needed to develop and apply ecosystem objectives, and recommend research required to fill the gaps.

- The EOWG will report progress to the Lake Ontario Secretariat. It will provide periodic progress reports and make appropriate recommendations related to Lake Ontario ecosystem and human health indicators and objectives.

- The EOWG will cooperate with the Fate of Toxics Committee to determine how data being collected by the Committee for the mass balance models can be utilized in developing, refining and monitoring the indicators.

Recommendation

Lake Ontario
Ecosystem Objectives Work Group

Background

Existing environmental legislation relies heavily on chemical-specific standards and criteria as a means for achieving and maintaining desired ambient water quality. The legislation implies that regulation and control of toxic pollutants on a chemical-by-chemical basis will adequately protect all beneficial uses of Lake Ontario and will ensure a productive, healthy ecosystem. As a check on the adequacy of chemical-specific standards and criteria, the Lake Ontario Toxics Management Plan includes commitments for the development of ecosystem objectives and indicators. The objectives are intended to provide a basis for measurement of ecosystem health and and for attainment of Plan goals. In establishing such objectives, the ecosystem is defined to include all aquatic and terrestrial plants and animals including humans.

The Great Lakes Water Quality Agreement of 1978, as amended in 1987, also calls for the development of "Lake Ecosystem Objectives" (Annex I) and "Ecosystem Health Indicators" (Annex II). Objectives and indicators developed under the GLWQA are related, in part, to "critical pollutants" causing defined "use impairments." The priority toxics of the LOTMP represent a subset of the "critical pollutants" of the GLWQA. Thus while development of ecosystem objectives for Lake Ontario will continue in response to its larger two-party role under the GLWQA, the effort for the LOTMP will be focused on indicators and objectives related to the LOTMP priority toxics. Development of ecosystem objectives and indicators for Lake Ontario will be accomplished as part of efforts to develop ecosystem objectives for all of the Great Lakes under the Water Quality Agreement.

In order to develop ecosystem objectives for Lake Ontario, the Coordination Committee requested the Binational Objectives Development Committee to direct the Ecosystem Objectives Work Group, which has responsibility for developing objectives and indicators for all the Great Lakes, to begin work on ecosystem objectives and indicators related to Lake Ontario Priority Toxics. In June, 1990, the EOWG submitted a report, Ecosystem Objectives for Lake Ontario, to the Secretariat. The report established five ecosystem objectives for the lake, and lay the groundwork for the ongoing effort to develop quantitative indicators for each objective. The following recommendation to the EOWG has been updated in light of that report.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix VII
Niagara River/Lake Ontario
Categorization Committee Charge

Charge to the
Niagara River/Lake Ontario
Categorization Committee

Background

Under both the Niagara River and Lake Ontario Toxics Management Plans chemicals are categorized based on a number of factors, including: their presence in the waterbodies or in the biota at levels with respect to agency standards and criteria, the relationship of their detection levels in the waterbodies to the standards and criteria, and whether they are known to be entering the waterbodies. As:

1. Our knowledge about chemicals in these waterbodies increases,

2. Standards and criteria are improved or new ones developed, and

3. Additional information is gathered on ambient levels of these chemicals in Lake Ontario,

the assignment of chemicals to specific categories will change.

A continuous effort will be needed to keep the categorization of chemicals in the river and lake up to date.

To undertake this effort, the Secretariats for the Niagara River and Lake Ontario established a Categorization Committee in February 1989 under the Lake Ontario and Niagara River Toxics Management Plans. In June 1990, the Categorization Committee submitted a report to the Niagara River Secretariat on the categorization of toxic chemicals for the Niagara River.

Based upon the findings and recommendations contained in that Categorization Committee report, the Niagara River and Lake Ontario Secretariats, submitted a report to the Coordination Committee outlining Four Party and individual agency actions that would respond to the recommendations in the Categorization Committee report. At its September 19, 1990 meeting on the Niagara River Toxics Management Plan update and status report, the Coordination Committee adopted the recommendations of the Secretariats. The following specific charge to the Categorization Committee has been revised in light of that action.

Charge

1. Maintain separate categorizations of chemicals for the Niagara River and Lake Ontario so that they are reasonably

current and available for use by the Niagara River and Lake Ontario Secretariats.

- By June 1991, conduct a comprehensive categorization of toxic chemicals for Lake Ontario, following the principles and guidance contained in the report "Proposed Actions In Response to the June, 1990 Niagara River Categorization Report to the Secretariat" adopted by the Coordination Committee at its September 19, 1990 meeting at Niagara-on-the-Lake, Ontario.

- Update the categorization of toxic chemicals for the Niagara River by June, 1992 and bi-annually thereafter; update the categorization of toxic chemicals for Lake Ontario by June 1993, and bi-annually thereafter.

2. In collecting data for the Lake Ontario categorization special attention should be paid to the appropriate use of "local" data, particularly that developed from spot-tail shiner. The Committee shall request a meeting with the Lake Ontario Secretariat concerning the appropriate use of "local" data prior to completing its categorization for Lake Ontario.

3. Advise the Secretariats on needs for changes in the established categorization procedures, clarifications in the committee's charge, etc.

4. This charge incorporates by reference the report "Proposed Actions In Response to the June 1990 Niagara River Categorization Report to the Secretariat" adopted by the Coordination Committee at its September 19, 1990 meeting at Niagara-on-the-Lake, Ontario.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix VIII
Niagara River/Lake Ontario Standards and Criteria Committee Charge

ecology and environment

Charge to the
Niagara River/Lake Ontario
Standards and Criteria Committee

Background

The levels of toxic chemicals in water and fish in Lake Ontario and in the Niagara River, and whether or not these levels exceed environmental standards and criteria, are major driving forces behind implementation of the Lake Ontario and Niagara River Toxics Management Plans. For many chemicals found in these waterbodies, standards and criteria do no exist. Where they do exist the values often differ among different agencies.

A focus of both toxic management plans is to ensure that standards and criteria are developed for chemicals found above background levels in the ambient water, biota, and sediments where such standards and criteria do not yet exist. At the same time, where agencies already have standards and criteria, a second focus of the plans is to examine differences, where they exist, among the standards and criteria, and propose common values that can be adopted by all four agencies. The development of consistent, and where needed new, standards and criteria is expected to be a continuing effort.

The Niagara River and the Lake Ontario Coordination Committee established a Standards and Criteria Committee to assist it in the plans and updates and in making recommendations to appropriate agencies on standards and criteria. This committee reports to the Secretariats. The committee is expected to consult with the IJC and other agencies as necessary to prevent duplication of effort and ensure a coordinated program.

In March 1990, the Standards and Criteria Committee submitted a report to the Secretariat on the water quality criteria of Lake Ontario and the Niagara River. In that report, the Committee evaluated:

- The water column criteria of the Four Parties, both those developed for the protection of aquatic resources, and those developed for the protection of human health; and

- The fish tissue criteria of the Four Parties, both those developed for the protection of wildlife, and those developed for the protection of human health.

Based upon the findings and recommendations contained in that Standards and Criteria Committee report, the Niagara River and Lake Ontario Secretariats, submitted a report to the Coordination Committee outlining Four Party and individual agency actions that

would respond to the recommendations in the Standards and Criteria Committee report. At its September 19, 1990 meeting on the Niagara River Toxics Management Plan update and status report, the Coordination Committee adopted the recommendations of the Secretariats. The following specific charge to the Standards and Criteria Committee has been revised in light of that action.

Charge

1a. For Category IA chemicals (exceeds enforceable standard) and IB (exceeds an unenforceable but more stringent criterion) chemicals, review the standards and criteria for their adequacy relative to the purposes of the two Toxics Management Plans, and identify standards and criteria that are inadequate for these purposes (Tasks 1a and 1b have been completed for the current categorization of toxics. However there may be an ongoing need to continue these efforts in light of future categorizations).

The Four Parties recognize that achieving the ultimate goals of the Great Lakes Water Quality Agreement and the Lake Ontario Toxics Management Plan requires achieving zero discharge of toxics. However, considering the current environmental status of Lake Ontario, the Four Parties also recognize the practical value of achieving toxic chemical load reductions required to meet a consistent set of adequately protective ambient criteria. The achievement of these criteria will constitute a significant interim milestone on the way to achieving virtual elimination to toxics from the Lake Ontario ecosystem.

b. Where significant differences in standards and criteria exist among agencies, describe the reasons for these differences and propose ways in which the differences can be resolved.

c. Monitor and report on additional standards and criteria now under development. Specifically:

- Water column criteria for the protection of human health to be developed by the Ontario Ministry of the Environment (MOE), Environment Canada and Health and Welfare Canada and

- Human health criteria based on fish consumption being developed by the NYS Department of Environmental Conservation.

d. Prioritize the list of IB chemicals for development of enforceable standards or criteria. Considerations in setting priorities should include the chemical's toxicity, persistence, and prevalence in the river and lake basins.

2. For Category IE chemicals (no criteria exist), describe the current status of standard and criteria development noting responsible agencies and scheduled completion dates for each chemical (a list of these chemicals is attached).

3. For Category IE chemical where no criteria or standard development is underway, prepare a plan for criteria development. The plan should include a scheme to prioritize chemicals for criteria development, starting with the Niagara River and Lake Ontario categorizations, and based on the MOE toxicity ranking system. Considerations in setting priorities should include the chemical's toxicity, persistence, and prevalence in the river and lake basin. The committee should describe where important scientific information gaps exist and propose agencies that are best suited to obtain this information.

4. Keep informed of and report on progress in the development of specific objectives by the federal agencies under the Great Lakes Water Quality Agreement (GLWQA), and coordinate their work, to the extent feasible, with work being done under the GLWQA.

5. Cooperate with, monitor, and report on efforts by the Binational Objectives Development Committee to evaluate the existing criteria for Aluminum and Iron and to develop criteria for them that take into consideration site-specific influences on their toxicity.

6. Monitor individual agency activity in the development of sediment criteria and report to the Secretariats by September 1991, and annually thereafter, on the development of sediment quality criteria that would be applicable to the Niagara River and Lake Ontario basins.

7. Ensure that the EPA member of the Standards and Criteria Committee should update EPA's "Gold Book Criteria" by applying new or revised Carcinogenicity Potency Factors and RFDs contained in EPA's Integrated Risk Information System (IRIS) database.

This charge incorporates by reference the report "Standards and Criteria for the Niagara River and Lake Ontario" submitted by the Niagara River and Lake Ontario Secretariats and adopted by the Coordination Committee during its September 19, 1990 meeting at Niagara-on-the-Lake, Ontario.

Toxics categorized as IE

Lake Ontario

pentachlorobenzene

polyfluorinated biphenyls

1,1-(difluoromethylene)

bis-chloro-mono (trifluormethyl) benzene

pentachlorotoluenes

endosulfan

pentachloroanisole

chlorophenyl - [chloro (trifluoromethyl) phenyl] methanone

dioxins (other than 2,3,7,8-TCDD)

polychlorinated dibenzofurans

heptachlorostyrene

tetrachloroanisole

nonachlor (cis + trans)

Niagara River

photomirex

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Appendix IX
Niagara River/Lake Ontario
Fate of Toxics Committee
Charge

Charge to the
Niagara River/Lake Ontario
Fate of Toxics Committee

Background

The Niagara River Toxics Management Plan has identified seven toxics that exceed existing standards or criteria in the water column in the Niagara River. The Lake Ontario Toxics Management Plan has identified eleven toxics that exceed existing standards or criteria in the water column or in fish tissue in Lake Ontario.

A common objective of both toxic management plans is to eliminate exceedances of standards and criteria. Mathematical models of pollutant fate can be developed to relate pollutant inputs to levels of toxics in the ambient water column, sediment and biota. The models can be used to estimate the reductions in loadings necessary to achieve standards and criteria and to estimate the time lags associated with system response. The Lake Ontario and Niagara River Secretariats have established a joint Fate of Toxics Committee (FOTC) to develop mathematical models of pollutant fate in the river and lake.

In April 1990, the FOTC submitted a report "A steady state mass balance and bioaccumulation model for toxic chemicals in Lake Ontario" containing a conceptual, or Level I, mass balance model for the lake. Work to refine, validate and calibrate the model continues (a refined version of the Lake Ontario model was submitted to the Secretariat in November 1990). A second, dynamic, Level I model for Lake Ontario has been submitted to the FOTC in draft form, and is under review. The FOTC has convened a peer review committee to review both models and make recommendations on the most appropriate model and element for use by the FOTC. A draft peer review report has been submitted to the FOTC and is now under review.

A draft report on a mass balance model for the Niagara River was also issued by the FOTC in 1990. The final report is expected in late 1990. The charge to the FOTC has been updated in light of this ongoing work.

Charge

- Complete conceptual, Level I model of pollutant fate for the Niagara River that account for essential system characteristics such as (with the exception of incorporating "timescales for response" into the model, this task has been essentially completed for Lake Ontario):

- Hydrodynamics;
- Zonation;
- Impacts of areas of concern such as harbors and embayments;
- Time scales for response; and
- Other physical, biological and chemical factors.

o Complete the peer review of the two Lake Ontario models.

o Complete development of the Level I model for the Niagara River. This model should not include the western Lake Ontario embayment as a compartment.

o Reach FOTC consensus and make a recommendation to the Secretariat on the most appropriate Level I static and dynamic models for Lake Ontario and the Niagara River.

o Use the models to relate pollutant loadings to levels of toxics in the ambient water column, sediment and biota, as appropriate. Level I estimates have been made for Lake Ontario. Estimates are in draft form for the Niagara River. Estimates from both models will need to be revised as the "essential system characterictiscs" are completely incorporated in to models, and as loadings estimates improve.

o Estimate the reductions in loadings necessary to meet all standards and criteria identified in the March 1990 report from the Standards and Criteria Committee to the Secretariat; estimate system lag times and estimate potential errors.

The Fate of Toxics Committee will estimate the reductions in loadings necessary to meet standards and criteria based on preliminary models of pollutant fate. These preliminary models will be based entirely on existing data.

Following the development of the Level I model(s) the Committee will develop a workplan for preparation of calibrated and verified Level II model(s). This new workplan will include:

o Proposals for collecting new data as necessary.

o Present options at different cost levels to improve precision of the model(s)

- Calibration of the Level I model(s), using existing data, and improved loadings estimates provided to the committee by the Lake Ontario Secretariat.

The Fate of Toxics Committee will report to the Niagara River and Lake Ontario Secretariats.

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Appendix X
Pollution Prevention Initiatives of the United States and Canada

In order to make further progress towards the goal of virtual elimination of toxic discharges as embodied in the Great Lakes Water Quality Agreement, the Four Parties are committed to evaluating how pollution prevention activities (for example, source reduction) can be incorporated into the LOTMP.

In particular, the Four Parties have developed Pollution Prevention Initiatives to encourage waste minimization in both the U.S. and Canadian sides of the Niagara River and Lake Ontario Basins (the Canadian Plan is proposed). The pollution prevention initiatives build on, and are complementary to, the existing pollution prevention activities of the individual agencies.

The key objectives of the U.S. plan are to:

- Determine how industrial facilities located in the Niagara River/Lake Ontario basin can better apply pollution prevention techniques to reduce their releases of toxic chemicals to air, land, and water; and
- Develop a joint industry/governmental initiative on pollution prevention.

The key objectives of the proposed Canadian plan are to:

- Facilitate and highlight government-industry cooperation in achieving source control and zero discharge of toxic substances under the LOTMP;
- Increase industry and municipal awareness of existing nonregulatory programs of MOE and EC which support source control and attainment of zero discharge;
- Identify opportunities for partnership or information sharing leading to development and implementation of pollution prevention projects; and
- Provide a visible means of documenting and tracking progress of specific commitments made to source control and zero discharge within the Lake Ontario/Niagara River geographic context.

At the same time, the United States and Canada are working to reach agreement on a pollution prevention plan at the national level. The Secretariat will ensure that the bi-national proposal and the Four Party proposal are not duplicative and will encourage use of the Four Party Initiatives as a pilot for the bi-national proposal.

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Appendix XI
Public Involvement Workplan
Niagara River/Lake Ontario Toxics Management Plans

NR/LOTMP Public Involvement Workplan 2/13/90

Schedule/Commit to doing	Time Frame	Responsible Parties
1. Include articles about NR/LOTMP in individual RAP newsletters	twice per year	DEC/DOE
2. Plan expansion of RAP newsletter distribution when relevant articles appear in them: Include more of the basin than the area covered by RAP mailing lists.	twice per year	DEC/DOE
3. Plan dates and locations of upcoming Coordination Committee meetings		Secretariat Coord. Committee
4. Plan dates and locations of the public workshops associated with the Coordination Committee meetings.	NR-2 per year LO-1 per year	Secretariat DOE/DEC
5. Develop travel reimbursement statement The agencies pay for one representative from each relevant RAP area to attend Coordination Committee meetipgs and workshops. Each country will be responsible for reimbursing the people from their side. DOE will negotiate with MOE and DEC will negotiate with EPA to pay for those from their own side of the border	in progress	EPA/DEC DOE/MOE

Schedule/commit to doing	Time Frame	Responsible Parties
7. Develop a statement about citizen membership on the technical subcommittees. Kevin Bricke is editing a proposal drafted by Louise Knox	in progress	4 agencies Secretariat
8. Schedule secretariat visits to the RAP sites.	annual	Secretariat
9. Develop feature articles for newspapers.	on hold	
10. Develop logo.	on hold	
11. Citizen groups assist with announcing meetings, workshops etc. in their newsletters	when needed	GLU, LOON others

TOTAL ESTIMATED COST: STAFF TIME ONLY

Mailing List Improvement	Time Frame	Responsible Parties
1. Inventory current list by catagory; identify who we need to add and make proposal for meshing list on either side.	May	DEC/EPA MOE/DOE
2. Citizens review catagories of publics on mailing list for completeness	May	LOON/GLU
3. Implement	July	DOE/EPA

ESTIMATED COST: STAFF TIME ONLY

WRITTEN MATERIALS

	coordinate production	review document	distribute
1) Project Overview Document	EPA	4 agencies Secretariat	DOE/EPA
2) Time Table	DOE	4 agencies Secretariat	DOE
3) Flyer for potentially involved public	DEC	4 agencies Secretariat	DOE/EPA

WORKSHOPS	Time frame	Responsible Parties
1) Develop issues for discussion		DEC/DOE work with Secret.
-print document		EPA Consultant
-provide mailing		DEC/DOE LOON/GLU
-distribution of document	3 weeks prior to workshop	DEC/DOE LOON/GLU
2) Develop Responsiveness Summary Document	following each workshop	DEC/DOE advise Secretariat
3) Manage logistics of workshop		Sponsoring Country DEC/DOE

Improved Media Support	Time Frame	Responsible Parties
1. Develop press releases to announce Coordination Committee meetings and Workshops	two weeks before workshop	alternate with sponsor country
2. Provide a press coordinator for each meeting or Workshop		alternate with sponsor country
3. Develop press features with Secretariat approval	on hold	

ESTIMATED COST: Staff time

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TOXICS MANAGEMENT PLAN

(INFORMATION TO BE SUPPLIED AFTER LOTMP WORKSHOPS)

Appendix XII
Public Responsiveness Document
Lake Ontario Toxics Management Plans