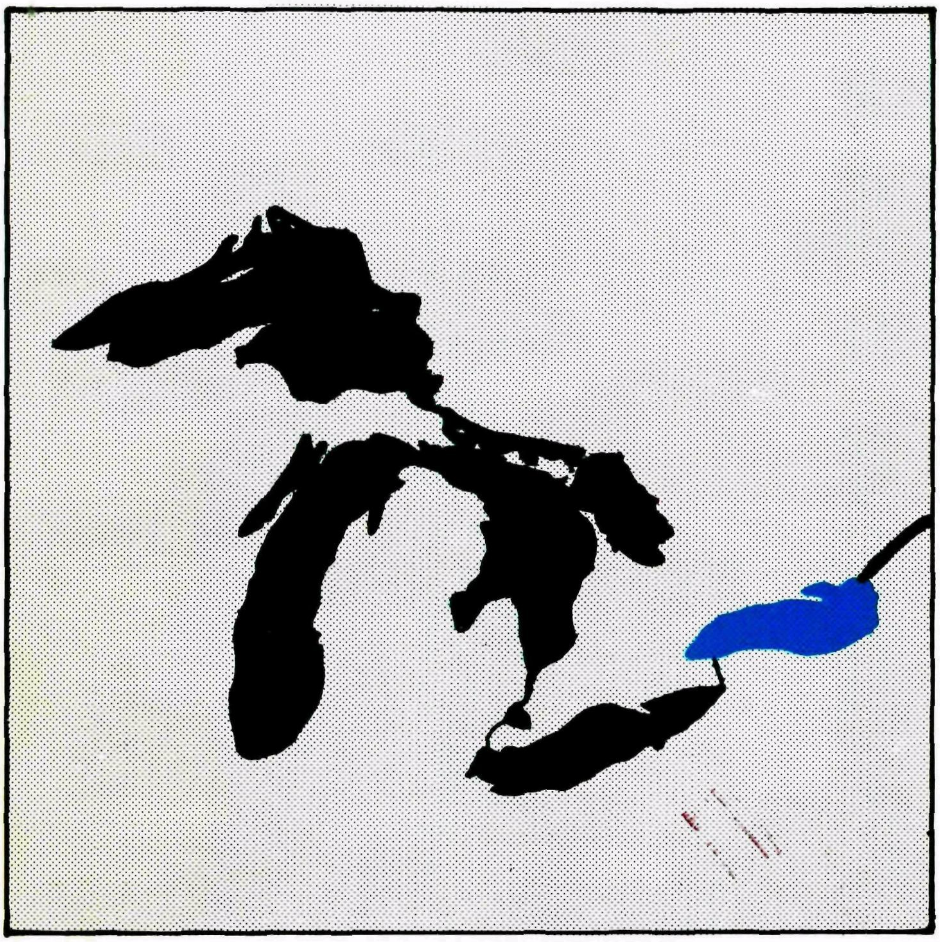
LAKE ONTARIO



TOXICS MANAGEMENT PLAN

A Report By The
LAKE ONTARIO TOXICS COMMITTEE
February 1989

Environment Canada
Environnement Canada

United States
Environmental
Protection Agency

Ontario

Ontario Ministry
of The Environment

New York State
Department of
Environmental
Conservation

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

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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 Plan.

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

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

The initial public outreach effort has been completed, and supplemental information and data have been generated. The results of these efforts are reflected in this Plan and its accompanying Public Responsiveness Document.

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

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

The Plan has been 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. Status reports and Plan updates will be developed on an annual basis.

II. Scope

A. Geographic Scope

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

The Lake Ontario Toxics Management Plan addresses the toxics problems encountered in the open waters of the Lake:

- Nearshore areas and embayments are included as part of the Lake,
- Tributaries, including the Niagara River, are treated as point source 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 Plan 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. For this reason, the Plan will focus initially on defining the relative importance of such aggregated inputs as the Niagara River, other tributaries, atmospheric deposition, direct discharges, and releases from sediments. Next, the Plan 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.

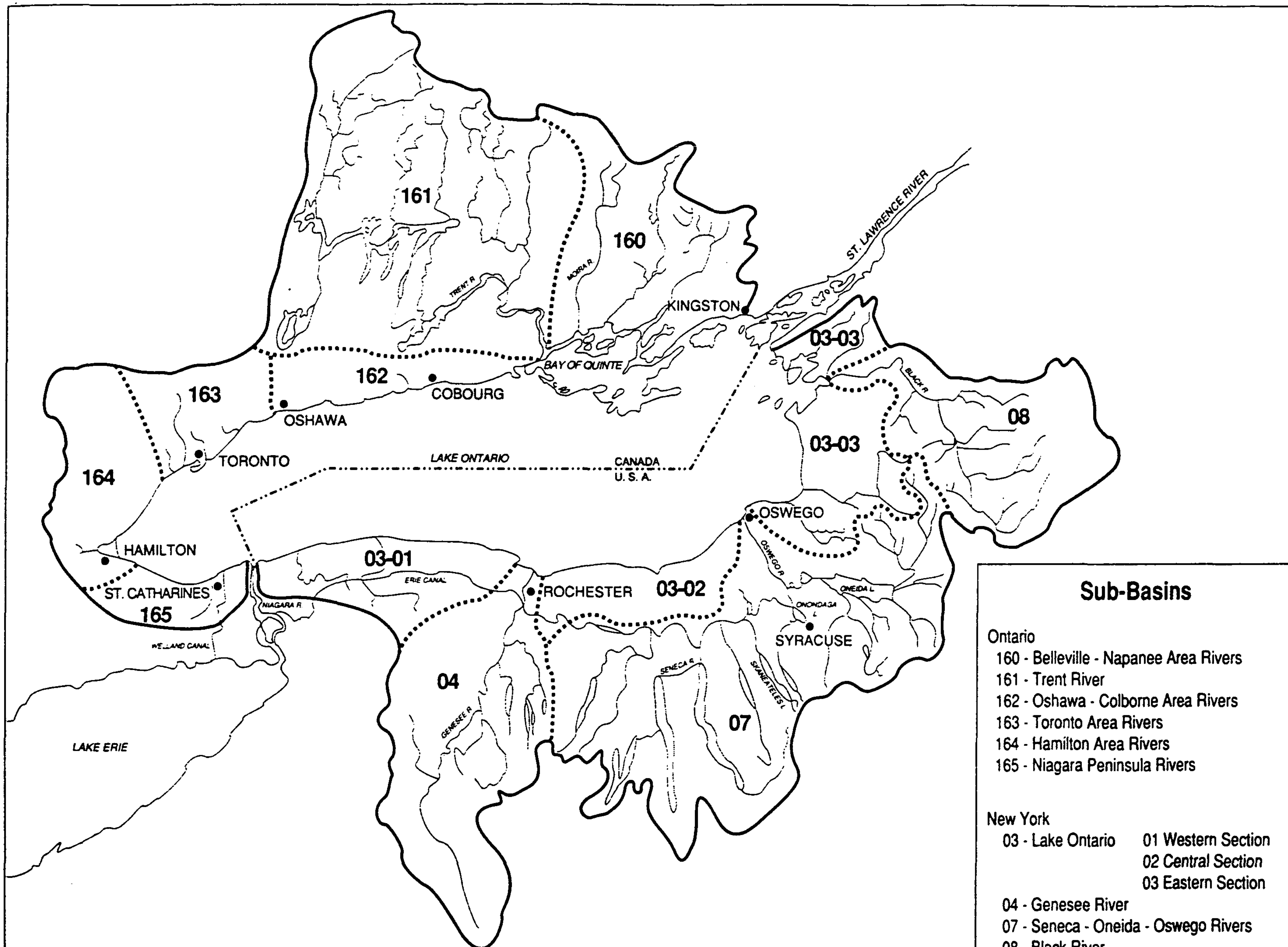

Figure 1. Lake Ontario Basin and Major Sub-Basins

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 indicators of ecosystem health. The chemical-specific descriptions are fairly well developed; the ecosystem-based descriptions are, however, less well developed, and will be a major focus of future planning activities.

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 consumption by humans.

  - PCBs, Mirex, Chlordane, Dioxin, and Mercury

    The edible portions of fish tissue in the larger specimens of some Lake Ontario sportfish, most frequently salmon and trout, exceed Canadian and/or U.S. standards for these five toxics.

  - Hexachlorobenzene, DDT and Metabolites, and Dieldrin

    The edible portions of fish tissue in the larger specimens of some Lake Ontario sportfish, most notably salmon and trout, exceed more stringent, but unenforceable EPA guidelines for these three toxics.

- 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.

- Generally accepted direct indicators of the impact of toxics in Lake Ontario on human health are not presently available.

B. Impact on Other Biota

Toxics in Lake Ontario are also a biotic health concern.

- They bioaccumulate in fish to levels that make them unsafe for consumption by wildlife. The toxics that exceed guidelines for piscivorous wildlife are: PCBs, dioxin (2,3,7,8 - TCDD), chlordane, mirex, dieldrin, DDT and metabolites, and octachlorostyrene.

- PCBs, iron and aluminum are also found in the ambient water column at levels above standards and criteria designed for protection of aquatic life.

- In the past, toxics have clearly been shown to have caused adverse impacts on other biota. For example, toxics have caused deformities and reproductive failures in fish-eating birds.

- However, the levels of toxics in Lake Ontario have been reduced over the past two decades. There is some question as to whether the persisting adverse impacts to other biota are linked solely to toxics.

C. Trends

There is clear evidence that the 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 colonies on Lake Ontario during the period from 1974 to 1986 show significant declines; and

- The levels of PCBs in lake trout, brown trout and coho salmon collected since 1975 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 Ontario biota may be stabilizing at unacceptably high levels.

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 bald eagles, ospreys, mink and otters.

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

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

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

B. <u>Objective 1: Reductions in Toxic Inputs Driven by Existing and Developing Programs</u>

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 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 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 developed for inclusion in Plan updates, and will provide a baseline in evaluating the need for further reductions.

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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 Lake Ontario sediments, and to all other sources of toxics to the Lake Ontario water column and biota.

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 International Joint Commission recognized Areas of Concern in the Lake Ontario basin: 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.

The Plan recognizes the Niagara River as one of the most significant sources of toxics to the Lake. The Four Parties have completed, and are currently implementing the Niagara River Toxics Management Plan. Since implementation of the Niagara Plan will also contribute to the elimination of the toxics problem in Lake Ontario, Table II incorporates the Niagara Plan in the Lake Ontario Plan 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.

The timetables for the full implementation of the RAPs will be included in Plan updates, as the RAPs are completed; load reduction estimates associated with the RAPs will also be included in Plan updates. The Niagara River Toxics Management Plan will achieve a 50% reduction in the Niagara River loadings of a specified list of persistent toxic chemicals by 1996.

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 basis or on an 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 system for categorizing toxics. The categories are shown in Table III.

In order to implement the system for categorizing toxics, the Lake Ontario Toxics Committee 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:

- o Seven (7) chemicals exceeded enforceable standards in the water column, fish tissue or both (Category IA);
- o Four (4) chemicals exceeded more stringent, but unenforceable, criteria or guidelines in the water column, fish tissue or both (Category IB);
- o Seventeen (17) chemicals were found only at levels at or below the most stringent standard, criterion or guideline (Category IC);
- o Two (2) chemicals were analyzed with detection limits too high to allow a comparison with standards, criteria or guidelines (Category ID); and
- o 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:

- o As shown in Table V, one hundred and one (101) additional chemicals showed evidence of presence or input (Category IIA); and
- o 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 a more limited role in the categorization process because there are no standards or criteria for these media. The system, however, is flexible enough to use this other ambient data as standards and criteria become available.

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.

- o For toxics which exceed enforceable standards we will enhance and implement control programs.

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

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

- o For toxics which 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.

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

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

- o 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 will be pursued on a priority basis, as appropriate.

Since the categorization of toxics plays a central role in directing the actions in the Plan, the categorization will be updated periodically 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 will be available in July, 1989.

The Plan focuses priority attention on the eleven chemicals that have been found to exceed standards or criteria (PCBs, dioxin (2,3,7,8-TCDD), chlordane, mirex, mercury, iron, aluminum, DDT and metabolites, octachlorostyrene, hexachlorobenzene, dieldrin). In order to deal effectively with 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. The tributaries have been ranked based on tributary 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 facilities (twelve in Ontario and three in New York) and two industrial facilities (one in Ontario and one in New York) that discharge directly to the Lake.

These conclusions are, however, quite general. We need to quantitatively define the total load, by source, of the eleven priority toxics; Table 9 in Appendix III presents a first estimate of these loads. Table 9 also includes 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 Plan includes a number of commitments to improve the loadings estimates; these include the collection of improved data on New York State tributary loadings beginning in the spring of 1989, and the review of all existing loadings estimates by the end of 1989.

In addition to knowing the sources of the eleven priority toxics, we also need to know their fate in the Lake Ontario ecosystem. Mathematical models will be 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 the technical basis for load reduction targets that will achieve standards, and will be used to estimate the time required to achieve standards. Preliminary load reduction targets and estimates of their reliability will be available by March 1990; final load reduction targets are projected, based on previous 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 rebuttable presumption of the Plan is that attainment and maintenance of these 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 Toxics Committee will:

- Ensure the development of ecosystem objectives for Lake Ontario;
- Monitor the attainment of these objectives; and
- Provide feedback on the effectiveness of the chemical-by-chemical approach.

Initial ecosystem objectives will be available by February, 1990.

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

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.

V. Costs

In controlling toxics, the Plan, 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. However, with the completion of the preliminary mass balance efforts a year from now, we may begin identifying control needs that do impose incremental costs on the regulated community. If so, the Plan will estimate the costs and benefits of those controls.

VI. Management Structure

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

- The re-named Niagara River/Lake Ontario Coordination Committee will continue to provide policy direction during implementation and revision of the Lake Ontario Toxics Management Plan.

- The Lake Ontario Toxics Committee will be re-named the Lake Ontario Secretariat and will continue to have day-to-day operating responsibility during the implementation and revision of the Plan.

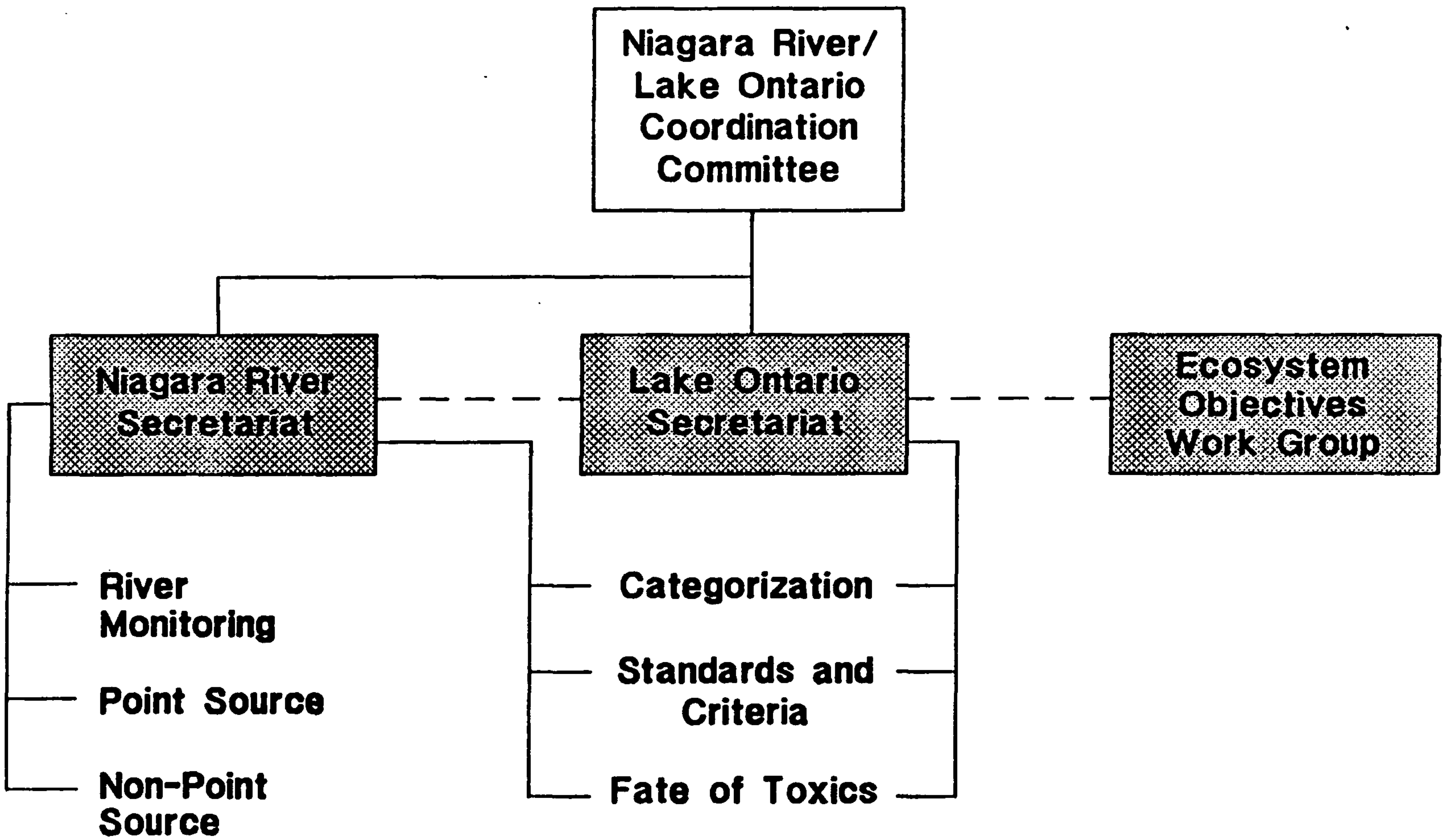
- An Ecosystem Objectives Work Group will be established by Canada and the United States; as described in Appendix VI, its first task will be to develop ecosystem objectives for Lake Ontario.

- A joint Niagara River/Lake Ontario Categorization Committee will be 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 joint Niagara River/Lake Ontario Standards and Criteria Committee will be 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.

Figure 2

MANAGEMENT STRUCTURE



- A joint Niagara River/Lake Ontario Fate of Toxics Committee will be formed to develop mathematical models relating toxic inputs to River and Lake responses; the charge to the Committee is included as Appendix IX.

VII. Public Involvement

A. Objectives

The objectives of the Lake Ontario Toxics Management Plan public involvement process are:

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

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

B. Planned Meetings

Public consultation during 1989 will rely heavily on open public meetings of the Coordination Committee, on participation in Remedial Action Plan meetings, and on binational workshops. This approach will be tried for one year, and is subject to modification at the time of the 1990 Plan update.

1. Coordination Committee Meetings

- The Coordination Committee will manage both the Niagara River and Lake Ontario Plans, conducting regular business meetings in public.

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

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

- Each meeting will include a public question and comment period.

- The Coordination Committee will then begin 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 will 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 the resolution of issues that are sensitive because of associated enforcement or litigation or which may bear on international relations in a manner requiring clearances or approvals through diplomatic channels and protocols.

2. Remedial Action Plan Meetings

- The Lake Ontario Toxics Committee will request that Lake Ontario issues be placed on the agenda of Remedial Action Plan (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 Lake Ontario Toxics Management Plan, and addresses an often voiced concern regarding coordination of the RAP and Lake Ontario planning efforts.

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

3. Binational Workshops

- Binational workshops will be held on an annual basis to review draft Lake Ontario status reports and draft Plan updates.

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

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

C. Status Reports and Plan Updates

- Lake Ontario status reports and Plan updates will be prepared on an annual basis.
- Initial draft documents will be transmitted to the public in September.
- Binational workshops will be conducted in October.
- The public comment period will be closed in November.
- Final draft documents, including a draft Public Responsiveness Document, will be completed and made available to the public in December.
- The Coordination Committee will approve the documents, with changes as necessary, in January.
- Final documents will be available for distribution to the public in February.

D. Technical Reports and Data

A bibliography will be maintained of technical reports and data developed during the implementation of the Plan. The bibliography and its updates will be distributed to those on mailing lists. In addition, relevant educational and informational materials will be incorporated into this bibliography as they are developed and become available to the LOTC.

Repositories where this information will be available are listed below:

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 Henry Clay Boulevard
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

<u>Canada</u>

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 Overleu 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. <u>Contact Network</u>

The Four Agencies will 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 the direction of special effort towards involving industry, municipal governments, organized labor and similar agencies, and facilitates coordination with related activities such as those carried out on the Niagara River and in Areas of Concern.

- The U.S. Environmental Protection Agency will take the lead in preparing and maintaining a mailing list for the appropriate interested parties in the United States, and Environment Canada will prepare and maintain a similar list for Canada.

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

- The mailing lists will be 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.

F. Modification

The Public Involvement section of the Plan will be reviewed at the time of the first update, and will be modified, as necessary, based upon feedback received from the public.

Table I

Planned Actions Driven By Existing And Developing Programs

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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
ii. Issue revised SPDES permit for Crucible	Final Permit	EPA/NYSDEC	EPA Review: 3/31/89 P.N. of Tentative Decision: 6/30/89 Final Decision: 9/30/89	Crucible has submitted a Fundamentally Different Factors (FDF) variance request which must be evaluated by EPA/DEC
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.

Table I
- continued -

ACTION		OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IAlb.	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

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
iii. Initiate follow-up enforcement actions, as appropriate	Follow-up enforcement actions, as appropriate	EPA	None required	See Appendix IV for resolution

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IA2b. 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	
ii. Transmit deficiency letters or take enforcement actions, as necessary	Letters and enforcement actions, as necessary	EPA/DEC	Continuous	Appropriate action selected based on IA2bi

Table I
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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. Current to 11/20/88.				
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
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
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
iv. Wetzel Road: Correction of dry weather overflows of raw sewage within collection system	Enforceable Municipal Compliance 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

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ACTION		OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 County and NYSDEC; expected to be signed shortly
vi.	Leroy: Upgrade of existing waste facilities	Enforceable Municipal Compliance Plan	NYSDEC	Completed	Facility will be upgraded. Judicial Order issued and Final Compliance extended to 1/1/91
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

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	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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.)				
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.

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	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
ii.	Finalize formal enforcement order against Transelco and ensure compliance with final order	Compliance	EPA/NYSDEC	If Transelco signs the consent order compliance will be 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
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.
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.

Table I
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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
iv. 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)

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
i. Issue final closure approval and post 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
ii. Issue final closure approval and post 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.
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

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	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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.
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
vi.	Complete RCRA Facility Assessment for George Robinson & Co. and corrective action as needed	Complete RFA	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
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. Ground water contamination has been detected. Additional ground water monitoring to continue for the next 18 months.

Table I
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	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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
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.
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
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.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
xi. SCA Chemical Services, Inc. (cont.)				The HSWA permit imposes upon SCA the requirements to implement an approved RCRA facility investigation plan in their 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 poping furnace to destroy unserviceable ammunition. Corrective action program is in the assessment stage which will identify releases from solid waste management units
ii. Eastman Kodak	Final permit	EPA/NYSDEC	---	Permit issued 3/6/86
IA4d. Make final permit decisions on all existing storage and treatment facilities in the basin				
i. Issue final permit decision for all facilities listed below by November 8, 1992	Final permit determination	EPA/NYSDEC	11/8/92	Storage and treatment facilities are listed below.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS

Storage and Treatment Facilities

EPA RCRA I.D. #	Facility	EPA RCRA I.D. #	Facility
NYD000631994	University of Rochester	NYD002233997	Camden Wire Co., Inc.
NYD000691162	Cheeseborough 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 Service 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

IA4f. Initiate corrective action programs through 3008(h) Administrative Orders. See comment column of IA4b, c, and d

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE*	COMMENTS
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	
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	
iii. Cleanup of FMC Corporation 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
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
v. Cleanup of the Pollution Abatement Services Site (Wine Creek)	RA	DEC	12/31/89	

*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.

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
vi. Cleanup of the Sinclair Refinery Site	RI/FS RD RA	EPA	Report: 12/31/88 9/30/90 12/31/92	PRP takeover
vii. Cleanup of the Volney Landfill Site	RD RA	EPA	12/31/89 12/31/90	
IA5b. Evaluation of additonal 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
IA5c. Inventory all existing or potential hazardous waste sites in drainage basin area to Lake Ontario	Inventory Update	EPA/DEC	Ongoing activity	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 the completion of interim segments is included in construction grant documents: <u>Project</u> Dewey - Eastman Jun., 1990 State - Mt. Hope Nov., 1992 Mt. Hope - Rosedale Jun., 1993 Transfer & Diversion Interceptors Aug., 1993 Lexington North Mar., 1994 Seneca Norton II Jun., 1994
ii. Develop CSO abatement plan for Onondaga County - Syracuse Metro	CSO/Abatement Plan	Onondaga County, NYSDEC	Jan., 1992	
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	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
2. Submit permit applications	Applications	Prospective permittees	February, 1990	
3. Issue permits	Stormwater permits	DEC	February, 1991	
4. Achieve compliance with permit limitations	Compliance	Permittees	February, 1994	
IA7aii. Small Municipal Stormwater Systems				
1. Submit permit applications	Applications	Prospective permittees	February, 1992	
2. Achieve compliance with permit limitations	Compliance	Permittees	February, 1996	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 §319(a) of the Clean Water Act	NYSDEC	March, 1989	Preliminary Nonpoint Source Assessment information was submitted as part of New York's Water Quality Assessment Report pursuant to §305(b) of the Clean Water Act. The final report should be submitted by March 1989.
IA8b. Prepare Nonpoint Source Management Program	State Nonpoint Source Management Program pursuant to §319(b) of the Clean Water Act	NYSDEC	June, 1989	Will provide overview of State non-point source program, and four year strategic plan. The final program should be submitted by June 1989
IA8c. Implement State Nonpoint Source Program	Implementation actions	NYSDEC, with other agencies, as appropriate	Schedule to be developed pursuant to §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
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 pesticide applicators must be certified. The Cooperative Extension Service also provides technical information and advice to farmers on pesticide use

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IA9. Air Toxics				
IA9a. Determining Impact of air source on Lake Ontario	Develop comprehensive emission inventories	NYSDEC	In progress	Expand Air Guide-1
		EPA		Continued technical & Section 105 support to State programs
	Ambient air monitoring in vicinity of Great Lakes	GLNPO	In progress	Addition of other toxic compounds of concern and increase size of monitoring network
IA9b. Controlling air toxics	Operate air toxics program in NYS	NYSDEC	Operating	Continued operation
		EPA		Continued Section 105 grant support
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

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Action	Output	Responsible Party	Deadline	Comments
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	
IA10d. Implement Section 313 of SARA	Reporting of toxic chemical releases in a publicly accessible data base	EPA	6/89	

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	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 is dependent on development of a Level I model of pollutant fate by the Fate of Toxics Committee
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
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
IAllf.	Identify operational mitigation procedures that will minimize adverse effects (i.e. 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
IAllg.	Identify areas ("hot spots") from which dredged material is unsuitable for open lake disposal	Maps	CE	Mar. 1990	Dependent on IAllb
IAllh.	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
IAlli.	Develop decision-making framework for evaluation of alternative disposal methods	Decision-making framework	CE/EPA/DEC	Ongoing	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
IA12aii. Reduce and recycle 50% of the solid waste generated in the Lake Ontario Basin	Reduction/recycling of up to 50% of current waste stream	NYSDEC	December, 1997	This initiative includes the 8 to 10% reduction described in IA12ai
IA12aiii. Install additional capacity in the currently 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	
IA12aiv. 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

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IA13. Sludge Disposal				
IA13a. Continue present program activities in regard to wastewater treatment plant sludge and industrial process sludge, as outlined in Sections B & D of Appendix IV	Sample POTW sludges for identification of and corrective measures for releases of hazardous waste	USEPA/ NYSDEC	Continuing	
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	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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
IA14aii. Study of Basin 04 (Lake Ontario tributaries)	Report on Basin Study	NYSDEC	December, 1991	
IA14aiii. Study of Basin 05 (Genesee River)	Report on Basin Study	NYSDEC	December, 1991	
IA14aiv. Study of Basin 07 (Seneca-Oneida-Oswego Rivers)	Report on Basin Study	NYSDEC	December, 1991	
IA14av. Study of Basin 08 (Black River)	Report on Basin Study	NYSDEC	December, 1991	

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IA15. Stream Classification				
IA15a. Reclassification 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)
IA15b. Reclassification of the waters of the Lake Ontario (proper) 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)
IA15c. Reclassification of the Seneca-Oneida-Oswego Rivers 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)
IA15d. Reclassification 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)

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ACTION		OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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)
IA16aii.	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	CPWSs serving greater than 10,000 persons must complete monitoring by December 31, 1988

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	CPWSs serving populations between 3,300 and 10,000 must complete monitoring by December 31, 1989
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	CPWSs serving less than 3,300 persons must complete monitoring by December 31, 1991

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
IB. Actions in Canada				
IB1. Industrial Discharges (both direct to the Lake and tributaries).				
IB1a. 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. <u>Organic Chemicals</u>: 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
ii. <u>Iron and Steel</u>: Dofasco Stelco LASCO	Final Permit	MOE	Public notice '89 Monitoring Reg. '89 Compliance Reg. 1991-1992	Iron and steel mills are in compliance with heavy metal requirements

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
iii. Paper & Pulp Mills: Beaver Wood Fibre Domtar Fine Paper Domtar Construction Materials Domtar Packaging Kimberley-Clark of Can. Ltd. Strathcona Paper Co. Quebec and Ontario Paper Co. Trent Valley Paper Board Fraser Inc. Thorold	Final Permit	MOE	Public notice '89 Monitoring Reg. '89 Compliance Reg. 1991-1992	Target loads for some mills set by internal Ministry Committee consistent with Best Practicable Technology Quebec and Ontario Paper Mill has appealed a new Control Order Domtar Construction has connected to municipal sewers in June 1987
iv. Petroleum Refineries: Texaco Canada Ltd. Petro Canada Products Ltd. (Mississauga & Oakville plants)	Final Permit	MOE	Public notice '87 Monitoring Reg. '88 Compliance Reg. 1990-1991	Petro Canada, Mississauga, is implementing a two-phase program to treat stormwater Current treatment systems produce final effluent similar to Best Available Technology treatment levels Petro Canada, Oakville, is producing modifications to existing wastewater treatment system
v. Metal Casting Operation : General Motors of Canada	Final Permit	MOE	Public notice '89 Monitoring Reg. '89 Compliance Reg. 1991-1992	Phenol treatment system installed in 1988

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ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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
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
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

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB2. Indirect Industrial Discharges				
a. Ministry of the Environment Position on the Sewer Use Control Program	Adoption of Position by Municipalities	MOE, EC Municipal Engineer Association	Completed	
b. Revision of Ontario Water Resources Act in Environmental Protection Act and Municipal Act to provide adequate legislative basis for the Sewer Use Control Program	Revised Acts	MOE, Municipal Engineer Association	July, 1989	
c. Sewer Use Program Regulation	The Sewer Use Control Program will include: cataloguing direct dischargers monitoring and enforcement protocale developing control requirements (except BATEA)	MOE, Municipal Engineer Association	December, 1989	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
d. Develop on a staged basis effluent limit regulation based on Best Available Technology Economically Achievable (BATEA). Regulations will first be applied to: - Fabricated Metal Products - Organic Chemicals - Waste Treatment & Recycling Industries - Primary Metal Industries Sectors	Regulations for effluent limits based on BATEA	MOE	1991-1993	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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).				
I. 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 (4 facilities) York-Durham, Oakville, Clarkson, Lakeview, Hamilton, Burlington, Grimsby, Whitby, and Kingston.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB4. 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.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB5. Combined Sewer Overflows				
IB5a. 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	
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 STP bypass. Study will be used in a future comprehensive implementation plan to improve water quality to Hamilton Harbour	Regional Municipality ot Hamilton-Wentworth Ministry of the Environment	March, 1990	
iii. Develop, install and evaluate a computerized system for reducing the number and volume of CSO	Reduced CSO being discharged to Cootes Paradise	Regional Municipality of Hamilton-Wentworth Ministry ot the Environment	December, 1990	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
iv. Construct CSO storage facility. Regional Municipality of Hamilton-Wentworth	72,000m^3 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	
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	
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	
vii. Develop CSO and STP abatement alternatives for the Humber STP sewer drainage area: Metro Toronto	Evaluation of Viable Control Alternatives	Metro Toronto/ Ministry of the Environment	September, 1988	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
ix. Construct stormwater and CSO storage tanks ($2000 m^3$ and $16000 m^3$). City of Toronto	Reduction of CSO and stormwater discharges to Toronto beach areas	Metro Toronto/ Ministry of the Environment	Not yet determined	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB6. 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
b. Developers to prepare stormwater management plans	Stormwater Management Plan	Developers	Voluntary	Technical guidelines for drainage design and erosion and sediment control have been released
c. Developers to include Stormwater management controls during construction of new development	Stormwater Management Works	Developers	Voluntary	Program indirectly controls toxics through control of sediment Some municipalities already have active programs
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	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
f. 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	Completed 1989	

Table I
- continued -

ACTION		OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB7.	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.
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.
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 & is presently in year 3.
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.
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.
f.	Pesticide Management	1) registration of pesticides, education and licensing of applicators.	MOE	None - voluntary	- annual licensing of pesticide applicators. - routine monitoring for 54 pesticides at river mouth stations - development of fate & pathway models
		2) Food Systems 2002 for 50% reduction in pesticide use.	OMAF	2002	- Commences Apr. 1/88. - Program consists of education, delivery & research.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB8. Air Toxics				
a. Revision to the current Regulation 308	New Regulation	MOE	1989/1990	
b. Monitoring Atmospheric Deposition through six monitoring stations	The whole Ontario network to be integrated with the New York State monitoring stations	MOE/EC New York	1989/1990	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB9. Spills				
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
IB10. Dredging and Dredged Material Disposal				
a. Identify all active dredging locations and open water dredged material disposal areas	Map of disposal areas	MOE	Ongoing	
b. Develop MOE sediment quality objectives and dredging and dredged spoil disposal guidelines to take into consideration biological effects	Guidelines to be applied to dredging projects	MOE	1989/1990	
c. Identify areas (hot spots) from which dredged spoil is unsuitable for open Lake disposal	Maps of hot spots	MOE	Ongoing	
d. Investigate alternative disposal methods, including confined or land disposal	Identification of alternatives to open Lake disposal	MOE	Ongoing	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 solids, ammonium and nitrate nitrogen
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	
c. Determine if sludges comply with standards for organic contaminants for sludges used on agricultural lands		MOE, OMAF, and MOH	Ongoing	

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

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 organic parameters, and metals in the Lake Ontario drainage basin
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
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
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

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
iii. Nearshore <u>Cladophora</u> Monitoring	Data summaries provided to requesting agencies upon request	MOE	Ongoing	1 control site monitored for PCBs, organochlorine pesticides, chlorophenols, chlorobenzenes
iv. Long Term Sensing Sites	Interpretive Report	MOE	Ongoing Commencing 1988 First Report 3 Qtr.,1990	2 long-term sites for metals, PCBs, organochlorine pesticides, chlorophenols, chlorobenzenes
IBl3c. 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
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
iii. Toronto Waterfront: Inventory and 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.
iv. Metro Toronto Waterfront - Trace contaminant inputs from CSO's and storm sewers	Interpretive Report	MOE	3rd Qtr., 1990 1st Phase	Sampling of 44 outfalls for heavy metals and organic contaminants on at least 2 occasions; resampling of 25 outfalls for 3 more events

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
v. Port Hope Harbour: Contaminant Loading Study	Interpretive Report	NWRI (enhanced funding by MOE)	2nd Qtr., 1989	Assessment of particle-associated contaminant (PCBs, metals, radio-nuclides) from Eldorado Nuclear discharge
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
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

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 first update of the Lake Ontario Plan.

Table I
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IB14. 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: Grimsby, 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
b. Review existing Drinking Water Standards and revise as necessary	Stringent water quality standards	MOE/EC	Ongoing	

Table II

Planned Actions Driven by Special Efforts
in Geographic Areas of Concern

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
IIB. Develop Remedial Action Plans to address identified Areas of Concern in the Lake Ontario Basin				
IIB1. Develop RAP for Eighteenmile Creek	RAP	NYSDEC	1992	For submittal to IJC
IIB2. Develop RAP for Rochester Embayment	RAP	NYSDEC	March, 1991	For submittal to IJC
IIB3. Develop RAP for Oswego River	RAP	NYSDEC	September, 1990	For submittal to IJC
IIB4. Develop RAP for Bay of Quinte	RAP	MOE/EC	3 Qtr., 1989	IJC Stage II Report Target

Table II
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
IIB5. Develop RAP for Port Hope	RAP	MOE/EC	2 Qtr., 1989	IJC Stage II Report Target
IIB6. Develop RAP for Toronto Waterfront	RAP	MOE/EC	4 Qtr., 1990	IJC Stage II Report Target
IIB7. Develop RAP for Hamilton Harbour	RAP	MOE/EC	3 Qtr., 1989	IJC Stage II Report Target
IIC. Implement Remedial Action Plans	To be defined	To be defined	To be defined	

Table III

Categories of Toxics

I. <u>Ambient Data Available</u>

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. <u>Ambient Data Not Available</u>

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)
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 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 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

phenols

- bromophenol
- dibromophenol
- tribromophenol
- pentachlorophenol

haloethers

- 4-bromophenylphenyl ether
- pentachlorophenylmethyl ether
- tribromoanisole
- dibromochloroanisole
- bromodichloroanisole

ethers

- diethyl ether

hydrocarbons

- benzene

amines

- benzidine
- simazine
- atrazine
- diethylatrazine
- desethylatrazine
- tribromoaniline
- dibromochloroaniline

styrenes (alkenylbenzenes)

- hexachlorostyrene
- pentachlorostyrene

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

metal containing compounds

butyltin
dibutyltin
methyltin
dimethyltin
tributyltin
alkyl-lead*

non metals

cyanide

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*IJC critical pollutant

Table VI
Differing Actions by Category

Category	Action
I. Ambient data available	
A. Exceeds enforceable standard	Early Implementation 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 enforeable 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 based actions are necessary. o Review as criteria change.
D. Detection limit too high to allow complete categorization	o Use a more sensitive analytical method or a 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 6 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 new evidence becomes available.

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 VII

Planned Actions Driven By Lake-wide Analyses of Pollutant Fate

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	Categorization Committee	July, 1989	The list will be updated annually to reflect new data and criteria
	Report recommending the collection of additional ambient data to support Category I Categorization	Categorization Committee	July, 1989	The Committee will attempt to develop definitive categorizations as described in Table VI
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

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
ii. Select obvious control programs based on best professional judgement	Selected 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 VIIBlbic output)
iii. Implement obvious control programs	Implemented programs	Four Agencies	Dependent on VIIBlaii outputs	
VIIBlb. Full implementation based on more complete information				
VIIBlbi. 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
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
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 VIIBlaii 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

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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
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 time taken thus far in conducting the Green Bay Mass Balance Study. The deadline is subject to change based on the results of activity VIIBlbid
VIIBlbii. 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 recommending standards reconcilation	Standards and Criteria Committee	July, 1989	As shown in Appendix II, the standards and criteria for priority toxics are not always consistent among jurisdictions.
b. Develop and adopt revised standards	Consistent enforceable standards for priority toxics	Individual Agencies (e.g., NYSDEC, MOE)	Dependent on VIIBlbiia	
VIIBlbiii. Evaluate and select alternative water quality-based control programs for priority toxics	Selected control programs for full implementation	Lake Ontario Toxics Committee	Dependent on VIIBlbi and VIIBlbii	Support provided by Fate of Toxics Committee

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
VIIB1biv. Implement the selected water quality-based control programs for priority toxics	Implemented Programs	Four Agencies	Dependent on VIIB1biii outputs	
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 Committee	July, 1989	
VIIB2b. Develop and adopt revised standards	Consistent Standards	Individual Agencies	Dependent on VIIB2a output	
VIIB2c. Move toxic to Category IA or IC, as appropriate	See VIIA2			
VIIB3. Category IC: Ambient data available; equal to or less than most stringent criterion				
VIIB3a. Review as criterion changes	See VIIA2			

Table VII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
VIIB4. Category ID: Detection limit too high to allow complete categorization				
VIIB4a. 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 monitoring 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				
VIIB5a. Recommend the development of standards and criteria	Report	Standards and Criteria Committee	July, 1989	Input to be provided by Categorization Committee (See VIIA2)
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
VIIB6. Category IIA: Ambient data not available; evidence of presence in or input to the Lake				
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	Improved categorization	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	
VIIB7. Category IIB: Ambient data not available; no evidence of presence in or input to the Lake				
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
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	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.
VIIC2. Define a program of research to support the development of improved ecosystem objectives	Report	Ecosystem Objectives Work Group	February, 1990	
VIIC3. Update Ecosystem Health section for Appendix II, "Toxics Problem in Lake Ontario"	Revised Appendix II	Lake Ontario Secretariat	August, 1990	
VIIC4. Monitor progress towards the attainment of the ecosystem objectives	Annual Status Reports	Lake Ontario Secretariat	Annually after the establishment of the ecosystem objectives	

Table VII
-Continued-

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 presumption of the Lake Ontario Toxics Management Plan 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.

Table VIII

Planned Actions Associated with Zero Discharge

	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
VIIIA.	Zero Discharge Commitments in the United States				
VIIIA1.	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	
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	
VIIIA1c.	Develop five year workplan to develop BAT and NSPS effluent guidelines for industrial categories for which they do not currently exist	Workplan	EPA	3/89	
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	

Table VIII
- continued -

	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
VIIIA2b.	Choose sites and firms to demonstrate technologies	Demonstrate technology and evaluate applicability for media and pollutant remediation	EPA	Ongoing	
VIIIA2c.	Assess areas and chemicals of concern in Basin for potential as SITE demonstration	Recommendation to SITE program manager	EPA/NYSDEC	3/88	
VIIIA3.	Hazardous Waste 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

Table VIII
- continued -

ACTION		OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
VIIIA3b.	Implement rule on pretreatment of hazardous waste prior to land disposal	Pretreatment of waste from electroplating, steel and other industries	EPA	Immediate	
VIIIA3c.	Develop regulations requiring submission of Waste Reduction Impact Statements	Regulations	NYSDEC	6/89	
VIIIA4.	Pesticides				
VIIIA4a.	Implement testing program for commercial pesticide active ingredients	Testing of 600 chemicals	EPA	Nine years from enactment of legislation	
VIIIA4b.	Identify pesticides that are a problem in Lake Ontario and request early action on restrictions	Recommendation letter to EPA	LOTC	12/89	

Table VIII
- continued -

	ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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	
VIIIA5b.	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	
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	

Table VIII
- continued -

ACTION		OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
VIIIA6.	Household Hazardous Waste				
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	

Table VIII
- continued -

ACTION	OUTPUT	RESPONSIBLE PARTY	DEADLINE	COMMENTS
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 9 industrial sectors and the municipal sector; Effluent Limit Regulation for industrial discharges to municipal systems	MOE	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
VIIIB3. Implement Pesticides management components of "Food Systems 2002":	50% reduction in Pesticides use	Ontario Ministry of Agriculture and Food (OMAF)	2002	
- 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
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	MOE	Ongoing	
VIIIB5. Implementation of the Canadian Environmental Protection Act	A new regulatory framework	Environment Canada	To be esta-blished	Implementation of CEPA will include: The development of a compr-ehensive 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 there ultimate disposal as waste The creation of a "living" list of priority substances subject to on going assessment for health and environmental impacts and control actions including regulatory restriction The imposition of a requir-ement on industry to supply the data necessary to allow for evaluation and assessment before materials are permitted to enter Canada

LAKE ONTARIO TOXICS MANAGEMENT PLAN

Appendix I

Lake Ontario and the Lake Ontario Basin

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A. INTRODUCTION

Lake Ontario is the last lake in the Great Lakes chain and consequently environmental conditions in this lake will reflect not only activities carried on within its basin but also influences upstream from the rest of the Great Lakes drainage basin. The following information describes some of the basic features of the lake and its basin.

B. LAKE CHARACTERISTICS

i) Morphometry

Lake Ontario is the smallest of the Great Lakes in surface area (18,960 km^2) and shoreline length (1,146 km) but, with a maximum depth of 244m, its average depth of 86m is second only to Lake Superior. This gives the lake a relatively deep bottom contour and, as a result, a significant fraction of the bottom, 47%, is classified as non-depositional. A wide variety of sediment types (gravel, sand, silty sand and silts) and bedrock exposures are evident in the non-depositional inshore zone.

Three basins, Niagara, Mississauga and Rochester, are recognized in the main portion of the lake with a distinct separation from a fourth basin, Kingston, at the eastern end of the lake (Figure I-1). Sediment deposits in the basins consist of fine silty clays and clays which have accumulated for the past 11,600 years (Thomas, 1983).

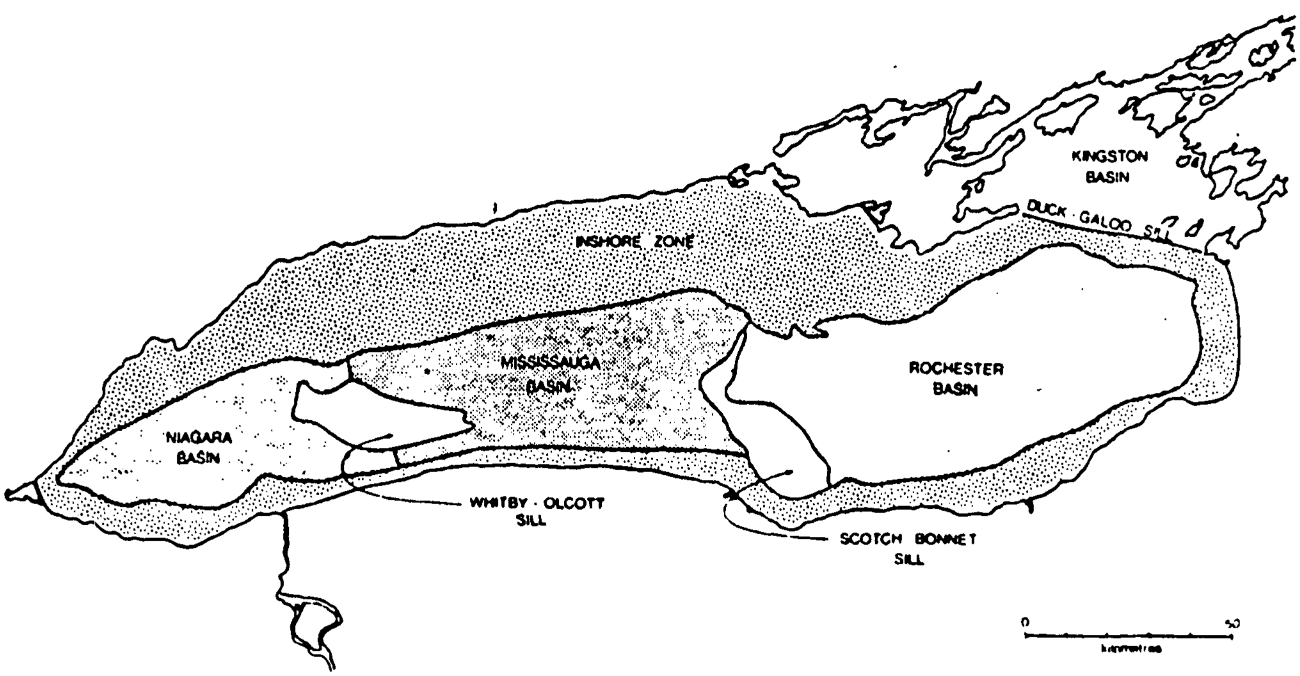


Figure I-1: Sedimentation Basins in Lake Ontario (Thomas, 1983).

ii) **Circulation**

Water circulation patterns are highly variable being influenced by wind stress on surface waters, hydraulic flows from discharging tributaries, water stratification and mixing and upwelling phenomena. Circulation patterns for Lake Ontario are described in greater detail in Simons and Schertzer (1985) and Simons et al (1985). The generalized circulation pattern shows the flow from the Niagara River moving predominantly eastward along the south shore of the lake. This is balanced by a westward flow in mid-lake, thus setting up a lake-wide counterclockwise circulation pattern. Net flow along the north shore is negligible with both eastward and westward components.

Simons et al (1985) computed net water transport in Lake Ontario to show that the eastward flow along the south shore to be 70,000 m^3/second. Comparing this to the outflow to the St. Lawrence and observations of periodic westward flows from the Niagara, they concluded that more than 90% of the inflowing water must be recirculated. With a mean speed of 5 km/day in the belt of the eastward flow and the length of the lake being approximately 300 km, it was suggested that the time scale for recirculation is a few months. This is indicative of a relatively short mixing time within the lake which could ensure the distribution of an introduced persistent substance throughout the lake in a timeframe within 1-2 years. Researchers (Thomas, 1983; Simon et al, 1985) have also correlated the distribution of sediment contaminants in the depositional basins with the water circulation patterns.

iii) **Water Balance**

The dominant inflow of water to Lake Ontario is from the Niagara River. The average flow out of Lake Erie into the Niagara River for the period 1900 to 1983 is 5800 m^3/sec which is 85% of the average Lake Ontario outflow to the St. Lawrence of 6800 m^3/sec (Yee and Lloyd, 1985). The five major tributaries to the lake, the Trent, Oswego, Twelve Mile Creek, Black and Genesee Rivers with flows of 198, 189, 179, 117 and 79 m^3/sec contribute an additional 11% (762 m^3/sec) of the outflow. Direct precipitation to the lake surface accounts for an additional 500 m^3/sec (50 year average) while evaporation represents an average annual loss of approximately 530 m^3/sec (Bruce and Rodgers, 1962).

Assuming a lake volume of 1640 km^3 and an outflow of 6800 m^3/sec, the residence time of water in Lake Ontario, defined as the time required to displace all the water in the lake, is approximately 7.6 years. In the consideration of the natural displacement of pollution from Lake Ontario, such a calculated residence time is not realistic for it does not consider influences such as mixing, stratification, sorption/desorption and biological processes which do occur. Considering only dispersion and dilution processes and assuming no continuing inputs of pollutants, it has been estimated that 20 years would be required to remove 90% of the pollution from Lake Ontario (IJC, 1969). More recent modelling efforts (IJC, 1987) have suggested that the water column may be highly responsive to changes in pollutant loadings but actual measured responses to loading reductions are not available.

iv) Chemical Characteristics

A review of Lake Ontario water chemistry on major ions, specific conductance and total dissolved solids can be found in Stevens (1987). The intent here is to describe some of the major features, particularly those water quality characteristics that are influenced by human activity.

Beeton (1969) and Dobson (1967) noted the increase in total dissolved solids, calcium, chloride, sodium, potassium and sulfate in Lake Ontario which Beeton believed started around 1910 and continued through 1965, largely as a result of human activity. During the period 1972 to 1983 major ion characteristics were considerably different with decreases noted for specific conductance, calcium, chloride and sodium (Stevens, 1987).

The accelerated cultural eutrophication of Lakes Erie and Ontario led to the introduction of a phosphorus control program in the 1970's which was primarily directed to the removal of phosphorus at sewage treatment plants. Phosphorus was seen to be the principal nutrient driving the eutrophication process. Total phosphorus in the surface waters of Lake Ontario peaked in 1973 and all measured forms of phosphorus have declined since that time consistent with phosphorus loading reductions to the lake (Water Quality Board, 1987). Relative stability in water transparency and summer oxygen depletion rates in Lake Ontario have been attributed to phosphorus control (Dobson, 1985).

Increases in nitrate + nitrite concentrations have been noted throughout the Great Lakes Basin and this has been raised as a concern by the Water Quality Board in its 1985 report to the International Joint Commission. Nitrate is a plant nutrient which can influence algal growth and community structure and thereby impact on food web dynamics in the lake ecosystem. Increased nitrogen loading to Lake Ontario can be attributed to a complex mixture of atmospheric, agricultural, urban and upstream sources.

v) Biological Characteristics

Lake Ontario has some characteristics associated with eutrophic conditions and others indicating oligotrophy. Morphometrically, the lake is oligotrophic but water quality is characteristic of mesotrophic lakes. In addition, some areas, such as the Bay of Quinte, are eutrophic. As a result of the increasing enrichment of the lake, a doubling of the mean annual biomass of algae at the Toronto water intake was observed over the period 1923 to 1954 with a shift in dominant genera similar to that of Lake Erie (Shenk and Thompson, 1965).

More recent data on phytoplankton indicator species suggest that the status of the lake is changing from meso-eutrophic to meso-oligotrophic which would be compatible with the decreases in phosphorus loadings (Water Quality Board, 1987). Zooplankton community structure is indicative of mesotrophic to oligotrophic conditions (Makarewicz, 1985).

A substantial change has occurred in the fish communities of the lake over the last 60-80 years (Beeton, 1969; Loftus and Regier, 1972; Christie, 1974). The native forage and top predator species (e.g. Atlantic salmon, lake trout and blue pike) have been eliminated or dramatically reduced through a complex interaction of habitat alteration, pollution, overfishing and the introduction of exotic species, most notably the sea lamprey and alewife. Today, populations of top predator fish (lake trout and exotic Pacific salmon) are being maintained and increased yearly through an extensive hatchery rearing and stocking program.

A generalized food web existing in Lake Ontario would consist of a predator fish in the family Salmonidae (e.g. lake trout, coho salmon) which feeds upon smelt, alewifes and sculpin. The diet of these forage fish is composed predominantly of amphipods, mysids and crustacean zooplankton which in turn feed on fine particulate matter and phytoplankton. Bioaccumulation of toxic chemicals within this food web is evident resulting in substantially elevated concentrations in the top predator fish (Borgmann and Whittle, 1983).

vi) **Environmental Status**

The trophic status of the lake appears to be responding positively to the phosphorus loading reduction programs on the lower Great Lakes. Algal and zooplankton assemblages that are evolving are consistent with a reduced nutrient status and while some of the water quality changes that have occurred in the lake are not as dramatic as might be desired, there are indications that conditions are not worsening and a measure of stability has been introduced.

Present fish populations largely reflect human intervention through extensive stocking programs. Present stocking levels by New York State and Ontario amount to approximately 8.5 million salmon and trout per year (Great Lakes Fishery Commission, 1987). While the stocking programs, together with other fishery management and water quality initiatives, have led to the existence of large populations of salmonids in Lake Ontario, changes within the structure of the forage fish base have led to questions as to whether these populations can be sustained (Christie et al, 1987). Furthermore, as only limited success has been achieved with the reestablishment of naturally reproducing species, the maintenance of existing habitat together with the restoration of degraded habitat will play a large role in the rehabilitation of the Lake Ontario fishery.

Lake Ontario, in terms of diversity and concentrations of persistent toxic substances found within environmental compartments of the system, is recognized as the most contaminated of the Great Lakes (Water Quality Board, 1983, 1985, 1987). Substantial improvements, based on concentration trend information from biota, have been experienced since the 1960's for a variety of contaminants. For the most part this improvement reflects the controls placed on the manufacture and use of certain chemicals (e.g. PCBs, DDT, mercury, mirex and dioxin). However, since the early 1980's no apparent trend has been evident for some substances (e.g. PCBs and mirex) suggesting continuing inputs or recycling within the lake ecosystem. In addition, enhanced sampling and analytical technology have led to the detection of substances where environmental distribution and trend data are unavailable.

Continuing problems with persistent toxic substances on the Great Lakes have led to a series of coordinated binational efforts to characterize environmental conditions and sources. This has included the Niagara River Toxics Committee (1981-84), Niagara River Toxics Management Plan (ongoing), Upper Great Lakes Connecting Channels Study (1984-88) and the present development of a Lake Ontario Toxics Management Plan.

C. BASIN CHARACTERISTICS

i) Physiography

Much of the following overview has been extracted from DeCooke and Witherspoon, 1973.

The Lake Ontario basin reflects the influence of the ice age when it and the other Great Lakes were formed. Areas near the lake were covered with water following the glaciation period, resulting in beaches, wave-cut cliffs and deltas. At the higher elevations, the relief reflects the action of the ice and the land forms are typical of a glaciated area with moraines, drumlins, eskers and till plains. In the northeast portion of the basin the area is interlaced with lakes and frequent outcrops of the Precambrian Shield. This extends eastward to the Adirondack Plateau as an outlier of the Precambrian Shield. South from the lake, lowlands occur near the shore rising to the glaciated upland with its moraines and drumlins. Behind this is the Allegheny Plateau which forms the northern edge of the Appalachian formation. This plateau is deeply indented by the Finger Lakes of New York State.

The drainage of the basin is characterized by small streams draining the lowland areas which have their sources in the steeper slopes of the moraines. These lowlands are the most important areas around the lake since the principal cities and agricultural areas are located on them near the lake. The soils are generally sands, silts and clays near the lake with loams and coarse materials in the moraines. Most of the land has been cleared for agriculture. The drainage of the uplands is by the larger river systems. These are made up of interconnected lakes. Typical are the Trent River on the north shore and the Genesee and Oswego Rivers on the south shore. Agriculture is practiced on the medium-textured soils of the drumlins and till plains which these river systems drain. However, their upper reaches are steep moraines and in the south the Precambrian Shield which for the most part is still forested. These uplands are dotted with many small lakes which serve as summer vacation areas for the population living in urbanized areas near the lake.

ii) Tributary System

The main sub-basins and tributaries are identified in Figure I-2 and Table I-1. Tributary flow, excluding the Niagara River, is divided almost equally between Ontario (434 m^3/sec) and New York State (429 m^3/sec) (IJC, 1969). Over 40% of the Canadian

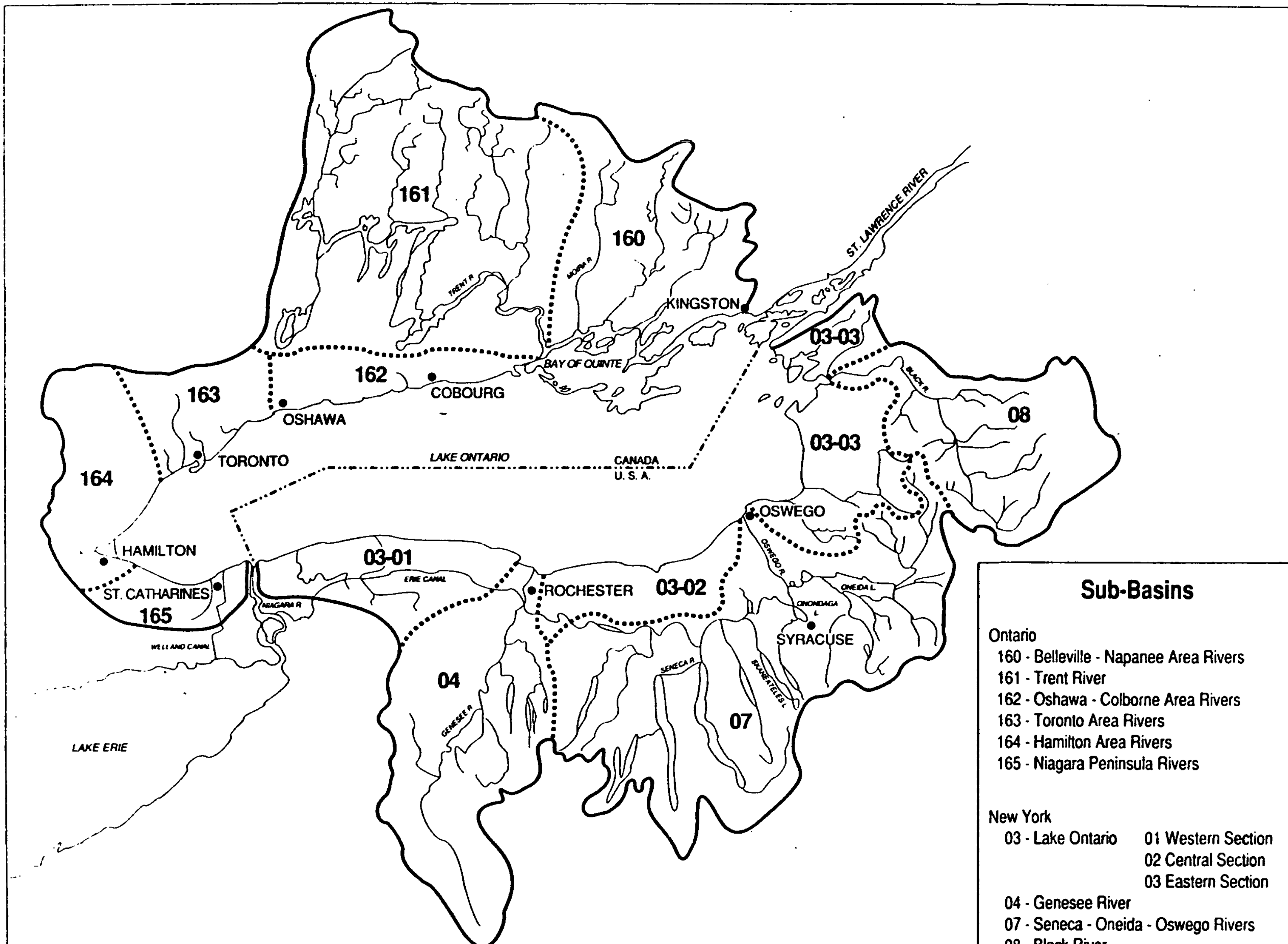


Figure I-2: Lake Ontario Basin and Major Sub-Basins tributary flow discharges to the Bay of Quinte which in turn discharges to the North Channel between Amherst Island and the mainland. Some work has been undertaken on exchange flows in this area (Freeman and Prinsenberg, 1986) which identified a persistent counterclock-wise circulation around Amherst Island but no determination was made on the relative exchange of flow to the lake (Kingston Basin) and the St. Lawrence River. Stevens (1987), in a zonation scheme for water quality in Lake Ontario, suggested that contributions from the Bay of Quinte and the Black River have little impact on the main body of the lake. The Black River constitutes approximately 25% of the New York State tributary flow to Lake Ontario (IJC, 1969).

TABLE I-1: Major Tributaries to Lake Ontario

Sub-Basin	Tributary	Flow (m^3/sec)
Ontario	Niagara River	5700
160	Moira River	38
	Salmon River	13
	Napanee River	8
161	Trent River	198
163	Humber River	9
	Don River	5
	Duffin Creek	3
164	Hamilton Harbour	39
	Oakville Creek	2
165	Twelve Mile Creek(1)	179
	Welland Canal(2)	10-31
New York		
03	Oak Orchard Creek	10
	Johnson Creek	4
	Irondequoit Creek	3
	Eighteenmile Creek	3
	Sandy Creek	3
	Northrup Creek	1
04	Genesee River	79
07	Oswego River	189
08	Black River	117

(1) Flow from this tributary is almost entirely composed of water discharged from the De Cew Falls hydroelectric power plant which withdraws water from the Welland Canal.

(2) The Welland Canal is not a natural tributary but it does divert water from Lake Erie to Lake Ontario. In recent years approximately $240m^3$/sec enters the Canal at Port Colborne; most of the volume is withdrawn for power generation, water quality enhancement and domestic and industrial consumption and is not returned to the Canal. The range of values shown represents Canal flows entering Lake Ontario during typical non-navigational and navigational seasons. The Welland Canal does receive discharges from municipal and industrial facilities.

iii) Population

The Lake Ontario basin was settled earlier than the rest of the Great Lakes Basin and by 1860 the population was about 1.4 million (Beeton, 1969). Today there are approximately 6.5 million people living within the basin with the Ontario population more than twice that of New York State (Table I-2). In addition, the Ontario population is growing at a faster rate. During the decade 1970/71-1980/81 the Ontario population grew at an annual average rate of 1.7% (Statistics Canada, 1986). The increase was primarily associated with urban development in the Toronto and Hamilton centered sub-basins (the Ontario basin population is approximately 91% urban). The New York State population, however, remained virtually unchanged during the same period.

It is projected that the Lake Ontario basin population will grow to 7.8 million by the year 2000, an increase of 20% from 1980/81.

iv) Land and Water Use

A detailed description of land use in the Lake Ontario basin can be found in reports associated with the International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG, 1976). An analysis of summary data from these reports (PLUARG, 1977) indicate that the major land uses in the basin can be broken down as follows:

Urban (residential and commercial/industrial	- 7%
Agriculture (cropland and pasture)	-39%
Forest	-49%
Other (lakes, wetlands, parks, etc.)	- 5%

TABLE I-2: **Lake Ontario Population and Population Density by Sub-Basin**

Sub-Basin	Area (km^2)	Population 1980/81(1)	Population 2000(2)	Population Density (persons km^2) 1980/81	Population Density (persons km^2) 2000
Ontario					
160	7055	178,316	225,748	25	32
161	12815	217,513	275,371	17	21
162	1910	197,523	250,064	103	130
163	3050	2,642,678	3,345,630	866	1096
164	2300	704,713(3)	892,426	306	388
165	1043	402,944(3)	510,127	386	489
Total	28173	4,343,687	5,499,366		
New York State					
03-01		249,700	268,600		
02		249,100	268,300		
03		73,100	91,500		
03(total)	6364	571,900	628,400	90	98
04	6146	266,800	290,500	43	47
07	13266	1,235,000	1,314,600	93	99
08	4962	63,600	87,300	13	18
Total	30,738	2,137,300	2,320,800		
Lake Ontario					
Total	58,911	6,480,987	7,820,166		

(1) Ontario and New York State population data based on 1981 and 1980 Census figures, respectively.

(2) Ontario population projections based on an assumed annual growth rate of 1.4% (IJC, 1985); average annual rate during 1981-86 for counties adjacent to Lake Ontario was 1.8%; Statistics Canada (1985) average annual growth rate to year 2000 for the Province of Ontario is about 1.2%.

New York State population projections based on N.Y.S. DEC (1985); town/county data have been apportioned to sub-basins.

(3) Population for this sub-basin was estimated.

Industrial/commercial activity in Ontario is centered on the urban fringe running around the western end of Lake Ontario from Oshawa to St. Catharines whereas in New York State the activity is based in the major urban centers of Rochester, Syracuse and Oswego. As an indication of the sectors represented in the Ontario portion of the basin, a special tabulation was made on data contained in Statistics Canada (1986) whereby the number of establishments was identified in each sub-basin (an establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics). The sub-basins, the number of establishments and the major industrial sectors represented (based on number of facilities and people employed) are shown in Table I-3.

TABLE I-3: Industrial Establishments in the Canadian Lake Ontario Basin

Sub-basin	Establishments	Major Sectors
160	171	Food and beverage; paper and allied industries; metal fabricating.
161	310	Rubber and plastics products; printing, publishing and allied industries; machinery; electrical products.
162	188	Rubber and plastic products; paper and allied industries; printing, publishing and allied industries; metal fabricating; transportation equipment.
163	6916	Food and beverage; rubber and plastic products; leather; textiles; clothing; furniture and fixtures; paper and allied industries; printing, publishing and allied industries; metal fabricating; machinery; transportation equipment; electrical products; chemical and chemical products; miscellaneous manufacturing.
164	960	Food and beverage; rubber and plastic products; printing, publishing and allied industries; primary metal; metal fabricating; machinery; electrical products; chemical and chemical products.
165	629	Textiles; clothing; furniture and fixtures; paper and allied industries; primary metal; metal fabricating; machinery; transportation equipment.

(Sub-basin 165 includes the Niagara River basin in this tabulation).

Lake Ontario is of considerable socio-economic value, providing water for human consumption, manufacturing, transportation, power, recreation and a variety of other uses. Withdrawals by municipalities for public water supplies constitute the major consumptive use. Approximately 2.6 million cubic metres are withdrawn daily to serve a combined Ontario and New York State population of 4.6 million. Withdrawals are predominantly by Ontario where the population distribution is heavily oriented along the shoreline (Table I-4). Use for power generation, essentially for cooling purposes in thermally generated power, is also substantial (more than 36 million cubic metres withdrawn per day) but little of this water is actually consumed (Table I-5).

Lake Ontario continues to support a commercial fishery. In 1985, Ontario harvested 1.7 million lbs (predominantly whitefish, yellow perch and eel) while the New York State catch amounted to 200,000 lbs. This was the first time this century that the total commercial catch for the lake dropped below 2 million lbs (Great Lakes Fishery Commission, 1986). The recreational fishery, however, continues to grow in both jurisdictions and constitutes a major industry on the lake. Trip expenditures (i.e. boats, angling equipment, bait, lodging, etc.) by Canadian and U.S. anglers on Lake Ontario in 1980 were estimated at $108 million (Talhelm, 1988).

TABLE I-4: **Average Daily Flows (1000 m^3/day) and Population (x 1000) Served by Waterworks Using Lake Ontario as a Source[1]**

Ontario	Flow	Population
Grimsby	7.0	14.7
Hamilton (and area)	277.8	308.1
Lincoln	2.1	5.2
Burlington	58.3	111.5
Cobourg	9.1	13.3
Toronto (and area)	1352.0	2360.0
Mississauga (and area)	285.8	545.0
Newcastle	7.9	13.2
Oakville	43.6	82.8
Oshawa (and area)	83.1	211.6
Port Hope	9.5	10.3
Bath	1.4	1.5
Belleville	25.7	35.5
Deseronto	1.2	1.8
Ernestown	2.6	6.8
Kingston	49.1	78.4
Kingston Township	12.5	19.7
Napanee	6.3	7.5
Picton	3.6	6.0
Thurlow	0.1	0.1
Sub-total:	2238.7	3833.0
New York State		
Chaumont	0.2 (est.)	0.6
Sackets Harbor	0.3	1.2
Metropolitan Water Board (Onondaga County)	97.7	314.2
Oswego	23.9	28.8
Brockport	12.1	27.5
Monroe County Water Authority	208.2	387.5
Ontario W.D.	6.8	20.7
Sodus Point	0.8	1.4
Sodus	2.6	4.3
Williamson W.D.	5.7	5.5
Wolcott	0.8	1.7
Albion	4.5	10.2
Lyndonville	0.6	1.1
Sub-total:	364.2	804.7
Total:	2602.9	4637.7

(1) Ontario and New York State data based on 1986/87 and 1984, respectively.

TABLE I-5: Water Withdrawal (1000 m^3/day) by Power Generating Facilities on Lake Ontario[1]

Ontario[2]

Plant	Fuel	Withdrawal
Lakeview	Coal	6307
Pickering	Nuclear	19526
		25833

New York State

Plant	Fuel	Withdrawal
Somerset	Coal	1296
Nine Mile Point	Nuclear	1765
Oswego	Oil & Coal	4905
R.E. Ginna	Nuclear	2180
Russell	Coal	632
		10778

(1) Water used for cooling purposes; very little is consumed. Data are based on design flows.

(2) Darlington, Hearn and Lennox plants are not operating; design flows of these plants are approximately 22032 $10^3 m^3$/day (Ontario Hydro, 1981).

D. REFERENCES

Beeton, A.M. 1969. Changes in the environment and biota of the Great Lakes, pp.150-187. In: National Academy of Sciences. Eutrophication: Causes, consequences, correctives. Proceedings of a Symposium. Washington, D.C. 661p.

Borgmann, U. and D.M. Whittle. 1983. Particle - size - conversion efficiency and contaminant concentrations in Lake Ontario biota. Can. J. Fish. Aquat. Sci. 40: 328-336.

Bruce, J.P. and G.K. Rodgers. 1962. Water balance of the Great Lakes system. Proc. Symp. Great Lakes Basin, Chicago, Ill., 1959. H.J. Pincus (ed), Amer. Assoc. Advan. Sci., Washington, D.C., Pub. No. 71, 41-69.

Christie, W.M. 1974. Changes in the fish species composition of the Great Lakes. J. Fish Res. Bd. Can. 31: 827-854.

Christie, W.J., K.A. Scott, P.G. Sly and R.H. Strus. 1987. Recent changes in the aquatic food web of eastern Lake Ontario. Can. J. Fish. Aquat. Sci. 44 (Suppl. 2): 37-52.

De Cooke, B.G. and D.F. Witherspoon. 1973. A preliminary Lake Ontario water balance diving IFYGL. Internat. Assoc. Great Lakes Res., Proc. 16th Conf. Great Lakes Res.: 675-683.

Dobson, H.F.H. 1967. Principal ions and dissolved oxygen in Lake Ontario. Internat. Assoc. Great Lakes Res., Proc. 10th Conf. Great Lakes Res.: 337-356.

Dobson, H.F.H. 1985. Lake Ontario water chemistry atlas. National Water Research Institute, Burlington, Ontario, Canada. Scientific Series No. 139.

Freeman, N.G., and S.J. Prinsenberg. 1986. Exchange flows in the Adolphus Reach/North Channel, p.27-39. In C.K. Minns, D.A. Hurley, and K.H. Nicholls (eds) Project Quinte: point-source phosphorus control and ecosystem response in the Bay of Quinte, Lake Ontario. Can. Spec. Publ. Fish. Aquat. Sci. 86: 270 p.

Great Lakes Fishery Commission. 1986. Minutes of Great Lakes Fishery Commission 1986 Annual Meeting. Great Lakes Fishery Commission, Ann Arbor, Michigan, 486p.

Great Lakes Fishery Commission. 1987. Minutes of the Great Lakes Fishery Commission 1987 Annual Meeting. Great Lakes Fishery Commission, Ann Arbor, Michigan, 275p.

International Joint Commission. 1969. Report to the International Joint Commission on the Pollution of Lake Erie. Lake Ontario and the International Section of the St.Lawrence River. International Lake Eire Pollution Board/Lake Ontario-St. Lawrence River Water Pollution Board. (3 volumes).

International Joint Commission. 1985. Great Lakes Diversions and Consumptive Uses. International Joint Commission Report to the Governments of the United States and Canada under the 1977 Reference. January, 1985. 82p.

International Joint Commission. 1987. Proceedings of the Task Force on Toxic Chemical Loadings Workshop, February 18-19, 1987, Toronto, Ontario, Canada (in preparation).

Loftus, K.H. and H.A. Regier (eds). 1972. Proceedings of the 1971 Symposium on Salononid Communities in oligotrophic Lakes. J. Fish. Res. Bd. Can. 29: 613-986.

Makarewicz, J.C. 1985. Phytoplankton and zooplankton composition, abundance and distribution: Lake Erie, Lake Huron, and Lake Michigan - 1983. Final Report to the U.S. EPA, Great Lakes National Program Office, Chicago.

New York State Department of Environmental Conservation. 1985. Population Projections, September 30, 1985; New York State Water Quality Management Plan. Bureau of Water Quality Management, New York State Department of Environmental Conservation.

Ontario Hydro. 1981. Biological investigations to improve once-through cooling system designs for the Great Lakes. Design and Development Division, Ontario Hydro. Report No. 81481, December, 1981.

PLUARG. 1976. Inventory of land use and land use practices in the Great Lakes Basin, Volume 5 - Canadian Lake Ontario Basin and Volume 6 - U.S. Lake Ontario Basin. Reports of the International Reference Groups on Great Lakes Pollution from Land Use Activities to the International Joint Commission.

PLUARG. 1977. Land use and land use practices in the Great Lakes Basin. Joint Summary Report - Task B. Report of the International Reference Group on Great Lakes Pollution from Land Use Activities to the International Joint Commission.

Schenk, C.F. and R.E. Thompson. 1965. Long-term changes in water chemistry and abaundance of phytoplankton at a single sampling location in Lake Ontario. Proc. Eighth Conf. Great Lakes Res., Univ. Michigan, Great Lakes Res. Div., Publ. 13: 197-208.

Simons, T.J., C.R. Murthy and J.E. Campbell. 1985. Winter circulation in Lake Ontario. J. Great Lakes Res. 11: 423-433. Yee, P. and J. Lloyd. 1985. Great Lakes Water Levels. Water Planning and Management Branch, Inland Waters Directorate. Environment Canada, Burlington, Ontario.

Simons, T.J. and W.M. Schertzer. 1985. The circulation of Lake Ontario during the summer of 1982 and the winter of 1982/83. National Water Research Institute, Burlington, Ontario, Canada. Contribution No. 85-26.

Statistics Canada. 1985. Population projections for Canada, Provinces and Territories 1984-2006. May, 1985.

Statistics Canada. 1986. Human Activity and the Environment, A Statistical Compendium. Structural Analysis Division, Statistics Canada. 374p.

Stevens, R.J.J. (compiler and editor). 1987. A review of Lake Ontario Water Quality with Emphasis on the 1981-82 Intensive Years. Report to the Surveillance Work Group, Great Lakes Water Quality Board, International Joint Commission, Windsor, Ontario. In preparation.

Talhelm. D.R. 1988. The international Great Lakes sport fishery of 1980. Great Lakes Fishery Commission Special Publication 88-4. 70p.

Thomas, R.L. 1983. Lake Ontario sediments as indicators of the Niagara River as a primary source of contaminants. J. Great Lakes Res. 9 (2): 118-124.

Water Quality Board. 1983. Great Lakes Water Quality Board Report to the International Joint Commission.

Water Quality Board. 1985. Great Lakes Water Quality Board Report to the International Joint Commission.

Water Quality Board. 1987. Great Lakes Water Quality Board Report to the International Joint Commission.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix II
Toxics Problem In Lake Ontario

TABLE OF CONTENTS

TABLES

FIGURES

(A) INTRODUCTION

The ultimate purpose of Appendix II is to present a definitive 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.

In preparing the January, 1988 draft of the Lake Ontario Toxics Management Plan, the Lake Ontario Toxics Committee made an initial attempt to characterize the toxics problem on both a chemical-by-chemical and ecosystem basis.

Since that time, a Toxics Categorization Workgroup has established an in-depth chemical-by-chemical categorization of toxics in the Lake:

- Part B of this Appendix, "Criteria, Standards and Other yardsticks", discusses and selects the measures (standards and criteria) that were used by the Toxics Categorization Workgroup in categorizing toxics.

- Part C2 of this Appendix, "A Chemical-by-Chemical Assessment of Lake-Wide Conditions", discusses the categorization system, and summarizes the Workgroup's conclusions.

A Niagara River/Lake Ontario Categorization Committee will continue the work of the Toxics Categorization Workgroup.

By contrast, there are no agreed-upon objective measures that can be used in assessing the toxics problem in Lake Ontario on an ecosystem basis. For this reason, this Plan calls for the establishment of ecosystem indicators and objectives that can be used in assessing the health of the Lake Ontario ecosystem. Pending the development of these indicators and objectives, Part C1 of this Appendix, "Ecosystem Health", has, for the most part, been left unchanged; Part C1 will be modified within eighteen months.

When this Appendix is revised, it will incorporate the results of new reference materials that have recently become available (e.g., the recent "Great Lakes Toxics Working Paper" prepared by the Conservation Foundation).

(B) CRITERIA, STANDARDS AND OTHER YARDSTICKS

Any discussion about 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 environmental protection 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 ambient waters of Lake Ontario are the Ontario Ministry of Environment's Water Quality Objectives and the New York State Department of Environmental Conservation's Water Quality Standards and Guidance Values (Table 1). These toxic limits can be 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 established objectives for several types of toxics that are intended to "protect the recognized most sensitive use in all waters.". These objectives are referred to as the IJC Objectives. In addition, 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 normal regulatory review process required for adoption by the regulatory agencies. Tables 2, 3, 4 and 5 summarize existing enforceable standards and objectives (as presented in Table 1) plus all other recommended criteria or objectives which, although not enforceable by law, represent current best scientific judgement regarding potential effects or risks due to toxicity or carcinogenicity. Again, these toxic limits are use- and media-specific and cover such aspects as human health or aquatic life protection in water (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 focusses 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 toxic 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 confronting the regulatory agencies. Accordingly, Table 6 summarizes the most stringent criteria applicable to ambient water and Table 7 summarizes the most stringent criteria applicable to fish tissue, which, in total, represent concentrations in water or fish considered adequate to protect the most sensitive use of Lake Ontario's aquatic resources.

Thus, for the purposes of the Lake Ontario Toxics Management Plan, Table 1 summarizes the measures against which toxic substances will be compared and categorized as 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).

Since criteria development and standard setting is an ongoing process, it must be recognized that many of these existing numbers will change and additional standards and criteria will be developed in response to new scientific knowledge. As this occurs, the Lake Ontario Toxics Management Plan will result in a review and possible re-categorization of affected toxic substances.

(C) AMBIENT LAKE CONDITIONS

1. ECOSYSTEM HEALTH

a) Food Chain Effects

Through a process known as biomagnification, toxics are concentrated by the organisms consuming them and are magnified many times as they go up through 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 food chain and biomagnification is, therefore, essential to an understanding of ecosystem effects. 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'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. Net plankton, 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 of 0.260 to 0.840 ppm. Fox also examined some of the 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) Measures of Ecosystem Health

i. Ecosystem Objectives

There are currently no ecosystem objectives for Lake Ontario. This is a disadvantage when trying to evaluate the health of the Lake Ontario ecosystem.

The Great Lakes Water Quality Agreement as amended in 1987 establishes, for the first time, ecosystem health indicators for use in Lake Superior and calls for similar indicators in the remaining lakes. The newly established indicators for Lake Superior are:

> "(a) 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/(metres)^2 (depths less than 100 metres) and 30-160/(metres)^2 (depths greater than 100 metres)".

The focus of the Lake Superior indicators of ecosystem health appears too narrow for effective use in Lake Ontario. While there may be some basic indicators that may be common to each Lake, there will be specific objectives required for Lake Ontario that will be tailored to its specific needs.

The Lake Ontario Toxics Management Plan calls for the establishment of ecosystem objectives for Lake Ontario that will be developed by the Ecosystem Objectives Work Group of the Binational Objectives Development Committee which has been established by Canada and the United States in response to the Great Lakes Water Quality Agreement.

ii. Toxicity to Wildlife

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 studied the severe reproductive failure of Scotch Bonnet Island herring gull colonies. Gilbertson reported a low breeding success value of 0.12 fledged young per adult mating pair. This is 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 a particularly low value of 16%. The mean breeding success was 0.06 fledged young per adult pair.

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.

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).

Further study in 1975 by Fox et al. and in 1977 by Gilman et al. found reproductive failure of herring gulls in the Great Lakes was mostly restricted to Lake Ontario. By 1977-1978, Weseloh et al. (1979) reported the breeding success of the Scotch Bonnet Island colonies to have improved to 1.10 and 1.01 fledged young per adult pair.

A report (Kurita et al., 1987) describes a comprehensive monitoring project to assess productivity and deformities in colonial waterbirds in the Upper Great Lakes. These species have proven to be a reliable, sensitive, integrating monitoring system for detecting net effects and ecosystem wide changes.

Study results support earlier information linking toxic chemical contamination to both deformities and reproductive failure. They further suggest that effects of toxic contamination are even more pervasive than previously believed. The paradox reflected by the report is the recorded, dramatic increase in incidence of deformities and failures in a period of declining levels of PCB and, presumably, other controlled toxic substances.

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 which were fed carp failed to reproduce, and mink which 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.

The 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 1950's, the lake trout had disappeared from the Lake. Efforts to restore lake trout began in 1973, but there has been no significant natural reproduction in the Lake. 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. Fishery agencies annually collect over 650,000 lake trout eggs from Lake Ontario that are hatched, reared to yearling size, and stocked to develop a new Lake Ontario strain of lake trout.

c) Human Health Effects

i. Drinking Water

Toxic chemicals have not been found in Lake Ontario drinking water at levels above standards designed to protect human health. However, the Lake Ontario Toxics Management Plan recognizes the need to develop more direct measures of the impacts of toxics on human health. Further conclusions on the impacts of toxics in drinking water on human health will be deferred until after the development of these more direct measures.

ii. Fish Consumption

Because of bioaccumulation, the level of certain toxics in fish is high relative to the levels of toxics in water. Therefore, although fish consumption is low relative to water consumption, the total exposure of humans to Lake Ontario toxics through fish consumption is higher than through water consumption. For example, Sonstegard (in Health of Aquatic Communities Task Force, 1986) has 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.

Fishing advisories began on Lake Ontario in 1970 with the discovery of bioaccumulated mercury and DDT. Later (in the mid-seventies) more advisories were imposed with the discovery of bioaccumulated PCBs and mirex. The advisories were revised in the early 1980s to reflect improvements found in the fish flesh contaminant levels and to permit the monthly consumption of some Lake Ontario fishes. 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 which 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.

In another study by Sonzogni and Swain (1984) it was suggested that those who consumed high quantities of contaminated Lake Ontario and Lake Michigan fish may have a small but elevated risk of developing cancer as compared to normal fish consumers. 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 (Lake Ontario Toxics Categorization Workgroup, 1988). 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 11, ambient data were available for forty-two chemicals:

- o Seven (7) 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).

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, one hundred and one (101) 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 a more limited role in the categorization process because there are no standards or criteria for these media. The system, however, is flexible enough to use this other ambient data as standards and criteria become available.

NYSDEC's fish flesh criteria for piscivorous (fish consuming) wildlife are included as 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.

b) Trends in Levels of Toxics in the Ambient Water Column and Fish Tissue

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.

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.

There is clear evidence that the 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 colonies on Lake Ontario during the period from 1974 to 1986 show significant declines (Figure 2); and

- The levels of PCBs in lake trout, brown trout and coho salmon collected since 1975 show significant declines (Figure 3).

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

c) Finished Drinking Water

i. United States

On the United States side of Lake Ontario there are thirteen Community Public Water Supply Systems (CPWS)[1] which utilize Lake Ontario as a raw water source. They are comprised of the Villages of Lyndonville, Albion, Brockport, Sodus, Sodus Point, Wolcott, Sackets Harbor and Chaumont, as well as Oswego City, Monroe County Water Authority, Ontario Town Water District, 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, has put EPA on a rigorous schedule to develop 83 drinking water standards by June, 1989, and has imposed significantly increased monitoring requirements on CPWS. The availability of additional standards and monitoring data will allow improved assessments of toxics in Lake Ontario potable drinking water beginning in 1989.

ii. Canada

The Drinking Water Surveillance Program (DWSP) currently monitors 44 plants, of which eleven 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).

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 System. Characteristics of sediment-contaminant interaction that surface in a discussion of toxic pollutants 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 dredged contaminated 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 existing 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 to 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, exceedances of median values for Lake Ontario data sets were found for PCBs, DDT and aldrin/dieldrin. In addition, occasional measured values for 2,3,7,8-TCDD and mirex also exceeded these experimental criteria (Table 15). The LOTMP calls for the establishment of a Standards and Criteria Committee; this Committee will consider 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 exibited a leveling off tendency. The continuing impairment of water use despite a significant reduction in toxic discharges, may be attributed in part to the 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 ambient 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" (eg., Areas of Concern) into the open lake;
- Chemical release of adsorbed toxicants into the water column thereby promoting bioavailability; and
- Alteration of the contaminant 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. Efforts should also be made to try to establish mechanisms and times for ultimate burial (eg., the time taken for 50% of a sediment associated contaminant to be removed from circulation within the ecosystem). This information will be developed as a product of detailed Lake modelling, a future activity under the Lake Ontario Toxics Management Plan.

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

Contaminants bound to fine grained sediment contributed by tributary inputs to Lake Ontario 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 Lake Ontario. Trends through 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 surface sediments have been compared with background concentrations in the pre-colonial sediments (Mudroch et al., 1988). The concentration ranges in surface sediments were generally wider 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 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.

The work of Thomas (1983) reflects 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 this Plan, there are seven Areas of Concern within the Lake Ontario Basin (Figure 4):

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

A summary of the problems in these Areas of Concern, 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 submission to the IJC. The status of RAP development is described in Appendix V.

TABLE 1.

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

AGENCY:		NYSDEC							MOE		FDA
MEDIUM:	C	WATER				WATER			WATER	FISH TISSUE	FISH TISSUE
PROTECTED USE:	A R	AQUATIC LIFE				HUMAN HEALTH			AQUATIC LIFE	HUMAN HEALTH	
CRITERION:	C I N	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
ALUMINUM			100								
ACENAPHTHENE	N							20			
ACRYLONITRILE	Y						0.07 f				
ALDRIN	Y						0.002 f				0.3
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					
CADMIUM	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	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	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				0.3
DIETHYL PHTHALATE	N					50 f,h					
DIMETHYL PHTHALATE	N					50 f,h					

TABLE 1. CONTINUED

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

AGENCY:		NYSDEC							MOE		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
DIOXIN (2378-TCDD)	Y			0.000001						0.00002	0.00005 0.00001 *
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					
GUTHION	N								0.005		
HEPTACHLOR	N		0.001 e				0.009		0.001		0.3
HEXACHLOROBENZENE	N						0.02 f				
HEXACHLOROBUTADIENE	Y	10	1				0.5				
HEXACHLORCYHEX			0.01 e				0.02 f				
HEXACHLORCYPENTDIENE	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		
MIREX	N		0.001 e				0.04 f			0.1	0.1
NAPHTHALENE	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							MOE		FDA
MEDIUM:	C A R C I N	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.

MOE 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:		W A T E R						
PROTECTED USE:	CARCIN?	H U M A N H E A L T H						
EXPOSURE ROUTE:		D R I N K I N G W A T E R					FISH CONSUMP	WATER+FISH CONSUMP
CRITERION:		TOXICITY		CARCINOGENICITY		AESTHETICS		
AGENCY:		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:		W A T E R						
PROTECTED USE:	CARCIN?	HUMAN HEALTH						
EXPOSURE ROUTE:		DRINKING WATER					FISH CONSUMP	WATER+FISH
CRITERION:		TOXICITY		CARCINOGENICITY		AESTHETICS		
AGENCY:		NYSDEC	IJC	NYSDEC	IJC	NYSDEC	EPA	EPA
COMPOUND / UNITS:		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.
- # 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:		WATER								
PROTECTED USE:	CARCIN?	AQUATIC LIFE								
CRITERION:		NOT CATEGORIZED AS ACUTE VS CHRONIC		ACUTE TOXICITY		CHRONIC TOXICITY		BIOACCUMULATION		FOOD TAINT
AGENCY:		MOE	IJC	EPA	NYSDEC	EPA	NYSDEC	NYSDEC	IJC	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 reprod m	3.9 b		1.1 b	1.13 b,e			
CHLORDANE	Y	0.06	0.06 Fathead lethality m	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 b,e			
CHROMIUM (HEX)	N			16		11	11 e			
CHROMIUM (TRI)	N			1700 b		210 b				
COPPER	N	5	5 Fish reproduction m	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) 0.1 Invert lethal (1/30 days)				0.08			
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 m	0.18		0.0023	0.002 e			
GUTHION	N	0.005	0.005 Invert lethality m			0.01				
HEPTACHLOR	N	0.001	0.001 Stonefly lethality m	0.52		0.0038	0.001 e			
HEXACHLOROBUTADIENE	Y			90 a	10	9.3 a	1			
HEXACHLORCYPENTDIENE	N			7 a	4.5	5.2 a	0.45			
IRON	N	300	300 Algae toxicity m		300	1000	300			
LEAD	N	2-25	5 Neurotox trout	82 b		3.2 b	3.2 b,e			
LINDANE	Y	0.01	0.01 Stonefly lethality m	2		0.08				
MALATHION	N	0.1				0.1	0.1 e			
MANGANESE	N									
MERCURY	N	0.2	0.2 Fish reproduction m	2.4		0.012	0.2 e,f			
METHOXYCHLOR	N	0.04	0.04 Invert effects m			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:		WATER								
PROTECTED USE:	CARCIN?	AQUATIC LIFE								
CRITERION:		ACUTE VS CHRONIC NOT SPECIFIED		ACUTE TOXICITY		CHRONIC TOXICITY		BIOACCUMULATION		FOOD TAINT
AGENCY:		MOE	IJC	EPA	NYSDEC	EPA	NYSDEC	NYSDEC	IJC	NYSDEC
COMPOUND / UNITS:	?	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
NAPHTHALENE	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			
PENTACHLOROPHENOL	N	0.5	0.4 Fish growth	20 d		13 d	0.4			
SELENIUM	N	100	1 Fish survival (ecosys)	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 presented is guidance value only.
m Accepted and incorporated into amended GLWQA, 1987.
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:	C	HUMAN HEALTH			AQUATIC LIFE: FISH HEALTH	AQUATIC LIFE: BIRDS & MAMMALS			QUANTIFICATION LIMIT
EXPOSURE ROUTE:	A	FISH CONSUMPTION				FISH CONSUMPTION BY BIRDS & MAMMALS			
CRITERION:	R					NON-CARCINOGENIC		1/100 CANCER RISK	
AGENCY:	C	MOE	IJC	FDA	IJC	NYSDEC	IJC	NYSDEC	IJC
	I								
COMPOUND / UNITS:	N	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	?	EDIBLE PORTION			WHOLE FISH	WHOLE FISH		WHOLE FISH	
ALDRIN + DIELDRIN	Y		0.3 m			0.12		0.022	
ALDRIN				0.3					
DIELDRIN				0.3					
ARSENIC									
BENZO(A)PYRENE					1 Potential fish tumors				
PAH									
CHLORDANE	Y	0.3		0.3		0.5		0.37	
TRICHLOROBENZENE						1.3			
DDT	Y	5		5		0.2	1 Bird eggshell thinning	0.27	
DIOXIN (2378-TCDD)	Y	0.00002		0.00005		0.000003		.0000023	0.00001
ENDRIN	N		0.3 m			0.025			
HEPTACHLOR	Y		0.3 m	0.3		0.2		0.21	
HEXACHLOROBENZENE	Y					0.33		0.2	
HEXACHLOROBUTADIENE	Y					1.3		4.5	
HEXACHLORCYHEX						0.1		0.51	
HEXACHLOROETHANE						14.1			
LEAD	N	1							
LINDANE	Y		0.3 m						
MERCURY	N	0.5		1			0.5 Bird behavior		
MIREX	N	0.1		0.1		0.33		0.37	
OCTACHLOROSTYRENE						0.02			
PCB	Y	2		2		0.11	0.1 Mink reproduction	0.11	
PENTACHLOROPHENOL	N					2			
SELENIUM	N				3 Fish survival				
TOXAPHENE				5					

NOTES:

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.

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:	CARCIN?	DREDGING			FISH HEALTH
AGENCY:		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 Subcimmittee 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; NY	AQ, 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.
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

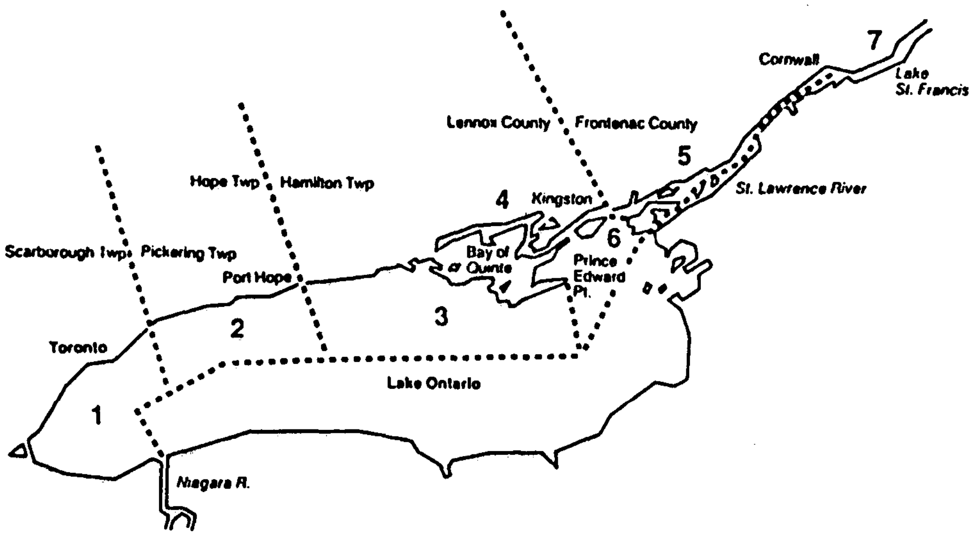
American Eel Channel Catfish Lake Trout Chinook Salmon Coho Salmon over 21" Rainbow Trout over 25" Brown Trout over 20"	Eat none
Carp White Perch Smaller Coho Salmon Smaller Rainbow Trout Smaller Brown Trout	Eat no more than one meal per month

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.

Table 9

Province of Ontario Fish Consumption Advisories
for Lake Ontario



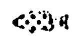
Number- Station

(continued)

Consumption Guidelines

					
One week	No restrictions	10 meals per wk 2.3 kg /wk. (5.1 lb /wk.)	7 meals per wk 1.54 kg /wk (3.4 lb /wk.)	1 or 2 meals/wk 0.45 kg /wk (1 lb /wk.)	None
Two weeks	No restrictions	5 meals per wk 1.3 kg /wk (2.8 lb /wk.)	4 meals per wk 0.86 kg /wk (1.9 lb /wk.)	1 or 2 meals/wk 0.45 kg /wk (1 lb /wk.)	None
Three weeks	No restrictions	4 meals per wk 0.95 kg /wk. (2.1 lb /wk.)	3 meals per wk 0.63 kg /wk (1.4 lb /wk.)	1 or 2 meals/wk 0.45 kg /wk (1 lb /wk.)	None
Long-term consumption	No restrictions	0.226 kg /wk (0.5 lb /wk.)	0.136 kg /wk (0.3 lb /wk.)	1 or 2 meals per month 0.45 kg /mo (1 lb /mo.)	None

Guide de consommation

					
Une semaine	Pas de restrictions	10 repas par sem 2,3 kg/sem (5,1 lb /sem.)	7 repas par sem 1,54 kg/sem (3,4 lb/sem.)	1 ou 2 repas par sem 0,45 kg/sem (1 lb/sem.)	Aucun
Deux semaines	Pas de restrictions	5 repas par sem 1,3 kg/sem (2,8 lb/sem.)	4 repas par sem 0,86 kg/sem (1,9 lb/sem.)	1 ou 2 repas par sem 0,45 kg/sem (1 lb/sem.)	Aucun
Trois semaines	Pas de restrictions	4 repas par sem 0,95 kg/sem (2,1 lb/sem.)	3 repas par sem 0,63 kg/sem (1,4 lb/sem.)	1 ou 2 repas par sem 0,45 kg/sem (1 lb/sem.)	Aucun
Consommation à long terme	Pas de restrictions	0,226 kg/sem (0,5 lb/sem.)	0,136 kg/sem (0,3 lb/sem.)	1 ou 2 repas par mois 0,45 kg/mois (1 lb/mois)	Aucun

	Contaminant identification	Identification des polluants
1	Mercury	Mercure
2	Mercury, PCB, mirex and pesticides	Mercure, BPC, mirex et pesticides
3	PCB, mirex and pesticides	BPC, mirex et pesticides
4	Mercury, PCB and mirex	Mercure, BPC et mirex
5	Mercury, other metals, PCB, mirex and pesticides	Mercure, autres métaux, BPC, mirex et pesticides
6	Mercury, other metals	Mercure et autres métaux
7	2,3,7,8-TCDD (Dioxin)	2,3,7,8-TCDD (dioxine)
8	Toxaphene	Toxaphène

Children under 15 and women of child-bearing age should eat only .

Les enfants de moins de 15 ans et les femmes en âge de procréer ne devraient manger que des poissons représentés par .

(continued)

Lake Ontario/Lac Ontario

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

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #1 **Lac Ontario N° 1** Jordan Harbour to Port Weller Jordan Harbour à Port Weller 4312/7919 Niagara R.M./M.R. de Niagara	Brown Trout[6,7,8] Truite brune[6,7,8]						○	●	●	●	●
	White Bass[2,7] Bar blanc[2,7]			○	○	○	●				
	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[6,8] Éperlan arc-en-ciel[6,8]	○	○								

Lake Ontario/Lac Ontario

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

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #1 **Lac Ontario N° 1** Burlington Bay, Hamilton Harbour Baie Burlington, Port d'Hamilton 4317/7950 Hamilton-Wentworth R.M. M.R. d'Hamilton-Wentworth	Rainbow Smelt[6] Éperlan arc-en-ciel[6]	○	○								
	White Perch[6] Bar-perche[6]	○	○	○	●	●					
	Brown Bullhead[6] Barbotte brune[6]	○	○	○	○	○	○				
	Carp[6] Carpe[6]			○	○	○	○	○	○	●	●
	Northern Pike[6] Brochet[6]							○	○	○	
	Black Crappie[6] Marigane noire[6]	○	○	○	○	○					
	White Sucker[6] Meunier noir[6]		○	○	○	○	○				
	Yellow Perch[6] Perchaude[6]	○	○	○	○	○					
	White Bass[6] Bar blanc[6]				○	○					
	Channel Catfish[6] Barbue de rivière[6]		●	●	●	●	●	●	●		
	Brown Trout[6] Truite brune[6]						○	●	●		
	Freshwater Drum[6] Malachigan[6]						●	●			
Lake Ontario #1 **Lac Ontario N° 1** Burlington Beach/Plage Burlington 4318/7948 Hamilton-Wentworth R.M. M.R. 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./M.R. d'Halton	Chinook[2,7,8] Saumon chinook[2,7,8]							●	●	●	●
	Rainbow Smelt[6,8] Éperlan arc-en-ciel[6,8]	○	○								
	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]					○	●	●	●	●	

(continued)

Lake Ontario/Lac Ontario

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #1 / Lac Ontario Nº 1 Credit River/Rivière Credit 4333/7935 Peel R.M./M.R. de Peel	Chinook[6,7,8] / Saumon chinook[6,7,8]						◐	◐	◐	◐	◐
	White Sucker[3] / Meunier noir[3]	○	○	○	○	○					
	Coho[6,7,8] / Saumon coho[6,7,8]					○	○	◐	◐	◐	◐
	White Bass[3] / Bar blanc[3]			○	○						
	Rainbow Trout[6,8] / Truite arc-en-ciel[6,8]				○	○	○	○	◐	◐	◐
	Lake Trout[3,7] / Truite de lac[3,7]				○	○	○	◐	◐	◐	
Lake Ontario #1 / Lac Ontario Nº 1 Marie Curtis Park/Parc Marie Curtis 4334/7934 Etobicoke	White Sucker[6] / Meunier noir[6]			○	○	○	○				
Lake Ontario #1 / Lac Ontario Nº 1 Long Branch 4335/7932 Toronto	White Sucker[6] / Meunier noir[6]					○	○	○			
	Lake Trout[3] / Truite de lac[3]			○	○	○	○	◐	◐	◐	
Lake Ontario #1 / Lac Ontario Nº 1 Humber River mouth Embouchure de la rivière Humber 4338/7928 Toronto	Brown Trout[3] / Truite brune[3]							◐	◐	◐	
Lake Ontario #1 / Lac Ontario Nº 1 Humber Bay area Région de la baie Humber 4337/7927 Toronto	Rainbow Smelt[6,7] / Éperlan arc-en-ciel[6,7]	○	○	○							
	Lake Trout[3,7] / Truite de lac[3,7]			○	○	○	○	◐	◐	◐	
	White Sucker[6,7] / Meunier noir[6,7]		○	○	○	○	○	○			
	Rainbow Trout[3,7] / Truite arc-en-ciel[3,7]			○	○	○	○	○			

Lake Ontario/Lac Ontario

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #1 / Lac Ontario Nº 1 Hearn Generating Station — Outer Harbour Centrale électrique Hearn — Port extérieur 4339/7920 Toronto	Carp[3] / Carpe[3]									◐	◐
	White Bass[6] / Bar blanc[6]			○	○	○	●				
	White Perch[6] / Bar-perche[6]		○	○							
	Yellow Perch[6] / Perchaude[6]	○	○	○	○	●					
	Rainbow Trout[6] / Truite arc-en-ciel[6]			○	○	○	○				
	Brown Trout[6] / Truite brune[6]				○	○					
	Gizzard Shad[6] / Alose à gésier[6]					○	◐	◐			
	Northern Pike[6] / Brochet[6]					○	○	○	○	○	●
	Rainbow Smelt[6,7] / Éperlan arc-en-ciel[6,7]		○	○	○						
Lake Ontario #1 / Lac Ontario Nº 1 Toronto Islands — Inner Harbour Îles de Toronto — Port intérieur 4350/7925 Toronto	Rainbow Smelt[6] / Éperlan arc-en-ciel[6]	○	○								
	Yellow Perch[3,8] / Perchaude[3,8]	○	○	○	○	○					
	White Sucker[6] / Meunier noir[6]				○	○	○	●			
	Northern Pike[6] / Brochet[6]							○	○	○	●
	Carp[3] / Carpe[3]							○	○	◐	◐
Lake Ontario #1 / Lac Ontario Nº 1 Ashbridges Bay/Baie Ashbridges 4340/7919 Toronto	Rainbow Smelt[6] / Éperlan arc-en-ciel[6]	○	○	○							
	White Sucker[6] / Meunier noir[6]			○	○	○	○	○			
Lake Ontario #1 / Lac Ontario Nº 1 Scarborough Bluffs Falaises de Scarborough 4342/7914 Toronto	Lake Trout[6,7] / Truite de lac[6,7]						◐	◐	◐		
	White Sucker[6] / Meunier noir[6]			○	○	○	○	○			
Lake Ontario #2 / Lac Ontario Nº 2 Rouge River mouth Embouchure de la rivière Rouge 4348/7907 Pickering Twp./Canton de Pickering Durham R.M./M.R. de Durham	Brown Bullhead[6] / Barbotte brune[6]			○	○	○					

(continued)

Lake Ontario/Lac Ontario

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #2 **Lac Ontario Nº 2** Frenchman Bay/Baie Frenchman 4348/7906 Durham R.M./M.R. Durham	Brown Bullhead[2] Barbotte brune[2]				○	◐	◐				
	Carp[2] Carpe[2]						○	○	○	◐	◐
	Northern Pike[2] Brochet[2]			○	○	○	○	○	○	○	○
	Yellow Perch[2] Perchaude[2]	○	○								
Lake Ontario #2 **Lac Ontario Nº 2** Pickering Generating Station Centrale électrique Pickering 4349/7903 Durham R.M./M.R. de Durham	Rainbow Smelt[2,8] Éperlan arc-en-ciel[2,8]	○	○	◐							
Lake Ontario #2 **Lac Ontario Nº 2** Oshawa area/Région d'Oshawa 4350/7848 Durham R.M./M.R. de Durham	Rainbow Trout[3,8] Truite arc-en-ciel[3,8]								◐	◐	◐
	Coho[2] Saumon coho[2]							○	◐	◐	
	Chinook[2] Saumon chinook[2]									◐	◐
Lake Ontario #2 **Lac Ontario Nº 2** Wilmot Creek/Ruisseau Wilmot 4354/7838 Durham R.M./M.R. de Durham	Rainbow Smelt[6] Éperlan arc-en-ciel[6]	○	○								
Lake Ontario #2 **Lac Ontario Nº 2** Ganaraska River Rivière Ganaraska Port Hope 4357/7818 Hope Twp./Canton d'Hope Northumberland Co. Cté de Northumberland	Rainbow Smelt[6] Éperlan arc-en ciel[6]	○	○								
	Rainbow Trout[6,7,8] Truite arc-en-ciel[6,7,8]					○	○	○	○	◐	◐
	Brown Trout[2,8] Truite brune[2,8]						◐	◐	◐	◐	
Lake Ontario #3 **Lac Ontario Nº 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]	○	○								
Lake Ontario #3 **Lac Ontario Nº 3** Presqu'ile Point/Pointe Presqu'ile 4400/7741 Brighton Twp./Canton de Brighton Northumberland Co. Cté de Northumberland	Walleye[2,8] Doré[2,8]						○	○			

Lake Ontario/Lac Ontario

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #3 **Lac Ontario Nº 3** Presqu'ile Bay/Baie Presqu'ile 4401/7742 Northumberland Co. Cté de Northumberland	Largemouth Bass[2] Achigan à grande bouche[2]	○	○	○	○	○	◐				
	Yellow Perch[2] Perchaude[2]	○	○	○							
Lake Ontario #3 **Lac Ontario Nº 3** 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]								○	○	○
Lake Ontario #3 **Lac Ontario Nº 3** Gravelly Bay/Baie Gravelly 4356/7657 Prince Edward Co. Cté de Prince Edward	Walleye[5] Doré[5]							○	◐	◐	
Lake Ontario #4 **Lac Ontario Nº 4** Bay of Quinte/Baie de Quinte General/Général 4408/7723 Hastings & Prince Edward Cos. Ctés 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[3] Barbue de rivière[3]			○	○	○	○	◐	●		
	White Bass[6] Bar blanc[6]	○	○	○	○						
	Smallmouth Bass[6] Achigan à petite bouche[6]	○	○	○	○	○	◐				
Lake Ontario #4 **Lac Ontario Nº 4** Bay of Quinte/Baie de Quinte Trent River mouth Embouchure de la rivière Trent 4408/7734 Sydney Twp./Canton de Sidney Hastings Co./Cté d'Hastings	Walleye[4,8] Doré[4,8]				○	○	○	○	◐	◐	
Lake Ontario #4 **Lac Ontario Nº 4** Bay of Quinte/Baie de Quinte Trenton to Belleville Trenton à Belleville 4410/7726 Hastings & Prince Edward Cos. Ctés d'Hastings et de Prince Edward	Walleye[2] Doré[2]					○	○	○	◐	◐	
	Yellow Perch[1] Perchaude[1]	○	○								

(continued)

Lake Ontario/Lac Ontario

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 Belleville, Telegraph Narrows, Long Reach Belleville, Détroit Telegraph, Tronçon Long 4410/7708 Hastings & Prince Edward Cos. Ctés d'Hastings et de Prince Edward	Walleye[2] Doré[2]										
	Largemouth Bass[2] Achigan à grande bouche[2]										
	Carp[2] Carpe[2]										
Lake Ontario #4 Lac Ontario N° 4 Bay of Quinte/Baie de Quinte Hay Bay/Baie Hay 4410/7808 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]										
Lake Ontario #4 Lac Ontario N° 4 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[4,8] Doré[4,8]										
Lake Ontario #4 Lac Ontario N° 4 Picton Bay/Baie Picton 4402/7707 Prince Edward Co. Cté de Prince Edward	Rainbow Smelt[3] Éperlan arc-en-ciel[3]										
Lake Ontario #4 Lac Ontario N° 4 Bay of Quinte, Glenora to Upper Gap Baie de Quinte, 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] Grande 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]										

Lake Ontario/Lac Ontario

Waterbody/ Cours d'eau	Fish Species/ Espèces de poisson	<15 (<6)	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 #6 Lac Ontario N° 6 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]										
Lake Ontario #6 Lac Ontario N° 6 Main Duck Island/Île Main Duck 4358/7637 Prince Edward Co. Cté de Prince Edward	American Eel[2] Anguille d'Amérique[2]										
	Lake Trout[2] Truite de lac[2]										
Lake Ontario #6 Lac Ontario N° 6 Lower Gap 4410/7635 Frontenac & Lennox & Addington Cos. Ctés de Frontenac, de Lennox et d'Addington	Whitefish[2,8] Grande 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]										
Lake Ontario #6 Lac Ontario N° 6 Reeds Bay/Baie Reeds 4408/7628 Wolfe Island Twp. Canton de Wolfe Island Frontenac Co./Cté de Frontenac	American Eel[2,7] Anguille d'Amérique[2,7]										
St. Lawrence River Fleuve St-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 Co's. Ctés de Prince Edward, de Lennox et d'Addington	Rainbow Smelt[6] Éperlan arc-en-ciel[6]										

Ontario Ministry of the Environment. 1988. Guide to Eating Ontario Sport Fish. 303 pp.

Table 10

Categories of Toxics

I. <u>Ambient Data Available</u>

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. <u>Ambient Data Not Available</u>

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

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

aldehydes

endrin aldehyde

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

metal containing compounds

- butyltin
- dibutyltin
- methyltin
- dimethyltin
- tributyltin
- alkyl-lead*

non metals

- cyanide

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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 14

OPEN LAKE SEDIMENT COMPARISON TO DREDGING GUIDELINES

MEDIUM: SEDIMENT		JURISDICTION			
PARAMETER	RANGE OF VALUES	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.

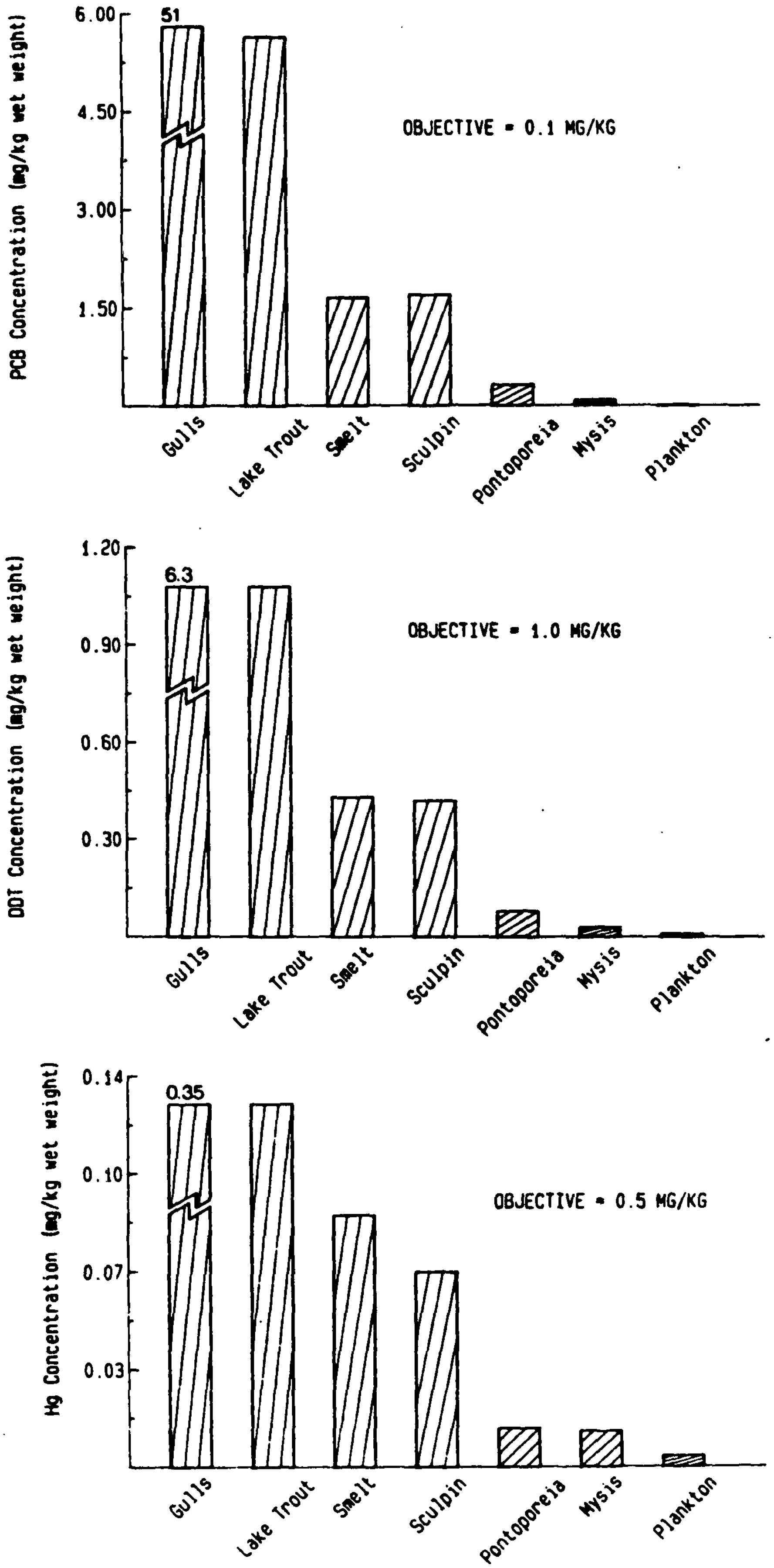
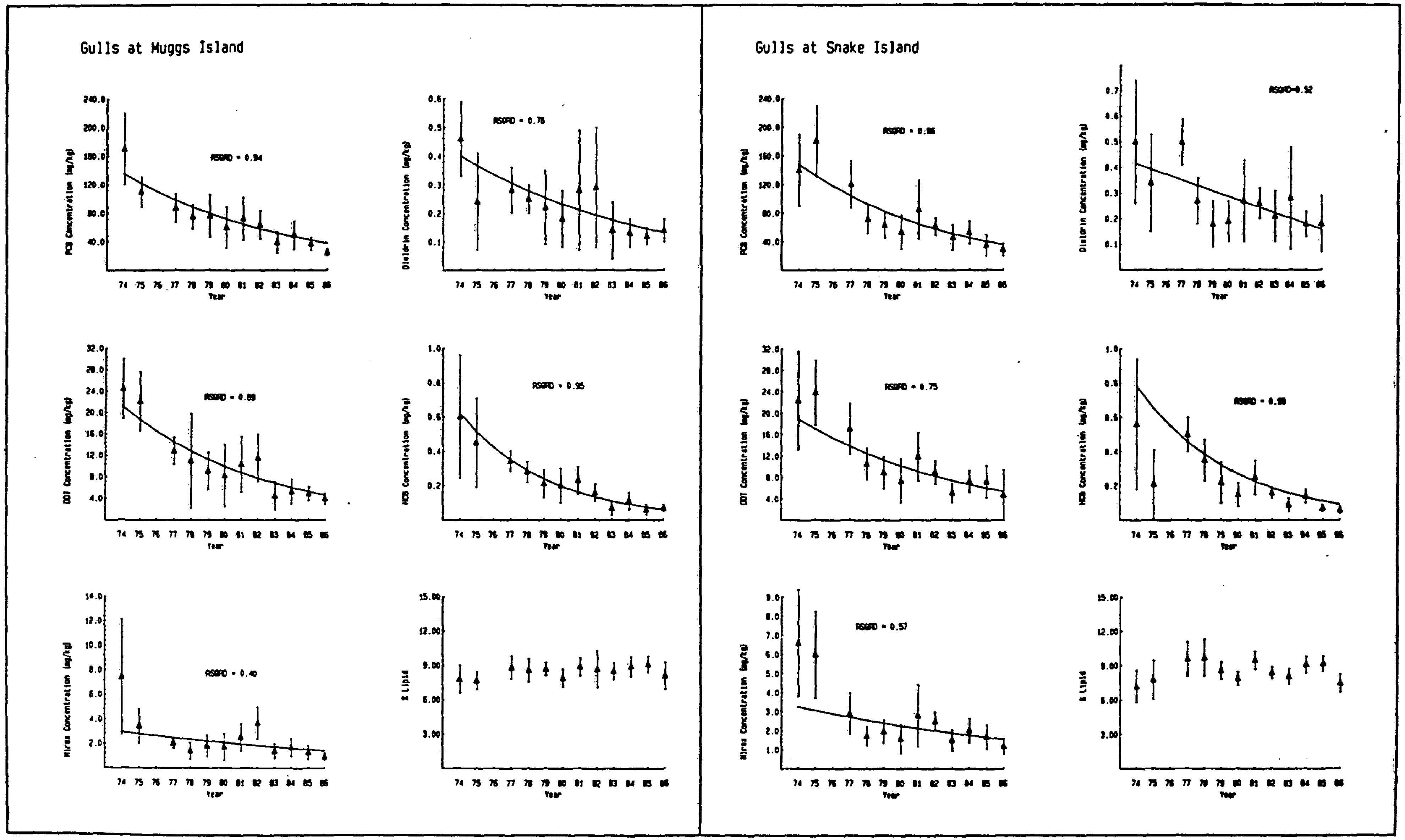


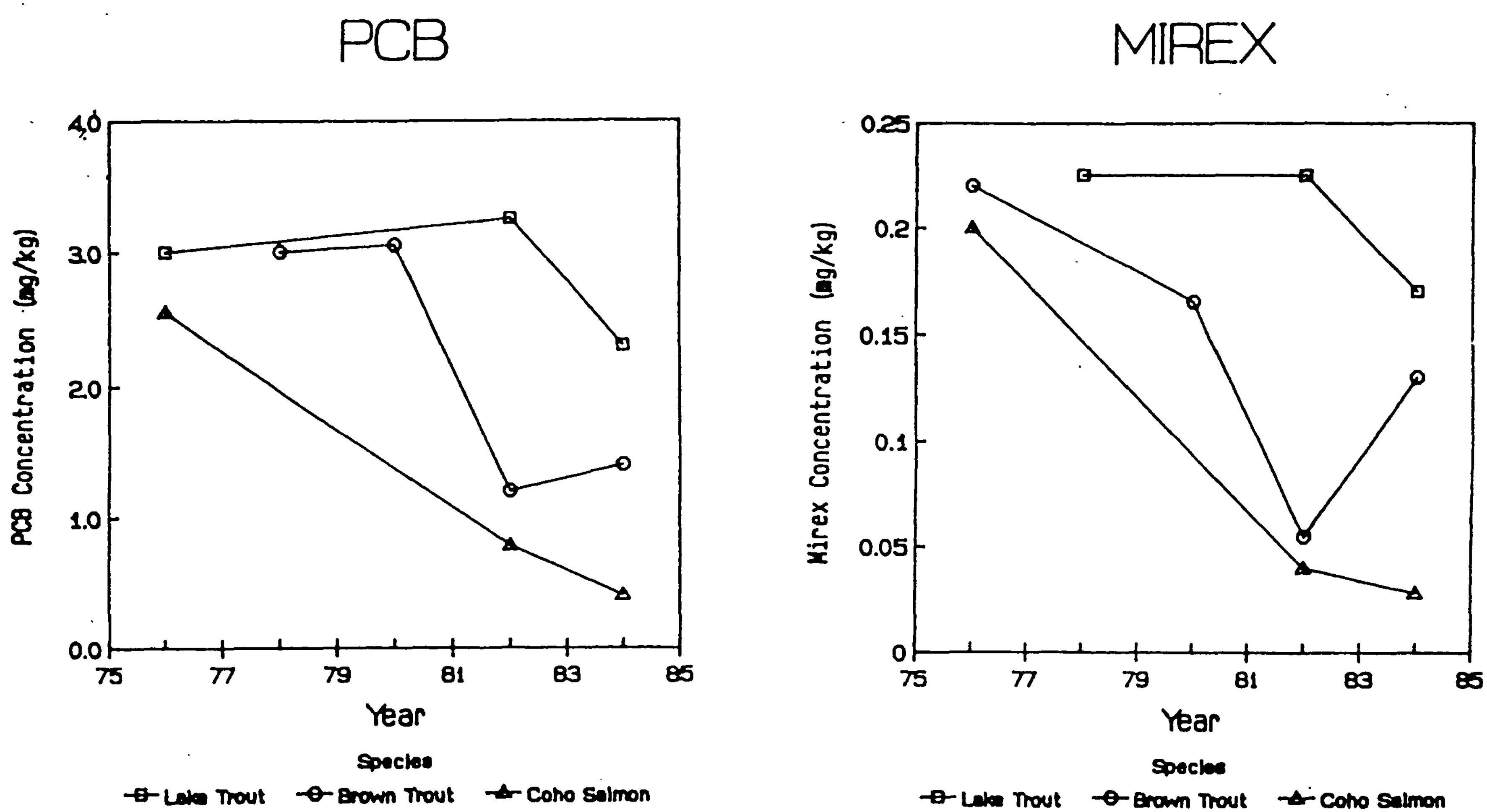
FIGURE 2 ORGANOCHLORINE CONTAMINANT AND LIPID CONCENTRATIONS IN HERRING GULL EGGS TAKEN FROM TWO COLONIES ON LAKE ONTARIO, 1974-1986.



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.

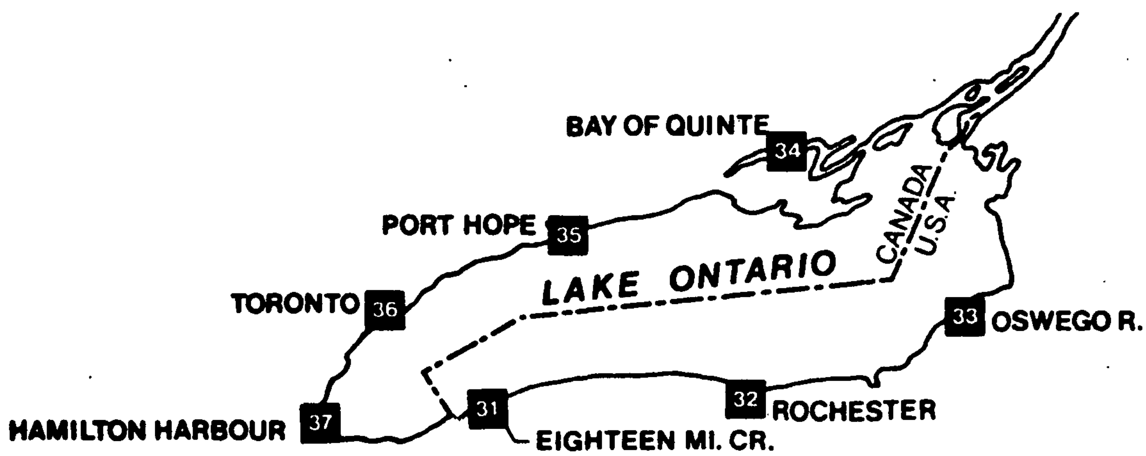
Figure 3

Average Levels of PCB and Mirex in
Lake Trout, Brown Trout and Coho Salmon
at Jordan Harbour



From: 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.

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

REFERENCES

Connor, M.S. 1984. Comparison of Carcinogenic Risks from Fish vs. Groundwater Contamination by Organic Compounds. Environ. Sci. Technol. 18:628-631.

Fox, G.A., A.P. Gilman, D.J. Hallett, R.J. Nostram, F.F. Onaska and D.B. Peakall. 1975. Herring Gull Productivity and Toxic Chemicals in The Great Lakes in 1975. Can. Widl. Serv., Toxic. Chem. Div. Manus. Report No. 34, 35 pp.

Fox, M.E., Carey, J.H., and Oliver, D.G. 1983. Compartmental Distribution of Organochlorine Contaminants in the Niagara River and the Western Basin of Lake Ontario. J. Great Lakes Res. 9:287-294.

Gilbertson, M. 1974. Pollutants in Breeding Herring Gulls in the Lower Great Lakes. Can. Field-Naturalist. 8:273-280.

Gilbertson, M. and R. Hale. 1974. Characteristics of the Breeding Failure of a Colony of Herring Gulls in Lake Ontario. Can. Field-Naturalist. 88: 356-358.

Gilman, A.P., G.A. Fox, D.B. Peakall, S.M. Teeple, T.R. Carroll and G.T. Hayman. 1977. Reproductive Parameters and Egg Contaminant Levels of Great Lakes Herring Gulls. J. Wildl. Manage. 41: 458-468.

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

Health of Aquatic Communities Task Force. 1986. Literature Review of the Effects of Persistent Toxic Substances on Great Lakes Biota. International Joint Commission. 256 pp.

Hornshaw, T.C., R.J. Aulerich and H.E. Johnson. 1983. Feeding Great Lakes Fish to Mink: Effects On Mink and Accumulation and Elimination of PCB'S by Mink. A. Toxical. Environ. Health. 11:933-946.

Humphrey, H.E.B. 1976. evaluation of Changes in the Level of Polychlorinated Biphenyls (PCB) in Human Tissue. Mich. Dept. Public Health, Final Report on FDA Contract 223-73-2209. 85 pp.

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.

Lake Ontario Toxics Categorization Workgroup. 1988. Categorization of Toxics in Lake Ontario. 38 pp.

Mudroch, A., L. Sarazin, T. Lomas, A. Leany-East, and C. De Barros. 1985. Report on the Progress of the Revision of the MOE Guidelines for Dredged Material Open Water Disposal, 1984/1985. NWRI Contribution No. 85-80, Burlington, Ontario.

Mudroch, A., L. Sarazin, and T. Lomas. 1988. Report: Summary of Surface and Background Concentrations of Selected Elements in the Great Lakes Sediments. J. Great Lakes Res. 14(2): 241-251.

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.

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

Ontario Ministry of the Environment. 1988. Guide to Eating Ontario Sport Fish. 303 pp.

Onuska, F.I., A. Mudroch, and K.A. Terry. 1983. Identification and Determination of Trace Organic Substances in Sediment Cores from the Western Basin of Lake Ontario. J. Great Lakes Res. 9(2): 169-182.

Pavlou, S., R. Kodeg, A. Turner, and M. Marchlik. 1987. Sediment Quality Methodology Validation: Uncertainty Analysis of Sediment Normalization Theory for Nonpolar Organic Contaminants. Envirosphere Corp., Bellevue, Washington.

Pearce, W. 1988. Personal Communication.

Skinner, L. 1986. Unpublished Wildlife Survey Data. New York State Department of Environmental Conservation. 1987.

Sonzogni, W.C. and W.R. Swain. 1984. Perspectives on Human Health Concerns from Great Lakes Contaminants. In: J.O. Nriagu and M.S. Simmons (eds.). Toxic Contamination in the Great Lakes. John Wiley & Sons. 16 pp.

Teeple, S.M. 1977. Reproductive Success of Herring Gulls Nesting on Brothers Island, Lake Ontario in 1973. Can. Field-Naturalist. 91: 148-157.

Thomas, R.L. 1983. Lake Ontario sediments as indicators of the Niagara River as a primary source of contaminants. J. Great Lakes Res. 9(2): 118-124.

Weseloh, D., P. Minean and D.J. Hallett. 1979. Organochlorine Contaminants and Trends in Reproduction in Great Lakes Herring Gulls, 1974-1978. Trans. 44th N.A. Wildl. Nat. Resources Conf. 543-557 pp.

Whittle, D.M. 1987 Report on Great Lakes Water Quality: Appendix B, Lake Ontario. Great Lakes Water Quality Board. Report to the International Joint Commission. 43 pp.

Wolfe, M.J., Cornell University, Ithaca, N.Y., Pers. Comm. to D. Busch, January 6, 1987.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix III

Toxics Loadings to Lake Ontario

TABLE OF CONTENTS

1. INTRODUCTION

Municipal and industrial discharges, both directly to the Lake and indirectly through tributaries, constitute important sources of toxic chemicals to Lake Ontario. These sources are easy to identify and to measure since they come from discrete pipes. Other sources may also be important but are much more difficult to identify and quantify. These include combined sewer overflows, which are most active during periods of heavy rainfall; surface runoff and groundwater flow from hazardous waste sites and industrial, urban, and agricultural areas; and atmospheric deposition of toxic chemicals, which may have originated thousands of miles away. Recycling of toxics bound to bottom sediments is also suspected of being a source.

This appendix will identify the major industrial and municipal discharges that have the potential for contributing significant toxics loadings to Lake Ontario. It will also identify the tributaries most likely to carry the largest portion of toxics inputs to the lake.

The ultimate purpose of Appendix III is to construct mass balance estimates for the toxics identified in Appendix II as exceeding standards. As a first step in the construction of these mass balance estimates, the Lake Ontario Toxics Committee has begun the process of identifying the most significant sources of toxics to the Lake. Table III-9 presents the outline of a loadings matrix: columns have been included for the most significant sources of toxics to the Lake; rows have been included for the Category IA, IB, and IIA toxics identified in Appendix II.

2. IDENTIFICATION OF SIGNIFICANT SOURCES

2.1 MUNICIPAL AND INDUSTRIAL POINT SOURCES IN BASIN

As a first approach to examining the relative importance of various point sources and establishing some priority for future direct measurement of toxic chemical loads, the assumption has been made that the toxic load is proportional to the wastewater flow alone. Because of this assumption, power plants which have very large cooling water flows but relatively small amounts of toxics, have been omitted from consideration so as not to bias the analysis. Future measurements will further refine wasteload estimates through characterization of their toxic chemical composition.

Tables III-1 and III-2 list municipal treatment plants and industrial facilities throughout the Lake Ontario basin in order of decreasing flow. These include all municipal treatment plants discharging 1.0 million U.S. gallons per day (3785 cubic meters per day) or greater and industrial facilities (other than power plants) that either discharge toxics or, based on processes and raw materials, have the potential to discharge toxics. In sections 3 and 4 this information will be used to identify potential major sources of toxics discharged directly to Lake Ontario and to identify tributaries to the lake that are likely to have major toxics inputs.

A summary of the wastewater flows from New York and Ontario sources (all treated), by lake or tributary discharge, for both industries and municipalities is shown in Table III-3. Wastewater flows from Ontario sources constitute about three-quarters of the total basin wastewater flows. Flows from Ontario sources exceed those from New York for both municipal and industrial categories. Since the population of the Ontario portion of the basin is about twice that of the New York portion, it is not surprising that the municipal treatment plant flows from Ontario are about twice those of New York. The ratio of industrial to municipal wastewater flows in New York is 0.30 while in Ontario it is 0.98. This suggests a much more industrialized population in the Lake Ontario Basin of Ontario than in the Lake Ontario Basin of New York.

2.2 MUNICIPAL AND INDUSTRIAL POINT SOURCES DISCHARGING DIRECTLY TO LAKE

Whether a particular facility is considered to discharge directly to the lake, or to a tributary is somewhat arbitrary. However, attempts have been made to define direct lake contributors as those facilities that discharge to the open lake or to embayments where loading measurements are best made at the end of the pipe and not at the mouth of a natural body of water entering the lake. Accurate loadings from tributary sources can best be determined by establishing monitoring stations at the tributary mouths.

Fifteen municipal treatment plants discharging directly to the lake are included among facilities in the basin contributing 90% of the municipal wastewater flow (Table III-1). These are listed in Table III-4 with an indication of the availability of monitoring data.

Of the industrial facilities that contribute 90% of the industrial wastewater flow (Table III-2), two discharge directly to the lake. These are Alcan

Rolled Products Company at Oswego and DuPont Canada at Kingston. Data on both organics and metals discharged are available from Alcan Rolled Products Company, but neither type of data is available from DuPont Canada.

Summary

Fifteen municipal plants (12 in Ontario and 3 in New York) discharge directly to the lake and are among the 25 plants contributing 90% of the municipal wastewater in the Lake Ontario Basin. Two directly-discharging industrial facilities (one in Ontario and one in New York) are among the industries in the Lake Ontario Basin contributing 90% of the wastewater flow. These facilities are the ones that should receive the most attention in future monitoring of direct lake discharge point sources.

2.3 TRIBUTARIES

Data are available to rank tributaries by three methods for their potential to contribute toxic chemicals to the lake: 1. point source wastewater flows; 2. tributary flow (reflecting runoff); and 3. hazardous waste sites. Although the Niagara River is the major tributary of Lake Ontario it is excluded from this analysis because it is the subject of the U.S. - Canada Niagara River Toxics Management Plan.

Point Sources

The Lake Ontario tributaries are ranked by total wastewater flow (industrial and municipal) in Table III-5.

Tributary Flows

Table III-6 lists the Lake Ontario tributaries by tributary flow. Eight tributaries contain 93% of the measured flow to Lake Ontario (exclusive of the Niagara River which contributes 86% of the total tributary flow to Lake Ontario).

Waste Sites

Table III-7 illustrates the number of waste sites in the New York and the Ontario portions of the drainage basin. These sites will be used to assist in prioritizing tributaries. For this purpose, the number of sites in each tributary basin is listed.

In New York there are 61 active sites and 292 inactive ones. Sanitary landfills are included. The State's inactive sites list contains, but is not limited to, all locations in which toxic materials may have been disposed of or allowed to remain in the past.

In Ontario there are 190 active and 513 inactive or closed sites, all of which are of the landfill type and include sanitary landfills. The presence or absence of hazardous waste at these sites has not yet been confirmed.

Inclusion of the wastes sites is not meant to imply that they are contributing toxic materials to Lake Ontario. However, because of the potential for such contribution, these data are being included in order to assist in establishing priorities for the monitoring of the tributaries to the Lake.

Summary

Ten tributaries are listed in Table III-8, and are ranked according to wastewater flow and stream flow. These ten tributaries (four in New York and six in Ontario) also contain the six with the highest stream flow. The ten listed tributaries deserve the greatest attention in future monitoring efforts.

The Trent River and the Oswego River Basins, of all the tributary streams, contain the greatest number of hazardous waste sites.

3. LOADING ESTIMATES

Extensive measurements have been made over the past five years on chemical concentrations in municipal treatment plant effluents, industrial discharges, and tributary discharges in the Lake Ontario basin. These monitoring programs were not designed to provide accurate estimates of chemical loadings. Data derived from them must be carefully reviewed before definitive conclusions from such estimates are developed.

Table III-9 presents a first-cut loadings matrix. As outlined in the Plan, the loadings matrix will be used, where possible, as the basis for the early implementation of water-quality-based toxics controls. Full implementation of a water-quality-based toxics control program will, however, require a better understanding of the fate of toxics in Lake Ontario based on further sampling, analysis, and mathematical modeling of the Lake.

The sampling and analytical methods, detection limits and descriptions of quality assurance and quality control protocols for the various agency monitoring programs have not been reviewed either by the Lake Ontario Toxics Committee or by representatives of the four participating agencies. This was a requirement for inclusion of loading figures in the Niagara River Toxics Committee Report. A similar requirement needs to be established for use by the Lake Ontario Toxics Committee to enable it to carry out meaningful assessments of baseline loadings estimates and of the effects of remedial actions.

Tributaries

The most extensive tributary monitoring has taken place on the Niagara River. Continuous samples are being taken from the river at Niagara-on-the-Lake on a weekly basis, and analyzed for a long list of organic and inorganic chemicals. Large volumes of sample are extracted and detection limits run as low as 1 ng/l. A four-agency committee has reviewed analytical procedures and quality control and a report on data collected between April 1986 and March 1987 has been prepared.

New York also operates a toxics-sampling station at the mouth of the Niagara River (at the Coast Guard Station). Samples are collected ten times per year, skewed to conform to flow variability, and are analyzed for toxic metals and volatiles. In addition, macroinvertebrate and sediment samples are collected for PCB, organochloride pesticides, and heavy metals determinations.

Unlike the Niagara River, whose flow shows only small seasonal variations, the other tributaries have flows with large seasonal variations. In Ontario, tributary sampling has been correlated with the tributary flow but this has not been done in New York. Thus the loading estimates on an annual basis for New York tributaries cannot be calculated with any certainty. The most intensive tributary loading measurements have been made on the Ontario side of the lake. Up to twelve samples have been analyzed from five major Ontario tributaries during 1986 for organics and up to 49 samples for EPA priority pollutant metals. This program has been in operation since 1979.

Sampling pollutants at tributary mouths on the New York side has been undertaken since 1982 at varied frequency (five to eight times per year), in the beginning for all USEPA priority pollutants, and since 1985 for heavy metals and purgeable halocarbons and aromatics. Sampling results show very large variations with time, as would be expected.

New York is committed to revising its tributary monitoring program so that it will meet the requirements of the LOTMP. Starting in the spring of 1989, New York will begin enhanced sampling for the Black River, the Oswego River, and the Genesee River (80% of New York's tributary loading outside the Niagara River). Chemicals analyzed will include all Category 1A and 1B chemicals except dioxin. Six to ten samples will be collected per year at each site.

Municipal Treatment Plants - Lake Discharges

Sampling from the major municipal treatment plants on both sides of the lake has been extensive. However, the parameters analyzed for and sampling methods and frequencies have been variable. Of the plants listed in Table III-3, the most data are available for three Toronto plants (Toronto Main, Highland Creek, and Humber) and the Rochester Van Lare and Northwest Quadrant plants (all among the plants contributing to 90% of the flow, Table III-4). From these plants, the metals data are the most extensive and may, because of their frequency of collection (weekly or greater, except for Northwest Quadrant), approximate the actual annual loadings.

Industrial Facilities - Lake Discharges

Of the two priority industrial discharges based on flow, only Alcan at Oswego, New York has contaminant discharge data. The Alcan facility has permit limits for PCBs and trichloroethane, and action levels for copper and zinc. The limited constituents are monitored on a monthly basis and the action levels on a tri-monthly basis by the discharger.

Storm Sewers and Combined Sewer Overflows

Urban runoff and combined sewer overflows during heavy rainfall or snowmelt, as well as dry-weather seepage have the potential for contributing toxics to Lake Ontario. Only a limited amount of data are available (Hamilton Harbor, and the Toronto Waterfront); no attempt, therefore, has been made to estimate total loadings to the Lake from these sources.

Atmospheric Loadings

Estimates have been made of the toxic chemical loadings to Lake Ontario from the atmosphere by Eisenreich, Looney, and Thornton (1981) and Strachan and Eisenreich (1986). These are based on limited and uncertain data. However, they do suggest that the atmosphere can be an important source of loading to Lake Ontario for some chemicals.

Output of Lake Ontario

Samples have been collected on a monthly basis by Environment Canada since 1982 at Wolfe Island on the St. Lawrence River. Analyses have been made for organochlorines and polycyclic aromatic hydrocarbons.

New York, since 1982, has been sampling the St. Lawrence River at Cape Vincent six times per year. Currently the collections are being made on a flow-related basis (3-spring, 1-summer, 2-fall). The samples are analyzed for toxic metals and volatiles.

Recycling of Toxics From Lake Ontario Sediments

The recycling of toxics from Lake Ontario bottom sediments is suspected of being a significant source of toxics to the water column and biota. Currently no data are available to quantify this source.

TABLE III-1 - MUNICIPAL TREATMENT PLANTS IN ORDER OF DECREASING WASTEWATER FLOWS

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
Metro-Toronto-Main	Ontario	677	677	Lake Ontario	19
Frank VanLare (Rochester)	New York	403	1080	Lake Ontario	30
Metro Toronto - Humber	Ontario	340	1420	Lake Ontario	40
Hamilton	Ontario	326	1746	Redhill Creek	49
Syracuse	New York	299	2045	Onondaga Lake	57
Mississauga - Lakeview	Ontario	200	2245	Lake Ontario	62
Metro Toronto - Highland Creek	Ontario	157	2402	Lake Ontario	67
York - Durham	Ontario	121	2523	Lake Ontario	70
Burlington Skyway	Ontario	88	2611	Hamilton Harbour	73
Lockport	New York	83	2694	Eighteenmile Creek	75
Mississauga - Clarkson	Ontario	75	2769	Lake Ontario	77
Peterborough	Ontario	55	2824	Otonabee River	79
Northwest Quadrant	New York	50	2874	Lake Ontario	80
Gates-Chili-Ogden	New York	50	2924	Genesee River	81
Belleville	Ontario	46	2970	Lake Ontario (Bay of Quinte)	83

TABLE III-1 - MUNICIPAL TREATMENT PLANTS IN ORDER OF DECREASING WASTEWATER FLOWS (Continued)

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
St. Catharines - Port Weller	Ontario	37	3007	Lake Ontario (Port Weller Harbour)	84
North Toronto	Ontario	36	3043	Don River	85
Auburn	New York	34	3077	Owasco Outlet	86
St. Catharines - Port Dalhousie	Ontario	33	3110	Lake Ontario	87
Oshawa - Harmony Creek #2	Ontario	27	3137	Lake Ontario	87
Watertown	New York	26	3163	Black River	88
Oshawa - Harmony Creek #1	Ontario	26	3189	Lake Ontario	89
Oakville - South West	Ontario	25	3214	Lake Ontario	89
Baldwinsville - Seneca Knolls	New York	19	3233	Seneca River	90
Webster	New York	17	3250	Lake Ontario	90
Oak Orchard	New York	17	3267	Oneida River	91
Meadowbrook - Limestone	New York	16	3283	Limestone Creek	91
Kingston Twp.	Ontario	16	3299	Lake Ontario	92
Ithaca	New York	15	3314	Cayuga Inlet	92
Port Colborne (Seaway)	Ontario	14	3328	Welland Canal	93
Wetzel Road	New York	14	3342	Seneca River	93

TABLE III-1 - MUNICIPAL TREATMENT PLANTS IN ORDER OF DECREASING WASTEWATER FLOWS (Continued)

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
Cobourg #1	Ontario	13	3355	Cobourg Brook	93
Dundas	Ontario	13	3368	Coates Paradise	94
Oakville - Southeast	Ontario	12	3380	Lake Ontario	94
Grimsby	Ontario	12	3392	Lake Ontario	94
Carthage - W. Carthage	New York	11	3403	Black River	95
Oswego - West	New York	11	3414	Lake Ontario	95
Trenton	Ontario	11	3425	Bay of Quinte	95
Whitby - Corbett Creek	Ontario	11	3436	Lake Ontario	96
Geneva	New York	10	3446	Seneca Lake	96
Milton	Ontario	10	3456	Oakville Creek	96
Oswego - East	New York	9	3465	Lake Ontario	96
Canandaigua	New York	9	3474	Canandaigua Outlet	97
Oneida	New York	9	3483	Oneida Creek	97
Fulton	New York	8	3491	Oswego River	97
Port Hope	Ontario	8	3499	Lake Ontario	97
Lindsay	Ontario	8	3507	Trent River	98
Newark	New York	7	3514	Ganargua Creek	98
Seneca Falls	New York	7	3521	Seneca River	98
Campbellford	Ontario	7	3528	Trent River	98

TABLE III-1 - MUNICIPAL TREATMENT PLANTS IN ORDER OF DECREASING WASTEWATER FLOWS (Continued)

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
Albion	New York	6	3534	W. Br. Sandy Creek	98
Newcastle - Port Darlington	Ontario	6	3540	Lake Ontario	98
Whitby - Pringle Creek #2	Ontario	6	3546	Pringle Creek	99
Napanee	Ontario	6	3552	Napanee River	99
Cayuga Heights	New York	6	3558	Cayuga Lake	99
Whitby - Pringle Creek #1	Ontario	6	3564	Pringle Creek	99
Wellsville	New York	5	3569	Genesee River	99
Brewerton	New York	5	3574	Oneida River	99
Cobourg	Ontario	4	3578	Lake Ontario	99.6
Avon	New York	4	3582	Genesee River	
Penn Yan	New York	4	3586	Keuka Outlet	
Dansville	New York	4	3590	Canaseraga Creek	
Canastota	New York	4	3594	Cowaselon Creek	
TOTAL (All Plants)		3594			

TABLE III-2 - INDUSTRIAL FACILITIES IN ORDER OF DECREASING WASTEWATER FLOWS

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
Stelco	Ontario	1245	1245	Hamilton Harbour	44
Dofasco	Ontario	787	2032	Hamilton Harbour	71
General Motors	Ontario	130	2162	Welland Canal	76
The Ontario Paper Company	Ontario	115	2277	Twelve Mile Creek	80
Eastman Kodak, Kodak Park	New York	112	2389	Genesee River	84
Alcan Rolled Products Co.	New York	95	2484	Lake Ontario	87
Dupont Canada	Ontario	73	2557	Lake Ontario	90
Harrison Radiator	New York	30	2587	Eighteenmile Creek	91
Fraser, Inc.	Ontario	25	2612	Twelve Mile Creek	92
LCP Chemicals	New York	20	2632	Geddes Brook	93
Lyons Falls Pulp & Paper, Inc.	New York	16	2648	Black River	93
Celanese Canada	Ontario	15	2663	Lake Ontario	94
Ford Motor Company	Ontario	15	2678	Lake Ontario	94
Beaver Wood Fibre	Ontario	14	2692	Twelve Mile Creek	95
Petro Canada	Ontario	13	2705	Lake Ontario	95
Exolon	Ontario	13	2718	Twelve Mile Creek	96
Stelco Page Hershey	Ontario	13	2731	Welland Canal	96
W.R. Grace - Evans Chemetics	New York	10	2741	Seneca River/Barge Canal	96

TABLE III-2 - INDUSTRIAL FACILITIES IN ORDER OF DECREASING WASTEWATER FLOWS

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
Domtar Fine Papers	Ontario	9	2750	Twelve Mile Creek	97
Kimberly Clark	Ontario	9	2759	Twelve Mile Creek	97
Miller Brewing Company	New York	9	2768	Oswego River	97
Boise - Cascade Corp. (Lewis & Latex Mills)	New York	9	2777	Beaver River	98
Bakelite Thermosets	Ontario	8	2785	Bay of Quinte	98
Armstrong World Industries	New York	8	2793	Oswego River	98
Texas Canada	Ontario	7	2800	Lake Ontario	98
Xerox Corp.	New York	5	2805	Tributary of Mill Creek and Four Mile Creek	99
Petro Canada	Ontario	5	2810	Lake Ontario	99
Garlock, Inc.	New York	3	2813	Red Creek	99
Carrier Corp. Thompson Road	New York	3	2816	Sanders Creek	99
Lapp Insulator	New York	2	2818	Oatka Creek	99
Trent Valley Paperboard Mills	Ontario	2	2820	Trent River	99
Domtar Packaging	Ontario	2	2822	Trent River	99
Burrows Paper Corp.	New York	2	2824	Moose River	99
Canadian Canners, Ltd.	Ontario	2	2826	Four Mile Creek	99
Borg - Warner Chemicals	Ontario	2	2828	Lake Ontario	99

TABLE III-2 - INDUSTRIAL FACILITIES IN ORDER OF DECREASING WASTEWATER FLOWS

Name	Location	Average Daily Flow $10^3 m^3$	Cumulative Flow	Receiving Watercourse	Cumulative % of Total Load
Specialty Metals Div., Crucible Inc.	New York	2	2830	Tributary of Onondaga Lake	99.5
Eastman Kodak - Apparatus Division	New York	2	2832	Tributary of Little Black Creek	99.6
Syracuse China	New York	2	2834	Ley Creek	
Oneida Ltd. - Chem. Engrg. Dept.	New York	2	2836	Sconondoa Creek	
Boise-Cascade Corp.	New York	1	2837	Black River	
General Motors - Fisher Guide	New York	1	2838	Ley Creek	
Domtar Wood Preserving	Ontario	1	2839	Trent River	
Morse Industrial Corp.	New York	1	2840	Tributary of Six Mile Creek	
FMC Corporation	New York	1	2841	Tributary of Jeddo Creek	
Domtar Construction Materials	Ontario	1	2842	Twelve Mile Creek	
Niagara Mohawk Fire Training Station	New York	1	2843	Tributary of Wine Creek	
Frontier Stone Products, Inc.	New York	1	2844	Barge Canal	
Total (All Plants)		2844			

TABLE III-3 - SUMMARY OF WASTEWATER FLOWS BY CATEGORY
(Flows in $10^3 m^3$/day; % flow in parentheses)

		MUNICIPAL	INDUSTRIAL	TOTALS
	NY	672 (53)	267 (10)	939 (25)
TRIBUTARIES*	ONT	588 (47)	2352 (90)	2810 (75)
	TOTAL	1260	2619	3749
	NY	490 (21)	95 (42)	585 (23)
LAKE	ONT	1844 (79)	130 (58)	1974 (77)
	TOTAL	2334	225	2559
	NY	1162 (32)	362 (13)	1524 (24)
TOTALS	ONT	2432 (68)	2482 (87)	4784 (76)
	TOTAL	3594	2844	6308

*Wastewater flows in the Niagara River basin, and in the upstream Great Lakes basin are not included in the Table because they are outside the study area of this Plan. Wastewater flows for the Niagara River basin are available, and are summarized below:

		MUNICIPAL	INDUSTRIAL	TOTALS
NIAGARA R.	NY	851 (88)	414 (82)	1265 (86)
	ONT	114 (12)	89 (18)	203 (14)
	TOTAL	965	503	1468

TABLE III-4

DIRECT LAKE DISCHARGES - MUNICIPAL TREATMENT PLANTS WHICH ARE AMONG THOSE CONTRIBUTING 90% OF THE TOTAL MUNICIPAL WASTEWATER FLOW IN THE LAKE ONTARIO BASIN

Name	Average Daily Flow $10^3 m^3$	Location	Analytical Information Available	
			Organics	Metals
Metro Toronto - Main	677	Ontario	Y	Y
Frank VanLare (Rochester)	403	New York	Y	Y
Metro Toronto - Humber	340	Ontario	Y	Y
Mississauga - Lakeview	200	Ontario	Y	N
Metro Toronto-Highland Ck.	157	Ontario	Y	Y
York-Durham	121	Ontario	N	Y
Mississauga - Clarkson	75	Ontario	N	N
Northwest Quadrant (Monroe Co.)	50	New York	Y	Y
Belleville	46	Ontario	N	Y
St. Catharines - P. Weller	37	Ontario	N	Y
St. Catharines - P. Dalhousie	33	Ontario	N	Y
Oshawa Harmony Ck. #2	27	Ontario	Y	Y
Oshawa Harmony Ck. #1	26	Ontario	Y	N
Oakville - South West	25	Ontario	Y	N
Webster	17	New York	Y	Y

TABLE III-5 RANKING OF TRIBUTARIES BY WASTEWATER FLOW INPUT

Stream	Location	Stream Flow 1000 m^3/day	Wastewater Flow Input 1000 m^3/day
Hamilton Harbour	Ontario	3,330	2,459
Oswego River	New York	16,340	683
Genesee River	New York	6,868	219
Twelve Mile Creek	Ontario	15,466	186
Welland Canal	Ontario	2,246	143
Eighteenmile Creek	New York	240	113
Black River	New York	10,129	77
Trent River	Ontario	17,107	67
Don River	Ontario	425	36
Cobourg Brook	Ontario	---	13
Pringle Creek	Ontario	---	12
Oakville Creek	Ontario	166	10
Oak Orchard Creek	New York	822	9
Sandy Creek	New York	220	9
Napanee River	Ontario	723	6
Humber River	Ontario	798	4
Johnson Creek	New York	308	4
Irondequoit Creek	New York	269	4
Northrup Creek	New York	61	4
Bear Creek	New York	34	4
Duffin Creek	Ontario	292	3
Four Mile Creek	Ontario	---	2
Wine Creek	New York	20	1
Moira River	Ontario	3,300	0
Salmon River	Ontario	907	0

TABLE III-6. RANKING OF TRIBUTARIES BY STREAM FLOW (AT MOUTH)

Stream	Location	Stream Flow 1000 m^3/day	Wastewater Flow Input 1000 m^3/day
Lake Ontario Tributaries Excluding Niagara River			
Trent River	Ontario	17,107	67
Oswego River	New York	16,340	683
Twelve Mile Creek	Ontario	15,466	186
Black River	New York	10,129	77
Genesee River	New York	6,868	219
Hamilton Harbour	Ontario	3,330	2,459
Moira River	Ontario	3,300	0
Welland Canal	Ontario	2,246	143
Salmon River	Ontario	907	0
Oak Orchard Creek	New York	822	9
Humber River	Ontario	798	4
Napanee River	Ontario	723	6
Don River	Ontario	425	36
Johnson Creek	New York	308	4
Duffin Creek	Ontario	292	3
Irondequoit Creek	New York	269	4
Eighteenmile Creek	New York	240	113
Sandy Creek	New York	220	9
Oakville Creek	Ontario	166	10
Northrup Creek	New York	61	4
Bear Creek	New York	34	4
Wine Creek	New York	20	1
Cobourg Brook	Ontario	----	13

TABLE III-6. RANKING OF TRIBUTARIES BY STREAM FLOW (AT MOUTH) (Continued)

Stream	Location	Stream Flow 1000 m^3/day	Wastewater Flow Input 1000 m^3/day
Pringle Creek	Ontario	---	12
Four Mile Creek	Ontario	---	2
Niagara River	Ontario/ New York	492,000	See U.S.-Canada Niagara River Toxics Management Plan

TABLE III-7
WASTE SITES BY DRAINAGE BASIN

New York

Basin	# of Active Sites	# of Inactive Sites	Total
Black River	9	8	17
Lake Ontario (East)	10	15	25
Seneca-Oneida-Oswego Rivers	23	129	152
Lake Ontario (Central)	4	37	41
Genesee River	3	58	61
Lake Ontario (West)	12	45	57
TOTALS	61	292	353

Ontario:

Basin	# of Active Sites	# of Inactive Sites	Total
Belleville-Napanee Area Rivers	44	66	110
Trent River	80	74	154
Oshawa-Colborne Area Rivers	11	61	72
Toronto Area Rivers	12	164	176
Hamilton Area Rivers	19	76	95
Niagara Peninsula Rivers	24	72	96
TOTALS	190	513	703

TABLE III-8 RANKING OF TRIBUTARIES BY VARIOUS FACTORS

	Ranking	
Tributary	Wastewater Flow	Stream Flow
Hamilton Harbour (Ont.)	1	6
Oswego River (NY)	2	2
Genesee River (NY)	3	5
Twelve Mile Creek (Ont.)	4	3
Welland Canal (Ont.)	5	8
Eighteenmile Creek (NY)	6	17
Black River (NY)	7	4
Trent River (Ont.)	8	1
Don River (Ont.)	9	13
Humber River (Ont.)	16	11

TABLE III-9
LOADINGS MATRIX

Chemical	Loadings in Kilograms/Day: Niagara River & Upstream Great Lakes(1)*	Tributaries: NY(2)	Tributaries: Ontario(3)	Municipal STP's: NY(4)	Municipal STP's: Ontario (5): 3 Toronto Plants (67%)	Municipal STP's: Ontario (5): Remaining 9 Plants** (33%)	Industrial Facilities: NY(6)	Industrial Facilities: Ontario(7)	Atmospheric Deposition(8)
(Numbers in column headings refer to accompanying footnotes)									
Category IA									
PCB	1.03	NI	0.10	(1.51) ND	(0.06) ND	(0.02) ND	0.02	NI	0.39++
Mirex	0.01	NI	0.00	NI	(0.01) ND	(0.01) ND	(NI) ND	NI	0.01++
Chlordane	(0.03) ND	NI	0.05	(0.14) ND	NI	NI	(0.02) ND	NI	NI
Dioxin (2,3,7,8-TCDD)	(0.01) ND	NI	NI	NI	NI	NI	NI	NI	NI
Mercury	NI	NI	0.75	(0.60) ND	0.03	0.03	(0.03) ND	NI	0.17++
Aluminum	286,380.	NI	7688.	NI	93.44	85.15	NI	NI	25.84+
Iron	519,630.	NI	3613.	(16.68) 185.56**	1425.	1475.	0.04	NI	18.87+
Category IB									
DDT	0.05	NI	0.04	(0.29) ND	(0.06) ND	(0.02) ND	(0.02) ND	NI	0.07++
Dieldrin	0.20	NI	0.05	(0.04) ND	(0.01) ND	(0.01) ND	(0.00) ND	NI	0.09++
Hexachlorobenzene	0.18	NI	0.00	(0.72) ND	(0.01) ND	(0.01) ND	(0.66) ND	NI	0.03++
Octachlorostyrene	NI	NI	(0.03) ND	NI	NI	NI	NI	NI	NI

TABLE III-9 (Continued)

LOADINGS MATRIX

Chemical	Loadings in Kilograms/Day: Niagara River & Upstream Great Lakes(1)*	Tributaries: NY(2)	Tributaries: Ontario(3)	Municipal STP's: NY(4)	Municipal STP's: Ontario (5): 3 Toronto Plants (67%)	Municipal STP's: Ontario (5): Remaining 9 Plants** (33%)	Industrial Facilities: NY(6)	Industrial Facilities: Ontario(7)	Atmospheric Deposition(8)
Category IIA									
Benz(a)anthracene	1.61	NI	NI	(2.73) ND	(2.78) ND	(1.02) ND	(0.66) ND	NI	NI
Benzo(a)pyrene	0.99	NI	(0.02) ND	(0.92) ND	(2.78) ND	(1.02) ND	(0.66) ND	NI	0.17++
Benzo(b)fluoranthene	1.46	NI	(0.05) ND	(1.71) ND	(2.78) ND	(1.02) ND	(0.66) ND	NI	NI
Benzo(k)fluoranthene	1.52	NI	(0.01) ND	(0.92) ND	(2.78) ND	(1.02) ND	(0.66) ND	NI	NI
Chrysene	2.06	NI	NI	(0.92) ND	NI	NI	(0.66) ND	NI	NI
Tetrachloroethylene	478.90	NI	NI	(1.15) 1.02	(0.54) 0.19	(0.18) ND	(0.66) ND	NI	NI

Sources not included:
- ° Direct surface runoff
- ° Direct groundwater inflow
- ° Direct stormwater discharges and combined sewer overflows
- ° Small tributaries, municipal STPs and industrial discharges

Other factors influencing the mass balance:
- ° Recycling of toxics from Lake Ontario sediments
- ° Output of toxics to the St. Lawrence River

*	Footnotes qualifying the data for each source are listed on succeeding pages.
**	Partial. Not available from some facilities.
+	Based on U.S. data only; wet deposition.
++	Entire lake (U.S. and Canada); total deposition (wet and dry).
NI	No Information
ND	Not Detected
(xx.xx)	Incremental load if non-detects were present at the detection level

TABLE III-9

FOOTNOTES

1. Loadings from the Niagara River and the Upstream Great Lakes are based on the 1986-87 data developed under the Niagara River Toxics Management Plan. The table below shows the separate Upstream Great Lakes and Niagara River components of the loadings.

CHEMICAL (Kg/day)	UPSTREAM GREAT LAKES	NIAGARA RIVER
PCBs	2.424	-1.391*
Mirex	0.00	0.014
Chlordane	ND	ND
Dioxin (2,3,7,8-TCDD)	ND	ND
Mercury	ND	ND
DDT	0.347	-0.294*
Dieldrin	0.210	-0.005*
Hexachlorobenzene	0.00	0.179
Aluminum	182,286.	104,094.
Iron	285,439.	234,191.
Octachlorostyrene	NI	NI
Benz(a)anthracene	1.049	0.562
Benzo(a)pyrene	0.00	0.993
Benzo(b)fluoranthene	0.00	1.463
Benzo(k)fluoranthene	0.00	1.518
Chrysene	1.619	0.439
Tetrachloroethylene	166.441	312.456

NI = No information.
ND = Not detected frequently enough to allow calculation of a mean loading.
* = The negative numbers indicate that a higher loading was measured at Fort Erie than at Niagara-on-the-Lake.

2. The tributary monitoring program that has been carried out by NYSDEC until quite recently was not designed to measure loadings. Detection limits were high so that organic chemicals were only rarely detected and the sampling frequency was insufficient to provide a good estimate of loadings during high flow events. Consequently, no estimates of loadings from the New York tributaries are available at this time.

3. The 1986 Ontario tributary loadings include tributaries that are ranked as significant sources to the lake. These tributaries are: Hamilton Harbour, Twelve Mile Creek, Trent River, Don River, Humber River, and the Welland Canal. The sampling strategy for Ontario tributaries emphasizes a frequent collection of sampling during high flow events. In general, 75% of the samples are collected during high runoff periods (snow melt or intensive summer rain events). The total number of samples from the significant tributaries amounted to eleven for trace organics and up to 64 for selected heavy metals.

   The Committee has not yet had the opportunity to review the location of sampling stations in order to ascertain that data from these sites accurately represent tributary loadings to Lake Ontario.

   Hamilton Harbour is suspected to be a major contributor to the total Ontario tributary load for many chemicals. At the mouth of the harbour (and within the harbour itself), a complex flow situation exists that includes:

   - mixing of tributary input within the harbour;
   - seiches on Lake Ontario that may reverse net flow;
   - thermal stratification within the harbour and in the outlet; and
   - seasonal variations.

   A description of harbour flow modeling has been submitted but a closer review of how the chemical data are collected and used in calculations will be needed to develop a more reliable loading estimate.

4. In the top 90% of municipal sewage treatment plants in the Lake Ontario basin, New York has three that discharge directly to the Lake. Van Lare and Northwest Quadrant are under a continuing monitoring program for 126 priority pollutants. Nine samples have been obtained from each plant between 12/84 and 12/86 for volatiles and metals. Three samples have been obtained in the same time period for base/neutrals, and all other USEPA priority pollutants. Twenty-four hour composites are used for all sampling except for volatiles where three grab samples are taken over a twenty-four hour period. Most of the loadings in Categories 1A and 1B were below the detection Limit (ND). The Town of Webster submits analyses for selected heavy metals, methylene chloride, and 1,1,1-trichloroethane through its quarterly self-monitoring reports required under the SPDES program.

   All analyses are required to be by USEPA approved methods published in the Federal Register, October 26, 1984.

5. In the top 90% of municipal sewage treatment plants in the Lake Ontario basin, Ontario has twelve that discharge directly to the Lake. Analytical results presented in the table were accumulated from the three Toronto plants (Main, Humber, and Highland Creek), and four of the remaining nine (York-Durham, Clarkson, Lakeview, and Oakville-Southwest).

Twelve samples were collected between 1/26 and 7/24/87. Trace organics were analyzed by GC/MS according to the USEPA sampling/analytical protocols. A total of 160 contaminants, including USEPA priority pollutants, were measured.

6. Alcan is the priority industrial discharge that goes directly to the Lake on the New York side. A priority pollutant scan in 1981 showed only Arochlor 1016 (of all the chemicals in the Loadings Matrix) to be above the detection level. Alcan has a SPDES permit that requires it to monitor on a prescribed schedule for this PCB, which has a permit limit of 0.02 Kg/day. The loading figure is for the period April 1986 through March 1987. Arochlor 1016 was monitored monthly with grab samples analyzed in accord with the USEPA method published in the October 26, 1984 Federal Register.

7. DuPont Canada is the priority industrial discharge that goes directly to the Lake. Currently there are no data available on organics and heavy metals.

8. Aluminum and iron loadings are taken from USEPA's Great Lakes Atmospheric Deposition (GLAD) network. The values for PCBs, DDT, benzo(a)pyrene, and mirex appear in Strachan and Eisenreich's paper entitled "Mass Balancing of Toxic Chemicals into the Great Lakes: The Role of Atmospheric Deposition", 1988, IJC. Mercury, Dieldrin, and hexachlorobenzene figures were secured in a personal communication from Steve Eisenreich on July 29, 1988, and are from his unpublished data.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix IV

Existing Programs

TABLE OF CONTENTS

Appendix IV

FIGURES

I. <u>Introduction</u>

Appendix IV provides a brief overview of some of the major existing programs that control the discharge of toxic pollutants to Lake Ontario. Its purpose is to provide a status report on existing toxics control programs that can serve as the basis for additional commitments; the additional commitments are presented in Table I of the Plan itself.

II. Existing Programs on the United States Side of the Lake.

A. Direct Industrial Discharges

In the United States portion of the Lake Ontario drainage basin there are 37 major and 123 significant minor direct industrial dischargers.[1] The location of all major dischargers is shown in Figure IV-1.

In accordance with the federal Clean Water Act (CWA), it is illegal for a facility to discharge pollutants as a point source to a surface waterway without obtaining a federal permit. In New York State, the authority to issue these federal permits was delegated to the New York State Department of Environmental Conservation (NYSDEC) in October of 1975. The permits, which are called State Pollutant Discharge Elimination System (SPDES) permits[2], include effluent limitations on the discharge of pollutants, schedules for the construction or installation of new pollution control technology, as well as requirements for self-monitoring and reporting.

Federal and state roles in monitoring and enforcing compliance with permit requirements are defined in the USEPA/NYSDEC Enforcement Agreement. In part, these include the following:

- NYSDEC review of Discharge Monitoring Reports (DMRs) submitted by permittees;
- Annual USEPA or NYSDEC inspection of all major and significant minor facilities to ensure SPDES permit compliance and appropriate sampling and laboratory procedures;
- NYSDEC identification and response to non-compliance issues through the Integrated Compliance Strategy System (ICSS);
- NYSDEC development of a Quarterly Non-Compliance Report (QNCR) for non-complying major facilities;
- Quarterly USEPA and NYSDEC coordination of enforcement activity via the Significant Non-Compliance Action Program (SNAP).

At present, all but one major and significant minor permits in the Lake Ontario drainage basin have been revised to include Best

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1. Industrial dischargers include all non-municipal discharges (e.g. industrial, commercial, institutional). Major discharges are identified through an elaborate ranking system which emphasizes a number of factors, including the presence of toxics in the effluent. Significant minor discharges are discharges which may impact the quality of the receiving waterway or may contain toxic pollutants.

2. A description of the New York State SPDES Program is included as Direct Industrial Discharges, Attachment I.

Available Technology Economically Achievable (BAT) requirements for toxic pollutants. In addition, SPDES permits may include more stringent water quality-based limits for toxics if the receiving water is determined to exceed ambient water quality standards for those toxic pollutants.[3]

As shown in Table 1, 92% of the major dischargers in the Lake Ontario drainage basin are in compliance with their permits.

Table 1[4]

No. of Majors	No. in Compliance	% Compliance
37	34	92

In accordance with the Water Quality Act of 1987, over the next few years NYSDEC will:

- Assess waterways for water quality impairment due to point source discharges and, by February 4, 1989, develop necessary Individual Control Strategies (ICSs) for dischargers that are identified as impacting water bodies on the 304(l) short list due to 307(a) toxics. The ICSs will include effluent limits or other permit requirements to assure that water quality standards are attained no later than June 4, 1992.

- Incorporate new technology-based requirements for Organic Chemicals, Plastics, and Synthetic Fibers Categories in reissued SPDES permits. The permits will require direct dischargers to comply with Best Available Technology Economically Achievable (BAT) requirements no later than March 31, 1989 for those permits issued before that date, or immediately upon reissuance for those permits issued after that date.

3. Two permittees have commented on their BAT/water quality-based effluent limits:

   ° Harrison Radiator has questioned its draft SPDES permit limits through comments submitted during the public notice period. An administrative order will be issued with the final permit resolving the outstanding issues.

   ° Crucible has requested a Fundamentally Different Factor (FDF) variance. Pending a final determination regarding this request, the previous round SPDES permit for Crucible will remain in effect.

4. For the period 4/1/88 - 6/30/88 four major industrial permittees were identified as being in significant non-compliance. These facilities were addressed at the November 1988 SNAP Meeting:

   ° LCP Chemical - New York Inc. (shut down 7/15/88)
   ° Milliken Generating Station (returned to compliance)
   ° Pennwalt Corp. - Lucidol Div. (returned to compliance)
   ° Ginna Nuclear Power Plant - Sta 13 (permit modification proposed)

Direct Industrial Dischargers
Attachment I

New York State SPDES Program

New York State has chosen the "Substance Specific" approach as the primary method of water quality-based toxic substance management and control for point sources. Water quality standards and guidance values have been adopted for over 200 toxic substances in both fresh and marine waters for the protection of human health and aquatic life. These are in addition to federally mandated technology-based treatment standards, and best professional judgement where such standards are lacking. As a secondary mechanism of toxics control, whole-effluent toxicity testing is being included in "third round" permits, particularly where water quality-based controls may not assure conformance with water quality standards.

In New York State, the identification of waters needing water quality-based controls began in the 1960's through the project/basin assessment process. This process focused on the control of conventional, non-toxic pollutants (BOD, UOD, SS, pH, etc.) from municipal and industrial discharges. In the late 1960's New York also began requiring technology limits based on the permit writers "best professional judgement".

The identification process was amplified in the mid 1970's through the completion of Water Quality Management Basin Plans for each drainage basin in the State as required by Section 303(e) of the Federal Water Pollution Control Act of 1972. These "303(e) Basin Plans" again focused primarily on conventional, non-toxic pollutants, but also included assessments for phenol, ammonia, cyanide, and three heavy metals which have been incorporated into the State water quality standards. These plans, coupled with the initial USEPA effluent guidelines, served as the guide for issuance of "first round" NPDES/SPDES permits.

The Federal Water Pollution Control Act of 1972 officially required both treatment technology and water quality-based effluent limitations for the first time. By this time, New York State already had half a decade of experience in writing permits that contained water quality limitations and was developing the experience to create other workable treatment technology limitations. Moving into the arena of uniform national wastewater treatment-technology standards proved to be a very slow process, fraught with controversy and lawsuits.

Relative to the control of toxic discharges to New York State's waterways, the most important new feature of the 1972 Water Pollution Control Act was the legal requirement to establish national industrial waste treatment technology standards in the form of "Best Available Technology Economically Achievable" (BAT). For the various categories of industry, USEPA was to promptly develop uniform national guidance documents containing treatment technology values for: BAT, New Source Performance Standards, and Industrial Pretreatment Requirements. The industrial discharges were expected to comply with these technology guidelines by 1983 for BAT and between 1984 and 1988 for industrial pretreatment requirements depending on the specific industrial category of the facility.

In 1977 USEPA was sued by several environmental groups for failing to create the industrial technology guidance values required by the 1972 act. Even subsequent to this suit, it was 1981 before the first set of USEPA documents appeared for the electroplating category of industries. In the absence of these national industrial technology standards, the project review engineers in New York State assigned with the responsibility to approve wastewater treatment facilities for industries gradually developed a comprehensive body of guidance values based on their own "best professional judgement" of what BAT should be. In 1983 New York formalized these best professional judgement (BPJ) values in the form of written policy guidance for the issuance of wastewater permits. At the present time permit writers utilize federal BAT guidance where available and state BPJ guidance values for all other industrial categories. As of this time, USEPA had promulgated its forty-fifth set of industrial wastewater treatment guidance values.

As the number of substance-specific ambient water quality criteria increased, a formal tabulation was prepared in 1983. The procedure for the development of criteria was incorporated into regulation in 1985, as were many of the substance-specific numerical criteria. The criteria are called "standards" if in regulation and "guidance values" if not. Standards or guidance values currently exist for about 215 toxic substances for both fresh and marine waters.

Prior to the development of "third round" permits, a basin approach to toxic substances control was initiated (1981 to 1984). This was consistent with the total maximum daily load (TMDL) and wasteload allocation (WLA) concept contained in the USEPA regulation "Water Quality Planning and Management", 40 CFR 130. To implement the basin approach, a toxic discharge inventory for each substance is developed. This is compared to the maximum allowable load in the most critical downstream segment in each basin under critical low flow conditions. The assumption is made that all toxic substances are conservative. That is, a substance which enters the water column remains in downstream segments unaffected by biological, chemical, and physical processes.

When discharge loadings at the technology level required by the Clean Water Act (i.e. BAT, best professional judgement, or secondary treatment) exceed the maximum allowable load for a given substance, that substance is considered "water quality limiting". Water quality-based limits are then applied, which are usually more stringent than technology-based limits.

Virtually all point sources were reviewed for water quality-based toxic effluent limits in the "second round" of permit issuance with about 75% revisited so far in the "third round" using the improved basin allocation method. This present cycle will be completed by 1988-89.

During "third round' permit issuance, whole-effluent toxicity testing is being included in permit development as a secondary mechanism of toxics control. It is considered for inclusion as a monitoring requirement when substances are present for which standards do not exist, water quality-based limits cannot be developed because of high ambient background concentrations or analytical detectability, the effluent contains an unusual mix of toxics, or there are observed impacts on aquatic life.

SURVEILLANCE, COMPLIANCE, AND ENFORCEMENT

DEC reviews the self-monitoring reports from dischargers, flagging any which exceed permit limits and using pre-determined criteria to assess significance (toxics are considered more significant than conventional pollutants, and large or frequent violations more significant than small or occasional exceedances).

In addition, DEC inspects facilities in operation and independently samples effluent to check the validity of self-monitoring data. Inspections often detect small operational problems before they grow into permit violations, and are focused on facilities with a history of problems and on dischargers to sensitive receiving waters.

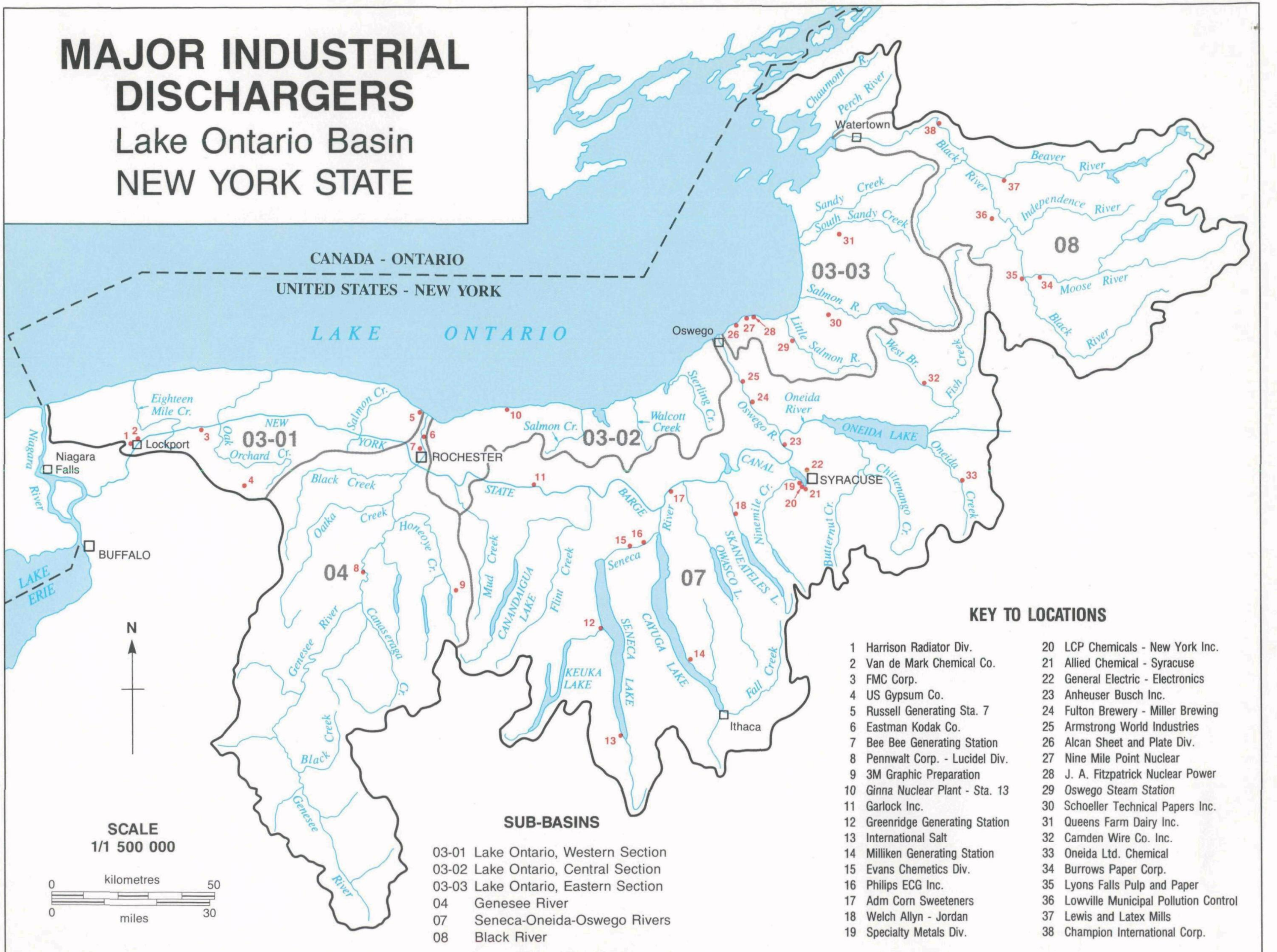
Significant violations of permit conditions trigger compliance or enforcement measures. In extreme cases, DEC may impose summary abatement or closure to end an immediate or very serious health or environmental threat. The department can also pursue criminal or civil penalties for illegal discharge. The common initial approach, however, is establishment of an "integrated compliance strategy" to abate the discharge as quickly as possible. The violator is obligated to follow the compliance strategy, which may include construction, corrective maintenance or changes in operation. DEC surveillance of the discharger is increased until permit limits are achieved.

SUMMARY

Today, New York State has in place and exercises all the elements needed to control the discharge of toxics to surface water from point sources:

- SPDES permit authority which has demonstrated successful control of toxics and conventional pollutants;
- Written procedures for setting effluent limits for toxics;
- Federally promulgated technology-based treatment standards and DEC's best professional judgement technology-based standards;
- Water quality standards for 95 toxic substances;
- Water quality criteria for more than 120 additional toxic substances (these criteria will become standards in the future, and are used in setting permit limits);
- A statewide basin-by-basin inventory of toxic substance discharges;
- A State laboratory certification program to ensure the reliability of effluent monitoring by dischargers;
- Stringent civil and criminal penalties for illegal discharge;
- A program to monitor dischargers and to achieve compliance;
- Citizens and public officials who are determined to keep surface waters free of toxic contamination.

Figure IV - 1



Brock University Cartography

B. Indirect Industrial Discharges

In accordance with the Federal Clean Water Act, indirect Industrial Users (industrial discharges to Publicly Owned Treatment Works (POTWs)) within the United States are regulated under the National Industrial Pretreatment Program. The national program includes General Pretreatment Regulations which contain general and specific discharge prohibitions protecting the individual municipal treatment systems and local environment from pass through and interference, and categorical pretreatment standards which limit, by industrial category, the pollutant discharges of industrial facilities which discharge into a POTW.

Pursuant to 40 CFR 403, Industrial Users must comply with both General Pretreatment Regulations and categorical standards. The primary focus of categorical standards is the control of toxic pollutants. Therefore, the standards contain specific numerical limitations based on an evaluation of specific technologies for each individual industrial category. There are two (2) types of categorical pretreatment standards. Existing source standards (Pretreatment Standards for Existing Sources (PSES)) correspond to Best Available Technology Economically Achievable (BAT) discharge limitations for existing direct dischargers. New source standards (Pretreatment Standards for New Sources (PSNS)) correspond to New Source Performance Standards (NSPS) for new source direct dischargers.

Federally approved local pretreatment programs are the vehicle for implementing the National Pretreatment Programs. POTWs were required to develop a pretreatment program as follows;

1. Any POTW (or combination of POTW's operated by the same authority) with a total design flow greater than 5 million gallons per day (mgd) and receiving, from industrial users, pollutants which pass through or interfere with the POTW's operation or are otherwise subject to pretreatment categorical standards;

2. A POTW designated by EPA or the State, even though the POTW has a design flow of 5 mgd or less, if it was determined that the nature and volume of the industrial influent caused: an upset of the treatment process, a violation of the POTW's effluent limitations, contamination of municipal sludge, or other circumstances that warrant a program to prevent interference with the POTW or pass through.

In New York State there are fifty-six approved local pretreatment programs, fourteen of which are in the Lake Ontario drainage basin[1]. The POTW's State Pollutant Discharge Elimination System (SPDES) permit requires the facility to implement its approved pretreatment program. At a minimum, each POTW must enforce Federal categorical standards as well as any more stringent local limitations developed as part of the POTW program.

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1. A listing of the fourteen approved pretreatment programs in the Lake Ontario basin is included as Indirect Industrial Discharges, Attachment I.

The EPA remains the pretreatment program approval authority in New York State pending delegation of this program to the New York State Department of Environmental Conservation (NYSDEC). EPA, with assistance from NYSDEC, monitors implementation of the fourteen (14) approved pretreatment programs in the basin by reviewing the pretreatment reports submitted by the POTW's under the terms of the National Pollutant Discharge Elimination System (NPDES/SPDES) permit and through annual pretreatment inspections or audits at the POTWs.

In areas of the state not covered by approved local pretreatment programs, EPA directly monitors compliance of industrial users with pretreatment standards. Within this category, there are twelve (12) industrial users of POTWs in the Lake Ontario drainage basin that are subject to categorical pretreatment limits. As of mid-1987, all failed to provide EPA with the demonstration of compliance required under 40 CFR 403.5 and were, therefore, subject to potential enforcement actions.

Following evaluation of the most current compliance status of each categorical industrial user in the Lake Ontario drainage basin, nine (9) Administrative Orders were issued. Specifically, EPA required these facilities to submit all overdue reports (Baseline Monitoring Report (BMR), 90-day compliance report, semi-annual status reports) pursuant to 40 CFR Part 403.12. All nine (9) non-compliers responded. Most of these industrial users were unaware of the pretreatment regulations or reporting requirements subject to Categorical Standards. Of the nine (9) facilities, one had eliminated the discharge to a POTW, another stated that it was not an industrial user of a POTW, two (2) others were not able to submit old sampling and analytical data but are presently in compliance, and the remaining five (5) facilities demonstrated compliance by submitting to EPA the required reports.

Indirect Industrial Discharges
Attachment I

Approved Pretreatment Programs in the Lake Ontario Drainage Basin

1) Auburn, City of
2) Canandaigua, City of
3) Fulton, City of
4) Geneva, City of
5) Ithaca, City of
6) Lockport, City of
7) Middleport, Village of
8) Monroe County
9) Newark, Village of
10) Newfane, Town of
11) Onondaga County
12) Oswego, City of
13) Watertown, City of
14) Webster, Town of

C. Municipal Discharges

In the United States portion of the Lake Ontario drainage basin, there are 39 major and 96 minor public owned treatment works[1] (POTWs). The location of all major municipal dischargers is shown in Figure IV-2. The Clean Water Act requires POTWs to obtain permits prior to discharging to surface waterway. In New York State, the authority to issue NPDES permits was delegated to New York State Department of Environmental Conservation (NYSDEC) by EPA in October of 1975. In addition, the Federal and State roles in monitoring and enforcing compliance with permit requirements are defined in the USEPA/NYSDEC Enforcement Agreement (see section on direct industrial discharges, supra).

At the present, all discharge permits in the Lake Ontario drainage basin require a minimum of secondary treatment or more stringent treatment as required to meet water quality standards. In addition, all major discharges into the Great Lakes drainage basin are required to comply with a 1.0 mg/l effluent limit for phosphorous. Taken together, these limitations are referred to as final effluent limits (FEL).

The National Municipal Policy (NMP) requires POTWs to be in compliance with FEL by July 1, 1988. In those cases where FEL will not be met, the NMP requires enforceable judicial orders with schedules for compliance for all major discharges. A snapshot of NMP compliance on July 1, 1988 is shown in Table 1.

Table 1

No. of major Discharges	No. meeting FEL (i.e. in compliance)	NMP Enforcement Projects [2]
39	33	6

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[1]Major POTWs have design flows equal to or greater than 1 million gallons per day (MGD). Minor POTWs have design flows less than 1 MGD. The numbers shown exclude a small number of privately owned treatment systems.

[2]Canastota, Fulton, Leroy, Seneca Falls, Wetzel Road* and Syracuse Metro* current enforcement status is summarized in Table I in the main body of the Plan.

*These are for violations within the collection systems and do not necessarily imply POTW non-compliance.

Figure IV - 2

Brock University Cartography

D. Hazardous Waste Treatment, Storage, and Disposal Facilities

The Resource Conservation and Recovery Act (RCRA) of 1976 authorized the Environmental Protection Agency (EPA) to establish a program to manage hazardous waste treatment, storage, and disposal facilities (TSDFs).

Pursuant to RCRA regulations, each new facility and each facility that had been operating as an existing facility on November 8, 1980 had to submit a Part A permit application describing all hazardous waste management activities. Existing facilities were authorized to continue to operate such activities under a pre-permit stage known as interim status. Regulations governing the operation of such facilities under interim status are in effect until such time as a full RCRA permit is issued or denied. A full RCRA permit is based on a Part B application. This application includes a detailed facility description, engineering designs and drawings, operating procedures, contingency plan, personnel training programs, closure plan, and financial assurance. An application is required upon request or statutory deadline for existing facilities and prior to operation for new facilities. The authority to issue RCRA permits was delegated to the New York State Department of Environmental Conservation (NYSDEC) in May, 1986. RCRA permits regulate the operation of such facilities through application of performance standards as promulgated under the regulations. The NYSDEC is authorized to issue permits for all RCRA requirements, except those promulgated under the Hazardous and Solid Waste Amendments of 1984 (HSWA) and those promulgated by the EPA after December 31, 1984.

HSWA requires the permit applicant to:

A. Construct land disposal facilities in accordance with Minimum Technology Requirements, such as double liners and leachate collection and detection systems.

B. Construct and operate treatment and storage tanks in accordance with the federal regulations promulgated July 14, 1986, which mandate secondary containment.

C. Identify and address any contamination at all solid waste management units.

D. Certify to waste minimization.

The HSWA permit also requires the applicant to initiate a corrective action program to address any environmental releases of hazardous waste or constituents at solid waste management units. A corrective action program consists of the following:

A. RCRA Facility Assessment to identify releases or potential releases requiring further investigation;

B. Interim Corrective Measures to take immediate action in response to releases;

C. RCRA Facility Investigation to fully characterize the extent of releases;

D. Corrective Measure Study to determine the need for and extent of remedial measures. This step includes the selection and implementation of appropriate remedies for all problems identified.

These four activities ensure that a facility, including those under interim status, will adequately identify all contamination and provide corrective action as necessary to protect human health and the environment.

At present there are 48 hazardous waste management facilities operating in the Lake Ontario drainage basin. The type and number of facilities are presented in Table 1. The location of these facilities is shown in Figure IV-3. It should be noted that most of the land disposal facilities will be closed or undergoing closure by the end of 1988.

Table 1

Type of Facility	No. of Facilities
Land Disposal Facilities (LDFs)	11
Incinerator Facilities	2
Storage/Treatment Facilities	35
Total	48

To enforce RCRA regulations, the NYSDEC operates an inspection program at the regional level that requires that compliance inspections be performed at TSDFs a minimum of once every two years, and for land disposal facilities, once per year.

Detailed compliance/enforcement information has been developed for land disposal facilities (generally high impact potential on the Lake Ontario Drainage Basin). This information has been developed based upon the July 1987 EPA/NYSDEC inspection reports and updated to October, 1988. Four of the eleven land disposal facilities in the basin are in non-compliance. Table 2 provides information on these four non-complying facilities, such as identification of the violator, the nature of the violation, enforcement actions undertaken or planned and when such actions took place or will take place.

Table 2

Name of Facility	Nature of Non-Compliance	Enforcement Actions Undertaken
Philips ECG	-Groundwater Monitoring Violation -Inadequate Part B -Loss of Interim Status (LOIS)	-Complaint issued 11/85 -Final Order and compliance schedule issued 10/86
Transelco	-Illegal Use of Surface Impoundment -Illegal Groundwater Monitoring	-Complaint issued 7/84 (stopped use of impoundment) -Negotiate final order for closure requirements by 3/89
Van de Mark, Inc	-Groundwater Monitoring Violation -Closure Plan Violations	-Final Order signed 6/85 -Closure certification accepted 10/88.
LCP	-Inadequate Groundwater Monitoring -Closure Plan Deficiencies	-Complaint issued 9/85 -Final Consent Order issued 12/85 requiring submittal of approvable closure plan to address violations. -Public notice of closure plan 12/87. Plan approved 9/88. Physical closure to be completed by 5/89.

The schedule for permitting and compliance activities required under RCRA and HSWA as described in more detail in Table 1 of the plan is as follows:

A. EPA/NYSDEC final permit determinations on all land disposal facilities by November 8, 1988;

B. EPA/NYSDEC will make final permit determinations on all existing incinerator facilities by November 8, 1989;

C. EPA/NYSDEC will make final permit determinations on all existing storage and treatment facilities by November 8, 1992;

D. EPA/NYSDEC will make final determinations on closure plans for closing facilities and subsequent certification or adherence to approved closure plans; and

E. Where permits have not been issued or the facility is going to close, EPA and NYSDEC have the power to require corrective action implementation through HSWA 3008(h) Administrative Orders, State enforcement procedures, and other authorities.

HAZARDOUS WASTE TREATMENT STORAGE & DISPOSAL FACILITIES
Lake Ontario Basin NEW YORK STATE

SUB-BASINS

03-01 Lake Ontario, Western Section
03-02 Lake Ontario, Central Section
03-03 Lake Ontario, Eastern Section
04 Genesee River
07 Seneca-Oneida-Oswego Rivers
08 Black River

KEY TO LOCATIONS

1 SCA Chemical Services Inc.
2 Bell Test Center
3 Akzo Chemic America
4 Van de Mark Inc.
5 GMC Harrison Radiator Div. Wastewater Treatment
6 GMC - Harrison Radiator
7 Van de Mark Chemical Co. Inc.
8 FMC Inc.
9 Black & Decker (US) Inc.
10 Bausch & Lomb Inc. Frame Center
11 Brooks Avenue Tank Farm RGEC
12 GMC Delco Products
13 Olin Corp.
14 GMC Rochester Products Div. Lexington Ave.
15 Eastman Kodak
16 Bausch & Lomb Inc. Optics Center
17 University of Rochester
18 Stuart-Oliver-Holtz Inc.
19 Southco Inc.
20 George Robinson Inc.
21 Xerox
22 Garlock Inc. Div. of Colt Industries
23 Garlock Inc. Div. of Colt Industries
24 Transelco - Div. of Ferro Corp.
25 Seneca Army Depot
26 W.R. Grace - Evans Chemetics
27 Philips ECG
28 Auburn Plastics Inc.
29 General Electric Co. Auburn Plant
30 Speciality Metals Div. - Crucible Inc.
31 LCP Chemicals
32 Construction Materials Products Div.
33 McKesson Envirosystems
34 Residual Fuel Storage Tank
35 Prestolite Motor Div.
36 Roth Bros. Smelting Corp.
37 Carrier Air Conditioning
38 GMC - Fisher Guide
39 Solvents & Petroleum Service Inc.
40 General Electric
41 Cambridge Filter Corp.
42 N. E. Environmental SVCS
43 Industrial Oil Tank & Line Cleaning
44 Camden Wire Co. Inc.
45 Camden Wire Co. Inc.
46 Lowville Pesticide Storage Site
47 Fort Drum Dept. of Army
48 Cheseborough Ponds

Figure IV - 3

Brock University Cartography

E. INACTIVE HAZARDOUS WASTE SITES

Inactive hazardous waste site investigation and remediation activites in the U.S. portion of the Lake Ontario Drainage Basin are conducted by both Federal and State agencies. The two programs complement each other in achieving correction of contamination created by past indiscriminate disposal of waste.

1. Federal Program

In December 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as "Superfund". The Act authorized EPA to provide long-term remedies at hazardous waste sites, and established a $1.6 billion fund, raised over five years from special industry taxes and general revenues, to finance remedial activities. In 1986, Congress reauthorized Superfund by enacting the Superfund Amendments and Reauthorization Act (SARA), increasing the fund to $8.5 billion and strengthening the remedial process.

Superfund calls for EPA to compile a National Priorities List (NPL) of hazardous waste sites which are candidates for remedial action. A priority site can be remediated in several ways:

- The responsible parties* can remediate it voluntarily;
- The responsible parties can be forced to remediate it by legal and administrative actions; or
- Superfund monies can be used to finance the remedial action. (If there is difficulty in getting the responsible parties to act, EPA will proceed under Superfund and will seek recovery of its costs through legal action at a later date.)

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* Responsible parties under Superfund include site owners and operators, as well as generators and transporters of waste to the site.

At NPL sites, a remedial investigation (RI) is normally conducted. The RI is designed to collect and analyze the data necessary to determine the nature and extent of the contamination at the site, to determine the need for remedial action, and to support the development of possible remedial alternatives. Then, a feasibility study (FS) is conducted. This study consists of a detailed evaluation of different remedial alternatives on the basis of benefits to human health and the environment, technical feasibility, and costs. At the conclusion of the RI/FS, EPA, in conjunction with the State selects a remedy for the site, and proceeds with the detailed design and construction for the selected remedy.

Table 1 summarizes the status and the total Federal/State funding associated with the sites already listed on the National Priorities List (NPL) in the Lake Ontario basin. The location of these sites is shown in Figure IV - 4. Table 2 lists additional potential sites in the basin on EPA's inventory.

Table 1
NPL SITE STATUS AND FUNDING
IN THE LAKE ONTARIO BASIN

Site	Performed or Underway Remedial Activites	Federal/State Funding($1000)
Byron Barrel and Drum - Site 819005	IRA RI/FS*	955
Clothier Disposal - Site 738014	IRA RI/FS*	2,242
FMC Corp. - Site 837001	-	-
Fulton Terminals - Site 738023	IRA RI/FS*	900
Pollution Abatement Services - Site 738001	IRA* RI/FS RD, RA, Monitoring*	11,500
Sinclair Refinery - Site 902003	IRM*, RI/FS*, RD*	3,600
Volney Landfill - Site 738003	RI/FS RD*	1,251
Total		$20,448

Key

IRA - immediate removal action
RI/FS - remedial investigation/feasibility study
RD - remedial design
RA - remedial action
IRM - Initial remedial measure

* Indicates remedial activity underway.

Table 2
SITES ON INVENTORY
IN THE LAKE ONTARIO BASIN

COUNTY	NO. OF SITES
Jefferson	9
Orleans	9
Monroe	65
Wyoming	9
Genesee	9
Allegany	12
Livingston	7
Seneca	14
Schuyler	8
Wayne	7
Cayuga	8
Onondaga	40
Ontario	6
Madison	6
Oswego	33
Tompkins	9
Oneida	30
Lewis	12
Yates	9
Herkimer	15
Total	309

* This is an approximation: for the purpose of this approximation, 100% of the land area in the counties cited above has been considered to lie within the boundary of the Lake Ontario basin. Niagara County is not included in order to avoid overlap with the Niagara River Toxics Management Plan.

2. New York's Hazardous Waste Site Remedial Program

The New York State Abandoned Sites Act of 1979 (Chapter 282) marks the formal beginning of New York State's Inactive Hazardous Waste Site Remedial Program. The Abandoned Site Act mandated a statewide inventory of inactive hazardous waste sites, established the New York Registry of Inactive Hazardous Waste Sites, and provided DEC and DOH the authority to order responsible parties to clean up their waste sites, or to initiate cleanup activities in the event that no responsible party could be identified. The first New York State Registry of Inactive Hazardous Waste Dump Sites, published June, 1980, listed 680 sites.

The Abandoned Sites Act was seen as an interim measure until the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or Federal Superfund proposed in 1979 was enacted and operating. It was intended to ensure that State and local governments would be prepared to implement a federal hazardous waste cleanup program.

State Superfund Law of 1982

As more sites were discovered and the need for additional funding became evident, New York enacted the State Superfund Law of 1982 (Chapter 857). This law established the Hazardous Waste Remedial Fund (State Superfund) from fees assessed against wastes generated in or transported into New York State. These monies were dedicated to pay for site investigation, remedial programs at sites where there is no responsible party, financing the non-federal share of remediation activities carried out under federal Superfund, and emergency response actions for spills involving hazardous waste.

The Superfund Law required DEC to prepare the Inactive Hazardous Waste Remedial Plan. It also authorized the creation of the first State Superfund Management Board whose function was to review and approve or modify the Remedial Plan. Upon completion of its legal mandate in June 1984, the original Board ceased to exist.

Executive Order #33, Community Right to Know

Governor Cuomo issued Executive Order #33 on December 29, 1983 mandating DEC to survey industry's past hazardous waste disposal practices. Questionnaires were distributed to nearly 15,000 industries suspected of generating or transporting hazardous wastes during the thirty-year period from 1952 to 1981. Approximately 60% of the questionnaires sent out were returned; 449 potential new disposal sites were identified. These sites required further investigation in order to decide which sites should be added to the Registry of Inactive Hazardous Waste Sites. The report of suspected waste sites was released April 1, 1985.

A number of companies could not provide the location of sites used for some of the waste disposals they reported, and these sites were listed as "unknown" in the 1985 report. An extended program was initiated in 1986 to investigate these deficiencies. The extended program also sought to obtain information from the earlier nonresponders surveyed new potential hazardous waste generators and transporters, surveyed previous owners of companies which went out of business, and attempted to find new addresses for companies that could not be located previously. The report was expected to be published in April, 1988.

1985 Amendments to the Superfund Law

The State anticipated $10 million per year in receipts from the waste-end assessments on industries that generate or transport hazardous wastes in New York State. In actuality these assessments yielded only $3.5 million per year. To remedy this shortfall, the State passed the 1985 Amendments to the State Superfund Law (Chapter 38). The 1985 Amendments authorized a significant increase in revenue totaling $22 million per year through industry-based fees. In addition, $8 million was appropriated out of the State's General Fund, thereby making available a total of $30 million to fund New York's Remedial Program.

The 1985 Amendments require DEC to publish Quarterly Reports indicating progress made in enforcement, site investigation and/or remedial activities at each site listed in the Registry. The Department was also required to prepare a status report and annual update of the Remedial Plan, initially by July 1, 1986, and in each successive year. This law constituted the second State Superfund Management Board, directing it to evaluate the State's implementation of the New York State Hazardous Waste Site Remedial Program.

The Environmental Quality Bond Act of 1986

With Superfund revenues of $22 million per year (plus $8 million from the State's General Fund), it would take at least 40 years to fund the State's share of remediating an estimated 500 hazardous waste sites. In order to complete cleanup within the State Superfund Management Board's recommended 13-year schedule, an additional funding commitment was needed from both industry and government. Governor Cuomo therefore proposed issuance of the Environmental Quality Bond Act of 1986 to raise $1.45 billion. Of this amount, $1.2 billion is earmarked for remediation of hazardous waste sites when other sources of funding are not available. Debt service incurred on the bonds issued to clean up hazardous waste sites will be shared equally by New York State and industries that produce or process hazardous waste. In 1986, the Legislature approved and Governor Cuomo signed the Bond Act authorizing a referendum for voter approval. On November 4, 1986, the Bond Act was approved overwhelmingly by voters of New York State.

Site Investigation

Once a hazardous waste site is listed in the Registry, the State must (1) determine whether hazardous waste at the site constitutes an imminent or significant threat to the environment or public health, and (2) identify potentially responsible parties.

DEC conducts two kinds (Phase I and Phase II) of investigations at the waste sites. For Phase I studies, DEC hires engineering consultants to search records of federal, State, and local agencies known to be involved with the site, and to interview site owners (if known) and local residents to gather pertinent information on the site. Phase I site investigations provide preliminary characterizations of hazardous substances present at each site; estimate pathways by which pollutants might be migrating from the original site of disposal; identify population or resources which might be affected by pollutants from the site; observe how the disposal area was used or operated; and gather information regarding who might be responsible for wastes at the site.

If additional information is needed to classify and rank a site, DEC will conduct a Phase II investigation to determine whether or not the site poses a significant threat to public health and the environment. All data gathered in the Phase II study are used to classify the site. These data are applied to the USEPA Hazard Ranking Score Model to arrive at a final Hazard Ranking Score to determine if a particular site qualifies for inclusion on the NPL.

Remedial Investigations/Feasibility Studies

The RI/FS contains two components: the Remedial Investigation (RI) and Feasibility Study (FS).

Whereas a Phase II study is performed to determine if a site contains hazardous waste, and if a significant threat to public health or environment exists, the RI defines the areal and vertical extent of the problem.

Data collected in the RI provides information on the configuration of the underground, contaminated plume emanating from the site and the pathways by which contaminants are escaping from the site. The FS utilizes the information generated by the RI to develop and evaluate alternative solutions (including the "no action" alternative) to the problem. Based on this evaluation of alternatives, an appropriate remedial action will be recommended and chosen.

Remedial Design and Construction

Once a remedy is selected, a remedial design is prepared and the remedial action is carried out.

Table 3 gives a listing of the number of sites in the Lake Ontario basin by county. The Class 2 sites are those which represent the highest priority in the New York State program.

TABLE 3
SITES ON NEW YORK STATE REGISTRY
IN THE LAKE ONTARIO BASIN*

COUNTY	# OF SITES	# OF CLASS 2 SITES	CLASS 2 SITES WITH REMEDIAL PROGRAM UNDERWAY OR COMPLETE	PHASE I, II UNDERWAY OR COMPLETE
Jefferson	2	1	0	0
Orleans	7	2	2	6
Monroe	61	14	4	28
Wyoming	1	0	0	1
Genesee	7	3	2	5
Allegany	9	3	2	6
Livingston	8	2	1	5
Seneca	8	2	1	5
Schuyler	1	0	0	1
Wayne	10	4	3	3
Cayuga	4	1	1	2
Onondaga	36	12	5	19
Ontairo	6	0	0	3
Madison	3	1	0	1
Oswego	29	7	6	16
Tompkins	7	4	3	6
Oneida	25	11	6	10
Lewis	3	0	0	0
Yates	4	1	0	2
Herkimer	15	6	2	9
TOTAL	246	74	37	128

*This is an approximation: for the purpose of this approximation, 100% of the land area in the counties cited above has been considered to lie within the boundary of the Lake Ontario Basin. Niagara County is not included in order to avoid overlap with the Niagara River Toxics Management Plan.

Figure IV - 4

Brock University Cartography

F. Combined Sewer Overflow

In the United States, combined sewer overflow (CSO) discharges are required by the Federal Clean Water Act to be covered by discharge permits. In New York State, the authority to issue such permits is delegated to NYSDEC. For the most part, CSOs are included in municipal SPDES permits as separate discharge points. In some instances, the SPDES permits also specify effluent limits for the CSO discharges.

There are thirteen (13) combined sewer systems in the Lake Ontario drainage basin. No dry-weather overflows are allowed from combined sewer system. NYSDEC has provided guidance through Technical and Operation Guidance Series (TOGS) to aid staff in the evaluation of CSOs to ensure that water quality objectives are met, and to protect the best usage of the State's water resources from significant impairment by the direct and residual degrading effects of CSOs through the elimination and/or reduction of CSO discharges. Out of the thirteen combined sewer systems, two facilities (Monroe County - Frank Van Lare STP and Onondaga County - Syracuse Metro STP) experience CSO problems that cause water quality violations.

EPA and NYSDEC, through the Construction Grants Program, has awarded grants to CSO abatement projects designed to restore uses of the receiving waters in priority water quality areas which had been impaired by the impact of CSOs. Three potential funding sources for CSO abatement projects were available.

1) <u>State's Regular Allotment</u>
   After September 30, 1984, the Governor may include in the State's priority system a category of projects needed to correct CSOs which impair water uses in priority water quality areas. Funds from the State's regular allotment may be used only for non-marine CSO abatement projects.

2) <u>Governor's Discretionary Set-aside</u>
   After September 30, 1984, up to 20% of a State's regular allotment, at the discretion of the Governor, may be used to fund categories of projects which were previously eligible for grant assistance before this date. Among the previous categories of projects is the correction of CSO, either marine or non-marine.

3) <u>Separate Appropriation for Marine Projects</u>
   After September 30, 1982, marine CSO projects may be funded through a separate Congressional appropriation. These projects are administered at EPA headquarters subject to a national priority system. These funds are to address impaired uses of public health risks in priority water quality areas in marine bays and estuaries caused by the impact of CSOs.

Currently, the only source of assistance, unless a project is on the latest, and last-to-be-generated priority list, will be a State Revolving Loan Program, presently under development.

Since 1972, Federal construction grants have been awarded for the following major CSO abatement projects in the Lake Ontario drainage basin:

- Monroe County-------------- $216 M (Planning and on-going construction)
- City of Auburn------------- $4.2 M (Planning and construction)
- Onondaga County------------ $6.2 M (Completed)
- Onondaga County------------ $91.0 M (Planning started)

G. Storm Water Discharges

In accordance with the Federal Clean Water Act, point sources discharging stormwater may require permits under the NPDES program. In New York State, these type of permits are issued by the New York State Department of Environmental Conservation (NYSDEC) under the SPDES program. The State has issued stormwater permits mainly to those industrial facilities permitted to discharge treated process wastewater that also have the potential for discharging stormwater contaminated by industrial activity.

However, with the passage of the Water Quality Act of 1987, greater emphasis will now be placed on the regulation of contaminated stormwater. The Act has established the following categories of stormwater discharges that must be regulated:

(1) Those discharges already permitted.

(2) Discharges associated with industrial activity.

(3) Discharges from municipal separate storm systems serving a population of 250,000 or more.

(4) Discharges from municipal separate storm sewer systems serving a population of 100,000 or more (but less than 250,000).

(5) Discharges designated as causing water quality violations or contributing significant quantities of pollutants.

All other storm water discharges (i.e. parking lots, shopping malls, office buildings, hospitals, schools, parks, etc.) are part of the moratorium that remains in effect until October 1, 1992. By the time, the moratorium expires, EPA will have to do the following:

(1) Identify volume and extent of pollutants in these discharges, and classes of storm water discharges that will be required to obtain a permit (October 1988).

(2) Establish procedures and methods to control storm water (October 1989).

(3) Establish regulation to designate discharges covered by the moratorium to be regulated to protect water quality and establish a comprehensive program (October 1992).

The WQA also exempts stormwater runoff from agricultural lands and uncontaminated stormwater from mining operations or oil and gas exploration, production, processing, or treatment operation or transmission lines from the requirement to obtain a permit.

Permits for industrial stormwater discharges in New York State may be re-evaluated when EPA issues final regulations in conformance with the Water Quality Act of 1987. EPA, the State and industries will have to accomplish the following:

(1) EPA to develop application regulations by February, 1989.

(2) Industries to submit permit applications by February, 1990.

(3) Permits to be issued by February, 1991.

(4) Industries to be in compliance with permit no later than February, 1994.

Municipal stormwater systems are required to reduce the discharge of pollutants to the maximum extent practicable and regulate non-storm water discharges into the storm system. Large municipals (greater than 250,000) are to abide by the industrial deadlines for filing an application and being in compliance. Smaller municipals (greater than 100,000 but less than 250,000) will have to submit a permit application by February, 1992 and be in compliance no later than February, 1996.

H. Other Nonpoint Sources

A nonpoint source (NPS) of pollution is usually considered an areawide source or many small sources of pollution distributed diffusely over an area, which cumulatively make a significant contribution to water quality degradation. Toxics may enter surface waters either dissolved in runoff or attached to sediment or other organic materials and may enter groundwater through soil infiltration. Contaminants transported from the land by runoff following a storm event are usually characterized as nonpoint if they enter the waterbody diffusely rather than at a discrete stormwater discharge point.

NPS impacts are associated with both long-term, fixed land uses (e.g., agriculture, urban development) and more sporadic and transitory activities (e.g., construction sites, timber harvesting). Programs to address activities such as forestry and construction must be preventive in nature; i.e., they must promote awareness and understanding of proper site management before a project is undertaken so that site-specific impacts can be prevented. On the other hand, the impacts of agricultural or urban land uses typically manifest themselves as identifiable longer-term problems in a waterbody (e.g., eutrophication of a lake or reservoir) which must be prevented or corrected by efforts to promote proper long-term management practices on the landscape.

Addressing nonpoint source pollution involves a broad array of program activities on the part of several federal, state and local agencies. In New York State, the Department of Environmental Conservation (DEC) has lead responsibility by virtue of its statutory authority, for the management of water resources and control of water pollution.

"Best Management Practices" (BMPs) are essential tools to better link water quality with the land management activities of pertinent resource management agencies and with the activities of local government. Since most of the institutional capability for implementing management practices to control NPS exists at the local level, cooperation and coordination among agencies is an essential part of "outreach" to develop awareness and enthusiasm for BMPs on the part of local government and the public.

Nonpoint sources of water pollution within the scope of the State's management strategy which may include substances of a toxic nature are: diffuse urban runoff; household on-lot wastewater disposal; pesticide and fertilizer use in agricultural and silvicultural operations, by commercial turf grass, yard care, and vegetation control operations, and by homeowners; small spills, accidents and leaks of hazardous substances associated with poor housekeeping at industrial and commerical facilities; and storage and use of road salt and other deicing chemicals and abrasives.

Some examples of NPS control related activities/programs are:

- Irondequoit Bay Segment of the Nationwide Urban Runoff Program (NURP) which evaluated the significance of urban runoff on water quality and evaluated the effectiveness of control measures.

- Septic tank control programs under the New York State Department of Health and county health departments which enforce standards for on-lot wastewater disposal systems.

- Training and certification of commercial and private (farmer) pesticide applicators by DEC. DEC also registers and classifies products for use in New York State, with authority to cancel these registrations if necessary. DEC is also responsible for the pesticide enforcement program to deter misuse of pesticides.

- The Agricultural Conservation Program of the U.S. Department of Agriculture which is used to partially fund soil and water conservation BMPs on private land.

While the total amount of activity that may be considered NPS control-related during the past few years has been substantial, collectively the activities have not constituted a defined program. There has been no articulated framework or strategy to provide the various individual efforts with a common management direction.

As the major point sources of water pollution are brought under control in New York, as well as nationwide, the water quality impacts of NPS become relatively more apparent. In recognition of these impacts, the Water Quality Act of 1987 provides new direction and authorizes Federal assistance for the preparation and implementation of state NPS programs.

Under the Water Quality Act, the State is required to submit, for EPA approval, an assessment report identifying those waters that cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of the Clean Water Act due to NPS pollution. This report will also describe the specific NPS categories affecting these waters and general programs and methods used for controlling this pollution. A preliminary listing of waters was submitted to EPA in April 1988 as part of New York's water quality assessment report submitted pursuant to section 305(b) of the Clean Water Act. While the report was due to EPA in August 1988, DEC now expects to submit the final report to EPA in March 1989.

The State is also required to submit, for EPA approval, a NPS management program providing an overview of the State's NPS program, as well as what the State intends to accomplish over the next four years. While the assessment report will identify the overall dimensions of the NPS problem, the management plan will target a subset of these waters on a watershed-by-watershed basis. Statewide approaches to problems such as urban stormwater runoff from developing areas may also be developed. While the program was due to EPA in August 1988, DEC now expects to submit the NPS management program to EPA in June 1989.

EPA will be encouraging the State to develop NPS programs which build upon related programs such as clean lakes, estuaries, stormwater permits, groundwater and wetlands, and complement and increase the effectiveness of State and local NPS programs already underway. In addition, EPA will encourage the State to coordinate its NPS programs with those of other Federal agencies.

I. AIR TOXICS

Introduction

The presence of toxic compounds in the Great Lakes has been a concern for quite a long time. The source of these toxic contaminants was thought to be by direct discharge into the lakes or tributaries by industry. More recently, concerns have been raised that air emissions from man-made sources are also being deposited into the Great Lakes and may contribute significantly to loadings of certain pollutants, such as PCBs (Strachan and Eisenreich)[1]. It is hypothesized that the presence of nearby and upwind pollutant sources, the large surface area of the lakes, and the absence of effective in-lake removal processes, could make the Great Lakes susceptible to input from airborne pollutants.

Possible sources of concern of air toxics emissions in New York State around Lake Ontario include hazardous waste disposal sites, industries that use or produce toxic substances, incinerators of waste materials, and the combined emissions of man-made sources in nearby urban areas, such as the Buffalo-Niagara area.

The EPA has established a national program for air toxics to develop control requirements for many of these sources. In addition to establishing National Emission Standards for Hazardous Air Pollutants (NESHAPs) under Section 112 of the Clean Air Act, EPA provides technical and financial support to state agencies for the development and implementation of air toxics programs.

The New York State Department of Environmental Conservation has developed one of the most comprehensive programs for controlling emissions of air toxics. Unless exempted by regulation, New York State regulates all chemical substances emitted from these sources under its air toxics control program. In addition, New York State, in cooperation with New Jersey and EPA, is involved in an extensive air toxics monitoring and assessment project located around Staten Island. This project will hopefully provide a model for other urban areas in assessing the "urban soup", toxics of concern within urban areas.

Finally, EPA is participating in several national programs to research the problems of atmospheric deposition and transport of air toxics. Two of the programs which most directly affect deposition into the Great Lakes are the National Atmospheric Deposition Program and the Great Lakes Atmospheric Inputs and Sources Network. Both programs address ways to measure the amount of airborne pollutants that are deposited and to identify both nearby and long range sources of airborne pollutants.

EPA's Approach to Controlling Emissions of Air Toxics

In addition to controlling emissions of criteria pollutants, EPA has established emissions standards (NESHAPs) for seven pollutants under Section 112 of the Clean Air Act (NESHAP). Sources of these pollutants must demonstrate compliance with federal emission requirements. These toxic pollutants are:

- Mercury
- Beryllium
- Asbestos
- Vinyl Chloride
- Benzene (NESHAP proposed)
- Radionuclides
- Arsenic

Under the Resource Conservation and Recovery Act (RCRA), EPA is developing regulations for toxic air emissions from hazardous waste treatment, storage and disposal facilities. In the Superfund program, air toxics will be addressed in clean-up decisions at sites. In addition, EPA has developed a program of technical and financial support to states to encourage them to develop air toxics control programs.

The overall effect of these programs is to limit and reduce the total atmospheric burden of a wide range of airborne pollutants, thereby reducing the amount available for deposition into the Great Lakes.

State Air Toxics Programs

Strong and effective state and local air toxics programs are essential to the implementation of the federal program. The federal program is based on the states:

* implementing and enforcing delegated NESHAPs.

* building the technical, regulatory and administrative capabilities needed to implement an effective control program. These capabilities include:

    - effective permitting procedures for new and existing sources
    - implementation of the Prevention of Significant Deterioration of Air Quality program.
    - expanded emission inventories for toxic compounds
    - legal authority and ability to regulate sources of air toxics

* assessing the health impacts in high-risk urban areas and reducing air toxics emissions that result from the combined effects of numerous sources and pollutants.

* controlling high-risk point sources of local concern that are not of broad enough concern for federal regulation.

In addition to the regulatory capability provided by the NESHAPS and other federal regulations, state air toxics regulations, and the identification of high risk urban areas, there is a state initiative program which is designed to help states financially and with technical information about sources of toxic air pollutants too localized for action under Section 112 of the Clean Air Act (NESHAPs). Under the state initiative program, the EPA supports state analysis of high risk point source problems (risk > 10^{-4}) by funding contractor or state support to assist the state in making control decisions.

New York State's Air Toxic Program

The New York State Department of Environmental Conservation (NYSDEC) has a comprehensive state air toxics program. NYSDEC's Bureau of Air Toxics mission is to provide a coordinated, technically current regulatory approach for the control of emissions of chemical substances for which no federal ambient air quality standards have been developed. The New York State regulation, 6 NYCRR Part 212, and New York's Air Guide-1, entitled "Guidelines for Control of Toxic Air Contaminants", provide the regulatory base upon which New York's air toxics program is built.

Air Guide-1, an engineering document, contains specific chemical control guidance for over 240 chemicals separated into three categories: high toxicity air contaminants, moderate toxicity air contaminants, and low toxicity air contaminants. The higher the toxicity, the more stringent the control requirements become. Air Guide-1 provides New York's regionalized air pollution control program staff with a screening mechanism to determine what control requirements are necessary for a source seeking a new or renewed state air permit. As part of this review, the applicant must evaluate the predicted maximum ambient impact of the chemical contaminant with the acceptable ambient level for the chemical contaminant in Air Guide-1 to determine acceptability or the amount of emissions reduction required.

EPA and NYSDEC are supporting a study in Staten Island in order to characterize the levels of toxics in the urban airshed. This study is monitoring for selected organics and metals both outdoors and indoors. It is anticipated that the Staten Island Study will provide a basis for addressing air toxics contaminants in urban areas. Consequently, toxic problems in urban areas near Lake Ontario may be more accurately addressed. In addition to the Staten Island Study, NYSDEC has established monitoring for approximately 25 lighter VOCs at many urban areas' sites along with dioxin and furan sampling in Niagara Falls and other selected areas around the state.

This combination of state air toxics control program, NESHAPs, the state initiative programs, and joint EPA and state urban area projects give NYSDEC and EPA the capability to identify and effectively control sources of toxic pollutants in the Lake Ontario area as well as the entire state.

National Efforts to Characterize Atmospheric Deposition

Acid Rain

The national program dealing with acid rain is intended to study the possible need to control further the emissions of pollutants such as sulfur dioxide and nitrogen dioxide, the two major causes of acid rain. Because of concerns raised over the contribution of acid deposition to adverse effects on the environment and public health and welfare, the National Acid Precipitation Assessment Program (NAPAP) was authorized by Congress under the Acid Precipitation Act of 1980 (P.L. 96-294, Title VII). Under this act, Congress directed that a ten year research plan be developed. Management of NAPAP and this plan is headed by the National Oceanic and Atmospheric Administration; the Environmental Protection Agency; the Departments of Agriculture, Energy and Interior; and the Council of Environmental Quality. According to the congressional mandate, NAPAP's research is to focus on:

* identifying sources
* establishing a nationwide acid deposition monitoring network
* developing and applying atmospheric transport models to predict long and short range transport
* determining the impact on the physical environment such as:
  - the impact of acid rain on America's lakes and streams
  - the corrosive effects of acid rain on building materials[2,3]

As part of NAPAP, the EPA established the STAR (State Acid Rain) program. As part of this program, New York is addressing the acid rain problem by undertaking strategy development studies relating to reduction of sulfur dioxide emissions. New York is examining the impact on acid deposition of different emission control strategies. New York is using a modification of the Cornell/Carnegie Mellon University economic model, which can analyze utility and industrial costs, to assess the costs of each possible strategy.

Also, as part of EPA's acid rain strategy, the National Atmospheric Deposition Program (NADP) was developed. Wet deposition monitors were placed nationwide to analyze the composition of rain and snow. Besides sampling for metals and nutrients (SOP_4, NO_3, NH_4, etc.), these monitors provide data which allows for study of long and short range transport and identification of high emitting area sources.

Great Lakes Study

In 1972, the United States and Canada, under the Great Lakes Water Quality Agreement of 1972, developed a framework for the surveillance, monitoring, research, protection, and reclamation of the physical and chemical quality of the Great Lakes system. Coordination of the monitoring of atmospheric deposition in the United States is provided by the Great Lakes National Program Office (GLNPO) located at EPA's Region V office. The Great Lakes Atmospheric Deposition (GLAD) network was established in 1981 to characterize this deposition. Thirty-six monitoring stations were installed along the U.S. shores of the five Great Lakes.

Like the NADP network the GLAD network collects wet-only deposition samples.[4] A list of chemicals sampled for is provided in Table 1. Based on a review of the data provided in the GLAD data analysis report, long range transport of lighter chemicals from urbanized areas to the Great Lakes is indicated; for heavier chemicals, like metals, transport is localized to the immediate vicinities of the urban areas where these pollutants are emitted.

Although a heavy metal itself, it is hard to determine whether or not mercury would exhibit transport properties similar to the heavy metals contained within the GLAD data analysis report. Because of its special properties, mercury is known to exhibit long range transport. For the other ten chemicals of concern (which the GLAD monitors do not sample for), whether they would show transport properties similar to those of the metals or the lighter chemicals cannot be determined based on the GLAD data.

As part of a strategy to monitor for a wider variety of chemicals than are sampled for at GLAD sites, in March of 1987 a document entitled "Design of a Great Lakes Atmospheric Inputs and Sources (GLAIS) Network"[5] outlined recommendations for a monitoring network to do atmospheric sampling for many chemicals of concern in the Great Lakes. EPA has begun implementation of this monitoring network. As part of an EPA study of the sources, the transport, and the fate of toxic substances in Green Bay, Wisconsin, coordinated by the GLNPO, atmospheric sampling has been proposed at 1.5 m above ground level in Green Bay. In addition, meteorological sensors for recording of wind direction, wind speed, temperature, relative humidity, solar radiation, and rain intensity have been installed at the same site. Sampling was proposed for PCBs, HCB, DDT and its metabolites, BaP, and dieldrin.[6] A sampling site of this type is now in operation in Green Bay. The chemicals sampled for at the Green Bay site are listed in Table 2. Three additional sites, one in Wisconsin, one in Michigan, and one in Canada at Point Petre on Lake Ontario, have been proposed for fiscal year 1989 (October 1988 through September 1989).

It is expected that the data obtained from these monitors will

Table 1
Chemicals Sampled for at GLAD Sites

"Nutrients":	Metals:
Nitrate	Cadmium
Ammonia	Copper
Nitrogen	Iron
Sulfate	Lead
Chloride	Calcium
Total Silica	Magnesium
Alkalinity	Sodium
Strong Acids	Potassium
Total Phosphorus	Arsenic
Total organic carbon	Aluminum
	Barium
	Beryllium
	Cobalt
	Chromium
	Lithium
	Vanadium
	Titanium
	Boron
	Zinc
	Manganese
	Strontium
	Nickel

Table 2
Chemicals Monitored for "GLAIS" Site in Green Bay

"Nutrients":	Metals:
Nitrate/Nitrite as N	Lead
Ammonia as N	Cadmium
Nitrogen	Arsenic
Sulfate	Copper
Chloride	Iron
Total Silica	Nickel
Total Phosphorus	Calcium
Total organic carbon	Magnesium
Alkalinity	Sodium
Strong Acids	Potassium
	Aluminum
Organics	Barium
PCBs	Beryllium
Dieldrin	Cobalt
	Chromium
	Lithium
	Vanadium
	Titanium
	Boron
	Zinc
	Manganese

vastly improve the data base for atmospheric concentrations of many toxic contaminants around the Great Lakes. Currently, there is a limited data base pertaining to atmospheric concentration of toxics. These proposed monitoring sites will allow better quantification of the toxic contributions to the Great Lakes from the atmosphere using procedures outlined by Strachan and Eisenreich[1].

Atmospheric Loadings to Lake Ontario

To assess the possible contribution of air contaminants into Lake Ontario, two approaches are appropriate. The first is to estimate concentrations in the air in the vicinity of Lake Ontario based on ambient measurements and calculate the flux of pollutants across the air/water boundary. This is the approach used by Strachan and Eisenreich[1] in estimating contributions of atmospheric deposition.

The second approach is to review the possible sources of the contaminants from known emission inventories, to attempt to estimate through dispersion modeling the ambient concentration in the vicinity of Lake Ontario and, from these estimates, to deduce the deposition into the lake. For seven of the eleven chemicals, there are no known sources because, in fact, the use of these chemicals is no longer permitted and there are no manufacturers of these chemicals near Lake Ontario. Fugitive sources of these chemicals exist; however, there are no reliable estimates of the quantities emitted.

Consequently, for the seven chemicals of concern for which good emission estimates are not available, the first approach may be the only reliable method.

1. PCBs

There are no air emissions sources of PCBs in New York State's inventory of permitted sources. PCBs were mainly used by electrical utilities as a heat transfer medium in transformers, but have now been banned from use in the United States. Since PCBs do not degrade quickly, they may be found in the soil or groundwater where PCBs were used, stored, or manufactured. Based on limited measurements of PCB concentrations in the atmosphere, Strachan and Eisenreich[1] have estimated 0.39 kg/day are deposited into Lake Ontario. This estimate is used in the loadings matrix in Appendix III of the Lake Ontario Toxics Management Plan. As there are no permitted air emissions sources of PCBs in New York State, the most likely sources of PCBs to Lake Ontario are:

a) disturbance of soil in which the chemical may persist, resulting in loadings to the atmosphere with possible subsequent deposition into the lake, and
b) evaporation from contaminated water sources to the atmosphere, resulting in subsequent deposition to Lake Ontario.

PCBs are being sampled at the "GLAIS" site in Green Bay and are proposed to be sampled at additional monitoring sites. These data can be used to more reliably estimate deposition into Lake Ontario.

2. Mirex

There are no air emissions sources of Mirex in New York State's inventory of permitted sources. Mirex is a pesticide that has been banned for use in the United States since December of 1977. It is possible that soil or water contamination could persist providing the same sources to the atmosphere as those for PCBs.

Mirex is not being proposed for sampling at the "GLAIS" sites.

3. Chlordane

There are no air emissions sources of chlordane in New York State's inventory of permitted sources. Chlordane was banned from use on April 15, 1987. On the other hand, the chlordane that was in inventory at the time of the ban is in limited use, but is restricted to application by beneath-ground injection for insect extermination. Consequently, emissions to the air are decreasing as the use of chlordane is phased out. Atmospheric inputs to Lake Ontario, if any, are most likely due to the fugitive processes described for PCBs.

Chlordane is not proposed to be sampled at any of the "GLAIS" sites.

4. Dioxin (2,3,7,8 TCDD)

There are four permitted air emissions sources near Lake Ontario (within approximately 67 miles of the lake) that emit dioxin; total permitted emissions are 0.025 lbs/day. If total emissions of dioxin from these sources are assumed to be deposited into Lake Ontario, the water quality standard of 1 ppq (parts per quadrillion) would be exceeded. New York State does not set an acceptable ambient level (AAL) for dioxin in Air Guide-1. Instead, significant sources of dioxins are reviewed on a case-by-case basis. A risk assessment analysis is performed on these sources to determine whether the source would have a detrimental impact on the population exposed. For the four sources mentioned above, it was determined that there was not a significant risk from dioxin to the population exposed.

Although the water quality standard would be exceeded using the unrealistic assumption that all emissions of dioxin near Lake Ontario would be deposited into the lake, the air emissions from these four sources have been controlled so air emissions do not pose a significant risk to the exposed population. Further analysis relating dioxin inputs to levels of dioxin in the Lake will be performed by the Fate of Toxics Committee.

NYSDEC operates two dioxin monitors in the Niagara Frontier near Lake Ontario. Dioxin is not being proposed for sampling at the "GLAIS" sites. The data from the NYSDEC dioxin monitors will provide a more accurate estimate of airborne dioxin in the vicinity of Lake Ontario.

5. Mercury

Total emissions of mercury from permitted sources in New York State near Lake Ontario were calculated to be 10.387 lbs/day; if all atmospheric emissions were deposited in Lake Ontario, the concentration of mercury in the lake would be 8×10^{-6} ppm, which does not exceed the water quality standard of 0.2 ppm. This estimate is conservative and the actual value for atmospheric deposition of mercury from New York State Sources into Lake Ontario is muchless than 10.387 lbs/day. Data from the GLAD sites shows that atmospheric mercury is either at or below the detection limits of the monitors (.1 ug/l). This further substantiates the low atmospheric input of mercury into Lake Ontario.

6. Octachlorostyrene

There are no air emission sources of octachlorostyrene in New York State's inventory of permitted sources. Atmospheric inputs, if any, are most likely due to the fugitive processes described for PCBs.

Octachlorostyrene is not proposed to be sampled at any of the "GLAIS" sites.

7. Aluminum

Total emissions of aluminum from permitted sources in Erie, Monroe, Niagara, Onondaga, Orleans, Oswego, St. Lawrence, and Wayne Counties (counties near Lake Ontario which have permitted sources of aluminum) were calculated to be 901.1 lbs/day; if all atmospheric emissions were deposited in Lake Ontario a concentration of 5.7×10^{-4} ppm of aluminum in Lake Ontario is calculated. This concentration is far below the standard and is conservative since the actual value for atmospheric deposition of aluminum from New York State sources into Lake Ontario is much less than 901.1 lbs/day.

8. Iron

Total emissions from permitted sources in Erie, Monroe, Niagara, and Onondaga Counties (counties near Lake Ontario which have permitted sources of iron) for an entire year were calculated to be 14.4 lbs/day; if all atmospheric emissions were assumed to be deposited in Lake Ontario, a concentration of 9.2×10^{-6} ppm of iron in Lake Ontario is calculated. This concentration is far below the standard is conservative since the actual value for atmospheric deposition of iron into Lake Ontario is much less than 14.4 lbs/day.

9. DDT

There are no air emissions sources of DDT in New York State's inventory of permitted sources. DDT is another pesticide that has been banned from use in the United States. Consequently, the 0.07 kg/day estimated by Strachan and Eisenreich and contained in Appendix III's loadings matrix is most likely attributable to the same fugitive sources listed for PCBs.

DDT is not proposed to be sampled at any of the "GLAIS" sites.

10. Dieldrin

There are no air emissions sources of Dieldrin in New York State's inventory of permitted sources. Dieldrin was banned from use in May of 1975. It is possible that soil or water contamination could persist. Therefore, the 0.09 kg/day due to atmospheric deposition of dieldrin, as estimated by Strachan and Eisenreich and contained in the loadings matrix of Appendix III, is most likely due to the fugitive sources listed for PCBs.

Dieldrin is being sampled for at the "GLAIS" site in Green Bay and will be sampled for at the proposed additional sites. This information will provide a more accurate estimate of airborne dieldrin in the vicinity of Lake Ontario.

11. Hexachlorobenzene

There are no sources of hexachlorobenzene in New York State's inventory of permitted sources. Hexachlorobenzene is in limited use as a pesticide although it is being reviewed by the EPA. Hexachlorobenzene is primarily applied by injection, perhaps, limiting its direct emission into the atmosphere. It is possible that soil or groundwater contamination could result in loadings to the atmosphere. The 0.03 kg/day atmospheric deposition of hexachlorobenzene estimated by Strachan and Eisenreich and contained in Appendix III is most likely due to the fugitive sources listed for PCBs.

Hexachlorobenzene is not proposed to be sampled at any of the "GLAIS" sites.

Conclusions

Five of the eleven chemicals of concern have been banned for use in the United States. There are no sources permitted to emit these toxics into the air. This restricts their probable atmospheric loadings to the fugitive emission sources outlined for PCBs. In addition, future airborne emissions from the United States can be expected to decline as the residual compounds degrade. A determination of the atmospheric contribution must, by necessity, depend on accurate atmospheric measurements of the compounds in the vicinity of the Great Lakes. Existing programs, GLAD and "GLAIS", will be expanded in terms of the number of sites and the compounds measured. Consideration will be given to modifying sample sites and parameters, as necessary, based on the recommendations of the Niagara River/Lake Ontario Fate of Toxics Committee.

In terms of mercury, aluminum, and iron the airborne contribution of permitted sources in New York State does not appear to be a major contributor to the concentrations in Lake Ontario. Sampling through 1985 indicates mercury concentrations are at the minimal detection range and confirms that airborne mercury is not likely a major source of contamination.

In the case of dioxin, assuming all permitted sources in New York State that emit dioxin near Lake Ontario deposit into the lake, the water quality standard of 1 ppq would be exceeded. While this scenario is unrealistically conservative, we need to develop a better definition of the transport properties that occur at the air/water interface.

References

1. Strachan and Eisenreich, Mass Balancing of Toxic Chemicals into the Great Lakes: The Role of Atmospheric Deposition, 1988, IJC.

2. United States Environmental Protection Agency, Acid Rain, EPA Journal, September 1986.

3. NAPAP, Interim Assessment, The Causes and Effects of Acidic Deposition, September 1987.

4. Gatz, Donald F., Van C. Bowersox, Jack Su, Gary J. Stensland, Great Lakes Atmospheric Deposition Network Data Analysis and Interpretation, 1986.

5. EPA-905/4-87-001, Design of a Great Lakes Atmospheric Inputs Sources (GLAIS) Network, March 1987.

6. Arimoto, Richard, The Atmospheric Deposition of Chemical Contaminants to the Great Lakes, August 11, 1987.

J. Oil and Hazardous Material Spills

Prevention and cleanup of oil and hazardous substance spills are the focus of U.S. programs developed under the Federal Water Pollution Control Act (FWPCA) and the Superfund Amendments and Reauthorization Act (SARA).

The FWPCA requires that non-transportation related facilities develop and follow a spill prevention control and countermeasures plan to prevent discharge of oil products to waters of the United States or their shorelines. Facilities that are involved in drilling, producing, gathering, storing, processing, refining, transferring, distributing or consuming oil products, with underground storage capacity greater than 42,000 gallons or aboveground storage greater than 1,320 gallons must comply. Containment systems, maintenance, security, operating procedures and reporting requirements are included. Oil removal contingency plans also are required for all Great Lakes ports.

New York State has additional requirements for the bulk handling and storage of petroleum products. These include registration of all facilities, periodic tests and inspections for leaks, installation of diking, gauges and valves to prevent overfills and releases, and new tank standards.

Hazardous substance releases are regulated under Section 313, Title III of SARA. Manufacturing operations employing more than ten people that manufacture, import, or process any of the more than 300 toxic chemicals, in amounts greater than 25,000 pounds, must report annually both their routine and accidental releases. Among the regulated chemicals are chlordane, PCBs, mercury and hexachlorobenzene.

Firms using any listed toxic chemicals in other ways, such as for degreasing, in amounts greater than 10,000 pounds per year must also report any releases. Release information will be made available to the public through a computerized data base in 1989.

Sections 302, 303 and 304 of SARA require facilities handling "extremely hazardous substances" to cooperate with state and local officials in preparing comprehensive emergency plans.

New York State's Hazardous Substance Bulk Storage Act further regulates the sale, storage and handling of hazardous substances to prevent releases. Like the petroleum bulk storage program, it requires tank registration, compliance with standards for construction, operation, maintenance, inspection and closure, and restricts the sale of toxics to unregistered facilities.

There are also national and statewide spill response programs in place, so if a release should occur, immediate action can be taken to limit its impact on the environment. New York has a 24 hour a day hotline to report spills, and regional NYSDEC staff are prepared to respond.

K. Dredging and Dredged Material Disposal

Individual dredging projects in Lake Ontario, such as maintenance of navigation channels and commercial marina areas, require authorization from the U.S. Army Corps of Engineers (CE) pursuant to Section 10 of the Rivers and Harbors Act (33 U.S.C. 403). Those projects with associated disposal of dredged materials in waters of the United States also require authorization pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344). The permitting authority must examine practicable alternatives, including reuse and upland disposal options, to the discharge of dredged material into the waters of the United States.

Individual dredging projects, including CE projects, are also subject to State review, and issuance of a Water Quality Certificate in accordance with Section 401 of the Clean Water Act, if the project includes disposal in waters of the United States.

On the federal level, applications for Section 10 and 404 permits in Lake Ontario are submitted to the Buffalo District, CE. The State and Federal applications are identical and joint. The agency to which the application is submitted provides the other with an official copy. After this point, permit decision actions are taken separately. When a complete application is received, the District issues a Public Notice soliciting comments on the proposed action from interested parties. The Environmental Protection Agency (EPA) reviews all dredge and fill Public Notices issued by the CE and provides comments and recommendations to avoid and/or minimize adverse impacts to the aquatic ecosystem. The CE must provide full consideration to these recommendations when making permit decisions. EPA has final authority on Section 404 permit actions in accordance with Section 404(c) of the Clean Water Act.

At present, in order to comply with federal regulations and guidelines, material to be dredged and/or open lake disposed must meet established criteria for toxics concentrations contained in the EPA Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments. These criteria are utilized by EPA, the CE and the New York State Department of Environmental Conservation (NYSDEC) in determining the suitability of dredged material for open lake disposal.

These guidelines provide three categories for sediments: non-polluted, moderately polluted, and heavily polluted. Criteria for determining whether dredged material is suitable for open lake disposal vary depending on the contaminant(s) of concern. For example, because of the documented bioaccumulation potential of mercury and PCBs, if the guideline values are exceeded, the sediments are classified as polluted and unacceptable for open lake disposal regardless of levels of other constituents. The guidelines are based on bulk analysis or total concentrations of sediment parameters. They are not designed to assess specific environmental effects of open water disposal of the tested sediments or what portion of the contaminant load may be biologically available. The bulk chemical content of a sediment may not reflect the actual potential for damage to the aquatic ecosystem associated with open lake disposal.

The current guidelines were developed over ten years ago. Since that time the awareness of the presence and biological effects of many contaminants has grown. Specific testing procedures and methods also have been and continue to be investigated that may enable better assessment of the environmental effects of open water disposal of dredged material. The Buffalo District CE routinely includes elutriate and bioassay testing for Federal dredging projects. These tests are not always required of non federal applicants.

According to the January, 1982 Report of the Dredging Subcommittee to the Water Quality Programs Committee of the Great Lakes Water Quality Board, sediment chemical data are not sufficient to assess potential environmental impacts. Bioassessment to determine acute toxicity, impacts on reproductive success, and contaminant bioaccumulation potential for particular aquatic organisms needs to be implemented on a routine basis. The Buffalo District CE is currently studying four new short term (life cycle) sub-lethal chronic toxicity bioassay techniques to better determine the level of restrictions which must be placed on dredged material disposal. Further work directed toward determining biological effects of specific contaminants will be undertaken to evaluate and develop appropriate testing procedures. EPA will coordinate with the appropriate agencies to formulate applicable criteria for consistent implementation.

Testing requirements similar to those for the analysis and evaluation of dredged material for ocean disposal may be appropriate. Testing procedures described in the EPA Region II/NY District COE <u>Guidance for Performing Tests on Dredged Material to be Disposed of in Ocean Waters</u>, include physical, chemical and biological analysis of dredged sediments. EPA will coordinate with all regulatory agencies involved to develop criteria and guidelines specific for Lake Ontario.

The physical and chemical testing will determine the potential for environmental degradation of dredging/disposal areas. Major constituents to be analyzed will be based on the conditions and characteristics of the proposed dredging and disposal areas and associated sediments. Contaminants that are identified as Lake Ontario priority pollutants will be included on a list of constituents that will be required to be tested for in any proposed dredged sediments to determine whether restrictions are required on the method of disposal.

Bioassay/bioaccumulation procedures will assess biological effects of projected dredging and discharge activities. Environmentally sensitive benthic and water column organisms indigenous to Lake Ontario will be selected as appropriate testing species.

EPA will work with the appropriate agencies to identify known "hot spots" or areas of high contaminant concentration and develop strategies for the disposal of dredged material from these areas to ensure that environmentally acceptable disposal options are available.

EPA will work with the appropriate agencies in developing alternative disposal options that will include contained upland sites. This will ensure that contaminated sediments which are not considered suitable for open lake disposal are appropriately disposed of utilizing methods that do not allow return of contaminants by runoff into the open lake water column or leaching into existing or potential groundwater resources.

Open lake disposal occurs in various locations throughout the lake. The sites are generally areas where dredged material has been disposed of historically. Since some of the sites have been receiving dredged material at various intervals throughout recent history, there is potential for cumulative and long-term impacts. The conditions at these sites will be investigated by the appropriate agencies, and evaluated as to whether continued use of each site would incur environmentally damaging impacts. Information from study projects that are aimed at determining existing conditions in the lake will be reviewed in the assessment of these areas.

L. Solid Wastes

Each year, an estimated 20.2 million tons of municipal solid waste, and substantial amounts of nonhazardous industrial wastes, sewage sludge, and construction and demolition wastes, are generated in New York State. About 2.4 million tons of this municipal waste, and a proportionate amount of the other solid wastes, originate in the Lake Ontario Drainage Basin. These wastes can cause both environmental and public health problems.

Some 25 years ago, New York State first sought to control odor, disease, and vermin at waste dumps through regulations prohibiting uncovered dumps and open waste fires. Since then, far-reaching social and technical changes have significantly affected solid waste management. These changes have been reflected in increasingly strict state controls. Since 1981, the last time state solid waste facility regulations were significantly revised, New York has modified environmental laws and has issued policies and guidelines improving such waste management.

The NYSDEC has replaced its solid waste management facility regulation Part 360 of Title 6, New York Codes, Rules and Regulations (6 NYCRR Part 360), with a new, comprehensive version incorporating recent legal, technical, and policy developments. The new regulation became effective on December 31, 1988.

New York's objective is to promote integrated solid waste management through the concept of a "solid waste management method hierarchy," or order of preference. This order is:

- Waste reduction;
- Recycling and reuse;
- Waste to energy; and
- Landfilling.

The revisions improve solid waste management by providing consistent, predictable rules for design, construction, operation, closure, and monitoring of facilities, and by requiring consideration of the entire solid waste management system, with an emphasis on recycling, before facilities are built.

The revised Part 360 safeguards environment and public health by requiring hydrogeologic investigations and groundwater protection measures, state-of-the-art construction, stringent operation and maintenance, increased monitoring, and expanded status reporting on solid waste management facilities.

The new regulation:

reorganizes and greatly expands Part 360; includes all State requirements for facilities using specific technologies, and accepting particular types of wastes, or those facilities located in certain geographic areas;

requires demonstrated consideration of recycling as part of a solid waste management system;

clarifies definitions and exemptions, making it easier for all persons and institutions involved to identify their responsibilities;

updates standards governing facility design, construction, operation, maintenance, closure, and monitoring. Important new requirements include double composite liners and dual leachate collection and detection systems for solid waste landfills; requires increased planning and engineering for facilities, extensive reporting and documentation about construction and operation;

incorporates technical criteria for solid waste management facilities, such as composting operations, land application facilities, and surface impoundments;

brings construction and demolition debris sites under stricter regulatory control;

establishes requirements for storage, treatment, and disposal of infectious waste, incinerator ash residue, and waste tires.

M. Sludge Disposal

Sewage sludge use and disposal is regulated under the joint authority of the Clean Water Act (CWA) and the Resource Conservation and Recovery Act (RCRA). Federal regulation (40 CFR Part 257) established standards for cadmium, PCBs, and pathogens in sludge applied to land, and established general management standards for landfills. Section 405(d)(2) of the CWA of 1987 placed new emphasis on EPA to identify and limit toxic pollutants in sewage sludge. EPA is developing a new national permitting program to implement comprehensive standards for the safe use and disposal of sewage sludge.

These technical standards will be implemented through either NPDES (SPDES) permits issued to POTWs, or under alternate State programs approved by EPA. New York State requires that sludge or its ash be monitored for the presence of toxic materials as regulated by 6 NYCRR Part 360 Solid Waste Management Facilities regulations. If such material is found to be present, the provisions of the National Industrial Pretreatment Program come into play, in which the offending material is controlled at its source (point of entry into the POTW collection system). This is outlined in Section B of this Appendix, Indirect Industrial Discharges.

In addition, the treatment, storage, and disposal of sewage sludge is regulated in New York State by 6 NYCRR Part 360. This includes agricultural use of sewage sludge through land application and composting. Part 360 establishes both construction and operational criteria for these facilities as well as contaminant concentration limits for the sludge and/or compost.

Sludge generated as the result of any industrial process, or resulting from the processing of hazardous wastes and disposed of by the generating facility, is treated as a hazardous waste material and must be handled and disposed of in accord with RCRA, the Hazardous and Solid Waste Amendments of 1984 (HSWA), and the Clean Water Act, as outlined in Section D of this Appendix, Hazardous Waste Treatment, Storage, and Disposal Facilities.

N. Ambient Water Monitoring

Monitoring of New York's surface waters is conducted along two fronts: water quality by the DEC's Division of Water; and wildlife (fish and furbearers), by the Department's Division of Fish and Wildlife.

Surveillance of New York's surface water quality is mandated by Article 17 of the Environmental Conservation Law (ECL). The objectives of this program are: to acquire, develop and disseminate water quality data; to determine long-term trends and variation in water quality; and to determine compliance with State water quality standards and guidance values. To accomplish these objectives, the State's surveillance network was significantly modified in 1987 to integrate ambient monitoring for toxic and conventional water quality parameters in three media (water column, sediment, and macroinvertebrates). This program modification, called Rotating Intensive Basin Studies (RIBS), is designed with the following objectives:

1. locate and identify water quality problems;
2. develop a water quality baseline for assessing trends;
3. expand knowledge of water quality cause and effect relationships (i.e., assess bioavailability of inplace toxics and effects of land use patterns, geology, and airborne contaminants);
4. provide data to support recommendations concerning water quality management; also assess policy impacts.

Sampling locations are selected using five principal considerations:

1. major international or interstate waters (to provide information on boundary transport of pollutants);
2. critical water use areas (e.g., public water supplies, recreational areas where there is considerable human contact, and important wildlife habitats);
3. areas of significant industrial or municipal usage and/or discharge;
4. stream segments with localized problems identified by Regional Offices or other program units;
5. stream segments which are considered "background", i.e., are upstream of significant anthropogenic sources of pollutants.

The major drainage basins of the state have been divided into three groups which balance anticipated workloads. Each grouping is monitored intensively for a two-year period within a six-year cycle. During each two-year study, 24 water column samples are collected at each station and analyzed for metals (cadmium, copper, mercury, nickel, lead, zinc, iron, aluminum, manganese), volatile halogenated organics, nutrients, suspended solids, total and fecal coliform, conductivity, hardness, turbidity dissolved oxygen, pH, and temperature. Six water column samples are used to run toxicity tests with Ceriodaphnia. The water column sampling schedule is designed to increase the frequency of sampling during months which have the greatest hydrological (flow) variability. Two spatial composites of fine-grained surficial sediments are collected and analyzed for metals, organochlorine pesticides, PCBs, total volatile solids, and grain size.

Macroinvertebrates are collected two to six times at each site and analyzed for community structure (species richness, diversity), metals, organochlorine pesticides, and PCBs.

NYSDEC is committed to proper Quality Assurance practices. It is Department policy that there shall be sufficient QA activities to assure that all environmental data will be of known and acceptable quality, scientifically valid, of known precision and accuracy, of acceptable completeness, representativeness and comparability, and where appropriate, legally defensible. NYSDEC's Division of Water employs a quality assurance officer and assistant, both full-time, to manage and conduct this program.

Key field elements for program quality assurance have been submitted to USEPA, or EPA protocols have been adopted when available or appropriate.

Field quality assurance project plans are developed in accord with EPA "Guidance for Preparation of Combined Work/Quality Assurance Project Plans", and reviewed by DEC's QA officer and EPA Region II at Edison. System audits are conducted in the field.

Laboratories providing analytical support must develop QA/QC plans. Performance audits, the use of spiked samples, etc., are conducted with these laboratories. System audits consist of on-site visits for qualitative review of equipment capability and personnel education/training.

The monitoring data are stored in both electronic processing and paper files. The processor is used to transfer data en masse from the analytical laboratory to DEC, and from DEC to the EPA's STORET System. The processor is also used to produce statistical summaries, compare sampling results against criteria or standard values, produce spatial data distributions, and perform a limited amount of data editing and verification. Paper files are used in the process of data editing and verification. This procedure objectively compares parameter results against reasonable values, and subjectively with expected or historical results for that particular sampling location.

The edited data are provided to DEC's permit writers, and are used to assess water quality by comparing it to established ambient standards and guidance values, and by analyzing water quality trends. They are also used in the development of the State's Priority Water Problem List, and in selection of locations for intensive integrated surveys. Additionally, data are made available outside the Department upon request.

Biennial reports are produced from the RIBS data. They are designed to provide a general overview of the sampling program to the public, federal and state agencies, and interested parties. These reports include data analysis, sampling and laboratory methodologies, network descriptions, quality control guidelines, standards and guidance values used to determine trends or detrimental water conditions, and data listings. These reports will be used along with other evaluated data to compile the water quality assessment for the State's 305(b) report, and its Priority Water Problems List.

New York's fish flesh monitoring program for Lake Ontario is composed of two elements:

1. contaminant trend surveillance;
2. contaminant source identification with the use of young-of-the-year fish.

The former program is a core program of the Division of Fish and Wildlife which documents changes in chemical contaminant levels in selected Lake Ontario fish species with time. In addition to trend surveillance, the data are evaluated by the New York State Department of Health for risk to human consumers. The data are also useful for predicting when sampling efforts may need to be intensified, or other species should be examined.

Collections are made on a biennial basis because of the time required to produce meaningful changes in contaminant concentrations in adult fish. These changes frequently require one to three years to manifest themselves once a contaminant source is eliminated.

Parameters examined and recorded in the field are: species; location; collection date; collection method; collection agents; fish length; weight; age; and sex. The Hale Creek Field Station Analytical Services Laboratory determines and records lipid content, PCBs, mirex, photomirex, DDT and metabolites, HCB, dieldrin, endrin, aldrin, chlordane and its degradation products, heptachlor, heptachlor epoxide, nonachlor, and hexachlorocyclohexanes. A subsample is shipped to the NYS Department of Health for TCDD analysis.

For the latter element, in the years 1984 through 1987, New York conducted a program called Great Lakes Nearshore Fish Contaminant Surveillance. The objectives of this program were:

1. document changes in contaminant levels in fish which reflect recent inputs to local aquatic ecosystems;
2. provide an enforcement mechanism for the control of point and nonpoint sources of chemical contamination.

Fish act as integrators of chemical contaminant inputs to their ecosystem. In addition, fish are the most probable source of significant chemical ingestion for a variety of bioaccumulative compounds. Most chemical contaminant trend monitoring programs address species consumed by man. The analyses are conducted on mature or older, more migratory individuals which represent exposure to contaminants over a long period of time, and from diverse locations. In contrast, this program directed itself toward young spottail shiners, which reflect recent contaminant exposure and inputs. In addition, the young spottail shiners have a limited home range, usually specific to the area in which they were hatched (i.e., within 0.5 miles of collection site).

Samples consisted of young-of-year spottail shiners collected from the mouths of major tributaries of the Great Lakes, or near significant potential sources of environmental contaminants. Sampling time was late summer/early fall of each year.

Parameters monitored include individual length and composite weight of the fish, sampling date, and the several chemicals listed above in the Contaminant Trends study.

Renewal of this program in 1989 and beyond will depend upon the availability of funding.

From 1982 through 1984, NYSDEC conducted a special study on chemical contaminants in New York furbearers. The objective of this study was to compare organochlorine and mercury residues in wild mink and otter with those of fish from the state's Toxic Substances Monitoring Program. Results indicated a significant correlation for PCBs and p,p'-DDE in fish and both mammalian species when the collection stations were less than 20 km apart. The correlation for mercury was significant on the basis of major watershed.

O. Stream Classification Program

Under Section 303(c) of the Clean Water Act, states are required to review and revise, if necessary, water body classifications, water quality criteria, and associated general policies, at least once every three years. Together, water body classifications (uses) and water quality criteria establish the water quality goals of a water body. At a minimum, the goal for all state waters must be to provide water quality for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water; or the state must complete a use attainability analysis (UAA) where this water quality goal is not attainable. A UAA is a structured scientific assessment of the factors affecting the attainment of the use, which may include physical, chemical, biological, and economic factors. The results of the review/revision, and a certification that revisions have been duly adopted pursuant to state law must be submitted to EPA for review and approval.

New York's Environmental Conservation Law provides, among other things, that the state's waters, both surface and underground, be grouped into classes in accordance with best usage, and standards of quality and purity be assigned to each class.

In adopting the classifications of waters and the standards of purity and quality assigned to each, consideration is to be given to the physical characteristics of the waterbody, the character of the district bordering said waters, the uses which have been made, are being made, or may be made of said waters, and the extent of defilement or fouling of the water by past discharges.

Classes are assigned according to best usages, which range from potable down through contact recreation and fishing (including fish propagation). Standards are set, in surface waterbodies, for both fresh and saline waters.

Classifications and standards are considered, in the state's water pollution control program, not to define the current quality of the water, but to be an objective in the conduct of the program.

The Environmental Conservation Law provides for periodic review and consideration for reclassification of the various lakes, ponds, and streams in the state. Such periodic review takes into consideration changes that would influence best usage of the water, including improvement in quality brought about by implementation of the state's water pollution control program, and changes in the character of the surrounding area. The public participation process is brought to bear in this endeavor.

Reclassification is usually conducted on a basinwide basis. The new classification of any particular lake, pond, or stream, or of any segment of lake, pond, or stream becomes official when, following approval by the State Environmental Board, it is filed as Regulation with New York's Secretary of State.

Reclassification hearings for the Black River, Lake Ontario, and Seneca-Oneida-Oswego Sub-Basins in the Lake Ontario Drainage Basin are tentatively scheduled for 1989.

The hearing for the Genesee River Sub-Basin was conducted in July, 1988. Formal reclassification usually occurs four to six months after the hearing.

P. Potable Water

On the United States side of Lake Ontario there are thirteen Community Public Water Systems (CPWS) which use Lake Ontario as a raw water source. 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". Table 1 lists these systems, and Figure IV-5 identifies the approximate location of each.

Under the Safe Drinking Water Act (SDWA), the USEPA delegated primary enforcement responsibility for the Public Water System Supervision (PWSS) program to the New York State Department of Health (NYSDOH). Under this delegation, NYSDOH is responsible for assuring that all public water systems are in compliance with the National Primary Drinking Water Regulations (NPDWR) promulgated under the authority of the SDWA. In accordance with the NPDWR, all CPWS are required to monitor for microbiological, inorganic, organic, and radiological contaminants. Table 2 lists the maximum contaminant levels (MCLs) established for inorganics, organics, and radionuclides in drinking water. CPWS are required to have their drinking water analyzed by a NYSDOH certified laboratory, and to submit the results of these analyses to the local health office.

A description of the NYSDOH PWSS program is included as Attachment I.

Federal and State roles in monitoring and assuring compliance with the NPDWR are defined in the NYSDOH/USEPA Memorandum of Understanding for Enforcement. In part, these include the following:

- Criteria by which systems in violation of the NPDWR are classified as Significant Non-Compliers (SNC) by EPA, and a description of appropriate actions for NYSDOH to take in response to instances of significant non-compliance;

- Quarterly submittal by NYSDOH of a Significant Non-Complier status report (SNCR);

- Quarterly USEPA and NYSDOH meetings regarding all systems on the SNCR;

- Criteria for which direct USEPA enforcement is appropriate.

At present, all CPWS on Table 1 are in compliance with the drinking water standards listed in Table 2.

The SDWA was amended in 1986, putting the USEPA on a rigorous schedule to develop 83 drinking water standards by June, 1989 (see Table 3). On July 17, 1987, the USEPA promulgated primary drinking water standards, also referred to as MCLs, for eight Volatile Organic Chemicals (VOCs) on the list of 83 contaminants. These eight VOCs and their respective standards are listed in Table 4. The regulations promulgated on July 17, 1987 require all CPWS to complete one year of quarterly monitoring for these VOCs by December 31, 1991, according to the following schedule:

<u>CPWS Population Served</u>	<u>Complete Monitoring By:</u>
Greater than 10,000	December 31, 1988
3,300 to 10,000	December 31, 1989
Less than 3,300	December 31, 1991

In addition to the monitoring requirements for the eight VOCs, all CPWS are also required to monitor for up to 51 unregulated organics (Table 5), also according to the schedule above. NYSDOH has, under its option to be more stringent, adopted in November 1988 a generic standard for these unregulated organics of five parts per billion (ppb) for all except the trihalomethanes and naphthalene.

Four of the thirteen CPWS utilizing Lake Ontario serve a population of over 10,000 persons (Brockport Village, Monroe County Water Authority, the Metropolitan Water Board and Oswego City). Therefore, for these systems the initial data bases of regulated VOCs and unregulated organics will be completed by early 1989, and at that time will give a better indication of any organic contamination of Lake Ontario water supply systems.

USEPA will be promulgating additional primary drinking water regulations over the next few years, to cover the remaining seventy-five contaminants specified for regulation. These regulations will include both MCLs as well as monitoring requirements, so that the data base on toxic contaminants in Lake Ontario will be greatly expanded. There have been some special studies with limited monitoring of certain organics such as 2,3,7,8-TCDD (Dioxin) from systems using Lake Ontario, but to date no contraventions of health advisories or drinking water guidelines have been encountered.

TABLE 1

Community Public Water Systems in New York State Which Use Lake Ontario as a Raw Water Source

SYSTEM NAME	POPULATION	COUNTY
Lyndonville Village	960	Orleans
Albion Village	5,800	Orleans
Brockport Village	10,800	Monroe
Monroe County Water Authority	260,000	Monroe
Ontario Town Water District	5,800	Wayne
Williamson Water District	5,500	Wayne
Sodus Village	1,800	Wayne
Sodus Point Village	1,300	Wayne
Wolcott Village	1,500	Wayne
Metropolitan Water Board (wholesaler)	70,000	Oswego
Oswego City	28,800	Oswego
Sackets Harbor Village	1,200	Jefferson
Chaumont Village	625	Jefferson

TABLE 2

Primary Drinking Water Standards
(values given in mg/l unless otherwise specified)

NAME	NYS MCL	FEDERAL MCL
INORGANIC		
Arsenic	0.05	0.05
Barium	1.00	1.00
Cadmium	0.010	0.01
Chromium	0.05	0.05
Lead	0.05	0.05
Mercury	0.002	0.002
Selenium	0.01	0.01
Silver	0.05	0.05
Fluoride	2.2	4.0
Nitrate	10.0	10.0
ORGANIC		
Endrin	0.0002	0.0002
Lindane	0.004	0.004
Methoxychlor	0.1	0.1
Toxaphene	0.005	0.005
Chlorophenoxys:		
2,4-D	0.1	0.1
2,4,5-TP Silvex	0.01	0.01
Total trihalomethanes	0.10	0.10
RADIOLOGICAL		
Combined radium-226 and radium-228	5 pCi/l	5 pCi/l
Gross alpha particle activity (including radium-226 but excluding radon and uranium)	15 pCi/l	15 pCi/l
Beta particle and photon radioactivity from manmade radionuclides	4 mrem/yr	4 mrem/yr

TABLE 3

Contaminants Required to be Regulated under the SDWA of 1986

Volatile Organic Chemicals

Trichloroethylene	Benzene
Tetrachloroethylene	Chlorobenzene
Carbon tetrachloride	Dichlorobenzene
1,1,1-Trichloroethane	Trichlorobenzene
1,2-Dichloroethane	1,1-Dichloroethylene
Vinyl chloride	trans-1,2-Dichloroethylene
Methylene chloride	cis-1,2-Dichloroethylene
Ethylbenzene	Styrene

Microbiology and Turbidity

Total coliforms	Viruses
Turbidity	Standard plate count
Giardia lamblia	Legionella

Inorganics

Arsenic	Mercury	Asbestos	Thallium
Barium	Nitrate	Sulfate	Beryllium
Cadmium	Selenium	Copper	Cyanide
Chromium	Fluoride	Nickel	Nitrite
Lead			Antimony

Organics

Endrin	Heptachlor
Lindane	Heptachlor epoxide
Methoxychlor	Vydate
Toxaphene	Simazine
2,4-D	PAH's
2,4,5-TP	PCB's
Aldicarb	Atrazine
Chlordane	Phthalates
Dalapon	Acrylamide
Diquat	Dibromochloropropane (DBCP)
Endothall	1,2-Dichloropropane
Glyphosate	Pentachlorophenol
Carbofuran	Pichloram
Alachlor	Dinoseb
Epichlorohydrin	Ethylene dibromide (EDB)
Toluene	Xylene
Adipates	Hexachlorocyclopentadiene
2,3,7,8-TCDD (Dioxin)	Aldicarb sulfoxide
1,1,2-Trichloroethane	Aldicarb sulfone

Radionuclides

Radium 226 and 228	Gross alpha particle activity
Beta particle and photon radioactivity	
Uranium	Radon

TABLE 4

Standards for Volatile Organic Chemicals and Others
(values given in ug/l unless otherwise specified)

CONTAMINANT	NYS MCL	FEDERAL MCL
Trichloroethylene	5	5
Carbon Tetrachloride	5	5
1,2-Dichloroethane	5	5
Vinyl Chloride	2	2
Benzene	5	5
p-Dichlorobenzene	5	75
1,1-Dichloroethylene	5	7
1,1,1-Trichloroethane	5	200

In addition, the New York State Department of Health has adopted, with an effective date of January 9, 1989, a general standard of 5 ppb (ug/l) for all Principal Organic Contaminants (POCs). Those requiring monitoring are listed below.

benzene
bromobenzene
bromochloromethane
bromomethane
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroethane
chloromethane
2-chlorotoluene
4-chlorotoluene
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachlorobutadiene
isopropylbenzene
p-isopropyltoluene
methylene chloride
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

TABLE 5

Unregulated Contaminants Which Require Monitoring

List 1 -- All systems must monitor for:

Chloroform	1,1-Dichloroethane
Bromodichloromethane	1,2-Dichloropropane
Chlorodibromomethane	1,1,2,2-Tetrachloroethane
Bromoform	Ethylbenzene
trans-1,2-Dichloroethylene	1,3-Dichloropropane
Chlorobenzene	Styrene
m-Dichlorobenzene	Chloromethane
Dichloromethane	Bromomethane
cis-1,2-Dichloroethylene	1,2,3-Trichloropropane
o-Dichlorobenzene	1,1,1,2-Tetrachloroethane
Dibromomethane	Chloroethane
1,1-Dichloropropene	1,1,2-Trichloroethane
Tetrachloroethylene	2,2-Dichloropropane
Toluene	o-Chlorotoluene
p-Xylene	p-Chlorotoluene
o-Xylene	Bromobenzene
m-Xylene	1,3-Dichloropropene

List 2 -- Vulnerable (by State determination) systems must monitor for:

Ethylene dibromide (EDB)
1,2-Dibromo-3-chloropropane (DBCP)

List 3 -- Systems must monitor at State discretion for:

1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene
1,2,4-Trichlorobenzene	p-Isopropyltoluene
1,2,3-Trichlorobenzene	Isopropylbenzene
n-Propylbenzene	Tert-butylbenzene
n-Butylbenzene	Sec-butylbenzene
Naphthalene	Fluorotrichloromethane
Hexachlorobutadiene	Dichlorodifluoromethane
	Bromochloromethane

ATTACHMENT I

BUREAU OF PUBLIC WATER SUPPLY PROTECTION

Consistent with the goal of insuring that a safe and adequate water supply is provided to the residents of New York State, the Bureau of Public Water Supply Protection reports to the Commissioner, through the Division of Environmental Protection, on program developments and accomplishments, industry trends, emergency situations, status of the Federal grant, and enforcement problems. The Bureau manages the Drinking Water Supply Supervision Program in the State, including carrying out the requiremnts of Part 5 of the State Sanitary Code, Article 11 of the Public Health Law, and the Federal Safe Drinking Water Act. Designs for new or improved water supply activities are reviewed including water supply applications, cross connection control, new process designs,and new equipment and materials. Technical assistance is provided to the field in water treatment plant operations, surveillance and monitoring, and water contamination problems. Emergency responses are coordinated and the release of emergency equipment supervised. A Statewide water plant operator training and certification program is managed as well as a certification program for Bottled and Bulk Water Operators and Fluoridation Grant activities. The Bureau is the liason with the Environmental Protection Agency on water supply matters and reports Statewide program developments directly to them through agreement under the Safe Drinking Water Act. These responsibilites are accomplished through the organization as follows:

Bureau of Public Water Supply Protection

The Bureau of Public Water Supply Protection has the primary responsibility for assuring that safe, potable water, in adequate quantities is provided in New York State. This is accomplished through the oversight of local water supply regulatory programs; the training and certification of water supply operators; the maintenance of a data base; development and initiation of enforcement policies;plan review; maintenance of a water quality surveillance program; and providing technical assistance to both local regulatory units and water suppliers.

The Office of the Bureau Director manages and directs the activities of the four sections and one unit of the Bureau; handles legislation, code revisions, grant implementation, budgeting, and administration; provides leadership for implementation of Bureau responsibilities and advises the Division Director of policy matters concerning Bureau programs.

Compliance and Operations Section

The Compliance and Operations Section assures that water systems are adequately operated and maintained; systems are operated and regulated by competent personnel; appropriate actions taken where deficiencies in water supplies exist and safe drinking water is provided during emergencies.

This is accomplished through direct technical assistance on questions of facility operations and emergency response,development and provision of training for water supply operators and certification of qualified individuals, assisting in and/or initiating enforcement actions at deficient water supplies and maintaining a Watch List of problem supplies.

Field Coordination Section

The Field Coordination Section assures that Regional and local health units are aware of Departmental policy and are carrying out the policies; maintains a system data base and solicits public participation wherever appropriate.

The Section maintains constant communications with field staff and is responsible for implementing new Bureau programs,as well as evaluating each Regional Office Water Supply Program. The data base for all public water supplies in New York State is updated and new ways sought to make handling of paperwork easier for all staff. Public participation is sought through the annual Water Week celebrations as well as many other educational/awareness efforts.

Special Studies Section

The Special Studies Section assures that safe, potable drinking water is available through laboratory studies, bottled water program, and implementation of filtration .

The Section coordinates activities with the Wadsworth Center for Laboratories and Research as well as conducting special studies on selected contaminants to determine prevalence. The bottled/bulk water program assures that safe, potable water is available for purchase. The Section will also be providing guidelines and implementing the filtration policy.

Design Section

The Design Section assures that water systems are designed and constructed in compliance with current standards.

The Section reviews all submittals of plans and specifications, engineering reports, cross connection control devise designs, federal aid applications and water supply applications for compliance with standards and current and future water supply needs. Cross connection control device testers are also certified through this section. In addition, the Section is responsible for developing and coordinating our efforts toward assuring an adequate future water supply for New York City.

Water Resources Management Strategy Unit

The Water Resources Management Strategy Unit is responsible for the development of thirteen substate and one statewide water resources management strategy, reviewing and approving watershed rules and regulations, groundwater protection and volatile organic chemical regulations.

The Unit is involved with many interagency coordination efforts as well as participation in hearings and policy development.

BIBLIOGRAPHY

Cartwright, R.H., and J.A. Ziarno. 1980. Chemical Quality of Water from Community Systems in New York; November 1970 to May 1975. Water Resources Investigation 80-77. U.S. Geological Survey. 444pp.

Close, J., K. Slade, and K. Markussen. 1982. Report of 1981 Organic Chemical Surveillance Survey at Community Water Systems in New York State. New York State Department of Health. 52pp.

Code of Federal Regulations: 40; Parts 141 and 142. July, 1987.

Federal Register. Wednesday, July 8, 1987; Part II.

Markussen, K.J. 1988. Personal Communication.

New York State Department of Health. 1976. Mirex Surveillance Sampling. Unpublished data.

New York State Department of Health. 1988 (Feb.). Municipal Water Supplies: Analysis for Dioxins and Dibenzofurans, November 1986. Unpublished data.

New York State Department of Health. 1982. New York State Atlas of Community Water System Sources. 79pp.

New York State Sanitary Code: Title 10; Part 5-1.

Schreiber, J.S. 1979. The Occurrence of Trihalomethanes in Public Water Supply Systems of New York State. New York State Department of Health. 78pp.

Slade, K.E. 1987 (April). Report of Statewide Surveillance of Organic Compounds in Selected Community Water Systems; New York State 1984-1985. 92pp.

U.S. Environmental Protection Agency. Federal Reporting Data System/ Interactive. 1980 through 1987.

U.S.EPA. Health Advisories. March 31, 1987.

U.S.EPA. Interstate Water Carrier Files. 1956 through 1976.

U.S.EPA. Water Quality of Community Water Supplies: 1,000 City Survey. c1979.

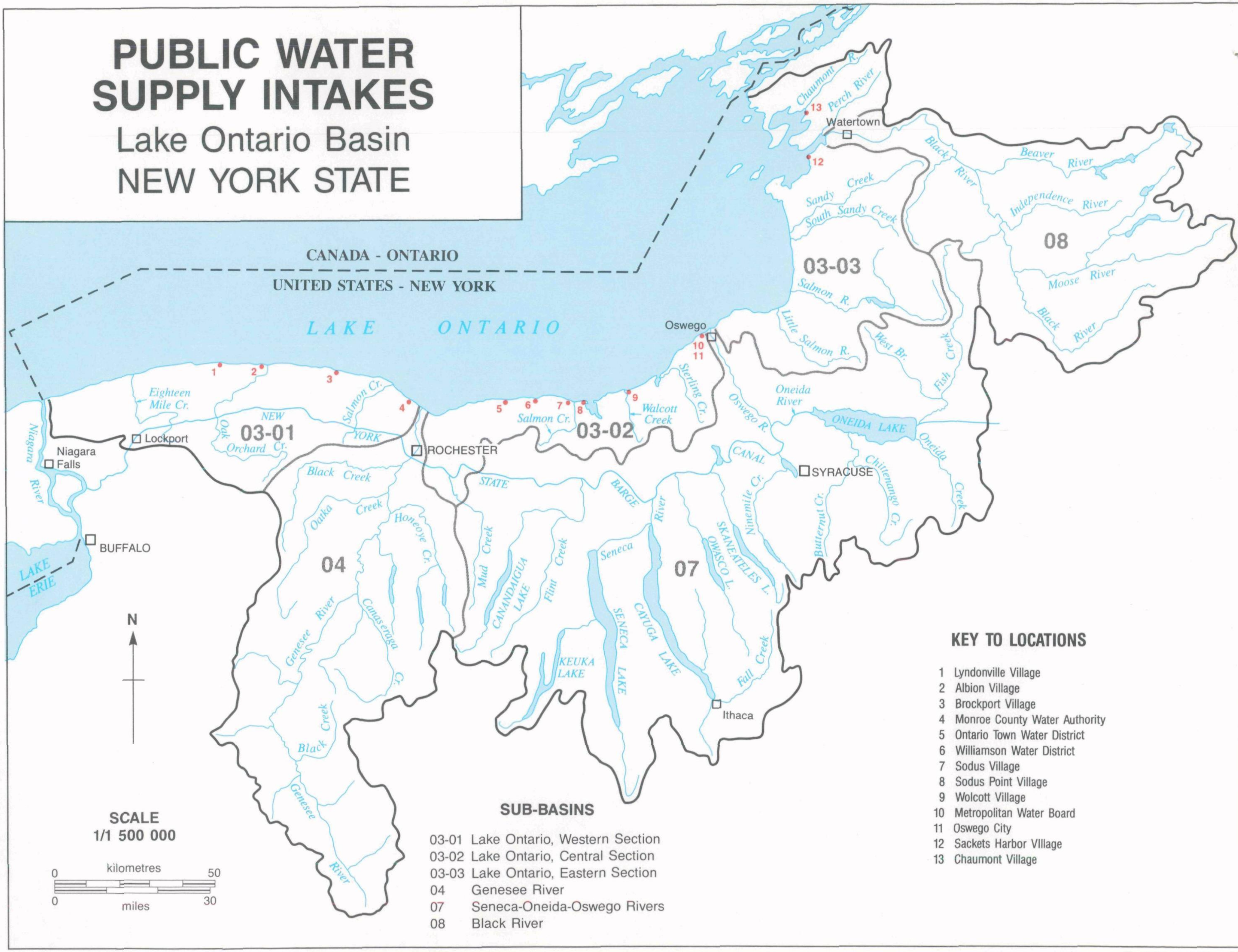


Figure IV - 5

Brock University Cartography

Q. Zero Discharge

Introduction

The Four Parties agree that 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 to reduce or eliminate pollutants before they reach the pipe in the first place.

General

EPA has committed to an aggressive leadership role in incorporating source reduction strategies, as appropriate, into all programs. In conjunction with its newly established Office of Pollution Prevention, EPA will explore ways, through regulation, coordinated Federal/State activity, data collection and analysis, and by identifying research needs and other strategies, to further reduce the levels of discharge to and ambient levels of toxics in Lake Ontario.

The goal of zero discharge, and methods to achieve it are already incorporated into existing regulatory programs. As an initial step, EPA and NYSDEC have identified program activities that can help in reducing toxics in the Lake. The purpose is to leverage these activities for maximum benefit to the Lake Ontario Basin.

Direct and Indirect Industrial Discharges

In accordance with Section 304(m) of the Water Quality Act of 1987, EPA is currently preparing a five year workplan to review and revise Best Available Technology (BAT) guidelines and New Source Performance Standards (NSPS) for direct and indirect industrial discharges subject to regulation under the National Pollution Discharge Elimination System (NPDES). This will be done for selected industrial categories with current BAT or NSPS, and for additional industries where they have yet to be developed.

As national BAT guidelines are developed or revised, DEC will use these to derive discharge limits under its SPDES program, as permits come up for renewal. In the absence of BAT guidelines, DEC will continue to derive its own Best Professional Judgement (BPJ) guideline values for the same purpose. DEC will review all BPJ values on a five-year cycle to insure that they are consistent with newly developed treatment technology, and then incorporate these revised guidelines into its SPDES permit program.

The Four Parties will prepare a letter to EPA recommending the inclusion in the workplan of specific industrial categories, based on their contribution of toxic chemicals to the Lake Ontario ecosystem.

Inactive Hazardous Waste Sites

Section 311 of the Superfund Amendments and Reauthorization Act (SARA) provides for a field-based research and development program to evaluate emerging technologies for the reduction, stabilization or destruction of hazardous waste.

The Superfund Innovative Technologies Evaluation (SITE) Program is a partnership linking toxic material reduction methods with the media and pollutants they have potential to remediate. Twenty one technologies are already being tested, and six field demonstrations have been completed. Inactive hazardous waste sites and areas with contaminated sediments within the Areas of Concern will be evaluated for suitability as demonstration sites, and a list of potential candidate sites will be forwarded to EPA by the Four Parties.

Hazardous Waste Treatment, Storage and Disposal Facilities

The Hazardous and Solid Waste Amendments of 1984 (HSWA) require transport, storage, and disposal facilities to minimize the amounts of hazardous wastes generated. Waste minimization through product substitution, process efficiency, resource recovery and other means is a particularly cost-effective and implementable means of toxics source reduction.

NYSDEC is currently developing regulations that would require a Waste Reduction Impact Statement with any application for a hazardous waste management permit. It would include a detailed facility assessment and an analysis of all potential waste reduction opportunities.

EPA is developing technical assistance documents on performing waste minimization reviews, the use of chemicals in metal parts cleaning, and industry-specific waste reduction methods. NYSDEC is also preparing a Hazardous Waste Reduction Guidance Manual for use by industry.

Additionally, EPA has mandated that nearly one third of all regulated hazardous wastes be treated before being disposed of on land. Part of HSWA implementation, this rule takes effect immediately for the steel and electroplating industries, and certain chemical and other manufacturers. It will affect about 861 million gallons of waste in the U.S. each year.

Pesticides

Recently enacted Amendments to the Federal Insecticide, Fungicide and Rodenticide Act of 1972 (FIFRA) include provisions to retest 600 active ingredients used in nearly 50,000 commercial pesticides. EPA is given nine years to complete the testing. A shifting of the financial burden to the regulated industry is also included in this legislation, as they will be responsible for retesting and disposal costs currently borne by EPA.

In order to take advantage of this new legislation, the Four Parties will assess which pesticides are a concern in Lake Ontario, and recommend the priority retesting of their active ingredients for toxic effects. This information can be factored into decisions on toxics control measures to be instituted for the Lake.

Toxic Substances Control

The Toxic Substances Control Act (TSCA) regulates the manufacture, import and usage of any of the 60,000 commercial chemicals on the TSCA inventory. In implementing this law, EPA has established mechanisms that allow for data collection on substances considered priorities by EPA programs. The Comprehensive Assessment Information Rule (CAIR), just published in the Federal Register, allows for chemicals to be nominated to the CAIR list in support of particular program needs. This allows for the collection of information on the import, manufacture and processing of toxics.

Another source of toxics data is through the EPA Testing Priorities Committee, which has a similar nomination process. Information on testing, analysis, treatment and exposure can be collected, and technical assistance provided, by justifying a program need for additional data.

The Four Parties will evaluate the need for additional data on toxic chemicals of concern, and forward a request for any identified needs to the appropriate TSCA support group.

Household and Commercial Hazardous Waste

Until recently, household waste had nowhere to go but the trash can. Recognizing the potential adverse effects from this individually minor, but collectively major source of toxics has lead to the sponsoring of "cleanup days", when residents can bring hazardous materials to a central collection point for proper disposal. Local sponsors can receive technical assistance from the NYSDEC in their efforts.

Additionally, NYSDEC is developing a manual on permitting, construction and establishment of a permanent waste collection facility.

III. EXISTING PROGRAMS ON THE CANADIAN SIDE OF THE LAKE

A. Direct Industrial Dischargers

The Ontario Ministry of the Environment employs a variety of measures to achieve compliance with its requirements, ranging from voluntary measures, formal programs, Control Orders, Requirements and Direction, Certificates of Approval to prosecution. This will change as MISA will set minimum legal requirements across the province.

The implementation of pollution control is a co-operative federal/provincial endeavour. Under the federal Fisheries Act, national legally binding Regulations and Guidelines set effluent limits for specific industrial sectors. Federal Guidelines set minimum acceptable national standards for existing plants, while Regulations prescribe national effluent limitations for new and expanded plants for various industrial sectors. The only exception is the Federal Regulation for chlor-alkali plants which apply to both existing and new facilities.

Ontario has agreed, under the Federal-Provincial Accord for Environmental Protection, to adopt pollution control requirements which are at least as stringent as the national requirements. Currently, federal effluent Guidelines and Regulations (year of promulgation) apply to: Pulp and Paper (1971), Petroleum Refineries (1973), Metal Mining (1977), Mercury Cell Chloralkali Plants (1977), Metal Finishing (1977) and Meat and Poultry Processing Plants (1977). Under the Fisheries Act Regulations, it is an offence to violate a *regulation* limit while under the Fisheries Act Guidelines, while it is not considered an offence to exceed the *guideline*, there may be potentially an infraction of the general prohibition under the act, prohibiting the deposit (discharge) of deleterious substances into waters frequented by fish. Federal Guidelines are, in fact, statements that indicate which practices will be considered necessary by the Federal government to meet the intent of the Fisheries Act.

Legal Requirements

Legally enforceable Control Orders (which are negotiated) under Section 13 of the Environmental Protection Act may be issued to any existing plant. Control Orders define tasks and compliance dates by which specific tasks must be completed. Legally enforceable Requirements and Directions may also be issued under Section 51 of the Ontario Water Resources Act. The requirements for issuance of these documents are different in the two Acts. For some sources, there are federal Regulation limits.

Design Certificates of Approval (C's of A) for sewage works are issued under the Ontario Water Resources Act. In the past, the C of A was an approval to install pollution control equipment with the design numbers shown in the C of A. Recently, some sewage work approvals have begun to include legally enforceable effluent limits.

Effluent Guideline Limits

Historically, for most sources, Ontario has taken an effluent guidelines approach in setting provincial requirements. This approach, which was incorporated into the "Industrial Guidelines", was based initially on experience with municipal sewage treatment systems. It was presumed that treated industrial effluents should have the same pollutant concentrations as treated municipal effluent. However, since industrial effluents are quite different from municipal effluents in regard to specific pollutants, pollutant concentration and volume flow, application of the same treatment technology did not result in similar treated effluent concentrations. Industrial wastewater effluents in many cases would require dilution by cooling water, etc. to meet the effluent concentrations. Guidelines allow for these differences where similar treatment technology has been installed.

New plants recycle and reuse water to a much greater extent than do older plants. As a result, even when such plants use a highly effective treatment system, the effluent may exceed concentration limits. In these situations, the Ministry sets loading limits on a kilograms discharged per day basis rather than on an effluent concentrations basis.

Ontario also uses a "water quality approach" in setting effluent limits. In the case of biodegradable pollutants, every river or lake has a definable dilution, dispersion or assimilation (self-purification) capacity for non-persistent waste discharges. Water quality considerations take precedence when biodegradable discharges exceed the assimilative capacity of the receiving waters, but are within the limits set by federal Guidelines or Regulations. In these cases more stringent requirements, based on the assimilative capacity, are used to set effluent loading limits. Some plants employ secondary treatment facilities to reduce biodegradable discharges; some of these biodegradable compounds are defined as toxic organics. The degree of biodegradation varies for specific compounds.

Best Professional Judgement Limit

Where there are no legal limits, MOE District Office staff, may set a guideline based on Best Professional Judgement. This incorporates a review of the manufacturing technology, effluent treatment technology and past performance.

Where innovative technology is being tried, Best Professional Judgement limits and/or conditions may be set out in a Certificate of Approval. These limits would then be legally enforceable.

In summary, chemical-specific limits for the various discharges are set in several forms: pollutant concentrations (milligrams per litre), pollutant loadings (kilograms per day), load per unit of production (kilograms related to production rate), and radioactive loadings (becquerels per litre per day). These limits may be based on any of the above rationales.

Compliance

The term 'compliance' in the context of this report indicates that the effluent data recorded in this report are not exceeding the limits for a given parameter, location and time. There may indeed have been violations of Ministry Acts, Regulations and control documents, and ensuing prosecutions during any period in which an industry may have been shown as being in compliance. Spills, for example, may cause violations which are not reported in in this document but are compiled separately.

Non-compliance is currently expressed in terms of the number of times in the calendar year that any discharger exceeds any effluent limit, whether that limit is a guideline, or a legal requirement as explained above.

Based on this current definition of non-compliance the numbers of industries that are out of compliance with monthly and yearly averages are 14 and 18 respectively (see Table 1). In order to provide a comparison with the USEPA reporting system, Ontario divided its industrial dischargers into major and minor dischargers. Status actions being taken by each industry are outlined in Tables 2 and 3.

Using the USEPA system, which entails the reporting of 'significant non-compliance' for the major dischargers, Ontario has seven (7) major direct dischargers compared to thirty-eight (38) on the New York side of Lake Ontario. The number of Ontario major industrial dischargers that are out of compliance based on SNC is three (3) as shown in Table 1.

Future Ministry Approaches to Compliance

The Ministry realizes that due to the varied derivations of current Ministry limits and guidelines that a formal compliance statement is currently difficult. Ministry staff are therefore examining the legal status of all effluent guidelines currently in use with a view to setting a comprehensive compliance assessment and reporting policy prior to the implementation of MISA limits regulations. In conjunction with the development of Ministry limits, compliance assessment will reflect the achievability of appropriate monthly average, weekly, and daily maximum, effluent limits. The limits and Ministry responses to non-compliance will be statistically based and supported by a policy framework. Objective evaluations of the seriousness of non-compliance will be based on the frequency and magnitude of violations.

The Ministry is studying similar approaches used by the United States Environmental Protection Agency and the Great Lakes states under the Clean Water Act with a view to compatibility with our neighbours' reporting practises. There is general consensus that the policy will express a concept of "Significant Non-Compliance" which will assign greater weight to serious or chronic infractions than to marginal or infrequent ones.

MISA Monitoring and Regulatory Progress

The ultimate goal of the MISA Program, announced by the Environment Minister Jim Bradley in June 1986, is the virtual elimination of toxic contaminants from all industrial and municipal effluents. In general, this will be done through two types of Regulations. The first type, Monitoring, will identify toxic contaminant concentrations and loadings. The second regulation, based on Best Available Control Technology Economically Achievable (BATEA), will set limits. Under BATEA, dischargers will be required to establish a minimum level of treatment regardless of location.

Environment Canada, industries, interest groups and the public are consulted in the development of these Regulations. A Joint Technical Committee (JTC), composed of industry and government (both Federal and Provincial) officials, develop monitoring programs to identify and characterize sources of contaminants discharging to surface waters in Ontario from the specific sector, either industrial or municipal, with which the JTC is associated. The JTC also reviews and considers the practical and effective requirements of the Regulations developed by Ministry staff. Policy decisions are the sole responsibility of the Ministry. Extensive public participation is part of the MISA Program. All Regulations in draft form are released for public comment.

The MISA Advisory Committee (MAC), a group of independent technical and environmental people, acts as an effective public advisory body to Environment Minister Jim Bradley. The MAC, created in November 1986, reviews all draft Regulations and provides advice and recommendations to the Minister. MAC representatives are observers at JTC meetings to maintain close liaison on developments in the MISA Program.

The General Effluent Monitoring Regulation was promulgated on June 7, 1988. The General Regulation is a legal description of the requirements for sampling devices, analyses, of flow measurement, the quality assurance and quality control, aquatic toxicity testing protocols (acute and chronic) and, the data handling and reporting.

The first sector regulation, Effluent Monitoring Regulation for the Ontario Petroleum Refineries, was promulgated June 7, 1988. This sector regulation requires both the conventional and trace contaminants to be identified and quantified as well as frequency of sampling of various discharges. A legal reporting requirement is part of the Regulation.

Regulations are under development or planned for each sector. The monitoring regulation will come into force following a public review period and revisions, if necessary. Effluent Limits Regulations for each sector will be developed taking account of monitoring data collected during the monitoring regulation. These are expected to be in place in three years.

Several other major Ministry projects supporting MISA are also well under way. A list of priority pollutants for Ontario was developed, and is entitled the Ontario Effluent Monitoring Priority Pollutants List or EMPPL. EMPPL includes a listing mechanism which recognizes and assigns significance to the environmental effects of a specific compound or pollutant. A study has been done on the availability of private laboratory services in North America. Also, a major study is in progress to assess various socio-economic impacts relating to the implementation of the MISA program for each industrial sector (Economic and Financial Profiles).

The Loans for Environmental Defence (LEND) Program has $150 million available to companies that need assistance to clean up pollution problems. Up to 40% of the cost of clean up is available to companies demonstrating financial need. The terms for these repayable loans will be based on individual circumstances.

TABLE 1

Non-compliance Comparison

ENVIRONMENT ONTARIO DISCHARGE REPORT vs USA EPA SNC
for
Lake Ontario Basin

ENVIRONMENT ONTARIO

Total Sources reporting in 1987 Discharge Report - 29

Companies out of compliance based on monthly averages (MOE) -	18
Companies out of compliance based on annual averages (MOE) -	14

USEPA REPORTING SYSTEM

Major Direct Dischargers* reporting - 7

Companies out of compliance based on SNC format -	3
(based on last reporting period of July to December 1987)	

* Major Discharges definition based on EPA .

prepared October 13/88

TABLE 2

Lake Ontario

Major Dischargers

Beaver Wood Fibre Company	Target loads set by Pulp and Paper Committee consistent with best practicable technology. Section 126 EPA survey completed; technical review by company to be completed June/88. Review by MISA and Order to be drafted Fall 1988.
Dofasco Inc.	Future reductions in suspended solids will be accomplished by eliminating overflows from the #1 Hot Mill Filtration Plant. Cyanide reduction will be acomplished with the installation of a Blast Furnace recirculating water system. Phosphorus exceeded requirement during four months as a result of upsets in By Products plant. Phenol reduced by improved on line treatment time for the Zimpro/HCN tower blow down and will be further reduced by diversion of the Biological Treatment Plant effluent to the Sanitary Sewer.
Domtar Packaging	New paper machine which started up in 1986 resulted in increased wastewater volumes and suspended solids being discharged to the Trent River. New "broke thickener", installed in mid - 1987, has reduced suspended solids in discharge since early 1988. Control Order requiring further improvements in suspended solids reduction nd addressing of effluent toxicity problem will be in place by autumn 1988
Fraser Inc.	Process upsets including equipment breakdown account for exceedances. Target loads set by Pulp and Paper Committee consistent with Best Practicable Technology.
Petro-Canada Products Ltd. (Clarkson)	The values listed on the data sheet for Phenols and Solvent Extractables are sums taken from sampling point 0100 and 0200. All other parameter values are for sample point 0100 exclusively. Partially treated storm water is, on occasion, being discharged directly into Lake Ontario. A program has been devised to enable Petro-Canada to contain and treat, through the water effluent treatment plant, all storm water up to and including the amount produced by a 5-year storm. The program is expected to be completed in 1989. Phase 1 of the program involved installation of a new stormwater basin and effluent sewer line and junction box to divert stormwater effluent to the wastewater treatment completed in Jan 1988. If stormwater continues to be discharged to the lake in 1988, Phase 2 of the program will be initiated.

Stelco Inc.	Since the diversion of #1 and #2 Interceptor sumps, April 1987, ammonia, cyanide and phenol loadings are in compliance. Suspended solids and solvent extractables (oils) will be reduced during 1988 rerouting of the Oil Recovery Plant to the Eastside Filtration plant. Since phosphorus and biochemical oxygen demand are consistently 98% below target loads, these pollutants are not being reported.
The Ontario Paper Company Ltd.	New Control Order appealed.

Minor Dischargers

(... borderline cases - more information may put it into Major Catergory)*

Borg-Warner Chemicals	This waste water treatment plant construction was completed in early 1986. Certificate of Approval 4-003-85-006 issued for plant, July 23, 1985. The revised effluent criteria are to be in force upon completion of construction (early '86). The following table uses actual flow times the actual concentration for the "ACTUAL" figure, and the actual flow times the Certificate of Approval value or set concentrations for the " GUIDELINE ".
BTL Industries Ltd.	Discharge consists of cooling water and surface runoff. The accuracy of historical flow measurement and sampling procedure is suspect. More accurate flow measurement equipment installed for MISA pre-regulation monitoring. Environmental Protection Act Section 126 Provincial Officer's Report being prepared during 1988.
Canadian Canners Ltd.	In compliance. Lagoon is discharged spring and fall.
Celanese Canada Ltd.	Reported data (control point 0100) is for Centre Outfall which carries cooling water, surface drainage and effluent from wastewater treatment plant. Water quality based total COD loading to the North Channel is limited to 1200 lbs (544 kg) per day as established in November 1975 Requirement and Direction. Wastewater treatment plant effluent quality data to be include in future Discharge Summary reports. Wastewater effluent quality data shows plant not to be in compliance january and February 1987; attributed to treatment plant startup acclimatization.
Corby Distilleries Ltd.	Treatment plant operated on an intermittent basis only, during periods of production. Moira R. impact minimal due to high streamflow.
Domtar ConstructionMaterials Ltd.*	Target loads set by Pulp and Paper Committee consistent with Best Practicable Technology. Company connected to the sanitary sewer June 1987.
Domtar Fine Papers*	Company is not in compliance for Biochemical Oxygen Demand loadings. Company is on voluntary program to reduce BOD5 by controlling colloidal solids.

Domtar Wood Preserving	Control Order issued on March 1, 1988 requiring Company to install a wastewater treatment system, surface collection system and a leachate collection system. Domtar has submitted submitted an application for approval of an upgrade to its effluent treatment process. Existing effluent objectives only for carbon filtration system effluent set out in Certificate of Approval #4-081-81 dated September 21st, 1982. Phenols: 20 micrograms/L; maximum loading .014 kg/day. Pentachlorophenol: 100 micrograms/L; maximum loading 0.68 kg/day. Effluent objectives will be reviewed for revision on new Certificate of Approval for upgraded treatment process. New objectives will consider total loading from all discharges. Treatment unit effluent to be added as IMIS reporting location to permit compliance assessment.
Dupont Canada Ltd.*	In compliance.
Eldorado Nuclear Ltd. Port Granby	Decommissioning of the site plans are indefinite. Effluent quality limits are set in AECB operating licence.License limits compliance point changed effective July 1, 1985 to Interceptor effluent. Arsenic exceedances in Feb, Apr, and July are minmal; a flow equilization timer control will be operational June 1/88, and is expected to lower arsenic levels leaving treatment facility.
Eldorado Nuclear Ltd., Port Hope	No flow measurements available - estimates only. Reported is the concentration of specific parameters from control point 02.
Eldorado Nuclear Ltd., Welcome	Decommissioning of the site is indefinite. Effluent quality limits are set in AECB operating licence. Collection ponds re-constructed in 1986 to improve arsenic treatment. Only Radium and Arsenic concentrations in Licence Limits - No loading criteria.
Exolon*	In compliance.
FORD Motor Company	On December 3, 1986, Halton Regional Council approved the discharge from Ford into the Regional sanitary sewer system. A completion date of Jun 30, 1988 is projected for the upgraded chemical pretreatment plant.
Kimberly Clark of Canada Ltd.	Target loads set by Pulp and Paper Committee consistent with best practicable technology. Company is reducing use of recycled paper to improve BOD5 reduction. Company operating polishing lagoons to reduce BOD5. Company expected compliance in 1988.

Ontario Hydro - Lakeview TGS	In compliance.
Ontario Hydro - Pickering N.P.G.D.	In compliance.
Petro-Canada Products Ltd., Trafalgar*	Recent investigations show the company is having a problem with the quality of biomass in the aeration system. A program to correct this is underway and should be completed by the end of 1988.
Stelco Page Hersey Works	In compliance. Company treating effluent for PCB contamination in sand/carbon filter system. Treatment system is approved under REG 11/82 Direction.
Strathcona Paper Company	In compliance. New flow monitoring installation and single outfall installed in 1987.
Texaco Canada Ltd.*	Decommissioning activities ongoing.
Trent Valley Paperboard Mills*	Suspended solids effluent objective of 140 kg/day set out in Certificate of Approval still under review. Receiving water studies have not identified an effluent impact with respect to BOD. Company preparing submission to demonstrate that exisitng effluent quality is equivalent to that from a mill employing optimized 'Best available Technology'.

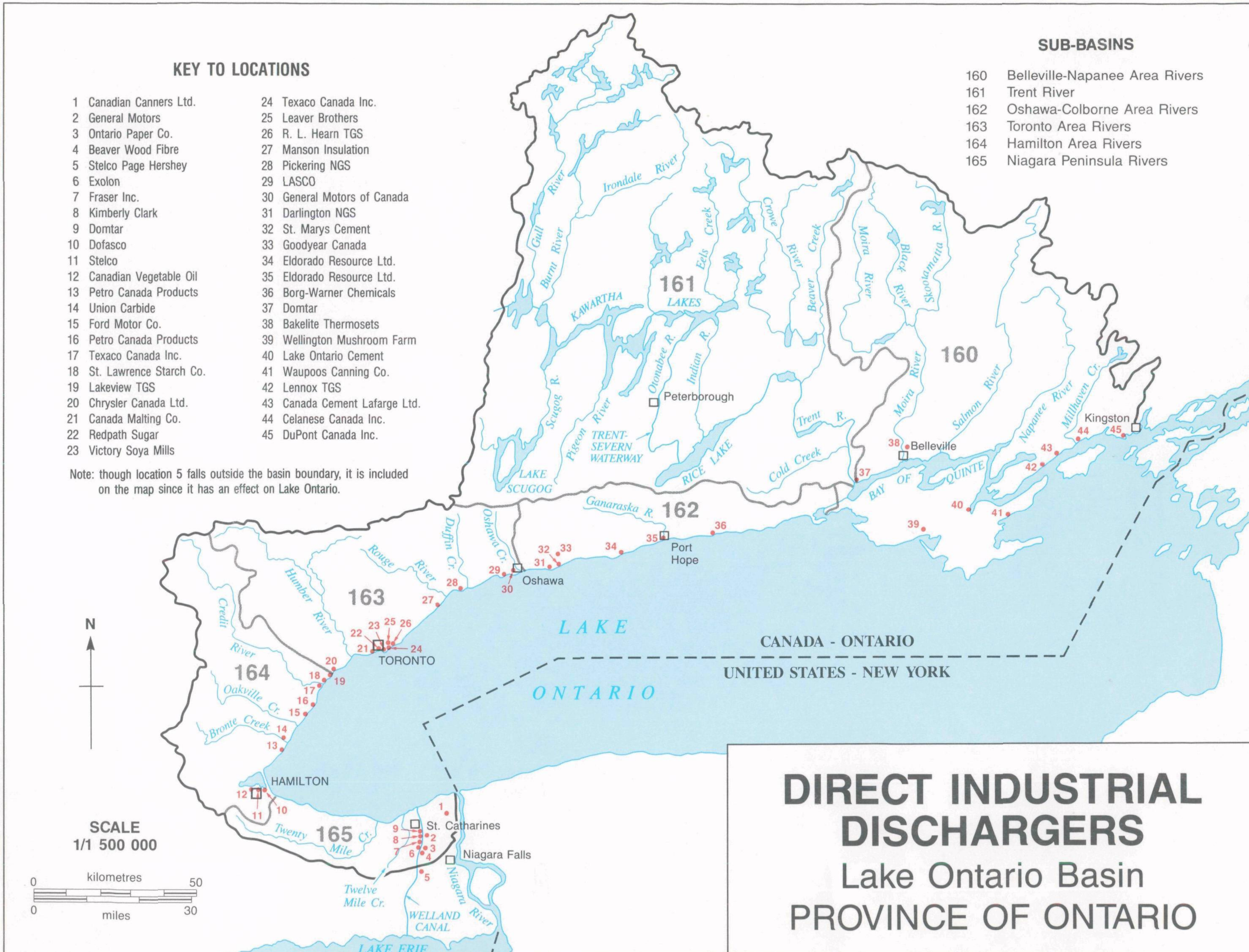

KEY TO LOCATIONS
1 Canadian Canners Ltd.
2 General Motors
3 Ontario Paper Co.
4 Beaver Wood Fibre
5 Stelco Page Hershey
6 Exolon
7 Fraser Inc.
8 Kimberly Clark
9 Domtar
10 Dofasco
11 Stelco
12 Canadian Vegetable Oil
13 Petro Canada Products
14 Union Carbide
15 Ford Motor Co.
16 Petro Canada Products
17 Texaco Canada Inc.
18 St. Lawrence Starch Co.
19 Lakeview TGS
20 Chrysler Canada Ltd.
21 Canada Malting Co.
22 Redpath Sugar
23 Victory Soya Mills
24 Texaco Canada Inc.
25 Leaver Brothers
26 R. L. Hearn TGS
27 Manson Insulation
28 Pickering NGS
29 LASCO
30 General Motors of Canada
31 Darlington NGS
32 St. Marys Cement
33 Goodyear Canada
34 Eldorado Resource Ltd.
35 Eldorado Resource Ltd.
36 Borg-Warner Chemicals
37 Domtar
38 Bakelite Thermosets
39 Wellington Mushroom Farm
40 Lake Ontario Cement
41 Waupoos Canning Co.
42 Lennox TGS
43 Canada Cement Lafarge Ltd.
44 Celanese Canada Inc.
45 DuPont Canada Inc.
Note: though location 5 falls outside the basin boundary, it is included on the map since it has an effect on Lake Ontario.
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
DIRECT INDUSTRIAL DISCHARGERS
Lake Ontario Basin
PROVINCE OF ONTARIO
SCALE
1/1 500 000
kilometres
0
50
miles
0
30
N
LAKE ONTARIO
CANADA - ONTARIO
UNITED STATES - NEW YORK
LAKE ERIE
KAWARTHA LAKES
LAKE SCUGOG
TRENT-SEVERN WATERWAY
RICE LAKE
BAY OF QUINTE
WELLAND CANAL
Peterborough
Belleville
Kingston
Port Hope
Oshawa
TORONTO
HAMILTON
St. Catharines
Niagara Falls
Gull River
Burnt River
Irondale River
Eels Creek
Crowe River
Beaver Creek
Moira River
Black River
Skootamatta R.
Salmon River
Napanee River
Millhaven Cr.
Scugog R.
Pigeon River
Otonabee R.
Indian R.
Trent R.
Cold Creek
Ganaraska R.
Oshawa Cr.
Duffin Cr.
Rouge River
Humber River
Credit River
Oakville Cr.
Bronte Creek
Twenty Mile Cr.
Twelve Mile Cr.
Niagara River
Brock University Cartography

Figure IV - 6

B. INDIRECT INDUSTRIAL DISCHARGES

In the Ontario section of the Great Lakes drainage basin there are 31 municipal sewage treatment plants (STP). These STP's accept wastes from approximately 10,000 industrial, commercial and institutional premises.

Sewage treatment plants are subject to the provisions of the Ontario Water Resources Act and the Environmental Protection Act (Ontario). STP process design, operating criteria and discharge limits for conventional wastewater effluent parameters are prescribed in a Certificate of Approval. Discharge limits are usually specified uniformly on the basis of type of treatment, e.g. secondary treatment, lagoons, etc. More stringent discharge limits based on the local receiving water quality may be required in some instances. These discharge limits are derived from the policies and objectives listed in "Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment (1984)".

Most of the STP's in Ontario use agricultural lands for sludge disposal. This disposal practice is regulated by Regulation 309 of the EP Act and the metal and conventional pollutant limits in the sludge are specified in "Ontario's Guidelines for Sewage Sludge Utilization on Agricultural Lands (1986)". This, consequently, restricts the influent metal concentrations into STP's that use agricultural lands for sludge disposal.

The discharge of industrial, commercial and institutional wastes to STP's is regulated locally by municipalities through the use of an industrial waste bylaw made under the Municipal Act (Ontario). These municipal bylaws are based on a model bylaw developed by a committee composed of members from the Ontario Ministry of the Environment (MOE), Environment Canada and the Municipal Engineers Association (Ontario). The bylaw prescribes limits for conventional pollutants, most metals and some organics. The pollutant limits are set so that there will be no public health or environmental problems in the sewer system or at the STP in the following areas: worker safety, pass through to the receiving water, sludge contamination, and interference with STP processes and equipment.

Hazardous wastes which are discharged to municipal sewers are also regulated under Regulation 309 of the EP Act. All waste generators are required to submit a Generator Registration Report and manifest each hazardous waste discharge to the sewer.

Monitoring and compliance activities are carried out by the local municipality and the MOE. In part, they include the following:

- inspection and compliance sampling of all significant industrial dischargers by the municipality;

- periodic audit of STP operational and effluent data and operations by the MOE;

- inspection and compliance sampling by the MOE of industries where complaints are received from the public or problems are identified by the municipality;

- monthly audit of Regulation 309 Generator Reports and manifests by the MOE.

As part of the Municipal-Industrial Strategy for Abatement (MISA) Program, the Ministry plans to develop effluent limit regulations to control industrial discharges to municipal sewers.

Limits based on the best available pollution control technology economically achievable will be placed on all dischargers within the designated sectors. These limits will be applied on a sector-by-sector basis. The 22 sectors selected to be placed first under BATEA limits are those which discharge the largest loadings of toxics to the sewer system.

BATEA-based discharge limits will be set for those pollutants having the greatest ability to harm human health or damage the environment. Limits will be stated in terms of allowable concentrations and either mass loadings or loadings per unit of production. As pollution abatement technology improves, limits will be revised reflecting the more stringent levels that can be economically achieved.

In addition to stating numerical limits, BATEA regulations will detail other industry control requirements. A section of the regulation will state an industry's responsibility for maintaining operating records, reporting information and notifying municipalities of violations. The steps to be taken following a violation will be defined, and the discharge limit review period will be specified.

Local limits will be developed by the municipalities in accordance with provincially-regulated standardized methods and procedures.

To develop local limits, municipalities must first identify the pollutants present in raw sewage which have a reasonable potential for passing through to receiving waterways, harming the health of sewage treatment plant workers, upsetting plant operation, or contaminating sludge.

The municipality must then determine, using technically-defensible methods, the maximum allowable loadings the sewage treatment plant can receive. Finally, the municipality will allocate the maximum allowable loads to dischargers under a BATEA limit and significant industrial dischargers. These limits must be approved by the Ministry.

Where a local limit and a BATEA limit conflict, the more stringent of the two will be enforced.

C. Municipal Discharges

The MISA (Municipal-Industrial Strategy for Abatement) program is designed to replace existing requirements which control only the conventional parameters associated with municipal and industrial wastewater treatment facilities.

Under the MISA program monitoring regulation for municipal wastewater treatment plant discharges will be developed in 1988. By that time, all municipal facilities will be required to carry out bioassay tests as well as monitoring of specific trace contaminants both metals and organics on a specified frequency. These results are to be reported to the Ministry of the Environment for assessment. Failure to report data will result in prosecution. The reported data will be used to determine concentrations and loading rates attainable by the Best Available Technology economically achievable (BATEA) by municipal sector. These limits will be stipulated in a Effluent Compliance Limit Regulation.

In addition to BATEA, more stringent effluent limits in the form of site specific requirements will be imposed on plants discharging into sensitive receiving water bodies.

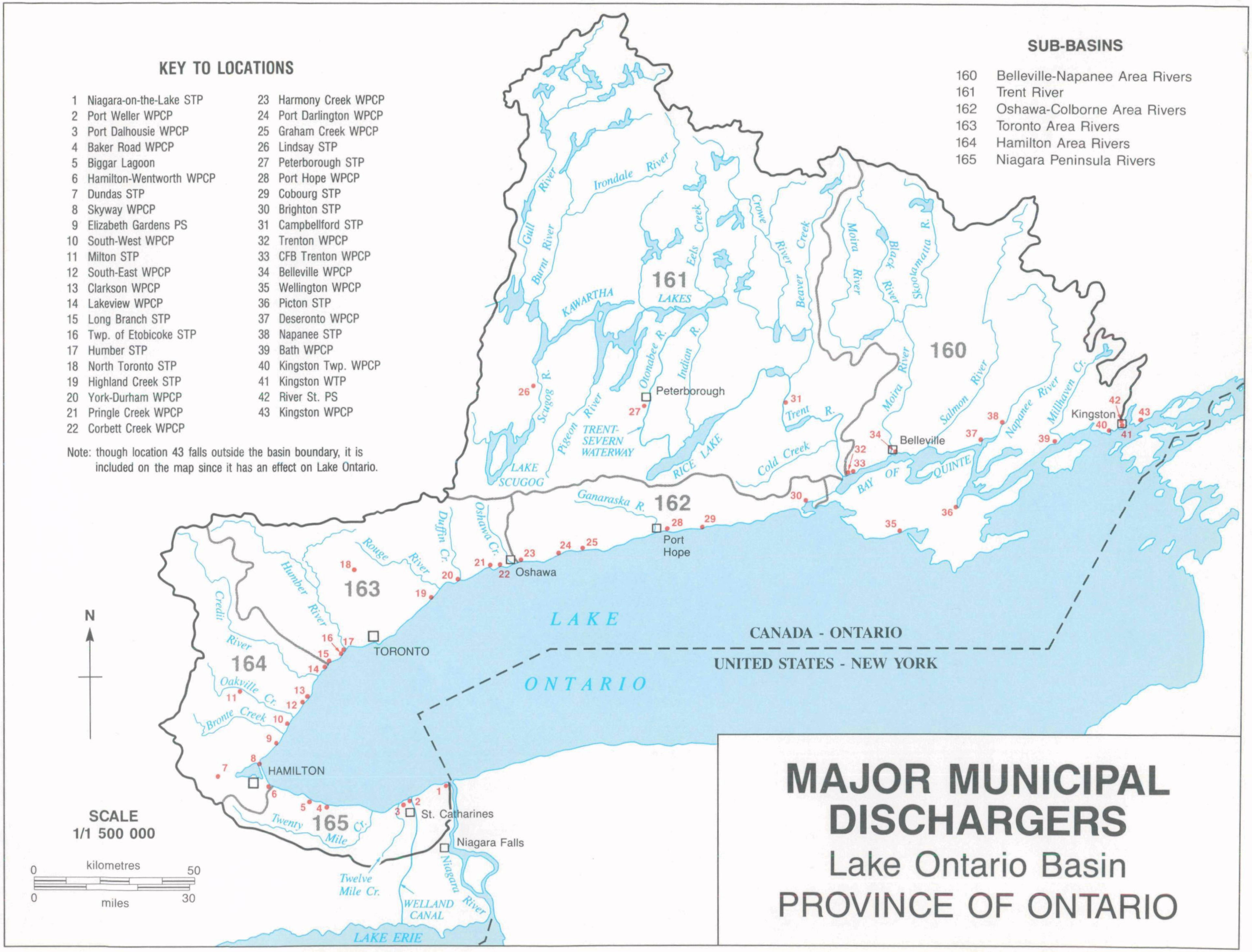


Figure IV - 7

Brock University Cartography

D. WASTE DISPOSAL SITES

Active Sites

All active waste disposal sites (190) must have a Certificate of Approval issued by the Ministry of the Environment (MOE). To get this certificate, a new proposed landfill site may have to undergo public hearings under the Environmental Protection Act and the Environmental Assessment Act. These hearings are designed to allow public input to the waste site selection process and to ensure that the proposed site is environmentally safe if approved for operation.

All active waste disposal sites are inspected routinely by the MOE to ensure that the terms and conditions of the Certificate of Approval are being met while the landfill is active. The owners/operators are responsible for the proper operation of their landfill sites and the MOE has grant assistance programs to help the operators in this task. Landfills not conforming to MOE standards may be closed.

Closed Sites

The Ministry of the Environment (MOE) has records of 510 closed waste disposal sites in the Lake Ontario Basin. A systematic review and gathering of data on each site was started in 1980 and will continue until approximately 1990 to ensure that existing problems at any site are identified and to prevent future problems at those sites that have this potential. Work in this program includes a review of all existing data on each site, field verification of site location, a classification of each site according to its potential to impact the environment, and where warranted, detailed field investigations to determine site hydrogeology and existing surface and groundwater contamination at a site. A monitoring program will be established at sites where the potential exists for off-site impact. As with the active sites, the site owner or past operator will be held responsible for any remedial actions necessary at a closed landfill site.

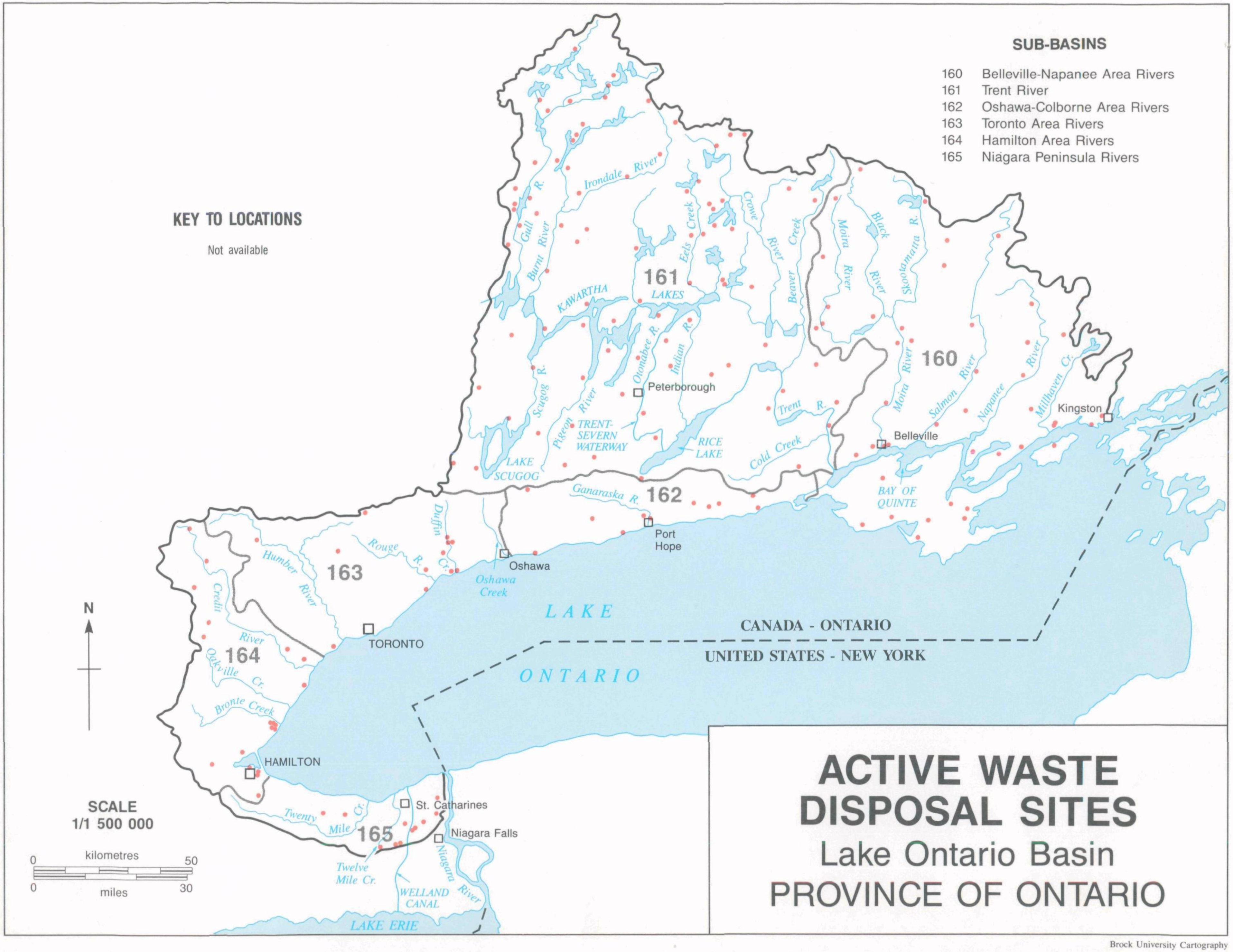

ACTIVE WASTE DISPOSAL SITES
Lake Ontario Basin
PROVINCE OF ONTARIO
SUB-BASINS
160 Belleville-Napanee Area Rivers
161 Trent River
162 Oshawa-Colborne Area Rivers
163 Toronto Area Rivers
164 Hamilton Area Rivers
165 Niagara Peninsula Rivers
KEY TO LOCATIONS
Not available
SCALE
1/1 500 000
kilometres
0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

Figure IV - 8

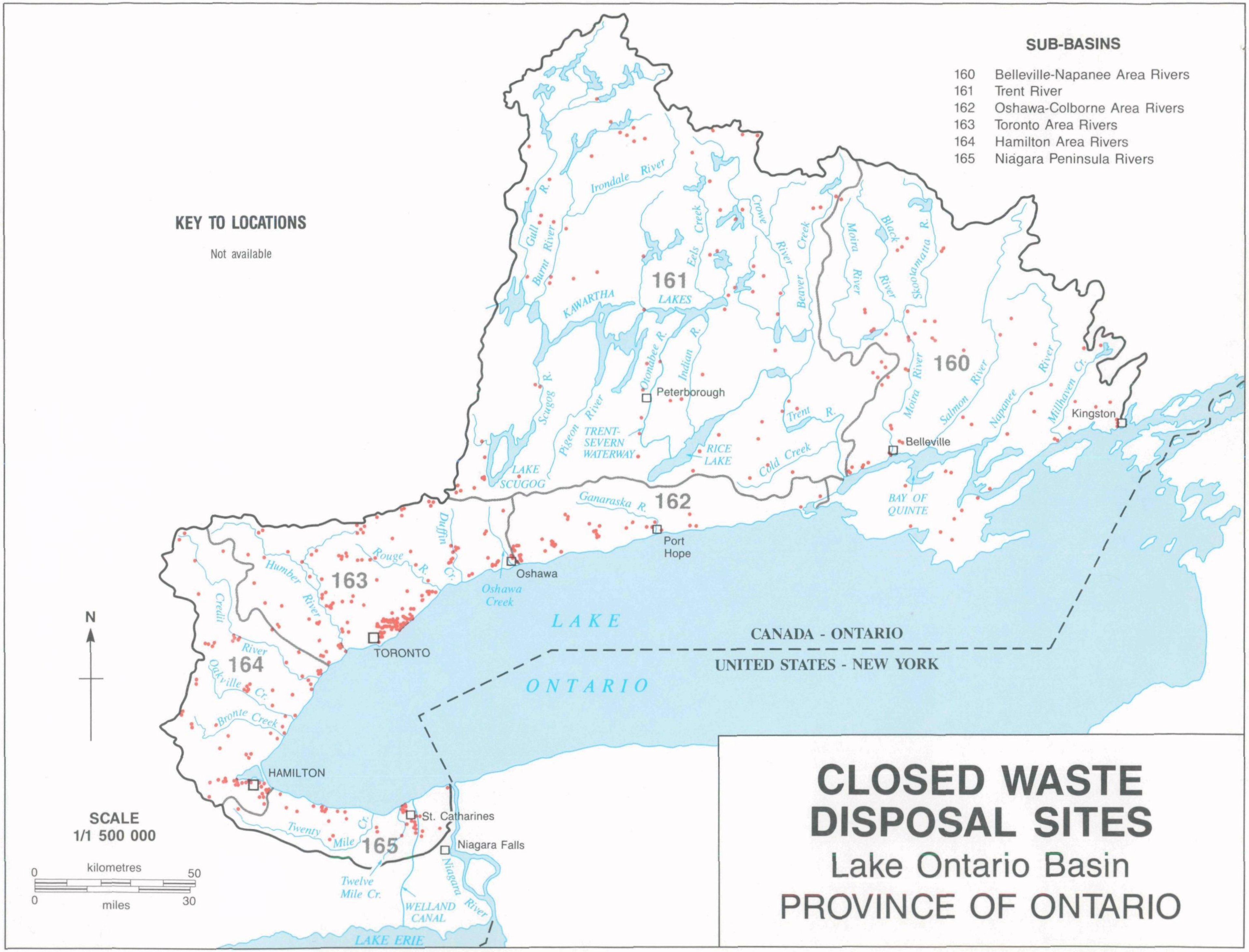


Figure IV - 9

Brock University Cartography

E. Combined Sewer Overflows

The Canadian portion of the Lake Ontario drainage basin is entirely within the province of Ontario. In the basin there are 18 municipalities that are served by combined sewers to various extents. The population served by combined sewers is about 600,000.

Sewer construction requires approval under the Ontario Water Resources Act. After the 1960's, construction of combined sewers is no longer approved for new urban centres.

Combined sewer overflow control is made through financial assistance by the provincial government to municipalities which own the sewers. Three financial assistance programs are in place. They are the Sewer Construction Grant Program, the Pollution Control Planning Study Grant Program and the Metro Toronto Waterfront Water Quality Improvement Program. In addition, a policy is being developed to extend grant eligibility to the control of combined sewer overflow and other pollution sources under an existing provincial program, the Direct Grant Program. More details of the programs are given below.

The Sewer Construction Grant Program is a long-standing one. Separation of combined sewers is eligible for a grant which varies according to the size of the proposed sewer. The grant percentage is 100% of the construction and engineering costs for a sewer of 700 mm diameter. It decreases as the sewer size increases. The program is under review to extend grant eligibility to facilities other than combined sewer separation. Municipalities are actively taking advantage of this program.

The Pollution Control Planning Study Grant Program, initiated in 1984, assists municipalities in the development of area-wide pollution control plans for remedy of urban water pollution. The planning addresses combined sewer overflow and other pollution sources; considers multiple water uses; and encourages coordinated and innovative solutions. Planning projects are in progress in 20 municipalities. Notable examples include the municipalities of St. Catharines, Peterborough and Kingston. $1.2 million are budgeted for this program in FY 1987-88.

The Metro Toronto Program started in 1984. Unlike the first two programs which have province-wide application, this one caters specifically to pollution remedy needs of Metro Toronto, which has the largest population (2.2 million) in Ontario. The program provides grants for pollution control planning studies and construction of remedial works including combined sewer separation. To date, the provincial government has provided $17 million under the program.

The province-wide Direct Grant Program currently provides grants for construction and upgrading of sanitary sewage collection and treatment facilities. The grant is 33% of the construction and engineering costs. A policy is being developed to extend grant eligibility to the control of combined sewer overflow and other pollution sources. It is expected that the enriched program will be available by late 1987 or early 1988.

As part of the Municipal-Industrial Strategy for Abatement (MISA) initiative, the Ontario Ministry of the Environment has planned to develop a policy and guidelines on the control of combined sewer overflows in the next few years.

F. Stormwater Runoff

The Canadian portion of the Lake Ontario basin (see Figure) covers an area of about 2.8 million hectars and has a population of about 4 million. Most of the urban centres in the basin are served by separate storm sewers except the combined sewer areas.

Up to now, pollution control of storm sewer discharges is voluntary. The provincial government, however, encourages and assists municipalities in pollution control through the grant programs described earlier in the "Combined Sewer Overflows" section. In addition, a provincial Urban Drainage Program has been developed with the aim to reduce stormwater runoff impacts from new urban developments as much as possible. The aim will be achieved through good planning at the watershed, subwatershed and subdivision levels; through conservation of natural drainage in developing areas; and erosion and sediment control during construction. The program is voluntary whose principal implementors are municipalities and local conservation authorities. The provincial government will provide technical guidance and technology transfer to the implementors.

The Ontario Ministry of the Environment is developing several initiatives to strengthen pollution control of urban storm sewer discharges. The following outlines the initiatives which are planned to be carried out progressively in the next few years.

Model Sewer-Use ByLaw

The development of a model sewer-use bylaw is nearing completion as part of the Municipal-Industrial Strategy for Abatement (MISA). Among the control of other point sources, the model bylaw proposes pollution control of stormwater discharges from industrial premises on a case-by-case basis. Storm sewer discharges from non-industrial sources will be exempt from control until the need for regulatory control is established and priority sources, for example, industrial wastewaters, are put under control.

Technology Consolidation

Some techniques are available for the estimation of storm sewer pollution loads and treatment efficiencies, but the techniques require specialist knowledge for successful applications. Most stormwater treatment technologies are in their infancy. A series of technology development projects is being planned to consolidate and improve the estimation techniques for universal routine applications. Stormwater treatment technologies will also be reviewed and design manuals will be developed.

Pollution Control Criteria

Existing pollution control criteria are built upon the implicit premise that discharges are continuous and steady. This premise may be true of sanitary and industrial wastewaters but not storm sewer discharges. A planned initiative is to develop storm sewer discharge control criteria that will take into account the highly time-variable and intermittent nature of storm sewer discharges.

Training and Technology Transfer

The plan is to provide training and transfer of technologies of pollution control of storm sewer discharges to staff of the Ontario Ministry of the Environment and to municipal and consulting engineers. The initiative will prepare practising professionals and technologists to take on work of pollution control of storm sewer discharges regardless whether the control will be voluntary or mandatory.

G. Non-Point Sources Agricultural Pollution Management

Different pollutants of agricultural origin include pesticides, bacteria and nutrients from livestock and poultry manure, and nutrients and sediments from eroding crop land. Considerable sediment and pollutant loads have also been found to originate with poorly constructed and maintained municipal drainage ditches.

Although there is a much less intensive program in the Lake Ontario Basin than in the Lake Erie Basin, where the $30 m, 5-year SWEEP program is being implemented, some of the initiatives being used are available throughout Southern Ontario.

The problems are being attacked on several fronts:

(1) Incentives: The Ministry of Agriculture and Food (OMAF) makes grants available for farmers for the construction of environmetally appropriate manure storages and for structural erosion control devices. Engineering assistance is provided.

(2) Education and Demonstration:

OMAF soil conservation advisors work with farmers and farm groups to develop sound, conservation land management practices and to set up local demonstrations to promote them.

(3) Abatement: MOE Regional staff investigate manure pollution incidents, pesticide contamination incidents and well water pollution problems; where warranted legal action is pursued. Currently, MOE and OMAF have developed a set of protocols for determining inter-Ministry responsibilities in resolving such problems.

(4) MOE Rural Beaches Program:

MOE has agreements with the Otonabee and Niagara Region Conservation Authorities to develop remedial strategies addressing rural sources contaminating public beaches.

(5) Drainage Design Construction:

Recently an inter-ministerial committee issued new guidelines for the construction of drains built under the Drainage Act. The design and implementation of these guidelines by municipalities will greatly reduce the erosion and sediment problems experienced with these drains historically.

(6) Pesticides Management: MOE carries out routine responsibilities involving registration of pesticides and education and licencing of pesticide applicators. In addition, MOE analyses for 54 pesticides in samples collected at major Lake Ontario tributary streams. Pesticide fate and pathways models have been developed to assist in developing optional pesticide use strategies.

H. AIR TOXICS

A major pollution challenge is the issue of air toxics. Air is the medium in which the most rapid transport of toxic pollutants can take place. As a result, water bodies like the Great Lakes and in particular Lake Ontario can be impacted by deposition of air toxics emitted from local sources, as well as from sources thousands of kilometres away.

Ontario's existing pollution reduction program is a broad multi-faceted control system which includes a number of elements. Air quality criteria are set based on the lowest of effects on human health, plants, odour perception or property. Corresponding to these criteria, there are 250 ambient air, point of impingement standards, guidelines and provisional guidelines designed to ensure that the air quality criteria are attained. A modelling scheme for evaluating concentrations from stack emissions at the maximum point of impingement is incorporated into the appendix to a Regulation (i.e. Reg. 308) under the Environmental Protection Act. All new or modified sources of emission to the atmosphere are required by the Act to obtain a certificate of approval which is based upon the attainment of the point of impingement standards.

In addition, there is a mobile source emission control program, as well as special regulations designed to control emissions from specific industries. There are abatement procedures including measures to immediately stop activities giving rise to unacceptable emissions, and both stop orders and control orders which specify measures that must be taken over set time periods to reduce emissions.

Ontario also has various measurement programs which can lead to abatement procedures to control toxic emissions. The mobile monitoring group conducts industrial source related surveys each year, measuring downwind ambient concentrations of more than 140 VOCs with two ot its mobile units. In addition, mobile mass spectrometers, the TAGA 3000 and 6000, are also used in surveys to measure more reactive and polar organics.

Exceedence of Ontario standards can lead to abatement procedures. Stack emission testing of major sources (e.g. municipal, hospital incinerators) has led to retrofits, to the mandating of very high levels of control technology for these sources, and to the development of policies requiring specific combustion and emission conditions. There is also a program to examine and evaluate injury and damage to plants and soil contamination resulting from air emissions. Measurements indicating exceedence of normal concentrations in plants and soil can lead to further investigations and abatement.

In addition, there are a number of projects under way aimed at air toxics. These include the development of an emission inventory of toxic compounds for Ontario/Eastern North America and a feasibility study for an inventory of urban toxic emissions. Modelling of the transport and deposition of toxic species is being undertaken on both the mesoscale and the regional scale. A companion data base, containing ambient monitoring data and emissions data is also being assembled for testing the models.

A vector system-based priority setting approach for toxics has been developed utilizing toxicity, exposure and environmental behaviour parameters. In addition, several ambient air, soil and plant monitoring networks are in the development phase.

In total, all these programs contribute to limiting and reducing the total atmospheric burden of a wide range of toxic pollutants to Lake Ontario and the Great Lakes.

Clean Air Program (CAP) - Revision to Regulation 308

Of particular significance to the management of air toxics is the recently proposed revision to the general air pollution regulation (i.e. Regulation 308). The main thrust of the revisions is the reduction of air toxic emissions by application of bottom-of-the-stack controls on all air pollution sources of any appreciable size. It is proposed that appropriate levels of control would be based on the pollutant's toxicity (carcinogenicity, mutagenicity, teratogenicity, sub-lethal effects on mammals, plants and non-mammalian animals and acute lethality), and its environmental behaviour properties (i.e. persistence, bio-accumulation and potential for redistribution into various compartments of the environment from ambient air). Pollutants of highest concern would require the most stringent level of control. Once the appropriate control technology has been selected, there is a requirement to prove that the second line of defence, a satisfactory level of ambient air quality (as defined by air quality standards) has been achieved. This will be done through dispersion modelling, using a newly proposed, state of the art set of models. This modelling package attempts to take into account the full range of meteorological (dispersion) conditions found in the Province of Ontario. The revisions also propose that the operational part of certificates of approval be renewable every 10 years. This would ensure that adequate control of emissions is being maintained and, particularly in the cases of contaminants deemed to be potentially harmful, that controls are updated on a regular basis in line with the latest developments.

If implemented, as proposed, the new regulations would contribute significantly to the reduction of atmospheric impact of air toxics on Lake Ontario and the Great Lakes.

Atmosperic Deposition of Toxic Species to Lake Ontario

Under the auspices of the Acidic Precipitation in Ontario Study (APIOS) the Deposition Monitoring Group of the Air Resources Branch of the Ontario Ministry of the Environment carries out monitoring, which will assist in assessing the importance of atmospheric deposition of a number of chemical species to the Great Lakes. Specifically, three networks are operated:

i) the daily network in which 24-hour precipitation samples are collected at 18 sites. At 10 of these sites, 24-hour filter pack samples are also taken to determine pollutant concentrations in air. The precipitation and filter samples are analyzed for acid-related parameters (e.g. sulphate, nitrate, etc.).

ii) the cumulative network, in which 28-day precipitation samples are collected at 38 sites. At 24 of these sites 28-day filter samples are also taken. These samples are analyzed for acid-related parameters, but the concentrations of a number of metals are also determined, including manganese, nickel, zinc, iron, lead, vanadium, aluminium, copper and cadmium.

iii) the toxics monitoring network which is currently being completed. This network will consist of six sites, at each of which precipitation samples will be collected over a 28-day period, and a 4-day air sample will be collected every second week. The target compounds in this network include DDT, DDD and DDE, PCB, hexachlorobenzene, hexachlorocyclohexane, aldrin, mirex, chlordane and oxychlordane. Sampling of precipitation has taken place at five of the sites for periods ranging between eight months and two years, and air sampling has been carried out at one site for two years. Installation of four further air samplers will take place during July 1988, and the sixth site will be installed during August or September 1988.

Site locations for the three networks are indicated on the attached map. It should be noted that the site selection criteria used in network design were set up to ensure that regionally representative samples are collected. That is, the possibility of contributions from local sources is specifically avoided.

Deposition to Lake Ontario

The toxics network has not yet been in operation long enough for deposition to Lake Ontario to be estimated. For selected metals the estimated loadings are given in Table 1. These estimates were obtained by combining previously published deposition fluxes (Tank et al., 1986) with the surface area of Lake Ontario (19,011 km^2).

TABLE 1

METAL DEPOSITION TO LAKE ONTARIO

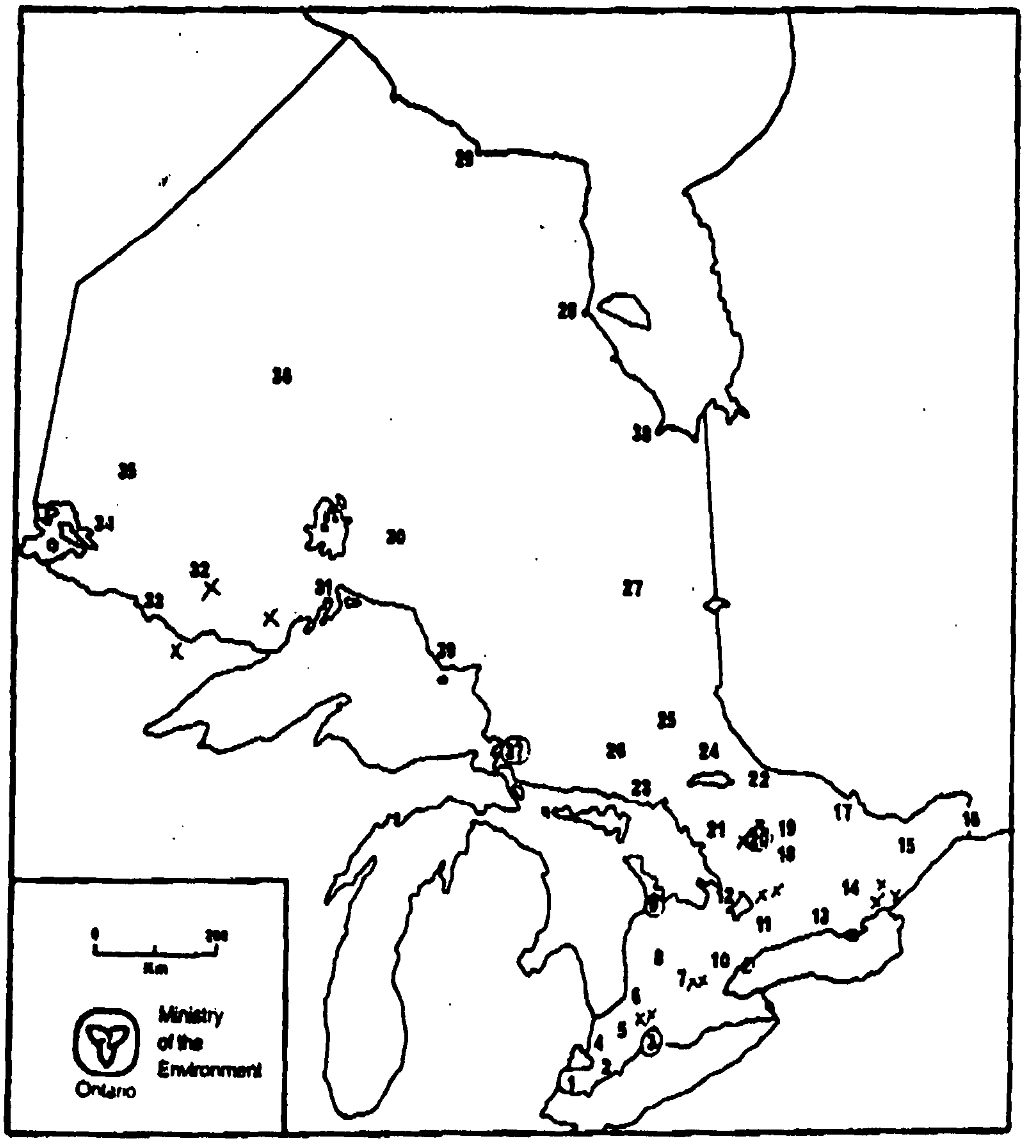
Metal	Annual Deposition (tonne) Wet	Dry	Total
Lead	120	90	210
Cadmium	2.7	0.7	3.4

It should be stressed that the uncertainties are large, particularly for the dry deposition estimates. For this reason, the deposition of other metals has not been calculated. However, an estimate may be made for other metals based on the relative concentrations as reported, for example, in the annual APIOS Deposition Data Summaries.

Integration with Other Agencies

A number of other agencies are concerned with monitoring the input of toxic species to the Great Lakes, specifically including Environment Canada, and the US EPA. This monitoring is mandated under the International Great Lakes Water Quality Agreement, and the monitoring plan is described in Annex 15 of that agreement. Ontario is represented on the working groups charged with implementing Annex 15.

SITE LOCATIONS FOR THE THREE NETWORKS



Cumulative Sites:

1. Colchester*
2. Merlin
3. Pt. Stanley*
4. Wilkesport*
5. Alvinston
6. Huron Park
7. Waterloo
8. Palmerston*
9. Shallow Lake*
10. Milton (removed March '84)
11. Uxbridge*
12. Coldwater
13. Campbellford*
14. Cloyne* (repl. Kaladar, June '83)
15. Smith's Falls*
16. Dalhousie Mills*
17. Golden Lake*
18. Wilberforce
19. Whitney
20. Dorset*
21. McKellar*
22. Mattawa*
23. Killarney*
24. Bear Island
25. Gowganda*
26. Azure Lake (repl. Ramsey, June '83)
27. Moonbeam*
28. Attawapiskat (rem. Feb '84)
29. Winisk (rem. Dec '86)
30. Geraldton (replaced Nakina, Aug '83)
31. Dorion*
32. Quetico Centre*
33. Lac la Croix
34. Experimental Lakes Area
35. Ear Falls*
36. Pickle Lake*
37. Turkey Lake*
38. Moosonee* (installed October '85)
39. Otter Island* (summer only)

* indicates both a wet and dry deposition network site

Daily Sites: X

Toxics Sites: O

The Annex calls for the establishment of two master monitoring sites during 1988/9, one in the U.S., the other in Canada. The U.S. master site is currently being installed at Green Bay in Michigan. The Canadian master site is planned for Point Petre, near Picton, where installation is expected to begin during August 1988. The sixth Ontario toxics monitoring site will allow data from the whole Ontario network to be integrated with data from the Annex 15 master and subsequent subsidiary sites.

Reference

Tang, A.J.S., Ahmed, A. and Lusis, M.A. (1986). Summary: Some Results from the APIOS Atmospheric Deposition Monitoring Program. Report ARB-110-86

I. SPILLS

Early in July of 1985, the Ontario Government announced the proclamation of Part IX of the Environmental Protection Act which was known as the "Spill Bill".

On November 29, 1985, Part IX came into force and on that same day the Ministry's Spill Action Centre (SAC) began phasing in operations.

Part IX of the Environmental Protection Act deals with spills of pollutants discharged:

- into the natural environment;
- from or out of a structure, vehicle or other container;
- that are abnormal in quantity or quality in light of all the circumstances of the discharge,

and which cause or are likely to cause adverse effects as defined in the legislation.

Part IX does the following:

- Establishes prompt and broad notification requirements.
- Establishes a duty on the person having charge, management or control of the spilled pollutant, as well as on the owner, to clean up the spill.
- Provides for liability - for loss and damage as well as costs and expenses - of the owner and person in control of the spilled material.
- Maintains the duties and liabilities of persons who cause or are otherwise responsible for spills under the common law or other statutes.
- Provides for the right of municipalities to respond to spills and for their compensation for cost and expenses from the owner and the person having control of the pollutant.
- Under certain conditions, provides for the authority of the Minister of the Environment to direct his employees or agents to respond to spills.
- Provides for the authority of the minister to issue orders to those liable at law and others who may be able to assist.
- Establishes a right-of-entry for those with a duty, those under order or direction, and municipalities, for the purpose of carrying out their respective duty, order or role as applicable.
- Establishes the right to compensation and a compensation mechanism with respect to directions and orders.
- Provides for the establishment of the Environmental Compensation Corporation.

When a spill occurs, the Canadian federal and provincial agencies which administer safety, transportation or environmental legislation and programs hold the discharger responsible for dealing with it. The discharger is required to report the incident, to obtain and clean up the pollutant or arrange for these actions to be carried out and restore the spill site to essentially pre-spill conditions where this can be reasonably expected.

The role of the Ministry staff sent to investigate spill sites is:

- to determine the nature and extent of environmental damage caused by the spill;
- to evaluate the adequacy of the clean-up and restoration efforts and recommend appropriate procedures where applicable;
- to help enforce the legislated responsibilities imposed on the discharger and others as applicable;
- to document all findings, actions and recommendations.

The Ministry's Investigations and Enforcement Branch Officers are empowered to gather information where it is believed an offence may have been committed under environmental legislation. They may obtain search warrants, seize documents, equipment, and/or material, and where a violation is identified, they will lay charges.

Branch staff are available to respond either on an emergency basis or to a post-incident report. On arrival at the spill site, they search for any indications of negligence and, if evidence is found that suggests further investigation is needed, staff proceed with the full authority granted them under law.

The government of Ontario has established a crown corporation entitled the Environmental Compensation Corporation (ECC). This crown corporation receives applications for compensation from parties who have suffered loss or damage due to a spill and to make compensation payments to such people. The ECC does not replace the role of insurance companies nor does it lessen the legal responsibilities of those involved in a spill. The ECC, however, can help where those sources of compensation are not available. The ECC may also receive applications from owners or controllers that have had to pay compensation to spill victims but were not themselves at fault for the spill.

J. DREDGING AND DREDGED SPOIL DISPOSAL

The classification process differentiates material on the basis of chemical and physical characteristics. The dredged material management options include: open water disposal, disposal on land, and confined disposal.

The dredged material will be classified in one of the following categories:

a) suitable for open-water disposal;
b) suitable for unrestricted use on land;
c) suitable for restricted use on land;
d) contaminated material requiring disposal at a certified confined disposal facility (dewatering permitted);
e) severely contaminated material requiring specialized disposal at a certified confined disposal facility (with no dewatering).

Selection of the disposal alternative is made on a case-by-case basis by following the interim classification procedure.

Open Water Disposal

The quality of dredged material is compared to the Open Water Disposal Guidelines (Table 1). If concentrations are less than these guideline values, open water disposal may be permitted subject to approval of an open water disposal site.

If the concentrations of any of the parameters in Group 1 exceed the Numerical Open Water Disposal Guidelines, open water disposal of the dredged material cannot be undertaken. Averaging of the sample results will not be allowed. Group 2 parameters will be used to assist with the interpretation of the Group 1 parameters and, where metal contamination has been established, to reinforce the requirement for containment of the material.

Where Group 3 parameters have also been required by MOE, approval for open water disposal will be based on both the individual concentrations and/or the average concentration per stratum/layer, i.e., averaging of the concentrations for individual layers will be allowed. If the individual concentrations or the average concentration per stratum for Group 3 parameters is less than the numerical guidelines, the dredged material will be acceptable for open water disposal. Open water disposal of dredged material not meeting the guidelines for Group 3 parameters may be allowed on a case-by-case basis at the discretion of MOE, where the "natural background" concentrations are equal to or greater than those in the dredged material.

Unrestricted Land Use

If the quality of the dredged material exceeds the Open Water Disposal Numerical Guidelines, or open water disposal is not permitted in the water body where the dredging is taking place, then the quality of the dredged material is compared to the Unrestricted Land Use Guidelines (Table 1).

Averaging of the sample results of the Group 1 parameters will not be allowed. If the concentrations of constituents in Group 1 falls within this category, the material may be placed on any lands with the owner's approval, or at an engineered, confined, in-water location. Current land use and/or zoning regulations do not restrict the choice of lands. The dredged material must be properly stabilized after placement. MOE concurrence is required.

The concentrations of the individual metals in Group 3 may be averaged for each stratum if the set of samples is considered to be representative of the area to be dredged. If the average concentration conforms to the Unrestricted Land Use Guideline, the sediments will be deemed acceptable for use on any land, or may be placed at an engineered, confined in-water location.

Where contaminants other than those listed are present in the sediments, the suitability of this material for unrestricted use on land shall be determined by MOE in consultation with the Ontario Ministry of Agriculture and Food.

Restricted Land Use

If the quality of the dredged material exceeds the unrestricted land use guidelines, it is compared to the Restricted Land Use Guidelines (Table 1). Averaging of the sample results will not be allowed. If the concentrations of constituents falls within this category, the dredged material may be used only on lands currently zoned either commercial, industrial, or parkland, or at an engineered, confined in-water disposal location.

The concentration of the individual metals in Group 3 may be averaged on a per stratum basis, if the set of samples is considered to be representative of the area to be dredged. If the average concentration conforms to the Restricted Land Use Guideline, the sediments will be deemed acceptable for use on commercial/industrial land, designated parklands/greenbelts or placement at an engineered, confined in-water disposal location. Where contaminants other than those listed are present in the sediments, the suitability of this material for use on commercial/industrial land shall be determined by MOE.

The dredged material must be properly stabilized after placement. Concurrence is required from MOE, and an inventory of locations where dredged material has been placed will be maintained.

Waste Containment

If the material fails to satisfy the Restricted Land Use Guidelines, it will be classified as waste. In this case, an acid leach test is then required. If the material is shown to be non-hazardous, then it may be disposed of at either an existing certified waste disposal site, or one certified by the Regional Director for the disposal of dredged material only, under the provisions of Regulation 309 of the Environmental Protection Act.

TABLE 1: DREDGED MATERIAL CLASSIFICATION (ug/g dry weight) (Interim)

Parameter	Open Water Disposal (1)	Unrestricted Land Use (2)	Restricted Land Use (3)
Group 1			
Cadmium	1.0	1.6	4.0
Lead	50.0	60.0	500.0
Mercury	0.3	0.5	0.5
PCBs	0.05	2.0	2.0
Group 2			
Loss of weight on ignition	6.0%		
Oil and Grease	1,500.0		
Total Phosphorus	1,000.0		
Total Kjeldahl N	2,000.0		
Ammonia (Total N)	100.0		
Grain Size	-------- characteristics to be reported ----		
Visual Description	-------- characteristics to be reported ----		
Group 3			
Arsenic	8.0	14.0	20.0
Chromium	25.0	120.0	120.0
Cobalt	50.0	20.0	25.0
Copper	25.0	100.0	100.0
Cyanide	0.1		
Iron	10,000.0	35,000.00	35,000.0
Molybdenum		4.0	4.0
Nickel	25.0	32.0	60.0
Selenium		1.6	2.0
Silver	0.5		
Zinc	100.0	220.0	500.0

(1) Rationale for the derivation of open water disposal guidelines discussed in Persaud in Wilkins, 1976.

(2) Rationale for the derivation of unrestricted land use guidelines discussed in OMAF/OMOE/OMH Guidelines for Sewage Sludge Utilization on Agricultural Lands, 1978.

(3) Rationale for the derivation of restricted land use guidelines are based on data provided by the Phytotoxicology Section of Air Resources Branch, MOE.

Additional parameters may be requested by the review agencies because of known discharges.

The MOE is currently developing biologically-based Sediment Quality Guidelines to be used in assessing contaminated sediment from the perspective of protecting water quality, benthic organisms against toxicity, and higher trophic organisms against bioaccumulation of contaminants from sediment via benthic organisms.

Work is well underway and guidelines for the following parameters are expected by March 1989.

TKN
TP
TOC
Arsenic
Cadmium
Chromium
Copper
Iron
Lead
Manganese
Mercury
Nickel
Zinc
Heptachlor
Endrin
Mirex
Aldrin
Chlordane
DDT (total)
p,p-DDT
p,p-DDD
p,p-DDE
p,p-DDT
PCBs
PCB 1254
PCB 1248
PCB 1016
Dieldrin
BHC
α-BHC
β-BHC
γ-BHC
HCB
Heptachlor Epoxide
γ-chlordane
Oil and grease

K. SOLID WASTE

The management of municipal waste in the Lake Ontario Basin is primarily achieved by landfilling methods. There are approximately 190 active landfill sites that receive an average of approximately 2.7 million tonnes per year. The majority of these sites are operating satisfactorily. Approximately a quarter of a million metric tonnes per year of municipal waste is incinerated at two facilities.

In 1981, the MOE implemented a Source Separation Program to financially support municipal recycling efforts. Other programs directed at municipalities were the Waste Management Improvement Program (WMIP) and the Waste Management Master Plan Program (WMMP). In 1987, all of these existing programs, as well as new funding programs were combined into one program called the Comprehensive Funding Program for Waste Management.

The Comprehensive Funding Program (CFP) was announced in April 1987. This funding program has two major components: 4Rs and treatment/disposal. The treatment/disposal component of the CFP included enhanced funding for WMIP and WMMP as well as a new Financial Assistance Program (FAP) directed at assisting municipalities to get from the planning stage to the operational stage of disposal facilities that they own and operate. The 4Rs component of the CFP is directed at both industries and municipalities to encourage diversion of waste from disposal options.

The Municipal Recycling Support Program, which replaced the Source Separation Program, is designed to assist municipalities in their attempts to recover as much material as possible from the waste stream through recycling. This program is aimed at getting the homeowner to separate recyclable materials, such as newspapers, glass and cans, from the regular trash. A new Municipal Recovery Program is available to assist municipalities in establishing facilities for recovering materials from mixed solid waste, or for processing these wastes into useful products, such as fuel or compost. A new Reduce/Reuse program was also introduced to assist municipalities, the private sector or others to implement projects aimed at altering consumer waste generation behaviour, or to help consumers reduce the amount of waste requiring disposal.

All of the above programs are primarily directed at municipalities. Another new program, the Industrial 4Rs Program, is directed specifically at the private sector. This program includes assistance available to industry in the form of technical advice and financial support. MOE financial assistance will help to reduce the costs and risks that industry faces in shifting to more environmentally sound waste management practices required by existing as well as future legislation that will more tightly control industrial discharges.

Proponents eligible for assistance include all industrial and commercial sectors. Projects eligible for assistance include feasibility studies, the implementation of new or expanded projects for the reduction, reuse, recycling and recovery of wastes, process or equipment modification or evaluation or both, demonstration of technology either new to Ontario or novel to industry in general, upgrading operations beyond current industry state-of-the-art, and research. The focus of the program is to support industry in projects that break new ground or reduce risks in the implementation of the 4Rs. Two waste exchanges, namely the Canadian Waste Materials Exchange and the Ontario Waste Exchange, are partially supported by this program.

The Ministry recognizes that some financial assistance is desirable to initiate the practice of special collection and disposal of household hazardous waste (HHW) throughout Ontario.

Accordingly, the Ministry has established a program of grants to encourage and aid municipalities in setting up special collection methods to deal with these wastes. In addition, the document, "Guide to Implementing Household Hazardous Waste Collections" has been produced by the Ministry as a detailed, step by step technical guide to conducting such programs.

The grants are for multi-material collection projects, including waste solvents, paint, medical compounds, pesticides, etc. and are not aimed at any one waste type.

L. SLUDGE DISPOSAL

Sewage sludges usually contain large amounts of phosphorus, together with trace amounts of magnesium, zinc, copper and boron and appreciable amounts of organic matter. In addition, anaerobically digested sludges contain large amounts of ammonium and nitrate nitrogen. There are 7 x 10^6 m^3 of sludge containing 4 to 5% solids, generated annually throughout the Province of Ontario. The sludge (4 x 10^6 m^3) generated in the Lake Ontario basin (57% of the total) is disposed of as follows:

24% (971 x 10^3 m^3) is used in agriculture
57% (2299 x 10^3 m^3) is incinerated
16% (644 x 10^3 m^3) is landfilled
2% (86 x 10^3 m^3) is placed in drying beds

Metals in sewer sludge of concern to agriculture in Ontario are arsenic, cadmium, cobalt, chromium, copper, mercury, molybdenum, nickel, lead, selenium and zinc. Critera for these metals are shown in Tables 1 and 2.

TABLE 1

METAL CRITERIA FOR FLUID ANAEROBICALLY DIGESTED SEWAGE SLUDGES

1 Metal	2 Mean Total Content of Uncontaminated Ontario Soils (ug/g)*	Maximum Permissible Metal Content Recommended in Sludged Soils (ug/g)*	Maximum Permissible Metal Addition to Uncontaminated Soil in Ontario (kg/ha)
Arsenic	7	14	14
Cadmium	0.8	1.8	1.6
Cobalt	5	20	30
Chromium	15	120	210
Copper	25	100	150
Mercury	0.1	0.5	0.8
Molybdenum	2	4	4
Nickel	16	32	32
Lead	15	60	90
Selenium	0.4	1.6	2.4
Zinc	55	220	330

*Based on dry weight at 100°C. The terms ug/g and mg/kg are interchangeable.

TABLE 2

METAL CRITERIA FOR ALL AEROBIC SEWAGE SLUDGES AND FOR ALL DRIED AND DEWATERED ANAEROBIC SEWAGE SLUDGES

Metal	Maximum Permissible Metal Concentration (mg/kg of solids)
Arsenic	170
Cadmium	34
Cobalt	340
Chromium	2800
Copper	1700
Mercury	11
Molybdenum	94
Nickel	420
Lead	1100
Selenium	34
Zinc	4200

M. AMBIENT WATER MONITORING

The collection of data is fundamental both to assessing the nature and extent of toxic chemical contamination in Lake Ontario and to determining the effectiveness of remediation efforts. The necessary information is obtained through specific studies and surveys as well as from more generalized, ongoing surveillance and monitoring activities. A considerable multitude of monitoring and research programs have been and are being conducted within the Lake Ontario Basin by a variety of institutions and jurisdictions. Oriented, as they are, towards specific components of the toxic chemical contamination problem in the Lake, most of them are inadequate to respond to the global problem as defined in the Lake Ontario Toxics Management Plan. However, by examining the results of the various programs, it is possible to discern similarities in trends at the different trophic levels in the Lake that are the target of these programs. This information can then be used to develop a basis for problem definition and a benchmark for ongoing measurement of change.

The following is intended to highlight the major and more recent programs from which much of the interpreted information in the Lake Ontario Toxics Management Plan was derived.

FEDERAL PROGRAMS

Environment Canada

Canada - U.S. Open Lake Surveillance

Five surveillance cruises were conducted on Lake Ontario during 1987 as part of the Great Lakes Intensive Surveillance Program (GLISP).

Interconnecting Channels Water Quality

Niagara River Ambient Monitoring Program
St. Lawrence River Water Quality Monitoring Program

Atmospheric Loading

Environment Canada operates a network of Great Lakes monitoring stations (two on Lake Ontario) measuring trace toxic contaminants in wet precipitation.

Herring Gull Monitoring Program

The Canadian Wildlife Service monitors trace organic contaminants in herring gulls as indicators of contamination in the Great Lakes. This information is supplemented with chemical analysis and assessment of mortality and gross deformities in other wildlife populations.

Fisheries and Oceans Canada

Commercial fish catches are sampled to determine compliance of marketed fish with federal guidelines.

Open Lake, Whole Fish Ecosystem Contaminant Monitoring Program

This program uses two to three species of fish representing various trophic levels to monitor food chain accumulation contaminant trends. Samples are analysed for a wide range of inorganic and organic materials and the work is carried out cooperatively with the U.S.E.P.A. and the U.S.F.W.S..

Fish Health Assessment

This consists of studies of spring spawning white suckers to identify pathological abnormalities.

Hamilton Harbour Fisheries Assessment and Rehabilitation

The program looks at current and future fisheries habitat requirements.

Lake Trout Reproduction

Studies carried out under this program relate physiological and histological responses affecting reproduction to potential contaminant stress.

Contaminants Surveillance

This monitoring program was initiated in 1977 to describe temporal trends of contaminant levels in aquatic ecosystems.

Phytoplankton Monograph

This is a five year project to prepare a monograph on the phytoplankton community structure, productivity, physiology and ecology and on lake dynamics.

Bioassessment

Under this program, phytoplankton bioassay techniques are developed and used to carry out contaminant assessment.

Biological Tissue Archive

The purpose of the activity is to establish a long term tissue archive to facilitate retrospective tissue contaminant analysis.

Long Term Biological Index Monitoring Program

This provides baseline information on the subvertebrate community and on the chemical and physiological environment as a measure of response to changes in water quality resulting from remedial actions.

Provincial Programs

Great Lakes Investigations and Surveillance Program

The Great Lakes surveillance program of the Province of Ontario conducted annually by the Ontario Ministry of the Environment and the Ministry of Natural Resources addresses water quality problems in the nearshore areas of the Great Lakes and their connecting waterways, defining ecosystem effects of municipal and industrial discharges, urban and agricultural drainages and shore-based construction activities. Information based on these activities is published in reports by the Ministry of the Environment and in scientific papers. Pertinent results from these studies are also summarized and submitted to the IJC Water Quality Board for inclusion in its reports to the International Joint Commission.

General goals and objectives of the Great Lakes program can be stated as:

- Assess the quality of the aquatic ecosystem (water quality, sediment quality and biota) in the Great Lakes and connecting waterways to determine water use suitability for aquatic life, recreation and water supply.
- Investigate areas of degradation, and define impact and cause (source) of water use interference.
- Assess the effectiveness of remedial programs and controls and recommend abatement measures.
- Investigate and identify emerging problems; provide early warnings and speedy response to new issues.
- Coordinate and assist in the development of Remedial Action Plans for Great Lakes Areas of Concern and Lakewide Management Plans.
- Develop new approaches and technologies for field data collection, data analysis and presentation, as well as computer simulation and model predictions, all in aid of the objectives as noted above.

- Ensure compliance with the international and the Canada-Ontario Great Lakes Water Quality Agreements and their requirement for annual scientific updates on inputs and conditions of the Great Lakes.

Activities associated with these objectives are in part cost-shared by the federal government under the Canada-Ontario Agreement (COA) on Great Lakes Water Quality.

Great Lakes Site-Specific Investigations

Each year the province conducts site-specific investigations to assess compliance and response to specific controls, to assess water quality trends, and to identify emerging problems generally in accordance with the objectives of Annex II of the Great Lakes Water Quality Agreement. For example, the following major investigations are currently being undertaken in Lake Ontario.

- **Hamilton Harbour Sediment Inputs and Bioassessment:**

In support of the development of the Hamilton Harbour Remedial Action Plan, whole water, effluent and suspended sediment samples were collected during 1988 at 10 sources and the mouth of the ship canal, to identify the quality and quantity of suspended sediments discharged into the bay from tributaries and municipal and industrial discharges. The impact of active sediment sources compared with historical accumulations must be clarified before recommendations concerning remedial options for contaminated sediments can be made. Extensive previous studies have also addressed water, sediments and biota and various cause-effect relationships necessary to develop remedial options.

- **Toronto Main STP Impact Assessment**

Intensive studies were undertaken in the area of the Main STP MISA pilot site at the Toronto waterfront, in 1984, 1986 and 1987. These data provided information on water transport and dispersion in this area of the lake, as well as contaminant levels in the effluents and receiving water. In 1987, large volume water sampling techniques (A.P.L.E.) were used to reduce contaminant detection levels to values low enough to assess the fate and transport of chemicals. Suspended sediments were also collected from the STPs and river mouths, for metal and organic contaminant analysis. Data analysis, modelling and reporting will be completed in 1988/89. This information will assist in the development of new regulations for the discharge of toxic contaminants.

- **Toronto Waterfront: Inventory and Assessment of Contaminants Associated with Suspended Particulates**

Previous investigations into effects of dredging and lakefilling activities have identified metals and organics associated with suspended solids near the lakefilling at the East Headland, in the vicinity of the Main STP discharge, and at the mouth of the Don River. Summaries of recent bed sediment data have identified zones of contaminated sediments within the waterfront area which suggest that, although the impact of suspended solids inputs on water quality tends to be localized, the potential exists for impacts on area sediment quality and aquatic biota. During 1986, suspended particulate samples were collected near river and STP inputs (Mimico Cr., Humber R., Don R., Humber STP, Main STP) and the East Headland and analyzed for physical parameters, nutrients, trace metals and PCB/organochlorine components.

- **Metro Toronto Waterfront - Trace Contaminant Inputs From CSO's and Storm Sewers**

In developing the Toronto Waterfront Remedial Action Plan, it was recognized that data for various contaminant inputs to the waterfront were inadequate for accurately assessing the relevant significance of pollution sources.

The first phase of this study will quantify the dry weather loading estimates for a number of contaminants from priority outfalls along the Toronto waterfront. Data will be used in whole lake and nearshore modelling programs which will examine the possible transport of contaminants to recreational areas, and water intakes. The fate of these contaminants and their relative distributions in suspended and bottom sediments, fish and biota will also be modelled.

- **Port Hope Harbour: Contaminant Loadings**

To assess the need for further control measures, suspended sediments in Port Hope Harbour and effluents from Eldorado Nuclear were assessed for particle-associated contaminants (PCBs, metals, radionuclides).

- **Bay of Quinte Toxic Contaminants**

Water, sediments and biota were surveyed during 1988 in the Bay of Quinte to assist in formulating specific abatement options for trace contaminants in the Bay of Quinte Remedial Action Plan. These samples were analyzed for heavy metals and organic contaminants to determine active sources of contaminants (including sediment mobilization), to estimate annual loads and to determine short-term trends.

- **St. Lawrence River Mass Balance**

Whole water and suspended sediments were sampled at various locations in the St. Lawrence River to determine the relative significance of contaminant loadings from Lake Ontario vs. local inputs at the Cornwall/Massena area of the river.

Table 1 summarizes the inorganic and organic parameters which are being assessed in the above-noted investigations.

TABLE 1
GREAT LAKES SITE-SPECIFIC INVESTIGATIONS
INORGANIC & ORGANIC PARAMETERS

Parameters	Hamilton Harbour Sediment Inputs and Bioassessment	Toronto Main STP Impact Assessment	TWF: Inventory & Assessment of Contam. Assoc. With Susp. Part.	Metro TW - Trace Contam. Inputs from CSO's and SS	Port Hope Harbour Contaminant Loadings	Bay of Quinte Toxic Contaminants	St. Lawrence Mass Balance
Aluminum	x	x	x	x	x	x	x
Cadmium	x	x	x	x	x	x	x
Mercury	x	x	x	x	x	x	x
Nickel	x	x	x	x	x	x	x
Arsenic	x	x	x	x	x	x	x
Chromium	x	x	x	x	x	x	x
Lead	x	x	x	x	x	x	x
Zinc	x	x	x	x	x	x	x
Copper	x	x	x	x	x	x	x
Iron	x	x	x	x	x	x	x
Selenium	x	x	x	x	x	x	x
Mangenese	x	x	x	x	x	x	x
PCB's/organochlorine pesticides	x	x	x	x	x	x	x
Chlorobenzenes	x	x	x	x		x	x
Chlorophenols		x	x	x		x	x
PAH's		x		x		x	x
Phthalates		x		x			
Phenoxyacid herbicides		x	x	x			
Triazine herbicides		x					
Volatile organics		x		x			
Speciated phenolics				x			
Dioxins/furans						x	
Radionuclides					x		

Long-Term Ambient Water Quality Monitoring

Provincial Water Quality Monitoring Network

The Ministry operates a regular tributary monitoring program comprised of a network of ambient water quality stations at many tributaries flowing into the Great Lakes. The Provincial Water Quality Monitoring Network (PWQMN) was established in 1964 to provide baseline conditions on provincial water quality; information for setting guidelines and objectives and for determining trends through surveillance as an aid to problem identification. The provincial network was expanded from an initial number of 180 sites to 840 during the late 1970's. Similarly, the number of parameters analyzed was also increased. In 1986, approximately 740 active stations were sampled throughout the province, 175 of which are located in the Lake Ontario drainage basin.

Generally, six to twelve samples per year are collected at each site. A core group of parameters is generally collected at each station consistent throughout the province. The group includes conventional parameters and heavy metals such as cadmium, chromium, copper, lead, zinc and mercury. Data on organic contaminants is not collected at most stations.

The Ministry initiated a major sampling effort for pesticides and industrial organic residues in 1979. The program has expanded in stages from analysis of a handful of parameters at a few sites to scans for up to 86 parameters now determined periodically at 81 stations across the province, including 32 stations in the Lake Ontario drainage basin (Table 2). Those parameters found at detectable levels in the basin are shown in Table 3.

Enhanced Tributary Monitoring Program

In addition, the Ministry has carried out the Enhanced Tributary Monitoring Program (ETMP) since 1980 to enhance the precision of annual tributary nutrient and contaminant load estimates from 17 significant Great Lakes tributaries. The five tributaries on Lake Ontario monitored under this program are noted in Table 2. Forty to one hundred event-oriented samples are taken at each station annually. Suspended and bed sediments are also sampled annually for trace metals and organochlorine pestides.

TABLE 2

PROVINCIAL WATER QUALITY NETWORK AND ENHANCED TRIBUTARY MONITORING PROGRAM STATIONS IN THE LAKE ONTARIO DRAINAGE BASIN SAMPLED FOR SOME TOXIC CONTAMINANTS

Tributary	Station Location
*Welland River	At Montrose Bridge
Welland River	New Syphon at Port Robinson
Welland River	At Sinclairville Bridge
Welland River	Lot 25, Con. 7 former Twp. of Binbrook
Chippawa Canal	At Hydro Footbridge Downstream from Whirlpool Road
Welland Canal	At Weir Downstream from Lakeshore Road
*Twelve Mile Creek	At Lakeport Road, St. Catharines
Twelve Mile Creek	Wellandvale Ave., St. Catharines
Twenty Mile Creek	21st Street, Louth Township
Credit River	Highway 5, Brindale
Etobicoke Creek	Highway 2, Long Branch
Etobicoke Creek	At Highway 10, 1.2 miles NW of Snelgrove
Humber River	Lakeshore Road, Toronto
Humber River	Albion Hill, Conservation Area
*Humber River	At Old Mill Road
Don River	Lakeshore Road, Toronto
Don River West	Sheppard Ave., Toronto
*Don River	At Pottery Road
Stouffville Creek	First Road North of Stouffville
Redhill Creek	At Barton Street East, Hamilton
Redhill Creek	Mountainbrow Blvd., Hamilton, Albion Falls
Crowe River	Highway 7, Marmora
Otonabee River	At Brnsforth Bridge, S. of Peterborough
Otonabee River	Highway 7, Peterborough
Otonabee River	Road to Nassau Mills
Otonabee River	At Lock No. 19 Dam, Peterborough
Otonabee River	Lock 25, Lakefield
Clear Lake Outlet	Highway 28, Youngs Point
Jackson Creek	Dalhousie Street, Peterborough
Trent River	Bridge Street bridge, Hastings
*Trent River	New Highway 2 bridge, Trenton
Moira River	Footbridge North of Highway 2, Belleville

*Enhanced Tributary Monitoring Program Locations

TABLE 3

PROVINCIAL WATER QUALITY NETWORK: PESTICIDE AND INDUSTRIAL ORGANIC PARAMETERS

CHLOROBENZENES

1,2,4,5 Tetrachorobenzene
Hexachloroethane
2,3,6 Trichlorotoluene
1,2,3 Trichlorobenzene
1,2,3,4 Tetrachlorobenzene
1,2,4 Trichlorobenzene
1,3,5 Trichlorobenzene
Hexachlorobenzene
Octachlorostyrene
Pentachlorobenzene
Trichlorotoluene

CHLOROPHENOLICS

2,4,5 Trichlorophenol
2,4,6 Trichlorophenol
Pentachlorophenol

ORGANOCHLORINE PESTICIDES AND PCB

Hexachlorocyclohex-Alpha BHC
Hexachlorocyclohex-Gamma BHC
Hexachlorobyclohex-Beta BHC
PCB Total
Aldrin
Dieldrin
Methoxychlor
Heptachlorepoxide
PP-DDE
PP-DDT
PP-DDD
OP-DDT

ORGANOCHLORINE PESTICIDES (continued)

Chlordane, Alpha
Chlordane, Gamma
Endosulfan I
Endosulfan II
Endrin
Endosulfan, Sulphate
Heptachlor
Mirex
Oxychlordane
Simazine

PHENOXY ACID HERBICIDES

Dicamba
Silvex
2,4,5 Trichlorophenoxyacetic

Monitoring of Biota

Ontario's Fish Contaminant Monitoring Program

The Ministry has conducted extensive testing of sportfish since the mid-1970s. To date over 120,000 fish have been analyzed, covering 1500 locations across Ontario, for a wide variety of metals, pesticides and industrial organic compounds. This is the largest continuous contaminants data base on biota in the Great Lakes. The results are published annually in the Guide to Eating Ontario Sportfish. The data in the guide are based on analysis of a skinless, boneless dorsal fillet.

In Lake Ontario, sport fish have been tested at 33 locations. Since 1976 testing has been carried out periodically at the Ganaraska River, which is a notable spawning run for rainbow trout (*Salmo gairdneri*). Similarly, coho salmon (*Oncorhynchus kisutch*) have been tested at the Credit River since 1972, where a regular autumn salmon run occurs. Salmon and trout have also been tested at Jordan Harbour since 1976. The program has gradually expanded and 22 species of fish have been tested throughout Lake Ontario. Parameters include PCBs, mirex, dioxin (2,3,7,8-TCDD) organochlorine pesticides, mercury and other heavy metals.

A principal purpose of the program is to advise anglers about the suitability of consuming fish from particular lakes. The data also indicates temporal and spatial trends in contaminant levels. PCB and OC pesticides have shown general declines in levels throughout the lakes for all species and all contaminants. Mercury levels have declined significantly in Lake St. Clair after the source from the chlor-alkali plant at Dow Chemical was terminated in 1970. In certain cases, the data may also help identify sources of pollutants to Lake Ontario.

Juvenile Fish Contaminants Surveillance

Juvenile fish contaminants surveillance was initiated in the Great Lakes in 1975 utilizing young-of-the-year spottail shiners (*Notropis hudsonius*). The purpose of the program is to establish a data base for spatial and temporal trend assessment, to identify point source areas of concern and use juvenile fish residue data as an early warning system for bioaccumulative material identification. Because of its restricted nearshore habitat, young-of-the-year spottail shiners as a biomonitor can provide site-specific contaminant residue data that may be used for point source identification.

Spottail shiners are important forage fish in the Great Lakes and therefore spottails in particular and forage fish in general represent an important link in contaminant transfer to higher trophic levels.

In 1988, collections were taken from seven sites on Lake Ontario, including Niagara-on-the-Lake, Twelve Mile Creek, Burlington Beach, Credit River, Oshawa Creek, Outlet River and Wolfe Island. Parameter groups tested for include organochlorine pesticides, chlorinated aromatics, chlorinated phenols, mercury, dioxins, dibenzofurans and PAHs.

Nearshore *Cladophora* Monitoring

Between 1980 and 1985 the Ministry annually monitored PCB and trace metal concentrations in the green filamentous alga *Cladophora glomerata* at 10 shoreline sites in Lake Ontario.

Table 4 is a list of the contaminants for which *Cladophora* is analyzed. The Ministry now has five years of sound monitoring data for Lake Ontario. Since 1986, the Ministry has annually sampled a single control site near Prince Edward County.

TABLE 4

CLADOPHORA MONITORING PROGRAM: PARAMETERS ANALYZED

Al	(aluminium)	Mo	(molybdenum)
As	(arsenic)	Na	(sodium)
Ba	(barium)	Ni	(nickel)
B	(boron)	N	(nitrogen)
Be	(beryllium)	Pb	(lead)
Ca	(calcium)	P	(phosphorus)
Cd	(cadmium)	Sb	(antimony)
Cl	(chlorine)	Se	(selenium)
Co	(cobalt)	Sr	(strontium)
Cr	(chromium)	S	(sulphur)
Cu	(copper)	Ti	(titanium)
Fe	(iron)	V	(vanadium)
Hg	(mercury)	Zn	(zinc)
K	(potassium)	PCBs/organochlorine pesticides	
Mg	(magnesium)	chlorinated benzenes	
Mn	(manganese)	chlorinated phenols	

Long-Term Sensing Sites

In 1988-89 the first of a number of long-term sensing sites will be established for detailed ecosystem monitoring, using a variety of biomonitors, located in two critical areas (Fort Erie and Niagara-on-the-Lake). The stations will examine trends, interrelationships and cumulative impacts of organic contaminants (Table 5). "Sensing sites" will serve as monitors with which to gauge levels of contamination of the lake ecosystem as a whole and as a testing ground for potentially useful biomonitoring techniques.

TABLE 5

LONG-TERM SENSING SITES: PARAMETERS ANALYZED

Mercury	PCB's/organochlorine pesticides
Copper	Chlorobenzenes
Nickel	Chlorophenols
Lead	PAH's
Zinc	
Cadmium	
Chromium	
Iron	
Aluminum	
Arsenic	
Selenium	
Manganese	
Barium	

N. DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for 'Objective' exceedence;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants, 11 of which utilize Lake Ontario as a water source, are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data has been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. The prime considerations in the assessment and design of the sampling system are:

i) the sample is an accurate representation of the actual water condition, e.g., raw water has had no chemical treatment;

ii) the water being sampled is not being modified by the sampling system;

iii) the sample tap must be in a clean area of the plant, preferably a lab area;

iv) the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself. The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures. Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Information System

The database contains a "Plant and Distribution System Description", consisting of seven components:

- Process component inventory
- Treatment chemicals utilized
- Process control Measurement information
- Design flow and retention time data
- Distribution system description
- Sampling system description
- A listing of relevant personnel including plant management and operating staff, and appropriate Ministry of the Environment staff.

"Field Data" are collected at the plant and from the distribution system sites on the day of sampling. The field data consist of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

"Laboratory Analytical Data" consists of results from samples gathered from the raw, treated and distribution sampling sites and analyzed for approximately 160 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water, be used in the treatment process or are treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis, however, those that are technically more difficult and/or costly to analyze for are done less frequently. These include Specific Pesticides and Chlorophenols. Total number of tests of bacteriological, conventional, metals and organics in raw and treated waters of Lake Ontario Plants are shown in Table 1. Parameters that are currently being monitored under DWSP are shown in Table II.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will be made and intercomparison data documented.

A catalogue of "Parameter Reference Information" for each substance analyzed on DWSP is included in the database. It documents parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses.

Drinking water quality in Ontario is evaluated against provincial objectives as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). 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. Ontario Drinking Water Objectives and other guidelines are shown in Table II.

TABLE 1

NUMBER OF TESTS CONDUCTED 1A - 1987

Water Treatment Plant	Raw				Treated		
	Bacteriological	Chemistry	Metals	Organics	Bacteriological	Chemistry	Metals
Grimsby	31	198	180	790	32	225	150
Hamilton	44	264	241	1045	44	251	222
Burlington	46	260	243	993	52	296	243
Lakeview	47	259	243	1027	48	295	243
Lorne Park	8	44	40	234	8	50	40
R.L. Clark	43	261	243	919	48	297	243
R.C. Harris	42	259	243	1017	45	229	203
Easterly	45	261	243	1018	48	285	228
Oshawa	32	176	160	224	37	200	160
Deseronto	23	132	120	590	23	150	120
Belleville	30	179	179	669	35	225	179

TABLE II

DRINKING WATER SURVEILLANCE PROGRAM

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML
P/A BOTTLE		0	0
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000
HEXACHLOROETHANE	NG/L	1.000	1900
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000
2,4,6-TRICHLOROPHENOL	NG/L	50.	5000
PENTACHLOROPHENOL	NG/L	50.	60000
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DMSNLESS	N/A	6.5-8.5
FIELD TEMPERATURE	°C	N/A	15 °C
FIELD TURBIDITY	FTU	N/A	1.0
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500
CALCIUM	MG/L	.100	100
CYANIDE	MG/L	.001	.200
CHLORIDE	MG/L	.200	250
COLOUR	TCU	.5	5.0
CONDUCTIVITY	UMHO/CM	1.	400
FLUORIDE	MG/L	.01	2.4
HARDNESS	MG/L	.50	80-100
MAGNESIUM	MG/L	.05	30
SODIUM	MG/L	.20	200
AMMONIUM TOTAL	MG/L	.002	.05
NITRITE	MG/L	.001	1.0

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
TOTAL NITRATES	MG/L	.02	10.
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DMSNLESS	N/A	6.5-8.5
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40
TOTAL SOLIDS	MG/L	1.	500
TURBIDITY	FTU	.02	1.0
METALS			
ALUMINUM	MG/L	.004	.10
ARSENIC	MG/L	.001	.05
BARIUM	MG/L	.001	1.0
BORON	MG/L	.01	5.0
BERYLLIUM	MG/L	.001	.0002
CADMIUM	UG/L	.30	5.0
COBALT	MG/L	.001	1.0
CHROMIUM	UG/L	.001	.05
COPPER	MG/L	.001	1.0
IRON	MG/L	.002	.300
MERCURY	UG/L	.01	1.0
MANGANESE	MG/L	.001	.05
MOLYBDENUM	MG/L	.001	.50
NICKEL	MG/L	.001	.05
LEAD	MG/L	.003	.05
SELENIUM	MG/L	.001	.01
STRONTIUM	MG/L	.001	2.0
URANIUM	UG/L	.02	20.
VANADIUM	MG/L	.001	.10
ZINC	MG/L	.001	5.0
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000
ALPHA CHLORDANE	NG/L	2.0	7000
GAMMA CHLORDANE	NG/L	2.0	7000
DIELDRIN	NG/L	2.0	700
METHOXYCHLOR	NG/L	5.0	100000.
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000
ENDRIN	NG/L	4.0	200
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000
HEPTACHLOR	NG/L	1.0	3000
MIREX	NG/L	5.0	N/A
OXYCHLORDANE	NG/L	2.0	N/A
O,P-DDT	NG/L	5.0	30000

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
PCB	NG/L	20.0	3000
O,P-DDD	NG/L	5.0	N/A
PPDDE	NG/L	1.0	30000
PPDDT	NG/L	5.0	30000
ATRATONE	NG/L	50.	N/A
ALACHLOR	NG/L	500.	35000
ETHLYENE DIBROMIDE	UG/L	.050	50.
HEXACHLOROBENZENE	NG/L	1.0	10.
POLYAROMATIC HYDROCARBONS			
PHENANTHRENE	NG/L	10.0	N/A
ANTHRACENE	NG/L	1.0	N/A
FLUORANTHENE	NG/L	20.0	42000
PYRENE	NG/L	20.0	N/A
BENZO(A)ANTHRACENE	NG/L	20.0	N/A
CHRYSENE	NG/L	50.0	N/A
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A
BENZO(E)PYRENE	NG/L	50.0	N/A
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A
PERYLENE	NG/L	10.0	N/A
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A
BENZO(A)PYRENE	NG/L	5.0	10.0
BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A
BENZO(B)CHRYSENE	NG/L	2.0	N/A
CORONENE	NG/L	10.0	N/A
SPECIFIC PESTICIDES			
TOXAPHENE	NG/L	N/A	5000
AMETRINE	NG/L	50.	300000
ATRAZINE	NG/L	50.	60000
BLADEX	NG/L	100.	10000
PROMETONE	NG/L	50.	52500
PROPAZINE	NG/L	50.	16000
PROMETRYNE	NG/L	50.	1000
SENCOR (METRIBUZIN)	NG/L	100.	80000
SIMAZINE	NG/L	50.	10000
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	280000
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000
2,4-DICHLORORPHENOXYBUTYRIC ACID	NG/L	200.	18000
2,4-D PROPIONIC ACID	NG/L	100.	N/A
DICAMBA	NG/L	100.	87000
PICHLORAM	NG/L	100.	2450000
SILVEX (2,4,5-TP)	NG/L	50.	10000
DIAZINON	NG/L	20.	14000
DICHLOROVOS	NG/L	20.	N/A
DURSBAN	NG/L	20.	N/A
ETHION	NG/L	20.	35000
GUTHION	NG/L	N/A	N/A
MALATHION	NG/L	20.	160000
MEVINPHOS	NG/L	20.	N/A
METHYL PARATHION	NG/L	50.	7000

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
METHYLTRITHION	NG/L	20.	N/A
PARATHION	NG/L	20.	35000
PHORATE (THIMET)	NG/L	20.	35.0
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
AMINOCARB	NG/L	N/A	N/A
BENONYL	NG/L	N/A	N/A
BUX (METALKAMATE)	NG/L	2000.	N/A
CARBOFURAN	NG/L	2000.	18000
CICP (CHLORPROPHAM)	NG/L	2000.	350000
DIALLATE	NG/L	2000.	30000
EPTAM	NG/L	2000.	N/A
IPC	NG/L	2000.	N/A
PROPOXUR (BAYGON)	NG/L	2000.	90000
SEVIN (CARBARYL)	NG/L	200.	70000
SUTAN (BUTYLATE)	NG/L	2000.	245000
METOLACHLOR	NG/L	500.	50000

VOLATILES

BENZENE	UG/L	.050	5.0
TOLUENE	UG/L	.050	24.0
ETHYLBENZENE	UG/L	.050	2.4
PARA-XYLENE	UG/L	.100	300
META-XYLENE	UG/L	.100	300
ORTHO-XYLENE	UG/L	.050	300
1,1-DICHLOROETHYLENE	UG/L	.100	7.0
METHYLENE CHLORIDE	UG/L	.500	1750
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	350
1,1-DICHLOROETHANE	UG/L	.100	N/A
CHLOROFORM	UG/L	.100	350
1,1,1-TRICHLOROETHANE	UG/L	.020	200
1,2-DICHLOROETHANE	UG/L	.050	5.0
CARBON TETRACHLORIDE	UG/L	.200	5.0
1,2-DICHLOROPROPANE	UG/L	.050	10.0
TRICHLOROETHYLENE	UG/L	.100	5.0
DICHLOROBROMOMETHANE	UG/L	.050	350
1,1,2-TRICHLOROETHANE	UG/L	.050	.60
CHLORODIBROMOMETHANE	UG/L	.100	350
TETRACHLOROETHYLENE	UG/L	.050	10.0
BROMOFORM	UG/L	.200	350
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17
CHLOROBENZENE	UG/L	.100	1510
1,4-DICHLOROBENZENE	UG/L	.100	5.0
1,3-DICHLOROBENZENE	UG/L	.100	130
1,2-DICHLOROBENZENE	UG/L	.050	200
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A
TOTAL TRIHALOMETHANES	UG/L	.500	350
STYRENE	UG/L	.05	46.5

Information from the system may be obtained through direct enquiries, and general information and the results of analyses are also published in the form of annual reports.

Results and Discussion

The plants using Lake Ontario as a water source, included in the DWSP are:

Grimsby	
Hamilton	
Burlington	
Lakeview	Mississauga
Lorne Park	
R.L. Clark	
R.C. Harris	Toronto
Easterly	
Oshawa	
Deseronto	
Belleville	

A "quantifiable" denotes that the result is greater than the statistical limit of detection established by the analytical staff. "Trace" denotes that the level measured is greater than the lowest value detectable by the analytical method, but lies so close to the detection limit that it cannot be confidently quantified. Whilst traces can be useful in trend analysis or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels, the occasional finding of a trace level of a contaminant is not considered to be significant.

The general chemistry and bacteriological parameter results at these Lake Ontario locations are consistent with those found elsewhere in the Great Lakes waters. The analyses show quantifiable levels of most metals in both raw and treated waters, but none of the treated water samples exceeded the applicable health-related Ontario Drinking Water Objectives (ODWO) for these substances.

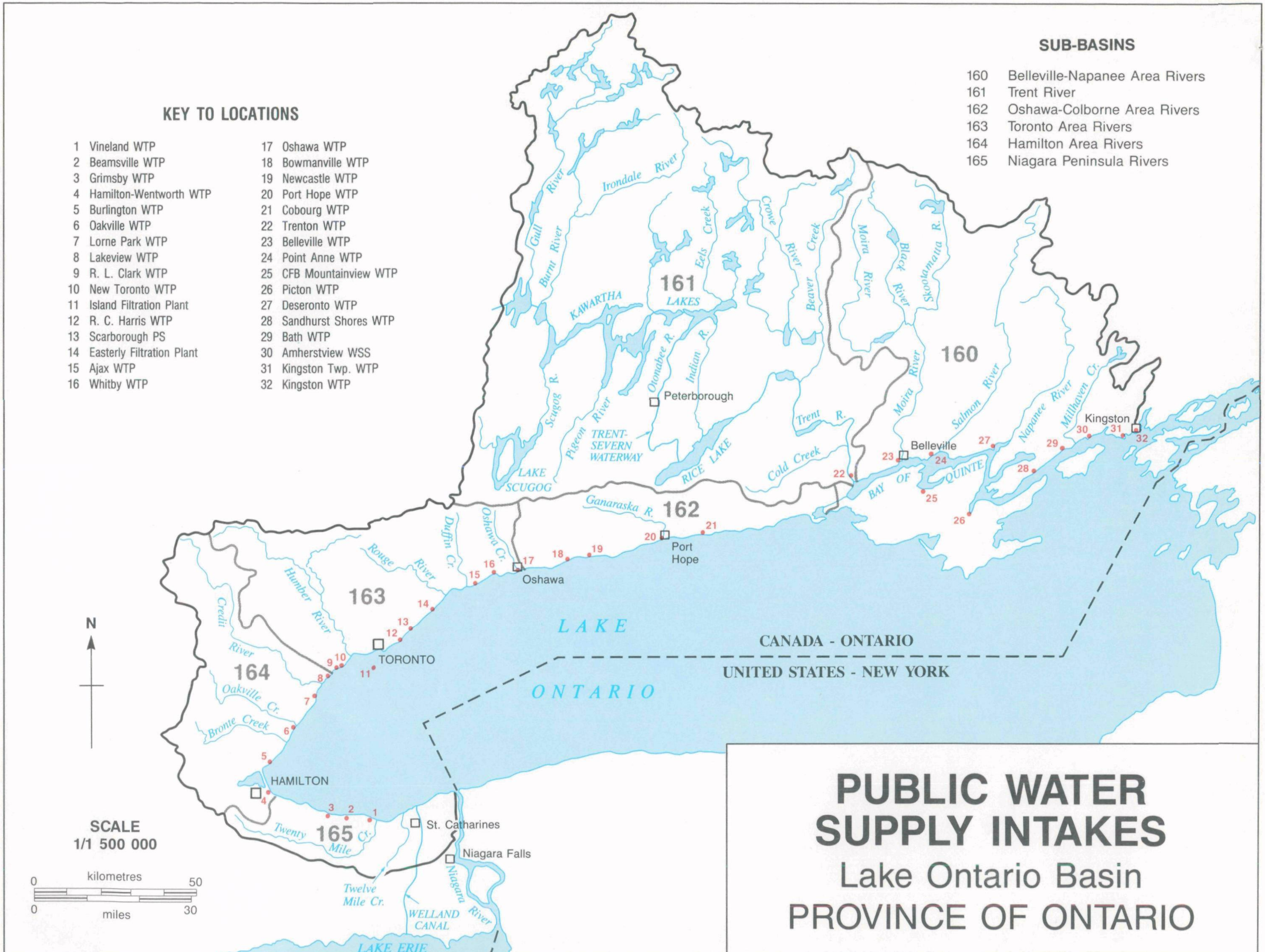
Of the pesticides only Bladex, Prometone and Simazine were found at quantifiable levels in raw water once, at Hamilton. Traces of -BHC and lindane occurred in most raw water samples; they are ubiquitous throughout the Great Lakes basin. Traces of other pesticides only occurred sporadically.

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes; quantifiable levels of these compounds at the low μg/L levels occurred in only a few raw water samples.

No quantifiable levels of any of the other organic compounds analyzed for were found in raw waters, although traces of toluene, hexachloroethane benzene, trichlorobenzenes, pentachlorobenzene, ethylbenzene and xylenes occurred at some locations.

The only organic compounds found at quantifiable levels in treated waters other than trihalomethanes, were hexachloroethane (found once at Hamilton), thiodan sulphate (found once at Grimsby), and m- and p-xylenes (found once at Lakeview). Trihalomethanes, formed when chlorine used for disinfection of treated water reacts with naturally occurring organic compounds, were found in all treated water samples. No treated waters exceeded the ODWO for trihalomethanes. A very few samples from the distribution system sites yielded quantifiable levels of organic substances - benzene, 1,1,1-trichloroethane, hexachloroethane, 2,3,6-trichlorotoluene and xylene, even when these were not present in the treated water at the plant; none exceeded any applicable health-related guidelines. Such contamination may have resulted on passage of the water through the distribution system. Similarly, the treatment plant and distribution system may contribute to the traces of chlorinated benzenes and toluenes, ethylbenzene, benzene and other organics occasionally occurring at distribution system sites. Traces of -BHC and lindane frequently were found in treated waters. Phenolic compounds were usually present only at trace levels in some treated water.

The results, for analyses carried out in 1987 on the programme, show that at all locations both raw and treated waters contain few contaminants.



PUBLIC WATER SUPPLY INTAKES

Lake Ontario Basin

PROVINCE OF ONTARIO

Figure IV - 10

Brock University Cartography

Zero Discharge Related Activities in Canada

a) General

Canada and Ontario are committed, through the Canada-Ontario Agreement on Great Lakes Water Quality (COA), to undertake programs and measures in accordance with the principle that discharges of toxic substances be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated.

Consistent with this principle and the philosophy of zero-discharge, Canada and Ontario have enacted and will continue to implement, a variety of measures, including:

- new or revised legislation and regulations pertaining to toxics control;
- programs for research, technology development and implementation of toxic source reduction and effluent treatment actions;
- programs for the identification, assessment and monitoring of toxic substances; and
- programs to inform and involve the public in activities related to toxics control.

The Canadian Environmental Protection Act is a recently enacted, comprehensive body of legislation that subsumes several former Acts and regulations and offers an ecosystem approach to environmental protection. It provides for broad government control over the release of toxic substances into the environment. It also sets a nationally derived precedent for progressing from "react and cure" to "anticipate and prevent" - the quintessential basis moving towards controlling pollution through intervention at source control as opposed to discharge controls. Specific provisions include:

1. an expanded definition of "substance" that includes both chemicals and their by-products, either in isolation or in mixtures and emissions, effluents, wastes and the products of biotechnology;

2. a expansion of the term "toxic" to mean harmful to human health AND/OR to the environment;

3. 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 wastes;

4. creation of a "living" list of priority substances subject to ongoing assessment for health and environmental impacts and control actions, including regulatory restrictions;

5. a requirement by industry to supply the data necessary to allow for evaluation and assessment before the materials are permitted to enter Canada;

6. regulation of the emissions, effluents and waste handling and disposal practices of federal departments, boards and Crown corporations.

The Act is supported through a comprehensive enforcement and compliance policy. This policy places strong emphasis on prevention of damage to the environment. The compliance requirements embody exchange and distribution of information including technology development and transfer. The policy also advocates and promotes the use of environmental audits. The latter will evaluate efficiency levels of pollution abatement programs adopted by industry, identify potential problem areas and develop recommendations for change and improvement as necessary.

The legislation provides for establishment of federal-provincial equivalency agreements that will ensure the requisite level of environmental protection prescribed under the Act is maintained across Canada. These bilateral arrangements deal with specific regulations, when and if the control limits, testing procedures, enforcement, penalties and citizens' rights are equivalent to federal requirements.

This cooperative jurisdictional framework:

1. ensures a strong and consistent enforcement of the Act;

2. minimizes overlap and duplication of effort;

3. relieves industry of the potential for "double jeopardy" from competing provincial and federal regulations;

4. guarantees all Canadians an equivalent level of protection.

The Act also embodies the concept of an "environmental bill of rights", recognizing the rights of citizens to a clean and healthy environment. Some of these include:

1. the right to be informed about proposed regulations, enforcement activities and about the health and environmental impacts of assessed substances;

2. the right to seek a review of regulations under the Act;

3. the right to ask that a board of review be established and the right to present a concern before that board;

4. the right to request that a suspected toxic substance be included on the Priority Substances List for assessment;

5. the right to request an investigation be conducted regarding a suspected violation of the Act;

6. the right to seek an injunction if personal injury is suspected as the result of a violation of the Act and the right to sue for compensation.

While this particular legislation is, as yet, only in its infancy, it promises to provide the powers needed by the governments to take the measures necessary to establish and maintain a safe and healthy environment. It also maintains continuity of established pollution control procedures while moving towards a nationally recognized policy for anticipation and source control.

Environment Canada's Environmentally Friendly Products Program

Environment Canada, in conjunction with Health and Welfare Canada has developed and initiated a program to introduce and promote environmentally friendly products. Products submitted for approval under the program are tested and, if they conform to specifications, are identified as posing no environmental risk. This allows responsible and concerned consumers to participate collectively in a process that will ultimately have a significant effect on environmental quality. It offers Canadians the opportunity to have an immediate and personal influence on the environment through their purchasing power both in the area of harmful waste elimination and in the promotion of technologies and processes that give rise to environmental benign products.

b) Direct Discharges

Industrial and Municipal Effluent Limits

The Municipal/Industrial Strategy for Abatement (MISA) is Environment Ontario's program to reduce the discharge of toxic contaminants to Ontario's waterways. The ultimate goal of the MISA program is the virtual elimination of persistent toxic contaminants from all discharges into Ontario's waterways. In this context, the Ministry considers virtual elimination of a persistent toxic substance to be reduction to a level as close to zero as is possible to measure contaminants. Under MISA, dischargers will be required to monitor and report on the contaminants present in their effluent streams. This information will be used to set legal discharge limits requiring reductions in toxic discharges to the level attainable with the best available pollution control technology which is economically achievable (BATEA).

BATEA is based not only on end-of-pipe treatment, but will also include a variety of other measures such as manufacturing process change, substitution of less toxic chemicals, in-plant treatment and recycling where appropriate. In addition to the BATEA limits set on discharges, the Ministry will require the use of "best management practices" (BMPs) to control releases of toxic pollutants from plant runoff, spillage and leaks, waste disposal sites, and drainage from raw materials. Periodic review of effluent limits will be carried out to achieve more stringent technology-based limits as improved treatment technologies are developed.

c) Indirect Discharges

The updated model sewer use by-law which was issued in September, 1988 by the Ontario Ministry of the Environment will enable municipalities to require local industries to reduce toxic discharges to sewer systems. The by-law sets stringent discharge limits on metals such as copper, cadmium, nickel and zinc; prohibits the discharge of hazardous substances such as PCB's and toxic pesticides, and provides improved administrative procedures to control sewer use.

In addition, limits based on the best available control technology economically achievable will be placed on 22 industrial sectors that are discharging to municipal sewers.

d) Control of the Generation, Handling and Disposal of Wastes

Ontario's basic waste management program is regulated under the Environmental Protection Act. The Waste Management Regulation (Reg. 309) sets out a complete chain of responsibilities from waste generation through transportation and disposal in controlling liquid industrial and hazardous wastes. A generator register and manifest system is used to track wastes from source to proper disposal at a receiving facility. Receiving facilities are operating under Ministry of Environment Certificates of Approval which identify wastes acceptable for disposal at each site. The system is managed by the province, with follow-up action, including enforcement for any irregularity.

The storage and movement of PCB wastes as well as the siting, operations and emissions from mobile PCB destruction facilities are regulated. This includes facilities for destruction of PCB contaminated mineral oil.

With respect to incentive programs for encouraging waste management, in June 1987 the Ontario Government announced its Comprehensive Funding Program (CFP) for waste management. This new program provides financial assistance to municipalities and the private sector for waste management activities. These activities include treatment and disposal facilities and initiatives under the Municipal 4R's Program (Reduction, Reuse, Recycling and Recovery Program); Household Hazardous Waste Management Program; and an Industrial Waste Management Program. The Industrial Waste Management Program provides assistance for industries to take advantage of new opportunities for waste reduction, reuse, recycling and recovery. This new program provides financial and technical assistance to explore beneficial uses of commercial and industrial waste and their reduction. Eligible projects include feasibility studies; reduction, reuse, recycling or recovery of wastes; process or equipment modification or evaluation; demonstration of technology; upgrading existing operations beyond current state-of-the-art for a particular industry, and research.

If industry were to purchase capital equipment, it was felt that they should maintain a reasonable financial stake to ensure that the equipment worked properly. The intent of the program is to share the risk, not assume the risk, with industry, in developing new ideas to maximize waste diversion. It was therefore determined that for research, development or demonstration projects, the program could cover up to 100% of the eligible costs. For capital, start-up or commissioning projects, the program would match the proponent's equity in the project to a maximum of 50% of eligible costs.

Budget projections for the 5-year period commencing in the 1987/88 budget year are $9.3 million. The budget for 1987/88 was $1.0 million and for 1988/89 is $1.2 million. The actual amount of expenditures for 1987/88 was approximately $0.4 million. This amount represents projects actually established and monies actually moved by March 31, 1988 since the June 1987 start date of the program. Currently, we have commitments for a further $0.8 million.

Proposals are currently evaluated on a first-come, first-served basis. The criteria used to evaluate proposals include the extent of reduction or elimination of contaminants of environmental concern, the quantity impact on the waste stream, the scope of the proposal with respect to the potential for further application in Ontario, a cost/benefit analysis, the capability of the proponent to undertake the project (both from a technical and business perspective) and the export potential for Ontario industry of new technology.

e. **Household Hazardous Waste Collection Programs**

The Ministry of the Environment (MOE) recognizes that various household and personal products are hazardous in nature. While there is presently no clear evidence of environmental impairment due to disposal of these materials by common sewer or garbage collection methods, the Ministry regards the special collection and disposal of these materials as prudent in the interests of ongoing environmental protection. At the same time, the Ministry recognizes that some financial assistance is desirable to initiate the practice of special collection and disposal of household hazardous waste (HHW) throughout Ontario.

Accordingly, the Ministry has established a program of grants to encourage and aid municipalities in setting up special collection methods to deal with these wastes. In addition, the document, "Guide to Implementing Household Hazardous Waste Collections" has been produced by the Ministry as a detailed, step by step technical guide to conducting such programs.

The grants are for multi-material collection projects, including waste solvents, paint, medical compounds, pesticides, etc. and are not aimed at any one waste type.

As municipalities are responsible for the management of household wastes, only municipalities will be eligible to apply for monetary assistance although the technical guideline described above will be available to all interested groups. Funding will apply only towards direct costs of conducting a project and not to feasibility studies or consultants' costs.

MOE financial participation is expected to last for 3 years, at the end of which period the results will be reviewed and a decision made on possible continuation of funding.

In the case of large municipalities which may require several collection projects to satisfy the needs of all population centres, each individual project is eligible for funding, but only once a year. It is not anticipated that small municipalities will require more than one project.

f. **Pesticides**

Ontario currently has a comprehensive and integrated pesticide control program designed to minimize the exposure of humans and the natural environment to pesticides, and to further reduce non-point source inputs to the Great Lakes Ecosystem of pesticides from urban and rural land drainage, and waste disposal sites. Principal controls include regulations under the Pest Control Products (PCP) Act and the Provincial Pesticides Act. These Acts establish which pesticides may be used and regulate the conditions of sale, storage, use and disposal based on classification criteria. Supporting these regulations is a licensing and permit system which prevents excessive and indiscriminate pesticide use. It also specifies the type and quantity of pesticide that may be purchased, and sets out the conditions of use.

A committee is currently evaluating options to recycle pesticide containers and to collect unwanted pesticides. The goal will be to mitigate improper disposal and contamination of disposal sites observed in the past.

The Ministries of Agriculture and Food and the Environment jointly provide cost-shared grants for the construction of facilities such as nurse tanks and back-flow prevention devices for chemical sprayers which reduce the risk of accidental discharges of pesticides to surface or groundwater supplies. A 40 percent grant to a maximum of $7,500 is available to farmers under this program.

Food Systems 2002, a program recently introduced by the Ontario Ministry of Agriculture and Food, has the goal of reducing pesticide by 50 percent over a 15-year period. Pesticide specialists have been hired to expand the integrated pest management program. Integrated pest management uses cultural, physical and biological controls as well as targeted chemical methods to control pests. Programs are directed toward the entire pest complex - insects, weeds and disease. Under Food Systems 2002 the Ontario Pesticide Education Program will expand to include growers and provide $800,000 annually toward research on pest management alternatives that will reduce dependency on chemicals.

The impact of Food Systems 2002 will be to directly reduce the loading of pesticides applied to the land. In combination with sound land management practices promoted through other programs the loading of pesticides to surface runoff potentially will be reduced even further than the 50 percent reduction target set by the program.

Research being funded by the Ontario Ministry of the Environment is supportive of the goals of Food Systems 2002. Projects are being conducted to find alternative pesticides for those deemed environmentally hazardous, and to determine hazards associated with pesticides in use.

g) Research and Technology Development

The Research and Technology Branch of the Ontario Ministry of the Environment provides grant and contract support for applied research and technology development under the Environmental Research Program. Research needs are identified annually in five categories: air quality, water quality, liquid and solid wastes, analytical methods and socio-economics.

Examples of issues identified as priorities within the Research Program include:

- development of emerging technologies for industrial process changes to reduce contaminant loadings to waste streams;
- development of innovative sewage treatment processes;
- assessment of the effects of intensive crop production practices on groundwater quality;
- development of innovative techniques and mechanisms to monitor and control hazardous contaminant discharges into sewer systems.

Socio-economic research related to zero discharge includes examination of key factors which motivate private sector decision regarding technology choice and assessment of the social implications of environmental contaminants and their control.

PART IV - Research Programs

The previous parts of this appendix have described various remedial thrusts undertaken by the agencies in response to toxic chemical contamination in Lake Ontario. The foundation of all of these is the research carried out by, not only the agencies, but by governments in general as well as by academic institutions and industry. The agencies, in particular, invest a significant level of resources in research on Lake Ontario. In addition, there is a tremendous amount of study devoted to related phenomena - into lake processes in general, into atmospheric processes and into many areas having applicability to understanding and ameliorating the toxic chemical problem in Lake Ontario. Of significant importance is the understanding that the agencies also identify research needs and direct the focus of their own efforts, as well as those of the research community at large, towards priority problems.

In this context, the work of the standing expert committees will undoubtedly highlight critical areas for further study as the overall effort to rid Lake Ontario of toxic chemical contamination progresses. This offers a number of significant advantages.

1. It will allow the agencies to focus their study efforts in response to information deficiencies as they are identified through remediation activities. Research resources will be channelled towards problem resolution directly linked to the elimination of the toxic contamination.

2. It will lead the agencies towards a common understanding of the problem and, consequently, a common solution. Working separately, agencies may well develop effective but different answers to problems resulting in a diversity of approaches that may later need to be reconciled.

3. It will foster a cooperative response to the shared problem of transboundary pollution, encouraging the pooling of resources in response to problems of a magnitude too great to be independently managed by any single agency.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix V

Geographic Areas of Special Concern

APPENDIX V - Geographical 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 centres 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
- Toronto Waterfront
- 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:

- o the recognition that disparate programs often focussed on specific problems without due attention being paid to overlapping responsibilities and consequences, and

- o the need to involve, in a coordinated manner, the multiplicity of jurisdictions and interests represented within these Areas of Concern.

Figure I 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 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 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.

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

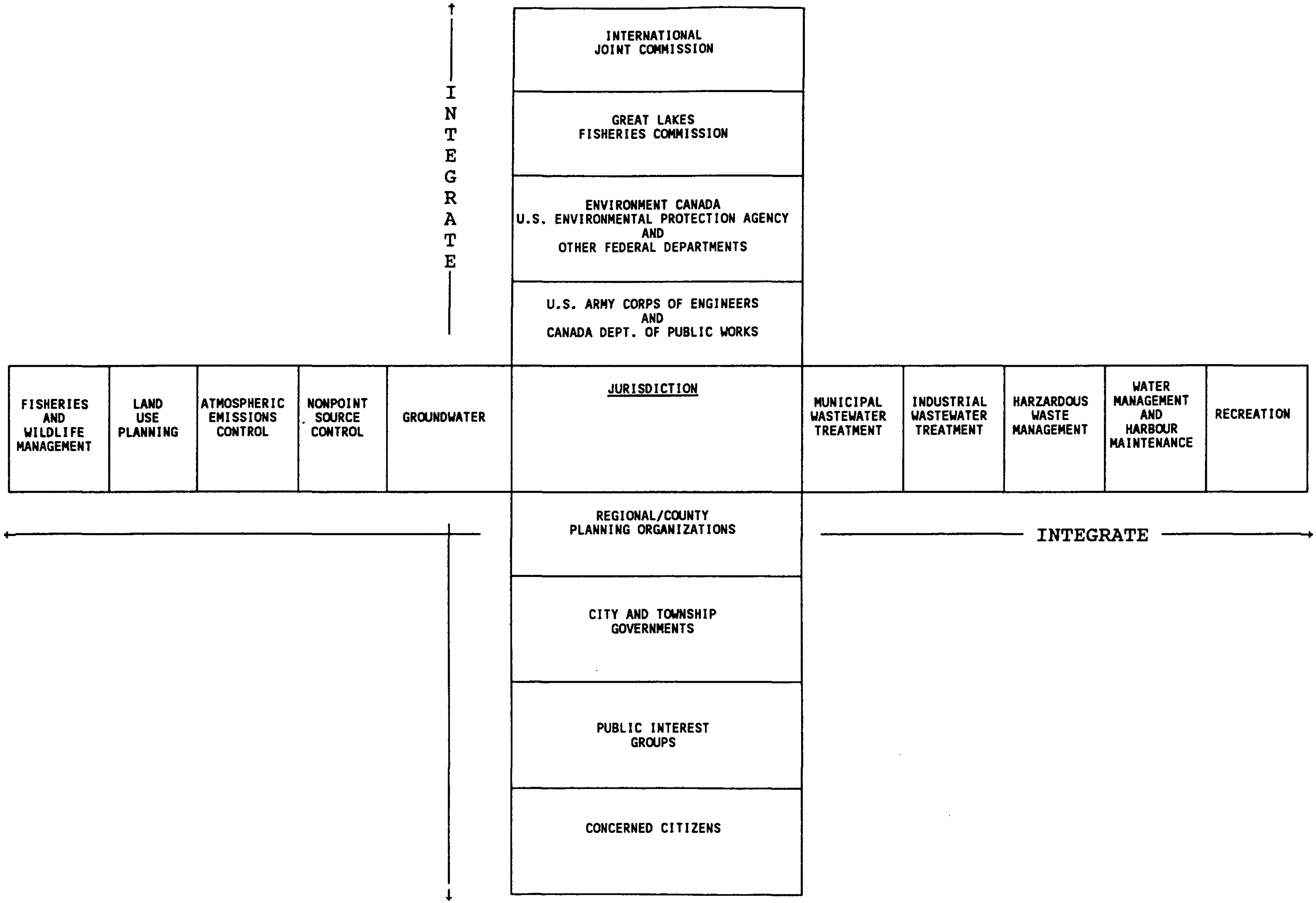


FIGURE II
A TWO DIMENSIONAL SCHEMATIC DIAGRAM WHICH DEPICTS THE NEED TO INTEGRATE THE RESPONSIBILITIES OF DIFFERENT AGENCIES, ORGANIZATIONS AND PROGRAMS UNDER THE UMBRELLA OF A REMEDIAL ACTION PLAN

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 - DECEMBER, 1988

LOCATION	IJC Stage I Report Target		IJC Stage II Report Target
	Jan-Mar 1989	Apr-Dec 1989	(Quarter)
Hamilton Harbour		X	3 Qtr 1989
Toronto Waterfront	X		4 Qtr 1990
Port Hope Harbour	X		2 Qtr 1989
Bay of Quinte	X		3 Qtr 1989

Hamilton Harbour

The assessment of environmental conditions in the harbour has been completed and published in a discussion document for public review. The primary focus of the document is on water and sediment quality and on contaminants in fish. Where data were available, information on related environmental matters such as fish populations and habitat, and wildlife and water birds have been included.

While the assessment has been completed, additional studies are being carried out to address the information gaps. These include:

- further assessment of the sources and biological effects of contaminated sediments;
- assessment of in-situ treatment of contaminated sediments;
- feasibility of proposed ammonia and phosphorus treatment at the Hamilton sewage treatment plant;
- intensive fish and fish habitat study of the Harbour;
- analysis of the water exchange between the bay and Lake Ontario for its impact on water quality, and
- fecal coliform testing to establish general nearshore levels and the reasons for their variation.

Three major studies have been completed in 1988. A socio-economic study of the several remedial options proposed (including a numerical model of the impact of ammonia and phosphorus control on hypolimnetic oxygen), a study of the source of suspended sediments to tributaries in the rural areas of the basin, and a determination of the sources of water clarity problems.

A number of plans are expected to be completed in 1989:

1. The Regional Municipality of Hamilton-Wentworth is preparing a plan for completion of a combined sewer overflow remediation program;

2. The RAP team, in conjunction with the Regional Conservation Authority,will be developing a plan for control of suspended solids loadings to the west end of the Harbour, and

3. The Ontario Ministry of the Environment is developing a pilot plan for a computer-assisted storm event control system to optimize sanitary and storm sewer operation in the area.

Intensive monitoring of the Harbour and its tributaries has been undertaken from 1986 to 1988 to establish baseline environmental quality data. A monitoring program has been designed for ambient water quality, sewage treatment plant effluents, fish, wildlife, sediments and tributary loadings. Effluent and process monitoring regulations under the Ontario Municipal-Industrial Strategy for Abatement (MISA) are expected to be in effect by mid-1989.

As well, a funding agreement has been established to clean up a contaminated sediment problem in Windermere Basin.

The steel industry continues to implement measures designed to reduce contaminant loadings to the harbour. Dofasco Inc. will be undertaking diversion of biological treatment effluent to the municipal sewage treatment plant in 1989. Plans are in place to recirculate Dofasco's blast furnace cleaning wastewater in 1989.

The loss of marsh in the harbour has been of concern to many. On June 13, 1988 the Board of the Royal Botanical Gardens approved a project to restore the marsh in Cootes Paradise with the help of Ducks Unlimited. However, the project is still subject to approvals by the regulatory agencies. Restoration is planned for the fall of 1989 and will take three months to complete at a cost of $1.25 million.

In March, 1988, a report on "Goals, Problems and Options" was released and submitted to Stakeholders. The report was considered at a public meeting in May, 1988 and a Stakeholders' meeting in October, 1988. It will form the basis of discussions between the Writing Team and Stakeholders leading to determination of the preferred options in early 1989.

<u>Toronto Harbour</u>

The emphasis in the last year has been on the establishment of a public information program and the development of a public advisory process. The public information program has been aimed at informing the public about the RAP process and providing opportunities for community involvement. The public advisory process has been aimed at gaining public input in goal setting.

Program activities have included distribution of a brochure and newsletters, poster display, and fact sheets on beaches, fish consumption, aesthetics and drinking water. During the spring of 1988, meetings were held with the Toronto Waterfront Remedial Action Committee (WRAP), environmental, conservation, recreation and community groups, and interested individuals preparatory to the Metro Toronto RAP.

The public involvement program consists of the production of reports and discussion papers, and the sponsorship of a workshop to review reports, set goals, and review ongoing remedial programs. The workshop, held in October, 1988 discussed the following documents:

- Environmental Conditions and Problem Definition Report
- Discussion Paper on Goals
- Discussion Paper of Existing Remedial Programs
- Reference List

The Centre for the Great Lakes was contracted to conduct the workshop held in October, 1988 at which more than 100 individual and group participants discussed water use goals and the progress of remedial measures was reviewed.

Municipalities within the study area have been requested to nominate representatives to the public advisory process, and provide staff to act on a technical advisory committee. Two municipal representatives will be added to the RAP team and a representative of the public may also be added to the RAP team in the future.

A number of studies and remedial actions have been undertaken and are ongoing in the Metro Toronto region. These include:

- river quality management plans for the Humber and Don rivers, and
- implementation of remedial measures (sewer separation projects and detention tanks) under the Metro Toronto Waterfront Water Quality Improvement Program.

Port Hope

The first stage report on problem definition has been completed and will be submitted in the first quarter of 1989.

The Port Hope Harbour RAP Public Involvement Program has been emphasized over the last year. The program consists of meetings with the Port Hope Environmental Advisory Committee, a newsletter, articles concerning Port Hope Harbour RAP in the Low Level Radioactive Waste Management Office of the Atomic Energy of Canada Ltd. (AECL-LLRWMO) newsletter and providing information packages on the RAP to all interested Port Hope area residents.

A RAP Community Information Workshop was held in March, 1988. It was attended by over 40 individuals and stakeholders. The workshop provided the stakeholders with the opportunity to express opinions on use goals and the Public Involvement process. Public consultation and stakeholder discussions will continue with the objective of submitting a final RAP to the IJC in December, 1989.

Detailed plans for sediment removal have been developed by the LLRWMO. Whiteshell Nuclear Research Establishment of AECL has completed a small scale in-situ demonstration project and supporting laboratory program to confirm the viability of the recommended cleanup method for the harbour (clamshell dredging followed by suction dredging of residual sediment). The project will ensure that the cleanup of the harbour will not pose any unacceptable environmental risks. The demonstration project's clamshell dredging was completed in the fall of 1987. The test area was left until June 1988 when the hydraulic cleanup process was undertaken. A summary report containing analytical results and remedial action recommendations is scheduled to be completed late in 1988.

The National Water Research Institute (NWRI) of Environment Canada is conducting a field survey to determine contaminant loadings of sediments to Port Hope Harbour. This study will give an indication as to the potential for recontamination of harbour sediments following the cleanup. It is based on the continuance of present loadings.

The implementation of the proposed remedial action for Port Hope Harbour is dependent on the establishment of a low level radioactive waste facility. A special Task Force was established in 1986 to identify the siting process by which candidate sites will be selected. The Siting Task Force has been given an eighteen month mandate to implement several of the recommendations in the first phase of the report entitled, "Opting for Cooperation". The siting process is anticipated to take three to five years to complete. Following this, the construction of an operational waste disposal facility will begin. This facility will be capable of receiving sediments from Port Hope Harbour.

Bay of Quinte

The public information and involvement component of the RAP is being jointly handled by the RAP team and a twenty one member Public Advisory Committee with the assistance of a consultant-facilitator. Several approaches have been employed throughout the development of the RAP to inform and involve the public. These have included: public meetings, information booths, newsletters,

questionnaires, and talks, plus routine media coverage. The final phase will involve consultation with the public concerning the options for remedial action.

The RAP Team produced a progress report in January, 1987 which documented ecosystem status, data gaps, impaired uses, concerns and restoration objectives together with a list of potential remedial options. Following the release of the report, a series of technical studies and consultant's evaluations were initiated to complete the ecosystem assessment and examine cost and feasibility of the potential remedial options. These are being published by the RAP Team as a series of technical documents for the RAP. The studies include:

- evaluation of municipal and industrial point source loadings;
- evaluation of diffuse source contaminant loadings at the Bay;
- evaluation of landfill sites as sources of persistent toxic contaminants;
- evaluation of phosphorus sediment flux;
- evaluation of toxics data base;
- toxics studies for water, sediments, and biota, and
- bacteriological studies

During 1988 scientists, resource managers, consultants and members of the Public Advisory Committee participated in two ecosystem modelling workshops. The purpose of the workshops was to construct a conceptual model of the ecosystem linkages and develop, to the extent possible, predictive numerical models which would allow an integrated evaluation of anticipated ecosystem responses to potential remedial measures.

The final phase of information synthesis, a socio-economic study, is now in progress. It will include a comparative assessment of the potential remedial measures options and their cost effectiveness.

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 5,122 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 of 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 analysed 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.

In development of the Remedial Action Plan, a technical meeting was held among NYSDEC staff and local scientists to review the environmental data and define the problems in this AOC. Input from this meeting and other sources relative to the problems in the AOC has been assembled into a problem-statement chapter. This and two other chapters, the Environmental Setting and the Introduction, have been given to the CAC as a working draft for their review. One meeting with the CAC has since been held, written comments received, and changes in these chapters are now being made.

A workplan has been developed, describing the activities, the timing, and the responsible parties (DEC's Regional Office at Syracuse, DEC's Central Office, and the Citizen's Advisory Committee) leading to the formal RAP document.

The Remedial Action Plan is scheduled for completion in 1990.

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 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 mid-November (1988).

A Citizens' Advisory Committee and subcommittees are in the process of being formed by Monroe County.

The Plan is expected to be completed in 1991.

Eighteenmile Creek

The International Joint Commission identified problems in the Eighteenmile Creek Area 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.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix VI
Ecosystem Objectives Work Group

ECOSYSTEM OBJECTIVES DEVELOPMENT

Background

The development and application of ecosystem objectives represents an alternative approach to the traditional, chemical specific environmental objective setting process employed in the Great Lakes Basin. As recognized in the revised (1987) Great Lakes Water Quality Agreement (GLWQA), chemical objectives alone are insufficient for protecting ecosystem integrity. Accordingly, the Parties to the GLWQA, the governments of Canada and the United States, are committed to the development of ecosystem objectives for the Great Lakes. To this end, the governments have established a Binational Objectives Development Committee which will include an Ecosystem Objectives Work Group.

It is proposed that the development of ecosystem objectives for Lake Ontario be undertaken through the GLWQA by the Ecosystem Objectives Work Group (EOWG). By adopting such an approach, the agencies build on the formalized cooperative intergovernmental framework on the Great Lakes with its clear definition, purpose and structure for objective development:

- o Annex 1 of the GLWQA sets out specific objectives (to include ecosystem objectives) under the Agreement and the framework for developing these between the Parties.
- o Annex 2 of the GLWQA defines and establishes the concept of lakewide management plans, including the development and application of objectives.
- o Annex 11 of the GLWQA sets out specific ecosystem health indicators for Lake Superior and calls for development of indicators for the rest of the Lakes.
- o Annex 12 of the GLWQA requires the establishment of action levels to protect human health based on multimedia exposure and the interactive effects of toxic substances.

The GLWQA structure provides access to the existing institutional arrangements amongst federal, state and provincial governments and incorporates the necessary links to the International Joint Commission as well as to the concerned and affected public. Clearly, this arrangement presents the logical vehicle for maintaining the direction and coordination essential to the success of such a unique undertaking. It further ensures that ecosystem objectives and indicators developed for Lake Ontario will be consistent and compatible with those developed for the rest of the Great Lakes. For these reasons, the Niagara River/Lake Ontario Coordination Committee has agreed to utilize the EOWG to carry out the ecosystem objective commitments in the Lake Ontario Toxics Management Plan. In addition, the Coordination Committee has established deadlines for meeting these commitments.

Considerations

1. Work undertaken through the auspices of the International Joint Commission led to the existing oligotrophic ecosystem objectives for Lake Superior identified in the GLWQA. A proposed mesotrophic indicator is presently in a draft stage. This background work and the expertise developed through these activities need to be drawn upon in future ecosystem objective development.

2. Existing approaches to ecosystem objective development have focused strictly on the aquatic system. The GLWQA defines the Great Lakes Basin Ecosystem as the interacting components of air, land, water and living organisms, including humans, within the drainage basin. The development of objectives by the Ecosystem Objectives Work Group will have to consider broadening the existing approaches beyond the aquatic system.

3. The GLWQA requires that the public be consulted in the development and adoption of objectives. The agencies supporting the development of the Lake Ontario Toxics Management Plan have also acknowledged the need for public participation in the development of ecosystem objectives.

Terms of Reference

The terms of reference of the GLWQA Ecosystem Objectives Work Group have not been finalized at the time of preparation of the LOTMP. However, the following elements are anticipated:

1. The Ecosystem Objectives Work Group (EOWG) reports to the Canada-U.S. Binational Objectives Development Committee.

2. The EOWG will be co-chaired by Environment Canada and the U.S. Environmental Protection Agency and will include membership from the Province and the States.

3. Membership on the EOWG should represent a range of ecological views and maintain historic continuity with IJC efforts, and include representation from agencies (including provincial and state agencies) with public health and natural resource management responsibilities involving Lake Ontario. Partial membership changes are anticipated when ecosystem objectives are being developed for the other Great Lakes.

4. The EOWG will undertake a review of the rationale and development of the existing oligotrophic objectives (Lake Superior) and proposed IJC mesotrophic objective.

5. The EOWG will consider alternative approaches to ecosystem objective development (eg. structural vs. functional, community vs. organism) including non-aquatic objectives (eg. humans, wildlife).

6. The EOWG will identify appropriate system variables for future monitoring based on an ecosystem objective concept.

7. The EOWG will identify gaps in knowledge needed to develop and apply ecosystem objectives and recommend research required.

8. Based on a consideration of 4,5,6 and 7 above, the EOWG will develop ecosystem objectives for Lake Ontario initially, and then for the other boundary waters of the Great Lakes system, or portions thereof, and for Lake Michigan.

9. In developing recommended ecosystem objectives for Lake Ontario, the EOWG will:

   - o Meet the output commitments and deadlines associated with activities VIIC1 and VIIC2 in the Lake Ontario Toxics Management Plan;

   - o Address both human health and the health of aquatic biota and their predators; and

   - o Report progress on a regular basis to the Lake Ontario Secretariat.

   The Niagara River/Lake Ontario Coordination Committee will recommend public membership for the EOWG.

10. The EOWG will identify appropriate additional public consultative mechanisms in the development of ecosystem objectives.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

Appendix VII
Niagara River/Lake Ontario
Categorization Committee Charge

Niagara River/Lake Ontario Categorization Committee Charge

Under both the Niagara River and Lake Ontario Toxics Management Plans chemicals will be categorized based on a number of factors, including: their presence in the waterbodies or in biota at levels above or below agency standards and criteria, the relation of their detection levels in the waterbodies to the standards and criteria, and whether or not they are known to be entering the waterbodies (see the two plans for details). As our knowledge about chemicals in these waterbodies increases, and as discharge levels change, the assignment of chemicals to specific categories will change. A continuous effort will be needed to keep the categorization scheme up-to-date.

The Categorization Committee is charged as follows:

1. Maintain the categorization of chemicals for the Niagara River and Lake Ontario (separately) so that they are reasonably current and available for use by the Niagara River and Lake Ontario Secretariats.

2. Perform the categorization using procedures established by the Secretariats tempered by scientific judgment.

3. Advise the Secretariats on needs for changes in the established categorization procedures.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

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

Niagara River/Lake Ontario Standards and Criteria Committee Charge

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 two Toxics Management Plans. For many chemicals found in these waterbodies, standards and criteria do not exist. Where they do exist the values often differ among different agencies.

An attempt will be made to insure that standards and criteria are developed for chemicals found above natural background levels in the ambient water, biota, and sediments where standards and criteria do not presently exist. At the same time, where agencies already have standards and criteria, an attempt will be made to examine differences, where they exist, and propose common values that can be adopted by all four agencies. These are expected to require a continuing effort.

The Niagara River and the Lake Ontario Secretariats are jointly establishing a Standards and Criteria Committee to assist them in the annual plan updates and in making recommendations to appropriate agencies on standards and criteria. This committee will report to the Secretariats. They will be expected to consult with the IJC and other agencies as necessary to prevent duplication of effort and insure a coordinated program.

The specific charge to the Standards and Criteria Committee is:

1. For Category IA (exceeds enforceable standard) and IB (exceeds a 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. 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.

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.

3. For Category IE chemicals, where no criteria or standard development is underway, prepare a plan for criteria development. The plan should include a scheme to select and prioritize chemicals for criteria development based on their likely environmental significance and the state of current scientific information for these chemicals. It should describe where important scientific information gaps exist and propose agencies that could best be responsible for obtaining this information.

4. The committee will keep informed of 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.

LAKE ONTARIO

TOXICS MANAGEMENT PLAN

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

Appendix IX

Niagara River/Lake Ontario Fate of Toxics Committee Charge

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

A common objective of both 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 Toxics Committee and the Niagara River Secretariat are establishing a joint committee to develop mathematical models of pollutant fate. The charge to the joint committee is as follows.

- Develop appropriate conceptual models that account for essential system characteristics such as:
  - Hydrodynamics;
  - Zonation;
  - Impacts of areas of concern such as harbors and embayments;
  - Time scales for response; and
  - Other physical, biological and chemical factors.
- Develop loading estimates, by source, for the chemicals that exceed standards and criteria; these estimates will build on those in the Niagara River and Lake Ontario Plans.
- Use the models to relate pollutant loadings to levels of toxics in the ambient water column, sediment and biota, as appropriate.
- Estimate the reductions in loadings necessary to meet standards and criteria; estimate system lag times and estimate potential errors.

The Fate of Toxics Committee will be expected to estimate the reductions in loadings necessary to meet standards and criteria based on preliminary models of pollutant fate within one year. These preliminary models will be based entirely on existing data. The Committee will also be expected to define additional sampling, analysis and research necessary to develop improved models, over time.

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

PUBLIC RESPONSIVENESS DOCUMENT

LAKE ONTARIO TOXICS MANAGEMENT PLAN

Lake Ontario Toxics Committee
February, 1989

Table of Contents

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.

Since January 28, 1988, when the Coordination Committee approved the release of the draft Plan to the public, the Lake Ontario Toxics Committee (LOTC) has pursued an aggressive public outreach effort to ascertain the public's views on the draft Plan and has continued to make necessary additions and improvements to the draft Plan.

The LOTC has:

- Developed a summary of the draft Plan entitled "Draft Lake Ontario Toxics Management Plan: Summary and Issues for Public Discussion";
- Made the draft Plan and Summary available at repositories around the Lake Ontario basin;
- Mailed approximately 6500 copies of the Summary to the public;
- Conducted five public meetings;

  Toronto, Ontario - 57 in attendance
  Rochester, N.Y. - 26 in attendance
  Watertown, N.Y. - 34 in attendence
  Niagara Falls, N.Y. - 22 in attendence
  Oswego, N.Y. - 27 in attendence

- Responded to requests for approximately 250 copies of the draft Plan; and
- Received 45 sets of written comments on the draft Plan, including one letter co-signed by representatives of twenty organizations.

The Public Responsiveness Document (PRD) reflects the extensive comments received from Canadian and U.S. citizens around the Lake Ontario Basin. The major portion of public comment is discussed in Part II, entitled, "Executive Summary: Public Comment And Responses". The Executive Summary is organized into seven sections:

A. The Toxics Problem In Lake Ontario;
B. Goals;
C. Today's Programs;
D. Geographic Areas Of Special Concern;
E. Future Approach;
F. Communication And Reporting; and
G. General.

These sections correspond to those used in the Plan Summary. For each section there are sub-sections summarizing:

- o What the draft Plan says;
- o What the public says; and
- o Proposed response.

Responses to additional public comments are included in Part III, entitled, "Responses To Additional Comments On The Draft Lake Ontario Toxics Management Plan".

II. Executive Summary: Public Comment And Responses

A. The Toxics Problem In Lake Ontario

What The Draft Plan Says

The draft Lake Ontario Toxics Management Plan concludes that:

- o Toxics are a problem in fish flesh because they accumulate to levels unsafe for human consumption;
- o The ecosystem may be under stress from chemical contamination, but more information is needed to understand what is taking place;
- o Toxics are considered by health agencies not to be a problem in treated drinking water;
- o Toxics in the Lake, and toxics continuing to enter the Lake are a problem because they make it impossible to achieve the Great Lakes Water Quality Agreement goal of virtual elimination of persistent toxics.

What The Public Says

There was no one who disagreed with the statement that bioaccumulated toxics in fish flesh are a problem.

Most felt that the ecosystem is under stress. Some felt that toxics are clearly the cause; others accepted the Plan's premise that the cause/effect link still needs to be established. Some suggested additional references that may prove useful in evaluating cause and effect; others emphasized the need for further research.

Many saw the need to take a more holistic view of the impact of toxics on human health; they emphasized that we don't fully understand the impact of toxics from Lake Ontario on humans. Some saw the need for epidemiological studies which would show the integrated effect of toxics from all sources on humans in the basin.

Most were extremely uncomfortable with the statement, "In drinking water, toxics are considered by health agencies not to be a problem". Some felt that toxics in treated drinking water are a problem; others felt that it is premature to say that toxics in treated drinking water are not a problem.

The concept of virtual elimination was generally discussed in the context of goals, and not in the context of the toxics problem in Lake Ontario.

Response

We agree that the ecosystem is under stress. We welcome additional references that may assist in evaluating the causes of this stress. However, although it appears likely that toxics at their current levels contribute to the stress, conclusive cause/effect evidence is not available. The Plan notes the establishment of an Ecosystem Objectives Work Group under the Great Lakes Water Quality Agreement. One charge to the Work Group will be to identify the research required to better understand the role of toxics in causing ecosystem stress. The Ecosystem Objectives Work Group will also be responsible for developing objectives that will be used in an assessment of the impacts of toxics in Lake Ontario on human health.

We recognize that the brief discussion of toxics in treated drinking water that is contained in the draft Plan is inadequate. The final Plan includes a much more in-depth evaluation of toxics in treated drinking water. To the extent that problems in treated drinking water are associated with raw water quality, they fall within the scope of this Plan. To the extent that they are associated with the water treatment process, they fall outside the scope of this Plan.

A Canadian federal interdepartmental task group comprised of representatives from Environment Canada, Fisheries and Oceans Canada, and Health and Welfare Canada has been formed to prepare a report on the effects of toxic chemicals in the Great Lakes. Part I of the two part report will be primarily a data compendium describing concentrations and levels of chemicals in Great Lakes media. The second part will interpret this information and describe the effects of these chemicals in the Great Lakes Basin. The report will be issued in July, 1989. The Lake Ontario Toxics Committee will review the results of the report to determine its applicability to the LOTMP and to our understanding of the human health impacts of toxics in Lake Ontario.

B. Goals

What The Draft Plan Says

The draft Plan outlines the following goals:

o Short term - reduction of chemical inputs.

o Intermediate - achievement of protective ambient levels.

o Long term - virtual elimination of persistent toxics in the Lake.

What The Public Says

Many stated that we need a more visionary statement of our goals.

Many emphasized the need to associate deadlines with our goals.

Many felt there is a need to quantify our load reduction goals.

Many supported the step-wise movement towards the virtual elimination of toxics in Lake Ontario:

o Load reduction, as a first step, had almost universal support;

o Further load reduction for problem toxics, such that protective ambient standards are attained, had substantial support; and

o Load reduction to zero also had substantial support.

Many felt that virtual elimination was a reasonable goal; others felt that it was too utopian and needed to be tempered based on economic impacts; still others felt that, although utopian, virtual elimination should still be retained as a long-term goal- "it's ok if goals are unachievable". There were, however, many different definitions of what virtual elimination means. For example:

o Zero discharge to the Lake;

o Non-detect in the Lake; and

o Present in the Lake at levels that do not harm human health and the ecosystem.

Some suggested that virtual elimination should apply to all toxics, not just persistent toxics.

Response

The final Plan contains only one goal, a long-term goal. The goal is a Lake that provides drinking water and fish that are safe for unlimited human consumption, and allows natural reproduction within the ecosystem of the most sensitive native species, such as bald eagles, osprey, mink and otters.

The Plan also includes objectives that move us towards the long-term goal. Many of the activities carried out to fulfill these objectives can be undertaken concurrently. To the extent possible, the objectives will be quantified and will include target dates.

Objective 1. Reductions In Toxic Inputs Driven By Existing And Developing Programs - Reduction of toxic inputs through the full implementation of existing and developing programs initiated prior to the Lake Ontario planning effort.

a. The final Plan includes target dates for the full implementation of existing and developing programs; many of these dates were also included in the draft Plan.

b. The final Plan does not include an aggregated load reduction estimate associated with the implementation of all existing and developing programs; the data necessary to develop this estimate are not yet available. An estimate will be developed for inclusion in a Plan update.

Objective 2. Further Reductions In Toxic Inputs Driven By Special Efforts In Geographic Areas of Concern - Remedial Action Plans (RAPs) are currently being developed for seven Areas of Concern in the Lake Ontario basin: Eighteenmile Creek, Rochester Embayment, Oswego River, Bay of Quinte, Port Hope, Toronto Waterfront and Hamilton Harbour. The final Plan contains commitments for the completion of the RAPs. 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 Areas of Concern will contribute to the elimination of the toxics problem in the open waters of the Lake. In addition, the Four Parties have completed, and are currently implementing the Niagara River Toxics Management Plan.

Objective 3. Further Reductions In Toxic Inputs Driven By Lake-wide Analyses Of Pollutant Fate - Further reduction of inputs for problem toxics such that we meet our goal for Lake Ontario. Our intention is to identify the input reductions required for problem toxics based on increasingly sophisticated analyses over time.

a. Preliminary (Level I) models of fate* for toxics exceeding standards or criteria will be developed by January, 1989. It is our intention to apply these preliminary models to identify the required input reductions. It is also our intention to identify target dates for the attainment of the required input reductions.

b. More fully-developed models of fate will be generated as necessary, after a careful evaluation of the preliminary models.

c. If standards and criteria are attained, but ecosystem objectives are not attained, further reduction of problem toxics will be required.

Objective 4. Zero Discharge - Further reduction of toxic inputs to zero through advances in technology and through restrictions or voluntary elimination of the manufacture and use of certain toxics. We cannot quantify this objective nor can we associate any target dates with it.

The Lake Ontario Toxics Management Plan deals with all toxics, not just persistent toxics.

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* In this "Executive Summary" the term "preliminary model of fate" is synonymous with the term "mass balance model".

C. Today's Programs

What The Draft Plan Says

In New York State, present pollution controls are based principally on the use of technology to prevent toxic substances from entering the environment. Controls such as wastewater discharge permits and hazardous site remedial plans usually specify use of the best technologies available. Where it can be shown that application of the most effective technology is not sufficient to protect public health or the environment, additional control measures are required.

In Ontario, effluent guidelines are set in legally-enforceable Control Orders or Certificates of Approval, based on both technology and water quality factors. The Provincial Ontario Municipal-Industrial Strategy for Abatement (MISA), begun in June, 1986, will set monitoring regulations and effluent limit regulations based on best available technology (BAT).

The draft plan describes existing toxics control programs and the activities that will be undertaken in the near future to fill gaps in these programs.

What The Public Says

There was general agreement that the full implementation of existing and developing programs will achieve a significant reduction of toxic inputs to the Lake.

There were a number of suggestions that the Plan include additional programs. Of particular note were concerns related to shock loadings and the need for source reduction.

There were also a number of specific comments on the individual programs.

Response

The final Plan includes descriptions of additional programs and commitments for their full implementation. They are:

- Air Toxics
- Spills
- Dredging and Dredged Material Disposal
- Sludge Disposal
- Solid Waste
- Ambient Water Monitoring
- Potable Water
- Stream Classification
- Zero Discharge

Specific comments on the individual programs will be addressed in Part III.

D. Geographic Areas Of Special Concern

What The Draft Plan Says

The Plan recommends focusing corrective activities on specific geographic areas around Lake Ontario: the Niagara River and seven Remedial Action Plan (RAP) areas located around the Lake.

What The Public Says

The public fully supports intensive efforts focussed on geographic areas of special concern. They also believe this focus will have a marked positive effect. However, localized efforts to remediate these designated sites should not result in increased ambient Lake contamination.

Many emphasized the importance of the Niagara River and the upstream Great Lakes as sources of toxics to Lake Ontario.

A few want to expand the study area to include the St. Lawrence River.

Many would like a process to list and de-list Areas of Concern.

Many see the need to coordinate the Lake-wide and RAP planning efforts.

Response

The Lake Ontario Toxics Committee acknowledges the importance of the Niagara River and the upstream Great Lakes as sources of toxics to Lake Ontario. The Lake Ontario Plan, using mass balance techniques, will identify the relative contributions of problem toxics entering the Lake from various sources, including the Niagara River and upstream Great Lakes. This will, in turn, facilitate identification of proposed reduction targets and implementation of appropriate management responses.

The Niagara River Toxics Management Plan will be used as the vehicle to identify the required management responses within the Niagara River Basin. The Niagara River Toxics Management Plan will also be used as the vehicle for referring proposed reduction targets for the upstream Great Lakes to the appropriate jurisdictions for response.

The general process for listing and de-listing Areas of Concern is outlined in the Great Lakes Water Quality Agreement. 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.

In order to better coordinate the Lake-wide and RAP planning efforts, the following steps will be taken:

- o The Lake Ontario Toxics Committee will prepare letters to the jurisdictions responsible for the individual RAPs, identifying chemicals that are problems on a Lake-wide basis, and seeking assistance in obtaining load reductions for these chemicals to the extent that they have been identified as problems in the Areas of Concern.
- o Information exchanges between the LOTC and the individual RAPs will be encouraged.
- o Public involvement efforts will be coordinated (See Communication and Reporting).

E. Future Approach

What The Draft Plan Says

Future controls will limit toxics on a chemical-by-chemical basis to ensure protection of human health and the ecosystem. Ecosystem objectives will be established to evaluate the effectiveness of the chemical-by-chemical approach.

What The Public Says

The chemical-by-chemical approach is seen as having advantages and disadvantages. The three major advantages are:

- o It allows us to set clear priorities;
- o Existing regulatory programs can deal with problems identified on a chemical specific basis; and
- o It is cost effective.

The two major disadvantages are:

- o It ignores cumulative and synergistic effects; and
- o We don't have the knowledge to set adequately protective standards.

One element of the chemical-by-chemical approach, the development of mass balances for problem toxics, has wide support. There are, however, concerns about acceptability and enforceability of the results of the mass balance efforts.

To the extent that a chemical-by-chemical approach is used, there is a need for uniform standards and advisories.

The use of an ecosystem-based approach in parallel with the chemical-by-chemical approach is one of the most popular elements of the Plan.

Many emphasized the need for broad involvement in establishing ecosystem objectives; representatives of the public, particularly academics, were frequently recommended for involvement in the development of ecosystem objectives.

There were some suggestions for ecosystem objectives; many suggested that the ecosystem be defined to include humans.

Response

The Plan retains the parallel chemical-by-chemical and ecosystem approaches. Each has advantages and disadvantages; they work well together. The mass balance approach is essential to the establishment of quantifiable input reduction targets on a chemical specific basis.

As outlined in the section on goals, preliminary mass balance estimates can be used to establish preliminary input reduction targets. The cost to the Four Parties will be approximately $100,000 (U.S.).

Decisions on incurring the substantial costs required to construct fully-developed mass balance estimates will be deferred until the completion of the preliminary models.

The Four Parties will move towards more uniform standards and advisories by referring differences to the Committee on Criteria and Standards. The Committee will develop recommendations on resolving differences for consideration by the individual jurisdictions.

An Ecosystem Objectives Work Group will be formed and will include representatives from the public.

Specific suggestions for ecosystem objectives will be referred to the Work Group.

In establishing ecosystem objectives for Lake Ontario, the ecosystem will be defined to include humans.

F. Communication And Reporting

What The Draft Plan Says

The draft Plan includes a number of continuing public involvement commitments:

- Coordination Committee meetings, open to the public, will be held at locations around the Lake.
- The Plan will be updated every two years; Status Reports will be issued in alternate years.
- Mailing lists will be maintained. Those on mailing lists will receive Plan Updates, Status Reports and bibliographies of Technical Reports.
- Technical Reports will be maintained in repositories around the Lake.

What The Public Says

The Lake Ontario Toxics Committee received a clear message calling for increased public participation in the development and implementation of the Lake Ontario Toxics Management Plan. The message also highlighted needs for more information and increased dialogue overall. Of particular concern were accountability, outreach to develop an effective, basin-wide constituency, and coordination with other related efforts.

Considerable interest was expressed for the establishment of a Citizen's Advisory Committee (CAC) associated with the Lake Ontario Toxics Committee. Some proponents indicated a need for funding to alleviate expenses while a few suggested funding should include a per diem stipend. Discussion also reflected concern about public participation in a multiplicity of such fora and the associated time commitments.

There was strong support for regular Coordination Committee meetings around the Lake. The suggested frequency ranged from every two months to every six months.

To ensure accountability, the public wants regular progress reports on the implementation of the Plan.

There were many suggestions for developing a basin-wide constituency. These included:

- Making informational materials more widely available by using local and university library systems;
- Using existing organizations such as the Lake Ontario Organizing Network;
- Using citizens to distribute information;
- Conducting bi-national conferences;
- Using newsletters;
- Developing educational curricula; and
- Making special efforts to involve industry, municipal government, labor groups, and other agencies.

The public also saw the need to coordinate with other ongoing public involvement efforts:

- Coordinate Niagara River Coordination Committee activities with Lake Ontario Coordination Committee activities; and
- Coordinate with RAP public involvement efforts.

Response

There will be one Coordination Committee for Niagara River and Lake Ontario issues. Business meetings of this Committee will be held to review status reports on Plan development and implementation, and to deal with problems and issues as they arise. These meetings will be open to the public. Meetings on the Niagara Plan will be held in Niagara Falls, Ontario or Niagara Falls, New York. Meetings on the Lake Ontario Plan will be held at various locations throughout the Lake Ontario Basin.

Following a careful evaluation of the identified needs and options for ongoing public involvement in the Lake Ontario effort, the LOTC recommends the Communication and Reporting component of the LOTMP be expanded considerably from that proposed in the draft Plan. It is felt the following recommendation reflects concerns on the part of both the agencies and of the participating public for an efficient and effective vehicle of communication. It is also the intent to implement this proposal for a one year trial and evaluate its effectiveness in meeting the needs of both the agencies and the public in the cooperative development and implementation of the LOTMP.

The LOTC recommends that public consultative activities build on the RAP processes around the Lake Ontario and Niagara River basins to disseminate information and air concerns for the Lake-wide activity. This takes advantage of established networks of stakeholders and concerned interests, focusses work in designated "hotspots" around the basin within the context of a Lake-wide program, and promotes coordination between the various interests at work in the basin. This will be supplemented with bi-national workshops held at least once a year (coincident with the release of annual* Status Reports and Updates) and additionally as issues and concerns arise that demand a more Lake-wide focus. The latter will feature specialists brought together to bring their collective expertise to bear on specific problems in a public forum. The LOTMP will not become a prime focus for existing RAPs, but Lake Ontario can be part of RAP agendas as issues arise and the responses will set direction for more comprehensive activities (such as workshops) as need arises.

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* The final Plan calls for the preparation of Status Reports and Plan Updates on an annual basis.

It is felt this approach will better serve the larger jurisdiction of a whole lake system, while, at the same time, ensuring the most effective use of the resources contributed both by the agencies and by the public. There is a large and diverse range of activities that make up the whole. The proposed strategy provides both the focus needed to effectively address these components and the mechanism for knitting them into a comprehensive and holistic plan of attack. The procedure also facilitates carrying out most of the specific suggestions referenced above.

G. General

What The Draft Plan Says

Not applicable.

What The Public Says

The public perceived the Plan to be "a good beginning". Many were impressed with the ability of the Four Parties to work together to produce a Plan. Most emphasized the need for further work. A few thought that the Plan was merely a rehash of existing information.

There were three additional recurring themes:

1. The plan should identify the laws that will need to be created or amended to achieve the goals of the Plan.

2. The plan should include a discussion of the costs and sources of funding for implementation of the Plan. Some asked that options at different cost levels be included.

3. The Lake Ontario Toxics Management Plan should serve as the basis for the Lake-wide Management Plan required by the GLWQA; there should be one plan for the Lake.

Response

We thank the public for its kind remarks. We agree that the Plan is just a beginning and that extensive further work is essential. We note that there are many elements of the plan (e.g., mass balance, ecosystem objectives) that are new. The lack of legislative authority has not yet been identified as an impediment to the implementation of any plan recommendations. This is because all implementation activities thus far included in the Plan fall in the category of existing and developing programs. However, with the completion of the preliminary mass balance efforts a year from now, we may begin identifying control needs that do go beyond existing legislative authority. If so, the Plan will recommend legislative changes.

Similarly, with regard to the costs of implementation, the Plan 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 any incremental costs on the regulated community. However, with the completion of the preliminary mass balance efforts a year from now, we may begin identifying control needs that do impose incremental costs on the regulated community. If so, the Plan will estimate the costs and benefits of those controls.

This PRD does identify incremental costs associated with continued development of the Lake Ontario Toxics Management Plan.

The Lake Ontario Toxics Management Plan serves as the Lake-wide Management Plan required by the GLWQA. It may need to be modified as consultation within the IJC community further defines the requirements for Lake-wide management plans under the GLWQA.

III. Responses To Additional Comments On The Draft Lake Ontario Toxics Management Plan

A. Plan

Comment: The involvement of a large number of Government jurisdictions in Lake Ontario environmental programs was seen both to complicate effective management and to blur jurisdictional responsibility. There is a need to clearly delineate the lines of responsibility of each Government agency, and define the responsibilities of municipalities in implementing the Lake Ontario Toxics Management Plan.

Response: The individual commitments in the Plan, identifying responsible parties, allow for agency cooperation, while maintaining a clear line of responsibility. The municipalities in the Lake Ontario Basin are directly influenced by the federal, state and provincial programs that are the focus of the LOTMP. As the Plan evolves, additional commitments may be included for municipal government.

Comment: There is a need to coordinate control programs in the United States and Canada.

Response: The control programs in the United States and Canada have been developed in response to separate statutory mandates. Coordination is occurring through the preparation of the LOTMP. To the extent that separate national programs as currently being implemented are inadequate to protect the Lake, the LOTMP will recommend additional controls.

Comment: Discuss Nuclear waste, particularly the release of radioactive substances from mining operations.

Response: The Lake Ontario Toxics Management Plan does not directly address radioactive material. This topic may be added in future updates of Appendix IV.

Table I: Planned Actions

IA1. Direct Industrial Discharges (U.S.)

Comment: The proposed five year permit revision provision for SPDES permits is in conflict with existing State and Federal law.

Response: USEPA does not believe that the five year permit reissuance provision is in conflict with State and Federal requirements. Technology-based effluent limitations and standards or new source performance standards are required conditions of the NPDES permit. It should be emphasized that these provisions do not apply to existing sources which modify their pollution control facilities or construct new pollution control facilities and achieve performance standards, but which are neither new sources or new dischargers. Only new dischargers which underwent construction after October 18, 1972, or new sources which meet the applicable promulgated new source performance standards before the commencement of discharge, may not be subject to any more stringent technology-based limits during the protection period. Therefore, when applicable, permits can be issued to include technology-based limits based on the most current effluent guidelines.

Comment: Who will check on the self-monitoring results of dischargers in the Lake Ontario Basin?

Response: NYSDEC checks on major discharges by collecting its own samples, and analyzing them. In addition, NYSDEC carries out plant inspections and also monitors the receiving waters (stream monitoring). Furthermore, a great deal of self-monitoring is performed by contract laboratories and paid for by the industrial plant. Contract laboratories used by New York dischargers are State approved.

IA2. Indirect Industrial Discharges (U.S.)

Comment: A variety of experts, including local experts, should be involved in interpreting the bioassays conducted at the eight Publicly Owned Treatment Works with Significant Industrial Users.

Response: The NYSDEC and USEPA will jointly interpret the results of these bioassays in accordance with State and Federal toxicity testing guidelines. Federal protocols for conducting toxicity testing are contained in "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms", USEPA/600/4-85/OB, March 1985. The State guidelines are included in the "New York State Manual for Toxicity Testing of Industrial and Municipal Effluents", NYSDEC, February 1985 and the NYSDEC, Division of Water's "Technical and Operational Guidance Series (1.3,2), Toxicity Testing in the SPDES Permit Program", April 1987. Pending the interpretation of these results, the State may issue additional permit requirements such as whole effluent toxicity testing permit limits, additional toxicity testing, a Toxicity Reduction Evaluation, or other types of controls in these permits. These additional permit requirements would be subject to public participation through the public noticing process.

IA4. Hazardous Waste Treatment Storage and Disposal Facilities (U.S.)

Comment: List facilities by County.

Response: A map showing the location of all treatment, storage and disposal facilities is included in the final Plan.

IA5. Inactive Hazardous Waste Site (U.S.)

Comment: Include a more specific timetable of planned actions.

Response: The draft Plan included a complete schedule leading to remedial action at each National Priority List Site. The final Plan includes updated schedules.

Comment: There seems to be some evidence of contaminant releases to the Oswego River from the Fulton Terminals Site.

Response: The surface water data collected from the Oswego River during the remedial investigation at the Fulton Terminals Site indicates the existence of only one organic contaminant, bis(2-ethylhexyl) phthalate, at low concentrations. That contaminant was detected upstream from Fulton Terminals at twice its level in the water adjacent to the site. The overall level of organic contamination was considerably higher in the river sediment samples than in the corresponding surface water samples. However, the observed contamination of sediments cannot be attributed to Fulton Terminals, since the major contaminants were not detected in the groundwater emanating from the site, and since higher total organic contaminants were observed upstream from the site than adjacent to or downstream from it. This information is indicative of one or more upstream sources of contamination.

In summary, there is no definitive evidence linking contamination in the Oswego River with the Fulton Terminals Site.

IA6. Combined Sewer Overflows (U.S.)

Comment: The construction of CSO abatement facilities at the Monroe County Frank Van Lare STP may be delayed from the date shown in the draft Plan if adequate funding cannot be obtained; the problem relates to the change from a construction grant assistance program to a loan program.

Response: Various overflow abatement projects remain to be constructed within the combined sewer system. Schedules have been developed to construct those projects regardless of the availability of Federal funding.

IA8. Other Nonpoint Sources (U.S.)

Comment: A number of reviewers recommended that DEC prepare the State Nonpoint Source Management Program in consultation with other agencies, including the New York State Soil and Water Conservation Committee, the Soil and Water Conservation Districts, the USDA Soil Conservation Service, the New York State Department of Agriculture and Markets; Health; and Transportation.

Response: The agencies named in the commentor's questions have been invited to participate on the State's Nonpoint Source Workgroup and to review the Management Program, as appropriate.

Comment: Lead Agency responsibility for agricultural non-point source pollution should remain with the New York State Soil and Water Conservation Committee and should utilize the Committee's network of local districts. The Committee has the experience and understanding of working with the agricultural community.

Response: Lead responsibility regarding implementation of the agricultural nonpoint source management program remains with the State Soil and Water Conservation Committee, utilizing the statewide network of local districts. As the agency responsible under State law for water quality and water resources management, DEC has the lead responsibility for developing the State's Nonpoint Source Management Program, including overall program planning and oversight.

Comment: Implementation of agricultural non-point source control measures must be on a voluntary basis.

Response: The implementation of agricultural nonpoint source controls is expected to continue on a voluntary basis. In the event of persistent and continuing water quality standards violations, and/or where additional nonpoint source controls are found to be feasible, State enforcement or other actions may have to be undertaken to assure the protection of water quality.

Comment: Best management practices should continue to be utilized as primary control measures.

Response: Best management practices will continue to be utilized as the primary control measure for agricultural nonpoint source control. The identification and listing of specific practices considered to be BMPs, the official endorsement of these BMPs for use and making suitable information/guidance on BMPs available comprise one of the key elements of any cost effective nonpoint source program.

Best management practices are essential tools to better link water quality with land management activities of pertinent resource management agencies and with the activities of local government. Cooperation and coordination among agencies is an essential part of "outreach" to develop awareness and enthusiasm for BMPs on the part of local government and the public.

Comment: Cost Sharing mechanisms must be established in order to offer incentives to landowners to implement best management practices.

Response: The Water Quality Act of 1987 and associated legislative history specifically excludes the use of certain funds for direct cost sharing to individuals (except for "demonstration projects" in some cases) while allowing the use of other funds for loans to farmers to manage nonpoint sources of pollution.

IA16. Potable Water (U.S.)

Comment: Those counties bordering on Lake Ontario should incorporate toxics information into their analyses of private drinking water wells.

Response: This task is not specifically included in the management plan. Community Public Water Systems serving less than 3,300 persons must complete the monitoring for eight regulated VOCs and up to 51 unregulated organics by December 31, 1991.

IB1. Direct Industrial Discharges (Canada)

Comment: Specify a short-term goal of full compliance with existing Certificates of Approval and Control Orders within two years. If compliance is not achievable within two years, pollution abatement equipment should be installed to meet existing Certificate of Approval or Control Order requirements.

Response: In general, MOE ensures that full compliance with existing Certificates of Approval and Control Orders is implemented as quickly as possible. In some cases, full compliance is achieved in less than two years. In other cases, full compliance has to be staged over a longer period of time due to the complexity of certain treatment methods or purchasing of specific equipment.

Comment: The implementation of MISA should be monitored to ensure that targets are being met.

Response: MOE will monitor progress of the MISA program against the deadlines in Table I of the final Plan.

Comment: Facilitate the development and implementation of acute and chronic toxicity tests that could be applied directly to effluents. Specify as an intermediate goal that all direct discharges are required to be subject to and "pass" chronic toxicity tests, particularly those tests used to assess reproductive success of aquatic organisms.

Response: MOE has developed protocols for both fish and Daphnia Magna acute toxicity tests. These protocols are being applied to MISA monitoring regulation. MOE is currently developing methods for other species. The MISA program's goal is the elimination of all toxic compounds. The monitoring regulation will help develop a staged program to achieve the ultimate goal of MISA.

IB2. Indirect Industrial Discharges (Canada)

Comment: Ontario should explain how and when MISA will control industrial discharges through municipal sewers.

Response: Appendix IV and Table I of the Plan provide a description of the program to control indirect industrial discharges and an associated list of MOE actions.

Comment: Promote the development and implementation of industrial pretreatment programs. The Lake Ontario Toxics Management Plan should encourage the Ontario Ministry of the Environment to specify and prioritize industrial sectors suitable for pretreatment programs, as well as publish an implementation schedule specifying when various industrial sectors will be required to comply with plant-specific pretreatment standards.

Response: The sectoral Best Available Technology limits will include 22 priority sectors. These sector limits can be supplemented by local limits to protect sewage treatment plants.

Comment: Encourage MOE to establish minimum sewer-use standards for Ontario, in order to reduce regional disparities.

Response: MOE is currently developing a sewer use control program. This program will be subject to public review and input. The final MOE position, including public comments will be finalized by the end of 1988. Since MOE recognizes the problem with existing sewer use control, MOE will impose Sectoral Best Available Technology limits, similar to those for direct dischargers, as early as 1991.

IB3. Municipal Discharges (Canada)

Comment: Encourage MOE to forego the requirement for monitoring regulation on municipal sewage treatment plants, and instead direct all their resources towards accelerating the development and implementation of the compliance regulation.

Response: The monitoring regulation for municipal sewage treatment plants is essential to ensuring the collection of a quality assured/quality controlled data base. This data base will facilitate the development of the effluent limit regulation.

IB4. Waste Disposal Sites- Active and Closed (Canada)

Comment: MOE should publish a report within one year that identifies the compliance status of the waste disposal sites in the Lake Ontario Basin (both active and closed) with respect to their Certificates of Approval.

Response: Information on the compliance status of the waste disposal sites in the Lake Ontario basin can be obtained from the inspection reports which are available from MOE's Regional Offices.

Comment: Take a more systematic and comprehensive approach to ensure that adequate programs are in place or under development to identify and remediate landfill problems.

Response: The gathering and assembling of information required for the inventory of waste disposal sites is a major part of MOE's long-term, comprehensive program to investigate and monitor waste disposal sites throughout the province. The information sources include the Ministry's computerized data files on individual sites, file archives and field inspections of the sites. In its updated list of Ontario waste disposal sites in 1988, the Ontario Ministry of the Environment has initiated detailed hydrogeological studies for closed landfill sites in Trenton, Picton and Caledonia. The Ministry is continually revising and expanding the inventory to ensure Ontario residents are kept informed of the locations, status and possible impacts of both closed and active landfill sites.

IB5. Combined Sewer Overflows / IB6. Storm Water Discharges (Canada)

Comment: Ensure the development of a list of the combined sewer overflows and stormwater discharge points in the Lake Ontario Basin. Indicate the approximate frequency of overflow in CSOs and the frequency of discharge at stormwater discharge points. Estimate the annual volume of wastewater and stormwater discharged untreated into Lake Ontario. Ensure the development of a monitoring program to estimate the potentially toxic chemical loadings to Lake Ontario from combined sewer overflows and from direct stormwater discharges. Identify programs to mitigate significant CSOs and direct stormwater discharges in cooperation with the municipalities concerned.

Response: There are existing comprehensive programs to study the effects of combined sewer overflows and stormwater discharges on water quality and also to assess the significance of these sources relative to other point and nonpoint sources. Programs such as pollution control planning (PCP) define impacts and remedial measures for storm and combined overflow sewers on a province-wide scale. Programs which are specific to a certain location or area, such as Toronto Area Watershed Management Study (TAWMS) provide in-depth assessment of local problems. Sewer rehabilitation programs (Lifeline Programs) are aimed at investigating potential problems that may be attributed to old sewers. These programs usually include a list of CSOs and storm sewers, frequency of discharges, and estimates of flow rates and toxic loadings.

IB7. Other Nonpoint Sources (Canada)

Comment: Ensure the development and implementation of monitoring programs to assess the impact of nonpoint sources of potentially toxic chemicals compared with point sources.

Response: The LOTC will form a Niagara River/Lake Ontario Fate of Toxics Committee, which will attempt to establish the relative magnitude and significance of point and nonpoint sources of toxics in Lake Ontario. The Fate of Toxics Committee will recommend a monitoring program to support its efforts.

B. Appendix II: Toxics Problem in Lake Ontario

Comment: Define the term "Ambient" as used in the Lake Ontario Toxics Management Plan.

Response: "Ambient" means the level or concentration of a toxic chemical in a medium (water column, sediment, fish tissue) within Lake Ontario.

Comment: Polychlorinated dibenzofurans, particularly 2,3,7,8 tetrachlorodibenzofuran, and 2,3,4,7,8 pentachlorodibenzofuran should be included on the list of problem chemicals.

Reponse: The expanded list of toxics includes polychlorinated dibenzofurans. Polychlorinated dibenzofurans (including 2,3,7,8-TCDF and 2,3,4,7,8-PeCDF) have been placed in Category IE, "No Criterion Available". The Criteria and Standards Committee will evaluate the need to develop standards or criteria for 2,3,7,8-TCDF and 2,3,4,7,8-PeCDF.

Comment: Polynuclear aromatic hydrocarbons (PAHs) should be considered for addition to the list of problem chemicals.

Response: A number of PAHs are included in Category IIA, "Evidence of Presence In or Input to the Lake", where ambient data (fish tissue, water column) is not currently available for Lake Ontario.

Comment: There appears to be a lack of confidence by the LOTC in data used to assess the state of Lake Ontario with respect to toxic chemical contamination.

Response: A great deal of useful data was available for preparing the LOTMP. However, some data is suspect or missing. Data limitations will be addressed during the continuing planning process.

Comment: The Parties signatory to the GLWQA clearly recognize two classes of toxic substances - those that are persistent and those that are not persistent. The LOTMP has not preserved this distinction and the blurring of these two discrete categories of contaminants will seriously hamper programs designed to bring about the restoration of Lake Ontario.

Response: The LOTC will evaluate the need to distinguish between persistent and nonpersistent toxic substances prior to recommending specific control actions for problem toxics in Lake Ontario.

Comment: Utilize the "synergistic approach" to assess the impact of toxic chemicals on the Lake Ontario ecosystem.

Response: The chemical-by-chemical approach will be used to move quickly to implementation in the context of existing law and regulation. The complementary ecosystem approach, which does account for synergistic effects, will serve as a check on the effectiveness of the chemical-by-chemical approach.

Comment: The Plan should assess the need for ecologically-based sediment criteria.

Response: The Committee on Standards and Criteria will assess the need for sediment criteria.

Comment: Define how the ecosystem approach is legally enforced by the Four Parties.

Response: The ecosystem approach is not directly enforceable. The ecosystem approach is useful as a check on the effectiveness of the chemical-by-chemical approach.

Comment: Proscriptions from eating fish are complied with only by knowledgeable people with other sources of protein readily available.

Response: We agree. That's one reason why the goal of the Plan is fish that are safe for unlimited human consumption.

Comment: We need to inform people of proper cleaning of fish to make them safer to eat.

Response: The New York State Department of Environmental Conservation publishes a fish filleting guide that shows how to fillet fish so as to reduce toxics consumption. This guide is widely distributed in New York State.

Comment: The LOTMP should encourage basic research on the role of sediments in determining levels of toxics in Lake Ontario; funds should be committed to this effort and some should go to academic institutions.

Response: The Committee on the Fate of Toxics in Lake Ontario is charged with outlining the required research program.

Comment: The Plan should include a commitment by the Four Parties to a coordinated multi-year research program to support modelling of Lake Ontario.

Response: The Committee on the Fate of Toxics in Lake Ontario is charged with outlining the required research program.

Comment: The biomonitoring programs and epidemiological studies on human populations in the Lake Ontario Basin should be included in the Plan.

Response: This issue will be addressed by the Ecosystem Objectives Work Group during the continuing planning process.

C. Appendix III: Toxics Loadings to Lake Ontario

Comment: Why are sanitary landfills excluded from the New York State data in Table III-7 (pg. 20)?

Response: The New York State Sanitary landfills have been included in the final Lake Ontario Toxics Management Plan.

Comment: There is a need to understand the impact of groundwater contamination on Lake water quality.

Response: The Niagara River/Lake Ontario Fate of Toxics Committee will attempt to identify all significant sources of toxics to Lake Ontario.

Comment: Nowhere does the draft plan address the question of municipal and industrial shock loading.

Response: High loadings of pollutants over a short period of time may cause extensive environmental impacts. This is recognized by the agencies and they feel that current stream monitoring can detect such effects. Special investigations can then track down the source. The agencies have the authority to force suspected sources to install continuous monitoring and to take other necessary steps to prevent reoccurrence. As part of the Ontario MISA effluent monitoring regulation, industrial and municipal facilities will be equipped with continuous monitoring instrumentation for some indicator parameters to detect short term shock loadings.