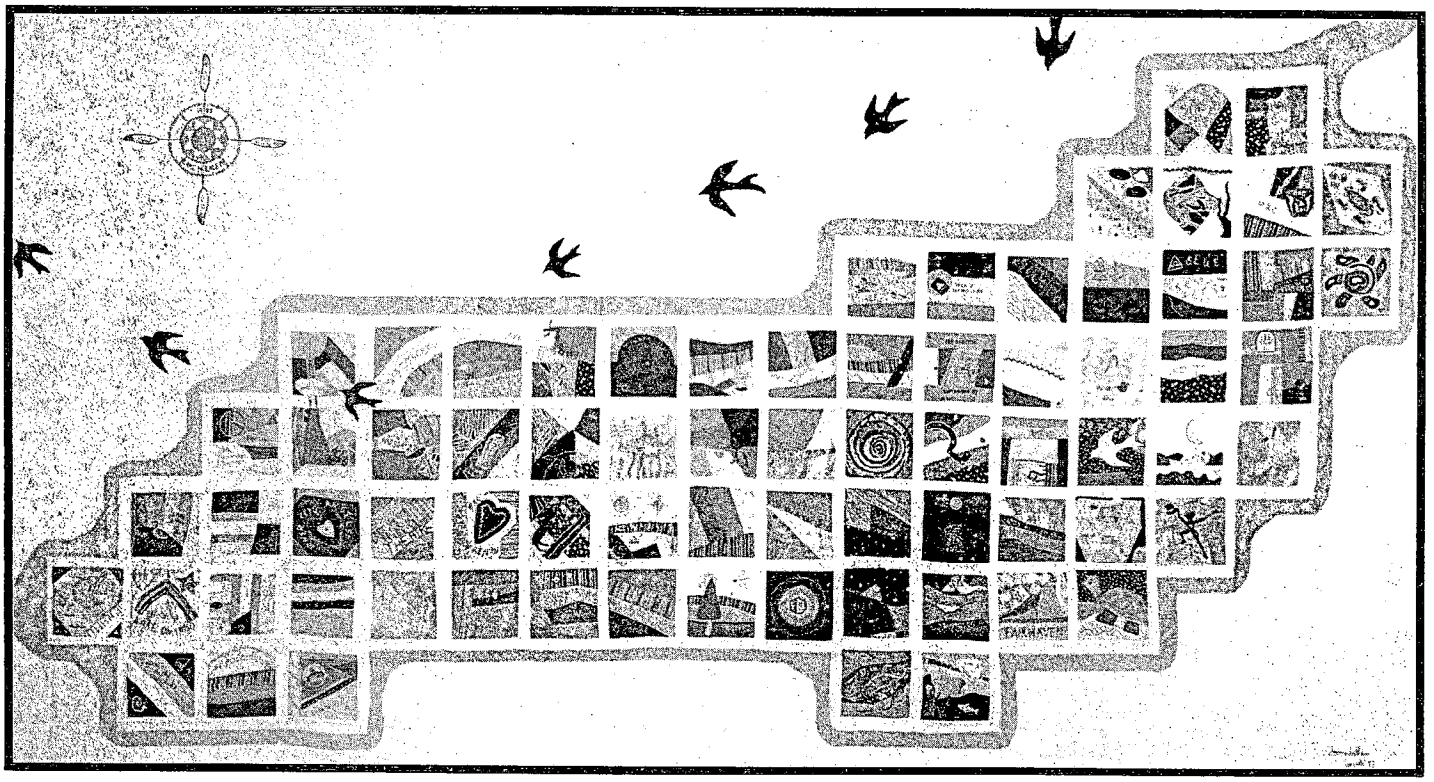
A CITIZENS' AGENDA FOR RESTORING LAKE ONTARIO



REPORT OF A REGIONAL MEETING ON LAKE ONTARIO WATER QUALITY ISSUES

GREAT LAKES UNITED

A CITIZENS' AGENDA FOR

RESTORING LAKE ONTARIO

REPORT OF A REGIONAL MEETING ON LAKE ONTARIO WATER QUALITY ISSUES

August, 1988

GREAT LAKES UNITED

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Great Lakes United is a coalition of more than 200 member groups of environmentalists, sportsmen and women, labor, and civic organizations from the eight Great Lakes states and two Canadian provinces. We are dedicated to promoting the protection and restoration of the Great Lakes Basin Ecosystem.

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The Story of the Cover Photo:

THE LAKE HEALER is a travelling quilt. It travels as a witness to the hundreds of stitchers who contributed to its making.

During the summer of 1987, I travelled to many communities in Ontario and New York with the Portable Theatre Company while they performed **Message in a Bottle**, a lake-healing musical.

Wherever we performed, I carried a picnic basket full of fabrics, needles and threads and buttons and beads. Rolling out a gaily colored Navaho blanket, I gathered people around me who added stitches to 10-inch squares which were later incorporated into a large quilt.

Almost 300 men, women and children sewed on this piece. While sewing they put good wishes, prayers and hope for the health of the lakes into their work. Each patch has a story.

The stitchers also contemplated ways in which they as individuals could contribute to the health of our great inland waters.

"*What harmful substances can we stop adding to the sewers?*" is one of the questions discussed during sewing sessions.

"*Do we need to organize and lobby politicians and how might we do that?*" was another.

Literature was passed out which suggested answers to these questions.

Wherever I went, I found people eager to stitch on this quilt as a physical manifestation of their desire for a healthy Lake Ontario.

Donna Bothen
December, 1987

Photo by Paul Till, Toronto, Ontario

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PREFACE

On December 5th, 1987 nearly seventy citizens and representatives of environmental groups gathered in Niagara Falls, New York. This Lake Ontario Regional Meeting was organized by Great Lakes United and was cosponsored by the Canadian Environmental Law Association, Citizen Action of New York, Clean Water Ontario, the Ecumenical Task Force of the Niagara Frontier, Operation CLEAN Niagara and Pollution Probe. Major assistance in organizing and hosting the meeting was provided by the Ecumenical Task Force.

Prior to the December 5th Regional Meeting, the major sponsors had begun discussing the need to coordinate more effective citizen action to help resolve the problems of toxic chemical contamination in Lake Ontario. They agreed that the December 5th meeting would be used as a launching pad for a much broader effort to take place throughout 1988 and beyond.

At the meeting, a central theme of discussion was how to mobilize a broad base of popular support and translate it into political action to clean up Lake Ontario. The principal elements of a citizens' action plan were agreed to at the meeting and a steering committee was selected. This committee has been meeting to shape the principles into an action plan and to discuss ways to involve more of the basin's citizenry to help carry out the action plan.

LOON, Lake Ontario Organizing Network, is a project of Great Lakes United, Pollution Probe and the other members of the Steering Committee. The purpose of the **LOON** project is to mobilize citizen support to implement the recommendations of the Regional Meeting to clean up toxic pollution in Lake Ontario.

This report is the summary of the major conclusions of the participants at the December 5th Regional Meeting as well as the results of Steering Committee discussions. This report should be viewed as a "work in progress". Steering Committee members represent Atlantic States Legal Foundation, Canadian Environmental Law Association, the Centre for the Great Lakes, Citizen Action of New York, Ecumenical Task Force, Energy Probe, Great Lakes United, Help Eliminate Lawn Pesticides and Pollution Probe.

Throughout this summer, a Caravan toured around Lake Ontario talking with citizens in their communities about our hopes and dreams for Lake Ontario as well as the mutual problems we share in cleaning up the Lake. On the tour, reactions to early drafts of this report were sought. The report will be discussed again in detail at a Citizens' Summit on Lake Ontario in Kingston, Ontario, on September 16-18, 1988.

INTRODUCTION

Lake Ontario is fed by the waters of the upper four Great Lakes rushing over the powerful Niagara Falls. It ends at the enchanting Thousand Islands to the east. The southern and eastern basin is largely rural with many scenic parks and resort areas along the shores. The northern and western basin is rimmed by an intensive industrial and metropolitan development including the Ontario cities of Toronto, Hamilton and St. Catharines.

The fact that Lake Ontario is the smallest of the five Great Lakes belies its grandeur. The Lake has a surface area of 19,000 square kilometres and a drainage basin of 70,700 square kilometres. Its depth is second only to Lake Superior averaging 86 metres and a maximum depth of 245 metres. It contains a total volume of 1,637 cubic kilometres (393 cubic miles) of water. It takes roughly 7.6 years to replace all the water in the Lake but it has been estimated that it would take 20 years to flush 90 percent of the pollutants from the Lake--assuming no more enter.

The Niagara River, carrying the outflow of Lake Erie and the upper Lakes, dumps 848 million cubic metres per day into the Lake, or roughly 85 percent of the flow from all Lake Ontario tributaries. Other tributaries in Ontario include Hamilton Harbour, Twelve Mile Creek near St. Catharines and the Trent River at the Bay of Quinte. The largest tributaries in New York besides the Niagara include the Oswego River, which drains the Syracuse and Finger Lakes areas, the Genesee River, entering at Rochester, and the Black River near Watertown.

Nearly 6.5 million people reside in the Basin, approximately two-thirds of whom live in Ontario. Over two-thirds of these people get their drinking water from the Lake. In addition to a drinking water supply, Lake Ontario supports a valuable sport and commercial fishery. The New York Sea Grant agency estimated that in 1984 Lake Ontario fishermen and women in New York spent an estimated $32 million on direct fishing-trip related expenses.

But this valuable resource, and the people, fish and wildlife who make their homes here, is besieged by an onslaught of toxic chemical pollution. Lake Ontario is considered by the International Joint Commission (IJC) to be the most polluted of all the Great Lakes. In the mid 1970's an epidemic of chick edema disease caused by organochlorine contaminants like dioxin, DDT and PCBs threatened to wipe out Lake Ontario's herring gulls (Gilbertson, 1985). Continued monitoring of contaminants in herring gull eggs shows that levels of some contaminants have declined since the mid-seventies but this decline has levelled off and contaminants are still unacceptably high.

Herring gulls are but one of the species which have been adversely affected by toxic pollutants in Lake Ontario. Wild mink are virtually non-existent within eight kilometres of the New York shore of the Lake because the fish that mink live on are so contaminated with PCBs that the mink are unable to reproduce (IJC, 1987). Bald eagles and osprey, birds whose diets consist primarily of fish, are also no longer found on Lake Ontario, because toxic contaminants are interfering with reproduction.

The sources of these toxic chemicals are numerous. The draft Lake Ontario Toxics Management Plan (1988) lists 46 industrial dischargers in New York and Ontario, and 15 large municipal waste treatment plants. These numbers mask the importance of industries which dump into municipal treatment plants. There are an estimated 11,000 industries dumping into municipal treatment plants in Ontario.

Hazardous wastes dumped into landfills are also contributing vast amounts of toxic chemicals to Lake Ontario, though precise estimates on the total impact are not available. The Lake Ontario Toxics Management Plan (LOTMP) states that a total of 139 active hazardous waste sites and 313 inactive sites lie within the drainage basin. Among the most threatening of all waste sites are those near Niagara Falls, New York, which contain thousands of tons of wastes from organochlorine chemical manufacturers. In the Hyde Park landfill, which is only 600 metres from the Niagara River and is leaking, there is an estimated 1-2 tons of TCDD dioxin (the most toxic form). Canadian officials have warned that this waste is so toxic that just a couple of shovels full could render the Lake lifeless.

The Niagara River continues to pour toxics into Lake Ontario from industrial and municipal plants and leaking dumpsites. The U.S. Environmental Protection Agency (EPA) estimates that a total of 505 kilograms of toxics are dumped into the river each day (Buffalo News, 1988). Of this load, 269 kilograms come from legally permitted industrial and municipal plants. Another 236 kilograms a day come from 33 of the worst dumpsites. The Hyde Park dump, with its ton or more of dioxin, leaks 21.2 kilograms of toxins into the River each day.

Bad as they are, these sources are only the beginning. Toxic fallout may drop more than 6 kilograms per day of PCBs onto the Lake's surface. Tons of sediments laden with pesticides and other pollutants wash into the Lake with every rainstorm.

What does this mean to the health of Lake Ontario residents? The Royal Society of Canada and U.S. National Research Council warned in 1986 that residents of the Great Lakes basin are exposed to and accumulate more toxic chemicals in our bodies than other population groups. As residents of the most polluted of the five Great Lakes, citizens around Lake Ontario are, therefore, likely to be more contaminated than our upstream friends.

The long-term impacts on human health from toxics in the Great Lakes basin are poorly understood. What little research is available leads to alarming conclusions as discussed in a later chapter. The warning signs are clear that urgent action is required to halt further contamination.

The governments have responded to the warnings with a variety of laws, agreements, pledges, and promises. There are numerous official government programs designed to have an impact on Lake Ontario's water quality. All of these programs are announced by governments as though they will solve the Lake's problems. At the top of the list is the Great Lakes Water Quality Agreement of 1978 between the U.S. and Canada. This "quasi-treaty" adopts the philosophy of zero discharge and virtual elimination of persistent toxic substances. An agreement signed in February of 1987 between New York, Ontario, the U.S. and Canada calls for a 50 percent reduction in the pollution load going into the Niagara River by 1996. Ontario is engaged in a five-year, phased reform of its water pollution control programme under the Municipal and Industrial Strategy for Abatement (MISA). Under the Great Lakes Water Quality Agreement, the states and Ontario are preparing "Remedial Action Plans" that are designed to restore the Great Lakes 42 toxic hot spots--seven of which are on Lake Ontario's shores. These are areas that the International Joint Commission has recognized for nearly 20 years as having water quality that is not up to the standards of the Great Lakes Water Quality Agreement.

While all of these initiatives are important steps in the right direction, the public has come to realize that, too often, promises like zero discharge are little more than political platitudes that don't reflect the way governments do business. Despite the laws and agreements, toxics continue to be dumped into Lake Ontario. A prime example came at the June 13, 1988 meeting of the Niagara River Toxics Committee when the governments announced what chemicals would be cut by 50 percent as required by the February 1987 accord. The governments decided that only 10 of the hundreds of toxic contaminants known to be present in the Niagara River would be on the list to be cut by 50 percent. This announcement came immediately after a report from the Ontario Ministry of the Environment showing that levels of dioxin, mirex and PCBs have risen sharply in the River in the last two years (in Buffalo News, 1988).

The public is aware that there is a big difference between promises made by politicians and government officials and the actual removal of toxics from the Lake Ontario ecosystem. We are frustrated, angered by the delays and frightened by the possible effects on our health. What is missing is strong will on the part of government agencies to aggressively enforce the laws on the books. Public pressure is the only hope for generating that strong will. It is essential that we--the public--repeatedly demand that governments move aggressively to live up to their promises to clean up and restore our environment.

More and more, the public is demanding to be included when governments make decisions affecting our Lake. In some cases, government officials have recognized that public involvement can help them achieve their goals. Right now the public around the basin is involved in the preparation of Remedial Action Plans for the eight Areas of Concern (including the Niagara River) around the Lake. A major public involvement program was just completed to review the governments' draft Lake Ontario Toxics Management Plan.

Our role as citizen activists is to constantly push the governments to aggressively implement laws and live up to promises like zero discharge.

Format of this Report:

This report is a vision of citizens' hopes for the future of Lake Ontario. At the December 5, 1987 Regional Meeting, we laid down a series of principles which form the heart of our citizens' agenda for cleaning up Lake Ontario. At the outset of this report, the ecosystem approach is defined as a framework for managing the Lake. Next, we briefly review Lake Ontario pollution problems from point and non-point sources, solid and hazardous waste sites and problems with contaminated sediments. Each section describes the problem and contains our recommended solutions.

At the end of the report is a Summary of Recommendations and a Glossary. The Summary is simply a listing of the recommendations contained within the report without any of the discussion or rationale. The glossary is an attempt to explain some of the acronyms and terms used which we were unable to fully describe within the text.

The report is intended to be a "work in progress". During this summer, a Caravan sponsored by Pollution Probe is travelling around Lake Ontario reviewing the report and receiving input from other citizens around the basin. In the fall, on September 16-18, a Citizens' Summit on Lake Ontario will be held in Kingston, Ontario. At the Summit, citizens will discuss this agenda and develop strategies for its implementation.

LAKE ONTARIO AS AN ECOSYSTEM: A GUIDING TENET

Everyone at one time or another has heard of the ecosystem concept even though its precise basis, scope and implications have not always been made clear. Essentially, an ecosystem approach defines its borders in ecological terms -- such as a Lake's watershed boundaries -- rather than political ones. Anywhere there are living and nonliving things that affect each other there is an ecosystem.

Basis of Ecosystem Concept:

Despite the fact it is governed by two federal governments, eight states, and two provinces, the Great Lakes Basin is an ecosystem. The governments have expressly recognized its physical and cultural integrity as such in the Great Lakes Water Quality Agreement.

Lake Ontario is also an ecosystem. Actions in one part of the lake will affect all of us in one way or another. But what does it mean to say that Lake Ontario is an ecosystem?

Ecosystem Science:

First of all, it means that a lake-wide perspective is needed in terms of monitoring and surveillance of biological, chemical, and physical processes. It also means that an integrated approach to the interpretation of data, and the interaction between all components of the environment must be taken into account. Only with this approach is it possible to understand the sources and eventual fates of pollutants and the interrelation of all media --including land and air pollution --on water quality.

Ecosystems Institutions:

An ecosystem perspective assumes the development of cooperative and coordinated strategies to deal with common problems. Networks of scientists, government officials, public interest groups, and concerned individuals need to exchange information and develop ways and means to meet the challenges that face them. The International Joint Commission and Great Lakes United are excellent examples of ecosystem institutions. These groups are defined by ecological terms that transcend political boundaries. The philosophy of the **LOON** project, targeted specifically for Lake Ontario, is another good example. With such institutions, the environmental citizenry can work effectively for better and more harmonized laws and regulations, and other tools for long-term protection and rehabilitation.

Ecosystem Ethics:

Ecosystem thinking further considers the broader value questions which arise when dealing with the long term goals of the lake system. The ecosystem approach results in the endorsement of what is often termed "sustainable development". The thrust of this concept is that development is only worthwhile so long as it is ecologically sound.

The Goal of Zero Discharge:

If Lake Ontario is an ecosystem, what are the general policy and legal objectives that we should strive for? A decade ago the national governments of Canada and the U.S., the states and provinces, and environmental groups agreed that the only long-term sustainable solution to the problem of persistent toxic pollution is to stop putting into the system those substances that the system can not handle -- the concept known as zero discharge.

In the Great Lakes basin, the zero discharge goal was established by Canada and the United States in 1978 under the Great Lakes Water Quality Agreement. According to that Agreement, the discharge of any or all persistent toxic substances is to be virtually eliminated and the philosophy adopted for the control of inputs of persistent chemicals is zero discharge. The 1978 Agreement was re-affirmed in 1987, and the zero discharge concept was strengthened in a number of sections.

There is no question of the support of these goals. Evidence of their acceptance by all basin states and provinces is found in the 1986 Great Lakes Toxic Substances Control Agreement. Moreover, when Great Lakes United held public hearings throughout the basin, the goal of zero discharge was continually and emphatically affirmed and endorsed by citizens throughout the basin.

The question is "how do we implement the goal of zero discharge?" While there is no one answer, the overall approach is to ensure there are concrete measures in place to immediately reduce, and then eliminate, the introduction of toxic chemicals. This can be achieved by "moving up the effluent pipe" to ensure that industrial processes are using clean and "closed loop" technologies and wastes are being recovered, reused, and recycled. All toxic inputs need to be identified (such as run-off and air deposition), and each of those inputs must be controlled at its source. It may be a sizable job, yet, a recent study by the U.S. Office of Technology Assessment (1986) noted that there are no practical or technical barriers to the achievement of the zero discharge goal.

Unfortunately, despite governments' commitments on paper, little has yet been done to achieve zero discharge. Sufficient resources have not been devoted, implementing laws have not been enacted, and political will has not been demonstrated. In fact, in the U.S., less than 1 percent of environmental budgets is devoted to pollution prevention and source reduction (Office of Technology Assessment, 1986).

Everyone has waited long enough. For Lake Ontario, it is time for zero discharge. The rallying cry for Lake Ontario citizen activists is "zero or nothing!"

ISSUES AND RECOMMENDATIONS

DISCHARGES FROM POINT AND NON-POINT SOURCES

In the past, governments have focussed the bulk of their pollution control efforts on municipal and industrial point sources. Discharge pipes were the most obvious and offensive sources of pollution.

We now know that achieving goals like swimmable and fishable waters and virtual elimination of persistent toxic substances will require doing much more than simply cleaning up municipal and industrial discharges. Tons of soil and sediment laden with pesticides, herbicides, oil, heavy metals and other contaminants wash into waterways from rural and urban areas with every rain storm. Toxic pollutants discharged into the atmosphere or onto the land can end up in Lake Ontario just as readily as what comes out of a discharge pipe. All sources of pollution to Lake Ontario should be treated with the same or more emphasis as point sources.

In the 1970's, hundreds of citizens and scientists were involved with the IJC's Pollution From Land Use Activities Reference Group study (IJC, PLUARG, 1978). This five-year study began because of a growing recognition that we can not effectively eliminate water pollution without controlling land use activities. The PLUARG study produced numerous recommendations which were basically ignored.

We recommend that the recommendations of PLUARG for controlling non-point pollution and runoff be reviewed and implemented by the governments around Lake Ontario.

The 1987 amendments to the Great Lakes Water Quality Agreement require more attention to problems caused by non-point pollution sources. The governments are required under a new annex to delineate areas of high priority which are contributing pollution to the Great Lakes from non-point sources. The governments are required to develop watershed management plans for these high priority areas. The plans are to include projects to demonstrate remedial measures and regulations to control non-point pollution.

We recommend that the Bay of Quinte and Hamilton Harbour, which have serious problems from non-point source pollution, be among the first watershed management plans developed and implemented for Lake Ontario.

Controlling non-point sources of pollution, as well as discharges from industries and municipal sewage treatment plants which continue to pour toxic substances into Lake Ontario, is crucial. The draft Lake Ontario Toxics Management Plan lists 46 industrial facilities in New York and Ontario with a combined total discharge of over 2,714,000 cubic metres of wastewater each day. This figure does not include those industries which dump into the Niagara River. The U.S. and Canada signed an agreement in February of 1987 to cut toxic discharges into the Niagara in half by 1996.

In New York, the U.S. Clean Water Act is the primary law governing discharges from industry and sewage treatment plants. Because there are no enforceable standards governing pollution under Canadian law, Ontario is developing the Municipal and Industrial Strategy for Abatement (MISA) modeled largely after the U.S. Clean Water Act. MISA will first impose monitoring on dischargers then require pollution control using the best available technology economically achievable (BAT-EA).

Ontario's MISA program will have a goal of virtually eliminating persistent toxic discharges from 300 direct industrial dischargers to waterways. The U.S. Clean Water Act espouses an interim goal of fishable, swimmable waters, and an ultimate goal that the discharge of toxic pollutants in toxic amounts be prohibited. Overriding both of these laws is the U.S. and Canada's commitment in the Great Lakes Water Quality Agreement that "the discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated."

Pollution control efforts in New York, Ontario, the U.S. and Canada have fallen far short of actually achieving these lofty goals. One reason is that so far, programs have focussed on large, identifiable point sources rather than diffuse non-point sources. Another reason is that programs focus on controlling pollution--not eliminating it. Even though production and use of PCBs has been banned in both countries, New York still issues permits to legally discharge PCBs into its waterways.

Ontario's MISA program has been criticized for its failure to close over 11,000 loopholes in the form of industries which discharge into sewage treatment plants.

We recommend that all industries in Ontario which dump into sewers be included under MISA for the program to achieve its goals.

The philosophical basis of laws concerning point source discharges in both countries is that there are "safe" levels of discharge for even the most persistent and toxic compounds. New York has promulgated these "safe" levels into a set of water quality standards which are considered among the strictest in the nation. These standards form the basis for the issuance of discharge permits.

This approach of setting "safe" standards for persistent toxic substances is incompatible with the Great Lakes Water Quality Agreement's goal of zero discharge for these substances. The Agreement distinguishes between persistent and non-persistent toxic substances. It requires that non-persistent toxic substances not be discharged in toxic amounts--the "safe standards" approach. But, the Agreement requires that persistent toxic substances not be discharged --period.

Source Reduction:

A major component of the solution to the problem of point source discharges is described in a section which follows titled, "Toxics Use and Hazardous Waste Reduction". Serious reduction in the quantities and toxicity of wastes discharged into Lake Ontario requires that we move away from our current focus on the end of the discharge pipe. New York and Ontario must develop and implement source reduction programs that focus on the other end of the pipe --in the factory.

We recommend that industries and all users of persistent and non-persistent toxic substances in New York and Ontario that seek permits to discharge into Lake Ontario or its tributaries be required to document that they have first utilized all possible technologies to avoid, reduce and recycle their wastes, residues and runoff.

Permits required under MISA, the U.S. Clean Water Act and Clean Air Act should only be granted after dischargers have complied with source reduction regulations.

Discharge Bans on Persistent Toxic Substances:

Even with a comprehensive source reduction program there is still much that must be done to control toxics from point and non-point sources. The following recommendations complement comprehensive source reduction programs.

The first step in the control of point source discharges is to agree on the toxic chemicals to be controlled.

We recommend that the governments create by December 31, 1988, a list of Critical Pollutants for Lake Ontario. This list should be created with public input and should be updated frequently as more data become available.

This list of Critical Pollutants is essentially completed. The IJC has listed 11 persistent toxic critical pollutants for the Great Lakes on their "Primary Track." The draft Lake Ontario Toxics Management Plan lists eight toxic pollutants for which ambient data are available and the compounds exceed either enforceable standards or a more stringent but unenforceable criterion. The following chemicals are common to both lists:

PCB	DDT and metabolites
Dieldrin	Dioxin
Mirex	Mercury
Hexachlorobenzene	

The IJC list also includes toxaphene, furan (2,3,7,8-TCDF), alkylated lead and benzo(a)pyrene. We do not recommend that the list be limited to these compounds; in fact, a much broader list is desireable. Environmentalists were dismayed when the governments announced that only 10 chemicals would be on the list for the Niagara River. The chemicals on this list are the ones that the governments will be attempting to reduce by 50 percent by 1996. Limiting the list to only 10 chemicals

is seen as weakening the commitment to reduce contamination in the Niagara River. Part of the problem in developing the lists for the Niagara River and the Lake Ontario Toxics Management Plan is that one of the governments' criteria is that they be compounds for which all jurisdictions have enforceable standards or guidelines. This seriously limits the list because Ontario does not presently have enforceable standards; it is now developing them under MISA.

Once the list is finalized, the governments must agree to eliminate any further discharge of these compounds. Permitted discharges of these worst pollutants must cease.

We recommend that the governments take immediate action that will result by January 1, 1998 in the banning of all further discharges of the persistent toxic pollutants from point and non-point sources which are on the Lake Ontario list of Critical Pollutants.

This ten-year time frame will allow industries to change processes, substitute less hazardous materials and adopt other changes to eliminate these discharges. In the interim, we must establish timetables for targeted reductions in toxic loadings in order to achieve more immediate reductions and to monitor the progress at implementing discharge bans. Our recommendations for these interim measures are described below in the section titled, "Load Reductions".

The recommendation above simply means that governments should not condone the release of any more of the most persistent toxic substances into Lake Ontario. These compounds are already making our fish unsafe to eat and endangering human health, aquatic and bird life in the ecosystem. We are not calling for a ban on the discharge of all pollutants, nor even all toxic pollutants; only the most serious persistent toxic compounds like PCBs, dioxins, furans, mirex and mercury.

In the interim of instituting these bans, immediate steps must be taken to prevent making the problem worse. New York has recently been accused of issuing weaker permits to dischargers. For example, a permit was issued to General Motors to discharge into a tributary of 18 Mile Creek, one of the seven Areas of Concern listed by the IJC on Lake Ontario. This permit allows the company to dump higher quantities of fluoride, phenols, copper and lead into the environment.

We recommend that New York and Ontario develop strong "anti-degradation" policies, which will prevent any increase in toxic discharges from a company.

Even the strictest permits and control orders are worthless unless they are backed up by strict enforcement and harsh penalties against violators. Ontario has consistently allowed violations of control orders governing industrial dischargers to the Great Lakes and has extended deadlines requiring cleanup steps. For example, the IJC's 1987 Report on Great Lakes Water Quality states that in 1984 and 1985, 44 percent and 45 percent respectively, of the significant industrial dischargers into Ontario's waters of the Great Lakes were not in compliance with the guidelines or requirements governing their discharge. In 1986, industrial dischargers' compliance with provincial requirements showed "no improvement over last year's results," according to a Ministry of the Environment press release.

We recommend that governments around Lake Ontario take aggressive action to improve enforcement of permits and control orders and penalize violators with stiff fines or criminal prosecution.

Load Reductions:

If the governments are willing to take the bold step of agreeing to a date when any further discharges of the worst pollutants will be eliminated, we can expect real improvement in toxic levels in Lake Ontario waters, fish and other biota. This is one concrete way in which zero discharge can be implemented. In the meantime, we must continue to push for an aggressive timetable spelling out concrete reductions in pollutants entering the lake ecosystem.

In the 1970's the governments launched a full-scale "war" on phosphorus in the Great Lakes. Billions of dollars were spent in both countries upgrading sewage treatment plants. The effort was largely successful. Lake Erie has been "returned from the dead", and rotting masses of algae no longer foul Great Lakes beaches.One of the key elements in this war was the establishment of "Phosphorus Load Reduction Targets" -- the number of tons of phosphorus that each lake could assimilate yet still maintain (or regain) its desired trophic status. The target loads were established in Annex 3 of the Great Lakes Water Quality Agreement.

The same basic approach should be taken with persistent toxic substances in Lake Ontario while we wait for the bans on further discharges to take effect. For example, a recent report from an IJC workshop (IJC, Scarborough Report, 1987) developed an estimate of the total loadings of PCBs, benzo(a)pyrene (a carcinogen) and lead. The report stated that Lake Ontario receives 2,540 kilograms per year of PCBs, 155 kilograms per year of benzo(a)pyrene and 426,000 kilograms per year of lead. The governments should agree on the number of pounds of PCBs that Lake Ontario can absorb yet still produce fish which are safe for unlimited human consumption. This interim target load would then be apportioned to New York and Ontario. Those two jurisdictions would then allocate their portion of the total lakewide load among the sources within their boundaries.

One important distinction between this system and the phosphorus target loads is that any loads for persistent toxic pollutants must be viewed as interim targets only. The ultimate target is zero discharge.

We recommend that, through the Lake Ontario Toxics Management Plan, the governments determine interim total maximum loads for reducing persistent toxic substances. The value of the interim load for each pollutant should be based on the amount of the compound which will allow the Lake to produce fish that are safe for unlimited human consumption. This interim total maximum load should then be apportioned between New York and Ontario.

In this way, the governments can spell out actual targets for reducing toxics in Lake Ontario and the dates when these targets can be expected to be achieved. This degree of commitment is what the public wants from government.

This basic approach is called for in the new Annex 2 on Lakewide Management Plans in the GLWQA. Similar requirements exist in the U.S. Clean Water Act. Section 303 (d) of the Act requires each state to determine total maximum daily loads for waters which exceed water quality standards. New York and Ontario should declare that all of Lake Ontario exceeds water quality standards because of the existence of fish consumption advisories. If fish are unsafe to eat, then obviously, water quality standards are not being met.

These interim targets for reduction should be the driving force behind all pollution control efforts, including but not limited to discharge permits issued under MISA and the Clean Water Act. Discharge permits should not be based on relative concentrations or units of production. Companies should not be allowed to discharge more toxics simply by increasing production or diluting their discharge.

We recommend that discharge permits contain limits that are based on reductions in total mass loadings of toxic substances. These reductions should be based on the interim total maximum load values.

Uniform Standards:

In New York and Ontario there are vast differences in the standards used, the approaches used in setting standards, and the processes by which the standards result in discharge permits. For example, New York's standard for dieldrin for the protection of human health and drinking water is 0.0009 ug/l while Ontario's is 0.7 ug/l (Canadian Environmental Law Research Foundation, 1988).

Currently, Ontario regulations are based on guidelines which are legally unenforceable as opposed to enforceable standards. The Province's MISA program aims to correct this deficiency but standards under MISA will not be in place until 1992.

The standards which exist and the approaches used in issuing discharge permits are based on the effects of a single compound on an organism. This, of course, is not reflective of what goes on in Lake Ontario where fish are exposed to a whole range of different compounds. There is a substantial body of literature to suggest that the toxic effects of many compounds are additive or synergistic.

We recommend that New York and Ontario agree on a set of uniform standards for Lake Ontario. (Ideally, these uniform standards should be set for all of the Great Lakes.) These uniform standards and the procedures which are used to issue discharge permits based on the standards should incorporate added safety factors to account for additive and synergistic effects of chemicals working in combination with each other.

One way to measure toxic effects of compounds acting in combination is to perform whole effluent testing. In this technique, test organisms are placed in the actual discharge water a company puts out. This is a good means of ensuring that discharge permits based on numerical water quality standards are adequately protective.

We recommend that dischargers be required to meet whole effluent testing requirements as well as discharge permits based on water quality standards.

Water quality standards are only one factor in the equation for issuing discharge permits. In New York, a receiving body of water is designated into a category of use. For example, Lake Ontario is designated in the highest use class (A) and is protected as a drinking water source. However, some streams which dump into Lake Ontario are designated at a much lower use category like "D" which is primarily industrial sewer. Different water quality standards apply for each use category, so companies can dump more toxic substances into waters in lower use categories.

Often, this stream classification system conflicts with Remedial Action Plans which seek to restore waters so that all beneficial uses like swimming and fishing can be enjoyed. For example, the goals for a Remedial Action Plan for an Area of Concern might include cleaning up waters so that all fish are safe to eat. Yet the State's stream classification might result in the issuance of discharge permits to companies dumping into tributaries of Lake Ontario. These discharges could continue to make fish unsafe to eat.

We recommend that New York abolish its stream classification system; all waters in New York which empty into Lake Ontario should be protected by the same stringent standards which protect the highest stream classification. Ontario should avoid including any stream classification scheme in the MISA program.

AIR TOXICS

The atmosphere is now recognized as a major source for many of the pollutants fouling the Great Lakes. While much has been done in both countries to attempt to control toxic pollution from point sources and leaking landfills, relatively little has been done to control atmospheric sources of toxics. The U.S. EPA has failed to set standards for all but eight air pollutants. For example, there are no standards under the U.S. Clean Air Act for PCBs, dioxins, furans, benzo(a)pyrene (a carcinogen) and mercury.

Overall, the atmosphere contributes an average 25 percent of the total toxic loading to the Great Lakes Basin (Elder, et.al. 1988). In Lakes Superior, Huron and Michigan, which have larger surface areas than Lake Ontario and fewer industries, the atmosphere contributes an even greater portion of the pollutant load. In Lake Superior, 90 percent of the PCBs, 96 percent of the benzo(a)pyrene and 97 percent of the lead coming into the Lake each year falls from the sky.

Lake Ontario may receive a smaller proportion of its pollutant load from the atmosphere relative to other sources because of its smaller surface area. On the other hand, Lake Ontario is more intensively developed than the upper Lakes, particularly the western basin from Niagara Falls to Oshawa. Local industry likely contributes more atmospheric toxics than would be expected in the upper, less developed Lakes. Unfortunately, data which might clarify this are inconclusive and even confusing. The draft Lake Ontario Toxics Management Plan (LOTMP) lists the atmosphere as the largest single source of PCBs to the Lake, contributing an estimated 6.3 kilograms per day. However, the IJC's Scarborough workshop in 1987 estimated that Lake Ontario receives a total loading of 2,540 kilograms of PCBs every year and only 7 percent comes from the atmosphere for a daily loading of just less than .5 kilograms. There are uncertainties and assumptions in both of these estimates but the point is that we need much more information on the importance of the atmosphere as a source of toxic pollution to Lake Ontario.

Despite its recognition of the atmosphere as a major source of Lake Ontario's PCB load, the draft Lake Ontario Toxics Management Plan includes no provisions to either verify the estimate or institute controls on atmospheric sources.

We recommend that the governments conduct additional monitoring to better understand the importance of both local and long-range atmospheric pollution as a source of Lake Ontario's toxic pollution load.

We recommend that the U.S. Congress and the Ontario government amend their respective clean air laws to require polluters to use the best available technology to reduce emissions of toxic pollution.

SOLID AND HAZARDOUS WASTES

Municipal Solid Waste Management:

The saga of the wandering, homeless garbage barge filled with refuse from Long Island, New York highlighted the growing solid waste crisis facing the industrialized world. Landfill space is running out, and improperly designed garbage incinerators or energy-from-waste plants pose a significant threat to human health and the environment in the form of toxic air emissions and deadly toxic ash. The amount of this deadly ash ranges up to 30 percent the original weight of the solid waste that is burned.

New York State's Solid Waste Management Plan sees energy-from-waste plants as playing an important role in waste disposal during what the Plan calls the "transition to recycling". This is a fundamentally mistaken concept. Once a municipality invests the tens of millions of dollars needed to build an incinerator, an incentive is created to keep generating a high volume of waste so that the plant will run most efficiently. When this occurs, recycling tends to be thrown out the window.

The situation is much the same in Ontario. Many municipalities are developing Solid Waste Master Plans. Citizens in at least 35 communities are engaged in this planning process. In many of these cases, the first solution proposed is an incinerator. Citizens in these communities are objecting because of concerns over toxic air emissions.

Fortunately, there is a solution to the crisis: an intensive recycling system capable of recycling more than 70 percent of the municipal solid waste stream. This new intensive recycling system transforms the following types of trash into marketable recycled products: food garbage and yard waste, paper and cardboard from households and commercial/industrial facilities, glass and metals. Only an intensive recycling system, where the various types of recycling are integrated into a holistic program, can prevent the need for solid waste incinerators, dramatically reduce the quantity of waste going into landfills, and maximize cost savings and other economic benefits of recycling. Small-scale, piecemeal approaches will fail to accomplish these goals.

We recommend that as a framework for an intensive recycling system, planners follow a hierarchy which emphasizes reduction, reuse, and recycling, in order of priority. Only after reduction, reuse, and recycling to the maximum extent possible, should disposal through landfilling or incineration be considered.

We are opposed to constructing mass burn incinerators first, and then gradually exploring and experimenting with trash recycling as an afterthought.

We recommend a moratorium on the construction of new solid waste incinerators, energy from waste plants, or resource recovery facilities in the Lake Ontario Basin until local and regional governments conduct thorough feasibility studies and implement intensive recycling systems for the management of their solid waste.

A thorough intensive recycling feasibility study must: 1) develop household trash separation procedures which are tailored to the needs of each community and will therefore promote a high level of participation among residents; 2) develop a collection system capable of transporting separated garbage from the curbside to recycling centers; 3) develop plans to collect solid waste from commercial and industrial facilities; 4) develop designs and specifications for recycling centers or facilities which will process the different categories of solid waste into recycled products which can be sold on the market; 5) assess currently available markets for recycled products; 6) assess the net cost of intensive recycling and compare it to the net cost of land-burial and incineration, both now and into the future; 7) assess the economic impact of intensive recycling in terms of new industries and jobs which can potentially be created; 8) assess the environmental impact of recycling and compare it to the impact of land-burial and incineration; 9) develop recommendations on how the community (or communities) should implement the intensive recycling system (ie. local ordinances, pilot projects in a target area).

An important stimulus to the success of recycling efforts is markets for recycled products.

We recommend that state and provincial governments assist in developing markets for recycled glass, paper, metal, tires, oil, and other materials. Government agencies should buy recycled products to the maximum extent possible.

Toxics Use & Hazardous Waste Reduction:

Over the past fifteen years, efforts to deal with the toxic chemical pollution crisis have focused on pollution control, that is controlling or managing hazardous waste by-products after they have been generated by industry. Furthermore, these pollution control efforts have been segmented, with separate divisions within government environmental agencies responsible for air pollution, direct discharges of chemically-contaminated wastewater into surface waterways and sewers, cleanup of inactive toxic waste sites, control of pesticides, and regulating licensed landfills and other hazardous waste disposal facilities. The segmented pollution control efforts by government often do little more than move wastes around. For example, air and water pollution control devices often create solid hazardous waste residues which go to landfills only to eventually seep into the surrounding groundwater. These segmented efforts have, up until now, resulted in little progress toward reducing toxic contamination in the Lake Ontario Basin. What, then, is the answer to this problem?

All the various forms of toxic chemical pollution (air emissions, direct discharges, land burial, etc.) can ultimately be traced back to the manufacture and use of toxic substances, as can the generation of hazardous waste by-products.

We recommend that there be a fundamental shift in the focus of government programs away from "end of pipe", or "managed disposal", to pollution prevention through toxics use reduction & hazardous waste reduction.

Although officials from government environmental agencies and from industry have recently become increasingly aware of the importance of hazardous waste reduction, little serious action has been taken and very little budgetary resources have been devoted to reducing sources of toxic pollution. Toxics use and hazardous waste reduction has not been made into the top priority it should be and it has not been explicitly integrated into government programs. The draft Lake Ontario Toxics Management Plan developed by the four governments does not even mention waste reduction.

In order to move toward serious pollution prevention through toxics use & hazardous waste reduction, we recommend that government agencies and industries which impact on the environment in the Lake Ontario Basin do the following:

1) Make waste reduction an important goal of existing pollution control regulatory programs. Waste reduction goals of 10 percent each year for the Lake Ontario Basin should be established. Waste reduction is distinct from waste management or pollution control. For example, the goal of 50 percent reduction in the discharge of toxic chemicals into the Niagara River is not necessarily a waste reduction goal (especially if the goal is achieved by moving toxic discharges from the River to the land or air). The 50 percent reduction goal could be achieved by source reduction however, by reducing the quantities of wastes discharged into all media by reducing the quantity of wastes produced.

2) Remove the most dangerous, life-threatening chemicals from the market and replace them with safer substances, products or processes.

3) Create offices or divisions of Waste Reduction in each of the four governments with jurisdiction over managing the Lake Ontario environment to implement the waste reduction goals. These bodies must be staffed with people who have the know-how to meet with managers at industrial facilities to develop ways to change production processes which will result in waste reduction.

4) These government offices should institute a mix of programs to achieve the waste reduction goals, including regulations, guidelines, educational programs and financial incentives.

5) Government must accurately measure waste generation and reduction at industrial facilities. Detailed reporting by industry on past and current waste reduction activities, as well as plans for future efforts, should be required. At present, there is little or no reliable data on the extent of industrial waste reduction. Waste reduction is usually measured incorrectly, because current measurements do not show the effects on waste generation of decreases in production. Thus, the information currently collected by government on waste generation is not useful as a baseline against which waste reduction can be measured. In order to accurately track waste reduction, industries must measure waste generation and reduction per unit of production. It would also be useful to determine how levels of specific hazardous substances within the waste are changing, again per unit of production.

6) These government offices must be supported with adequate funding. According to the U.S. Congress' Office of Technology Assessment, less than 1 percent of current environmental spending by government agencies is devoted towards source reduction (in Canadian Environmental Law Research Foundation, 1988).

7) Industries or other users of toxic substances which seek to dispose of toxic by-products into the air, surface waters or land should first be required to develop Toxics Use & Hazardous Waste Reduction Plans which are subject to public review and government approval.

8) Government and industry must work together to make waste reduction part of the everyday consciousness of all workers and managers involved with production at industrial facilities, instead of just the job of those responsible for complying with environmental regulations. Waste reduction must be viewed as being closely connected with modernization, cutting-costs, increasing efficiency and increasing profitability at industrial facilities.

HAZARDOUS WASTE SITE REMEDIATION

Cleaning Up Past Mistakes:

The ghost town of Love Canal and the chemical seeps along the Niagara gorge below the Hyde Park landfill have become synonymous with the problem of leaking hazardous waste sites in the Lake Ontario Basin. The Love Canal tragedy drew national and international attention to the hazardous waste disposal practices of industrialized countries ten years ago when birth defects, severe health effects and psychological trauma characterized the lives of the residents of this suburban area in the Niagara Frontier. Hyde Park, a few miles across town from Love Canal and below the Falls, is the largest dioxin dump in the world.

Love Canal made the world wake up and take notice. Hyde Park has given urgency to citizens' demands for permanent solutions involving excavation to clean up these dumps, which threaten Lake Ontario and the more than four million people who draw their drinking water from it.

In the United States, the outcome of Love Canal has been the federal and state Superfund programs, which were intended to identify and clean up hazardous waste sites that were endangering the health of other communities like Love Canal. After ten years, we still do not have exact figures on the extent of the problem. According to the Lake Ontario Toxics Management Plan, there are seven inactive hazardous waste sites in the New York portion of the Basin that are on the National Priority List and are therefore designated for clean up under the U.S. federal Superfund program. There are 246 sites on the New York State Superfund list in the Lake Ontario Basin. The sites along the Niagara River have not been included in this tally because the Niagara River is the subject of a separate international cleanup agreement. But within three miles of the Niagara River, which alone contributes over 80 percent of the water to Lake Ontario, there are also 48 active hazardous waste sites operating in New York in the Lake Ontario Basin. Most are to be closed or are undergoing closure by the end of 1988.

In Ontario, a post-Love Canal inventory of waste disposal sites shows 130 active sites in Ontario and 127 closed waste disposal sites in the Ontario part of the Lake Ontario Basin. The Province has yet to establish a comprehensive program for the cleanup of waste disposal facilities comparable to the U.S. Superfund program. In 1983, Ontario released a policy document outlining its plan for perpetual care after closure. The plan would require the facility operator to continue to be responsible for a closed facility for a specific period of time after closure, during which time all potential problems at the facility should become manifest. After the operators' responsibility lapsed, financial levies would

be used to create a fund which would be applied to clean up sites in the perpetuity phase. In addition, the Province has established a $10 million-a-year security fund to deal with hazardous spills, problem waste sites and historic contamination situations.

We recommend that Ontario develop a comprehensive program for the cleanup of hazardous waste sites, which is at least as detailed as the combined state and federal Superfund programs in New York.

The current federal and state Superfund programs are inadequate to deal with the problem of cleaning up contaminated sediments. The current programs must be expanded to include and expeditiously address this problem, or additional programs must be developed. In Ontario, a comprehensive waste sites remediation programme should incorporate the program elements to deal with contaminated sediments. (The section which follows, titled, "Contaminated Sediments", provides more details on the elements of such a program.)

We recommend that federal, state and Provincial programs be developed to address the cleanup of contaminated sediments.

Current federal, state and provincial programs are grossly under-funded to be effective in permanently cleaning up hazardous waste sites which threaten Lake Ontario. The Environmental Protection Agency has estimated that the average clean-up cost of a toxic dumpsite can range from $6 million to $12 million, depending on whether groundwater was contaminated. The Congressional Office of Technology Assessment has estimated that permanent cleanups will cost an average of $25 million at sites without groundwater contamination and $63 million where there is groundwater contamination.

In light of these figures (which are arguably too conservative to get the job done in any case) Ontario's $10 million Security Fund is grossly inadequate. Similarly, New York's initial program goals of raising $10 million annually was grossly inadequate to meet the challenge of dump site cleanup.

In 1986, the voters of New York enhanced the Superfund programs by passing a $1.45 billion Environmental Quality Bond Act. The lion's share of the fund ($1.2 billion) was to be used for hazardous waste site remediation. Many voters did not realize that the Bond Act funds are to be used only after responsible parties, state and federal Superfund options have been exhausted. Therefore, comprehensive use of Bond Act funds may not begin for several years. It was estimated that it would take forty years to clean up the New York waste sites. However, with the additional monies raised by the Bond Act, it was hoped that the forty-year cleanup schedule could be cut to 14 years so that the sites would be cleaned up by the year 2000.

The court settlement at Hyde Park set cleanup costs at $17 million. But a permanent solution, which would involve excavation of eighty-thousand tons of source chemicals, is more likely to cost between $100 million and $1 billion dollars. All governments have been using unrealistically low estimates of site cleanup costs, which mislead the public as to the true, full cost of waste site remediation.

In November of 1986, New York State voters overwhelmingly approved the Environmental Quality Bond Act by a two-to-one margin. The voters believed that the fund would provide a secure source of funding for the immediate cleanup of leaking dumpsites. Environmentalists also applauded the formation of the fund, which it was thought would give the state government the clout to deal with

recalcitrant corporations that were dragging their feet to avoid clean-up liabilities. We have all beendisappointed because, in spite of the passage of the Bond Act, the foot-dragging continues.

We recommend that the State of New York apply monies raised under responsible party settlements, state and federal Superfund programs and the Bond Act to the immediate remediation of hazardous waste sites which imperil Lake Ontario. Furthermore, we recommend that the governments make public the deadlines for when they intend to have all other remedies exhausted so that Bond Act funds can be used.

Adequate waste site remediation is consistently undermined and impeded by the foot-dragging tactics of the responsible parties. It is essential that all jurisdictions have the resources and the authority to implement cleanup programmes on site and recover costs later as necessary. It is also important that jurisdictions use this authority in order to achieve site cleanup without delay.

We recommend that periods of negotiation with responsible parties on cleanup agreements be restricted to no more than one year, after which jurisdictions shall have and shall exercise the authority to implement cleanup on site without further delay.

The Future of Hazardous Waste Management:

The current wisdom is that, eventually, all hazardous waste landfills leak. Sophisticated engineering strategies using double plastic liners and leachate collection systems inevitably fail because of flawed materials or crude installation practices. Naturally-occurring clay deposits are riddled with soil inconsistencies which act as escape routes for buried hazardous wastes. For this reason, many jurisdictions are banning or severely restricting the land burial of untreated hazardous wastes.

We recommend that governments in the Lake Ontario Basin secure legislative protection for a ban on land burial of hazardous wastes.

We further recommend that above-ground storage of hazardous wastes under carefully controlled situations is a preferable solution and should be substituted for below-ground landfills.

The advantages of above-ground storage include less leachate production, easier monitoring, and easier retrievability in the event that a new technology to treat or recycle the wastes becomes feasible. Above-ground storage would also be more visible to the public, could help erase the "out of sight -- out of mind" mentality and help generate public pressure for more permanent solutions like source reduction.

Simply storing hazardous wastes in above-ground warehouses, however, is not considered a carefully controlled situation. Proposals for above-ground storage facilities must be carefully scrutinized to ensure that they are as, if not more, secure than the best designed landfill. The most appropriate technology (whether above- or below-ground, or some other technology) must be determined on a

case-by-case basis. Technology to treat and dispose of hazardous wastes is rapidly evolving, making it even more prudent for governments not to be too hasty in choosing a "permanent" solution like land burial that could quickly become outdated.

More research and development is needed to adapt existing technologies for application to hazardous waste site excavation. Although the U.S. Environmental Protection Agency declares that excavation is routinely considered for every cleanup proposal, programs are needed to evaluate and develop excavation techniques can be applied safely to a variety of hazardous waste sites. The U.S. Environmental Protection Agency's SITE program (Superfund Innovative Technology Evaluation) has not been specifically directed to assess excavation technologies, although it is mandated specifically to look at destruction and monitoring technologies.

We recommend that cleanup plans give priority to removal of hazardous wastes from contaminated sites (as opposed to "containment") using excavation technologies in a manner that is environmentally-sound and safe for humans.

We further recommend that sites be designated for demonstration projects for excavation techniques. One site should be located in the Niagara Falls area, possibly at Hyde Park.

Innovative and emerging technologies have an important role to play in the cleanup of hazardous waste sites. However, it is crucial that source chemicals be excavated and held in above-ground storage facilities until these new technologies are ready to be applied to destroy these hazardous wastes. The absence of adequate destruction facilities should not be used as an excuse to delay excavation, because to delay will imperil the Lake Ontario ecosystem and drinking water.

We recommend that research continue to develop clean-up technologies and remedial alternatives that lead to effective waste destruction, employing the best technology available.

We further recommend that until new technologies are proven, priority be given to developing and applying excavation technologies to prevent further contamination of the environment.

CONTAMINATED SEDIMENTS

Preventive Measures:

Contaminated sediments provide a continuing source of toxics to Lake Ontario waters and biota. It is important that we begin immediately to reduce all active discharges that which continue to contribute to sediment contamination. Provisions in the 1987 Great Lakes Water Quality Agreement calling for virtual elimination of toxics and zero discharge are mandates to aggressively pursue this goal.

In some areas of Lake Ontario, harbours and rivers are dredged and the dredged material is deposited in open water disposal sites. In most areas where this occurs, including Rochester, Oswego and Newfane in New York, there is evidence that the dredged material is contaminated with toxic pollutants and heavy metals. Moreover, the sediment sampling and analytical criteria used by the governments is not designed to take into account the impact of resuspended pollutants on the ecosystem.

We recommend that governments undertake an immediate ban of open water disposal of dredged material.

Sediment build up at tributary mouths creates problems impacting navigational use, recreational use and flood potential in those rivers and streams. Currently, these problems are used as a rationale for dredging sediment. Dredging causes resuspension of sediments and creates long-term disposal problems for the contaminated dredge spoil. Some of this dredging could be avoided if erosion control programs were instigated along all tributaries. Buffer zones of vegetation along rivers would lessen erosion and might eliminate the need for dredging.

We recommend that Lake Ontario governments undertake long needed erosion control programs on all major Great Lakes tributaries.

Most dredged material storage facilities are continuing sources of contaminants to Lake waters and biota. Most storage facilities are constructed of rock rubble and fine fill. The fill utilized to construct these facilities often comes from urban construction sites. This material could easily have been contaminated by past industrial use. Even though they are called "confined disposal sites," they are

actually designed to leak. The facilities are filled up with dredge spoils and water by the dredging boats. The construction of the CDF allows the water to run through the rock and fill encircling the facility.

We recommend that all dredged material facilities in Lake Ontario be managed as hazardous waste sites, so that they are subject to regular assessments and remediation.

We recommend that, because of contaminated sediments problems, the seven Areas of Concern around Lake Ontario be regarded as hazardous waste sites to increase the public's awareness of in-place pollution problems.

Restorative Solutions:

Experts admit that even if we stopped all toxics from entering the Great Lakes today, we would still be left with the massive problem of cleaning up the historic in-place pollutants from the era of heaviest contamination in the 1950's and 1960's.

Animal and biota research demonstrates that these pollutants are not dormant but are bioavailable by many complex circumstances and they are moving up the food chain. Little is known about the mechanisms which re-release these contaminants or the contaminants' interaction with the water, biota, aquatic life, birds, mammals, and ultimately, humans.

We recommend that governments conduct far more research on the fate of contaminated sediments and their mobilization into the food chain. Government funds should immediately be made available for intensive research in this area.

At recent International Joint Commission workshops on contaminated sediments, complex protocols for remediation were discussed. These ranged from treatment in site to dredging, overtopping and plowing.

We recommend that governments conduct actual demonstration projects for potential contaminated sediment remediation solutions. Governments should fund such projects at once so that effective remedial strategies can be utilized in Areas of Concern as soon as possible.

Government funding is essential to accomplish the massive job of assessing and cleaning up the contaminated sediments problem in Lake Ontario and the Areas of Concern that surround it.

We recommend that governments establish an "Aquafund" program, similar in concept to the U.S. Superfund.

This new program should be used to identify and set priorities for the worst areas of sediment contamination, fund research, development and demonstration of clean-up technologies, and implement clean-up programs.

Barriers to Tackling the Problem of Contaminated Sediments

Short-term and Future:

All seven of Lake Ontario's Areas of Concern share contaminated sediment problems. However, until governments settle on viable solutions for remediation, no meaningful progress will be made on Remedial Action Plans. Each individual RAP process is frustrated and stymied by being asked to solve the problem of contaminated sediments independently. This duplication could result in a vast waste of the public's time and money. The following are conclusions reached by the participants of Great Lakes United's December Regional Meeting and the Steering Committee on the development of RAPs and the problem of contaminated sediments.

- **Most RAPs have the goal of restoring healthy, sustainable fish populations in Areas of Concern. Until contaminated sediments are in some way cleaned up, this common goal will not be achievable in any of the Areas.**
- **We recognize that Areas of Concern are artificial designations. Studies to define boundaries, extent and degree of sediment contamination in Lake Ontario should be carried out in the next year. These studies should relate the levels of sediment contamination in the seven Areas of Concern to the whole Lake Ontario levels and assess the fate and movement of sediments lakewide. Further information must also be obtained on the movement of toxics from sediments to the water column via the process of repartitioning. This information will help us set realistic priorities for the sites that require remediation by 1989.**
- **At the December Regional Meeting, concerns were raised that contaminated sediments were last on the list of government clean-up priorities in Areas of Concern. Participants were concerned that the next three to four years would only be devoted to studies and not to any remedial action program on known toxic hot spots. Funding is needed now to assure that research and action can go on simultaneously to clean up contaminated sediments.**
- **Remedial Action Plans are under-funded Basin-wide. Additional resources are required now to implement remediation and abatement of known sources and to evolve new protocol and solutions.**

IMPACTS OF TOXICS ON HUMAN AND ECOSYSTEM HEALTH

> *In light of [available] information, the committee finds substantial evidence that the human population living in the Great Lakes basin is exposed to, and accumulates, appreciably more toxic chemical burden than people in other large regions of North America for which data are available.*

This conclusion by the Royal Society of Canada and U.S. National Research Council was reached in 1985 after reviewing several studies on the accumulations and impacts of toxic chemicals in the bodies of Great Lakes Basin residents. With pollution levels in Lake Ontario being worse than any of the other Great Lakes, residents of Lake Ontario are understandably becoming increasingly concerned about the impacts of toxins recycling throughout their ecosystem on their health. They feel they are particularly at risk because of the evidence that the dumps along the Niagara Gorge are indeed leaking at a greater rate than previously thought.

In the summer of 1987, dioxin, likely emanating from the Hyde Park landfill, was found in sediments at the mouth of the Niagara River. During 1983 litigation on the Hyde Park waste site, Occidental denied that dioxin was moving from the site. Fortunately, several years ago the residents of Niagara-on-the-Lake, Ontario were able to get an alternate source of drinking water for their community because of their proximity to the River. The town's drinking water source is now Lake Erie, on the opposite side of the Niagara peninsula. It is sad and ironic that Lake Erie--declared 20 years ago to be dead--is now a preferred drinking water source over Lake Ontario.

While the levels of some persistent toxic chemicals have diminished in the last decade in Lake Ontario, there is evidence that levels have stopped dropping. While other direct discharges may have been reduced, the impact of the aging dumpsites is likely rising. Many people are seriously concerned about the threat this poses to Lake Ontario drinking water. This fear distinguishes Lake Ontario residents from those on the other Great Lakes.

While drinking water treatment plants purify water from harmful bacteria causing disease, they are not designed to effectively remove the persistent toxic chemicals. Few municipalities have viable emergency plans or alternative sources of drinking water should the worst case scenario happen in Lake Ontario. Water, the basis of all life, has become a disturbing symbol for residents of Lake Ontario. Governments continue to try to reassure citizens that drinking water from Lake Ontario is safe.

What limited data that is available on human health effects of toxics in the Great Lakes suggests that food produced in the region is likely a more significant source of human contamination than drinking water (Davies, 1986). A meal of fish from Lake Ontario could deliver the equivalent dose of toxics as a lifetime of drinking water from Lake Ontario.

New York State officially advises that no one should eat trout or salmon longer than 21" from Lake Ontario because of contamination from PCBs, myrex and dioxin. Most of the salmon caught exceed 21" and some fishermen won't eat their fish or will limit the amount they consume. But rarely are contaminated fish thrown back. Usually someone in the fishing party or on the docks or breakwalls is happy to take unwanted fish.

The long-term impacts on human health from consuming these fish are poorly understood. Data from Michigan show that eating contaminated Great Lakes fish while pregnant can cause serious effects on babies (Fein, Jacobson, et.al., 1984). More data from Michigan show that PCB levels in blood serum rose dramatically after people ate a meal of contaminated fish (Humphrey, 1983). A highly-controversial report from two Canadian scientists in 1987 (Tom Muir and Anne Sudar) suggested a correlation between numerous incidents of ecosystem health effects--higher human cancer rates, fish tumors, bird deformities --and areas in the Great Lakes known to have had toxic contamination problems.

Government agents were quick to disavow the Muir-Sudar report because, despite all of the circumstantial evidence showing direct linkages, there was not enough evidence to show a direct cause and effect relationship between the health effects observed and toxics in the Great Lakes. While it will never be possible to draw complete cause and effect relationships between Lake pollution and our health, citizens are concerned that governments are ignoring the links between human health and the environment. The Muir-Sudar report and other reports in Canada from government scientists attempting to draw attention to human health concerns have been lauded by the public but criticized as alarmist and inaccurate by the federal government which sponsored the original research.

Even though many residents of the Great Lakes Basin avoid eating fish from the lakes, toxins like PCBs and DDT have been found in mother's milk and human adipose tissue. A preliminary IJC study analyzing a typical shopping basket of fresh food grown and raised in southern Ontario demonstrated that the major pathway for human exposure (80 percent plus) to persistent toxic chemicals studied came from food. However, far too little is known about the pathways of human exposure. Doctors' record keeping and medical data collection have not been designed to correlate environmental conditions with health problems. For instance, preliminary research shows that when air quality is poor, hospital admissions for respiratory problems go up. This kind of data collection is not being done routinely. While governments are reluctant to cause alarm by carrying out more human health testing, the public is frustrated by not knowing what to do to reduce their own risks.

Health Effects in Fish and Wildlife:

While it is often difficult to demonstrate the deadly effects of toxic chemicals on humans, conclusive work has been done linking toxic substances in Lake Ontario to severe problems in wildlife in the

Lake ecosystem. While not specific to Lake Ontario, one of the most interesting pieces of research was done in 1988 by Theo Colborn of the Conservation Foundation. She reviewed all the available literature on the effects of toxic substances on fish and wildlife in the Great Lakes. One conclusion is:

> *Sixteen top predator species have been cited as having exhibited reproductive problems or population decline in the Great Lakes or along the Great Lakes shoreline in certain populations since the 1950's. This list comprises nine bird species -- the bald eagle, black-crowned night-heron, Caspian tern, common tern, double-crested cormorant, Forster's tern, herring gull, osprey and ring-billed gull; three mammal species --the Beluga whale (from the St. Lawrence River), mink and otter; two native fish species --lake trout and sauger; and one reptile species -- the snapping turtle.*

Many of these species are, or were, present in the Lake Ontario area and exhibit the problems cited in the literature.

According to data supplied to the IJC by the New York Department of Environmental Conservation there are no wild mink within 8 kilometres of the Lake Ontario shore. Mink, which feed on fish, are known to exhibit reproductive failure from PCB contamination. Populations of otters are also very low close to the Lake (Gilbertson, 1985). Bald eagles and osprey, two fish-eating birds, also no longer nest along Lake Ontario.

Perhaps the most widely recognized study on the effects of toxics on wildlife in the Great Lakes was the work done by Gilbertson on herring gulls in Lake Ontario. Between 1972 and 1975 Lake Ontario herring gulls were on the verge of being wiped out due to reproductive failure. Severe reproductive failure has also been observed in Lake Ontario double-crested cormorants and common terns. Common terns have also shown abnormalities like crossed beaks, small eyes and duplicate limbs (Gilbertson).

Linking reproductive failures and birth defects in fish and wildlife to human health effects is not an exact science. But it is obvious that if fish and wildlife are sick, the ecosystem is not well, and humans, as part of that ecosystem are likely to be effected also. In fact, some population groups that eat large quantities of fish from Lake Ontario may be especially at risk. The fish which these people eat, large salmon and lake trout, are likely even more highly contaminated than the smaller fish which are eaten by birds.

Research from Michigan confirms that people are being affected by toxic chemicals. A study at Wayne State University showed that babies born to mother's who ate higher quantities of PCB contaminated fish (6.6 to 41.7 kilograms per year) had lower birth weight, shorter gestational age, smaller head circumference and slower neuromuscular responses (Fein, Jacobson, et.al).

Residents of Lake Ontario are rightfully worried about the effects of toxic substances on our health. We demand that governments begin immediately to take these concerns seriously. We offer the following recommendations to generate answers to our questions:

- **We recommend that the Department of Health and Welfare Canada with Environment Canada and the U.S EPA undertake a coordinated intensive study of Lake Ontario residents and health trends as they relate to toxic chemicals in their environment.**
- **We recommend that both federal agencies responsible for public health ensure that uniform, comprehensive, and comparative data are collected routinely on all Great Lakes populations. These statistics should document the occurrence of disease rather than simply mortality data.**
- **We recommend that more efforts be undertaken by both governments to identify the pathways of human exposure to persistent toxic chemicals.**
- **We recommend that full scale testing of mother's milk be undertaken and a public education program be carried out directed at Lake Ontario mothers so that women can make informed decisions about whether or how long they breast feed their infants.**
- **We recommend that population groups and babies born to mothers who consume higher quantities of Lake Ontario fish be assessed for health effects and high quantities of contaminants in their bodies.**
- **We recommend that the Canadian government reinstate the full resources of the herring gull testing program, which has given us crucial data on contaminant levels in Lake Ontario. Due to government cutbacks, this program is currently not effective. Although gull eggs are still being collected and frozen, staff resources to analyze those eggs are not available.**
- **We recommend that the Canadian government perform follow-up work on the recent report "Toxic Chemicals in the Great Lakes Ecosystem: Some Observations", by Tom Muir and Anne Sudar, by undertaking coordinated research between the Canadian Departments of Health and Welfare and the Environment.**
- **We recommend that the U.S. government reinstate funds to continue the National Human Adipose Tissue Survey, which was recently eliminated. We cannot afford to throw away the U.S. National Tissue Bank, the main source of our knowledge about levels and trends in the assimilation of toxics in humans.**

SUMMARY OF RECOMMENDATIONS

Lake Ontario as an Ecosystem:

Lake Ontario is an ecosystem, which simply means that its borders are defined in ecological terms, rather than political ones. Actions in one part of the lake will affect all of us in one way or another. A lake-wide perspective is needed in terms of monitoring and surveillance of biological, chemical, and physical processes. Management decisions must take into account the interactions between all components of the environment. Only with this approach is it possible to consider the sources and eventual fates of pollutants and to understand the interrelation of all media--including atmospheric pollution--on water quality.

An ecosystem approach is also the foundation of our support for the goal of zero discharge of persistent toxic substances. Governments and environmental groups have long agreed that the only long-term sustainable solution to the problem of persistent toxic pollution is to stop putting into the system those substances that the system could not handle--the concept known as zero discharge.

In the Great Lakes basin, the zero discharge goal was established by Canada and the United States in 1978 under the Great Lakes Water Quality Agreement. According to that Agreement, the discharge of any or all persistent toxic substances is to be virtually eliminated and the philosophy adopted for the control of inputs of persistent chemicals is zero discharge. The 1978 Agreement was re-affirmed in 1987, and the zero discharge concept was strengthened in a number of sections.

Achieving zero discharge involves a comprehensive approach to ensure that concrete measures are in place to immediately reduce, and then eliminate, the introduction of toxic chemicals. This is best done by "moving up the effluent pipe" to ensure that industrial processes are using clean and "closed loop" technologies and wastes are being recovered, reused, and recycled. All toxic inputs--including run-off and air pollution--need to be identified and each of those inputs must be controlled at its source.

Everyone has waited long enough. For Lake Ontario, it is time for zero discharge. The rallying cry for Lake Ontario citizen activists is "zero or nothing!"

Discharges from Point and Non-Point Sources:

We recommend that the recommendations of PLUARG for controlling non-point pollution and runoff be reviewed and implemented by the governments around Lake Ontario.

We recommend that the Bay of Quinte and Hamilton Harbour, which have serious problems from non-point source pollution, be among the first watershed management plans developed and implemented for Lake Ontario.

We recommend that all industries in Ontario which dump into sewers be included under MISA for the program to achieve its goals.

We recommend that industries and all users of persistent and non-persistent toxic substances in New York and Ontario that seek permits to discharge into Lake Ontario or its tributaries be required to document that they have first utilized all possible technologies to avoid, reduce and recycle their wastes, residues and runoff.

We recommend that the governments create by December 31, 1988, a list of Critical Pollutants for Lake Ontario. This list should be created with public input and should be updated frequently as more data become available.

We recommend that the governments take immediate action that will result by January 1, 1998 in the banning of all further discharges of the persistent toxic pollutants from point and non-point sources which are on the Lake Ontario list of Critical Pollutants.

We recommend that New York and Ontario develop strong "anti-degradation" policies, which will prevent any increase in toxic discharges from a company.

We recommend that governments around Lake Ontario take aggressive action to improve enforcement of permits and control orders and penalize violators with stiff fines or criminal prosecution.

We recommend that, through the Lake Ontario Toxics Management Plan, the governments determine interim total maximum loads for persistent toxic substances. The value of the interim load for each pollutant should be based on the amount of the compound which will allow the Lake to produce fish that are safe for unlimited human consumption. This interim total maximum load should then be apportioned between New York and Ontario.

We recommend that discharge permits contain limits that are based on reductions in total mass loadings of toxic substances. These reductions should be based on the interim total maximum load values.

We recommend that New York and Ontario agree on a set of uniform standards for Lake Ontario. (Ideally, these uniform standards should be set for all of the Great Lakes.) These uniform standards and the procedures which are used to issue discharge permits based on the standards should incorporate added safety factors to account for additive and synergistic effects of chemicals working in combination with each other.

We recommend that dischargers be required to meet whole effluent testing requirements as well as discharge permits based on water quality standards.

We recommend that New York abolish its stream classification system; all waters in New York which empty into Lake Ontario should be protected by the same stringent standards which protect the highest stream classification. Ontario should avoid including any stream classification scheme in the MISA program.

Air Toxics:

We recommend that the governments conduct additional monitoring to better understand the importance of both local and long-range atmospheric pollution as a source of Lake Ontario's toxic pollution load.

We recommend that the U.S. Congress and the Ontario government amend their respective clean air laws to require polluters to use the best available technology to reduce emissions of toxic pollution.

Solid and Hazardous Wastes:

We recommend that as a framework for an intensive recycling system, planners follow a hierarchy which emphasizes reduction, reuse, and recycling, in order of priority. Only after reduction, reuse, and recycling to the maximum extent possible, should disposal through landfilling or incineration be considered.

We recommend a moratorium on the construction of new solid waste incinerators, energy from waste plants, or resource recovery facilities in the Lake Ontario Basin until local and regional governments conduct thorough feasibility studies and implement intensive recycling systems for the management of their solid waste.

We recommend that state and provincial governments assist in developing markets for recycled glass, paper, metal, tires, oil, and other materials. Government agencies should buy recycled products to the maximum extent possible.

We recommend that there be a fundamental shift in the focus of government programs away from "end of pipe", or "managed disposal", to pollution prevention through toxics use reduction & hazardous waste reduction.

In order to move toward serious pollution prevention through toxics use & hazardous waste reduction, we recommend that government agencies and industries which impact on the environment in the Lake Ontario Basin do the following:

1) Make waste reduction an important goal of existing pollution control regulatory programs. Waste reduction goals of 10 percent each year for the Lake Ontario Basin

should be established. Waste reduction is distinct from waste management or pollution control. For example, the goal of 50 percent reduction in the discharge of toxic chemicals into the Niagara River is not necessarily a waste reduction goal (especially if the goal is achieved by moving toxic discharges from the River to the land or air). The 50 percent reduction goal could be achieved by source reduction however, by reducing the quantities of wastes discharged into all media by reducing the quantity of wastes produced.

2) Remove the most dangerous, life-threatening chemicals from the market and replace them with safer substances, products or processes.

3) Create offices or divisions of Waste Reduction in each of the four governments with jurisdiction over managing the Lake Ontario environment to implement the waste reduction goals. These bodies must be staffed with people who have the know-how to meet with managers at industrial facilities to develop ways to change production processes which will result in waste reduction.

4) These government offices should institute a mix of programs to achieve the waste reduction goals, including regulations, guidelines, educational programs and financial incentives.

5) Government must accurately measure waste generation and reduction at industrial facilities. Detailed reporting by industry on past and current waste reduction activities, as well as plans for future efforts, should be required. At present, there is little or no reliable data on the extent of industrial waste reduction. Waste reduction is usually measured incorrectly, because current measurements do not show the effects on waste generation of decreases in production. Thus, the information currently collected by government on waste generation is not useful as a baseline against which waste reduction can be measured. In order to accurately track waste reduction, industries must measure waste generation and reduction per unit of production. It would also be useful to determine how levels of specific hazardous substances within the waste are changing, again per unit of production.

6) These government offices must be supported with adequate funding. According to the U.S. Congress' Office of Technology Assessment, less than 1 percent of current environmental spending by government agencies is devoted towards source reduction (in Canadian Environmental Law Research Foundation, 1988).

7) Industries or other users of toxic substances which seek to dispose of toxic by-products into the air, surface waters or land should first be required to develop Toxics Use & Hazardous Waste Reduction Plans which are subject to public review and government approval.

8) Government and industry must work together to make waste reduction part of the everyday consciousness of all workers and managers involved with production at industrial facilities, instead of just the job of those responsible for complying with environmental regulations. Waste reduction must be viewed as being closely connected with modernization, cutting-costs, increasing efficiency and increasing profitability at industrial facilities.

We recommend that all those concerned about reducing hazardous wastes, including the governments around Lake Ontario, contact U.S. Senators and Representatives to urge adoption of H.R. 2800 (June 16, 1988 substitute version) in the few remaining days of this legislative session.

Hazardous Waste Site Remediation:

We recommend that Ontario develop a comprehensive program for the cleanup of hazardous waste sites, which is at least as detailed as the combined state and federal Superfund programs in New York.

We recommend that federal, state and Provincial programs be developed to address the cleanup of contaminated sediments.

We recommend that the State of New York apply monies raised under responsible party settlements, state and federal Superfund programs and the Bond Act to the immediate remediation of hazardous waste sites which imperil Lake Ontario. Furthermore, we recommend that the governments make public the deadlines for when they intend to have all other remedies exhausted so that Bond Act funds can be used.

We recommend that periods of negotiation with responsible parties on cleanup agreements be restricted to no more than one year, after which jurisdictions shall have and shall exercise the authority to implement cleanup on site without further delay.

We recommend that governments in the Lake Ontario Basin secure legislative protection for a ban on land burial of hazardous wastes.

We further recommend that above-ground storage of hazardous wastes under carefully controlled situations is a preferable solution and should be substituted for below-ground landfills.

We recommend that cleanup plans give priority to removal of hazardous wastes from contaminated sites (as opposed to "containment") using excavation technologies in a manner that is environmentally-sound and safe for humans.

We further recommend that sites be designated for demonstration projects for excavation techniques. One site should be located in the Niagara Falls area, possibly at Hyde Park.

We recommend that research continue to develop cleanup technologies and remedial alternatives that lead to effective waste destruction, employing the best technology available.

We further recommend that until new technologies are proven, priority be given to developing and applying excavation technologies to prevent further contamination of the environment.

Contaminated Sediments:

We recommend that governments undertake an immediate ban of open water disposal of dredged material.

We recommend that Lake Ontario governments undertake long needed erosion control programs on all major Great Lakes tributaries.

We recommend that all dredged material facilities in Lake Ontario be managed as hazardous waste sites, so that they are subject to regular assessments and remediation.

We recommend that, because of contaminated sediments problems, the seven Areas of Concern around Lake Ontario be regarded as hazardous waste sites to increase the public's awareness of in-place pollution problems.

We recommend that governments conduct far more research on the fate of contaminated sediments and their mobilization into the food chain. Government funds should immediately be made available for intensive research in this area.

We recommend that governments conduct actual demonstration projects for potential contaminated sediment remediation solutions. Governments should fund such projects at once so that effective remedial strategies can be utilized in Areas of Concern as soon as possible.

We recommend that governments establish an "Aquafund" program, similar in concept to the U.S. Superfund.

The following conclusions pertain to the development of RAPs and the problem of contaminated sediments.

- Most RAPs have the goal of restoring healthy, sustainable fish populations in Areas of Concern. Until contaminated sediments are in some way cleaned up, this common goal will not be achievable in any of the Areas.
- "Areas of Concern" are artificial designations. Studies to define boundaries, extent and degree of sediment contamination in Lake Ontario should be carried out in the next year. Further information must be obtained on the movement of toxics from sediments to the water column via the process of repartitioning.
- Contaminated sediments are last on the list of government clean-up priorities in Areas of Concern. Without a change in priorities, the next three to four years may only be devoted to studies and not to any remedial action program on known toxic hot spots. Funding is needed now to assure that research and action can go on simultaneously to clean up contaminated sediments.
- Remedial Action Plans are under-funded Basin-wide. Additional resources are required now to implement remediation and abatement of known sources and to evolve new protocol and solutions.

Impacts of Lake Ontario Toxics on Human Health:

Residents of Lake Ontario are rightfully worried about the effects of toxic substances on our health. We demand that governments begin immediately to take these concerns seriously. We offer the following recommendations to generate answers to our questions:

We recommend that the Department of Health and Welfare Canada with Environment Canada and the U.S EPA undertake a coordinated intensive study of Lake Ontario residents and health trends as they relate to toxic chemicals in their environment.

We recommend that both federal agencies responsible for public health ensure that uniform, comprehensive, and comparative data are collected routinely on all Great Lakes populations. These statistics should document the occurrence of disease rather than simply mortality data.

We recommend that more efforts be undertaken by both governments to identify the pathways of human exposure to persistent toxic chemicals.

We recommend that full scale testing of mother's milk be undertaken and a public education program be carried out directed at Lake Ontario mothers so that women can make informed decisions about whether or how long they breast feed their infants.

We recommend that population groups and babies born to mothers who consume higher quantities of Lake Ontario fish be assessed for health effects and high quantities of contaminants in their bodies.

We recommend that the Canadian government reinstate the full resources of the herring gull testing program, which has given us crucial data on contaminant levels in Lake Ontario. Due to government cutbacks, this program is currently not effective. Although gull eggs are still being collected and frozen, staff resources to analyze those eggs are not available.

We recommend that the Canadian government perform follow-up work on the recent report "Toxic Chemicals in the Great Lakes Ecosystem: Some Observations", by Tom Muir and Anne Sudar, by undertaking coordinated research between the Canadian Departments of Health and Welfare and the Environment.

We recommend that the U.S. government reinstate funds to continue the National Human Adipose Tissue Survey, which was recently eliminated. We cannot afford to throw away the U.S. National Tissue Bank, the main source of our knowledge about levels and trends in the assimilation of toxics in humans.

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*GLOSSARY**

acute effects/acute toxicity: the adverse effects from exposure to a toxic substance that occur or develop rapidly; as opposed to chronic effects, which take longer to manifest.

ambient standards: the concentration of a toxic substance in the ambient air or water that, based on available data, will not result in significant risks of adverse effects to either a human population or aquatic life.

anti-degradation policy: a policy or provision of law designed to protect existing high quality waters by restricting new or increased discharges of pollutants. In the U.S., these policies are required under the Clean Water Act to prevent polluters from dumping more pollutants into water bodies that meet or are cleaner than water quality standards. In principle, anti-degradation means that any companies wishing to add a new or increased discharge to a water body must treat their effluent to the same quality as the water they take in --they must not add any additional pollution --even if another company decreases its discharge.

Area of Concern: one of 42 areas within the Great Lakes basin which have been identified by the International Joint Commission as having water quality conditions which do not meet the objectives of the Great Lakes Water Quality Agreement. Water quality conditions in areas of concern impair the areas' ability to support aquatic life and/or beneficial uses like fishing and swimming. The seven areas of concern around Lake Ontario are Eighteen Mile Creek, the Rochester Embayment, and the Oswego River in New York and the Bay of Quinte, Port Hope, the Toronto Waterfront and Hamilton Harbour in Ontario. The Niagara River is also an area of concern.

best available technology economically achievable: the best method, process, or type of equipment currently available which can be use to economically treat wastes. Administrators can set standards for pollutants in waste streams based on best available technology. The standard may be a numeric value or a specific piece of equipment or technology. Standards based on best available technology are contrasted with standards based on attaining a desired level of water quality for the protection of aquatic life or other desirable uses.

bioaccumulation: the process of accumulating toxic chemicals through the food chain. The concentration of the compound is sequentially increased as it moves up from one trophic level to the next. bioconcentration: the process by which an organism accumulates toxic chemicals directly from the water because more toxic chemicals are absorbed than excreted. Toxic compounds are often found in higher concentrations in organisms than in ambient water because of the compounds' ability to bioconcentrate.

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* **NOTE**: many of the definitions used in this Glossary were borrowed from, "Zero Discharge: A Strategy For The Regulation of Toxic Substances in the Great Lakes Ecosystem," by Paul Muldoon and Marcia Valiante, the Canadian Environmental Law Research Foundation, 1988.

biomonitoring: using organisms to test the toxicity of substances being discharged, or suspected to be present in ambient water. May be used to measure acute or chronic toxicity. Because of bioconcentration, biomonitoring is often used to detect toxic compounds when the concentrations of the compounds are below levels that can be detected by laboratory equipment. Caged clams, rainbow trout and daphnia are among the species often used for biomonitoring.

carcinogen: cancer-causing chemicals or substances.

chronic effects: adverse effects which manifest themselves after the lapse of a time period. They can be caused by repeated exposure to low doses or by one large dose.

cumulative effects: Effects produced by simultaneous exposure to two or more toxic chemicals. The final effects can take on three forms: 1) additive effects, where the final effect is simply the sum of the individual effects; 2) antagonistic effects, where the effect of one toxic chemical is reduced by the presence of another; 3) synergistic effects, where the presence of one or more toxic chemicals produces a greater effect than the sum of the individual effects.

ecosystem: a community of living organisms, together with their habitat, and including the interactions among these components. It is described by specifying the non-living and living things (including humans) in it and the interactions between them.

epidemiology: the scientific study of the distribution of diseases and human-health risks within populations.

Great Lakes Water Quality Agreement/GLWQA: a joint agreement between the United States and Canada originally signed in 1972 and amended in 1978 and 1987. The Agreement commits the two countries to plan and implement programs and practices which will "restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem."

International Joint Commission/IJC: a binational organization established by the Boundary Waters Treaty of 1909 between the U.S. and Canada. The Commission is set up to resolve disputes between the two countries that may arise along the border including disputes involving water and air pollution, water levels, flows and diversions, and power generation.

leachate: materials suspended or dissolved in water and other liquids, usually from waste dump sites, that percolate through soil and rock layers.

load reduction: the process of decreasing the absolute amount or quantities of pollutants entering the environment from point and non-point sources.

mass balance approach: an approach to evaluate the sources, transport and fate of contaminants entering a water system, as well as their effects on water quality. In a mass-balance budget, the amounts of toxic chemicals entering the system less the quantity stored, transformed or degraded must equal the amount leaving the system. If inputs exceed outputs, pollutants are accumulating and contaminant concentration levels rise. Once a mass-balance budget has been established for a pollutant of concern, the long-term effects on water quality can be simulated by mathematical modeling and priorities can be set for research and remedial action.

modeling: mathematical simulation of actual conditions that is used to predict the fate of toxics in the ecosystem.

non-point source: a discharge into a receiving medium that takes place over an extended area and for which no point source --such as a discharge pipe --can be readily identified. An example is the movement of agricultural pesticides into groundwater and surface water. Pollutants entering waterways from atmospheric sources and leaking from landfills are sometimes included in the use of the term "non-point sources".

objectives: these denote maximum water quality or maximum contaminant concentrations to be achieved. They can be expressed as both numerical and narrative statements.

organochlorine contaminants: a large group of toxic chemicals contaminating the Great Lakes ecosystem. The compounds contain combinations of carbon, chlorine and other atoms. They are widely used in industrial processes, in the manufacture of agricultural pesticides and in the chlorination of waste waters. They bioaccumulate and are suspected causes of cancer in humans.

persistent toxic substances: pollutants which persist in the environment for long periods of time as opposed to pollutants which biodegrade into less harmful substances. The Great Lakes Water Quality Agreement defines "persistent" as having a half-life of more than eight weeks.

point source: a specific, identifiable source --often a pipe --emitting or discharging into the air, water or onto land.

PCBs, polychlorinated biphenyls: a group of compounds which are among the most ubiquitous of all environmental contaminants in the Great Lakes. Banned in both countries now, but were used widely by industry as insulators, fire retardants and plasticizers. PCBs bioaccumulate, are persistent and cause reproductive failure, skin and gastrointestinal disorders in mammals.

ppb: parts per billion = ug/l = micrograms per litre.

ppm: parts per million = mg/l = milligrams per litre.

quality-based standards: a standard that is based on the characteristics of the receiving medium and related to the attainment or maintenance of quality standards. The ability of the receiving medium to assimilate the total pollutant load is a key aspect in determining a quality-based standard.

RAP, Remedial Action Plan: comprehensive plans to be developed to restore water quality conditions in each of the Areas of Concern throughout the Great Lakes so that the areas will fully support beneficial uses. The states and provinces are primarily responsible for the preparation of RAPs. The 1987 amendments to the Great Lakes Water Quality Agreement requires that RAPs be prepared and direct the governments to employ an ecosystem approach and involve the public in their preparation. Remedial actions are also undertaken to clean up other environmental problems such as Superfund sites.

risk assessment: a process for estimating the likelihood that a toxic response could take place if people or animals were exposed to certain concentrations of toxic chemicals over a given period of time. Some water quality standards are based on a risk-assessment approach and are calculated on the likelihood that the substance will cause an "acceptable" level of increased risk, such as one additional cancer death per 100,000 people.

source reduction: techniques used within a plant to avoid or reduce the generation of hazardous substances; it is contrasted with pollution-control and waste-management techniques.

stream classifications: a system used by the New York Department of Environmental Conservation (DEC) in developing discharge permits for industry and municipalities. Stream are classified ("A", "B", "C", etc.) according to the uses which the water body is to be protected for. For example, a body of water that is used as a drinking water source is classed as "A" and a body of water that will not support fish propagation is classed as "D". The DEC applies different water quality standards based on the stream classification.

synergistic effects: effects produced by exposure to simultaneous doses of two or more toxins. When the final effect is greater than the sum of the effects caused by the individual toxins then the chemicals have synergistic effects.

technology-based standards: a standard based on the technology that can be used to reduce the discharge of a pollutant. A technology-based standard can either specify a process to be used or it can specify a numerical standard that has been calculated based on specific processes. This standard does not depend on the dispersion ability of the receiving medium, the ability of the receiving medium to assimilate the compound or the toxic effects of the compound in the ecosystem.

total loads: the amount of toxic chemicals, in absolute terms, entering the ecosystem via point and non-point sources.

toxic substance: a substance that can cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological or reproductive malfunctions, or physical deformities in any organism or its off-spring or that can become poisonous after concentrating in the ecosystem or in combination with other substances.

trophic levels: the individual stages in the food chain, beginning with micro-organisms and ending with humans.

trophic status: the successive aging of an aquatic resource like a lake due to enrichment from nutrients. Lakes age naturally from oligotrophic, to mesotrpohic to eutrophic. Aging, or eutrophication, is accelerated by human activities like discharging sewage into the lake ecosystem.

ug/l: micrograms per litre = parts per billion (ppb).

U.S. EPA: the United States Environmental Protection Agency.

REFERENCES

Bricke, K., Collin, R., Hamdy, Y. and Sampson, R.C.J. 1988. Draft Lake Ontario Toxics Management Plan. A Report to the Niagara River Coordination Committee.

Colburn, Theo. 1988. Great Lakes Toxics Working Paper. A Report to Environment Canada, Ottawa. Contract number KE144-7-6336. The Conservation Foundation, Washington D.C.

Congress of the United States, 1986. Serious Reduction of Hazardous Waste. Office of Technology Assessment, Washington D.C.

Davies, K. and MacPherson, A. 1986. Human Exposure Routes to Selected Persistent Toxic Chemicals in the Great Lakes Basin: A Case Study. Dept. of Public Health. Toronto, Ontario.

Dawson, C. 1986. Expenditures of Anglers Fishing in New York's Great Lakes Waters. New York State Sea Grant Extension, Cornell University, Ithaca, New York.

Elder, Jane; et al. 1988. Sweet Water, Bitter Rain: Toxic Air Pollution in the Great Lakes Basin. A 1988 Update. Sierra Club, Madison, Wisconsin. May, 1988.

Fein, G.G. Jacobson, J.L. Jacobson, S.W. Schwartz, P.M. and Dowler, J.K. 1984. Prenatal Exposure to Polychlorinated Biphenyls: Effects on Birth Size and Gestational Age. Journal of Pediatrics. 105: 315-320.

Gilbertson, M. 1985. Epidemics in Great Lakes Birds and Mammals Caused By Chemical. for presentation to the Symposium on Persistent Toxic Substances and the Health of Aquatic Communities. June 18-20, 1985. Minneapolis, Minnesota. Fish Habitat Management Branch, Fisheries and Oceans Canada, Ottawa.

Gilbertson, M. 1985. The Niagara Labrynth--the Human Ecology of Producing Organochlorine Chemicals. Can. J. Fish. Aquatic Sci.42: 1681-1692.

International Joint Commission. 1978. Environmental Management Strategy for the Great Lakes System. Final Report to the IJC, From the International Reference Group on Great Lakes Pollution From Land Use Activities. Windsor, Ontario, July 1978.

International Joint Commission. 1987. Report on Great Lakes Water Quality. Windsor, Ontario.

International Joint Commission, Science Advisory Board, Water Quality Board and International Air Quality Advisory Board. Summary Report of the Workshop on Great Lakes Atmospheric Deposition, Scarborough, Ontario. October, 1987

MacClennan, Paul. Niagara River Toxic Levels Rising, Ontario Study Shows. The Buffalo News. Buffalo, New York, June 2, 1988.

MacClennan, Paul. EPA Details Volume, Sources of Poisons Put Into Niagara. The Buffalo News. Buffalo, New York, March 10, 1988.

Muir, T. and Sudar, A. 1987. Toxic Chemicals in the Great Lakes Basin Ecosystem: -Some Observations. Water Planning and Management Branch, Environment Canada, Burlington, Ontario.

Muldoon, P. and Valiante, M., 1988. Zero Discharge: A Strategy for the Regulation of Toxic Substances in the Great Lakes Ecosystem. Canadian Environmental Law Research Foundation, Toronto, Ontario, 1988.

National Research Council of the United States and The Royal Society of Canada. 1985. The Great Lakes Water Quality Agreement: An Evolving Instrument For Ecosystem Management. National Academy Press, Washington D.C., 1985

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