ST. LAWRENCE
REMEDIAL ACTION PLAN

PLAN D'ASSAINISSEMENT
ST-LAURENT

Stage 1

Environmental Conditions and Problem Definitions

August 1992

Remedial Action Plan
Plan d'Assainissement

Canada Ontario

THE ST. LAWRENCE RIVER
AREA OF CONCERN

REMEDIAL ACTION PLAN
FOR THE CORNWALL-LAKE ST. FRANCIS AREA

STAGE 1 REPORT:
ENVIRONMENTAL CONDITIONS AND PROBLEM DEFINITIONS

ST. LAWRENCE RAP TEAM

AUGUST 1992

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MOHAWK COMMUNITY OF AKWESASNE

Words of Spiritual Communication

The Mohawk Nation is governed by the guiding principles, embodied in two words "Ohenton Kariwatekwen". Words of spiritual communication toward the natural environment, expressed before anything else. Whenever our people gather, a speaker is chosen to find the finest words of thanksgiving directed toward the earth mother and all of creation.

We encourage all people who may listen, to feel for the environment as we have felt since creation. We are living in turbulent times as ancient prophesies are being fulfilled. Indeed as has been foretold, the trees would start dying from its tops down. The waters would be dirtied and many fish and water life would die. Great destruction awaits our children and grandchildren if we fail to find answers needed to heal the environment. We encourage the best possible Remedial Action Plan for the clean-up of "Kaniatarowaneneh" St. Lawrence River be adopted.

The People

We who have gathered together see that our cycle continues. We have been given the duty to live in harmony with one another and with other living things. We are grateful and give thanks that this is true.

We also give greetings and thanks that our people still share the knowledge of our culture and ceremonies and still are able to pass it on.

We have our elders here and also the new faces are coming towards us, which is the cycle of our families; for all this we give thanks and greetings for mankind in mind, health and spirit.

Now our minds are one
Agreed

The Mother Earth

We give thanks and greetings to the earth; she is giving that which makes us strong and healthy. She supports our feet as we walk upon her. We are grateful that she continues to perform her duties as she was instructed. The women and Mother Earth are one; givers of life.

We are her colour, her flesh and her roots. Once we acknowledge and respect her role, then begins a true relationship, and all that is from her returns to her.

Now our minds are one
Agreed

The Three Sisters

Our people have been given three main foods from the plant world. They are known as the three sisters; corn, beans and squash. We acknowledge them for providing strength to mankind and also to many other forms of life.

For this we give thanks and greetings in the hope that they will continue to replenish Mother Earth with the necessities of the life cycle.

Now our minds are one
Agreed

Plant Life

We give greetings and thanks to the plant life. Within plants is the force of substance that sustains many life forms; among them are food, medicine and beauty.

From the time of creation we have seen the various forms of plant life work many wonders in areas deep below the many waters and the highest of mountains. We give greetings and thanks, and hope that we will continue to see plant life for generations to come.

Now our minds are one
Agreed

Medicinal Plants

We greet and give acknowledgment thanksgiving to the medicine plants of the world. They have been instructed by the Creator to cure disease and sickness.

Our people will always know their native names for this is the name we will use when we are weak and sick, for invested in the plants is the power to heal. They come in many forms and have many duties. It is said that because of this, our relationship is very close. Through the ones who have been vested with knowledge of the medicine plant, we give thanks.

Now our minds are one
Agreed

The Animals

We give thanks and greetings to all animals of which we know the names. They are still living in the forest and other hidden places, and we see them sometimes. Also from time to time they are still able to provide us with food, clothing, shelter and beauty.

This gives us happiness and peace of mind because we know that they are still carrying out their instructions as given by the Creator.

Therefore, let us give thanks and greetings to our animal brothers.

Now our minds are one
Agreed

Bodies of Water

We give thanks to the spirit of waters for our strength of well being. The waters of the world have provided to many; they quench thirst, provide food for plant life, and are the source of strength for many medicines we need. Once acknowledged, this too becomes a great power for those who seek its gift, for mankind himself is made from the waters.

Now our minds are one
Agreed

Trees

We acknowledge and give greetings to the trees of the forests. They continue to perform the instructions which they were given. The maple tree is symbolized as the head of the trees. It provides us with syrup, which is the first sign of the rebirth of spring. All the trees provide us with shelter and fruits of many varieties. The beauty of the trees is ever changing. Some of the trees stay the same throughout the cycle of the year.

Long ago our people were given a way of peace and strength and this way is symbolized by the everlasting tree of peace. The trees are standing firm toward the sky for which we give a thanksgiving.

Now our minds are one
Agreed

Birds

We now turn our thoughts toward the winged creatures that spread their wings just above our heads to as far upward as they can go. We know them as having certain names. We see them, and we are grateful.

They have songs which they sing to help us appreciate our own purpose in life. We are reminded to enjoy our life cycle. Some birds are available to us as food. We believe that they are carrying out their responsibilities.

To us the eagle is the symbol of strength. It is said that they fly the highest and can see the creation. It warns us if any great danger is coming. We show our gratitude for the fulfilment of his duties.

Now our minds are one
Agreed

The Four Winds

We listen, hear their voices as they blow above our heads. We are assured that they follow the instructions given them, sometimes bringing rain, and renewing the waters upon the earth. They always bring us strength. They come from the four directions.

The air and winds are still active in the changing of the seasons. Winter is the time when the earth is covered with snow and cold winds blow. Summer wind causes life to continue. In the fall season life matures and gets ready for the continuation of the cycle once more.

You refresh us and make us strong. For this we give greetings and thanksgiving.

Now our minds are one
Agreed

Our Grandfathers, The Thunderers

We call them our grandfathers. They are the Thunder People. We are of one mind that we should give them greetings and thanks.

Our grandfathers have been given certain responsibilities. We see them roaming the sky above, carrying with them water to renew life.

At certain times we hear our Grandfathers making loud noises. Our Elders tell us their voices are loud to suppress the powerful beings (not of his making) within the Mother Earth, from coming to the surface where the people dwell. Grandfathers, you are known to us as protective guardians and as medicine, so we now offer these words of thanksgiving.

Now our minds are one
Agreed

The Moon or Night Sun

In our world we have night time or darkness. During this time we see the moon reflects lights, so that there isn't complete darkness. We have been instructed to address her as our Grandmother. In her cycle she makes her face in harmony with other female life.

She is still following these instructions and we see her stages. Within these are the natural cycle of women. She determines the arrival of children on earth, causes the tides of the ocean, and she also helps us measure time.

We know that there are two sides to the natural flow, for day time there is night. They are on equal balance yet. Our Grandmother continues to lead us. We remain grateful, and we express our thanksgiving.

Now our minds are one
Agreed

The Day Sun

Our thoughts turn toward the sky. We see the day sun, the source of all life. We are instructed to call him our eldest brother. He comes from the east, travels across the sky, and sets in the west. With the sunshine we can see the perfect gifts which we are grateful for.

Brother sun nourishes Mother Earth and is the source of light and warmth. The cycle of the sun changes; during the winter months there is just enough heat and sunshine to allow Mother Earth to rest; we say "She wears a blanket of snow". As the cycle continues the sunshine and heat becomes stronger to allow all life forms to be reborn.

Our brother is the source of all fires of life. With every new sunrise is a new miracle; for this we are grateful.

Now our minds are one
Agreed

Stars

The stars are helpers of our Grandmother moon. They have spread themselves all across the sky. Our people knew their names and their messages of future happenings, even to helping mold individual character of mankind.

When we travel at night we lift our faces to the stars and are guided to our homes.

They bring dew to the gardens and all growing plants on Mother Earth.

When we look in the sky to the vast beauty of the Stars, we know they are following the way the Creator intended. For this we offer our greetings and Thanksgiving.

Now our minds are one
Agreed

The Sky Dwellers

The four powerful spirit beings who have been assigned by the Creator to guide us both by day and by night are called the Sky Dwellers. Our Creator directed these helpers to assist him in dealing with us when we are happy and of many minds during our journey on Mother Earth. They know and so our every act and they guide us with the teachings that the Creator established.

For the power of direction, we give greetings and Thanksgiving to these four beings, his helpers.

Now our minds are one
Agreed

The Creator

Now, we turn our thoughts to the Creator. We will choose our finest words to give thanks and greeting to Him. He has prepared all these things on earth for our peace of mind. Then he thought, "I will now prepare a place for myself where no one will know my face, but I will be listening and keeping watch on the people moving about on the earth."

And indeed, we see that all things are faithful to their duties as he has instructed them. We will therefore gather our minds into one and give thanks to the Creator.

Now our minds are one
Agreed

Closing Words

We have directed our voices toward our Creator in the best way that we will abide by his word so that we may yet be happy.

If we have left something out, or if there are more who have other needs or other words, let them send their voices to the Creator in their own ways. Let us be satisfied that we have gone as far as it was possible to fulfil our responsibility.

Now our minds are one
Agreed

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This document was prepared by the St. Lawrence River Remedial Action Plan (RAP) Team under the guidance of the Canada-Ontario RAP Steering Committee. RAP Team membership during the preparation of this document has included:

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FOREWORD

This report constitutes the Stage 1 submission of the St. Lawrence River Remedial Action Plan (RAP), in accordance with the Canada-Ontario commitment to the Great Lakes Water Quality Agreement. It provides a summary of the environmental conditions and problem definitions in the St. Lawrence River area of concern (Cornwall-Lake St. Francis). A description of the public involvement program as it has developed to date is also included.

Background - What's a RAP?

The International Joint Commission (IJC) was established in 1909 by the Boundary Waters Treaty to deal with water and related issues along the Canada/United States border.

Since 1973, the Great Lakes Water Quality Board of the IJC has identified Areas of Concern throughout the Great Lakes and their connecting channels where Great Lakes Water Quality Agreement, provincial or state water quality objectives have been exceeded and uses of the areas have been impaired. Of the 42 areas of concern identified by the IJC, 12 are entirely within the Canadian Great Lakes Basin, while five are a shared Canadian/United States responsibility.

The Water Quality Board recommended that a Remedial Action Plan (RAP) be developed for each area of concern which would outline a "systematic and comprehensive approach to restoring beneficial uses . . . consistent with an 'ecosystem approach' to the protection of the Great Lakes" (IJC, 1985). When completed the RAP will provide: a description of the area; location and extent of environmental problems and use impairment; description of pollution sources leading to the problems; and the remedial actions proposed to restore beneficial uses, including scheduling and tracking procedures. The 1978 Great Lakes Water Quality Agreement (revised with 1987 Protocol) requires the RAP to be submitted to the IJC at three stages:

1. when the definition and description of the environmental problems and impaired beneficial uses are complete;
2. when remedial measures and implementation plans have been selected; and
3. when monitoring indicates that beneficial uses have been restored.

The St. Lawrence River Area of Concern

The St. Lawrence River area of concern includes the Maitland, Ontario area and the reach from Cornwall-Massena (Ontario and New York) downstream through Lake St. Francis (including the Quebec portion). It was identified as an area of concern by the IJC as a result of sediments contaminated with PCBs and excesses of water quality objectives for phenols and coliform bacteria (Cornwall-Massena), and elevated organolead concentrations in fish (Maitland) (IJC, 1985).

There are currently two Remedial Action Plan programs underway for the St. Lawrence area of concern, Cornwall/Lake St. Francis and Massena. The Maitland area has been addressed through ongoing agency programs and not through a specific RAP process primarily due to the closure of the organolead plant (Dupont) in 1985 and the subsequent improvement in environmental lead levels and the removal of fish consumption advisories for lead. This Stage 1 document has been prepared as part of the RAP process for the Cornwall-Lake St. Francis area in Ontario and Quebec. It is a joint effort by Canada and Ontario under the Canada/Ontario Agreement. New York state is proceeding with a separate Remedial Action Plan for Massena with provisions for Canadian involvement at critical stages.

A common definition of the geographic scope of the Area of Concern has, however, been agreed to by all parties as follows:

The St. Lawrence River Area of Concern (AOC) includes the waters from the Moses-Saunders power dam to the eastern outlet of Lake St. Francis adversely impacted by contaminants. This includes waters shared by the United States, Canada, and the Mohawks at Akwesasne.

For purposes of identifying water related sources of contaminants in New York State, the AOC includes the New York portion of the St. Lawrence River, including the area upstream of the Snell lock and power dam to the Massena public water supply intake, the Grasse River from the mouth upstream to the first dam, the Raquette River from the mouth upstream to the NYS Route 420 bridge and the St. Regis River from the mouth upstream to the dam at Hogansburg.

Recommendations of remedial measures will depend on the jurisdictions of the various governments involved.

Remedial actions will be identified for the Ontario portion of the area of concern and the identified sources in Cornwall. Remedial actions which may be required for the Quebec portion of Lake St. Francis due to Cornwall sources will also be written into the plan.

Maitland

Maitland is located approximately 88 km downstream of the outlet of Lake Ontario. The river at this point is about 1750 metres wide with a mid-channel depth of 20 m.

A 1975 Environment Ontario survey of water quality, sediment quality and benthos attributed adverse impacts to two industrial dischargers of effluent: Dupont and Genstar (Nitrochem Inc.).

In the Maitland area, elevated lead levels in fish and sediment have been partially resolved with the shutdown of Dupont's tetraethyl lead plant. Further activities in this section of the St. Lawrence River will be directed toward an Environment Ontario follow-up investigation of the continuing Nitrochem Inc. and Dupont monomer plant discharges. Extensive effluent monitoring is being done to comply with Ontario's Municipal and Industrial Strategy for Abatement (MISA) program regulation. A remedial action plan specific to the Maitland area of the St. Lawrence River will not be prepared at this time.

Dupont produced tetraethyl lead as a gasoline additive from 1965 to 1985 when the plant ceased operations. In 1985, Environment Ontario issued a fish consumption advisory in the Blue Church Bay/Maitland area based on lead levels in sport fish caught during 1983 and 1984. In 1987, the advisory based on lead was removed, however elevated mercury and PCB levels in older fish of some species still restricts fish consumption in this area.

A 1984 Environment Ontario survey showed that the sediment chemistry had not changed substantially since 1975. The Nitrochem plant outfall did not have any discernible impact on sediment chemistry in the 1984 survey. Dupont discharges created a 3 km plume of elevated lead levels and had a smaller impact on sediment levels of hexachlorobenzene (HCB), oil and grease, copper and possibly PCBs, cobalt and total Kjeldahl nitrogen (Wilkins, 1987). The 1984 survey also showed that less than 1 percent of the lead emitted during the plant's 20 year operation remained within the study area and estimated that some 400 tonnes had been transported downstream. The distribution in sediment of several inorganic contaminants including mercury and PCBs in the 1984 survey also indicated a pattern consistent with a major input upstream of the Maitland area (ie. Lake Ontario).

Elevated levels of HCBs, oil and grease and copper in Maitland area sediments may be associated with the continuing effluent from the Dupont monomer outfall. The need for further controls is being assessed through Environment Ontario's Municipal and Industrial Strategy for Abatement (MISA) program.

Public Involvement

Phase 1 of the public involvement program (information dissemination activities) ran from June to September 1988. This included an open house in June, the creation of a RAP display and slide show, production and distribution of a brochure, fact sheets and draft terms of reference for a Public Advisory Committee (PAC) and presentations by RAP Team members to potential PAC member groups. Public views on water quality issues and concerns were documented.

A Public Advisory Committee (PAC) was formed in November 1988 with members from the following sectors: Academia, Agriculture, Cottagers, Downstream (Quebec), Environmental Groups, Fishing, General Public, Health, Industry, Labour, Municipalities, Mohawk People, Power Generation, Shipping Recreation and Tourism and Small Business. In January 1989 the PAC struck a subcommittee to develop goal statements. Eight goals, along with an introductory 'perspective' statement, were tabled at the March 1989 meeting of the full committee.

The PAC meets monthly (every third Tuesday) and its subcommittees meet more frequently (some weekly). Three subcommittees (Technical, Public Outreach, and Remedial Options) are presently operating. Membership of the PAC has grown to approximately 40 members representing 17 sectors of the community.

Communication with the general public is continuing via open houses, trade shows and a RAP newsletter.

RAP Development

The RAP Team has been working since 1986 to analyze and complete the data base on environmental conditions and sources in the Cornwall-Lake St. Francis area. A report detailing environmental conditions and sources was prepared and submitted for public review in November 1988 (St. Lawrence River RAP Team, 1988). This work has included coordination with Environment Canada (Quebec Region), Environment Quebec, the United States Environmental Protection Agency, the New York State Department of Environmental Conservation (DEC) and the Mohawk Governments of Akwesasne.

RAP team efforts are presently being directed toward the completion of a remedial options discussion paper. Chapters of the paper have been reviewed in draft form by the Public Advisory Committee. Additions and suggestions from the committee are being incorporated as well as input from a remedial options technical workshop on feasibility and effectiveness of remedial options, held in March of 1991. Evaluation and selection of preferred options will follow with public review.

International Activities

Mechanisms for the involvement of Environment Quebec, New York State Department of Environmental Conservation and the Mohawk Governments of Akwesasne have been identified. In March 1988, the Mohawk Governments of Akwesasne were officially recognized by the Board of Review for the Canada-Ontario Agreement Respecting Great Lakes Water Quality (COA) and their direct participation in the RAP welcomed. In July 1988, the Canadian RAP Steering Committee also welcomed the contributions of Environment Quebec through liaison with the RAP Team.

The St. Lawrence River Restoration Council was formed in May 1989 with representation from the Cornwall Public Advisory Committee (PAC), the Massena Citizen's Advisory Committee (CAC) and the Mohawks Agree on Safe Health (MASH) group. The Council was supported by these groups as a forum for information

exchange until 1991. The Cornwall PAC withdrew its support because of internal difficulties with representation on the council.

Although the IJC specifies the development of binational RAPs for areas of concern which are shared between the U.S.A. and Canada, New York State is developing a separate Remedial Action Plan for the Massena area of the St. Lawrence River area of concern. It continues to be COA's position that a binational RAP effort with New York State is required. The goal of such a joint RAP development process with DEC was partially achieved in May 1988 with an agreement between Environment Canada, Environment Ontario and The New York Department of Environmental Conservation (NYSDEC) to develop joint statements on environmental problems and goals for the Cornwall-Massena area of concern. Subsequent meetings between the Canadian and United States RAP Teams have outlined a process for the development of these joint statements which requires input from Environment Quebec, the Mohawk People of Akwesasne and the Canadian and United States publics. A joint goal statement (below) has received the approval of the Cornwall PAC, Massena CAC and the Mohawk People through the St. Lawrence River Restoration Council, as well as Environment Quebec and a joint statement of the problem in the form of a Cornwall-Massena Stage I summary report has been prepared.

Joint Goal Statement for the St. Lawrence River Area of Concern:

> The goal of the Cornwall and Massena Remedial Action Plans is to restore, protect, and maintain the chemical, physical and biological integrity of the St. Lawrence River ecosystem, and in particular, the Akwesasne, Cornwall-Lake St. Francis and Massena Area of Concern in accordance with the Great Lakes Water Quality Agreement.
>
> The goal of the Cornwall and Massena Remedial Action Plans includes protecting the downstream aquatic ecosystem from adverse impacts originating in the Akwesasne, Cornwall-Lake St. Francis and Massena Area of Concern.

In general, cooperation and coordination among and between the various groups and agencies involved in the Cornwall/Massena area of concern has improved, but much more remains to be done. There exists a unique opportunity in this multi-jurisdictional area to effectively share the benefits from recent initiatives such as the Canadian St. Lawrence River Action Plan in Quebec, the Canadian Great Lakes Action Plan in Ontario and the Superfund Investigations in New York. The presence of observers from the New York State Department of Environmental Conservation, the Massena Citizen's Advisory Committee (CAC) and Environment Quebec at PAC meetings has been useful in improving communications.

Canadian officials continue to monitor transboundary pollution from Massena sources on two fronts. First, staff of Environment Canada, Environment Ontario and Environnement Quebec are providing input to the EPA Superfund, State Superfund programs and the EPA 106 Order for the clean up of the three Massena industrial sites (General Motors, ALCOA, Reynolds) and river sediments. Secondly, the sharing and review of Canadian and American ambient data is occurring through the RAP process. Analysis of this data confirms that transboundary movement of PCBs from Massena is ongoing. An initiative to coordinate monitoring activities in this section of the St. Lawrence River has been supported by all agencies involved and plans are underway to begin discussions at an international workshop to be scheduled for February 1992 in Massena.

Human Health

Elevated levels of contaminants in the Great Lakes basin and the public and scientific concern about the associated effects on human health have motivated the Great Lakes Health Effects Program. A study of the effects on human health of consumption of contaminated in sport fish and wildlife has been designed by Health and Welfare Canada. The Cornwall area residents are no exception in their concern over human health and the relationships between consumption of fish and wildlife and human exposure to contaminants. Having

consumption advisories on fish because of mercury and PCB contamination and being an area of high consumers of fish and wildlife, these residents may have a greater exposure to contaminants. Cornwall was chosen as one of two sites (Mississauga being the other) for a more detailed assessment of exposure to contaminants from the consumption of fish and wildlife. The study consists of two questionnaires in a mail-out package: The Great Lakes Basin Anglers Survey asks about fishing activities and consumption of sport fish from various Ontario locations and includes a few questions on health and lifestyle; the Fish and Waterfowl Consumption Survey for the Cornwall Area asks about consumption of fish and waterfowl from specific Cornwall area locations. A second stage of the study will collect information on the range and levels of contaminants found in humans consuming fish and wildlife from the Great Lakes basin by asking 100 volunteers to provide blood and hair samples and complete a more detailed dietary questionnaire.

The native people on the Akwesasne Reserve have been affected directly as a result of their concerns over human health and contaminant exposure through consuming fish and wildlife. Their subsistance lifestyle has been altered drastically and the Mohawk Councils have issued advisories to consume no fish from the St. Lawrence River of any size or species. Previous health studies have been inconclusive due to confounding factors, however, the Great Lakes Health Effects Program through the Assembly of First Nations are currently undertaking projects to address basin-wide and local native concerns.

Additional health concerns in the Cornwall area relate to the elevated incidence of: bladder cancer in men, pancreatic cancer in women; asthma and respiratory disease in men and; congenital anomalies. Although the incidences are statistically non-significant (Health & Welfare Canada, 1991), the possibility of disease trends that may be related to environmental contamination is suggested. Further study has been suggested and a recent updated report from the Eastern Ontario Health Unit is pending.

RAP Timetable

The approximate timetable for the St. Lawrence RAP is outlined below, with initiation and target completion dates given for major milestones.

Activity	Initiation-Target Completion Dates
Phase 1, Public Involvement Program	June-September 1988
Identification of Desired Use Goals	November 1988 - 4th quarter 1989
Identification of Remedial Options	2nd quarter 1990 - 2nd quarter 1991
Selection of Preferred Remedial Options	3rd quarter 1991 - 2nd quarter 1992
RAP (Stage 2) for Review	3rd quarter 1992 - 4th quarter 1992

Ongoing Studies

This document summarizes environmental conditions and identifies environmental problems in the Cornwall area of concern, based primarily on information and data collected prior to 1990. As the RAP progresses through Stage 2, this document will be supplemented with results of field work, analysis and the Public Involvement Program.

The following activities have been designed to support the development of remedial options. Results of these activities will also serve as a baseline against which to monitor the results of the implementation of remedial options.

1. Studies to further quantify contaminant loadings and transboundary movement in water and suspended sediment.

2. Surveys of sport fish, spottail shiners, waterfowl and mussels for contaminant analysis as well as the completion of an investigation of the physiological impact of contaminants on fish.

3. Additional studies of the environmental conditions of depositional zones in the Quebec waters of Lake St. Francis, including a variety of ecotoxicological studies.

4. Continuation of Phase 3 of the public involvement program which includes the review of a comprehensive set of remedial options for the river by the Cornwall Public Advisory Committee.

5. Monitoring of zebra mussels is underway to determine densities and distribution of this exotic species now present in the AOC.

6. Cornwall Waterfront sediment assessment to determine availability of contaminants to the biota and further define the need for sediment remediation.

7. Through the use of existing fish tainting threshold concentration data for Domtar's effluent, dispersion modelling and detailed review of Domtar's process and effluent treatment, the fish tainting issue will be further investigated in 1991.

8. A pilot fish and wildlife exposure study is underway in the Cornwall area in cooperation with Health and Welfare Canada's Great Lakes Health Effects Program. The local concerns on consumption rates and exposures will be addressed through questionnaires and hair and blood sampling for contaminants in volunteer participants. In addition about 140 personal interviews are being conducted by three local interviewers in the Lancaster area, near Cornwall. A separate project to address native concerns in the Great Lakes basin in also underway in cooperation with the Assembly of First Nations.

Comments from the Public Advisory Committee on the Stage I report were very thorough and provided the RAP team with useful insight into the concerns of the local community. Responses to the PAC on every individual comment were presented in written and verbal form. Changes/additions to the document as a result of their comments were included if the information was available. However, additional information to supplement the Stage I document is being collected and interpreted and will be presented in an addendum or included in the Stage II report. The major topic areas to be addressed in more detail include: shipping and industrial spill occurences and spill readiness, local and long-range air deposition of contaminants, up-to-date effluent loadings and a mass balance for the river, leachate and groundwater contamination and, the incidence and causes of fish tumours and tainting.

MISA

Environment Ontario is implementing a program called the Municipal-Industrial Strategy for Abatement (MISA), which will require, at a minimum, the application of Best Available Technology Economically Achievable by direct dischargers of effluent to the surface waters in Ontario. The goals of the MISA program is the virtual elimination of persistent toxic substances. Requirements for the pulp and paper (includes Domtar), organic chemicals (includes Courtaulds Fibres and Cornwall Chemicals), inorganic (ICI) and municipal (includes the Cornwall sewage treatment plant) sectors are currently being developed. The St. Lawrence River in the vicinity of Cornwall has also been selected as a MISA pilot project site. The goal of this study is to develop procedures for setting effluent requirements based on the more stringent option between Best Available Technology Economically Available and water quality based requirements.

MISA monitoring activities in the area of concern have been extensive. Recent data (post 1987-88) for municipal and industrial discharges is not yet available for most facilities in Cornwall with the exception of Domtar. The reports should be released in the coming months. Effluent data for the Domtar mill was issued by Environment Ontario in the summer of 1991 and subsequently in October. This information is not presented in this Stage 1 document because the report was in the final review stages at that time. All recent MISA monitoring information will be presented in a future addendum or included in the Stage II report.

MISA pilot site activities include the use of a model to simulate the hydrodynamics, dispersion characteristics and far-field transport of pollutants. This model is being applied for the entire width of the St. Lawrence River at Cornwall and will evaluate the water column dispersion pattern downstream of each of the point source discharges. Modelling the effects of point source discharges will aid in the selection of appropriate control options.

Impaired Uses

The St. Lawrence River in this area provides a wide array of beneficial uses, many of which are impaired to some degree. Table I outlines conditions for impaired use as outlined in Annex 2 of the Great Lakes Water Quality Agreement and their application to this area of concern. A summary of environmental conditions, problems and impaired uses is provided in Table 1-1 (see Summary of Environmental Conditions and Concerns).

Table I Conditions for Impaired Uses* and their Application to the St. Lawrence River at Cornwall-Lake St. Francis

CONDITION FOR IMPAIRED USE	APPLICATION TO ST. LAWRENCE RAP
1. Restrictions on fish and wildlife consumption	**Impaired.** In Lake St. Francis (from Glen Walter - Quebec Border) sport fish consumption is restricted: human consumption advisory for walleye (>45 cm), northern pike (>45 cm), white sucker (>45 cm), smallmouth bass (>35 cm) and black crappie (>15 cm) due to elevated mercury levels; sturgeon (>45 cm) and channel catfish (>30 cm) due to elevated PCB levels. In the North Channel i.e. Power Dam to Glen Walter: walleye (>35 cm), yellow Perch (>25 cm), northern pike (>45 cm). In the South Channel (Grasse River to Ile Jaune): walleye (>45 cm), northern pike (>45 cm), channel catfish (>55 cm), carp (>75 cm) and sturgeon (>45 cm). Children under 15 and women of child-bearing age are advised to eat only species which are fully unrestricted. Mohawk advisories restrict consumption of all fish species.
2. Tainting of fish and wildlife flavour	**Further study required.** Anecdotal evidence; previous reports of fish tainting may have been associated with Domtar effluent; Domtar study results; creel census survey of >900 anglers indicated no problem. 1990 survey inconclusive but is being reinvestigated in 1991.
3. Degradation of fish and wildlife populations	**Impaired.** Fish community probably shifted as a result of Seaway and dam construction. Impacts on sturgeon and walleye probable due to flooding of historical spawning areas. Exploitation (sport, commercial and subsistence) continues to be a major factor controlling fish population abundance. Information on other sport fish species does not include any recent changes in status of any significance (1984-1988) however data prior to 1984 are not available except for yellow perch. Perch populations have fluctuated since the mid-70s but no trend is apparent i.e. no significant increase or decrease in population size. Impact of recent zebra mussel invasion cannot be quantified at this early stage in the invasion. Incremental littoral zone habitat loss due to shoreline development activities is a problem. Impacts of contaminants on fish abundance is unknown. Waterfowl production has been reduced by wetland loss; impacts of contaminants unknown; use of the area by staging waterfowl is suspected to be down. Data on other wildlife species not available.
4. Fish tumours or other deformities	**Impaired.** Lip papillomas reported on white suckers; 1990 survey (preliminary) found liver tumours in walleye (close to 20% males, 50% females) and white suckers but no conclusions can be drawn from data prior to histopathological confirmation.
5. Bird or animal deformities or reproductive problems	**Further study required.** No impacts have been identified. The potential for such impairments exists given the levels of contaminants which are generally comparable to other areas in the Great Lakes where such impairments have been documented. The absence of colonies of nesting cormorants, gulls, and a substantial population of mink restrict study opportunities. Anecdotal evidence on the Akwesasne Reserve (New York) has been documented.
6. Degradation of benthos	**Impaired.** Benthic community structure impaired due to habitat restrictions; contaminant uptake documented, inorganic contaminant levels in sediments exceed Provincial Sediment Quality Guidelines to protect benthic community.
7. Restrictions on dredging	**Impaired.** Sediment contaminant levels (nutrients, oil and grease, metals and PCBs) in some areas exceed guidelines for open water disposal of dredged sediments.

(Table I cont'd)

Condition for Impaired Use	Application to St. Lawrence RAP
8. Eutrophication or undesirable algae	**Impaired.** Nutrient enriched conditions combine with low flows in nearshore areas of Lake St. Francis to produce algae and associated odours; algal growth on weed beds. Algal growth may be becoming more pronounced in some areas. Loss of emergent weed beds is a continuing problem. It is possible that a plant community shift is occurring with the exotic Eurasian milfoil being replaced by native species. Aquatic plant production is extensive due to combination of nutrient inputs and changes in system hydraulics due to Seaway/dam construction.
9. Restrictions on drinking water, or taste and odour problems	**Impaired.** No restrictions for the City of Cornwall; historic (early 1980s) taste and odour problems downstream of Cornwall caused by phenolic and other organic discharges from Domtar; additional treatment costs (for carbon filters) incurred for Glen Walter plant (1988) to protect against impact from transboundary movement of PCBs from Massena (and organics from Cornwall); potential impairment for private intakes where no treatment is employed.
10. Beach closings	**Impaired.** Several beach closures during 1986, 1988, and 1989; elevated bacteria levels downstream of Cornwall; No beach closures in Lake St. Francis, Quebec during 1987, 1988, 1989 or in Ontario during 1990, 1991.
11. Degradation of aesthetics	**Impaired.** Masses of uprooted aquatic weeds collect in embayments and create localized water quality, odour and aesthetic impairment and potential health hazard; odour of effluents in ambient water creates impairment.
12. Added costs to agriculture and industry	**Impaired.** Contaminant levels have adversely affected commercial fisheries by rendering some species unmarketable in some areas. Contaminant levels and general degradation of some sport fish species has probably adversely affected the local tourism industry.
13. Degradation of phytoplankton and zooplankton populations	**Further study required.** None documented, however; the healthy fish community is indicative of viable plankton community. Zebra mussel invasion may have major impact on plankton community.
14. Loss of fish and wildlife habitat	**Impaired.** Construction of the Seaway and dams had a major impact on fish and wildlife habitat in terms of physical alteration associated with dredging, change in habitat stability due to flooding and stabilization of water levels and stream channel morphometry have affected aquatic plant and wetland communities. Continual shoreline development has affected both wildlife and nearshore fish habitats.

" Impairment of beneficial use(s) means "a change in the chemical, physical or biological integrity of the Great Lakes System sufficient to cause any of the following": [14 conditions for impaired use] (Annex 2, Great Lakes Water Quality Agreement of 1978 as amended 1987).

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1.0 SUMMARY OF ENVIRONMENTAL CONDITIONS AND CONCERNS

The St. Lawrence Area of Concern (AOC) includes the waters from the Moses-Saunders power dam to the eastern outlet of Lake St. Francis. This includes waters shared by the United States, Canada, and the Mohawks at Akwesasne.

Three municipalities are located in the AOC, including: The City of Cornwall, and the muncipalities of Charlottenburg and Lancaster Township. Part of the Mohawk Community of Akwesasne is also located in the AOC. Each of these communities is dependent, to varying degrees, upon local industry, agriculture, commerce and tourism for employment.

The St. Lawrence River AOC provides a wide variety of industrial, municipal and recreational uses, including: boating, shipping, hydro-electric power generation, domestic and industrial water supplies, waste assimilation, sport and commercial fishing, hunting, nature appreciation, swimming and recreational water sports; however, many of these beneficial uses are impaired to some degree by contaminants. The primary contaminants of concern, i.e. those which cause negative effects locally and/or can be found at levels which exceed criteria or objectives established to protect human health, aquatic life or the beneficial uses of the water body, include polychlorinated biphenyls (PCBs) and mercury. Other contaminants of concern include: zinc, lead, chromium, polychlorinated dioxins and furans, polynuclear aromatic hydrocarbons (PAHs), phenols, and oils and grease. Many other organic chemicals and other metals can also be found in the AOC at low (trace) concentrations; however, dilution, media transfer and/or degradation of these contaminants is so great that there are no local or measureable effects. Causes of impairment other than chemical contamination include habitat loss, excessive growth of aquatic vegetation, and bacterial contamination.

Sources of these contaminants include: historic and ongoing point sources; non-point sources, including agricultural runoff, urban runoff, leachate from landfills, atmospheric emissions and upstream contaminant loadings; and transboundary sources from industrial facilities in Massena, New York.

The environmental impacts caused by these contaminants of concern, along with their sources, are summarized below and in Table 1-1.

HEAVY METALS AND TOXIC ORGANICS IN FISH AND WILDLIFE SPECIES

Fish

The two contaminants of concern in fish in the AOC are PCBs and mercury. Fish from Lake St. Francis contain higher concentrations of both chemicals, than fish upstream of the AOC, suggesting that the sources of contamination are either historical and/or ongoing local discharges including those from Massena, New York. Mercury levels are also higher in fish collected from the north channel of the St. Lawrence than elsewhere in the AOC. Conversely, PCB levels are higher in fish collected from the south channel (U.S. side) than they are elsewhere in the AOC.

Mercury is the major contaminant restricting consumption of most sport fish species, the only exceptions are yellow perch, bullhead and panfish. PCBs are responsible for consumption restrictions on sturgeon, channel catfish and most recently, walleye from the south channel of the St. Lawrence River and Lake St. Francis. PCBs in commercial and coarse fish species also exceed consumption guidelines, and result in the sporadic closure of commercial fisheries. Presently the carp and American eel fisheries are closed. PCB levels in young-of-the-year spottail shiners exceed the Great Lakes Water Quality Objective for the protection of fish and wildlife that consume the fish and increased dramatically in 1989 and 1990 at several sampling sites in the south channel.