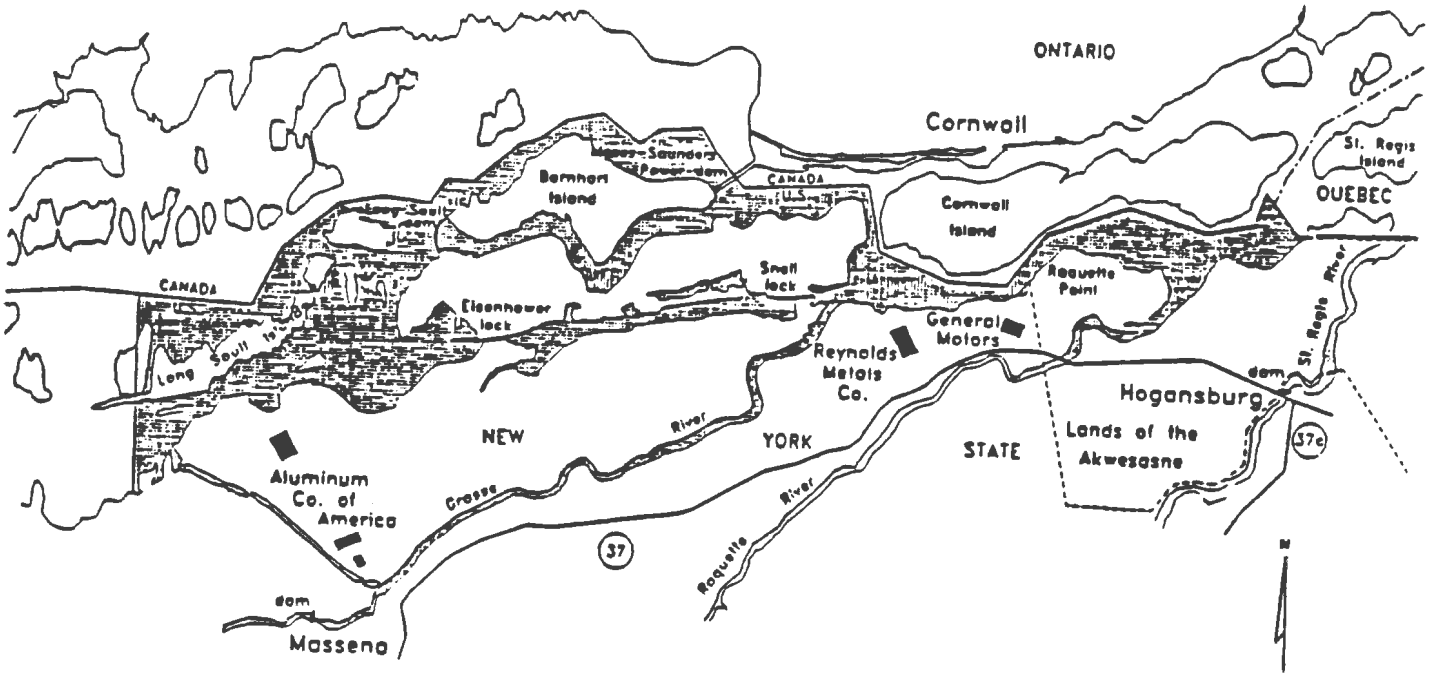
ST. LAWRENCE RIVER AT MASSENA, NEW YORK

REMEDIAL ACTION PLAN

RAP UPDATE SUMMARY of

Use Impairment Status, Progress, Strategies, Criteria, and Priorities

June 1996



The Massena Area of Concern

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I. EXECUTIVE SUMMARY:

As the lead agency for developing and implementing the St. Lawrence River at Massena Remedial Action Plan (RAP), New York State Department of Environmental Conservation began RAP development in 1988. This process was assisted by the formation of the Massena Citizen Advisory Committee which consisted of members from industry, local government, environmental groups, sporting interests, academia, and business. The Stage 1 report, which identifies use impairments, their causes and sources, was completed in 1990. The Stage 2 RAP, completed in 1991, includes the development of remedial strategies to restore water quality and beneficial uses of the tributary rivers and the St. Lawrence River and to eliminate adverse impacts to the Area of Concern (AOC) from sources of pollutants at major hazardous waste sites as well as from other sources within the drainage basin and AOC.

Following completion of the Stage 2 RAP, a Remedial Advisory Committee (RAC) was appointed to represent all stakeholders and assist NYSDEC in RAP implementation. The first RAP Update was completed in August 1992. A second comprehensive Update was completed in April 1995 that documents remedial progress and develops remedial strategy tracking. The RAP identifies priority remedial strategies that include over thirty remedial activities consisting of investigative recommendations, assessments, plans and improvement actions needed to restore beneficial uses. High priority is being given to the cleanup of land-based hazardous waste sites and contaminated river sediments. During the 1995 construction season, considerable progress was made with land-based remediation at the ALCOA and Reynolds Metals sites as well as with the contaminated sediment removal projects in the St. Lawrence River at General Motors and in the Grasse River at ALCOA. Further remedial work is scheduled during 1996 and is planned to continue through 1998. Before, during and after remediation monitoring is essential to reassess use impairments in the Area of Concern and to determine watershed contributions and AOC impacts.

Because of the international aspect of this Remedial Action Plan, an evaluation of the possible transboundary effects associated with the downstream interests and jurisdictions (Canadian, Provincial, and Mohawk Nation at Akwesasne) is a complicating factor for this connecting channel Area of Concern. As New York State has taken the lead to address the Massena area impairments, Canadian jurisdictions have also taken responsibility for the development and implementation of the RAP concerning the Ontario and Quebec side of the river. The Remedial Advisory Committee and NYSDEC have further developed use impairment restoration and protection (delisting) criteria and remedial strategies. These criteria and strategies are being applied to focus attention on priority remedial activities and to document progress as beneficial uses are restored and protected. This Remedial Action Plan process is to continue through the Stage 3 delisting of the Area of Concern.

II. INTRODUCTION:

The purpose of this Remedial Action Plan (RAP) Update Summary of Use Impairment Status, Progress, Strategies, Criteria, and Priorities is to provide assistance to those persons involved in the identification, development, implementation, and tracking of remedial strategies and priorities to restore and to protect the St. Lawrence River at Massena Area of Concern during 1996 and into the future. The summary is designed to fulfill the need of having a "working document" on which to base discussions and document progress to achieve the RAP goal.

This 1996 Massena RAP Update Summary provides the current status of use impairments and remedial activity progress, updates use impairment restoration strategies and priority remedial activities, and presents use impairment restoration and protection criteria. This summary builds on the problem definition and remedial strategies set up in previous Massena RAP publications and is intended to not only update progress but to track and to guide the implementation of remedial activities of the St. Lawrence River at Massena RAP. The format of this update summary follows the previous update; however, the development of use impairment restoration and protection criteria in Section VI is new.

The Massena, New York portion of this connecting channel Area of Concern (AOC), being developed and implemented for the St. Lawrence River at Massena/Cornwall Remedial Action Plan, has the goal to restore, protect and maintain the chemical, physical and biological integrity of the river's ecosystem in accordance with the Great Lakes Water Quality Agreement. The RAP is a dynamic process that is being implemented to address AOC water quality, watershed and ecosystem pollution problems and to assure that beneficial uses are restored and protected.

Specifics concerning the basis for use impairment definitions, sources, and potential sources of contamination have been described in detail in the Stage 1 Remedial Action Plan dated November 1990. The Stage 2 RAP document dated August 1991 and the RAP Update of August 1992, described environmental programs, recommended remedial activities, and commitments that are ongoing, planned or needed to restore and to protect the beneficial uses. The 1995 Remedial Action Plan Update provided a summary of Stage 1 and Stage 2, updated the specifics of current remedial program activities, and established a reporting process that details the development, implementation, and tracking of remedial strategies to address each use impairment. Descriptions of various environmental control program initiatives that support RAP strategies are also included in the 1995 RAP Update.

The foundation laid by Stage 1, Stage 2, and the current Update format therefore provide for the continuation of preparing RAP update documentation. In order to achieve the goal of the Massena RAP, (essentially...to eliminate all use impairments), remedial strategies are designed to focus on the restoration and protection of beneficial uses (e.g. addressing the habitat impairment) and the cleanup of the contamination sources (e.g. toxic chemicals in river sediments) that involve the Area of Concern. This 1996 RAP Update Summary describes the corrective strategies needed to address both contamination sources and use impairments.

III. USE IMPAIRMENTS STATUS:

Table 1 and **Table 2** are used to summarize the status, causes, and sources of the use impairments as established in the Stage 1 and Stage 2 documents. **Table 1** lists the use impairment indicators and then summarizes their Stage 1 status along with their current status of impairment. This status comparison has been added to the listing of use impairments so that, as the RAP process continues and progress is made, we can obtain a "quick look" of this progress as well as the remaining impairment priorities.

Table 1 also contains a comment for each use impairment relative to establishing restoration and protection of the beneficial use. For the fifteen use impairment indicators evaluated: three have been determined to be "impaired"; seven others "will require further investigation and assessment"; and, the remaining five are rated as "not impaired". Among those requiring further investigation, two indicators previously rated not impaired are to receive expanded review. These involve the dredging restrictions and beach closings use impairments. Respectively, we will be further assessing any dredging restrictions outside the seaway channel and evaluating partial body contact in open waters of the Area of Concern.

Together, Table 1 and the Use Impairment Restoration and Protection Strategies (as developed in Section V) provide a remedial activity focus for the restoration of beneficial uses. A strategy management form has been further developed for each use impairment indicating the needed follow-up activity. In Appendix B there are ten individual use impairment strategy management forms in all: one for each of the three indicators rated as impaired and one for each of the seven indicators rated as needing further study.

Table 2 has been developed to identify the specific causes and sources of each use impairment in the Massena AOC. This information has been summarized from the content of the Stage 1 and Stage 2 documents. Clearly, PCBs are a main cause of use impairments. Other contaminants of concern include DDE, PAHs, mercury, metals, arsenic, and phosphorus. Other causes include physical disturbances created by the construction of the power dam and the St. Lawrence Seaway, natural erosion, foreign species (zebra mussels), fish overharvest, and contaminated sediments.

The sources of the causes of the use impairments shown in Table 2 include: inactive hazardous waste sites, contaminated sediments, industrial and municipal point source discharges, dredging, atmospheric deposition, nonpoint sources, and Lake Ontario. Contaminated river sediment dredging as well as land-based hazardous waste site cleanup activities are being implemented by the three major industries in the Area of Concern to address PCBs and the other contaminants of concern. This remediation is expected to play a major role in beneficial use restoration.

Table 1 and Table 2 follow immediately and are succeeded by Section IV Remedial Activity Progress in which updated reporting in nine program activity areas is presented. Section V contains a summary of the ten Use Impairment Restoration and Protection Strategies as detailed in Appendix B. Section VI presents the newly developed Use Impairment Restoration and Protection Criteria in a table form that is further detailed in Appendix C. Section VII identifies priority remedial activities that include a listing of investigative needs.

TABLE 1 - USE IMPAIRMENT STATUS

St. Lawrence River at Massena Remedial Action Plan

USE IMPAIRMENT	STAGE 1 STATUS	CURRENT STATUS	AREA OF CONCERN COMMENT
Fish and Wildlife Consumption Restrictions	Impaired	Impaired	PCBs are cause; Need post remediation study and non-AOC determination
Loss of Fish and Wildlife Habitat	Impaired	Impaired	Seaway and Dam changed features; need reassessment
Transboundary Impacts	Impaired	Impaired	Post remediation studies will be key; consider AOC and watershed
Degradation of Fish and Wildlife Populations	Likely	Likely	Define desired level
Fish Tumors or Other Deformities	Likely	Likely	Need AOC study to verify existence
Bird or Animal Deformities or Reproductive Problems	Likely	Likely	Need AOC study to verify existence
Degradation of Benthos	Likely	Likely	Need AOC community structure study to verify existence
Restrictions on Dredging Activities	Not Impaired	Not Impaired; Expanded Review	Maintenance dredging not impaired; to review expanded dredging proposals
Beach Closings	Not Impaired	Not Impaired; Expanded Review	No beach impairment; to review partial body contact
Degradation of Plankton Populations	Unknown	Unknown	Need AOC study
Tainting of Fish and Wildlife Flavor	Not Impaired	Not Impaired	Tumor study will further support
Eutrophication or Undesirable Algae	Not Impaired	Not Impaired	Added partial body contact review will aid determination
Drinking Water Restrictions, Taste and Odor Problems	Not Impaired	Not Impaired	Additional data useful
Degradation of Aesthetics	Not Impaired	Not Impaired	Survey would be useful
Added Costs to Agriculture or Industry	Not Impaired	Not Impaired	Need to verify no transboundary impact

TABLE 2 - USE IMPAIRMENT CAUSES AND SOURCES

St. Lawrence River at Massena Remedial Action Plan

USE IMPAIRMENT	CAUSES	SOURCES
Fish and Wildlife Consumption Restrictions	PCBs	Inactive hazardous waste sites, Contaminated sediments, Industrial discharges
Loss of Fish and Wildlife Habitat	Physical disturbances, Natural erosion Contaminated sediments, Foreign species	Dredging, natural erosion
Transboundary Impacts	PCBs, DDE, Phosphorus, Metals, Mercury, Sediments, (Cornwall Phos.)	Waste sites, Atmospheric deposition, Pt. source discharges, Lake Ontario
Degradation of Fish and Wildlife Populations	PCBs, DDE, Mercury, Physical disturbances, Fish overharvest	Point source discharges, Hazardous waste sites, seaway construction, Cornwall AOC Commercial fishing (historic), L.Ontario
Fish Tumors or Other Deformities	PAHs	Contaminated sediments
Bird or Animal Deformities or Reproductive Problems	PCBs	Contaminated sediments
Degradation of Benthos	PCBs, PAHs, Lead, Copper, Physical disturbances	Pt. source discharges, Contaminated sediments, waste sites, nonpoint sources
Restrictions on Dredging Activities	To consider larger area for PCBs, Arsenic, Chromium, Copper, Nickel, Zinc	If any: Contaminated sediments, Inactive haz. waste sites, Industrial discharges
Beach Closings	To consider partial body contact downstream from combined sewer overflows	If any: Municipal discharges, CSOs
Degradation of Plankton Populations	Not believed impaired	If any: Contributing sources above
Tainting of Fish and Wildlife Flavor	Not impaired	None known
Eutrophication or Undesirable Algae	Not impaired	None known
Drinking Water Restrictions, Taste and Odor Problems	Not impaired	None known
Degradation of Aesthetics	Not impaired	None known
Added Costs to Agriculture or Industry	Not impaired	None known

IV. REMEDIAL ACTIVITY PROGRESS:

The RAP process intends to identify all activity resources contributing to the goal to eliminate use impairments. Concurrent with this RAP planning and implementation effort, various New York State Department of Environmental Conservation (NYSDEC) and other agency environmental program activities are in place and progressing as part of ongoing environmental programs, protection laws, and policies. The RAP strives to influence these programs to address local area, watershed and ecosystem concerns. In turn, these activities do contribute and support progress towards achieving the RAP goal. The specific accomplishments and needs of the RAP is what needs to be communicated.

The RAP strategies developed in the following section, therefore, make use of all resource commitments and related remedial actions and seek to incorporate an ecosystem approach into remedial activities to restore and to protect beneficial uses. By communicating the RAP process, it is desired that remedial activities take on this ecosystem approach. One purpose of the Remedial Advisory Committee is to assure that all stakeholders' interests and concerns have been satisfactorily investigated and resolved as much as possible. A key to this is securing implementation commitments to achieve RAP objectives.

To facilitate reporting of remedial activity progress, the RAP subject matter is broken down into the nine major program area/remedial activity topics listed below. Brief summary descriptions of progress in these nine environmental program activity areas are provided. Additional details of projects and the progress of implementation in each of these nine areas are also presented in the larger more recent St. Lawrence River at Massena RAP 1995 Update document.

A. Hazardous Waste Site Remediation

USEPA and NYSDEC have issued various Administrative Orders that require land-based as well as contaminated river sediment remediation. Implementation of these orders is fundamental to Area of Concern rehabilitation and forms a basis for most initial remedial strategies. Completion and settlement of these remediation activities includes Natural Resource Damage Claims that address recovery for damages and injury to the natural resources. Land-based remedial actions are required at each of the three large Massena area industrial sites. Active remediation is proceeding at the ALCOA and Reynolds Metals sites.

At ALCOA, the cleanup of 14 contaminated areas on the plant site is in progress; eight locations have been remediated. The secure hazardous waste landfill has been constructed and is in use. The entire project is to be completed in 1998. Projected costs for land-based and river sediments is in excess of $250M. An estimated 190,000 cubic meters of PCB contaminated waste and soil and 24,000 cubic meters of pot liner waste containing cyanide and fluoride contamination will be removed and placed in the secure landfill.

At Reynolds Metals, the land area with the most serious contamination has been remediated, with the waste sent to a secure off-site landfill for disposal. The cleanup of the remaining sites is scheduled for 1996. The total estimated cost is about $100M. Approximately 18,000 kg of PCBs will be removed in the cleanup process.

At General Motors, three contaminated locations on site are to be remediated following the contaminated river sediment removal project discussed below. This land-based remediation is tentatively scheduled between 1996 and 1998. A secure landfill cap and leachate collection system are planned for certain on site wastes. The total cost of remediation (including river work) is projected to exceed $76M.

Remedial activities at other land-based hazardous waste sites within the watershed are associated with localized problems that are believed to have less impact in the Area of Concern use impairments. It is expected that the PCB cleanup activities which are underway, or committed to, will eliminate all significant PCB contributions to the St. Lawrence River and that the use impairments caused by chemical discharges will cease to exist in the foreseeable future. The Remedial Advisory Committee is in the process of developing restoration targets (see Section VI and Appendix C) and a surveillance plan for the AOC to determine when the impairments cease to exist.

B. Contaminated River Sediments

Contaminated river sediment dredging projects are required by USEPA enforcement orders and are in various phases of implementation adjacent to the three major industries.

At General Motors, the dredging of the majority of the contaminated river sediments in the St. Lawrence River was completed in 1995. An elaborate sheet piling and silt curtain containment system was installed and monitored. Extensive filtrate treatment was provided for dewatered dredge materials. The remaining cove area bordering the Akwesasne lands is planned to be dredged in 1996. In all, over 76,500 cubic meters of PCB contaminated waste and soil is to be removed for the GM remediation projects.

At Reynolds Metals, contaminated sediment removal from the St. Lawrence River is scheduled for 1996. Like GM, Reynolds plans to use sheet piling to secure the dredge area.

At ALCOA, where the company is required to remove contaminated sediments in the Grasse River, a pilot dredging project was completed in 1995 with the primary dredging scheduled for 1996.

The Administrative Orders that require sediment removal work are designed so that there is no lapse of responsibility for the remediation of PCB contaminated areas along the Grasse River and into and including downstream portions of the St. Lawrence River. In

other words, all major contaminated sediment areas are addressed under one of the three federal orders such that where one facility's investigative and remedial dredging responsibility ends another facility's responsibility takes over.

C. Point Source Discharges

A significant reduction in the mass of PCBs and other contaminants discharged from the Massena area industries (primarily stormwater/site related) has been achieved by the installation of improved wastewater treatment systems, implementation of best management practices, and interim/completed remediation activities. The permit renewal process involving the three major industrial companies has the goal of achieving non-detectable discharge levels of PCBs, as well as reduced discharges of other contaminants for each water discharge. Although PCBs are no longer used, past waste disposal practices have so contaminated the facility sites that stormwater runoff is contaminated. Site remediation work is required to cleanup PCB contamination and along with treatment is expected to resolve any discharge violations.

Reynolds Metals has agreed to install new state-of-the-art air cleaning equipment and to rebuild their aluminum reduction facility to increase efficiency and reduce the production of contaminants. The levels of PCB in the wastewater discharges is expected to decrease to non-detectable levels when the site remediation work is completed. The cost of upgrading of the plant and air cleaning equipment is projected to exceed $250M in addition to the cleanup costs.

At General Motors, the PCB levels in the wastewater (non-process/stormwater) have been reduced to where most samples are non-detectable. ALCOA is in general compliance with water and air discharge standards. ALCOA has reduced their water use by half over the past five years and has reduced their PCB discharges to non-detectable levels, except for occasional excursions and a continuing problem at one minor discharge point. Corrective action to identify the sources of the PCB and eliminate the discharges is underway.

D. Nonpoint Source Pollution Control

Excessive nutrients (phosphorus) and sedimentation (erosion) from agriculture are believed to be the main nonpoint source pollution problems in the St. Lawrence River Basin. County Water Quality Management Strategies have been developed to address nonpoint source pollution. Implementation of these County Water Quality Management Strategies and related Best Management Practices (BMPs), including improvements to stormwater management, is recommended and is progressing. Various funding programs (grants) now support and are available to assist in the implementation of these nonpoint source pollution control efforts. Refer to the 1995 update for additional details.

E. Air Pollution Control

The remedial strategy calls for the reduction of hydrogen fluoride and other contaminant emissions from the major industrial facilities in the AOC. The Clean Air Act Amendments of 1990 require air discharges to comply with Maximum Achievable Control Technology (MACT) limits which address hydrogen fluoride emissions. When further developed, NYS Air Standards may require treatment beyond MACT to be phased in over a period of time.

At ALCOA, the plant is in general compliance with the air discharge standards. The new dry scrubber air pollution control equipment at the plant is expected to also meet the more stringent air standards which are being developed. The current air cleaning equipment at Reynolds Metals is not adequate to meet the more stringent discharge standards currently being developed; upgrades are planned.

F. Fish and Wildlife Assessments/Actions

Many of the use impairments are based on fish and wildlife conditions and considerations. Some fish and wildlife investigative information has been reported; many investigations remain unfunded. Consumption restrictions and habitat impairments are known. Environmental monitoring, as well as further habitat study and assessment, is needed to establish required remediation which may include enhanced management plans and actual construction projects. The relicensing of the power dam by the Federal Energy Regulatory Commission should have some bearing towards resolving related use impairments.

G. Health and Environmental Assessments/Actions

Three studies and the resulting report documents that evaluate human health risks and focus on the Akwesasne Mohawk population have been completed as well as the summary document dated January 1995. The reports concluded that the health risks to the Mohawk Nation at Akwesasne from the consumption of fish contaminated with PCBs are greater than those of anglers on major New York State waterbodies. Mohawk risks are larger primarily because their consumption rates of locally caught fish were higher and because the average PCB levels in the St. Lawrence River fish were higher than those in fish from some of the other waterbodies. The results of the studies confirm the value of the health advisories for fish and wildlife consumption and call for the continuation of educational and outreach efforts until contaminant levels, particularly PCBs, decrease. Follow-up studies and public outreach activities have been identified that are needed to monitor and to reduce the exposure of local persons. For example, maintaining current and useful contaminated fish consumption advisory information serves to reduce exposure of user

groups, particularly young women having or intending to have children. Funding is needed for follow-up investigations.

H. Investigations and Monitoring Activities

Monitoring plans have been established for contaminated sediment removal and land-based hazardous waste remediation projects. The development and implementation of these plans are subject to regulatory review and approval. These activities will be closely monitored. The focus of these projects and environmental monitoring is to minimize the local and downstream impacts resulting from the remedial activities and to comply with cleanup criteria.

In addition to the remedial activity monitoring required of the industries, pre- and post-cleanup assessments directed at evaluating the extent of the restoration of beneficial uses will be needed. These further health, fish, wildlife, plankton, and macroinvertebrate studies and investigations will be used to better define a change in status of use impairment indicators under the RAP process. Funding for these additional investigations and assessments is limited and in most cases is subject to specific priorities. For example, grant funding scopes are defined and other project money may very well have specific requirements attached. Priority investigation and monitoring activities are identified and listed in Section VII herein. Additional details concerning a comprehensive listing of monitoring activities in and around the Area of Concern are contained in the larger 1995 RAP Update (Section III.C.9 of the 1995 Update).

I. Public Participation and Outreach

Regular meetings of the Remedial Advisory Committee (RAC) throughout the implementation of the Stage 2, and documentation of the Stage 3, Remedial Action Plan process will continue to keep stakeholders informed of remedial activities and progress and continue to provide a means for local concerns to be addressed. Field trips are used to learn more about the specifics of remedial activities and to respond to committee interests. An informational video describing the Massena Area of Concern has been prepared to increase public awareness about the restoration and protection activities and the needs of this important geographic area. A newsletter, promotional brochure, and RAP display are other examples of outreach activities that have been incorporated into the public participation activities involving the Massena AOC. The Remedial Advisory Committee will continue to provide advice and consultation.

V. RESTORATION AND PROTECTION STRATEGIES:

Ten of the fifteen use impairment indicators for the St. Lawrence River at Massena Remedial Action Plan require the development and implementation of remedial strategies. These strategies as applied to each use impairment indicator and to the sources of contamination are further described in this 1996 RAP Update Summary report by the following: Table 3, the ten use impairment strategy management forms contained in Appendix B, and the ten use impairment narrative summaries presented in this section after Table 3.

A. Table 3 - Summary of Sources, Use Impairments, Causes, and Remedial Strategies

Remedial strategies that are established to address the sources of contamination and that will restore and protect beneficial uses involve three areas of work: 1) conducting investigation and assessment activities, 2) the development/implementation of plans, controls, and physical construction improvement activities, and 3) the documentation of the progress and the ultimate success story that needs to be communicated as part of the Stage 3 RAP document. Table 3 is a newly developed table that summarizes the contamination sources and use impairment concerns, describes their causes, and identifies these needed remedial strategies.

Table 3 has been developed to summarize the remedial activity strategies needed to address the sources, causes, and use impairment concerns and to show their interrelationship. For example, a specific cause (e.g. PCBs) may contribute to more than one contamination source or impairment concern. Similarly, specific remedial strategies (e.g. investigation, management plan, or physical improvement) may contribute to addressing more than one contamination source, use impairment concern, or cause of an impairment.

In addition to describing the remedial strategies needed to address the sources and use impairment concerns, Table 3 also identifies the needed documentation and provides an overall status of the remedial strategies for each source or impairment concern. These strategies and needs have been identified by the RAC committee and NYSDEC as necessary steps to restore and to protect beneficial uses and to work towards the delisting of the Area of Concern. Table 3 is closely linked to Section VII which identifies and lists priority remedial activities. Section VII is designed to be expanded to include specifics for the implementation of physical remedial activities, improved controls and plans, and investigation/assessment activities that are needed for the coming year. For example, certain investigations and long-term monitoring plans are needed to provide the documentation that the restoration of beneficial uses has been achieved and the satisfaction that the contamination sources are no longer contributing to the impairments in the Area of Concern. Table 3 summarizes this information on the next two pages:

TABLE 3 - SUMMARY OF SOURCES, USE IMPAIRMENTS, CAUSES, AND REMEDIAL STRATEGIES
St. Lawrence River at Massena Remedial Action Plan

Source or Use Impairment	Cause	Remedial Activity Strategies			Status
		Investigation/Assessment	Plans / Improvements	Documentation	
Land-based Hazardous Waste Sites	PCBs, Dioxin, Mercury	Determine contaminant releases and verify cleanup standards achieved.	Implement remedial actions*. Identify any add'l fish and wildlife health actions.	Long-term monitoring and remedial effects; evaluate aqua culture study.	I,R,U
Contaminated Sediments	PCBs, Dioxin, Mercury, Metals	Determine contaminant releases and verify cleanup standards achieved.	Implement remedial actions*. Identify any add'l fish and wildlife health actions.	Long-term monitoring and remedial effects; evaluate aqua culture study.	I,R,U
Other Non-point (AOC & Watershed)	Dredging, Construction, Physical Disturbances, Spills (Haz. sub.), Natural Erosion Sediments	Identify, measure and evaluate the effects of remedial actions.	Define investigations. Define needed practices (BMPs) & controls. Implement actions identified to control nonpoint pollution.	Conduct long-term monitoring; document remedial effect.	N
Point Source (Industrial & Municipal SPDES)	Phosphorus, PCBs, Organic Compounds, Metals, Contaminated Sediments	Identify, measure and evaluate the effects of remedial actions.	Complete SPDES renewals*. Define any new controls. Implement measures identified by permits and controls.	Conduct long-term monitoring; document remedial effect.	I,N
Combined Sewer Overflows	Metals, Phosphorus	Identify, measure and evaluate the effects of remedial actions.	Complete SPDES renewals* and CSO controls. Determine additional controls.	Conduct long-term monitoring; document remedial effect.	I,N
Other Point Sources	None known	Identify any sources. Perform loading assessment.	Develop based on new information and/or mass balance discrepancy.	Conduct long-term monitoring; document remedial effect.	N
Lake Ontario	PCBs, Dioxin, Mirex, DDE	Transport study. Conduct water column analyses and assess source load contributions.	Encourage added source control and pollution prevention practices.	Conduct long-term monitoring; document remedial effect.	N

Source or Use Impairment	Cause	Remedial Activity Strategies			Status
Air Deposition	PCBs, Fluoride, Organic Compounds	Transport study. Conduct air pollution analyses and assess source load contributions.	Encourage added source control and pollution prevention practices*.	Conduct long-term monitoring; document remedial effect.	I,N
Fish & Wildlife Consumption Restrictions	PCBs	Measure fish and wildlife levels on a continual basis to assess; apply criteria to evaluate; verify cleanup standards achieved.	Complete site remediation*. Implement BMPs/controls. Establish any add'l fish and wildlife or human health management plans.	Achieve < contam. levels. Define no health advisory (due to AOC). Conduct long term monitoring.	I,P,N
Fish & Wildlife Habitat Loss and Impairment	Physical Disturbances, Contaminated Sediments, Natural Erosion Sediments, Introduced Species, Water Level Controls.	Evaluate existing habitat. Develop non-indigenous and non-AOC habitat use plans. Assess cause impacts (Zebra Mussels, Purple Loosestrife, and others)	Assess type, quantity, and quality of habitat; verify adequate. Develop/implem. habitat improvement plan. Define any controls for cause factors.	Conduct long-term monitoring; document remedial effect; track implementation of FERC relicensing requirements.	N
Transboundary Impacts	PCBs, DDE, Metals, Mercury, Phosphorus Cornwall AOC	Identify upstream causes. Measure water/air column and determine extent of any problem. Verify standards and cleanup levels achieved.	Complete land & river haz. waste site remediation*. Develop/implement BMPs. Verify protection.	Monitor; Document no contributory effect to Cornwall/downstream from the AOC; verify LaMP addresse upstream (L.Ont.) effects/impacts.	I,N
Other possible impairments: [Contaminated Benthos, Tumors or Deformities, Bathing/Dredging Restrictions, Fish/Wildlife/Bird Problems of Reproduction or Population]	PCBs, DDE, PAHs, Metals, Mercury, Physical Disturbances, Overharvest of Fish, Contaminated Sediments.	Perform studies to find and eliminate any impairment. Verify attainment of restoration/protection criteria.	Complete site remediation*. Perform projects to achieve criteria and verify. Develop/implement BMPs.	Link impairment to source and assess remedial action. Conduct long-term monitoring; document remedial effect.	I,N

NOTES: Metals could include: Aluminum, Arsenic, Cadmium, Chromium, Copper, Cyanide, Iron, Lead, Mercury, Nickel, Zinc.
* Implementation progressing at ALCOA, General Motors, and Reynolds Metals.

STATUS KEY:
- C = Completed
- P = Planned
- D = Deferred
- I = Implementation progressing
- U = Under development/assessment/investigation
- N = Needs development/assessment/investigation
- R = Required by enforcement/permit/agreement

A full range of remedial activities was identified by the Use Impairment / Remedial Activity Matrix contained in the comprehensive 1995 RAP Update document. In the remainder of this section, these corrective strategies are applied to each use impairment indicator to establish a restoration and protection strategy:

B. Use Impairment Restoration and Protection Strategy Management Forms

With the actions that have been taken or are in progress or planned, we have developed an integrated strategy for managing each use impairment indicator to assure the restoration and protection of beneficial uses as described below.

The development of the remedial strategies for each use impairment was initiated by identifying the specific actions and needs that should restore and protect the beneficial uses. Further, the current status of these remedial strategies is defined as well as a projected completion date and an identification of a responsible party (as much as possible). This information for each use impairment indicator is then consolidated on a single page form entitled the "Use Impairment Restoration and Protection Strategy" management form. These strategy management forms are contained in Appendix B and are to be updated periodically to document the status of remedial activity progress and any strategy modifications.

Each Use Impairment Restoration and Protection Strategy management form therefore targets a specific use impairment and provides impairment descriptive data, a remedial strategy plan with status, and narrative comments. Summary descriptions of the remedial strategies for the ten use impairments identified as impaired or as requiring further investigation for the St. Lawrence River at Massena Area of Concern are presented next. Each use impairment strategy management form in Appendix B describes its use impairment indicator status as either impaired, likely impaired, unknown impairment, or reopened for further assessment. The ten use impairment and their status are:

1. Fish and wildlife consumption restrictions	-impaired
2. Loss of fish and wildlife habitat	-impaired
3. Transboundary impacts	-impaired
4. Degradation of fish and wildlife populations	-likely
5. Fish tumors or other deformities	-likely
6. Bird and animal deformities/reproductive prob.	-likely
7. Degradation of benthos	-likely
8. Restrictions on dredging activities	-expanded assessment
9. Beach closings	-expanded assessment
10. Degradation of plankton populations	-unknown

[To assist in the problem definition of a use impairment and the description of the desired restored condition, Use Impairment Restoration and Protection Criteria have been developed in the next Section VI. Further, Appendix C contains details of these criteria for each of the fifteen St. Lawrence River at Massena RAP use impairment indicators.]

C. Summaries of Remedial Strategies for <u>each</u> Use Impairment Indicator

The narrative summaries for each Use Impairment Restoration and Protection Strategy management form for the Massena Area of Concern are described below. The ten use impairment strategy management forms are in Appendix B. The development of remedial strategies to achieve the restoration targets, as defined by the criteria in Appendix C, is essentially the goal of the Remedial Action Plan. These remedial strategies seek to restore and to protect the beneficial uses involved with each of the use impairment indicators:

1. Fish and Wildlife Consumption Restrictions

The consumption restriction use impairment is caused by PCBs. The sources of the historic cause of this use impairment include industrial discharges, inactive hazardous waste sites, contaminated sediments, air deposition, and Lake Ontario. Following the removal of sediments from the St. Lawrence and Grasse Rivers by the three major Massena industries, and the completion of land-based hazardous waste site remediation, investigations and long term monitoring will be needed to evaluate the extent of any remaining impairment. The land-based inactive hazardous waste site remediation and the modification of point source discharge permits will contribute to the restoration and protection of the beneficial use. The establishment and implementation of additional Best Management Practices (BMPs) involving fish, aquatic and wildlife as well as human health, will also benefit the restoration and protection of this and other use impairment indicators.

Following reports on the success of remediation in the AOC, it is expected that the three major industries will continue to document the accomplishments. The industries will need to verify that hazardous waste site cleanup standards have been achieved. When fish and wildlife studies indicate that contaminant levels are acceptable and when there are no health advisories due to causes from the AOC and its watershed, modification to the use impairment status can be reconsidered. Additional fish and wildlife or human health management strategies may be required.

[Note: Table 1 from Stage 2 of the RAP had previously identified mercury, dioxin, and mirex as additional likely causes of this use impairment. In New York State, mercury and dioxin have not contributed to health advisories on fish. Mirex is no longer believed to be a significant cause for health advisories in the Massena area. This is based on fish examined by Sloan and Jock (1990) where most fish examined had mirex concentrations below or near the reporting limit of 0.01 ug/g, an order of magnitude below the USFDA action limit of 0.1 ug/g. Therefore, these three chemical causes (mercury, dioxin, and mirex) are no longer identified with the fish and wildlife consumption restriction use impairment indicator.]

2. Loss of Fish and Wildlife Habitat

This use impairment is due to contaminated river sediments and physical disturbances caused by the construction of the power dam and St. Lawrence Seaway. Loss of fish and wildlife habitat involves the presence of elevated levels of PCBs, metals and PAHs that are most likely impacting the benthos. Dredging, natural erosion, and other sediment disturbances (e.g. prop wash) are other sources that contribute to the cause of this use impairment.

The actions undertaken by three entities will contribute to the restoration and protection of habitat: 1) the completion of hazardous waste site remediation and the implementation of Best Management Practices by the major industries, 2) the implementation of Federal Energy Regulatory Commission (FERC) relicensing requirements affecting habitat by the New York Power Authority concerning the power dam, and 3) the assessment and verification by NYSDEC that the type, quantity, and quality of habitat in the AOC is adequate and that management plans (including seaway dredging) are inplace to protect this beneficial use. Also, the documentation of the creation of new habitat outside the AOC will contribute to resolving this use impairment.

3. Transboundary Impacts

This additional use impairment indicator (used to address binational considerations) is rated as impaired and is believed to be caused by the pollution transport of PCBs, phosphorus, nitrogen, metals and contaminated sediments to downstream Canadian St. Lawrence River areas. Sources of pollutant transport include land-based hazardous waste sites, contaminated river sediments, point source discharges including combined sewer overflows (CSOs), suspended solids, Lake Ontario, and potentially atmospheric deposition and nonpoint sources.

Once the contaminated river sediment and land-based remediation has been completed (estimate 1998), the accomplishment of cleanup levels and the existence of any contributions to downstream impacts will need to be assessed. Ambient water quality standards, air discharge standards, sediment criteria, and flora/fauna criteria need to be achieved. The LaMP must address any upstream Lake Ontario effect on downstream St. Lawrence River areas. Also, as noted under the beach closings use impairment indicator (#9), further assessment is needed concerning the existence and extent of any partial-body contact use impairment in non-bathing beach areas downstream of combined sewer overflows.

4. Degradation of Fish and Wildlife Populations

This likely use impairment is caused by PCBs, mercury, DDE, physical disturbances and fish overharvesting. The sources include industrial discharges, inactive hazardous waste sites, contaminated sediments, Lake Ontario, the Cornwall AOC and the international seaway. Further studies are needed to define the extent of any impairment and assess the results of implementing the required remedial activities that address the consumption restrictions and habitat impairments above. The construction of the seaway and power dam changed the ecology significantly such that a post-1959 fish and wildlife baseline, to define the desired fish and wildlife community structure (number and balance), is needed.

The following items need to be addressed in order to resolve this use impairment: demonstrate that environmental threats are addressed, document that fish and wildlife management goals are achieved, document no toxicity from sediments, and verify that a healthy, reproducing population of bentivores and piscivores exists. Also the fish and wildlife habitat, that is near the AOC but outside the defined boundary and was created as a result of the St. Lawrence Seaway construction, needs to be assessed as to its contribution towards restoration of this beneficial use.

5. Fish Tumors or Other Deformities

This likely use impairment is probably partially due to PAHs (off the Reynolds site) from contaminated river sediments. A current fish pathology study before and most importantly after the sediment removal is needed for comparison and a determination of the existence of tumors. The use impairment is considered resolved when the incidence rates of fish tumors and other deformities do not exceed unimpacted areas, survey data confirm the absence of liver tumors in bullheads or suckers, fish tissue standards are achieved, and there are no deformities observed in resident species.

6. Bird and Animal Deformities or Reproductive Problems

This likely use impairment is probably caused by PCBs from contaminated river sediments. After completing the land-based hazardous waste site and contaminated river sediment remediation work, investigations and longer term monitoring will be needed to define the existence and extent of any use impairment. Enhancements to fish/aquatic/wildlife management plans may also be needed.

The delisting criteria are satisfied when studies demonstrate compliance with tissue standards or objectives as a protection level which indicates healthy communities

of significant species. Incidence rates should not exceed control sites. Without sufficient evidence to suggest that deformities or reproductive impairment is probable, an extensive biomonitoring program is not warranted.

7. Degradation of Benthos

This likely use impairment is probably due to PCBs, PAHs, lead, copper and physical disturbances that come from industrial discharges, contaminated river sediments, inactive hazardous waste sites, nonpoint sources and river activity. After completing the land-based hazardous waste site and contaminated river sediment remediation work, investigations and longer term monitoring will be needed to define the existence and extent of any use impairment. Enhancements to fish/aquatic/wildlife management plans may also be needed. PAHs have been added as a cause of the degradation of benthos use impairment because studies have shown PAHs to have substantially altered benthic populations at Reynolds Metals. These studies were required of Reynolds by NYSDEC as preliminary monitoring for the dredging project.

The delisting criteria are satisfied when benthic surveys demonstrate a healthy community. In the absence of community data, sediment quality criteria must be achieved such that no threat is evident. The emphasis is placed on demonstrating the absence of toxic effects of sediment associated contaminants and on demonstrating bioassay results comparable to controls.

8. Restrictions on Dredging Activities

Although this use impairment indicator has been determined unimpaired for the ongoing St. Lawrence Seaway navigational channel maintenance dredging, it is believed an impairment is likely to exist when considering expanded dredging proposals outside the seaway maintenance channel. Here, there is concern about chemicals such as PCBs, arsenic, chromium, copper, nickel and zinc that are known to be present in contaminated river sediments. After implementing the required contaminated river sediment removal projects, and defining further the contaminated sediment guidelines, investigations will be needed: sediment analyses, toxicity tests, benthic studies, bioaccumulation studies, fish surveys and deformity assessment. Based on this knowledge, determinations on the extent of any dredging restrictions and/or any further required remedial actions and dredging decisions can then be made.

During the currently required (by order) remedial dredging activities, there will be substantial restrictions on conducting dredging and on dredge spoil/water disposal. For example, spoils are to be placed in approved landfills, return water will

undergo treatment by flocculants and activated carbon, and certain monitoring activities and studies must be conducted.

Delisting criteria are satisfied when sediment criteria are achieved and any restricted dredging activities are approved and not the result of currently active AOC or watershed sources. Study results should confirm this. Dredging approvals need to verify that dredge spoil disposal does not contribute to use impairments and beneficial uses are protected.

9. Beach Closings

Although this use impairment indicator has been determined unimpaired for the New York State portion of the AOC, further assessment is needed concerning the existence and extent of any partial-body contact use impairment in non-bathing beach areas downstream of combined sewer overflows (CSOs). Following the development and evaluation of additional data, which should include bacteria, an assessment of any impairment will be made.

Delisting criteria are satisfied when bathing beach and partial body contact water standards and guidelines are achieved. Concentrations of fecal coliform and E. coli should be consistently below 100 colonies per 100 ml sampled.

10. Degradation of Plankton Populations

The existence and extent of any use impairment is unknown. Current studies are needed and more importantly, following the completion of ongoing and planned land-based hazardous waste site and contaminated river sediment remediation, investigations and long term monitoring are required to assess the status of this use impairment indicator.

Delisting criteria are satisfied when a healthy fish community can be demonstrated. Bioassay data should confirm no significant toxicity in ambient waters. When compared to unimpacted areas, the plankton community structure should be favorable (population, size, and variability). In the absence of community structure data, an evaluation requires plankton bioassays to confirm no toxic impact in ambient waters. A helpful indicator is to observe a healthy fish community in the Area of Concern.

VI. RESTORATION AND PROTECTION (DELISTING) CRITERIA:

In addition to defining specific delisting criteria for each use impairment indicator, this section will expand on defining the goal(s) and beneficial uses for the Massena Area of Concern.

A. Goals and Beneficial Uses for the Massena AOC

For the St. Lawrence River (Cornwall/Massena) AOC, the development of the RAP is proceeding as two separate documents: the Cornwall (Ontario, Canada) RAP and the Massena (New York, United States) RAP. NYSDEC, the Massena RAC, the Cornwall RAP team and the Cornwall Public Advisory Committee (PAC), in consultation with Quebec and the Mohawk Nation at Akwesasne, developed a single goal for the two RAPs. The goal recognizes that pollution affects more than the immediate area of a particular jurisdiction and that attention should also be turned to downstream and cross-stream areas that are impacted by pollution from the 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 Remedial Action Plans include protecting the downstream aquatic ecosystem from adverse impacts originating in the AOC and its watershed. This goal was agreed upon by NYSDEC, the Massena Citizen Advisory Committee (CAC), the Canadian governments, the Cornwall Public Advisory Committee (PAC) and the Mohawks at Akwesasne. A Binational Statement, that summarizes the Stage 1 RAP documents and was published in 1994, endorses this goal.

In order to implement this broad goal statement for the Massena RAP, the Remedial Advisory Committee has further defined specific RAP goals and beneficial uses that describe the desired water quality, AOC conditions, and stakeholders' uses. This expanded breakdown of the RAP goal(s) and the beneficial uses are listed below:

* **RAP Goals:**

    1. Water quality in the St. Lawrence River that achieves best use standards and is not adversely affected by tributary rivers and streams.

    2. All river waters aesthetically pleasing so as to encourage active and passive recreation.

    3. Fish and wildlife levels in the AOC that are sustained and free of consumption restrictions.

    4. Remedial activities that provide for the restoration of use impairments and the long term protection of beneficial uses.

* **Beneficial Uses:**

1. Commercial uses include shipping, normal marine traffic, and business activities such as tourism and trade including related recreational uses.

2. Recreational uses include boating, sport and ice fishing, nature observation, public marinas, charters, sightseeing, and stewardship activities.

3. Municipal and public uses include drinking water, recreational activities, educational opportunities, and treated wastewater disposal.

4. Industrial uses include transportation and treated wastewater disposal.

5. Non-human uses: fish and wildlife habitat for resident and migratory species, food production for fish and wildlife, the preservation of natural resources, and the protection of watershed ecology uses.

To evaluate the extent to which the Area of Concern will support these goals and uses, the Remedial Advisory Committee has developed restoration and protection criteria for each use impairment indicator. These criteria will provide the definition of the goal or restoration target that is desired to satisfy each use impairment and ultimately lead to the delisting of the Area of Concern. The following section describes these criteria:

B. Beneficial Use Restoration and Protection (Delisting) Criteria

For each of the fifteen use impairment indicators, restoration and protection (delisting) criteria have been developed. Together, these criteria provide the necessary mechanism to evaluate the extent to which a beneficial use has been restored and protected against future impairment. By evaluating the status of each of these criteria (restoration targets) and by providing a discussion of the rationale and supporting data, the specific needs have been determined for all use impairments in order to accomplish the RAP goals.

Appendix C provides a detailed description of the restoration and protection criteria for each use impairment indicator. In Appendix C, the use impairment indicators are separated into three groups based on the current status evaluated for each use impairment: Group 1) indicators have a status of impaired; Group 2) indicators need further study; and, Group 3) use impairment indicators are rated as not impaired. A description of the rationale and supporting data needed to address the individual criteria for each use impairment indicator is included.

Table 4 has been developed as a summary of the listing of the restoration and protection criteria for use each use impairment and the status of each criteria. Table 4 follows this section. The further definition of the criteria, their updated status, and reporting their supporting data needs are all subject to progress updates and modifications based on recommendations by the Remedial Advisory Committee as coordinated by NYSDEC.

TABLE 4 - RESTORATION AND PROTECTION (DELISTING) CRITERIA

St. Lawrence River at Massena Remedial Action Plan

USE IMPAIRMENT	RESTORATION CRITERIA	STATUS
Fish and Wildlife Consumption Restrictions	* No AOC restrictions due to inplace or watershed sources. * Compliance with fish and wildlife tissue standards. * Other upstream sources addressed by LaMP. * Attain sediment criteria and waste site standards.	* Impaired * Need data * Need to verify * Need data
Loss of Fish and Wildlife Habitat	* Amount and quality of habitat exists and protected to meet goals * Amount and type of wetlands and riparian vegetation adequate with beneficial use protected. * Management plans in place to restore and protect habitat. * FERC relicensing requirements met.	* Impaired * Need data * Need to verify * License Pending
Transboundary Impacts	* River and land-based remediation complete; no contribution from AOC/watershed to Cornwall RAP/downstream use impairments. * Attain ambient water quality stds. and sediment criteria. * Attain flora and fauna environmental and health criteria. * Other upstream St. Lawrence River sources addressed by LaMP. * Downstream contamination concerns addressed.	* Impaired * Need data * Need study * Need to verify * Need to assess
Degradation of Fish and Wildlife Populations	* Attain desired level of healthy and self-sustaining communities. * AOC consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals. * In the absence of community structure data, bioassays confirm no significant toxicity from the water column or sediments. * Attain quantitative fishery targets (biomass, percent, richness)	* Need data * Need to verify * Need data * Need data
Fish Tumors or Other Deformities	* Incidence rates do not exceed rates in unimpacted control sites. * No neoplastic or preneoplastic liver tumors in bullheads/suckers. * Attain IJC, state, and federal tissue standards/objectives.	* Need data * Need survey * Need to verify
Bird or Animal Deformities or Reproductive Problems	* Attain IJC, state, and federal tissue standards/objectives. * Attain appropriate sediment quality criteria. * Deformity or reproductive incident rates less than inland controls * Wetlands support healthy communities of significant species. * Biomonitoring results better than unimpacted control sites.	* Need data * Need to verify * Need data * Need survey * Need data
Degradation of Benthos	* Macroinvertibrate structure similar to unimpacted control sites. * Mesotrophic species present where suitable substrates are located * Absent community data, toxicity of sediments parallels controls. * Resident fauna do not have elevated contaminants.	* Need data * Need survey * Need data * Need data
Restrictions on Dredging Activities	* AOC sediments (metals, organics, nutrients) meet stds./criteria. * Restrictions not due to AOC watershed; beneficial use protected. * Dredge spoil disposal does not contribute to use impairments, activities registered and approved, beneficial uses protected.	* Not Impaired ⊗ * Not Impaired * Not Impaired

-continued on the next page-

TABLE 4 - RESTORATION AND PROTECTION (DELISTING) CRITERIA - continued

Beach Closings	* Waters do not exceed standards, guidelines, or objectives of use. * For beaches: no toxic irritants, numerical and clarity standards attained, and free from public health advisories. * For beaches: daily geometric mean for fecal coli < 100 colonies. * Attain ambient water quality standards for total and fecal coli. * Demonstrate stormwater CSO areas present no threat.	* Not Impaired ⊛ * Not Impaired * Not Impaired * Not Impaired * Not Impaired ⊛
Degradation of Plankton Populations	* Plankton community structure similar to unimpacted control sites * Absent community data, no plankton bioassay toxicity impact. * Healthy fish communities present in the AOC.	* Not Impaired ⊛ * Not Impaired * Not Impaired
Tainting of Fish and Wildlife Flavor	* No complaints about fish tainting. * Survey results confirm no tainting. * Ambient water quality standards and criteria not exceeded	* Not Impaired * Not Impaired * Not Impaired
Eutrophication or Undesirable Algae	* No persistent water quality problems due to cultural eutrophica. * Ambient water quality standards, criteria, guidelines attained. * Beneficial goals are achieved and maintained (boating, fishing)	* Not Impaired * Not Impaired * Not Impaired
Drinking Water Restrictions, Taste and Odor Problems	* No taste and odor problems for treated drinking water supplies. * Attain treated drinking water health standards and criteria. * Drinking water treatment requirements not excessive.	* Not Impaired * Not Impaired * Not Impaired
Degradation of Aesthetics	* AOC waters devoid of substances producing aesthetic problems. * No increase in turbidity causing a visible contrast to natural. * No visible residue of oil or floating substances. * Acceptable response to spills with preventive measures.	* Not Impaired * Not Impaired * Not Impaired * Not Impaired
Added Costs to Agriculture or Industry	* No add'l costs to treat water due to AOC or spill conditions. * No transboundary impact due to watershed/AOC contamination.	* Not Impaired * Not Impaired

NOTE: Achieving all delisting criteria would indicate the preparation of a Stage 3 document is appropriate.

⊛ = Additional survey data may be appropriate to verify and assure protection.

VII. PRIORITY REMEDIAL ACTIVITIES:

Based on the use impairment restoration and protection strategies and the criteria developed in the preceding two sections, necessary priority remedial activities can be identified and listed. In order to accomplish the RAP goals and to restore beneficial uses, these priority remedial activities are fundamental to continuing progress with remedial strategies that involve each use impairment. Priority remedial activities will be most important to keep in mind as "next step items" for 1996 and beyond. These activities are essential to addressing the restoration and protection criteria and will be most useful towards affecting use impairment status considerations and reassessments.

The summary of the remedial activity strategies contained in Table 3 is linked to this section and highlights the remedial strategies which consist of the following types of activities: investigation/assessment, plans/improvements, and documentation. These priority remedial activities form the elements of the individual use impairment restoration and protection strategy management forms provided in Appendix B.

By updating the status of the listed priority remedial activities and by including more current study results and use impairment strategy identification information, the priorities or next step remedial activity strategies to resolve RAP use impairments have been identified. A separate listing of the investigative and assessment activity needs and then a listing of the plans and improvement action items are presented below to assist in the identification of priority remedial activities:

A. Investigative and Assessment Activities

Each Use Impairment Restoration and Protection Strategy management form lists the remedial strategies identified to address a use impairment, its contamination sources, and the causes. Below are excerpts of the remedial strategies that call for certain investigative and assessment activities that have been identified as needed to restore and protect beneficial uses:

1. Assessment of the contaminant release associated with the required remedial work (ongoing and post remediation).
2. Conduct sediment analyses and compare to sediment criteria (as developed).
3. Verification of achieving site cleanup standards.
4. Develop/implement fish pathology study (tumors/deformities).
5. Document fish tissue standards/objectives achieved.
6. Conduct fish survey (to address quantitative analysis).
7. Establishment of a habitat and community structure baseline (post 1959).
8. Assessment of the quantity, quality, and balance of habitat areas.
9. Define desired fish and wildlife populations and balance goals.

10. Verify/document acceptable fish and wildlife population levels present.
11. Verify/document fish and wildlife management goals achieved.
12. Confirm wetlands support a healthy community.
13. Obtain/assess plankton community structure data.
14. Verification of achieving ambient water quality standards.
15. Confirm no significant toxicity in AOC water and/or sediment.
16 Assess non-bathing beach water quality for use impairment.
17. Document any deformities, assure occurrence less than inland controls.
18. Establish and monitor status of transboundary effect(s).
19. Monitoring and assessment of additional fish/wildlife consumption data.
20. Conduct benthic community structure studies.
21. Verify populations of mesotrophic species acceptable.
22. Document biomonitoring study results better than control results.
23. Verify flora/fauna health criteria achieved.

B. Plans and Improvement Actions

As noted above, each Use Impairment Restoration and Protection Strategy management form lists the remedial strategies identified to address a use impairment, its contamination sources, and the causes. Below are excerpts of the action items that call for the development of certain plans or the implementation of specific physical improvements that have been identified as needed to restore and protect beneficial uses:

1. Complete the ALCOA land-based remediation.
2. Assess ALCOA's Grasse River contaminated sediment removal pilot project.
3. Conduct Reynolds Metals and General Motors 1996 St. Lawrence River dredging.
4. Continue Reynolds Metals and General Motors land-based remediation.
5. Implement BMPs associated with the individual remediation projects.
6. Continue ongoing major industrial SPDES permit renewal/modification process.
7. Decide the next step, if any, for human health assessment/needed mgt. strategy.
8. Verify LaMP addresses Lake Ontario effects on the AOC.
9. Development of contaminated sediment criteria.
10. Develop and implement any additional needed BMPs.
11. Define the extent or span of the AOC dredge area (Re: dredge restrictions)
12. Assure any needed dredging restrictions are safe and approved.

C. Long Term Strategy

Implementation of the St. Lawrence River at Massena Remedial Action Plan is a dynamic process that incorporates plans and actions to provide periodic update reports as knowledge of the use impairments, location of sources, and effectiveness of remedial action implementation advances. Ultimately, the RAP will need to develop and implement a comprehensive water quality and use surveillance plan to evaluate and to verify the restoration and protection of beneficial uses. This Update Summary sets the stage for progress reporting and the development of a surveillance plan by the establishment of the Restoration and Protection Criteria presented in Section VI.

Because of the international nature of this Area of Concern, a joint U.S./Canadian statement of progress and resolution of use impairments will also be sought. Cleaning up the known sources of pollutants of this shared multi-use waterbody is fundamental to reclaiming and maintaining the valuable resource of the St. Lawrence River.

Once significant progress has been made in the improvement of use impairment status and/or significant details of remedial activity implementation have been accomplished that address contamination sources, an expanded RAP Update document can again be produced to report on these activities. Ultimately, Stage 3 will require documentation of the resolution of all use impairments and satisfactory evidence that contamination sources are no longer impacting beneficial uses in the Area of Concern.

D. Selected References

1. New York State Department of Environmental Conservation (NYSDEC). St. Lawrence River at Massena, New York Remedial Action Plan Update, April 1995. 144 pp.

2. Environment Canada, OMEE, OMNR, USEPA, and NYSDEC. A Binational Statement: Cornwall/Massena RAPs Stage 1 Summary, 1994. 17pp.

3. NYSDEC. St. Lawrence River at Massena RAP Update, August 1992.

4. NYSDEC. St. Lawrence River at Massena RAP Stage II, August 1991.

5. NYSDEC. St. Lawrence River at Massena RAP Stage I, November 1990.

VIII. APPENDIX

APPENDIX A

List of Remedial Advisory Committee Members

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APPENDIX B

Strategy Management Forms

Presented below is the shell of the Use Impairment Restoration and Protection Strategy management form. This blank form is provided as a worksheet to update the ten completed strategy management forms that follow and are described herein in Section V of this 1996 Remedial Action Plan Summary Update:

USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: FORM#:

USE IMPAIRMENT INDICATOR:

IJC#: AOC LOCATION:

IMPAIRMENT STATUS & CAUSES:

POLLUTION SOURCES:

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.			
2.			
3.			
4.			
5.			
6.			

COMMENTS:

STATUS KEY:

C = Completed
P = Planned
D = Deferred
I = Implementation progressing
U = Under development/assessment/investigation
N = Needs development/assessment/investigation
R = Required by enforcement/permit/agreement

USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA, NY** FORM#: 1

USE IMPAIRMENT INDICATOR: Fish & Wildlife Consumption Restrictions

IJC#: 1 AOC LOCATION: St. Lawrence, Grasse & Raquette Rivers

IMPAIRMENT STATUS & CAUSES: IMPAIRED - PCBs

POLLUTION SOURCES: AOC industrial discharges, inactive hazardous waste sites, Lake Ontario, contaminated sediments

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. Ongoing	NYSDEC	Renew major industrial SPDES permits	I
2. 12/96	GLRC	Evaluate Aquaculture Contam. Study (Grant)	U
3. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
4. 12/98	Indust.	Verify site cleanup standards achieved	I
5. 12/98	Indust.	Report on success of remediation in AOC	N
5. Ongoing	NYSDEC	Document F & W study contam. levels	N
6.	NYSDEC	Establish any add'l F & W management plans	N
7.	NYSDOH	Declare no health advisories (AOC caused)	N
9.	DEC/DOH	Establish any add'l health mgt. strategy	N
10.	RAC/DEC	Reassess use impairment status	N

COMMENTS: Contaminant levels in fish & wildlife exceed current stds., guidelines or objectives; public health advisories are in effect. Contaminated sediment removal and haz. waste land based remediation projects are the first large steps towards restoration of impaired uses. Follow-up on mgt. plans, investigations and long term monitoring will provide needed documentation. As determined by the Division of Fish & Wildlife in 1994, Mirex is no longer considered a significant impairment cause. Hg and Dioxin have not contributed to health advisories on fish and are also deleted.

STATUS KEY:

C = Completed
P = Planned
D = Deferred

I = Implementation progressing
U = Under development/assessment/investigation
N = Needs development/assessment/investigation
R = Required by enforcement/permit/agreement

USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE RIVER AT MASSENA** FORM#: 2

USE IMPAIRMENT INDICATOR: Loss of Fish and Wildlife Habitat

IJC#: 14 AOC LOCATION: Within AOC

IMPAIRMENT STATUS & CAUSES: IMPAIRED - contaminated sediments and physical disturbances from construction of dams and seaway.

POLLUTION SOURCES: Elevated levels of contaminants including PCBs, metals and PAHs most likely impact benthos; dredging and potentially natural erosion disturbances are sources.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.	NYSDEC	Establish habitat baseline (post 1959) *	N
2. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
3.	NYPA	Implement FERC relicensing requirements	N
4.	NYSDEC	Assess quantity & quality of habitat areas	N
5.	NYSDEC	Verify adequate habitat (amt./type/quality)	N
6.	NYSDEC	Verify mgt. plans inplace to protect habitat	N
7.	RAC/DEC	Reassess use impairment status	N

COMMENTS: Localized habitat impairment within the AOC has been identified as part of fish and wildlife management programs. Contamination of water and sediment of wetlands is directly related to loss of habitat. * The construction of the power dam and the St. Lawrence Seaway dramatically altered habitat after its 1959 completion. Changed habitat areas within and outside the Area of Concern need to be assessed and a habitat baseline established. The creation of new habitat areas will also serve to restore this impairment. Overall habitat assessment should include the development of non-indigenous and non-AOC habitat use plans as well as an assessment of the cause impacts from zebra mussels and purple loosestrife.

STATUS KEY:

C = Completed
P = Planned
D = Deferred
I = Implementation progressing
U = Under development/assessment/investigation
N = Needs development/assessment/investigation
R = Required by enforcement/permit/agreement

USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE RIVER AT MASSENA** FORM#: 3

USE IMPAIRMENT INDICATOR: Transboundary Impacts

IJC#: 15 AOC LOCATION: Binational issues; downstream St. Lawrence River impacts.

IMPAIRMENT STATUS & CAUSES: IMPAIRED - Probable causes are downstream transport of PCBs, phosphorus, nitrogen, metals and sediments. Cross-river transport not likely.

POLLUTION SOURCES: Inactive hazardous waste sites, point source discharges, CSOs, Lake Ontario and potentially atmospheric deposition and nonpoint sources. No direct evidence documented.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
2. 12/98	Indust.	Verify cleanup levels achieved	N
3. Ongoing	EPA/DEC	Verify ambient water quality stds. achieved	N
4. Ongoing	EPA/DEC	Verify contam. river sediment criteria met	N
5.	EPA/DEC	Establish no transboundary effect *	N
6.	EPA/DEC	Verify flora/fauna health criteria met	N
7.	EPA/DEC	Verify LaMP addresses Lake Ontario effects	N
8.	NYSDEC	Dev./Impl. any add'l needed BMP's	N
9.	RAC/DEC	Reassess use impairment status	N

COMMENTS: Indirect evidence exists for downstream St. Lawrence River impacts from the Massena AOC, Cornwall AOC and upstream (Lake Ontario) sources. Cross-river impacts are not likely. * Need to establish no contributory effect from the Massena portion of the AOC and its watershed to the Cornwall portion of the AOC and downstream and document that the LaMP addresses any upstream (Lake Ontario contributions.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 4

USE IMPAIRMENT INDICATOR: Degradation of Fish and Wildlife Populations

IJC#: 3 AOC LOCATION: St. Lawrence, Grasse & Raquette Rivers

IMPAIRMENT STATUS & CAUSES: LIKELY - PCBs, Mercury, DDE, physical disturbances and fish overharvesting

POLLUTION SOURCES: AOC industrial discharges, Lake Ontario, Cornwall AOC, international seaway, inactive haz. waste sites and contaminated sediments

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.	NYSDEC	Develop baseline community data (post 1959)	N
2.	NYSDEC	Assess F & W numbers and balance goals	N
3. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
4.	NYSDEC	Verify acceptable F & W population levels	N
5.	NYSDEC	Confirm no significant toxicity	N
6.	NYSDEC	Document F & W targets/mgt. goals achieved	N
7.	RAC/DEC	Reassess use impairment status	N

COMMENTS: This use impairment was identified by fish and wildlife management programs. YOY trend analyses and management goals are needed to provide for the assessment and protection of piscivorous wildlife. In the vicinity of the AOC, haz. waste site remediation and habitat mgt. plans (for fish/aquatic/wildlife) will be key elements. The RAP needs to document that environmental threats are addressed by the remediation. Fish and Wildlife community survey and structure data (number & balance) are needed to document that goals are achieved, that there is not toxicity from sediments present, and that a healthy reproducing population of bentivores and poscivores exists.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 5

USE IMPAIRMENT INDICATOR: Fish Tumors or Other Deformities

IJC#: 4 AOC LOCATION: Within AOC

IMPAIRMENT STATUS & CAUSES: LIKELY - PAHs

POLLUTION SOURCES: Potentially contaminated sediments

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1.	NYSDEC	Dev./Imp. fish pathology study (tumors/def.)	N
2. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
3.	NYSDEC	Conduct fish survey (liver tumors)	N
4.	NYSDEC	Verify compliance (fish tissue stds./objs.)	N
5.	NYSDEC	Verify no observed reproductive deformities	N
6.	RAC/DEC	Reassess use impairment status	N
7.			

COMMENTS: Limited data and reports have indicated tumor rates exceed those in unimpacted areas. A current fish pathology study and fish survey are needed to verify compliance with fish tissue standards and objectives and to verify no observed reproductive deformities. Studies should be conducted before and after sediment removal. The most significant concentration of PAHs is located in the river off of the Reynolds site. The use impairment is resolved when the incidence rates of fish tumors and other deformities do not exceed unimpacted areas; survey data confirm the absence of liver tumors in bullheads or suckers; fish tissue stds. are achieved; and, there are no deformities observed in resident fish.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 6

USE IMPAIRMENT INDICATOR: Bird or Animal Deformities or Reproductive Problems

IJC#: 5 AOC LOCATION: Within AOC

IMPAIRMENT STATUS & CAUSES: LIKELY - PCBs

POLLUTION SOURCES: Potentially contaminated sediments

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
2. 12/98	Indust.	Verify cleanup levels attained	N
3. Ongoing	NYSDEC	Attain State, Fed, IJC tissue stds./objs.	N
4. Ongoing	NYSDEC	Confirm incident rates < inland controls	N
5. Ongoing	NYSDEC	Confirm wetlands support healthy community	N
6. Ongoing	NYSDEC	* Biomonitoring results better than controls	N
7.	RAC/DEC	Reassess use impairment status	N
8.			

COMMENTS: Indirect evidence indicates impaired effects exist regarding: fish tissue, frog coordination, and reduced mink animal populations. No data on unusual incidents of cross-bill syndrome, egg-shell thinning or eagle populations exists. The delisting criteria are satisfied when studies demonstrate compliance with tissue standards and objectives and healthy communities of significant species are observed. Incidence rates should not exceed control sites.

* An extensive biomonitoring program is not warranted unless sufficient evidence suggests that deformities or reproductive impairment are probable.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 7

USE IMPAIRMENT INDICATOR: Degradation of Benthos

IJC#: 6 AOC LOCATION: St. Lawrence, Grasse & Raquette Rivers

IMPAIRMENT STATUS & CAUSES: LIKELY - PCBs, lead, copper, PAHs and physical disturbances

POLLUTION SOURCES: Potentially industrial discharges, contaminated sediments, inactive hazardous waste sites, nonpoint sources and physical disturbances.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
2. 12/98	Indust.	Verify cleanup levels attained	N
3.	NYSDEC	Conduct benthic community structure studies	N
4.	NYSDEC	Confirm sediment quality criteria achieved	N
5.	NYSDEC	Verify populations of mesotrophic species	N
6.	NYSDEC	Bioassay results better than controls	N
7.	RAC/DEC	Reassess use impairment status	N
8.			

COMMENTS: PAHs were added as a cause. A 1979 study indicated somewhat declining benthic populations. Data is needed to document that the macroinvertebrate community structure does not significantly diverge from unimpaired area. Also, data is needed to document no significant toxicity (bioavailability) of sediment-associated contaminates. The delisting criteria are satisfied when benthic surveys demonstrate a healthy community. In the absence of community data, sediment quality criteria are to be achieved such that no threat is evident. The emphasis is on demonstrating the absence of toxic effects of sediment associated contaminants and on demonstrating bioassay results comparable to controls.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 8

USE IMPAIRMENT INDICATOR: Restrictions on Dredging Activities

IJC#: 7 AOC LOCATION: AOC beyond navigation channel

IMPAIRMENT STATUS & CAUSES: NOT IMPAIRED - (seaway channel navigational maintenance dredging only)
EXPANDED REVIEW -- concern for dredging proposals outside the seaway channel for: PCBs, Arsenic, Chromium, Copper, Nickel & Zinc.

POLLUTION SOURCES: Contaminated sediments from hazardous waste sites and industrial discharges.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
2. 12/98	Indust.	Verify cleanup levels attained	N
3.	EPA/DEC	Define contaminated sediment criteria	N
4.	NYSDEC	Define span of AOC dredge area	N
5.	NYSDEC	Conduct sediment analyses and evaluate	N
6.	NYSDEC	Confirm sediment criteria achieved	N
7.	NYSDEC	Assure dredging restrict. safe/approved*	N
8.	RAC/DEC	Reassess use impairment status	N

COMMENTS: Seaway dredging is not impaired. Need to review expanded dredge area for restrictions on dredging and/or disposal activities. Because disposal of dredged material in the St. Lawrence River is prohibited, proper disposal plans for dredge spoils must be approved. * Delisting criteria are satisfied when the sediment criteria are achieved and any restricted dredging activities are approved & registered. Studies should confirm that the cause of any restrictions is not the result of currently active AOC or watershed sources. Spoil disposal must not contribute to use impairments and beneficial uses must be protected.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 9

USE IMPAIRMENT INDICATOR: Beach Closings

IJC#: 10 AOC LOCATION: Downstream of Massena area CSOs, downstream in the St. Lawrence River, and in the Canadian AOC (beach closure impairment).

IMPAIRMENT STATUS & CAUSES: NOT IMPAIRED - (defined by Stage 1 and Stage 2 documents for the New York State portion of the AOC)

EXPANDED REVIEW - (needed for partial body contact downstream of CSOs, for bacteria in Canadian AOC, and for downstream St. Lawrence River bathing and partial-body contact area impacts)

POLLUTION SOURCES: none documented

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/96	DEC/RAC	Assess Canadian beach closing indicator	P
2.	NYSDEC	Obtain water quality data (partial contact)	N
3.	NYSDEC	Evaluate WQ data against stds./guidelines	N
4.	NYSDEC	Verify coliform standards achieved	N
5.	NYSDEC	Assess CSO impact (on part.body contact)	N
7.	RAC/DEC	reassess use impairment status	N

COMMENTS: Further documentation of water quality data is needed to evaluate any exceedance of standards or guidelines in the St. Lawrence River near: 1) Canadian beaches; 2) Mohawk Nation at Akwesasne non-bathing beach areas; 3) partial-body contact areas downstream of CSOs. Delisting criteria are satisfied when bathing beach and partial body contact water standards and guidelines are achieved. The concentrations of fecal coliform and E. coli are to be consistently below 100 colonies per 100 ml samples.

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USE IMPAIRMENT RESTORATION and PROTECTION STRATEGY

REMEDIAL ACTION PLAN: **ST. LAWRENCE AT MASSENA** FORM#: 10

USE IMPAIRMENT INDICATOR: Degradation of Plankton Populations

IJC#: 13 AOC LOCATION: Investigation needed

IMPAIRMENT STATUS & CAUSES: UNKNOWN

POLLUTION SOURCES: Past hazardous waste disposal areas; physical habitat changes.

TARGET DATE:	RESP. PARTY	REMEDIAL STRATEGY / ACTION ITEM:	STATUS:
1. 9/98	Indust.	Complete haz. waste rem. & implement BMPs	I
2.	NYSDEC	Obtain plankton community structure data	N
3.	NYSDEC	Confirm no sign. divergence from controls	N
4.	NYSDEC	Bioassays confirm no toxicity (No #2 *)	N
5.	RAC/DEC	Reassess use impairment status	N
6.			

COMMENTS: Phytoplankton and Zooplankton population data are needed to evaluate if plankton community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics. * In the absence of community structure data, an evaluation requires plankton bioassays to confirm no toxicity impact in ambient waters. A helpful indicator is to observe a healthy fish community in the AOC. Delisting criteria are satisfied when a healthy fish community can be demonstrated. Bioassay data should confirm no significant toxicity in ambient waters. A favorable comparison to unimpacted areas should be observed for the plankton community structure.

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APPENDIX C

Use Impairment Restoration and Protection Criteria

Appendix C provides a detailed description of the restoration and protection criteria for each use impairment indicator. The use impairment indicators are presented below in three groups based on the current evaluation of the status of each use impairment as described in Table 1 herein: Group 1) use impairment indicators have a status of impaired; Group 2) indicators have a status of needing further study; and, Group 3) indicators have a status of not impaired. A description of the rationale and supporting data needed to address the use impairment is included for each indicator's restoration and protection criteria.

In this 1996 Summary Update, Table 4 has been developed as a summary that lists the criteria for use each use impairment and indicates the status of accomplishing each criteria. These criteria have been developed by listing specific standards and guidelines needed to declare a use impairment indicator as not impaired. As such, certain aspects of these criteria are dynamic and are subject to revision as progress is made in further defining the restoration targets for Great Lakes Areas of Concern. The three groups of use impairment indicators follow:

1. **Use Impairments rated as IMPAIRED:** These use impairment indicators have a status of impaired. Upon achieving all defined restoration and protection criteria, the use impairment indicator will be considered no longer impaired with its beneficial use protected. [Note: Each use impairment indicator that follows is underlined. Each restoration and protection criteria that follows starts with "*"]

   Fish and Wildlife Consumption Restrictions -

   * Restrictions on fish and wildlife consumption in the Area of Concern due to watershed or inplace contaminants are absent. Contaminant levels created by anthropogenic chemicals do not exceed current standards, objectives or guidelines in all non-migratory fish and wildlife. No public health advisories are in effect for human consumption.

   * U.S. Food and Drug Administration Action Level of 2 mg/kg PCBs in the edible portion of the fish; and, 0.05 mg/kg in fish tissue accomplished to protect human health in New York State. (Determine chemicals of concern and allowable levels for all consumed species. FDA levels and AOC levels may differ; need to verify standards and specify acceptable levels)

   * Any remaining restrictions on fish and wildlife consumption are due to upstream sources that are addressed by other management plans such as Lakewide Management Plans (LaMPs).

   * Cleanup standards have been accomplished both in contaminated river sediments and land-based hazardous waste sites. (Specify standards)

Rationale: Delisting criteria are satisfied when the absence of consumption advisories due to sources from the AOC and its watershed are in accordance with IJC guidelines and address jurisdictional, state, and federal standards.

Supporting Data: Document fish and wildlife study reports that indicate satisfactory consumption result levels. Verify remediation results assure protection.

Loss of Fish and Wildlife Habitat -

* Amounts and quality of physical, chemical, and biological habitat required to meet fish and wildlife management goals have been achieved and protected.

* Amount and type of wetlands and riparian vegetation adequate with beneficial uses protected.

* Local plans or other management plans in place to restore and protect habitat.

* Federal Energy Regulatory Commission (FERC) relicensing process requirements accomplished to enhance and protect habitat.

Rationale: Delisting criteria are satisfied when fish and wildlife management goals have been achieved and protected. The location of habitat creation will be based on compatibility with other use goals, such that an acceptable balance among habitat, shipping and boating interests is achieved. A post-seaway/power dam construction habitat baseline needs development. Stakeholders, Remedial Advisory Committee members, and biological professionals all have roles in identifying acceptable habitat levels.

Supporting Data: Describe desired habitat and management goals. List specific habitat creation and/or rehabilitation projects and the status of each in the AOC. (For example, additional littoral shore may be provided by the creation of islands.) Describe fish and wildlife management programs. Demonstrate rehabilitation and protection of habitat. Document that current habitat surveys indicate an adequate amount of habitat is present with no additional loss attributable to water or sediment quality. Document FERC relicensing requirements and accomplishments.

Transboundary Impacts -

* River and land-based remediation is accomplished such that the Massena AOC and its watershed do not contribute as a source to the use impairments in the Cornwall portion of this connecting channel AOC. Cleanup levels are achieved.

* Specific ambient water quality standards, air discharge standards, and contaminated sediment criteria have been achieved to define no contributory effect to use impairments in the entire U.S./Canadian AOC.

* Flora and fauna meet established environmental and health criteria to define no contributory effect to use impairments in the entire U.S./Canadian AOC.

* Any remaining impacts to the entire AOC are attributable to upstream effects not associated with the AOC and its watershed and are being addressed by some other management plan such as a Lakewide Management Plan (LaMP). Includes water/air impacts.

* Downstream contamination concerns are acknowledged and addressed to the maximum extent practicable under the RAP.

Rationale: Delisting criteria are satisfied when all potential transboundary impacts from the Massena AOC and its watershed are determined to have no significant effect on the use impairments in the Cornwall portion of the AOC or downstream.

Supporting Data: Studies providing ambient water quality, air discharge, and sediment data demonstrate no AOC or downstream effects. Flora and fauna surveys also indicate no AOC or downstream effects to the environment or health.

2. **Use Impairments rated as NEEDING FURTHER STUDY:** These use impairment indicators have a status of likely, unknown impairment, or expanded review and require further investigation or assessment. Upon achieving all defined restoration and protection criteria, the beneficial use will have been enhanced by the RAP process, the RAP goals satisfied, and the use impairment indicator considered no longer impaired with its beneficial use protected. [Note: Each use impairment indicator that follows is underlined. Each restoration and protection criteria that follows starts with "*"]

<u>Degradation of Fish and Wildlife Populations -</u>

* Environmental conditions support healthy, self-sustaining communities of desired fish and wildlife at predetermined levels of abundance that would be expected from the amount and quality of suitable physical, chemical, and biological habitat present.

* Fish and wildlife objectives for the AOC are consistent with Great Lakes ecosystem objectives and Great Lakes Fishery Commission fish community goals.

* In the absence of community structure data, fish and wildlife bioassays confirm no significant toxicity from water column or sediment contaminants.

* Quantitative fishery targets achieved indicating a self-sustaining mesotrophic community. Targets include: kg/ha units of biomass of fish in littoral habitats, percent of native species, and species richness per survey transect.

Rationale: Delisting criteria are satisfied for fish when populations are determined to be healthy and self-sustaining in a mesotrophic environment. Effort is needed to demonstrate that environmental threats to all species are addressed by fish and wildlife management programs consistent with the GLWQA, Great Lakes Fishery Commission goals, and Great Lakes ecosystem objectives. The construction of the seaway and power dam changed the ecology significantly such that a post 1959 fish and wildlife baseline needs to be developed.

Supporting Data: Fish and wildlife community structure data (number and balance) supports conclusions; abundance and composition is not impaired based on historical data. Desired levels within a statistical range achieved. Sediment bioassays with fish confirm no significant toxicity. Surveys indicate healthy, reproducing populations of benthivores and piscivores. Bird preservation guidelines, nature observation, aesthetics, and resident and transitory species guidelines are achieved.

Fish Tumors or Other Deformities -

* Incidence rates of fish tumors or other deformities do not exceed rates at unimpacted control sites.

* Survey data confirm the absence of neoplastic or preneoplastic liver tumors in bullheads or suckers.

* Compliance with IJC, state and federal biological tissue standards or objectives.

* No reproductive deformities in observed resident species.

Rationale: Delisting criteria are satisfied when survey results are consistent with expert opinion on tumors and there are no reports of tumors or other deformities based on acknowledged background incidence.

Supporting Data: Survey results confirm the absence of tumors and demonstrate no significant difference from control sites. Studies document that the AOC and watershed sources are not the cause of any reported incidence. Fishing and nature observation goals met.

Bird or Animal Deformities or Reproductive Problems -

* Compliance with IJC, state and federal biological tissue standards or objectives.

* Compliance with the establishment of appropriate sediment quality criteria.

* Incidence rates of deformities (e.g. cross-bill syndrome) or other reproductive problems (e.g. egg-shell thinning) in sentinel wildlife species do not exceed background levels of inland control populations.

* Wetlands support healthy communities of significant species.

* When conducted, biomonitoring study results are better than standards or objectives when compared to unimpacted control sites.

Rationale: Delisting criteria are satisfied when studies demonstrate compliance with tissue standards or objectives which indicates healthy communities; this protection level serves to prevent the initiation of tumors and deformities in species and their consumers. Incidence rates should not exceed control sites. Without sufficient evidence to suggest that deformities or reproductive impairment is probable, an extensive biomonitoring program is not warranted.

Supporting Data: Survey results from bird, animal, and amphibian populations confirm the absence of deformities or reproductive problems and demonstrate no significant difference from control sites. AOC and watershed sources are not the cause of any incidence. Measurements verify a healthy community and population balance. Habitat and nature observation goals are achieved.

Degradation of Benthos -

* Benthic macroinvertibrate community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics.

* In the absence of community structure data, the toxicity of sediment-associated contaminants is not significantly higher than controls at unimpacted sites.

* Populations of mesotrophic species are present in the benthos where suitable substrates are located.

* Resident fauna do not have elevated contaminants.

Rationale: Delisting criteria are satisfied when benthic surveys demonstrate a healthy community. In the absence of community data, sediment quality criteria are to be achieved such that no threat is evident. Because of boating and shipping, the emphasis is placed on demonstrating the absence of acute and chronic toxic effects of sediment associated contaminants and on demonstrating bioassay results comparable to controls.

Supporting Data: Benthic macroinvertibrate community structure surveys, at representative locations in the AOC, are desired with results comparable to unimpacted control site composition. When performed, bioassay results comparable to control site values are desired. Demonstrate that appropriate sediment quality criteria requirements are achieved. Need to determine acceptable statistical deviation of benthic community structure and control site relationship.

Restrictions on Dredging Activities -

* Concentrations of metals, trace organic compounds and nutrients in the sediment within the AOC (located within the actual or potential dredging areas and current shipping routes) do not exceed the sediment quality standards, criteria, or guidelines for acceptable dredge and disposal material (lowest effect levels), except where background concentrations exceed levels.

* When sediment criteria are exceeded, any restrictions on dredging are specific to inplace conditions located within the actual or potential shipping routes and are not attributable to current AOC watershed contributions. Restricted dredging activities are registered with and have appropriate authority approval. Restrictions do not contribute to other use impairments and assure beneficial use protection.

* When restricted dredging is approved, sediment disposal activities are also registered and approved by appropriate authority. These disposal activities do not contribute to other use impairments and assure beneficial use protection.

Rationale: Delisting criteria are satisfied when contaminants in sediments do not exceed standards, criteria, or guidelines such that they are not causing restrictions on the dredging. Where restrictions exist, dredging and disposal activities are approved, do not contribute to other use impairments, and provide use protection. Restricted dredging areas are due to inplace conditions and are not the result of currently active AOC or other watershed sources.

Supporting Data: Sediment core results are in compliance with IJC and state sediment quality standards, criteria and guidelines. Where data is available, provide graphic displays of trends. Restricted dredging and disposal activities must be monitored to assure beneficial use protection. Assure against sediment toxicity.

Beach Closings -

* When waters, which are commonly used for total body contact or partial body contact recreation, do not exceed standards, objectives, or guidelines for such beneficial use.

* For public swimming beaches, the waters must be free of chemical substances capable of creating toxic reactions or irritations to skin/membranes, must achieve numerical and clarity standards for safety, and must be free of public health advisories.

* Beaches are considered safe for swimming when the daily geometric mean of a minimum of five fecal coliform samples collected from different sites within the beach area is less than 100 colonies per 100 ml. based on standardized sampling protocols.

* Ambient water quality standards are not exceeded: The monthly median value for total coliforms per 100 ml., and more than 20 percent of the samples, from a minimum of five samples, does not exceed 2,400 and 5,000 respectively. The monthly geometric mean of fecal coliforms per 100 ml. from a minimum of five samples, does not exceed 200.

* Exceptions apply to stormwater events in non-bathing beach areas located downstream below combined sewer overflows. Monitoring may indicate some standards and guideline exceedences; however, these non-bathing partial body contact areas must present no threat to downstream designated bathing areas.

Rationale: Delisting criteria are satisfied when bathing beach and partial body contact water standards and guidelines are met. Concentrations of fecal coliform and E. coli should be consistently below 100 colonies per 100 ml. sampled.

Supporting Data: Coliform data, bathing beach reports, and AOC open water quality surveys indicate the beneficial use of bathing in beach areas and partial body contact in non-bathing areas is in compliance with regulations and protected against health threats.

Degradation of Plankton Populations -

* Phytoplankton or zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics.

* In the absence of community structure data, plankton bioassays confirm no toxicity impact in ambient waters (i.e. no growth inhibition).

* Healthy fish communities are present in the Area of Concern which indicates a viable plankton community.

Rationale: Delisting criteria are satisfied when a healthy fish community can be demonstrated. This incorporates the ecosystem approach. Bioassay data should confirm no significant toxicity in ambient waters in accordance with AOC beneficial use goals.

Supporting Data: Plankton community structure data and bioassay toxicity data support observations of the presence of healthy fish communities. Plankton community structure favorable when compared to unimpacted sites in population, composition, and statistical variability.

3. **Use Impairments rated as NOT IMPAIRED:** These use impairment indicators have a status of not impaired. Upon confirming that all defined restoration and protection criteria have been achieved, the use impairment indicator will be verified as not impaired with beneficial use protected. [Note: Each use impairment indicator that follows is underlined. Each restoration and protection criteria that follows starts with "*"]

Tainting of Fish and Wildlife Flavor -

* There are no complaints about fish tainting.

* Survey results confirm no tainting of fish and wildlife flavor.

* The presence of tainting contaminants (such as phenols) in the water column do not exceed ambient water quality standards and criteria.

Rationale: Delisting criteria are satisfied when there is an absence of reports of fish tainting and surveys support this conclusion. Compliance with ambient water quality standards, objectives, and guidelines indicates no tainting problem.

Supporting Data: Documented reports and ambient water quality data support beneficial use goals.

Eutrophication or Undesirable Algae -

* No persistent water quality problems attributed to cultural eutrophication (e.g. none of the following present: dissolved oxygen depletion of bottom waters, nuisance algal blooms or accumulation, decreased water clarity).

* Ambient water quality survey data consistently equal to or better than standards, criteria, or guidelines.

* Beneficial goals are achieved and maintained including boating, fishing, sightseeing, nature observation, aesthetics, passive and active recreational activities.

Rationale: Delisting criteria are satisfied when survey results indicate phosphorus concentrations and loadings, chlorophyll, ammonia, water clarity, dissolved oxygen and other ambient water quality levels are consistently better than standards, criteria, and guidelines. The observation of algal blooms in the AOC or downstream needs to be evaluated as to the cause, the undesirable nature and any proposed remedial action.

Supporting Data: Suggested thresholds for ambient water quality in the AOC include: phosphorus concentration < 20 ug/l, Secchi disc transparency > 1.2 meters, dissolved oxygen > 6 mg/l, unionized NH3 < 0.02 mg/l.

Drinking Water Restrictions, Taste and Odor Problems -

* The absence of taste and odor problems for treated drinking water supplies.

* No exceedence of human health standards, guidelines, or objectives for treated drinking water supplies for densities of disease causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances.

* For treated drinking water, the treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in other comparable portions of the Great Lakes which are known not to be degraded (e.g. settling, coagulation, and disinfection treatment is standard).

Rationale: Delisting criteria are satisfied when standard drinking water treatment practices are employed and human health standards and guidelines are achieved. Contaminants from the Area of Concern watershed and the AOC should not be causing drinking water quality problems in the AOC or contributing to transboundary impacts.

Supporting Data: Ambient water quality and treated drinking water quality survey data confirm compliance with the New York State standards and guidelines. Document that there is no significant health impact from transboundary effects.

Degradation of Aesthetics -

* Area of Concern waters are devoid of any substance which produces a persistent objectionable deposit, unnatural color, or turbidity, or unnatural odor (e.g. oil slick, surface scum).

* No increase in turbidity that would cause a visible contrast from natural conditions.

* No visible residue of oil or floating substances.

* Any sightings of oil, scum, floating objects, or reports or objectionable odors are spill related and at a frequency of occurrence and cleanup response acceptable to the public (instances of repeated spills require improved response and prevention measures).

Rationale: Delisting criteria are satisfied when the narrative standards for ambient water quality parameters such as suspended solids, oil, and color are achieved. These require no presence that would adversely affect the waters best use or interfere with achieving the beneficial use goals.

Supporting Data: Document that the quantitative targets established for dischargers having the potential to cause such conditions are achieved: 3 mg/l for suspended solids, 15 mg/l for oil and no floating substances. Verify that water clarity data, bioassay, and bacteria survey data support aesthetic use goals. Document that the implementation of remedial measures involving physical construction provide protection of beneficial uses and improve AOC aesthetics.

Added Costs to Agriculture or Industry -

* No additional costs are required to treat water prior to use due to contamination or spills within the Area of Concern.

* No transboundary impact due to watershed or AOC contamination.

Rationale: Delisting criteria are satisfied when there are no additional costs required to treat the water prior to use for agricultural or industrial purposes (e.g. livestock watering, irrigation, crop-spraying, noncontact food processing, industrial application).

Supporting Data: No reports of increased costs to agriculture or industrial business due to spills or inplace contamination pairing water use.