

ST. CLAIR RIVER BINATIONAL PUBLIC ADVISORY COUNCIL

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Substantial Improvements Shown in St. Clair River Environmental Quality

The Report to the Public on the Progress of the St. Clair River Clean-up prepared by the St. Clair River Binational Public Advisory Council (BPAC), has shown that significant and substantial improvement in environmental quality have occurred over the last decade. The changes are part of the ongoing BPAC Remedial Action Plan. These improvements have largely been the result of regulatory and voluntary initiatives on the part of local industries and municipalities in Ontario and Michigan, and in particular the petrochemical facilities located in the Sarnia area. Two of the major improvements follow;

- Restrictions on fewer fish species, with larger fish acceptable for consumption than before the Remedial Action Plan was begun. In particular, mercury levels have dropped substantially since the early 1970's due to process changes at Dow Chemical.
- The zone of sediment contamination in the River has been reduced from 64 kilometers (40 miles) of continuous contamination in the late 1960's, to 12 kilometers (7 miles) in 1985, to a reach of approximately six kilometers (3.5 miles) of intermittent pockets south from the Sarnia industrial complex along the Ontario shoreline.

Concentrations of contaminants in the river have also been decreasing over the past 20 to 30 years, which may be attributed to in-place initiatives by industrial dischargers. As with fish consumption advisories, this is largely the result of voluntary and legislated measures that include abatement, source control, improved training and pollution prevention plans by local industries.

Benefits from improved conditions to communities in Ontario and Michigan include;

- Restrictions on drinking water consumption or taste and odour problems, and added cost to agriculture or industry - have changed status to "NOT IMPAIRED".
- Tainting of fish and wildlife flavour - which had been classed as "requiring future assessment: on site-specific basis" has been assessed and determined to be "NOT IMPAIRED".
- Significant improvements are the direct consequence of the reduction in frequency and size of spills from industrial facilities in Ontario and Michigan.

This is a partial fulfillment of the role of BPAC. Many challenges have been identified and many recommendations are still to come including a need to address non-point sources of pollution; coordinating, strengthening and implementing habitat protection; identifying impacts from local sources of air emissions, addressing issues such as fish and wildlife consumption, beach closings and degraded sediments and benthos.

Implementation measures and commitments to future improvements represent tens of millions of dollars of environmental remediation and significant effort on the part of the industrial sector, municipal, state, provincial and federal government agencies, and numerous non-governmental agencies and individual stakeholders. All of these have dedicated representation on the St. Clair River Binational Public Advisory Council.

Note: Data as of September 1997 for December 1998 publication

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*A Report to the Public
on the
Progress of the
St. Clair River Clean Up*

December 1998
(based on data to September 1997)

**St. Clair River
Binational Public Advisory Council**

This report is submitted in partial fulfillment of the role of BPAC: “commitment to audit the implementation of the St. Clair River RAP;” “evaluate progress towards goals, objectives and delisting;” and, “provide advice on priorities and directions to governments”.

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Notable Points

Implementation measures and commitments to future improvements represent tens of millions of dollars of environmental remediation and significant effort on the part of the industrial sector, municipal, state, provincial and federal government agencies, and numerous non-governmental agencies and individual stakeholders. The following is a reflection of the status of data and information made available by September, 1997.

As a result of improved conditions:

- Two of the nine impairments of beneficial uses -- restrictions on drinking water consumption, or taste and odour problems, and, added cost to agriculture or industry -- have changed status to “not impaired”.
- A third impairment -- tainting of fish and wildlife flavour – which had been classed as “requiring future assessment on a site-specific basis” has been assessed and determined to be “not impaired”.
- Two of nine delisting criteria have been met as a result of changes documented in the most recent RAP update of environmental conditions. These address “Restrictions on drinking water consumption a taste and odour problems” and “Added costs to agriculture or industry” (no water plant shutdown attributable to water quality over two-year period - none since November, 1994).
- Significant improvements are the direct consequence of the reduction in frequency and size of spills from industrial facilities in Ontario and Michigan.
- There has been marked progress towards achievement of the remaining delisting criteria and restoration of other impairments of beneficial uses.

1.0 Introduction

1.1 Role of BPAC

The role of the St. Clair River Binational Public Advisory Council (BPAC) is to:

- audit the implementation of the RAP;
- evaluate progress towards goals, objectives, and delisting
- review the environmental monitoring results
- provide advice on priorities and directions to the RAP Implementation Committee and its subcommittees; and,
- issue an annual report to the public which assesses progress on the RAP.

This report has been written to fulfill the requirements of the final role to “issue an annual report...”. The progress that has been made towards restoring the St. Clair River Area of Concern (AOC) is summarized in Section 2; the implementation activities underway and not underway are summarized in Section 3; the remaining challenges to cleaning up the River are summarized in section 4; and recommendations are made in section 5.

1.2 St. Clair River

The St. Clair River is a 64 kilometre- (40 mile-) river draining Lake Huron into Lake St. Clair. Its watershed extends over 337 000 hectares (832 000 acres), draining several small creeks in Ontario - Baby, Clay, Talfourd, and Marshy - and larger rivers in Michigan - Black, Belle, and Pine. The River has relatively high flows because the channel is uniform with very few bends or meanders, dropping only 1.4 metres (4.6 feet) between Lake Huron and the beginning of the St. Clair River delta at the River’s mouth. Most of the shoreline is now artificial, consisting of residential, recreational, and industrial developments, especially on the U.S. side.

The River serves as a shipping channel for a number of industries and the broader Great Lakes Seaway system. It also is a source of cooling and process water for municipalities, industry and thermal generating stations, and provides drinking water for 170 000 people. Commercial fishing in the River is considered negligible but migratory fish travel into lower Lake Huron creating an important commercial fishery nonetheless; however, sport fishing is popular, and hunting and trapping are significant uses. The wetlands of the delta have been identified as one of the most significant areas for waterfowl production, staging, and migration in the Great Lakes. Approximately 16% of all the Great Lakes coastal wetlands of importance to waterfowl are found in the St. Clair delta (SOLEC, 1997).

Approximately 73% of the land in the watershed is under agricultural production. The land is intensively farmed, with a heavy concentration on cash crops, soybeans, wheat, corn, pasture and livestock, such as beef and swine. Sarnia and Port Huron are the two cities bordering the River, while the rest of the mainly rural watershed comprises a population base in towns and villages. Two Native communities - the Chippewas of Sarnia First Nation and the Walpole Island First Nation Unceded Territory - are situated within the AOC.

1.3 The St. Clair River: A Great Lakes Area of Concern

Forty two sites within the Great Lakes basin have severe environmental and water quality problems. These pollution “hot spots” are called Areas of Concern (AOCs). Eleven AOCs are within Canada, five AOCs are shared between Canada and the United States, and twenty six AOCs are within the United States.

The St. Clair River was declared an AOC in 1986 as a result of the elevated contaminants levels in the water, contaminated sediments, impaired benthos, and bacterial contamination. Industry was the main source of pollution, but municipal sewage treatment plants and other point source and non-point source pollutants are also concerns.

1.4 Remedial Action Plan Stage 1 Report

The St. Clair River Remedial Action Plan (RAP) Stage 1 was initiated to define environmental problems (“impairments to beneficial uses”). To undertake this work, two committees - a federal/provincial/state RAP Implementation Team - and a local BPAC with representatives from industry, agriculture, municipalities, counties, First Nations and other groups - were formed. The 1991 report identified current environmental conditions and beneficial use impairments. Since then, an Addendum Report and Stage 2 Implementation Annex were released in 1993 based on data collected between 1988 and 1992. A second draft Addendum Report has recently been released in 1997 and is based on data collected between 1992 and 1996. Additionally, an updated status of beneficial use impairments has been provided.

1.5 Remedial Action Plan Stage 2 Report

Preparation of the St. Clair River RAP Stage 2 Recommended Plan involved the dedication and expertise of many individuals, particularly volunteers, from both within and outside of the AOC. Stage 2 marked the establishment of a new working relationship between members of the BPAC and government agency members on the RAP team, who jointly developed the Stage 2 RAP Recommended Plan document through facilitated workshops and task groups. This report, released in 1995, used an ecosystem approach to develop a framework for restoring the environmental integrity of the River and recommends remedial and preventative actions to reach these goals. In order to guide the development of remedial and preventative options, implementation of the RAP and targeted monitoring programs, benchmark conditions were developed which are the preconditions for the “delisting” of each impairment to beneficial uses. The RAP Team developed specific delisting criteria which would address the nine impairments to beneficial uses.

Delisting Criteria That Have yet to be reached

restrictions on fish and wildlife consumption will be considered not impaired...	<i>... when contaminant levels in fish and wildlife populations do not exceed current standards, objectives or guidelines and no public health advisories are in effect for human consumption of fish and wildlife,</i>
benthos will not be considered impaired...	<i>... when invertebrate community structure can be documented as unimpaired or intermediate as defined by recent OMOE benthic investigations</i>
dredging activities will not be impaired...	<i>...when no limitations on disposal of dredging spoils</i>
beach closings will not be considered impaired...	<i>...when zero beach closings based on standards regulation beach closing over a two-year period</i>
aesthetics will not be considered impaired...	<i>...when over a two-year period, there are no objectionable deposits, unnatural colour or turbidity, unnatural odour or unnatural scum/floating materials occur</i>
fish and wildlife habitat will not be impaired...	<i>...when regulations ensure that sufficient enforceable mechanisms are in place to protect existing aquatic and wetland habitat from cultural destruction or degradation, including filling, dredging, adversely affecting the hydrology, cutting or removing vegetation required for habitat and allowing pollutants such as sediment excess nutrients or toxic substances to enter aquatic or wetland habitat, when 800 acres (324 hectares) of wetland habitat in Michigan is acquired into public ownership by the year 2000, and existing habitat is protected in Ontario and when 445 hectares ((1100 acres) of Darcy McKeough Floodway is restored and enhanced, when 600 ac of aquatic and/or riparian habitat is protected and/or rehabilitated, when 200 acres (81 ha) of Michigan state-owned public bottomlands are reclaimed and restored, when 150 acres (61 hectares) of wet prairie/meadow habitat in Michigan is restored by the year 2000, when 20000 acres (809 ha) of wildlife habitat in Michigan is enhanced by the year 2000, and a long-term habitat management plan, including an assessment of needs (GAP analysis) relating to wildlife diversity and integrity will be completed</i>
bird and animal deformities or reproductive problems...	<i>... delisting guideline under review</i>

Delisting Criteria for Impaired Uses That Have Been Met

tainting of fish and wildlife flavour	<i>...no identifiable tainting in walleye harvested from St. Clair River near Sarnia</i>
restrictions on drinking water consumption or taste and odour problems	<i>... no treatment plant shutdowns due to exceedences of drinking water guidelines have occurred over a two-year period.</i>
added costs to agriculture or industry...	<i>... no plant shutdowns have been attributable to water quality over a two-year period; there have been no added costs for the disposal of contaminated sediments.</i>

2.0 Progress of the Clean Up

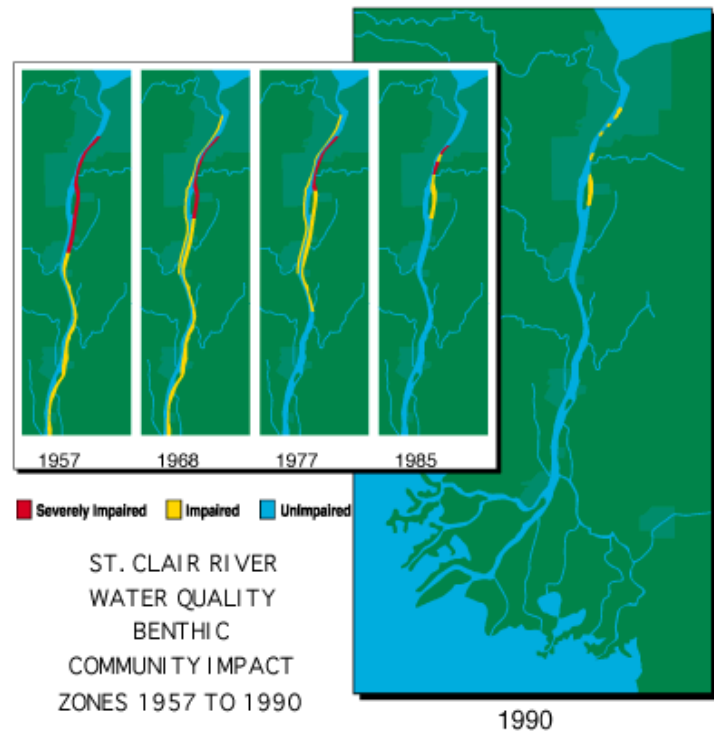
One of the more significant findings since 1991 was the substantial improvements in environmental quality which had occurred over the last decade. These improvements have largely been the result of regulatory or voluntary initiatives on the part of local industries and municipalities in Ontario and Michigan, and in particular, petrochemical facilities located in the Sarnia area.

Although fish consumption advisories still exist, there are now restrictions on fewer fish species, and larger fish are acceptable for consumption than before the RAP began. This is a measurable outcome of industrial investment in source control. In particular, mercury levels have dropped substantially since the early 1970's, due to process changes at Dow Chemical.

The zone of sediment contamination in the River has been reduced from 64 kilometres (40 miles) in the late 1960's of continuous contamination to 12 kilometres (7 miles) in 1985, to a reach of approximately six kilometres (3.5 miles) of intermittent pockets in 1990 south from the Sarnia industrial complex along the Ontario shoreline. Concentrations have generally been decreasing over the past 20 to 30 years, which may be attributed to in-place initiatives by industrial dischargers. As with fish consumption advisories, this is largely the result of voluntary and legislated measures including abatement, source control, improved training, and pollution prevention plans by local industries.

Improvements to community structure have been documented on the basis of a shrinking of the zone of severely impacted biota. In 1968, this zone included the entire shore of the river; in 1977 it consisted of a 21 kilometre (13 mile) zone immediately downstream of the Sarnia industrial complex, and in 1985, it was reduced to 12 kilometres (7.4 miles). Studies conducted in 1990 and 1994/95 confirm that nodes of impaired benthos remain in three areas along the industrial complex, and the option of small-scale clean ups remain. While confined disposal of contaminated sediment is required following navigational dredging near Walpole, these substantive improvements in sediment quality reflect the concerted efforts of the industrial community.

There appear to be very positive trends since the release of the 1993 Addendum report with regard to the reduction of chemical spills and loadings of ammonium, total phosphorus, solvent extractables, particulate residues, and overall organochlorines to the river. The following is a summary of overall progress made towards cleaning up the River. Details can be found in the 1997 Stage 1 Update (Geomatics International, 1998).



2.1 Water Quality

- Fecal coliform levels are event-driven, and vary markedly from year to year at any site, although there is some evidence to suggest an overall improvement from 1993 - 1995.
- Head and mouth surveys of the St. Clair River indicate that (1) organochlorine pesticides are similar throughout the river reflecting background concentrations in Lake Huron, but at lower concentrations than occurred in earlier periods, (2) industrial chlorinated organics continue to increase in the downstream direction but concentrations are trending downward, and (3) loadings of sodium and chloride to the river have decreased substantially.
- The 20 volatile organic compounds monitored hourly at the Lambton Industrial Society stations south of Courtright are below minimum detection limits (MDLs) ranged from 0.04 ppb to 0.27 ppb, depending on the compound, in 1997), almost 99% of the time. The frequency with which any compound was measured at greater than one ppb during an incident declined from nine occurrences in 1992 to one in 1997. Long-term drinking water standards, set to protect health over a lifetime of consumption, were exceeded at the monitor for a total of 10 hours in 1992 for benzene and toluene; five hours for benzene in 1992; six hours for ethylbenzene in 1994; and zero hours for any monitored compound in 1995, 1996, or 1997.
- The Cole Drain continues to be a significant source of several metals and organochlorine contaminants including aluminum, copper, zinc, hexachlorobenzene, hexachlorobutadiene, and total PCBs, however, remedial works completed by Dow Chemical in 1997 and on-going in 1998 must be explored to determine its effectiveness.
- There has been a dramatic decline in the number of spills reported to OMOE between 1986 (135) and 1996 (19).

2.2 Biota Quality

- Contaminant levels detected in an Ontario study (1985-1986 and 1990-1991) in waterfowl consumed by humans are, for the most part, either non-detectable or very low and do not constitute a health hazard to consumers.
- Contaminant levels in snapping turtles, mudpuppies, and seven species of waterfowl were found to be generally decreasing when comparing 1991-95 data with 1985-87 data; but in a few cases, levels were significantly above yardstick levels (although authors felt the levels are generally below the point where reproductive success of the species concerned is affected). Snapping turtle eggs on Walpole Island in 1995 were found to contain PCBs (490 ppb) and dieldrin (2.1 ppb); mudpuppy eggs in Mitchell's Bay in 1995 contained PCBs (480 ppb) and dieldrin (9.7 ppb); Black-crowned night heron - no location given - in 1992, were found to contain PCBs (2,400 ppb) and dieldrin (41 ppb); Forster's tern - no location given - in 1992, were found to contain PCBs (8,310 ppb) and dieldrin (64 ppb), and octachlorostyrene (46 ppb).
- Fish consumption advisories continue for the upper, middle, and lower reaches of the River as a result of contamination by metals, dioxins and furans, and/or PCBs and other organic contaminants.
- Invertebrate populations in nearshore sediments tend to be richer on the Ontario side than on the Michigan side but densities were higher in Michigan.
- Invertebrate population richness and density show no consistent temporal trend between 1977

and the 1990-95 period.

- in a Great Lakes basin-wide study of 42 AOCs and numerous marshes, no statistical differences were found between AOC and non-AOC sites in terms of species habitat use, species present, vegetation diversity, except for two species of amphibians which were less frequent in AOC marshes

2.3 Point Source Loadings

2.3.1 Petroleum Sector

Municipal-Industrial Strategy for Abatement monitoring data for industrial direct dischargers in the AOC is generally complete for the period of 1991 through 1996, however, availability of data were variable from OMOE. The following are trends that have been observed.

- Effluent flows have increased slightly between 1991 and 1996.
- Significant loading reductions have been achieved in certain parameters, especially ammonium, particulate residue (Imperial Oil, Products Division had particulate residue loadings well below their 1991 levels during the last two years), total phosphorus, benzene and solvent extractables (Imperial Oil, Products Division had solvent extractables' loadings well below their 1991 levels during the last two years). Shell Canada Products Ltd, Sarnia Manufacturing Centre, had loading reductions for benzene, ammonium, total phosphorus, residual particulates, solvent extractables, sulfide, and total carbon, despite higher effluent volumes during the past three years and an increase in phenols in 1996.
- Total phenolics and sulphides have shown little or no change from 1991 to 1996.

2.3.2 Organic Sector

- In general, effluent flows have remained about the same with the exception of Dow Chemical Canada and Novacor Chemicals.
- Loadings of most parameters at Imperial Oil, Chemicals Division and Bayer Inc. have remained relatively constant or increased slightly.
- Loadings of certain parameters at Dow Chemical Canada (total effluent flow decreased by more than one-half in 1994 as compared to 1991 or 1992; total loading of dissolved carbon also decreased by almost half in 1994) and Novacor Chemicals (Corunna) (effluent flows decreased slightly from 1991 to 1996, which is also reflected in the loadings of ammonium, total phenolics, particulate residues and solvent extractables; total phosphorus was however, much higher in 1996 than in 1992) have decreased along with the decreases in effluent flows.

2.3.3 Inorganic Chemicals Sector

- Most direct dischargers in this sector are no longer operating. Little data exist for Praxair Canada Ltd., Cabot Canada Ltd., Chinook Group Ltd., and Terra International, in order to generate historical comparisons or develop any trends.

2.3.4 Thermal Generating Sector

- From 1991 effluent flows at the Lambton Generating Station have decreased slightly, but an 80% decrease has been achieved in the loadings of particulate residue.
- Effluent temperatures at the Lambton Generating Station have, on average, not changed much over the 4 years of record but the average temperature differential between discharge and ambient river water has decreased slightly.
- Detroit Edison, Marysville and Belle River power plants data were not made available.

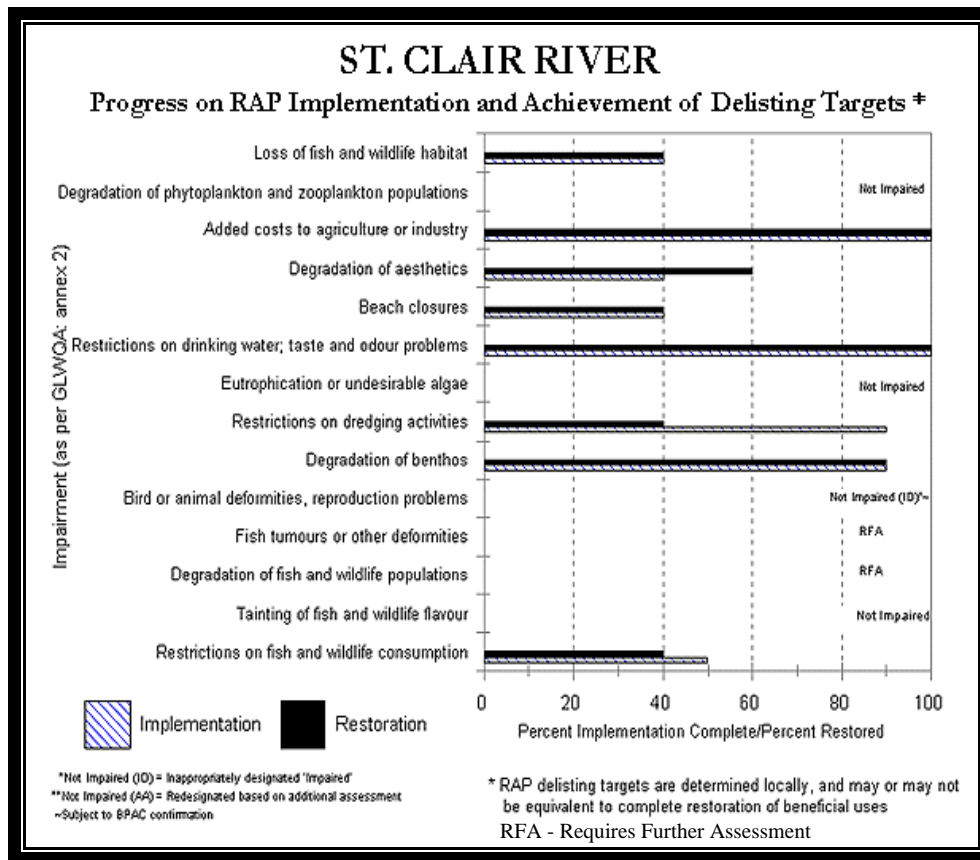
2.4 Municipal Sector

- reports on the effect of sewer overflows on fecal coliform levels in the Black River and St. Clair River (downstream of Black River) between 1993 and 1995 showed that coliform counts on the River rose nearly fivefold almost immediately to beyond the acceptable level of 200 organisms/100mL and coliform levels at the Black River mouth rose from a normal level of about 162 to 1300 organisms/100mL; levels of rainfall intensity on the day of sampling were also found to affect coliform counts.
- there have been no drinking water treatment plant shutdowns on the Canadian side of the River since November, 1994
- there have been no mandatory closure notices issued to drinking water treatment plants on the U.S. side of the River for the past few years; only two occurrences above maximum contaminant levels between 1989 and 1996 (thallium at East China Township and St. Clair plants in 1992)

2.5 Non-Point Source

- four beaches remained posted during 1994 and 1995
- the trend of higher levels of *E. coli* downstream of creek outlets was confirmed during bacteriological monitoring of 16 sites on the Canadian side of the river from Sarnia to the southern boundary of Lambton County in 1994/1995. Overall higher levels (counts ranging from 5 to 22,000 organisms/100 mL) were observed in 1996, particularly at and downstream of Talfourd Creek and at Centennial Park, concluding that tributaries were having an adverse effect on river water quality
- analysis of fecal coliform bacteria from Michigan and Ontario shorelines between 1984 and 1994 confirm that results above yardstick levels occur on both the Ontario side and the Michigan side, indicating that the problem of high bacterial levels is wide-ranging throughout the AOC; an update to the study conducted in 1995 revealed marked improvement in bacterial levels for Ontario from 1993 to 1994, and 1995 data show that the trend is continuing, although a 1996 study showed that levels are increasing again in the 1994 to 1996 period.
- sampling for coliform in Lake Huron and the St. Clair River in 1997 concluded that there is significant evidence of contamination of the water of Lake Huron, Black River, the Black River Canal, and the St. Clair River based on the samples collected, the path of the contamination is from heavily polluted streams and drains, combined sewer overflows and surface water runoff, there is clear correlation between beach contamination and the proximity of that beach to a polluted waterway, there is a clear correlation between precipitation events and increases in contamination levels resulting in beach closings, there is a downstream decrease in pathogen indicators - probably a result of cumulative effects of time, dilution and temperature, if levels of contamination in the St. Clair River rise after decreasing below health advisory levels this is a clear indication of additional contaminant input from another source, based upon data available from the samples, there is no coliform indicated contamination in the St. Clair River on the U.S. side at Marine City or Lake St. Clair, sewer separation will not eliminate health advisories and beach closings, nor meet delisting criteria for the impaired use.
- analysis of 1994, 1995, 1996 bacteria counts revealed levels above the RAP yardstick of 33 organisms/100mL for all three summers in and around Walpole Island

3.0 Implementation Activities



Krantzberg et.al 1998

3.1 Progress

The *Stage 2-Recommended Plan* listed a total of 46 Issues/Actions requiring implementation to ensure the delisting of all impairments to beneficial uses and the eventual removal of the AOC designation.

Many of the actions recommended in the *Stage 2-Recommended Plan* have been acted on since the release of that document in 1995. Of the point-source actions, 13 of 16 have been acted upon; six out of 12 non-point source pollution (NPS) actions have been acted upon, and all other groups have been acted upon to varying degrees.

3.1.1 Point Source

All of the point source recommended actions were at least partially implemented with the exception of three:

- 1) recommendations for state agencies to develop whole plant permitting systems;
- 2) recommendations to develop a small business toxic reduction education program; and,
- 3) the setting of new “yardsticks” or the adjustment of existing “yardsticks”.

The purpose of developing yardsticks was twofold. The development of agreed-upon quantitative open water yardsticks assists in measuring progress towards achievement of goals and objectives in the mid- to long-term. In the shorter term, yardsticks will assist efforts to measure potential impact from existing sources and assess the need for additional remediation. The rationale for selecting numerical yardsticks was the selection of the lowest, scientifically valid number from each of the five principle jurisdictions (Ontario, Michigan, Canadian and U.S. Federal Governments, and the International Joint Commission) following application of several screening criteria.

A dramatic reduction in the frequency and size of spills is one of the most significant actions to have occurred

Generally, numerous actions have been undertaken relating to the control and reduction of chemical and bacterial contaminants from point sources. Virtually all of the major industrial and municipal facilities in both Michigan and Ontario have shown significant progress in implementing these actions. The most notable of these is the dramatic reductions of spills to the St. Clair River.

Other actions have resulted in significant control of persistent and bioaccumulative substances. Yardstick values or better have been achieved for several non-persistent, non-bioaccumulative substances at Shell Canada, Imperial Oil, Products Division, Chinook Group, Dow Chemical, Ethyl Canada and Bayer.

Combined sewer overflow control programs have been undertaken at a number of municipal facilities; most of the programs are not yet complete, but significant reduction in bacterial contamination and other contaminants found in urban runoff should be achieved by the completion of ongoing activities in Sarnia, Port Huron and the City of St. Clair.

Three facility operators --Imperial Oil, Chemicals Division, Montell Canada Inc., and Ontario Hydro -- stated in a questionnaire that monitoring/emissions inventorying systems had been established and were in operation; some have installed continuous monitoring systems.

3.1.2 Non-Point Source Pollution

Of the 12 non-point source pollution recommendations, six have been acted upon. Some actions implemented are at the level of policy definition, such as those included in the Lambton County Official Plan related to urban runoff for new developments and the Sombra Township Official Plan which requires erosion control measures for new developments.

Other actions are currently at the planning stage, such as the Non-Point Steering Committee's St. Clair Stewardship Initiative, relating to promotion of agricultural landowner programs to reduce contaminant loadings of rural runoff and ensure the maintenance of rural sanitary sources, and the identification, protection and enhancement of natural areas.

None of the recommended actions relating to the development of watershed/subwatershed management plans, reductions in the use of lawn fertilizers and pesticides, improved waste site planning and management, location non-services sources of domestic waste, discharge of grey water from boats, and the proper use and disposal of household hazardous waste have been specifically addressed.

3.1.3 Sediment

All three of the recommended actions on sediments have been implemented to some degree. The further characterization of contaminated sediments was undertaken in 1994 and 1995 by the Lambton Industrial Society and OMOE, and additional Toxicity Identification and Evaluation studies are currently underway. Additionally, an OMOE multicomponent study was commissioned on the application of computer modelling and biomonitoring tools.

In 1996, Dow Chemical Canada completed the in-situ pilot scale sediment remediation program for the area south of the former, shore-based Cole Drain discharge. Additionally, further remediation work, Dow has reported that as of December 1996, no chemical puddles were observed on bottom sediments adjacent to their property since monitoring in 1986.

3.1.4 Habitat

All of the habitat actions for restoration have been addressed in some manner, ranging from the publication of educational brochures, to site-specific shore enhancement measures, through to the development of a landowner habitat enhancement program through the binational St. Clair River Stewardship Initiative.

3.2 Commitments for Future Actions

Other than those actions which are on-going, very few firm commitments for further implementation efforts relating to the recommended actions have been provided to the RAP Implementation Committee. Only six actions have been identified for future actions.

Commitments for Future Actions	
Persistent, Potentially Bioaccumulative Substances	Ethyl Canada Inc. - lead
Point Source Discharges to Air	Imperial Oil, Chemicals Division- propylene, benzene, methyl ethyl and methyl isobutyl ketones
Eliminate Spills	Imperial Oil, Chemicals Division, Suncor Inc, E.B. Eddy Paper Inc.
Elimination of all discharges/leachate to Cole Drain	Dow Chemical Canada Inc.
Zero discharge	Chinook Group, Dow Chemical Canada Inc., Lambton Generating Station
Develop long-term habitat management plan	Lambton County - Natural Heritage System

4.0 Remaining Challenges

Continued problems relate to biota and sediment quality. This may, in part, reflect the long time which may be required for the reduction in sediment-adsorbed contaminants derived from historical loadings. Although there are positive trends since 1993, total net loadings of particulate residue, solvent extractables, and total phenols continued to increase at some chemical sector facilities in the AOC.

Due to differences in sample locations and study design, it is not possible to directly correlate the number of and magnitude of occurrences in which contaminant levels were found to be above yardsticks from one reporting period to the next. The value of this summary is in tracking overall progress through time. Based on the updated information to 1997, occurrences above yardstick values continue to be noted for a variety of parameters in all media.

- Levels above water quality yardsticks have been recorded for iron, mercury, zinc, bacteria, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, and pentachlorobenzene.
- Levels above sediment quality yardsticks have been documented for arsenic, cadmium, copper, iron, lead, manganese, mercury, nickel, zinc, oil and grease, total Kjeldahl nitrogen, total phosphorus, hexachlorobenzene, polyaromatic hydrocarbons, and PCBs.
- Biota yardstick exceedences include dieldrein, hexachlorobenzene, octachlorostyrene, polyaromatic hydrocarbons, and polychlorinated biphenyls.

The principal water quality occurrences were found in the vicinity of tributary mouths (bacteria) and downstream of the Cole Drain (organochlorines).

Sediment quality occurrences were most frequent in the vicinity of the Sarnia industrial complex (Bayer to Stag Island) and in the lower river (Port Lambton, Southeast Bend).

Biota quality occurrences for organochlorines occurred principally in the lower river around Walpole Island and in Mitchell Bay.

The location of occurrences of high contaminant levels reflects the focus of studies undertaken since the first addendum report. These studies have focused on priority segments of the river, which are by definition those most degraded in environmental terms. The results provide some indication of the problems that remain in the priority areas, but do not reflect overall AOC ambient conditions.

4.1 BPAC Priorities

A list of actions and recommendations from the RAP Stage 2 Recommended Plan (1995) was prepared and sent out to all BPAC members. Members were asked to rank possible actions as “high”, “medium” or “low”. The challenges facing the future of the AOC were divided into seven sectors: habitat; sediment; monitoring and research; point source; non-point source; public education and outreach; and, RAP implementation. Fourteen BPAC members responded to the list and a summary of their responses is provided in the attached appendix.

5.0 Conclusions

The following are the BPAC's conclusions to implementation agencies, municipalities, and facilities, based on a review of the *Stage 1 Update*, *Stage 2 Recommended Plan*, and BPAC meetings.

- Overall, recommended actions implemented since 1993 have focused principally on the elimination of spills and the design and/or construction of upgraded waste treatment facilities. Key recommended actions behind schedule with regard to implementation include meeting specified requirements for yardstick parameters (especially at priority sources), and reducing non-point source pollution contribution of contaminants. Eliminating or reducing the Cole Drain as a point source of pollution is also a key recommended action which is currently being addressed.
- The habitat protection measures have been ad hoc with no coordinated regulatory or policy framework in either Ontario or Michigan. More work is required in the AOC related to the identification of existing natural habitats for protection, shoreline and wetland protection, greater enforcement of existing regulations, development of regulations relating to the use of small watercraft in shallow marshes, education of landowners, and the control and eradication of exotic species.
- Major weaknesses exist in the total amount of habitat restored and identification of habitats and measures for additional rehabilitation.
- The recommended actions relating to the linkage of urban and rural stormwater control, the reduction in the use of road salt have not yet been acted upon.
- Many point source substances on the yardstick list have not been specifically addressed, other than benzene and toluene.
- Significant work remains to address the issue of water, sediment and biotic impacts from local sources of air emissions.
- Very little improvement has been shown on restrictions on fish and wildlife consumption, restrictions on dredging activities, and beach closings. Despite significant recovery, benthos remain degraded in isolated zones. Bacterial levels remain a significant concern and must be addressed through ongoing source controls.

6.0 Recommendations

The relationship between implementation of recommended actions and improvements in the status of identified impairments to beneficial uses, including their eventual delisting, cannot be determined quantitatively. However, the actions recommended in the Stage 2 - Recommended Plan were defined on the basis of improving overall water, sediment and biota quality in the AOC. As such they were specifically targeted to parameters and sources known to be causing impairments to beneficial uses.

- Implementation of most of the actions is critical to resolving many of the impairments to beneficial uses in the AOC. In particular, reduction or elimination of contaminants from point sources, and spills should result in immediate improvement in those impairments indicated for beach closings and degradation of aesthetics.
- Implementation of non-point source pollution remediation will be reflected principally to beach closings; impairments related to fish and wildlife consumption, degradation of benthos, and restriction on dredging activities are affected by both on-going non-point pollution sources, as well as in-situ sediment condition.

See Stage 2-Recommended Plan for list of impairments and associated contaminants or problems for specific recommendations.

7.0 BPAC membership and alternates

Bob Allen	Bob Fleming	Fred Kemp	Patrick Quain
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Dean Barnett	Tara Founk	Ted Kierstead	Wills Rawana
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Sharon Bender	Rick Gallerno	Bob Lalonde	Frank Schoonover
Steve Bentley	Mike Gariepy	Kristina Lee	Clare Schuerer
Malcolm Boyd	Bob Greene	Tim Lozen	Susan Shink
Donald Cox	Chris Greensmith	Jim Mason	Geoff Smith
Dan Collins	Don Gunning	Colin McLuckie	Ken Smy
Donald Craig	Tip Haagsma	Ronald Miller	Doug Steen
David Cram	Ian Harris	Dan Miskokoman	Bill Trebics
William Darmstaetter	Donald Isaac	Scott Munro	Patricia Troy
Dan DeGrow	John Jackson	Al Norwood	David Webb
Ron Denning	Karen Jamison	Lawrence O'Keefe	Bud West
Victoria Donohue	John Johnson	Larry Osborn	Al Williamson
Paulette Duhaime	Robert Johnston	Jon Parsons	Modris Zandbergs
Lori Eschenburg		Terry Plain	

8.0 References

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Acronyms used in this report

AOC	Area of Concern
BPAC	Binational Public Advisory (Accountability) Council
MDL	Minimum or method detection limit
NPS	Non-Point Source
OMOE	Ontario Ministry of the Environment
PCBs	Polychlorinated Biphenyls
ppb	parts per billion
RAP	Remedial Action Plan
RFA	Requires Further Assessment
SOLEC	State of the Lakes Ecosystem Conference