ST. MARY'S RIVER

REMEDIAL ACTION PLAN

The St. Marys River Area of Concern

Remedial Strategies for Ecosystem Restoration

STAGE 2 REPORT

Environment Canada Environnement Canada

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Ontario Ministry of the Environment

DEQ

ST.MARYS RIVER

REMEDIAL ACTION PLAN

Stage 2: Remedial Strategies for Ecosystem Restoration

December 2002

BPAC

Binational Public Advisory Council
St. Marys River Area of Concern

14 February 2003

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Dear Mr Marsden:

The Binational Public Advisory Council for the St Marys River Area of Concern accepts the Stage II report attached. We're happy to see progress made on the ultimate goal of remediating the legacy of environmental damage to the river. There is a long way to go, but this document shows that some progress has been made. Although there has been a lack of resources directed from some of the government agencies toward the Remedial Action Plan process, we are encouraged by some of the positive steps such as the upgrade to the Sault Ste Marie, Ontario East End Sewage Treatment Plant. We look forward especially to seeing progress on contaminated sediment management plans that incorporate processes and problem areas across the entire St Marys River watershed.

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Toward these ends, we urge the agencies to give high priority to the development of the Technical Implementation Annex. Interested people can consult our website www.lssu.edu/bpac to review our ongoing concerns about the RAP.

Thank you for your efforts at producing the Stage II report and we look forward to working with you and the other partner agencies on furthering the remediation process.

Regards,

Gregory Zimmerman, Chair

ACKNOWLEDGEMENTS

Preparation of the Stage 2 Remedial Action Plan document has involved the dedication and expertise of many individuals from both the Canadian and U.S. sides of the St. Marys River. Completion of this report would not have been possible without the commitment of the Binational Public Advisory Council (BPAC), past and present members, government agency representatives on the RAP team, and volunteers.

The draft document was produced by the former Lake Superior Programs Office with contributions from the following:

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Jim Waybrant	Michigan Department of Natural Resources
John Kelso	Canadian Department of Fisheries and Oceans

Grateful acknowledgements are also extended to the many technical reviewers who provided valuable recommendations and editorial comments, and to the following individuals who were instrumental in the preparation of the final document.

Janette Anderson	Environment Canada
Gail Krantzberg	International Joint Commission
John Marsden	Environment Canada
Ralph Jessup	Environment Canada

Thanks extended to Dr. J.R.M. Kelso of the Department of Fisheries and Oceans for his contribution to the St. Marys River RAP with respect to the development of watershed management plans and the habitat components of this report.

Lake Superior State University has generously provided a BPAC office that serves as a resource centre for the St. Marys River. Reference material pertaining to the AOC and GIS maps of the watershed are available at this location.

In memoriam of Roman Aikens we would like to acknowledge his public service and dedication to protecting the quality of the St. Marys River.

Preface

The RAP process is dynamic, with action plans developed in response to the most current information. This Binational St. Marys River Stage 2 Report represents a suite of activities that will lead to the eventual delisting of the Area of Concern. The report is considered to be a work in progress, based on current information. In some cases, the action plan is to acquire more refined and current information to definitively recommend management actions to restore beneficial uses. The release of this Stage 2 Report at this time is intended to represent a RAP milestone, by providing information to potential implementors, to facilitate partnerships for further actions.

The RAP Implementation Annex, which will be issued subsequently to this Stage 2a Report, will identify the roles, responsibilities, costs, and timelines for RAP implementation.

Finally, it should be noted that the dollar sign, "$", wherever it appears in this report, will denote "$US" when referring to funding from American sources and "$Can" when referring to Canadian sources.

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EXECUTIVE SUMMARY

The St. Marys River was identified in 1985 by the International Joint Commission (IJC) as one of 43 Areas of Concern (AOC) on the Great Lakes for which cleanup or Remedial Action Plans (RAPs) are required. As an international waterway, the St. Marys River requires a cooperative effort between Canadian and U.S. Governments to coordinate the remedial action process. The St. Marys River is one of three binational RAPs developed jointly between Ontario and Michigan, with Environment Canada and the Ontario Ministry of Environment being the lead agencies responsible for its development.

Remedial action planning is a three staged process. The Stage 1 RAP for the St. Marys River described environmental conditions and identified use impairments. The area was originally classified as an AOC because of problems associated with phosphorus, bacteria, oil and grease, heavy metals, trace organics, contaminated sediments, fish consumption advisories, and impacted biota. Stage 1 was reviewed by federal, state, and provincial agencies and the IJC.

The Stage 2 document outlines a strategy to remediate the impaired beneficial uses and defines a set of criteria to measure progress toward delisting the AOC. It contains, in addition to a large number of restoration and monitoring actions already underway, descriptions of approximately sixty recommended actions to restore the beneficial uses. These actions address issues such as: the control of industrial and municipal point sources, a management program for sediment remediation, the restoration of fish and wildlife habitat, monitoring the effectiveness of restoration activities and progress toward delisting, and finally, the need to transfer information about the RAP to interested citizens and communities.

A. Impaired Beneficial Uses

The St. Marys River was designated an AOC because 9 of the 14 beneficial uses defined by the Great Lakes Water Quality Agreement were impaired. The following abridgment of Table 2.1 summarizes the current status of beneficial use impairments for this area. Ambient water quality is not recognized as a formal use impairment under the Water Quality Agreement; however, the natural high quality water that enters the St. Marys River from Lake Superior was established by the BPAC as the minimum water quality standard to be achieved throughout the river system to its outflow into Lake Huron.

Table E.1 - Summary of Impairments to Great Lakes Water Quality Agreement Beneficial Uses in the St. Marys River Area of Concern

(I = impaired; NI = not impaired; RFA = requires further assessment)

Beneficial Use Impairment	Status	Conditions in the St. Marys River
Restrictions on Fish and Wildlife Consumption		
(a) Restriction on fish consumption	I	In Ontario and Michigan, mercury and PCB contamination has resulted in fish consumption advisories for chinook salmon, walleye, yellow perch, longnose suckers, northern pike, channel catfish, and carp.
(b) Consumption of wildlife	NI	No AOC specific advisories are in effect. However, OMNR has issued an advisory, throughout Ontario, against the consumption of kidneys and liver from moose, black bear, and deer.
Tainting of Fish and Wildlife Flavour	NI	Tainting of fish from the St. Marys River is not common.
Degradation of Fish and Wildlife Populations		
(a) Dynamics of fish populations	I	Populations of native fish have been reduced due to habitat alteration, over fishing, pollution, exotic species, and stocking. The St. Marys River is also the major contributor of sea lamprey infestation to northern Lake Huron, which accounts for an annual mortality of 54% of adult lake trout. Zebra mussels have also been discovered in the St. Marys River.
(b) Body burdens of fish	I	Evidence indicates that chemicals with hepatic mixed function oxidase (MFO) inducing potential (eg., PAHs and PCBs) are present in the St. Marys River below the power dam. The condition reflects localized contamination of the sediments, water, and benthic invertebrates. The presence of dehydroabletic acid (DHA) indicates the bioaccumulation of resin acids as a result of exposure to the pulp mill effluent.
(c) Dynamics of wildlife populations	RFA	Extensive development on both sides of the river has resulted in the degradation and loss of aquatic and terrestrial habitat. The potential effect of this development on birds, mammals, and other animals has not been well documented. Wildlife populations appear to be stable or increasing, but assessment criteria are required.
(d) Body burdens of wildlife	RFA	Mercury and PCB (Aroclor) concentrations have been detected in waterfowl breast meat, however there is no criteria for assessment. Eggs from herring gull, black tern, and common tern nests should be analyzed.
Fish Tumours and Other Deformities	I	White suckers sampled from the St. Marys River exhibited liver tumour prevalence in excess of 9%, likely associated with exposure to chemical contaminants, such as PAHs in contaminated sediments. Liver cancers have also been identified in brown bullheads from Munuscong Bay.
Bird and Animal Deformities or Reproductive Problems	RFA	A full assessment of bird and animal populations has not been accomplished.

Beneficial Use Impairment	Status	Conditions in the St. Marys River
Degradation of Benthos		
(a) Dynamics of benthic populations	I	On the Ontario side, benthic communities are moderately impaired downstream of the Algoma Slag site. Impairment also occurs on both sides of the Lake George Channel, within Little Lake George, and at the north end of Lake George.
(b) Body burdens of benthic organisms	I	Elevated PAH levels were noted in mussels placed downstream of the Algoma Slip and also in those exposed to sediments along the Algoma Slag Dump shoreline. Arsenic, mercury, and PCBs have also been observed to bioaccumulate in benthic organisms.
Restrictions on Dredging Activities	I	Sediments from navigational portions of the following sites exceed OMOE or U.S. EPA disposal guidelines: the Algoma Slip, the Algoma Slag Dump site, Lake George Channel, Little Lake George, northern half of Lake George, Cannelton Industries waste site, the head of the St. Joseph and West Neebish Channels, and Lake Munuscong.
Eutrophication or Undesirable Algae	I	Eutrophication and algae are an issue in the vicinity of the East End Water Pollution Control Plant. This could be alleviated through implementation of secondary treatment at the plant.
Restrictions on Drinking Water Consumption or Taste and Odour Problems		
(a) Consumption	NI	Treated water consumption has never been restricted in the AOC. All drinking water obtained from surface waters requires standard treatment. See however, section 7.3 and Action NPSM-10 in section 5.4.
(b) Taste and odour problems	NI	Taste and odour problems have not been reported.
Beach Closures	I	E. coli bacterial densities in excess of the PWQO and MWQS occur in Ontario and Michigan waters downstream of storm sewers, combined sewer overflows, industrial outfalls, and the East End WPCP.
Ambient Water Quality	I	Ambient water quality is not recognized as a beneficial use impairment; however, water quality is to be reflected as a goal in the Stage 2. Water leaving the St. Marys River should be as clean as that coming in.
Degradation of Aesthetics	I	Oil slicks downstream of the Algoma Slip and Terminal Basin have occurred. Oily fibrous material mixed with woody debris anecdotally occurs along the Ontario shoreline. Oil spills from ships or accidents that release chemicals to the river are a threat in the AOC. Aesthetic impairment also exists downstream of the East End WPCP.
Added Cost to Agriculture and Industry	NI	None documented.
Degradation of Phytoplankton and Zooplankton	NI	Open water community structure and densities reflect Lake Superior.

Beneficial Use Impairment	Status	Conditions in the St. Marys River
Loss of Fish and Wildlife Habitat	I	Significant loss of fish and wildlife habitat has occurred as a result of shoreline alteration, industrialization, urbanization, and shipping activities, particularly within and immediately above and below the St. Marys rapids. The unnatural flow regime resulting from the present operation of the the gated, flow-control structure at the head of the rapids has resulted in changes to the biological integrity and productive potential of the remaining rapids habitat. Also, specific habitats throughout the river are now threatened by colonization of exotic species such as purple loosestrife, Eurasian fish species, zebra mussels and other exotic invertebrates.

B. Public Involvement

The Binational Public Advisory Council (BPAC) was formed in 1988 to provide informed and continuous public participation in the St. Marys River RAP. The citizen-based group represents interests from both Ontario and Michigan. Members work with and advise RAP participants on key aspects of the planning process.

A number of workshops were held in support of the Stage 2 process to ensure broad based public involvement in RAP development. As a result, the BPAC and RAP participants developed a set of water use goals and delisting criteria for the St. Marys River AOC. The goals represent a wide variety of environmental principles, which must be considered with future development along the shores of the St. Marys River, to ensure that river water quality and the overall ecosystem are protected and enhanced for all users. The delisting criteria will be used to guide the development of remedial actions, preventative measures, and regulatory programs, and to direct monitoring efforts in the AOC. These guidelines will also assist in measuring the progress towards achievement of water use goals and alleviating use impairments.

In addition, four task teams were formed to develop strategic plans for the restoration of impaired beneficial uses. Task team participants, including agency and BPAC representatives, examined *Point Sources* of contamination, *Education and Reporting* programs, *Clean Up and Restoration* of contaminated sediments, and *Flora and Fauna* habitat issues in the AOC. The principle findings and recommendations of the task teams have been incorporated into the Stage 2 report.

C. Industry Involvement

Algoma Steel Inc. (ASI) recently signed a three party Environmental Management Agreement (EMA) with Environment Canada and the Ontario Ministry of Environment. In this voluntary agreement, ASI has agreed to undertake a number of initiatives addressing issues such as benzene and polynuclear aromatic compounds reduction, polychlorinated biphenyl and mercury removal, blast furnace visible emissions reduction,

boat slip remediation, solid waste management plans, and participation in a steel sector wide initiative regarding the implementation of a Code of Practice.

Another major local industry, St. Marys Paper, has also demonstrated a commitment to environmental objectives by investing $14 million in an activated sludge secondary treatment facility. Likewise, Cannelton Industries Inc. has completed a number of clean up activities to remediate the former tannery site. These include the excavation of 33,000 tons of tannery waste materials and contaminated soils to off site solid waste disposal facilities, construction of surface drainage works, a shoreline berm to prevent erosion, and seeding and mulching to revegetate the site.

D. Achievements

The following actions and commitments indicate clearly the high degree of determination among stakeholders to restore the impaired beneficial uses in the St. Marys River AOC:

(1) *Point Source Pollution Restoration and Protection Measures*

Algoma Steel Inc.:

- Commissioning of a main filtration plant in 1990, at a cost of $20 million, to reduce suspended solids and phenols
- Signing of Letter of Commitment to $45 million in environmental improvements
- Process improvements including basic oxygen furnace emissions project ($21million), blast furnace contact water recirculation facility ($14 million), biological treatment plant that eliminates phenols and cyanide from coke oven wastes ($2 million), and fixed ammonia removal system
- Established air quality monitoring station to record dustfall and total suspended particulates
- Implemented street washing program for residents near coke ovens and enhanced dust control measures with use of dust suppressants and paving
- Recently signed the three party Environmental Management Agreement (EMA) with Environment Canada and the Ontario Ministry of Environment.

St. Marys Paper Ltd.:

- Activated sludge secondary treatment facility completed in 1995, at a cost of approximately $14 million, resulting in reduced BOD and suspended solid levels
- Installed scrubbers to eliminate particulate emissions from two boilers

Water Pollution Control Plants:

- Continuous phosphorus removal system added to East End Water Pollution Control Plant

- New sludge handling facilities added to East End Plant
- East End Plant now being upgraded to secondary treatment under the $60 million Canada-Ontario Infrastructure project described below.

Combined Sewer Overflows:

- Commitment of $25 million from Sault Ste. Marie, Michigan to a project that will eliminate combined sanitary and storm water sewers in its wastewater treatment system.
- Phase A of the project has been completed ($8 million) and has resulted in the closing of two combined sewer overflow outfalls.
- Phase B underway ($6.5 million) and will result in the closing of two more outfalls.
- In 1997, the city of Sault Ste. Marie, Ontario embarked on an aggressive five year voluntary abatement plan to improve the existing sewage collection system. To date, initiatives have totaled $1.1 million.
- Work is also under way on a $17 million program, to be completed in 2002, that will result in the re-routing of sewers and upgrades to two sewage pumping stations and sewage containment tanks. This program is part of a new $60 million Canada-Ontario Infrastructure project through which the City of Sault Ste. Marie, Ontario will install sewage overflow tanks, make upgrades to increase primary treatment capacity, add secondary treatment to the East End water pollution control plant and rehabilitate sewers in areas of high infiltration.

(2) *Non Point Source Pollution Restoration and Protection Measures*

Contaminated Sediments:

- Pilot test of chemical injection system to treat contaminated sediments was completed.
- Sault Ste. Marie, Ontario invested $1.98 million in the relocation of Trader's Metal to clean up and beautify the St. Marys River waterfront.
- Air quality monitoring program in vicinity of Algoma steel (atmospheric deposition)
- Remediation of Cannelton Industries Superfund site

(3) *Restoration and Protection Measures for Flora and Fauna*

- St. Marys Rapids hydrology study
- Little Rapids restoration project
- Geozone mapping of the AOC
- Sea lamprey control
- Enhanced fish access to Munuscong Bay Waterfowl Sanctuary
- Formation of St. Marys River Fisheries Task Group

E. Recommendations to Eliminate Remaining Beneficial Use Impairments

Restoring beneficial uses to the St. Marys River AOC requires a cooperative effort by government, industry, and the public, aimed at reduction or cessation of impacts on the ecosystem and rehabilitation of historically degraded sites. The following table summarizes the main recommended actions for the restoration and protection of the St. Marys River. Note that the remediation and monitoring actions are grouped separately and in each case are listed in the same order in which they appear in the report. General reporting and education actions and management actions are listed at the end of the table.

Table E.2 - Summary of Recommended Actions for the St. Marys River AOC

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Restrictions on Fish and Wildlife Consumption	**--------- Remediation Actions --------** · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. **-------- Monitoring Actions ---------** · **Action NPSM-2:** Aerial Monitoring of the Cannelton Industries Site · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain · **Action FFM-3:** Fish Harvest Survey · **Action FFM-4:** Continue with sport fish contaminant monitoring programs in the St. Marys River and tributaries.
Degradation of Fish and Wildlife Populations	**--------- Remediation Actions --------** · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. · **Action NPS-1**: Develop a multi-agency sediment management program for the river to address remedial options and implement actions for contaminated sediments, including long-term sediment contamination studies. For details on this high priority action see section 5.3 of the Stage 2 Report. · **Action NPS-4:** Identification and Control of Contaminant Inputs from the Algoma Slag Dump (including stabilization of shoreline and nearshore sediments) · **Action NPS-7:** Remediation for Contaminated Terrestrial and Aquatic Disposal Sites · **Action FF-7:** Continue with St. Marys River Fishery Task Group efforts to develop a 10 year assessment program for the river. · **Action FF-8:** Continue to support sea lamprey control efforts. **--------- Monitoring Actions ---------** · **Action PSM-6:** Monitor the receiving water every three years at St. Marys Paper Ltd. to document response of fish communities to improved effluent quality as mill

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Degradation of Fish and Wildlife Populations (continued)	upgrades and process improvements are implemented. · **Action PSM-8:** Monitor the Short Term Variability and Monthly Ranges of Contaminant Discharges from Water Pollution Control Plants in the AOC · **Action NPSM-2:** Aerial Monitoring of the Cannelton Industries Site · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain · **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways · **Action NPSM-11:** Assess the Potential Hazards Associated With Spills from Shipping Vessels · **Action FFM-5:** Complete a Canadian Wildlife Survey assessment of common tern and black tern populations for the entire St. Marys River. · **Action FFM-6:** Analyze contaminant levels in eggs from herring gull, black tern, and common tern nests in the AOC. · **Action FFM-7:** A monitoring program should be developed to assess change in fish and wildlife populations in the AOC in response to habitat enhancement efforts.
Fish Tumours and Other Deformities	---------- **Remediation Actions** -------- · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. · **Action PS-7:** Continue with process improvements at industrial and municipal facilities. · **Action NPS-1:** Development of a Multi-Agency Sediment Management Program · **Action NPS-4:** Identification and Control of Contaminant Inputs from the Algoma Slag Dump (including stabilization of shoreline and nearshore sediments) ---------- **Monitoring Actions** ---------- · **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways · **Action FFM-1:** Identify the Causes of Fish Tumours and Other Deformities Which Originate Within the AOC
Bird and Animal Deformities or Reproductive Problems	---------- **Monitoring Actions** ---------- · **Action FFM-8:** Reproductive assessments of herring gulls, black terns, and common terns should be done within the AOC boundary. Deformities should be assessed in common terns in the St. Marys River.
Degradation of Benthos	---------- **Remediation Actions** ---------- · **Action NPS-1**: Develop a multi-agency sediment management program for the river to address remedial options and implement actions for contaminated sediments, including long-term sediment contamination studies. For details on this high priority action see section 5.3 of the Stage 2 Report. · **Action NPS-2**: Conduct further studies to characterize sediment quality in high priority areas (ie., adjacent to Algoma Slag Dump, portion of Little Lake George Channel downstream of East End WPCP, and the Algoma Slip). · **Action NPS-3**: Complete sediment chemistry analysis and benthic community assessment as part of the *St. Marys River Contaminated Sediment Zones Evaluation* (Kauss 1999b)

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Degradation of Benthos (continued)	· **Action NPS-5**: Algoma Steel Inc. has removed sediments from the slip during maintenance dredging operations. Therefore, further sediment quality and benthic community assessments should be made to determine the effectiveness of contaminant removal and to determine the need for further dredging. ---------- **Monitoring Actions** ---------- · **Action PSM-1:** Long-Term Water Monitoring at the Cannelton Industries Site · **Action PSM-6:** Monitor the receiving water every three years at St. Marys Paper Ltd. to document response of benthic communities to improved effluent quality as mill upgrades and process improvements are implemented. · **Action NPSM-1**: Monitor effluent from East End Water Pollution Control Plant for concentrations and loadings of persistent contaminants exceeding guidelines in Lake George Channel sediments. · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain · **Action NPSM-5**: Re-sample river sediments every five years to obtain trend with time information. · **Action NPSM-6**: Periodically conduct benthic, toxicity, and sediment chemistry studies in the Bellevue Marine Park area.
Restrictions on Dredging Activities	---------- **Remediation Actions** ---------- · **Action NPS-1**: Develop a multi-agency sediment management program for the river to address immediate dredging needs. For details on this high priority action see section 5.3 of the Stage 2 Report. · **Action NPS-5:** Evaluate sediment quality and quantity in the Algoma Slip to determine need for further dredging. ---------- **Monitoring Actions** ---------- · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain
Eutrophication or Undesirable Algae	---------- **Remediation Actions** ---------- · **Action PS-3:** Upgrade East End Water Pollution Control Plant to secondary treatment. · **Action NPS-6**: Control non point source pollution from agricultural activities. ---------- **Monitoring Actions** ---------- · **Action NPSM-8:** Monitor Non-Point Sources of Pollution in the AOC

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Ambient Water Quality	**---------- Remediation Actions ----------** · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. · **Action PS-2:** Reduce storm water infiltration to prevent sewage bypasses. · **Action PS-3:** Upgrade East End Water Pollution Control Plant to secondary treatment. · **Action PS-5:** Address contaminants in storm water discharge system by source control, air quality control, and pollution prevention education programs. · **Action PS-6:** Continue with Clean Water Regulation (Canada) and National Pollutant Discharge Elimination System (US) Programs for industrial dischargers. · **Action PS-7:** Continue with process improvements at industrial and municipal facilities. · **Action PS-8:** Continued work on CSOs in Sault Ste. Marie Mich. · **Action NPS-1:** Development of a Multi-Agency Sediment Management Program · **Action NPS-7:** Remediation for Contaminated Terrestrial and Aquatic Disposal Sites · **Action NPS-8:** Plan and Implement Appropriate Remediation, Protection, and Enforcement Actions to Remove Any Potential Public Health Risks Identified by Action NPSM-10 **---------- Monitoring Actions ----------** · **Action PSM-1:** Long-Term Water Monitoring at the Cannelton Industries Site · **Action PSM-3:** Ambient Water Monitoring in the St. Marys River · **Action PSM-7:** Design and implement monitoring system for storm water. · **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways · **Action NPSM-10:** Assess Health Risks to Communities and Individuals Taking Their Water From the "Down-River" Regions of the St. Marys River System · **Action NPSM-11:** Assess the Potential Hazards Associated With Spills from Shipping Vessels
Beach Closings	**---------- Remediation Actions ----------** · **Action PS-2:** Reduce storm water infiltration to prevent sewage bypasses. · **Action PS-3:** Upgrade East End Water Pollution Control Plant to secondary treatment. **---------- Monitoring Actions ----------** · **Action NPSM-7:** Assess potential human health risks resulting from floating contaminated masses near, and downstream from, Bellevue Marine Park.

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Degradation of Aesthetics	**---------- Remediation Actions ----------** · **Action PS-4:** Relocate discharge pipe from East End Water Pollution Control Plant to deeper, faster moving water in the Lake George Channel in order to improve dispersion of discharge plume. · **Action PS-9:** Algoma Steel to Limit Discharges from its Dekish Operation · **Action FF-9**: The Algoma Slag Dump shoreline is an eyesore. Shoreline stabilization and providing habitat for plant growth (eg., via soil addition) would help to soften and stabilize the landscape. **---------- Monitoring Actions ----------** · **Action PSM-2:** The Sault Ste. Marie, Michigan Air Quality Monitoring Project · **Action PSM-4:** The Sault Ste. Marie, Ontario Air Quality Monitoring Project · **Action PSM-5:** Monitoring of Particulate Emissions at Algoma's Dekish Operation
Loss of Fish and Wildlife Habitat	**---------- Remediation Actions ----------** **Action NPS-6**: Control non point source pollution from agricultural activities and road crossings on tributaries. **Action NPS-7:** Remediation for Contaminated Terrestrial and Aquatic Disposal Sites **Action FF-1:** *Walleye recovery in the Bar River:* · Mitigate the effects of land use practices upstream of historic walleye spawning grounds. · Use stabilizing structures, contour streambanks, plant trees along the shoreline, and provide exclusionary fencing to restrict livestock access to river. **Action FF-2:** *Watershed Development Plan for Bennett and West Davignon Creeks (See Table 6.1)* **(a)** Maintain headwater reaches in natural state **(b)** Restrict development within 30m of shoreline **(c)** Plant trees in riparian zone **(d)** Restrict livestock access to stream **(e)** Assist passage of migratory salmonids by enhancing migratory pathways while excluding sea lamprey passage (see **(n)**) **(f)** Create spawning and nursery habitat **(g)** Naturalize Diversion Channel **(h)** Prevent seepage of petroleum products into aquifer to protect groundwater quality **(i)** Design and implement soil remediation projects for inactive parcels of land on Algoma Steel property **(j)** Algoma to work with OMOE in addressing specific contamination issues **(k)** Increase habitat quality and migration pathways in Diversion Channel with instream modifications. **(l)** Optimize volume of flow between Diversion Channel and Bennett and West Davignon Creeks **(m)** Maintain migratory pathways **(n)** Exclude passage of sea lamprey **(o)** Adhering to buffer strip guidelines and continued restrictions on development

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Loss of Fish and Wildlife Habitat (continued)	**(p)** Provide alternative water sources for livestock **(q)** Streambank stabilization **(r)** Construct retention ponds or man-made wetlands to reduce effects of storm water discharge **(s)** Continued wetland development to improve salmonid staging habitat and provide for waterfowl and other wildlife **(t)** Maintenance of riparian buffer zone contiguous with a forested area no less than 1000 ha **(u)** Reforestation of inactive agricultural lands **(v)** Tree planting along top of Diversion Channel **(w)** Enhance wetland forming off mouth of Diversion Channel **Action FF-3:** *Watershed Development Plan for East Davignon and Fort Creeks etc.:* A watershed plan similar to Action FF-2 should be developed for East Davignon and Fort Creeks, *Root River, Crystal Creek, and the Big and Little Carp Rivers.* **Action FF-4:** *Munuscong River/Bay: Sedimentation Reduction* Several key non point source pollution control projects to reduce sedimentation in the river and in Munuscong Bay (e.g., stabilization of eroding streambanks at Stirlingville Bridge site and at Pickford). **Action FF-5:** *Mission Creek:* Complete hydrogeological and waste characterization study to be completed, including a feasibility study for the removal of waste and restoration of the natural flow of the creek. **Action FF-6:** *Rapids Habitat:* (A number of options have been presented for the remediation of rapids habitat and associated wetlands.) **(a)** Protect remnant rapids habitat from further reduction and degradation and maximize the productive capacity of the rapids area **(b)** Enhance remnant rapids habitat by placing additional spawning substrate in rapids area - map existing substrate, identify target fish species assemblages, and note areas likely to become dewatered under differing flow conditions **(c)** Create new rapids areas elsewhere in the St. Marys River, especially in the Little Rapids area - identify areas with the hydrologic and physical characteristics to support rapids generation **(d)** Create alternative to rapids habitat such as artificial spawning substrate **(e)** Create wetlands downstream of Whitefish Island to connect wetland habitat to adjacent remnant rapids **(f)** Create new wetland/rapids complexes **(g)** Enhance habitat and water quality in tributary watersheds **Action FF-7:** *Fisheries Assessment:* **(a)** Mortality rates for walleye, northern pike, and yellow perch require further assessment. **(b)** Continue with St. Marys River Fishery Task Group efforts to develop a 10 year assessment program for the river. **Action FF-8:** Continued Support for Sea Lamprey Control Efforts **Action FF-9:** Stabilize shoreline of Algoma slag dump to provide habitat for plants

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Loss of Fish and Wildlife Habitat (continued)	**---------- Monitoring Actions ----------** **Action PSM-1:** Long-Term Water Monitoring at the Cannelton Industries Site **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways **Action NPSM-11:** Assess the Potential Hazards Associated With Spills from Shipping Vessels **Action FFM-2:** Continued support for the Marsh Monitoring Program **Action FFM-7:** A monitoring program should be developed to assess change in fish and wildlife use of the AOC in response to habitat enhancement efforts. **Action FFM-9:** Evaluate Influence of Water Levels and Flows on Spawning and Production **Action FFM-10:** Determine Minimum Water Levels and Flow Rates Necessary for Spawning **Action FFM-11:** Monitoring Water Quantity
General Actions Relating to Reporting, Education, Human Health, and Management	
General Reporting and Education Actions	**Action RE-1:** Revitalizing Public Understanding and Involvement in Remediation Activities **Action RE-2:** Communication of Any Identified Health Risks Resulting from Adverse Effects to First Nations/Native American Water Supplies or Lands **Action RE-3:** Identify, Track, and Publicize Implementation Activities Within the AOC **Action RE-4:** Raise Public Awareness of Environmental Health Concerns **Action RE-5:** Quantify the Economic Benefits of a Healthy Natural Ecosystem
Actions Relating to Human Health	**Action NPSM-10:** Assess Health Risks to Communities and Individuals Taking Their Water From the "Down-River" Regions of the St. Marys River System **Action NPSM-12:** Identify Locations Within the AOC Which are Associated With Elevated Levels of Human Health Disorders
General Management Actions	**Management Action MNG-1:** It is recommended that a workshop session, or series of sessions be convened which will produce a set of precise, objectively defined delisting criteria that are numerically quantified wherever possible, and which will provide the necessary decision framework that will govern the delisting of each impaired beneficial use and ultimately the delisting of the AOC itself.

Beneficial Use Impairment	*Recommendations for the Restoration of Beneficial Uses** and for the Associated Monitoring Activities
General Management Actions (continued)	**Management Action MNG-2:** It should also be noted that monitoring activities which track progress toward delisting must, in large measure, be determined by those very same criteria which define the delisting process itself. Consequently, modifications or additions to the delisting criteria, such as those which are recommended under management action MNG-1 will likely require corresponding changes to the monitoring activities. It is recommended, therefore, that a workshop session, or series of sessions also be convened to establish the necessary coordination between the overall monitoring strategy and the revised delisting criteria resulting from Action MNG-1.

* The recommended actions are labeled as follows:

Action PS-n denotes the n-th point source (PS) recommended action (see section 4.3).

Action NPS-n denotes the n-th non-point source (NPS) recommended action (see section 5.3)

Action FF-n denotes the n-th flora and fauna (FF) recommended action (see section 6.3).

Action RE-n denotes the n-th reporting and education action (see section 7.3).

Action MNG-n denotes the n-th management recommended action.

Monitoring recommendations for point sources, non-point sources, and flora and fauna are denoted by **Action PSM-n, Action NPSM-n,** and **Action FFM-n**, respectively (see sections 4.4, 5.4, and 6.4 respectively).

1.0 INTRODUCTION

1.1 Stages of the Remedial Action Plan

The *Great Lakes Water Quality Agreement of 1978* (GLWQA) (revised 1987), provides general and specific water quality objectives to restore, protect, and maintain the Great Lakes Basin Ecosystem. The agreement affirms the determination of Canadian and U.S. Governments to adopt an ecosystem approach to planning, research, and management of the Great Lakes and connecting channels. As a result, participating federal, state, and provincial agencies, in cooperation with the International Joint Commission (IJC), identified 43 degraded areas on the Great Lakes as specific Areas of Concern (AOC), for which cleanup or Remedial Action Plans (RAPs) are required.

The RAP program was initiated in 1985 as a recommendation by the Great Lakes Water Quality Board. Eight Great Lakes states and the Province of Ontario committed themselves to developing and implementing remedial action plans in each AOC within their political boundaries. As an international waterway, the St. Marys River requires a cooperative effort between Canadian and U.S. Governments to coordinate the remedial action process. The St. Marys River is one of three binational RAPs developed jointly between Ontario and Michigan, with Environment Canada and the Ontario Ministry of Environment being the lead agencies responsible for its development. The Canadian RAP program is guided by the *Canada-Ontario Agreement* respecting the Great Lakes Basin Ecosystem. The cooperation and involvement of Environment Canada, the Ontario Ministry of Environment, the U.S. Environmental Protection Agency, the Michigan Department of Environmental Quality, the Department of Fisheries and Oceans , the Ontario Ministry of Natural Resources, and the Michigan Department of Natural Resources is fundamental to this procedure.

Remedial action planning is a three staged process. The Stage 1 RAP for the St. Marys River described environmental conditions and identified use impairments. The area was originally identified as an AOC in 1985 because of problems associated with phosphorus, bacteria, oil and grease, heavy metals, trace organics, contaminated sediments, fish consumption advisories, and impacted biota. Stage 1 was reviewed by federal, state, and provincial agencies and the IJC. The Stage 2 document outlines various strategies for remediation and evaluates existing remedial efforts. Resolutions developed herein lay the groundwork for the third stage, which monitors the path of remediation in the AOC, documenting progress, and updating remedial efforts. An integral part of Stage 3 is the monitoring effort and the means employed (eg., biological community properties, restoration of habitat function, sediment and water chemistry sampling) to assess ecosystem recovery. Recognizing that the process is a dynamic one, RAP participants must be willing to acknowledge any deficiencies that arise at each stage and act accordingly to modify remedial strategies.

The *Great Lakes Health Effects Program* (GLHEP) of Health Canada worked with RAP participants on the integration of human health considerations into the development of all area

RAPs. In the U.S., the *Agency for Toxic Substances and Disease Registry* (ATSDR) addresses human health effects from exposure to contaminants in the Great Lakes. The Binational Ecosystem Objectives Working Group for Lake Superior has also produced human health objectives and developed indicators of progress in remediating health related impairments. These lake-wide objectives and indicators, however, are broader in scope than those of the St. Marys River AOC.

1.2 Role of Agencies in the St. Marys River RAP

Under the protocols of the *Great Lakes Water Quality Agreement*, Environment Canada, the Ontario Ministry of the Environment, the U.S. Environmental Protection Agency, and the Michigan Department of Environmental Quality (hereafter referred to as the Four Agencies) signed a Letter of Commitment (April 17, 1998) to the restoration of this binational AOC. This Four-Party Agreement states that Environment Canada and the Ontario Ministry of the Environment have the primary responsibility for the administration of the shared activities for the St. Marys RAP.

The Four Agencies, recognizing the mutual benefits of cooperating on matters of binational interest, agree that restoration of the boundary waters cannot be achieved independently by any one agency and that each of the Four Agencies must be accountable to their citizens for continued environmental improvement and protection. The Four Agencies recognize that part of the shared accountability is to promote RAP implementation and to persuade other implementors to undertake remedial work within the appropriate jurisdiction. This means that the Agencies are committed to ensuring that stakeholder and public involvement is an integral part of the RAP process.

To delist the St. Marys River AOC, the Four Agencies have the responsibility to coordinate the development and review of measurable and achievable delisting criteria. In addition, the Agencies recognize the need for monitoring and surveillance efforts to track progress towards delisting the AOC.

The active participation of all four agencies is paramount to the cleanup of this binational AOC. This is best demonstrated by empowering local participation, facilitating implementation activities, actively pursuing solutions to problems, defining research needs, and by recognizing successes through the transfer of information and methodologies. The Four Agencies acknowledge that, as defined in the GLWQA, the federal governments have committed to cooperate with state and provincial governments in the development and implementation of binational RAPs.

In February of 2000, the Four Agencies finalized a "Compendium of Position Papers," addressing roles and responsibilities for administration, binational delisting, public involvement and outreach, and progress reporting.

The Administration paper establishes a management, working group, and ad hoc technical committee structure. This consists of a Four-Agency Management Committee, to perform oversight and monitor RAP progress and a Technical Working Group to coordinate State, Provincial, and Federal resources for restoration of the Areas of Concern. In addition, Ad-Hoc Technical Teams will be formed on an as needed basis to resolve technical issues and review RAP documents.

The Binational Delisting paper sets out a process to delist individual beneficial use impairments and to delist the shared Areas of Concern once restoration has occurred. The Four Agencies will coordinate and facilitate monitoring to track site progress under this commitment.

The Public Involvement and Outreach paper outlines activities to maintain public interest in local water quality issues. The Four Agencies will facilitate funding and partnership opportunities to restore the shared Areas of Concern and build broad community support for RAP implementation.

The Progress Reporting paper describes the format, defines responsibilities, ensures distribution, and provides timetables for biennial progress reports to the International Joint Commission and the public. These biennial progress reports will describe the current status of areas of concern and progress toward achieving delisting criteria and restoring beneficial use impairments.

The *St. Marys River Area of Concern, Michigan Progress Report* was completed in November, 1999, and parts of that report have been used to complete this stage two document.

The Compendium of Position Papers is available from:

Michigan Department of Environmental Quality
Surface Water Quality Division
Storm Water and Remedial Action Unit
P.O. Box 30273
Lansing, MI 48909
517-241-7734

It is also available on the Internet at the following website:
http://www.on.ec.gc.ca/glimr/raps/connecting/detroit/detroit_compend12.pdf

1.3 Public Involvement

Public participation is a critical part of the RAP process. The goal of public involvement is to ensure that the remedial action plan responds to community needs and enjoys a high level of support for implementation. As part of this involvement, the Binational Public Advisory Council

(BPAC) for the St. Marys River RAP has provided the information contained in the following sub-sections.

(A) Binational Public Advisory Council – St. Marys River

The Remedial Action Plan process began in 1985 with the identification of Areas of Concern in the Great Lakes basin by the International Joint Commission. As part of this process, a central Binational Remedial Action Plan Committee was formed in 1987. The committee was comprised of representatives from the Ontario Ministries of the Environment and Natural Resources, the Michigan Department of Natural Resources, the United States Environmental Protection Agency, and Environment Canada. The RAP team was charged with the development of plans to address contaminated conditions at several of the Areas of Concern including the St. Marys River.

Annex 2 of the Great Lakes Water Quality Agreement states that "The Parties (Canada and the United States), in cooperation with State and Provincial governments, shall ensure that the public is consulted in all actions undertaken pursuant to this Annex." Recognition of the importance of this provision prompted the St. Marys River RAP Team to form the Binational Public Advisory Council (BPAC) during the fall of 1988. The particular role of the BPAC was to provide advice on public opinion and views regarding the remedial action plan. The charter of the BPAC called for equal representation from both Canada and the United States for the following categories:

- Environment
- Recreation/tourism
- Industry/shipping/small business
- Labour
- Fisheries
- Municipalities
- Academic
- Elected officials
- Citizens at large
- Public health
- Native peoples

During the 14 years that BPAC has been in existence, there have been representatives from all the categories listed above. A core of long term members (referring to themselves as "die-hards") has remained dedicated throughout that time period. A list of current BPAC members can be found in appendix one.

The BPAC's adopted charge is as follows:

> The BPAC shall comment on and advise the RAP Team on key aspects of RAP preparation and implementation. This includes: the goals of the plan, problems to be

addressed, water uses to be restored, planning methodology, technical data, remedial action alternatives, plan recommendation, and plan implementation. The goal of the BPAC is to arrive at a plan which both BPAC and the RAP Team can come to a consensus on, and for which there is broad public support and commitment.

BPAC members shall relay relevant RAP information and decisions to members of the groups they represent and, where appropriate, shall seek ratification of BPAC resolutions by groups within their constituencies.

In addition, U.S. and Canadian BPAC members have been appointed to the Statewide Public Advisory Council (SPAC) and the Ontario Public Advisory Council (OPAC) respectively. These organizations have been advocates for the collective RAPs and Public Advisory Committees.

(B) BPAC Achievements

The BPAC has met on a scheduled basis (most routinely as quarterly meetings) since 1988. The BPAC as a group participated and helped produce the following products during the 14 years of existence:

- *Identification of Impairments and Conditions* – The BPAC assisted in identifying those impairments in the AOC which formed the basis of the investigations for the Stage 1 Report published in March 1992. As part of that process, the BPAC participated with the RAP Team in public workshops and working sessions.

- *Development of Water Use Goals* – The BPAC played a crucial role in the development and adoption of water use goals for the St. Marys River. In December of 1992, the Ontario Ministry of the Environment sponsored a Goals and Objectives Workshop to facilitate public and agency feedback. The goals were subsequently adopted by the BPAC and form the desired endpoint of efforts to restore the impaired beneficial uses of the river and eventually to delist the river's Area of Concern status.

- *Identification of Remediation Needs and Options* – Following submission of the Stage 1 Report, an effort was made to examine the various strategies available for remediation of the beneficial use impairments and to achieve the water use goals. RAP task teams were developed to concentrate expertise of the agencies and BPAC members to examine *Point Sources* of contamination, *Education and Reporting* programs, *Clean Up and Restoration* of contaminated sediments, and *Flora and Fauna* habitat issues in the AOC. The resulting reports of the RAP task teams have been incorporated into the Stage 2 Report and form the means by which the beneficial uses can be restored and water use goals can be achieved.

- *Assessment of Community Programs and Projects* – BPAC has been making efforts to partner with other citizen groups that strive to protect and restore the ecosystem of the St. Marys River and communities. As part of that effort, BPAC has been compiling and

updating lists of programs and projects in the region which can be supported to achieve the goals of the RAP. This priority list of projects has been incorporated into the Lakewide Management Plan (LaMP) for Lake Superior and has been presented to various agencies to be included in their program plans.

- *Development of Delisting Criteria* – In March 1999, a workshop was held to develop delisting criteria. BPAC members along with Canadian and U.S. government agencies, tribal and first nations, academics, industry, and St. Marys River area residents worked to define appropriate and concise endpoints to be achieved before the Area of Concern can be delisted.

- *Establishment of BPAC Office and Library* – The BPAC was greatly encouraged and revitalized with the establishment of an office and library at the Gale Gleason Institute of Lake Superior State University. The office was organized and functions with grants through the U.S. Environmental Protection Agency. Documents, photographs, and historical material related to the RAP process and the St. Marys River in general have been catalogued by student interns and are available to the public through the BPAC library. Students have also created and are maintaining a web site for the BPAC and are working to consolidate geographical information system (GIS) maps and make them accessible to the public as well.

- *Creation of the "Friends of the St. Marys River"* - The BPAC supported the creation of a not-for-profit organization, the Friends of the St. Marys River. The Friends of the St. Marys River provides a local Canadian organization which can assist in the implementation of the Remedial Action Plan, especially for remedial works, education, promotion, and reporting.

It has become apparent throughout the Great Lakes that the most successful RAPs have not only government support but also an active and dedicated local community to implement the plan. The St. Marys River BPAC has remained committed to the RAP process despite uncertain funding, a changing political climate and government downsizing. BPAC will continue to provide a vital link to stakeholders and community support throughout the implementation stages of the RAP. BPAC plans to continue forming partnerships with other watershed based groups in the area and to encourage the formation of additional groups whose purpose is to restore and protect watersheds in the St. Marys River system. BPAC is also planning to continue local notification, outreach, and education of area citizens through regular meetings and the BPAC office.

1.4 Industry Participation

As described in section 4.2, Algoma Steel Inc. (ASI) committed itself in 1992 to $45 million in environmental improvements to be completed by December 1996. This commitment demonstrated the steelmaking company's resolve to support environmental projects that address toxicity levels in process effluent, emissions control, and sediment contamination. Since then

ASI has continued to implement pollution abatement technology in compliance with Ministry of Environment MISA regulations and has renewed its environmental commitment by recently signing a three party Environmental Management Agreement (EMA) with Environment Canada and the Ontario Ministry of the Environment.

As stated in the text of the EMA, its objective is to clearly define a list of initiatives with negotiated timelines for environmental activities which Algoma Steel agrees to undertake. The activities identified in the agreement deal with issues which the three stakeholders agree are priorities but have specific objectives which are currently beyond the compliance regime administered by Environment Canada or the Ministry of the Environment. It is a voluntary initiative which complements the existing regulatory process and assists Algoma Steel in planning and prioritizing a multi year environmental program. The agreement covers the period from the date of signing to December 31, 2005, and to this point, Algoma's financial difficulties (see section 2.2) have not interfered with its voluntary commitments.

The EMA includes initiatives related to benzene and polynuclear aromatic compounds reduction plans, polychlorinated biphenyl and mercury removal, blast furnace visible emissions reduction, boat slip remediation, solid waste management plans, and participation in a steel sector wide initiative regarding the implementation of a Code of Practice. The complete text of the agreement is contained in Appendix 2, and may also be found on Environment Canada's Internet site at http://www.ec.gc.ca/epa-epe/Algoma/en/index.cfm. It should also be noted that this same website also contains the executive summaries of the semi-annual reports submitted by Algoma to the two governments, under the terms of the EMA.

Another major local industry, St. Marys Paper, has also demonstrated a commitment to environmental objectives by investing $14 million in an activated sludge secondary treatment facility. Details of this may be found in section 4.2, along with information on another initiative designed to eliminate particulate emissions. Likewise, Cannelton Industries Inc. has completed a number of clean up activities to remediate the former tannery site. These include the excavation of 33,000 tons of tannery waste materials and contaminated soils to off site solid waste disposal facilities, construction of surface drainage works, a shoreline berm to prevent erosion, and seeding and mulching to revegetate the site.

2.0 THE ST. MARYS RIVER ECOSYSTEM

Extensive background information on the St. Marys River Area of Concern has been documented in the Stage 1 report (St. Marys River RAP Team 1992). This section summarizes background information that is pertinent to Stage 2 discussions, and highlights recent and additional material.

2.1 Characteristics of the Area of Concern

The St. Marys River AOC includes the area of the river which extends from Whitefish Bay between Point Iroquois, Michigan and Gros Cap, Ontario downstream to Quebec Bay, Ontario - Humbug Point, Ontario in the St. Joseph Channel and Hay Point, Ontario - De Tour Passage, Michigan (Figure 2.1). The St. Marys River is the only outlet of Lake Superior. It flows southeasterly through several channels to Lake Huron, a distance of 100 to 120 km (63 to 75 miles) depending on which route is taken. The elevation of the river drops a total of 6.7 m (22 feet) over this distance, with 6.1 m (20 feet) occurring at the St. Mary's Rapids. The average flow of the river is 2,144 m^3/s (75.8 x 10^3 cf/s).

The watershed of the St. Marys River includes all of the Lake Superior drainage basin as well as a number of small tributaries that flow directly into the river. Michigan tributaries include the Waiska, Charlotte, Little Munuscong, Munuscong, and Gogomain Rivers as well as several small streams. In Ontario, the main tributaries are the Big Carp, Little Carp, Root, Garden, Echo, and Bar Rivers and Bennett, East Davignon, West Davignon, and Fort Creeks.

Approximately 83 percent of the lands within 5 km (3 miles) of the St. Marys River consist of undeveloped forest and wetlands. Extensive areas of emergent marsh wetlands border the lower river. Chippewa County, Michigan, for example, has 4,848 ha (11,979 acres) of coastal wetlands (St. Marys River RAP Team 1992). Agriculture is the second most widespread land use, with about 10 percent of the area in farmland. In general, agriculture is restricted because of a limited growing season and poorly drained soils. Livestock for dairy and meat products and hay crops are the dominant agricultural activities. Urban areas constitute about 5 percent of the land use in the AOC. The remainder of the area is used for rural residential, industry, commercial, and waste disposal.

The St. Marys River is a key element in the Great Lakes-St. Lawrence Seaway. As a result, extensive alterations to the river have been undertaken since the mid 1800s in order to facilitate ship navigation between Lakes Huron and Superior, enhance rail and vehicular traffic, and provide hydroelectric power. The St. Marys River also provides domestic and industrial water supply, fish and wildlife habitat, sport fishing, hunting and trapping opportunities, recreational activities, and use as an effluent receiver. The river is a popular resource for recreational boating with seven marinas located between Bruce Mines and Sault Ste. Marie, Ontario.

Water is withdrawn for cooling and process streams at Algoma Steel Inc. and St. Mary Paper Ltd.

and for hydroelectric generating stations in Ontario and Michigan. The river is also a source of drinking water for over 100,000 people. Municipal intakes are located in the upper river at Gros Cap, Ontario and at Sherman Park, Sault Ste. Marie, Michigan's public beach. The Michigan plant has a capacity of 22.7 x 10^3 m^3 per day while the Ontario plant has a capacity of 40.0 x 10^3 m^3 per day. There are also communal and private intakes along the river serving permanent and seasonal residences that are not connected to municipal supplies; however, there are very few private water intakes along the Canadian side within the reaches of the St. Marys River up to and including Lake George.

The St. Marys River watershed supports a diverse fish community within a wide range of habitat types. Open waters and embayments, emergent wetlands, sand and gravel beaches, and the Rapids area provide spawning, nursery, and feeding grounds for a number of native and introduced species. Pacific salmonine, namely pink, coho, and chinook salmon, and rainbow trout are seasonally abundant in the river and provide for a popular sport fishery.

Commercial fishing by Native Americans occurs in Whitefish Bay and in the upper reaches of the St. Marys River. Tribal commercial fishing in this area is mostly for whitefish and lake trout. In Ontario, commercial fishing for walleye, lake trout, lake whitefish, and perch occurs immediately outside the AOC. The St. Marys River also supports a subsistence fishery involving, but not limited to, Native Americans and First Nations Canadians who retained the right to fish in the river through treaties made with the U.S. and Canadian governments respectively. Utilization of the fishery will be better understood when the Fish Harvest Survey Report is completed by the St. Marys River Fishery Task Group (*see* section 6.4).

At the 2000 State of the Lakes Ecosystem Conference (SOLEC 2000), the St. Marys River was given the highest biodiversity rating in the Great Lakes. This rating emphasizes the pressing need to protect the River's uniquely important riparian environment and to successfully address the problems identified in the Stage 1 report.

As described in the St. Marys River Stage 1 Report, "The St. Marys River has an abundant supply of diverse riparian bird habitat. In fact, one hundred and eighty-six species of waterfowl, colonial waterbirds, shorebirds, passerines and raptors inhabit the area, as residents or as temporary inhabitants. As well, the river is an important staging and migration corridor for dabbling ducks, diving ducks and geese. Wetlands of the St. Marys River are part of a series of feeding and resting areas utilized by waterfowl while migrating to and from their prairie breeding and southern wintering areas.

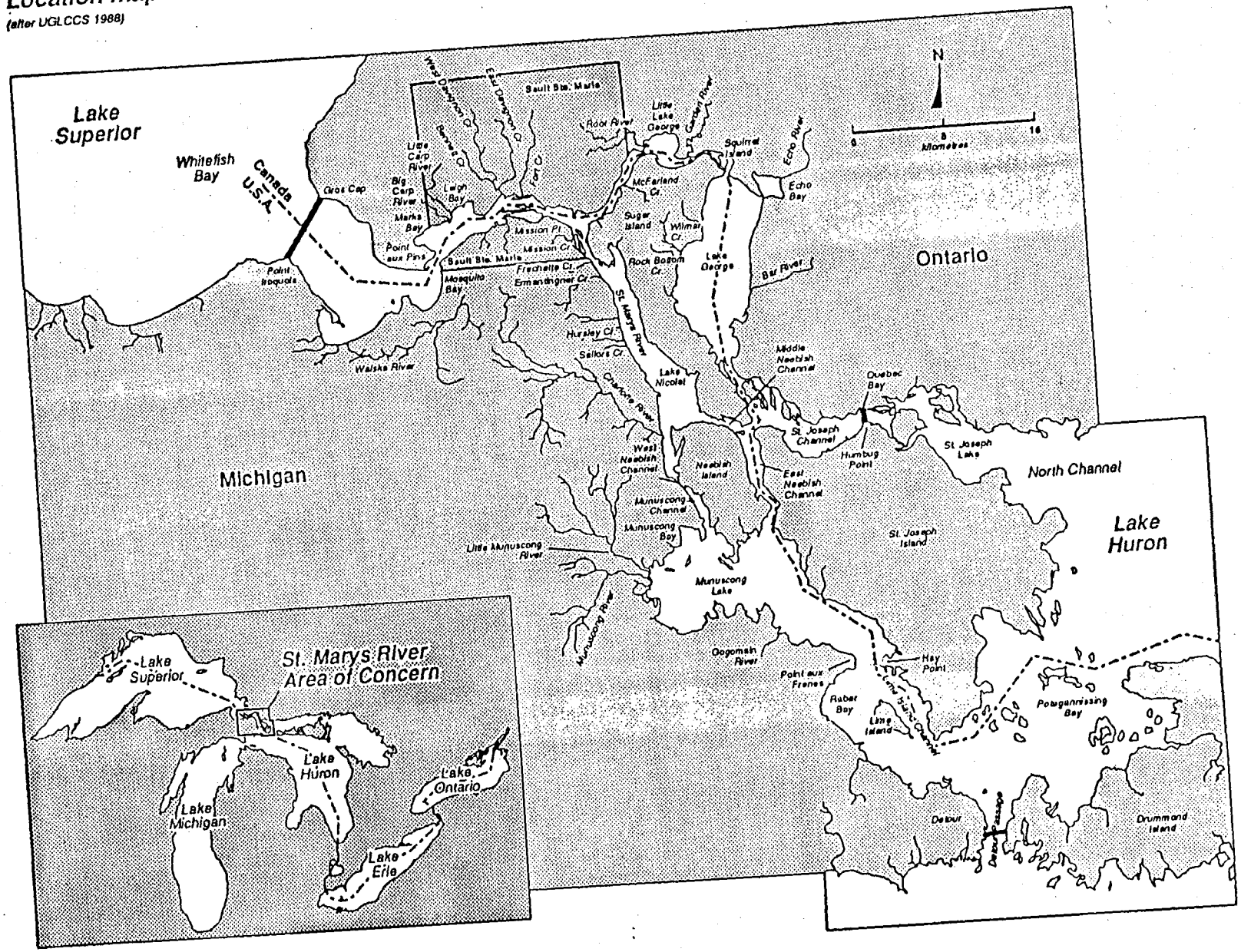
The river provides breeding, nesting, and rearing habitat for mallards, common mergansers, wood ducks, black ducks, Canada geese, common goldeneye, blue-winged teal, American widgeon, American coot, northern pintails, ring-necked ducks, and common loons. Colonial waterbirds nesting on the many islands and in the marshes along the banks of the river include ring-billed gulls, common terns, double-crested cormorants, great blue herons, black terns, herring gulls, and black-crowned night herons."

Figure 2.1

St. Marys River Remedial Action Plan

Location map of the St. Marys River Area of Concern

(after UGLCCS 1988)



Furthermore, "Riparian shorelines of the St. Marys River provide excellent habitat for a variety of small mammals including beaver, otter, muskrat, mink, raccoon, American water shrew and northern water shrew. The most common large mammal is the white-tailed deer, even though it is not abundant on the Ontario side of the river," (Stage 1 Report).

For additional information on the various species assemblages and habitat types the reader is referred to the St. Marys River Stage 1 Report and its appendices.

2.2 Socioeconomic Profile

The largest communities in the AOC are Sault Ste. Marie, Ontario with a population of 85,010 (1991 census) and Sault Ste. Marie, Michigan with 15,000 residents. Although the population of the region has remained fairly stable over the years, there has been a gradual decline during the last decade. Both cities serve as industrial and commercial centres for a large portion of northern Michigan and the Algoma District of Ontario. The communities of Echo Bay and the Batchewana Rankin site and Garden River Indian Reserves are also part of the Ontario community (St. Marys River RAP Team 1992). In Michigan, the Bay Mills Indian Community (~1,000 members) is located 24 km (15 miles) northwest of Sault Ste. Marie with additional reservation land on Sugar Island. The Sault Ste. Marie Tribe (~20,000 members) has reservation land in each of seven counties of the eastern Upper Peninsula with its largest community located in Sault Ste. Marie, Michigan.

Algoma Steel is Canada's third largest integrated steel producer, and plays a major role in the local and provincial economies. With 4,000 employees and 8,000 pensioners, the company's annual wage and pension payments exceed $300 million, and it purchases more than $150 million annually in local goods and services. Recently, however, Algoma has experienced significant financial setbacks, and on April 23, 2001, it announced it was initiating a restructuring of its financial obligations and had obtained an Order for Protection under the *Companies' Creditors Arrangement Act* (CCAA).

In October, 2001 the company released a restructuring plan with its employees, the Steel Workers Union, investors, pension members and the City of Sault Ste. Marie. On December 22, 2001, the Government of Canada announced a loan guarantee to Algoma Steel Inc. of up to $50 million, which will provide the company with the essential financial liquidity to successfully implement this restructuring plan. The federal government will also provide $500,000 to establish a community economic development and diversification strategy and will allocate an additional $3 million for the implementation of a diversification fund for Sault Ste. Marie to support projects, initiatives and programs. $1.7 million dollars has already been committed to 16 federal projects, under the Federal Economic Development Initiative for Northern Ontario.

St. Marys Paper Ltd. has rebounded from financial troubles experienced in early 1990, and has

plans for a $25 million investment in order to adapt to changing market standards (Northern Ontario Business 1998). Production improvements are not expected to change the mill's capacity or increase the workforce.

A Community Development Strategy, which formed the basis for the City's Official Plan, outlines tourism, economic, and social development opportunities for the Sault Ste. Marie, Ontario, region. The plan includes a Waterfront Development Strategy that provides for the revitalization of waterfront property at Bellevue Marine Park, the Plummer Hospital site, and the Gateway Project situated between Great Lakes Power and the Station Mall property. Efforts will be made to incorporate habitat enhancement initiatives and remediation into waterfront development activities in these areas.

The Economic Development Corporation and the local Industrial Opportunities Committee of Sault Ste. Marie, Ontario, have developed a resource base to attract new industry and employment to the city (Economic Development Corporation 1997). The strategy is to encourage diverse economic development and promote the unique natural environment and cultural heritage of the area. The project has the support of local government and major employers.

In 1997, a five year Overall Economic Development Plan was completed for the eastern Upper Peninsula of Michigan. Under this plan, the efforts of the Regional Planning and Development Commission are directed at improving the economy of the area. Recent activities have included such things as solid waste management, community projects, promotion of new business opportunities, and recreation, land use, and transportation planning. The George Kemp Downtown Marina development and the Ashmun Bridge (extending between downtown Sault Ste. Marie to the other side of the Edison Sault Canal) improvement project are also expected to enhance the area and promote tourism.

Three lower St. Marys River islands were donated to the city of Sault Ste. Marie, Michigan in 1986. Funding from the city and a Coastal Zone Management grant will help to enhance recreational opportunities, scenic viewing areas, environmental and historical interpretation, and natural areas on the islands.

The industrial sector of the eastern Upper Peninsula has shown steady growth in the past five years. In Chippewa County, the Sault industrial park currently has four manufacturing firms with expansion plans underway. Expanding operations are an indication of the healthy economy felt throughout the region (Eastern Upper Peninsula Regional Planning & Development Commission 1997).

Capitalizing on the international market potential has increased tourism, social, and commercial relations between the cities of Sault Ste. Marie Ontario and Michigan. For example, an education consortium, *Binational Regional Initiative Developing Greater Education* (BRIDGE), of Lake Superior State University, Sault College, and Algoma University was formed in 1993 to

promote a unique, cross-border educational initiative. BRIDGE builds on the special characteristics of the region while broadening the economic base of the two Saults to better serve the educational and training needs of the area. This initiative attracts interest, support, and funding by the provincial, state, and federal governments as well as the private sector. BRIDGE is operated as a joint venture of a Canadian (BRIDGE Ontario) and a U.S. (BRIDGE Michigan) nonprofit corporation. Funding to date has come from private donations, a transition assistance grant of $265,000 from the Ontario Ministry of Education and Training, and a $75,000 grant from the Ontario Ministry of Northern Development and Mines.

In January 2000, the St. Marys River was formally recognized as a Canadian Heritage River within the Canadian Heritage Rivers System (CHRS). The CHRS was established by the federal, provincial, and territorial governments for the purpose of recognizing outstanding rivers in Canada and ensuring future management that will protect these rivers and enhance their significant heritage values for the long term benefit and enjoyment of all Canadians (Canadian Heritage Rivers Board 1997). As part of the requirements for designation as a Canadian Heritage River, a Heritage Strategy document was produced which set out 13 objectives, 77 proposed action items and an implementation direction for the Canadian portion of the St. Marys River.

The "Friends of the St. Marys River," a legal non-profit corporation, is working closely with other groups on both sides of the river to ensure commitments to the river are addressed, including implementing the objectives and action items that were identified in the River's Heritage Strategy document. This organization recognizes that one of the most critical objectives is the development of an empowered broadly based community group whose mandate would be to pursue implementation of the Heritage Strategy, to establish short-, medium-, and long-term goals, to monitor the progress of implementation, and to promote the St. Marys River as a pre-eminent river in the Canadian Heritage River System. On June 6, 2001, the membership of the Friends of the St. Marys River Board of Directors was formally ratified. At this same meeting, the Board of Directors adopted Terms of Reference that set out the Mission, Goals and Objectives, Membership, Committees and Financial Direction. As well, the Board passed its first by-law that sets out specific duties and direction including the provision of two new Sub-committees, i.e., the Protection & Remediation and Promotion & Development Committees.

There are two important program initiatives that the Friends will support, i.e., the Great Lakes Heritage Coast and the Remedial Action Plan for the St. Marys River. The Friends will also consider supporting local initiatives such as those being proposed for the St. Marys River Marine Centre and Sault Ste. Marie Legacy Landmark where heritage river themes can be presented. In addition, the Friends of the St. Marys River will continue to assist their counterparts in Michigan who have submitted an application for the American portion of the St. Marys River to be nominated as an American Heritage River. At the 4th Biennial International Water Trails Conference held in Portland, Maine, September 7-9, 2001, the North American Water Trails Associaltion recognized the efforts of the Friends of the St. Marys River and the St. Marys River Heritage Water Trail received an honourable mention North American Water Trails Blue Ribbon award.

Human Health

Part of the overall health of the ecosystem is the well being of the residents of the St. Marys River AOC. To assess health vulnerabilities in each AOC, Health Canada determined that examination of the following factors should be included in Remedial Action Plans: contaminant levels in water, air, sediments, and biota; point and non point sources of contamination; pathways of exposure; and health-related information, such as potential risks groups and community-raised concerns. Health Canada has compiled baseline information on the health status of communities within and around the AOC (GLHEP 1998).

In 1998, Health Canada published the report *Health Data and Statistics for the Population of Sault Ste. Marie Ontario and Region* which contained baseline information for the study area for a large number of "specific health outcomes selected on the basis that they *may be linked* to exposure to environmental contaminants." As explained in the report, "statistical results of comparisons of health outcome measures between the study area and the whole of Ontario [were] presented. Mortality, morbidity and incidence rates as well as birth weight information [were] also given." No attempt, however, was made in the report to explain causal relationships between the various contaminants in the environment and specific health disorders. Consequently, relationships between the waters the St. Marys River and human health disorders within the AOC cannot be inferred from this document.

Health Canada also participated in a study which assessed the lifetime health risk of skin cancer resulting from recreational dermal exposure to water borne PAHs in the St. Marys River. In this study, duplicate sediment samples collected in 1992 from inshore and offshore locations at five sites along the river, were analyzed for PAHs by Health Canada and MOE (Hussain et al., 1998). The sites, from upstream to downstream, were the Rytac Sailing Club, Lake George Channel, Bell Point, Squirrel Island, and Ojibway Trailer Park. The inshore locations were very close to shore; the offshore locations were 15-100 m from shore.

Risk assessments were based on the assumption that an individual would swim once per day at a maximum of 30 days per season over a maximum of 30 years during their lifetime. Estimation of the risk from such exposure indicated that at the Rytac, Lake George Channel, and Bell Point offshore locations, risk was higher than negligible (i.e., more than one excess cancer in a population of one million exposed individuals). At all other sites, both inshore and offshore, risk was well below the negligible level.

After completing this study, Health Canada informed local residents that the risk of developing skin cancer as a result of dermal exposure to PAHs at most locations is essentially negligible and that the risk of swimming farther from shore (in the more heavily polluted water) could be lowered by swimming less often and taking a shower immediately after each swim.

In the U.S., the *Agency for Toxic Substances and Disease Registry* (ATSDR) is required to conduct a health assessment for every site placed on the National Priorities List under the

Superfund program (eg., former tannery site at Cannelton Industries Inc.). The objectives of the health assessments are to (1) assess any current/future impacts on public health; (2) develop health advisories/recommendations; and (3) identify actions, including studies, that are needed to either mitigate and evaluate health effects or to prevent them from occurring. An "Interim Preliminary Public Health Assessment" for the Cannelton Industries site was prepared by the Michigan Department of Public Health under a cooperative agreement with the ATSDR.

2.3 Impaired Beneficial Uses

The St. Marys River was identified as an AOC because of impairment of nine of the 14 beneficial uses defined by the Great Lakes Water Quality Agreement. Table 2.1 summarizes the current status of beneficial use impairments for this area. Ambient water quality is not recognized as a formal use impairment under the Water Quality Agreement; however, the natural high quality water that enters the St. Marys River from Lake Superior was established by the BPAC as the minimum water quality standard to be achieved throughout the river system to its outflow into Lake Huron.

Table 2.1. Summary of impairments to Great Lakes Water Quality Agreement beneficial uses in the St. Marys River Area of Concern (I = impaired; NI = not impaired; RFA = requires further assessment).

Beneficial Use Impairment	Status	Conditions in the St. Marys River
Restrictions on Fish and Wildlife Consumption		
(a) Restriction on fish consumption	I	Fish consumption advisories are currently in effect for: *Ontario*: -mercury: larger sized chinook salmon (>65cm), walleye (>45cm), yellow perch (>35cm), and longnose suckers (>30cm) in the St. Marys River (OMOE 1999) -mercury: chinook salmon (>75cm), walleye (>55cm), northern pike (>75cm), and channel catfish (>55cm) in the North Channel of Lake Huron (OMOE 1999) *Michigan*: -mercury: walleye (>36cm) in the St. Marys River -PCBs: walleye (>35cm), northern pike >66cm, and carp >15cm (MDCH)
(b) Consumption of wildlife	NI	Although there are no guidelines for human consumption of wildlife, the OMNR has advised against the consumption of kidneys and liver from moose, black bear, and deer because of high cadmium levels. This advisory exists for the entire province of Ontario.

Beneficial Use Impairment	Status	Conditions in the St. Marys River
Tainting of Fish and Wildlife Flavour	NI	Tainting of fish from the St. Marys River is not common. In the few isolated cases that were reported, a determination could not be made as to whether tainting was due to poor handling or other problems, either acute, as in chemical or industrial spills, or chronic, as in long term chemical loading (Skinkle 1992). Because the incidence of tainted fish is infrequent, a comprehensive fish tainting evaluation has not been conducted.
Degradation of Fish and Wildlife Populations		
(a) Dynamics of fish populations	I	The St. Marys River is the major contributor of sea lamprey infestation to northern Lake Huron, where parasitic lamprey account for an annual mortality of 54% of adult lake trout. Excessive mortality rates preclude lake trout rehabilitation efforts as well as other Lake Huron fishery programs (GLFC 1997). The sea lamprey population in the St. Marys River is estimated to be ~ 5.2 million (T. Morse, pers. comm.). Sea lamprey control measures are expected to reduce lamprey populations in Lake Huron and northern Lake Michigan appreciably. Fish communities are diverse and healthy in the St. Marys River; however, populations of native fish have been reduced and assemblages have changed due to habitat alteration, over fishing, pollution, exotic species, and stocking. Zebra mussels were discovered in the Ontario waters of the St. Marys River in 1994. A Lake Superior Zebra Mussel Survey (1991) identified the area around the canal entrance to the Parks Canada Lock as having the capacity to support zebra mussels. The Ontario discovery was at this site as predicted (S. Greenwood, pers. comm.). Zebra mussels had been found in association with the U.S. Army Corp locks in Michigan several years previous.
(b) Body burdens of fish	I	Hepatic mixed function oxidase (MFO) activity in white suckers sampled below the power dam on the St. Marys River suggests exposure to chemicals with MFO inducing potential (eg., PAHs and PCBs) (Smith et al. 1990). The condition reflects localized contamination of the sediments, water, and benthic invertebrates. Most resin and fatty acids were non-detectable in white suckers collected downstream of St. Marys Paper Ltd.; however, the presence of dehydroabletic acid (DHA) indicates the bioaccumulation of resin acids as a result of exposure to the pulp mill effluent (Beak 1996). Resin acid levels in fish tissue are expected to decline now that secondary treatment of mill effluent is in place.

Beneficial Use Impairment	Status	Conditions in the St. Marys River
(c) Dynamics of wildlife populations	RFA	Extensive development on both sides of the river has resulted in the degradation and loss of aquatic and terrestrial habitat. The potential effect of this development on birds, mammals, and other animals has not been well documented. Wildlife populations appear to be stable or increasing (ie., double-crested cormorants) but assessment criteria are required. Ring-billed gull numbers are increasing while common tern populations are decreasing due to a decline in nesting habitat (CWS study of colonial waterbirds nesting on the Great Lakes). In 1999, a portion of the St. Marys River was surveyed for common terns. This survey needs to be completed including black tern numbers in the assessment. Results can be compared with previous counts.
(d) Body burdens of wildlife	RFA	Mercury concentrations in waterfowl breast meat ranged from 0.12-0.46 mg/kg. Aroclor (PCB) was detected in all samples ranging from 0.002-4.873 mg/kg however there is no criteria for assessment (CWS National Wildlife Research Centre). Eggs from herring gull, black tern, and common tern nests should be analyzed.
Fish Tumours and Other Deformities	I	Liver tumours were identified in white suckers from industrialized sites on the Great Lakes. The prevalence of hepatic neoplasms in excess of 5% should be interpreted as an indicator of environmental degradation. White suckers sampled from the St. Marys River (1985-1990) exhibited tumour prevalence in excess of 9% (N=185). It is likely that hepatic cancers are associated with exposure to chemical contaminants, such as PAHs in contaminated sediments (Baumann et al. 1996). Liver cancers have also been identified in brown bullheads from Munuscong Bay (Smith et al. 1990).
Bird and Animal Deformities or Reproductive Problems	RFA	Researchers found three cross-bill common tern chicks out of 120 birds sampled on Lime Island in 1998 (Michigan State University). No other deformities have been noted in wildlife along the St. Marys River; however, a full assessment of bird and animal populations has not been accomplished. Reproductive assessments of herring gulls, black terns, and common terns should be done within the AOC boundary. Deformities should be assessed in common terns inhabiting the St. Marys River.
Degradation of Benthos		
(a) Dynamics of benthic populations	I	Benthic community health on the Michigan side of the AOC appears to be good; however detailed studies are necessary to confirm this. In localized areas on the Ontario side, benthic communities are moderately impaired downstream of the Algoma Slag site to a distance of ~4 km. Impairment also occurs on both sides of the Lake George Channel, within Little Lake George, and at the north end of Lake George. In the vicinity of Bellevue Marine Park, surficial sediment samples collected in Sept., 1995 indicate reduced levels of metals, nutrients, oil and grease, and PAHs compared to levels measured in 1985. Since 1985, sediments in this area have had a relatively diverse benthic fauna and these changes are likely associated with reduced surficial sediment contamination (Kilgour and Morton 1998).

Beneficial Use Impairment	Status	Conditions in the St. Marys River
(b) Body burdens of benthic organisms	I	Arsenic, mercury, and PCBs tend to bioaccumulate in benthic organisms. Caged mussels placed downstream of the Algoma Slip acquired the highest total PAH levels when compared to low total PAH levels in mussels placed upstream of the Algoma Slip and near the Michigan shore. The effects of these contaminants on benthic organisms are not known. Elevated PAH levels were also noted in mussels exposed to sediments along the Algoma Slag Dump shoreline (Kauss 1999a).
Restrictions on Dredging Activities	I	Contaminated dredged spoils from the Algoma Slip must be disposed of in an approved waste disposal site. Sediments from navigational portions of the following sites have had contaminant levels that exceeded OMOE or U.S. EPA guidelines for the disposal of contaminated sediment: adjacent to the Algoma Slag Dump site along the Ontario shore; both sides of Lake George Channel; Little Lake George; northern half of Lake George; Michigan shore adjacent to Cannelton Industries waste site; the head of the St. Joseph and West Neebish Channels; and Lake Munuscong.
Eutrophication or Undesirable Algae	I	Eutrophication and algae continue to be an issue in the vicinity of the East End Water Pollution Control Plant. Conditions in embayments and in slow moving parts of the river downstream from the WPCP have not been documented. Ultimately this could be alleviated through implementation of secondary treatment at the plant.
Restrictions on Drinking Water Consumption or Taste and Odour Problems		
(a) Consumption	NI	Treated water consumption has never been restricted in the AOC. All drinking water obtained from surface waters requires standard treatment. See however, section 7.3 and Action NPSM-10 in section 5.4.
(b) Taste and odour problems	NI	Taste and odour problems have not been reported.
Beach Closures	I	E. coli bacterial densities in excess of the PWQO and MWQS occur in Ontario and Michigan waters downstream of storm sewers, combined sewer overflows, industrial outfalls, and the East End WPCP.
Ambient Water Quality	I	Ambient water quality is not recognized as a beneficial use impairment; however, water quality is to be reflected as a goal in the Stage 2. Water leaving the St. Marys River should be as clean as that coming in.

Beneficial Use Impairment	Status	Conditions in the St. Marys River
Degradation of Aesthetics	I	Recently, both municipalities have been increasing access and development along the waterfront. Further projects should be encouraged as long as this development proceeds within the context of protecting and enhancing the natural environment of the river. Oil slicks downstream of the Algoma Slip and Terminal Basin have occurred; however, no complaints have been received since March 1990. Oily fibrous material mixed with woody debris anecdotally occurs along the Ontario shoreline. Periodic spills have also been reported. Given the extensive use of the river for transport, oil spills from ships or accidents that release chemicals to the river are a threat in the AOC. Aesthetic impairment also exists downstream of the East End Water Pollution Control Plant. Floating scum periodically occurs along the north shore of Sugar Island and the Ontario shoreline of Lake George Channel, downstream from the East End Plant.
Added Cost to Agriculture and Industry	NI	None documented.
Degradation of Phytoplankton and Zooplankton	NI	Open water community structure and densities reflect Lake Superior. Phytoplankton and zooplankton populations, however, have not been documented in the nearshore areas of the St. Marys River.
Loss of Fish and Wildlife Habitat	I	Significant loss of fish and wildlife habitat has occurred as a result of shoreline alteration, industrialization, urbanization, and shipping activities, particularly within and immediately above and below the St. Marys rapids. The unnatural flow regime resulting from the present operation of the Compensating Works -the gated, flow-control structure at the head of the rapids- has resulted in changes to the biological integrity and productive potential of the remaining rapids habitat (Edsall and Gannon 1993). Changes in flow through the gates result in higher flow for a period of time and then reduction back to a guaranteed minimum flow. Rapid fluctuations in water levels when gates are opened further and then closed, as well as timing relative to critical life stages of fish and invertebrates are a concern. A total rapids area of 29.68 ha is separated by an 800 m long concrete berm. Flow over the 6.25 ha rapids area north of the berm is supplied by gate #1 and flow over the 23.43 ha rapids south of the berm is supplied by the other 15 gates. While agreements on water use have guaranteed minimum amounts of water for the rapids it is a significant change in flow that existed pre 1985 that has resulted in both a reduction in size of the rapids habitat and a reduction in discharge over the rapids. Specific habitats throughout the river are now threatened by colonization of exotic species such as purple loosestrife, Eurasian fish species (ruffe and gobie), and zebra mussels and other exotic invertebrates.

2.4 Point Sources of Pollution

Main point sources of pollution to the St. Marys River AOC include effluent from two major industrial facilities representing the iron and steel (Algoma Steel Inc.) and the pulp and paper sectors (St. Marys Paper Ltd.); two municipal Water Pollution Control Plants (East and West End plants) in Ontario; and a Waste Water Treatment Plant in Michigan.

Although the East End Water Pollution Control Plant will shortly be upgraded to a secondary facility, as described below, it has until now been a primary treatment facility. It provides chemical treatment for phosphorus removal and receives effluent from residential, commercial, and small industrial users. The plant services a population of approximately 64,800 and discharges to the St. Marys River in the Lake George Channel. The West End plant is a

Table 2.2. Municipal point source loadings to the St. Marys River. Values for East and West End Water Pollution Control Plants (WPCP) based on yearly average for 1999 (Ontario Clean Water Agency). Loadings for the Michigan Waste Water Treatment Plant (WWTP) based on average monthly effluent data for 1997 (R. Eberhardt, pers. comm.).

	Discharge limits†	East End WPCP	West End WPCP	Michigan WWTP
Cadmium (µg/l)	-	1.0 **	1.0 **	<10
Copper (µg/l)	-	17 **	10 **	<10
Zinc (µg/l)	-	136 **	30 **	33
Chlorine (µg/l)	-	-	-	0.23
Phosphorus (mg/l)	1.0 mg/l	0.61	0.56	0.52
Phenols (µg/l)	-	-	3.25	-
Ammonia (kg/d)	-	373.11*	9.59♦	-
Faecal Coliform (#/100 ml)	-	101-160000*	101-5400*	57
Total Coliform (#/100 ml)	-	488	1001-100000*	-
E. coli (#/100 ml)	-	4-17300	6-2300	-
BOD_5 (mg/l)	25 mg/l	43.01	5.82	4.23
Total Suspended Solids (mg/l)	25 mg/l	21.14	7.47	8.15
Average Daily Flow (m^3/d)	-	34,720	10,501	11,356

†Ministry of the Environment discharge limits for regulated parameters in the operation of sewage treatment facilities.

*Values from Point Source Task Team Report 1994. Information not available in 1999.

**Metals analysis for East and West End WPCPs from Sewer Water Inspection Program, 1998.

♦Higher than normal ammonia levels were experienced in the fall and early winter 1999 but annual averages were within guidelines.

secondary treatment facility utilizing a conventional activated sludge process with continuous phosphorus removal. Effluent is discharged to the St. Marys River at Leigh Bay above the rapids. The plant services a primarily residential area with a population of about 16,200. The Waste Water Treatment Plant in Sault Ste. Marie, Michigan is a secondary treatment facility with phosphorus removal. This plant also discharges to the river and serves a population of 15,000. Table 2.2 summarizes the loadings of conventional contaminants from each facility.

There are no combined sewers in the city of Sault Ste. Marie, Ontario. However, several sanitary to storm sewer overflows exist in the central older part of the city. Consequently, the hydraulic capacity of the East End Water Pollution Control Plant (ie., 54,550 m^3/d) is exceeded during periods of high flow, resulting in the bypass of untreated sewage directly to the St. Marys River. In an effort to prevent further overloading, the Ministry of the Environment imposed a development restriction in 1989 on new housing in the city's east end. In addition, the City of Sault Ste. Marie, Ontario adopted a five year plan to reduce storm water infiltration to the East End plant. To date, work has been completed on a sewer diversion to the West End plant from the Fort Creek subdivision at an approximate cost of $300,000. Work is also under way on a $17 million program that will result in the re-routing of sewers and upgrades to two sewage pumping stations and sewage containment tanks. When this program has been completed in the fall of 2002, there will be no more raw sewage by-passes into the storm water collection system.

These and other improvements to the City's wastewater treatment system are being supported under the Canada-Ontario Infrastructure Program through a new joint project, announced December 18, 2001. Through this project, the City of Sault Ste. Marie will install the sewage overflow tanks, make upgrades to increase primary treatment capacity, add secondary treatment to the East End water pollution control plant and rehabilitate sewers in areas of high infiltration. The Government of Canada through Industry Canada and the Government of Ontario through SuperBuild will each contribute up to $20,181,333 to the project, and the City of Sault Ste. Marie will invest the balance, bringing the total project cost to $60,544,000. All of the improvements implemented through this project are expected to be completed by March 2006.

Unlike Sault Ste. Marie, Ontario, approximately 85% of the sewer system for the city of Sault Ste. Marie, Michigan consists of combined stormwater and sanitary sewers, and part of this system has the potential to overflow untreated sewage to the St. Marys River under certain high flow conditions. To control these combined sewer overflows (CSOs), the City of Sault Ste. Marie, Michigan plans to separate the stormwater and sanitary sewers. The plan will result in the elimination or treatment of combined sewage discharges containing raw sewage. While this is a long-term plan, the City has already made several improvements that have resulted in the closure of the four worst CSOs. Overflow now occurs only rarely in severe runoff events.

St. Marys Paper Ltd. is a mechanical pulp mill that uses groundwood pulp, purchased bleach kraft pulp, and filler (Beak 1996). The mill has three paper machines in operation: two produce super-calendared paper for catalogues and advertising material; a third machine produces newsprint. Process water is drawn from the St. Marys River upstream of the mill. Effluent is discharged to the St. Marys River through a submerged diffuser at an average flow rate of

27,325 m^3/d. Table 2.3 summarizes the loadings of conventional contaminants from St. Marys Paper Ltd. It should be noted that these loadings are well below the regulated discharge limits.

Table 2.3. Major industrial point source loadings to the St. Marys River Area of Concern. Municipal Industrial Strategy for Abatement (MISA) upper limit discharge quality for regulated parameters included for comparison.

	Discharge Limit ‡	St. Marys Paper Ltd.†		Discharge Limit ‡	Algoma Steel Inc.*	
		1998	1999		1998	1999
Heavy metals (kg/d):						
Lead	-	-	-	11.3	2.9438	2.5141
Zinc	-	-	-	22.5	18.360	6.0622
Cyanide (kg/d)	-	-	-	16.4	12.756	5.5772
Phosphorus (kg/d)	110	22.127	15.211	-	-	-
Phenols (kg/d)	0.267	0.0015528	0.0019539	1.45	0.35597	0.4442
Ammonia (kg/d)	-	-	-	219	73.518	81.803
BOD_5 (kg/d)	3235	340.99	372.19	-		-
Total Solids (kg/d)	5084	1111.3	1142.9	2380	696.54	468.59
Benzene (kg/d)	-	-	-	0.143	0.1116	0.10224
Benzo(a) pyrene (kg/d)	-	-	-	0.166	0.12852	0.02182
Naphthalene (kg/d)	-	-	-	0.389	0.12563	0.00111
Oil and grease (mg/l)	-	-	-	15.0♦	0.232	2.046
Flow (m^3/d)	-	31,496	30,150	-	258,816	224,092

† MISA Compliance Report, 1998 (average values for Jan. to Dec. 1998; average values for Jan. to Sept. 1999). Upper limit for discharge quality effective Jan.1, 1998.
*MISA Compliance Report, 1998 and 1999 (average values for Jan. - Dec. 1998 and 1999). Includes process effluent discharge to the St. Marys River from main filtration plant, bar & strip lagoon, and #1 and #2 tube mills. Upper limit for discharge quality effective Apr. 13, 1998.
♦No loading limit for oil and grease. Recorded value is the maximum concentration limit.
‡ Discharge must be non-toxic to rainbow trout and Daphnia magna.

Algoma Steel Inc. began making rails for Canadian and American railways at the start of the twentieth century. It is now a fully integrated operation producing flat rolled products. Processing includes coke, iron, and steel making operations, hot forming, and finishing. Process

water is drawn from the St. Marys River and wastewater is discharged directly to the river from the main filtration plant, the bar and strip lagoon, and #1 and #2 tube mills. Contaminant loadings for all point source discharges from Algoma Steel have been summarized in Table 2.3, and are well below regulated discharge limits.

2.5 Non-point Sources of Pollution

Algoma Slag Site

The Algoma Steel slag site has been identified as a potential source of chemical constituents (i.e., PAHs, volatile organics, metals, phenols, cyanide, ammonia, and acid) to the groundwater (Beak 1990). In 1989, a network of monitoring wells was established in the Algoma landfill by the Ministry of the Environment, and a program was initiated to monitor groundwater quality of the landfill site. A study was completed to determine if the disposal site is a source of toxic seepage to the river via groundwater contamination. Results indicated that deeper groundwater was not affected by shallow, site-affected groundwater, and that groundwater from beneath the slag site does not migrate towards the city water supply wells (Beak 1990). However, during the study period the site contributed 15% of the benzene, toluene, and xylene load and 32% of the PAH load to the river (Beak 1990). To address this problem, a one million dollar coal tar collection system was installed in 1990 by Algoma Steel at Bennett Creek.

Following the initial groundwater study, the monitoring program was assumed by Algoma and was repeated on a two-year cycle, up to and including 1997. The findings of these subsequent groundwater studies, indicated an improving trend in water quality and little or no impact on the St. Mary's River water quality. Algoma Steel then determined that a two-year cycle was not further warranted and that a four-year cycle for the groundwater study would be undertaken, beginning in 2001 and then repeated in 2005. The findings of the 2001 groundwater study were reported in the February, 2002 semi-annual report, as required under the three party Environmental Management Agreement (see Action NPS-4 in section 5.3). The executive summary of this report may be found on the Internet, at the URL given in section 1.4.

Algoma continues with its initiatives to reduce the overall load of material sent to the landfill and is actively involved in programs for paper, cardboard and wood that divert these materials from the landfill and send them for recycling. Of these three commodities, an estimated total annual average of approximately 160,000 kilograms is diverted out of the landfill. Furthermore, Algoma also recycles an average 500,000 tonnes of steel each year, minimizing the amount getting to landfill.

Sault Ste. Marie Ontario Landfill

An environmental assessment (1988) of the Sault Ste. Marie landfill (Ontario) identified an on-site leachate plume flowing towards the Root River, a tributary of the St. Marys River. A landfill leachate collection and transmission system was installed (1998), and collected leachate

is now directed by force-main to the West End STP for treatment. The landfill has a negligible impact on the surface waters of the St. Marys River (Beak 1993).

Sediments

A sediment survey was conducted in the St. Marys River to determine the extent of contamination and the potential impacts of contaminated sediments on the aquatic ecosystem of the AOC. In 1992, samples were collected from eight sites extending from the former tannery dump site (i.e., Cannelton Industries Inc.) downstream to Lake George. An additional survey (1995) concentrated on the Bellevue Marine Park area. All samples were surficial ponar grabs.

Toxicity tests performed in 1992 indicated that sediments from the Algoma Slip elicited the greatest effect on benthic organisms followed by samples collected from Bellevue Marine Park (Bedard and Petro 1997).

Chromium sediment concentrations (2,600 µg/g) in Tannery Bay exceeded the Provincial Sediment Quality Guidelines (PSQG) severe effects level (110 µg/g). Total PAH sediment levels ranged from 0.8 to 291 µg/g, well below the severe effects level (10,000 µg/g) (Arthur and Kauss 1999). The higher total PAH levels were associated with benthic invertebrate growth impairment; however, PAH levels in samples collected in 1995 were insufficient in explaining this result (Bedard and Petro 1997).

Wood fibres and detritus produced unsuitable benthic habitat in the vicinity of Bellevue Marine Park and up river to the Clergue Generating Station. This latter site was not sampled as part of the benthic study; however, wood fibres and detritus were observed during dredging operations (S. Greenwood, pers. comm.). Growth impairment of mayfly *(Hexagenia limbata)* and chironomid *(Chironomus tentans)* larvae was associated with oil-based substances retained within the organic materials (Bedard and Petro 1997). Levels of PAHs, nutrients, and most metals were in excess of PSQG lowest effect levels; however, concentrations were reduced from 1985 values (Kilgour and Morton 1998).

Sediments containing elevated PAH levels have been dredged from the Algoma boat slip and confined within an approved disposal facility (i.e., 20,000 m^3 of dredgate) (RAP update info., R. Stewart OMOE). The slip serves as a docking area for commercial vessels and continues to receive contaminant inputs from ASI (30" and 60" Blast Furnace sewers) and two tributary creeks (East Davignon and Bennett).

Adjacent to the Cannelton Industries Inc. site is Tannery Bay, located on the south shore of the St. Marys River. The site operated as a sawmill and tannery for many years, and waste products were disposed or migrated offshore and settled in the river sediments. Remedial investigation work has indicated that sediments contain organic material contaminated with chromium, mercury, lead, cadmium, and arsenic. A detailed investigation of sediments in 1995 determined that the river currents continue to deposit layers of clean sediment over the contaminated

organic material. The U.S. EPA approved a remedy for site clean up that included leaving the contaminated sediments in place, capped by the layer of clean sediments. A biomonitoring program will be on-going to determine that the selected remedy is protective.

2.6 Exotics

The invasion of aquatic habitats by nonindigenous, or exotic, species poses a serious and continuing threat to native ecosystems of the Great Lakes region. Since these aquatic nuisance species (ANS) often have no natural predators in their new environment, their populations can expand dramatically to the point where they out-compete native species for food and habitat, and in some cases even displace them entirely.

One such exotic species which poses a particularly serious threat to the Great Lakes is the sea lamprey, which accounts for 54% of adult lake trout mortality in Lake Huron. The St. Marys River is the largest contributor of sea lamprey to northern Lake Huron, with lamprey populations estimated to be higher in Lake Huron than in all other Great Lakes combined (GLFC 1997). The preferred spawning habitat for sea lamprey in the St. Marys River is similar to that of salmonid species. Therefore, spawning habitat rehabilitation efforts to augment fish populations should coincide with enhanced sea lamprey control measures.

In addition to the sea lamprey, there are a number of other aquatic nuisance species which also threaten the integrity of the Lake Superior aquatic ecosystems. Among these are the alewife, the Eurasian water milfoil, purple loosestrife, rainbow smelt, round goby, ruffe, and zebra mussel. Descriptions of these ANS may be found in the Lake Superior Lakewide Management Plan (LaMP) on the Internet at www.epa.gov/glnpo/lakesuperior/lamp2000/index.html.

Since it is virtually impossible to eradicate an ANS once it has invaded a new habitat, it is generally agreed that prevention is the best means of control. This explains why such emphasis is placed on restricting and regulating ballast water discharges. Unintentional introductions of exotic species into the Great Lakes have occurred primarily through the transport of ballast water carried in ships engaging in international trade. In fact, nearly a third of the nonindigenous organisms found in the Great Lakes have been introduced since the opening of the St. Lawrence Seaway in 1959.

In both the United States and Canada, there are a few regulations governing ballast water in the Great Lakes. The U.S. Coast Guard, for example, established both regulations and guidelines for the control of ANS in 1996, which established mandatory reporting and sampling procedures for all vessels to help limit the further introduction of ANS through ballast water. The Canadian Coast Guard, likewise, has had guidelines in place since 1989 and works in conjunction with the Department of Fisheries and Oceans, the Marine Safety Branch of Transport Canada, and the U.S. Coast Guard to ensure that ballast water guidelines are being met (L. Superior LaMP, 2000).

3.0 GOALS AND EVALUATION CRITERIA

3.1 Water Use Goals

One of the first directives facing the BPAC was the determination of a common vision for the future state of the St. Marys River AOC which would clearly identify locally defined water use goals and also represent regional environmental priorities. The subsequent challenge was to select from among a range of remedial actions those which, when implemented, would not only restore the impaired beneficial uses, but also support these more general water use goals important to the local community. The inclusion of these locally defined objectives in the Stage 2 report is an essential prerequisite to achieving broad local support for implementation.

Through a series of public workshops, the Binational Public Advisory Council and the Remedial Action Plan Team developed a set of water use goals for the St. Marys River AOC. The goals represent a wide variety of environmental principles, which must be considered with future development along the shores of the St. Marys River, to ensure that river water quality and the overall ecosystem are protected and enhanced for all users of the river. The water use goals were designed to address specific beneficial use impairments in the AOC.

The following water use goals were adopted by the BPAC in November 1990:

Aesthetics

Aesthetically pleasing

- Remedial actions shall not detract from the aesthetic quality of the Area of Concern.

Balance between natural shoreline and human use

- The river shall be available for compatible multi-use activities which do not exceed the carrying capacity of the river system or to the exclusion of recreational activities.
- Waterfront development shall require public notice and consultation and an environmental impact assessment.
- Sustainable development shall be consistent with goals set forth.

Public access

- Public access to and along the river for recreation should be increased, improved, and maintained.

Recreation and Shipping

Recreation

- Commercial and recreational vessels must be subject to speed regulation.

Navigation

- All vessels must be operated by licensed operators trained to protect water quality consistent with the water use goals and regulation.
- There shall be no winter navigation.

Sources of Contaminants

Spills

- An adequate spills prevention program and proper recovery equipment shall be established and maintained.

Point Sources

- Industrial/commercial wastes shall not be treated in domestic sewage plants.
- Programs shall be established to collect and treat domestic and industrial/commercial waste oils and hazardous chemicals.
- Municipal and private sewage treatment effluents from operational and closed sites shall be sufficiently treated to satisfy the water use goals.
- Costs or mitigation of negative impacts shall be borne by the party responsible for the impact.
- There should be zero discharge of materials and substances by way of water, land, and air. These materials are those which are considered to be:

  Toxic: a substance which can cause death, disease, behavioural abnormalities, cancer, genetic mutations, physiological or reproductive malfunctions or physical deformities in any organism or its offspring, or which can become poisonous after concentration in the food chain or in combination with other substances;

  Persistent: any toxic substance with a half-life (in water) of greater than eight weeks;

  Bioaccumulative: the uptake and retention of substances by an organism from both its environment (ie., directly from the water) and its food;

  Bioconcentrated: the ability of an organism to concentrate substances within its body at concentrations greater than it's surrounding environment or food;

  Mutagenic: a substance or physical agent that can cause changes in one or more hereditary features by modifying genes. Ionizing radiation is a mutagen;

Teratogenic: a substance capable of causing changes to the developing fetus;

Carcinogenic: a substance or physical agent that can cause cancer in humans (eg., asbestos, bischloromethyl ether (B.C.M.E.), and beta-napthylamine);

and/or may cause adverse effects to the health of the biota, especially fish, animals, and humans.

Non-point Sources

- Hazardous wastes found in closed land based waste disposal or storage sites shall be rendered safe, harmless, and healthful to meet the water use goals.
- Stormwater runoff and landfill leachate effluents from operational and closed sites shall be sufficiently treated to satisfy the water use goals.
- Runoff from non-point sources resulting from land management practices in the Area of Concern shall not compromise the ecosystem and shall meet our water use goals.

Sediments

- Sediments in the watershed shall be rendered safe, harmless, and healthful to meet the water use goals.
- Future dredging to enlarge the St. Marys River main shipping channels shall require an environmental impact assessment and specifically assess alteration of flows, sedimentation, and impact on recreation in downstream channels.
- Dredging in the Area of Concern shall meet the water quality goals and address bank stability and wildlife habitat.

Exotics

- The intentional introduction of new species of plants and animals will require an environmental impact assessment.
- Undesirable exotic species shall be controlled or eliminated to meet the water use goals.

Human Health

- The water shall be safe, drinkable with standard treatment, and healthful for humans.
- The water shall be safe for wholebody contact (eg., swimming).
- Water shall be free from unnatural colour, odour, taste, turbidity, and heat.
- There shall be no further unnatural diversion in or out of the Great Lakes Basin - particularly Lake Superior as it affects the St. Marys River.
- Discharge water from the generation of power and for cooling shall meet our water quality goals.

Ecosystem Health

- Migratory and indigenous fish and wildlife habitat (natural and enhanced) shall be provided and protected, including wetlands, nesting sites, and other ecologically sensitive areas.
- Existing fish and wildlife habitat of the St. Marys River ecosystem shall be retained and protected from contamination or development.
- The water shall be safe and healthful for the benthic community, migrating and indigenous wildlife, and native species of fish.

Monitoring

- An integrated state of the art air, water, and sediment monitoring system shall be established, maintained, and updated in perpetuity.
- The results of all activity undertaken in all goals shall be made public.
- A funded committee be established to monitor and ensure that these goals are implemented.

3.2 Delisting Criteria

The delisting criteria presented in Table 3.1 were developed for each beneficial use impairment and, collectively, will provide a decision framework for delisting the St. Marys River AOC. The criteria will be used to guide the development of remedial actions, preventative measures, regulatory programs, and to direct monitoring efforts. In addition, they will assist in measuring progress towards achievement of water use goals and alleviating use impairments. It is recognized, however, that many of the delisting criteria in Table 3.1 are open to subjective interpretation, something that could cause problems when it comes time to delist.

Management Action MNG-1: It is recommended, therefore, that a workshop session, or series of sessions be convened which will produce a set of precise, objectively defined delisting criteria that are numerically quantified wherever possible, and which will provide the necessary decision framework that will govern the delisting of each impaired beneficial use and ultimately the delisting of the AOC itself. These criteria, furthermore, should be developed and reviewed in accordance with the principals set forth in Chapter 2 of the *Four Agency Compendium of Position Papers* (see section 1.2).

Management Action MNG-2: It should also be noted that monitoring activities which track progress toward delisting must, in large measure, be determined by those very same criteria which define the delisting process itself. Consequently, modifications or additions to the delisting criteria, such as those which are recommended under management action MNG-1, will

Table 3.1. St. Marys River Area of Concern Water Use Goals and Delisting Criteria for each Beneficial Use Impairment.

Beneficial Use Impairment	Water Use Goals	Delisting Criteria
Restrictions on fish and wildlife consumption	Sources of Contaminants (*point and non point sources, air deposition*) Ecosystem Health Human Health	• No locally derived fish and wildlife consumption advisories as determined by the most stringent standards, objectives or guidelines.
Degradation of fish and wildlife populations	Sources of Contaminants (*spills, point and non point sources, sediments*) Exotics Ecosystem Health	• Concentrations of persistent toxic substances in fish and wildlife will be below no observable adverse effect concentration (NOAEC) for reproductive, population, and teratogenic effects. Effects will be the same as control populations from unaffected areas which may include Lakes Superior and Huron. • Delisting criteria for sea lamprey control should be guided by Sea Lamprey Control Centre goals and objectives for control of lamprey on the St. Marys River. • A St. Marys fisheries management plan, compatible with both the Lake Huron Binational Initiative and the Lake Superior Lakewide Management Plan, should be developed to protect, enhance, and restore habitat, fish communities, and native species. The plan should provide guidelines for the control of exotic species. The guiding principle should provide for sustainable use of this resource founded upon self-sustaining fish populations. • Wildlife management plans for resident and migratory species.
Fish tumours and other deformities	Sources of Contaminants (*spills, point and non point sources, sediments*) Ecosystem Health	• Concentrations of persistent toxic substances in fish and wildlife will be below no observable adverse effect concentration (NOAEC) for reproductive, population, and teratogenic effects. Effects will be the same as control populations from unaffected areas which may include Lakes Superior and Huron.
Bird and animal deformities or reproductive problems	Sources of Contaminants (*spills, point and non point sources, sediments*) Ecosystem Health	• Concentrations of persistent toxic substances in fish and wildlife will be below no observable adverse effect concentration (NOAEC) for reproductive, population, and teratogenic effects. Effects will be the same as control populations from unaffected areas which may include Lakes Superior and Huron.

Degradation of benthos	Sources of Contaminants (*spills, point and non point sources, sediments*) Exotics Ecosystem Health	• Due to frequent disruption of benthic communities within navigational channels, as a consequence of ship traffic (includes adjacent areas that may be affected by ship traffic through bow waves, etc.) and navigational dredging, emphasis is placed on demonstrating the absence of acute and chronic toxic effects of sediment-associated contaminants and on demonstrating bioassay end points comparable to controls. • Benthic community structure outside the shipping channel is not significantly different from control sites of comparable physical and chemical characteristics (ie., shallow, silty sand, substrates with no oxygen limitations). When benthic macroinvertebrate community structure does not significantly diverge from unimpacted sites of comparable physical and chemical characteristics. Populations of mesotrophic species such as mayfly (*Hexagenia*), fingernail clam (*Pisidium*), and oligochaetes (*Ilyodrilus templetoni* and *Spirosperma ferox*) are present where suitable substrates are located, and historical data indicates that these organisms are native to the area. • In the absence of community structure data, this use may be considered restored when toxicity of sediment-associated contaminants is not significantly higher than controls. Resident fauna does not have elevated contaminant levels relative to unimpacted areas.
Restrictions on dredging	Sources of Contaminants (*sediments*)	• When contaminants in dredged sediment do not exceed the standards, criteria, or guidelines that permit open water disposal. These levels are based on sediment concentrations associated with compounds identified within this AOC from local point or non point sources, and not based on contributions of new atmospheric deposition of compounds.

Eutrophication and undesirable algae	Sources of Contaminants (*point and non point sources*) Ecosystem Health	• All embayment waters have persistent total phosphorus concentrations of <20 µg/l, a secchi disc transparency of >1.2 m, dissolved oxygen at saturation, chlorophyll concentration of <10 µg/l, and unionized ammonia <0.02 µg/l. • Phosphorus load from East End Water Pollution Control Plant <1 mg/l with a consideration of seasonal variability in receiving water sensitivity. All plants to consistently meet Certificate of Approval limits or MI permit system limits. • Any failure to meet these targets must not be attributable to cultural eutrophication (ie., nutrient inputs from human sources such as sewage). • Conditions above to be maintained for at least five years prior to delisting. • Mean monthly values for delisting targets should be met throughout the river, with sampling points representative of different river reaches and in proximity to known significant sources.
Ambient water quality	Human Health Recreation and Shipping (*navigation*)	• Water should be substantially free from the presence of organisms that may produce human diseases and infections as a result of human activity. Consideration should be given to the effects of diversions, impoundments, and fluctuating water levels. (Note: all drinking water obtained from surface waters requires standard treatment). • Iron, phenols and ammonia need to be within applicable standard for finished drinking water.
Beach closings	Human Health Aesthetics (*public access*)	• For officially designated or commonly used full-body water contact beaches, the daily geometric mean should not exceed regulatory standards for parameters measured and be free from public health advisories and beach closures due to sewage discharges from any source for a period of two years. • Water should be substantially free from the presence of toxic algae or contaminated sediments, which result from human activities and which threaten human health through dermal exposure. Also free from bacteria, fungi, or viruses that may produce enteric disorders or eye, ear, nose, throat, and skin infections.

Degradation of aesthetics	Aesthetics (*aesthetically pleasing, natural balance, public access*)	• When the waters are devoid of any substance that produces a persistent objectionable deposit, unnatural colour, turbidity, or odour (eg., oil slick, surface scum). • Oil and petrochemicals should not be present in concentrations that can be detected as visible film, sheen or discolouration on the surface, detected by odour, or form deposits on shorelines and bottom sediments. • To address turbidity, waters should be free from substances attributable to municipal, industrial or other discharges resulting from human activity that will settle to form putrescent or otherwise objectionable sludge deposits. • Persistence to be defined as in eutrophication, in terms of spatial and temporal scales.
Degradation of phytoplankton and zooplankton	Sources of Contaminants (*spills, point and non point sources, sediments*) Exotics Ecosystem Health	• Ambient water quality meets applicable guidelines for the protection of aquatic life. • Delisting targets are met for eutrophication or undesirable algae.
Loss of fish and wildlife habitat	Ecosystem Health Sources of Contaminants (*sediments, exotics*)	• Delisting shall not occur until appropriate planning has been undertaken on an ongoing basis by local, state or provincial, and federal governments. Plans shall ensure no net loss of existing habitat. Where possible, they should address restoration of lost habitat and rehabilitation of degraded habitat. Water quality guidelines for fish and wildlife requirements will also be addressed in these plans. • Watershed management planning should be completed through the establishment of a Watershed Council. Plans should include the same goals as listed above. • Agreements related to water flow regimes on the St. Marys River linked to fish and wildlife needs will be negotiated and adhered to. • Control programs as identified in Fish & Wildlife Management Procedures and Practices should be established for the protection and maintenance of habitat from invasion and colonization of exotic species.
Ambient air quality	Sources of Contaminants (*point sources*)	• Local sources of air emissions should be at levels that meet the most restrictive regulatory standards for human health. (Note: ambient air quality is not recognized as a formal use impairment).

likely require corresponding changes to the monitoring activities. It is recommended, therefore, that a workshop session, or series of sessions also be convened to establish the necessary coordination between the overall monitoring strategy and the revised delisting criteria resulting from Action MNG-1. The resulting changes to the monitoring strategy, furthermore, should be carried out in accordance with the principals set forth in Chapter 2 of the *Four Agency Compendium of Position Papers* (see section 1.2).

Recognizing the close connection between monitoring and delisting, the two series of workshops should be closely coordinated and attended by the same people, i.e., experts designated by the Four Agencies, BPAC members, First Nations representatives, those involved in managing RAP related activities, and any other interested stakeholders who may wish to attend.

The documentation from the two series of workshops should be included in a "Stage 2 Update," along with the revised delisting criteria, as part of the Stage 2 Implementation Annex.

4.0 POINT SOURCE POLLUTION - RESTORATION AND PROTECTION STRATEGIES FOR AIR AND WATER

The primary focus of the Point Source Task Team was to prioritize and identify sources of pollutants, and to recommend remedial actions for point source discharges not currently effectively addressed by control programs in place. The task team defined point source discharges as either pipes or tributaries leading to the St. Marys River. Objectives addressed by the group were to apply and enforce the most stringent standards to all point source discharges to the AOC via air, land, and water; and to make progress towards the implementation of best available technology for the treatment of municipal sewage and industrial waste (including separation of storm and sanitary sewers).

Using a facilitated workshop process, the task team completed the following activities:

- Ranked contaminants of concern in the St. Marys River based on impaired beneficial uses and RAP objectives (Table 4.1).
- Reviewed point source discharges for guidelines that had been exceeded and prepared a table of current point source loadings to the St. Marys River for contaminants of concern (*see* Tables 2.2 and 2.3).
- Reviewed current controls and standards for point sources (sec. 4.1).
- Developed draft recommendations for point source discharges (sec. 4.3).

The findings of the task team indicate that industrial (Algoma Steel Inc., St. Marys Paper Ltd.) and municipal (Ontario Water Pollution Control Plants, Michigan Waste Water Treatment Plant) point source discharges contribute significant loadings of contaminants to the St. Marys River AOC, even though (with one exception) they are meeting their regulated discharge limits, as shown by Tables 2.2 and 2.3. Nine beneficial use impairments have been associated with point source loadings: degradation of benthos, dredging restrictions, ambient water quality, aesthetic impairment, fish consumption advisories, eutrophication, fish tumours, beach closings, and degradation of fish habitat.

Table 4.1. Ranked contaminants of concern in the St. Marys River based on impaired beneficial uses and RAP objectives (Point Source Task Team 1994).

Contaminant of Concern	Beneficial Use Impairment(s) Associated with Contaminants
1. Polycyclic aromatic hydrocarbons (PAHs)	• degradation of benthos • restrictions on dredging activities • beach closings • fish tumours and other deformities • degradation of fish and wildlife populations • ambient water quality

Contaminant of Concern	Beneficial Use Impairment(s) Associated with Contaminants
2. Heavy metals (cadmium, copper, chromium, iron, lead, manganese, nickel, zinc)	• degradation of benthos • restrictions on dredging activities • ambient water quality
3. Oil and grease	• degradation of benthos • restrictions on dredging activities • degradation of aesthetics
4. Cyanide	• degradation of benthos • restrictions on dredging activities • ambient water quality
5. Mercury	• restrictions on fish consumption
6. Phosphorus	• restrictions on dredging activities • eutrophication or undesirable algae • ambient water quality
7. Benzene, toluene, and xylene (BTX)	• degradation of benthos • restrictions on dredging activities • ambient water quality • fish tumours and other deformities
8. Phenols	• degradation of benthos • ambient water quality
9. Arsenic	• degradation of benthos
10. Ammonia	• ambient water quality
11. Bacteria	• restrictions on dredging activities* • ambient water quality • beach closings
12. Polychlorinated biphenyls	• degradation of benthos • restrictions on dredging activities • degradation of fish and wildlife populations • restrictions on fish consumption
13. Biochemical oxygen demand (BOD)	• ambient water quality • loss of fish habitat
14. Solids	• degradation of aesthetics • ambient water quality

* Provincial dredging regulations do not include restrictions related to bacteria.

4.1 Regulatory Programs

A number of regulatory programs, guidelines, and agreements are in place or under development

at the Federal, State, and Provincial levels to maintain and enhance the environmental quality of the St. Marys River. These regulations and policies are outlined below.

Ontario and Canada

Point source discharges from Algoma Steel Inc. and St. Marys Paper Ltd. are under regulation by the *Municipal Industrial Strategy for Abatement* (MISA). MISA is a regulatory-based program under the *Ontario Environmental Protection Act* to control toxic contaminants in industrial and municipal effluents, initially, through a regulatory component to enforce technology-based effluent limits. The program allows the Province to enforce a minimum pollution control requirement based on the implementation of Best Available Technology Economically Achievable (BATEA). As treatment technologies advance, the minimum requirements are adjusted, working towards the goal of virtual elimination of persistent toxic contaminants. This is consistent with the policies stated in the *Great Lakes Water Quality Agreement* as amended in 1987.

St Marys Paper Ltd is also regulated under the *Pulp and Paper Effluent Regulations* and is therefore required to conduct environmental effects monitoring (EEM). In 1992, Environment Canada and the Department of Fisheries and Oceans put forth an amendment to the ***Pulp and Paper Effluent Regulations*** under the *Fisheries Act* that requires all mills to conduct environmental effects monitoring. EEM monitoring will provide a description of the biological quality of the mill's receiving water. The receiving water will be monitored every three years to document temporal and spatial responses of benthic and fisheries communities to improved effluent quality, as mill upgrades and process improvements are implemented. EEM monitoring assesses the adequacy of effluent regulations for protecting fish, habitat, and the beneficial uses of the fisheries resource. Pulp and paper effluent regulations set limits for the discharge of total suspended solids, biochemical oxygen demand, and acute lethality in mill effluent.

The federal *Fisheries Act* provides for the protection of fish, fish habitat, and human use of fish by prohibiting the discharge of deleterious substances to Canadian waters frequented by fish. A deleterious substance is defined as any substance or water that has been processed or changed which, if added to the system, would degrade the quality of the water such that it is rendered harmful to fish or fish habitat.

Michigan and the United States

Point source discharges to Michigan surface waters are regulated by the *National Pollution Discharge Elimination System* (NPDES). The United States Environmental Protection Agency (U.S. EPA) has delegated the responsibility to issue surface water discharge permits to the Michigan Department of Natural Resources under the authority of the federal *Clean Water Act.* The U.S. EPA has also delegated regulation of most air pollution point sources to the state of Michigan under the *Clean Air Act.* The EPA retains regulation of point sources on Tribal Lands in the St. Marys River watershed.

As a non-regulatory measure, the U.S. EPA Office of Water encourages all citizens to learn about their water resources and supports volunteer monitoring programs. The data produced by the volunteer programs is used to characterize watersheds, screen for water quality problems, and measure baseline conditions and trends.

4.2 Restoration and Protection Measures Completed or In Progress

Combined Sewer Overflows

The city of Sault Ste. Marie, Michigan has made a $25 million commitment to eliminating the combined sanitary and stormwater sewers in its wastewater treatment system. The project is split up into two phases, with phase A completed at a cost of $8 million and resulting in the closure of two combined sewer overflow outfalls. Phase B is presently under way and will result in the closure of two more outfalls ($6.5 million). There are seven outfalls remaining to be closed. Expected completion date for the project is ~2020, including improvements to street and water utilities. This work is funded by the citizens of Sault Ste. Marie, Michigan through increased sewer rates.

In 1997, the city of Sault Ste. Marie, Ontario embarked on an aggressive five year voluntary abatement plan to improve the existing sewage collection system. Furthermore, as described in section 2.4, additional improvements to the City's wastewater treatment system will be supported under the Canada-Ontario Infrastructure Program through a new joint project which will install sewage overflow tanks, make upgrades to increase primary treatment capacity, add secondary treatment to the East End water pollution control plant and rehabilitate sewers in areas of high infiltration.

Algoma Steel Inc. (ASI)

Algoma Steel Inc.'s main filtration plant, treating 320,000 m^3/d of effluent, was commissioned in 1990 at an approximate cost of $20 million. Significant reductions in suspended solids, from 4,000 kg/d to 251 kg/d, and phenols, from 250 kg/d to 5 kg/d, were realized.

The restructuring of ASI in 1992 included a Letter of Commitment to $45 million in environmental improvements to be completed by December 1996. The agreement demonstrates the steelmaking company's commitment to environmental projects that address toxicity levels in process effluent, emissions control, and sediment contamination. ASI will continue to implement pollution abatement technology in compliance with Ministry of Environment MISA regulations.

In April 1998, ASI completed construction of a basic oxygen furnace emissions project ($21 million) and a blast furnace contact water recirculation facility ($14 million). The latter project eliminates discharge from the blast furnace scrubber by recycling the water back to the gas

cleaning plant. The procedure reduces ammonia and cyanide levels in the bar and strip lagoon effluent. ASI has also replaced its existing phenol removal system with a biological treatment plant ($2 million) that eliminates both phenols and cyanide from coke oven wastes. Coke-making process water has been treated for fixed ammonia removal since 1996.

ASI initiated an air quality assessment program in 1994 to identify sources of particulates associated with the northwest corner of the plant. As a result, the company established an air quality monitoring station to record dustfall and total suspended particulates from the steel plant. An OMOE monitoring station records emissions of polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds. ASI has also implemented a street washing program for residents near the coke ovens and enhanced dust control measures with the use of dust suppressants and paving. Further efforts are required to reduce emissions from the steel making process.

Construction of a Direct Strip Production Complex (DSPC) was completed in 1997. The new mill streamlines hot rolled strip production by transforming liquid steel directly into coiled product using a continuous process. Ninety seven percent of process water is recycled through a state-of-the-art water treatment plant at the DSPC facility. Minor blowdown volumes are routed to the main filtration plant for treatment.

In addition, Algoma Steel has recently renewed its environmental commitment by signing a three party Environmental Management Agreement (EMA) with Environment Canada and the Ontario Ministry of Environment (see section 1.4 and appendix 2).

St. Marys Paper Ltd.

An activated sludge secondary treatment facility (~$14 million) was completed in 1995 resulting in a reduction in biochemical oxygen demand (BOD), from 4,630 to 411 kg/d, and suspended solids, from 2,368 to 1,148 kg/d. The facility meets all provincial and federal effluent regulations. St. Marys Paper has also installed scrubbers (1990) to eliminate particulate emissions from two boilers.

Water Pollution Control Plants

A continuous phosphorus removal system was added to the East End treatment facility in 1989, resulting in total phosphorus levels below the 1.0 mg/l requirement (GLWQA 1987). New sludge handling facilities were also added to the treatment plant at this time to improve the efficiency of chlorination procedures and to significantly reduce bacterial levels in the discharge. Despite these improvements, BOD levels still exceed the OMOE secondary effluent guideline of 25 mg/l, and elevated bacterial numbers are present (*see* Table 2.2). These problems, however, will be addressed by the recently announced upgrades described in section 2.4, which will be implemented under the Canada-Ontario Infrastructure Program.

The West End plant continues to meet average annual effluent limits for BOD, suspended solids, and phosphorus. Effluent from the Michigan Wastewater Treatment Plant complies with National Pollutant Discharge Elimination System (NPDES) permit limits and monitoring requirements.

4.3 Restoration and Protection Actions Needed

In addition to the restoration and protection measures described above, which are either completed or ongoing, there are a number of other actions which have been recommended to minimize the effects of point source (PS) discharges to the St. Marys River. Descriptions of these actions are given below, along with lists of proposed implementing agencies and partners (see list of acronyms at the end of this report). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support (which could range, for example, from major funding initiatives to the provision of scientific advice upon request) will be delineated in the implementation annex.

Action PS-1: *Virtual Elimination*
Implementing Organizations: EC, USEPA, OMOE, MDEQ, MDNR, DFO, Industry, SSMO, SSMM
Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. In this context, it should be noted that the three party EMA signed by ASI, EC, and *OMOE* includes among its objectives "the reduction or elimination of specific substances which are found to be persistent, bioaccumulative and toxic in the environment and appear in appendix 2 of the 1994 Canada-Ontario Agreement as Tier I and Tier II substances." Also included among the EMA objectives is "the reduction or elimination of air discharges in the form of visible and gaseous emissions, which exceed or are inconsistent with existing or proposed limits or guidelines or are the subject of pollution reports to *OMOE*."

Action PS-2: *Reduce Stormwater Infiltration at East End WPCP*
Implementing Organizations: SSMO, IC, OMOE
With funding provided by the Canada-Ontario Infrastructure Program and the City of Sault Ste. Marie Ontario, as described in section 2.4, storm water infiltration to the East End WPCP collection system will be reduced to prevent sewage bypasses during periods of high runoff. As recommended in the study by Kauss and Nettleton (1999), the influence of heavy rainfall events on treatment plant discharge quality and loadings will be minimized through plant capacity expansion and temporary containment of storm water runoff until proper treatment can be effected.

Action PS-3: *Upgrade East End WPCP to Secondary Treatment*
Implementing Organizations: SSMO, IC, OMOE
The upgrading of the East End WPCP to secondary treatment will be supported under the

Canada-Ontario Infrastructure Program through the new joint project described in section 2.4. This upgrade, which was recommended by the Point Source Task Team (1994), will decrease the impact of the WPCP on the river and could prevent localized algal blooms, sediment contamination, and public beach closings on Sugar Island.

A study which examined the financial requirements of replacing the East End plant with an upgraded secondary treatment facility (Zegarac and Muir 2000) determined that the City of Sault Ste. Marie would benefit from the practice of full-cost pricing of their water, wastewater and storm water services. According to the study, if prices were to reflect the full cost of these services (including construction, maintenance and renovation), there would be adequate funding to upgrade sanitary sewers and treatment plants and to make capital expenditures to help solve the problems in the East End WPCP drainage area. At the same time, the shift to full-cost recovery would promote economic efficiency and better communicate the additional costs associated with increased demand, while lifting the burden on general revenues.

Action PS-4: *Relocate Discharge Pipe at East End WPCP*
Implementing Organizations: SSMO, IC, OMOE
The East End WPCP discharge pipe should be relocated to deeper, faster moving water in the Lake George Channel in order to improve the dispersion of the discharge plume (Kauss and Nettleton 1999).

Action PS-5: *Contaminant Source Control*
Implementing Organizations: SSMO, SSMM, EC, OMOE, USEPA, MDEQ, MDNR, Industry
Contaminants in storm water discharge systems (U.S. and Canada) should be addressed by source control, air quality control, and pollution prevention education programs for business, industry, and the public (Point Source Task Team 1994).

Action PS-6: *Continue with Canadian and U.S. Regulatory Programs for Industrial Dischargers*
Implementing Organizations: EC, DFO, OMOE, MDEQ
Canadian regulatory programs (e.g., *Fisheries Act*, Pulp and Paper Regulations, and MISA) and U.S. programs such as NPDES provide sufficient point source control for the steel mill, paper mill, and the U.S. waste water treatment system under present plans. Plans should be re-evaluated every five years for effectiveness (Point Source Task Team 1994).

Action PS-7: *Encourage Major Point Source Dischargers to Continue Process Improvements*
Implementing Organizations: EC, OMOE, MDEQ, MDNR, SSMO, SSMM
The major industries and municipalities serving as point source dischargers to the AOC should be encouraged to continue with voluntary process improvements. Post-implementation monitoring will provide the necessary information to determine whether process modifications continue to have a positive effect in the St. Marys River.

Action PS-8: *Continued Work on CSOs in Sault Ste. Marie Mich.*
Implementing Organizations: SSMM, MDEQ
Continued work will be needed on the CSOs in the Sault, Michigan wastewater system.

Action PS-9: *Algoma Steel to Limit Discharges from its Dekish Operation*
Implementing Organizations: Algoma Steel, OMOE
Algoma Steel has signed a Program Approval with the *OMOE* to limit discharges from its Dekish operation, which is an uncontrolled source of particulates associated with iron making. The program approval is to have the company effect some form of positive control of this source. Full implementation of controls at this operation is targeted for June 2002.

4.4 Monitoring

The following point source monitoring (PSM) actions, some of which are ongoing, have been recommended to obtain baseline information, measure compliance, and to assess the effectiveness of remedial actions. Lists of the proposed implementing agencies and partners are given beneath the title of each recommended action (see list of acronyms). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support (which could range, for example, from major funding initiatives to the provision of scientific advice upon request) will be delineated in the implementation annex.

Action PSM-1: *Long-Term Water Monitoring at the Cannelton Industries Site*
Implementing Organizations: USEPA
Upon completion of the remedial action at the Cannelton Industries Superfund site, water quality monitoring was initiated to determine the effectiveness of the remedial action. Groundwater and surface water were sampled twice in the first year for the following parameters: arsenic, cadmium, chromium III, chromium VI, lead, mercury, total organic carbon, and hardness. Groundwater samples were all below federal standards. Some of the surface water samples exceeded federal standards. The next round of sampling will be completed in 2003. During the required 5-year review of the site, which will be conducted in 2004, modifications to the water quality monitoring plan will be evaluated.

Action PSM-2: *The Sault Ste. Marie, Michigan Air Quality Monitoring Project*
Implementing Organizations: EC, OMOE, MDEQ, Inter-Tribal Council of Michigan, USEPA
This is a joint effort undertaken by Environment Canada, Ontario Ministry of the Environment, Michigan Department of Environmental Quality, Inter-Tribal Council of Michigan, and the U.S. Environmental Protection Agency to deploy an air quality monitoring network in the Sault Ste. Marie area. The project is in response to citizen complaints about orange-brown haze and particulate deposition caused by emissions from Algoma Steel Inc. The network consists of 2 sites in Michigan and 6 sites in Ontario. In 2001, the two sites in Michigan were established at Lake Superior State University and Bahweting School (Figure 4.1). The equipment at these

sites includes: two PM2.5 filter-based (FRM) monitors and 1 speciation monitor used to determine ions (sulfate, nitrate, ammonium potassium), elemental/organic carbon, and trace elements including toxic metals. This equipment is operated by the Inter-Tribal Council of Michigan, with laboratory support from Michigan Department of Environmental Quality. In addition, the Ontario Ministry of the Environment also operates one continuous mass monitor.

Action PSM-3: *Ambient Water Monitoring in the St. Marys River*
Implementing Organizations: MDEQ
The Michigan Department of Environmental Quality is now monitoring ambient water in the St. Marys River for a number of parameters, including conventional pollutants, metals, and pesticides.

Action PSM-4: *The Sault Ste. Marie, Ontario Air Quality Monitoring Program*
Implementing Organizations: OMOE, Algoma Steel
The Ontario Ministry of Environment established an air quality monitoring program in Sault Ste. Marie, Ontario in the mid 1970s. An air quality index station (Merrifield School, Figure 4.1) records outdoor concentrations of pollutants (sulphur dioxide, total reduced sulphur, coefficient-of-haze, nitrogen oxides, particulate matter, polycyclic aromatic hydrocarbons, volatile organic carbons, and dustfall) that may adversely affect human health, animal life, vegetation, and the use and enjoyment of property. On an annual basis, the Air Quality Index (AQI) in Sault Ste. Marie is good to very good 97% of the time. Elevated levels of particulate, total reduced sulphur, and ozone are the pollutants responsible for the approximately 220 hours of moderate to poor air quality recorded annually since 1991.

Particulate matter, total suspended solids, polycyclic aromatic hydrocarbons (PAHs), volatile organic carbons, and dustfall are currently being measured at the Bonney Street site in the west end of the city (Figure 4.1). Elevated PAH and particulate levels are a concern in this area. Both contaminants are associated with diverse urban sources (eg., vehicle exhaust, wood burning stoves, barbeques); however, a substantial contribution can be attributed to Algoma Steel Inc. operations.

Reports summarizing non-compliance with Ambient Air Quality Criteria (AAQC) and identifying long-term (1979-1994) air quality trends in Sault Ste. Marie, Ontario have been produced (Olivier and Potvin 1996; Clara and Racette 1996). Quarterly reports on air quality have been issued since 1998. Data from air quality and meteorology instruments are supplemented by vegetation, soil, and snow sampling studies. In general, there has been a trend of improving air quality in Sault Ste. Marie, Ontario from 1987 to 1994 (Clara and Racette 1996). Ambient concentrations of sulphur dioxide and nitrogen dioxide are well below provincial AAQC. There are occasional excursions above the AAQC for total reduced sulphur, ozone, inhalable particulate matter, and total suspended particles. While Algoma is to be

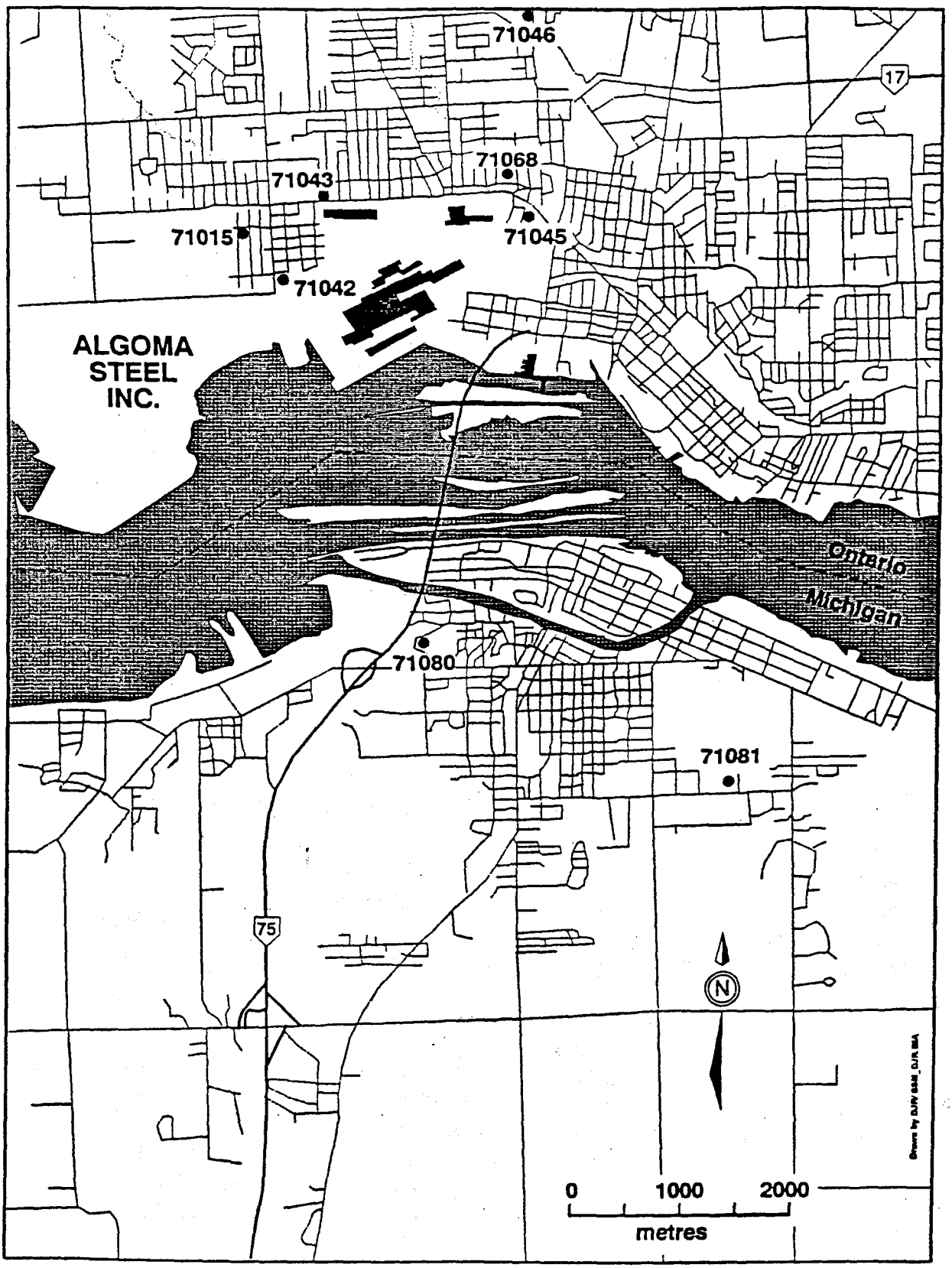


Figure 4.1. Air quality monitoring sites, Sault Ste. Marie.

Station No.	Location	Station No.	Location
71015	Spadina/Young St.	71046	Fairview Ave.
71042	Bonney Street	71068	Merrifield School
71043	Wilding/Wallace	71080	Lake Superior State
71045	73 Adelaide St.	71081	Balweting School

commended for improvements that have been realized over the years, further efforts to characterize the risk to the community at these levels is required, including source identification and emission reduction (Clara and Racette 1996).

Recognizing this, ASI, in the three party Environmental Management Agreement with EC and *OMOE* (see section 1.4), has committed itself to (a) the reduction or elimination of air discharges in the form of visible and gaseous emissions (including PAHs and benzene), which exceed or are inconsistent with existing or proposed limits or guidelines or are the subject of pollution reports to *OMOE*, (b) continued discussions on developing an air quality monitoring partnership with the *OMOE*, and (c) participation in the discussion and resolution of local trans-boundary air issues between Sault Ste. Marie Ontario and Sault Ste. Marie Michigan.

Action PSM-5: *Monitoring of Particulate Emissions at Algoma's Dekish Operation*
Implementing Organizations: OMOE, Algoma Steel
As previously mentioned in section 4.3 under Action PS-9, Algoma Steel has signed a Program Approval with the *OMOE* to limit discharges from its Dekish operation, which is an uncontrolled source of particulates associated with iron making. The purpose of this is to have the company achieve positive control of these emissions, and this will presumably require some sort of monitoring. Full implementation is targeted for June 2002.

Action PSM-6: *Monitor Receiving Water at St. Marys Paper*
Implementing Organizations: St. Marys Paper Ltd., DFO, EC
Under the EEM program, monitor the receiving water every three years at St. Marys Paper Ltd. and document response of fish and benthic communities to improved effluent quality as mill upgrades and process improvements are implemented.

Action PSM-7: *Monitoring System for Stormwater*
Implementing Organizations: SSMO, SSMM, SSMRCA, EC, OMOE, MDEQ, MDNR
A monitoring system should be designed and implemented for storm water, including flows and concentrations of pollutants of concern (Point Source Task Team 1994).

Action PSM-8: *Monitoring Study to Examine the Short Term Variability and Monthly Ranges of Contaminant Discharges from Water Pollution Control Plants in the AOC*
Implementing Organizations: SSMO, SSMM, EC, OMOE, USEPA, MDEQ, MDNR
Since temporal averaging can mask large levels of short term variability in time sequenced data, it follows that monthly averages of contaminant discharges from WPCPs provide an incomplete basis on which to assess environmental impacts. Studies should, therefore, be carried out which would monitor contaminant loadings from the water pollution control plants at time scales sufficiently small to detect any short term elevations which could pose a hazard to human health or the environment. These studies should record the short term maxima and the monthly ranges of contaminant discharges, in addition to the monthly averages, which are already being computed, and report on any anomalous, hazardous elevations that are observed.

5.0 RESTORATION AND PROTECTION STRATEGIES FOR SEDIMENT AND OTHER NON-POINT SOURCES OF POLLUTION

Non-point sources of pollution are diffuse inputs that reach the AOC from multiple points of origin via natural and anthropogenic delivery mechanisms. These include such things as atmospheric deposition (*see* sec. 4.4), intermittent stormwater discharges, groundwater migration, spills from shipping vessels, and contaminated sediments. The very nature of non-point source pollutant loads makes assessment of their magnitude and impacts difficult.

Navigation (Spills from Shipping Vessels)
The Canadian locks did not operate between 1987 and 1998 because of structural wall failures. Following reconstruction and restoration in 1997-98 the lock opened to recreational and small vessel use in 1999. The majority of river traffic passes through the American locks, with vessels carrying crude oil, grain, steel, coal, petroleum products, and iron ore between Lake Superior and industrial centres on the lower Great Lakes. Spills from shipping vessels can be a significant source of contamination to the river system.

Contaminated Sediments
The Clean Up and Restoration Task Team's efforts were directed at contaminated sediment remediation in the AOC. The team prioritized 13 contaminated sites for remediation (Table 5.1) and developed a list of sediment monitoring programs (sec. 5.4). The sites extended from Point aux Pins Bay, downstream to Lake George in Ontario waters, and from Tannery Bay to upper Lake Nicolet in Michigan waters. Recommendations for remedial actions at specific locations, however, were not completed by the task team.

A sediment survey was conducted by the Ontario Ministry of the Environment in 1992 as part of a continuing program of environmental monitoring of the St. Marys River. The purpose of the survey was to update and enhance the Ministry's database on inorganic and organic contaminants in surficial sediments collected from selected locations in the river and to determine if sediment contaminant levels were still associated with benthic community impairment (Arthur and Kauss 1999). Benthic invertebrates are appropriate biological indicators as they are directly associated with contaminants in sediments through their feeding and behavioral activities. Some areas of the AOC continue to support benthic communities reflective of organic enrichment, contaminated sediments, and habitat loss from dredging activities.

Sediment samples were collected from the Algoma Slip to determine sediment quality, toxicity, and degree of impairment to benthic invertebrates. Results indicated that sediments were marginally to significantly polluted with elevated levels of inorganics, metals, solvent extractables (oil and grease), and PAHs (Pope and Kauss 1995). Severe benthic community impairment was also evident within the slip. The absence of pollution-intolerant species (eg., *Hexagenia)* reflects the toxic nature of the sediments relative to the upstream control site in Pointe aux Pins Bay (Pope and Kauss 1995). The number of pollution-tolerant invertebrates

was also low. Algoma Steel has since removed sediments from the slip during maintenance dredging operations; however, further sediment quality and benthic community assessments should be made to determine the effectiveness of contaminant removal (Pope and Kauss 1995).

Table 5.1. Summary of selected St. Marys River areas requiring clean up and restoration as determined by surficial sediment quality data (Clean Up and Restoration Task Team 1994). The potential for re-contamination is reflected in the upstream to downstream order of the site listings. Site ranking is based on the number of contaminants exceeding Provincial Sediment Quality Guideline (PSQG) lowest (LEL) and severe effect levels (SEL) at each location.

Location	# of contaminants exceeding PSQG LEL	# of contaminants exceeding PSQG SEL	Rank*
Point aux Pins Bay, ON	3	0	11
Algoma Slag Dump, ON	29	5	3
Algoma Slip, ON	30	3	1
Bellevue Marine Park area, ON♦	30	6	2
East End Water Pollution Control Plant/Lake George Channel, ON and MI	29	1	4
Bells Point, ON	18	2	7
Little Lake George, ON	28	0	5
Squirrel Island, ON	0	0	12
Ojibiway Trailer Park beach, ON	0	0	13
Lake George, ON and MI	24	1	6
Cannelton Dump, MI	8	1	A
Sault Ste. Marie, MI	18	1	B
Lake Nicolet, MI	8	1	C

* Michigan and Ontario sites were ranked separately as alpha and numerical values respectively.
♦The site around the old government dock (now Purvis Marine dock) is very contaminated with wood waste and oil and grease (S. Greenwood, pers. comm.). At one time there was an oil and gas storage tank farm at the dock area and oil tankers still dock to discharge fuel into a pipeline. Therefore, the Bellevue Park site encompasses the river bed up to and including the dredged channel into the government dock.

Sediment and benthic invertebrate samples were also collected from the Bellevue Marine Park area of the St. Marys River as part of this ongoing aquatic environmental assessment program (Kilgour and Morton 1998). The primary objectives were to determine the spatial variation in benthic community composition in the river and to ascertain whether distribution was affected by sediment characteristics (ie., contaminants, particle size, etc.). The study also examined the change in community composition between 1968 and 1995 to determine if benthic communities reflected or suggested improvements in water and sediment quality.

Results indicated that sediments in this area are still significantly contaminated with metals, oil and grease, petroleum hydrocarbons (TPHs), PAHs, and nutrients. Although there have been improvements in sediment chemistry and benthic community composition since 1987, concentrations of metals, nutrients, and PAHs are still in excess of Provincial Sediment Quality Guideline lowest effect limits (Kilgour and Morton 1998). Variation in benthic community composition was associated with variation in metals, nutrients, oil and grease, and physical sediment conditions (ie., percentage of silt and very coarse-fine sand) (Kilgour and Morton 1998). Consequently, the benthos remains impaired relative to pristine reference locations (eg., Pointe aux Pins Bay).

According to Murphy (2000), there are places in the Bellevue Marine Park region where contaminated sediments are meters deep. Although it is possible that a surface cap of less toxic sediment is forming, it is also likely that the production of gases in deeper sediments will at times continue to lift masses of wood fibre and oil to the surface. In fact, such masses, up to 500L in volume and containing volatile naphthalene, have been observed floating in the area (Murphy, 2000). Furthermore, it is not clear that the risks posed by dermal exposure to these floating masses have been thoroughly assessed. Hypersensitive/ allergic reactions from minor exposure to these types of sediments can be very serious. Skin irritations were observed by Environment Canada staff sampling these sediments in the Sault, and two serious hypersensitive responses occurred with similar contamination in Hamilton Harbour. It is suggested, therefore, that local health authorities determine if the recreational activities (e.g., swimming, boating, windsurfing) in the region of the Bellevue Marine Park, and downstream from it, are likely to bring members of the public into dermal contact with these contaminated floating masses, and if so, to determine the health risks posed by such contact. If these risks are significant, it is recommended that the local health authorities take whatever actions are necessary to protect the public.

Sediments near the Algoma Slag Dump, a disposal site covering approximately 400 ha above the St. Marys Falls, were also sampled as part of the sediment contamination and biological monitoring assessment program. Sediments at many sampling locations contained elevated concentrations of organic carbon, arsenic, cyanide, several heavy metals, and PAHs (Kauss 1999a). Contaminant levels were generally higher at the sampling locations near the Algoma Slip area. Arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc, PAHs, and total organic carbon concentrations exceeded respective Provincial Sediment Quality Guideline lowest effect levels at the majority of stations sampled (Kauss 1999a). Arsenic, iron,

manganese, zinc, and total organic carbon also exceeded severe effect levels at some locations. In addition, levels of available cyanide were above the provincial guideline for open water disposal of dredged material at most stations (Kauss 1999a). Elevated PAH levels were also noted in caged mussels exposed to sediments along the shoreline (Kauss 1999a).

In 1989, the U.S. EPA examined the extent and nature of sediment contamination at the Cannelton Industries site. The results indicated that soil, sediment, and tannery wastes at the site contained chromium, cadmium, lead, arsenic, and mercury. As a result, the site was added to the National Priorities List, a list of sites that are eligible for study and cleanup assistance under the Superfund program.

5.1 Regulatory and Other Programs

Ontario and Canada

In Canada, the *Federal Fisheries Act* is the most significant Federal Statute for the protection of fish habitat from chemical pollution. The habitat protection provisions of the Act provide for the protection of fish and fish habitat from disruptive and destructive activities and require no net loss of productive capacity of fish habitat. The Act provides comprehensive powers to protect fish, fish habitat, and human use of fish by prohibiting the deposition of harmful substances in water where fish are found or on lands that drain into these waters. The Act is legally enforceable when an impact on fish or fish habitat can be shown, and is administered by the federal Department of Fisheries and Oceans and by Environment Canada.

The focus of the revised (1999) *Canadian Environmental Protection Act* (CEPA) is pollution prevention and protection of the environment and human health in order to contribute to sustainable development. The federal Departments of Environment and Health have responsibilities under this legislation. Enforcement officers may issue an environmental protection compliance order to prevent a violation from occurring, to put an immediate stop to a CEPA violation, or to require action to be taken to correct a violation. The compliance order is designed to restore an alleged offender to compliance with the Act as quickly as possible.

In Ontario, *Provincial Sediment Quality Guidelines for Open Water Disposal of Dredged Spoils* have been established for the protection of aquatic life and to address the significance of sediment contaminants in-situ. This policy is specially designed for disposal of contaminated sediments where dredging is proposed.

The *Ontario Water Resources Act* and the *Environmental Protection Act* provide limited controls for urban and rural/agricultural runoff. *Stormwater Quality Guidelines*, developed jointly by the Ontario Ministries of the Environment and Natural Resources, address the need for stormwater quality management. These guidelines apply to new developments only. Stormwater drainage plans and management practices are encouraged through the *Ontario*

Drainage Management Program with funds for municipal stormwater abatement provided through the Ministry of the Environment's *Pollution Control Planning Program.*

Michigan and the United States
The Non-point Source Management Program was established by the 1987 *Clean Water Act Amendments*. The program provides states and tribes with grants to implement non-point source pollution control measures described in approved pollution management plans.

The U.S. Environmental Protection Agency (EPA) is implementing a national initiative, the *Clean Water Action Plan*, in cooperation with the U.S. Department of Agriculture. The plan takes a cooperative approach to restoring and protecting water quality where federal, state, tribal, and local governments work with interested stakeholders to (1) identify watersheds not meeting clean water goals, and (2) work cooperatively to focus resources and implement effective strategies to alleviate watershed problems.

The Michigan Department of Environmental Quality is administering funds from the Clean Michigan Initiative to restore and protect land and water in Michigan.

5.2 Restoration and Protection Measures Completed or In Progress

Navigation: The U.S. Army Corps of Engineers regularly samples the main navigation channel for contaminants before maintenance dredging operations. No recent problems with contamination have been found in the channel.

Chemical Injection Treatment of Contaminated Sediments: A chemical injection system was developed as part of a pilot test to treat contaminated sediments in the St. Marys River. The system was designed to enhance the biodegradation of some organic contaminants by treating the sediment in situ with ferric chloride or calcium nitrate. Laboratory and field studies indicated that ferric chloride injection reduced acute toxicity of sediments by about 75% (Zarull and Allan 1994). This system has been used successfully in Salem, Mass. (Babin et al. 2001) and Hong Kong (Babin et al. 1999) to remediate sediments. Two new full-scale projects are beginning in Detroit and Shing Mun River, China but whether it is effective or less expensive than other methods is very site specific (Murphy et al. 1995, 1999).

Traders Metal Site: The city of Sault Ste. Marie, Ontario, invested $1.98 million to relocate Trader's Metal from Queen Street to Yates Avenue (January 1995) in an effort to clean up and beautify the St. Marys River waterfront. The move complements the construction of Bondar Park and the extensive waterfront boardwalk system between the park and the Traders Metal site, which has been redeveloped for a casino. Trader's Metal is working with the *OMOE* District Office on decommissioning the site. Relocation of Trader's Metal will reduce contaminant inputs to Fort Creek and ultimately to the St. Marys River.

Soil Contamination From Atmospheric Deposition: An ongoing air quality monitoring program (*OMOE*) in the vicinity of Algoma Steel Inc. indicated elevated levels of PAH in the air. Consequently, the deposition of PAH to the terrestrial environment was assessed in 1980 and re-examined in 1997. In 1980, several PAH compounds exceeded background levels for soils with concentrations decreasing with distance from the steel plant and with soil depth (McIlveen 1998). PAH levels were significantly lower in the 1997 sediment collection. The investigation concluded that PAH compounds are being deposited on and accumulated by soil and vegetation in the residential community adjacent to Algoma Steel (McIlveen 1998). Additional sampling is required to determine the extent and severity of soil PAH contamination.

The Cannelton Industries Site: The U.S. EPA issued a unilateral administrative order in January, 1998, directing Cannelton Industries Inc. to remediate the former tannery site. During June-October 1999, the following clean up activities were conducted at the site:

- excavation of 33,000 tons of tannery waste materials and contaminated soils to off site solid waste disposal facilities
- back filling and regrading as needed to stabilize the site
- construction of surface drainage works and shoreline berm to prevent erosion
- seeding and mulching to revegetate the site.

The U.S. EPA will conduct long term monitoring to verify that the site is not a threat to human health and the environment. Deed restrictions will limit future use consistent with wetland protection regulations.

As previously described in section 2.5, the contamination at the Cannelton Industries site also includes offshore sediments in Tannery Bay which contain historical deposits of organic material contaminated with chromium, mercury, lead, cadmium, and arsenic. However, since the river currents, except during low water levels, continue to deposit layers of clean sediment over the contaminated organic material, the U.S. EPA approved a natural remedy that would leave the contaminated sediments in place, allowing natural processes to gradually bury them with layers of clean sediment. Long term monitoring, however, will be required to verify that erosion processes during the low water periods are not reversing the natural recovery processes which occur during the high water periods (see Action NPSM-2). In addition, a long term biomonitoring program (see Action NPSM-3) will be needed to measure the biological uptake levels of the contaminants in the sediments. If these monitoring programs reveal that "natural remediation" is not having the desired results, then additional remediation will be needed.

5.3 Restoration and Protection Actions Needed for Non-Point Sources (NPS)

Besides the ongoing and completed measures described in the previous section, a number of additional restoration and protection actions have also been recommended to minimize the effects of non-point sources (NPS) on the St. Marys River. Recommendations have also been made for a number of pre-implementation, base-line assessment actions essential to the planning and execution of these restoration measures. Although these assessment activities have strong

monitoring components, they are also essential prerequisites for the sediment remediation activities described below, and for this reason have been included in this section rather than the next one. Descriptions of all these remediation and assessment actions are given below, along with lists of the proposed implementing agencies and partners (see list of acronyms at the end of this report). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support (which could range, for example, from major funding initiatives to the provision of scientific advice upon request) will be delineated in the implementation annex.

Action NPS-1: *Development of a Multi-Agency Sediment Management Program*
Implementing Organizations: EC, OMOE, Industry, SSMRCA, and those listed under Action NPSM-4
The most important of all the non-point source remediation activities is the development and implementation of a Multi-Agency Sediment Management Program for the St. Marys River system. This would be a long term program which would include the wide scope of planning, remediation, and monitoring activities described in the following list, many of which are touched on elsewhere in this report. It should be noted that this list includes a number of recommendations contained in the IJC's 1998 status assessment, and several that were identified by the *Clean Up and Restoration Task Team* as described in section 5.4.

a) The sediment mapping in the St Marys River system should be continued until all significant zones of contaminated sediment, including those in the "down river regions," have been included in the survey. Once these zones have all been located and identified, they should each be characterized, if they haven't already, by determining their spatial distribution and by identifying and quantifying the contaminants within them. The identification would be done using the most current benthic, toxicity, and sediment chemistry studies (see Actions NPS-2 and NPS-3 below). The zones should also be ranked on the basis of toxicity and/or degradation of benthos.

b) Using the monitoring data described above, develop a consistent, scientifically defensible, and publicly acceptable decision-making framework that will identify remediation options and provide a logical basis to guide community-based management decisions on sediment remediation within the AOC (Krantzberg, 1998). This framework would contain, for example, the decision criteria used in identifying which zones require remediation and which remediation options are most appropriate for each zone. It would also provide the logical justification for these criteria and identify all of the data requirements needed for their application, thereby guiding decision making and providing the public with the means to understand and participate in the management process. Using available data, the framework would identify the range of remediation and disposal options for each site and would identify what additional information is needed to choose between them. Then, once this information has been obtained, it would guide the final selection of the most appropriate option (e.g., dredging, in situ treatment, capping, etc.).

c) Once the final options have been selected in consultation with the public, implementation would be carried out with agency support and would be guided by precisely defined, numerically quantified objectives developed by the sediment management teams and incorporated into the delisting criteria (see management Action MNG-1). These objectives would define the completion-point for both implementation and ultimate remediation, and would be the focus of appropriate monitoring activities, as described under item **(h)** below.

d) To prevent additional accumulation of contaminants, and also their re-accumulation following remediation, it would be necessary to implement, prior to sediment remediation, a strategy to identify and control all major point and non-point sources of contaminant loadings to sediments within the St. Marys River system.

e) The identification of contaminant sources, as described in item **(d)**, would require a monitoring program that would track water and sediment quality at stations above, at, and below major dischargers, with the downstream limit for stations extending to the point of near-background conditions (IJC, 1998). It would also require the monitoring of any non-point sources (and tributaries) which may be contributing contaminants to the waterways within the AOC. The control measures, referred to in item **(d)**, for point and non-point sources would include process upgrades at industrial and municipal facilities, cooperative environmental management agreements between industry and government, enforcement of government regulations, and the measures described below under Action NPS-6.

f) There would also be a requirement to monitor and control any resuspension of contaminants that may occur during sediment remediation activities (see Action NPSM-4c) or during the dredging of navigation channels (see Action NPSM-4d).

g) Atmospheric inputs of persistent toxic substances to the waters and basin of the River would also need to be tracked (IJC, 1998; see also Action NPSM-4a).

h) Appropriate monitoring of remediation, both short-term and long-term, would be a vital component of the sediment management program. The short term monitoring would track progress toward the immediate implementation objectives, whereas the long term monitoring would track ecosystem response to the remediation and control measures and the ultimate effectiveness (or ineffectiveness) of these measures in meeting the delisting criteria. These monitoring activities, therefore, would provide the necessary information for adaptive management decisions on any changes or additions which may be required in the remediation strategy in order that it meet its designated goals.

i) The management program should also incorporate the benefits afforded by advancing technology. Thus, for example, remedial actions previously considered necessary but unrealistic, should be initiated once new technology makes them feasible, provided the necessity of these actions is still supported by current monitoring data and decision criteria.

j) All the above monitoring and remediation activities, furthermore, should be fully coordinated with those of the Lake Superior LaMP (IJC, 1998) and those of the various RAP task teams. Furthermore, since Lake Huron is downstream from the St. Marys River, they should also be coordinated with those of the Lake Huron Binational Initiative.

Primary responsibility for Action NPS-1 is to be shared jointly by Environment Canada and the Ontario Ministry of the Environment, with the cooperation of local industry.

Action NPS-2: *Further Characterize Several High Priority Areas*
Implementing Organizations: EC, OMOE, industry
While there is a significant amount of information about sediment quality in a number of areas, there still remains a requirement to further characterize several high priority areas including the area adjacent to the slag dump, the East End Water Pollution Control Plant, the Algoma Slip, and Little Lake George. It is hoped that the information necessary to carry out this characterization of high priority areas will be provided by the study described below in Action NPS-3. These two actions are consistent with the recommendations of the Clean Up and Restoration Task Team and will provide important information for the successful completion of Action NPS-1a.

Action NPS-3: *Completion of the St. Marys River Contaminated Sediment Zones Evaluation*
Implementing Organizations: EC, OMOE
A *St. Marys River Contaminated Sediment Zones Evaluation* (Kauss 1999b) was conducted (fall of 1999) to determine the extent and severity of sediment contamination from the Algoma Slag Dump, Algoma Slip, and a portion of the Lake George Channel downstream of the East End Water Pollution Control Plant. The Point aux Pins Bay area was also sampled. Benthic invertebrates were also sampled at these locations. Sediment chemical analysis is under way, and support has been provided by the Government of Canada's Great Lakes Sustainability Fund for the analysis of the benthic samples and an interpretive report, the draft version of which was completed in September 2001. The final version of this report should receive high priority so as to make further recommendations for sediment remediation. The culmination of this study is an important prerequisite to the successful completion of Action NPS-1a.

Action NPS-4: *Identification and Control of Contaminants from the Algoma Slag Dump*
Implementing Organizations: Algoma Steel, EC, OMOE
It is extremely important that contaminants originating from the Algoma Slag dump be identified and controlled to prevent continuing adverse impacts on the St. Marys River AOC.

a) In an effort to identify and quantify the impacts resulting from groundwater seepage, ASI has made a commitment in the three party EMA to continue a program of monitoring the landfill site to assess trends in groundwater quality. The groundwater monitoring will be conducted

on a four-year cycle commencing in 2001 and again in 2005. The results of the monitoring will be included in the first semi-annual report following completion of the studies as required in section 7.1 of the EMA. ASI has also committed to continue its efforts to reduce the overall load of material sent to the landfill for disposal and to develop and implement a suitable long-term plan for the waste disposal site describing its site operations and closure. The plan will be submitted to *OMOE* and EC as part of the February 1, 2002 semi-annual report. The executive summary of this, and other semi-annual reports, may be found on the Internet at the URL provided in section 1.4.

b) It is also necessary to minimize the impact of contaminated sediments adjacent to the landfill site. Although actions were taken in 1993 to stabilize the shoreline along the slag dump, there is relatively little shoreline stability in some areas. It is therefore recommended that action be taken, wherever necessary, to stabilize the shoreline and nearshore sediments of the slag dump (see Eberhardt, 2000). See also Action FF-9.

Action NPS-5: *Evaluation of Algoma Slip Sediment and Implementation of Clean-up*
Implementing Organizations: Algoma Steel, EC, OMOE

The Algoma Slip sediment quality and quantity needs to be evaluated from an environmental perspective and remediated as required. This need is addressed in the three party EMA signed by ASI, EC, and *OMOE*, which includes among its objectives "the de-listing of the 'beneficial use impairment' associated with the ASI boat slip as identified in the Stage 1 report for the Remedial Action Plan (RAP) for the St Marys River." To achieve this, Algoma has agreed to: (a) assess sediment contamination and submit a clean-up plan to *OMOE* in its Feb 1, 2001 semi-annual report, and (b) complete the clean-up and submit a summary report to *OMOE* in its first semi-annual report following completion of the work (see the Internet site provided in section 1.4).

Action NPS-6: *Control of Agricultural and Other Non-point Sources of Pollution*
Implementing Organizations: EC, USEPA, AAFC, OMAFRA, OMOE, MDEQ, Local Farming Community

As recommended under monitoring Action NPSM-8, comprehensive studies should be carried out within the AOC to monitor agricultural runoff and other non-point sources of pollution such as road runoff into tributaries. Using the results of these studies, suitable measures to control these non point sources should be designed and implemented (see also actions FF-1 and FF-4). Examples of such control measures, might include, for example (depending on the results of Action NPSM-8):

a) limiting livestock access to surface waters,
b) proper management of manure piles and milkhouse waste disposal systems,
c) restoring and stabilizing stream banks to reduce erosion,
d) extending buffer strips along drainage ditches and streams, and

e) providing education and financial support to farmers to facilitate the implementation of these and other proper farm management practices.

Suitable criteria controlling and implementing these measures will need to be developed.

Action NPS-7: *Remediation for Contaminated Terrestrial and Aquatic Disposal Sites*
Implementing Organizations: EC, USEPA, OMOE, MDEQ, HC, Local Health Authorities
If the monitoring initiated under Actions NPSM-9 and NPSM-12 determines that contaminated terrestrial or aquatic disposal sites within the AOC (i.e., those not already adequately covered by previous site-specific recommendations) are a danger to public health or the health of the ecosystem, then appropriate reporting and remedial actions should be taken to alert the public and rectify the situation. Measures should be taken to ensure that all hazardous contaminants are properly isolated and disposed of in a manner which is harmless to human health and the environment. Where appropriate, aquatic disposal sites, should they be found to exist, would be remediated under the sediment management program described in Action NPS-1. Enforcement measures should also be initiated wherever warranted.

Action NPS-8: *Plan and Implement Appropriate Remediation, Protection, and Enforcement Actions to Remove Any Potential Public Health Risks Identified by Action NPSM-10*
Implementing Organizations: EC, USEPA, OMOE, MDEQ, HC, Local Health Authorities
If the information obtained from monitoring action NPSM-10 confirms the existence of real or potential health risks to the smaller communities taking their water from the "down-river" regions of the St. Marys River system, then appropriate remediation, protection, and enforcement actions should be implemented to rectify the situation. These actions would include, but would not be limited by, those related actions described elsewhere in this Stage 2 Report. If it is determined, on the basis of information provided by Action NPSM-10, that those actions are insufficient, then additional remediation, protection and enforcement actions should be planned and implemented as required.

5.4 Monitoring

The following non-point source monitoring (NPSM) actions have been recommended to assess the need for new remedial actions and the effectiveness of those actions already under way. A list of the proposed implementing agencies and partners is given beneath the title of each recommended action (see the list of acronyms at the end of this report). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support (which could range, for example, from major funding initiatives to the provision of scientific advice upon request) will be delineated in the implementation annex.

Action NPSM-1: *Monitoring East End WPCP and Identification of Upstream Sources*
Implementing Organizations: EC, OMOE, SSMO

Further evaluation of the East End Water Pollution Control Plant effluent is required to determine concentrations and loadings of persistent contaminants exceeding guidelines in Lake George Channel sediments. In addition, the relative contribution of upstream sources, including point and non point sources, and their loadings to sediment contamination in Lake George Channel and Little Lake George should be investigated (Kauss and Nettleton 1999). The information provided by this action should be regarded as contributory to Action NPSM-10.

Action NPSM-2: *Aerial Monitoring of the Cannelton Industries Site*
Implementing Organizations: USEPA
In 1998, Cannelton Industries submitted a report entitled "Stability of Tannery Bay Sediments", which will provide a baseline for monitoring whether sediment erosion is occurring at the site. In preparation for the required 5-year site review, aerial photographs will be reviewed to determine any changes to the shoreline. In addition, site monitoring will include visual inspection of the bay from a boat. Elevations of the top of sediment will be measured at several established locations to exclude changes in surface elevation of sediment over time.

Action NPSM-3: *Biological Monitoring at the Cannelton Industries Site to Ensure Protection of the Ecological Food Chain*
Implementing Organizations: USEPA
Biological monitoring of the sediments in Tannery Bay will also be conducted to ensure that the natural remedial processes described earlier (i.e., capping with clean sediment) are having the desired effect and will provide the necessary degree of protection to the ecological food chain. A biological monitoring program has been implemented at Cannelton Industries site, to evaluate the bioavailability of site contaminants to aquatic organisms and wildlife. A baseline study in Tannery Bay using caged clams was completed in 1997 by the National Oceanic and Atmospheric Administration. A second round of biological monitoring was conducted in 2000, and a third round is scheduled for 2003. Sampling results will be used during the required 5-year site review, to determine whether the site remedy continues to provide adequate protection for human health and the environment.

Action NPSM-4: *Task Team Monitoring Recommendations*
Implementing Organizations: Listed below, or where indicated.
a) Continue with data collection at air quality monitoring network. [See Actions PSM-2, 4, 5]
b) Determine disposal options for dredged material following Provincial Sediment Quality Guidelines for Open Water Disposal of Dredged Spoils. [EC, *OMOE* (See Action NPS-1)]
c) Monitor change and impacts of remedial activities. [EC, *OMOE* (See Action NPS-1)]
d) Establish monitoring program for potential dredging and sediment dispersal within navigation channels. [USACOE, TC, MDEQ, EC, *OMOE* (See Action NPS-1)]

Action NPSM-5: *Re-sampling of River Sediments to obtain Trend Information*
Implementing Organizations: EC, USEPA,OMOE, MDEQ, USACOE

As part of the long term monitoring program described under Action NPS-1(h), re-sampling of river sediments should be carried out systematically to obtain trend information on sediment quality and benthic community status. The period for re-sampling should be adjusted in accordance with the number and magnitude of remedial actions which have taken place since the last sampling time. It has also been recommended that future surficial sediment quality surveys near the Algoma slag dump should incorporate benthic community assessment (Kauss 1999a).

Action NPSM-6: *Benthic, Toxicity, and Sediment Chemistry Studies at Bellevue Marine Park*
Implementing Organizations: EC, OMOE
Benthic, toxicity, and sediment chemistry studies using core samples should be continued in the Bellevue Marine Park area and at reference locations to confirm and document further improvements in water and sediment quality (see also Action NPSM-7). If improvements continue to occur, then further remediation may not be necessary (Kilgour and Morton 1998).

Action NPSM-7: *Assess Potential Health Risks Resulting from Floating Contaminated Masses*
Implementing Organizations: Local health authorities, HC
Determine if the recreational activities (e.g., swimming, boating) in the region of the Bellevue Park, and downstream, have a significant potential to expose members of the public to dermal contact with floating contaminated masses. If so, determine the health risks posed by such contact. If these risks are significant, take whatever actions are necessary to protect the public.

Action NPSM-8: *Monitor Non-Point Sources of Pollution in the AOC*
Implementing Organizations: EC, USEPA, MDEQ, *OMOE*, OMAFRA
Comprehensive studies should be carried out within the AOC to monitor agricultural runoff and other non-point sources of pollution such as stream bank erosion and runoff into tributaries at road crossings. Particular emphasis should be given to those regions of the AOC for which there is a shortage of data. The study should also identify and alert the public to any potential public health hazards which may result from these sources.

Action NPSM-9: *Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways*
Implementing Organizations: EC, USEPA, MDEQ, *OMOE*, HC
Monitoring should be carried out to identify any terrestrial or aquatic sites (legal and illegal) which have been used for the disposal of contaminated or hazardous material and which may have been leaching or otherwise transferring contaminants into the streams, rivers, lakes, and groundwater within the AOC (see also Action FF-5). Should such sites be found to exist, the contents of the sites, and the offending contaminants within them, should be identified and their impacts assessed. If any of these sites are found to pose a real or potential hazard to public

health or to the ecosystem, the public should be alerted to the nature and magnitude of these hazards and appropriate remediation and enforcement actions should be taken as described under Action NPS-7.

Action NPSM-10: *Assess Health Risks to Communities and Individuals Taking Their Water From the "Down-River" Regions of the St. Marys River System*
Implementing Organizations: INAC, USEPA, MDEQ, *OMOE*, HC
The drinking water supplies to Sault Ste. Marie, Ontario and Sault Ste. Marie, Michigan are not impaired, since they originate either from aquifers or from the unpolluted upstream region of the St. Marys River near Lake Superior. Some small communities, however, take their water from regions of the river system which are downstream from the various point and non-point sources of contaminants within the AOC. Monitoring should therefore be carried out to determine if these downstream communities are at risk due to water borne contaminants. In particular, it should be determined if the contaminated sediments located in these "down-river" regions of the St. Marys River system (e.g., Lake George) pose a potential health risk to the communities taking water from these parts of the River. Furthermore, it should be determined if there has been any disposal of contaminated soils and other materials within this part of the river system which could also pose such a risk (see Action NPSM-9). If any of the above mentioned health risks are confirmed, then the public should be alerted to these risks and informed of the causes (see Actions RE-2 and RE-4), and appropriate remediation, protection, and enforcement actions should be implemented to rectify the situation (e.g., see remedial actions described in sections 4.3 and 5.3).

Action NPSM-11: *Assess the Potential Hazards Associated With Spills from Shipping Vessels*
Implementing Organizations: EC, DFO, USEPA, USFWS, MDEQ, *OMOE*, HC, TC
Studies should be carried out by the agencies, if they have not already done so, to examine the historical frequency and nature of significant spills from shipping vessels within the AOC, and to determine the likelihood of major spills occurring in the future. An assessment should also be made of the potential health and environmental impacts of a major spill, should it occur, and of the adequacy of the existing prevention and response measures in protecting the public and the environment. The public should also be informed of those cargoes which pose the greatest risk by virtue of their toxicity, bulk, and frequency of shipment. If studies such as these have already been carried out by the agencies, they should be made available to the public.

Action NPSM-12: *Identify Locations Within the AOC Which are Associated With Elevated Levels of Human Health Disorders*
Implementing Organizations: HC, USEPA, MDEQ, *OMOE*, Local Health Authorities
Studies should be carried out in those regions of the AOC which are near confirmed or potential sources of hazardous contaminants (e.g., landfills and other disposal sites, abandoned industrial sites, or sites identified under Action NPSM-9), in order to determine if those who have lived or

worked in these regions are manifesting elevated levels of health disorders known to be associated with present or past exposure to toxic substances. The studies should identify statistical or causal relationships between any observed region-specific health anomalies and the contaminants known to have been present. Should such relationships be discovered, then, depending on their degree of statistical significance, appropriate measures should be initiated (see Action NPS-7) to address any real or potential public health hazards which might exist. Wherever warranted, these measures would include (a) restricting public use of the identified source areas, and (b) ensuring that all contaminants in these areas are properly isolated and disposed of in a manner which is harmless to human health and the environment. Furthermore, the results of the above mentioned studies should be made readily accessible to the public and the local medical community.

6.0 RESTORATION AND PROTECTION STRATEGIES FOR FLORA AND FAUNA

The St. Marys River watershed, wetlands, and riparian areas provide habitat for a number of fish and wildlife species. While much of the river is unaffected by human influence, other portions are heavily impaired. Fish spawning and rearing habitat, as well as wildlife staging areas, have been lost with the construction of navigational structures, hydropower generation, dredging, and filling activities. Three categories of habitat loss and degradation are predominant in the AOC: loss of rapids habitat, loss of wetlands, and urban/agricultural degradation of tributary streams. Beneficial use impairments associated with this loss include degradation of fish and wildlife populations, consumption restrictions, bird and animal deformities or reproductive problems, and degradation of benthos.

The fish community of the St. Marys River is influenced by cold, oligotrophic Lake Superior waters that funnel through the dredged shipping channels. Native and exotic cold water and warm/cool water fish species coexist within the river system. Commercially important species, such as whitefish, sturgeon, lake trout, and walleye, are no longer as abundant as they once were in this river system (Bray 1993). Populations have been impaired by overfishing, introduction of exotics, accumulation of toxic chemicals, water level fluctuations, and habitat destruction through shoreline alteration, dredging, and development, including agricultural development along tributaries. Invasive exotic species found within the St. Marys River in the past five years include zebra mussels, three spined stickleback, spiny water flea, and alewives. The size and extent of these populations is not yet known; however, their presence has been associated with the Michigan and Ontario locks.

The St. Marys River is the major contributor of sea lamprey infestation to northern Lake Huron, where parasitic lamprey account for an annual mortality of 54% of adult lake trout. Excessive mortality rates preclude lake trout rehabilitation efforts as well as other Lake Huron fishery programs (GLFC 1997). The sea lamprey population in the St. Marys River is estimated to be ~ 5.2 million (T. Morse, pers. comm.). Sea lamprey control measures are expected to reduce lamprey populations in Lake Huron and northern Lake Michigan appreciably.

The St. Marys Rapids area supports a productive fishery with excellent recreational fishing opportunities. Construction of shipping and power canals have decreased the area of the rapids by at least 50% from their natural state (Bray 1993). The development has caused a reduction in total discharge in the rapids area by at least 80%, along with an increase in temporal variability in flows (Bray 1993). Together, this results in an intermittent dewatering of portions of the remnant rapids. In addition, the Little Rapids-Sugar Island and East Neebish Rapids areas have been lost as a result of navigational dredging. Construction of a causeway culvert system has reduced flow significantly through the Little Rapids.

Loss of wetland habitat in the St. Marys River, from industrial and urban expansion, has been most severe along the shoreline of Sault Ste. Marie, Ontario, downstream of the rapids (Bray

1993). Wetland areas offer warmer water temperatures and greater nutrient availability, improving the overall productivity of the system. The effect of loss of fish habitat in the St. Marys River may be increased by the destruction of wetland habitat in close proximity to the rapids area (Bray 1993).

Destruction of the rapids and wetland habitat along the Sault Ste. Marie waterfront has been extensive and, for the most part, permanent. The infilling of wetlands for urban development constrains opportunities for restoration as these areas cannot be returned to healthy, productive habitat. Similarly, losses to the St. Marys Rapids, in excess of 50 ha, are largely unrecoverable. For this reason, remedial options for aquatic habitat should include: enhancement of remnant rapids habitat or creation of new rapids or similar habitat; enhancement or creation of wetlands in association with the remnant rapids or tributaries to the St. Marys River; and, rehabilitation of tributary streams (Flora and Fauna Task Team Report 1994). Nevertheless, implementation of some or all of these options will only partially compensate for historic losses to aquatic habitat in the AOC.

6.1 Regulatory programs

Ontario and Canada

Fisheries Act: As previously described in section 5.1, this Act is the most significant Federal Statute for the protection of fish habitat from chemical pollution. The habitat protection provisions of the Act provide for the protection of fish and fish habitat from disruptive and destructive activities and require no net loss of productive capacity of fish habitat. The Act provides comprehensive powers to protect fish, fish habitat, and human use of fish by prohibiting the deposition of harmful substances in water where fish are found or on lands that drain into these waters. The Act is legally enforceable when an impact on fish or fish habitat can be shown, and is administered by the federal Department of Fisheries and Oceans and by Environment Canada.

Federal Food and Drug Act: authorizes Health Canada to establish tolerances for chemical substances in fish and fishery products intended for human consumption. These criteria have been adopted by the Province of Ontario. The *Guide to Eating Ontario Sport Fish* gives consumption advice for sport fish from Ontario waters and is published every other year by the Ministry of the Environment in cooperation with the Ministry of Natural Resources. The *Sport Fish Contaminant Monitoring Program* provides information for this guide.

Public Lands Act: restricts activities on or adjacent to crown land. Anyone wishing to work along a shoreline requires an approved work permit. Permits are reviewed by the OMNR, *OMOE*, Conservation Authorities, and Transport Canada.

Beds of Navigable Waters Act: a Provincial Act that can be used to restrict alterations to water courses.

Planning Act: a Provincial statute giving the Ministry of Municipal Affairs the jurisdiction over Municipal Land Use Planning in Ontario. The Act provides an opportunity for organized Municipalities to produce Official Plans, create bylaws, and approve severances, among other things. Section three of the Act allows the Province to incorporate Policy Statements that relate to matters of resource management (eg., Wetlands Policy Statement).

Conservation Authorities Act: flood and fill regulations promulgated under this act are used by Conservation Authorities to control or restrict development in the channel and flood plain. The Sault Ste. Marie Region Conservation Authority issues permits to authorize works within flood plains, particularly along the St. Marys River.

Canadian Environmental Protection Act: As previously described in section 5.1, the focus of the revised (1999) CEPA is pollution prevention and protection of the environment and human health in order to contribute to sustainable development. The federal Departments of Environment and Health have responsibilities under this legislation. Enforcement officers may issue an environmental protection compliance order to prevent a violation from occurring, to put an immediate stop to a CEPA violation, or to require action to be taken to correct a violation. The compliance order is designed to restore an alleged offender to compliance with the Act as quickly as possible.

Michigan and the United States

Clean Water Act: this federal Act regulates the discharge of dredged or other fill material into navigable waters and their adjacent wetlands.

Wetland Protection part of Michigan Act 451: provides for the preservation, management, protection, and use of wetland resources. Under this act, the Michigan Department of Environmental Quality requires a permit to alter wetlands and provides penalties for illegal wetland alteration. It also establishes a permit program to regulate some activities in wetlands that are above the ordinary high water marks of lakes and streams. The Act establishes a state policy to protect the public against the loss of wetlands; however, most normal agricultural and silvicultural activities are exempted from permit requirements.

Inland Lakes and Streams part of Michigan Act 451: requires a permit for dredging, filling, and construction activities in inland lakes and streams and associated wetlands below the ordinary high water mark.

Great Lakes Submerged Lands part of Michigan Act 451: requires a permit for construction activities in the Great Lakes including the bays and harbours on bottomlands and in the water. Projects proposed in or near coastal wetlands are usually denied a permit unless the activity is necessary to exercise a riparian right of access, such as an open pile dock.

Shorelands Protection and Management part of Michigan Act 451: defines and regulates some construction in high risk erosion areas, flood areas, and environmental areas adjacent to the

Great Lakes and connecting waterways. Also provides for the designation of Environmental Areas necessary for the preservation and maintenance of fish and wildlife.

Soil Erosion and Sedimentation Control part of Michigan Act 451: requires permit based on soil erosion control plan for earth change activities that disturb one or more acre or are within 500 ft of a lake or stream.

Environmental Protection part of Michigan Act 451: requires a finding of no pollution or destruction of the air, water, or other natural resources by all permitting and licensing agencies, unless there are no feasible and prudent alternatives. The Act provides for citizen-based lawsuits against any individual, company, or government entity in order to protect the air, water, and other natural resources.

6.2 Restoration and Protection Measures Completed or In Progress

St. Marys Rapids Hydrology Study:
A hydrological study (Environmental Hydraulics Group 1995) estimated the gains in Rapids habitat that would result from various incremental increases in minimum flow volumes through the gates at the Compensating Works. Under normal flow conditions (ie., one gate open half way), it has been estimated that 90% of the Rapids south of the berm would be watered. The entire area would be submerged for flows greater than two gate openings. Field tests have been proposed to supplement this hydraulic analysis. Repairs to the 16 gates have been completed. The Lake Superior Board of Control did a flow study to confirm model predictions and calibrate flow for specific gate openings in August 1999. Results of this study are pending.

The Ontario Ministry of Natural Resources has been working with the agency responsible for ordering flow changes since 1994 to mitigate effects by supplying appropriate timing for water level fluctuations (ie., take into account critical life stages for fish and invertebrates) and expressing concern with flood/drought scenarios (S. Greenwood, pers. comm.).

Little Rapids Restoration Project:
The Little Rapids at the head of Sugar Island have been occluded by shipping channel construction and the building of the causeway between the Sugar Island ferry terminal and the island proper. The potential for reestablishing a portion of the Little Rapids area by installing a series of culverts through the Sugar Island causeway was examined by U.S. participants (MDNR) in the RAP process (Acres International Corporation 1997). It is anticipated that the resumption of water flow through the Little Rapids area would provide up to 28 ha of additional rapids habitat.

Pre-construction assessment of the substrate and fish community in the Little Rapids area has been completed. White and redhorse suckers, carp, northern pike, and perch were captured above and below the causeway (J. Waybrant, pers. comm.). Whitefish and steelhead trout were

found in the areas of higher flow around the Sugar Island ferry dock. This initial assessment suggests that increasing the flow in the Little Rapids would enhance the fishery in this area. Additional surveys are required.

Geozone mapping:
The Flora and Fauna Task Team endeavored to provide options for the protection of existing fish and wildlife habitat and to encourage the rehabilitation of degraded sites. To complete this task, the team developed a series of maps that partition the St. Marys River into manageable geographic units or geozones. Shoreline features, level of industrial or urban development, and characteristics of the river, such as rapids, channels, and lakes, define each of the 12 geozones. Significant habitat types (ie., biozones) that support flora and fauna populations have also been identified and located on natural feature, biologically sensitive, and human influence overlays. The idea is to rank biozones based on their importance to maintaining the watershed of the AOC and their contribution to the natural functioning of the ecosystem. From this, monitoring systems and protection priorities can be established to guide remedial efforts.

Sea Lamprey Control:
Researchers at Clarkson University developed a model to predict the movement and dispersal of the lampricide TFM in the St. Marys River under a range of flow conditions. The model suggested that a TFM treatment would only be effective in the north channel of the River and not in the Lake Nicolet portion. A rhodamine dye study was conducted to validate the transport model. The harmless dye was applied to the river from the railway bridge upstream of the Great Lakes Power generating station. The dye study confirmed the model predictions. TFM applied under similar flow conditions would be effective in portions of the north channel, resulting in a 35% reduction in the River's sea lamprey population (Schleen 1997). Furthermore, the cost of treating the St. Marys River with TFM would exceed the annual budget for lampricide application in the entire Great Lakes basin (Schleen 1997). Alternatively, treatments with granular Bayluscide, a bottom toxicant that would target 'hot spots' or areas of high larval density, would be more efficient and cost effective for treatment of the St. Marys River (Schleen 1997).

Consequently, 81 hectares of the river were treated with granular Bayluscide (aerial helicopter application) in 1998, followed by a much larger treatment of 760 hectares in 1999. In the plots treated, an estimated 88% of the larvae present were removed (determined by larval assessments before and after the treatments). The combined treatments targeted about 51% of the estimated 5 million larvae in the river, resulting in an estimated 45% removal. The Bayluscide treatment appeared to have minimal impacts on non-target organisms.

The Great Lakes Fishery Commission encourages integrated control and development of alternate (non chemical) lamprey control strategies in an effort to reduce dependence on lampricides. In the St. Marys River watershed, barrier dams, constructed on the Big Carp and Echo Rivers, prevent the upstream migration of spawning phase sea lamprey into these tributaries. Traps in the St. Marys River remove spawning lamprey and supply males for the

sterile male-release program. After sterilization, male lamprey are released into the St. Marys River (sterile males have been released into the St. Marys River since 1991). Studies indicate that sterile males compete as aggressively as untreated males, wasting the spawning potential of female sea lamprey. The number of larvae produced in streams that have a sterile male population is reduced (Schleen et al. 1998). In 1999, traps at the Great Lakes Power and the USCOE hydroelectric facilities (both of which have recently undergone improvements), trapped 56% of the estimated 20,000 spawners in the river. In 1999, over 26,000 sterile males were released, resulting in an estimated 4.7:1 ratio of sterile:normal males. Together the integrated trapping and sterile male releases is estimated to have reduced the theoretical reproductive potential by 92%.

The focus of efforts on the river will now be on further enhancement of alternative control efforts and full implementation of the St. Marys River assessment plan. The requirement for future granular Bayluscide treatments will be determined by assessment results. The focus will now move to the lake and the observation of the predicted reduction in fish damage beginning in 2000 and reductions in spawning abundance in the St. Marys beginning in 2001.

Enhanced fish access:
The Michigan Department of Natural Resources recently bulldozed openings into the Munuscong Bay Waterfowl Sanctuary dyke, allowing free water and fish movement into the rich emergent wetland matrix, unattainable by many fish since 1963 (S. Greenwood, pers. comm.).

St. Marys River Fisheries Task Group:
The St. Marys River Fisheries Task Group, established under the authority of the Lake Huron Technical Committee of the Lake Huron Committee, Great Lakes Fishery Commission, is a multi-agency organization with representatives from Michigan, Ontario, Bay Mills Tribe, Chippewa/Ottawa Treaty Fishery Management Authority, and First Nations. The role of the Task Group is to identify data needs and develop an assessment plan that will give resource management agencies the information they need to work towards sustainable fisheries (see, for example, monitoring actions FFM-9, 10, and 11 in section 6.4). The Task Group conducted a fish harvest survey of the entire St. Marys River from Whitefish Bay, Lake Superior to Detour Passage, Lake Huron and around St. Joseph Island including Potagannissing Bay. Harvest information was collected from May to October 1999 for the open water and from January to March 2000 for the ice fishery. Results of this study are pending.

Wetland Monitoring at the Cannelton Industries Site:
The Cannelton Industries site includes a sizable wetland area that borders the St. Marys River. In order to evaluate the potential for future releases to the wetland area, a monitoring study was carried out by the Michigan State University prior to the remediation actions described earlier. The results of the study, will be used to develop long term monitoring and management requirements for the area.

6.3 Restoration and Protection Actions Needed

The following actions have been recommended to restore and protect the flora and fauna (FF) of the St. Marys River ecosystems. A list of proposed implementing agencies and partners is given beneath the title of each recommended action (see list of acronyms at the end of this report). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support (which could range, for example, from major funding initiatives to the provision of scientific advice upon request) will be delineated in the implementation annex.

Action FF-1: *Bar River Habitat Project*
Implementing Organizations: EC, OMOE, OMNR, OMAFRA, AAFC
It may be possible to contribute to the recovery of the Bar River walleye spawning stock by mitigating the effects of land use practices (primarily agricultural) upstream of historic spawning grounds. Geiling (1998) provided a description of land use practices along the river, identifying sites prone to erosion, agricultural run off, and sites where livestock have direct access to the stream. Remedial options include placement of stabilizing structures, contouring stream banks, installation of exclusionary fencing, and tree planting.

Approximately 6,900 white cedar seedlings would be required to replant the river bank (ie., one tree every two metres, two rows deep, for 6.9 km of stream bank) (Geiling 1998). Exclusionary fencing would have to be constructed in areas where livestock have access to the river. Alternate watering sources for livestock would also be required.

There are two sections of the Bar River that have been altered, likely to accommodate increased crop production. These straightened areas with steep banks and no vegetation are highly susceptible to erosion and elevated water temperatures. Remediation would require contouring and stabilization of the stream banks and up slope planting of trees (Geiling 1998).

Action FF-2: *Watershed Development Plan for Bennett and West Davignon Creeks*
Implementing Organizations: EC, DFO, AAFC, OMOE, OMNR, OMAFRA, ASI, SSMRCA, Local Groups
The Bennett and West Davignon Creek system empties into the St. Marys River at the Algoma Steel boat slip. A Diversion Channel accepts flood waters from both creeks. A small rural tributary, Leigh's Bay Creek, empties into the Diversion Channel. The *Watershed Development Plan* (1998) for this system identifies specific remedial options to address habitat components and outlines preventative measures required to protect this northern Ontario watershed. This watershed development plan addresses urban, rural, and industrial development and is a proactive approach to the application of pollution prevention concepts in Lake Superior. However, since this draft plan has not been submitted for public comments and has not been approved by any of the stakeholders, it will be necessary for the implementing organizations, in consultation with stakeholders, to review and revise it as required prior to implementation.

Table 6.1. Remedial options for habitat protection and conservation of the upper, middle, and lower sections of the Bennett and West Davignon Creek system (see Action FF-2) as outlined in the Watershed Development Plan. Information required is listed in italics.

	Uplands section of the creek system upstream from the Precambrian Shield	Middle section from point where flows are divided between the natural stream channels and the Diversion Channel upstream to the edge of the Precambrian shield	Lower section of watershed includes flow-managed reaches of both creeks, the Diversion Channel, and Leigh Bay
Fish Habitat Enhancement and Rehabilitation	no enhancement or rehabilitation opportunities identified **(a)** maintenance of headwater reaches in a natural state is encouraged **(b)** restrict new development within 30m of shoreline	**(c)** tree planting in riparian zone **(d)** restricting livestock access to stream *-requires funding source to defray costs to landowners*	**(e)** assist passage of migratory salmonids (eg., jumping pools below weirs, boulder placement, refuge creation) **(f)** create spawning and nursery habitat for non-jumping fish between estuary and furthest downstream weir in the Diversion Channel **(g)** naturalization of Diversion Channel *-stream survey to assess migratory pathways, weir design, jumping pools, and resting areas* *-habitat and fish community usage study in the Diversion Channel from furthest downstream weir to the estuary*
Groundwater Quality Protection and Conservation	no specific protective measures advised as development is restricted in this area	**(h)** prevent seepage of petroleum products from aggregate extraction operations into the aquifer to protect groundwater quality	**(i)** cooperation between Algoma Steel and the *OMOE* in designing and implementing soil remediation projects for inactive parcels of land **(j)** Algoma Steel to continue to work with OMOE in addressing specific contamination issues as required (eg., phenolic seepage into downstream portion of the combined channel) *-requires assessment of soil and groundwater contaminant levels on Algoma Steel property*
Surface Water Quantity Rehabilitation	-maintenance of natural stream hydrology	-maintenance of natural stream hydrology	**(k)** increase habitat quality and migration pathways in Diversion Channel with instream modifications **(l)** review of weir and culvert design with respect to flow volumes between Diversion Channel and Bennett and West Davignon Creeks to optimize use of allocated flows **(m)** maintain migratory pathways **(n)** exclude passage of sea lamprey *-definition of seasonal distribution of flow volumes prior to water reallocation and redesign of water management structures*

Table 6.1 continued

Surface Water Quality Enhancement and Rehabilitation	**(o)** protection of natural water quality by adhering to buffer strip guidelines and continued restrictions on development	**(c)** tree planting to enhance riparian buffer zone **(d)** restrict livestock access to stream **(p)** provide alternative water sources for livestock **(q)** streambank stabilization *-identify current land use practices, livestock access points, streambank erosion, and parcels of inactive agricultural land*	**(r)** reduce elevated bacteria and phosphorus levels between storm sewer pipe and the receiving water course through construction of retention ponds or man-made wetlands **(s)** continued wetland development to improve salmonid staging habitat and provide for waterfowl and other wildlife *-options assume that water quality impairments upstream from Algoma Steel are the result of elevated iron, phosphorus, and bacteria levels; therefore, water quality sampling is required in the Diversion Channel and Mid and Upland sections of the Bennett and West Davignon Creeks*
Wildlife and Terrestrial Habitat Issues	**(t)** maintenance of riparian buffer zone contiguous with a forested area of no less than 1,000 ha	**(u)** reforestation of inactive agricultural lands *-a guide outlining existing reforestation programs and strategies for owners of inactive agricultural land*	**(v)** tree planting along top of Diversion Channel to improve aesthetic values and augment songbird habitat
Wetland Enhancement	**(w)** enhancement of wetland forming off the mouth of the Diversion Channel including contouring the shoreline of the estuary and planting semi-aquatic vegetation *-list of appropriate species for planting* *-identify areas of shoreline in need of contouring*		

Table 6.1 provides a summary of the potential remedial options included in the plan. The lower section of the watershed includes the flow-managed reaches of both creeks, the Diversion Channel, and Leigh Bay. The middle section extends from the point where flows are divided between the natural stream channels and the Diversion Channel upstream to the edge of the Precambrian Shield. The uplands section of the creek system continues upstream from the Shield.

Action FF-3: *Watershed Development Plan for the East Davignon and Fort Creeks etc.*
Implementing Organizations: EC, DFO, AAFC, OMOE, OMNR, OMAFRA, ASI, SSMRCA, Local Groups
A watershed plan similar to Action FF-2 should be developed for the East Davignon and Fort Creeks, which also pass through urban and industrial lands (P. Kauss, pers. comm.). Sub-watershed plans should also be developed for Root River, Crystal Creek, and the Big and Little Carp Rivers, subject to the acquisition of funding.

Action FF-4: *Sedimentation Reduction in the Munuscong River/Bay:*
Implementing Organizations: MDEQ, MDNR
The Munuscong River is in need of several key non point source pollution control projects to reduce sedimentation in the river and in Munuscong Bay. The Stirlingville Bridge site and further upstream at Pickford are two examples where eroding streambanks need stabilization.

Action FF-5: *Characterization/Feasibility Study for Waste Removal in Mission Creek:*
Implementing Organizations: MDEQ, USEPA
Mission Creek in Sault Ste. Marie, Michigan, has been identified by local residents as having been a waste dump for many years. The creek still contains a great amount of household waste, appliances, cars, containers, and what appears to be waste from former local industries including the Union Carbide operations. Citizens are requesting that a complete hydrogeological and waste characterization study be completed including a feasibility study for the removal of waste and restoration of the natural flow of the creek (see also Actions NPS-7 and NPSM-9).

Action FF-6: *Remediation of Rapids Habitat*
Implementing Organizations: DFO, EC, OMNR, TC, MDEQ, USFWS, USACOE
The Flora and Fauna Task Team examined a number of options for the remediation of rapids habitat and associated wetlands. The options listed below were designed to restore and rehabilitate habitat in order to enhance fish and wildlife populations in the AOC. The implementing organizations will examine all of these options and decide which should be implemented.

(a) *Protection of remnant rapids habitat*
This option encompasses both the protection of remnant habitat from further reduction and degradation as well as the maximization of the productive capacity of the rapids area. In essence, this is a water quantity issue.

Water use demands in the rapids area have been prioritized by the International Joint Commission (1978) as follows: (1) shipping (ie., lock operation); (2) protection of rapids fishery; and (3) other approved uses including hydroelectric power generation. A berm was constructed in 1985 to prevent intermittent dewatering of the rapids. While the structure is largely effective, dewatering of portions of the rapids still occurs. A preliminary assessment of the extent of dewatering has been completed (see *Rapids Hydrology Study* above); however, the impact of dewatering on the biotic community remains to be examined.

Fisheries assessment using conventional netting in the rapids area is recognized as being either extremely difficult or impossible. A series of controlled angling efforts would, however, identify use of rapids habitat by larger fish. Conventional sampling gear could then be used in the shallow waters around the edge of the rapids to provide information on forage fish and the young of some predator species.

(b) Physical enhancement of remnant rapids habitat

Berm construction represents the first attempt to enhance the remnant rapids habitat. The berm maintains a minimum level of flow along the southern shore of Whitefish Island, an area believed to contain some of the best fish spawning habitat in the rapids. The area also supports a highly productive benthic invertebrate community. The option requires the placement of additional substrate to potentially increase the size and productive capacity of the remnant rapids.

Preliminary assessment would involve mapping existing substrate composition, identifying target fish species assemblages, and noting areas likely to become dewatered under differing water supply scenarios. This information could then be used to guide substrate placement strategies.

(c) Creation of new rapids areas in the St. Marys River

An alternative to enhancing or enlarging the remnant rapids would be to augment rapids elsewhere in the St. Marys River (eg., Little Rapids restoration). Areas in the river or its tributaries, which have the hydrologic and physical characteristics required to support rapids regeneration, need to be identified. Vertical drop, substrate type, streambank characteristics, the potential for ice scouring, and flow velocities are factors that must be accounted for at each site. Artificial rapids would have to be designed to incorporate sea lamprey control mechanisms.

(d) Creation of alternatives to rapids habitat

A variety of methods are available to either create artificial spawning substrate or to cleanse existing habitat in order to enhance fishery production. Artificial substrate would have to have similar characteristics to a rapids area. A self-cleaning substrate system involves directing water into a bed of distribution pipes underlying a man made spawning bed, creating an upwelling through the bed. The self-cleaning system is

applicable to areas with high fine sediment deposition.

(e) *Creation of wetlands in association with existing rapids*
Wetland creation downstream of Whitefish Island would connect wetland habitat to the adjacent remnant rapids. The option would involve depositing suitable fill in the area between Whitefish Island and the channel leading to the former Canadian navigation lock. Placement of boulders and rock rubble as a buffer against the fast current of the rapids would protect the site from erosion. A number of small channels could be constructed between the rapids and the new wetland to direct drifting larval fish into the wetland area.

(f) *Creation of new wetlands/rapids complexes*
It may be possible to create a simulated rapids area in the Great Lakes Power tailrace just upstream from Fort Creek in Sault Ste. Marie, Ontario. Clean rock fill could be added to deflect most of the existing current away from the mouth of Fort Creek while the remainder of the flow would be directed over the top of the structure. Wetland features could be incorporated into the design.

A series of islands and shoals extending along a band of shallow water on the north shore of Sugar Island can also be considered for wetland development. Riffle habitat could be created by placing boulder/rubble obstructions to concentrate river flows over suitable gravel/cobble substrates. The lee of these boulder barriers might then accommodate wetland development.

(g) *Enhance habitat and water quality in tributary watersheds*
Creating or enhancing wetlands in selected areas of tributary streams would provide a range of fish and wildlife habitats and would reduce sediment and nutrient inputs to the St. Marys River. Tributary streams provide spawning and nursery habitat for anadromous fish species, forage fish production, and linkages to terrestrial inland habitats. Removing barriers or impediments to migration, such as low head barrier dams, would also enhance fish production in tributary streams.

(h) *Do nothing*
The Flora and Fauna Task Team recognize that this option will maintain or increase dependence on hatcheries and stocking programs to enhance fish populations in the St. Marys River.

Action FF-7: *Develop a 10 Year Fisheries Assessment Program for the River*
Implementing Organizations: DFO, GLFC, OMNR, USFWS, SMRFTG, ITFAP
Netting survey results (1995) indicated an estimated 51% mortality rate for walleye in the St. Marys River (Fielder and Waybrant 1998). Northern pike and yellow perch also appeared to be experiencing very high mortality rates. High mortality rates for these species, combined with slow growth rate as a result of the cold, oligotrophic Lake Superior water, and a short growing

season, should be cause for concern and requires further assessment. Therefore, the St. Marys River Fishery Task Group (SMRFTG) should continue its efforts to develop a 10 year assessment program for the river.

Action FF-8: *Continued Support for Sea Lamprey Control Efforts*
Implementing Organizations: DFO, EC, OMNR, GLFC, USFWS, ITFAP
For a description of these efforts, see section 6.2.

Action FF-9: *Stabilize Shoreline of the Algoma Slag Dump to Provide Habitat for Plants*
Implementing Organizations: Algoma Steel, EC, OMOE, SSMRCA
Materials have been deposited over the years along the shoreline of the Algoma Slag Dump to extend the dump and, in the process, encroach upon the St. Marys River. Although actions were taken in 1993 to stabilize the shoreline along the slag dump, there is relatively little shoreline stability in some areas and poor habitat for plant growth. Stabilizing these areas and providing a more hospitable habitat for plants (eg., via soil addition) is required.

6.4 Monitoring - The Flora and Fauna Monitoring (FFM) Actions

The following flora and fauna monitoring (FFM) actions have been recommended to provide baseline information, identify factors contributing to impairments, and to assess the effectiveness of the remedial actions. This section also contains a number of monitoring actions and studies recommended by the St. Marys River Fishery Task Group (SMRFTG) to identify data needs and develop an assessment plan that will give resource management agencies the information they need to work towards sustainable fisheries (see actions FFM-9, 10, and 11). A list of proposed implementing agencies and partners is given beneath the title of each recommended action (see the list of acronyms at the end of this report). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support (which could range, for example, from major funding initiatives to the provision of scientific advice upon request) will be delineated in the implementation annex.

In addition, the Flora and Fauna Task Team (1994) compiled a list of existing monitoring programs for the St. Marys River AOC which are shown in Table 6.2.

Action FFM-1: *Identify the Causes of Fish Tumours and Other Deformities Which Originate Within the AOC*
Implementing Organizations: DFO, USFWS, SMRFTG
Studies should be carried out, along with any monitoring which may be required, to positively identify which contaminants originating within the AOC are contributing to *Fish Tumours and Other Deformities.* Particular emphasis should be given to those contaminants already suspected of contributing to the problem (i.e., PAHs in sediments) and to the causes of deformities which have been observed in Munuscong Bay.

Action FFM-2: *Marsh Monitoring Program*
Implementing Organizations: EC-CWS, EC-GLSF, USGLPF
A Marsh Monitoring Program was established to provide baseline information on marsh bird and amphibian populations and their habitat. This is a cooperative project with the involvement of the Long Point Bird Observatory, Canadian Wildlife Service, Great Lakes Sustainability Fund,

Table 6.2. Existing programs to monitor the quantity and quality of habitat capable of supporting flora and fauna populations in the St. Marys River AOC (see list of acronyms at the end of this table).

Goal	Monitoring Program (responsible agency)
Fish and Wildlife Habitat:	
-to protect fish and wildlife habitat from contamination, development, loss, and dredging	• Conduct overflights to detect changes in environmental areas (MDNR) and land use (ASCS). The USACOE agreed to maintain an aerial photographic database of the river and to update the photos every five years (D. Fielder, pers. comm.). • erosion control (surveyors for Province of Ontario) • storm water and flooding control (SSMRCA, OMNR, SSMO) • sediment transport (SSMRCA, OMNR) • sewage and water quality control (AHU, OMOE) • shoreline alterations (OMNR, SSMO-DSMP) • shoreline alterations within the city (SSMRCA)
-to ensure no net loss of wetlands	• detecting changes in wetlands (USFWS, NOAA, MDNR, USCG, USACOE, local groups, universities) • wetland evaluations (OMNR, MDEQ) • Marsh Monitoring Program (CWS, USGLPF) • municipal plan review - upgrade to re-zone lands for long term protection (OMNR) • all shoreline alterations (OMNR, MDEQ) • landowner agreements for long term protection (OMNR)
-maintain water quality standards	• water levels (USACOE) and flow rates (LSBC) • river monitoring (OMOE, MDEQ)
Benthic Community:	
-to maintain a diverse and appropriate benthic community for the area	• OMOE has been sampling sediments and associated benthic invertebrate communities for many years and will continue to do so, given the resources (P. Kauss, pers. comm.).
Fish Community:	
-reduce incidence of defects and reproductive problems (compare to control)	
-eliminate advisories and reduce contaminant levels	• Native fish contaminant trends (MDEQ) • Sport fish contaminant levels (OMOE) • Juvenile (young of the year) fish have been sampled and analyzed by the

Goal	Monitoring Program (responsible agency)
	OMOE's Biomonitoring Section. Additional collections have been made in recent years as part of the Great Lakes Nearshore and Tributary Sampling program (OMOE).
-sustain populations	• Sport fish creel/CAN-AM Derby (OMNR) • Creel survey, 1999-2000 (MDNR, OMNR, Bay Mills Tribe, COTFMA, First Nations) • Gill net survey, 1995 (MDNR, OMNR, Bay Mills Tribe) • Bait and commercial fish harvest (OMNR) • Fish spawning study (USFWS, NOAA, MDNR, USCG, USACOE, local groups, universities) • St. Marys River Fishery Task Group has been set up to develop a 10 year assessment program for the river.
-sustain diversity	• No monitoring program identified
Wildlife Community:	
-decrease in populations of exotics	• Purple loosestrife inventory/education (OMNR) • Sea lamprey ammocoete abundance (DFO, USFWS, GLFC) • Sea lamprey adult assessment and trapping (DFO, USFWS) • Sea lamprey flyovers, habitat identification (DFO, USFWS) • Sea lamprey mark and recapture program (DFO, USFWS, ITFAP) • Model of river flow for chemical treatment (GLFC - Lake Huron Technical Committee)
-prevention of introductions and spread of exotics	• Check for vegetation such as loosestrife (SSMRCA) • Check for zebra mussels and river ruffe (OMNR, MDNR)

AHU	Algoma Health Unit	MDNR	Michigan Department of Natural Resources
ASCS	Algoma Soil Conservation Service	MSU	Michigan State University
SSMRCA	Sault Ste. Marie Region Conservation Authority	NOAA	National Oceanic and Atmospheric Administration
COTFMA	Chippewa/Ottawa Treaty Fishery Management Authority	OMOE	Ontario Ministry of the Environment
CWS	Canadian Wildlife Service	OMNR	Ontario Ministry of Natural Resources
DFO	Department of Fisheries and Oceans	SSMO	City of Sault Ste. Marie, Ontario
GLFC	Great Lakes Fishery Commission	SSMO-DSMP	Sault Ste. Marie District Shoreline Management Plan
ITFAP	Inter-tribal Fisheries and Assessment Program	USACOE	U.S. Army Corps of Engineers
LSBC	Lake Superior Board of Control	USCG	U.S. Coast Guard
MDEQ	Michigan Department of Environmental Quality	USFWS	U.S. Fish and Wildlife Service
		USGLPF	U.S. Great Lakes Protection Fund

and the U.S. Great Lakes Protection Fund. The program is coordinated by the Long Point Bird Observatory and implemented by volunteers. Marsh monitoring surveys were conducted in the St. Marys River AOC from 1994 to 1996. Study sites were located in the St. Marys River marsh (Echo Bay and Pumpkin Point) on the Canadian side of the river, and at Lake Nicolet Marsh and Munuscong Lake Wildlife Management Unit Marsh in Michigan. The study concluded that the AOC supports healthy marsh bird and amphibian populations; however, efforts should be made to rehabilitate marsh habitat and to continue with these surveys in order to properly address habitat loss in the St. Marys River watershed.

Action FFM-3: *The Fish Harvest Survey*
Implementing Organizations: SMRFTG
The first Fish Harvest Survey was completed in 1999-2000 as a cooperative effort by provincial, state, and native fisheries management agencies in Ontario and Michigan. The goal was to determine the total fish extraction from the St. Marys River by all sources (ie., angling, commercial and subsistence fishing).

Action FFM-4: *The Fish Contaminant Monitoring Programs*
Implementing Organizations: MDEQ, OMOE, OMNR
The Michigan Department of Environmental Quality and the Ontario Ministry of the Environment will continue with Fish Contaminant Monitoring Programs in the St. Marys River and tributaries. Results are used to determine consumption advisories in the AOC.

Action FFM-5: *The CWS Surveys of the Common and Black Tern Populations*
Implementing Organizations: EC-CWS
Complete a Canadian Wildlife Survey assessment of common tern and black tern populations for the entire St. Marys River.

Action FFM-6: *Analysis of Contaminant Levels in Eggs*
Implementing Organizations: EC-CWS, USFWS
Analyze contaminant levels in eggs from herring gull, black tern, and common tern nests in the AOC. This should include an evaluation of the contaminant levels in eggs from sites near highly contaminated areas such as the Algoma slag dump, or wherever bird deformities have been observed.

Action FFM-7: *Monitoring of Population Changes Due to Habitat Enhancement*
Implementing Organizations: EC, USFWS, OMNR, MDEQ
A monitoring program should be developed to assess change in fish and wildlife populations in the AOC in response to habitat enhancement efforts.

Action FFM-8: *Reproductive Assessments of Gulls and Terns*
Implementing Organizations: EC-CWS, USFWS
Reproductive assessments of herring gulls, black terns, and common terns should be done within the AOC boundary. Deformities should be assessed in common terns in the St. Marys River.

Action FFM-9: *Evaluate Influence of Water Levels and Flows on Spawning and Production*
Implementing Organizations: DFO, OMNR, USFWS, SMRFTG
Design and implement studies to evaluate the influence of water levels and flow rates on spawning and fish production in the St. Marys River and St. Marys Rapids.

Action FFM-10: *Determine Minimum Water Levels and Flow Rates Necessary for Spawning*
Implementing Organizations: DFO, OMNR, USFWS, SMRFTG
Design and implement a study to determine minimum water levels and flow rates necessary for

spring and fall spawning fish species in the St. Marys River and St. Marys Rapids.

Action FFM-11: *Monitoring Water Quantity*
Implementing Organizations: DFO, OMNR, USFWS, SMRFTG
As a connecting channel, water levels in the St. Marys River reflect the water supply from Lake Superior as regulated by the International Lake Superior Board of Control. The Board's approach has been to attempt to "balance the levels of Lakes Superior and Michigan-Huron about their mean levels, giving consideration to their natural ranges." (IJC 2001). Fisheries concerns in the St. Marys Rapids were recognized in 1990 with adoption of the current Lake Superior regulation plan, Plan 1977A. This marked a considerable improvement in ensuring sufficient water for some critical life processes over the long term. However, issues remain around short and medium term flow alterations in the rapids, for maintenance and study purposes and water level changes affecting riparian, wetland and littoral habitats in the lower river. The International Lake Superior Board of Control of the International Joint Commission could contribute to addressing these fisheries concerns through their expertise in regulating water levels in the Great Lakes.

7.0 REPORTING AND EDUCATION

The mandate of the Education and Reporting Task Team was to develop a plan for the coordination and dissemination of information relating to the St. Marys River. To achieve this goal, the task team developed plans for a resource centre (St. Marys River Centre) and established a *Friends of the St. Marys River* organization that would be eligible for funding. This non-profit, grass roots organization has been involved in clean-up activities along the shores of the St. Marys River, promotion of the River as a Heritage Water Trail, establishing a public library to house documents concerning the AOC, and participating in the St. Marys River Celebration. These activities are designed to educate the public on environmental issues and increase the sense of public responsibility and stewardship for remediation of the AOC.

7.1 Education Programs - On-going and Completed

Storm Drain Marking Program:
The *Yellow Fish Road Storm Drain Marking Program* was developed in Canada to increase public awareness and knowledge about protecting fish habitat in urban streams. The program educated the public on proper methods for disposal of hazardous household materials by stressing the linkage between storm drains and adjacent waterways. The local *Yellow Fish Road* program in Sault Ste. Marie, Ontario was initiated by the environmental advocacy group, Clean North. During the summers of 1994 and 1995, students from local schools used yellow fish symbols to mark 3,400 storm drains that discharge to the St. Marys River and its tributaries, a level of participation unequaled anywhere else in Canada. Students in Sault Ste. Marie, Michigan, also participated in a similar project by stenciling a message beside storm drains indicating that anything going into the drainage system will be discharged to the St. Marys River and could pose a hazard to the aquatic ecosystem.

Waterfront Development Plan:
The City of Sault Ste. Marie, Ontario, has completed a number of development projects designed to enhance waterfront properties, attract residents and tourists to the area, and increase public awareness of ecologically sound designs while realizing a direct cost-savings for the municipality. Development has been guided by a Waterfront Development Strategy, adopted by the City in 1988.

Environmental Platform:
The Munuscong River Watershed Association (MRWA), in partnership with the Sault Area Community Foundation, Pickford High School, Michigan State University Extension, Bay Mills Indian Community, Chippewa County Soil Conservation Office, and Americorp, has received funding to construct an educational platform on the Munuscong River next to Pickford High School. The majority of the funding will be used to build a 50 ft by 100 ft outdoor classroom to accommodate over 400 students. Bird feeders, weather station equipment, and water quality measuring devices will be purchased for use at the site. Bi-weekly monitoring will continue at

seven MRWA test sites on the Munuscong River. The balance of the grant money was used to sponsor an Eastern Upper Peninsula Environmental Conference in October 1999. Funding was provided by Michigan's Learn and Serve program.

Wetland Observation Platform:
The Sault Ste. Marie High School in Michigan constructed a platform on the school grounds that allows for the observation of a functioning wetland and pond on the school property. The platform provides opportunities to educate students on wetland flora and fauna, the ecological importance of functioning wetlands, and to foster ecological stewardship in the area's future leaders.

7.2 On-going Reporting of Area of Concern Activities and Monitoring

The Binational Public Advisory Council established an office at Lake Superior State University in 1998 to serve as a resource centre for the St. Marys River. Documents related to the AOC and maps of the watershed will be housed in this office.

7.3 Reporting and Education Actions Needed

It is important that information about government and industry successes and developments be transferred in a reader-friendly manner to interested citizens, agencies, and elected officials. In particular, the flow of information across the border needs to be enhanced. These points were emphasized by the IJC in its site assessment of the St. Marys River AOC, and are addressed by Actions RE-1 and RE-3, which have been taken, in large measure, directly from the IJC report.

The IJC also identified the Native American/First Nation population as the most impacted group within the AOC, and pointed out that their lands "continue to be affected by the release of raw sewage during wet weather flow conditions." Furthermore, it expressed concern over what appears to be a lack of specific outreach programs directed to these people. This concern is addressed by Action RE-2 which has also been taken, with some modification, from the IJC report.

A list of proposed implementing agencies and partners is given beneath the title of each recommended action (see the list of acronyms at the end of this report). Note that these lists are only proposals and do not constitute commitments on behalf of those organizations included within them. The actual role to be played by the organizations and the type and extent of their support will be delineated in the implementation annex.

Action RE-1: *Revitalizing Public Understanding and Involvement in Remediation Activities*
Implementing Organizations: EC, OMOE, USEPA, MDEQ
Give immediate priority to revitalizing public involvement in the implementation of the remediation activities in the AOC, with a view to generating and sustaining community understanding and support for the goals of AOC restoration. The Four Agencies will accomplish this by demonstrating their strong commitment to the principals set forth in Chapter Three of the *Four Party Compendium of Position Papers* (see section 1.2).

Action RE-2: *Communication of Any Identified Health Risks Resulting from Adverse Effects to First Nation/Native American Water Supplies or Lands*
Implementing Organizations: HC, OMOE, USEPA, MDEQ, INAC
(a) Any health risks identified by Action NPSM-10 resulting from adverse effects to First Nation/Native American water supplies or lands should be communicated without delay to the affected communities. Impacts should be used as further justification for controlling excess flows and upgrading the East End WPCP.
(b) The four responsible agencies should utilize existing First Nation/Native American outreach programs at Lake Superior State University or other institutions to better communicate with communities on both sides of the U.S./Canadian border. Efforts should also be made to improve direct channels of communication with the general membership of these communities.

Action RE-3: *Identify, Track, and Publicize Implementation Activities Within the AOC*
Implementing Organizations: EC, OMOE, USEPA, MDEQ
Implementation activities within the AOC and their specific benefits should be clearly identified, tracked, and publicized with particular attention to the information needs of industry and citizens. This effort might well be linked with an ongoing initiative such as the Bi-national Regional Initiative Developing Greater Education (BRIDGE, see section 2.2).

Action RE-4: *Raise Public Awareness of Environmental Health Concerns*
Implementing Organizations: HC, EC, USEPA, MDEQ
Remediation that addresses beneficial use impairments should also address health-related issues. The RAP process can be used to raise public awareness of environmental health concerns, reduce human exposure to potentially harmful contaminants, and increase public support for remediation. See for example Action NPSM-10.

Action RE-5: *Quantify the Economic Benefits of a Healthy Natural Ecosystem*
Implementing Organizations: EC, OMOE, MDEQ
Future development in the commercial, industrial, or tourism sectors requires careful planning and sustainable solutions to eliminate any potential environmental impacts on the beneficial uses of the AOC. While the natural environment provides opportunities and challenges for the growth of the St. Marys River community on both sides of the border, contamination problems could resurface from economic, urban, or industrial growth and development. Therefore, any efforts made to quantify linkages between the economic development capacity of this area and the restoration, enhancement, and protection of the natural ecosystem would be beneficial to the

RAP process.

Actions Described in Previous Chapters Involving Public Participation and Education

Furthermore, in addition to the activities described above, there are a number of other recommended actions described previously in this report which also involve public participation and education. These are briefly summarized below:

1. The pollution prevention education programs for business, industry, and the public described in Action PS-5.
2. Items (d) and (u) listed in Table 6.1, which focused on:
    - the involvement of landowners in activities that would restrict livestock access to streams
    - the reforestation of inactive agricultural lands by distributing a guide outlining existing reforestation programs and strategies to owners of inactive agricultural land
3. The "no net loss" landowner agreements mentioned in Table 6.2, that will ensure long term protection of wetlands
4. The Marsh Monitoring Program described under Action FFM-2, coordinated by the Long Point Bird Observatory and implemented by volunteers.

8.0 SUMMARY OF RECOMMENDATIONS FOR THE RESTORATION AND PROTECTION OF THE ST. MARYS RIVER

The following table summarizes the main recommendations to restore the impaired beneficial uses in the St. Marys River AOC. Note that the remediation and monitoring actions are listed separately in the same order in which they appear in the Stage 2 Report. General reporting and education actions and management actions are listed at the end of the table.

Table 8.1 - Summary of Recommendations to Restore the Beneficial Uses in the St. Marys River

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Restrictions on Fish and Wildlife Consumption	**——— Remediation Actions ———** · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. **——— Monitoring Actions ———** · **Action NPSM-2:** Aerial Monitoring of the Cannelton Industries Site · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain · **Action FFM-3:** Fish Harvest Survey · **Action FFM-4:** Continue with sport fish contaminant monitoring programs in the St. Marys River and tributaries.
Degradation of Fish and Wildlife Populations	**——— Remediation Actions ———** · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. · **Action NPS-1**: Develop a multi-agency sediment management program for the river to address remedial options and implement actions for contaminated sediments, including long-term sediment contamination studies. For details on this high priority action see section 5.3 of the Stage 2 Report. · **Action NPS-4:** Identification and Control of Contaminant Inputs from the Algoma Slag Dump (including stabilization of shoreline and nearshore sediments) · **Action NPS-7:** Remediation for Contaminated Terrestrial and Aquatic Disposal Sites · **Action FF-7:** Continue with St. Marys River Fishery Task Group efforts to develop a 10 year assessment program for the river. · **Action FF-8:** Continue to support sea lamprey control efforts. **——— Monitoring Actions ———** · **Action PSM-6:** Monitor the receiving water every three years at St. Marys Paper Ltd. to document response of fish communities to improved effluent quality as mill upgrades and process improvements are implemented.

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Degradation of Fish and Wildlife Populations (continued)	· **Action PSM-8:** Monitor the Short Term Variability and Monthly Ranges of Contaminant Discharges from Water Pollution Control Plants in the AOC · **Action NPSM-2:** Aerial Monitoring of the Cannelton Industries Site · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain · **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways · **Action NPSM-11:** Assess the Potential Hazards Associated With Spills from Shipping Vessels · **Action FFM-5:** Complete a Canadian Wildlife Survey assessment of common tern and black tern populations for the entire St. Marys River. · **Action FFM-6:** Analyze contaminant levels in eggs from herring gull, black tern, and common tern nests in the AOC. · **Action FFM-7:** A monitoring program should be developed to assess change in fish and wildlife populations in the AOC in response to habitat enhancement efforts.
Fish Tumours and Other Deformities	---------- **Remediation Actions** ---------- · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. · **Action PS-7:** Continue with process improvements at industrial and municipal facilities. · **Action NPS-1:** Development of a Multi-Agency Sediment Management Program · **Action NPS-4:** Identification and Control of Contaminant Inputs from the Algoma Slag Dump (including stabilization of shoreline and nearshore sediments) ---------- **Monitoring Actions** ---------- · **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways · **Action FFM-1:** Identify the Causes of Fish Tumours and Other Deformities Which Originate Within the AOC
Bird and Animal Deformities or Reproductive Problems	---------- **Monitoring Actions** ---------- · **Action FFM-8:** Reproductive assessments of herring gulls, black terns, and common terns should be done within the AOC boundary. Deformities should be assessed in common terns in the St. Marys River.
Degradation of Benthos	---------- **Remediation Actions** ---------- · **Action NPS-1**: Develop a multi-agency sediment management program for the river to address remedial options and implement actions for contaminated sediments, including long-term sediment contamination studies. For details on this high priority action see section 5.3 of the Stage 2 Report. · **Action NPS-2**: Conduct further studies to characterize sediment quality in high priority areas (ie., adjacent to Algoma Slag Dump, portion of Little Lake George

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Degradation of Benthos (continued)	Channel downstream of East End WPCP, and the Algoma Slip). · **Action NPS-3**: Complete sediment chemistry analysis and benthic community assessment as part of the *St. Marys River Contaminated Sediment Zones Evaluation* (Kauss 1999b) · **Action NPS-5**: Algoma Steel Inc. has removed sediments from the slip during maintenance dredging operations. Therefore, further sediment quality and benthic community assessments should be made to determine the effectiveness of contaminant removal and to determine the need for further dredging. **---------- Monitoring Actions ----------** · **Action PSM-1:** Long-Term Water Monitoring at the Cannelton Industries Site · **Action PSM-6:** Monitor the receiving water every three years at St. Marys Paper Ltd. to document response of benthic communities to improved effluent quality as mill upgrades and process improvements are implemented. · **Action NPSM-1**: Monitor effluent from East End Water Pollution Control Plant for concentrations and loadings of persistent contaminants exceeding guidelines in Lake George Channel sediments. · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain · **Action NPSM-5**: Re-sample river sediments every five years to obtain trend with time information. · **Action NPSM-6**: Periodically conduct benthic, toxicity, and sediment chemistry studies in the Bellevue Marine Park area.
Restrictions on Dredging Activities	**---------- Remediation Actions ----------** · **Action NPS-1**: Develop a multi-agency sediment management program for the river to address immediate dredging needs. For details on this high priority action see section 5.3 of the Stage 2 Report. · **Action NPS-5:** Evaluate sediment quality and quantity in the Algoma Slip to determine need for further dredging. **---------- Monitoring Actions ----------** · **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain
Eutrophication or Undesirable Algae	**---------- Remediation Actions ----------** · **Action PS-3:** Upgrade East End Water Pollution Control Plant to secondary treatment. · **Action NPS-6**: Control non point source pollution from agricultural activities.

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Eutrophication or Undesirable Algae (continued)	**---------- Monitoring Actions ----------** · **Action NPSM-8:** Monitor Non-Point Sources of Pollution in the AOC
Ambient Water Quality	**---------- Remediation Actions ----------** · **Action PS-1:** Virtually eliminate all persistent and bioaccumulative contaminants from industrial and municipal discharge. · **Action PS-2:** Reduce storm water infiltration to prevent sewage bypasses. · **Action PS-3:** Upgrade East End Water Pollution Control Plant to secondary treatment. · **Action PS-5:** Address contaminants in storm water discharge system by source control, air quality control, and pollution prevention education programs. · **Action PS-6:** Continue with Clean Water Regulation (Canada) and National Pollutant Discharge Elimination System (US) Programs for industrial dischargers. · **Action PS-7:** Continue with process improvements at industrial and municipal facilities. · **Action PS-8:** Continued work on CSOs in Sault Ste. Marie Mich. · **Action NPS-1:** Development of a Multi-Agency Sediment Management Program · **Action NPS-7:** Remediation for Contaminated Terrestrial and Aquatic Disposal Sites · **Action NPS-8:** Plan and Implement Appropriate Remediation, Protection, and Enforcement Actions to Remove Any Potential Public Health Risks Identified by Action NPSM-10 **---------- Monitoring Actions ----------** · **Action PSM-1:** Long-Term Water Monitoring at the Cannelton Industries Site · **Action PSM-3:** Ambient Water Monitoring in the St. Marys River · **Action PSM-7:** Design and implement monitoring system for storm water. · **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways · **Action NPSM-10:** Assess Health Risks to Communities and Individuals Taking Their Water From the "Down-River" Regions of the St. Marys River System · **Action NPSM-11:** Assess the Potential Hazards Associated With Spills from Shipping Vessels
Beach Closings	**---------- Remediation Actions ----------** · **Action PS-2:** Reduce storm water infiltration to prevent sewage bypasses. · **Action PS-3:** Upgrade East End Water Pollution Control Plant to secondary treatment.

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Beach Closings (continued)	**---------- Monitoring Actions ----------** · **Action NPSM-7:** Assess potential human health risks resulting from floating sediment near, and downstream from, Bellevue Marine Park.
Degradation of Aesthetics	**---------- Remediation Actions ----------** · **Action PS-4:** Relocate discharge pipe from East End Water Pollution Control Plant to deeper, faster moving water in the Lake George Channel in order to improve dispersion of discharge plume. · **Action PS-9:** Algoma Steel to Limit Discharges from its Dekish Operation · **Action FF-9**: The Algoma Slag Dump shoreline is an eyesore. Shoreline stabilization and providing habitat for plant growth (eg., via soil addition) would help to soften and stabilize the landscape. **---------- Monitoring Actions ----------** · **Action PSM-2:** The Sault Ste. Marie, Michigan Air Quality Monitoring Project · **Action PSM-4:** The Sault Ste. Marie, Ontario Air Quality Monitoring Project · **Action PSM-5:** Monitoring of Particulate Emissions at Algoma's Dekish Operation
Loss of Fish and Wildlife Habitat	**---------- Remediation Actions ----------** **Action NPS-6**: Control non point source pollution from agricultural activities and road crossings on tributaries. **Action NPS-7:** Remediation for Contaminated Terrestrial and Aquatic Disposal Sites **Action FF-1:** *Walleye recovery in the Bar River:* · Mitigate the effects of land use practices upstream of historic walleye spawning grounds. · Use stabilizing structures, contour streambanks, plant trees along the shoreline, and provide exclusionary fencing to restrict livestock access to river. **Action FF-2:** *Watershed Development Plan for Bennett and West Davignon Creeks (See Table 6.1)* **(a)** Maintain headwater reaches in natural state **(b)** Restrict development within 30m of shoreline **(c)** Plant trees in riparian zone **(d)** Restrict livestock access to stream **(e)** Assist passage of migratory salmonids by enhancing migratory pathways while excluding sea lamprey passage (see **(n)**) **(f)** Create spawning and nursery habitat **(g)** Naturalize Diversion Channel **(h)** Prevent seepage of petroleum products into aquifer to protect groundwater quality **(i)** Design and implement soil remediation projects for inactive parcels of land on Algoma Steel property **(j)** Algoma to work with OMOE in addressing specific contamination issues

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Loss of Fish and Wildlife Habitat (continued)	**(k)** Increase habitat quality and migration pathways in Diversion Channel with instream modifications. **(l)** Optimize volume of flow between Diversion Channel and Bennett and West Davignon Creeks **(m)** Maintain migratory pathways **(n)** Exclude passage of sea lamprey **(o)** Adhering to buffer strip guidelines and continued restrictions on development **(p)** Provide alternative water sources for livestock **(q)** Streambank stabilization **(r)** Construct retention ponds or man-made wetlands to reduce effects of storm water discharge **(s)** Continued wetland development to improve salmonid staging habitat and provide for waterfowl and other wildlife **(t)** Maintenance of riparian buffer zone contiguous with a forested area no less than 1000 ha **(u)** Reforestation of inactive agricultural lands **(v)** Tree planting along top of Diversion Channel **(w) Enhance wetland forming off mouth of Diversion Channel** **Action FF-3:** *Watershed Development Plan for East Davignon and Fort Creeks etc.:* Watershed plans similar to **Action FF-2** should be developed for East Davignon and Fort Creeks, *Root River, Crystal Creek, and the Big and Little Carp Rivers.* **Action FF-4:** *Munuscong River/Bay:* Several key non point source pollution control projects to reduce sedimentation in the river and in Munuscong Bay (e.g., stabilization of eroding streambanks at Stirlingville Bridge site and at Pickford). **Action FF-5:** *Mission Creek:* Complete hydrogeological and waste characterization study to be completed, including a feasibility study for the removal of waste and restoration of the natural flow of the creek. **Action FF-6:** *Rapids Habitat:* (A number of options have been presented for the remediation of rapids habitat and associated wetlands.) **(a)** Protect remnant rapids habitat from further reduction and degradation and maximize the productive capacity of the rapids area **(b)** Enhance remnant rapids habitat by placing additional spawning substrate in rapids area - map existing substrate, identify target fish species assemblages, and note areas likely to become dewatered under differing flow conditions **(c)** Create new rapids areas elsewhere in the St. Marys River, especially in the Little Rapids area - identify areas with the hydrologic and physical characteristics to support rapids generation **(d)** Create alternative to rapids habitat such as artificial spawning substrate **(e)** Create wetlands downstream of Whitefish Island to connect wetland habitat to adjacent remnant rapids **(f)** Create new wetland/rapids complexes **(g)** Enhance habitat and water quality in tributary watersheds

Beneficial Use Impairment	Recommendations for the Restoration of Beneficial Uses* and for the Associated Monitoring Activities
Loss of Fish and Wildlife Habitat (continued)	**Action FF-7:** *Fisheries Assessment:* **(a)** Mortality rates for walleye, northern pike, and yellow perch require further assessment. **(b)** Continue with St. Marys River Fishery Task Group efforts to develop a 10 year assessment program for the river. **Action FF-8:** Continued Support for Sea Lamprey Control Efforts **Action FF-9:** Stabilize shoreline of Algoma slag dump to provide habitat for plants **——— Monitoring Actions ———** **Action PSM-1:** Long-Term Water Monitoring at the Cannelton Industries Site **Action NPSM-3:** Biological Monitoring at the Cannelton Industries site to ensure protection of the ecological food chain **Action NPSM-9:** Identify Terrestrial and Aquatic Disposal Sites Transferring Contaminants into Waterways **Action NPSM-11:** Assess the Potential Hazards Associated With Spills from Shipping Vessels **Action FFM-2:** Continued support for the Marsh Monitoring Program **Action FFM-7:** A monitoring program should be developed to assess change in fish and wildlife use of the AOC in response to habitat enhancement efforts. **Action FFM-9:** Evaluate Influence of Water Levels and Flows on Spawning and Production **Action FFM-10:** Determine Minimum Water Levels and Flow Rates Necessary for Spawning **Action FFM-11:** Monitoring Water Quantity

General Actions Relating to Reporting, Education, Human Health, and Management	
General Reporting and Education Actions	**Action RE-1:** Revitalizing Public Understanding and Involvement in Remediation Activities **Action RE-2:** Communication of Any Identified Health Risks Resulting from Adverse Effects to First Nations/Native American Water Supplies or Lands **Action RE-3:** Identify, Track, and Publicize Implementation Activities Within the AOC **Action RE-4:** Raise Public Awareness of Environmental Health Concerns **Action RE-5:** Quantify the Economic Benefits of a Healthy Natural Ecosystem
Actions Relating to Human Health	**Action NPSM-10:** Assess Health Risks to Communities and Individuals Taking Their Water From the "Down-River" Regions of the St. Marys River System **Action NPSM-12:** Identify Locations Within the AOC Which are Associated With Elevated Levels of Human Health Disorders

General Actions Relating to Reporting, Education, Human Health, and Management	
General Management Actions	**Management Action MNG-1:** It is recommended that a workshop session, or series of sessions be convened which will produce a set of precise, objectively defined delisting criteria that are numerically quantified wherever possible, and which will provide the necessary decision framework that will govern the delisting of each impaired beneficial use and ultimately the delisting of the AOC itself. **Management Action MNG-2:** It should also be noted that monitoring activities which track progress toward delisting must, in large measure, be determined by those very same criteria which define the delisting process itself. Consequently, modifications or additions to the delisting criteria, such as those which are recommended under management action MNG-1 will likely require corresponding changes to the monitoring activities. It is recommended, therefore, that a workshop session, or series of sessions also be convened to establish the necessary coordination between the overall monitoring strategy and the revised delisting criteria resulting from Action MNG-1.

* The recommended actions are labeled as follows:
  Action PS-n denotes the n-th point source (PS) recommended action (see section 4.3).
  Action NPS-n denotes the n-th non-point source (NPS) recommended action (see section 5.3)
  Action FF-n denotes the n-th flora and fauna (FF) recommended action (see section 6.3).
  Action RE-n denotes the n-th reporting and education action (see section 7.3).
  Action MNG-n denotes the n-th management recommended action.

Monitoring recommendations for point sources, non-point sources, and flora and fauna are denoted by **Action PSM-n, Action NPSM-n,** and **Action FFM-n**, respectively (see sections 4.4, 5.4, and 6.4 respectively).

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Acronyms

AAFC	Agriculture and Agri-Food Canada
AHU	Algoma Health Unit
AOC	Area of Concern
ASCS	Algoma Soil Conservation Service
ASI	Algoma Steel Inc.
ATSDR	Agency for Toxic Substances and Disease Registry
BATEA	Best Available Technology Economically Achievable
BOD	Biochemical oxygen demand
BPAC	Binational Public Advisory Council
BRIDGE	Binational Regional Initiative Developing Greater Education
CA	Conservation Authority
CHRS	Canadian Heritage River System
COTFMA	Chippewa/Ottawa Treaty Fishery Management Authority
CSO	Combined sewer overflow
CWS	Canadian Wildlife Service
DHA	Dehydroabletic acid
DFO	Department of Fisheries and Oceans
DSPC	Direct Strip Production Complex
EEM	Environmental Effects Monitoring
EC	Environment Canada
EPA	(U. S.) Environmental Protection Agency
GLFC	Great Lakes Fishery Commission
GLHEP	Great Lakes Health Effects Program
GLSF	Great Lakes Sustainability Fund
GLWQA	Great Lakes Water Quality Agreement
HC	Health Canada
IC	Industry Canada
IJC	International Joint Commission
INAC	Indian and Northern Affairs Canada
ITFAP	Inter-Tribal Fisheries Assessment Program
LaMP	Lakewide Management Plan
LSBC	Lake Superior Board of Control
OMAFRA	Ontario Ministry of Agriculture Farming and Rural Affairs
OMNR	Ontario Ministry of Natural Resources
OMOE	Ontario Ministry of the Environment (also designated as MOE)
MISA	Municipal Industrial Strategy for Abatement
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MFO	Mixed function oxidase
MOE	Ontario Ministry of the Environment (also designated as OMOE)
MSU	Michigan State University

MRWA	Munuscong River Watershed Association
NOAA	(U. S.) National Oceanic and Atmospheric Administration
NOAEC	No observable adverse effect concentration
NPDES	National Pollution Discharge Elimination System
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PSQG	Provincial Sediment Quality Guidelines
RAP	Remedial Action Plan
SMRFTG	St. Marys River Fisheries Task Group
SSM	Sault Ste. Marie
SSMM	City of Sault Ste. Marie, Michigan
SSMO	City of Sault Ste. Marie, Ontario
SSMRCA	Sault Ste. Marie Region Conservation Authority
TC	Transport Canada
TFM	3-trifluoromethyl-4-nitrophenol
TPH	Petroleum hydrocarbons
USACOE	U. S. A. Core of Engineers
USCG	U.S. Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	U. S. Fish and Wildlife Service
USGLPF	U. S. Great Lakes Protection Fund
WPCP	Water Pollution Control Plant
WWTP	Waste Water Treatment Plant

Measurements and Units

mg/l	= milligrams per litre	= parts per million (ppm)*
mg/kg	= milligrams per kilogram	= parts per million (ppm)
µg/l	= micrograms per litre	= parts per billion (ppb)*
µg/g	= micrograms per gram	= parts per million (ppm)
kg/d	= kilograms per day	
m^3/d	= cubic metres per day	
#/100ml	= number per 100 millilitre	
m^3/s	= cubic metres per second	
cf/s	= cubic feet per second	

*How small is small?
One part per million:
= one inch in 16 miles;
= one minute in two years;
= one bad apple in 2,000 barrels;
= one ounce in 31 tonnes of potato chips.

One part per billion:
= one inch in 16,000 miles;
= one second in 32 years;
= one bad apple in 2 million barrels;
= a pinch of salt in 10 tonnes of potato chips.

At what point are chemicals perceived? Table salt in water becomes somewhat unpalatable at one part per thousand; swimmers can detect chlorine in a pool at one part per million; and sensitive noses can detect the odour of fuel oil at one part per billion.

APPENDIX 1 - CONTACT LISTS

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(Note that Council positions change yearly)

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APPENDIX 2:

ENVIRONMENTAL MANAGEMENT AGREEMENT

between

Algoma Steel Inc.

and

Her Majesty the Queen in Right of Canada,
as represented by the Minister of Environment (EC)

and

Her Majesty the Queen in Right of Ontario,
as represented by the Minister of the Environment (MOE)

ENVIRONMENTAL MANAGEMENT AGREEMENT

between

Algoma Steel Inc.

and

Her Majesty the Queen in Right of Canada,
as represented by the Minister of Environment (EC)

and

Her Majesty the Queen in Right of Ontario,
as represented by the Minister of the Environment (MOE)

Section 1 - Definitions

1.1 In this document,

1.1.1 *ASI* means the steelworks located in Sault Ste. Marie owned by Algoma Steel Inc.

1.1.2 *CEPA* means the Canadian Environmental Protection Act S. C. 1999 c. 33 and as amended from time to time.

1.1.3 *contaminant* means any solid, liquid, gas, odour, heat, vibration, radiation or combination of any of them resulting directly or indirectly from human activities that may cause an adverse effect.

1.1.4 *Director(s)* means the Regional Director of the *MOE* Northern Region and/or the Regional Director of *EC Ontario Region.*

1.1.5 *EBR registry* means the Environmental Bill of Rights registry administered by the MOE (www.ene.gov.on.ca).

1.1.6 *EMA* means the signed three-party Environmental Management Agreement.

1.1.7 *EPA* means the Environmental Protection Act R.S.O. 1990 c. E.19 administered by the Ontario Ministry of the Environment and as amended from time to time.

1.1.8 *Green Lane* means the *EC* internet environmental page (www.cciw.ca/green-lane/or-home.html).*PAH* means the group of 17 polynuclear aromatic hydrocarbons as listed in appendix 1.

1.1.9 *the parties* means *ASI, EC* and *MOE.*

Section 2 - Introduction and Background

2.1 Introduction

The development of several inter-governmental agreements and initiatives over the past few decades have resulted in an opportunity for the parties to this document to negotiate an Environmental Management Agreement (*EMA*),which advances several environmental issues at Algoma Steel Inc (*ASI*). This *EMA* is a voluntary initiative designed to complement the existing regulatory process. It provides a mechanism for *ASI* to commit to environmental initiatives that exceed existing regulatory requirements while taking into consideration the criteria and principles embodied in the Voluntary Non-Regulatory Initiatives (*VNRI*) document of November 1997. The *VNRI* document was developed by the New Directions Group, which has multi-stakeholder membership and is comprised of representatives from government, industry and environmental non-governmental organizations and was used as guidance in completing this *EMA*.

A key goal of this *EMA* is to bring together several federal and provincial objectives in one concise document and provide one window through which *ASI* can deal with government agencies. Progress towards reduction or elimination of the "beneficial use impairments"(as defined in the Canada-US Water Quality Agreement) and pollution incident reports are important objectives considered in the development of this *EMA*.

Under Annex 2 of the 1987 Protocol to the 1978 Canada- U.S. Water Quality Agreement, an Area of Concern (where the impairment of beneficial uses of a geographic area has been realized) was established for the St. Mary's River in 1988. This led to the development of a Remedial Action Plan led by the Ontario Ministry of the Environment with support from Environment Canada and other federal departments and the formation of a Binational Public Advisory Council. Criteria for the delisting (as defined in the Canada-US Water quality Agreement) of the "beneficial use impairments" have been completed in the development of the Remedial Action Plan Stage 2 document.

An Air Quality Committee formed pursuant to the United States-Canada Air Quality Agreement between Canada and the United States, requested in 1997, that a bi-national multi-stakeholder consultation be undertaken to evaluate complaints from Michigan residents regarding trans-boundary pollution from Sault Ste. Marie, Ontario. An ongoing consultation and monitoring partnership between federal, state, provincial and tribal stakeholders has been developed to address this issue.

This *EMA* hopes to further the goals of the 1994 Canada-Ontario Agreement, Great Lakes Water Quality Agreement, Remedial Action Plan, United States-Canada Air Quality Agreement and other government programs, and align them with the environmental initiatives which *the parties* agree are current priorities.

The *EMA* is also consistent with *ASI's* policy on reducing the impact of its operations on the overall environment and adjacent residential areas. All parties agree that the establishment of a list of environmental projects, with appropriate time lines in a clearly defined plan, is beneficial to all stakeholders and provides a clear path to realizing the goals and mandates of *the parties* who are signatories to this agreement. The draft *EMA* was presented at a public meeting held in Sault Ste. Marie on May 18, 2000, and posted on the *MOE* Environmental Bill of Rights Registry and the Green Lane internet site for a 30 day period ending June 30, 2000.

2.2 Background

ASI is an integrated steel producer, with annual production of finished steel products of approximately 2.1 million tonnes. It is located on an 810 hectare parcel of land, which includes a 328 hectare non-hazardous landfill site (*MOE* Certificate of Approval #A560101). Finished products include plate, strip and cold rolled steel. The facility is operated with three cokemaking batteries, one operational blast furnace, one basic oxygen steel plant and a variety of finishing mills, including a recently completed direct strip production complex.

Environmental improvements over the last decade have resulted in *ASI* currently achieving full compliance with *Ontario Regulation 214/95* (MISA) at its eleven control points, which discharge to the St. Mary's River. Major environmental upgrades to reduce and treat waste streams at *ASI* over the past decade include the installation of a main wastewater treatment plant, blast furnace wastewater recirculation system, pH control of process wastewater discharges from the Bar and Strip Lagoon, fixed ammonia removal, biological treatment of phenol in cokemaking wastewater and secondary emission controls for visible emissions from the steelmaking operation. A commitment to address particulate emissions from the Ironmaking dekishing operations was provided to *MOE* in a Program Approval issued in November 1998. Controls on this source will be fully implemented by September 2002. Over the past ten years, *ASI* has committed approximately $100 Million for capital environmental facilities.

Regarding climate change issues, *ASI* has made changes to its processes, incorporating direct strip casting and rolling technology. This addition of the newest steel processing technology, along with reductions in the amount and types of fuel used, advancements in fuel burner technology and a change to its iron ore source has resulted in significant reductions in the production of greenhouse gases. Between 1990 and 2000, *ASI* will realize a 6.5% reduction in carbon dioxide(CO_2) emissions. *ASI* has increased the use of natural gas in new and refurbished facilities and thereby reduced its reliance on heavy fuels.

ASI has been actively upgrading electrical equipment to newer, more energy efficient types that has resulted in net energy savings. This commitment will continue with future improvements planned for equipment upgrades and energy use monitoring.

ASI is a participant in the Voluntary Challenge Registry (VCR), the Accelerated Reduction/Elimination of Toxics (ARET) Program, the Ontario Anti-Smog Action Plan and is a signatory to the Canadian Steel Producers' Association (CSPA), Statement of Commitment and Actions.

ASI sponsors a used oil collection day, twice per year, in Sault Ste. Marie, as a public service to collect and recover waste oil from the community. Since beginning this program in 1991, *ASI* has collected approximately 74,000 litres of waste oil from the public. Waste oils collected both on and off site are processed into waste derived fuel and utilized by *ASI* as a fuel source, reducing the need to purchase virgin fuel. Within the operations, a program has also begun to directly recycle oil at the mill source. This approach will be expanded wherever possible and maintenance programs will ensure that the volume used is minimized

ASI believes that the commitments contained in the Agreement represent realistic and achievable goals and, wherever possible, *ASI* will work toward improving the timetable and the levels of reduction.

Section 3 - **Goals and Objectives**

3.1 Goals and Objectives are as follows:

- the reduction or elimination of specific substances which are found to be persistent, bioaccumulative and toxic in the environment and appear in appendix 2 of the 1994 Canada-Ontario Agreement as Tier I and Tier II substances (appendix 2 attached),

- the reduction or elimination of air discharges in the form of visible and gaseous emissions, which exceed or are inconsistent with existing or proposed limits or guidelines or are the subject of pollution reports to *MOE*,

- improved management of solid waste and contaminated sediments,

- continued discussions on developing an air quality monitoring partnership with the *MOE*,

- the de-listing of the "beneficial use impairment" associated with the *ASI* boat slip as identified in the Stage 1 report for the Remedial Action Plan (RAP) for the St Marys River,

- participation in the discussion and resolution of local trans-boundary air issues between Sault Ste. Marie Ontario and Sault Ste. Marie Michigan,

- enhancement of pollution prevention planning initiatives, such as raw products substitution, new technology applications and energy or water use reduction programs, and,

- continued participation in other steel sector initiatives and other voluntary programs as outlined below:
    - Strategic Options Process for the Steel Sector (SOP)
    - Accelerated Reduction/Elimination of Toxics Program (ARET)
    - Voluntary Challenge Registry for Climate Change (VCR)
    - Anti-Smog Action Plan (ASAP)
    - Canadian Steel Producers Association Best Practices Manuals

Section 4 - Activities

4.1 The following schedule outlines the activities which *ASI* agrees to undertake to assist in achieving the goals and objectives outlined in Section 3.1. Items in the following table are further described in Sections 4.1.1 to 4.1.9.

TABLE 4

Project	ASI Commitment / Time
1. Benzene Air Emissions Reduction (1993 base year emission rate of 432.6 grams/tonne of Coke produced)	a) 50% Reduction by December 31, 2000 (216 g/t). b) 75% Reduction by December 31, 2003 (108 g/t). c) 85% Reduction by December 31, 2005 (57.3 g/t).
2. PAH Air Emissions Reduction (1993 base year emissions of 21.3 grams/tonne of Coke produced)	a) 20% Reduction by December 31, 2000 (17g/t). b) 54% Reduction by December 31, 2005 (9.8 g/t).
3. Blast Furnace Visible Emissions	a) Study / experiment with flame system. b) Maximize the efficiency of flame suppression. c) Report the findings in the Feb 1, 2001 semi-annual report.
4. Annual Cokemaking Plans	a) develop annual Cokemaking Environmental Plans. b) include the plan in the February 1 semi-annual reports.
5. PCB Destruction	a) In storage PCBs to be destroyed by Dec. 31, 2005.
6. ASI Boat Slip	a) Assess sediment contamination and submit clean-up plan to MOE in the Feb 1, 2001 semi-annual report. b) Complete clean-up and submit summary report to MOE in the first semi-annual report following completion of the work.
7. ASI Landfill	a) Continue groundwater monitoring program and submit results to MOE on a four-year cycle (2001 & 2005). b) Develop and submit a Closure Plan to MOE in the Feb 1, 2002, semi-annual report.
8. Mercury Recycling	Recycle all in-storage Mercury by Dec. 31, 2001.
9. Environmental Code of Practice for Integrated Steel Mills	a) Complete a review of the code by Dec. 31, 2000. b) Develop an implementation strategy by June 30, 2001. c) Provide an annual progress report on the implementation of the code.

4.1.1 Benzene Air Emissions Reduction (Cokemaking)

For the purposes of this Agreement, the 1993 base year for Benzene air emissions from *ASI* is reported to be 432 grams/tonne coke production.
ASI has reduced total benzene loadings by approximately 27% since 1993. These reductions are a result of shutting down an older phenol plant in 1997 and replacing this facility with a biological waste treatment system. Benzene discharge levels were reduced in 1995 by loading and shipping of light oil by rail, rather than by ship, as was previously the case.

In addition to the above noted achievements, *ASI* will continue to reduce benzene air emissions over the period from 2000 to 2005. The reductions will occur in steps, with a reduction of 50% being achieved by December 31, 2000(216 g/t); 75% being achieved by December 31, 2003(108 g/t); and further reductions to 85% (of the 1993 base year) by December 31, 2005. It is anticipated that the above reductions will be attained by the use of a technology referred to as "gas blanketing", whereby the volatiles such as benzene are prevented from gaining access to the atmosphere by use of an inert gas and a system to carry the resulting mixture to coke oven gas lines to be used as a fuel. The emission reductions associated with the Benzene control program will be verified using third party auditing and the results of these audits will be reported in the following semi-annual report as identified in section 7.1.

Good management practices will continue to be applied to the cokemaking process to reduce emissions from this source. *ASI* will make every effort to improve on the above schedule.

4.1.2 *PAH* Air Emissions Reduction (Cokemaking)

For the purposes of this Agreement, the 1993 base year for *PAH* air emissions rate from *ASI* is reported to be 21.3 grams/tonne of coke produced from the three batteries.

PAH emissions are reduced by the use of good operating and maintenance practices on the coke oven batteries. *ASI* has made significant reductions in the level of *PAHs* as a result of adopting these practices and the application of annual cokemaking plans over the past 10 years.

ASI will reduce *PAH* air emissions in steps, with a reduction of 20% being achieved by December 31, 2000(17g/t); and 54% being achieved by December 31, 2005(9.8 g/t) from the base year.

These reduction levels will satisfy the 1996 Strategic Options Report objectives and are equivalent to the reductions committed to in the CSPA Statement of Commitment and Actions.

Measurement of *PAH* emission levels to monitor progress towards the above goals, will occur by the use of the observation and calculation methods developed by the CSPA, Environment Committee. The emission reductions associated with the *PAH* reduction program will be verified using third party auditing and the results of these audits will be reported in the following semi-annual report as identified in section 7.1.

The measurement of ambient levels of *PAH*s will continue to assist in measuring progress in meeting these reduction targets.

4.1.3 Blast Furnace Visible Emissions

ASI will continue to apply flame technology to enhance the control of visible emissions from this source. *ASI* will set up a study team to further develop and maximize this control method. A flame emission control system is presently in use on the #7 Blast Furnace.

The present system while meeting its original purpose, was recognized by *ASI* as being less than optimally efficient. The design of the flame suppression system will be changed to enhance the blanketing and dispersion characteristics of the flame. This will allow more efficient displacement of oxygen at the interface of molten iron and air and thereby reduce the formation of fugitive particulate emissions of iron oxide.

ASI believes there is opportunity to better understand the technical aspects of the application and thereby develop a very practical and innovative technology. It is expected that the flame suppression equipment will be installed in mid-2000. The results of this study will be provided to *MOE* and *EC* in the February 1, 2001 semi-annual progress report.

In the event that the flame suppression trial does not produce satisfactory results, *ASI* will continue to pursue alternative methods to reduce Blast Furnace visible emissions. All activities arising from this effort will be reported in each semi annual progress report.

4.1.4 Annual Cokemaking Plans

ASI will provide the *MOE* and *EC* with annual Cokemaking Plans included in each February 1 semi-annual report as outlined in section 7.1. The purpose of these plans is to provide continuous improvement to the coke oven batteries and to reduce emissions over time, through the application of proactive maintenance techniques.

Annual Cokemaking Plans have been provided to the *MOE* for a number of years and have proven to be a valuable tool in reducing emissions from the batteries. *ASI* will continue to implement these plans to reduce both visible and *PAH* emissions in accordance with the ongoing commitments made in the annual plans.

4.1.5 PCB Destruction

ASI's holdings of waste Polychlorinated Biphenyls (PCBs) and equipment are contained in secure storage that currently meets both provincial and federal legislation.

An inventory of *ASI*'s total PCB holdings as of December 31, 1999, is attached as Appendix 3. The amount recorded in the report represents the current stored inventory for the purposes of this agreement. ASI will eliminate a volume of PCB's equivalent to the stored inventory

by December 31, 2005. Elimination of PCB's will begin no later than December 31, 2001. *ASI* will make every reasonable effort to eliminate all PCBs and equipment from usage.

4.1.6 *ASI* Boat Slip

The *ASI* boat slip was last dredged in 1995. At that time approximately 11,500 cubic metres of dredge materials from the Slip were disposed of in the *ASI* waste disposal site. *ASI* will sample and analyze the sediments for Contaminants above Provincial Sediment Quality Guidelines, in accordance with the same terms of reference used in the 1993 study of Slip sediment quality. The results of this monitoring plan along with appropriate recommendations for any remedial work will be provided to *MOE* and *EC* for their review and comment as part of the February 1, 2001, semi-annual report. If remedial work is required, this would be completed during the 2001 work season and a summary report on the clean-up activities will be provided to *MOE* and *EC* in the first semi annual report following the completion of the clean-up activities.

4.1.7 *ASI* Landfill

ASI commits to continue a program of monitoring of the landfill site to assess trends in groundwater quality. The groundwater monitoring will be conducted on a four-year cycle commencing in 2001 and again in 2005. The results of the monitoring will be included in the first semi-annual report following completion of the studies as required in section 7.1.

ASI commits to continue to make efforts to reduce the overall load of material sent to the landfill for disposal.

ASI will commit to develop and implement a suitable long-term plan for the waste disposal site describing its site operations and closure. The plan will be submitted to *MOE* and *EC* as part of the February 1, 2002, semi-annual report.

4.1.8 Mercury Recycling

Elemental mercury has a number of uses in industry, including electrical switching components. As a result of taking this equipment out of service, *ASI* has accumulated an inventory of mercury that is being stored in steel vaults. *ASI* will have removed, by a licensed waste contractor, all stored mercury by December 31, 2001. The details of this program, including total Mercury recovered, will be provided in the first semi-annual progress report subsequent to completion of the work.

4.1.9 Environmental Code of Practice

EC has developed an Environmental Code of Practice for Integrated Steel Mills as an outcome of the Strategic Options Process (SOP) for the Steel Manufacturing Sector. The Code is designed to identify the minimum environmental performance standard for new integrated steel mills and to provide a set of voluntary environmental performance goals for

existing facilities.

ASI will continue to participate in the SOP and supports the principle of enhanced voluntary initiatives for the purpose of advancing environmental protection in Ontario and Canada.

ASI will;

i Conduct a thorough review of the Code to determine:
- *ASI*'s current level of achievement with regard to each recommendation in the Code;
- which of the Code recommendations are achievable with the current equipment at *ASI*;
- what limitations there are in achieving any of the Code recommendations. This review will be completed by December 31, 2000.

ii Develop an Implementation Strategy which will prioritize the Code recommendations into a schedule that is in step with *ASI*'s other environmental initiatives and commitments. This will include an implementation timeline for the Code recommendations that are deemed to be achievable within the timeframe of this *EMA*. This Implementation Strategy will be completed by June 30, 2001.

iii Provide an annual progress report to the *MOE* and *EC*, which is consistent with the reporting method developed by the CSPA. In the absence of such a reporting method, the progress will be reported in a manner consistent with the requirements set out in Section 7.

Section 5 - **General**

5.1 Any request by *ASI* to change a requirement in this Agreement shall be made in writing to the *MOE* and *EC* with reasons for the request, at least 30 days prior to any specified date for meeting that requirement. Details of this request will be subject to assessment and/or verification by the Director(s) and may require posting on the *EBR* registry and *Green Lane internet site.*

5.2 The requirements of this Agreement are undertaken on a voluntary basis and currently exceed regulatory requirements. Compliance with this Agreement does not relieve *ASI* from:

5.2.1 complying with any applicable order, statute, regulation, municipal, provincial or federal requirements; and

5.2.2 obtaining any approvals, such as certificates of approval or consents, required by law.

5.3 Nothing in this Agreement shall be interpreted as preventing the *MOE* or *EC* from issuing

orders against *ASI*, taking any other steps to bring about compliance by ASI or to prosecuting *ASI* for any non-compliance, including anything related to this Agreement.

5.4 Nothing in this Agreement shall be interpreted as preventing the *MOE* or *EC* from proposing and implementing new legislation or new policies, including that which is related to matters covered by this Agreement.

5.5 In the event any party to this Agreement is, in the opinion of the *Director(s)*, rendered unable to perform or comply with any commitments herein because of

5.5.1 natural phenomenon of an exceptional, inevitable or irresistible nature, or insurrections, or

5.5.2 strikes, lockouts or other industrial disturbances, or

5.5.3 inability to obtain materials or equipment for reasons beyond the control of *ASI*, or

5.5.4 any other cause whether similar to or different from the foregoing beyond the reasonable control of the parties,

the commitments herein, to the extent that they are affected by the circumstances in 5.5.1 through 5.5.4 above, may be modified in a manner mutually agreed upon by the parties.

ASI must notify the *MOE and EC* immediately of any of the circumstances in 5.5 and provide details that demonstrate that no practical alternatives are feasible in order to meet the commitments. *ASI* shall provide a written explanation for its failure to meet the commitments herein, and such explanation shall be in a format suitable for posting on the *EBR* registry and the ***Green Lane***.

5.6 This Agreement shall be in force from the date of signing to December 31, 2005.

5.7 Termination of this Agreement can be initiated by any of *the parties* at any time. Notice of intent to terminate this Agreement, along with an appropriate rationale, shall be provided to the other *parties* no less than 30 days prior to the date of termination. The rationale will be posted on the *EBR* registry and the *Green Lane* .

5.8 This agreement shall not be legally binding and shall not give rise to any rights or obligations and shall not be enforceable in any court of law.

Section 6 - Public Consultation

6.1 Two (2) members representing the broader public participated on an advisory committee which evaluated and commented on matters relating to the development of the draft *EMA*. The Terms of Reference for this committee, which have been agreed to by *the parties*, are appended to this *EMA* as appendix 4.

Section 7 - Reporting

7.1 *ASI* shall provide semi-annual progress reports to the Director of Northern Region of *MOE* and the Regional Director of *EC*, Ontario Region in a format acceptable to the *Director(s)*. The reports will detail all activities associated with the advancement of the goals and objectives identified in Section 3 of this *EMA* and shall include, but not be limited to, the following:

7.1.1 A discussion of the status of activities as they relate to completion dates specified in Section 4.

7.1.2 A discussion of the impact of work completed as it relates to reductions of emissions or other progress towards the goals and objectives agreed to in Section 3.

7.1.3 A full accounting of issues that occurred which have resulted in *ASI* not being able to maintain the progress on and completion of activities set out in Section 4.

7.1.4 Facility wide emission inventories, which will include an assessment of the primary pollutants [oxides of nitrogen (NOx), oxides of sulphur (SOx), Volatile Organic Compounds (VOCs), total suspended particulate (TSP) Carbon Monoxide (CO)] and Carbon Dioxide (CO2) will be produced and submitted with the appropriate semi-annual report for the calendar years 2000, 2003 and 2005. The TSP evaluation will include a reporting of the fine particulate matter (PM10, 2.5).

7.2 Semi-annual progress reports shall be provided to *MOE* and *EC* by August 1st and February 1st in each year that this Agreement is in effect.

7.3 The first semi-annual progress report will be due by February 1, 2001, and will summarize activities including all matters set out in this Agreement.

7.4 Progress reports submitted by *ASI* pursuant to 7.1 are public and will be subject to public distribution. The semi-annual reports will include an executive summary. Information regarding the progress reports will be posted on the *EBR* registry and the *Green Lane*.

7.5 On site assessment associated with progress and completion of projects identified in this Agreement will be the responsibility of the *MOE*.

Signed: _____ *Date:* 23/01/01

Algoma Steel Inc.

Signed: _____ *Date:* 20/11/00

Her Majesty the Queen in Right of Ontario as
Represented by the Minister of the Environment.

Signed: _____ *Date:* 4 Dec 00

Her Majesty the Queen in Right of Canada as
Represented by the Minister of the Environment.

APPENDIX 1

The following list identifies 18 polynuclear aromatic hydrocarbons (PAHs) which are routinely analyzed to assess PAH release into the environment. This list represents the significant compounds studied by Algoma Steel Inc. in assessing the boat slip remediation conducted in 1993. This list contains the 16 compounds which the Ministry of the Environment laboratory has approved analytical methods for and includes Benzo (j) Fluoranthene, Fluorene and perylene.

Acenaphthene

Acenaphthylene

Anthracene

Benzo (a) Anthracene

Benzo (a) Pyrene

Benzo (b) Fluoranthene

Benzo (ghi) Perylene

Benzo (j) Fluoranthene

Benzo (k) Fluoranthene

Chrysene

Dibenzo (a,h) Anthracene

Fluoranthene

Fluorene

Indeno (1,2,3-cd) Pyrene

Naphthalene

Perylene

Phenanthrene

Pyrene

APPENDIX 2

Canada Ontario Agreement respecting the Great Lakes Basin Ecosystem

Tier 1 substances:

The Tier 1 listing includes the 11 critical pollutants identified by the International Joint Commission, plus critical pollutants identified in the Niagara River and Lake Ontario Toxic Management Plans and the Lake Superior Binational Program. Tier 1 pollutants are targeted for virtual elimination by adopting the philosophy of zero discharge for local or direct sources, and by encouraging similar actions binationally and globally in order to eliminate distant sources or long-range transport as inputs to the Great Lakes Basin.

- Aldrin/dieldrin
- Benzo(a)pyrene
- Chlordane
- DDT
- Hexachlorobenzene
- Alkyl-lead
- Mercury
- Mirex
- Octachlorostyrene
- PCBs
- PCCD (dioxins)
- PCDF (furans)
- Toxaphene

Tier II substances:

Tier II compounds include substances identified by science-based screening methodologies or Lakewide Management Plans. These substances have the potential for causing widespread impacts, or have already caused local adverse impacts on the Great Lakes environment.

- Anthracene
- Cadmium
- 1,4-dichlorobenzene
- 3,3'-dichlorobenzidine
- Dinitropyrene
- Hexachlorocyclohexane
- 4,4"-methylenebis(2-chloraniline)
- Pentachlorophenol
- Tributyl tin

Plus 17 PAH's as a group, including but not limited to:

- Benz(a)anthracene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Perylene
- Phenanthrene

Tier II will be updated periodically, on the basis of sound science, to ensure emerging contaminant issues are addressed as information becomes available. Persistent, bioaccumulative and toxic substances may be elevated from the Tier II listing through a weight-of-evidence approach, and through a process of stakeholder consultation.

1.PCB Site Identification

APPENDIX 3

PCB site no.	WASTE CLASS 243 D
503 85 A016	

2 PCB Holder

name of company holdng PCB	
Algoma Steel Inc.	
Contact Person	Signature
Craig Knight	
Tel no	
(705) 945-3149	

3.PCB Site Location

Queen Street West
Sault Ste. Marie Ontario
Northeastern Region

4.Corporate Name and Address of Holder

Algoma Steel Inc	
PO Box1400	
Sault Ste. Marie, Ont	P6A 5P2

5. The generator Registration Number associated with this PCB waste storage site must be entered here.	ON0393200

6. Date Survey Completed	December 31, 1999

7. Liquids	high Level (over 10000 ppm)	low level (50-10000 ppm)
a. bulk liquid	Litres 9,260.87	Litres 10,379.69
b. transformers	No. of transformers 67	No. of transformers 4
c. total liquid in transformers	Litres 24,583.544	Litres 215.5

8. Solids

Capacitors	a. Ballasts	No. of Drums 3
	b. other capacitors	No. of Capacitors 63 Barrels
	c. total weight other capacitors/large cap./other equip.	Kg. 548.1

Soil/Gravel	d. soil and gravel	No. of Drums	No. of Drums
	e. Total weight not in drums	Kg. 3200	Kg.

Other Solids	f. clothing	No. of Drums 46 (1 empty)	No. of Drums 32
	g.total weight	Kg.	Kg.

APPENDIX 4

ASI HARMONIZATION PILOT ADVISORY COMMITTEE

TERMS Of REFERENCE

Membership Membership is to be comprised of two representatives from the public. Other stake-holders who will participate in meetings of this advisory committee include representatives from ASI, EPB-OR and MOE ("the parties" as defined in section 1 of the agreement)

Nomination of the 2 members from the public shall be based on their ability to represent the broadest constituency. Factors considered for nominee selection include; a history of public involvement/experience/knowledge, commitment and ability to represent and report to the public and, knowledge in the workings of ASI, EPB-OR and MOE. Appointment of public members to this committee will be by consensus agreement of the parties.

Purpose This committee is established to provide advice to the parties, on matters related to the development of a voluntary environmental plan for ASI. The advisory committee will provide assistance to the parties by;

- ensuring timely and accurate distribution of information to all stakeholders in relation to the development and finalization of the Environmental Management Agreement (EMA)
- reviewing and providing comment to the project coordinator on issues related to completion of steps identified in the detailed work plan
- reviewing and providing comment to the project coordinator on relative priorities of projects as they are being negotiated in the EMA
- reviewing and commenting on the action items or project list identified in the EMA
- receiving contacts and reviewing information from individuals, groups, other parties or agencies having a interest in this EMA

Chair The chair will be the project coordinator for the term of the pilot program work plan. The chair will be responsible for arranging an agenda and producing minutes for each meeting.

Meetings Meetings will be called by the chair as necessary. The duration of this committee is expected not to exceed six months or until a final EMA is completed.

Reporting Members are encouraged to provide a two way flow of information between their respective associates and this committee. Information arising from business of this committee is public and will be distributed to other affected parties as required. This will be the responsibility of the committee chair.