LAKE SUPERIOR AND ST. MARYS RIVER AOCs
DELISTING CRITERIA and RE-EVALUATION OF BUI's

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1.0 INTRODUCTION

This report is intended to provide an objective analysis of delisting criteria and a re-evaluation of the status of BUI's for the four Lake Superior AOC's and the St. Marys River AOC. The Stage 2 documents have recently been released for each of these AOC's and these provide an 'update' on the status of BUI's. However, the data on which this 'update' are based, are several years out of date, the most recent being year 2000 but mostly older data, in some cases going back over 10 years.

The Stage 2 status information in all AOC's document significant progress in the implementation of remedial actions over the past 10 years or so. In some cases this is also reflected in the delisting of specific BUI's. However, many beneficial uses remain either impaired or requiring further assessment (i.e., needing updated field studies) even though significant improvements have been undertaken via remedial actions. In some cases, for example Nipigon Bay, there are few remaining remedial actions available to take yet this AOC still shows 5 beneficial uses impaired.

Following almost 15 years of the Remedial Action Planning Program, the goal of which is to delist all Great Lakes AOC's, it is time to take an objective look at the progress to date and, perhaps, the means of marking progress. Progress within the RAP program was to be measured by the completion of three documents (Stages 1 through 3) of which all AOC's have now completed Stages 1 and 2. The final Stage document is essentially a final assessment and future management guide to be completed on the delisting (or imminent delisting) of the AOC. In Canada, we have successfully reached this stage in only one AOC – Collingwood Harbour.

This document attempts to evaluate the progress to delisting for the 5 uppermost AOC's to determine a 'most likely' status of BUI's, look at possible hindrances to delisting, and determine the key actions required to move closer to delisting. This is not a complete analysis. It is preliminary, intended to identify key factors requiring further analysis. It is based principally on an "expert knowledge" process whereby key RAP Team members attempt to look beyond the data. Again, this process is not complete and should involve more input from a wider range of professionals working in this area.

The experts who participated in the preparation of this report includes Ken Cullis (MNR, Thunder Bay), Patrick Morash (MOE, Thunder Bay), D. Hollinger (MNR, Thunder Bay), Sue Greenwood (MNR, Sault Ste. Marie), and Mike Ripley (BPAC Co-chair, Sault Ste. Marie).

2.0 FACTORS INFLUENCING DELISTING

In assessing the status of BUI's, it is necessary to look at number of factors. The rating of a particular BUI is based primarily on the return to human use of those beneficial uses determined the Great Lakes Water Quality Agreements (1972, 1987). This sounds straight forward and in fact a number of environmental guidelines and standards exist against which to evaluate this. However, the meeting of these standards or guidelines can, in individual circumstances, be complicated by a wide a variety of factors and is proving to be more difficult than originally envisioned. In addition to the use of generally accepted scientific standards, each of the RAP Teams/Public Advisory Committees established water use goals and, in some cases, specific delisting criteria for the BUI's. Although the IJC requested each AOC to undertake this process as part of their individual RAP Programs, very little guidance was given resulting in a wide array of goals and delisting criteria. In many cases, these goals/criteria were more stringent than simply meeting a particular standard, in other cases they were either confusing or setting targets designed to fail.

The prevention/delayment of the delisting of BUI's may also occur due to wider lake contamination effects and stochastic effects. The following provides a list of factors that may play a role in delaying or preventing the delisting of individual beneficial uses:

F1. Water Use Goals and/or Delisting Criteria are 'nice to have' but too difficult to achieve;
F2. Goals and Delisting Criteria are not readily measurable to determine when/if achieved;
F3. Goals and Delisting Criteria can not be achieved due to legal, jurisdictional, or developmental (e.g., research) responsibilities being held by non-parties to the RAP;
F4. Stochastic factors affecting recovery once sources have been eliminated (in-place pollutants is one example, time to be expunged from large populations is another);
F5. Possible unknown sources of contaminants within the AOC;
F6. Contamination from sources outside the AOC, including atmospheric contributions or human activities which prevent achievement (e.g., fisheries management);
F7. Known sources not fully remediated (on-going and in-place);
F8. Lack of recent monitoring studies comparable to those utilized to establish the original impairment;
F9. Delays or lack of access to obtain the most recent data available; and
F10. Poor data or improper use of data to establish the original impairment status.

We have introduced these factors for discussion purposes and for further consideration by relevant stakeholders. It is beyond the scope of this report to fully evaluate each. However, these will be considered to some degree in our following delisting criteria and BUI assessment for the Lake Superior and St. Marys AOC's.

3.0 DELISTING CRITERIA ANALYSES – FIVE AOC'S

3.1 Thunder Bay Harbour

The following table presents the delisting criteria as modified from the Stage 2 document.

IMPAIRMENTS	DELISTING CRITERIA
(A) Restrictions on Fish Consumption	Targets for this impairment to be produced.
(B) Degradation of Fish and Wildlife Populations	**Target B1:** Provide recommendations and strategies for the restoration and protection of sturgeon in Lake Superior. **Target B2:** Prevent upstream migration of spawning phase sea lamprey; allow upstream movement of migratory fishes. **Target B3:** Ballast water treatment, control, and regulatory measures to eliminate introductions and transfer of non-indigenous species. **Target B4:** The implementation of a fisheries management plan for the AOC.
(C) Fish Tumors and Other Deformities	Delisting criteria for this impairment to be produced.
(D) Loss of Fish and Wildlife Habitat	**Target D1:** Increased abundance of walleye using Current River estuary for spawning (double the pre-enhancement (1991) population estimate of 1100 fish); increased egg deposition and fry production. **Target D2:** Increased diversity and abundance of fish populations in embayment areas of the Neebing-McIntyre Floodway as compared to the unaltered sections of the floodway. **Target D3:** Protect mouth and shoreline of McVicar Creek from wave action and foster growth and redevelopment of an historic wetland. **Target D4:** Restore environmental integrity and natural history of the Waterfront Park region on the Kaministiquia River. **Target D5:** Restore and enhance estuarine habitat diversity in McKellar River; demonstrate rehabilitation method for dredged channel; increase littoral zone and provide critical habitat for resident and migratory fish and birds. **Target D6:** Restore access to productive spawning habitat; produce a self-sustaining rainbow trout population in the headwaters of the Current River (128 adult rainbow trout were transferred to Ferguson Creek, a tributary of the Current River, between 1993-1995). **Target D7:** Maintain BOD levels in the Kaministiquia River below MISA discharge limits. **Target D8:** Standardize aquatic habitat data collection using conventional survey techniques. **Target D9:** Identify remedial options to address habitat issues in a rural environment; outline preventative measures to protect northern Ontario streams. **Target D10:** Implement the Slate River Watershed management Plan. **Target D11:** Re-vegetate areas in vicinity of McVicar Creek, Sanctuary Island and the McKellar River which were disturbed during project construction. Use plants indigenous to the AOC, and produce a natural plant community.

IMPAIRMENTS	DELISTING CRITERIA
(E) **Degradation of Phytoplankton and Zooplankton**	Targets for this impairment to be produced.
(F) **Degradation of Benthos**	**Target F1:** Completion of the benthos enhancement components of the fish and wildlife habitat remediation actions. **Target F2:** Secondary Treatment at the Bowater Pulp and Paper Mill.
(G) **Restrictions on Dredging**	**Target G1:** Reduce environmental impacts associated with industrial activity. Related remediation measures are the point source actions **Target G2:** Mitigate sediment contamination through the completion of the sediment related components of the NOWPARC project.
(H) **Beach Closings**	**Target H1:** Remove health hazard for water based recreational activities. **Target H2:** Complete implementation of the preferred option for Chippewa Park.
(I) **Degradation of Aesthetics**	**Target I1:** Aesthetic improvement of the Thunder Bay harbour and its tributaries; enhance public awareness of long-term impact of careless waste disposal. **Target I2:** Re-vegetate areas in vicinity of McVicar Creek, Sanctuary Island and the McKellar River which were disturbed during project construction. Use plants indigenous to the AOC, and produce a natural plant community. **Target I3:** Completion of the aesthetic enhancement components of the NOWPARC project. **Target I4:** Completion of the aesthetic enhancement components of the following fish and wildlife habitat actions: **Target I5:** Implement the components of the Slate River Watershed management Plan which will reduce aesthetic impairment.

The delisting criteria for fish consumption, fish tumours, and phytoplankton/zooplankton have not been developed. The Stage 2 document refers to management actions – MNG-1, MNG-2, and MNG-3 which are intended to further define specific delisting criteria for these BUI's. However, the local Public Advisory Council (PAC) has developed a set of water use goals (specific to the harbour and to the Lower Kaministiquia River). The Stage 2 document further identifies "remedial strategies for ecosystem restoration" which incorporate a series of recommendations followed by specific actions to be undertaken. In this case it is quite possible to consider delisting once the specified actions have been completed.

Examples of potential impediments to delisting individual BUI's can be identified for a number of the above delisting criteria. Based on the list of factors identified in Section 2 of this report, below is a brief assessment of individual targets whose achievement is somewhat or very improbable. The number(s) in brackets relate to the specific factor in the previous section.

Target B3: Ballast water treatment, control, and regulatory measures to eliminate introductions and transfer of non-indigenous species. **[F1; F3]**
Target D1: Increased abundance of walleye using Current River estuary for spawning (double the pre-enhancement (1991) population estimate of 1100 fish); increased egg deposition and fry production. **[F1; F4; F5]**
Target D4: Restore environmental integrity and natural history of the Waterfront Park region on the Kaministiquia River. **[F1 (what is "environmental integrity") F2; F3; F4; F6]**

Target D6: Restore access to productive spawning habitat; produce a self-sustaining rainbow trout population in the headwaters of the Current River (128 adult rainbow trout were transferred to Ferguson Creek, a tributary of the Current River, between 1993-1995). **[F1; F4]**

Target D7: Maintain BOD levels in the Kaministiquia River below MISA discharge limits. **[F8]**

Target D9: Identify remedial options to address habitat issues in a rural environment; outline preventative measures to protect northern Ontario streams. **[F1; F2; F3]**

Target D10: Implement the Slate River Watershed management Plan. **[F3]**

Target F1: Completion of the benthos enhancement components of the fish and wildlife habitat remediation actions. **[F2; F7]**

Target G1: Reduce environmental impacts associated with industrial activity. **[F1; F2; F3]**

Target I1: Aesthetic improvement of the Thunder Bay harbour and its tributaries **[F2; F3; F10]**

In addition to these specific factors, one could also cite potential problems in implementing large-scale habitat enhancement projects identified in the remedial strategy to respond to impairments associated with aesthetics and the loss of fish and wildlife habitat. Although important to do these, the need for large sources of funding over many years makes the achievement of the targets extremely problematical. Even if the funding and commitment continues, their eventual delisting will take many years, if not decades. Perhaps the target should relate more to obtaining the buy-in of affected jurisdictions (e.g., the city, province) via the incorporation of specific habitat improvements into official plans and other programs. These could be achieved in time, through the use of development resources or some form of long-term tax-based funding mechanism.

Some targets also go beyond the requirements of the RAP process. In the case of Thunder Bay Harbour, for example, the aesthetics targets and associated actions call for improvements along the waterfront related to the removal or enhancement of old buildings and other structures. Although this is worth while, it is not relevant to delisting the AOC and, further, is not a priority for funding in the context of AOC remedial measures.

3.2 Nipigon Bay

The Nipigon Bay RAP prepared 21 goals to guide the remediation program. These goals were translated into delisting criteria for the Beneficial Use Impairments, some remaining more as goal statements and others being more quantitative.

Fish and Wildlife Populations and Habitat Loss

- Maintenance of migration routes and suitable spawning and wildlife habitat
- Rehabilitation of walleye stocks to historic levels (approx. 41,000)
- Restore degraded habitat and provide a stormwater management plan that will no longer degrade the stream
- Increase existing aquatic and terrestrial habitat by providing more natural fluctuations in lake an driver levels
- Partially increase forage base for local fish populations by restoring degraded habitat and benthic communities
- Reduce amount and rate of lampricide use to control sea lamprey via research and development of new technology
- Provide diverse and functional habitat for aquatic and terrestrial organisms
- Identify and rehabilitate degraded trout habitat
- Restore a healthy benthic community for impacted areas

Benthic Population Dynamics and Habitat Loss

- Sediments will be considered rehabilitated when the benthic community in question is not significantly different from a control site
- Reduce impacts to benthos from water level fluctuations
- Provide a local net increase in benthic habitat
- A properly functioning secondary treatment system and benthic community

Aesthetics

- No evidence of an objectionable deposit, scum, colour, odour or turbidity
- Enhance local recreational opportunities and waterfront aesthetics
- Improve creek aesthetics and enhance local recreational opportunities
- Remove a major portion of anthropogenic impacts to aesthetics by reducing unnatural erosive forces

In general, many of these should be readily achievable although some may be difficult to measure **[F1; F2]**. Concepts related to "restore", "enhance", "reduce", "increase", etc. are very subjective and more goal like than actual delisting criteria. In the scheme of things, however, they may be more suitable than quantitative values. As noted above for Thunder Bay, specific quantitative targets for populations or habitat restoration can delay delisting significantly.

In this regard the criterion for walleye stocks (approx. 41,000) is dependant on what is meant by "approximately" and may be difficult to achieve **[F1; F4; F5]**.

The sixth criterion under fish and wildlife populations/habitat loss is also very problematical. Although the sea lamprey control program is subject to consideration under RAPs, the reliance on new technology could jeopardize the achievement of this criterion **[F1; F3]**.

The first criterion under benthic population dynamics/habitat may also be very difficult to achieve. There is no definition of what the control site may be and it could take a very long time to attain no "significant" difference **[F1; F4; F6]**.

The second and third criteria under Aesthetics do not specifically address the Great Lakes Water

Quality Agreement General Objective and should probably be removed **[F1; F10]**.

The last criterion is both unclear and questionable. "Erosive forces" are dependent on many factors including storm frequency, duration and intensity. The only control humans have on this criterion relate to minimizing changes in upstream hydrology (usually caused by channeling, increasing imperviousness, and so on) and in stabilizing eroding banks. However, the suggested program was to implement the Nipigon River Water Management Plan and continue to monitor "water quality aesthetics". It is not clear to what extent implementation of the plan would result in "reducing" unnatural erosive forces nor is it clear at what point in the implementation would delisting be achieved [F1; F2; F3].

3.3 Jackfish Bay

The Jackfish Bay RAP does not have delisting criteria *per se*. The following is a list of 10 goals established as a means to guide remedial measures in the AOC.

Use Impairment	Water Use Goal

• Restrictions on fish consumption
• Degradation of fish and wildlife populations
  • dynamics of fish and wildlife populations
  • body burdens of fish and wildlife populations
• Loss of fish and wildlife habitat
• Fish tumours and other deformities
• Bird/animal deformities and reproductive problems
	• All fish caught in Blackbird Creek and Jackfish Bay must be safe to consume at any size and in any number. Fish contaminant levles must be less than or equal to background levels for consumption
	• Fish habitat and spawning areas in Blackbird Creek and Jackfish Bay must return to a state conducive to healthy fish populations
	• The Blackbird Creek/Jackfish Bay fishery must form part of a balanced and healthy aquatic community
	• Water quality should be improved to the point that Jackfish Bay is no longer an Area of Concern

• Degradation of benthos
  • dynamics of benthic populations
  • body burdens of benthic populations
	• Blackbird Creek can continue to convey mill effluent provided that it does not impair beneficial uses, inhibit indigenous biota, or produce other adverse effects on the ecosystem
	• Discharge of toxins from point sources must be reduced to meet or exceed Federal and Provincial guidelines

• Restrictions on dredging activities • Degradation of aesthetics	• Fish habitat and spawning grounds must return to a healthy condition • Aesthetic values within the Jackfish Bay AOC must be improved to encourage its use for recreation and to improve its tourism value • Remove Jackfish Bay as an Area of Concern • Maintain present water uses in the AOC

Goal statements, by definition, provide a direction but are generally not quantitative end points which must be met. Hence, one can identify success in some measure by moving from the current condition toward that identified in the goal. In some cases, the goal statements above refer to accepted standards or guidelines which are more quantitative and can be more precisely defined. As such these statements are more pragmatic than delisting criteria in terms of the eventual delisting of the Nipigon Bay AOC.

These goals are very pragmatic and their achievement (or near achievement) should be readily achievable. Exceptions to this include the second, third, fifth, and seventh goals (right-hand column above) are problematical in terms of factors **F1; F2**; and **F6**. In addition, the fifth goal may in fact be contradictory. It may not be possible to have both conditions apply, especially as best management practices required of the company may allow some degree of degradation.

3.4 Peninsula Harbour

As in the case of Jackfish Bay, the Public Advisory Committee for Peninsula Harbour developed goals but did not specify delisting criteria. However, the PAC grouped the 12 goals as primary, secondary, and implementation goals. Primary goals are considered as 'may require remedial action' to achieve; secondary goals are considered as 'important and should be maintained'; and implementation goals that relate to the need for continued public information and consultation.

Primary Goals (May Require Remedial Action)

1. The water quality of Peninsula Harbour should meet the requirements contained in the most stringent, current version of the Ministry of the Environment's *Water Management, Goals, Policies, Objectives, Guidelines and Implementation Procedures,* as well as the guidelines defined under the IJC's Great Lakes Water Quality Agreement (GLWQA). In the long term, ambient water should show virtual elimination of persistent toxic substances and other contaminants from human origin.

   To meet this goal, industrial and municipal sources are required to establish a timetable to achieve zero discharge of persistent toxic substances and hazardous contaminants. The Government of Canada is committed to the virtual elimination and zero discharge of persistent toxins as stated in the GLWQA. In addition, the Lake Superior Binational Program, through its Lake Superior Lakewide Management Plan, is implementing a Zero Discharge Demonstration Program in the Lake Superior basin.
2. Fish health should be improved in order to eliminate the need for consumption guidelines and satisfy the criteria of the GLWQA. Over time, reductions in contaminant levels in aquatic organisms should reflect the virtual elimination of persistent toxic substances and contaminants resulting from human origin. In addition, water quality and physical habitat should be able to promote a self-sustaining population of indigenous species.
3. The invasion of foreign organisms to the Great Lakes should be prevented through the control of ballast water.
4. All delisting criteria must be met in order to remove Peninsula Harbour as an Area of Concern.

Secondary Goals (Important, Should be Maintained)

5. The condition of the harbour should be maintained to facilitate commercial shipping, industrial uses (intake and other uses), boating (recreational and charter) and water sports.
6. Industrial and municipal sources, including surface runoff, should be allowed to discharge into the harbour provided the primary goals are being addressed.
7. The atmospheric deposition of potentially hazardous substances resulting from human activity should have no adverse impacts on the ecosystem.
8. The water quality should be maintained such that the population and health of wildlife and fish do not differ significantly from surrounding regions.

Implementation

9. Public information sessions and consultation should occur throughout the RAP implementation phase.
10. Mechanisms should be in place for regular reviews of RAP goals based on random sampling of effluent discharges and updates to the environmental conditions database. Paramount to this, is the timely analysis and reporting of information.
11. Unrestricted access is a basic underlying principle behind these water use goals. As such, public access for recreational boating and walking areas should be enhanced.
12. The natural features of this Area of Concern should be used as an educational tool. Educators and students should be informed of regional and global environmental problems, the RAP process, the importance of public involvement, and the interrelationship between man and his environment. Government researchers should be encouraged to make presentations about their study to local schools.

Although the Stage 2 RAP document refers specifically to delisting criteria (goal 4), these are not specifically defined for this AOC.

In the way these goals are structured, only the first four goals require to be achieved in order to fully delist this AOC. As such, the delisting approach taken in this AOC is substantially different than virtually all others. One key advantage of this approach is to identify many of the things that would be nice to do **[F1]**, difficult to measure **[F2]**, and outside the jurisdictional capacity of the RAP process **[F3; F6]** separately and in a category not needing to be achieved in order to delist the AOC. However, one would assume that the delisting process would still acknowledge the secondary and implementation goals and ensure that they will continue to be addressed in whatever means possible following delisting.

However, the four primary goals are also subject to some of these problems. The first relies on current guidelines and standards and this is adequate. However, reference to achieving virtual elimination is more problematical. The advantage in the approach taken, is that only the timetable requires preparation, not the achievement of virtual elimination.

The second goal contains a up to three potential criteria for delisting. The removal of consumption advisories is straight forward but could be hampered by stochastic factors and on-going contamination outside the AOC **[F5; F6]**. The point relating to self-sustaining populations is also subject to problems of measurement and outside conditions **[F2; F6]**.

The third goal was also common to Thunder Bay and Nipigon Bay and its achievement is clearly outside the jurisdictional control or enforcement of the RAP **[F3]**.

3.5 St. Marys River

The St. Marys RAP and its Binational Public Advisory Council have developed a set of very detailed delisting criteria, as follows:

Beneficial Use Impairment	Delisting Criteria
Restrictions on fish and wildlife consumption	• No locally derived fish and wildlife consumption advisories as determined by the most stringent standards, objectives or guidelines.
Degradation of fish and wildlife populations	• 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. • 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	• 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	• 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	• 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.

Beneficial Use Impairment	Delisting Criteria
	Resident fauna does not have elevated contaminant levels relative to unimpacted areas.
Restrictions on dredging	• 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	• 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	• 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	• 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	• 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	• 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	• 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

Beneficial Use Impairment	Delisting Criteria
	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.

Overall, the RAP Team and BPAC undertook a very thorough and well thought out process in developing delisting criteria. By and large, these criteria are both specific enough and tied to acceptable standards as to be (theoretically) achievable. They generally are not subject to many of the problematical factors such as not being measurable **[F2]**, subject to the jurisdiction of non-parties **[F3]**, and specify AOC sources as key for delisting after remediation **[F6]**.

However, an example of the 'nice to do' category **[F1]** is the inclusion of an additional BUI and associated delisting criteria. The ambient water quality BUI is additional to the IJC requirements and is basically unnecessary. It is somewhat redundant as many if the other BUI's are based on exceedences of water quality parameters. Additionally, not all water quality guidelines need to be met to restore accepted beneficial uses and, further, meeting some of these may not be possible. The remediation and monitoring costs of human pathogens, for example, could be very high and compete with resources needed for other BUI's.

The following identifies delisting criteria particularly subject to the defined problematic factors:

Degradation of Benthos - 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. **[F3; F4; F5; F6; F7]**

Fish and Wildlife Habitat Loss - Watershed management planning should be completed through the establishment of a Watershed Council. Plans should include the same goals as listed above. **[F1; F3]**

Fish and Wildlife Habitat Loss - 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. **[F1; F3]**

4.0 UPDATED BUI STATUS

Updated status of Beneficial Use Impairments (BUIs) based on data available since the Stage 2 documents were prepared, interviews with knowledgeable RAP Team participants, and an assessment of delisting criteria. (I = impaired; NI = not impaired; RFA = requires further assessment NIAC = not impaired based on AOC condition; NISA = not impaired if specified action undertaken).

4.1 Thunder Bay

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Fish and Wildlife Consumption			
Fish Consumption	I	Based on the 2003-2004 Sport Fish Guide, consumption advisories remain in place both inside and outside the harbour. These do not appear to have changed significantly from the advisories presented in the 1999-2000 SFG. Further in-AOC remediation may not contribute to further reductions in advisories for these contaminants.	NIAC
Wildlife Consumption	NI	There are no advisories in place for the consumption of wildlife by humans.	NI
Degradation of Fish and Wildlife Populations			
Dynamics of Fish Populations	I	Water quality has improved with 100% chlorine dioxide substitution (1994) and secondary effluent treatment at Bowater. The clean-up near Northern Sawmills (formerly Northern Wood Preservers) should further improve conditions. No fish kills have been reported in recent years, walleye populations are increasing in the lower Kaministiquia River and sturgeon are moving throughout the river (K. Cullis, MNR, pers. com.). However, modelling shows that infrequent peak discharges of BOD > 11 t/d at Bowater exceed assimilative capacity of river (D. Hollinger, MNR, pers. com.). Discussions are now underway to establish a receiving water based BOD effluent limit; if established then this impairment can be delisted.	NISA

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Body burdens of Fish	I	Although exceedences of guidelines for the protection of aquatic organisms remain in the harbour, contaminant levels are comparable with those in the open lake, hence additional remediation within the AOC will not remove this impairment.	NIAC
Dynamics of Wildlife Populations	I	Habitat rehabilitation projects have been undertaken at Mission Island, Kaministiquia River Park, Northern Wood, lower McVicar Creek, and Sanctuary Island. In addition, City of Thunder Bay Official Plan has incorporated policies for the protection and restoration of waterfront natural areas (policies 5.10 to 5.13) and for the preparation of EIAs (policy 2.3).	NI
Body Burdens of Wildlife	I	Additional assessment is required to determine the status of this impairment. The Canadian Wildlife Service summer 2000 data on herring gull eggs on Mutton Island and cormorant eggs on Welcome Island for PCBs, dioxins, and furans.	RFA
Fish Tumours and Other Deformities	I	Existing data on liver cancers in white suckers taken from the Kaministiquia River date from 1990 and this condition has not been recorded in any other location within the AOC nor have any more recent observations been made. Recent effluent and sediment remediation efforts may have removed this impairment.	RFA
Tainting of Fish and Wildlife Flavour	NI	There have been no reports from the public or fisheries/wildlife personnel.	NI
Bird and Animal Deformities or Reproductive Problems	NI	Bird and animal deformities have not been reported within the boundaries of the AOC.	NI
Loss of Fish and Wildlife Habitat	I	Habitat rehabilitation projects have been undertaken at Mission Island, Kaministiquia River Park, Northern Wood, lower McVicar Creek, and Sanctuary Island. In addition, City of Thunder Bay Official Plan has incorporated policies for the protection and restoration of waterfront natural areas (policies 5.10 to 5.13)	NIAC

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
		and for the preparation of EIAs (policy 2.3). Although delisting criterion targeting the number of walleye has not been reached, other pressures may be occurring (fishing) and on-going improvement is expected.	
Degradation of Phytoplankton and Zooplankton Populations	I	This BUI was originally assumed to be impaired in the vicinity of industrial outfalls, however, no formal studies were completed. Process effluent from Bowater is now non-acutely lethal to *Ceriodaphnia*. Secondary treatment at Abitibi has also decreased effluent toxicity.	RFA
Degradation of Benthos	I	The installation of secondary treatment at Bowater, the closure of Ogilvie Mill, and the completion of sediment clean-up at Northern Woods should be contributing to improvements of the benthic communities. Sediments in the north harbour area are currently being sampled for characterization of contaminants and benthic community health and an assessment is proposed for the Kaministiquia River (P. Morash, MOEE, pers. com.).	RFA
Restrictions on Dredging Activities	I	Provincial sediment quality guidelines were exceeded in 2000 in sediments dredged from the south harbour entrance and near the Richardson's Elevator (north harbour). There were no exceedences for PCBs, organochlorine pesticides, or PAHs, however exceedences were noted for TKN, Cr, Cu, Fe, Mn, Ni, and NH3 (open water disposal guideline) (Trow Consulting 2000). However, dredging has not been required in the harbour for 10 years, other than this small pre-emptive project, nor is any dredging expected in the foreseeable future (G. Jarvis, Port Authority, pers. com.). The combination of past remediation and large CDF capacity reduces the impact of this BUI. Current sediment characterization studies in the north harbour will determine the need for further remediation in this area.	RFA
Eutrophication or Undesirable Algae	NI	There have been no reports of nuisance algae growth within the AOC.	NI

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Drinking Water Consumption or Taste and Odour Problems	NI	No restrictions on drinking water consumption or evidence of aesthetic impairment.	NI
Beach Closings	I	Improvements to water circulation at Chippewa Park are planned for the Spring 2003 which should significantly reduce levels of faecal coliform. Problems at Boulevard Lake are not the result of anthropogenic sources and can not be remediated.	NISA
Degradation of Aesthetics	I	The original impairment was based principally on harbour-front aesthetics and most of the delisting criteria have been met. The implementation of the Slate River management plan has not occurred and should result in reductions in sediment. However, this action does not address the GLWQA general objective on aesthetics nor does it address the original intent of the aesthetic BUI, hence this BUI should be considered for delisting.	RFA
Added Cost to Agriculture and Industry	NI	There are no additional costs required to treat process water prior to use for industrial or agricultural purposes.	NI

The following summarizes the BUI's ranked other than NI and provides an assessment of problematical factors (from Section 2) preventing/slowing their delisting:

- Fish Consumption - ranked NIAC **[F4; F5; F6]**
- Dynamics of Fish Pop. - ranked NISA **[F8]**
- Body Burdens of Fish - ranked NIAC **[F4; F5; F6]**
- Fish Tumours - ranked RFA **[F8; F9]**
- Loss of F&W Habitat - ranked NIAC **[F3; F6]**
- Deg. of Phyto- & Zooplankton - ranked RFA **[F8; F9]**
- Dredging - ranked RFA **[F4; F8]**
- Beach Closings - ranked NISA **[F1; F10(partly)]**
- Aesthetics - ranked RFA **[F2; F3; F10(partly)]**

4.2 Nipigon Bay

GLWQA IMPAIRED BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Fish and Wildlife Consumption	NI		NI
Tainting of Fish and Wildlife Flavour	NI	Fish flavour no longer considered impaired due to mill process changes and a continued lack of complaints. Wildlife flavour remains unimpaired.	NI
Degradation of Fish and Wildlife Populations			
(a) Dynamics of Fish Populations	I	Fish populations are generally improving due AOC remedial measures (K. Cullis, MNR, pers. com.) including the development and implementation of a water level management plan. This plan should protect brook trout spawning grounds and walleye recruitment is known to be improving. Any continuing pressures on populations would only result from STP effluent. This system should be upgraded to secondary treatment.	NISA
(b) Body burdens of fish	NI	Further sampling of fish has confirmed that body burdens for anthropogenic contaminants continue to remain low	NI
(c) Dynamics of Wildlife Populations	NI	Area faunal surveys indicate that diversity is relatively high and abundances, although fluctuating, are typical of the region.	NI
(d) Body Burdens of Wildlife	NI	Sampling of contaminant residues in waterbirds and an index established to assess the risk of fish-eating wildlife bioaccumulating organochlorides have indicated that body burdens remain unimpaired in the Nipigon Bay.	NI
Fish Tumours and Other Deformities	NI	A continued lack of reports from fisheries personnel and the public indicate that tumours or deformities are not a problem.	NI
Bird and Animal Deformities or Reproductive Problems	NI	A continued lack of evidence from studies of nearby cormorant and herring gull colonies.	NI

GLWQA IMPAIRED BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Degradation of Benthos (a) Dynamics of Benthic Populations	I	The benthic community remains degraded in the vicinity of the Domtar mill and the Nipigon STP outfall. However there is no sediment at the mill outfall, only wood fibre. Upgrading the STP to secondary treatment would likely remove impairment at the STP outfall.	I
(b) Body Burdens of Benthic Organisms	NI	Low levels of contaminants in sport fish and sediments (relative to background and ambient conditions) were documented in the bay. Lack of support for either a cause or effect of benthic contamination results in its unimpaired status.	NI
Restrictions on Dredging Activities	NI	Exceedances of the PSQG's for a number of metals and nutrients occur in most areas of Nipigon Bay. However, strict application of these guidelines to the specific historical and ambient conditions found in the bay would allow the disposal of dredged sediments, except from the area adjacent to the mill discharge, in most open-water areas of the AOC. The sediments adjacent to the Domtar outfall have never been, nor are they scheduled to be, dredged. Because these sediments represent the only area exceeding guidelines, this use will be considered unimpaired.	NI
Eutrophication or Undesirable Algae	I	Algal growth on substrates in the lower river have not been recently observed (K. Cullis, MNR, pers. com.). Upgrading of the Nipigon, Red Rock, and Domtar STPs would likely remove this impairment.	NISA
Restrictions on Drinking Water Consumption or Taste and Odour Problems	NI	Same status as reported in Stage 1.	NI
Beach Closing	NI	Same status as reported in Stage 1.	NI

GLWQA IMPAIRED BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Degradation of Aesthetics	I	The installation of a foam barrier in the outfall channel appears to have resolved the previous foam issue. The intent of the GLWQA general objective on aesthetics was not related to on-shore waterfront developments, hence this BUI should be re-assessed against the 3 aesthetics water use goals.	RFA
Added Costs to Agriculture and Industry	NI	Same status as reported in Stage 1.	NI
Degradation of Phytoplankton and Zooplankton Populations	NI	Same status as reported in Stage 1.	NI
Loss of Fish and Wildlife Habitat.	I	Wood fibre no longer continues to accumulate at the mill outfall; the water level management plan has been implemented; a recent assessment of Big Trout Creek did not identify any habitat issues (K. Cullis, MNR, pers. com.); substrate algal growth in the lower river has not been recently observed; log drives are no longer occurring; and it is not likely that the STP outfalls are contributing to habitat loss. The only remaining action required for this BUI is to undertake aquatic and riparian habitat rehabilitation in Clearwater Creek.	NISA

Although some additional assessment of conditions should be undertaken and documented, it appears that most impairments relate to the lack of secondary treatment at STPs. It would seem that upgrading of these facilities would result in delisting most of the impairments. Also, if the wood fibre at the mill outfall is left in place and the area is not restored with clean sediment, then perhaps STP upgrading is all that is required to delist the AOC. The remaining impairment to the degradation of benthos is principally the result of not removing the wood fibre **[F7]** and the RFA assigned to the aesthetics category is partly the need to conduct more monitoring **[F8]** and partly due to the inappropriateness of using waterfront/buildings in the designation **[F10]**.

4.3 Jackfish Bay

GLWQA IMPAIRED BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Fish and Wildlife Consumption	I	Based on the 2003-2004 Sport Fish Guide, consumption advisories remain in place both inside the harbour and in open Lake Superior waters. These do not appear to have changed significantly from the advisories presented in the 1999-2000 SFG. Further in-AOC remediation may not contribute to further reductions in advisories for these contaminants.	NIAC
Degradation of Fish and Wildlife Populations			
(a) Dynamics of Fish Populations	I	Lake trout populations have declined historically and fish populations in Blackbird Creek remain impaired as a result of pulp mill effluent. However, Brook trout (*Salvelinus fontinalis*) and fathead minnows (*Pimephales promelas*) were captured in the creek in 1995 and as a result of improvements in mill effluent, fish populations in the main bay may now be healthy (K. Cullis, MNR, pers. com.).	RFA
(b) Body Burdens of Fish	I	Low levels of hexachlorobenzene, mecury, and chlorinated pesticides were found in lake trout. The GLWQA Specific Objective for the protection of piscivorous wildlife from PCBs was exceeded in lake trout sampled in 1989, 1990, and 1992. Atmospheric inputs are believed to be the contributing factor. Improvements in mill processes have enhanced water quality; however, increases in dioxins in lake whitefish suggests that further improvements may be warranted.	I
(c) Dynamics of Wildlife Populations	RFA	Recently collected CWS data requires assessment.	RFA
(d) Body Burdens of Wildlife	RFA	Recently collected CWS data requires assessment.	RFA

GLWQA IMPAIRED BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Fish Tumours and Other Deformities	I	This impairment is based on old data (1989 – 1996), all collected prior to mill effluent changes. New comparable studies are required.	RFA
Bird and Animal Deformities or Reproductive Problems	RFA	Recently collected CWS data requires assessment.	RFA
Degradation of Benthos			
(a) Dynamics of Benthic Populations	I	Benthic populations in the main bay may be improving, however are still impacted in Blackbird Creek.	I
(b) Body Burdens of Benthic Organisms	I	Overall, benthic body burdens are likely improving, however are still impacted in Blackbird Creek.	I
Restrictions on Dredging Activities	NI	Sediments in the AOC contain several contaminants that exceed guidelines for dredging and open water disposal. However, without the demand for navigational or other dredging activities, contaminated sediments should be considered in the context of other ecosystem impairments.	NI
Degradation of Aesthetics	I	Conditions have improved with the installation of a foam curtain by Kimberley Clark, however the presence of foam and dark colored water continues to occur in Blackbird Creek.	I
Loss of Fish and Wildlife Habitat.	I	Wildlife habitat in the AOC is not impaired and fish habitat in Moberly Bay and the main bay have improved with improvements in mill effluent and are not likely a factor in limiting Lake Superior fish populations. However, forage habitat in Blackbird Creek remains impaired.	I

On-going impairments in this AOC relate principally to the continued use of Blackbird Creek to convey mill effluent. Although the effluent quality has improved significantly due to improvements in the waste water system, some impairment will remain.

The following summarizes the key problematical factors limiting delisting of this AOC:

- Fish Consumption - ranked NIAC **[F4; F5; F6]**
- Dynamics of Fish Pop. - ranked RFA **[F7(?); F8]**
- Body Burdens of Fish - ranked I **[F6; F7(?)]**
- Dynamics of Wildlife - ranked RFA **[F8; F9]**
- Body Burdens of Wildlife - ranked RFA **[F8; F9]**
- Fish Tumours - ranked RFA **[F8]**
- Bird & Animal Deformities - ranked RFA **[F8; F9]**
- Dynamics of Benthos Pop - ranked I **[F7; F8]**
- Body Burdens of Benthos - ranked I **[F7]**
- Aesthetics - ranked I **[F7]**
- Loss of Habitat - ranked I **[F7]**

4.4 Peninsula Harbour

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Fish and Wildlife Consumption Fish Consumption	I	Existing advisories for toxaphene are not an AOC remediation issue and mercury levels in Consumption advisories based on mercury levels have declined for longnose suckers and lake trout. Based on the 2003-2004 Sport Fish Guide, consumption advisories remain in place both inside the harbour and in open Lake Superior waters. These do not appear to have changed significantly from the advisories presented in the 1999-2000 SFG. However, known in-place sources of mercury occur in the harbour.	I
Wildlife Consumption	NI	No wildlife consumption impairments (Braune 1999).	NI
Degradation of Fish and Wildlife Populations Dynamics of Fish Populations	I	Lake trout populations had declined historically, however recent lake trout netting studies (2002) within the fisheries zone (includes harbour and near open lake) found lake trout to be in rehabilitated (K. Cullis, MNR, pers. com.).	NI
Body Burdens of Fish	RFA	Recent Sport Fish Guide data indicate elevated levels of mercury, PCBs, mirex and pesticides.	I
Dynamics of Wildlife Populations	NI	Because of the natural absence of wetlands, wildlife populations such as waterfowl and shore birds are not abundant nor are they considered to be impaired. The herring gull population in	NI

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
		the harbour has been stable for at least six years (1992-1997).	
Body Burdens of Wildlife	NI	Contaminant levels in herring gull eggs are comparable to other Lake Superior sites and not considered impaired.	NI
Fish Tumours and Other Deformities	NI	As a result of extensive surveys in the area in recent years, fisheries personnel have not found any evidence to confirm the presence of fish tumours and deformities. There have been no reports from the public to indicate that this is a problem.	NI
Tainting of Fish and Wildlife Flavour	NI	There have been no reports from the public or fisheries/wildlife personnel	NI
Bird and Animal Deformities or Reproductive Problems	NI	Incidents of bird or animal deformities have not been reported in the AOC. Exposure of local wildlife populations to contaminants is minimal because of a lack of appropriate nesting and breeding habitat.	NI
Degradation of Benthos			
Dynamics of Benthic Populations	RFA	Benthic sampling and caged clam studies were undertaken in 2002. The results should be available for assessment in mid to late 2003.	RFA
Body Burdens of Benthic Organisms	RFA	Re-assessment will be undertaken when the results of the 2002 benthic sampling and caged clam studies are available.	RFA
Restrictions on Dredging Activities	I	Sediments with high levels of mercury and PCB extend approximately 3 km from Marathon to a depth of 2 - 36 m and exceed guidelines for disposal of dredged materials for aquatic sediments.	I
Eutrophication or Undesirable Algae	NI	Algal growths have not been reported in recent years. Effluent from the Water Pollution Control Plant is discharged offshore via a submerged diffuser.	NI

GLWQA IMPAIRMENT OF BENEFICIAL USE	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Drinking Water Consumption or Taste and Odour Problems	NI	In 1991, the town of Marathon added a sixth well to its water supply network. There have been no consumption restrictions or taste and odour problems reported in the AOC.	NI
Beach Closings	NI	Because of the rocky nature of the shoreline along Pebble Beach and the cold, high energy waters of Lake Superior, there have been no beach closures or advisories issued in the AOC.	NI
Degradation of Aesthetics	NI	There have been no reports of foam or unsightly effluent plumes since the installation of submerged diffusers at both the mill (1984) and the Water Pollution Control Plant (1982). The secondary treatment facility and submerged diffuser for the mill are now located outside the AOC boundary.	NI
Added Cost to Agriculture and Industry	NI	There is no agricultural activity in the AOC. Pre-treatment of process water at the mill is not required.	NI
Degradation of Phytoplankton and Zooplankton Populations	NI	There have been no reported effects of contaminants on plankton populations in the AOC.	NI
Loss of Fish and Wildlife Habitat	I	The current fishery remains predominantly offshore and lake trout stocks within the overall fisheries zone have improved substantially in recent years to the point that stocks are self-sustaining (K. Cullis, MNR, pers. com.). No wildlife habitat loss has been documented in the harbour.	NI

The primary issue for delisting this AOC is the removal or covering of contaminated sediments in the main harbour **[F7]**. It is not known to what degree these in-place sources are contributing to fish consumption advisories or elevated body burdens in fish. This should be further assessed both in terms of contributions to fish within the harbour as well as, possibly, to fish in the open waters of Lake Superior.

4.5 St. Marys River

Beneficial Use Impairment	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Restrictions on Fish and Wildlife Consumption			
(a) Restriction on fish consumption	I	The 2001 Michigan Fish Advisory Guidebook and 2003-2004 Ontario Sport Fish Guidebook both indicate on-going fish consumption advisories based on elevated levels of mercury, PCBs, mirex and/or pesticides.	I
(b) Consumption of wildlife	NI	No AOC specific advisories are in effect.	NI
Tainting of Fish and Wildlife Flavour	NI	Tainting of fish from the St. Marys River is not common.	NI
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. 2001-2002 assessment data indicate that the sea lamprey control program has significantly reduced larval lamprey abundance in the St. Marys River since before 1999. Effects of these reductions on lake trout need to be determined. Fish community study in Fall 2002 results will be available in summer 2003.	RFA
(b) Body burdens of fish	I	Evidence that chemicals with hepatic mixed function oxidase (MFO) inducing potential (e.g., PAHs and PCBs) are present date back to the late 1980's. Also, the presence of dehydroabletic acid (DHA) indicated the bioaccumulation of resin acids as a result of exposure to the pulp mill effluent. Since these data have been obtained St. Marys Paper has gone to tertiary treatment and is meeting all MOE standards for water quality. Need to	I

Beneficial Use Impairment	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
		determine recent contaminant levels in resident fish versus open lake to determine further actions which may be required. Recent sport fish consumption advisory data indicate elevated levels of mercury, PCBs, mirex and pesticides in fish.	
(c) Dynamics of wildlife populations	RFA	Wildlife populations appear to be stable or increasing, but assessment criteria are required.	RFA
(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. Recent CWS contaminant data on eggs from herring gulls, black terns, and common terns need to be assessed.	RFA
Fish Tumours and Other Deformities	I	This impairment is based on old data and needs to be reassessed.	RFA
Bird and Animal Deformities or Reproductive Problems	RFA	A full assessment of bird and animal populations to determine the incidence of deformities has not been undertaken.	RFA
Degradation of Benthos			
(a) Dynamics of benthic populations	I	On the Ontario side, benthic communities are moderately impaired downstream of the Algoma Slage site. Impairment also occurs on both sides of the Lake George Channel, within Little Lake George, and at the north end of Lake George.	I/RFA
(b) Body burdens of benthic organisms	I	Eleveated 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.	I/RFA
Restrictions on Dredging Activities	I	Recent dredging at former government dock (now Purvis Marine Ltd.) revealed contaminant levels exceeding guidelines. This location and others may soon require further dredging and it is likely that all or	I

Beneficial Use Impairment	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
		most have sediment contaminant levels in excess of guidelines.	
Eutrophication or Undesirable Algae	I	The East End Water Pollution Control Plant is currently upgrading to secondary treatment and holding tanks are being constructed to capture storm water for treatment. Sault St. Marie Michigan is also undergoing sewer separation. Echo Bay has constructed an STP to eliminate septics. These action meet delisting requirements and results need to be assessed.	NISA
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.	NI
(b) Taste and odour problems	NI	Taste and odour problems have not been reported.	NI
Beach Closures	I	On-going improvements to the East End Water Pollution Control Plant, including combined sewer overflow holding tanks, and the sewer separation program in Sault St. Marie Michigan should result in improvements to this BUI.	NISA
Ambient Water Quality	I	Recommend removing this as a use impairment in part because water use goal can never be attained (water going out as clean as water coming in) and it is redundant with other BUIs in terms of use of water quality standards and quidelines.	Not Applicable
Degradation of Aesthetics	I	Aesthetic objectives will largely be met with the installation of sewer separation in Michigan, ongoing upgrades to the East End Water Pollution Control Plant in Ontario, and recent upgrading of the St. Marys Paper treatment to tertiary. Continuing oil spills from ships is now primary issue.	NISA

Beneficial Use Impairment	Stage 2 Status	UPDATED CONDITIONS	Proposed Status
Added Cost to Agriculture and Industry	NI	None documented.	NI
Degradation of Phytoplankton and Zooplankton	NI	Open water community structure and densities reflect Lake Superior.	NI
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. New cottage development on shoreline properties continues to alter habitat.	I

The completion of upgrades to the East End Water Pollution Control Plant, including adding secondary treatment and holding tanks, sewer separation in Sault St. Marie Michigan and the construction of an STP in Echo Bay should result in significant improvements to several BUIs. In particular, delisting should be considered for eutrophication/undesirable algae, beach closings, and the degradation of aesthetics once these works are completed and following specific monitoring **[F8]**.

With regard to the remaining BUI's, the following indicates some of the problematic factors specific to this AOC:

- Fish Consumption - ranked I **[F4; F5; F6; F7]**
- Dynamics of Fish Pop. - ranked RFA **[F9]**
- Body Burdens of Fish - ranked I **[F4; F5; F6; F7; F8]**
- Dynamics of Wildlife Pop. - ranked RFA **[F8; F9]**
- Body Burdens of Wildlife - ranked RFA **[F8; F9]**
- Fish Tumours - ranked RFA **[F8]**
- Dynamics of Benthic Pop. - ranked I/RFA **[F8]**
- Body Burdens of Benthic Pop. - ranked I/RFA **[F8]**
- Restrictions on Dredging - ranked I **[F4; F6; F7]**
- Loss of Fish and Wildlife Habitat - ranked I **[F2; F3]**

5.0 SUMMARY and RECOMMENDATIONS

It is clear that there have been substantive improvements in the four Superior AOC's and the St. Marys River AOC since the beginning of their respective RAP programs. Several BUI's have been delisted and it appears that many more should soon be delisted as a result of specific remedial actions either planned or underway. Also, there appears to be a strong likelihood of further delisting should specified monitoring programs be completed. Each of these has been documented in Section 4 above.

It is also clear, however, that some BUI's in each of the five AOC's may never be delisted as a result of problematical factors and the nature of the delisting criteria. Ten problematical factors limiting delisting of individual BUI's are presented in Section 2. These have been discussed and their influence has been suggested in the case of both delisting criteria (Section 3) and Beneficial Use Impairments (Section 4). From our review of the delisting criteria/goals prepared for each AOC, it is apparent that several were either overly optimistic, not relevant, or beyond the scope of the RAP process.

The following recommendations are presented:

1. This report is a preliminary attempt to update the current real status of BUI's. From this work it is clear that some collected but currently not available data need to be incorporated. These include the 2000 CWS wildlife studies and the Fall 2002 complete river fish community studies undertaken for the St. Marys River.

2. The number of experts with knowledge of these AOC's needs to be expanded. This should include other experts in the AOC's (particularly the St. Marys River) as well as those undertaking the individual studies and/or data analyses.

3. It is recommended that within the context of the five AOC's evaluated in this report that further expert opinion analysis is required. It is suggested that the problematical factors analysed herein form the basis of a more inclusive review undertaken, perhaps, in a workshop format, to:
   (1) fully evaluate the current status of each BUI;
   (2) prepare a 'shopping list' of the most necessary studies to be implemented;
   (3) re-consider stated delisting criteria as per the comments in Section 3; and
   (4) develop a clear road map to Stage 3 and full delisting.

4. The problematical factors indicated in this report need to be further addressed. These are real factors, some of which can be addressed with more resources (e.g., additional studies, additional remediation) and others require either a great deal more time (e.g., stochastic delays to restoration), or the co-ordination and participation by a greater number of agencies. At any rate, under the current situation they clearly exist and will result in delays to delisting of AOC's for decades (if ever). These factors are not specific to these five AOC's but are endemic to all AOC's in the Great Lakes to a larger or lesser degree. As such, the IJC and the parties to the Great Lakes Water Quality Agreement need to re-assess the process within which AOC's are determined, evaluated, remediated, and delisted.