

AGREEMENT REVIEW COMMITTEE

Report to the Great Lakes Binational Executive
Committee: **Volume 2**

**FINAL REVIEW WORKING GROUP
REPORTS TO ARC**

DECEMBER 2006

**Review of the Canada–U.S.
Great Lakes Water Quality Agreement**

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GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP A FINAL REPORT TO ARC December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

This report summarizes the work conducted by Review Workgroup A, which was tasked with reviewing the scope and purpose, goals and objectives (**Articles I-III**); standards regulatory requirements and research (**Article V**); programs and other measures (**Article VI**); and management and administrative elements (**Articles X-XV**), as provided under the Canada – U.S. Great Lakes Water Quality Agreement. The above noted Articles were reviewed against five evaluation elements: clarity, relevancy, achieving results, management framework and accountability.

This report includes the following:

- Details on the Workgroup's discussions and findings regarding the application of the five review elements against the ten Articles under its purview;
- Recommendations, where the Workgroup generally agreed, for possible changes or additions to Articles and/or the Agreement;
- The Workgroup's responses to the five overarching questions; and
- Appendices that include: considerations for potential changes to the definitions in Article I of the Agreement; a Workgroup participant's suggestions for measures to increase or introduce enforcement and public participation in implementing the Agreement; details on Workgroup meetings and membership; and references and additional resources.

RECOMMENDATIONS AND KEY FINDINGS

Workgroup members identified the following recommendations and key findings about which they could *generally* agree. This list is meant to be representative and not exhaustive; full details are included in the body of the report.

Definitions, Scope and Purpose, and Objectives (Articles I-III)

The Workgroup generally agreed that *Article I (Definitions)* is clear and relevant. For the Article to be more clear and relevant Workgroup members recommend the amendments to the following existing definitions: Boundary Waters of the Great Lakes System; Compatible Regulations; General Objectives; Great Lakes Basin Ecosystem; Great Lakes System; Hazardous Polluting Substances; Monitoring; Specific Objectives; Surveillance; Toxic Substance; Research; State and Provincial Governments; and, Tributary waters of the Great Lakes System. Workgroup members also recommended that to add clarity and make the Agreement more relevant the following additional terms be included in an updated Agreement: Beneficial Uses; Groundwater; Contamination; Indicators; Chemical, Biological and Physical Integrity; Virtual Elimination; and, Implementation. Appendix A (Considerations for Potential Changes to Definitions in Article 1 of the Great Lakes Water Quality Agreement) includes definitions used by the IJC's Science Advisory Board and Water Quality Boards that could serve as a starting point for future revisions to the Article.

In the Workgroups review of *Article II (Purpose)*, various perspectives were put forward on the clarity and purpose of the existing Agreement. Some members felt the current wording of the purpose statement of the Agreement, "to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem" is clear and adequately communicates the purpose of the Agreement. However, other members felt the current language does not clearly describe the focus and intent of the purpose statement and how this purpose will be achieved. The

Workgroup generally agreed that there remains a need for an international agreement for the Great Lakes; however, a continuum of opinions emerged regarding the focus and purpose of a revised agreement: most participants recommended that a revised Agreement use an ecosystem approach to protect water quality; one participant noted that a revised Agreement should have a narrow scope and focus on water quality only (no ecosystem approach); one participant recommended a revised Agreement should focus on the ecological integrity of the entire Great Lakes Basin aquatic ecosystem; while another participant recommended a larger scope for the Agreement to focus on the ecological integrity of the entire Great Lakes Basin ecosystem. The Workgroup did not reach consensus on these issues.

The Workgroup generally agreed that while the Agreement does commit the Parties to develop and implement programs and other measures to fulfill the purpose of the Agreement and to meet its objectives, and while progress has been made, the Agreement has not yet achieved the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem. Specifically, Workgroup members noted that implementation has been hindered by a lack of dedicated resources sufficient for full implementation of the provisions of the Agreement. For example, Workgroup members cited: the lack of progress in delisting Areas of Concern (e.g. completing the remediation of contaminated sediment and improvements to waste water infrastructure); continued fish consumption advisories; an array of emerging issues not being currently addressed (such as invasive species and the growing threat to the Great Lakes from the array of emerging problematic substances including pharmaceutical and personal care products). The Workgroup also generally agreed that it is difficult to measure the overall progress of the Agreement.

The Workgroup generally agreed that **Article III (General Objectives)** is clear, it is not outdated; and remains relevant as written. The Workgroup generally agreed that the Article does contain some terms/concepts that need to be updated to reflect their current interpretation (e.g. the references to heat and groundwater). As well, Workgroup members generally agreed and recommended that the Article could be made more current through the addition of several new objectives to address critical and omitted issues such as: the cumulative or compound effects of combinations of harmful items such as toxic chemicals, materials, and heat; the threat of aquatic invasive species; the growing threat to the Great Lakes from the array of emerging problematic substances including pharmaceutical and personal care products; and, the negative impacts resulting from human induced climate change. Also, the Workgroup generally agreed that the Agreement is not designed to evolve as new problems arise and that language should be added to indicate that Agreement objectives will evolve with new science, technology and discoveries.

Standards, Research and Regulatory Requirements (Article V)

The Workgroup generally agreed that **Article V (Standards, Research and Regulatory Requirements)** is clear, relevant and is an example of an Article that demonstrates a strong specific relationship between the Agreement and its Annexes. Many mechanisms such as Lakewide Management Plans (LaMPs) have been developed under the Agreement; however, the Workgroup noted that whether these mechanisms are functioning well is a separate question that would require further discussion. Some of the Workgroup members were of the view that: dedicated resources have been insufficient for full implementation of Article V; there are clear indicators to determine progress for the first section of the Article but not for the orientation of research programs and priorities and mechanisms for international cooperation (the second section of the Article). Also, many Workgroup members recommended that accountability mechanisms should be strengthened

to ensure the Parties are meeting their stated commitments. Last, the Workgroup generally agreed that there needs to be better coordination between what the IJC needs to carry out its role and responsibilities and the information that the Parties provide.

Programs and Other Measures (Article VI)

The Workgroup generally agreed the text of **Article VI (Programs and Other Measures)** is clear and that each of the sections (a-q) remains relevant and necessary. Workgroup members made the following suggestions to clearly identify program / environmental outcomes in the Article: Text should be added indicating that pollution could come from municipal, private and non-point sources; the regulatory aspect of Section 1(a) could be added to Section 1(q), and to improve 1(q), text could be added to include pathogens and other chemical contaminants. Similarly, text should be added to Subsection 1(a) (iii) to include domestic septic systems, because septic system failures are a significant problem contributing to eutrophication and bacterial problems.

Workgroup members recommended that the Article could be streamlined and identified invasive species as a challenge that is not currently addressed in the Article and Agreement as a whole. Overall, the Workgroup generally agreed that the entire Article contains some terms and many dates that are now outdated; but the scope remains comprehensive and therefore would not need to be changed significantly.

Management and Administrative Elements (Articles X-XV)

For this group of Articles, the majority of significant issues were found *within Article X (Consultation and Review)* and *Article XI (Implementation)*.

In its review of **Article X (Consultation and Review)**, members of the Workgroup expressed the view that the Agreement does not reflect the current status of broader consultation and does not include sufficient mechanisms to allow a large number of interested parties to participate and adequately commit to the process (e.g. local and municipal levels of government, Aboriginal peoples and Tribes and the public). The Workgroup generally considered Article X to be clear on general aspects, short on specific forms of implementation, and unclear on what organizations need to be consulted. Some members felt the Agreement needs to formally define a public/citizen engagement mechanism (e.g. citizen petition process or Citizen Advisory Committee). Some members of the Workgroup recommended that an additional Article be added on public consultation and participation which would explain the requirements for public participation and notification in one location within the Agreement. The Workgroup generally agreed that there is a need for increased coordination between other agreements that are not under the Agreement or the Binational Executive Committee, and that have a similar interest with the Agreement (e.g. St. Lawrence Plan).

Members of the Workgroup pointed out that **Article XI (Implementation)** does not contain provisions to hold the Parties accountable or to address the consequences for either Party if it fails to carry out the Agreement or has insufficient funds for implementation. Workgroup members expressed the view that the management and coordination approaches of the Agreement could benefit from: 1) provisions to strengthen accountability; 2) benchmarks for measuring progress; and 3) an implementation schedule that facilitates binational priority setting to address issues of greatest importance to the restoration and protection of the basin ecosystem. Members also noted the need for an explicit objective process (3rd Party or via the IJC) to uncover program deficiencies against

performance (e.g. a Gaps Analysis) in order to assist in determining disparities between the achievement of the goals set out in the Agreement and the implementation of Governments' programs.

The Workgroup generally considered **Articles XII (Existing Rights & Obligations), XIII (Amendment), XIV (Entry and Termination) and XV (Supersession)** were found to be clear and relevant and generally operating effectively.

2. Overview of Review Working Group Mandate

The Great Lakes Water Quality Agreement Review Working Group A (hereunder referred to as "Workgroup") has been tasked to examine the Scope and Purpose; Goals and Objectives; and Function of the Canada – U.S. Great Lakes Water Quality Agreement (GLWQA, or the Agreement). Specifically, the Workgroup reviewed the following components of the Great Lakes Water Quality Agreement:

- Definitions (Article I)
- Purpose (Article II and Preamble)
- General Objectives (Article III)
- Standards, Regulatory Requirements, Research (Article V)
- Consultation and Review (Article X)
- Implementation (Article XI)
- Standard Provisions (Articles XII, XIII, XIV, XV)
- Article VI (to be reviewed by all Review Working Groups)

The Workgroup agreed to take a systematic approach in their evaluation and divide their task into three sections: **Articles X-XV** which address the management and administrative elements of the Agreement; **Article V** (Standards, Regulatory Requirements and Research) and **Article VI** (Programs and Other Measures), which each Working Group has been asked to review; and, **Articles I-III** which address definitions, purpose and general objectives of the Agreement.

The Workgroup conducted its review through a series of two hour long conference calls held between April 28 and December 07, 2006. Workgroup conference calls consistently received good Canadian and U.S. participation. For further details on Workgroup meetings and membership, please see Appendices C, D, and E.

3. Evaluation Framework

As instructed by the Agreement Review Committee the Workgroup conducted its Article evaluations against five major review elements: clarity, relevancy, achieving results, management framework, and accountability, as defined below:

Clarity: An assessment of the clarity of the purpose, goals, objectives, programs and other measures set out in the Agreement and whether there exists a shared common understanding or acceptance of the meaning of the terms of the Agreement;

Relevancy: An assessment of the continued relevance of terms found in the Agreement;

Achieving Results: An assessment of the implementation and appropriateness of prescribed programs, policies and measures and demonstrated progress including the application of sound science;

Management Framework: An assessment of institutional structures set out in the Agreement, cooperation and coordination and assessing potential duplication with other initiatives or instruments of a similar nature, and synergies and linkages with other initiatives; and

Accountability: Issues to be addressed include the ease of access to, and quality of monitoring data for reporting purposes; the role of the IJC; and long-term sustainable commitment from the Great Lakes community.

ARTICLE I: DEFINITIONS

Article I of the Great Lakes Water Quality Agreement states:

- (a) *“Agreement” means the present Agreement as distinguished from the Great Lakes Water Quality Agreement of April 15, 1972;*
- (b) *“Annex” means any of the Annexes to this Agreement, each of which is attached to and forms an integral part of this Agreement;*
- (c) *“Boundary waters of the Great Lakes System” or “boundary waters” means boundary waters, as defined in the Boundary Waters Treaty, that are within the Great Lakes System;*
- (d) *“Boundary Waters Treaty” means the Treaty between the United States and Great Britain Relating to Boundary Waters, and Questions Arising Between the United States and Canada, signed at Washington on January 11, 1909;*
- (e) *“Compatible regulations” means regulations no less restrictive than the agreed principles set out in this Agreement;*
- (f) *“General Objectives” are broad descriptions of water quality conditions consistent with the protection of the beneficial uses and the level of environmental quality which the Parties desire to secure and which will provide overall water management guidance;*
- (g) *“Great Lakes Basin Ecosystem” means the interacting components of air, land, water and living organisms, including humans, within the drainage basin of the St. Lawrence River at or upstream from the point at which this river becomes the international boundary between Canada and the United States;*
- (h) *“Great Lakes System” means all of the streams, rivers, lakes and other bodies of water that are within the drainage basin on the St. Lawrence River at or upstream from the point at which this river becomes the international boundary between Canada and the United States;*
- (i) *“Harmful quantity” means any quantity of a substance that if discharged into receiving water would be inconsistent with the achievement of the General and Specific Objectives;*
- (j) *“Hazardous polluting substance” means any element or compound identified by the Parties which, if discharged in any quantity into or upon receiving waters or adjoining shorelines, would present an imminent and substantial danger to public health or welfare; for this purpose, “public health or welfare” encompasses all factors affecting the health and welfare of humans including but not limited to human health, and conservation and protection of flora and fauna, public and private property, shorelines and beaches;*
- (k) *“International Joint Commission” or “Commission” means the International Joint Commission established by the Boundary Waters Treaty;*
- (l) *“Monitoring” means a scientifically designed system of continuing standardized measurements and observations and the evaluation thereof;*

- (m) “**Objectives**” means the General Objectives adopted pursuant to Article 111 and the Specific Objectives adopted pursuant to Article IV of this Agreement;
- (n) “**Parties**” means the Government of Canada and the Government of the United States of America;
- (o) “**Phosphorus**” means the element phosphorus present as a constituent of various organic and inorganic complexes and compounds;
- (p) “**Research**” means development, interpretation and demonstration of advanced scientific knowledge for the resolution of issues but does not include monitoring and surveillance of water or air quality;
- (q) “**Science Advisory Board**” means the Great Lakes Science Advisory Board of the International Joint Commission established pursuant to Article VI11 of this Agreement;
- (r) “**Specific Objectives**” means the concentration or quantity of a substance or level of effect that the Parties agree, after investigation, to recognize as a maximum or minimum desired limit for a defined body of water or portion thereof, taking into account the beneficial uses or level of environmental quality which the Parties desire to secure and protect;
- (s) “**State and Provincial Governments**” means the Governments of the States of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Wisconsin, and the Commonwealth of Pennsylvania, and the Government of the Province of Ontario;
- (t) “**Surveillance**” means specific observations and measurements relative to control or management;
- (u) “**Terms of Reference**” means the Terms of Reference for the Joint Institutions and the Great Lakes Regional Office established pursuant to this Agreement, which are attached to and form an integral part of this Agreement;
- (v) “**Toxic substance**” means 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;
- (w) “**Tributary waters of the Great Lakes System**” or “**tributary waters**” means all the waters within the Great Lakes System that are not boundary waters;
- (x) “**Water Quality Board**” means the Great Lakes Water Quality Board of the International Joint Commission established pursuant to Article VI11 of this Agreement.

EVALUATION FINDINGS

In meetings held on August 17th and 10th, 2006, the Workgroup reviewed Article 1 against five major review elements: clarity, relevancy, achieving results, management framework, and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. *Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?*

The Workgroup generally agreed that definitions A, B¹, D, I, K, M, N, O, Q, S, U, and X are clear and need not be discussed further.

The Workgroup made the following comments and suggestions with respect to the clarity of the following definitions:

Definition C: “Boundary waters of the Great Lakes System”

There were divergent views on the clarity of this definition. Some Workgroup members felt the definition was clear, while other Workgroup members noted:

- It was not clear how boundary waters differ from the Great Lakes water system within the Agreement. That is, the distinction may be that the Great Lakes system includes Lake Michigan but not as part of the boundary waters, but this distinction is not explained in the definition;
- It would be helpful to remove the reference to the Boundary Waters Treaty altogether from Part C; and,
- It could be helpful to incorporate the definition of boundary waters from the Boundary Waters Treaty, to ameliorate confusion. There was disagreement as to whether a footnote would be the best way to incorporate this citation. Further, if the text from the Boundary Waters Treaty were incorporated, it would need an additional phrase, or words, to clarify that it alluded to the Great Lakes and the boundary waters.

Definition E: “Compatible regulations”

Several Workgroup members noted that:

- It is not clear what regulations the definition is referring to or by whom the regulations are enacted.
- It is unclear whether “compatibility” is between the regulations of the Parties, or between their regulations and the Agreement. The Workgroup generally agreed that compatibility was between the regulations and the framework laid out by the Agreement, meaning that that the Parties do not have to enact the same regulations, but that independently, they must be compatible with the Agreement.
- The term “compatible” might be better understood if it were changed to “equivalent”. A number of Workgroup members countered that “equivalent regulations” are more constraining than “compatible regulations,” which do not present a ceiling for the Parties’ regulations.
- Use of the phrase “principles” in Part E is unclear since the Agreement refers to purpose and objectives, not principles. The Annexes do include principles, but the terminology in the definitions should be consistent within the Agreement. It was suggested that the term

¹ The Workgroup noted that Definition B, contains a typo, which should be corrected to read “and forms an integral part...”

“principles” be deleted and instead have Part E refer to the “purposes and objectives” and possibly also to the “goals” of the Agreement.

Definition F: “General Objectives”

One Workgroup member recommended that since Part F uses the term “beneficial uses,” this term should also be listed and defined in Article I. Others noted that there was no need for this since beneficial uses are well defined in Annex II. The Workgroup generally agreed that “beneficial uses” should be defined in Article I.

Definition G: “Great Lakes Basin Ecosystem”

The Workgroup made the following comments and suggestions with respect to the clarity of the definition of “Great Lakes Basin Ecosystem” in the Agreement:

- It is unclear how far the ecosystem extends because when the St. Lawrence River crosses over the boundary, it is no longer a part of the Boundary Waters Treaty. Does it extend to the east end of Ontario or to the Atlantic Ocean?
- A Workgroup member representing the Government of Quebec stated that the government of Quebec finds this definition very clear and has no problem with it because it respects provincial jurisdiction over water management. The government of Quebec does not want to be bound by, nor does it want any of its territory to be included in GLWQA because there are no such boundary waters on the St. Lawrence River in Quebec. Further, Quebec wants to maintain its jurisdiction over water with its own priorities of intervention.
- Several Workgroup members felt that it is not clear whether Areas of Concern (AOC) have to be included or not and whether the boundaries of AOCs need to be within the Basin. Annex 2 does not address this either. AOCs were drawn up in a way that is consistent with the Agreement, but they are not consistent with what they are trying to protect.

Definition H: “Great Lakes System”

One Workgroup member recommended changing the text of Definition H to read “...within the drainage basin of the St. Lawrence River...” instead of “*within the drainage basin on the St. Lawrence.*” In addition he noted that the word “river” in the definition should be pluralized.

Definition J: “Hazardous polluting substance”

Workgroup members made the following comments and suggestions with respect to the clarity of the definition of “hazardous polluting substances” in the Agreement:

- If the word “element” were defined scientifically, it would not include biological materials, only chemical elements.
- The definition does not specify the quantities of materials that would have to be dumped to cause “imminent and substantial danger.” Acetic acid was given as an example of a substance listed in Appendix 1 of the Agreement that would not cause such danger if a small quantity were released into the system. The definition could be changed from “any quantity” to “such quantity” to imply that small quantities of some materials would not cause such danger.
- Some Workgroup members felt that the term “would present an imminent and substantial danger” should be deleted (or possibly replaced with “would pose a risk”) since the term may be too high a standard to meet in order to include a substance on the Appendix 1 list

of Hazardous Polluting Substances. These Workgroup members also, felt that “danger” may be too strong a word to include in the definition and that a legal review should be undertaken to ensure that the final wording is consistent with Canadian legislation (e.g. CEPA, Fisheries Act). Another Workgroup member noted that the U.S. Clean Water Act does include language relating to imminent and substantial endangerment, so the terms have a familiar meaning in U.S. law.

- The Workgroup generally agreed that this definition needs to be carefully reconsidered in light of the discussions described above.

Definition L: “Monitoring”

One Workgroup member noted the need to reference indicators in the definition. Others questioned this need. One Workgroup member characterized the difference between indicators and monitoring as: “Monitoring” refers to the collection of data, while “indicators” are the collections of data that have an attached comparison to something else. Another Workgroup member noted that indicators are mentioned in Annex 11 regarding the development of ecosystem health in the Great Lakes Basin, but the Annex does not explain what indicators are. It was therefore suggested by a Workgroup member that perhaps a separate definition for “ecosystem health indicators” be developed since the term appears elsewhere in the Agreement.

Definition P: “Research”

It was generally agreed that this definition is clear; however, some Workgroup members made the following comments and suggestions:

- The definition should not be solely based on monitoring and surveillance, as that would exclude the basis for making conclusions.
- There needs to be a clear distinction between monitoring and research. Parts L and P need to remain mutually exclusive so that monitoring isn’t confused to mean research

Definition R: “Specific Objectives”-

The Workgroup debated why the phrase “after investigation” was included in the definition and if the phrase may have been included to specify how the specific objectives would be carried out. Many Workgroup members agreed that the term “investigation” was meant to be flexible and that changing the terminology could make it “muddy”.

Definition T: “Surveillance”

One Workgroup member noted that the term “regular” should be added to the definition to further separate it from the definition from Monitoring (Part L). Another Workgroup member countered that surveillance implies something more in depth than monitoring so it does not need the term “regular” to be added to it. Another Workgroup member noted that throughout the Agreement, the terms “surveillance” and “monitoring” are mentioned hand-in-hand and stated that it is not clear why each has its own definition if they are continually used in conjunction with each other.

Definition V: “Toxic substance”

Workgroup members made the following diverging comments and suggestions with respect to the clarity of the definition of “toxic substance” in the Agreement:

- The term “poisonous” gives a connotation of instant lethal harm. It was suggested that the term could be replaced with “harmful” or “deleterious” since these might still capture the intent of the original wording and would also capture the broad spectrum of sublethal effects (e.g. endocrine disruption, reproductive malfunctions, etc). A Workgroup member noted that while “poisonous” somewhat implies an instant effect that may not appear in humans, such effects have been found to occur in amphibious creatures inhabiting the Great Lakes. As well, effects in humans that happen almost instantly (poisonously) during development, may not appear/manifest until much later in life. Another Workgroup member noted that the word “poisonous” might seem like an archaic one to use regarding toxic substances. Another Workgroup member countered this and noted that the dictionary definition of toxic includes reference to the word poisonous. It was also noted that much of the language in Part V is similar to the definition of toxic substances in the U.S. Clean Water Act, but the Act does not use the term “poisonous” in its definition. It was also noted that an authoritative Toxicology textbook, “Casarett and Doull’s Toxicology”, has the subtitle, “The Basic Science of Poisons”.
- Workgroup members generally agreed the definition should not be weakened.

Definition W: “Tributary waters of the Great Lakes System”

One Workgroup member noted that the definition is clear but it does not contain everything pertinent to “tributary waters”. Other Workgroup members noted the definition is clear in a legal sense, but not in a physical, natural or scientific sense because the definition doesn’t address what rivers and watersheds do or why the Agreement should care about them. The Workgroup generally agreed that the definition is clear but that a definition that is more illustrative of scientific principles would be more appropriate.

RELEVANCY

1. *Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?*

The Workgroup generally agreed that Parts A, B, D, I, K, M, N, O, Q, S, U, and X were all relevant and would not be discussed in further detail.

The Workgroup made the following comments and suggestions with respect to the relevancy of the following definitions:

Definition H: “Great Lakes System”

One Workgroup member noted that the inclusion of groundwater, atmospheric moisture and metabolizing biota would make the definition more relevant as it would then include all of the waters within the drainage basin and not exclusively surface water.

Definition J: “Hazardous polluting substance”

One Workgroup member noted that this definition would be more relevant if it included biological materials or substances such as pathogens or invasive species and that rewriting this definition would help strengthen the Article.

Definition P: “Research”

It was generally agreed that this definition is relevant. One Workgroup member noted that public participation and public science are not included in the implementation of the Agreement and that the public’s inclusion should be listed as an object of the Agreement and not as a definition.

Definition R: “Specific Objectives”

One Workgroup member stated that the definition would become more relevant if additional substances were listed e.g. including bacteria, viruses and other biological components.

Definition S: “State and Provincial Governments”

There were differing views within the Workgroup as to whether the government of Quebec should be included in this definition. Several Workgroup members noted that it is important for the government of Quebec to be included in this definition. A Workgroup member representing the government of Quebec stated that the government of Quebec does not want to be bound by, nor does it want any of its territory to be included in GLWQA because there are no such boundary waters on the St. Lawrence River in Quebec. Further, Quebec wants to maintain its jurisdiction over water with its own priorities of intervention (*as stated above under Clarity Part “G”*).

Definition T: “Surveillance”

One Workgroup member questioned the inclusion of the definition of “surveillance” because it is defined elsewhere in the Agreement.

Definition V: “Toxic substance”

The Workgroup generally agreed that the definition was relevant but that it could be improved upon (see previous discussion under Article 1 Clarity).

Definition W: “Tributary waters of the Great Lakes System”

One Workgroup member suggested that to make the definition more relevant, it should include reference to waters other than surface waters. Another Workgroup member noted that “Tributary waters” is only mentioned in the Agreement a few times so there doesn’t seem to be a need to alter the definition.

The Workgroup generally agreed that Definition W is a legal definition and altering it to include a scientific aspect could suggest a discussion on whether the Agreement is a water quality agreement or an ecosystem agreement. Overall, the Workgroup generally agreed that the definition is relevant but one that is more illustrative of scientific principles would be more appropriate.

ACHIEVING RESULTS

This review element was not considered applicable to this Article.

MANAGEMENT FRAMEWORK

This review element was not considered applicable to this Article.

ACCOUNTABILITY

This review element was not considered applicable to this Article.

RECOMMENDATIONS

During its discussions, the Workgroup generally agreed on the following possible changes for the Article:

- The term “beneficial uses,” which appears in definition F, should also be defined in Article I.
- For Part W “Tributary waters of the Great Lakes System” the current definition is clear and relevant; however, a definition that is more illustrative of scientific principles is more appropriate.

DISCUSSION OF POSSIBLE ADDITIONAL TERMS TO ARTICLE I

During its review of Article I, several Workgroup members identified the need to include definitions of the following terms in the Article: beneficial uses, groundwater, contamination and indicators.

Members of the Workgroup also noted that the terms “chemical, biological, physical, integrity,” and “virtual elimination” found in Article II should be defined in Article I.

Members of the Workgroup recommended that the term “implementation” which is used throughout the Agreement be defined in Article I.

Also, the Workgroup generally agreed that the possible definitions from the lists of the IJC’s Science Advisory Board and Water Quality Board (see Appendix A), could be used as starting point for the future should the Article I be opened for revision and that it is important that definitions in Article I be consistent with any definitions included in, or relevant to, any of the Annexes.

ARTICLE II: PURPOSE

Article II of the Great Lakes Water Quality Agreement states the purpose of the Agreement as follows:

The purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. In order to achieve this purpose, the Parties agree to make a maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System.

Consistent with the provisions of this Agreement, it is the policy of the Parties that:

- (a) The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated;*
- (b) Financial assistance to construct publicly owned waste treatment works be provided by a combination of local, state, provincial, and federal participation; and*
- (c) Coordinated planning processes and best management practices be developed and implemented by the respective jurisdictions to ensure adequate control of all sources of pollutants.*

EVALUATION FINDINGS

The Workgroup spent a considerable amount of time reviewing Article II. Article II was reviewed in meetings held on September 07, 14, 21, and October 5 and 12, against five major review elements: clarity, relevancy, achieving results, management framework and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. Does the Article contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(a) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

Yes and No. Most Workgroup members noted that the text in Article II is clear and adequately communicates the purpose of the Agreement.

Some Workgroup members noted that the purpose statement of the Article: “*The purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem*” is not clear and requires clarification: (1) to clearly describe the focus and intent of the Agreement; (2) to better understand how this purpose will be achieved.

For example: some Workgroup members recommended that although concern about water quality was the impetus for the Agreement, Article II does not explicitly state “water quality” in the purpose statement. Another Workgroup member stated that the purpose of the Agreement

was made ambiguous in 1978 with inclusion of the term “ecosystem”. Others were of the view that water quality, its maintenance and restoration can not be achieved without being mindful of the obvious ecosystemic connections to water quality that pervade the Great Lakes Basin. A Workgroup member noted that the confusion is whether this is still an agreement on water quality using an ecosystem approach to the multimedia routes of contamination and pollution or whether it has been transformed into an agreement on ecosystem integrity of the entire Great Lakes Basin. Another noted that the term “ecosystem integrity” is a use of language that has an inherent imprecision of meaning, making it not directly observable, so that in practice it is one of those things, like “health” that is noticeable by its absence. Thus, a number of measures corresponding to “water quality”, and to observations of health indicators in fish and wildlife have been developed as at least partly representative. This situation contributes to the confusion and ambiguity that has arisen as an issue.

As well, members of the Workgroup noted that to add clarity in communicating the purpose of the Agreement, the following terms found in Article II are not currently defined in Article I (Definitions) and should be defined in a revised Agreement: chemical, biological, physical, integrity; and virtual elimination.

(b) Are program outcomes and/or environmental outcomes clearly identified?

Yes, the Workgroup generally agreed that the policy statements in this Article clearly articulate the following program and/or environmental outcomes: the virtual elimination of persistent toxic substances, funding assistance to construct publicly owned water treatment works, and the coordination of planning processes and best management practices. However, some Workgroup members noted that these policy statements may not be placed appropriately in the Article. Several Workgroup members commented that an Article that defines the purpose of the Agreement should include visionary statements and that specific policy statements should be placed elsewhere in the Agreement.

(c) Are there outdated terms, concepts or references?

Yes. Several Workgroup members expressed the view that the term “upgrade and maintain” should be added to policy statement (c): “*Financial assistance to construct [and maintain] publicly owned waste treatment works be provided by a combination of local, state, provincial, and federal participation*”. In this context, a working group member cited the November 2006 Sierra Legal Defense Fund report: “the Great Lakes Sewage Report Card:”

General Comments on Clarity:

As the Workgroup deliberated this review element, a continuum of opinions emerged regarding the focus and purpose of a revised Agreement: most participants recommended that a revised Agreement use an ecosystem approach to protect water quality; one participant noted that a revised Agreement should have a narrow scope and focus on water quality only (no ecosystem approach); one participant recommended a revised Agreement should focus on the ecological integrity of the entire Great Lakes Basin aquatic ecosystem; while another participant recommended a larger scope for the Agreement to focus on the ecological integrity of the entire Great Lakes Basin ecosystem. The difference between these interpretations of the purpose is important because each viewpoint affects all aspects of the Great

Lakes Water Quality Agreement including, for example: Lakewide Management Plans; Remedial Action Plans; selection of indicators; and priorities for research and monitoring.

In the discourse between Workgroup members, divergent perspectives relating to the different interpretations of the Agreement have been expressed and the Workgroup did not reach consensus on this issue.

For example, to explicitly reference water quality, one Workgroup member recommended the following changes to the first sentence in Article II: *“Purpose of this water quality agreement is to address more specifically water quality issues in context of an ecological perspective, where chemical, biological and physical factors that could change water quality characteristics are considered”*.

In addition, another Workgroup member suggested that injury to health and property is still occurring as a result of exposures to pollution of the boundary waters² and that the purpose should continue to focus on water quality and the protection of health and property from trans-boundary water pollution pursuant to Article IV of the Boundary Waters Treaty. To achieve this, the Workgroup member suggested that the word “ecosystem” should be removed from this article; and wording be added in order to explicitly state that this is an agreement on water quality.³ Several other Workgroup members supported this kind of wording.

In contrast, another Workgroup member noted that if the Agreement is broadened to address the full array of ecological issues across the Great Lakes Basin then “of the waters” should be removed from the purpose statement. Others argued that such a broadening of scope would exceed the capacities of the Parties to realistically implement the Agreement.

In addition, several Workgroup members noted that Article II does not explicitly refer to water quantity and asked whether water quantity as well as quality issues in the Great Lakes could be considered under the term physical integrity. Other Workgroup members recommended that water quantity is relevant to this agreement only as it is incidental to or relates to water quality. These Workgroup members noted that the Agreement should not be retooled to focus on water quantity since this will take away from the overall objective of Agreement, which is to address water quality issues. Further, the eight Great Lakes States and the Provinces of Ontario and Quebec, on December 13, 2005 concluded the Great Lakes — St. Lawrence River Basin Sustainable Water Resources Agreement that focuses on water quantity and the management of water takings in the Basin.

Lastly, several Workgroup members noted that there is no temporal aspect to the purpose statement of the Agreement and this issue will need to be further discussed when/if the purpose statement is revised.

² International Joint Commission, *Priorities 2003 - 2005: Priorities and Progress under the Great Lakes Water Quality Agreement* (2006)

³ One RWG A member’s suggested wording: *“Pursuant to Article IV of the Boundary Waters Treaty, the purpose of the Parties in signing the Great Lakes Water Quality Agreement is to prevent injury to health and property from pollution of the boundary waters, by restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes basin. In order to achieve this purpose, the Parties agree to make the maximum effort to develop programs, practices and technologies necessary for a better understanding of water quality in the Great Lakes basin and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the waters of the Great Lakes.”*

RELEVANCY

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

A Workgroup member noted that there still exists a demonstrable need for the Agreement since there is still documented injury to health and property from pollution of the boundary waters, particularly by persistent toxic substances. For example, chapter 5 of the IJC Great Lakes Science Advisory Board⁴ report contains a detailed review of the recent literature on the effects of exposures to persistent toxic substances on human health. Several others noted that there is also a demonstrable need for the Agreement to address the ecosystem approach as delineated via the SOLEC process.

(a) Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

Several Workgroup members noted that researchers have documented new challenges and new understandings of problems such as invasive species and new persistent toxic substances (PTS) that may require different solutions than in the past. Also, new scientific insights into the mechanisms of PTS induced injury are raising new concerns and challenges with respect to low dose effects that are manifested after lengthy time periods, interactions between different PTSs, and cumulative effects.

(b) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

The Workgroup generally agreed that the Agreement does provide that the Parties are develop and implement programs and other measures to fulfill the Purpose the Agreement. For example, the phrase “virtual elimination” in section (a) of Article II first arose in the U.S. Clean Water Act (CWA) and has direct echoes in the Canadian Environmental Protection Act (CEPA). It was also noted that that the Agreement drives certain policies of the CWA and CEPA.

It was noted by a Workgroup member that SOLEC drives efforts to define and monitor the physical and biological integrity of the Great Lakes ecosystem and these go beyond current laws and have become a part of the overall Great Lakes restoration and protection policy and strategy. However, another Workgroup member disagreed with this characterization, saying the SOLEC does not have measures of ecosystem integrity (a whole system property). Instead, SOLEC reports on measurements of various chemical, biological, and social “observable properties” or indicators and attempts to infer ecosystem integrity from them. Furthermore, the Workgroup member stated that there is no evidence that SOLEC goes beyond current laws or that it drives Great Lakes restoration and protection policy and strategy.

(c) Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

The Workgroup generally agreed that the Agreement does drive actions. For example: the concept of virtual elimination has been incorporated into the Canadian Environmental Protection Act (CEPA); information generated from the work of GLWQA Annex 15 (Airborne Toxic Substances)

⁴ International Joint Commission, Priorities 2003 - 2005: Priorities and Progress under the Great Lakes Water Quality Agreement (2006)

was used in the development of the global Treaty on Persistent Organic Pollutants; the GLWQA led to the creation of the Great Lakes Binational Toxics Strategy; the development of the Great Lakes Legacy Act in the U.S. and in Canada the development of the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem.

(d) Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

The Workgroup generally agreed that there are several current relevant issues that exist at present that are either not addressed or not adequately reflected in the current language of the Agreement. For example:

- The Workgroup generally agreed that language on pollution prevention should be added to subparagraph (a) to the Agreement to make it more relevant and current. It was noted that this policy thrust came after the Agreement and that the U.S. and Canada have national legislation on pollution prevention and agencies that have offices to deal with this issue. Members of the Workgroup also noted that the Preamble to the Agreement has a sentence on preventing further pollution and that perhaps this concept should be incorporated into Article II as well. Another Workgroup member clarified that language in Article II, section (a), should not be eliminated since it remains relevant; rather, it requires updating to make it current.
- Several Workgroup members noted that a reference to human health is missing from Article II. It was noted that there are other places in the Agreement that refer to human health, but not in Article II. Further, the International Joint Commission's (IJC) report by the IJC Health Committee states that the Agreement does not specifically address human health; it only hints at it.
- Another Workgroup member inquired if the issue of property should be added to Article II. Property is referred to in Article IV of the Boundary Waters Treaty and in the Preamble to the Agreement.

General Comments on Relevancy:

Several Workgroup members noted that the reference to "waste treatment works" in Article II (b), was put into the Agreement when the focus was on eutrophication and when waste treatment plants were a contentious issue between the Parties which may not be as important today. Other Workgroup members clarified that although this issue has evolved to include a larger picture (e.g. storm water and combined sewer overflow) the issue remains important today. For example, diplomatic notes were recently exchanged between Canada and the U.S. regarding the situation on the Saint Mary's River and recent information showing significant loadings into Lake Erie.

A Workgroup member recommended that Article II be separated into two items: (1) the discharge of toxic substances in toxic amounts be prohibited; (2) the discharge of any or all persistent toxic substances be virtually eliminated. These are two distinct policy items that should be addressed separately.

ACHIEVING RESULTS

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

(a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

Yes, the Workgroup generally agreed the provisions in Article 2 are sufficient to achieve its intended goals and noted that scientific progress will continue and the Agreement should be able to accept new information as it becomes available. In addition, a Workgroup member noted that since the objective of the Agreement is to prevent injury to health and property from pollution of the boundary waters, the goal has manifestly not been achieved, though presumably improvements in water quality have likely reduced the extent of the injury.

(b) Does the Agreement fail to address critical issues?

The Workgroup generally agreed that the Agreement does not adequately address many critical issues that exist today that were not anticipated when the Agreement was last revised. Examples of these critical issues and approaches include: pollution prevention, invasive species, climate change, and newly classified toxics substances. In addition, a Workgroup member observed that the idea of the hydrological cycle is not included in the purpose of the Agreement and the inclusion of a reference to hydrology in Article II should be reviewed. The hydrological cycle is a significant driver that is not mentioned; the more humans interfere with hydrologic connectivity, the more we will see impairments in water quality. The Workgroup member noted that the Great Lakes Atlas has a useful picture explaining the hydrological cycle. It impacts the biological and chemical (not just physical) integrity of the Lakes. Some Workgroup members supported inclusion of a reference to the hydrological cycle, but were unsure how it should be included.

**This issue is further explored under Article II, Question 5(b) of this report*

2. Are the demonstrated results consistent with goals and objectives in the Agreement?

(a) Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not?

Yes, the Workgroup generally agreed that programs, policies and measures have been developed that address Sections a and b of Article II. The Workgroup generally agreed that Section c of Article II has only been partially addressed because although progress has been made, the Workgroup cannot pronounce that all sources of pollution have been controlled.

(b) Are any parts of the Agreement in any way an obstacle to progress?

No, the Workgroup generally agreed that there are no significant parts of Article II that are in any way an obstacle to progress.

(c) Are there external impediments that prevent implementation?

Yes, the Workgroup generally agreed that the lack of adequate funding to implement the terms of the Agreement is an external obstacle to implementation. For example, it was noted that there has been inadequate funding in Canada and the U.S. related to waste water treatment infrastructure.

(d) Are there other barriers to progress?

Some members of the Workgroup commented that there are institutional, constitutional, and other political barriers related to land use planning and policy decisions. Specifically these Workgroup members noted that there are many different authorities with land use policy power that makes implementation quite difficult. For example, the bulk of land use planning, policy and decision making in Canada and the U.S. is done at State and local levels of government.

Members of the Workgroup also noted that there are funding barriers for contaminated sediment and wastewater infrastructure upgrades and that there is a need for an updated report on the status on implementation for these issues to better allow for an assessment of progress that has been made for these parts of the Agreement.

(e) To what extent can results be attributed to the Article/Annex?

The Workgroup generally agreed that progress has been made in each category (programs, policies, and measures) as a result of the Agreement, but that there is still significant progress to be made.

3. *Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?*

(a) Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?

No, as mentioned in Article II, Achieving Results Part 2c, the Workgroup generally agreed that the allocation of resources has not been sufficient to meet the goals and objectives of the Agreement.

4. *Is the science in the Agreement still relevant? If not, why?*

(a) If the science in the Agreement is still relevant, how has it been incorporated?

Yes, the Workgroup generally agreed that Article II is in concert with the existing science and remains relevant today. The Workgroup generally agreed that the Agreement should include a broader range of science including ecology, meteorology, social sciences, and hydrology.

(b) Does the science adequately influence decision-making?

Yes, the Workgroup generally agreed that the Agreement is based on science and does adequately influence decision-making.

5. *Does the Agreement incorporate science to address emerging issues?*

(a) Are there new issues and programs that need to be addressed?

The Workgroup generally agreed that the Agreement does not adequately incorporate science to address emerging issues. For further details, please see the Workgroups responses to questions: *Article 2, Achieving Results, 1b and 5b*

(b) Can the Agreement accommodate emerging issues?

The Workgroup members generally saw shortcomings in the ability of the Agreement to accommodate emerging issues. Specifically, several Workgroup members noted the policies defined in Article II, subparagraphs (a), (b), and (c), should be updated to include new and emerging issues. Two options for updating the Purpose Statement were identified: (1) removing the policies from the Purpose Statement and instead stating them elsewhere, which would result in a very broad Purpose Statement; or (2) add policies to either the Purpose Statement or to the Article III (General Objectives) related to issues such as pollution prevention or invasive species. One Workgroup member disagreed, asserting that the present Agreement was able to address emerging issues.

Several Workgroup members suggested a variety of policies/ approaches that could be incorporated into the Purpose Statement including: the precautionary principle, adaptive management, robust decision-making, and risk management. It was also mentioned that having the policies linked to the purpose will help to clarify how the Parties will fulfill the purpose of the Agreement. Some Workgroup members objected to the incorporation of the precautionary principle into the Agreement.

Other Workgroup members commented that emerging issues can be addressed in response to the general overall objectives stated in the Agreement.

MANAGEMENT FRAMEWORK

1. Are management and coordination approaches identified in the Agreement?

(a) Is management and coordination specified? If so, briefly outline.

Yes, the Workgroup generally agreed that Article II, Subparagraph (c), establishes a point of coordination. Subparagraph (c), states the policy of the Parties that “*coordinated planning processes and best management practices be developed and implemented by the respective jurisdictions to ensure adequate control of all sources of pollutants*”.

The Workgroup also noted that the Preamble of the Agreement specifies that the Parties agreed that the best means to achieve improved water quality is through “development and implementation of cooperative programs and other measures”.

(b) Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

Some members of the workgroup believe that Subparagraph (b) of Article II, which states; “*financial assistance to construct publicly owned waste treatment works be provided by a combination of local, state, provincial, and federal participation*”, will require updating to reflect the differences between

the Parties on the issue of funding of publicly owned waste treatment works (POTWs). Specifically, in the U.S., localities use a combination of funding sources to construct (POTWs), including long term loans provided by the Federal government to States, municipalities, and others through the Clean Water State Revolving Fund. It was also noted by a Workgroup member representing the government of Québec that, because of Constitutional distribution of powers in Canada, provinces are not bound by federal policy regarding participation on the financing of elements under provincial jurisdiction. It was noted by the same Workgroup member that local governments are a provincial responsibility in Canada, and they are not bound by such policy. It was noted that because of jurisdiction in Canada, affected provinces may participate in the implementation of the GLWQA at their discretion. Canada and Ontario presently have in place the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem 2002-2007 to implement the existing GLWQA. In recent years, the Federal government has participated together with the province and municipalities to fund some upgrades to sewage treatment plants located in Ontario on the Great Lakes.

(c) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

This review question was not considered applicable to this Article as management processes are addressed in other Articles and Annexes.

(d) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

Yes, the Workgroup generally agreed that although these synergies are not explicitly stated in the Agreement there are synergies and linkages with a number of other initiatives, including the Canada – Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA), the Canada Fisheries Act, the global Treaty on Persistent Organic Pollutants, the U.S. Great Lakes Legacy Act and the U.S. Great Lakes Regional Collaboration initiative.

ACCOUNTABILITY

1. *Is there comprehensive monitoring and reporting?*

(a) Are there clear indicators to determine progress?

Yes and No, the Workgroup held diverging views. Some Workgroup members identified the following deficiencies: (1) the absence of a direct connection to indicators and the GLWQA Review process, making it difficult to examine progress; (2) the absence of adequate indicators to determine progress related to preventing injury to human health; (3) the absence of wildlife health sentinel monitoring system in place to comprehensively and systematically monitor exposure and health effects of diverse wildlife species, and potential health effects in humans. Several Workgroup members noted that a broad base of indicators is available (e.g. State of the Lakes Ecosystem Conference (SOLEC)) with the purpose of better understanding the Great Lakes ecosystem. However, others expressed the view that these were not adequate and left much to be desired in the way they are presented (e.g. need something more than a “gas gauge”).

(b) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

(c) Are they being met?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

(d) If not, why not?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

(e) Is the frequency of reporting sufficient?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

2. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

(a) Is the role of the IJC as set out in the Agreement clear and appropriate?

The Workgroup generally agreed that the role of the IJC as set out in Articles VII and VIII of the Agreement is clear and that its role could be strengthened by mentioning it (within the purpose statement in Article II) as a key organization involved with the implementation of the Agreement. In addition, a common theme raised by Workgroup members was the view that the IJC has not been adequately funded or mandated to adequately fulfill its role.

A Workgroup member noted that there remains a need for an independent body, such as the IJC, to evaluate the use and dissemination of monitoring and reporting data. The Workgroup member recommended that two main support groups be established: the producers of data (e.g., scientists) and the users of data (e.g., government personnel, private citizens, Tribal and aboriginal groups).

(b) Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

This review question was not considered applicable to this Article as it is discussed in Article VII and VIII. Also refer to response above: Article 2, Accountability 2a, for further relevant discussion.

3. Does the Agreement enable an effective level of commitment?

In general, several Workgroup members noted that the Agreement does enable an effective level of commitment by the Parties.

(a) Is the role of the public identified?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

(b) Does the Agreement identify appropriate mechanisms for public engagement?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

(c) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".

(d) Does the Agreement drive action by communities and industry?

Yes, the Workgroup generally agreed that although communities and industry are not explicitly mentioned in Article II, the policies in the Article related to the development of best management practices and goals of virtual elimination have drive action by communities and industry.

PREAMBLE

The Preamble of the Great Lakes Water Quality Agreement states:

PROTOCOL AMENDING THE 1978 AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND CANADA ON GREAT LAKES WATER QUALITY, AS AMENDED ON OCTOBER 16, 1983

The Government of the United States of America and the Government of Canada,

REAFFIRMING their commitment to achieving the purpose and objectives of the 1978 Agreement between the United States of America and Canada on Great Lakes Water Quality, as amended on October 16, 1983;

HAVING developed and implemented cooperative programs and measures to achieve such purpose and objectives;

RECOGNIZING the need for strengthened efforts to address the continuing contamination of the Great Lakes Basin Ecosystem, particularly by persistent toxic substances;

ACKNOWLEDGING that many of these toxic substances enter the Great Lakes System from air, from ground water infiltration, from sediments in the Lakes and from the runoff of non-point sources;

AWARE that further research and program development is now required to enable effective actions to be taken to address the continuing contamination of the Great Lakes;

DETERMINED to improve management processes for achieving Agreement objectives and to demonstrate firm leadership in the implementation of control measures;

Have agreed as follows:

AGREEMENT BETWEEN CANADA AND THE UNITED STATES OF AMERICA ON GREAT LAKES QUALITY, 1978

The Government of Canada and the Government of the United States of America,

HAVING in 1972 and 1978 entered into Agreements on Great Lakes Water Quality;

REAFFIRMING their determination to restore and enhance water quality in the Great Lakes System;

CONTINUING to be concerned about the impairment of water quality on each side of the boundary to an extent that is causing injury to health and property on the other side, as described by the International Joint Commission;

REAFFIRMING their intent to prevent further pollution of the Great Lakes Basin Ecosystem owing to continuing population growth, resource development and increasing use of water;

REAFFIRMING in a spirit of friendship and cooperation the rights and obligations of both countries under the Boundary Waters Treaty, signed on January 11, 1909, and in particular their obligation not to pollute boundary waters;

CONTINUING to recognize that right of each country in the use of the Great Lakes waters;

HAVING decided that the Great Lakes Water Quality Agreements of 1972 and 1978 and subsequent reports of the International Joint Commission provide a sound basis for new and more effective cooperative actions to restore and enhance water quality in the Great Lakes Basin Ecosystem;

RECOGNIZING that restoration and enhancement of the boundary waters cannot be achieved independently of other parts of the Great Lakes Basin Ecosystem with which these waters interact;

CONCLUDING that the best means to preserve the aquatic ecosystem and achieve improved water quality throughout the Great Lakes System is by adopting common objectives, developing and implementing cooperative programs and other measures, and assigning special responsibilities and functions to the International Joint Commission;

Have agreed as follows:

EVALUATION FINDINGS

In a meeting on August 17, 2006, the Workgroup reviewed the Preamble to the Agreement against five major review elements: clarity and relevancy, achieving results, management framework and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. Does the Article contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

The Workgroup generally agreed that the Preamble is akin to a historical document, which should not be changed.

RELEVANCY

2. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

The Workgroup generally agreed that the Preamble is relevant and that it is akin to a historical document, which should not be changed. If however, the Agreement were amended, additional text would need to be added to the Preamble to be consistent with the amendments made to the Agreement.

ACHIEVING RESULTS

Achieving results was not discussed with respect to the Preamble because the Workgroup generally agreed that this review element was not applicable.

MANAGEMENT FRAMEWORK

Achieving results was not discussed with respect to the Preamble because the Workgroup generally agreed that this review element was not applicable.

ACCOUNTABILITY

Achieving results was not discussed with respect to the Preamble because the Workgroup generally agreed that this review element was not applicable.

RECOMMENDATIONS

- The Workgroup generally agreed that if the Agreement were amended, additional text would need to be added to the Preamble to be consistent with the amendments to the Agreement.

ARTICLE III: GENERAL OBJECTIVES

Article III of the Great Lakes Water Quality Agreement states:

The Parties adopt the following General Objectives for the Great Lakes System. These waters should be:

- (a) Free from substances that directly or indirectly enter the waters as a result of human activity and that will settle to form putrescent or otherwise objectionable sludge deposits, or that will adversely affect aquatic life or waterfowl;*
- (b) Free from floating materials such as debris, oil, scum, and other immiscible substances resulting from human activities in amounts that are unsightly or deleterious;*
- (c) Free from materials and heat directly or indirectly entering the water as a result of human activity that alone, or in combination with other materials, will produce colour, odour, taste, or other conditions in such a degree as to interfere with beneficial uses;*
- (d) Free from materials and heat directly or indirectly entering the water as a result of human activity that alone, or in combination with other materials, will produce conditions that are toxic or harmful to human, animal, or aquatic life; and*
- (e) Free from nutrients directly or indirectly entering the waters as a result of human activity in amounts that create growths of aquatic life that interfere with beneficial uses.*

EVALUATION FINDINGS

Over the course of two meetings, which occurred on July 27 and August 3, 2006, the Workgroup reviewed Article III against five major review elements: Clarity, Relevancy, Achieving Results, Management Framework and Accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

3. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(a) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

Article III addresses the broad objectives of the Agreement. The Workgroup generally agreed that some of the text in the Article III objectives to be unclear. For example, it is unclear what the term “heat” in subparagraphs (c) and (d) refers to. A Workgroup member pointed out that “heat” originally referred to thermal pollution from power plants, but some members of the Workgroup questioned whether a more current interpretation of “heat” could also include increases in water temperature attributed to the negative impacts resulting from human induced climate change.

Another area identified by the Workgroup as lacking clarity is whether the “Great Lakes System,” which is the water system to which the objectives in Article III apply, includes groundwater. Some Workgroup members interpret the Agreement as already including provisions for the protection of groundwater within the “Great Lakes System” but one Workgroup member in particular felt that to add clarity to the General Objectives of the Agreement, protection of groundwater within the Great Lakes System from the negative results of human activity should be added as a general objective. She also suggested that the Agreement include reference to the hydrological cycle.

(b) Are program outcomes and/or environmental outcomes clearly identified?

Yes, the Workgroup generally agreed that use of the phrase “free from” in Article II is clear and direct.

(c) Are there outdated terms, concepts or references?

The Workgroup generally agreed that Article II is not outdated but that there are terms/concepts that need to be updated to reflect their current interpretation (e.g. heat and groundwater). See response above (Article III, Clarity, 1a) for further discussion.

RELEVANCY

4. *Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?*

The Workgroup generally agreed that there is a need for the General Objectives, as written (i.e., they are relevant) but that Article III can be made more current through the addition of several new objectives to address critical, omitted issues.

(a) Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

Members of the Workgroup identified several environmental conditions/challenges that have developed or become more conspicuous since the Agreement was originally written. These include:

- the cumulative or compound effects of combinations of harmful items such as toxic chemicals, materials, and heat;
- the threat of aquatic invasive species;
- the growing threat to the Great Lakes from the array of emerging problematic substances including pharmaceutical products;
- free from negative impacts resulting from human induced climate change

The Workgroup also discussed the need to incorporate a mechanism to address emerging issues so that the GLWQA can evolve as new problems arise. An individual noted that this might also help address the problem of the chemical limits of Annex I regularly becoming outdated.

The Workgroup generally agreed that Article III could be amended to indicate that the General Objectives will evolve with new science, technology, and discoveries.

A Workgroup member noted that Article III is written as declaring the waters should be “free from” pollutants and other harmful items, thereby setting up the Article as having a negative view of the Great Lakes. He recommended that Article III also declare that the waters should be “available for” beneficial uses, such as swimming, drinking, and fishing. Another Workgroup member agreed with this suggestion. Another noted that the GLWQA is a water quality agreement and the Great Lakes Charter Annex between the Great Lakes States and Provinces of Ontario and Quebec addresses the sustainable use of Great Lakes water supply. A Workgroup member explained that the Purpose Statement has a positive viewpoint (e.g., the chemical, physical, and biological integrity of water), but agreed that the inclusion of some tangible positive obligations (e.g., drinkable, swimmable) would be consistent with the GLWQA. Another Workgroup member suggested that positive obligations might be more appropriate in the Preamble. The Workgroup generally agreed that positive obligations should be included, but did not reach consensus on where the positive obligations should be included within the GLWQA.

(b) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

Yes, the Workgroup generally agreed that the Article does in certain situations encourage actions beyond those required by, current domestic laws and policies of each country.

(c) Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

Yes, the Workgroup generally agreed that the Article does drive action; however, it was noted that there is a difference between driving actions and making progress.

(d) Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

Yes and No. Some Workgroup members identified “sustainable use” of Great Lakes waters as a best management practice that is not currently reflected in the General Objectives of Article III. Other Workgroup members objected since the GLWQA is a water quality agreement and the Great Lakes Charter Annex between the Great Lakes States and Provinces of Ontario and Quebec addresses the sustainable use of Great Lakes water supply.

General Comments on Relevancy:

The Workgroup discussed the need for the GLWQA to be modernized. Many Workgroup members agreed that it should be updated in a more aggressive fashion than it has been in the past. For example, language could be inserted into the Preamble to highlight achievements that have been made towards improving the water quality of the Great Lakes.

ACHIEVING RESULTS

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

(a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

A Workgroup member noted that the water quality of the Great Lakes has improved dramatically from when the Cuyahoga River caught fire but explained that results are hard to measure in quantitative terms. The Workgroup member said that the lakes are still far from “free from” problems, and that this goal is likely unattainable.

The Workgroup also commented that the General Objectives do not address implementation. The Workgroup did not reach consensus on whether implementation language should be added to the General Objectives.

A Workgroup member noted that strategic planning processes are used by the Parties to implement the General and Specific Objectives of an agreement.

A Workgroup member suggested that implementation be mentioned in the General Objectives, since it relates to achieving results. Another Workgroup member disagreed, explaining that Article III explains what the Parties aim to accomplish, not how they plan to accomplish the goals.

A Workgroup member suggested that Article III could be reorganized to list each objective followed by the elements that will be used to achieve each objective.

(b) Does the Agreement fail to address critical issues?

Workgroup members identified several critical issues that the General Objectives do not address:

- the growing threat to the Great Lakes from pharmaceutical products;
- the negative impacts resulting from human induced climate change;
- **the cumulative or compound effects of combinations of harmful items such as toxic chemicals, materials, and heat; and,**
- the threat of aquatic invasive species (*this issue received general agreement from the Workgroup*).

2. Are the demonstrated results consistent with goals and objectives in the Agreement?

This review element was not considered applicable to this Article.

3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

This review element was not considered applicable to this Article.

4. Is the science in the Agreement still relevant? If not, why?

This review element was not considered applicable to this Article.

5. Does the Agreement incorporate science to address emerging issues?

(a) Are there new issues and programs that need to be addressed?

See response above: Article III, Achieving Results Question 1a.

(a) Can the Agreement accommodate emerging issues?

The Workgroup generally agreed that Article III does not currently contain language addressing the likely reality of emerging issues, that it is not structured to evolve as new problems arise, and that adding this language would also diminish the problem of the chemical limits in Annex I that regularly become outdated. Many of the Workgroup members agreed that Article III could be amended to indicate that the objectives will evolve with new science, technology, and discoveries.

General Comments on Achieving Results

With respect to achievement of the General Objectives, the Workgroup discussed the value of including implementation language in Article III. One suggestion was to reorganize Article III so that each objective is listed, followed by the elements that will be used to achieve each objective. The Workgroup had mixed reactions to this suggestion. A Workgroup member commented that the aim of Article III is to explain *what* the Parties aim to accomplish, not *how* they plan to accomplish the goals.

MANAGEMENT FRAMEWORK

1. Are management and coordination approaches identified in the Agreement?

This review element was not considered applicable to this Article.

ACCOUNTABILITY

1. Is there comprehensive monitoring and reporting?

(a) Are there clear indicators to determine progress?

A Workgroup member commented that the “beneficial uses” referenced in Article III provide clear indicators for progress. This Workgroup member observed that the term “beneficial uses” comes from the Boundary Waters Treaty and that the Agreement has increased the number of beneficial uses from the eight listed in the Boundary Waters Treaty to fourteen, thereby increasing the value of the Great Lakes Water System.

A Workgroup member suggested the term “highest use” replace the term “beneficial use”. The term “highest use,” which appeared in a 1984 article by Lind and Glass in the Journal of Great

Lakes Research, is suggestive of continuously promoting work of a higher level to produce positive effects.

The Workgroup discussed the term “free from” and generally agreed that it is an appropriate measure of the level of accountability since it implies that further work can always be done in the elimination of various pollutants, materials, etc.

(b) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

Accountability

The Workgroup discussed two ways in which the General Objectives contain provisions for accountability. First, the term “free from” in the General Objectives is an appropriate measure of accountability since it implies that further work can always be done in the elimination of various pollutants, materials, etc. Second, Article III implies accountability in the sense that the Parties, who report out on the listed objectives, have accountability for what they accomplish.

A Workgroup member expressed concern that the phrase “the Parties adopt” does not suggest that both Parties are equally responsible, nor does it frame what the obligations of each government are.

The Workgroup members also discussed following approaches for increasing accountability in Article III:

- A Workgroup member suggested changing the title of Article III to restate the objectives as goals. However, the Workgroup further noted that goals and objectives tend to mean the same thing. A Workgroup member noted that many treaties incorporate a list of broad objectives followed by more specific ones, similar to the structure of the Agreement with its objectives and provisions. Another Workgroup member noted that other international instruments, for example the 1996 Protocol to the London Convention (Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972) contains sections that state the objectives of the instrument.
- A Workgroup member suggested that the goals of the Agreement should be the General Objectives, and that the General Objectives should indicate the limits of various substances in the water.
- A Workgroup member commented that there is a difference between the General Objectives and the Specific Objectives. The General Objectives apply to the entire Great Lakes water system whereas the specific objectives apply only to the boundary waters. It was suggested that waters in the Great Lakes system not defined as Boundary Waters might benefit from stronger language in the General Objectives, in order to bring more attention to them.

Reporting

This part of the review question was not considered relevant for this Article. Please see evaluations of Articles X to XV for further relevant discussion.

Monitoring

This part of the review question was not considered relevant for this Article. Please see evaluations of Articles X to XV for further relevant discussion.

Evaluation

This part of the review question was not considered relevant for this Article. Please see evaluations of Articles X to XV for further relevant discussion.

(c) Are they being met?

See discussion in Article III, Clarity 1 (a) above.

(d) If not, why not?

See discussion in Article III, Clarity 1 (a) above.

(e) Is the frequency of reporting sufficient?

This part of the review question was not considered relevant for this Article. See evaluation of Article VII.

2. Does the Agreement enable an effective level of commitment?

(a) Is the role of the public identified?

See comments under Article X: “Accountability” and “Achieving Results”; and, Article XI: “Accountability”.

(b) Does the Agreement identify appropriate mechanisms for public engagement?

See comments under Article X: “Accountability” and “Achieving Results”; and, Article XI: “Accountability”.

(c) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

See comments under Article X: “Accountability” and “Achieving Results”; and, Article XI: “Accountability”.

(d) Does the Agreement drive action by communities and industry?

See comments under Article X: “Accountability” and “Achieving Results”; and, Article XI: “Accountability”.

RECOMMENDATIONS

During its discussions, the Workgroup identified the following possible changes to the Articles to address points raised in the review:

- “Positive” obligations (e.g., making the Great Lakes available for beneficial uses, such as swimming, drinking, and fishing) should also be included in the Agreement, to counterbalance the “negative” obligations outlined in the objectives (e.g., the Great Lakes should be free from pollutants and other harmful items). The Workgroup did not, however, reach consensus on where in the Agreement such positive obligations should be inserted.
- Include a statement regarding the threat of aquatic invasive species in relation to water quality in the General Objectives.
- Article III could be amended to indicate that the objectives will evolve with new science, technology, and discoveries. This would diminish the current problem of chemical limits in Annex I regularly becoming outdated.
- The first sentence in Article III should be changed to read *The Parties adopt the following General Objectives to protect the water quality in the Great Lakes System.*

ARTICLE V: STANDARDS, OTHER REGULATORY REQUIREMENTS AND RESEARCH

Article V of the Great Lakes Water Quality Agreement states:

1. *Water quality standards and other regulatory requirements of the Parties shall be consistent with the achievement of the General and Specific Objectives. The Parties shall use their best efforts to ensure that water quality standards and other regulatory requirements of the State and Provincial Government shall similarly be consistent with the achievement of these Objectives. Flow augmentation shall not be considered as a substitute for adequate treatment to meet water quality standards or other regulatory requirements.*
2. *The Parties shall use their best efforts to ensure that:*
 - (a) *The principal research funding agencies in both countries orient the research programs of their organizations in response to research priorities identified by the Science Advisory Board and recommended by the Commission;*
 - (b) *Mechanisms be developed for appropriate cost-effective international cooperation; and*
 - (c) *Research priorities are undertaken in accordance with Annex 17.*

EVALUATION FINDINGS

At a meeting on June 22, 2006, the Workgroup reviewed Article V against five major review elements: Clarity, Relevancy, Achieving Results, Management Framework and Accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. **Does the Article contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?**
- (e) **Is the text of the Agreement and the objectives, programs and other measures described therein clear?**

During its discussions, the Workgroup identified several areas of the text that were, or might be viewed, as unclear. The following points were raised:

- A Workgroup member noted that it is important to define what is meant by “water quality” at the beginning of the Agreement (this is not defined in the current Agreement). This could be clarified in the Preamble or in the Article I definitions.
- The Article states that “*flow augmentation shall not be considered as a substitute for adequate treatment to meet water quality standards or other regulatory requirements.*” A Workgroup member noted that the phrase “flow augmentation” is not clear and that the phrase “effluent dilution” might be more clear but another Workgroup member noted that “flow augmentation” could refer to more than just “effluent dilution.” The Workgroup did not reach consensus on this point.
- A Workgroup member noted that it is unclear to whom “principal research funding agencies” in part 2a refers. Another Workgroup member added that the State Department views any entity that contributes money as a principal research funding agency, but it still remained unclear to some in the Workgroup.
- A Workgroup member noted that it is unclear what is meant by the term “orient” in part 2a of Article V. Is it synonymous with the term “align?” Or does it infer that the research must be funded?
- A Workgroup member noted that it is not clear whether part 2b also refers to research.
- A Workgroup member questioned whether the “appropriate” was necessary in part 2b and how it clarified that part.
- A Workgroup member commented that the link between Parts 2a and 2c of the Article is unclear. The co-chair replied that Annex 17 (referenced in Part 2c) lays out the research agenda and Part 2c mandates that the Parties look to Annex 17 to determine research priorities. Annex 17 details the “what” whereas Part 2c details the “how.”

(b) Are program outcomes and/or environmental outcomes clearly identified?

This review element was not considered applicable to this Article.

(c) Are there outdated terms, concepts or references?

This review element was not considered applicable to this Article.

General Comments on Clarity

- A Workgroup member pointed out it is unclear to what degree research priorities are identified by the Science Advisory Board (SAB). It was noted that an inventory of the SAB's recommendations is publicly available.

RELEVANCY

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

A Workgroup member noted that Article V is an example of a strong and specific relationship between the Agreement and the Annexes (specifically Annex 17) that water quality standards are part of Federal and State law in the U.S. and that Annex 1 of the Agreement does not fully reflect the current U.S. regulatory regime.

(a) Have the environmental conditions/challenges originally intended to be met by the agreement changed, and if so, what are the implications of those changes?

This review element was not considered applicable to this Article.

(b) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

A Workgroup member, while noting the relevance of the Article also noted that the Article calls for the Parties to use their best efforts to ensure that water quality standards and other regulatory requirements of the State and Provincial Government shall similarly be consistent with the achievement of the General and Specific Objectives. However, this Workgroup member added, the term "best efforts" between the Parties might be very different due to jurisdictional differences and the relative roles of the States in the U.S. and the Provinces in Canada.

Another Workgroup member added that the phrase "best effort" appears several times in the Agreement, but this terminology doesn't limit the Parties from using other domestic mechanisms to implement the Agreement.

(c) Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

Yes, the Workgroup generally agreed that processes to drive actions are described in the Article but their implementation is subject to political processes.

(d) Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

This review element was not considered applicable to this Article.

ACHIEVING RESULTS

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

A Workgroup member noted that there have been many “mechanisms” developed under the Agreement (such as the Lakewide Management Plans); whether these mechanisms are functioning well is a separate question, but mechanisms are in place.

(b) Does the Agreement fail to address critical issues?

This review element was not considered applicable to this Article.

2. Are the demonstrated results consistent with goals and objectives in the Agreement?

This review element was not considered applicable to this Article.

3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

The Workgroup generally agreed that dedicated resources have been insufficient for full implementation.

(a) Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?

The workgroup generally agreed that dedicated resources have been insufficient for full implementation.

4. Is the science in the Agreement still relevant? If not, why?

This review element was not considered applicable to this Article.

5. Does the Agreement incorporate science to address emerging issues?

The workgroup generally agreed that the Article does not directly address emerging issues but they are addressed indirectly through the Science Advisory Board and research priorities language in paragraph 2(a) of the Article.

General Comments on Achieving Results

- A Workgroup member noted that Part 2b of the Article makes a cross-reference to the Preamble to the Agreement, which states: “Concluding that the best means to preserve the aquatic ecosystem and achieve improved water quality throughout the Great Lakes System is by adopting common objectives, developing and implementing cooperative programs and other measures, and assigning special responsibilities and functions to the International Joint Commission...” . Accordingly, this Workgroup member suggested that the Workgroup consider adding the notion of “developing and implementing cooperative programs and other measures” in part 2b with respect to implementation.
- Another Workgroup member noted that some international cooperation mechanisms have been dismantled under the current Agreement and the Workgroup generally agreed to examine those mechanisms that have been dismantled and whether its activities have been assumed by another effort.
- A Workgroup member suggested that an organization like the BEC might be valuable in satisfying the requirement for mechanisms in Part 2.

MANAGEMENT FRAMEWORK

This review element was not considered applicable to this Article.

ACCOUNTABILITY

1. Is there comprehensive monitoring and reporting?

(a) Are there clear indicators to determine progress?

The Workgroup generally agreed that yes, there are clear indicators to determine progress for paragraph 1 of the Article; but, no for paragraph 2 of the Article.

(b) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

Accountability:

Yes, the Workgroup generally agreed that the Article does provide measures that can be used to assess accountability.

Reporting:

A Workgroup member noted that the Water Quality Board used to issue a regular biennial report, which was a valuable source of information for the public. Following the 1987 Protocol, the biennial report of the Water Quality Board was stripped from the IJC's charge and water quality information stopped flowing to the public. Another Workgroup member noted that comparable information is available in other reports and on other websites (e.g., SOLEC), but several Workgroup members argued that while other reports and websites may provide

ecosystem information, they don't specifically and concisely address whether Parties are meeting the specifics of the Agreement, nor are they neutral, objective, third-party reviewed sources of information (which would be necessary if such information were to be included in the IJC Annual Reports). Someone from the IJC would have to extract this information from a diversity of other sources, and the IJC would have to be given additional resources for this. The co-chair observed that the essential task of the IJC would be to boil all this information down into concrete questions and answers (e.g. Are the Great Lakes improving? How?). This is necessary to get the attention of policy makers.

Monitoring:

No, the Workgroup observed that monitoring provisions are not provided for in this Article.

Evaluation:

The Workgroup noted that the Water Quality Board, Science Advisory Board and IJC Biennial Reports on Great Lakes Water Quality provide evaluations of implementation of provisions of the Agreement.

The Workgroup generally agreed that because "best efforts" did not guarantee that appropriate legislation/regulations/resource allocations would be devoted to a problem, new accountability mechanisms are important to ensure the Parties are living up to their stated commitments.

(c) Are they being met?

Yes, the Workgroup generally agreed that they are being met through the reporting mechanisms cited in the response to (b) above.

(d) If not, why not?

This review element was not considered applicable to this Article.

(e) Is the frequency of reporting sufficient?

Yes, the Workgroup generally agreed that the frequency of reporting is sufficient.

2. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

Yes, the Workgroup generally agreed that there is a defined role for the Commission and its Science Advisory Board.

(a) Is the role of the IJC as set out in the Agreement clear and appropriate?

Yes.

(b) Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

The Workgroup generally agreed that tools and information are available but may not be adequate. There Workgroup generally agreed that there needs to be better coordination between what the IJC needs and the information that the Parties provide.

3. Does the Agreement enable an effective level of commitment?

(a) Is the role of the public identified?

A Workgroup member suggested that the Agreement may need more specific language to address accountability to the public and to adopt a perspective that's more inclusive of and collaborative with the public.

(b) Does the Agreement identify appropriate mechanisms for public engagement?

The Workgroup observed that mechanisms are not addressed in this Article, but are addressed in other Articles. (*See discussion under Article XI Accountability Question 3*).

(c) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

The Workgroup observed that this topic is not addressed in this Article, but is addressed elsewhere (*See discussion under Article XI Accountability Question 3*).

(d) Does the Agreement drive action by communities and industry?

The Workgroup generally agreed that this Article does drive actions by communities and industry indirectly through the federal, state, and provincial governments' implementation of the provisions of paragraph 1 of this Article. The provisions of paragraph 2 of the Article also may exert some influence.

RECOMMENDATIONS

During its discussions, the members of the Workgroup identified the following possible changes to the Articles to address points raised in the review:

- An organization similar to BEC may be valuable to help satisfy the requirement for mechanisms outlined in Part 2 of the Article.
- Consider defining the term "water quality"; perhaps in the Preamble to the Agreement.
- Consider clarifying the terms "orient" in 2 (a) and "flow augmentation" in Part 1.

- Consider adding the notion of “developing and implementing cooperative programs and other measures” in part 2b with respect to implementation.
- Accountability mechanisms should be strengthened to ensure the Parties are living up to their stated commitments.

ARTICLE VI: PROGRAMS AND OTHER MEASURES

Article VI of the Great Lakes Water Quality Agreement states:

1. *The Parties, in cooperation with State and Provincial Governments, shall continue to develop and implement programs and other measures to fulfill the purpose of this Agreement and to meet the General and Specific Objectives. Where present treatment is inadequate to meet the General and Specific Objectives, additional treatment shall be required. The programs and measures shall include the following:*

(a) ***Pollution from Municipal Sources.*** *Programs for the abatement, control and prevention of municipal discharges and urban drainage into the Great Lakes System. These programs shall be completed and in operation as soon as practicable, and in the case of municipal sewage treatment facilities no later than December 31, 1982. These programs shall include:*

- (i) *Construction and operation of waste treatment facilities in all municipalities having sewer systems to provide levels of treatment consistent with the achievement of phosphorus requirements and the General and Specific Objectives, taking into account the effects of waste from other sources;*
- (ii) *Provision of financial resources to ensure prompt construction of needed facilities;*
- (iii) *Establishment of requirements for construction and operating standards for facilities;*
- (iv) *Establishment of pre-treatment requirements for all industrial plants discharging waste into publicly owned treatment works where such industrial wastes are not amenable to adequate treatment or removal using conventional municipal treatment processes;*
- (v) *Development and implementation of practical programs for reducing pollution from storm, sanitary, and combined sewer discharges; and*
- (vi) *Establishment of effective enforcement programs to ensure that the above pollution abatement requirements are fully met;*

(b) ***Pollution from Industrial Sources.*** *Programs for the abatement, control and prevention of pollution from industrial sources entering the Great Lakes System. These programs shall be completed and in operation as soon as practicable and in any case no later than December 31, 1983, and shall include:*

- (i) *Establishment of water treatment or control requirements expressed as effluent limitations (concentrations and/or loading limits for specific pollutants where possible) for all industrial plants, including power generating facilities, to provide levels of treatment or reduction or elimination of inputs of substances and effects consistent with the achievement of the General and Specific Objectives and other control requirements, taking into account the effects of waste from other sources;*
- (ii) *Requirements for the substantial elimination of discharges into the Great Lakes System of persistent toxic substances;*
- (iii) *Requirements for control of thermal discharges;*

- (iv) *Measures to control the discharges of radioactive materials into the Great Lakes System;*
 - (v) *Requirements to minimize adverse environmental impacts of water intakes;*
 - (vi) *Development and implementation of programs to meet industrial pretreatment requirements as specified under sub-paragraph (a) (iv) above; and*
 - (vii) *Establishment of effective enforcement programs to ensure the above pollution abatement requirements are fully met;*
- (c) ***Inventory of Pollution Abatement Requirements.*** *Preparation of an inventory of pollution abatement requirements for all municipal and industrial facilities discharging into the Great Lakes System in order to gauge progress toward the earliest practicable completion and operation of the programs listed in sub-paragraphs (a) and (b) above. This inventory, prepared and revised annually, shall include compliance schedules and status of compliance with monitoring and effluent restrictions, and shall be made available to the International Joint Commission and to the public. In the initial preparation of this inventory, priority shall be given to the problem areas previously identified by the Water Quality Board;*
- (d) ***Eutrophication.*** *Programs and measures for the reduction and control of inputs of phosphorus and other nutrients, in accordance with the provisions of Annex 3;*
- (e) ***Pollution from Agriculture, Forestry, and Other Land Use Activities.*** *Measures for the abatement and control of pollution from agriculture, forestry and other land use activities including*
- (i) *Measures for the control of pest control products used in the Great Lakes Basin to ensure that pest control products likely to have long term deleterious effects on the quality of water or its biota be used only as authorized by the responsible regulatory agencies; that inventories of pest control products used in the Great Lakes Basin be established and maintained by appropriate agencies; and that research and educational programs be strengthened to facilitate integration of cultural, biological and chemical pest control techniques;*
 - (ii) *Measures for the abatement and control of pollution from animal husbandry operations, including encouragement to appropriate agencies to adopt policies and regulations regarding utilization of animal wastes, and site selection and disposal of liquid and solid wastes, and to strengthen educational and technical assistance programs to enable farmers to establish waste utilization, handling and disposal systems;*
 - (iii) *Measures governing the hauling and disposal of liquid and solid wastes, including encouragement to appropriate regulatory agencies to ensure proper location, design and regulation governing land disposal, and to ensure sufficient, adequately trained technical and administrative capability to review plans and to supervise and monitor systems for application of wastes on land;*
 - (iv) *Measures to review and supervise road salting practices and salt storage to ensure optimum use of salt and all-weather protection of salt stores in consideration of long-term environmental impact;*
 - (v) *Measures to control soil losses from urban and suburban as well as rural areas;*

- (vi) *Measures to encourage and facilitate improvements in land use planning and management programs to take account of impacts on Great Lakes water quality;*
- (vii) *Other advisory programs and measures to abate and control inputs of nutrients, toxic substances and sediments from agricultural, forestry and other land use activities;*
- (viii) *Consideration of future recommendations from the International Joint Commission based on the Pollution from Land Use Activities Reference; and*
- (ix) *Conduct further non-point source programs in accordance with Annex 13;*
- (f) ***Pollution from Shipping Activities.*** *Measures for the abatement and control of pollution from shipping sources, including*
 - (i) *Programs and compatible regulations to prevent discharges of harmful quantities of oil and hazardous polluting substances, in accordance with Annex 4;*
 - (ii) *Compatible regulations for the control of discharges of vessel wastes, in accordance with Annex 5;*
 - (iii) *Such compatible regulations to abate and control pollution from shipping sources as may be deemed desirable in the light of continuing reviews and studies to be undertaken in accordance with Annex 6;*
 - (iv) *Programs and any necessary compatible regulations in accordance with Annexes 4 and 5, for the safe and efficient handling of shipboard generated wastes, including oil, hazardous polluting substances, garbage, waste water and sewage, and for their subsequent disposal, including the type and quantity of reception facilities and, if applicable, treatment standards; and*
 - (v) *Establishment by the Canadian Coast Guard and the United States Coast Guard of a coordinated system for aerial and surface surveillance for the purpose of enforcement of regulations and the early identification, abatement and clean-up of spills of oil, hazardous polluting substances, or other pollution;*
- (g) ***Pollution from Dredging Activities.*** *Measures for the abatement and control of pollution from all dredging activities, including the development of criteria for the identification of polluted sediments and compatible programs for disposal of polluted dredged material, in accordance with Annex 7. Pending the development of compatible criteria and programs, dredging operations shall be conducted in a manner that will minimize adverse effects on the environment;*
- (h) ***Pollution from Onshore and Offshore Facilities.*** *Measures for the abatement and control of pollution from onshore and offshore facilities, including programs and compatible regulations for the prevention of discharges of harmful quantities of oil and hazardous polluting substances, in accordance with Annex 8;*
- (i) ***Contingency Plan.*** *Maintenance of a joint contingency plan for use in the event of a discharge or the imminent threat of a discharge of oil or hazardous polluting substances, in accordance with Annex 9;*
- (j) ***Hazardous Polluting Substances.*** *Implementation of Annex 10 concerning hazardous polluting substances. The Parties shall further consult from time to time for the purpose of revising the list of hazardous polluting substances and of identifying harmful quantities of these substances;*

- (k) **Persistent Toxic Substances.** Measures for the control of inputs of persistent toxic substances including control programs for their production, use, distribution and disposal, in accordance with Annex 12;
 - (l) **Airborne Toxic Substances.** Programs to identify pollutant sources and relative source contribution, including the more accurate definition of wet and dry deposition rates, for those substances which may have significant adverse effects on environmental quality including the indirect effects of impairment of tributary water quality through atmospheric deposition in drainage basins. In cases where significant contributions to Great Lakes pollution from atmospheric sources are identified, the Parties agree to consult on appropriate remedial programs. The Parties shall conduct such programs in accordance with Annex 15;
 - (m) **Surveillance and Monitoring.** Implementation of a coordinated surveillance and monitoring program in the Great Lakes System, in accordance with Annex 11, to assess compliance with pollution control requirements and achievement of the Objectives, to provide information for measuring local and whole lake response to control measures, and to identify emerging problems.
 - (n) **Remedial Action Plans.** Measures to ensure the development and implementation of Remedial Action Plans for Areas of Concern pursuant to Annex 2;
 - (o) **Lakewide Management Plans.** Measures to ensure the development and implementation of Lakewide Management Plans to address Critical Pollutants pursuant to Annex 2.
 - (p) **Pollution from Contaminated Sediments.** Measures for the abatement and control of pollution from all contaminated sediments, including the development of chemical and biological criteria for assessing the significance of the relative contamination arising from the sediments and compatible programs for remedial action for polluted sediments in accordance with Annex 14; and
 - (q) **Pollution from Contaminated Groundwater and Subsurface Sources.** Programs for the assessment and control of contaminated groundwater and subsurface sources entering the boundary waters of the Great Lakes System pursuant to Annex 16.
2. The Parties shall develop and implement such additional programs as they jointly decide are necessary and desirable to fulfill the purpose of this Agreement and to meet the General and Specific Objectives.

EVALUATION FINDINGS

Article VI was reviewed by the Workgroup on November 9, 16 and December 07, 2006 against the five major review elements: clarity, relevancy, achieving results, management framework, and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below. In addition, specific comments from other Review Working Groups on Article VI have been included where relevant.

CLARITY

1. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

- 1. Is the text of the Agreement and the objectives, programs and other measures described therein clear?**

The Workgroup generally agreed the text of the Article is clear. One Workgroup member noted that in the first paragraph of Section 1 the current wording of “present treatment” is unclear and that “but not limited to:” should be included at the end of this paragraph. Another member noted that “Discharges” as defined within Section 1(b) (i) should not be limited to effluent discharges, as appears to be implied. This is because the Great Lakes are also impacted by airborne emissions of persistent toxics substances.

2. Are program outcomes and/or environmental outcomes clearly identified?

Workgroup members made the following suggestions to clearly identify program / environmental outcomes in the Article:

- Text should be added indicating that pollution could come from municipal, private and non-point sources.
- The regulatory aspect of Section 1(a) could be added to Section 1(q), and to improve 1(q), text could be added to include pathogens and other chemical contaminants.
- Text should be added to Subsection 1(a) (iii) to include domestic septic systems, because septic system failures are a significant problem contributing to eutrophication and bacterial problems.

One Workgroup member noted that Article VI is not the appropriate location to propose specific scientific requirements. Rather the Article should stipulate the method(s) of reaching the general objectives.

3. Are there outdated terms, concepts or references?

The Workgroup generally agreed that the entire Article contains some terms (see evaluation under Relevancy below) and many dates that are now outdated; but the scope remains comprehensive and therefore would not need to be changed significantly.

4. Other comments

Several members noted that the Article should have more connection with the Annexes and suggested that the Article should contain a “list” and the details would all be located in the Annexes. Another Workgroup member suggested condensing the Article and removing the tiered structure of the sections (i, ii, iii, etc.) in the Article (see Recommendations below for an example of how the Article can be streamlined).

Review Working Group B (Toxic Chemicals) found that Article VI is clearly articulated and relevant, however, the balance of the Article with respect to the management of toxic substances, specifically 1(a)(i); (iv);(v), 1(b)(i);(ii);(vi), 1(c)(vii), 1(j), 1(k), 1(l) and 2, is presented as a compendium of program afterthoughts that may have been best integrated into existing articles consistent with the requirements of each to meet the purpose of the agreement.

RELEVANCY

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

(a) Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

The Workgroup generally agreed that each of the sections (a-q) of the Article remain relevant. The Workgroup identified invasive species as a challenge that is not currently addressed in the Article and Agreement. Many Workgroup members recommended that an additional section (r) should be added to Part 1 of the Article to specifically address invasive species. Furthermore, it was noted that if this section were added, it would likely require an additional Annex to be added. The groundwork for the inclusion of invasive species would be contained in Article VI, but the details would follow in an appropriate Annex. One Workgroup member suggested that a more effective approach to address invasive species is through a fisheries-related vehicle and not through a water quality agreement. It was also noted that there is a difference between emerging and existing problems related to invasive species that should be taken into account in any new Annex addressing this issue. *(See related discussion above under Article VI Clarity 1b).*

Review Working Group H (Groundwater Issues) noted that additional programs and measures need to be developed to address threats assessment and sourcewater protection including well decommissioning, onsite wastewater system re-inspection, leaking underground storage tanks, deep well injection, and other groundwater contamination threats.

Review Working Group D (Phosphorus and Non-Point Source Pollution), noted: the need to assess increased P content of soils due to increased use of manure and fertilizer on farm lands, resulting in increased soluble P levels in storm water runoff; an apparent inconsistency of P limits for plant discharges between Annex 3- Goal 2(a) [0.5 mg/l total P maximum] vs. the Annex 3 Supplement, Goal # 3(a)- Lower Lakes [1 mg/l] This inconsistency in the Agreement is not supported by laws of either Party; and, near-shore eutrophication problems have appeared in all of the Lakes except Lake Superior. Significant additional work will be needed on improving target P loading estimates from point and non-point sources, expanding monitoring programs to address

near shore areas, tributary loadings, wet-weather events and potential significant increases from non-point sources, and revising model runs to reflect these changes.

(b) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

The Workgroup generally agreed that, with respect to Section 1(c): Inventory of Pollution Abatement Requirements, accountability for preparation of the inventory is generally lacking and also there is likely some kind of an information gap preventing all the information from being packaged together. The Workgroup generally agreed that such an inventory is important and relevant but was not able to point to a single such inventory that is currently prepared. A participant noted that the last time a similar inventory was prepared was likely in 1989. It was also noted that the U.S. has the Toxics Release Inventory (TRI) and other relevant reports and inventories and Canada maintains the National Pollutant Release Inventory (NPRI), but it is unclear if these meet this need. The Workgroup generally agreed that it is a binational responsibility to put this inventory together and that such an inventory would be very useful for many organizations, but that it would likely require a high level of effort to obtain all the data and transform it into a common format.

A Workgroup group member also noted that, with respect to Section 1(i): Contingency Plan, there is a joint contingency plan between the Parties for the management of unforeseen spills. This plan is maintained by the US Coast Guard and Transport Canada.

(a) Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

The Workgroup generally agreed that Article VI does drive action by providing details on how the federal governments, in cooperation with state and provincial governments, will develop programs to address pollution from the following sources: municipal; industrial; agriculture, forestry and other land use activities; shipping; dredging; onshore and offshore facilities; airborne; contaminated sediment; and contaminated groundwater.

(b) Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

Workgroup members noted several deficiencies in Article VI and made the following comments and suggestions on improving the relevancy of Article VI:

- *Section 1(k)* does not account for “emerging chemicals of concern” that might not meet the formal criteria as "persistent toxic substances", but nonetheless share similar properties. This includes metabolites and degradation products of PTSs. It also includes substances that are emitted or released at a faster rate than they break down, so they are always present, and can eventually reach high concentrations in the environment, with resultant exposures of organisms. Such substances as pharmaceuticals, personal care products, and other chemicals and byproducts, with continuous use and releases, are candidates needing attention. A participant also noted that there is a need for research/technology development that can address the shortcomings of conventional treatment and achieve the removal of such substances during municipal wastewater treatment.

- Section 1(a) (i) should be broadened to include municipalities that do not have sewer systems. A Workgroup member also noted that in this section, non-point sources of urban runoff is a significant gap and not specifically cited, nor is the need for Best Management Practices to be developed and implemented; and Section 1(e) only partly alludes to urban runoff.
- Section 1(g) is relevant, but Annex 7, to which it is linked, is out of date.
- A participant noted that the compliance-related sections in Section 1(g) need to be made stronger.
- There are inconsistencies in Section 1(l) because Annex 15 does not commit to the implementation of anything.
- The addition of invasive species would make the Article more relevant.
- Subsections 1(e) (viii) and 1(e) (ix) relating to “Land Use Activities Reference” and “non-point source programs” are out of date.
- The issue of “Cargo sweeping” could be included to Section 1(f) to add relevancy.
- One participant noted that section 1(l) should address the airshed of the region, which would include substances transported via airflows.
- One participant noted that the word “physical” should be added to criteria for assessment in Section 1(p).
- Section 1(q) is adequate to cover groundwater as a pollution vector, but does not address a multitude of other groundwater quantity and contamination issues that relate to the protection and management of groundwater as a vital and sustainable resource. In addition, all programs and measures under the Article except 1(f) are likely to have a groundwater component. (*Comment provided by RWG H*).

As well, the Workgroup generally agreed that Part 2 of Article VI is relevant since it allows for unforeseen programs.

(c) Other Comments.

The Workgroup generally agreed that although some text may be outdated, the Article remains highly relevant and necessary. The Workgroup noted that Article VI addresses topics covered in the Agreement’s Annexes and does not contain as detailed information as found in the respective Annexes.

ACHIEVING RESULTS

The Workgroup generally agreed that this review element is not applicable to its review of Article VI. A comprehensive review of each of the Annexes referenced in Article VI has been conducted by other Review Work Groups.

General Comments on Achieving Results

Workgroup members noted that funding has not been adequate to implement all the programs and other measures identified in the Article. e.g., to complete contaminated sediment remediation in AOCs and for improvements to waste water infrastructure. A member also noted that Section 1(m) can accommodate emerging issues.

MANAGEMENT FRAMEWORK

The Workgroup generally agreed that this review element is not applicable to its review of Article VI. A comprehensive review of each of the Annexes referenced in Article VI has been conducted by other Review Work Groups.

General Comments on Management Framework

Workgroup members noted that there is no institutional structure set out in Article VI and found that management and coordination approaches of the Agreement could benefit from: 1) provisions to strengthen accountability; 2) benchmarks for measuring progress; and 3) an implementation schedule that facilitates binational priority setting to address issues of greatest importance to the restoration and protection of the basin ecosystem. Members also noted the need for an explicit objective process (3rd Party or via the IJC) to uncover program deficiencies against performance (e.g. such as a Gaps Analysis) in order to assist in determining disparities between the achievement of the goals set out in the Agreement and the implementation of Governments' programs.

ACCOUNTABILITY

The Workgroup generally agreed that this review element is not applicable to its review of Article VI. A comprehensive review of each of the Annexes referenced in Article VI has been conducted by other Review Work Groups. (See comments above under General Comments on Management Framework)

RECOMMENDATIONS

- The Workgroup generally agreed that the entire Article contains some terms and many dates that are now outdated; but the scope remains comprehensive and therefore would not need to be changed significantly.
- The Workgroup generally agreed that an additional section (r) could be added to specifically address invasive species. The groundwork would be a reference in Article VI, and the details would be in an additional corresponding Annex.
- To increase the clarity and relevancy of the Article, the Workgroup generally agreed that the sections of the Article could be better arranged by subject or by the order in which the Annexes are presented. One Workgroup member suggested the following grouping:
 - **Polluting Activities:** including all the "Pollution from..." provisions listed under sections a, b, d, e, f, g, and h.
 - **Harmful Substances:** including all the toxic substances found in sections d, j, k, l, p, and q.
 - **Inventory, Surveillance, and Monitoring** – sections c and m.
 - **Remedial Plans** – sections n and o.
 - **Contingency Plans** – section i.

ARTICLE X: CONSULTATION AND REVIEW

Article X of the Great Lakes Water Quality Agreement states:

1. *Following the receipt of each report submitted to the Parties by the International Joint Commission in accordance with paragraph 3 of Article VII of this Agreement, the Parties shall consult on the recommendations contained in such report and shall consider such action as may be appropriate, including*
 - (a) *The modification of existing Objectives and the adoption of new Objectives;*
 - (b) *The modification or improvement of programs and joint measures; and*
 - (c) *The amendment of this Agreement or any Annex thereto.*

Additional consultations may be held at the request of either Party on any matter arising out of the implementation of this Agreement

2. *When a Party becomes aware of a special pollution problem that is of joint concern and requires an immediate response, it shall notify and consult the other Party forthwith about appropriate remedial action.*
3. *The Parties, in cooperation with State and Provincial Governments, shall meet twice a year to coordinate their respective work plans with regard to the implementation of this Agreement and to evaluate progress made.*
4. *The Parties shall conduct a comprehensive review of the operation and effectiveness of this Agreement following every third biennial report of the Commission required under Article VII of this Agreement.*

EVALUATION FINDINGS

In meetings held on May 11 and 25, 2006, the Workgroup reviewed Article X against the five major review elements: clarity, relevancy, achieving results, management framework, and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. *Does the Article contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?*

(f) **Is the text of the Agreement and the objectives, programs and other measures described therein clear?**

During its discussions, the Workgroup identified several elements of the Article that were, or appeared to be, unclear in their meaning and application. Specifically, Workgroup members identified the following concerns:

- It is not clear as to who is to “consult” and the original intent was for only the two Parties to consult.
- The Article should include a discussion of broader representation including other governmental and non-governmental organizations.
- It should be made clearer that the consultation referred to in Part 1 of the Article relates to Articles III, IV and Annex 1 of the Agreement.
- The term “Parties” is not clear. Some Workgroup members indicated they wanted the term to be more precisely defined while others cautioned that too much specificity might inhibit organizational change over time.
- The terms “objectives” and “indicators” are ambiguous and their connection is not well defined.
- The Article is clear that there needs to be consultation, but it is unclear how and by whom it is to be conducted.

In general, the Workgroup generally agreed that Article X is clear on general aspects, short on specific forms of implementation and unclear on what organizations need to be consulted.

(b) **Are program outcomes and/or environmental outcomes clearly identified?**

This review element was not considered applicable to this Article.

(c) **Are there outdated terms, concepts or references?**

This review element was not considered applicable to this Article.

RELEVANCY

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

Workgroup members generally agreed that the need for continuous consultation and review embodied in Article X remains relevant. There was some discussion, however, concerning the appropriateness of the existing review cycle. Some Workgroup members suggested a more frequent review than every six years because realities can change quickly. On the other hand, others promoted extending the terms of a comprehensive review of the operation and effectiveness of the agreement (e.g. every 10 years) because reviews create significant resource and time demands and that other provisions of the Article should be reviewed on a shorter cycle. Other Workgroup members noted that any recommended change in the review cycle would need to consider impacts on IJC reporting. Other Workgroup members noted that the goal of a revised Agreement should be more flexibility and that the Parties should look at how to make the GLWQA more flexible without requiring reviews. The Workgroup did not reach a consensus on this issue.

The Workgroup generally agreed that relevancy would be enhanced by broadening the consultation to include other governments and the public.

ACHIEVING RESULTS

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

(a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

Yes. The Workgroup generally agreed the objectives, programs, policies are sufficient to achieve the goals of this Article.

(b) Does the Agreement fail to address critical issues?

The Workgroup generally agreed that new initiatives are covered by the current Agreement but one Workgroup member asked whether issues are being addressed adequately once they have been raised.

Several Workgroup members asked whether the language in section 2 of the Article needs to be more clear about defining a “special pollution problem,” and whether a “special pollution problem” should be expanded to include environmental problems more generally.

One Workgroup member raised a concern that the Agreement does not instruct the Parties how to deal with environmental problems that cause injury to the health or property of the other Party, even when they are well documented in the scientific literature. This was countered by one Workgroup member who argued that that the Agreement is an enabling agreement and is not designed to prescribe specific courses of action for the Parties.

2. *Are the demonstrated results consistent with goals and objective in the Agreement?*

One impediment identified by a Workgroup member to effective consultation is the absence of a public petition process for the IJC to hear grievances when citizens or others think that government actions are not in sync with the Agreement. Others noted that though there is no formal petition process, the IJC does hold public meetings to advise the Parties on the implementation of the Agreement but there is no formal public meeting process in the procedure of the Agreement.

3. *Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?*

Workgroup members expressed the following concerns:

- One Workgroup member cited a lack of budget for Tribal governments;
- Another Workgroup member noted that much of the financial burden under the Agreement falls on state and local governments, which have limited resources; and
- Regarding Article X, Section 4, several Workgroup members indicated that there were no formal budgets devoted to reviews conducted by the IJC, the federal governments, or any other group.

4. *Is the science in the Agreement still relevant? If not, why not?*

As noted above in the section on clarity of the Article, the Workgroup generally agreed that the terms "objectives" and "indicators" and their connection need to be clarified. Several other Workgroup members suggested that indicator work with respect to persistent toxic substances also does not appear in the Agreement.

MANAGEMENT FRAMEWORK

1. *Are management and coordination approaches identified in the Agreement?*

(a) *Is management and coordination specified? If so, briefly outline.*

No. The Workgroup noted that the Article calls for consultation but does not provide specifics on how it can be carried out.

(b) *Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?*

Yes and No. The Workgroup noted that the Binational Executive Committee (BEC) has been meeting twice per year but generally agreed that not all the consultation called for in Part 1 of the Article has been achieved. In addition, a Workgroup member noted that there needs to be better coordination with First Nations, Tribes, citizen groups and other stakeholders.

(c) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

Yes and No. The Workgroup noted that the Binational Toxics Strategy, SOLEC, Binational Monitoring Network and IADN all have appropriate coordination approaches; however, the Workgroup generally agreed that there is a need for increased coordination between other agreements that are not under BEC or the GLWQA that have a similar interest with the Agreement such as the St. Lawrence Plan for Sustainable Development 2005-2010 (St. Lawrence Plan).

(d) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

Yes and No. See discussion above under Management Framework section (c).

ACCOUNTABILITY

The Workgroup discussion focused on how the Article does not reflect the current status of broader consultation that is generally associated with activities in the Great Lakes Basin. As noted earlier, some Workgroup members expressed the view that the Agreement does not include sufficient mechanisms to allow a large number of interested parties to participate and adequately commit to the process (e.g. local and municipal levels of government, First Nations, Aboriginal Peoples and Tribes) or formally define a public/citizen engagement mechanism, e.g., citizen petition process and Citizen Advisory Committee in the operation and management of the Agreement.

RECOMMENDATIONS

The Workgroup generally agreed:

- Article X is clear on general aspects, short on specific forms of implementation and unclear on what organizations need to be consulted.
- There is a need for increased coordination between other agreements that are not under BEC or the GLWQA that have objectives similar to the GLWQA such as the St. Lawrence Plan.
- An Article on public consultation and participation should be added to Agreement to explain the requirements for public participation and notification in one location within the Agreement.
- The consultation should be expanded to include other governments and the public or that a new Article should be drafted to include a broader consultation process.

ARTICLE XI: IMPLEMENTATION

Article XI of the Great Lakes Water Quality Agreement states:

1. *The obligations undertaken in this Agreement shall be subject to the appropriation of funds in accordance with the constitutional procedures of the Parties.*
2. *The Parties commit themselves to seek:*
 - a. *The appropriation of funds required to implement this Agreement, including the funds needed to develop and implement the programs and other measures provided for in Article VI of this Agreement, and the funds required by the International Joint Commission to carry out its responsibilities effectively;*
 - b. *The enactment of any additional legislation that may be necessary in order to implement the programs and other measures provided for in Article VI of this Agreement; and*
 - c. *The cooperation of the State and Provincial Governments in all matters relating to this Agreement*

EVALUATION FINDINGS

Over the course of two meetings, which occurred on May 25 and June 8, 2006, the Workgroup reviewed Article XI against five major review elements: clarity, relevancy, achieving results, management framework and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. **Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?**
 - (a) **Is the text of the Agreement and the objectives, programs and other measures described therein clear?**

A Workgroup member commented that it is not clear in the text of Article XI whether obligations under the Agreement are valid if funds have not been appropriated. Another Workgroup member, however, clarified this by citing the sentence in Article XI that states that if funds are not available, the Parties will commit to seeking them.

The workgroup generally agreed that part of the text of paragraph 2(a) should be revised from "...and other measures provided for in Article VI of this Agreement..." to "...and other measures provided for in Articles V and VI of this Agreement..."

- (b) **Are program outcomes and/or environmental outcomes clearly identified?**

This review element was not considered applicable to this Article.

(c) Are there outdated terms, concepts or references?

No. The Workgroup generally agreed there are no outdated, terms, concepts or references in this Article.

RELEVANCY

The Workgroup generally agreed the Article remains relevant and did not warrant further discussion.

ACHIEVING RESULTS

The Workgroup generally agreed that the Article will lead to the achievement of results and noted that achievement of results is a separate issue from implementation and accountability. The Workgroup did not see a need to further discuss this review element.

MANAGEMENT FRAMEWORK

1. Are management and coordination approaches identified in the Agreement?

The question of management and coordination approaches triggered diverging opinions about the fundamental purpose of the Agreement. Two perspectives were offered:

- The purpose of the Agreement should be to restore ecosystem integrity. A Workgroup member made the point that the BEC issued a written decision saying it was going to follow an ecosystem approach. The Chair clarified that the BEC decision was made in the context of how to move forward with Annex 2 and does not apply to the entire Agreement.
- The purpose of the Agreement should be to address water quality.

(a) Is management and coordination specified? If so, briefly outline.

Yes, the Workgroup generally agreed that the Article has a workable approach but some members observed that execution is subject to political processes.

(b) Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

Yes, the Workgroup generally agreed that the Article has a workable approach but execution is subject to political processes.

(c) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

No, the Workgroup generally agreed that priority setting is not addressed by this Article.

(d) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

The Workgroup generally agreed that the Article does not directly address these linkages but, in practice, the linkages exist (e.g., Great Lakes Binational Toxics Strategy, State of the Lakes Ecosystem Conference, etc.).

ACCOUNTABILITY

1. Is there comprehensive monitoring and reporting?

See the discussion in Article V discussion under Accountability.

(a) Are there clear indicators to determine progress?

See the discussion in Article V discussion under Accountability.

(b) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

The Workgroup observed that Article XI does not address the consequences for either Party if it fails to carry out the Agreement or has insufficient funds to do its job. Many Workgroup members felt that actual implementation and accountability has been lacking.

A Workgroup member recommended that a provision be added to Article XI that provides for a reporting mechanism to hold the Parties accountable for their activities.

Another Workgroup member suggested a citizen involvement on review committees and a citizen petition process.

A Workgroup member indicated that accountability could be increased by requiring the Parties to indicate which elements of the GLWQA have/have not received funding.

(c) Are they being met?

No, the Workgroup generally agreed that they are not being met fully: funding and legislation have been inadequate for full implementation of the Agreement.

(d) If not, why not?

Members of the Workgroup noted several reasons for these not being met: the cumbersome process for securing funding and because the Great Lakes region must compete with national priorities and priorities in other regions.

(e) Is the frequency of reporting sufficient?

The workgroup generally agreed that this Article does not address the issue of reporting. See the response to Accountability question (b) above.

2. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

This review element was not considered applicable to this Article.

3. Does the Agreement enable an effective level of commitment?

(a) Is the role of the public identified?

Members of the Workgroup observed that the public appears to have little or no role under the existing terms of the Agreement, except at open IJC meetings. The Workgroup generally agreed that there should be greater opportunity for public participation. (*See comments under Article X: "Accountability" and "Achieving Results"; and, Article XI: "Accountability".*)

(b) Does the Agreement identify appropriate mechanisms for public engagement?

A Workgroup member suggested that appropriate mechanisms for public engagement could include such things as:

- Citizen participation on advisory boards, or creation of a Citizens Advisory Board;
- A citizen petition process along the lines of those contained in various existing international financial institutions and trade agreements, e.g. the CEC; and public participation in all reporting and information exchange processes, e.g. the IJC biennial meetings.

This Workgroup member's summary of his suggestions is attached as Appendix B.

(c) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

A Workgroup member suggested that the answer was No and that there is a need for greater public participation.

2. Does the Agreement drive action by communities and industry?

A Workgroup member suggested that the answer was No and referred to the answers to 3. above.

General Comments on Accountability:

- A Workgroup member pointed out that an assessment of the obligations of each Party under the Agreement depends upon whether the Agreement is construed as an ecosystem integrity

agreement or a water quality agreement. The Chairs responded that the Workgroup has to evaluate the Party's obligations as they are described in the current Agreement. The current Agreement is called a water quality agreement and that is how the review Workgroups should interpret the Party's obligations. Whether the Agreement is operating as something other than a water quality agreement is a different question. Part of the review process is also documenting changes that individuals feel would improve the Agreement and the Workgroup should document this ambiguity in the existing agreement and perceived differences in the objective of the agreement versus how it is actually operating. But these are not questions that can be resolved at this point in the review process.

- Another Workgroup member added that the review Working Groups should rely on the obligations of each Party as described in Article VI.

ARTICLE XII: EXISTING RIGHTS AND OBLIGATIONS

Article XII of the Great Lakes Water Quality Agreement states:

Nothing in this Agreement shall be deemed to diminish the rights and obligations of the Parties set forth in the Boundary Waters Treaty.

EVALUATION FINDINGS

Article XII was reviewed by the Workgroup on June 8, 2006 against the four major review elements: clarity, relevancy, achieving results and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. *Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?*

There was general consensus amongst the Workgroup on the meaning of the Article despite its brevity. The Workgroup generally agreed that this Article assumes the Boundary Waters Treaty continues to be a foundation of the Agreement and will continue to be implemented by the Parties; and, that this Article recognizes the Boundary Waters Treaty as a higher obligation than the Agreement and the Agreement can not contradict or diminish the Boundary Waters Treaty. The Workgroup did not reach consensus as to whether the Agreement, or how, can in fact be enforced by the Parties.

RELEVANCY

1. *Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?*

The Workgroup generally agreed that the Article is relevant and important, and will remain so while the Parties enforce the Agreement.

ACHIEVING RESULTS

This review element was not considered applicable to this Article.

ACCOUNTABILITY

Workgroup members noted that it is the duty of each Party's government to enforce the Agreement according to how each Government codifies the Agreement.

General Comments

- Several Workgroup members wondered whether it is typical for such a treaty to continuously undergo review. It was observed that while the Agreement has been reviewed, the Boundary Waters Treaty has not been reviewed since its establishment in 1909. A Workgroup member clarified that most Treaties are not routinely and regularly reviewed.
- One Workgroup member commented that the Boundary Waters Treaty does not address the hydrological cycle, which makes the implementation difficult and that in order for the Agreement to encompass both water quality and quantity, it is necessary to look at the obligations of both Parties under the Boundary Waters Treaty.
- There is discussion elsewhere as to whether the Boundary Waters Treaty and the Agreement are enforceable.

ARTICLE XIII: AMENDMENT

Article XIII of the Great Lakes Water Quality Agreement states:

1. *This Agreement, the Annexes, and the Terms of Reference may be amended by agreement of the Parties. The Annexes may also be amended as provided therein, subject to the requirement that such amendments shall be within the scope of this Agreement. All such amendments to the Annexes shall be confirmed by an exchange of notes or letters between the Parties through diplomatic channels, which shall specify the effective date or dates of such amendments.*
2. *All amendments to this Agreement, the Annexes, and the Terms of Reference shall be communicated promptly to the International Joint Commission.*

EVALUATION FINDINGS

Article XIII was reviewed by the Workgroup on June 8, 2006 against five major review elements: clarity, relevancy, achieving results, management framework, and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. *Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?*

The Workgroup generally agreed that the Article is clear that the Agreement can be amended, and defines what the amendment process is. However, several Workgroup members noted that it was unclear if some annexes in the Agreement have different means of amendment. For example, it was noted that Annex 2 includes text to the effect that it should be reviewed every two years.

RELEVANCY

This review element was not considered applicable to this Article.

ACHIEVING RESULTS

This review element was not considered applicable to this Article.

MANAGEMENT FRAMEWORK

This review element was not considered applicable to this Article.

ACCOUNTABILITY

This review element was not considered applicable to this Article.

General Comments

- Several Workgroup members noted that many people, including some in government, have not been aware that the Agreement could be amended without a renegotiation process. .
- A Workgroup member provided a brief history of amendments to the Agreement since its inception. Since 1972, the Agreement was renegotiated in 1978. The Agreement was then amended by protocol in 1987. Since then, there have only been a few substantive changes to the Agreement. One Workgroup member added that in 1983 a phosphorus load reduction supplement was signed through an exchange of notes and letters. The Workgroup member noted that this process of exchanging notes and letters is conducted through the State Department in the U.S. and Foreign Affairs in Canada and that the process is more complicated than it sounds.
- The Workgroup discussed whether there should be a general public announcement when an amendment was taking place. It was noted that such an announcement is not common for most bilateral agreements, but that the U.S. has typically given such announcements.

ARTICLE XIV: ENTRY INTO FORCE AND TERMINATION

Article XIV of the Great Lakes Water Quality Agreement states:

This Agreement shall enter into force upon signature by the duly authorized representatives of the Parties, and shall remain in force for a period of five years and thereafter until terminated upon twelve months' notice given in writing by one of the Parties to the other.

EVALUATION FINDINGS

Article XIV was reviewed by the Workgroup on June 8, 2006 against five major review elements: clarity, relevancy, achieving results, management framework, and accountability. The general findings, recommendations and specific opinions of Workgroup members are captured below.

CLARITY

1. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

The Workgroup generally agreed that the Article is clear. One Workgroup member commented that it is not clear from the text of the Article how the public would know if one of the Parties had terminated the Agreement. The Workgroup member proposed elaborating on the termination language but many other Workgroup members felt this would unnecessarily clutter the Article. Another Workgroup member stated that if either Party terminated the Agreement, it would be obvious.

RELEVANCY

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

The Workgroup generally agreed that the Article provisions remain relevant. However, several Workgroup members questioned the need for the five-year provision in the Article. A Workgroup member clarified that this provision may have been included in the Agreement to ensure that the Agreement remained intact for a minimum of five years. It was further noted that this five-year provision also appears in the Boundary Waters Treaty.

ACHIEVING RESULTS

This review element was not considered applicable to this Article.

MANAGEMENT FRAMEWORK

This review element was not considered applicable to this Article.

ACCOUNTABILITY

This review element was not considered applicable to this Article.

ARTICLE XV: SUPERSESSION

Article XV of the Great Lakes Water Quality Agreement states:

This Agreement supersedes the Great Lakes Water Quality Agreement of April 15, 1972, and shall be referred to as the "Great Lake Water Quality Agreement of 1978".

IN WITNESS WHEREOF the undersigned representatives, duly authorized by their respective Governments, have signed this Agreement.

DONE in duplicate at Ottawa in the English and French languages, both versions being equally authentic, this 22nd day of November 1978.

EN FOI DE QUOI, les représentants soussignés, dûment autorisés par leur Gouvernement respectif, ont signé le présent Accord.

FAIT en double exemplaire à Ottawa en français et en anglais, chaque version faisant également foi, ce 22e jour de novembre 1978.

EVALUATION FINDINGS

Article XV was reviewed by the Workgroup on June 8, 2006 against five major review elements: clarity, relevancy, achieving results, management framework, and accountability. The general findings and specific opinions of Workgroup members are captured below.

CLARITY

The Workgroup generally agreed that the Article is an example of a standard clause and remains clear.

RELEVANCY

The Workgroup generally agreed that the Article is an example of a standard clause in the Agreement and remain relevant.

ACHIEVING

RESULTS

This review element was not considered applicable to this Article.

MANAGEMENT FRAMEWORK

This review element was not considered applicable to this Article.

ACCOUNTABILITY

This review element was not considered applicable to this Article.

General Comments

- A Workgroup member expressed concern as to whether the English and French versions of the Article translate in the same manner.
- The Workgroup discussed whether the Agreement includes the Annexes or whether the Agreement itself is only the Articles. A Workgroup member pointed out that Article I (b) provides that the Annexes form an integral part of the Agreement.
- One Workgroup member questioned why the Agreement is still referred to as the 1978 Agreement if it was modified in 1987 and noted that the title is confusing and if changes are made to the Agreement in the future, the Agreement should be renamed, for example, the "GLWQA of 2008." Another Workgroup member responded that the amendments in 1978 constituted a full renegotiation of the Agreement, whereas the 1987 amendments were simply an exchange of notes, which is likely why the date associated with the Agreement is 1978.

4. Responses to Overarching Questions

In addition to the review of each Article against the five evaluation elements, RWG A also addressed five overarching questions.

1. Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

In our review, various perspectives were put forward on the clarity and purpose of the existing Agreement. Some members felt the current wording of the purpose statement of the Agreement, "to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem" is clear and adequately communicates the purpose of the Agreement. However, other members felt the current language does not clearly describe the focus and intent of the purpose statement and how this purpose will be achieved. The Workgroup generally agreed that there remains a need for an international agreement for the Great Lakes; however, a continuum of opinions emerged regarding the focus and purpose of a revised agreement: most participants recommended that a revised Agreement use an ecosystem approach to protect water quality; one participant noted that a revised Agreement should have a narrow scope and focus on water quality only (no ecosystem approach); one participant recommended a revised Agreement should focus on the ecological integrity of the entire Great Lakes Basin aquatic ecosystem; while another participant recommended a larger scope for the Agreement to focus on the ecological integrity of the entire Great Lakes Basin ecosystem. The Workgroup did not reach consensus on this issue.

2. Does the Agreement, and its implementation⁵, achieve the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes basin ecosystem?

The Workgroup generally agreed that while the Agreement does commit the Parties to develop and implement programs and other measures to fulfill the purpose of the Agreement and to meet its objectives, and while progress has been made, the Agreement has not yet achieved the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem. Specifically, members of the Workgroup noted that implementation has been hindered by a lack of dedicated resources sufficient for full implementation of the provisions of the Agreement. Examples cited by Workgroup members to support this position include:

- The lack of progress in delisting AOCs (e.g., lack of funding to complete contaminated sediment remediation and improvements to waste water infrastructure);
- Continued fish consumption advisories;
- An array of emerging issues not being currently addressed (such as invasive species, and the growing threat to the Great Lakes from the array of emerging problematic substances including pharmaceutical and personal care products);

⁵ "Implementation" is defined as the achievement of the goals set out in the Agreement and not as a formal review of Governments' programs (Source: ARSC GLWQA Review Process).

The Workgroup also generally agreed that it is difficult to measure the overall progress of the Agreement. Members cited:

- The absence of a direct connection to indicators and the GLWQA Review process;
- The absence of adequate indicators to determine progress related to preventing injury to human health; and
- The absence of wildlife health sentinel monitoring system in place to comprehensively and systematically monitor exposure and health effects of diverse wildlife species, and potential health effects in humans.

3. Is the Agreement, and its implementation⁶, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so what are they?

The Workgroup generally agreed that the Agreement and its implementation, is not sufficient to protect and restore the Great Lakes. Specifically, members of the Workgroup expressed the view that the Agreement does not adequately address several critical and omitted issues and approaches:

- The threat of aquatic invasive species;
- Emerging problematic substances;
- The compound effects of harmful agents (toxic chemicals, materials and heat);
- The negative effects from human induced climate change
- Pollution prevention;
- Boundary Waters Treaty pollution provisions, (in particular, Article IV). This Workgroup member also pointed to Article VIII and expressed the view that the Parties' equal and similar rights imply tributary water quality management responsibilities,);

Some members of the Workgroup felt that the Agreement is not designed to evolve as these new problems arise and that language should be added to indicate that Agreement objectives will evolve with new science, technology and discoveries.

4. In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

Members of the Workgroup cited the following as examples of cases in which the Agreement successfully fulfills its intended purpose and current goals and has driven action:

- Significant progress on reducing phosphorus loadings to the Lakes (e.g. target loads were achieved);
- The widespread adoption of sewage treatment;
- The development of mechanisms to help focus implementation on a lakewide basis (i.e. Lakewide Management Plans);
- The concept of virtual elimination has been incorporated into the Canadian Environmental Protection Act (CEPA);

⁶ "Implementation" is defined as the achievement of the goals set out in the Agreement and not as a formal review of Governments' programs.

- Information generated from the work of GLWQA Annex 15 (Airborne Toxic Substances) was used in the development of the global Treaty on Persistent Organic Pollutants;
- The Agreement led to the creation of the Great Lakes Binational Toxics Strategy which has resulted in many significant reductions of harmful pollutants;
- The development of the Great Lakes Legacy Act in the U.S. to facilitate the remediation of U.S. Areas of Concern;
- Regular reporting on a broad base of monitoring and surveillance indicators through the State of the Lakes Ecosystem Conference (SOLEC) effort;
- Fostering joint Canadian Federal and Provincial action through the development of the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem; and,
- Fostering a high degree of binational cooperation and collaboration through mechanisms such the Binational Executive Committee (BEC).

On the other hand, members of the Workgroup cited the following as examples of cases in which the Agreement has fallen short of fulfilling its intended purpose and current goals including barriers to progress include:

- Funding is not adequate to implement the Agreement (e.g. to complete contaminated sediment remediation in AOCs and for improvements to waste water infrastructure);
- Contaminant inputs from municipal wastewater, industrial and non-points sources remains a concern;
- The Agreement is not flexible enough to address emerging issues (see Question 3) in a timely manner;
- An effective response to invasive species in the Basin is not in place;
- Progress must still be made on reducing loadings of Persistent Toxic Substances (PTSs) to the Lakes including longstanding chemicals of concern and chemicals of emerging concern;
- There are institutional, constitutional and political barriers related to land use planning; and,
- Injury to health and property is still occurring;

5. What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

The following new approaches were suggested by Workgroup members to improve the operation and effectiveness of the Agreement:

- ***Increase collaboration and cooperation:*** members of the Workgroup felt that there is a need for increased coordination between other agreements that are not under the Agreement or the Binational Executive Committee and that have a similar interest with the Agreement (e.g. St. Lawrence Plan). It was also noted that there needs to be better coordination between what the IJC needs to carry out its role and responsibilities, and the information that the Parties provide.
- ***Broaden and modernize consultation approach:*** members of the Workgroup felt that the Agreement does not reflect the current status of broader consultation or include sufficient mechanisms to allow a large number of interested parties to participate and adequately commit to the process (e.g. local and municipal levels of government, First Nations, Aboriginal Peoples and Tribes and the public). For example, the Workgroup generally

considered Article X to be clear on general aspects, short on specific forms of implementation, and unclear on what organizations need to be consulted. Some members felt the Agreement needs to formally define a public/citizen engagement mechanism (e.g. citizen petition process or Citizen Advisory Committee). Some members of the Workgroup recommended that an additional Article be added on public consultation and participation which would explain the requirements for public participation and notification in one location within the Agreement.

- ***Strengthened Accountability to ensure implementation and progress:*** members of the Workgroup pointed out that Article XI (Implementation) does not contain provisions to hold the Parties accountable or to address the consequences for either Party if it fails to carry out the Agreement or has insufficient funds for implementation. Workgroup members found the management and coordination approaches of the Agreement could benefit from: 1) provisions to strengthen accountability; 2) benchmarks for measuring progress; and 3) an implementation schedule that facilitates binational priority setting to address issues of greatest importance to the restoration and protection of the basin ecosystem. Members also noted the need for an explicit objective (3rd Party or via the IJC) process to uncover program deficiencies against performance (e.g. a Gaps Analysis) in order to assist in determining disparities between the achievement of the goals set out in the Agreement and the implementation of Governments' programs.

- ***Increased flexibility and adaptability:*** members of the Workgroup expressed the view that there is a need for the GLWQA to accommodate new issues and evolve as new problems arise, in concert with new science, technology and discoveries.

APPENDIX A: Considerations for Potential Changes to Definitions in Article I of the Great Lakes Water Quality Agreement

Some Members of the Workgroup suggested that the following definitions used by the IJC's Science Advisory Board and Water Quality Boards be considered in the review of the Agreement.

1) Definitions from IJC's Water Quality Board (WQB)⁷

Adaptive management: A type of natural resource management that implies making decisions as part of an ongoing process. Continuously monitoring the results and feedback of an action provides a flow of information that may indicate the need to change or maintain actions. Scientific findings and the needs of society may also indicate the need to adapt resource management to new information.

Biodiversity (biological diversity): The number and abundance of species found within an ecosystem. It includes the variety of genes, species, varieties, and the ecological processes that connect everything in the ecosystem.

Biological integrity: The ability to support and maintain a balanced, integrated adaptive assemblage of organisms sharing species composition in the natural habitat of a given region or ecosystem.

Biosphere: Relatively thin life-supporting stratum of the earth's surface; the global ecosystem that can be sub-divided into regional or local ecosystems.

Best management practices: Methods determined or designed to be the most effective, feasible, and practical means of preventing or reducing environmental pollution from nonpoint sources and natural resource exhaustion in an ecosystem.

Chemical Integrity: The dynamic interaction of natural and manmade chemical substances, whereby various chemicals and combination of chemicals do not adversely impact organisms including humans.

Cumulative effects: Effects of environmental pollution or natural resource stresses that result from separate, individual actions that, collectively, become significant over time.

Ecological integrity: The ability of the ecosystem to maintain its organization, structure, function, and health as well as continue its natural processes of self-organization. Ecological integrity is an integration of biological; chemical; and physical integrity.

Ecosystem: A natural unit of living (biotic) and non-living (abiotic) things and the forces that move among them. Living things are plants and animals, including humans. Non-living parts may be

⁷ International Joint Commission, 2003 – 2005 IJC Great Lakes Priorities report (1.15 Glossary of Ecological Integrity, Ecosystem Approach, and Related Terms) (2006).

water, air, soils, sediments, rocks, and minerals. All elements are interconnected and interact. Managing any one resource may affect others in that ecosystem. Ecosystems can be small—a single stand of aspen—or large—an entire watershed or wetland, including hundreds of forest stands across many different ownerships.

Ecosystem approach: A strategic and adaptive method for sustainable and comprehensive thinking, planning, and management for protecting or restoring natural ecosystem components, functions, and values. It broadly considers all environmental and natural resources within the ecosystem (*e.g.*, the Great Lakes basin ecosystem) as well as their interactions and cumulative effects on the ecological, social, and economic health, and sustainable development of the ecosystem communities.

Ecosystem health: The physique of an ecosystem. A healthy ecosystem is stable and diverse, resilient and resistant to environmental changes and resource stresses. It is characterized by a state of dynamic equilibrium in its composition, structure, and functions; good maintenance of its physical, chemical, and biological components and their interrelationships for biological diversity and ecological integrity over time. A healthy ecosystem provides abundant and beneficial services, such as food, water, shelter, economic livelihood, recreation, and natural beauty, to its constituents.

Ecosystem management: An ecological approach to environmental and natural resource management to enhance diversity, integrity, and health of the ecosystem by blending environmental, social, and economic needs and values.

Ecosystem sustainability: The long-term ability of an ecosystem to maintain its proper components, ecological processes and functions, biological diversity, and productivity for present and future generations.

Environment: All the external factors, conditions, and influences that affect an organism, a community, or an ecosystem.

Great Lakes-St. Lawrence River basin: The drainage area of the Great Lakes-St. Lawrence River system from Lake Superior downstream to the Gulf of St. Lawrence. Within the context of the Agreement, the drainage basin of the St. Lawrence River is included from Lake Ontario to Cornwall, Ontario/Masenna, New York where the river is the international boundary between Canada and the United States.

Great Lakes-St. Lawrence River ecosystem: The ecological system of water, air, land and biota, including humans, in the Great Lakes-St. Lawrence River basin.

Physical Integrity: Sustainable natural processes, pathways, and landscapes that maintain and improve Great Lakes water quality and quantity, and support natural biodiversity and ecosystem function.

Sustainability: Achieving and maintaining a balance between the human need to improve well-being on one hand, and preserving and restoring natural resources and ecosystems, on which we and future generations depend. Sometimes called “sustainable development” or in the spirit of achieving balance, “environmentally sustainable economic development.”

Water-quality approach: A narrower perspective, in comparison with the ecosystem approach, aimed at managing water quality in the Great Lakes by setting objectives for certain chemicals in water based on the most sensitive uses of that water. It does not take full account of interactions within the ecosystem or of stressors external to water.

Watershed: The region draining into a river, river system, or body of water. This is the hydrologic delineation of a watershed, and in the context of watershed planning, the definition often is broadened to include the functional, ecological, cultural, and aesthetic values of the specified geographical unit.

Watershed approach: A coordinated framework for environmental and natural resource management that focuses all stakeholder efforts on the highest-priority problems within hydrologically defined geographic areas (*i.e.*, watershed). It requires the involvement of all stakeholders in the watershed and embodies cyclical management for assessment, planning, management, implementation, and monitoring as iterative processes driven by continuous evaluation, adjustment, and adaptation.

2) Definitions from IJC's Science Advisory Board⁸

“**Ecosystem approach**” means a science and policy framework that recognizes the fundamental interconnections of all ecosystem components, and emphasizes the maintenance of biological diversity, of natural relationships among all species including humans, and dynamic processes that ensure ecosystem sustainability.

“**Aquatic nuisance species**” means non-indigenous (nonnative), water-dwelling plants, animals or other viable biological materials that enter an ecosystem beyond their natural range, are harmful, and threaten the diversity or abundance of native species; the ecological stability of infested waters, wetlands or other property; or the commercial, agricultural, aquacultural or recreational activities dependent on such waters, including human health.

“**Native species**” means those plant or animal species originally living, growing or produced in an ecosystem within their historic range.

“**Biodiversity**” means the full range of variety and variability within and among living organisms and the natural associations in which they occur.

“**Ecosystem stressor**” means an agent of change in the physical, chemical and/or biological characteristics of the ecosystem, often the result of human activity that compromises ecosystem integrity.

“**Biodiversity Investment Area**” means a geographic area within the Great Lakes Basin Ecosystem which supports exceptionally rich biodiversity and/or endemism and contributes significantly to the integrity of the ecosystem. Such areas contain habitat which supports natural, self-sustaining productivity and long term ecological integrity.

⁸ International Joint Commission, 2003 – 2005 IJC Great Lakes Priorities report (2006).

“**Habitat**” means the physical, chemical and biological characteristics at a particular locality that collectively support an organism, population or community, including the basic life requirements of food, water, substrate, and cover or shelter.

“**Stewardship**” means the careful and responsible management of ecosystem resources entrusted to humans in the interest of achieving and protecting ecosystem integrity for its intrinsic value and/or for the benefit of current and future generations

“**Sustainable use**” means the consumption or employment of a resource which, all other factors being equal, does not cause depletion that harms the resource or constitutes a threat to ecosystem integrity for present and future generations.

APPENDIX B: Enforcement and Public Participation Great Lakes Water Quality Agreement

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Working Group A is tasked with reviewing the scope and purpose, goals and objectives, and function of the *Great Lakes Water Quality Agreement* (the Agreement). The criteria for the review are: clarity, relevancy, achieving results, management framework and accountability. In the course of the Working Group A we have considered whether the Agreement is enforceable and the possibility of citizen participation. Consistent with the review criteria, we recommend consideration of four measures to increase or introduce enforceability of the Agreement, and to ensure increased citizen participation in its implementation. Making the Agreement enforceable, at least as between the Parties, and providing for a citizen complaint process should it not be enforced, would give the Agreement relevancy, ensure that it achieves results, provide a more transparent and responsive management framework, and create accountability.

Enforceability

The options are that the Agreement be enforceable between the Parties, and at the suit of third parties such as ordinary citizens. The former seems the most realistic improvement to be made at this time. As the Agreement now stands, it is essentially a “reasonable efforts” or “gentleman’s” agreement. In short, it is neither enforceable by the Parties nor by third parties. On the principle that someone should be obliged to do what he or she has agreed to do, and given that the Agreement is in the public interest and therefore enforcement will be in the public interest, there seems little basis for opposition to recommending that the Agreement be enforceable, at least as between the Parties.

Interestingly, the Council for Environmental Cooperation (the “CEC”) has recently opined regarding a citizen petition under the North American Agreement on Environmental Quality (the “NAAEC” environmental side agreement to NAFTA) that even the *Boundary Waters Treaty*, the parent of the Agreement, is likely not an enforceable environmental law in the United States, and is only partially enforceable in Canada. (See the CEC website regarding the Devils Lake citizen submission at <http://www.cec.org/citizen/index.cfm?varlan=English>.)

Public Petition Process

If the Agreement is enforceable between the Parties, at a minimum, then the modern trend in international agreements is to provide for a public petition process whereby ordinary citizens can hold the government Parties accountable should they fail to enforce the Agreement. There is nothing novel about this approach. It is a feature of many agreements:

- the NAAEC under NAFTA mentioned above;
- the Canada-Chile Free Trade Agreement;
- the DR-CAFTA; and
- the U.S.-Peru FTA.

In addition, several international financial institutions have established citizen driven accountability or independent recourse mechanisms.

A public petition process under the Agreement should address the following issues: standing to make a petition; grounds for a petition; types of petition(s); screening of petitions; investigation, response and reporting; and follow-up actions.

It is therefore recommended that the Agreement include a public petition process that permits concerned citizens and non-government organizations to bring implementation issues before the IJC. The above example processes have not been overly burdensome on the governments and civil servants involved and will facilitate the purpose of the agreement.

Advisory Board Participation

Citizen representatives, one from each country, should be appointed to the advisory boards overseen by the IJC, currently the Water Quality Board, the Science Advisory Board and the Council of Great Lakes Research Managers. The Agreement should also make provision for representative(s) from the region's Tribes and First Nations.

Alternatively, a separate Citizens Advisory Board should be created. Such a board would have the advantage of organizational independence.

Public Participation in Reporting

The IJC and, perhaps more importantly, the governments should assure ample opportunity for public participation in all reporting and information exchange processes, and in particular the IJC biennial meetings. The Agreement should specify that the IJC biennial and board reports will be completed substantially in advance of the biennial meeting, and that commissioners, report authors, and government officials will all be present to accept comment and to answer questions from the public about the reports.

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GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP B FINAL REPORT TO ARC December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

The Great Lakes Water Quality Agreement Review Toxics Work Group (hereunder “workgroup”) held conference calls on April 28, May 8, May 26, June 5, 19 and 30, 2006 to review Article 4 and Annex 1; July 24, 2006 to review Annex 10, and August 4 and 14, 2006 to review Annex 12, and September 11 to review Annex 15. The workgroup also held an in-person meeting on August 22, 2006, in Ann Arbor to finish reviews of Annex 10 and 12, and commence a review of Annex 15. Call and meeting notes are attached in Appendix 1 of this report. There have been approximately 20 attendees at each meeting or conference call from the United States and Canada.

Some general findings have emerged from the workgroup review of Article 4 and Annex 1, 10, 12 and 15 (hereunder the “Annexes”), which are reviewed below by major review element.

With respect to clarity, the workgroup has identified a number of key terms that require definition or further clarification. In addition, many sections of the Agreement are outdated and refer to deadlines long past and/or entities no longer in existence. Also, there is the general sense that the variety of chemical related Annexes are not well integrated together, but rather read as independent and separate pieces of a somewhat confusing puzzle. The workgroup feels that this should be rectified, either by further explanation of the purposes of each Annex, or by appropriate cross-referencing, or perhaps by some limited consolidation, where warranted.

With respect to relevancy, the workgroup generally feels that Article 4 and Annexes 1, 12 and 15 are still very relevant to the current needs of the Great Lakes Basin, whereas the specific need for Annex 10, which is to identify hazardous polluting substances around the basin that could potentially discharge to the basin, may no longer exist, and could perhaps be folded into one of the Articles or Annexes 4 and 8. Annex 15 is felt to be very robust and in need of only minor updating, whereas Annex 1 may require significant updates, particularly to the procedures for biennial consultation and to the methodologies for developing new water quality objectives (as well as other options detailed below in section 5). Annex 12 is relevant as far as it goes in addressing persistent toxic substances, however there are concerns that non persistent but continuously available substances, such as some pharmaceuticals and other potential endocrine disrupting compounds, may not be adequately addressed by the Agreement..

Workgroup members recognized that the Agreement raises some challenging management issues such as multi-media transport, multiple exposure routes and impacts of complex chemical mixtures. Many members felt that revision of the Agreement would allow this forward-thinking and challenge setting to be renewed and prevent the Agreement from becoming obsolete. All workgroup members felt that the importance of international sources should be emphasized in a revised Agreement, and should link to international efforts to reduce toxic pollutants from outside the basin and the two countries.

With respect to achieving results, there are significant points of disagreement within the group as to how effective the Parties have been in implementing the Agreement. Some workgroup members feel that much progress has been made in the Great Lakes Basin with regard to addressing toxic pollutants, both through the advent of regulatory programs such as the Great Lakes Initiative (GLI), and through voluntary programs such as the GLBTS. Other workgroup members, while acknowledging that progress has been made, are concerned that the level of resources dedicated to key programs, such as environmental monitoring, chemical screening, and human health research,

have diminished significantly in recent years, making implementation of the Agreement far more difficult. There are still fish advisories in the Great Lakes basin.

With respect to a Management Framework for the Annexes, most workgroup members felt that this was a significant weakness, perhaps warranting the adoption of a “governance model” to oversee the activities of the various Annexes. With respect to Annex 1, it was recommended that the biennial consultation process be co-located with the biennial State of the Lakes Ecosystem Conference (SOLEC), and with respect to Annex 12, some workgroup members recommended that the GLBTS, or a similar program, be codified as the appropriate location for the overall management of the implementation of Annex 12 activities.

An overarching management issue was identified relating to the need to assess and characterize potential threats from newly-identified chemicals. The various list-making activities under Annexes 1 and 10 have not been maintained and are not well structured to fulfill this purpose. Scientific advances in computational screening of chemicals as well as monitoring and analytical capabilities accomplish some of what the Early Warning System section of Annex 12 calls for, but a coordination system that ties everything together in a Great Lakes context is lacking. Some workgroup members recommended the Agreement be revised to include a more robust and comprehensive framework for identifying and prioritizing among chemical threats. The GLBTS, or a similar program, would be a logical candidate for guiding this activity and would allow efficient coordination of prioritization and response actions.

Finally, consistent with the review on GLWQA reporting conducted by the IJC in 2001-2, the reporting requirements stipulated in the Annexes are not followed to the letter (i.e., there is no Annex 1 or Annex 12 report, per se), although there is significant reporting that takes place through the GLBTS Annual Report, the IADN report, the LaMP reports, etc. Options for rectifying this, discussed in detail below, include a gaps analysis of current reporting, providing “roadmaps” via the internet to relevant reports, and providing a roll-up report, perhaps as part of the GLBTS Annual Report, for all chemical related activities under the GLWQA.

2. Overview of Review Working Group Mandate

Review working group B has been charged with reviewing the Articles and Annexes of the Great Lakes Water Quality Agreement in cooperation with working groups A, C through H and a special issues working group. Specifically, review working group B has been tasked with assessing the operation and effectiveness of Article IV, Annexes 1, 10, 12 and 15 via a series of predetermined principles and guidelines as set out by the Agreement Review Committee. In summary, these guidelines include answering a series of questions under the headings of Clarity, Relevance, Achieving Results, Management Framework and Accountability and a number of overarching questions for consideration (as defined by the Terms of Reference). Information gathered through the review has been collated and submitted in both the interim report, and this, the final report.

Membership includes a fairly even distribution of U.S. and Canadian representatives. Among these are Canadian and U.S. federal government representatives, Canadian and U.S. provincial/state government representatives, First Nations/Aboriginal/Tribal representatives, Canadian and U.S. municipal agency representatives, NGO's, Industry and Academia as well as representatives of the public.

See Appendix II for detailed membership listing.

3. Evaluation Framework

Article IV/Annex 1: Specific Objectives

CLARITY

1. Does the Article contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(g) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

- One commenter stated that Article IV could include a description of how objectives are to be used by various agencies.
- One commenter noted that Article IV makes reference to the Parties consulting on "the control of pollutant loading rates for each lake basin to protect the integrity of the ecosystem over the long term". The intent of the consultatoin on loading rates should be clarified in the Agreement. It is not clear whether the intent is to promote action by either party to reduce loading (implying some kind of binational waste load allocation..) or whether it was simply intended to share information on emissions to the lakes (as is done under LaMPs).
- Other work group members questioned whether the lists called for under the Article/Annex are well defined. Annex 1: According to the Annex 1 supplement, 3 lists are to be developed (1=substances present in the lakes and toxic; 2= substances present in the lakes and potentially toxic; and 3 = substances potentially discharged to the Great Lakes and toxic). However, Annex 10 provides 2 lists – those hazardous polluting substances that are present in the lakes (so Annex 10 Appendix 1 = Annex 1 List 1?) and potentially hazardous polluting substances (so Annex 10 Appendix 2 =Annex 1 list 2?). It would be helpful if the lists were clarified and referenced appropriately in the two Annexes.
- Some other work group members concluded that the Article and Annex is clear as currently stated.
- Several work group members noted that Article IV should clarify that these are interim objectives.

(b) Are program outcomes and/or environmental outcomes clearly identified?

- Some work group members believed that the program outcomes are not defined - the Article mostly relates to efforts not outcomes. For example: Section 1 c - "...all reasonable and practicable measures shall be taken to maintain or improve..water quality..." Section 1d - "...agencies shall not consider...". These statements do not impose a result, only a process.

- Some work group members believed that some of the outcomes could not be achieved. There are outdated standards and concepts in the Agreement and Annex with respect to both water quality standards and atmospheric deposition from global and natural sources. With regards to water quality standards, that process has necessarily become much more complicated and rigorous since the signing of the agreement and neither the staff, nor the committees of the IJC are now adequate for this process. The federal governments have adequate staff and should completely assume this role. With regard to air deposition, the Agreement did not envision either the global nature of most toxic air pollutants, nor the natural occurrence of some air pollutants. Consequently the Agreement and its Annex is inappropriately rooted in concepts like "virtual elimination" (VE) which cannot be achieved for naturally occurring substances like mercury. For global pollutants, its focus ignores the more important global sources while at the same time it inappropriately attempts to eliminate every last molecule of air emissions in the basin.

(c) Are there outdated terms, concepts or references?

- Work group members found some terms in Article IV that are not defined in Article I: ecosystem, pollutant, beneficial use, persistent toxic substance (persistent is defined elsewhere but it would be helpful to have it referenced before it is used in the Articles); Terms in Article IV that are defined in Article I: Toxic substance: this definition lists effects that qualify a substance as "toxic". It would be better to simply define it as a substance that "impairs" (list of impairments could be used as examples). May also want to think about stretching the definition to include effects on communities (e.g., a substance linked to disruption of a benthic community - may have an indirect effect). Section 3b mentions protection of ecosystem integrity from water pollutants - This may need revision if the Agreement focus is changed (i.e. ecosystem integrity vs. water quality).
- Some work group members stated that Annex 1 is out of date, too prescriptive for current purposes, and has been functionally replaced by programs now in place by the Parties. The Annex needs to be revised to refer the Parties to Agreement objectives and direct them to utilize their programs to accomplish Agreement objectives.
- Many work group members agreed that the numbers throughout Annex 1 are way out of date, as numerous assessments have concluded. This really isn't an issue with the text of the agreement itself, but is a failure to implement the identified means of updating these numbers through bilateral consultative processes.
- Work group members also asked for clear definitions of "Best Available Technology," "statistically valid", "reasonable and practicable", "flow augmentation" and "natural phenomena".

General Comments on Review Element:

- The language throughout is clear, although in several cases it lacks sufficient specificity. For example in 1c, what constitutes "all reasonable and practicable measures?" Similarly, in 3a&b, in what manner shall the parties consult and what will be the outcome of such consultations.

The terminology and concepts used remain current. In some cases, such as protection of beneficial uses "from the combined effects of pollutants," the concepts even forward-thinking. In the specific objectives supplement to Annex 1, item 3: Lake Ecosystem Objectives seems very out of place. This is a very large and important concept and should be either moved within Annex 1 itself, or expanded to form its own annex on "ecosystem objectives for water quality." Exclusive of these few sentences, the remainder of the Annex and Article 4 deal almost exclusively with chemical parameters, with the lone exception of one sentence on "microbiological" factors.

RELEVANCY

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

(a) Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

- Work group members stated that the Agreement does not adequately address emerging chemicals of concern. Article IV: Environmental conditions/challenges - substances of concern not identified in the Agreement (emerging substances such as PBDEs etc) - Agreement has a mechanism to add these substances. However, objectives for emerging substances of concern may not be easy to develop (subtle, longer term effects). Article IV may not be most efficient way to address substances for which water quality objectives are difficult to develop (or that will require revisions to the current methods for establishing objectives). Additionally - Lists in Annex 1 that are to be established (and which may be equivalent to Lists 1 and 2 in Annex 10) are out of date and do not provide any assistance in determination of risk - for prioritization). These lists are irrelevant if they are not updated and if **they** are not used to prioritize substances for action.

(b) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

- Work group members noted that the lists themselves do not drive action. Article IV implies that there will be some form of collaborative review of objectives and setting of pollutant loading rates - but there is no mechanism defined.

(c) Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

- Work group members argued that the listing process itself did not constitute action to address pollutant loads.

- (d) Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?
- Article IV refers to guidelines/objectives for specific substances, which reflect current practice in various agencies. However, prioritization of substances for action is not in response to the Agreement lists. Agreement lists are irrelevant to the development of management tools.

General Comments on Review Element:

- The US and Canada have dramatically decreased the vast majority of emissions and discharges and the environmental conditions in most instances have significantly improved, particularly during the onset of these programs. Most water quality and fish tissue standards have now been attained, and further reductions in US and Canadian emissions and discharges is generally having little effect on the environment. There continue to be fish advisories in the Great Lakes basin from persistent toxic substances. Where problems persist, global and legacy sources are often an issue. The Agreement does not reflect the best tools for managing global pollutants. Additionally other laws and statutes have created other binational and international bodies such as the CEC and UNEP and the Agreement lacks coordination in these areas.
- The basic premise (which is that we need interim objectives prior to virtual elimination) has not changed, and yet the numbers we use to decide whether there is an impairment have changed. We have also come to understand that there are toxic chemicals that are at levels of concern in the Great Lakes that were not originally identified in the GLWQA. We have made some progress, but not nearly enough, to clearly understand the additive/synergistic/antagonistic effects of a mixture of chemicals in the environment. This reinforces the need for VE and the protection of high quality waters per Item 1.c. I would say the Article does drive actions because it establishes the need for a minimally acceptable level of contaminants. This is essentially what water quality standards are, so it is still relevant because we use water quality standards for permitting and in the case of LaMPs, for determining critical chemicals.
- Article IV and Annex 1 are the principal means through which Great Lakes Water Quality Criteria are coordinated on a binational level. With the exception of the numbers being outdated, it has worked very well in this regard and the fact that most current water quality guidelines in both countries are below the identified values should not be interpreted to imply there is no longer a need for this Article, but rather as evidence of its importance. Aside from other changes in the Great Lakes ecosystem, the improvement in the knowledge base regarding environmental chemistry and toxicology over the recent decades, including the "discovery" of many chemicals of emerging concern is the primary change affecting Article 4 and Annex 1. Annex 1 has not kept pace with these discoveries and it is clear that some change needs to be implemented to ensure updates are made.
- Article IV continues to have relevancy. Wording is broad enough that this Article still applies to current conditions. The Article calls for periodic review and up-dates to

assure relevancy. The Article calls on actions from the Parties in several places. The reference to Annex 1, as Annex 1 is now written, dampens the relevancy of this Article. This can be addressed through Annex amendments.

- The Article as written has lost a level of relevancy based on the current level science and knowledge concerning the Great Lakes and toxic chemicals.
- The Article should be strengthened to encourage strong actions on the part of the enforcement agencies. The Article does not drive actions it needs to require accountability on a scheduled basis for review.
- The Annex is not relevant as applied to the conditions that now exist in the Great Lakes. There is current research and knowledge that challenges the parameters of the chemicals and their levels as stated in the Annex. The Annex needs to be updated to reflect present day science.

ACHIEVING RESULTS

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

- Work group members generally agreed that the agreement does not address global pollutants. Can't achieve virtual elimination (VE) without addressing global sources.
 - Work group members also argued that the Agreement does not address whole classes of emerging chemicals. For example, WQA does not address PBDEs, PFOs, PPCP, EDCs, and microbiological. These substances should be added to the Annex.
 - Many work group members noted that the WQA does not differentiate between in- and out-of-basin sources. Parties are not taking an active approach to updating Annex 1.
 - The parties do not follow a mechanism to update lists. Implementation has failed to address new chemicals – not proactive. VE and zero discharge (ZD) places focus on sources in the basin. Other agreements address sources outside of the basin.
 - The WQA is about water quality. It doesn't make sense to only look in-basin if out-of-basin sources affect water quality.
- (a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?
- No: no mechanism is identified to review or update Specific objectives (see MGMT framework)
- (b) Does the Agreement fail to address critical issues?

- Article IV deals with specific objectives only - scope is adequate - mechanisms and checks need to be defined.
2. Are the demonstrated results consistent with goals and objectives in the Agreement?
- (a) Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not?
- Work group members agreed that no updates to specific objectives, no defined process for checking consistency of specific objectives or implementation across Basin was achieved.
- (b) Are any parts of the Agreement in any way an obstacle to progress?
- Work group members found no apparent obstacles except by omission of enabling mechanisms
 - Some work group members argued that the agreement's preoccupation with elimination of every last molecule of US and Canadian emissions or discharges hinder its ability to recognize the broader global pollutants.
- (c) Are there external impediments that prevent implementation?
- Work group members observed that the parties have not been held accountable for updating specific objectives - no specific departments or mechanisms assigned.
- (d) Are there other barriers to progress?
- No additional comments.
- (e) To what extent can results be attributed to the Article/Annex?
- Results attributable to implementation issues (JS)
3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?
- (a) Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?
- Work group members generally agreed that agencies need to clearly identify and provide resources to groups carrying out the review.

- Other work group members argued that the US and Canada have generally focused adequate resources and have met the vast majority of goals though there are still fish advisories in the Great Lakes basin..

4. Is the science in the Agreement still relevant? If not, why?

(a) If the science in the Agreement is still relevant, how has it been incorporated?

- Several work group members argued that the Agreement's science is flawed because it ignores global pollutants and because standard setting has become more complicated and sophisticated- beyond the capabilities of IJC staff and committees, in that there has been a significant reduction in staff and funding..
- Work group members requested more information on how science was applied to develop criteria. The rationale for how the criteria were developed is not available. Were safety factors used? What media/receptors are being protected? Many criteria are outdated and not protective.
- The WQA only enable the parties if they carry out the program. The parties have not implemented the precautionary principle. There is no unanimity of opinion in risk assessment. It is better to take a precautionary approach through hazard assessment.
- Standard setting is so complex that special expertise is needed. Not possible to replace the expertise in U.S. and Canadian agencies.
- The U.S. and Canada don't have to have the same guidelines, the WQA just has to be protective. Purpose of Article IV is to set objectives and make sure the parties set standards that are protective of the objectives.

(b) Does the science adequately influence decision-making?

- Work group members had mixed reviews on this topic. Some thought that information gathered under the Agreement is incorporated into jurisdiction's policies and programs, but the specific objectives are out of date or absent.

5. Does the Agreement incorporate science to address emerging issues?

- The role of the agreement in addressing global pollutants needs to be evaluated. Since other agencies are already playing a lead role in this issue, the signatories to the agreement, first needs to understand both the science and organizations already dealing with these global issues.

(a) Are there new issues and programs that need to be addressed?

- Work group members generally agreed that emerging chemicals are not adequately addressed.

- (b) Can the Agreement accommodate emerging issues?
- Work group members generally agreed that the agreement can address emerging issues, but mechanisms need to be defined.
 - The lack of a link to international agreements to address global sources was noted by several work group members.
 - Commenters noted the GLBTS might provide linkage to other agreements. The GLBTS linkage refers to the ability to coordinate with international groups, e.g., CEC.

General Comments on Review Element:

- The specific objectives are out-of-date and much of the reporting and updating that Article 4, Annex 1 and the supplement to Annex 1 promised has not been achieved. While this reporting and updating is probably still a good idea, it's hard to judge clarity, relevancy, etc. without having those reports at hand. "Are there barriers" to implementation is an interesting question given the apparently missing reporting and updating. Did the Parties do these things or try to and simply not document it in a way that is easily retained by today's staff? Or did the Parties not try at all because they didn't have the time or resources? Also, the GLWQA doesn't seem to have a mechanism for imposing consequences for not reporting and updating. The IJC is required to be the watchdog, but they have no way of enforcing their concerns. The Parties ultimately have had to hold themselves accountable and it would not be surprising that resources went to hot button issues and issues with regulatory consequences instead of steadfast adherence to a voluntary agreement.
- Although the agreement clearly provides the ability to update the Specific Objectives, the means for identifying information to do so is passive rather than active. The Objectives can be updated if information becomes available and is presented to show that they should be. Updates would be greatly facilitated if the agreement gave the parties or the IJC a specific charge to develop scientific information that identifies new chemicals of concern, validates the current objectives or indicates a need for revisions. A detailed binational framework to screen for chemicals that are products or bi-products of industry, combustion processes or potential degradation products of such chemicals should be established within the agreement, including both modeling and analytical chemistry aspects to predict and observe levels and impacts of these chemicals within the ecosystem.
- Annex 1 currently has no function regarding the achieving of results.
- Methodologies prescribed in Article IV continue to provide for driving results. The underpinnings of Article IV continue to support from both the science and institutional standpoints, Agreement objectives. Article IV as written can accommodate emerging issues.
- The Article does not have any mechanism to measure results.

- The Annex as written is not up to date. Measuring results would be difficult. With out-of-date targets you will get out-of-date results.

MANAGEMENT FRAMEWORK

1. Are management and coordination approaches identified in the Agreement?

(a) Is management and coordination specified? If so, briefly outline.

- Management and coordination of specific objectives are outlined in Article IV, Sections 2 and 3.

(b) Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

- Work group members observed that management and coordination approaches are not adequate to ensure achievement of the Agreement's goals: For example, under Section 2 it states that specific objectives will be "kept under review by the Parties and the IJC...". This section should refer to a scheduled activity (currently outlined in the Supplement to Annex 1, which states that Parties will consult on specific objectives every 2 years to establish or modify). This section should reference the schedule in Annex 1. It would be better to have the review assigned to a specific department within each Party to improve accountability. There is no requirement to report on the review - this should be part of the new agreement. Additionally, Section 3 provides no mechanism for establishment of new objectives or consultation on lake wide pollutant loading rates. There should be a mechanism with a defined department, schedule and audit process.

(c) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

- If "b" were better defined, the approaches could facilitate priority setting. Improvements could be made by ensuring that the appropriate personnel in each Party (and the IJC) were consulted.

(d) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

- Work group members agreed that international coordination is not adequate, especially with regard to atmospheric deposition. Not apparent in Article IV (but GLBTS provides an opportunity for building binational approaches and linkages to international programs).

General Comments on Review Element:

- Article IV appears to identify three institutions (i.e., the Parties, regulatory agencies and the IJC). Of those three institutions, the least clear is the Parties. While the U.S. State

Department may be the official "Party" on the U.S. side, they are certainly not the implementer. Maybe there should be a further definition of Parties?

I'm not sure that linkages to other initiatives is appropriate for Article 4 since the specific objectives should come from the Parties and the Great Lakes state, provincial and tribal jurisdictions. It is appropriate for the GLWQA to make linkages elsewhere, however, since so much of the toxic chemicals load is atmospheric.

- Annex 1 management and coordination provisions are out-of-date and do not reflect the structure currently in place by the Parties to accomplish Agreement objectives.
- Annex 1 needs to be revised as described under the Clarity tab to include the management structures and international programs now in place that will accomplish Agreement objectives.
- Article IV management and coordination measures are adequately specified to satisfy current and future needs. Article IV management and coordination measures will ensure achievement of goals of the Agreement. Article IV management and coordination measures facilitate prioritization and can address issues of most importance. Article IV does not provide direct linkage to international programs, but this can be done through revision of Annex 1. The Article does not need to be rewritten to accomplish this.
- The Article does not layout some criteria for the "Parties", but it is vague.
- The Annex does layout some management responsibilities. There is room for further refinement of these responsibilities, however.

ACCOUNTABILITY

1. Is there comprehensive monitoring and reporting?

(a) Are there clear indicators to determine progress?

- Work group members observed that there are existing reports to the IJC and other reporting mechanisms that meet the objectives of the Agreement, such as SOLEC. However, work group members found that there does not seem to be a mechanism for reviewing objectives or pollutant loadings across the Basin.

(b) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

- Work group members argued for more focused reporting, especially relating to Article IV.
- Several work group members noted that SOLEC does not really report on program accountability. SOLEC reports on ecosystem status.
- Other work group members stated that existing reports are sufficient.

(c) Are they being met?

- Some work group members concluded that certain objectives are being met through the policies and programs implemented by the parties and other agencies in the basin (PWQOs are almost identical to Specific objectives). Not clear whether progress is being made on critical pollutant loadings.
- (d) If not, why not?
- Work group members found no mechanism to schedule or ensure implementation/review.
- (e) Is the frequency of reporting sufficient?
- Mechanisms are available for reporting on concentrations of substances in environmental media, although they may not be suitable for reporting exceedances to the IJC. However, there is no reporting mechanisms for the review of objectives and loadings.
2. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?
- (a) Is the role of the IJC as set out in the Agreement clear and appropriate?
- Work group members observed that the role of the IJC has been diminished since 1987.
 - Under Article IV, the IJC is to keep the Specific Objectives under review and report to the Parties, but it is not clear whether the resources are sufficient to do this.
- (h) Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?
- Work group members found that the resources available to the IJC are generally insufficient. IJC is not getting the same level of information as required to assess programs and is not likely sufficient to track science and implementation of objectives.
3. Does the Agreement enable an effective level of commitment?
- (a) Is the role of the public identified?
- Work group members noted that the IJC does have regular public consultation, but its role under Article IV is unclear. Under Specific Objective Supplement to Annex 1, the parties, in cooperation with the State and Provincial government, shall ensure that the public is consulted in the development and adoption of specific objectives.
 - The biennial consultation process has not been maintained.
 - There are opportunities for public comment through the IJC biannual meeting, but there is no consultation process specific to Article IV and Annex 1.

- (b) Does the Agreement identify appropriate mechanisms for public engagement?
- No specific mechanism is defined in Article IV.
- (i) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?
- Work group members generally recommended that the parties should put a process in place to ensure consultation with all stakeholders. This process could supplement other activities such as the Canadian review of domestic substances and the U.S. High Production Volume Chemical Program.
- (d) Does the Agreement drive action by communities and industry?
- Industry has undertaken voluntary programs to meet the objectives of the Article.
 - The U.S. also developed the Great Lakes Water Quality Initiative in response to Article IV/Annex 1. Regulatory compliance has driven action.

General Comments on Review Element:

- Some participants on the review were not intimately familiar with much of reporting and updating that Article IV, Annex 1 and the supplement to Annex 1 promised. While this reporting and updating is probably still a good idea, it's hard to judge clarity, relevancy, etc. without having those reports at hand. (Same comment made under Achieving Results.) The indicators for Article IV are present in the form of Specific Objectives, although other than saying we will use "statistically valid sampling data" the Article is not clear about how we judge whether objectives are being met. This was a similar quandary to the question the LaMPs faced in trying to decide what was a critical chemical. In Lake Superior, we chose the most protective "yardstick" from the Lake Superior jurisdictions and compared it to the 95th percentile. In other words, if only 5% of the samples exceeded that most protective yardstick, it triggered our concern. We also used impairments at multiple AOCs (e.g., if a metal caused dredging impairments at more than one Lake Superior AOC, that metal also triggered as a LaMP chemical of concern.) We did NOT try to decide if the indicator/yardstick was being "met", just whether there was a reason to be concerned. We ended up with 4 management categories, including the nasty nine (bequeathed to the LaMP via the Lake Superior Binational Agreement), lake wide remediation (those that exceeded the 5% trigger), local remediation (multiple AOCs) and prevention (nasty chemicals that either weren't tested in Lake Superior yet or were tested but didn't exceed). Only the first three were considered to be "critical."
- Annex 1 should be revised to identify establish responsibilities of the Parties and those to whom they delegate responsibilities for meeting Agreement objectives.
- Article IV does place accountability directly on the Parties. Specific reporting language could be added to a revised Annex 1 that would strengthen accountability.

- The Article lacks direction concerning accountability. There needs to be specific instructions concerning reportability and accountability to the "Parties" and their agencies.
- The Annex is total lacking in enforceable accountability attributes. There should be one standard for the toxic chemicals and their levels. There are at least two and one, GLI, has higher acceptable levels then Annex 1. With this condition what standard would be used to assess accountability? There should be one list with the most conservative standards.

Annex 10: Hazardous Polluting Substances

Clarity

2. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(a) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

Work group members offered the following:

- The definition of Hazardous Polluting Substances (HPS) as found in Annex 1 is inconsistent with the criteria and the listing process to be applied to Annex 10 appendix lists – specifically appendix #1.
- "Discharge" and "release" should be defined in the context of this Annex. (Note: Annex 8 has a definition of discharge but it does not address municipal or industrial point sources or agricultural non point sources and Annex 5 had a definition for discharge but specific to discharges from vessels.)
- Considerable overlap and duplication may exist between the chemical lists identified as being mandated in Specific Objectives Supplement to Annex 1 and listed chemicals in Annex 10 appendices.

(b) Are program outcomes and/or environmental outcomes clearly identified?

- The concept of indirect toxic effects of HPS has not been identified in Annex 10.
- The concept of chronic effects of HPS has not identified in Annex 10 and is not reflected in the Appendices.

(c) Are there outdated terms, concepts or references?

- The current focus of the Annex 10 appendices is acute risks on aquatic and animal life by HPS. Appendix 1 is a list of known substances that have toxic effects while Appendix 2 is a list of substances that potentially could have toxic effects. This should be made clear in part 1 of the Annex.
- Annex 10's focus on HPS is based on acute toxicological effects. It should be defined in terms of total risk.

(d) Other Comments

- Annex 10 appears to support Annexes 4, 5, 6, and 8 and as such may be specific to accidental releases of HPS into Great Lakes waters.

Relevancy

2. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?
 - a. Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?
- Criteria for listing (or referencing) chemicals should be linked (i.e., toxicity and discharge) in order to consider the quantity that results in toxic effects.
- Non lethal effects should be considered as part of toxicity.
- Indirect toxic effects of HPS should be addressed. A compound may by itself not hazardous but could by interaction or reaction with the environment produce a toxic condition for biota.
- Synergistic effects should be noted in Annex 10. Possible reference back to Supplement to Annex 1 – 2(d)
- b. Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?
- Not clear whether the Annex has driven additional action.
- c. Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?
- Annex 10 should take account of CEPA review of the Domestic Substances List of chemicals in commerce, High Production Volume chemicals, and should generally link to other program lists (as suggested by the draft IJC white paragraph 1).
- The Annex needs to be substantially re-written to clarify the original intention of the Annex. Was the annex written to identify only those HPS entering the Great Lakes waters from accidental releases from the transport, storage, handling and disposal from vessels and onshore and offshore facilities or a broader concern of hazardous substance release from any source?

Achieving Results

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?
 - (a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

- Work group members did not have sufficient information to assess the science used to develop Annex 10.
- (b) Does the Agreement fail to address critical issues?
- Work group members did not have sufficient information to understand how the Annexes were intended to work together and the issues they were to address.
- 2. Are the demonstrated results consistent with goals and objectives in the Agreement?**
- (a) Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not.
- Several Canadian work group members noted that Canadian Federal laws do not address all of the elements of Annex 10.
- (b) Are any parts of the Agreement in any way an obstacle to progress?
- No comments.
- (c) Are there external impediments that prevent implementation?
- No comments.
- (d) Are there other barriers to progress?
- No comments.
- (e) To what extent can results be attributed to the Article/Annex?
- Other lists developed by the parties address elements of Annex 10, but not clear whether they were influenced by the Agreement.
3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?
- (a) Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?
- No comments.
- (b) Other comments.
4. Is the science in the Agreement still relevant? If not, why?
- (a) If the science in the Agreement is still relevant, how has it been incorporated?

- No comments.
- 5. Does the Agreement incorporate science to address emerging issues?
 - a. Can the Agreement accommodate emerging issues?
- The Parties are not utilizing Annex 10 lists effectively nor are they being “continually revised” as per 1(c)
- 6. Other comments.
 - Article 11 of the WQA (Purpose) may need to be referenced in Annex 10 as the mechanism to protect the Great Lakes from environmental harm.
 - GLWQA should be reflected in Canadian Federal Environment Law.
 - Need to assess whether criteria used in other programs are consistent with Annex 10 criteria.

Management Framework

1. Are management and coordination approaches identified in the Agreement?
 - (a) Is management and coordination specified? If so, briefly outline.
 - Work group members generally agreed on the need for a management mechanism and formal process for proposing new chemicals similar to the process contemplated under Annex 1.
 - (b) Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?
 - IJC Eleventh Biennial Report recommended using other lists in lieu of Annex 10. Some work group members did not agree with the recommendation because it would reduce the focus on the Great Lakes.
 - (c) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?
 - Work group members did not see any priority-setting process under Annex 10.
 - (d) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

- Work group members acknowledged the development of lists by other programs and recommended that the link between Annex 1 and Annex 10 be clarified.

Other comments

- A management process should be established to insure that the HPS appendices are updated by the parties
- Develop appropriate links between Annexes 1 and 10 so that chemicals adopted by one Annex may be nominated to the other.

Accountability

1. Is there comprehensive monitoring and reporting?

(a) Are there clear indicators to determine progress?

- Work group members generally found that Annex 10 is focused on maintaining the list of chemicals and does not drive action.

(b) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

- Need to build accountability provisions into Annex 10 possible link to Annex 1 to have “specific objectives” developed or referenced.

(c) Are they being met?

- Work group members generally found a need for management coordination and accountability processes built into the Agreement, including Annex 10.

(d) If not, why not?

- No criteria under the Agreement for the parties to take action on the chemicals on the list.

(e) Is the frequency of reporting sufficient?

- No comments.

(f) Other comments.

2. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

a. Is the role of the IJC as set out in the Agreement clear and appropriate?

b. Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

- c. Other comments.
 - No specific role is specified for the IJC under Annex 10.
 - One commenter suggested that the IJC could maintain a secretariat role to report on lists updates.
3. Does the Agreement enable an effective level of commitment?
- a. Is the role of the public identified?
 - b. Does the Agreement identify appropriate mechanisms for public engagement?
 - Annex 10 does not specify a role for the public.
 - c. Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?
 - The work group members found it difficult to assess the activities of the parties and other stakeholders without more information about their programs.
 - The parties are to maintain the lists and develop and implement management programs. Some chemicals are addressed through existing programs, but there are too many chemicals to assess actions for all of them.
 - d. Does the Agreement drive action by communities and industry?
 - No comments.
 - e. Other comments.
- A process similar to Annex 1 should be incorporated so that other parties may propose changes to Annex 10 lists.
 - The development of a more formal relationship between the GLWQA and Canadian and United States environmental federal laws should be examined in order to affect a greater level of accountability

Annex 12: Persistent Toxic Substances

Clarity

1. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(a) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

- Work group members also requested clarification of terms used the Annex.
- Virtual elimination and zero discharge: There was much discussion respecting the definitions of virtual elimination (VE) and zero discharge (ZD). Workgroup members agree that these concepts are not defined in the GLWQA. Some members believe that this should be taken up by the Parties in a future revision to the GLWQA. Many members believe that clarification is warranted to make clear that VE and ZD do not include naturally occurring substances (or to make clear that VE and ZD refer to PTS that are released as an outcome of anthropogenic activities.) Some members feel that the concept of “unwarranted” vs. “warranted” releases of PTS should be introduced. Others believe VE needs to refer to more than just sources of PTS, including relating to its substantial absence from the environment and also to an absence of effects on indigenous organisms. Finally, some work group members felt that there must be more emphasis on international sources of PTS to the basin, with more direct links to what is happening internationally to management mechanisms in the basin, because if they are not achieving ZD internationally, there will always be inputs of PTS to the basin. Note that the Virtual Elimination Task Force did come up with descriptions of ZD and VE.
- The definition of “persistence” and “half-life” generated much discussion. Some workgroup members noted that a substances “half life” is media dependant, and that sediments and biota should be considered in a discussion of half life, not only water. Other workgroup members suggested that an analysis of how other treaties, such as the Stockholm Convention on Persistent Organic Pollutants, which address PTS should be studied to make certain that there is consistency across various agreements to which one or both of the Parties are signatories. Other work group members are in favor of leaving the definitions of persistence as they are currently defined.

(b) Are program outcomes and/or environmental outcomes clearly identified?

- Workgroup members recommended a rewrite of paragraph 7.

7. Research. Research should be intensified to support the programs related to persistent toxic substances, especially for the implementation of the above recommendations for monitoring (item 4), an early warning system (item 5), and the protection of human health (item 6). This means that the research should strive to determine the sources, transport, fate and exposure pathways, and effects of toxic substances aimed at the protection of human health, fishery resources and wildlife of the Great Lakes Basin Ecosystem. In particular, a review should be conducted to determine:

(a) The research necessary to develop analytical and modeling tools that provide a quantitative relationship between sources of toxic substances to the waters of the Great Lakes (whether those sources are within the basin or outside the basin and whether those sources are natural or anthropogenic) and the exposure of various Great Lakes human and aquatic and terrestrial wildlife communities to those substances;

(b) The significance of effects of persistent toxic substances on human health and aquatic life; and

(c) Interactive effects of residues of toxic substances on aquatic life, wildlife, and human health.

(c) Are there outdated terms, concepts or references?

- Some work group members argued that PTS are released to the environment from multiple entry points other than just point, non-point sources and other wastes but also through life cycle use of products containing PTS, and that there should be a focus on elimination of uses of PTS in production and commerce. Other work group members felt the emphasis should be on products only where there is a threat of release.
- The work group unanimously agreed that the concept of “joint programs” is ambiguous, given that the Parties do not operate joint regulatory programs.
- The work group felt that the concept of “action levels”, as articulated in section 6, is open to multiple interpretations as to the degree of effort that must be taken to “protect human health.” Moreover, there may be inconsistencies between Annex 12 and Annex 1. For example, are the action levels under Annex 12 consistent with the interim goals under Annex 1, and does Annex 12 focus on human health and Annex 1 focus on aquatic life? Some reviewers also commented that interactive effects and multi-media exposure in paragraph 6 has not been addressed.

(d) Other Comments.

- Work group members noted that the implementation dates for programs and measures in 3(a) and 3(b) are outdated.

Relevancy

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?
 - a. Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?
 - b. Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

- c. Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

By in large, the work group felt that Annex 12 remains very relevant, and should be retained essentially intact, with only minor changes, similar to the 1999 review conclusions of the Parties. Some workgroup members expressed the concern that, as Annex 12 only addresses persistent toxic substances, and not substances which, while not technically persistent, are continuously discharging and may be toxic to aquatic organisms (e.g., some pharmaceutical compounds), there may be a gap in addressing these materials in the GLWQA, further noting that Article II(a) calls for the “reduction of toxic substances in toxic amounts...”

Achieving Results

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?
 - a. Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?
 - Work group members differed on the degree to which relevant science has been used to implement Annex 12.
 - One group of work group members believed that reporting on human health impacts has been limited. They found a reluctance in the U.S. to report on human health effects. They also believe that reporting from Health Canada has been restricted in recent years.
 - Other work group members believe that many studies have been released in both the U.S. and Canada, such as those from ATSDR.
 - Work group members also disagreed on the adequate use of Structure Activity Relationships (SAR) to assess chemicals prior to their use in commerce.
 - One co-chair summarized the discussion by pointing out that the question is “Does the Agreement provide the language to authorize the studies and have the resources been allocated?” CEPA review of the current inventory of domestic substances invest the use of SARs and other quantitative measures. A lot of information is being generated in the U.S. and Canada using SARs, but the information needs to be better integrated into Great Lakes monitoring programs.
 - b. Does the Agreement fail to address critical issues?
 - Work group members found a need for additional resources to support implementation at the lake level, particularly to improve consistency in monitoring programs.

2. Are the demonstrated results consistent with goals and objectives in the Agreement?
 - a. Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not.
 - Some reviewers feel that the Early Warning System is not properly integrated in a Great Lakes context, though much good work is going on. Others expressed a desire to implement a sentinel species wildlife program.
 - b. Are any parts of the Agreement in any way an obstacle to progress?
 - None identified.
 - c. Are there external impediments that prevent implementation?
 - Additional resource needs.
 - d. Are there other barriers to progress?
 - No comments.
 - e. To what extent can results be attributed to the Article/Annex?
 - Work group members found that many monitoring programs are achieving the results outlined under Annex 12, but the results have not been documented under Annex 12.
3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?
 - a. Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?
 - Work group members generally agreed that insufficient resources have been devoted to monitoring.
 - One commenter especially noted the lack of monitoring for fish health in relation to persistent toxic substances.
 - b. Other comments.
 - Is the science in the Agreement still relevant? If not, why?
 - If the science in the Agreement is still relevant, how has it been incorporated?

- Commenter observed that there has been mixed results in data availability, computing the loads, and doing the modeling. Also difficult to determine acceptable loadings. Progress has been made, e.g., IADN, Lake Michigan Mass Balance, and Lake Ontario, but loads on a lakewide basis are not well known. With the exception of Lake Erie, we don't have a good understanding of phosphorus load to the Great Lakes. Techniques have been experimented with to try to develop lakewide tributary load estimates based on monitoring of selected tributaries.
- Does the Agreement incorporate science to address emerging issues?
 - Can the Agreement accommodate emerging issues?
 - Work group members discussed the need to address emerging contaminants through the application of SARs as part of monitoring programs.
- Other comments.
 - Some reviewers felt that "previously unidentified" substances identified under paragraph 4(d) have not been sufficiently included in monitoring programs to achieve goals a-c in many cases.
 - Other Comments/Options:
 - Re-start the Canadian Great Lakes Human Health Effects Program
 - Improve chemical review process.
 - Improve lake level monitoring.

Management Framework/Accountability

1. Are management and coordination approaches identified in the Agreement?
 - a. Is management and coordination specified? If so, briefly outline.
 - b. Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?
 - c. Do management and coordination approaches facilitate priority setting to address issues of greatest importance?
 - d. Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?
- Some reviewers felt that a management framework be adopted in Annex 12 to oversee and to prioritize actions to assist the parties with the virtual elimination of PTS. The GLBTS was recommended as an appropriate location for the overall management of the implementation of Annex 12 activities. Others favored a more generic option statement regarding management and oversight of Annex 12.

- Some reviewers felt that there was not an adequate reporting on Annex 12, though there are reports that address significant parts of the Annex. Work group members suggested that Parties should conduct a “gaps analysis” of current reporting to determine where there are potential shortfalls in information on Annex 12 activities, in order to fill in information gaps and help outside parties to determine whether Annex 12 is being adequately implemented.

2. Is there comprehensive monitoring and reporting?

- a. Are there clear indicators to determine progress?
 - b. Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?
 - c. Are they being met?
 - d. If not, why not?
 - e. Is the frequency of reporting sufficient?
 - f. Other comments.
- Work group members found that monitoring and reporting is conducted by various Federal, State, and Provincial programs. TRI, NPRI, and GLBTS meet many of the objectives of Annex 12.
 - The parties don’t generate a specific Annex 12 report, but other reports meet the spirit and many of the requirements of Annex 12.
 - Some work group members suggested a need for a “roll-up” report to respond directly to the reporting requirements under the Agreement. The work group members argued that such a report is needed to help the parties and the public gain access to information called for under the Agreement. One commenter also suggested that existing reports focus by-products and emissions and do not sufficiently assess the use of BPTS in raw materials and products.
 - Other work group members argued that current reporting is sufficient.

3. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

- a. Is the role of the IJC as set out in the Agreement clear and appropriate?
 - b. Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?
 - c. Other comments.
- Work group members saw the activities under Annex 12 as the responsibility of the parties, but with
Potentially a more prominent role for the IJC.

Annex 15: Airborne Toxic Substances

Clarity

There were no comments on Annex clarity.

Relevancy

Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

- The group agreed that atmospheric deposition will only become more important in the future as sediments are cleaned up and out-of-basin sources become more significant. The Annex focuses on airborne toxics and mentions research on the significance of atmospheric loadings to the Great Lakes system relative to other pathways. There was a comment that inputs from all pathways should be included in Annex 15. However, programs to assess inputs from non-point sources and sediments are mentioned in Annexes 13 and 14, but these programs have not been developed as robustly as for atmospheric deposition. Part 4 of Annex 12 calls for monitoring to determine concentrations in the Great Lakes System, impacts of PTS, and sources of input of PTS.
- There was a comment that non-aquatic wildlife should be included under 2(b).

Achieving Results

- The group generally agreed that the IADN program had been successfully implemented. Monitoring for additional parameters would have been desirable, but resource limitations limited the parameters monitored. Overall, IADN had achieved the goals outlined under Annex 15.

Are the demonstrated results consistent with goals and objectives in the Agreement?

- Many of the activities in Annex 15—research on atmospheric deposition, modeling of atmospheric transport of PTS, the realization of IADN, and pollution control measures through national regulation and voluntary efforts like the GLBTS—have been implemented. IADN puts out periodic atmospheric loadings reports. Peer reviews on the IADN have been conducted, and recommendations from those reviews have been included in IADN Implementation Plans and have been successfully carried out.

Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

- Work group members discussed the need for additional resources to support the IADN program.

Management Framework/Accountability

- Management and accountability are addressed through the IADN program. Work group members discussed the peer review process used by the program.

Is there comprehensive monitoring and reporting?

- Reporting on Annex 15 activities occurs through several venues (IADN loadings reports, SOLEC reports and conferences, GLBTS progress reports, etc.) but there is no periodic report for Annex 15 per se. This is a larger policy issue relevant to all of the Annexes (Is Workgroup A addressing it?), as is the role of the IJC in implementing the Annexes. See Options 12(a) and 12(b) in the Annex 12 options paper.
- The group noted the importance of developing improved models as called for under Part 2(c), as well as the need for more funding for monitoring and modeling.

Annex 15 does not specifically mention monitoring of substances of emerging concern, though Annex 12 calls for establishment of an Early Warning System to “anticipate future toxic substances problems”.

Other comments

- There is only a short reference to out-of-basin and foreign sources in Part 5(a). These sources are significant contributors to atmospheric deposition to the Lakes.

4. Response to Overarching Questions

Question 1 – Is the Agreement’s purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

The Purpose statement of the Agreement is still both valid and relevant; however, the Parties need to recognize that to achieve the concept of virtual elimination of toxic substances in Great Lakes waters, airborne pollutants from global sources need to be addressed more vigorously in international fora such as the UN and Commission for Environmental Cooperation’s Sound Management of Chemicals Workgroup. Further, opportunities for public comment and general interaction with the Parties need to be made clearer in a revised Agreement.

Question 2 – Does the Agreement, and its implementation, achieve the desired effect of restoring and maintaining the chemical, physical and biological integrity of the waters of the Great Lakes basin ecosystem?

Given all the suggested options and recommendations from Workgroup “B” reviewers with respect to the text found within the current agreement, an *amendment by protocol* of the Agreement might be the most appropriate mechanism to achieve the desired effect of restoring and maintaining the chemical, physical and biological integrity of the Great Lakes basin ecosystem.

Question 3 – Is the Agreement, and its implementation, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so, what are they?

The GLWQA is successful on many fronts but also falls short in that it is an agreement that commits only Canada and the United States to restore and maintain the chemical, physical and biological integrity of the Great Lakes. Though much progress has been made on the home front, global pollutants cause a significant impact in the Great Lakes Ecosystem. To properly define the Water Quality Agreement as an international agreement on the Great Lakes, the Agreement should specify that the Parties recognize that inputs from airborne pollutant into the Great Lakes are also coming from global sources and this fact needs to be addressed more specifically through multinational agreements and seek international solutions. The Agreement needs to commit the parties to monitor and model the global contribution to the Great Lakes of sources of pollutants. The final format for addressing the issue of global long range transport of pollutants can be integrated into Annex 12 and 15. Can the virtual elimination of persistent toxic substances in the Great Lakes be considered achieved if non compliance is caused only as the result of deposition from international sources?

Question 4 – In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

Workgroup “B” was tasked with reviewing in detail Articles IV and Annexes 1, 10, 12 15 and to a lesser degree Article VI. This question is adequately addressed within the review of these sections detailed within the options and recommendations in the Path Forward section our report.

Question 5 – What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

Throughout the review, many work group members noted that reports outlined in the Agreement have not been prepared. There is an axiom that states “what gets monitored gets managed”. The Parties to the GLWQA fail to report adequately on a variety of Annexes and Articles. The management of the Agreement cannot be properly assessed against its targets and timelines when deliverables are not monitored and routinely reported. The six year review of the adequacy of the agreement is an insufficient mechanism to insure compliance by the parties. A new approach is necessary to monitor compliance with both the intent and deliverables within the Agreement. Binational reporting to the Binational Executive Committee may be an option to consider in order to track compliance.

5. Path Forward

I. OPTIONS

A. Article IV and Annex 1

Major issues relating to Article IV and Annex 1 have been identified by the workgroup as warranting further detailed evaluation under the GLWQA binational review:

1. *Review of Specific Objectives*

To our knowledge, a biennial consultation process of the Parties to review and amend Annex 1, per Article 4, S.3 and Specific Objectives Supplement to Annex 1, S.2(a), has not occurred in recent years. During a revision in 1987, the Parties agreed to develop and maintain three lists of substances [Supplement to Annex 1, S.2(c)(i-iii)]. These lists have not been maintained.⁹

Consequently, there are numerous discrepancies between Specific Objectives in Annex 1 and the national, provincial, or state criteria, objectives or guidelines of Canada and the US that have been developed and maintained, some of which are more stringent than the current Specific Objectives. The majority of Specific Objectives date to 1973 and may not reflect the current knowledge base (*e.g.*, environmental fate, behavior, dose-response toxicity, mode of action, etc.), nor advancements to analytical methods. In addition, there are improved, modern approaches to develop water quality criteria that are not incorporated.

Option 1: Article IV, S.3 should be revised to define a biennial consultation to include membership, meeting location, reporting frequency, and accountability. The consultation could take place as a part of the biennial State of the Lake Ecosystem Conference, or the GLBTS Integration Workgroup could serve as the defacto consultation manager, using Article IV, S.3 as the authority to do so.¹⁰ The public consultation, per Specific Objectives Supplement to Annex 1, S.2(a), could be also be managed by the GLBTS Integration Work Group.

Option 2: Additional clarity should be given to the relationship of lists 1, 2, and 3 in the Specific Objectives Supplement to Annex 1 and the lists in Appendix 1 and 2 of Annex 10. The Parties should also consider the possibility of amalgamating/consolidating Annex 10 into The Specific Objectives Supplement to Annex 1 in a manner consistent with the intent of both Annexes.

Option 3: A number of options are identified for consideration to review, revise and/or amend Annex 1. Each of the options below requires a binational consultation in accordance

⁹ Both Parties actively maintain lists of substances that might partially meet the intent and specific requirements of these sections. Examples include: the Canadian Domestic Substances List Categorization and Screening Program (DSL), Canada's National Pollutant Release Inventory (NPRI) program, the U.S. EPA High Production Volume (HPV) Challenge program, U.S. EPA's Toxic Substances Control Act (TSCA) Inventory Update Rule, etc. The Parties should take consideration of this in a revision to the GLWQA.

¹⁰ A similar binational entity to the GLBTS could serve in this role, as well.

with Article IV, S.3(a) and Specific Objectives Supplement to Annex 1, S.2(a), as discussed above. Three specific options are as follows:

3(a): The Parties develop new Specific Objectives using a common methodology: The Parties create a revised Annex 1 for setting new Specific Objectives for the management of open waters, using current toxicological information and a binationally adopted methodology for deriving common numeric values.

3(b): The Parties adopt current values as new Specific Objectives in a revised Agreement: The Parties adopt new Specific Objectives from existing pool of current criteria and guidelines from Federal, Provincial, State and Tribal regulatory programs (e.g., Canadian Water Quality Guidelines and U.S. EPA's Great Lakes Initiative).

3(c): The Parties rely on current programs in lieu on Specific Objectives: Rather than developing new common Specific Objectives, the Parties revise Annex 1 to provide guidance on the use of existing Federal, Provincial, State and Tribal regulatory program's water quality criteria or guidelines.

Option 4: Consideration should be given to revising the list of entities and a consultation and decision making process under Specific Objective Supplement 2(a) which can propose changes to the Specific Objectives to include Tribes, First Nations, aboriginal peoples, municipalities and/or the general public.

2. *Aquatic media-based objectives*

Water quality objectives may not be adequate to protect all components of the aquatic ecosystem. An expansion in sediment and tissue based guidelines and objectives may be warranted. It may also be advantageous to provide objectives to protect both human and non-human (e.g., wildlife, benthos, fish) use of water, sediment and tissue.

Option 5: Revise Article 4, S.1(a) to include explicit mention of sediment and tissue based guidelines and objectives, if either nation has developed values, or should direct the parties to develop and maintain such guidelines and objectives, where warranted .

3. *Newly detected substances and chemical mixtures not addressed through consultation*

Recently detected substances of emerging awareness in the Great Lakes Basin (e.g., PDBE, PFOS) have not been addressed by a formal, binational consultation of the Parties under the auspices of the Great Lakes Water Quality Agreement, but discussions have occurred in other forums. Combined effects of multiple pollutants (Article 4, 5.3(a)) also have not been addressed by consultation of the Parties.

See Option 1, above. Substances of emerging awareness and mixtures should be addressed by the Parties in the biennial consultation process.

4. *Persistent, toxic substances (PTS) Specific Objectives and Virtual Elimination:*

Supplement to Annex 1, S.1(a) states, “..the Specific Objectives set out for such substances [i.e., persistent toxic substances] are adopted as interim objectives”. Some regard this as as permission by the Parties to discharge PTS in perpetuity at stated levels, rather than being understood as interim management objectives toward virtual elimination.

Option 6: The Specific Objectives Supplement to Annex 1 – 1(a) should be revised to make more explicit that Specific Objectives are interim management objectives to track progress toward virtual elimination (replace with “zero discharge”?) and not misconstrued as discharge standards and/or permission for the continued anthropogenic release of PBT’s at the levels stated by the objectives.

Option 7: Rather than including a single objective for PTS, the Parties might consider a recovery trajectory (i.e., a series of gradually declining objectives and dates) toward virtual elimination (replace with “zero discharge”?).

5. *Out of Basin Sources are not addressed by the GLWQA*

Sources of Pollutants from out of the Great Lakes Basin that travel into Great Lakes Basin Ecosystem are not explicitly addressed in Article IV or Annex 1 of the Great Lakes Water Quality Agreement.

Option 8: Article IV and Annex 1 should make mention of out-of-basin sources, and the need for links to international pollution prevention and monitoring programs such as UNEP, through the GLBTS.

Supplemental Options

Option 9: Reference to the Boundary Waters Treaty of 1909 Article 4 paragraph 2 (“...waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other.”) would help clarify the reasons for development of Specific Objectives. The Parties should consider rewriting Article IV – 1 preamble to reference to the Boundary Waters Treaty of 1909 Article 4 paragraph 2.

Option 10: Some terms used in Article IV and Annex 1 in several cases lack sufficient specificity, are neither measurable nor results based and should be defined in Article 1. Reference to definitions found in other articles/annexes or define the following terms in Article 1:

- Virtual Elimination
- Beneficial use
- Ecosystem
- Persistent Toxic substance
- Statistically valid sampling data
- Reasonable and practicable measures
- Flow augmentation
- Natural phenomena
- In-shore waters

Pollutants (*could be the same as "Hazardous polluting substances?"*)
Best Available Technology

Option 11 : Article IV makes reference to the Parties consulting on "the control of pollutant loading rates for each lake basin to protect the integrity of the ecosystem over the long term". It is not clear whether the intent is to promote action by either party to reduce loading (implying some kind of binational waste load allocation...) or whether it was simply intended to share information on emissions to the lakes (as is done under LaMPs). The intent of the consultation on loading rates should be clarified in the Agreement.

Option 12: The inclusion of The Specific Objectives Supplement to Annex 1 section 3, Lake Ecosystem Objectives, seems out-of-place and underdeveloped concept as it currently stands. The Parties should consider transferring the concepts of Lake Ecosystem Objectives as articulated in The Specific Objectives Supplement to Annex 1 section 3, into Annex 2 or to its own annex on ecosystem objectives. The Parties could also consider removing this language altogether.

B. Annex 10

Major issues relating to Annex 10 have been identified by the workgroup as warranting further detailed evaluation under the GLWQA binational review. Annex 10 recognizes that there are non-persistent hazardous chemicals in commerce if released into the Great Lakes ecosystem will have or potentially could have toxic effects on aquatic and animal life.

1. Annex 10 appendices are antiquated and unnecessary.

As stated in the draft IJC White Paper (see appendix 1, the reason for maintaining the appendices no longer exists. There are many chemical lists of HPS that are maintained electronically that could be incorporated in Annex 10 by reference (as outlined in paragraphs 5&6). Annex 10 also appears to be supportive of Annexes 4 and 8 and as such is specific to accidental releases of HPS into Great Lakes waters. This inference is further supported by annex 10 text as outlined in sections 3(b), 5 and 6.

Option 1a): Eliminate appendices to Annex 10 and incorporate electronic lists by reference. Rewrite Section 1 to reflect change and update Article 111 to with a "General Objective" principle for HPS entering Great Lake's waters.

Option 1b) Eliminate procedures for listing chemicals (Sections 2 and 4), and simply rely on other US and Canadian programs. Rewrite Annex 10 to reflect change linkages.

Option 1c) Maintain procedures for listing chemicals (Sections 2 and 4), changing "listing" to "referencing"

Option 1d) Eliminate Annex 10, and incorporate lists by reference in Annexes 4 and 8, which address programs and measures to control risk of spill pollution or releases from the transport, storage, handling and disposal of HPS from vessels and onshore and offshore

facilities. This option in no manner should reduce the capacity of the Agreement to take action on HPS as per Article 11.

2. *Criteria for listing substances.*

Toxicological and discharge criteria for listing substances in Annex 10 may be dated. Chronic toxicity, as well as synergistic, non lethal and indirect effects may not be adequately addressed. Moreover, toxicological and discharge criteria should be considered together. Criteria should also consider prioritization of management actions.

As the need to maintain specific lists within Annex 10 is longer needed, are toxicological and discharge criteria still needed within Annex 10 (Sections 3(a) and 3(b)? A determination as to whether other programs listing criteria are sufficient to address the purposes of Annex 10 is warranted.

Option 2(a): Revise and update toxicological and discharge criteria in Section 3 (a) and (b) to reflect current state of knowledge.

Option 2(b): Eliminate Sections 3(a) and (b) and rely on other US and Canadian Programs to identify HPS.

Option 2(c): Specify in the Annex the HPS lists (from other sources) that need to be referenced. Provide a mechanism for the parties to update referenced lists. (Utilize the IJC or a Great Lakes governance model like the GLBTS)

3. *Management/Reporting in Annex 10*

There are no formal management, maintenance, timelines or reporting mechanisms incorporated in Annex 10. For that reason the Appendices have not been updated since the Annex was created. If option 1(a) or 1(b) and 2(b) above are selected by the Parties, it may make sense to incorporate Annex 10 into Annexes 4 and 8. Otherwise, formal management and reporting mechanisms are warranted.

Option 3 (a): Incorporate formal management and reporting mechanism into Annex 10.

Option 3 (b): Eliminate Annex 10, and incorporate lists by reference in other Annexes like 4 and 8, which address programs and measures to control risk of pollution from transport, storage, handling and disposal of HPS. Report through other appropriate annexes.

Option 3(c): Report on Annex 10 issues as part of an overall GLWQA chemicals report which incorporates Annex 1 and perhaps Annex 12. (perhaps through the GLBTS Annual Report.)

C. **Annex 12**

Major issues relating to Annex 10 have been identified by the workgroup as warranting further detailed evaluation under the GLWQA binational review. Generally, the language in Annex 12 is

thought to be relevant, but there are various opinions regarding how well it has been implemented. Following are specific work group options. Note that within these groupings, options are not necessarily mutually exclusive

1. *Update dates in Annex 12*

Work group members noted that the implementation dates for programs and measures in 3(a) and 3(b) are outdated.

Option 1: If these items have not yet been achieved, new dates should be set. If they have, the language should be re-phased so that the existing programs or information are "maintained."

2. *Virtual elimination and zero discharge*

There was much discussion respecting the definitions of virtual elimination (VE) and zero discharge (ZD). Workgroup members agree that these concepts are not defined in the GLWQA. Some members believe that this should be taken up by the Parties in a future revision to the GLWQA. Many members believe that clarification is warranted to make clear that VE and ZD do not include naturally occurring substances (or to make clear that VE and ZD refer to PTS that are released as an outcome of anthropogenic activities.) Some members feel that the concept of "unwarranted" vs. "warranted" releases of PTS should be introduced. Others believe VE needs to refer to more than just sources of PTS, but also to relate to its substantial absence from the environment and also to an absence of effects on indigenous organisms. Finally, some work group members felt that there must be more emphasis on international sources of PTS to the basin, with more direct links to what is happening internationally to management mechanisms in the basin, because if they are not achieving ZD internationally, there will always be inputs of PTS to the basin. Note that the Virtual Elimination Task Force also developed descriptions of ZD and VE, which are attached.

Option 2(a): Define VE and ZD in the context of in-basin anthropogenic sources of PTS.
– 2a(i-ii)

Option 2(b): Include language in redrafted definitions of VE and ZD that introduce the idea of warranted versus unwarranted releases.

Option 2 (c): Expand the definition of VE to include substantial absence from the environment and also to an absence of effects in the indigenous organisms.¹¹

Option 2 (d): Make clear in Annex 12 that focusing on VE and ZD in the basin does not address international sources of PTS and that the Parties must work with international fora to reduce out of basin sources as well as in basin sources of PTS.

¹¹ One proposed definition, "Virtual elimination means the treatment of, removal of or prohibition of activities involving persistent toxic substances so that they are undetectable and cause no injury to health or property."

Option 2 (e): Refer to the Virtual Elimination task Force descriptions of ZD and VE. (please see pages 28-29 below).

3. *Rewrite paragraph 7, on Research*

Work group members recommended that paragraph 7 on research be rewritten.

Option 3: Reword paragraph 7 – as follows:

Research. Research should be intensified to support the programs related to persistent toxic substances, especially for the implementation of the above recommendations for monitoring (section 4), an early warning system (section 5), and the protection of human health (section 6). This means that the research should strive to determine the sources, transport, fate and exposure pathways, and effects of toxic substances aimed at the protection of human health, fishery resources and wildlife of the Great Lakes Basin Ecosystem. In particular, research should be conducted to determine:

- (a) The research necessary to develop analytical and modeling tools that provide a quantitative relationship between sources of toxic substances to the waters of the Great Lakes (whether those sources are within the basin or outside the basin and whether those sources are natural or anthropogenic) and the exposure of various Great Lakes human and aquatic and terrestrial wildlife communities to those substances;
- (b) The significance of effects of persistent toxic substances on human health and aquatic life; and
- (c) Interactive effects of residues of toxic substances on aquatic life, wildlife, and human health.

4. *Releases of PTS from Products*

Some work group members PTS are released to the environment from multiple entry points other than just point, non-point sources and or wastes but also through life cycle use of products contain PTS, and that there should be a focus on elimination of uses of PTS in production and commerce. Other work group members felt the emphasis should be on products only where there is a threat of release.

Option 4 (a): Section 2a(iii) should be rewritten or harmonized with the concept additional sources or production of PTS as defined in 3(a).

Option 4 (b): Section 2a(iii) should be rewritten or harmonized with the concept additional sources or production of PTS as defined in 3(a), to the extent that these may result in releases to the basin.

5. *Definitions of Persistence and Half Life*

The definition of “persistence” and “half-life” generated much discussion. Some workgroup members noted that a substances “half life” is media dependant, and that sediments and biota should be considered in a discussion of half life, not only water. Other workgroup members suggested that an analysis of how other treaties, such as the Stockholm Convention on Persistent Organic Pollutants, which address PTS should be studied to make certain that there is consistency across various agreements to which one or both of the Parties are signatories. Other work group members are in favor of leaving the definitions of persistence as they are currently defined:

Option 5 (a): Persistence should be redefined to include multiple matrices (e.g., sediments, biota).

Option 5 (b): Parties should refer to other PTS treaties and/or agreements such as POPs, to ascertain whether there is consistency across the various definitions of Persistence.

Option 5 (c): Parties should not change the current definition of Persistence.

6. *Acknowledge that programs are not “joint” but “cooperative” between two parties*

The work group unanimously agreed that the concept of “joint programs” is ambiguous, given that the Parties do not operate joint regulatory programs.

Option 6: Revise language under paragraph 3(c) from “Joint programs” to, “coordinated programs”.

7. *Clarify “Action Level’s*

The work group felt that the concept of “action levels”, as articulated in section 6, is open to multiple interpretations as to the degree of effort that must be taken to “protect human health.” Moreover, there may be inconsistencies between Annex 12 and Annex 1. For example, are the action levels under Annex 12 consistent with the interim goals under Annex 1, and does Annex 12 focus on human health and Annex 1 focus on aquatic life? Some reviewers also commented that interactive effects and multi-media exposure in paragraph 6 has not been addressed.

Option 7: Parties should revisit the term “action levels”, in section 6, to clarify what they are supposed to represent, and how they are to be utilized, and how they relate to Annex 1 Water Quality Objectives, and other relevant health or toxicologically based threshold values .

8. *Address non-persistent substances/continuously available toxic substances*

Some workgroup members expressed the concern that, as Annex 12 only addresses persistent toxic substances, and not substances which, while not technically persistent, are continuously discharging and may be toxic to aquatic organisms (e.g., some pharmaceutical compounds), there may be a gap in addressing these materials in the GLWQA, further noting that Article II(a) calls for the “reduction of toxic substances in toxic amounts...”

Option 8: Parties should consider how substances which are continuously available in the environment through steady discharge, and toxic (i.e., toxic in toxic amounts) are addressed in the GLWQA, either through Annex 12, or another Annex.

9. *Adequate funding for Monitoring and Surveillance*

Some reviewers felt that "previously unidentified" substances identified under paragraph 4(d) have not been sufficiently included in monitoring programs to achieve goals a-c in many cases.

Option 9: Provide more resources to monitoring programs, integrating with early warning system.

10. *Integrated Early Warning System*

Some reviewers feel that the Early Warning System is not properly integrated in a Great Lakes context, though much good work is going on. Others expressed a desire to implement a sentinel species wildlife program.

Option 10: Integrate disparate pieces of early warning system (section 5) into a cohesive and integrated "system." Provide links to national screening and research programs. This is needed in order to rapidly separate newly identified chemicals that are a potential threat from those that are not. Develop a sentinel species wildlife program.¹²

11 *Establish Management Framework/Management Responsibilities*

Some workgroup members expressed a concern that there are no mechanisms in the GLWQA for managing chemicals (i.e., how do the Parties set priorities?). Reviewers felt that a management framework should be adopted in Annex 12 to oversee and to prioritize actions to assist the parties with the virtual elimination of PTS. The GLBTS was recommended as an appropriate location for the overall management of the implementation of Annex 12 activities. Others favored a more generic option statement regarding management and oversight of Annex 12.

Option 11: Parties should develop a management framework for addressing chemicals under Annex 12, in order to set priorities and decide which chemicals to address first.

AND

(a): "Codify" the GLBTS program in Annex 12, to provide for the overall management of Annex 12 activities. Include a more active oversight role for the IJC, as well.

¹² A proposed definition: "A true animal sentinel system is a system in which data on animals exposed to contaminants in the environment are regularly and systematically collected and analysed to identify potential health hazards to other animals or humans." Source, Fox, Glen, EHP, Volume 109, Supplement 6, December, 2001.

OR

- (b): Work in cooperation with their public and private partners toward the goal of virtual elimination of persistent toxic substances resulting from human activity, particularly those which bioaccumulate, from the Great Lakes Basin, so as to protect and ensure the health and integrity of the Great Lakes ecosystem. The underlying tenet of these actions must be that the governments cannot, alone, achieve the goal of virtual elimination. They must challenge all sectors of society to participate and cooperate to ensure success.

12. *Consolidate Annex 12 Reporting*

Some reviewers felt that there was not an adequate reporting on Annex 12, though there are reports that address significant parts of the Annex. Work group members suggested that Parties should conduct a “gaps analysis” of current reporting to determine where there are potential shortfalls in information on Annex 12 activities, in order to fill in information gaps and help outside parties to determine whether Annex 12 is being adequately implemented.

Option 12(a): Generate a roll-up report of Annex 12, gathering information from national and regional programs that address all facets of Annex 12 (perhaps as part of the GLBTS Annual Report). Include a gaps analysis in this report

Option 12(b): Employ the use of the IJC website to establish links to various program activities on both sides of the border that address Annex 12. Include a gaps analysis.

D. Annex 15

Major issues relating to Annex 15 have been identified by the workgroup as warranting further detailed evaluation under the GLWQA binational review. Note that the IADN Steering Committee, a binational group made up of the U.S. and Canadian program managers, laboratory personnel, data manager, quality assurance officer, and others who deal with ongoing operation of the network has made specific language change recommendations for a revised Annex 15, attached in Appendix 3.

1. *Considering toxicity to non-aquatic wildlife*

The group felt that non-aquatic wildlife should also be included under Section 2(b).

Option 1: Revise 2(b) to include understanding the effects of PTS on the health of humans and aquatic life and wildlife.

2. *Formally add peer review of IADN to Annex 15*

Many of the activities in Annex 15—research on atmospheric deposition, modeling of atmospheric transport of PTS, the realization of IADN, and pollution control measures through national regulation and voluntary efforts like the GLBTS (GLBTS)—have been implemented. IADN puts out periodic atmospheric loadings reports. Peer reviews on the IADN have been conducted, and

recommendations from those reviews have been included in IADN Implementation Plans and have been carried out.

Option 2: Add peer review as a formal, regular component of IADN operations in Part 4.

3. *Include monitoring for chemicals of emerging concern to IADN*

Annex 15 does not specifically mention monitoring of substances of emerging concern, though Annex 12 calls for establishment of an Early Warning System to “anticipate future toxic substances problems”.

Option 3: Revise Part 4(a) to end with “including substances of emerging concern”. IADN typically does not have enough funding to add many new substances, but there is a possibility of conducting short-term screening-level studies if new chemicals were analyzable given current methods (or slight variations thereof). This is dependent on funding, however, and long-term monitoring of new compounds would require funding to allow proper method development and subsequent ongoing sample analyses.

4. *Add a stronger reference to national and international PTS sources and agreements such as the Stockholm Convention.*

There is only a short reference to out-of-basin and foreign sources in Part 5(a). These sources are significant contributors to atmospheric deposition to the Lakes.

Option 4(b): Add or revise language in Part 5(a) to say that, for situations “where such contributions arise from beyond the jurisdiction of the Parties” to strive to work through international agreements such as the Stockholm Convention to address the sources. The Stockholm Convention could be specifically named or not.

5. *Annex 15 Reporting*

Reporting on Annex 15 activities occurs through several venues (IADN loadings reports, SOLEC reports and conferences, GLBTS progress reports, etc.) but there is no periodic Annex 15 report per se. Some in the workgroup felt that there should be formal reporting for each of the annexes. This is a larger policy issue that came up during the discussion of Annex 15. Other such issues that were discussed include what the role of the IJC in implementing the Annexes should be and management, linking, and accessibility of data from PTS monitoring programs. See Options 12(a) and 12(b) in the Annex 12 options paper.

E Article VI

Clarity: Article VI -1 is clearly articulated and relevant, however, the balance of the Article with respect to the management of toxic substances, specifically 1(a)(i); (iv);(v), 1(b)(i);(ii);(vi), 1(c)(vi), 1(j), 1(k), 1(l) and 2, is presented as a compendium of program afterthoughts that may have been best integrated into existing articles consistent with the requirements of each to meet the purpose of

the agreement. Article VI specifies programs and measures to deal with pollutants from various sources and as such specifies deliverables and commitments for the Parties
The Article could be modified to insure that all programs and measures are updated as warranted.

Some outcomes of Article VI are time dated (1(a) and 1(b)) and the status of programs and requirements as stated are unknown. Some concepts lack specificity (measures to/for ..., compatible regulations, substantial elimination, minimize adverse environmental impacts, deleterious effects, and practical...) subsequently leading to a lack of accountability. There has been a great deal done in the basin to reduce levels in pollutant discharges and subsequently reducing these pollutant concentrations in both the waters of the Great Lakes and monitored biota. The reporting of these successes has occurred both at SOLEC and at the GLBTS meetings, although not always at times that fit the template of Article VI.

Relevancy: The concepts articulate in Article VI, as currently written, are still relevant but duplicated elsewhere in the Agreement.

Achieving Results: Article VI represents an assembly of postulated programs and due diligence measures that the Parties, States and Provincial governments would need to develop and implement to fulfill the purpose of the GLWQA. Many of the concepts and programs outlined within this Article have been undertaken by the parties. Assessing the implementation and appropriateness of the prescribed programs and measures let alone demonstrated progress against these activities is problematic and not completed in many cases.

Management Framework: There is no institutional structure set out in Article VI. Duplication of direction exists for example, in Article VI -1(k) and in Annex 12 – 3(a), (b), (c) (“programs and measures for the elimination of discharges of persistent toxic substances”).

Accountability: Accountability under sections 1(a)(i); (iv);(v), 1(b)(i);(ii);(vi), 1(c)(vii), 1(j), 1(k), 1(l) and 2, is diverse and in some cases rests not with the parties. There are no clear directions given on how to assess the gaps between “Program and Other Measure” commitments and actual delivery. For example actions under in 1(a)(i); (iv);(v) rests with municipalities. Accountability under 1(j), 1(k), 1(l) rests within Annexes 10, 12 and 15. Other than Annex15, accountability requirements under annexes 1, 10 and 12 are problematic

Article VI represents aspects of a current IJC recommendation to develop a flexible Binational Action Plan separate from but required by the agreement, to help the parties realize the goals of the agreement and identify full accountability, and to insure implementation. The Binational Action Plan would provide for clear and achievable goals, accountability, binational coordination, program integration, adaptive management, data management, substantive reporting, research, monitoring and surveillance to address ecosystem stressors including climate change, air pollution, existing chemicals, emerging chemicals of concern, ground water contamination, excess nutrients, contaminated sediments, and invasive species to name just a few.

Notes:

One reviewer objects to the inclusion of the IJC recommendation within the submission on accountability in Article VI to the ARC. It was stated that referencing the IJC recommendation

which was an intrusion into Workgroup “B” deliberations and reporting and that is not proper or justified.

RECOMMENDATIONS

A. Article 4/Annex 1

It is generally felt that Annex 1 is in need of some revisions in an updated GLWQA. Article IV, S.3 should be revised to define a biennial consultation to include membership, meeting location, reporting frequency, and accountability. Specific Water Quality Objectives need to be updated (See Options above). Also, the intent of the consultation on loading rates is referenced in Article IV should be clarified in the Agreement. General consensus indicated that the Annex does not drive action in its current condition and that the Parties need to revisit the existence of lists in their current state and consider options for updating and/or redefining the process for maintaining these lists. Some terms in the Annex should be revisited and clarified or updated. Special consideration of global pollutants and legacy sources needs to be given.

B. Annex 10

Major issues relating to Annex 10 have been identified in this preliminary analysis as warranting further detailed evaluation under the GLWQA binational review. Annex 10 provides for a list of Hazardous Polluting Substances (HPS) in shipping and commerce that may release to the Great Lakes ecosystem have or potentially could have toxic effects on aquatic and animal life. Annex 10 appears to be wholly supportive of Annexes 4 and 8 and as such is specific to accidental releases of HPS into Great Lakes waters. There are many chemical lists of HPS that are maintained electronically that could be incorporated in Annex 10 by reference (as outlined in paragraphs 5&6. It is recommended that Annex 10 be specifically reference in Annexes 4 and 8 and Annex 10 to be rewritten to identify electronic HPS lists to be maintained by the Parties.

C. Annex 12

Annex 12 is generally felt to be current and relevant, but in need of some revisions in an updated GLWQA. Some terms in the Annex should be revisited and clarified or updated (see Options). The Parties should also consider how non-persistent but continuously available toxic substances are addressed by the GLWQA (i.e., toxic substances in toxic amounts, per Article II(a)), and whether Annex 12 (or another Annex) should be broadened to address these in light on ongoing concerns regarding their detrimental impacts to the Great Lakes environment. Also, to address concerns regarding the lack of overall management and specific reporting on Annex 12 activities and progress, the Parties should develop a management framework which ties together the various program elements of Annex 12, such as research, monitoring and surveillance, and pollution prevention, in order to help the Parties set priorities and make key management decisions regarding toxic substances in the Great Lakes Basin. Further, the parties should report out on progress related to Annex 12, or provide a roadmap to current reporting that addresses Annex 12 issues. The GLBTS, or a similar binational entity, is a logical location for the overall management and reporting of Annex 12, and should be codified in a revision to the GLWQA, as such.

D. Annex 15

Annex 15 is generally felt to be clear in addressing research and monitoring of Airborne Toxic Substances, and relevant, as atmospheric deposition continues to be a significant pathway by which toxic substances enter the Great Lakes System. Many of the activities in Annex 15,—research on atmospheric deposition, modeling of atmospheric transport of PTS, the realization of and continued support for the IADN (Integrated Atmospheric Deposition Network), and pollution control

measures through regulation and voluntary efforts like the GLBTS, have been implemented. Revisions should be made to reflect the status of IADN as an established, ongoing program, including an intent to monitor for substances of emerging concern as called for in Part 5 of Annex 12 (“Early Warning System”). A stronger reference to addressing international PTS sources through multilateral agreements such as the Stockholm Convention is needed in the Annex. The concerns expressed for Annex 12 regarding management of and reporting on implementation are also applicable to Annex 15. Progress made under Annex 15 also falls under the umbrella of Annex 12, so the Annex 12 management and reporting framework could be used to guide actions under Annex 15.

E. General

The toxics issues within the current agreement are discussed in detail in Article IV& VI, Annex 1, 10, 12 & 15. Integration of the toxics annexes into one overarching annex would provide for clear and achievable goals, accountability and substantive reporting, binational coordination, program integration, adaptive & data management, research, monitoring and surveillance aspects of toxics issues within the Great Lakes. The new integrated annex would encompass an ecosystem approach with the main focus on water quality but could also provide for actions that address a broad range of toxic stressors that impact the Great Lakes ecosystem possibly through climate change, air pollution, existing chemicals, emerging chemicals of concern, and ground water contamination

GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP C
FINAL REPORT TO ARC
December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

The Working Group review Annex 2 using the specific review elements. Annex 2 is fairly clear, although there is some ambiguity regarding some of its provisions. The Annex has led to some progress, although that progress has been slow. The ambiguity, however, is not the reason. The prime reason for the failure to make more rapid progress in achieving the goals in this Annex is the lack of and inconsistency of resources to conduct the work.

A primary point of ambiguity is related to whether the Annex focus is on the open waters only or on nearshore, inland, tributaries, and watersheds. This leads to questions about whether it is the intent that the Agreement/Annex 2 take an ecosystem approach or simply a water quality approach; whether the Annex focuses on the open waters only or on nearshore, inland, tributaries, and watersheds; and whether the Remedial Action Plans and Lakewide Management Plans are to be prepared and implemented in relation to Critical Pollutants using an ecosystem approach to the multi-media sources, pathways and distribution of this narrow group of contaminants or are they for general ecosystem management and stewardship within the Great Lakes basin.

Annex 2 has driven action in proportion to the parties' commitment. Some of the environmental challenges contemplated and the concepts addressed in Annex 2 when the annex was written have changed, making it outdated. In some areas, the scope of the Annex has not kept pace and seems focused on past problems/pollutants for BUIs that may have limited the ability to address emerging issues. U.S. and Canadian, federal laws, as well as state and provincial laws that are related to the annex, and, in some cases, go beyond the requirements of the Annex. However, there are some goals that have not been achieved or addressed by current laws in both countries.

Accountability for action is not strong in the Annex. In some cases, silence in the Annex has produced inaction. Some people feel that there needs to be more detail to ensure the Annex addresses issues more effectively, while others feel that there is sufficient flexibility for the parties to address issues that they believe need to be addressed.

There are a number of critical issues not addressed in the Annex including: emerging chemicals; TMDLs; mass balances; inclusion of non-AOC nearshore contamination concerns; no basis for remediation/recovery zones for AOCs; no mention of sustainability; no mention of LaMP ecosystem goals and milestones; no adaptive management; no precautionary principle. There is a concern that the Annex sometimes may be construed too narrowly, ie., the LaMP's sole focus on chemical contamination in open waters.

Where the LaMPs and RAPs programs are effective is where all levels of government are committed to progress. Progress is dependent upon this and continued funding. Without the commitment of the Parties and other levels of government, there is not much inherent in Annex 2 that would drive action forward. The LaMPs have evolved beyond the specific language in the Annex and have been developed using an ecosystem and/or watershed-based approach

Annex 2 talks about RAPs and LaMPs as having stages with a discrete endpoint. RAPs are generally following the process outlined in the Annex. Three RAPs have been delisted and there has been progress in addressing contamination in others. However, LaMPs are a longer-term tool under which other programs have developed.

Beneficial Use Impairments are poorly defined in the Annex and do not always reflect current problems in the AOCs and open lake. The BUIs are poorly defined and do not adequately address “injury to health and property” (referred to in the preamble of the Agreement on page 1) on both sides of the border.

These adaptations bring into question the necessity of the requirement for biennial reporting on LaMPs that use significant resources (time and money) of the Parties and can take resources away from implementation. Additionally, reporting on progress of the AOCs is supposed to occur every two years, but there has been inconsistent reporting. There is a time lag on RAP stage reporting, resulting in reporting gaps.

These comments and findings led the group to identify a series of recommendations related to the use of guidance documents, watershed management and the LaMPs, including adaptive management as a guiding principle, stressing human health factors, Beneficial Use Impairments, LaMP and RAP reporting, linking LaMPs and RAPs and monitoring and indicators.

2. Overview

The Review Process

Working Group members were asked to review and comment on the Annex using the specific review elements. The goal was to develop a comprehensive set of comments that reflect the range of opinions, not necessarily reach consensus. People generally commented on the issues with which they are familiar. Small working groups were created for each of the review elements, and these members compiled and/or summarized the comments. The summary documents were discussed on the bi-monthly conference calls and additional comments included. This allowed people to become more familiar with the issues and have the opportunity to comment and ask questions to further develop comments.

Review Working Group G Membership

The review group had 82 members on (45 U.S. 27 Canada) including 21 representatives from the Canadian and U.S. federal governments; 14 representatives from Canadian and U.S. provincial/state governments; 3 representatives from aboriginal groups and tribes; 12 representatives from Canadian and U.S. municipal agencies, 11 representatives from NGOs, 13 representatives from industry, and 2 representatives from academia.

There were approximately 20 people on each call, with an average of 9 people providing written comments on the elements (including representatives from Aboriginal groups, provincial/state government, NGOs, industry, municipal agencies, federal government and academia)

3. Summary Evaluation of Provisions Reviewed

Clarity

(Do the Parties have a common interpretation of the provisions of the Agreement?)

Overarching Question

1. Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

- Despite the apparent clarity of the title of the Great Lakes Water Quality Agreement and the apparent clarity of the intent stated in the initial pages of the Annex, the group generally thought that there is ambiguity about the Annex's stated purpose. People identified areas where there is a lack of clarity. These include:
 - There is ambiguity regarding whether the Annex takes an ecosystem approach or simply a water quality approach.
 - There is ambiguity regarding whether the Annex focus is on the open waters only or on nearshore, inland, tributaries, and watersheds.
 - Beneficial Use Impairments are poorly defined, particularly with regard to human health.
 - Is this an "international agreement for the Great Lakes" or is it an international agreement on water quality in the Great Lakes?
 - There is a general question about the purpose of the Annex regarding whether it uses an ecosystem approach or a water quality approach.
 - There is a question related to whether the Remedial Action Plans and Lakewide Management Plans are to be prepared and implemented in relation to Critical Pollutants using an ecosystem approach to the multi-media sources, pathways and distribution of this narrow group of contaminants or are they for general ecosystem management and stewardship within the Great Lakes basin?
 - Criteria need to be developed for water quality impairments that affect human health and property on the other side of the border.
- There was the opinion expressed that the Annex is clear.

3. Does ANNEX 2 contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(e) Is the text of Annex 2 and the objectives, programs and other measures described therein clear?

- There are numerous places where the document is not clear. There is a difference of opinion as to whether this is a good or a bad thing (Does this provide flexibility or does it give license to ignore a specific component of the Annex?). Some people believe that flexibility allows for adapting to changing needs, while others believe that there is a need for clear requirements that the parties should address.
- Some people believe that BUIs are spelled out in too much detail and are too prescriptive, while others believe that there is a need for more detail.

The Ambiguity of the Ecosystem Approach

- There is concern about whether the Annex is consistent in focusing on using an ecosystem approach or a water quality only approach, and particularly with regard to pollution by persistent toxic substances. The ecosystem approach in the agreement is referred to but not defined nor really applied.
- It refers to the ecosystem approach for AOCs and open waters, but is silent on land, tributaries, and inland lakes.
- There is not a good definition of the ecosystem approach.

Definitions

- The BUIs are poorly define including with regard to “injury to health and property”.
- There is no clear definition or criteria for designation of AOCs.
- The Annex refers to the ecosystem approach for AOCs and open waters, but is silent on land, tributaries, and inland lakes.
- “Open lake waters” is not defined.
- The 14 BUIs do not explicitly reflect human health risks (long or short term).
- The list of BUIs (Section 1 (c)) may be outdated, and some do not reflect current views regarding priorities for the Great Lakes and other impairments may not be addressed. For example, tainting of fish and wildlife flavour, for example, is one that could be replaced by something more relevant to concerns in the AOCs or other degraded areas. The Canadian Detroit River RAP implementing organization has added another BUI – Failure to meet water quality standards/ objectives, because this is an important source of information about water quality and the presence of contaminants.
- There is no reference in the Annex on how the standard should be met to restore and/or eliminate BUIs.

General Principles

- In Section 2 (b) there is an “or” in “Areas of Concern or Critical Pollutants”. It should be “and”. Otherwise the principle of the RAPs is not as clear. If the reason for the “or” is because it applies only to LaMPs, then that is a clarity issue.
- When comparing Article 2 of the Agreement with Section 2(d) of the Annex there are different policies for toxic substances and persistent toxic substances with regard to point source impact zones.

Designation of Areas of Concern

- Although the Annex clearly states that the parties list and delist AOCs, and the IJC comments, it is not clear who sets the criteria for delisting and how the delisting is implemented.

Remedial Action Plans for Areas of Concern

- Section 4 (b): It is unclear what is meant when it says “affected State and Provincial Governments not now covered by this Agreement ...” Who are they referring to?

Designation of Critical Pollutants for the Development of Lakewide Management Plans

- There is no clear method to determine critical pollutants. The Agreement does not specify how the contaminant lists should be revised, discussed and regularly updated.

Lakewide Management Plans for Critical Pollutants

- Clarification Question: Section 6 (b): Should the words “classify efforts to reduce Critical Pollutants by their stages” be simplified as “classify the stages of the reduction of Critical Pollutants”? (language clarification)

1(b) Are program outcomes and/or environmental outcomes clearly identified?

- There are no goals or targets established to achieve sufficient remediation such that the impairment is considered “fixed”. Related to this, there is no guidance provided for delisting AOCs within Annex 2. Some believe that goals and targets are needed and they do provide guidance. Others believed that this is not necessarily a bad thing.

General Principles

Regarding ecosystem approach, see question 1.

- The use of the ecosystem approach in Section 2 (a) is still appropriate as a concept. However, it would seem beneficial to incorporate the watershed approach into Annex II and elsewhere in the Agreement.
- The LaMPs are an overarching planning document, broader than AOC RAPs. LaMPs should address not only open waters, but all waters. This does not preclude the RAPs from specifically addressing designated AOCs.
- There is no indication of the timeframe required for completion of RAPs, and this can vary tremendously depending on the number and nature of the beneficial use impairments and the extent and challenges of the respective AOCs.

Lakewide Management Plans for Critical Pollutants

- Clarification Question: Section 6 (a) (iii) and (iv): Do the words Agreement Objectives refer to both the General Objectives listed in Article III and the Specific Objectives listed in Article IV and Annex 1?
- Clarification Question: Section 6 (a) (iv) and (v): These sections relate to load reductions of Critical Pollutants necessary to meet Agreement Objectives. How do these accord with the policy of “virtual elimination” of discharges of any or all persistent toxic substances?
- Clarification Question: Section 6 (a) (viii): As well as a “process for evaluating remedial measure implementation and effectiveness”, Does there need to be a provision for estimating the timelines by which beneficial uses will be restored?
- Clarification Question: Section 6 (a) (x) refers to “a process for recognizing the absence of a Critical Pollutant in open lake waters”: What is meant by this term and how does this differ from sub-section (ix)? Is this provision needed to demonstrate that the persistent toxic substances have been “virtually eliminated”?

1(c) Are there outdated terms, concepts or references?

- The text and language of Annex 2 need to be updated, as well as the Reporting Progress date in section 7 and related matters.
- Terms that are used nowadays need to be included, as well as a definition. For example, “Area of Recovery”; “Delist”; “Delisting Criteria”; “Stakeholders”; “Public participation”; “Community Involvement”; “Partnerships”.
- The concept of “beneficial use impairment” is interesting and could be exported to other ecosystems but would need a better development and precision in its definition. The 14 elements do not explicitly reflect human health risks (long or short term). In some cases they refer to short term measurable indicators (beach closures, restriction on fish consumption) in other cases... (added costs to agriculture & industry degradation of fish population,...)

General Principles

- Clarification Question: Section 2 (c) on identifying Areas of Concern and developing RAPs and LaMPs: Is this provision outdated since Lakewide Management Plans for Critical Pollutants have now been developed for all the five Great Lakes? Might the Parties want to reiterate their commitment to the RAPs and LaMPs for critical pollutants or might they wish to remove this subparagraph?
- RAPs are no longer done in discrete stages any longer (Section 4 (d)). The same may be said for LaMPs (Section 6 (c)).

Reporting Progress

- Section 7 (a) on Point Source Impact Zones has not been followed by the governments and may be an out-of-date concept.

1(d) Other Comments.

- No preamble in many of the sections assumes that the reader understands the purpose and intent. It might be worthwhile to reconsider this approach in light of the varied levels of understanding of these complicated issues.
- Some AOCs are watershed-based. The term “watershed” should be explained.
- Annex 2 does not clearly state the scopes of RAPs vis a vis LaMPs.

Designation of Critical Pollutants for the Development of Lakewide Management Plans

- There are not clear outcomes.
- “Pollutant” is not defined.
- Normally when we discuss “impairments” as a part of the Clean Water Act programs in the U.S., it is with respect to listing those waters for impairments under section 303(d) of the Clean Water Act and/or developing (TMDLs) for those pollutants which may be causing the impairments.

Relevancy

(Are the provisions still relevant to the ongoing management activities?)

1. Is there a demonstrable need for the Agreement to achieve the stated goals and objectives?

- Annex 2 provides a critical framework and understanding among governments that has fostered progress, although goals have not yet been met, and there are additional goals that need to be added.

1(a) Have the environmental conditions/challenges originally intended to be met by Annex 2 changed, and if so, what are the implications of those changes?

- BUIs need to be reviewed to determine if they are still relevant and if others need to be added.
- The scope of the Annex has not kept pace with scientific understanding of threats to chemical, biological and physical integrity of the lakes. The environmental challenges contemplated in Annex 2 have changed. Examples of emerging threats include, but are not limited to: effects of climate change; impact of aquatic and terrestrial invasive species; and effects of urbanization, and emerging chemical contaminants, etc.
- All of the above changes imply that an integrated management component could be developed above and beyond strictly pollution control programs.
- Although the Annex has provided some results, it is still relevant as are LaMPs and RAPs because more must be done to achieve sustainability.
- Section 1(b)(i) refers only to critical pollutants in open lake waters. A reference needs to be made to a Great Lakes tributaries as well.

1(b) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by current domestic laws and policies of each country?

- Yes and no. Some laws exceed what is in the Annex, but there are also goals that have not been achieved or addressed by current laws in both countries.
- In some ways, they encourage actions beyond what is required by domestic laws and policies, but in other ways they are not compatible with such laws and policies. The GLWQA was one of the first places where ecosystem management and approaches were promoted among several parties and on a multi-media basis. Now, many of our laws and policies have followed suit.

1(c) Does the Annex drive actions? If not, can you identify reasons why it does not?

- Yes and no. It drives action, but not without funding resources. However, the Annex creates an impetus for action that drives funding that might not otherwise be made available without the Annex.
- Annex 2 drives action in proportion to the parties' commitment. The LaMPs and RAPs are effective because the states and government agencies are committed to progress. Progress is dependent upon commitment. If the parties were not as committed as they currently are to

achieving objectives through action, there is not much inherent in Annex 2 that would drive action forward. Hence, when funding and interest in AOC activity dropped off over a period of years, there was less action. Now that funding and interest in AOCs are on the rise, so is activity. It is key to success that the partners hold all accountable for progress, and structures such as the LaMP and RAPs provide a framework for that.

1(d) Does the Annex reflect current/appropriate environmental management tools (e.g. legislation, guidelines and best management practices)?

- Annex 2 could be updated to reflect current tools, including the recognition of watershed/resource management plans, adaptive management, species at risk recovery plans, binational management plans and objectives. However, LaMPs, now that they have been developed, could be identified as the vehicle with which to enable these tools to be put into practice, in turn strengthening the linkage between guidelines/BMPs/RAPs and LaMP objectives.

Other Comments

- The establishment and implementation of RAPs and LaMPs are still relevant, and many of the tools to do so exist. LaMPs need to be better defined as to whether they should remain as plans to focus only on the reduction of critical pollutants, or if they should include management of all aspects of the lake ecosystem. The problems in not achieving RAP and LaMP goals seem to fall more under the review elements of accountability and management.
- Inclusion of a provision recognizing the principle of “adaptive management” would allow flexibility in meeting the goals of the Agreement/Annex.

Accountability

(Can Progress Be Tracked And Were Appropriate Corrective Actions Identified?)

Reporting and assessment. The ease of access to, and quality of data for monitoring and reporting purposes, role of the IJC and long-term sustainable buy-in and commitment from the Great Lakes community.

1. Is there comprehensive monitoring and reporting?

(g) Are there clear indicators to determine progress?

- There are clear indicators used for individual RAPs and LaMPs and SOLEC indicators are being applied or developed for the LaMPs and RAPs. There need to be other indicators for other aspects of LaMPs. There is not clear coordination of indicators and monitoring across the Great Lakes and between Great Lakes and RAP scale. There should be coordination and consistency of monitoring and indicators among the lakes.
- LaMPs and RAPs need endpoint targets so that progress can be assessed more readily. However, quantitative targets need not be in the Agreement.

(h) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

- Yes, the Annex has the best provisions for accountability, reporting, monitoring, and evaluation in the Agreement.

(i) Are they being met?

- Yes, for the most part. However, the point source impact zones are not being reported on consistently, usually indirectly.
- The governments have become consistent at providing a LaMP report every two years for each lake. While there have not been formal reports on the RAPs every two years, LaMP reports have included brief reports on RAP activities.
- The concept of “adaptive management” also needs to be incorporated in the provisions. Much of what is being done is new and new approaches will be necessary to address RAP/LaMP needs. The monitoring and reporting should reflect the approach of learning and adapting when there is a need to bring in research or make a change management.

(j) If not, why not?

There are several reasons:

LaMPs

- It is unclear why point source impact zones have not been reported on consistently. In our discussions, there was not great awareness of the requirement.
- There are not enough resources, especially in personnel and their time allotment to do the job.

- The issue has not been a priority.

RAPs

- Resources and priorities

(k) Is the frequency of reporting sufficient?

- LaMP biennial reporting is eating up a lot of resources (time and money) of the parties. Teams barely finish one report when they have to start preparing for the next one. This leaves less time for implementation.
- Another idea is that a five year reporting cycle with full plan (RAP/LaMP) reviews on the tenth or fifteenth year will facilitate more accurate trend monitoring and allow for more effective public involvement in the process. It would also provide a better opportunity for IJC review and response.
- The reporting on RAPs is supposed to occur every two years, but there has been inconsistent reporting. There is a time lag on RAP stage reporting.
- Although RAPs are developed in 3 Stages (as per section 4 (d)), the timeframes between each Stage vary greatly in years.

(l) Other comments.

2. Is there a defined role for the IJC and are adequate tools and data provided to fulfil its role?

(a) Is the role of the IJC as set out in the Agreement clear and appropriate?

- Yes. The Annex gives them a very specific role for RAPs, but it is unclear what the IJC does or is supposed to do with the LaMP reports.
- It is unclear if they have adequate tools and data to fulfill its role.

(b) Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

- Yes

(c) Other comments.

- Some people feel the independent reviews are not done and reported on in a timely manner.
- The IJC takes too long to comment on some RAP and LaMP reports submitted to them.
- There may need to be clarification on reporting. It is unclear if the RAP stages are reporting points. It is unclear whether the RAP stage reports are being substituted for biennial reporting.
- RAP and LaMP reporting have evolved differently. The IJC has not been able to do its review requirements as a result.

3. Does the Agreement enable an effective level of commitment?

(a) Is the role of the public identified?

- Not clearly.

(b) Does the Agreement identify appropriate mechanisms for public engagement?

- Since 2(e) is the only mention of the public, there is no mechanism identified.
- No, not specifically. Mechanisms for public consultation and involvement have been at the discretion of the leading agencies involved in the RAP/LaMP at the local level.

(c) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

- It does not preclude ownership.

(d) Does the Agreement drive action by communities and industry?

- Yes. The factors that drive action are
 - The listing of impaired beneficial uses in the Annex
 - A public advisory committee that facilitates the networking to do this.
 - The listing of BUIs and Stage 1 publicity help to drive action.
 - At the local level, the RAP Team /Coordinator involves the community, stakeholders, etc.

(e) Other Comments

- More partnering is needed to ensure that the Annexes provisions are implemented more effectively
- The Annex could be more specific about public consultation, but not how it will be done.

Management Framework

(Are The Institutional Structures Set Out In The Agreement Effective?)

1. Are management and coordination approaches identified in the Agreement?

(a) Is management and coordination specified? If so, briefly outline.

- There are general provisions for cooperation and consultation between parties and state and provincial governments, although these are somewhat vague. There should be recognition of other levels of government.

(b) Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

- In most areas, RAP teams of government agencies were set up to develop the plan and a formal public advisory committee was set up to participate in the development of the plan. In the implementation stage, however, there has been much less consistency in approach.
- In the language of the Annex, it does not specifically identify who should become involved in the LaMPs and RAPs, although it does not preclude them. The programs have evolved to include a wide range of partners, although it is not comprehensive. There needs to be recognition that success of the LaMPs and RAPs is dependent on management and coordination with other governmental entities and other partners. Some people believe that the language should be more specific, while other believe it should remain vague.
- The real problem is the shortcomings of the governments in implementing the provisions. To solve the debate on whether to update language, the effort should focus on improving implementation and accountability. Making changes to Agreement /Annexes is less important than assuring completion of the work already identified. New language could appear in such a new guidance document and would make most efficient use of resources. Management could then most expeditiously focus on implementation needs instead of language change in the Annex.
- The Annex identifies the need for providing some flexibility in implementation on such topics as the ecosystem approach. The LaMP and RAP processes need to be rigorous and complete to pass the test(s) of applying the ecosystem approach and the accomplishment of delisting. These requirements are best suited for and imposed by a guidance document. There is a history of such guidance documents being produced after 1987 by IJC which helped the development of LaMPs and RAPs. These guidance documents need to be resurrected and updated with the new concerns that are being expressed.

(c) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

- Not always. See also Clarity Question 1a and Achieving Results 5b.

(d) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

- Yes, but they could be better. Two examples are:
 - There has been only limited coordination between the RAP and LaMP programmes. This is a problem because the goals and priorities of the LaMP should affect the goals and actions in each RAP in that lake's watershed.
 - There also needs to be better coordination of the LaMPs with international programmes such as the Commission for Environmental Coordination North American-wide toxics strategies. For example, the Lake Superior LaMP has set goals for elimination of certain designated substances. These goals cannot be met unless the goals for North American-wide programs are as stringent as those for Lake Superior.

(e) Other comments.

Achieving Results

(Have appropriate environmental improvements occurred?)

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

(a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

- Yes, but there are some problems with point source discharges and BUIs. The metrics for achieving results for point source and BUIs are unclear.

(b) Does the Agreement fail to address critical issues?

- Some commenters feel that the Annex fails to address some critical issues. These include: emerging chemicals, TMDLs, mass balances, inclusion of nearshore contamination concerns, no basis for remediation/recovery zones for AOCs, no mention of sustainability, no mention of LaMP ecosystem goals and milestones; no “adaptive management”; no precautionary principle. The Annex may be construed too narrowly, i.e., sole focus on chemical contamination in open waters – this may not permit full achievement of P, B, and C integrity of the lakes.

2. Are the demonstrated results consistent with goals and objectives in the Agreement?

(a) Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not?

- Not always. A Lake Huron LaMP has not been developed. This is the result of a lack of resources. However, there is a Lake Huron binational program that has set some priorities, although it is not a formal LaMP and it is submitted to the IJC for review.
- Only 3 of the 43 AOCs have been delisted, and point source impact zones have not been addressed. This is a result of lack of resources, lack of setting priorities, and, other issues.

(b) Are any parts of the Agreement in any way an obstacle to progress?

- No, with a few exceptions. The lack of clarity with regard to BUI and AOC reporting could impede progress.
- The Annex tends to focus heavily on chemical contamination. The focus on contaminants rather than the broader ecosystem program is perhaps a detriment to progress, being that there are scarce resources to sufficiently address all LaMP and RAP issues.

(c) Are there external impediments that prevent implementation?

- Yes, resources (e.g., for science and monitoring), people, money, priorities, and lack of commitment.

(d) Are there other barriers to progress?

- Yes, including inadequate stakeholder participation, lack of public education, long timeframe required for commitment, lack of program linkage to base federal, state, and tribal programs

(e) To what extent can results be attributed to the Article/Annex?

- A number of results can be attributed to the Article/Annex
 - Assessing BUIs in areas in the Great Lakes region.
 - Much of the progress in AOCs can be directly attributable to the Annex since its BUIs drive action.
 - Production of and reporting on LaMPs

(f) Other comments.

3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

- No.

(a) Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?

- No.

(b) Other comments.

4. Is the science in the Agreement still relevant? If not, why?

(a) If the science in the Agreement is still relevant, how has it been incorporated?

- Yes, but some is outdated.
- The inclusion of “adaptive management” principles can be incorporated to ensure relevancy in the future.

(b) Does the science adequately influence decision-making?

- It is unclear. Science has influenced decision making, but not in all cases.

(c) Other comments.

5. Does the Agreement incorporate science to address emerging issues?

(a) Are there new issues and programs that need to be addressed?

- Yes. Examples include Combined Animal Feeding Operation (CAFOs), pretreatment, pollutant trading, emerging chemicals, ecosystem goals, and indicators and timelines.

(b) Can the Agreement accommodate emerging issues?

- Yes, there are provisions that have allowed some flexibility. However, the Agreement seems focused on past problems/pollutants for BUIs that have limited the ability to address emerging issues. Incorporation of “adaptive management” would allow greater flexibility.

4. Findings

- A. While there are some issues with clarity, etc in Annex 2, the prime reason for the failure to make more rapid progress in achieving the goals in this Annex is the lack of and inconsistency of resources to conduct the work.
- B. Some of the environmental challenges contemplated and the concepts addressed in Annex 2 when Annex 2 was written have changed, making it outdated. In some areas, the scope of the Annex has not kept pace.
- C. There are many laws and programs that have additional requirements that are related to the goals of the Annex and surpass the Annex. However, there are some goals that have not been achieved or addressed by current laws in both countries.
- D. Annex 2 drives action in proportion to the parties' commitment. Where The LaMPs and RAPs programs are effective is where all levels of government are committed to progress. Progress is dependent upon this and continued funding. Without the commitment of the Parties and other levels of government, there is not much inherent in Annex 2 that would drive action forward.
- E. The LaMPs have evolved beyond the specific language in the Annex and have been developed using an ecosystem and/or watershed-based approach.
- F. There is ambiguity regarding whether the Annex focus is on the open waters only or on nearshore, inland, tributaries, and watersheds.
 - i. Is the intent that the Agreement/Annex 2 takes an ecosystem approach or simply a water quality approach?
 - ii. Is the Annex to focus on the open waters only or on nearshore, inland, tributaries, and watersheds?
 - iii. Are the Remedial Action Plans and Lakewide Management Plans to be prepared and implemented in relation to Critical Pollutants using an ecosystem approach to the multi-media sources, pathways and distribution of this narrow group of contaminants or are they for general ecosystem management and stewardship within the Great Lakes basin?
- G. The requirement for biennial reporting on LaMPs use significant resources (time and money) of the parties and can take resources away from implementation.
- H. The BUIs are poorly defined in general and do not adequately address "injury to health and property" (referred to in the preamble of the Agreement on page 1) on both sides of the border.
- I. Reporting on progress of the AOCs is supposed to occur every two years, but there has been inconsistent reporting. There is a time lag on RAP stage reporting, resulting in reporting gaps.
- J. There are a number of critical issues not addressed in the Annex including: emerging chemicals; TMDLs; mass balances; inclusion of non-AOC nearshore contamination concerns;

no basis for remediation/recovery zones for AOCs; no mention of sustainability; no mention of LaMP ecosystem goals and milestones; no adaptive management; no precautionary principle. There is a concern that the Annex sometimes may be construed too narrowly, i.e., the LaMPs sole focus on chemical contamination in open waters.

- K. The Annex seems focused on past problems/pollutants for BUIs that may have limited the ability to address emerging issues.
- L. Beneficial Use Impairments are poorly defined in the Annex and do not always reflect current problems in the AOCs and open lake.
- M. Accountability for action is not strong in the Annex. In some cases, silence in the Annex has produced inaction. Some people felt that there needs to be more detail to ensure the Annex addresses issues more effectively, while others felt that there is sufficient flexibility for the parties to address issues that they believe need to be addressed.
- N. Annex 2 talks about RAPs and LaMPs as having stages with a discrete endpoint. LaMPs are a longer-term tool under which other programs have developed.

5. Recommendations

- A. **Guidance Documents.** Annex 2 should identify the concept of having guidance documents outside the Annex to assist in program implementation and allow flexibility to meet new environmental challenges.
- B. **Watershed Management and the LaMPs.** Annex 2 should be revised to reflect and allow the continuing evolution of the LaMP program to a watershed-based tool for the lakes.
- C. **Including adaptive management as a guiding principle.** Annex 2 should include a provision recognizing the principle of “adaptive management” would allow flexibility in meeting the goals of the Annex.
- D. **Stressing human health factors.** Annex 2 should include criteria for water quality impairments that affect human health and property on both sides of the border.
- E. **Beneficial Use Impairments.** The parties should remove the BUI list from the Annex and develop a list outside the agreement **OR** update the list and better define the BUIs.
- F. **LaMP reporting.** Comprehensive LaMP reporting should occur less frequently than every two years, i.e. every five years.
- G. **RAP reporting.** There should be greater clarity on reporting requirements for AOCs .

- H. **Linking LaMPs and RAPs.** Annex 2 should require greater coordination among the LaMPs and RAPs.
- I. **Monitoring and indicators.** Annex 2 should require better coordination and consistency of monitoring and indicators among the lakes.

GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP D FINAL REPORT TO ARC December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

The Great Lakes Water Quality Agreement Review Work Group D (hereafter “workgroup”) comprehensively reviewed Annex 3 and Annex 13 by answering the questions posed in the Evaluation Framework. The findings for each annex has been documented and reported via conference phone call summaries which are found in section 6 of this report. Findings and recommendations emanated from Annex 3 and Annex 13 reviews and were reached by consensus.

Annex 3, which was initially designed to minimize eutrophication problems in the Great Lakes by reducing phosphorus loads from multiple point and non-point sources, provides accountability, reporting and monitoring for the total phosphorus loads to the Great Lakes. There is one goal for restoration of year-round aerobic conditions in the bottom waters of the Central Basin of Lake Erie that relates primarily to the open waters of the Great Lakes, but this goal does not seem attainable based on present observations that oxygen depletion rates are weakly controlled by phosphorus loads. It was believed aerobic conditions could be restored by successfully reducing total phosphorus loads to Lake Erie below 9600 metric tons, however, loads are below this target and anoxic conditions persist. The total phosphorus load is linked to offshore total phosphorus concentrations. The decline in open lake phosphorus concentrations in all the Lakes during the 1980’s suggested total phosphorus loadings were successfully in control. After, the 1980’s very little model analysis was done on the Great Lakes and with the exception of Lake Erie, total phosphorus load calculations stopped in 1991. The other goals of Annex 3 are dominated by references for substantial reduction of algal biomass in all the Great Lakes, bays and other areas of the Lakes. This is primarily a nearshore issue. While provisions for accountability, reporting, monitoring, and evaluation are provided in Annex 3 for the open water issues, the nearshore monitoring programs are only implied.

The 1999 Annex 3 review concluded that insufficient scientific justification existed for changing the phosphorus control objective and phosphorus load targets. This Review Workgroup recommends that the parties should consider adding to Annex 3 a nearshore algal surveillance program, revision of the 1970’s models to reflect ecosystem structure and function change (role of invaders) that have occurred in the lakes. These revisions should result in a concerted research, monitoring and integrated modeling effort to quantitatively address nuisance algal conditions, including cladophora, in near-shore areas and nutrient depletion in open waters. The improved models should simulate system-level cause-effect relationships, i.e. the simultaneous low productivity and fish carrying capacity in the open water areas and nuisance algal bloom and mat formations in the nearshore areas of the lake. These models will provide more accurate predictions and if necessary, revised target phosphorus loads could then be developed on a watershed basis to address eutrophication problems in near-shore areas and bays resulting from tributary and wet weather loadings. This will require significant engagement by local governments to formulate local goals, objectives, programs, strategies and measures to address land use and growth impacts. As a result, a closer interface between Annex 3 and Annex 13 may be needed. The Great Lakes monitoring programs of the two countries should focus a larger percentage of monitoring efforts on the nearshore conditions in order to compare with the more traditional open-water conditions.

Annex 13 was formulated to abate and reduce diffuse pollution from non-point sources that negatively impact the Great Lakes ecosystem. Science on the subject was just emerging at the time the Annex was incorporated in the Great Lakes Water Quality Agreement as amended in 1987. Annex 13 was not reviewed in the 1999 review process. Annex 13 lacks substantive goals and objectives to guide efforts towards reducing non-point source loading contributions to the Great Lakes. For instance, there are no

binational criteria for what constitutes the minimum elements of a watershed plan at each scale appropriate for reporting. Moreover, there are no reduction targets, methods or monitoring programs defined to allow the evaluation of abatement and reduction in diffuse pollution. Although this Annex helped to stimulate development of Watershed Management Plans on a localized basis there is no coordinated watershed tracking system among the various levels of government. Even more, no common definition of watershed Priority Hydrologic Units and no prioritization system exist. The workgroup experts positively agree that land management practices and land use have changed since the agreement was signed by the parties. However, it appears that local governments are typically responsible for designing and implementing land use regulations and controls so there is a disconnect between the entities responsible for implementing the Agreement and the entities with the authority to address land use challenges.

Annex 13 needs clearly to be refurbished. The group recommends a better name and a main objective: «Watershed management to control diffuse pollution». Wetlands protection, enhancement and restoration merit a separate consideration but may or may not be included in Annex 13. Clear goals and objectives have to be defined to control diffuse pollution and evaluate progress made through application of watershed management plans. The parties should also coordinate reliable land use inventories that provide the status of land use abatement activities and how these activities contribute to attaining the goals and objectives to control diffuse pollution in the Great Lakes basin. Coordination should be provided by the parties and defined in Annex 13 to allow involvement of all levels of governments and organizations to report on the efficiency of diffuse pollution abatement and reduction programs.

2. Overview of Review Working Group Mandate

Review Working Group D was tasked with review the following components of the Canada – U.S. Great Lakes Water Quality Agreement:

Annex 3. The Control of Phosphorus Annex proposed programs to minimize eutrophication problems in the boundary waters of the Great Lakes System.

Annex 13. The Control of Pollution from Non-Point Sources Annex delineates programs and measures for the abatement and reduction of non-point sources of pollution from land-use activities.

The workgroup initially had a membership of 44 persons, with 17 from Canada. Three persons were recruited to join the assigned membership to strengthen watershed management review. Of these, 28 of the membership were active in contributing to the discussion of the workgroup over the time period from April 28th to September 19th. Six additional recognized modeling experts from both Canada and the United States were invited by the co-chairs to join with modeling experts already on the workgroup. This team reran the models used to set the target phosphorus loads and models to assess the cladophora problem in the nearshore zone.

Organizations represented cover Federal Agencies from both countries, state and provincial units of Government from both countries, Universities, private corporations, the IJC, conservation authorities, Great Lakes Commission, and environmental interest groups.

Individual participation in each workgroup call is found in Section 6.

3. Evaluation Framework

Clarity:

Clear articulation of purpose, goals, objectives, programs and other measures; the existence of a shared understanding and acceptance of the meaning of the Agreement.

4. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

In general, participants felt that **Annex 3** and **Annex 13** lacked clarity in a number of key terms such as “near-shore” waters, “priority hydrologic units”, “nuisance algal conditions and biomass”, “elimination and substantial elimination”, “diffuse pollution from non-point sources”, and “sustainability”.

Annex 3 and **Annex 13** lacked clarity on actual reporting requirements and timeliness of reporting.

In general, participants felt that **Annex 13** lacks a contemporary statement of purpose or clearly articulated goals. At the time the Annex was initiated it served as an important catalyst to promote the development of demonstration projects for watershed planning and formulation of innovative non-point source control techniques. Today, however, these types of initiatives should no longer be considered as pilot projects, but rather need to move into full scale implementation. The Agreement should be amended to promote this transition. The agreement should also recommend coordination of reporting on achievements from watershed management plans and abatement of diffuse sources of pollution from land-use activities.

(f) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

Annex 3:

- In the 1999 review it was suggested to more clearly define the term “load” as a “maximum allowable” load.
- There is a lack of clarity on actual reporting requirements for Section 5.
- The term “nuisance” algae should be defined.
- The language in the lead paragraph of item 2 of Annex 3 that directs the parties to develop and implement phosphorous control programs is unclear as to whether they should be designed to only achieve the stated load reductions or whether they should be continued regardless of load achievement? Basin wide, these programs have not been implemented across the board.
- The 1978 GLWQA Annex 3 language and the 1983 supplement (and/or the 1987 revisions made by protocol) have melded. Some of the programs and tables [See response Relevancy- 1)b-below] are out of date, and should be updated or deleted to improve clarity.

Annex 13:

- The Agreement lacks substantive goals and objectives. Given this shortcoming it also lacks an adequate framework for coordination, implementation and performance accountability. Therefore, a process should be initiated to develop substantive goals and objectives for the Agreement, as well as an appropriate management framework to guide the effort. The Annex 13 Technical Sub-group has formulated some preliminary suggestions and those are presented in section 1)d below.
- If this Annex is revised then it is suggested that its main focus should be addressing “diffuse pollution from non-point sources”. This would improve the clarity and focus of the Agreement in terms of the language translation between the two countries.
- Additionally, a change to the title of the Annex should be considered. Something akin to “Watershed Management to Address Diffuse Pollutants from Non-point Sources” would create greater clarity of purpose. Once watershed planning efforts are completed additional regulatory and non-regulatory programs may be needed at the appropriate jurisdictional level (state/provincial/local) to achieve non-point source controls.
- There is a lack of a clear definition of “watershed”. While recognizing that most planning and implementation work in the U.S. occurs on a 12 digit HUC code basis, reporting occurs primarily on an 8-digit HUC code basis.
- There appears to be no common definition for what constitutes a “priority hydrologic unit” and it appears that no one has prioritized among the watersheds at any scale. Setting priorities would require the development of bi-nationally agreed to criteria to set the priorities, as well as an agreed to scale to which the criteria might be applied.

(g) Are program outcomes and/or environmental outcomes clearly identified?

Annex 3:

- Environmental goals/outcomes described in Item 1 of Annex 3 reference the need to address nuisance algal biomass problems in the Lakes, but does so in somewhat vague and inconsistent terms.
- Programmatic outcomes described in Item 2 of Annex 3 and Target Loads described in Item 3 of Annex 3 are substantive and clear. However, there is an inconsistency between Item 2) a of the original Annex and Table 2 of Item 3 in the 1987 Supplement to the Agreement. The former references the need for Waste Water Treatment Plants (WWTP) over 1 Million Gallons per Day (MGD) in the Lake Ontario and Lake Erie Basins to achieve 0.5 mg/l Total Phosphorus (TP) effluent concentrations while the supplement describes a 1.0 mg/l effluent concentration. This needs to be reconciled.
- This vagueness is in part due to the lack of a definition of the term “nuisance” and the inconsistent use of the terms “algal biomass” and “algal nuisance growths” between the goals for the different lakes.

- Another definitional short-coming is the lack of definition of what constitutes near-shore vs. off-shore waters.

Annex 13:

- No, lacking substantive goals and objectives in the Agreement, it is difficult to identify clear environmental or program outcomes.
- Comprehensive watershed management plans have not been prepared consistently across the Basin, and there are differences in how the parties, as well as state, provincial and local governments, are implementing watershed planning and management programs.
- The group found it difficult to find a consistent source to identify information on watershed management plans since much of this planning is being accomplished through local governments and local groups with no way of aggregating the information to higher levels of government.
- Some hydrology work has been done to integrate watersheds with the lakes. However, additional work is still needed to add water quality/pollutants of concern to the hydrology.
- Two criteria suggested for a successful watershed plans were: listing the top issues in the watershed, and describing implementation action.

(h) Are there outdated terms, concepts or references?

Annex 3:

- The primary concept that appears to be outdated is that the original Phosphorus control program was designed to address primarily off-shore eutrophication problems. This has now evolved into a near-shore problem in most of the lakes and both near-shore and off-shore in Lake Erie.
- There is a need for a clear definition of what constitutes near- shore waters and what is considered off-shore or open waters.
- There is also a need to define “priority hydrologic units” and “sustainability” in Article I- Definitions.
- The lakes may need to be viewed as having two distinct zones w/ different problems and different management measures.
- The next generation of P controls needs to focus on reducing P loads in near-shore waters and in watersheds.

- Additionally, some eutrophication problems in the lakes may be due to increasing Nitrogen loadings and these sources need to be addressed as well.

Annex 13:

- Watershed management planning should no longer be considered as a demonstration project. It is a well recognized management tool that should be utilized on a broad scale throughout the Basin.
- Similarly, many Best Management Practices (BMPs) to control non-point sources are well beyond the pilot project status in most cases and should be used on a widespread basis. While some new and innovative BMPs may still need pilot testing most are now well proven pollution reduction tools.
- The Agreement needs to reflect this.

(i) Other Comments.

Annex 3:

- There needs to be a melding of the original Agreement and the Supplement in order to fix an inconsistency between the two.

Annex 13:

- There are cross-cutting issues between Annex 13 and Annex 16 (on Groundwater). The IJC urbanization effects study found that an urban PLUARG is needed.
- An adequate reporting system is not yet in place to track progress of utilization of the available non-point source control programs and tools across the Basin.
- Inclusion of Item 3 - Wetlands and their Preservation- in Annex 13- Pollution from Nonpoint Sources- seems to be a curious fit in this Annex. Wetlands are not viewed by RWG D participants as a pollution source.
- Following is a conceptual proposal to begin a discussion about potential substantive goals and objectives to be considered for Annex 13:

Goal: To use all appropriate tools for effective watershed management in tributary watersheds of the Great Lakes which will ensure that impacts of diffuse pollution from nonpoint sources do not negatively effect the chemical, physical and biological quality of the Lakes

Objectives

- 1 - To establish bi-national criteria for what constitutes the minimum elements of a watershed plan at each scale appropriate for reporting
- 2 - To enable the systematic engagement of and reporting from local governments which implement watershed plans and accomplish pollution reduction projects
- 3 - To establish reduction targets for diffuse pollution, ensure methods and monitoring are available to do this
- 4 - To identify a suite of best management practices for diffuse pollution reduction
- 5 - To establish threshold environmental outcomes and a method and timeline for review of effectiveness
- 6 - To ensure there is sufficient institutional capacity to undertake, coordinate, and integrate the necessary actions and decisions on a watershed basis

Relevancy:

The continued relevancy of the Agreement.

3. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

- a. **Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?**

Annex 3:

- The environmental challenges in the lakes are similar but the environmental conditions and the science to evaluate them have evolved.
- The introduction of Aquatic Invasive Species (AIS) has significantly altered the ecosystems.
- In order to address nuisance algal biomass problems in near-shore waters and in bays more focus needs to be placed on reducing nutrient loads from watersheds and tributaries on a localized basis. This will require greater analysis and attention to the impacts from growth and land use changes.
- Need to quantify effects of invasive species in off shore waters. For near shore waters some work that has been done in western Lake MI apparently indicates there may be a relationship.

- Need to assess increased P content of soils due to increased use of manure and fertilizer on farm lands, resulting in increased soluble P levels in storm water runoff. There is an important linkage between Annex 3 and Annex 13 in this regard.

Annex 13:

- Yes, there have been significant changes in the Great Lakes watersheds that need to be addressed. Non-point source pollution remains a significant contributor to water quality problems in the Great Lakes ecosystem.
- The increasing impacts on the Great Lakes from growth and expanding urbanization need to be addressed.
- Additional stressors in the Great Lakes ecosystem include, but are not limited to, the growing presence of aquatic invasive species (AIS), toxic algal blooms, anoxia, botulism, etc.
- In order to address these and other emerging issues in the Basin continued investment in science and research is essential to assure cost-effective allocation of limited resources.

b. Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

Annex 3:

- The Agreement helped to spur development of programs, initiatives, and scientific reviews that did not exist at the time. For instance, the ban on Phosphorus in detergents by states was an important supplement to the regulatory programs in place at the time and the bans continue to be an effective implementation strategy.
- The agreement was also an important driver as LaMPs were prepared.
- More recently, the Agreement appears to have less impact on promoting new control strategies
- The Agreement holds the parties responsible, but not accountable.
- There is an apparent inconsistency of P limits for plant discharges between Annex 3- Goal 2)a [0.5 mg/l total P maximum] vs. the Annex 3 Supplement, Goal # 3)a- Lower Lakes [1 mg/l] This inconsistency in the Agreement is not supported by laws of either Party.

Annex 13:

- The Annex does encourage actions beyond what is required. LaMPs are a good example. For instance, the Lake Michigan LaMP has a thoughtful approach to watershed management, which is not required by the Agreement or the Annex.

- Watershed planning and management are largely the responsibility of state/local governments, not the Agreement Parties. The Annex needs to recognize the appropriate roles of these governmental entities, which are continually evolving. Authority and responsibility among the various levels of government needs to be more clearly defined.
- RAPs are also a key mechanism for involving local governments. Local responsibilities can be defined in the RAPs, where they exist.
- The relevant Ontario laws are the Nutrient Management Act and the proposed Clean Water Act (Bill 43).
- The Ontario CWA is aimed at protecting drinking water sources on a watershed basis. It has a Great Lakes component, but there is no legal authority to mandate watershed management outside urban areas.

c. Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

Annex 3:

- There is a need for the Agreement to help drive progress towards achieving the goals and objectives.
- Yes, the Agreement does have real targets/ drivers for P control.
- The Agreement is also a driver in development of SOLEC indicators and P indicators.
- Annex 3 still does drive actions, but when the P monitoring stopped it lessened the data upon which to make decisions.

Annex 13:

- While the Agreement helped catalyze the development of early efforts in watershed management, it has not been a significant driver of implementation actions for either country in recent years.
- The lack of substantive goals and objectives in the Agreement diminishes the potential of the Agreement to drive implementation. Annex 13 needs to be re-drafted into today's terminology and conditions.
- The lack of a comprehensive federal framework in which state/provincial and local governmental entities can conduct and coordinate their watershed and non-point source control activities lessens the utility of the Annex. Annex 13 needs a driver to promote greater local government action on non-point sources and watershed management.
- Need to apply a Plan, Monitor and Evaluation Circle analytic approach.

- US watershed planning is a local area of responsibility and some are funded thru Clean Water Act Section 319 projects. Canada does not have statutory support to do non-point source management at the present time. The Province of Ontario has used a phosphorus load trading scheme within a TMDL concept to trade dollars for phosphorus load reductions.
- The shortfall of resources dedicated to non-point source control programs further limits the effectiveness of this Annex. While some limited funding is available, it is mostly provided on a localized basis.
- More public education on watershed management is needed.

d. Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

Annex 3:

- To a great extent yes it does. For instance, since the Agreement was developed significant advancements have been made in the design and utilization of watershed management approaches in the Great Lakes Basin.
- One area where the tools may have fallen behind is related to lake modeling. Many participants feel that various lake models need to be re-run to reflect current Phosphorus loadings and ecosystem conditions. The Annex 3 Technical Sub-group is coordinating an interim effort to do so and the results should be available in September. Both whole lake and some near-shore modeling will be done.
- Renewed efforts to gather nutrient monitoring data and loading conditions may be needed. Gathering updated info will better explain Lake Erie conditions; help clarify how lakes are processing nutrients; use hydro-dynamic models to assess near shore conditions.
- One of the key areas of emphasis going forward needs to be on controlling sources that result in nuisance algal biomass in near-shore areas and bays.

Annex 13:

The Annex does not reflect current information or tools and needs to be updated to do so. For instance:

- There are 9 critical elements for watershed plans now being required by EPA in the US. These might be considered for broader application.
- The Agreement needs to identify improved mechanisms for engaging local governmental entities in the process of implementing Annex 13.

- It also needs to clearly articulate the appropriate roles of the various levels of government in addressing non-point source problems.
- One potential change to the Agreement was offered to help do so: Amend the lead sentence of Item 2 of Annex 13 to add “local governments”.
- Critical pollutants are not defined, but should be.

e. Other Comments.

Annex 3:

- Given the advances in science and improved reporting since inception of the Agreement the following conditions are worth noting:
 1. Phosphorus (P) loads have decreased as a result of the implementation of the P control programs in Annex 3, but oxygen depletion problems in Lake Erie and near shore-algal biomass problems still exist in most of the Lakes
 2. Target P concentrations in off-shore waters have been attained except for the western and central basins of Lake Erie, but near-shore algal biomass problems remain.
 3. Target P loads are helping to solve the offshore problems and they still need to be met in order to maintain the goals, but target levels need to be reviewed for currency since many of them are several decades old.
 4. Target P loads now need to be developed for near-shore areas and watersheds and more localized goals, objectives, programs, strategies and measures need to be formulated to address near-shore areas and bays.
- Setting targets should be a dynamic process that evolves with changes in the ecosystem.

Annex 13:

- Have approximately 53 tertiary level watersheds draining into GL basin on the Canadian side w/ an average size of 4000 sq. km.
- There are approximately 111 8 digit Hydrologic Unit code watersheds in the US Basin in the 600- 3000 square mile range.

Achieving Results:

The implementation and appropriateness of prescribed programs, policies and measures and demonstrated progress; including the application of sound science.

8. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?
- a. Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

Annex 3:

- Implementation of the Agreement was viewed as a success story in inter-governmental cooperation, particularly in the 1970s and 1980s, because of the significant reductions in P loadings that resulted in reversing the trends in eutrophication at the time.
- It is not possible to determine if P load targets are being met today due to the lack of load estimates in the last 15 years. Even if target loads on a lakewide basis are being met, it seems likely that nearshore areas and embayments may be experiencing excess P loading and the resulting degradation in trophic status. As TMDLs and other local and regional loading targets are developed, the relevant historical record should be examined and updated where necessary.
- Even though significant progress has been made towards achieving the loading targets in the Agreement, a number of the in-lake environmental objectives may not yet have been achieved, particularly for near-shore waters.
- Programs and policies are apparently sufficient to attain, or exceed, necessary reductions of the total phosphorus target loads in the open waters of four of the five lakes (Lake Erie appears to be the exception). Because of the apparent success of the TP load control measures, TP load calculations were apparently dropped after 1991. Current TP load calculations have been renewed only in Lake Erie and during the Lake Michigan mass balance process (1994 and 1995). This implementation shortfall results in a loss of scientific ability to evaluate current open lake conditions in four of the five lakes. The goal of maintaining adequate oxygen levels in Lake Erie year round may be difficult to achieve because the “dead zone” continues most years even though measured total phosphorus loads are below the loads expected to restore year round oxygen levels and oxygen depletion rates have not changed despite successful implementation of phosphorus load controls.
- Near-shore eutrophication problems have appeared in all of the Lakes except Lake Superior. Significant additional work will be needed on improving target P loading estimates from point and non-point sources, expanding monitoring programs to address near shore areas, tributary loadings, wet-weather events and potential significant increases from non-point sources, and revising model runs to reflect these changes.
- Nitrogen loading is also a source of nutrients that contributes to eutrophication and needs to be addressed.

Annex 13:

- In general, there is a lack of clear and substantive goals and objectives articulated in the Agreement. It is therefore difficult to ascertain if the programs, measures and policies are sufficient to attain them.
- The original intent of Annex 13 was to get watershed management off the ground in the Great Lakes Basin. The Agreement succeeded in helping to do so. However, today, over 25 years later, there is a new context within which we are operating. • No, because of how Annex 13 is written. The Agreement identifies the need for watershed planning but establishes no clear objectives to implement land management programs or initiatives designed to reduce nutrient loadings.
- No, because of how Annex 13 is written. The Agreement identifies the need for watershed planning but establishes no clear objectives to implement land management programs or initiatives designed to reduce nutrient loadings.
- There is a lack of definitions, inventories, and depictions of linkages w/ other programs or a management framework within which to operate.
- The Agreement is silent on the issue of developing watershed inventories. The sub-group has identified the following information to give better context to review questions. There are approximately 111 watersheds on the U.S. side of the Great Lakes Basin using the 8 digit Hydrologic Unit Codes. There are approximately 53 similar sized watersheds on the Canadian side. See the Sharepoint site for lists and maps. It is important to note that the US EPA recommends watershed planning on a 12 digit HUC level as a more manageable and outcome oriented scale. US Geological Survey will complete verification of 12 HUCs in late October.
- In general, positive results have been achieved insofar as the development of selected non-point source programs and the value of watershed management planning have now been well established.
- When the Agreement was developed many of the non-point source and watershed planning concepts were in a developmental stage. Numerous demonstration projects were utilized to help them mature.
- It is now time to move such initiatives from a demonstration project phase to a full scale implementation phase.
- Given this transition Annex 13 should be amended to more clearly define substantive goals and objectives that should be achieved in the next 20-30 years.

b. Does the Agreement fail to address critical issues?

Annex 3:

- The Agreement does not adequately address near-shore eutrophication issues that have grown in recent years. The impacts of Aquatic Invasive Species (AIS), such as zebra mussels and quaga mussels, have not been adequately assessed or addressed.
- The Agreement also does not call for adequate levels of control on sources causing near-shore problems as it does for off-shore challenges.

Annex 13:

Yes, while not meant to be a comprehensive list the following are some examples

- Water quantity issues in the context of water quality.
- Groundwater that impacts watersheds.
- Storm water runoff (SRO)
- Pathogenic contaminants.
- SOLEC indicators for land cover and conversion, biodiversity, impaired waters, TMDLs, and Section 319 NPS projects.
- Watershed literacy and citizen involvement.
- Environmental outcomes.
- Incentives for local governments to engage in watershed management planning and implementation.
- Water education.

Additionally, the Watershed Sub-group of the Special Issues Work Group (SIWG) has identified a number of potential cross-cutting issues that they have been reviewing that may have applicability to Annex 13. There may also be merit in looking at some of these items as part of the LaMPs under Annex 2.

- Agricultural land use
- Drinking Water infrastructure
- Source water protection and watershed planning
- Near shore waters and coastal areas
- Urbanization and sprawl
- Water quantity, diversions and use, and hydrometric regimes

9. Are the demonstrated results consistent with goals and objectives in the Agreement?

a. Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not.

Annex 3:

- Partially, the programs identified in Annex 3, item 5) a, b and c of the Agreement have been implemented.
- Some of the non-point source programs in section 5)d of the Agreement have been initiated by state, provincial and/or local governments while others have not been fully implemented due to lag times for science and technology to address the issues and due to a lack of resources in some cases.
- R &D efforts in item 5)e are being addressed by another RWG.
- Item 5)f is also being addressed by another RWG, but it is worth noting that it is difficult to assess progress if we do not have monitoring programs to adequately measure near-shore or tributary conditions.
- There was a discussion of where to draw the line between clarity and implementation, regarding the Dissolved Oxygen goal of restoring year round oxygen conditions. The alternatives discussed were (1) change the goal if it is unattainable, and (2) to address the situation under implementation.

Annex 13:

- If the intent was primarily to gear up watershed planning initiatives then that has occurred in select locations.
- However, with no substantive goals and objectives in the Annex it is difficult to measure if the programs and policies have been successful.
- Watershed planning is a dynamic and iterative process.
- There is a lack a comprehensive or holistic view of all of the non-point source programs that are being utilized.
- Item 4 of Annex 13 is vague and difficult to measure.

b. Are any parts of the Agreement in any way an obstacle to progress?

Annex 3:

- We do not see any major obstacles to progress in the Agreement but lack of specificity discourages a proactive approach.

Annex 13:

- Need to shift focus on watershed planning and management from demo projects to standard programs for widespread implementation.
- There is a lack of environmental outcome based metrics for watershed management. These need to be developed.

c. Are there external impediments that prevent implementation?

Annex 3:

- Yes, there is a lack of resources to do adequate monitoring and P loading analyses.
- The lack of integration of critical programs is sometimes an impediment to successful implementation. There needs to be better coordination among the various programs and activities.
- If we do not have a current base of information and scientific understanding of the lake dynamics, particularly for near-shore areas, then it is difficult to know where to allocate scarce resources most effectively.
- There are also international unfair trading limitations in the North American Free Trade Agreement (NAFTA) and the World Trade Organization (WTO) that stifle incentives and/or subsidies.

Annex 13:

- The lack of adequate funding is an impediment.
- Political systems are not set up to effectively handle non-point source control efforts because thus far they are primarily voluntary in nature. The resource investments are not on a comparable level w/ the point source control programs such as the \$20B invested in WWTP upgrades. We may need to more fully examine and utilize other mechanisms to achieve ecosystem protection goals.
- There is no timely reporting on what is happening w/ development and implementation of watershed plans. It is not clear who reviews the plans that are prepared. Additionally, these plans are often dynamic and it is hard to keep up with them as they evolve over time.
- Canada does not have a coordinated approach for watershed planning among conservation authorities and they depend on voluntary collaborative efforts rather than regulatory requirements. The US section 319 funds go to states for allocation within their boundaries, generally to address watershed planning under section 305 impaired waters.
- EPA does get copies of local watershed plans prepared under the auspices of section 319. 319 projects require a 40% match to 60% federal % \$.

d. Are there other barriers to progress?

Annex 3:

- Only Lake Erie currently has a systematic updating of data. Need to do so for the other Lakes as well.
- Other nutrients, particularly N, are also increasing in the lakes and need to be factored into the equation. Data from 1983- 2005 suggest that N levels are increasing in all lakes due to nonpoint sources from agriculture.
- Additionally, nitrogen loading is increasing due to many WWTP's removing ammonia w/o corresponding de-nitrification processes. If selected WWTP's are not denitrifying their discharges then this may need to be addressed as well.
- There is a lack of knowledge on the impacts resulting from air deposition of pollutants.
- Climate change may be adversely impacting the lakes by increasing water temperatures and lowering oxygen levels.
- There is also a lack of understanding of the land-to-water pollutant transport process.

Annex 13:

- It is difficult to report on the entire non-point source programs because they are very dynamic, continually evolving and conducted at multiple levels of government. There is also no mechanism for the Parties to receive up to date information regarding the programs, which makes it difficult to assess progress.
- There is a need to establish baseline conditions as benchmarks for many of the non-point source programs.
- Land use controls to address non-point sources are lacking. Since the Parties are the federal governments and land use controls are typically provided by local governments, a disconnect exists between the entities responsible for the Agreement and those with authority to address a major contributing source.
- There is a lack of funding for monitoring programs and trend analysis.
- In order to develop and implement a management framework for monitoring progress of the non-point source control programs additional staff capacity will be needed.

e. To what extent can results be attributed to the Article/Annex?

Annex 3:

- The good success in addressing open water issues in four of the Great Lakes and the eastern basin of Lake Erie are in part result of implementing provisions of the Agreement.
- However, we cannot dwell on past successes
- Successes in addressing Annex 3) Items 5) a,b,c are directly related to implementation of the Annex.

Annex 13:

- Annex 13 helped to catalyze the use of watershed planning and management in the early years. It was a driver to help get watershed planning up and running in the early 80's. In the 80's the emphasis shifted to do watershed work primarily in the AOCs. Later, in the 90's, watershed work shifted to address section 303)d impaired waters. Today, other drivers are more prominent.
- It is also difficult to attribute results to Annex 13 because comprehensive watershed data is generally not reported.

f. Other Comments.

Annex 3:

- There are nuisance algae conditions [Chladophora] in Lake Ontario that are getting worse and will continue to do so. The near- shore areas are a bath tub that has not been fixed. We have also not addressed tributary watersheds adequately. The aim should be a healthy ecosystem not a particular P load.
- The whole ecosystem should be the focus, not just P loadings or targets.

Annex 13:

- A suggestion was made that that we might do better by referring to "Diffuse pollutants" rather than "nonpoint sources". This would be closer to the Canadian terminology. We also may want to include Watershed Management- Planning in the title of Annex 13. This would better convey the intent to address watershed issues on a more holistic basis.

10. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

- a. Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?**

Annex 3:

- It appears that resources were sufficient through about 1990, but that priorities changed when it appeared the P loadings were going down.
- Since then both dollars and staffing have gone down and there is not currently adequate resources being allocated to assure continued success.
- There are nuisance algae conditions [Chladophora] in Lake Ontario as well as other Great Lakes that are getting worse and will continue to do so. The near- shore areas are a bath tub that has not been fixed. We have also not addressed tributary watersheds adequately. The aim should be a healthy ecosystem not a particular P load.
- The whole ecosystem should be the focus, not just P loadings or targets.
- Furthermore, w/o adequate scientific information upon which to base resource allocation decisions then it is more difficult to better target and prioritize resources that are available.

Annex 13:

- No, resources are not sufficient to control diffuse pollutants to a level necessary to protect the Great Lakes ecosystem.
- The resources that are provided are variable and tend to fluctuate over time. A more continuous and stable funding stream to address non-point source control programs is needed.
- Enhanced funding is needed for all phases of the non-point source control effort including, but not limited to, enhanced monitoring, implementation of best management practices, construction of infrastructure to address urban runoff, research and development, staff capacity, and management of the non-point source control efforts.
- These resources need to be provided not only for work directly on the Great Lakes but also for tributary watersheds throughout the Basin.
- Funding needs in the U.S. are presented in the Great Lakes Regional Collaboration (GLRC) Strategy Report of December 2005.

b. Other comments.

Annex 3:

No comments

Annex 13:

- The Great Lakes Regional Collaboration report cited \$13.7 billion to fund waste water treatment improvements from the Clean Watersheds Needs Survey 2000 Report to Congress (www.epa.gov/owm/mtb/cwns/index.htm).

11. Is the science in the Agreement still relevant? If not, why?

a. If the science in the Agreement is still relevant, how has it been incorporated?

Annex 3:

- Eutrophication is perceived as an "old" issue by some jurisdictions with a consequent reduction or elimination of monitoring programs. Recent evidence at LEMN and IAGLR conferences indicates that the increase in phosphorus in Lake Erie cannot be explained by changes in internal P cycling by dreissenid mussels. Consequently, there is need to redesign and reinstitute point and non-point monitoring. The focus of attention has been Lake Erie, but increases in Cladophora and cyanobacteria blooms in the other lakes indicates that a re-look at programs to address Annex 3 objectives is required on all the Great Lakes.
- Oxygen levels are unchanged even though P loads have gone down.
- Need to factor aquatic invasive species and global climate change impacts into the models.
- Models may need to be re-run with updated target loads and updated ecosystem assumptions. In particular, for Lake Erie, with current P loading concentrations and settling rates and increases in the presence of mussels.

Annex 13:

In general:

- It is not entirely clear what the term "science" may include in this context. Perhaps adding a definition or further explanation would be helpful.
- That said, Annex 13 is focused primarily on promoting use of watershed planning and management approaches. Watershed management is viewed as more of a management strategy than as a scientific approach.

In particular:

- The Annex 13 Technical Sub-group has compiled information about what elements are critical to good watershed management plans. These include the nine minimum elements of watershed plans as adopted by EPA's non-point source control program. They can be found on the Sharepoint web site at <http://akron.glnpo.net/glwqa/default.aspx>. Click on the Annex 13 Technical Sub-group folder.

- There are many analytic processes involved in watershed planning and management, including but not limited to: monitoring, modelling, loading allocations, social sciences, TMDLs, etc. These technical processes are important components of watershed planning but they are not currently an integral element of the Annex.
- There is a strong view that it is time to move watershed planning out of the demonstration project phase and into full implementation across the Basin and that the Agreement should reflect this transition.

b. Does the science adequately influence decision-making?

Annex 3:

- Scientific analyses are indicating that the focus of efforts to control eutrophication needs to shift from the open waters to near-shore areas because that is where most of the remaining environmental challenges, such as the presence of green slimes exist.
- There is uncertainty about what is causing increases in lake P and the subsequent appearance of increasing eutrophication.
- The science on the lake ecosystem dynamics is also changing and this is not reflected in the older models, which need to be updated.
- Several factors, such as the increase in Aquatic Invasive Species (AIS), impacts to the lake ecosystem from global climate change, increasing runoff from land management decisions and other factors, have changed the system so that updated models are needed to analyze the system.

Annex 13:

- The weak link between science and this Annex may be the decision-making process. Who makes decisions and at what level is not clear.
- Watershed appropriate scientific tools are not easily accessible at the local level where many of the watershed planning and diffuse pollution decisions are made.
- Site specific modelling capabilities are not well developed and without them it is difficult for local decision-makers to make well informed choices. For instance, we apparently do not have good scientific models capable of predicting what load reductions would result from wetlands restoration.
- Both point and non-point sources need to be part of comprehensive watershed planning and TMDL processes.
- An example of a successful restoration site is the Maumee River where they have tracked progress to demonstrate results.

c. Other

comments

Annex 3:

No comments

Annex 13:

- It would be helpful to have comprehensive national lists of both point and non-point sources that cause significant water quality problems in the Lakes

12. Does the Agreement incorporate science to address emerging issues?

a. Are there new issues and programs that need to be addressed?

Annex 3:

- The science on the lake ecosystem dynamics has changed and is not reflected in the older models, which need to be updated.
- There is uncertainty about what is causing increases in lake P and the subsequent appearance of increasing eutrophication.
- The science on the lake ecosystem dynamics is also changing and this is not reflected in the older models, which need to be updated.
- Several factors, such as the increase in Aquatic Invasive Species (AIS), impacts to the lake levels from global climate change, increasing runoff from land management decisions and other factors, have changed the system so that updated models are needed to analyze the system.
- Running the lake models again provides a unique opportunity to increase scientific understanding in the GL Basin.
- Other nutrients, such as Nitrogen (N), need to be better analyzed and factored into the analyses of eutrophication as well.
- Nitrogen problems can be found in the Gulf of Mexico too.

Annex 13:

In general:

- It is difficult to determine since science does not appear to be an integral element of the current structure of Annex 13 and because watershed planning is such a dynamic process.

In particular:

There are both new issues and some old issues that have not yet been adequately addressed. Some of these include:

- Source Water Protection (SWP)
- CAFO's
- Sanitary Sewer Overflows (SSOs) and Combined Sewer Overflows (CSOs).
- The SIWG has also identified a number of watershed related issues that may need to be addressed.
- There are also linkages between watershed planning and the RAPs and LaMPs processes identified in Annex 2.

b. Can the Agreement accommodate emerging issues?

Annex 3:

- The Agreement can be amended at anytime by mutual Agreement of the Parties, but this is rarely done.
- The Agreement allows new issues that are identified to be examined, but the system does not necessarily have the capacity to operationalize the changes in a timely manner.
- Other processes may be able to address emerging issues faster than GLWQA change process.
- The choice of whether to amend the Agreement or to utilize other applicable authorities needs to be made based at least in part on the urgency of the emerging issue.
- We should propose changing the title of Annex 3 to Control of eutrophication, so we can address both P and N issues under this Annex.

Annex 13:

The Agreement can address emerging issues within its 6 year review cycle. However, for some critical threats or problems the 6 year review cycle is not timely enough. While the Agreement does not prevent the Parties, or others, from responding more rapidly, it does not have a mechanism to fast track critical problems on a more timely basis.

Management Framework

Appropriate institutional structures, cooperation and coordination, including potential duplication with other initiatives or instruments of a similar nature, and synergies and linkages with other initiatives.

4. **Are management and coordination approaches identified in the Agreement?**
a. **Is management and coordination specified? If so, briefly outline.**

Annex 3:

- The management framework is OK and management approaches are sufficiently laid out.
- However, there are shortcomings with the coordination mechanisms as laid out in the Agreement.
- Implementation is loose.
- The BEC has authorized implementation of a key P monitoring initiative.

Annex 13:

- No, there is a lack of an adequate management framework to guide implementation of this Annex, particularly at a working level.
- The Annex 13 Technical Sub-group has compiled information about what elements are critical to good watershed management plans. These include the nine minimum elements of watershed plans as adopted by EPA's non-point source control program. They can be found on the Sharepoint web site at <http://akron.glnpo.net/glwqa/default.aspx>. Click on the Annex 13 Technical Sub-group folder.

- b. **Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?**

Annex 3:

- Some monitoring work continues to be done (concentration measurements and stream gauging at a limited number of sites) but loading calculations are not being done for four of the five Great Lakes; thus achievement of the goals is unknown.
- The agreement should foster greater coordination regarding the linkages between Annex 3 and Annex 13.

Annex 13:

- Perhaps the coordination mechanisms were originally sufficient to promote watershed demonstration projects.
- However, these approaches are clearly inadequate to achieve contemporary needs or future watershed planning and management.
- The reporting specified in Annex 13 item 5 has not been completed on a biennial basis, as suggested.

c. Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

Annex 3:

- Most participants believe that priority setting occurs pretty well w/in LaMPs, but to a lesser extent among the LaMPs.
- Priority setting seems to be working on Lake Erie; but it is harder to tell on some of the other lakes.
- Canada does provide adequate inter-provincial coordination of programs and there is good bi-national cooperation within and across LaMPs.
- For Ontario there is a focus on watershed management planning. The current agreement lasts through March 2007. It is focused on surface water protection.
- Planning efforts for some lakes are better than other lakes.
- Coordination has occurred on Lake Erie, but some question whether the Agreement caused the “facilitation” to occur, or if it happened on a more ad hoc basis.

Annex 13:

- No, priority setting is very loosely driven.
- There is no priority setting mechanism, nor have the priority hydrologic units been identified.
- There are no methodologies for prioritization established.
- There are no apparent coordination mechanisms for prioritization among LaMPs or Among RAPS.
- There are no established coordination mechanisms among local initiatives.

d. Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

Annex 3:

- Yes, the BEC is one example of bi-national cooperation.
- Lake Erie at the Millenium Group is another example.
- SOLEC, a bi-national reporting system on the lakes.

Annex 13:

- There are some linkages between the Agreement and other initiatives, such as the SOLEC indicators supported by the IJC.
- However, lacking any clear depiction of local government roles and goals, there is no good framework or a coordination mechanism to promote and manage these linkages.

e. Other comments.

Annex 3:

No comments

Annex 13:

- A governance issue is the need to develop a relationship to better link the watershed planning that occurs.
- There is a lack of a framework, coordination mechanisms, and definition of local government roles. Consideration should be given to identifying the roles and relationships of all pertinent entities under the Agreement.

Accountability:

Reporting and assessment. The ease of access to, and quality of data for monitoring and reporting purposes, role of the IJC and long-term sustainable buy-in and commitment from the Great Lakes community.

2. Is there comprehensive monitoring and reporting?

- **Are there clear indicators to determine progress?**

Annex 3:

- Yes, there are some clear indicators available, such as the SOLEC indicators. However, it is important to recognize the distinction between targets (as outcomes) and indicators (as milestones).

- Present targets and indicators relate primarily to off-shore waters. Similar targets need to be developed for Annex 3, items 1) b-f.
- The BEC has authorized implementation of a key P monitoring initiative.

Annex 13:

- No, the Annex was originally focused on promoting demonstration projects of watershed planning. Defining indicators was not a priority at that time.
- Today, there is a clear need for specification of indicators and a comprehensive process for monitoring and reporting on them for the entire Great Lakes Basin.
- While SOLEC indicators are available on a lake specific basis as part of selected LaMPs they are not applied on a Basin wide perspective.
- Indicators and monitoring are needed to address the complex problems of near-shore waters.
- Items 4)a and 4)b of Annex 13 fall short of being adequate insofar as they only address P loads; not the lake ecosystem as a whole. Monitoring/ reporting needs to be broader than just P loadings.
- Most of the RAPs and LaMPs are fulfilling what is delineated in Item 1 of Annex 13, but beyond that comprehensive monitoring and reporting is not done.

(m) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

Annex 3:

- Initially, there was a very well established accountability framework, but it was somewhat modified in the early 1990s w/ the cessation of P monitoring.
- There still is a viable system of accountability for off-shore waters, but it might be worthwhile to consider recommending a surveillance and monitoring provision be added to Annex 3 of the GLWQA.
- There is not an adequate accountability system for the near-shore waters.
- It appears in Section 4)a that the Agreement clearly calls for P load reduction plans for Lake Erie and Lake Ontario that can be reviewed and evaluated. Section 4) b calls for progress reports and annual updates to the plans, again just for LE and LO and not the other lakes. It does not appear that the Agreement contains similar explicit accountability provisions for the Upper Basin Lakes. Section 5)f calls for the Parties to “evaluate efforts taken by the Parties to reduce Phosphorus in the Great Lakes Basin.”

Annex 13:

- On a broad scale there is some accountability on a lake specific or area basis through LaMPs, RAPs and TMDLs
- Inter-lake or basin-wide accountability mechanisms are lacking however, as are mechanisms to address the loading contributions from tributaries to lakes.
- There are inadequate coordinating mechanisms among various monitoring and reporting initiatives
- There is no mechanism in Annex 13 to track changes in land use, contributions from non-point sources and the BMPs being used to address them or to address Annex 13- Items 4)a and 4)b.
- There appears to be no process for allocating pollutants from air deposition, such as Mercury to the Great Lakes Basin.

Are they being met?

Annex 3:

- TP monitoring needs to be re-visited to ensure the information collected allows us to compute the TP loads w/ confidence.
- Annex 3 needs monitoring programs and indicators to address near-shore areas.
- TP load reporting has been discontinued for all lakes except Lake Erie.
- In Lake Michigan 5 years ago the view was that algal growths had been substantially eliminated. Today it has returned. Therefore, achievement of the targets have not been maintained, at least in near-shore waters. However, we do not know if the return of chladophora is a function of increased loads or some other factors.
- Open water P concentrations have been met and point source loading targets have been met, in LM.
- Annex 3, Items 1 e) and f were met, but now the algae problems have returned, so they have not been maintained.
- Annex 3- Item 1) c- for Lake Ontario (LO) and the International Section of the St. Lawrence River, have been met and maintained.
- We cannot determine if Annex 3- Item 1) e- Lake Michigan (LM) has been maintained due to a lack of frequency of monitoring and reporting.

Annex 13:

- It appears that in general the accountability provisions in the Agreement are being met, but given the prior observations about the lack of adequate indicators or accountability mechanisms this is not sufficient.
- The biennial SOLEC meetings and reports help address Annex 13, item 5, but not comprehensively.

(n) If not, why not?

Annex 3:

- In the 1980's –early 1990s the P target loads were achieved and the open water P concentrations were below established goals. Therefore, the assumption was made that the goals had been met and ongoing monitoring or loading calculations was not needed. This turned out to be incorrect, as algal problems have returned in certain locations.
- Items 1) b-f have not been adequately addressed yet because of costs and the variability of near-shore monitoring needs.

Annex 13:

- The lack of broad based goals in the Annex, the lack of a sufficient accountability system to gauge progress are the two primary reasons.

(o) Is the frequency of reporting sufficient?

Annex 3:

- RWG D believes that biennial reporting is adequate, however, there is an implied annual reporting requirement in section 4)b of Annex 3 of the Agreement that has apparently not been met and which needs to be reconciled.

Annex 13:

- Biennial reporting is sufficient where it occurs as part of SOLEC indicators. However, since the overall accountability system is lacking there are many areas where biennial reporting is not happening.
- It appears that there is virtually no reporting system to address the formulation and implementation of watershed plans at the local level.

(p) Other comments.

Annex 3:

No comments

Annex 13:

No comments

5. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

d. Is the role of the IJC as set out in the Agreement clear and appropriate?

Annex 3:

- Item 6 on page 34 of the Agreement assigns evaluation responsibilities to the Parties. While the IJC role was more prominent in the first twenty years of the Agreement, the Parties have taken on more responsibility to evaluate progress since then.

Annex 13:

- The role of the IJC is not clear.
- The Agreement is clear on the responsibility and the roles and responsibilities of state and provincial governments, but it is not clear on the role of local governments, who are an integral player in land use and watershed matters. The role of local governments and conservation authority's needs to be delineated somewhere.

e. Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

Annex 3:

- Information collection is the Parties responsibility and the IJC role has been modified by the Parties over time. This has impacted the way that tools are utilized and information flows to the IJC.
- There are a number of shortcomings in the data/ information collection system that impact the ability of both the IJC and the Parties to successfully fulfill their roles.
- There is a lack of information to enable adequate measurement of nuisance algae conditions under Annex 3- Item 1e) –Lake Michigan and 1)f- Bays and near-shore areas throughout the Great Lakes system.

Annex 13:

- No, the IJC does not have all of the tools that are needed because the reporting in Annex 3, item 5 have not been done.

f. Other comments.

Annex 3:

No comments

Annex 13:

No comments

3. Does the Agreement enable an effective level of commitment?

f. Is the role of the public identified?

Annex 3:

- No, only state and provincial government roles are identified.

Annex 13:

- No.

g. Does the Agreement identify appropriate mechanisms for public engagement?

Annex 3:

- No, except for the public health role in the bi-national governmental processes.

Annex 13:

- No.

h. Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

Annex 3:

- No, just state and provincial governments

Annex 13:

- In addition to the federal Parties, the Agreement allows for state and provincial governments to have some “ownership”. The Agreement does not prohibit, nor does it encourage, other governmental or non-governmental entities to take on a proactive role.
- What does “ownership” as used above mean?

i. Does the Agreement drive action by communities and industry?

Annex 3:

- Yes, through wastewater treatment plant discharge permit limits.

Annex 13:

- The Agreement does not require watershed planning at the local level government level, although some entities do so for reasons outside the Agreement.

j. Other comments.

Annex 3:

No comments

Annex 13:

- The Annex 13 Technical Sub-group is addressing this issue. They have suggested that we use the 8-digit HUC codes to define the typed of watershed that needs to be included.
- There is a need to develop common elements of a watershed plan. Those have been placed in the Sharepoint site folder for the Annex 13 Technical Sub-group.

4. Response to Overarching Questions

1. Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

The Great Lakes Water Quality Agreement's principle purpose statement, "to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem" is still valid and relevant. Since 1972, the Great Lakes Water Quality Agreement between Canada and the United States has provided a model for binational cooperation, consultation and action to restore and maintain water quality and ecological health in the Great Lakes basin.

2. Does the Agreement, and its implementation, achieve the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes basin ecosystem?

Implementation of the agreement has been inconsistent over the last thirty years due to a lack of specificity on what monitoring and surveillance needs to be taken to support Annex 3.

Annex 3 has been one of the great successes of the Great Lakes science and management community to control eutrophication in the open waters of the lakes through reduction of phosphorus loadings based on model developed targets for each lake, Saginaw Bay, Georgian Bay and the North Channel. This goal was largely attained for the Lakes by the end of the 1980's, but the status of compliance with the developed loads of the major embayments does not appear to have ever been determined. Implementation of phosphorus load measurement was discontinued after 1991 for all Lakes except Lake Erie.

Annex 3 also calls for control of algal biomass and elimination of algal growths to restore water conditions in the lakes, bays, and other areas where nuisance growths are present. The failure to maintain the biological integrity of the nearshore areas of four of the five Great Lakes needs to be addressed.

Advanced models capable of tracking nutrient management of increasing phosphorus (and nitrogen) loads from land use activities are needed. These models must link the nearshore zone to the open lake to understand the excess nutrient issues in the nearshore zones while open lake waters in the upper lakes are solidly oligotrophic and total phosphorus concentrations are much lower than expect in all lakes (except Erie) by the models used to develop the current target loads.

Annex 13 lacks a contemporary statement of purpose and clearly articulated goals. At the time the Annex 13 was initiated, it served as an important catalyst to promote the development of watershed planning and formulation of innovative non-point control techniques. New issues have been identified by the SIWG which may be appropriate to include in Annex 13 (or Annex 2). The Agreement should be amended to promote the transition from viewing watershed planning as a pilot approach to full scale implementation and coordination of basin-wide watershed planning.

3. Is the Agreement, and its implementation, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so what are they?

The Agreement, and its implementation, is not sufficient to protect and restore the Great Lakes with regard to Annex 3 and 13.

The following critical issues that are not addressed, or not adequately addressed, in the Agreement were pointed to by RWG D:

- Annex 3 does not adequately address the nearshore zone of the Great Lakes. A reoccurrence of excess nutrients has emerged for the nearshore of the four Great Lakes, bays, and other areas. There needs to be a monitoring and surveillance program developed in conjunction with models to understand nuisance algal problems and to be able to determine what management actions can be undertaken to control and eliminate these unsightly and esthetic problems.
- Annex 13 lacks substantive goals and objectives. Given this shortcoming it also lacks an adequate framework for coordination, implementation, and performance accountability. Therefore, a process should be initiated to develop substantive goals and objectives for Annex 13 (in coordination with Annex 2), as well as an appropriate management framework to assure timely reporting of the dynamic work being accomplished within the watersheds of the Great Lakes Basin.

4. In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

The following were cited as examples of where the Agreement successfully fulfills its intended purpose and current goals:

- Progress has been made on reducing phosphorus loadings to all the Great Lakes. The GLWQA has resulted in substantial reductions of phosphate concentrations in detergents as well as in the widespread adoption of sewage treatment to great environmental effect.
- Watershed planning has become a standard tool for managing diffuse pollution from non-point sources.

The following were cited as examples of where the Agreement has fallen short of fulfilling its intended purpose and current goals:

- Nearshore nutrient conditions are out of control in many areas of the Great Lakes and accurate nutrient loadings measurements may not be possible due to the deterioration of the monitoring and surveillance activities needed to determine loads.
- Target loads to the Great Lakes have remained unchanged for nearly thirty years, and one area where management tools needs updating relates to lake modeling. New lake models are needed to reassess the target loads and to incorporate both whole lake and near-shore areas.

- One key area of emphasis going forward needs to be on controlling sources that result in nuisance algal biomass in near-shore areas and bays.
- Inadequate reporting by the Parties makes it difficult to assess if the requirements of Annex 3 and Annex 13 are being met.
- Annex 13 does not reflect current information or tools and needs to be updated. For instance there are 9 critical elements for watershed plans now being required by EPA in the US. The agreement needs to identify improved mechanisms for engaging local governmental entities and clearly articulate the appropriate roles of the various levels of government in addressing non-point source problems. The coordination of watershed planning within a Great Lake is accomplished by the LaMP, but coordination amongst LaMPs needs articulation.
- The Agreement is not flexible enough to address emerging issues in a timely manner.
- Inadequate resources to do monitoring, P loading analyses and a current base of information and scientific understanding of the lake dynamics, particularly for near-shore areas.

5. What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

- Goals should be achievable and unachievable goals should be removed e.g restoration of year-round aerobic conditions in the bottom waters of the Central Basin of Lake Erie via phosphorus control is not possible.
- Clearer language on relationships and roles between various levels of Government.
- Provide an ability to address emerging issues outside the process of reviewing the GLWQA.
- Coordination for the LaMPs to integrate and report on watershed management approaches to address issues between lake basins.
- Incorporate local governmental jurisdictions in the Agreement that provide much of the watershed management planning in the Great Lakes Basin.

5. Path Forward

II. Recommendations

The workgroup has reached consensus on recommendations for both Annexes.

- Annex 3 was reviewed in 1999. The recommendation at that time was insufficient scientific justification for changing the phosphorus control objectives and phosphorus load targets in Annex 3. The workgroup finds that this situation has changed.

Annex 3 represents a great deal of research and modeling to prepare and implement the control of phosphorus in the open waters of the Great Lakes. Cultural eutrophication was reversed and phosphorus concentrations began to decline and by the end of the 1980's, most target open lake concentrations were attained. Habitat and water quality improved as the models predicted. Indications from the late 1990's and early 2000's suggest that the open lake phosphorus target concentrations have been overshot in four of the five lakes (Lake Erie being the exception), with nutrient starved offshore waters. Impaired water quality has returned in nutrient rich coastal zones. Coastal ecosystem impairments of Cladophora blooms coupled with Dreissenids have altered nutrient cycling and transfer from the nearshore areas to the open lake areas. The modeling work for phosphorus controls should be reviewed to see if loadings are appropriate for the trophic states expected in the open waters of each of the Great Lakes and to develop recommendations for the control of nutrient enriched coastal areas where nuisance algal blooms have returned. There is a need to redesign and reinstitute point and non-point monitoring to assure that the loads being provided are complete due to the rise in significance of wet weather diffuse loadings to the Lakes.

Annex 3 currently implicitly addresses the nearshore zone. A revised Annex 3 should explicitly address the nearshore areas and bays in all the lakes where nuisance algae growths have re-emerged (Lake Superior being the exception). Goals of Annex 3 Section 1 (b thru f) p29 are dominated by references for substantial reduction of algal biomass in all the Great Lakes, bays and other areas of the Lakes. This should be indicated primarily as a nearshore issue. While provisions for accountability, reporting, monitoring, and evaluation are provided in Annex 3 for the open water issues, the nearshore monitoring programs are only implied. Consideration needs to be given by the Parties in annex 3 for a nearshore algal surveillance program. (See Annex 11 Section 3 (b)).

Given the findings of the Annex 3 Technical sub-group of RWG D described in their report, we would like to propose the following recommendations for monitoring and modeling to aid nutrient-eutrophication management of the Great Lakes in the face of ecological changes that appear to have occurred:

1. The Great Lakes monitoring programs of the two countries should focus a larger percentage of their efforts on monitoring near-shore conditions in order to compare with the more traditional open-water conditions. It is quite possible for a lake to be experiencing nuisance conditions in the near-shore areas while appearing to be meeting water quality objectives in the open-water.
2. A more thorough investigation of the utility of models developed in the 1970s for future management of Great Lakes nutrient-eutrophication conditions needs to be undertaken. This effort should focus on determining how models should be modified/refined if they are found to be lacking relative to ecosystem structure and function changes that have occurred in the lakes.

3. There needs to be a concerted research, monitoring, and modeling effort to quantitatively understand, in the sense of developing a model that can simulate system-level cause-effect relationships, the simultaneous low productivity and fish carrying capacity in the open water of Lake Ontario and nuisance algal bloom and mat formations in the near-shore areas of the lake. The role of Dreissenids that have invaded shallow water areas in this observation should be researched.
4. There needs to be a concerted research, monitoring, and modeling effort to quantify the relative contributions of various environmental factors (total phosphorus loads, changes in the availability of phosphorus loads to the central basin, hydrometeorological impacts on temperature conditions and hypolimnion structure and volume, Dreissenid-induced alterations of nutrient-phytoplankton-light conditions and oxygen demand functions) to central basin hypoxia.
5. There is a need for a concerted Cladophora modeling initiative with the overall goal of providing lake managers with reliable estimates of the response of Cladophora growth and accumulated biomass to changes in soluble phosphorus concentrations in the coastal areas affected by Cladophora blooms. The initiative should include (1) regular monitoring of Cladophora biomass and tissue phosphorus content and soluble reactive phosphorus levels in the near-shore and (2) an integrated program of field and laboratory studies and mathematical modeling to better understand phosphorus cycling and Cladophora growth under conditions representative of the post-dreissenid period.
6. All of the above efforts should be implemented using a well-coordinated, bi-national, ecosystem approach that respects potential interactions between nutrient-eutrophication management and other management issues, such as fisheries, persistent bio-accumulative and toxic chemicals, human health protection relative to water recreation and drinking water supply, sediment reduction, etc.

Annex 13 was formulated to address diffuse pollution from non-point sources which negatively impact Great Lakes ecosystems. It combined a number of issues and tools that might be helpful in addressing the probably negative effects known at that time. Science on the subject was just emerging at the time the Annex was written, and the Annex was not reviewed in the last agreement review process.

RWG D believes that there is a significant shortcoming in Annex 13 of the Agreement insofar as there is a lack of substantive goals and objectives in the Agreement. Some preliminary suggested goals and objectives are offered for consideration in item 5 below.

The workgroup acknowledges the impaired water quality in near-shore areas of many of the Great Lakes. Anthropogenic forces, climate changes, and new issues identified by SIWG threaten ecosystem integrity and sustainable use of near-shore habitats essential for healthy lake functions.

Comprehensive watershed planning in all tributaries to the Great lakes and implementation of those plans are currently the best method of addressing diffuse pollution from non-point sources. Watershed management needs to be incorporated into the Agreement to help resolve the competing interest of nutrient-starved offshore waters and nutrient enriched near-shore areas. Local organizations, governments and NGO's are now the crucial partners to the success of watershed planning and implementation processes. Current watershed work has no formal means to be accounted for in the international context, and there is no way to provide the Parties with a timely picture of issues and scale of problems being addressed. Methods to prioritize this watershed work is critical to improving Great lakes water quality, and

a focus on specific loading and impairments in the near-shore areas would help address key current issues there.

Wetlands protection, enhancement and restoration may or may not be included in the watershed plans and might merit separate consideration somewhere in the Agreement.

The Annex 13 Technical Sub-group of RWG D also formulated suggestions regarding a potential update to the Agreement. On the following page is a brief discussion regarding the issues which could be addressed in the review of the GLWQA and should be coordinated with Annex 2.

1. **Watershed Inventory-** The Annex is silent on this issue. The sub-group has identified the following information to give better context to review questions. There are approximately 111 watersheds on the U.S. side of the Great Lakes Basin using the 8 digit Hydrologic Unit Codes. There are approximately 53 tertiary (8 HUC similar sized) watersheds on the Canadian side. See the Sharepoint site for lists and maps. It is important to note that the US EPA recommends watershed planning on a 12 digit HUC level as a more manageable and outcome oriented scale. US Geological Survey will complete verification of 12 HUCs.
2. **Priority Hydrologic Units-** There appears to be no common definition for what constitutes a “priority hydrologic unit” and it appears that no one has prioritized among the watersheds at any scale. Setting priorities would require the development of binationally agreed to criteria to set the priorities, as well as an agreed to scale to which the criteria might be applied. Examples of looking at prioritization include AOCs, diffuse source loadings, and impacts to habitat. Additional work would need to be done on the outcomes desired through establishing priority HUCs. Without a shared definition it is difficult to apply a priority setting process, so the group will not be prioritizing watersheds. Further consultation on these issues is highly encouraged to determine a) the appropriateness of prioritizing at the Basin scale and b) the mechanics and coordination of doing so.
3. **Watershed Management Plans-** The group found it difficult to find a consistent source to identify this kind of information as much of this planning is being accomplished through local governments and local groups with no way of aggregating the information to higher levels of government. In addition, this activity faced the scale issue, while we do Great Lake lakewide plans, at what scale of activity do we need to track the tributary watersheds has not been defined. While the US has established a “Nine Minimum Elements” for their CWA Section 319 Nonpoint Source funded projects (see Sharepoint for this), States and local governments and groups do design their own methods. In **A Survey Report on Watershed Approach in the Great Lakes-St. Lawrence River Basin** by Dr Kai Chen it is stated “ Most of the watershed project managers are now pursuing the entire watershed perspective, not simply isolated issues or single source of the problems. But there are still some deficiencies and gaps..(1) lacking sustainable watershed approaches, and effective monitoring and evaluation, data collection and information exchange; (2) limitation of local water, land and tributary management; (3) shortage of systematic and comprehensive planning clear targeting and environmental efficiency requirements; (4) poor dialogue, communication and connection with the objectives of the GLWQA”. This perspective is also reinforced by the Review ‘s Special Issues Work group on Watersheds and Land Use, see their report of additional detailed responses.

4. Land Use Controls to Address Non-point Sources- The Watershed Planning and Land Use Subgroup of the Special Issues Work Group is focusing specifically on this issue. The general observations of RWG D on this question are:
- (a) Local governments are typically responsible for designing and implementing land use regulations and controls. Only the federal governments are parties to the GLWQA so there is a disconnect between the entities responsible for implementing the Agreement and the entities with the authority to address land use challenges.
 - (b) Local governments utilize a wide variety of land use management tools, only some of which are designed to protect the environment in general, and watersheds in particular.
 - (c) There appears to be no reliable inventory of land use management approaches to protect watersheds in either the U.S. However, Canada has agricultural land-use management inventories indicating changes in practices impacting soil erosion and water quality. The Great Lakes Atlas on the GLNPO website has some of this information but it is not organized in a way that would assist watershed managers.
 - (d) Without a specific, scale appropriate inventory it is impossible to determine the status of land use abatement activities. Some general characterization of this is also found in the Great Lakes Atlas, but not at a scale that would provide substantive information on which to judge specific watershed problems or help establish priority hydrologic units.
5. Name Change for Annex and Preliminary goals and objectives - In order to appropriately frame the Annex a name change has been discussed and generally relates to Watershed Management to Control Diffuse Pollution from Nonpoint Sources. This is not meant to be a comprehensive or all inclusive response, but a place to begin the discussion of providing a more meaningful structure for the Annex. A preliminary set of possible goals and objectives follows:

Goal: To use all appropriate tools for effective watershed management in tributary watersheds of the Great Lakes which will ensure that impacts of diffuse pollution from non-point sources do not negatively effect the chemical, physical and biological quality of the Lakes.

Objectives

- 1 - to establish bi-national criteria for what constitutes the minimum elements of a watershed plan at each scale appropriate for reporting
- 2 - to enable the systematic engagement of and reporting from local governments which implement watershed plans and accomplish pollution reduction projects
- 3 - to establish reduction targets for diffuse pollution, ensure methods and monitoring are available to do this
- 4 - to identify a suite of best management practices for diffuse pollution reduction
- 5 - to establish threshold environmental outcomes and a method and timeline for review of effectiveness
- 6 - to ensure there is sufficient institutional capacity to undertake, coordinate, and integrate the necessary actions and decisions on a watershed basis

Options

Because consensus was reached on the recommendations and responses to the review questions, there are no options offered.

GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP E FINAL REPORT TO ARC December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

Sediment Review Working Group (RWG)

This is the final draft report which encompasses the review period April 28, 2006 – September 25, 2006. The Sediment RWG held conference calls on May 9, May 30, June 13, June 27, July 18, August 1, August 15, August 29 and September 12 to develop a plan to complete their review of Annexes 7, Dredging and 14, Contaminated Sediments, and to begin the review process pursuant to the five elements. The five elements are: relevancy, clarity, management framework, accountability, and achieving results. Articles 1 (Definitions) and 6 (Programs and other Measures) were also reviewed as they relate to Annexes 7 and 14.

Some time was spent initially in an attempt to balance the membership with regards to representation among government, academia and non-government agencies. Discussions on the elements were carried out with the whole group and then the Sediment RWG decided that it would be more expedient to split the RWG into two Sub Committees, one for each of Annex 7 and Annex 14.

Each Sub Committee held conference calls through August to finalize discussions on the five elements as follow: August 1 (clarity and relevance), August 15 (achieving results) and August 29 (management framework, accountability, and recommendations). A summary of the discussions for each element, by Annex, is included below.

A draft of this Sediment Report was distributed to the full membership for review and later discussed at the full Sediment RWG teleconference on September 12, 2006. On September 25, 2006, a revised final report was circulated to the RWG E and submitted to ARC. Once comments had been incorporated from the RWG E and ARC (ARC Feedback and Guidance to GLWQA Review Working Group Co-Chairs, November 2006), it was again circulated to the full membership on December 5, 2006, and final revisions were made prior to submission of the report to ARC on December 15, 2006.

Annex 7

The Annex 7 objectives are to identify previous and existing practices in both countries related to dredging activities, maintain a register of significant dredging projects undertaken in the Great Lakes and encourage information exchange related to dredging technology and environmental research.

General findings that emerged from the Annex 7 Sub Committee review are provided below by each major element.

Clarity: The annex was found to be concise and straightforward, providing a clear articulation of its purpose and objectives.

Relevancy: The annex was found to be relevant based on its charge at the time it was written, but currently, it is no longer as relevant. The Dredging Sub Committee, formed and tasked with specific activities under Annex 7, completed many of the tasks and has not been active since 1989. The focus and terminology are dated.

Achieving Results: The Dredging Sub Committee met most of their objectives, which were consistent with the goals and objectives of the Agreement at the time Annex 7 was written. The science and technology of dredging and dredged material management have advanced significantly.

Management Framework: The annex provided for the creation of the Dredging Sub Committee and identified specific activities to be accomplished.

Accountability: The Dredging Sub Committee reported to the Water Quality Board with regard to what they were accomplishing. Currently this is no longer applicable as they became inactive in 1989.

Annex 14

The Annex 14 objectives are to identify the nature and extent of sediment pollution in the Great Lakes System, develop methods to evaluate the impacts and to assess technological capabilities of programs to remedy such pollution.

In the review of Annex 14 according to each major element, the Annex 14 Sub Committee found the following:

Clarity: The Sub Committee found the objectives, although clear, were not complete: there is no overall goal or time-frame for achieving the objectives and there is no mention of frequency or extent of data exchange to coordinate research data. In addition, desired outcomes for surveillance programs and some terms need to be clarified.

Relevancy: The Sub Committee felt that the annex should be updated to reflect current conditions. There is now a better awareness and understanding of the environmental conditions and challenges. The challenges remain relevant: limited funding and resources, limited corporate and public involvement, insufficient research and technological development and lack of a decision-making framework.

Achieving Results: The Sub Committee found that with respect to achieving results, the parties have not achieved the objectives of this annex. For example, there is not a single source of the nature and extent of sediment pollution in the Great Lakes System, and the impact of the sediment contamination on the Great Lakes and ecosystem function is not completely understood. The annex stipulates the need for an evaluation framework and a management framework but falls short in requiring implementation of frameworks (i.e. requiring correction of the problems). Annex 14 should propose accountability for remediation of contaminated sediments and reporting of progress. In other words, Annex 14 needs to be expanded to include more than the requirement for just gathering information, but should not duplicate the systematic and comprehensive remedial framework in Annex 2 for addressing all threats to water quality and ecosystem function.

Management Framework: The Sub Committee believes that there is no clear institutional framework even though a management framework (along with adequate resources) is the key to success. When evaluating the existing technologies for the management of contaminated sediments, the annex needs to include a requirement to evaluate the anticipated short-term and long-term risks of each remedial alternative. In fact, the development of good delisting criteria in the form of a narrative, qualitative statement is required. Ultimately, work is getting done but there is room for improvement.

A sediment management framework process is needed that is bi-nationally coordinated. A management framework could be the most beneficial for monitoring outcomes. However, flexibility needs to be maintained at the point of implementation due to the prevalence of site-specific conditions. The Sub Committee believes that the management framework should determine the goals and outcomes desired and evaluate how to manage the delisting criteria.

Accountability: The Sub Committee found that there are no provisions for accountability except for biennial progress reporting.

Recommendations

The Sediment RWG drafted some recommendations, the most important of which was to consider combining the outdated Annex 7 with Annex 14. As stated in the Draft Options Paper, 1999, the main purpose of Annex 7 is to deal with dredging for navigation purposes. Problems associated with contaminated sediments frequently arise when dealing with dredging for navigation purposes, requiring specific management responsibilities for both dredging techniques and disposal activities. It is in this area that there is significant overlap and a strong potential for duplication with the activities assigned to Annex 14. Clearly, what is needed is an Annex within the Agreement to manage all sediments, contaminated or not, within the Great Lakes, whether those activities are for dredging or removing sediments as a pathway source for contaminants (Draft Options Paper to the Binational Executive Committee on the Review of the Canada-U.S. Great Lakes Water Quality Agreement, July 1999)

Another option presented was that Annex 7 should be updated by including a statement that contaminated sediment at navigational dredging sites should be addressed under the Annex 14 framework.

It is also recommended that there should be a Sediment Working Group under the Water Quality Board which would focus on contaminated sediment and navigational dredging issues.

Other recommendations are provided for issues surrounding control of contaminant sources, the need for the Annex to be action-oriented (i.e. include remediation) and to include a focus on beneficial uses, the need to broaden sediment remediation options, to use risk management decision-making in evaluating contaminated sediment sites, and the need for public involvement.

2. Overview of Review Working Group Mandate

Review Working Group (RWG) was tasked with reviewing the following components of the Canada – U.S. Great Lakes Water Quality Agreement:

- Clarity, Relevancy with regards to Objectives, Research and Studies, Long-term measures and Reporting, Achieving Results, Management Framework and Accountability for Annex 7 and Annex 14.
- Recommendations for revising Annex 7 and Annex 14.
- Comments on Articles 1 and 6.

Below is a brief characterization of membership for the Review Working Group

- Co-Chairs: John Shaw (Canada); David Cowgill (U.S.A.)
- Total number of members in Sediment RWG: 84

- Canadian membership (approx. 1/3 of total membership) included government agencies (Environment Canada, South Nation Conservation Authority, Public Works & Government Services Canada, Agriculture and Agri Food Canada, Ontario Ministry of Environment, Quebec Ministère des Transports), academia (University of Waterloo, McMaster University), consulting firms (two) and other non-governmental groups (First Nations Environmental Network).
- American membership: (approx. 2/3 of total membership) included government agencies (EPA, Indiana Department of Environmental Management, US Geological Survey, Great Lakes Commission, NOAA, City of Gary, US Army Corps of Engineers), academia (San Diego State University, Southern Illinois University, Grand Valley State University), consulting firms (50% of U.S. membership) and other non-governmental groups.
- Sub Committee Chairs: Annex 7: Bonnie L. Eleder (8 members: 4 from government agencies, 4 from consulting firms); Annex 14: Roger Santiago (19 members: 10- from government agencies, 1 from academia and 8 from consulting firms)

3-1 . Evaluation Framework for Annex 14 – Contaminated Sediment

Clarity:

Clear articulation of purpose, goals, objectives, programs and other measures; the existence of a shared understanding and acceptance of the meaning of the Agreement.

5. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(j) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

The objectives, as written, are clear though they may not be complete in that there is no overall goal or time frame for achieving the objectives.

Under research and studies, there is no mention of the frequency, extent of the data exchange or ways to interact to coordinate the data. There is also nothing to suggest that there will be any coordination of the data assessment.

Surveillance programs are clear and relevant however the desired outcomes are not clear. Terms such as compatible criteria, common methods, standard approach, and agreed procedures need to be defined. It is unclear if biological indicators are developed to determine accumulation rates/extent in biota or in the water column from polluted bottom sediment.

Long term measures are not clear and need to be defined and expanded to include measures other than dredging

Reporting is necessary. The steps for reporting are clear but the reporting has not been tracked and the desired deliverables have not been identified.

(k) Are program outcomes and/or environmental outcomes clearly identified?

Environmental and program outcomes have not been clearly identified. There is no overarching goal for this Annex.

(l) Are there outdated terms, concepts or references?

Further clarification is required on terms, concepts, and references within the Annex.

(m) Other Comments.

Relevancy:

The continued relevancy of the Agreement.

4. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

In order to achieve stated goals and objectives it is suggested that the annex be updated to reflect current conditions and combined with relevant sections of annex 7. Objectives need to be updated to reflect current situations. Defining the extent of sediment contamination throughout the Great Lakes system is difficult and extremely costly. Sediments throughout the Great Lakes will not be remediated given current technology and limited resources.

Focus is required on other contaminated sediment sites outside of the AOC and on source control. The IJC identified Areas of Concern (AOCs) as the “toxic hot spots” upon which the Parties should focus their efforts. Both existing AOCs and other contaminated sediment sites within the Lakes should also be the focus of the objectives. There is general data on other contaminated sediment sites which need to be compiled into one list. Priority of sites should be based on the level of risk they pose to human health and the Great Lakes ecosystem, i.e. biological effects. Non-AOC contaminated sediment sites, therefore, should not necessarily be treated at a lower priority than AOC sites since the purpose of sediment remediation is risk reduction.

a. Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

There is a better awareness and understanding of the environmental conditions/ challenges which remain relevant. Below is a list of some of these challenges:

- limited funding and resources,
- regulatory complexity,
- lack of a decision-making framework,

- limited corporate involvement,
- insufficient research and technology development,
- limited public and local support, and
- limited coordination among agencies and parties.

b. Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

No, the annex does not even cover the full scope of existing domestic laws and policies

c. Does the Annex drive actions? If not, can you identify reasons why it does not?

The current annex does not sufficiently drive action towards sediment management in the AOCs. A timeline should be included as part of the sediment management plan.

Timelines for implementation of remedial options are site- specific and can extend over several years. Timelines for remediation are site-specific because different sites have different physical, chemical, and biological characteristics, different community concerns, different beneficial use impairments, and different amounts of resources available for remediation. Likewise, there is no "one size fits all" answer to how soon a system should recover following remediation. Different remedial alternatives work at different rates. A remedial option should not be chosen solely on the length of time it takes the system to recover; rather, the decision should also weigh the net risk reduction of the various remedial alternatives assessed as part of the risk management decision making process. Similarly, there is no single answer as to how long a system should be monitored following remedial activities. That decision should be based on a thorough understanding of the system, which should be developed as part of the conceptual site model in the assessment phase. Monitoring, and the data collected as part of it, should be done for scientific reasons with a specific purpose.

d. Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

The Agreement does not currently reflect current/appropriate management tools.

e. Other Comments.

Under 2(c) Technology Programs - "in-place decontamination" should be changed to "in situ treatment".

Procedures should be established to evaluate the effectiveness of both existing technologies and any potential newly developed technologies

Achieving Results:

The implementation and appropriateness of prescribed programs, policies and measures and demonstrated progress; including the application of sound science.

13. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

There is a need to define performance measures as well as expected/desired outcomes.

The parties have not achieved the objectives of this Annex, which are to identify the nature and extent of pollution in the Great Lakes System, develop methods to evaluate the impacts and to assess technological capabilities of programs to remedy such pollution. There have been studies of some of the areas but there is not a single source of the nature and extent of contaminated sediment in the Great Lakes System. For instance, there is no single source of maps of the distribution of contaminants in each of the lakes nor are the sediments in each of the lakes fully measured for sediment contamination. The impact of the contaminants in sediment on the Great Lakes and their ecosystem function are not completely understood. The final desired outcome is not provided. Resolution on this issue is required because a single source documenting the nature and extent of sediment pollution in the Great Lakes would imply that there are mutually compatible criteria on what is contaminated. Sharing of information (tech transfer, cleanup levels, and assessment frameworks) appears to be limited. There needs to be a central database that allows access by the public which provides the locations of the hot spots or areas of contaminated sediment and information or data on the nature of the sediment contamination.

a. Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

The programs, measures and policies stated appear to be sufficient to identify the nature of and extent of contaminated sediment based on available scientific information and data. However they fall short in achieving the overall purpose of the agreement, i.e. the restoration of the Great Lakes Basin Ecosystem as it relates to the remediation of contaminated sediments. The annex stipulates the need for an evaluation framework and a management framework but falls short in requiring implementation of the management framework, i.e. correction of the problems. There is still a need for a contaminated sediment framework to be established that is agreed upon and followed by all of the parties.

b. Does the Agreement fail to address critical issues?

Viewpoint 1 (Prevailing view). **One of the limitations of the Annex 14 is that actions involved with the cleanup of contaminated sediments are found only under Annex**

2. Critical issues are not addressed as the Annex does not require correction / remediation of contaminated sediments, referring the issues to Annex 2 RAPs and LaMPs. There appears to be insufficient reporting of progress. Since 1997, the Binational Toxics Strategy sediment goal tracking has been included in the BTS Annual Progress reports posted on www.binational.net. The Annex should propose accountability for remediation of contaminated sediments and reporting of progress and not just leave it to Annex 2. One of the limitations of the Annex 14 is that discussion actions involved with the cleanup of contaminated sediments is found only under Annex

2. **Annex 14 needs to be expanded to include more than just the requirement for information gathering.**

Viewpoint 2 (Divergent view). There was an opposing view point on how Annex 2 and 14 should be addressed in relation to contaminated sediment. The purpose of Annex 14 is different from the purpose of Annex 2. Annex 2 is designed to comprehensively and systematically address threats to water quality and ecosystem function. Annex 14 is designed to evaluate one potential threat to water quality – contaminated sediments. Contaminated sediments, along with all other threats to water quality and ecosystem function, should continue to be addressed as part of the comprehensive and systematic remedial framework of Annex 2. There is no need to duplicate the framework that already exists in Annex 2.

c. Other Comments

Under (C) Technology Programs (i) the Annex calls for evaluating existing technologies for the management of contaminated sediments, but fails to define a specific goal or expected outcome. The goal of managing contaminated sediment is to acceptably reduce their risk to the system.

Management of contaminated sediments means to reduce risk, which can often be achieved by reducing the bioavailability of the contaminants. Mass or volume reduction of contaminants does not necessarily reduce risk. For example, there may be a large mass of contaminants buried within the sediment that is not bioavailable. If this mass is stable and is not bioavailable, it may not pose an unacceptable risk to the system. On the other hand, a small mass of contaminants could be very bioavailable, and, therefore, present a much greater risk to the system. Reducing mass does not necessarily reduce risk. The focus should be on risk reduction.

Virtual elimination of persistent toxic substances is a goal to work towards but with limited resources we must reduce impact and risk to the environment. The following paragraph from Grapentine, et al (2002) Human & Ecological Risk Assessment, **8**: 1641-1655 provides further explanation: “The underlying philosophy is that observations of elevated concentrations of contaminants in sediments alone are not indications of ecological degradation. Rather, it is the biological responses to those contaminants that are the concern. A recommendation on remedial or other management activity requires evidence of an adverse biological effect either on the biota resident in the sediment, or on biota that are affected by contaminants originating from the sediment. Effects can be direct or indirect and may be physical, chemical, and/or biological.”

14. Are the demonstrated results consistent with goals and objectives in the Agreement?

There needs to be consistency in the approach for selecting remedial alternatives (including demonstrating that they work) and consistency in selecting the clean-up goals among the Parties.

One way to achieve consistency is to agree on a risk management framework to evaluate a site, set clean-up goals for the site, select an appropriate remedial technology from the remedial alternatives, and evaluate the success of the remediation from a risk-reduction perspective.

g. Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not.

A Management Framework has not been implemented as of yet but many AOCs are achieving results as reported annually in the Binational Toxics Strategy report. Other AOCs are on the verge of implementation. Implementation of management framework requires high levels of resources.

Both Canada and the US have developed the programs and policies initially required to be implemented under the Agreement. An Assessment Framework was set up in Canada to evaluate contaminated sediment with regard to chemical concentrations, sediment toxicity, benthic communities, biomagnification, sediment stability and other elements. This process has been applied at all Canadian AOCs. Management options for handling this sediment could include dredging, natural recovery, infilling capping. The preferred option is chosen in consultation with all stakeholders. In each specific location, the final decision on the remedial option is made by the risk manager.

Assessment Frameworks in the US are based on state and federal regulatory programs and statutes. They involve identifying a range of remedial options by going through the remediation assessment process and involving multiple stakeholders. At the federal level, a comprehensive Contaminated Sediment Guidance was issued in December 2005 by U.S. EPA. This Guidance should bring more uniformity in approach and focus on the remediation of contaminated sediment.

Long-term monitoring is required to evaluate the long-term effectiveness of the remedial action. We need to correct the misleading idea that only dredging is a solution for remediation of contaminated sediments and other remedial options should be included.

The Annex does not specifically address identifying and controlling the source of the sediment contamination, which is critical to long-term success in sediment remediation. The source needs to be identified and sufficiently controlled prior to implementing a remediation option.

The overall goal is risk reduction. In situations where there is an unacceptable risk by leaving the contaminated sediment in situ, there is a need for management and long-term monitoring.

h. Are any parts of the Agreement in any way an obstacle to progress?

One obstacle is that there is no requirement for implementation of a management framework. Another is the lack of consensus-based criteria and a well-defined expected outcome. Within annex 14 most of the items previously outlined have been completed in relation to progress. The Management Framework identifies suitable options, but it does not necessarily require implementation of the option in the AOC. Intervention is not always required; however, there is a commitment to move forward to reduce risk and develop long-term management goals.

Annex 14 is characterized as an information-gathering vehicle. Anything more than support to Annex 2 will not be easy to push forward. Perhaps Annex 2 could include contaminated sediment in non-AOCs.

i. Are there external impediments that prevent implementation?

Implementation of a management framework requires extensive resources for development of a site-specific management framework for each AOC where sediments need to be addressed.

j. Are there other barriers to progress?

- Regulatory complexity,
- Limited corporate involvement,
- Insufficient research and technology development,
- Limited local support from industry or municipalities that may have been identified as potential sources of the sediment contamination,
- Historic contamination problems – often rely on government funding for remediation
- Difficulty in demonstrating significance of limited local remediation to the overall health of the Great Lakes ecosystem
- Poorly understood and lack of economic incentives/cost benefit relative to sediment cleanup,
- Lack of cooperation among stakeholders responsible for sediment cleanup,
- Historic industrial discharges along miles of Great Lakes shoreline which makes it very costly and time consuming to delineate/evaluate and identify accountability,
- Differing ideas, objectives act as barriers - encountering disagreement between stakeholders, municipalities and different governmental and country agencies on what needs to be done,
- Lack of defined qualitative delisting criteria acceptable to all parties,
- Technical complexity leads to uncertainty in project costs and difficulty with partner negotiations.

k. To what extent can results be attributed to the Article/Annex?

Annex 14 defines steps to be followed and programs needed for evaluation and development of the approach for addressing contaminated sediments – the Parties have complied and developed the approach and frameworks for assessment and management except for reporting of progress. Standard approach and methods have been developed for evaluating the contaminated sediment. Some of this work has resulted in the remediation of high priority areas.

Because the Annex focused attention on AOCs, we have seen progress in these locations.

1. Other comments.

The importance of clearly defining what is meant by "management framework", "evaluation framework" etc. was discussed by the Sub Committee but some confusion remained. If the Agreement is changed the Parties should define what is meant by the various terms using the word, framework. A Glossary of Terms would be helpful in preventing confusion. Suggested definitions:

Management Framework – refers to the oversight of Great Lakes contaminated sediment activities to ensure the parties are meeting their commitments. It includes review and reporting on progress, evaluation of delisting criteria, etc.

Evaluation (or Assessment) Framework – refers to the assessment of chemical quality, ecological and human health effects and stability of contaminated sediment deposits.

Sediment Management Framework – refers to the evaluation, selection and implementation of remedial options/contaminated sediment management strategy.

15. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

In the US there are mixed views on if there are sufficient resources to deliver on programs and policies set out in the agreement. In Canada there are sufficient resources to carry out contaminated sediment site assessments; however, additional resources are required to implement sediment management options.

Two opposing views were presented on how contaminated sediments are remediated.

Viewpoint #1 (Divergent view). The first view states that sediment remediation is not just about moving the sediments from one site to another. It should be about permanent removal and destruction of the contaminants. It does not address the issue of permanent destruction of the contaminants in the sediment. Long-term management needs to be addressed. Current annexes don't seem to deal with long-term management of contaminants.

Viewpoint #2 (Prevailing view). **Sediment remediation is not about the permanent removal and destruction of contaminants, but rather, it is about reducing the risk posed by the contaminants.** Risk reduction can be achieved in different ways at different sites, some of which do not require the removal of contaminated sediments; rather, in-situ treatment, isolation, or monitored natural recovery may be appropriate. Moreover, destruction of contaminants consumes so many resources (monetary and otherwise), that few resources would be left to address the majority of contaminated sediment sites.

It is not a realistic expectation that all contaminants in remediated sediment be destroyed. There are several sediment management approaches which have different degrees of permanence and incorporate appropriate long-term monitoring programs. As technology advances, so will sediment management approaches. With regard to long-term management, natural or enhanced recovery (with long-term monitoring and appropriate administrative controls) has been selected as the preferred remedial option at selected sites. Monitoring at these sites is ongoing. Government has further to go in setting up framework of assessment tools to provide a determination of what is adequate. A management framework is the key to success, along with the need for resources. The challenge is to apply this framework to the specific site. The Annex is adequate in defining the processes, but not adequate enough in carrying them out.

US delisting criteria are planned to be in place by October 2007.

State of scientific knowledge increased exponentially during the late eighties to early nineties, but this growth has not been sustained. Since then the funding has been focused more on clean-ups and less on research. On the US side, more funding for research has been seen specifically for contaminated sediments. Initially there was a Great Lakes focus. Research and Development dollars then shifted to sources from other parts of the country. Since Annex 14 was created with the focus on contaminated sediments, the focus shifted from the Great Lakes to areas throughout the country. Within AOCs the “polluter pay” principle has been employed. In situations where a Potentially Responsible Party is not identified government agencies at various levels have shared costs with local stakeholders to implement the sediment management strategy.

a. Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?

In Canada resources currently available for sediment assessment have been successful: funding has allowed the assessment of the extent of the sediment contamination; however current resources are inadequate for the development and implementation of site-specific management frameworks to address remediation.

b. Other comments.

Annex 2 is the framework for dealing with cross-cutting issues

16. Is the science in the Agreement still relevant? If not, why?

At the time Annex 14 was written it was thought there needed to be uniform contaminated sediment criteria. In the 20 years since then, the understanding has changed, with more of a focus driven towards science-based site-specific sediment criteria. People do not have the same endpoints in mind for each AOC. With science-based criteria, it is easier for the public to accept. In addition to sediment criteria, biological effects assessment should be used in a weight-of-evidence process in order to determine whether sediments pose a risk to human health and/or the environment. Risk-based guidelines and approaches may be more applicable today and in the future.

There is a need for delisting criteria, in the form of a narrative qualitative statement as to what functions the system would have to recover to in order to be delisted. These delisting criteria would be applicable throughout the Great Lakes. This would allow site-specific applications to meet criteria.

In Canada, guidelines and regulatory criteria are also required during the assessment phase to evaluate the efficiency of the cleanup. In the U.S., U.S. EPA's Contaminated Sediment Guidance provides assessment guidelines.

If the Agreement is modified, the Parties should recognize that these are important issues where there might be differences of opinion.

a. If the science in the Agreement is still relevant, how has it been incorporated?

b. Does the science adequately influence decision-making?

When evaluating the existing technologies for the management of contaminated sediment, the Annex needs to include a requirement to evaluate the anticipated short-term and long-term risks that each technology could have on the ecosystem if implemented. Decision-making is based on both science and accountability.

c. Other comments?

17. Does the Agreement incorporate science to address emerging issues?

a. Are there new issues and programs that need to be addressed?

There is a need to include procedures and assessments under the management framework of point source controls. The Annex should specifically state that new and emerging issues be addressed. A proper management framework would address new and emerging issues.

b. Can the Agreement accommodate emerging issues?

The Annex states "an evaluation of existing technologies". It does not allow for new technology.

18. Other comments.

Progress/Accomplishments:

Research and Studies - Binational Information Exchange:

1988 – Procedures for the Assessment of Contaminated Sediment Problems in the Great Lakes (Report to the IJC Water Quality Board, 1988)

1988 – Conference Proceedings for "The Sediment Solution: Cleaning up Contaminated Sediment on our Great Lakes and North American Marine Coasts" (Merrillville, Indiana, November 30-December 3, 1988)

1990 – Proceedings of the Technology Transfer Symposium for the Remediation of Contaminated Sediments in the Great Lakes Basin (Report to the Sediment Subcommittee of the Great Lakes Water Quality Board, IJC), held October 1988.

1995 – Sediment Remediation '95 – An International Exchange of Experiences in the Remediation of Contaminated Sediments, held in Windsor, Ontario May 8-10, 1995.

2001 – Workshop on Treating Great Lakes Contaminated Sediments – sponsored by USEPA, Environment Canada, and the Great Lakes Commission, in cooperation with the Great Lakes Binational Toxics Strategy.

Surveillance Programs:

1988 – Procedures for the Assessment of Contaminated Sediment Problems in the Great Lakes (Report to the IJC Water Quality Board, December 1988)

1980s-1990s – USEPA research to develop sediment quality criteria

1997 – Incidence and Severity of Contamination in Surface Waters of the U.S. (National Sediment Inventory)

2004 – Incidence and Severity of Sediment Contamination in Surface Waters of the U.S. (National Sediment Quality Survey, 2nd Edition)

1999 - DECIDING WHEN TO INTERVENE: Data Interpretation Tools for Making Sediment Management Decisions Beyond Source Control

Based on a Workshop to Evaluate Data Interpretation Tools used to Make Sediment Management Decisions held at the Great Lakes Institute for Environmental Research at the University of Windsor on December 1-2, 1998

2002 - A Guidance Manual to Support the Assessment of Contaminated Sediments in Freshwater Ecosystems

Volume I - An Ecosystem-Based Framework for Assessing and Managing Contaminated Sediments [PDF size: 997kb]

Volume II - Design and Implementation of Sediment Quality Investigations [pdf size: 1,345kb]

Volume III - Interpretation of the Results of Sediment Quality Investigations [pdf size: 1,689kb]

1994 - Assessment and Remediation of Contaminated Sediments (ARCS) Program ASSESSMENT GUIDANCE DOCUMENT

1988- Options for the Remediation of Contaminated Sediments in the Great Lakes (Report to the IJC Water Quality Board, December 1988)

1997 - OVERCOMING OBSTACLES TO SEDIMENT REMEDIATION in the Great Lakes Basin: White Paper by the Sediment Priority Action Committee Great Lakes Water Quality Board, International Joint Commission

2005 – Canada-Ontario Agreement – Contaminated Sediment Assessment and Management Decision Framework (Environment Canada and Ontario Ministry of the Environment).

Technology Programs:

1990 - Review of Removal, Containment and Treatment Technologies for Remediation of Contaminated Sediments in the Great Lakes, (USACE, 1990)

Link to USEPA ARCS Documents: <http://www.epa.gov/grtlakes/sediment/reports.html>

1991 – Biological Remediation of Contaminated Sediments, with a Special Emphasis on the Great Lakes (EPA /600/9-91/001)

1994 - Assessment and Remediation of Contaminated Sediments (ARCS) Program

Remediation Guidance Document

1996 - Assessment and Remediation of Contaminated Sediments (ARCS) Program
ESTIMATING CONTAMINANT LOSSES FROM COMPONENTS OF REMEDIATION
ALTERNATIVES FOR CONTAMINATED SEDIMENTS

1998 - Palermo, M., Maynard, S., Miller, J., and Reible, D. 1998. "Guidance for In-Situ Subaqueous Capping of Contaminated Sediments," EPA 905-B96-004, Great Lakes National Program Office, Chicago, IL

2005 – Sediment Capping and Natural Recovery: Contaminant Transport Fundamentals with Applications to Sediment Caps (USACE)

2005 – Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (U.S. EPA)

Long-Term Measures

1986 - Forum to Review Confined Disposal Facilities for Dredged Materials in the Great Lakes, IJC

Corps of Engineers Dredged Material Management Plans

Reporting - Accomplished through Government reports to the IJC.

Management Framework:

Appropriate institutional structures, cooperation and coordination, including potential duplication with other initiatives or instruments of a similar nature, and synergies and linkages with other initiatives.

6. Are management and coordination approaches identified in the Agreement?

Management and coordination approaches are mentioned briefly under section 2 (b) (iv) of the Annex.

Viewpoint #1 (Prevailing view). **There is still a need for a contaminated sediment framework to be established that is agreed upon and followed by all of the parties.** The management approach is vague and a clean-up process is needed that is coordinated throughout the US and Canada. A generic framework could be most beneficial for monitoring outcomes.

There is a need for a standard approach to developing delisting criteria. These delisting criteria would be applicable within AOCs, States/Provinces or throughout the Great Lakes. This would allow site-specific applications to meet criteria.

Flexibility needs to be maintained at the point of implementation due to the prevalence of site-specific conditions. Some guidance is required to outline the framework creating a broad process applicable to all sites. A Framework would determine the goals and outcomes desired and evaluate how to manage the de-listing criteria.

Two different frameworks make reference to:

1. Institutional arrangement - linking with other sediment initiatives
2. Technical arrangement - a component of the Institutional framework

Viewpoint #2 (Divergent view). Another opinion is that in the US the management and coordination approaches are provided through the regulatory programs and US EPA guidance, including US EPA's 2005 Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.

A counterargument to Viewpoint #2 is that although the Guidance for Hazardous Waste Sites is one example of guidance, it is not necessarily used throughout the Great Lakes by everyone.

f. Is management and coordination specified? If so, briefly outline.

No. The agreement merely states that a standard approach and agreed procedures be developed. There are no specifics/details.

g. Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

No

h. Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

No

i. Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

The linkage to Annex 2 is important and previously identified. Example: Reduction of sources. There is no linkage to the GLWQA to other outside agreements, international programs or strategies, except for the Great Lakes Binational Toxics Strategy sediment goal.

j. Other comments.

Relevancy Comments:

2 (b) iv - research and studies - it is difficult for the Parties to develop a standard approach and agreed upon procedures for the management of contaminated sediments. Laws and regulatory programs are the basis for managing sediments in U.S. Agreed-upon goals and objectives are relevant. How each Party achieves these and produces results needs to be left to their respective programs and laws; flexibility is needed.

Accountability:

Reporting and assessment. The ease of access to, and quality of data for monitoring and reporting purposes, role of the IJC and long-term sustainable buy-in and commitment from the Great Lakes community.

3. Is there comprehensive monitoring and reporting?

Viewpoint #1 (Prevailing view). There is nothing in this Annex that provides for accountability or a process to implement lessons learned except a brief mention of reporting progress biennially. The Annex is about quantifying or classifying but does not delve into remediation, a necessary outcome and an accountable action.

Viewpoint #2 (Divergent view). Another view is that Annex 14 should not delve into remediation because Annex 2 already comprehensively and systematically addresses threats to water quality and ecosystem function. Contaminated sediments, along with all other threats to water quality and ecosystem function, should continue to be addressed as part of the comprehensive and systematic remedial framework of Annex 2. There is no need to duplicate the framework that already exists in Annex 2.

(q) Are there clear indicators to determine progress?

Though dates are difficult to project and establish and adhere to, there is a definite need for broadly laid out milestones to monitor progress.

(r) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

In general, with regard to reporting by the Parties, there is a need to clarify specific types of reporting who is responsible, specifically what is to be reported, and to whom. There are no provisions for accountability. There is a requirement for biennial progress reporting, but no specifics. It is assumed that monitoring will occur at least biennially as part of the reporting. But there are no clear-cut indicators. There needs to be a linkage to Annex 2 to ensure appropriate monitoring and source control measures are implemented to support the development and implementation of sediment management strategies.

(s) Are they being met?

Some progress has been made in this area. An example is the following two documents:

1988 – Procedures for the Assessment of Contaminated Sediment Problems in the Great Lakes (Report to the IJC Water Quality Board, December 1988)

1999 - DECIDING WHEN TO INTERVENE: Data Interpretation Tools for Making Sediment Management Decisions beyond Source Control

(t) If not, why not?

(u) Is the frequency of reporting sufficient?

Yes

(v) Other comments.

7. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

No

g. Is the role of the IJC as set out in the Agreement clear and appropriate?

No. The role of the IJC is unclear. The IJC should follow an evaluation process and report to the public.

h. Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

No

i. Other comments.

3. Does the Agreement enable an effective level of commitment?

k. Is the role of the public identified?

No, the Agreement does not specify an effective level of commitment. However the public is involved in the identification/assessment process as well as the implementation/remediation process.

l. Does the Agreement identify appropriate mechanisms for public engagement?

No, the public involvement should be addressed in the management framework to provide reports to the public to involve engagement (however it is referred to in Annex 2 RAP Public Advisory Committees).

m. Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

No

n. Does the Agreement drive action by communities and industry?

No

o. Other comments.

3-2. Evaluation Framework for Annex 7 - Dredging

Note: This review of Annex 7 does not address all of the sub questions for each review element separately, but provides a summary of the review discussions under each element

Clarity:

Clear articulation of purpose, goals, objectives, programs and other measures; the existence of a shared understanding and acceptance of the meaning of the Agreement:

Overall, the concise and straightforward nature of the annex lends to a clear articulation of purpose and objectives. Specifically, a Dredging Subcommittee is established with a clearly written listing of tasks to be undertaken.

Three phrases are not clear. “significant wetlands” (does this refer to quality, size, importance, diversity, criteria of Provincially Significant Wetlands?); “significant dredging projects” (by size or what?); and “environmental effects” (define specific environmental effects to be assessed).

Another term that has caused some interpretative problems was “criteria.” To some, dredged material and sediment “criteria” implies numerical values of specific pollutants. Others would perceive it in a broader context of testing and evaluation procedures.

Relevancy:

The continued relevancy of the Agreement:

Annex 7 is relevant based on its initial objectives which are to identify previous and existing practices in both countries related to dredging activities, maintain a register of significant dredging projects undertaken in the Great Lakes and encourage information exchange related to dredging technology and environmental research. However, the Dredging Subcommittee hasn't been active since 1989 and many of their tasks outlined in the Annex have been completed. To maintain relevancy, the tasks outlined in this annex should be redefined with consideration of what has been completed, the activities of the IJC and Parties in relation to Annex 2, and to account for present issues with regard to dredging in the Great Lakes system. These may include disposal, preservation of habitat, protection of threatened species, beneficial use, reduction of sediment loadings, and source control.

Annex 7 is dated, both in its focus and terminology. Dredging is presented as a source of nutrients and contaminants to the Lakes, and as a threat to wetland habitats. Those issues are less of a concern as they are addressed through the regulatory programs. However, nutrient-contaminated sediment would still be addressed under Annex 14 should the contamination be related to a BUI.

Viewpoint #1. (prevalent view) Dredging for navigational purposes may have toxic contaminant issues. This is not addressed in Annex 7. As a result, Annex 7 is not as relevant today. Dredging projects are put on hold due to contaminant issues.

Viewpoint #2. (divergent view) Another opinion is that Annex 7 is relevant today. Dredging, if done for environmental purposes, is only one management option. There are many very different considerations for navigational dredging than for environmental dredging and other management options exist for addressing contaminated sediments. For example, navigational dredging is often undertaken to fulfill an

economic need (shipping), so economic considerations, among others, drive the decision to dredge. Navigational dredging, therefore, cannot and should not be considered the same issue as contaminated sediment and it should not be treated as such. Navigational dredging should not be shoe-horned into the same management framework as contaminated sediment. If contaminated sediment is encountered at a navigational dredging site, then the portions of the dredging management and disposal aspects of the contaminated sediment framework from Annex 14 would be potentially applicable to address the contamination. This would avoid duplication while keeping navigational dredging distinct from contaminated sediments.

To enhance Annex 7's relevancy, it should include a reference to Annex 14 for addressing contaminated sediment; i.e., if contaminated sediment is encountered at a navigational dredging project, then the framework from Annex 14 should be applied.

ACHIEVING RESULTS:

The implementation and appropriateness of prescribed programs, policies and measures and demonstrated progress; including the application of sound science:

The Dredging Subcommittee appears to have met most of the objectives of Annex 7. The most significant accomplishments of this Subcommittee were:

Progress/Accomplishments:

1. – Review Existing Practices

Dredging Registers published by IJC (1975-1989 (published in 1982); 1980-1984 (published in 1990); 1985-1989 (digital copy only);

Forum to Review Confined Disposal Facilities for Dredged Materials in the Great Lakes, IJC 1986

Review of Removal, Containment and Treatment Technologies for Remediation of Contaminated Sediments in the Great Lakes, (USACE, 1990)

2. Documents utilized for classification of polluted sediments include:

1977 USEPA Region V, Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments

1994 USEPA Great Lakes Dredging Testing and Evaluation Manual

1992 Evaluating Environmental Effects of Dredged Material Management Alternatives – A Technical Framework

3. Preserve Wetland Areas Threatened by dredging and disposal:

US Army Corps of Engineers and USEPA implementation of section 404 of the Clean Water Act of 1972, regulating the filling of wetlands.

4. Research on dredging technology and fate and effects:

1991 – Literature Review and Technical Evaluation of Sediment Resuspension during Dredging (USACE)

1992 Evaluating Environmental Effects of Dredged Material Management Alternatives – A Technical Framework

Corps of Engineers implemented research programs including DMRP - Dredged Material Research Program; DOIS – Dredging Operations Technical Services; DOER – Dredging Operations Environmental Research

5. Other Dredging Subcommittee Activities

completed a study to examine the relative contribution of dredging to contaminant loads to Lake Erie: “Great Lakes Dredging in an Ecosystem Perspective – Lake Erie”;

conducted a workshop on open-lake disposal site selection criteria development in Toronto (1983), which resulted in the Dredging Subcommittee "Open Lake Disposal Site Selection Guidelines

“Evaluation of Dredged Material Disposal Options for Two Great Lakes Harbours Using the Water Quality Board Dredging Subcommittee Guidelines” (1983);

“Evaluation of Sediment Bioassessment Techniques” (1986)

“Procedures for the Assessment of Contaminated Sediment Problems in the Great Lakes” (1988)

“Options for the Remediation of Contaminated Sediments in the Great Lakes” (1988)

These results are consistent with the goals and objectives in the Agreement, at the time Annex 7 was written.

Regulatory programs for dredging and disposal of sediments have been established which have resulted in improved water quality.

The science and technology of dredging, dredged material testing and evaluation, and dredged material management has advanced significantly since Annex 7 was created. However, while the products of the Dredging Subcommittee in the late 70's, early and mid 80's are slightly dated, the Parties have developed and maintained guidance and procedures, which have built upon the Dredging Subcommittee's work. The science of Annex 7 is therefore current.

Emerging issues include source control, in particular, non point source (storm water runoff); sediment loadings source reduction; protection of threatened species; beneficial use of dredged material.

Management Framework:

Appropriate institutional structures, cooperation and coordination, including potential duplication with other initiatives or instruments of a similar nature, and synergies and linkages with other initiatives:

Annex 7 provides for a management framework. It directed the creation of a Dredging Subcommittee under the Water Quality Board. The Dredging Subcommittee was created in 1979 and was active until 1989.

Accountability:

Reporting and assessment. The ease of access to, and quality of data for monitoring and reporting purposes, role of the IJC and long-term sustainable buy-in and commitment from the Great Lakes community:

During the first ten or so years of Annex 7, the Dredging Subcommittee was active and reported to the Water Quality Board. The Dredging Subcommittee was renamed as the Sediment Subcommittee and worked on Annex 14 issues for a few years before becoming inactive in 1989. Currently, this is no longer applicable.

4. Response to Overarching Questions

1. Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

No comments.

2. Does the Agreement, and its implementation, achieve the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes basin ecosystem?

3. Is the Agreement, and its implementation, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so what are they?

4. In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

5. What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

5. Path Forward

III. OPTIONS

Options for management of recommendations

for Annexes 7 and 14:

- A. Instead of removal of Annex 7, close off Annex 7 by adding some wording to the effect that the remaining Annex 7 actions have been incorporated into Annex 14
- B. Essentially close off Annex 7 and Annex 14 and take appropriate information from both and form a new annex that deals with all current and past issues dealing with contaminated sediments.
- C. Incorporate recommendations within Annex 7 and Annex 14 and leave as is
- D. Update Annex 7 and include a statement in Annex 7 that contaminated sediment at navigational dredging sites should be addressed under the Annex 14 framework.

II. RECOMMENDATIONS: ANNEX 14 CONTAMINATED SEDIMENT

1. Review and update IJC BUI criteria for contaminated sediment (e.g. Annex 7 open water disposal).
2. Requirement to produce delisting criteria, in the form of a narrative qualitative statement as to what functions the system would have to recover to in order to be delisted.
3. Annex 14 should include the requirement to implement management framework (process which guides the selection, development, implementation and monitoring of the preferred management option) for contaminated sediment. A divergent view is that this proposed requirement is unnecessary because Annex 2 already covers it.
4. Include wording in the Annex that a critical first step to any successful sediment remediation is source control. The Annex should formally recognize and tie-in with other pertinent source control initiatives for controlling sources.
 - Two aspects i) pollution prevention from toxics and other contaminants and ii) sediment remediation
 - Linkage to source control
 - Sediment management framework needs to include the management of contaminant sources. This is currently addressed in Annex 2
5. Broaden sediment remediation options to expressly include in situ options, ex-situ options and natural recovery. The current available options are broader than what is currently in the annex.

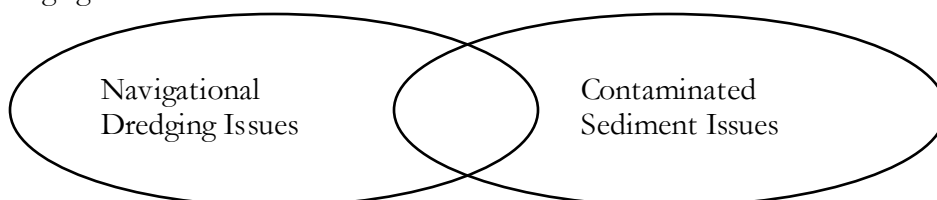
6. The Parties, in cooperation with State and Provincial Governments, shall use risk management decision-making in evaluating contaminated sediment sites and in selecting remedies. Virtual elimination of persistent toxic substances is the ultimate goal to work towards, but impact and risk to the environment must be reduced first. Evidence of adverse biological responses to the contaminants in sediments should be established prior to recommendation of remedial actions. A divergent view is that methods used to address contaminated sediment need to be consistent with the virtual elimination of persistent toxic substances. Natural recovery as a remedial option should only be used when appropriate.
7. Change the nature of Annex 14 to also address non-AOC contaminated sediment sites within the Great Lakes. Non-AOC sites should also be listed in sediment management programs. Priority of sites should be based on the level of risk they pose to human health and the Great Lakes ecosystem (i.e. biological effects).
8. Addressing the needs of a management framework should include wording around emerging issues.
 - o Revise with other management framework recommendations
 - o Site-specific versus institutional management framework
9. Milestones to track progress should be included as part of the management framework. Milestones should be identified to track progress within a specific location and also to evaluate progress in the Annex itself.
10. The Annex should require that procedures be established to evaluate the effectiveness of both existing technologies and any potential newly developed technologies.
11. The approach and mechanisms identified in the Annex have been accomplished but they are not comprehensive and should be summarized and reported following a schedule that both Parties can meet.
12. The IJC role is not referenced in Annex 14, and should be committed to reporting information to the public as information is received. The IJC should follow an evaluation process and report to the public.
13. Public Involvement:
 - o Public involvement should be addressed in the introduction of the Annex to reflect its importance and necessary role.
 - o The public should be involved in the identification/assessment process as well as the implementation/remediation process.
 - o Public involvement should be addressed in the management framework and reports should be made to encourage participation.
 - o Need to incorporate a process to ensure the public holds the Parties and their respective agencies accountable

III. RECOMMENDATIONS: ANNEX 7 DREDGING

1. Source control (both point and non point) is an important component to the clean up of contaminated sediment and dredging of navigation channels. Source controls should be implemented before a sediment clean-up is undertaken so as to prevent recontamination of the waterway. Source control is also important with regard to maintenance dredging both as sediment source reduction and pollution prevention. It is recommended that the new sediment annex consider source control issues.
2. The new sediment annex should be more action-oriented (i.e., include remediation), and the scope broadened to entire Great Lakes Basin.
3. The new sediment annex should include a focus on beneficial use and using the watershed approach on a project or river specific basis.
4. There is a need for a committee or working group under the Water Quality Board focused on sediment and dredging issues. Accountability and achieving results will need to also be addressed. This should be included in the new sediment annex.

Pros of a merged annex: (Prevailing view) Contaminated sediments and the dredging of sediments for navigational purposes are opposite sides of the same issue. As stated in the Draft Options Paper, 1999, the main purpose of Annex 7 is to deal with dredging for navigation purposes. Problems associated with contaminated sediments frequently arise when dealing with dredging for navigation purposes, requiring specific management responsibilities for both dredging techniques and disposal activities. It is in this area that there is significant overlap and a strong potential for duplication with the activities assigned to Annex 14. Clearly, what is needed is an Annex within the Agreement to manage all sediments, contaminated or not, within the Great Lakes, whether those activities are for dredging or removing sediments as a pathway source for contaminants (Draft Options Paper to the Binational Executive Committee on the Review of the Canada-U.S. Great Lakes Water Quality Agreement, July 1999) The new Annex would incorporate all of the pertinent concerns around both Annex 7 and Annex 14, and also result in an updating of the issues and concerns for Annex 14.

Cons of a merged annex: (Divergent view) Merging the two Annexes would oversimplify issues and solutions related to contaminated sediment, for which there several management options. Dredging is only one management option. There are many very different considerations for navigational dredging than for environmental dredging and other management options for addressing contaminated sediments exist. For example, navigational dredging is often undertaken to fulfill an economic need (shipping), so economic considerations, among others, drive the decision to dredge. Navigational dredging, therefore, cannot and should not be considered the same issue as contaminated sediment and it should not be treated as such. If contaminated sediment is encountered at a navigational dredging site, then the contaminated sediment framework from Annex 14 should be applied to address the contamination. This would avoid duplication while keeping navigational dredging distinct from contaminated sediments.



6. Evaluation of Articles 1 and 6

ARTICLE 1: DEFINITIONS

The following words/phrases requiring definitions were put forward by the RWG E members for consideration:

beneficial use

watershed approach

source control – point and non point sources

significant wetlands

environmental effects (of dredging)

sediment criteria or sediment quality criteria

contaminated sediment / management

biological indicators

ARTICLE 6 – PROGRAMS AND OTHER MEASURES

There was consensus among the members that Article 6 in general covers the programs and measures required for Annexes 7 and 14.

(g) Pollution from Dredging Sources

Updated wording in the last sentence of item (g) would be appropriate to reflect the current state related to the “development of compatible criteria” and the need to “minimize (?) adverse effects on the environment”.

What is meant by the phrase, “minimize adverse effects on the environment”? Dredging can have adverse effects on the environment including but not limited to, destruction of benthic habitat, resuspension of contaminants, transport of contaminants downstream, release of contaminants, and leaving an equally or more contaminated sediment surface post-dredging as compared to the pre-dredging surface concentrations.

GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP F FINAL REPORT TO ARC December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

The Great Lakes Water Quality Agreement (GLWQA) Review Work Group (RWG) addressed Annex 11 (Surveillance and Monitoring) and Annex 17 (Research and Development) in the attached reviews. While the RWG noted that each of these annexes has driven important progress toward achieving the goals and objectives of the GLWQA, the RWG agreed that there are important opportunities to improve the operation and effectiveness of both annexes. Some of the key observations from the RWG's discussions are summarized briefly below.

Key Observations and Recommendations

Overall, the RWG strongly agreed that Annex 11 and 17 are critical to the success of the GLWQA. Research, surveillance, and monitoring provide the means to identify emerging issues and water quality trends that need to be addressed and they provide the means to fill critical scientific information gaps. Surveillance and monitoring also enable the Parties and others to measure the results of program activities and progress towards achieving water quality goals. In short, surveillance and monitoring enable results-based management. Research also provides the knowledge base for informed decision-making on policy and programmatic approaches, providing information on the potential efficacy of different interventions.

Most of the additional key observations and recommended areas for improvement are relevant to both Annex 11 and Annex 17, as described below.

1. Management and Action Planning Framework

The RWG observed that neither Annex 11 nor 17 contain provisions that call on the Parties to establish clear management frameworks that provide mechanisms for action planning and coordination and on-going prioritization of monitoring and research needs and activities. In addition, the RWG observed that Annex 11 could make a stronger connection to the role surveillance and monitoring information should be required to inform the Parties' efforts to set and adjust targets towards achieving the objectives of the GLWQA.

The RWG recommends that the Agreement call for the Parties to establish a robust management framework that enables effective and efficient management and implementation of monitoring and research activities related to water quality in the Great Lakes. Section V of this report, addresses this recommendation, and others, in greater detail.

2. Coordination and Collaboration

For both monitoring and research, the RWG believes that the Annexes should address the need for coordination and collaboration to a greater extent and call on the Parties to establish mechanisms to accomplish this. Since many useful monitoring and research activities and initiatives are conducted by others, such as State and Provincial governments, local and Tribal governments, academia, industry, and other organizations, the RWG believes that it is important to ensure that coordination and collaboration mechanisms are extended to address these areas.

The RWG recommends that the Agreement should call for greater and broader coordination and collaboration on monitoring and research related to Great Lakes water quality issues. While joint

monitoring and research programs may not always be feasible, expanding coordination and collaboration efforts is essential to improving the operation and effectiveness of monitoring and research.

3. Ability to Address Emerging Issues

Neither Annex 11 nor 17 call for mechanisms to enable the specific lists of monitoring and research needs to be updated to address emerging issues relevant to improving water quality in the Great Lakes. While the RWG recognizes the importance of including specific lists of monitoring and research needs to keep sustained commitment and attention focused on specific needs, the RWG believes that a process is needed to ensure that emerging water quality issues receive appropriate attention. Such a process can help ensure that the Annexes do not become outdated.

The RWG recommends that the Agreement should provide for an on-going, active process to ensure that emerging water quality issues receive adequate attention with regard to both surveillance and monitoring and research and development. RWG participants, however, emphasized the critical importance of ensuring consistency and continuity in the implementation of existing monitoring and research activities when addressing emerging issues.

4. Reporting and Accountability Provisions

While the Parties have taken some steps to improve reporting on monitoring and research activities, the RWG believes that significant progress is needed in the areas of reporting, data sharing, information management, and communications to equip the Parties, other governments and organizations and the public to effectively understand and utilize Great Lakes water quality information. Neither Annex 11 nor 17 contain reporting provisions and the Agreement lacks any focus on data and information management. In addition, some RWG participants indicated that they believe that existing reporting processes being implemented by the Parties should be modified to provide opportunities for broader public review and input.

The RWG recommends that the Agreement be modified to include stronger provisions for reporting and accountability. Reporting should address both the status of implementation of programs and activities to support the Agreement, as well as monitoring and research information that shed light on the “State of the Lakes.” In addition, the RWG recommends that a revised Agreement should outline a clear process for organizations and the interested public to provide input to and comment on monitoring and research objectives, targets, and action plans developed to support the Agreement.

5. Funding and Resources to Support Implementation

RWG participants expressed significant concern over inadequate and inconsistent funding by the Parties for monitoring and research activities needed to implement the GLWQA. RWG participants agreed that many monitoring and research programs do not have sufficient funding to adequately fulfill the purpose, objectives, and obligations of Annex 11, Annex 17, and the Agreement. Several RWG members observed that continued funding cuts have had a significant impact on the effectiveness of monitoring and research activities in recent years.

The RWG recommends that the Agreement should include provisions for periodic assessment of the implementation status and effectiveness of monitoring and research programs developed to address GLWQA provisions.

6. GLWQA Focus on Water Quality versus Ecosystem Integrity

The RWG had significant discussions on the implications of expanding the focus and/or interpretation of the Agreement (and Annexes 11 and 17) from water quality, with an ecosystem perspective, to a broader concept such as “ecosystem integrity.” Some RWG participants expressed strong concerns that such a broadening would distract attention and resources away from the Agreement’s core focus on water quality, weakening its effectiveness. Other RWG participants indicated that the Agreement could serve as an important and more powerful tool for addressing broader ecosystem health challenges that confront the Great Lakes basin. The RWG noted that these divergent perspectives on the fundamental focus and purpose of the Agreement have broad implications for all of the Articles and Annexes in the Agreement, and that it will be important for the GLWQA Agreement Review Committee (ARC) to consider these perspectives.

Overall, ***the RWG recommends that changes be made to the surveillance and monitoring, and research and development provisions of the GLWQA*** to address key issues identified during this review process and summarized in this report. The recommended changes could be made either through a revision to the current version of the Agreement or in the context of a new agreement.

Furthermore, ***the RWG recommends that the revised surveillance and monitoring, and research and development provisions of the GLWQA be drafted to explicitly address the needs and elements described above.***

Finally, ***the RWG recommends updating and clarifying the definitions of the terms associated with Annexes 11 and 17 in Articles I and IV of the Agreement.***

2. Introduction

Review Work Group (RWG) F is one of several RWGs created by the GLWQA Agreement Review Committee (ARC) to assess and review the articles and annexes of the Agreement, and was specifically charged with reviewing Annex 11 (Surveillance and Monitoring) and Annex 17 (Research and Development). As outlined in the GLWQA Terms of Reference¹³, RWG F used the evaluation framework as a starting point for the review. The RWG's specific responses to the questions in this evaluation framework are included in Appendices A and B of this report. Using the responses to the evaluation questions as reference, RWG F identified several cross-cutting findings and issues related to both annexes. This report integrates the evaluation of Annexes 11 and 17 into a single evaluation of the science-based provisions of the GLWQA, including surveillance, monitoring, research, and development.

RWG F met for regularly scheduled conference calls beginning in May 2006 and continuing through mid-December 2006. The RWG, however, experienced limited and irregular participation throughout the review process, with participation balanced more heavily on the Canadian side. An official RWG F roster is included in Appendix C.

The review process is separated into two phases of review; first, answering the evaluation framework questions, and second, synthesizing these findings and identifying consistent and overarching themes from the RWG discussions. This second review phase also included an examination of Articles I and VI from the perspective of Annex 11 and 17 provisions, as well as the articulation of responses to the overarching questions outlined in the *Terms of Reference*.

The key themes and overarching observations, as identified by RWG, are outlined below in Section III, Key Findings. While the RWG acknowledged that this review process was not intended to produce extensive and detailed recommendations, a number of recommendations did surface during RWG F discussions, and are outlined in Section V, Key Recommendations.

¹³ GLWQA *Terms of Reference*. Final Draft: August 9, 2006

3. Key Findings

INTRODUCTION

Overall, the RWG strongly agreed that the component parts of Annexes 11 and 17 are critical to the success of the GLWQA. Surveillance, monitoring, research, and development provide the means to identify emerging issues and water quality trends that need to be addressed and they provide the means to fill critical scientific information gaps. Surveillance and monitoring also enable the Parties and others to measure the results of program activities as well as progress towards achieving water quality goals. In short, surveillance and monitoring enable results-based management. Research provides the knowledge base for informed decision-making on policy and programmatic approaches, providing information on the potential efficacy of different interventions.

Based on review of Annexes 11 and 17, the RWG agreed that there are important opportunities to improve the operation and effectiveness of both Annexes. Furthermore, the RWG found that the key observations and recommended areas for improvement discussed, and listed below, are relevant to both Annex 11 and Annex 17, including the need for 1) increased coordination and collaboration on research, monitoring, and surveillance, 2) a systematic management framework for on-going prioritization and action planning, 3) ability to address new and emerging issues, 4) reporting and accountability provisions, and 5) resources to support implementation and development of research, monitoring and surveillance programs. RWG Members noted that while Annexes 11 and 17 both drive action and progress towards the goals of the GLWQA, increased attention to the areas discussed below is needed to fulfill the intention and purpose of the Agreement and the Annexes.

COORDINATION AND COLLABORATION

For monitoring, surveillance, research, and development, the RWG agreed that the Annexes should address the need for coordination and collaboration to a greater extent and call on the Parties to establish mechanisms to accomplish this. Participants recognized that many useful monitoring and research activities and initiatives are conducted by others, such as State and Provincial governments, local and Tribal governments, academia, industry, and other organizations, and the RWG believes that it is important to ensure that coordination and collaboration mechanisms are extended to address these entities.

RWG participants pointed to a number of areas in both Annex 11 and 17 where coordination occurs to a limited degree, though the RWG noted that overall, coordination and collaboration on the component parts of both Annexes is lacking. Section 2 of Annex 11, for example, describes coordination and management approaches to a limited degree. However, participants agreed that the Agreement would be better served if Annex 11 (and Annex 17) contained a more explicit management framework that enables flexibility and broader coordination and collaboration on science-based activities (e.g., surveillance, monitoring, research, and development). In addition, RWG participants agreed that the Annexes should more explicitly call for coordination of surveillance, monitoring, and research activities by the Parties, State and Provincial Governments, *and* local and tribal governments, *as well as* by academia, industry, and non-governmental organizations.

RWG participants noted that coordination of surveillance, monitoring and research activities is needed on multiple levels. The RWG identified several areas where efforts are being made to improve coordination, although these efforts are not referenced in either Annex and there was a general sense among RWG participants that more effective coordination is needed. Several coordination efforts include:

- The Council of Great Lakes Research Managers and the IJC coordinate information sharing on some aspects of surveillance and monitoring and research activities (see http://www.ijc.org/conseil_board/research_greatlakes/en/cglrm_home_accueil.htm); the Council has also developed a Research Coordination Strategy;
- Environment Canada and the Great Lakes National Program Office (GLNPO) of the U.S. Environmental Protection Agency coordinate multiple surveillance and monitoring activities and some research activities within the Great Lakes basin; and
- In the U.S., the Great Lakes Regional Collaboration has created a mechanism for improved communication and coordination among numerous U.S. Government agencies that manage monitoring and research programs and activities relevant to water quality in the Great Lakes basin.

RWG participants agreed that little attention is paid to coordination and management of research activities in Annex 17. Section 2 of Annex 17 only states that “the Parties, in cooperation with State and Provincial Government, shall conduct research...” Although Annex 17 does not specify management or coordination approaches, the reference to other Articles/Annexes in the Agreement, in Section 2, provides a vehicle for management and coordination, for coordination is referenced in other Articles/Annexes. RWG participants additionally noted that a number of cooperative initiatives have been completed on a variety of levels (State/Provincial, lake by lake, etc). Many of these efforts, such as the Lakewide Management Plans (LaMPs), were done in spirit of GLWQA, but are not addressed within Agreement. RWG participants also identified current cooperative monitoring initiatives in the Great Lakes basin. Cooperative monitoring is an approach that attempts to address a few key information needs, as identified by the LaMPs, through new monitoring and research on the lake¹⁴.

While the science, and associated surveillance, monitoring, and research activities, do influence decision-making in the Great Lakes basin, RWG participants believe there is room for improvement. More coordinated and extensive science-based activity, coupled with improved reporting, would likely elevate the visibility and importance of Great Lakes water quality challenges in the eyes of the public and policy-makers. Such increased awareness should drive more environmental improvements sooner. Furthermore, the RWG indicated that the Agreement and Annexes 11 and 17 provide very limited guidance and requirements to facilitate priority setting to address surveillance, monitoring and research issues of greatest importance. RWG participants recognized the important need for management and coordination approaches that facilitate priority setting and efficient use of resources for delivering results.

¹⁴ This is accomplished by actively seeking the expertise and participation of agency staff and academia in designing a program to address that need; coordinating these new activities to the extent possible with ongoing programs; providing seed money and, in some cases, grants to conduct the work; arranging for technology transfer and sharing of equipment and expertise; and, as necessary, arranging for data sharing agreements. It focuses on one lake at a time, according to a BEC-endorsed rotational cycle. It was started in Lake Ontario in 2003, and is led by a binational Steering Committee led by U.S. EPA’s GLNPO and Environment Canada.

MANAGEMENT FRAMEWORK FOR ON-GOING PRIORITIZATION AND ACTION PLANNING

As discussed above, the RWG observed that neither Annex 11 nor 17 contain provisions that call on the Parties to establish clear management frameworks that provide mechanisms for coordination, on-going identification and prioritization of monitoring and research needs, and action planning. By requiring a flexible process or management framework in both Annexes 11 and 17, emerging monitoring and research needs and issues not explicitly listed in the Agreement could be identified, prioritized, and addressed. Such a process should be required on a regular schedule over time. Currently, this lack of an effective prioritization and planning mechanism leaves the science-based Annexes vulnerable to becoming outdated quickly.

The RWG observed that Annex 11 specifically could make a stronger connection to the role surveillance and monitoring information has on informing the Parties' efforts to set and adjust targets towards achieving the objectives of the GLWQA. RWG participants indicated that the purpose of surveillance and monitoring activities, as outlined in Annex 11, should be to inform priority-setting and decision-making. The RWG discussed that highlighting a continuous improvement-focused, results-based management approach in Annex 11, could help to make this linkage more transparent within the Agreement, by tying monitoring results back to their role in informing efforts to update the objectives and targets in the Agreement. RWG participants noted several places in Annex 11 where the Agreement could be adjusted to foster continuous improvement, including:

- In section 1(c), add a sub-bullet (iv) that creates an explicit link back to the objectives and targets contained in other articles and annexes in the Agreement by calling for the need to update objectives and targets identified in and under the Agreement based on the findings of surveillance and monitoring activities;
- Section 3 of Annex 11 should be modified to indicate that there may be additional areas for assessment aside from those explicitly listed in section 3 and that a process or approach should be added to ensure that this list reflects current needs based on recent science and research;
- Section 4 of Annex 11 should be modified to more clearly incorporate a process or framework for establishing, updating, and reporting on key water quality and ecosystem health indicators; and
- Reporting is an important component of an effective management system framework, and Annex 11 should be modified to explicitly require reporting on the status of surveillance and monitoring program implementation and the status of monitoring results related to water quality.

RWG participants noted several problems with how the Agreement is currently structured regarding objective setting and a flexible and responsive management system. Article II for example, outlines the objectives and desired environmental outcomes for the Agreement. Section 4 of Annex 11 presents two specific ecosystem health indicators (for Lake Trout and *Pontoporeia hoyi*) and provides numeric targets for both of them. RWG participants indicated that the presentation of specific indicators with targets is tantamount to presenting specific objectives. RWG participants, however, expressed several concerns about the presence of these ecosystem health objectives/desired outcomes in Annex 11. In particular, RWG participants indicated that Annex 11 appears to be an inappropriate place in the Agreement to list desired environmental outcomes, objectives, or targets. RWG participants indicated that specific objectives would be more appropriate to include in Annex 1. The RWG also identified several places

where the terms, concepts, and references in Annex 11 are outdated. Specific examples include (1) Annex 11, Section 2¹⁵ and (2) Annex 11, Section 4¹⁶.

RWG participants agreed that Section 4 of Annex 11 should include a framework, approach, or process for establishing and reporting on water quality indicators (from an ecosystem perspective) that tracks progress toward implementing the environmental objectives and desired outcomes for the Agreement. Participants noted that while this is a water quality agreement, attention to some “ecosystem health” indicators may be appropriate in the Agreement since water quality (taken from ecosystem perspective) is not always easy to monitor directly¹⁷.

Some RWG participants expressed strong concerns that such a broadening distracts attention and resources away from the Agreement’s core focus on water quality, weakening its effectiveness. One participant indicated that the incorporation of an adaptive management process into Annexes 11 and 17 could increase the likelihood that the GLWQA would be distracted from its core focus on water quality. Other RWG participants indicated that the Agreement could serve as an important and more powerful tool for addressing broader ecosystem health challenges that confront the Great Lakes basin. The RWG noted that these divergent perspectives on the fundamental focus and purpose of the Agreement have broad implications for all of the Articles and Annexes in the Agreement, and that it will be important for the ARC to consider these perspectives.

Annex 17 identifies research and development needs in Section 2, but it does not provide a continuous improvement-based management approach to ensure that the Parties undertake research beyond that listed in the Annex. RWG participants observed that the Annex does not provide a mechanism to address new or emerging issues or other research needed to support the implementation of programs and activities to meet the goals and objectives of the Agreement. Furthermore, Annex 17 does not reference or address prioritization of research and development issues, aside from the inherent prioritization imbued from being explicitly listed as a research need in Section 2. In addition, the Annex provides no explicit information on the relative priority of various research needs and activities listed in Section 2.

The RWG identified that Annex 17 fails to include all research and development needs that are articulated in the Agreement. While some cross-references are made, these are not complete or consistent. In other

¹⁵ The RWG believes that reference to the Great Lakes International Surveillance Plan in the Water Quality Board Annual Report of 1975 is an outdated model for the development of the joint surveillance and monitoring program. The RWG discussed that it would be useful to remove specific reference to the Great Lakes International Surveillance Plan from the Annex.

¹⁶ *Annex 11, part 4*: The RWG believes that the references to Lake Trout and *Pontoporeia hoyi* as indicators of ecosystem health are outdated. First, the name of *Pontoporeia hoyi* has changed to *Diporeia hoyi*. Second, the RWG agreed that the concept of including a static list of indicators within the annex, without a process or approach for updating or modifying the list over time, is an outdated concept as this leaves Annex 17 vulnerable to becoming outdated. Furthermore, Annex 11 does not reference work on surveillance, monitoring, and indicators that has been accomplished since 1978 and 1987. For example, efforts such as binational surveys, national monitoring networks, the Great Lakes Observing System (<http://glos.us/>), and SOLEC are not referenced in the Annex. Progress has been made on certain endpoints or targets, while other endpoints deserve more attention.

¹⁷ Water quality sampling and measurement may not be able to detect trace amounts of certain toxic substances. However, these substances may bioaccumulate in certain species, providing important information on water quality and its effects on ecosystems. Indicators linked to “sentinel species” can play in monitoring and assessing changes in water quality that impact ecosystem health.

cases, there are numerous research components scattered throughout the Agreement that would be more clearly identifiable (and more easily managed) if they were grouped together under Annex 17¹⁸.

In conclusion, the Agreement (and Annexes 11 and 17) does not provide a clear and comprehensive map of monitoring and research needs and challenges, and this can lead to confusion. The RWG advocated clarifying the management framework for addressing monitoring, surveillance, research, and development, and setting a framework for the systematic prioritization of these needs.

EMERGING NEEDS AND CHALLENGES

Neither Annex 11 nor 17 call for mechanisms to enable the specific lists of monitoring and research needs to be updated to address emerging issues relevant to improving water quality in the Great Lakes. While the RWG recognizes the importance of including specific lists of monitoring and research needs to keep sustained commitment and attention focused on specific needs, the RWG believes that a process is needed to ensure that emerging water quality issues receive appropriate attention. Such a process can help ensure that the Annexes do not become outdated.

The RWG indicated that while a significant demonstrable need remains for the science provisions called for in Annexes 11 and 17, significant water quality challenges remain that have consequences for human and ecosystem health, economic vitality, and property protection. At the same time, the RWG concluded that both Annexes are ill-equipped to adapt to address new monitoring and research needs posed by emerging water quality issues and changing environmental stressors. RWG participants noted that the challenges that were originally intended to be met by the Agreement have changed.

For example, the “challenges” that are presented as chemical-specific objectives in Annex 1 (and that require monitoring as outlined in Annex 11) have changed. These need to be updated and the scope of monitoring broadened to accommodate these new chemicals/objectives. Similarly, the original challenge or focus for Lakewide Management Plans [which requires monitoring as per Annex 11.1(e)] was critical pollutants; the Parties have chosen to broaden the focus of LaMPs to focus on topics of concern on a lake by lake basis. This broadens out the scope of monitoring needs considerably.

RWG participants agreed that a process is needed to address new and emerging issues and noted several emerging issues and water quality challenges that are not referenced or explicitly addressed in the Agreement or Annex 11. Some examples include:

- Increases in certain persistent, bioaccumulative, and toxic chemicals (PBTs) and other substances that have similar properties but that may not be formally defined as PBTs,
- Increases in certain substances found in pharmaceutical and personal care products,
- Increases in certain water-borne pathogens, viruses, and diseases,
- Conditions in near-shore areas outside of Areas of Concern (AOCs),
- Changes in groundwater flows and hydrology; and
- Invasive species.

¹⁸ Annex 12, in particular, identifies numerous research needs (e.g., Annex 3 Supplement, section 5(e); Annex 7, section 4; Annex 12, sections 5 and 7; Annex 14, section 2; Annex 15, section 2).

While section 1(d) of Annex 11 addresses “identification of emerging problems,” the RWG agreed that changes are needed in Annex 11 to broaden the scope of efforts to accommodate emerging issues and to adapt surveillance and monitoring programs to both identify and respond to emerging issues.

The RWG also agreed that while Annex 17 is still relevant, a number of issues have emerged that are not addressed, or are not adequately addressed, in the Agreement such as research on the effects of climate change and aquatic invasive species on water quality. While the Annex is still relevant, it has not evolved to take on a more flexible, continuous improvement-based approach (e.g., plan, do, check, act) to research and development, which limits the responsiveness and ability to address emerging issues. Additionally, and as discussed above, Annex 17 lacks a call for research and development coordination and collaboration, which limits the ability to comprehensively address emerging issues or to coordinate research activities across multiple parties.

The environmental conditions in the lakes have changed, and will continue to change. As they do, RWG participants agreed that new research questions and issues will arise which will not be adequately covered by Annex 17. For example, the introduction of *Dreissena* have had an impact on contaminant cycling, water quality, the food-web – Annex 17, Section 2(i) is specific to the impact of non-native species on fish and wildlife populations and habitat, and so is not sufficiently broad to address the full extent of the needed research. Similarly, the impacts of climate change on water quantity, water quality, and the food web, are not addressed. The Annex should take on a more forward-looking approach, and be designed to ensure that it provides an effective framework for research and development 20+ years from now.

Specifically, RWG participants agreed that Annex 17 would more effectively and comprehensively address emerging issues if it (1) included a flexible process or continuous improvement-based management framework; (2) called for coordination and collaboration on research and development issues; and (3) added risk management considerations.

Examples of emerging research needs not addressed in Annex 17, Section 2 include:

- Causes and remedies of bacterial outbreaks (e.g. beach closures),
- Landscape/watershed sources and remedies for water quality impairment,
- Climate change effects on water quality and ecosystems, and
- Water quantity effects and forecasting.

The RWG concluded that the Agreement, and in particular Annexes 11 and 17, does not sufficiently accommodate emerging monitoring and research issues and needs. To fulfill the purpose of the Agreement, specifically to “restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem,” a flexible process is needed to enable monitoring and research on new and emerging issues, though not to the detriment of currently identified monitoring and research needs.

REPORTING AND ACCOUNTABILITY

While the Parties have taken some steps to improve reporting on monitoring and research activities, the RWG believes that significant progress is needed in the areas of reporting, data sharing, information management, and communications to equip the Parties, other governments and organizations and the public to effectively understand and utilize information related to Great Lakes water quality. Neither

Annex 11 nor 17 contain reporting provisions, and the Agreement lacks any focus on data and information management. In addition, some RWG participants indicated that they believe that existing reporting processes being implemented by the Parties should be modified to provide opportunities for broader public review and input.

Specifically, RWG participants strongly agreed that there is a significant need for continued progress in expanding reporting and accessibility of information on the status of research and trends related to the “State of the Lakes,” including water quality, environmental conditions, and ecosystem health. In particular, RWG participants discussed the need to present information and data in formats that are accessible and useful to various constituencies, including the public, for informing decision-making. The following characteristics were identified as being important for effective information sharing:

- Provide information at several relevant geographic scales – local (for harbors and other important sites), state and province, region/basin, and lake;
- Coordinate and present data and information from different sources in a single location to facilitate better analysis and comparison;
- Provide information in a variety of formats and levels of detail to support the needs of different constituencies; and
- Make information available in different media formats (e.g., web, print).

Furthermore, the GLWQA could advance research and monitoring data and information management and sharing efforts by incorporating explicit obligations around this topic in Annex 11 and Annex 17 or elsewhere in the Agreement. RWG members noted that recommendations made by the Great Lakes Regional Collaboration on Information Management (see <http://www.glrc.us/>) could be used to inform such an addition to the GLWQA.

The absence of reporting obligations undermines an effective results-based management framework, as well as the ability to ensure that surveillance, monitoring, and research information is reported and communicated in formats and timeframes needed to influence decision-making and management activities. RWG participants identified the need for reporting in two important areas: (1) reporting on the implementation status of efforts to fulfill the obligations of Annexes 11 and 17, and (2) reporting on the results of surveillance, monitoring and research activities relevant to the “State of the Lakes”.

The RWG acknowledged that some reporting takes place, but noted that this reporting is not required as part of either Annex 11 or 17. While the Council of Great Lakes Research Managers and the IJC have established an on-line research inventory, reporting to it is not mandatory. Specific examples of current reporting activities on research and monitoring activities, while not required by the Agreement, are included in Appendices A and B.

In addressing accountability, RWG participants agreed neither Annex 11 nor 17 provide a clear chain of accountability for monitoring or research to ensure that the parties are achieving desired human health and ecosystem health outcomes. Critical questions include: “Are the lakes fishable, drinkable, and swimmable?” RWG participants noted that individual agencies must address these questions and report on them to the public and that SOLEC has organized some aspects of its reporting around these questions. Several RWG participants suggested reporting on the status of implementation of the Agreement could be added to the biannual SOLEC report as an appendix.

Several RWG participants expressed significant concern over the lack of opportunities for public review and input related to those initiatives and mechanisms that guide, manage, and/or coordinate monitoring and research activities, such as SOLEC. These participants added that an effective accountability framework should include provisions for input and review by other parties aside from the Governments of the U.S. and Canada.

The RWG concluded by noting that clarity is needed in terms of specific information flows, and responsibilities of data and research information sharing. Several efforts could help strengthen focus on accountability:

- The IJC Commissioners have called for increased focus on accountability for the 13th Biannual Report.
- A third-party National Research Council (NRC) review of the agreement was identified as an effective vehicle for assessing progress and driving increased accountability.

IMPLEMENTATION

RWG participants expressed significant concern over inadequate and inconsistent resource allocation by the Parties for monitoring and research activities needed to implement the GLWQA. RWG participants agreed that many monitoring and research programs have not been adequately implemented and/or do not have sufficient funding to fulfill the purpose, objectives, and obligations of Annex 11, Annex 17, and the Agreement. Several RWG members observed that continued funding cuts have had a significant impact on the operation and effectiveness of monitoring and research activities in recent years.

Several RWG participants suggested that a more thorough audit or assessment of existing monitoring and research programs would be useful to identify more specifically where these programs are and are not being effectively implemented to achieve results that are consistent with the goals and objectives in the Agreement. RWG participants emphasized that to be effective; monitoring and research programs require consistent and predictable levels of funding over multi-year periods to ensure data availability, quality, consistency, and comparability over time. When shifting political priorities affect funding levels for surveillance, monitoring and research activities, the effectiveness of these programs is diminished.

In reference to Annex 11 specifically, RWG participants noted, that Section 2, implementation, is purposefully vague to allow the parties to determine the methods and terms of implementation. It was noted that there are efforts underway between EPA and Environment Canada to increase coordination. Some RWG participants noted that at present, weak coordination exists binationally, and that more structured coordination is present on both sides of the border between the federal and state/provincial levels.

In particular, RWG participants expressed significant concern over inadequate and inconsistent funding by the Parties for water quality monitoring surveillance, research, and development activities. RWG participants agreed that many programs do not have sufficient funding to adequately fulfill the purpose, objectives, and obligations of Annexes 11, 17, and the Agreement. It was noted that several of the RWG participants manage or are otherwise involved in water quality monitoring and research initiatives, and that they have witnessed first-hand the debilitating impacts that continued funding cuts have had on the effectiveness of these activities in recent years. RWG participants noted that the research inventory maintained by the IJC and the Council of Great Lakes Research Managers (<http://ri.ijc.org/>) includes information on specifically research funding by topic area.

Overall, RWG participants agreed that the Agreement should include provisions for periodic assessment of the implementation status and effectiveness of monitoring and research programs developed to address provisions included in the Agreement.

ARTICLES I AND VI: TERMS AND DEFINITIONS

RWG participants agreed that the provisions included in Annexes 11 and 17 (e.g., monitoring surveillance, research, and development) are not comprehensively referenced in Articles I and IV. While Article VI, Programs and Other Measures, includes references to monitoring and surveillance (and Annex 11), no mention of research, development, or Annex 17 is included. The RWG indicated that while Article VI is not meant to be comprehensive, this exclusion is notable. RWG participants noted that “research” is included in Article V (Standards, Other Regulatory Requirements, and Research), but that “research” should also be included in Article VI, as are “surveillance” and “monitoring.” While Articles V and VI are the bridge from the 1972 Agreement to the 1987 amended Agreement, RWG participants indicated that there is duplication between the Articles, and questioned their inclusion in the Agreement.

The RWG agreed that if Article VI is to remain in a (revised) Agreement, “research” should be included, similar to Article VI (m), surveillance and monitoring. The RWG indicated however, that Article VI requires serious reorganization and rework. The ARC should consider Article VI’s relevancy and purpose if it is to remain in the GLWQA. Similarly, the RWG recommends that the ARC consider the definition and clarity of terms—research, monitoring surveillance, development (no definition)—included in Article I, Definitions.

4. Overarching Questions

The following section outlines RWG F's answers to the overarching questions, which were outlined in the Agreement's *Terms of Reference*. The answers provide a high level assessment of the Agreement.

2. Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

Review Work Group (RWG) F participants generally agreed that the purpose statement of the Great Lakes Water Quality Agreement (GLWQA, or the Agreement), "to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem"¹⁹ remains valid and relevant, and that it reflects what should be the purpose of an international agreement for the Great Lakes. Participants emphasized that while significant progress has been made in improving water quality in the Great Lakes, significant water quality challenges (both new and historical) need focused attention. Participants agreed that the Agreement falls short in addressing the physical integrity of the Great Lakes Basin and specifically pointed to the lack of attention given to restoring and maintaining the "physical" integrity of the Great Lakes in the Agreement's component annexes. Furthermore, RWG F participants indicated that including "protect" in the purpose statement, as in, "to restore, maintain, and protect," would strengthen the overall purpose of the Agreement.

RWG F participants also indicated that the inclusion of provisions addressing monitoring surveillance, and research and development in an international agreement for the Great Lakes remains essential. Research and development, surveillance, and monitoring provide the means to identify emerging issues and water quality trends that need to be addressed and they provide the means to fill critical scientific information gaps. Surveillance and monitoring also enables the Parties and others to measure the results of program activities and progress towards achieving water quality goals. In short, surveillance and monitoring enable results-based management. Research and development provides the knowledge base for informed decision-making on policy and programmatic approaches, providing information on the potential efficacy of different interventions. In addition, surveillance, monitoring and research are significant to the Party's joint decision-making with regards to the development and implementation of Article VI.

RWG F had significant discussions on the implications of expanding the focus and/or interpretation of the Agreement (and Annexes 11 and 17) from water quality, addressed with an ecosystem perspective, to a broader concept such as "ecosystem integrity." Some RWG participants expressed strong concerns that such a broadening distracts attention and resources away from the Agreement's core focus on water quality, weakening its effectiveness. Other RWG participants indicated that the Agreement could serve as an important and more powerful tool for addressing broader ecosystem health challenges that confront the Great Lakes basin. Most RWG participants expressed comfort with maintaining the focus of the Agreement on water quality, addressed with consideration to an ecosystem approach. The RWG noted that divergent perspectives on the fundamental focus and purpose of the Agreement have broad implications for all of the Articles and Annexes in the Agreement, and that it will be important for the ARC to consider these implications.

¹⁹ *Great Lakes Water Quality Agreement of 1978*, as amended by Protocol signed November 18, 1987, Article II

3. Does the Agreement, and its implementation²⁰, achieve the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes basin ecosystem?

RWG F participants generally agreed that the Agreement has been instrumental in driving important progress in restoring and maintaining water quality in the Great Lakes, but that the Agreement and its current implementation are insufficient to achieve the goals of chemical, physical, and biological integrity. RWG participants noted that much of the implementation work has focused on addressing chemical integrity, with less attention to physical and biological integrity. Participants additionally recommended that more attention be given to protecting the physical integrity of the Great Lakes Basin ecosystem. In addition, RWG participants expressed significant concern over inadequate and inconsistent funding by the Parties for activities needed to effectively implement the GLWQA.

4. Is the Agreement, and its implementation²¹, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so what are the issues?

As mentioned above, RWG participants indicated that the Agreement and its current implementation are insufficient to protect and restore the Great Lakes. RWG participants noted that many aspects of the Agreement are not designed to address emerging water quality issues and challenges. For example, RWG participants identified several areas that are not sufficiently addressed by the Agreement (including from a monitoring and research perspective):

- Increases in certain persistent, bioaccumulative, and toxic chemicals (PBTs) and other substances that have similar properties but that may not be formally defined as PBTs;
- Increases in certain substances found in pharmaceutical and personal care products;
- Increases in certain water-borne pathogens, viruses, and diseases;
- Conditions in near-shore areas outside of Areas of Concern;
- Changes in groundwater flows and watershed hydrology;
- Groundwater as a resource vital to the physical, chemical, and biological integrity of the Great Lakes Basin ecosystem; and
- Invasive species.

While the RWG recognizes the importance of maintaining and including specific lists of objectives, targets, programs, or needs to keep sustained commitment and attention focused on specific needs, the RWG believes that an on-going process is also needed to ensure that emerging water quality issues receive appropriate attention, though not at the expense of addressing on-going issues. Such a process can help ensure that the Agreement does not become outdated.

5. In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

²⁰ "Implementation" is defined as the achievement of the goals set out in the Agreement and not as a formal review of Governments' programs.

²¹ Ibid.

RWG participants noted that many specific objectives listed in various articles and annexes have been addressed effectively under the Agreement. In these cases, participants indicated that the Agreement helped to focus attention and resources on specific needs. Participants generally agreed that the Parties' operational efficiency in the areas of surveillance, monitoring, and reporting has been strengthened by the Agreement. Specific examples of areas where the Agreement has successfully fulfilled its intended purpose include:

- Annexes 15,
- The monitoring and research called for in Annex 3, and
- The monitoring to support the RAPs and LaMPs.

RWG participants indicated that the Agreement falls short in several key areas

- The Agreement has weak provisions for identifying and addressing emerging issues and challenges affecting water quality;
- The Agreement has been weak in its focus on physical and biological integrity related to water quality;
- The Agreement has weak provisions for fostering coordination and collaboration among the Parties, Provincial and State governments, local governments, Tribes and Aboriginal groups, and others; and
- The Agreement has weak provisions for reporting and accountability.

6. What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

RWG participants indicated that the Agreement has weak management systems for ensuring priority-setting, coordination, and collaboration to achieve results. RWG suggested that the Agreement should be modified to include provisions requiring the development of collaborative, coordinated, continual improvement-focused processes to achieve the goals and objectives of the Agreement. By establishing this type of framework, the Agreement would tighten the linkages between objectives, targets, indicators, monitoring and reporting. Such a continual improvement focused framework could also require the development of action plans to ensure effective and coordinated implementation.

5. Key Recommendations

This section summarizes the recommendations identified by Review Work Group (RWG) F related to surveillance and monitoring and research and development, in the Great Lakes Water Quality Agreement (GLWQA).

First, *the RWG recommends* that changes be made to the monitoring and research provisions of the GLWQA (currently contained in Annexes 11 and 17) to address key issues identified during this review process and summarized in this report. The recommended changes could be made either through a revision to the current version of the Agreement or in the context of a new Agreement.

Second, *the RWG recommends* that the revised monitoring and research provisions of the GLWQA be drafted to explicitly address the needs and elements described below. RWG participants indicated that it would likely be possible to integrate discussion of monitoring and research provisions into a single annex, or section of the Agreement, replacing the two separate annexes (Annexes 11 and 17). Monitoring and research could be subsumed under a “science” umbrella, which could also address related topics which are not covered in the current Agreement such as data management.

Management and Action Planning Framework: The Agreement should call for the Parties to establish a robust management framework that enables effective and efficient management and implementation of monitoring and research activities related to water quality in the Great Lakes. The management framework should explicitly address the following functions:

- Prioritization of research and monitoring needs;
- Establishment of targets and timeframes for addressing objectives; and
- Development of monitoring and research action plans to guide activities and clarify roles and responsibilities to support effective implementation.

In calling for a management framework, the Agreement should also retain references to specific monitoring activities and indicators (see Annex 11, Sections 3 and 4) and to specific research needs (see Annex 17, Section 2). RWG participants indicated that the inclusion of specific needs in the body of the Agreement (even if the list runs the risk of becoming outdated) plays a critical role in sustaining focus and commitment to addressing these needs. The RWG recognized that the specific monitoring activities and indicators, as well as specific research needs and priorities, should also be documented and addressed in the action plans and other documentation prepared under the management framework.

The management framework should also be explicitly designed to accommodate the additional needs and functions described below, for surveillance and monitoring as well as research and development.

Coordination and Collaboration: The Agreement should call for greater and broader coordination and collaboration on surveillance, monitoring and research and development relevant to the GLWQA. While joint monitoring and research programs may not always be feasible, expanding coordination and collaboration efforts is essential to improving the operation and effectiveness of monitoring and research. RWG participants noted that there are numerous monitoring and research initiatives underway in the Great Lakes basin, but that the need for greater communication and harmonization of approaches exists. RWG F participants also recommend that the Agreement address the need to engage orders of government and other entities beyond State and Provincial governments in surveillance, monitoring, and research collaboration and coordination. Local and municipal governments, Tribes and Aboriginal groups, academia, non-governmental organizations, and industry play increasingly important roles in the implementation of monitoring and research.

Emerging Needs and Challenges: The Agreement should provide for an on-going active process to ensure that emerging water quality issues receive adequate attention with regard to both surveillance and monitoring and research and development. RWG participants, however, emphasized the critical importance of ensuring consistency and continuity in the implementation of existing monitoring and research activities when addressing emerging issues. RWG participants noted that shifts in focus and

funding of monitoring and research programs have undermined infrastructure that is vital to the assessment of both programs and the state of the lakes.

Reporting and Accountability: The Agreement should include stronger provisions for reporting and accountability. Reporting should address both the status of implementation of programs and activities to support the Agreement, as well as monitoring and research information that shed light on the "State of the Lakes." Standard setting processes should be transparent, accessible, and responsive to established and emerging threats. Ideally, reporting is implemented as part of a broader system, which also addresses data sharing, information management, and communications, which supports effective decision-making and results-based management in the basin.

A clear management framework that better aligns targets, action plans, roles and responsibilities, and implementation activities will enhance accountability. In addition, the Agreement should outline a clear process for organizations and the interested public to provide input to and comment on monitoring and research objectives, targets, and action plans developed to support the Agreement.

Implementation: The Agreement should include provisions for periodic assessment of the implementation status and effectiveness of monitoring and research programs developed to address GLWQA provisions. Such an audit or assessment function would equip the Parties to determine whether progress is being made with regard to the objectives and action plan established under the Agreement and to make adjustments as needed.

RWG participants recognize that the operation and effectiveness of the monitoring and research provisions of the Agreement will only be sufficient if adequate resources and funding are programmed for implementation. RWG participants emphasized the critical importance of building the political will for sustained implementation if and when the Agreement is revised or rewritten.

Finally, *the RWG recommends* that the definition of the terms in Articles I and IV of the Agreement which are associated with Annexes 11 and 17, such as definitions for "monitoring," "surveillance," and "research," should be updated, clarified, and/or added.

GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP G FINAL REPORT TO ARC December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

Annexes 4,5,6,8 and 9 were reviewed by Working Group G. These Annexes represent potential discharges of specific pollutants from ships, the oil handling facilities associated with ships or response to spills associated with ships.

Clarity

For the Annexes reviewed above, the working group generally found that the Annexes as originally written were clear in defining what pollutant was to be dealt with, and what requirement was placed on the parties. In the context of the Agreement and these Annexes, the perceived threat was large commercial vessels.

Relevancy

The continued relevancy of the Annexes reviewed was a topic of considerable discussion. The globalization of trade has had huge impacts on the shipping industry, of which the Great Lakes trade is a very small but vibrant part. At the time of the signing of the Agreement, very few of the international conventions governing pollution prevention by ships had been ratified by either of the parties. Nineteen years later, virtually all IMO conventions governing the pollution aspects of shipping have either been ratified, or are in the process of being ratified by the two countries. Regional focus has been replaced by global realities. The Great Lakes have, to some extent, been exempted and protected as being in 'internal waters' of both nations. However, the drafters of domestic legislation in either country have not used the specifics of Agreement as a model, when they brought the international conventions into force (although the overall intent is still roughly compatible in most cases) .

Contrasting that, is the regional focus on pollution, which was inclusive of the threat from ships, which was the original intent of the Agreement and most recently as set out in the final report of the Great Lakes Collaboration.

Domestic policies, after the Exxon Valdez spill and US domestic national legislation in the form of the Oil Pollution Act of 1990, only three years after the signing of the Agreement, set the stage for media politics, not science or the Agreement to determine what marine agencies would be responsible for. Again while the argument can be made that the legislation is not incompatible with Annex 4 or 9, the driver was clearly not the Agreement.

Jurisprudence, such as the Intertanko decision and the recent ruling by a California court that the Environmental Protection Agency has a role under the Clean Water Act in regulating ballast water discharges, have had, or will have, an effect on the ability of responsible agencies to stay within the tenants of the Agreement.

Results

Despite the somewhat negative view of the specific relevancy of the Agreement, with the exception of the introduction of aquatic invasive species, the desired outcomes for both countries from an overall perspective have been generally met. It is not perfect, oil spills still occur, though generally in very low levels, and more from sources that were not the primary targets in 1987. Chemical spills from ships are generally measured in drops or gallons, not tons and are significantly lower in number or amount than shore side spills. An interesting irony is that, the requirements set out in the Agreement under Annex 9 for spill response, and the expertise and equipment that was built up in anticipation of large ships source spills, in fact, has been primarily used for shore sourced spills.

Garbage and sewage discharge from large commercial ships is a non-issue.

The science and policy of cargo residue discharge is a continuing debate, including waste water discharge from slurry tanks. Research is continuing, but the original science that determined the current policy has yet to be discounted.

Like oil and hazardous chemicals, the focus has shifted from the original target of the Agreement. The role of recreational vessels, grey water discharges and the number of pump out facilities for them is now the current focus.

The marine side of oil handling facilities is well regulated in comparison to the state of affairs on the signing of the Agreement. Unfortunately, the number of ships utilizing them is significantly down from 1987.

The joint contingency plans originally set up under the Agreement have been a model for the Oil Spill Response Regimes for both countries. CANUSLAK has become the model for similar joint oil spill response exercises on either coast and even into the Arctic.

The requirement for studies to establish improved procedures for the abatement and control of pollution from shipping sources has resulted in many scientifically based policies and procedures for both countries.

Reporting requirements in the Agreement, as signed, required the Canadian Coast Guard and the United States Coast Guard and other interested agencies to meet annually to consider Annexes 4,5,6,8 and 9 and to provide a report to the International Joint Commission. Because of personnel efficiencies in the 90's, this was altered to a two year cycle and reports have been provided consistently throughout the agreement.

The discharge of ballast water and the threat of introduction of aquatic invasive species into the Great Lakes by ship sources has become THE principle issue of concern and the subject of the bulk of the biennial report and the majority studies since approx 1996. It is very briefly mentioned in Annex 6 1 (b) as a problem worth studying.

Management

The organizations specifically tasked to undertake the responsibilities of Annexes 4,5,6,8 and 9 are the United States Coast Guard and the Canadian Coast Guard. Though clearly an organization charged with different priorities than in 1987, the United States Coast Guard is still the appropriate agency for these Annexes, and has been consistent as the 'go to' agency. On the Canadian side, the business of government has resulted in significant departmental reorganizations between the Canadian Coast Guard, Transport Canada and the Department of Fisheries and Oceans. The current Canadian Coast Guard operates as a Special Operating Agency with a very specific mandate different from that of 1987. From the point of view of the Agreement, while agencies have reported changes to the IJC, there is a need to acknowledge the current responsibilities of the various departments and to provide flexibility for any future reassignment of responsibilities.

Despite the above, all departments and organizations have been consistent in continuing to cooperate to achieve the overall requirements of the various Annexes. What does seem to have been lost with the dispersion of responsibilities (and the passage of time) is a consistent understanding of what exactly are the legal and political implications for each agency, with respect to the Agreement. In the intervening years significant amount of domestic legislation and regulatory authority has been promulgated with respect to pollution prevention from ships. It is not all consistent with the Agreement, nor is the current mandate of individual agencies an easy fit, at times, to accomplish requirements of the Agreement.

Accountability

Responsible Agencies have been consistent in their reporting to the International Joint Commission since the Agreement has been signed. The annual report, while changed to a biennial schedule, remains a key tool for all agencies to review 'services, systems, programs, recommendations, standards and regulations relating to shipping activities for the purpose of maintaining or improving Great Lakes water quality.'

The role of States and Provinces are mentioned in specific areas of the Agreement as interested or responsible parties. In many cases this relationship is clear. In others it is less so, and in some cases has resulted in non compatible policies between jurisdictions – e.g state-wide no discharge zones for sewage from ships, despite federally mandated and approved marine sanitation devices that meet or exceed State discharge standards.

The role of municipalities or the 'public' is not mentioned in any of the Annexes reviewed.

The oversight role of the IJC was clear in the review.

Crosscutting Issues -

The role of AIS introduction from ships was also discussed under the Special Issues Working Group. The draft reports from that group suggest that the issue would be examined under the broader 'biodiversity' envelope. There is precedent in the Biodiversity Convention itself with respect to ships as well as in Canadian and US policy that assigns ship specific response to Marine Agencies because of the safety aspects. The recent legal decision in the State of California and the future of the involvement of the Environmental Protection Agency remains to be seen.

There is also potential overlap under the general title of Annex 17. As directed in Annex 6 – parties are under obligation to undertake a study where the review of services, programs, recommendations, standards and regulations relating to shipping activities indicates areas of improvement. Annex 17 as written is not inclusive of the requirements of Annex 4,5,6,8,or 9.

Recommendations

From the point of view of the review of Annexes 4,5,6,8 and 9, it is clear that much has changed since the signing of the Agreement. This change is sufficient to recommend that serious consideration be given by the parties to look at updating the specific requirements in the Agreement that deal with ship source pollution. A single 'vessel source' Annex might be an efficient approach in the future.

2. Overview of Review Working Group Mandate

The Review Working Group (RWG) was tasked with reviewing the following components of the Canada – U.S. Great Lakes Water Quality Agreement:

Annex 4,5,6, and 9, the so-called “Coast Guard” Annexes reference various operational discharges from ships that could have negative effects upon the water quality of the Great Lakes. Requirements for the parties under the Agreement are specific and set in detail in separate Annexes. Requirements for Oil and Hazardous substances discharges are referred in Annex 4. Garbage, Sewage and Cargo Residues are referenced in Annex 5. The potential for discharge of Aquatic Invasive Species from ballast water is mentioned in Annex 6 (as well as the requirement to review and report on pollution from shipping sources, consult with the IJC and study any potential pollution problem from ships identified by the parties). Annex 9 sets out requirement for a joint contingency plan in response to oil spills. Annex 8 sets out requirements for Onshore and Offshore Oil Handling Facilities but specifically exclude vessels.

In comparison to many of the other working groups involved in the review, with a wide and large base of working group members, Working Group G started with, and stayed with a small cadre of (approx 6) individuals representing a cross section of responsible or interested federal departments, state and provincial agencies, municipal and non governmental environmental organizations. A face to face meeting in April in Chicago and conference “call in” set the tone for the Group in providing working group members with information and references. The latest report GLWQA report to the IJC by the responsible parties was provided as well as online sources to access previous reports and the synthesis of public comment by the IJC. While not specific to each call, it was noted that the biennial reports of the IJC had, on occasion, made specific recommendations for a particular Annex.

Conference calls were conducted over the course of the summer. For most calls, a contractor supplied minutes. Each call referenced a specific Annex with the questions posed to the group as per the terms of reference of the GLWQA review.

3. Evaluation Framework

Clarity

Clear articulation of purpose, goals, objectives, programs and other measures; the existence of a shared understanding and acceptance of the meaning of the Agreement.

6. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

(n) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

Annex 4 The text is clear as to the objectives and measures described for oil and hazardous substances. It is very clear that the Annex directs the parties to preventative measures.

Annex 5 The text and intent is clear with respect to the regulation of discharge of garbage, sewage and 'wastewater'.

Annex 6 The requirements of this Annex are clear and specific. The realities of WHICH agencies do the review currently (as the text specifically targets the USCG and the CCG) have changed considerably. Similarly, the requirements of consultation are very clear and the Annexes to review are defined, however, the annual requirement has been changed to biennial. The intent is also clear for undertaking studies but the prescriptive nature of the way they are to be done has been modified in practice.

Annex 8 In the context of 1987 the concept to the authors of the Annex likely was clear, but including rail, road, pipelines, offshore facilities, wells and storage facilities in the Annex has allowed it to be overwhelmed by jurisdictional complexities.

Annex 9 The text of the Annex is very clear and is summarized in the "Purpose" section.

(o) Are program outcomes and/or environmental outcomes clearly identified?

Annex 4 The Annex is quite specific in terms of requirements and outcomes.

Annex 5 The Annex is clear on the outcomes described for the waste streams identified.

Annex 6 The Annex is clear on the outcomes described for all requirements.

Annex 8 The Annex is clear on intent but the myriad of agencies, Federal, Provincial, State, Regional etc who currently have jurisdiction or who would be responsible to implement or regulate required outcomes are significantly more complex. On the Canadian side alone a partial list of responsible agencies would include the National Energy Board, various regional and national modal agencies of Transport Canada (Marine Safety, Marine Policy, Surface (rail) Programs) Environment Canada, OMEF, OMNR as well as certain municipalities. The U.S. side would be even more complex because of the increased number of state agencies.

Annex 9 The outcomes are clearly articulated i.e. to provide an adequate cleanup response to pollution incidents.

(p) Are there outdated terms, concepts or references?

Annex 4 Overall the wording of the Annex is still clear in 'today's' terms.

Annex 5 The Annex is not clear on the context of 'ballast water' as a waste stream. Aquatic invasive species are not usually considered a substance and the definition of waste water specifically excludes oil or hazardous substances being mixed with ballast water. The terms are clear and consistent in modern usage for the rest of the waste streams.

Annex 6 The Annex is 'dated' in its reference to the Canadian Coast Guard and its understanding of the role of ballast water in the introduction of Aquatic Invasive Species.

Annex 8 The Annex is fine on terms. The reality of what it means in practice is less so.

Annex 9 The concept of funding under article 4 is not what in practice has happened. The 2003 agreement says each party will fund its own operations.

(q) Other Comments.

Annex 8 To the knowledge of working group members, the 'wide' range of requirements under the Annex has not been reported on in some time (if ever). From the Marine Agencies' point of view, the requirements and regulations for Oil Handling Facilities are reported in the biennial GLWQA report.

Annex 9 The annex provides the generally accepted objectives of cooperation between governments (Federal / Provincial / State). The issues of 'sources' and mandated areas are complex.

Relevancy:

The continued relevancy of the Agreement.

5. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

a. Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

Annex 4 – While the fresh water aspects of oil pollution have not changed nor has the need to prevent oil pollution from ships, the political and regulatory environment has changed considerably, as a result of an oil spill far from the Great Lakes. The Annex predates the Exxon Valdez oil spill and the subsequent promulgation of the Oil Pollution Act of 1990, MARPOL I and II and the equivalent regulations under the Canada Shipping Act. Nevertheless the subsequent legislation is in most parts compatible with the intent of the Annex. From a 'threat' of oil pollution to the Great Lakes the reality of the liability aspects of the legislation on the U.S. side has significantly decreased the number of ships carrying oil on the Great Lake, thus the potential of oil spills from ships.

Annex 5 Commercial vessels on the Great Lakes have been subject to regulatory requirements regarding sewage, wastewater and garbage in both countries, in part driven by the protection requirements as set out in the Annex. Certainly for Sewage the Great Lakes requirements exceeded international requirements. Discharge of garbage in the format normally thought of (i.e. galley waste for example) has been prohibited by the regulatory agencies on both sides of the border in agreement with the Annex. The need was there at the time the Annex was signed. The need has generally been met. In the non-discharge of these waste streams the environmental conditions have been improved. The political and public perception however is still that commercial vessels are a significant source of pollution. Grey water, especially from recreational vessels remain a public concern. The Annex does allow for designation of critical use areas for non-discharge of sewage. Where these have been designated for political reasons, there is a disconnect between federal and state regulatory requirements for commercial ships.

Annex 6 The political and organizational realities have changed considerably since the Annex was included. On a positive note, if anything the consultation between the parties has improved considerably since 1987. However the realities of the Great Lakes shipping trade both for the domestic and foreign fleet have changed significantly since the late 80's as have the 'environmental issues' of importance. Ship source invasions of Aquatic Invasive Species have exponentially taken over as the issue of concern.

Annex 8 In practice, while the concept is acknowledged, the actual practical implementation of what is required in the Annex has in fact been undertaken by a multitude of agencies. The requirements of the Annex are in fact being met – but not (other than by the Marine Agencies) through the auspices of the GLWQA.

Annex 9 The need for adequate cleanup response to a pollution incident remains.

b. Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

Annex 4 is generally compatible with current domestic legislation of both parties and international conventions. The domestic legislation is in advance of the Annex to some degree (e.g. the requirement for Oily Water Separator discharges of 5 ppm rather than the International standard of 15).

Annex 5 Politically the environment, especially as regulated by state agencies have become increasingly intolerant of international standards (e.g. Sewage) despite the fact that domestic federal regulation of both parties address or exceed international standards. The annex does include a section on 'Additional' measures for shore side disposal of waste streams in the Annex.

Annex 6 The Annex and the environmental issue to be reviewed are still compatible with those of concern to the Great Lakes although the one issue, potential for introduction of Aquatic invasive Species from ships has come to dominate. The consultation requirement still drives the biennial report and the Annex has been instrumental in allowing both countries to provide funding to studies.

Annex 8 The political and bureaucratic conditions now in place as compared to those in 1987 are very different. With respect to Offshore Facilities for example, the legislative and financial liability issues have in practice driven all above water rigs off the Great Lakes. A significant well and pipeline infrastructure exists in Lake Erie but from a regulatory point of view the agencies responsible do not report to the IJC in the context of the GLWQA. Similarly, with the exception of specific oil handling facilities regulated by the marine agencies, which are reported on in the context of the GLWQA, the majority of on-shore facilities have little or no connection to the IJC or the GLWQA.

Annex 9 The overarching objectives are compatible, but the domestic sensitivities and detailed mandates of federal, provincial and state agencies and their application has meant that the Annex now lags most local initiatives. The polluter pay principle is consistent. There are still issues with Land vs. Marine Spills.

c. Does the Agreement reflect current/appropriate environmental management tools (e.g. legislation, guidelines and best management practices)?

Annex 4 as indicated above predates both countries' current legislation and MARPOL I and II. As a result the current management tools were driven externally – either by Congress or as a result of an international marine pollution convention. Certainly in the Canadian system the tenants of the Annex were included in the domestic legislation incorporating MARPOL.

Annex 5 Overall, the current federal regulatory response to the waste streams required are consistent with the appropriate environmental management tools. The way 'Cargo Residue' has been dealt with through literal reading of MARPOL V is somewhat problematic but the USCG is currently undertaking regulatory initiatives to rectify the problem.

Annex 6 The biennial reports consistently indicate that the legislation, policies and practices of the responsible agencies are in line with the Agreement.

Annex 8 The Annex, in its overall idea, is very compatible with the various domestic laws and policies of both nations. The problem becomes that, in practice, the broad brush results in laws, regulations and policies that are not in the context of the GLWQA or the IJC.

Annex 9 The Annex is too general and does not recognize the myriad of federal, provincial, state and municipal legislation. The Annex is a good example of the differing priorities of the GLWQA in various agencies.

d. Other Comments.

Annex 4 Overall, the current relevance of the Annex is questionable in driving the actions specific for the protection of the Great Lakes from commercial ships. Certainly in practice and reality the focus has shifted to smaller commercial vessels such as fishing vessels and recreational vessels as the source of continuing 'mystery' spills.

Annex 8 The Marine Agencies continue to report on Oil Handling Facilities under their mandate. The all-encompassing nature of the Annex encompasses so many diverse and varied jurisdictions, that structures and modes make it largely irrelevant.

Annex 9 Various legal and jurisdictional issues have undermined the authority of the GLWQA as shown in the various agency responses to this Annex.

Achieving Results:

The implementation and appropriateness of prescribed programs, policies, measures and demonstrated progress; including the application of sound science.

19. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

a. Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

Annex 4 Overall, since the Annex and the Agreement was first published, there has been a decrease in oil and hazardous substances spilled in to the Great Lakes. To credit it with the specific requirements of the Annex was probably true pre Exxon Valdez.

Annex 5 The programs, regulations and legislation have been sufficient to achieve the goals for the waste streams identified in the Annex.

Annex 6 While overall the programs on the Canadian side have been assigned to different agencies, the policies have been sufficient to achieve the goals, and the studies especially are based on science.

Annex 8 The objective and goals have, despite the large swath of issues, jurisdictions and modes (Marine, Rail, Surface etc), been surprisingly achieved. However, most, with the exception of those under the Marine Agencies, have been achieved outside the Annex or the GLWQA.

Annex 9 There is a credible cleanup response capability on the Great Lakes. It is not driven by scientific data needs although science does help in tracking current flows and weather patterns that could affect cleanup of a spill.

b. Does the Agreement fail to address critical issues?

Annex 4 General principle of prevention of discharges of harmful quantities of oil and hazardous substances addresses the critical issue. Mystery spills still happen but not through any fault of the Annex.

Annex 5 Discharge of Grey water is not specifically mentioned nor are exhaust emissions.

Annex 6 As above, Grey water and exhaust emissions from ships is absent. Non ballast potential for aquatic invasive species introduction is also missing (ie hull fouling, sea chests etc) although both parties are active internationally at IMO and domestically.

Annex 8 Spills are still going into the Great Lakes from Onshore Facilities. There are no longer any 'offshore' facilities on the Great Lakes.

Annex 9 The Annex does not address the recognition of financial liabilities and the sense of overall obligation on the part of polluters when it comes to bi-national impacts and is not consistent with the public's sense of fairness.

20. Are the demonstrated results consistent with goals and objectives in the Agreement?

m. Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not.

Annex 4 Yes, programs, policies required to be implemented were in fact implemented.

Annex 5 Yes, programs, policies required to be implemented were in fact implemented.

Annex 6 Yes requirements continue to be met although the 'studies' have changed focus over the years from oil and hazardous substances to aquatic invasive species introduction

Annex 8 The programs envisaged by the Annex are in place – especially in regard to those regulated by the Marine Agencies. However, most jurisdictions responsible for implementation do not do so in the context of the Annex or the GLWQA.

Annex 9 Yes, although the Annex has been superseded by the federal US/Can Joint Plan.

n. Are any parts of the Agreement in any way an obstacle to progress?

Annex 4 No

Annex 5 No

Annex 6 Yes – Politically the continued reference to the Canadian Coast Guard in roles they no longer have can be contentious at times

Annex 8 Yes . The multi-agency responsibility and the multi-modal reality suggest the Annex is virtually unmanageable.

Annex 9 Yes The vagueness of the funding issue has allowed other mandates to supersede the Annex. The lack of consistent legal mechanisms around the GLWQA itself within Federal/ Provincial / State authorities has allowed various jurisdictions to implement programs not consistent with the Annex. At the very least it confuses the issue with regard to jurisdictions – potentially leading to inefficient pollution response.

o. Are there external impediments that prevent implementation?

Annex 4 There are certainly external influences on the implementation of the Annex but they have not prevented implementation.

Annex 5 Potentially. Multi-state application of 'no discharge' zones as allowed in the Annex under Critical Use Areas may become an impediment to application of federal and international standards for Marine Sanitation Devices aboard ships

Annex 6 External focus on international conventions and the reality of Global shipping is significantly more in focus today than at the time of the signing of the Annex.

Annex 8 As above. It has been implemented in the confines of the responsible marine agencies.

Annex 9 The legal requirements of certain domestic legislation are in some respects in direct disagreement with the Annex. (Oil Pollution Act of 1990)

p. Are there other barriers to progress?

Annex 4 Mystery spills and spills originating on land but ending up in the water are not under the control of the regulatory agencies of the parties or of the vessel operators

Annex 5 There is some issue with respect to "Cargo Residues" due to the literal interpretation of MARPOL V as brought into U.S. legislation. The USCG has a process in place to rectify this.

Annex 6 Human resource constraints for all agencies have forced a streamlining of process from the original consultation concept. An additional barrier to progress would be financial constraints from various government(s) over time.

Annex 9 Full commitment is required by stakeholders, including time and resources allocated.

q. To what extent can results be attributed to the Article/Annex?

Annex 4 Overall, the initial regulatory efforts at the time of signing the Agreement likely could be attributed to the Annex. However the politics of the Oil Pollution Act of 1990 and international maritime conventions have taken over as primary drivers.

Annex 5 Some. Domestic requirements regarding sewage and standards developed for Marine Sanitation Devices exceed international standards.

Annex 6 – The Annex can be credited with some of the first studies with respect to Ships on the Great Lakes and their role in the introduction of aquatic invasive species

Annex 8 Termpol regulations for the Canadian Marine Agencies and compatible regulations on the U.S. side

Annex 9 The Joint Plan and CANUSLAK were considered the litmus test for Canadian / US relations with regard to pollution response.

r. Other Comments.

21. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

c. Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?

Annex 4 Resources for oil and hazardous substance prevention certainly became available much more readily after the sinking of the Exxon Valdez. Personnel cuts in the 1990 from “Program review” on the Canadian side have not been restored. Additional resources could still be advantageously utilized for prevention of mystery spills or reception facilities.

Annex 5 Both nations have provided appropriate levels of resources to deliver programs. However, as above, resources removed in the rationalization of the 90’s have not been restored.

Annex 6 The Biennial review continues to be the most comprehensive examination of ship source pollution into the Great Lakes. There continue to be dedicated personnel in the responsible agencies and the level of funding for studies, while up and down over the years, has been usually sufficient to meet requirements.

Annex 8 Resources have been sufficient within the marine agencies. The wide definition of oil handling facilities make it problematic to resource inspection of the myriad of small ones.

Annex 9 Over the last several years, both the CCG and the USCG have attempted to achieve significant efficiencies in coordinating their respective national systems. This has resulted in less ‘solely dedicated’ CANUSLAK events than in previous years.

Overall the levels of large-scale activities have decreased in favour of dual or piggy-backed efforts especially with regard to exercises.

d. Other comments.

22. Is the science in the Agreement still relevant? If not, why?

a. If the science in the Agreement is still relevant, how has it been incorporated?

Annex 4 Science did not play a large part in the Annex.

Annex 5 Science has played a role in determining standards for sewage discharge as in the current regulations of both countries.. Similarly, science has played a major role in determining appropriate areas for cargo residue discharge and the threat (if any) by certain commodities if discharged overboard. These have provided the current policy for the USCG and the proposed regulations in Canada.

Annex 6 Appropriate science has been behind the environmental policies of the responsible agencies of both countries and has been consistent. Science has been incorporated as ‘advice’ in any environmental regulatory process for both nations. Recent examples would be the advice on alternate ballast exchange zones for vessels or the NOBOB research done by NOAA / GLERL which has affected the policies of both countries.

Annex 8 The Annex does not specifically encompass science.

Annex 9 Science impacts are limited to advances in detection technology, advances in determining the fate and effects of pollution, advances in treatment agents and advances in recovery and /or in-situ burning techniques.

23. Does the Agreement incorporate science to address emerging issues?

a. Can the Agreement accommodate emerging issues?

Annex 4 Science is being incorporated in the tracking of mystery spills with highly sophisticated technology. DC-3's have been replaced with Twin Otters. Advances in technology has created 'green oils' and green ships but are not realistically tied to either the Annex or the GLWQA.

Annex 5 Annex does not seem to have a specific ability to incorporate emerging issues such as grey water discharge from recreational vessels or air emissions.

Annex 6 The Annex is not particularly well worded to incorporate emerging issues. However, both agencies have utilized the 'study' portion of the Annex to expand research into areas such a hull fouling, and cargo residues.

Annex 9 One emerging issue is the loading of pollution via small craft and the impacts of an increasing population base using these small craft. This is not anticipated in the Annex.

24. Other comments.

Management Framework:

Appropriate institutional structures, cooperation and coordination, including potential duplication with other initiatives or instruments of a similar nature, and synergies and linkages with other initiatives.

8. Are management and coordination approaches identified in the Agreement?

k. Is management and coordination specified? If so, briefly outline.

Annex 4 The general tone of the Annex is prescriptive. It is very specific but speaks more to Naval Architecture and ship outfitting than management and coordination.

Annex 5 The Annex is specific with regards to prohibition of garbage and a requirement for compatible regulations for garbage, sewage and waste water

Annex 6 The Annex assumes the management structure of the responsible agencies is appropriate for the job but does not specify – other than consultation and studies – how to do it.

Annex 8 The Annex refers to compatibility of regulations, review of operation, maintenance and inspection of facilities within 6 months of date of entry into force of the agreement (although nothing after that is required).

Annex 9 The Annex assigns management and coordination to the CCG and the USCG. The Annex framework anticipates the continuing management structure of the two agencies as of 1987. This, in practice, has not happened.

1. Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

Annex 4. The requirements do reinforce the goals of the Agreement.

Annex 5 Compatible regulations by both countries are in fact in force for the waste stream specified. There are minor discrepancies with respect to the allowance of chlorine as a disinfectant in the US and not in Canada.

Annex 6 All agencies have a long history of cooperation to ensure the goals are met. However, consultation between marine agencies and ‘other’ interested parties has decreased with the rationalization of personnel and resources in the 90’s. The goals of the agreement do not necessarily show a multi-agency collaborative effort outside the ‘marine agencies’.

Annex 8 If limited to the marine agencies, the management and coordination has been sufficient to accomplish the goals set out. If the larger picture is included with a myriad of jurisdictions and modes, it is unclear whether that applies in the knowledge base of the working group. Spills still go into the water from shore side facilities.

Annex 9 Competing mandates make the achievement of some objectives cumbersome. For example the JRT lists must incorporate 1 province, 7 states, 5 federal departments all with similar (or differing) mandates

m. Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

Annex 4 No, the tone of the Annex is specific and prescriptive. The general principles suggest oil and hazardous substances should be prevented from being discharged into the Great Lakes in harmful quantities.

Annex 5 No, the priorities since the signing of the Annex are external to the Annex and politically driven – e.g. Cargo Residue and State ‘no discharge zones for sewage’.

Annex 6 For this Annex, it is not the management approaches that facilitate priority setting rather, it is the threat to the environment. (or political perception of that threat). The priorities of the Agreement have changed considerably from the 1980 and early 90’s (oil and hazardous substance discharges / sewage) to aquatic invasive species introductions today.

Annex 8 Since the requirement of the Annex is to report only once, 6 months after coming in force, it would be hard to indicate that priorities are set through the Annex. Nevertheless, the marine agencies are continuously looking at improvements, and in their areas of responsibility, the management and coordination seem appropriate.

Annex 9 There are no specified approaches in the Annex for priority setting and with various mandates it has become cumbersome in implementation.

n. Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

Annex 4 International agreements and external political forces have overtaken the Annex, yet it is still an appropriate goal.

Annex 5 As above. Both countries are in synch with regional and international standards.

Annex 6 Shipping is a global enterprise. The international aspect is much more coordinated than it was in 1987. Similarly, with the advent of e-mail and the internet, significant synergies are available in communication between all agencies. There are significantly more working groups and interagency meetings than when the Annex was written.

Annex 8 International conventions are, in fact, in synergy with the intent of the Annex.

Annex 9 The Annex references the overall Joint Plan which in turn is limited by the mandate of departmental interests. The Joint Plan (Federal) may require a greater distribution and contribution by state and provincial stakeholders.

o. Other comments.

Accountability:

Reporting and assessment. The ease of access to, and quality of data for monitoring and reporting purposes, role of the IJC and long-term sustainable buy-in and commitment from the Great Lakes community.

4. Is there comprehensive monitoring and reporting?

(w) Are there clear indicators to determine progress?

Annex 4 There is comprehensive monitoring and reporting of oil discharged into the waters of the Great Lakes by both countries. The reporting indicates a clear downward trend since the Annex was signed.

Annex 5 There is comprehensive monitoring and reporting by both countries although it is in addition to the requirements of the Annex. Domestic ships of both countries are inspected yearly and Port State Control initiatives encompass ocean-going vessels.

Annex 6 The Annex requires the agencies to report and study but there are no specific indicators required to be included.

Annex 8 The decrease in spills from Oil Handling Facilities would be an indicator. The annex does require review of the operation of facilities and that does happen in the context of the marine agencies.

Annex 9 Progress is measured in terms of the number of spills and responses and subjectively in terms of reviews and exercises. These are not identified specifically in the Annex.

(x) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

Annex 4 The Annex requires to an appropriate party in case of knowledge of a spill. There is no explicit requirement for monitoring and / or evaluation in the Annex.

Annex 5 Not specifically in this Annex (although reported on by the parties to the IJC).

Annex 6 There are specific provisions to report to the IJC “ prior to the annual meeting on Great Lakes Water Quality”. The accountability, monitoring and evaluation is not specifically mentioned in the Annex but is put in practice via the biennial reports.

Annex 8 There is a requirement to review the operation of the facilities.

Annex 9 The Annex is reported on in the Biennial Report to the IJC. There are no specific reporting requirements in the Annex.

(y) Are they being met?

Annex 4 Yes, both countries have mandatory reporting of spills

Annex 5 No reporting requirements, although provisions of Annex being met.

Annex 6 Yes. Due to personnel constraints in 1995 the parties advised the IJC that they would meet the requirements biennially rather than annually. The commitment has been met consistently ever since.

Annex 8 Yes, at least in those facilities under the purview of the marine agencies

Annex 9 In the Biennial report.

(z) If not, why not?

(aa) Is the frequency of reporting sufficient?

Annex 4 There is no specified frequency in this Annex although Annex 6 requires a report to the IJC annually.

Annex 5 As above, there is no specified frequency in the Annex.

Annex 6 Yes. The frequency of reporting is probably more efficient in the two year cycle with the number of long-term studies being funded by various agencies.

Annex 8 Yes and No. The Annex only requires one report 6 months after implementation. The marine agencies do report under the requirement to review the operation of the facilities in the biennial report to the IJC.

Annex 9 Yes. However because of the limited, focused and reactive nature of the Annexes objectives—the monitoring / reporting is not well defined.

(bb) Other comments.

9. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

j. Is the role of the IJC as set out in the Agreement clear and appropriate?

Annex 4 The role of the IJC as a driver of the ‘right’ thing to do when the Annex was signed is clear. The subsequent role of the IJC in this Annex is less so once the requirements had been met in the domestic legislation.

Annex 5 In the context of Annex 6, as it peripherally requires an annual report to the IJC, but it is not talked about in this Annex.

Annex 6 The Annex requires the IJC to receive the various studies. Traditionally, these have been incorporated into the Biennial report to the parties although what specific use the IJC makes of the reports is not specified.

Annex 8 The Annex is clear on the role of the IJC as the instigator of change for setting up a program of regulation of ‘facilities’. It is not clear what role the IJC should have after that.

Annex 9 The IJC plays little role in the development or monitoring of this Annex.

k. Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

Annex 4 – no tools or information defined. Annex 6 provides for general reporting and the responsibilities of oil spills are in fact reported at that time

Annex 5 – As above. Covered in Annex 6

Annex 6 Not specifically, other than the requirement to receive the report.

Annex 8 Very specific for the initial setup only. A requirement to review the report and consult with the parties on the adequacy of the programs and measures has proven to be troublesome.

Annex 9 The specifics of Annex 9 are not clearly linked to the IJC role and responsibilities.

1. Other comments.

3. Does the Agreement enable an effective level of commitment?

p. Is the role of the public identified?

Annex 4 - The public is not identified in this Annex unless they are reporting a spill to the appropriate agencies

Annex 5 The role of the public is not identified.

Annex 6 The public is not identified in the Annex although the public is included in the release of the Biennial report of the parties and the IJC reports.

Annex 8 The public is not identified.

Annex 9 The role of the public is not identified.

q. Does the Agreement identify appropriate mechanisms for public engagement?

Annex 4. As above, there is no identified mechanism other than to report spills.

Annex 5 There is no mechanism for public engagement.

Annex 6 The Annex refers to 'other interested agencies'. This has, in practice, meant Environment Canada, the Environmental Protection Agency and on occasion, State or Provincial officials. The public per se has not been identified.

Annex 8 There is no mechanism for public engagement.

Annex 9 There is no mechanism for public engagement.

r. Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

Annex 4 The Annex does speak to the role of state and provincial levels of government, although only in the context of shore-side reception facilities.

Annex 5 The Annex does speak to the role of state and provincial governments in regard to regulation of sewage from recreational vessels.

Annex 6 The Annex does speak to 'interested agencies' as above.

Annex 8 The Annex makes many agencies other than the federal governments responsible by default but does not specifically allow for 'ownership'.

Annex 9 The Annex does not give ownership to others but the Coast Guards do engage the public as stakeholders

s. Does the Agreement drive action by communities and industry?

Annex 4 The Annex did initially drive action by industry in complying with the regulatory aspects of fitting out ships and reporting spills

Annex 5 Initially there was considerable technology innovation when the Great Lakes Sewage requirements were promulgated. There was, however, a limited market and much of that has been dissipated. There are still some actions by marinas to ensure sewage pump-out facilities are available.

Annex 6 The Annex in this case is specific to the 'marine agencies' involved although the results of required studies has driven a number of actions by industry.

Annex 8 The Annexes require a wide swath of actions by industry on initial set up of the program. It does not drive action outside of that.

Annex 9 Involvement with regard to the Annex is decided by lead agencies and mandated programs.

t. Other comments.

4. Response to Overarching Questions

1. Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?

The Agreement, within the context of the "Coast Guard or Marine Annexes" sought to provide prevention of pollution from ship sources and a binational oversight of the policies and practices of the parties in achieving such prevention.

In the context of the Agreement of 1978 and the 1987 protocol, and the types of commercial vessels, both domestic and foreign, of the time, the goals were in advance of any international convention or regulation.

In the years since the Agreement was signed, the 'world' has caught up. There are now many international conventions dealing with all the pollution vectors that are dealt with in the Agreement (and additional ones that are not dealt with in the Agreement). Canada and the U.S. have had significant impact and input into these conventions. In many cases both nations' participation has ensured that protection of the Great Lakes was part of the final document of the convention, (or in the domestic legislation that enabled the convention). However, the reality of any process that includes many nations and vested interests means that not all aspects of protection are present in all cases.

In the case of a little understood source of pollution in 1987 terms, biological pollution from ballast water, hull fouling and ship systems have become the primary focus of the marine agencies.

The Agreements' purpose is still valid and relevant to ensure that the fresh waters of the Great Lakes are protected from ship source pollution.

Bi-national oversight is still appropriate to ensure that policies, programs and legislation of the parties and the relevant regulatory agencies are compatible and effective.

2. Does the Agreement, and its implementation, achieve the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes basin ecosystem?

The Agreement, specifically in the "Coast Guard or Marine Annexes" in its present form provided the impetus for the current cooperative regime of both parties for preventing pollution from ships, oil handling facilities and the response to any oil spills into the waters of the Great Lakes. Ships, in comparison to other sources of pollution, provide an extremely small part of the total input of pollution into the Great Lakes. The Agreement has played a significant role in assisting the parties to minimize that input. However, oil and hazardous substances still on occasion go into the water, and ships are still associated with the discharge of aquatic invasive species into the Great Lakes. In that sense, the job is not done to suggest that the Agreement has had the desired effect.

3. Is the Agreement, and its implementation, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so, what are they?

The Agreement, in the case of the “Coast Guard or Marine Annexes” fails to protect the Great Lakes from other vectors of ship source pollution associated with exhaust emissions, and non ballast introductions of aquatic invasive species (the responsible marine agencies are well aware of the issues).

4. In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

The Agreement was very appropriate at the time it was signed with respect to expectations and realities of both domestic and foreign shipping. The Agreement predated virtually all of the current international and domestic pollution regimes for ships and in many cases provided a model for international cooperation. The Great Lakes really did lead the world with the Agreement. Unfortunately, that was then. In the current context, the Agreement has failed to keep up with the Globalization of shipping and the realities of the mass of goods that are moved or the speed at which technology has driven trade. The IMO has a credible presence that it did not have at the time of the signing of the Agreement. Mr. William Oneill – Secretary General of IMO, for most of the period since the signing of the Agreement, had his roots in the Great Lakes with the Seaway, and the firsthand knowledge of successful bi-national cooperation has been translated as a successful model for IMO. There are now IMO Resolutions, Guidelines or Conventions for every form of pollution covered in the Agreement as applied to ships as well as some that are not covered in the Agreement.

The Agreement also did not keep pace with the politics surrounding shipping. The spill of the Exxon Valdez affected not only a lot of shoreline in Prince William Sound, it has had implications that are entirely out of proportion to the size of the spill itself. From naval architecture, to liability regimes, the phase out of single hull tankers and thus increased use of segregated ballast, (thus increased transfer of invasive species) the Exxon Valdez became a political rallying cry to “clean up shipping”. No matter that for the Great Lakes, the Agreement was already doing that based on science and good management. The decrease in oil spills on the Great Lakes has far more to do with the liability aspects of the Oil Pollution Act of 1990 and the subsequent exodus of tank shipping from the Great Lakes than good seamanship and or bi-national clauses in the Agreement. The requirements of Annex 9 for example were superseded by domestic legislation that did not have the Great Lakes as its primary focus. The process may be repeated with a number of bills in the U.S. Congress that would suggest ballast water discharge standards based on politics rather than science.

The Agreement has also not been flexible enough to anticipate the changes in the business of government – especially with respect to the changing role of Canadian Marine Agencies.

5. What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

From the point of view of the Annexes specific to shipping, the role of International Conventions related to ship source pollution, and their effect on domestic legislation, must be acknowledged. Specific aspects related to protection of the Great Lakes over and above the Conventions should be the focus of recommendations to the parties.

One theme that did come out quite clear in the discussions was the differing expectations by different departments on both sides of the border with respect to the Authority of the Agreement. Some departments considered the Agreement virtually sacrosanct with regard to driving actions. Others did not even consider it – except in regards to the review or a line or two in the Biennial Report. Whatever the recommendations that go forward, if the Agreement is to continue to be effective all parties must have the same understanding of just exactly where the Agreement fits ‘into the picture’ and that understanding must be the same for all.

The input of the public was very clear – they want a voice.

5. Path Forward

I. OPTIONS

Status Quo.

The Agreement has had previous reviews. These reviews clearly concluded that changes to the Agreement were either not advisable or not possible in the political climate of the review. From a responsible Marine Agency point of view, on both sides of the border, and the Annexes appropriate to ship source pollution, the agencies have been doing their best to get around the anachronisms and have to date done their best to honour the intent of the specific Annexes, even if the specifics were no longer applicable. Should this direction be chosen, all Marine Agencies would continue on this path. Public input would continue to be solicited at Great Lakes forums on regulatory matters.

Renegotiation of individual Annexes.

The review has found shortcomings in most of the Annexes reviewed, based on the questions posed to the Review Working Group. The generic name “Coast Guard Annexes” and the perception of what that means, especially to the Canadian Agencies involved, would be one of the first.

For each individual Annex reviewed, there is a specific ship source discharge or group of discharges that is a threat to the Great Lakes and specific action – often quite prescriptive – is required of the parties to minimize, prohibit, or manage the discharge in the Agreement. Since the signing of the Agreement, when an international Convention has been ratified by the party (or parties), the domestic legislation that has implemented the convention has included specific requirements for the ships entering the Great Lakes (the exception being the U.S. legislation acknowledging MARPOL V that specifically excluded the Great Lakes). Current legislation, still in place as a result of the Agreement and predating International Conventions often exceed international requirements. (eg Great Lakes Sewage Pollution Prevention Regulations on the Canadian side).

While Canada and the US have not ratified each IMO pollution Convention at the same chronological time, the Pollution Prevention Legislation published this summer in Canada Gazette Part I should make both parties equivalent. Whether or not the U.S. and Canada have similar ratification strategies in regards to the Ballast Water Convention remains to be seen.

If the Annexes were to be renegotiated based on the pollution source and the matching Convention, the specific requirements that would exceed the Convention requirements and /or be specific to protect the Great Lakes should be relatively straight forward. It is suggested that additional Annexes be put in place for those pollutant discharge sources that are currently missing (e.g. exhaust emissions). A decision will have to be made whether to have a specific Annex for Ballast Water that includes the proposed IMO Convention or a more encompassing one for all ship vectors of introduction of aquatic invasive species. (i.e. hull fouling, sea chests etc).

It is suggested that the format in the Biodiversity Convention would be appropriate in that it recognizes the solution for ship specific discharges to involve safety and marine specific laws, policies and practices. The Special Issues working group has provided an examination of the issue in the same context (i.e. Biodiversity) and it is suggested that ballast water, hull fouling etc. be a separate annex and not be folded into a larger AIS/ Biodiversity Annex – while remaining compatible.

There will still be a requirement for certain parts of Annex 8 regarding the marine aspects of oil handling facilities and it might be suggested that an Annex that includes a focus on the realities of the recreational boating industry and its effects on the health of the waters might be appropriate.

Renegotiation of a single Ship Source pollutant Annex.

An option that might be both politically palatable to the IJC and both parties is the concept of a single ship source pollutant Annex. The Biennial Reports to the International Joint Commission by the responsible marine parties (not the ones necessarily named in the Agreement) has been consistent for at least the last decade, in identifying the risks to the Great Lakes from ship source pollutants, the understanding of that threat and the regulatory response that deals with the threat by each agency. With the exception of the introduction of aquatic invasive species from ships and the continuing need for research into ballast water technologies, and solutions for the implied threat of other ship vectors such as hull fouling, sea chest infestation and anchor chain; the reports continue to show the threat of pollution to the Great Lakes from large commercial ships is significantly, if not exponentially, smaller than other pollution inputs into the system. The marine agencies have been diligent at implementing and enforcing a regulatory regime that in most cases had its roots in the requirements of the Agreement.

A single ship source pollutant Annex would be, in theory, a logical and not particularly controversial document. There are only so many potential sources of pollutant discharge from a ship. These are known. The intent of the original Agreement and Annex is known. The legislative, regulatory or policy response is known for each source of pollutant, as is the effectiveness of the response.

Oil pollution from large commercial ships for example, which was the focus of much of the original Annex, has been regulated on many levels by both countries. The lack of tankers carrying persistent oils as cargo these days suggests that there are perhaps better targets to focus on to protect the Great Lakes. Mystery spills, small unregulated vessels, fishing vessels and recreational vessels are all under the pollution risk “radar” from a policy, jurisdictional and legislative point of view.

Similarly, despite public and political perceptions, sewage discharge from large commercial ships is a virtual non-issue. The role of grey water discharge from recreational vessels is a much larger issue and more complicated because of jurisdiction issues.

The threat from ship source introductions of aquatic invasive species on the other hand is still a significant threat and much work needs to be done. However the science is significantly clearer and more comprehensive than in 1987.

For each and every source of pollution from vessels on the water of the Lakes, what is required is the delta between the science of what can and should be done to protect the waters of the Great Lakes versus the known response and what level of oversight is expected politically and by the public.

II. RECOMMENDATIONS

Renegotiate a single Annex for ship source pollution within the Great Lakes

GREAT LAKES WATER QUALITY AGREEMENT

REVIEW WORKING GROUP H
FINAL REPORT TO ARC
December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States, their Departments or Agencies, or their States or Provinces.

Executive Summary

Annex 16 (Pollution from Contaminated Groundwater) was added to the GLWQA by Protocol in 1987, mainly in response to contaminated groundwater impacting the Great Lakes, such as along the Niagara River in New York. Although this is still a problem, the current Annex 16 addresses only the impact of contaminated groundwater on the Great Lakes and ignores the important issue of protecting and managing groundwater quality and quantity as a sustainable resource for drinking water and other agricultural and industrial uses vital for the Great Lakes economy.

Annex 16 does not reflect the environmental challenges facing the Great Lakes related to groundwater quality and groundwater quality-quantity interactions and the reality of groundwater-surface water interaction and the role that nonpoint source pollution in contaminating groundwater. Due to this limited focus of Annex 16, it does not currently address or provide mechanisms for addressing groundwater trends, emerging problems, and the development of indicators. As such, it does not address groundwater as a resource that needs to be protected and sustained.

There is a better understanding of the Great Lakes groundwater systems than there was in 1987. Legislation has kept pace to a certain extent. There have been some significant changes in legislation and new groundwater tools since Annex 16 was drafted that are not addressed in the current Annex, however, there is still much that is not known or understood. This is due to insufficient mapping of groundwater resources in the Great Lakes Basin. There is no coordination of cross-border monitoring networks to provide consistent information on groundwater.

The Review Group for Annex 16 concluded that the Annex has some problems. It is unclear who is responsible for implementing the requirements of Annex 16. Reporting on groundwater is inconsistent. Part of the difficulty is that reports can be onerous and are required too frequently. Annex 16 and Article 1 do not integrate groundwater adequately into the definitions of the Great Lakes System or the Great Lakes Ecosystem. Annex 16 and the GLWQA do not mandate pollution prevention for groundwater (source protection) equivalent to protections given to surface and tributary waters.

A significant amount of monitoring and research is needed to identify groundwater contaminants, their extent, and their travel times and loadings to surface water bodies. A sustained commitment to monitoring, modeling, and research is necessary to ensure that the requirements of Annex 16 are fully realized. It is most likely that the terms of Annex 16 will be satisfied when ground and surface water quantity and quality are managed in an integrated and watershed context.

The report identifies a series of research needs, findings, and recommendations outlined in Parts 7, 8, and 9. The recommendations focus on the following:

1. Retitling Annex 16 "Groundwater";
2. Groundwater-Surfacewater Interaction;
3. Groundwater mapping;
4. Clearly Identifying Responsible Agencies;
5. Groundwater Trends;
6. Groundwater Definitions;
7. Monitoring;
8. Modeling;

9. Reporting Requirements; and
10. Water Quantity Management.

Overview of Review Process

The Groundwater Annex review group completed its review of Annex 16 by review elements. The team held biweekly conference calls to discuss the review elements and to review the draft document. A drafting team consisting of seven individuals representing both countries met twice in Windsor to develop the summary document and to finalize the report.

As additional background material for the review of Annex 16, and to get an understanding of the findings and conclusions of previous review exercises conducted subsequent to the establishment of the Protocol in 1987, documents relevant to Annex 16 were reviewed and resulting recommendations were extracted and summarized for the RWG as shown in Appendix A.

The working group has a total of 34 members, representing the two federal governments, the states and provinces, environmental organizations, industry, and first nations and tribes. Between 8 and 16 people participating on the conference calls and in the meetings.

Part 1: Introduction

Background

Annex 16 (Pollution from Contaminated Groundwater) was added to the GLWQA by Protocol in 1987, mainly in response to contaminated groundwater impacting the Great Lakes, such as along the Niagara River in New York. While such areas usually require perpetual control, the potential also continues to exist for new point and non-point contaminant sources to threaten groundwater in the Great Lakes Basin. Unfortunately, the current Annex 16 addresses only the impact of contaminated groundwater on the Great Lakes and ignores the important issue of protecting and managing groundwater quality and quantity as a sustainable resource for drinking water and other agricultural and industrial uses vital for the Great Lakes economy.

Overview

Groundwater is a major natural resource in the Great Lakes Basin. It has a number of common human uses such as supplying drinking water for 8.2 million people in the basin. It is also a major component of many manufacturing processes and other industrial and agricultural applications utilizing large amounts of groundwater. One of the most important functions that groundwater plays in the Great Lakes Basin is its natural discharge to streams, lakes, and wetlands. Groundwater is a large subsurface reservoir from which water is released slowly to provide a reliable minimum level of surface water flow that is essential for ecosystem function especially during periods of drought. Because of the relatively slow movement of groundwater, when it is pumped from wells in large quantities, years may pass before the effects are fully manifested in either the surface water or groundwater systems.

The quality of groundwater can be altered by either point or non-point sources of contamination that enters from the land surface and infiltrates to the groundwater system. Notable among these pollutants are hydrocarbons, solvents, pathogens, pesticides, herbicides, and fertilizers. Groundwater quality and water levels may also be diminished by the stress of overpumping which may induce natural, but unwanted for most human uses, chemical constituents into the fresh groundwater system. Notable among these constituents are brine, arsenic, and radium. Therefore, threats to groundwater quality can come from human activities on the land surface, from the effects of overpumping, or from natural conditions underground. In addition, large-scale groundwater withdrawal can redirect, or significantly reduce, the discharge of groundwater to streams, lakes, and wetlands, thus depriving the surface water of a generally high quality, constant temperature source of water. The resulting changes can alter the amount of surface water but, also, alter ecosystems that rely on groundwater discharge.

The Great Lakes Water Quality Agreement has focused attention on the quality of surface water, including that in streams that discharge to the Great Lakes, as a means of determining which watersheds contribute the highest loads of specific contaminants. However, it has only recently been recognized that the flow of many of these streams, especially those in basins with highly porous soils, have a large amount of their flow that originates as groundwater discharge. Hence, a high percentage of water flowing to the Great Lakes consists of water that infiltrates the land surface, enters the groundwater system, flows underground for varying distances, discharges to a body of surface water, and then continues its path to the Great Lakes as streamflow. Therefore, management strategies for protecting the quality of Great Lakes water must incorporate the groundwater flow component in order to be comprehensive. In short,

the Great Lakes cannot be protected without protecting the groundwater resources in the Great Lakes Basin.

Part 2: Current Annex 16 Requirements and Analysis

Requirement 1.0

Annex 16 of the Great Lakes Water Quality Agreement requires the Parties to “identify existing and potential sources of contaminated groundwater affecting the Great Lakes.”

Analysis: Requirement 1.0

Groundwater-Surface Water Interaction

Recognizing the ground and surface waters in the Great Lakes Basin as components of a single resource, leads to the logical conclusion that all occurrences of groundwater contamination have a potential to affect the Great Lakes and its tributaries.

The Agreement fails to incorporate groundwater as a component in the Great Lakes Basin system (eg it is not included in Article 1 or Article 6 –Definitions and Programs and other Measures) and does not reflect the interrelationship of groundwater and surface water as related to water quality.

Linkages between groundwater quality and surface water quality are generally not recognized, as non-point source programs normally focus on runoff from the land surface. Effectively integrating ground and surface water quality monitoring networks in the context of the hydrogeology of the Great Lakes Basin is an essential tool to meeting the requirement of this Annex. Doing so will require long-term investment in monitoring and research.

Monitoring

Routine monitoring of water supplies and monitoring of ground and surface water quality are essential components for the detection of groundwater contamination and stressors related to the sustainability of groundwater quantity. Groundwater flow systems, however, are three-dimensional, and it is not possible to cost-effectively monitor and sample thousands of cubic miles of the subsurface with monitoring wells. In the 1980’s monitoring focused on point sources of contaminants, and that was the historical basis for Annex 16.

Nonpoint Source Pollution

In the Great Lakes Basin, due to the vast quantities of contaminants involved, nonpoint source groundwater pollution may have a larger impact on the lakes and their tributaries than those resulting from point sources, even if it is less concentrated and toxic. More research is required.

Requirement 2.0

The second requirement of Annex 16 is to “map hydrogeological conditions in the vicinity of existing and potential sources of contaminated groundwater.”

Analysis: Requirement 2.0

Mapping.

The need for regional-scale mapping of hydrogeological conditions in the manner required to assess non-point sources of contamination is becoming increasingly recognized. For example, regional groundwater characterization and monitoring is a necessary component of local groundwater remediation programs to ensure protection of the resource.

Predictions of the transport and fate of contaminants are often highly dependent on details that are very difficult and costly to determine with certainty. Mapping of groundwater conditions will require sustained investment and may be iterative as new technologies and information requirements emerge.

Requirement 3.0

Annex 16 also requires that the Parties “develop a standard approach and agreed procedures for sampling and analysis of contaminants in groundwater in order to: (1) assess and characterize the degree and extent of contamination; and (2) estimate the loadings of contaminants from groundwater to the Lakes to support the development of Remedial Action Plans and Lakewide Management Plans pursuant to Annex 2.”

Analysis: Requirement 3.0

Agency and Jurisdictional Responsibilities

This is a challenging requirement given the range of agencies and jurisdictional responsibilities within the basin. It is further complicated by the diversity of groundwater conditions and issues across the region, the ever evolving list of contaminants, and the development of new technologies to detect them and predict their behavior.

Monitoring Programs in Canada and the U.S.

An Ontario Regional Provincial Groundwater Monitoring Network of 450 instrumented wells has recently been established by the province in partnership with the 36 Conservation Authorities and 10 municipalities. The network specifically monitors groundwater levels and quality to determine long term trends and emerging issues. A complimentary program also exists for water quality and flow monitoring of Ontario streams including sampling during periods of low flow, which, in many cases, can be used to infer groundwater quality.

Municipal drinking water supplies, both groundwater and surface water, are also monitored under the Safe Drinking Water Acts in both Canada and the U.S.

In the United States, groundwater quality in most states is routinely monitored by municipal public drinking water supply agencies. More general monitoring efforts are also being conducted, but they are not well coordinated. For example, the State of Michigan closed its groundwater monitoring network in 1992. The status of other Great Lakes states groundwater monitoring programs is yet to be assessed.

None of these programs were driven by Annex 16. The hope is that future monitoring could be done in a collaborative manner.

Requirement 4.0

Finally, Annex 16 specifies that the Parties shall “control the sources of contamination of groundwater and the contaminated groundwater itself, when the problem has been identified.”

Analysis: Requirement 4.0

The “source” aspect of this requirement may necessitate the control of structures (e.g., a leaking underground storage tank or hazardous waste site) and land use practices (e.g., the use of specific pesticides and restrictions on road salt use and agricultural land-spreading of sewage sludge) and the control of accumulation of contaminants (e.g., subsurface non-aqueous phase contaminants). Control of structures and preventative practices typically may be more feasible than the control of legacy accumulations of contaminants. The control of groundwater contaminated from point sources is difficult and expensive; this has been the topic of considerable research over the past two decades. An array of physical, chemical, and biological technologies for groundwater remediation have been developed and implemented for a range of contaminants and varying in-situ settings. The control of groundwater contaminated from non-point sources is extremely difficult, because of the large volumes of groundwater that may be contaminated. Additionally, the time period between controlling the source and mitigating the discharge of contaminated groundwater to surface water may be years, decades, or centuries. Effective land and water use planning, in conjunction with sound best management practices, are therefore the preferred means of preventing the further degradation of groundwater resources by non-point sources of pollution.

Surface water quality can be impaired by contaminant loadings from groundwater for long periods of time, even if measures are taken immediately to prevent further degradation. Programs to manage the delivery of non-point source contaminants generally do not recognize pathways through groundwater flow systems

Part 3: Review Element Questions and Answers

Overarching Questions

7. **Is the Agreement's purpose statement still valid and relevant and does it reflect what should be the purpose of an international agreement for the Great Lakes?**

Review Work Group (RWG) H participants generally agreed that the purpose statement of the Great Lakes Water Quality Agreement remains valid and relevant, and that it reflects what should be the purpose of an international agreement for the Great Lakes. Participants emphasized that while significant progress has been made in improving water quality in the Great Lakes, significant water quality challenges (both new and historical) need focused attention.

The inclusion of monitoring, surveillance, and research provisions in the agreement for the Great Lakes is critical. Monitoring, modeling, and research help identify emerging issues and water quality trends that need to be addressed.

8. **Does the Agreement, and its implementation, achieve the desired effect of restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem?**

The Agreement has been critical in driving action in restoring and maintaining water quality in the Great Lakes, but the Agreement is insufficient to achieve the goals of chemical, physical, and biological integrity. Much of the implementation focuses on addressing chemical integrity, with less attention to biological integrity and no attention to address the physical integrity.

With regard to Annex 16, it does not have the desired effect of restoring and maintaining because it only addresses groundwater as a source of pollution and not as a resource. If it were addressed as a component in the hydrologic cycle, it would be a significant factor in addressing chemical, physical, and biological integrity.

9. **Is the Agreement, and its implementation, sufficient to protect and restore the Great Lakes, or does it fail to address critical issues? If so what are they?**

The Agreement and its current implementation are insufficient to protect and restore the Great Lakes. Many aspects of the Agreement are not designed to address emerging water quality issues and challenges.

The Agreement does not address:

- Groundwater as a resource and its impact on the Great Lakes ecosystem
- Effects of climate change
- Urban and rural nonpoint source pollution
- Emerging contaminants such as pharmaceuticals, flame retardants, personal care products and nanotechnologies.
- The growth of impervious surfaces
- Water borne diseases
- Water quality linkages to human health.

10. In what situation/cases does the Agreement successfully fulfill its intended purpose and current goals and where does it fall short? Are there common features that characterize successes or best practices, and are there areas needing improvement?

Many specific objectives have been addressed effectively under the Agreement. In these cases, the Agreement helped to focus attention and resources on specific needs. In other cases, the Agreement does not drive new action.

- There are weak accountability provisions for reporting on and implementing the Agreement;
- The Agreement has weak provisions for identifying and addressing emerging issues and challenges affecting water quality;
- The Agreement does not adequately address physical and biological integrity;
- The Agreement has limited impact in fostering coordination and collaboration among the Parties, Provincial and State governments, local governments, Tribes and Aboriginal groups, and others.

11. What new approaches, if any, should be instituted to improve the operation and effectiveness of the Agreement?

- Responsible and accountable agencies should be identified for implementing the agreement.
- The agreement should increase its focus on the importance of the hydrologic cycle and the concept of watershed management.
- The Agreement should state a need for adequate funding for implementation.
- The Parties should agree to a process for identifying a series of indicators and agencies responsible for those monitoring and reporting on these indicators.
- The management structure should be strengthened should be strengthened to improve the effectiveness of the Agreement.
- Develop mechanisms for including local units of state, provincial and municipal government in the accountability for implementation of the Agreement.

Clarity

Clear articulation of purpose, goals, objectives, programs and other measures; the existence of a shared understanding and acceptance of the meaning of the Agreement.

7. Does the Agreement contain defined, clear and adequately communicated purpose, goals, objectives, programs, provisions and other measures?

- Annex 16 is the shortest and most general of the Annexes. It does not reflect the current state of the science or the issue of groundwater protection. Annex 16 focuses solely on the contamination of the Great Lakes surface waters by contaminated groundwater but does not recognize the broader surface water-groundwater interaction or the need to protect groundwater as an important resource.
- Annex 16 does not have a clearly stated goal beyond the general control of pollution sources.

- The purpose of Annex 16 is to protect the Great Lakes from contaminated groundwater, but this is not clearly stated, rather, it is inferred.
- The objective, to identify and control pollution sources, is unclear. There are no programs, provisions, or other measures identified in Annex 16.
- Mapping of groundwater resources is discussed in Annex 16 as an important element of understanding groundwater as a vector of pollution transport. It is generally accepted that there is an incomplete understanding of groundwater flow in the Great Lakes Basin as it relates to pollutant transport and groundwater recharge and the effects of land use on contamination of the groundwater system.

(r) Is the text of the Agreement and the objectives, programs and other measures described therein clear?

- No. The objectives, programs, and other measures are implied only.

(s) Are program outcomes and/or environmental outcomes clearly identified?

- No, the program outcomes and/or environmental outcomes are not clearly identified. They are vague and general. This Annex is not consistent or compatible with, or as comprehensive as, the other Annexes.

(t) Are there outdated terms, concepts or references?

- The Agreement focuses on contamination of the Great Lakes from contaminated groundwater, but pollution of surface water from groundwater was an issue of greater concern when Annex 16 was first drafted. The original title of Annex 16 implies a focus on groundwater as a local phenomenon, whereas more recent research and interest is on the more dispersed nonpoint source pollution.
- Annex 16 is outdated. The focus of Annex 16 should be broadened. This is best expressed by a change in the title of Annex 16 from "*Pollution from Contaminated Groundwater*" to "*Groundwater*". This would be a simple but significant change.
- Groundwater quality and quantity needs to be defined as part of the Great Lakes ecosystem.
- There are several concepts missing from the document, related to the management of groundwater, including:
 - The role of nonpoint source pollution in contaminating groundwater.
 - Groundwater quantity (levels and flows) and sustainability, as it affects quality.
 - Groundwater quantity needs to be protected and the linkages between surface water and groundwater recognized. Levels and flows of surface waters are supported by groundwater in many parts of the basin. Overpumping of groundwater or development over critical recharge areas can lead to losses of groundwater resources that result in reduction in stream flow.
 - The impacts of groundwater on biological and physical integrity.
- The issue of groundwater monitoring quality and/or quantity, needs to be addressed more fully.
- There are significant research needs to fully address the goals of the agreement as they are related to broader groundwater goals.

(u) Other Comments.

- Annex 11 “Surveillance and Monitoring” should include a consideration of groundwater trends, emerging problems, and the development of indicators
- Annex 11 should make specific reference to groundwater.

Relevancy

The continued relevancy of the Agreement.

1. Is there a demonstrable need for the Agreement to achieve the stated goals/objectives?

- Yes. There is a need to reach the goals, but the goals do not reflect the broad range of groundwater issues in the basin.

(d) Have the environmental conditions/challenges originally intended to be met by the Agreement changed, and if so, what are the implications of those changes?

- Original concerns need to be broadened to include groundwater as a valuable Great Lakes resource not just a source of contamination.
- If the Agreement is about restoring chemical, physical, and biological integrity, groundwater must be a more important part of Annex 16/Agreement. It requires a broadening of the scope of Annex 16 to reflect the true role of groundwater in the hydrologic cycle in establishing and restoring of chemical, physical, and biological integrity of the Great Lakes.
- Annex 16 does not reflect the spectrum of current thinking related to nonpoint source pollution. As currently listed, Annex 16 is incomplete and only partially relevant.
- Concerns about groundwater quality in some areas have led to the abandonment of wells for supply. In other areas, groundwater has become more important as a source of supply. Some of these changes are related to water quality and some to water quantity, so both should be acknowledged in the agreement.
- The groundwater annex does not address pollutant classes the way some other annexes do (e.g. RAPs and LaMPs); critical groundwater pollutants and issues need to be identified in other annexes or parts of other annexes that also apply to groundwater should be incorporated into a groundwater Annex.

(e) Are the Articles/Annexes compatible with, and do they encourage actions beyond those required by, current domestic laws and policies of each country?

- Current laws go beyond Annex 16. Parties are driven by their respective Safe Drinking Water Acts and state and provincial drinking water protection laws.

(f) Does the Article/Annex drive actions? If not, can you identify reasons why it does not?

- No. There is no ownership of Annex 16 because it lacks resources and it does not reflect the current view of surface water-groundwater interactions. Annex 16 is so vague that it could be easy to say that goals are being met.

(g) Does the Agreement reflect current/appropriate environmental management tools (e.g., legislation, guidelines and best management practices)?

- No. It does not state the need for any legislative or environmental management tools, especially monitoring as related to Annex 16.
- Groundwater is not considered in the definitions of the Agreement.
- Some legislation/tools that could be addressed in annex 16 are:
 - Monitoring
 - Encouraging source protection planning
 - Well testing
 - Updating the U.S. Clean Water Act to include groundwater
 - Encouraging groundwater modeling
 - Preventing non-point source pollution
 - Tracking stormwater infiltration as a possible carrier of contamination (e.g. road salt) and as it relates to protection of recharge as a sustainable resource.
 - Tracking climate change and the unknown effects of it (Changes in recharge or lake levels) should be addressed
 - Mapping sensitive areas (e.g., recharge areas) as part of a watershed management plan to protect groundwater
 - Promoting agricultural best management practices
 - Encouraging collaborative agreements

(h) Other Comments.

- Annex 16 only deals with past problems and does not address protection of groundwater and groundwater recharge as a resource requiring careful management. There is a need to encourage use of best management practices such as source water protection, stormwater management and infiltration, and watershed management and planning, recognizing that groundwater and surface water divides, i.e. watersheds, may not coincide and that broader planning may be needed.

Management Framework

Appropriate institutional structures, cooperation and coordination, including potential duplication with other initiatives or instruments of a similar nature, and synergies and linkages with other initiatives.

1) Are management and coordination approaches identified in the Agreement?

- Not fully. Annex 16 makes reference to “the parties, in cooperation with state and provincial governments, shall coordinate existing programs to control contaminated groundwater.....”.

(f) Is management and coordination specified? If so, briefly outline.

- No See no. 1) above.

(g) Are management and coordination approaches appropriate and sufficient to ensure achievement of the goals of the Agreement?

- No

(h) Do management and coordination approaches facilitate priority setting to address issues of greatest importance?

- No

(i) Are there demonstrated synergies and linkages with other initiatives (i.e. international programs, strategies or Agreements)?

- Generally, no. Many of the decisions that impact groundwater quantity and quality (eg land use development) are made at the state and local level. Local authorities do not, generally, see themselves reflected in the document. Local initiatives could be brought into this. Municipalities could play a greater role in protection of groundwater.
- There are opportunities for linkages with the Great lakes Charter Annex 2001 Implementing Agreements to include the protection and management of groundwater quantity.

(j) Other comments.

- There is an urgent need to identify lead agencies to address Annex 16 in both Parties and to link with watershed planning initiatives to create a proper management framework for groundwater, in a collaborative framework with state, provincial, and local governments, e.g., the Canada-Ontario Agreement.

Achieving Results

The implementation and appropriateness of prescribed programs, policies and measures and demonstrated progress; including the application of sound science.

1. Are the programs, measures and policies stated in the Agreement sufficient to achieve the goals/objectives in the Agreement?

- No. There are no programs, measures, or policies described in Annex 16. All are implied.

(a) Are the objectives, programs, policies and measures sufficient to achieve goals in the Article/Annex, based on available scientific information and data?

- No. The current focus of the Agreement and Annex 16 is on chemicals and point source issues.

(b) Does the Agreement fail to address critical issues?

- Yes. It does not address groundwater as a sustainable resource critical to the Great Lakes, requiring protection and management. Nor does it make reference to water quantity, nonpoint sources of contamination and surface water-groundwater interaction in ecosystem management.

(c) Other Comments.

2. Are the demonstrated results consistent with goals and objectives in the Agreement?

- Demonstrated results are minimal. No report on progress on implementing this Annex has ever been prepared.

(a) Were the programs, policies, and measures that were initially required to be implemented under the Agreement developed? If not, why not?

- The programs are implicit. They developed by necessity outside of the agreement. Actions and laws such as the U.S. Superfund law (Comprehensive Environmental Response Compensation and Liability Act - CERCLA) law drove the agreement rather than Annex 16 driving laws. It was put in to catch up with events. Some protocols were established for Superfund sites and RAPs
- Currently drinking water is the key and often the driver for groundwater protection; however drinkingwater protection has not been an explicit goal of the agreement or this Annex.

(b) Are any parts of the Agreement in any way an obstacle to progress?

- It is so vague, it doesn't drive action. That, in itself, can be a barrier to action. The reporting requirements are unrealistic (every two years) to demonstrate any progress, and too vague, making it easy to let reporting slip. Further, lead agencies are not identified, so there is no responsibility for meeting the goals or even reporting on them.

(c) Are there external impediments that prevent implementation?

- Lack of understanding of the surface water-groundwater interaction.
- Security and confidentiality are often cited as reasons to not report on groundwater activities.

(d) Are there other barriers to progress?

- The dearth of information and the lack of resources to do the analysis. This is a federal agreement, but much of the information about groundwater is held by states and provinces.

(e) To what extent can results be attributed to the Article/Annex?

- None.

(f) Other Comments.

3. Has the appropriate level of resources been dedicated to deliver the programs, measures and policies set out in the Agreement?

- The IJC conducted a review of research funding on each of the Annexes. Annex 16 was among the lowest supported by research funding.

(a) Is the allocation of resources considered sufficient to meet the goals and objectives of the Agreement?

- No

(b) Other comments.

8. Is the science in the Agreement still relevant? If not, why?

- The science is still relevant, but it does not reflect current understanding of groundwater. Annex 16 deals only with pollution from groundwater. There has been significant work on nonpoint source pollution of groundwater. Annex 16 does not reflect current groundwater science comprehensively enough.

(a) If the science in the Agreement is still relevant, how has it been incorporated?

- See above

(b) Does the science adequately influence decision-making?

- Events and crises, like groundwater contamination at Love Canal in New York or Walkerton in Ontario, are more likely to influence groundwater decision-making.

(c) Other comments.

9. Does the Agreement incorporate science to address emerging issues?

- No.

(a) Are there new issues and programs that need to be addressed?

- Yes, the threat of nonpoint pollution in contaminating groundwater and its movement through groundwater-surface water interaction needs to be addressed.

(b) Can the Agreement accommodate emerging issues?

- No, not without significant revision.

(c) Other comments.

Accountability

Reporting and assessment. The ease of access to, and quality of data for monitoring and reporting purposes, role of the IJC and long-term sustainable buy-in and commitment from the Great Lakes community.

1. Is there comprehensive monitoring and reporting?

- 1) Annex 16 requires biennial reporting, but the requirement has never been fulfilled. The issue of groundwater monitoring, whether quality or quantity, needs to be addressed more fully.
- 2) Groundwater monitoring is done primarily as it relates to drinking water. There is no driving force for general monitoring status of groundwater without a particular use designation. The question was raised related to the need for legislation to increase monitoring of groundwater.
- 3) Groundwater mapping has been focused primarily on mapping near contaminated sites and areas highly dependent on groundwater use. If there is a change to look at nonpoint source pollution to the Great Lakes, there is a greater need for basinwide groundwater resource evaluation.
- 4) A greater emphasis on sourcewater protection would lead to the necessity to develop models consistently for both sides of the border.
- 5) Ontario has a new monitoring and reporting groundwater system in place with a network of about 450 wells after the original network was closed down for 20 years. There have been various levels of monitoring at different times with more monitoring wells in the past than today. A more holistic monitoring system is needed.
- 6) There is also work being done on a SOLEC groundwater dependent species indicator that should be referenced, as well as other SOLEC indicators for monitoring groundwater conditions.
- 7) There is little comprehensive groundwater work being done on the whole basin. Local and State or Provincial work is being done, but that work is generally uncoordinated.
- 8) It is important to have models in place to help ascertain whether the impacts on a monitoring well are related to pumping, use, or weather-related changes. Monitoring wells are not representative across the states because there are not enough monitoring wells in most states.
- 9) There is a need to conduct monitoring related to surface water-groundwater water interaction.

(cc) Are there clear indicators to determine progress?

- No, however, some indicators are being developed under SOLEC, but these relate more to monitoring changes in environmental conditions.

(dd) Are there provisions for accountability, reporting, monitoring and evaluation in the Agreement?

- The Provisions are in place for reporting only, and those are completely ignored.

(ee) Are they being met?

- No

(ff) If not, why not?

- There is no lead agency assigned in the Agreement and so, no agency is accountable for reporting under this Annex; also there have been no requests from the IJC to report on Annex 16.

(gg) Is the frequency of reporting sufficient?

- The reporting requirements are probably too frequent, but more importantly, no reports have ever been produced, possibly because the reporting requirements are too vague.

(hh) Other comments.

2. Is there a defined role for the IJC and are adequate tools and data provided to fulfill its role?

- No, although, article IX allows the IJC to request that the Parties provide this data free of charge.

(c) Is the role of the IJC as set out in the Agreement clear and appropriate?

- There is no defined role in Annex 16 currently, however, the IJC could play a role in helping to coordinate cross-border monitoring networks, and encourage leaders of key agencies to ensure that work is done.

(d) Are the tools and information that the IJC needs to carry out its role and responsibilities identified and provided for in the Agreement?

- Under article 7, the IJC has a role related to coordinating efforts from boundary waters, tributaries and other sources. There could be a mandate.

3. Does the Agreement enable an effective level of commitment?

- No

(e) Is the role of the public identified?

- The role is not defined; however, if an issue is identified, stakeholders do get involved.

(f) Does the Agreement identify appropriate mechanisms for public engagement?

- It's not in Annex 16, but there are others listed in the broader agreement.

(g) Does the Agreement allow for ownership by others, including all levels of government, Aboriginal peoples, Tribes, other organizations and stakeholders (industry, NGOs, communities, individuals)?

- No. Annex 16 does not even create ownership by the Parties themselves, let alone others.

(h) Does the Agreement drive action by communities and industry?

- No. Does it need to? Yes

(i) Other comments

Part 4. Cross-Cutting Linkages

- The **Special Issues Working Group** should consider some aspects of groundwater, especially those related to ecosystems and sustainability of groundwater sources as part of watershed management. Coordination with the **Special Issues Working Group** will be needed if it is concluded that Annex 16 should include a more comprehensive hydrologic cycle approach.
- Many of the decisions that impact groundwater (eg. Land use development decisions) are made at the local level and it is important that local authorities see themselves reflected in the document. The question was raised whether that should be in Annex 13 about Watershed Planning instead. A participant noted that there is a need for good definitions (article 1) and better watershed planning. This could also be addressed by the watershed and **RAP-LaMP** Annex.
- Linkages with other working groups: Annex 16 working group would take a broad view of groundwater that includes source water protection. Other issues to consider include the impact of climate change, aquatic invasive species, and watershed management planning
- Groundwater can be an important source of non-point source contamination to streams, lakes, and wetlands. This implies integration of groundwater issues with Annex 16 on non-point sources of contamination. Watershed management is a key concept for surface-water runoff related to non-point sources. In some areas and for some constituents, surface-water issues and groundwater issues dovetail, however, not all.
- The **Special Issues Working Group** also is considering some aspects of groundwater, especially those related to ecosystem and sustainability of groundwater sources. Coordination with the

RWG will be needed if it is concluded that Annex 16 should include a more comprehensive hydrologic cycle approach.

- **Annex 11 “Surveillance and Monitoring”** should include a consideration of groundwater trends, emerging problems, and the development of indicators.
- **Annex 17 “Research and Development”** needs to address research needs for groundwater or Annex 16 could identify such research needs.

Part 5: Discussion of Article 6 – Programs and Other Measures

- Groundwater is not included as part of the definition of Great Lakes Basin Ecosystem and the Great Lakes System. If groundwater were included in the definition, it would be subject to many of the programmatic requirements of this Article. The Agreement currently views groundwater as a source of pollution, and not as part of a system. Groundwater is an important part of the system. For example, the volume of the groundwater within the basin is estimated to be equivalent to the amount of water in Lake Michigan. Further, groundwater, which is generally of good quality, is a significant portion of the annual recharge of each lake.
- There are changes needed in the article to reflect groundwater’s importance. Groundwater should be included in the programs and measures described in the article.
- Under Article 6, all programs and measures except “f” (Pollution from Shipping Activities) are likely to have a groundwater component.
- Additional programs and measures need to be developed to address threats assessment and sourcewater protection including well decommissioning, onsite wastewater system reinspection, leaking underground storage tanks, deep well injection, and other groundwater contamination threats.
- Program and measure “q” (pollution from Contaminated Groundwater and Subsurface Sources) is adequate to cover groundwater as a pollution vector, but does not address a multitude of other groundwater quantity and contamination issues that relate to the protection and management of groundwater as a vital and sustainable resource.

Part 6: Discussion of Article 1 – Definitions

- Article 1 is very limiting with regard to groundwater and definitions need to be updated.
- There is a need for a definition of ‘Groundwater’ as groundwater is an integral component of the Great Lakes ecosystem, and takes various forms in contributing to the Great Lakes resource (eg Direct groundwater contribution, contribution as baseflow in tributaries, etc).
- Groundwater must be included and especially addressed in Definition “g” (Great Lakes Basin Ecosystem) and “h” (Great Lakes System).

Part 7: Research Needs

The following research is needed for a better understanding of the issues related to groundwater

- 1) Comprehensive definition of the role of groundwater in supporting ecosystems.

- 2) Information on consumptive use.
- 3) Simplified methods for identifying large groundwater withdrawals near boundaries of hydrologic basins
- 4) Estimates of the effect of land – use changes and population growth on groundwater availability and quality.
- 5) Information on direct groundwater discharge to surface water streams and to the Great Lakes
- 6) Systematic identification of natural recharge areas and rates of recharge.
- 7) Accurate mapping of groundwater basins will help manage the withdrawal of groundwater as well as management of the interlinked surface waters
- 8) Research on groundwater would be greatly aided if the governments were to clearly set out water quality testing requirements for private water wells. At a minimum bacterial content, nitrate, fluoride, iron, hardness, and turbidity should be measured immediately following new well construction. For this testing requirement to be implemented successfully, the testing must be legislated.
- 9) Research on groundwater would be greatly aided by a comprehensive survey of water quality in all private wells. This should include all unregulated wells including rural wells, cottage wells, and private wells in urban areas in addition to farm wells. This survey should be repeated at least every ten years, allowing for ample time between surveys to investigate trends and findings in more detail.
- 10) Using satellite and other advanced technology for mapping and contamination identification.
- 11) Effects of land-use changes and population growth on groundwater availability and quality.

The highest priority research funding should be directed to the following ground water research needs listed in priority order:

- Research on the effects of land-use changes and land management practices as well as population growth on ground water availability and quality;
- Development of a comprehensive description of the role of ground water in supporting ecological systems;
- Development of improved estimates that reliably reflect the true level and extent of consumptive use; and
- Research on ground water discharge to surface water streams and to the Great Lakes, and a systematic estimation of natural recharge areas.
- Develop models that position groundwater within the hydrologic cycle and includes the impacts of changes in climate.

Part 8. Findings

1. Annex 16 does not reflect the environmental challenges facing the Great Lakes related to groundwater quality and groundwater quality-quantity interactions
2. Annex 16 does not address groundwater as a resource that needs to be protected and sustained.
3. Annex 16 does not reflect contamination of groundwater by point and nonpoint sources
4. There is insufficient mapping of groundwater resources in the Great Lakes Basin.

5. It is unclear which Parties' agencies are responsible for implementing the requirements of Annex 16.
6. Annex 16 does not currently address groundwater trends, emerging problems, and the development and use of indicators
7. Groundwater monitoring networks do not exist in many Great Lakes jurisdictions
8. There is no coordination of cross-border monitoring networks to provide consistent information on groundwater.
9. No Parties report has ever been received by the IJC under Annex 16.
10. There have been some significant changes in legislation and new groundwater modeling tools since Annex 16 was drafted that are not addressed in the current Annex. However, these are not a result of Annex 16.
11. Annex 16 and Article 1 do not integrate groundwater adequately into the definitions of the Great Lakes System or the Great Lakes Basin Ecosystem.
12. Annex 16 and the GLWQA do not mandate pollution prevention for groundwater (source protection) equivalent to protections given to surface and tributary waters.
13. A significant amount of monitoring and research is needed to identify groundwater contaminants, their extent, and their travel times and loadings to surface water bodies. A sustained commitment to monitoring, modeling and research is necessary to ensure that the requirements of Annex 16 are fully realized.
14. Ground and surface water quantity and quality are not currently managed in an integrated and watershed context.

Part 9. Recommendations

1. **Retitling Annex 16 "Groundwater".** The Groundwater Annex should be broadened in scope to better reflect the environmental challenges facing the Great Lakes related to groundwater protection and its management as a vital resource. As a first step, Annex 16 should be retitled: "Groundwater".
2. **Groundwater-Surfacewater Interaction.** Annex 16 should promote research for better understanding-groundwater-surfacewater interaction and its influence on Great Lakes water quality.
3. **Groundwater mapping.** The governments should commence a project to map and characterize all of the groundwater aquifers in the Great Lakes Basin that reflect their multiple layers and different flow patterns, not just in the vicinity of contaminant sources. Such a project would be a first step would dramatically enhance the ability to manage these vital waters and advance scientific understanding of these unseen resources
4. **Clearly Identifying Responsible Agencies.** The Parties should each designate a lead agency to be responsible and accountable for coordination and implementation of the groundwater Annex to ensure regular reporting under Annex 16.
5. **Groundwater Trends.** Annex 11 and Annex 16 should include a consideration of groundwater trends, emerging problems, and the development and implementation of indicators

6. **Groundwater Definitions.** Annex 16 and Article 1 should integrate groundwater into the definitions of the Great Lakes System or the Great Lakes Basin Ecosystem.
7. **Monitoring.** The Parties should establish and coordinate groundwater monitoring networks for both levels and quality, and assemble a committee of managers from key federal, provincial, and state agencies to ensure that the work is done. This includes the development of an integrated data management system for reporting to the IJC and the public.
8. **Modeling.** The parties should develop models that position groundwater within the hydrologic cycle and the relationship to the Great Lakes System and includes the impacts of changes in climate and other groundwater stressors.
9. **Reporting Requirements.** Progress reports on groundwater trends and programs should be required every two years to ensure continued accountability. More comprehensive technical groundwater data related to the Great Lakes System to be reported by the lead Federal Government agencies should be required every five years and should include information compiled from all levels of government including municipal and state/provincial as well as from all other Federal Departments having responsibility for groundwater as part of their mandate.
10. **Water Quantity Management.** Management of Great Lakes water quality is closely tied to the management of Great Lakes water quantity, including the management of ground water quantity and streamflow. Reference should be made in the GLWQA as being closely linked to other agreements such as the Great Lakes Charter Annex 2001 Implementation Agreements as a vital arrangement / agreement essential to the protection of Great Lakes water quality.

Part 10: Agreements and Instruments Supporting the Great Lakes Water Quality Agreement

In consideration of a new Great Lakes Water Quality Agreement and groundwater Annex, linkages should be made with the following agreements and mechanisms:

- Great Lakes Charter Annex Implementation Agreements for managing water withdrawals
- Provincial Groundwater Monitoring Partnership Agreement (Ontario only)
- Canada-Ontario Agreement on the Great Lakes Basin Ecosystem
- Great Lakes Regional Collaboration Strategy
- Provincial Clean Water Act and Sourcewater Protection Regulations
- New U.S. Phase 2 stormwater regulations
- The new U.S. EPA Groundwater Rule
- International Atmospheric Deposition Network
- Great Lakes Toxics Reduction Strategy

GREAT LAKES WATER QUALITY AGREEMENT

SPECIAL ISSUES WORKING GROUP **FINAL REPORT TO ARC** December 18, 2006

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

This final report from the Special Issues Working Group (SIWG) describes and provides recommendations on "...key issues affecting the Great Lakes Basin Ecosystem which are not addressed, or are not currently adequately addressed, by the [Great Lakes Water Quality] Agreement" (Agreement). The report covers specific topics that fall into two categories. First, three broad themes (climate change, biodiversity threats and responses, and watershed planning and land use) addressed by the SIWG Subgroups using a step-wise analysis approach; and second, additional specific topics that the SIWG identified as warranting separate attention (source water protection, invasive species, and cage aquaculture) after the step-wise analyses were completed.

OVERARCHING OBSERVATIONS

As a result of the review process, the SIWG has noted the following significant observations from across all the issues it addressed.

- While the Agreement's purpose statement, "...to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem" is still valid and relevant, the purpose needs to be revised to include more detail, consistency, and clarity for today's conditions.
- The term "ecosystem approach" is in need of clarity and guidance. Those working to protect the Great Lakes have various interpretations of what such an approach is and what this kind of approach says about the scope of the Agreement. The SIWG's prevailing view is that geographically the Agreement should span the open waters, near-shore areas, tributaries, and other aquatic and terrestrial areas (i.e., the full Basin). With regard to the ecological scope, the SIWG's prevailing view is that the Agreement should take an ecosystem approach to the physical, biological, and chemical integrity of the waters of the Great Lakes Basin (and not single out one component of that integrity).
- The SIWG believes that the Agreement should also consider that stressors are upstream and in the watersheds, and it should provide guidance regarding implementation of the ecosystem approach.

Other overarching observations include:

- While recognizing work remains to be done, the Agreement is **successfully fulfilling a number of its stated goals**, especially in addressing the chemical integrity of the waters of the Basin.
- The SIWG's view is that **the Agreement is not achieving the desired purpose**. In particular, there is need for more attention to the conditions of and stresses to the physical and biological integrity of the Great Lakes Basin ecosystem.

- The Agreement's **inability to address new, re-emerging and emerging issues**, such as near-shore eutrophication, cumulative impacts, climate change, off-shore industry, and aquatic invasive species, is testament to its current limitations.
- The policy goals of the Agreement could be expanded to reflect a broader scope of threats to the Great Lakes.
- Implementation of the Agreement is hindered by lack of political will to implement and fund required programs to protect and restore the Great Lakes.
- **Climate change** can be considered a stressor or threat that exacerbates most, if not all, of the other themes and specific topics identified by the SIWG. To be effective, the Great Lakes management paradigm needs to consider and address actual and prospective climatic changes.
- Throughout its work, the SIWG recognized that economic benefits accrue to Canada and the U.S. as a result of a vibrant Great Lakes ecosystem. Further, the Working Group took note of the costs of past, current, and future pollution and degradation to the system, the costs of remediation, and the current lack of resources to adequately address Great Lakes issues. **Economic costs and benefits** will need further attention if any revisions to the Agreement are to be considered.

SUMMARY OF THEMES AND TOPICS

The SIWG believes the special issues captured by the following themes and topics are significant threats to the waters of the Great Lakes Basin ecosystem. Without coordinated attention to these issues, the purposes of the Agreement will remain unfulfilled, and the physical, chemical, and biological integrity of the Great Lakes ecosystem will become increasingly compromised. Below are brief descriptions of the themes and topics addressed by the SIWG, followed by a summary of the SIWG's corresponding recommendations. More information and detail is provided in the body of the report.

Theme 1: Watershed Planning and Land Use

Since the origin of the Agreement, population growth and sprawl in the Great Lakes Basin have brought massive increases in land development and corresponding changes to land use patterns. Land use activities throughout the Great Lakes Basin are negatively affecting Great Lakes waters by altering much of the Basin's hydrologic regime through decreased infiltration and groundwater recharge, increased runoff, and increased flow through stream channelization. Great Lakes water quality and the greater Great Lakes Basin ecosystem are being further affected by the lack of meaningful coordination between local watershed and land use decision makers, and the binational and national policies and programs related to Great Lakes protection and remediation.

Theme 2: Biodiversity Threats and Responses

One measure of the health and functions of ecosystems is biodiversity. Moreover, water quality is maintained through various biotic and abiotic features and processes that are components of biodiverse landscapes and ecosystems. Separation of ecological functions and attributes from water quality impacts can result in incomplete and inherently unfeasible water quality recovery efforts. The integrity of ecosystems can also be compromised if certain thresholds are passed, after which loss of biodiversity and

associated functions can cause fundamental system changes, further exacerbating water quality issues. Great Lakes biodiversity is threatened by major challenges including aquatic invasive species, terrestrial invasive species, habitat conservation and species management, cage aquaculture, near shore waters and coastal area management, and declining water levels/submerged lands.

Theme 3: Climate Change

Climate change has the potential to have profoundly adverse impacts on the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. Depending on the rate of change, the impacts could be ecologically extensive and economically widespread. Climate change is projected to have many, potentially severe, negative impacts on water supply, water quality, natural ecosystems, human health, and beneficial uses.

Specific Topic 1: Invasive Species

The Great Lakes are being assaulted by ongoing introductions of invasive species and are suffering significant environmental and economic damages as a result. Aquatic Invasive Species (AIS) cause beneficial use impairments (BUI), affect water quality by concentrating toxins and releasing them back into the water column, and increase turbidity. AIS are a leading cause of biodiversity loss in the Great Lakes, and can also themselves be considered biological pollutants that exacerbate existing problems because they reproduce and are generally able to withstand extirpation efforts.

Specific Topic 2: Source Water Protection

The Great Lakes are the drinking water source for tens of millions of people, and “fishable, swimmable, drinkable” has long been recognized as the encapsulation of a vision for the Lakes. Yet the Agreement does little to address the “drinkable” goal. Source protection—protecting the waters of the Great Lakes Basin, including aquifers as well as surface water—is the first barrier in a multi-barrier approach to drinking water protection.

Specific Topic 3: Cage Aquaculture

The impacts of cage aquaculture are not yet fully understood, but potential problems associated with it include localized elevations of nutrient concentrations from fish waste and excess feed, increased disease outbreak in concentrated fish populations (possibly resulting in subsequent risk for pathogens to spread to free-swimming populations), release of antibiotics in excess feed and fish excrement, and transfer of undesirable genetic characteristics of cultured fish to wild populations via cultured fish escapees.

SUMMARY OF RECOMMENDATIONS²²

Theme 1: Watershed Planning and Land Use

²² The following recommendations represent either the consensus or the prevailing views of the SIWG. There are diverging views on some recommendations. Where they apply, these diverging views are captured in the body of the report.

- The Agreement should define “watershed planning” and “watershed management plans;”
- The Agreement should establish a broad institutional watershed planning framework with goals, objectives, implementation targets, and mechanisms to coordinate land use decision makers at all levels of government. One framework objective should be establishing watershed management plans that are developed and implemented with local partners, include all the tributaries across the Great Lakes Basin, are clearly linked to larger lake-wide targets, and are contributing to the goals set out in LaMPs and RAPs;
- Annex 13 should be strengthened to address the need for more systematic and comprehensive LaMPs that address the threats of land use patterns to water quality;
- Annex 2 should clarify that true implementation of the “ecosystem approach” requires watershed management planning
- The Agreement should more explicitly address significant pollutants, such as nitrogen, that cut across all land uses from rural to urban;
- The Agreement should clarify that its scope covers the effects of land use on the water quality of the Lakes’ near-shore, coastal, and shoreline areas, and their tributaries; and
- The Agreement should provide a framework for more coordination around upstream sources of downstream contaminants between the Lakes.

Theme 2: Biodiversity Threats and Responses

- The Agreement should explicitly address the need for the protection, conservation, and recovery of aquatic and related terrestrial biodiversity as a factor in maintaining or improving water quality;
- The Agreement should explicitly note biodiversity as key measure and driver of ecosystem processes related to maintenance of water quality;
- The Agreement should provide for further research on biological (habitat) and water quality implications of emerging lands;
- The 4th line of the Agreement should be amended as follows:
 - “REAFFIRMING their intent to prevent further pollution and degradation of the Great Lakes Basin Ecosystem owing to continuing population growth, resource development and increasing use of water.”; and
- A new annex should be created to address biodiversity OR Annex 2 should be revised to add biodiversity provisions.

Theme 3: Climate Change²³

- The specific objectives in the Agreement’s Annex 1 “Specific Objectives” should be refined so that language related to temperature and thermal discharges provides a direct link to climate change;

²³ The SIWG also identified several recommendations for the Parties to facilitate implementation of the climate change recommendations. These are identified in the body of the report.

- Additional authority to address climate change should be articulated in the Agreement's introductory language, in Article II, "Purpose," particularly subsection (c); in Articles III and IV; in Article VII, referencing the IJC; in Article X, subsections (b) and (c); and in Article XIII; and
- A new annex should be created for the Agreement to support climate change-related monitoring and research OR Annex 17, "Research and Development," and Annex 11, "Surveillance and Monitoring," should include specific authorities for joint climate change-related monitoring and research.

Specific Topic 1: Invasive Species

- A new annex to the Agreement should be created to address invasive species by establishing clear goals and accountability mechanisms
- Annex 11 should be amended to include AIS surveillance and monitoring; and
- The Agreement should take into account the goals, milestones, and specific recommendations included in the Great Lakes Regional Collaboration Strategy and its Aquatic Invasive Species appendix.

Specific Topic 2: Source Water Protection

- The Agreement should name source protection as one of its primary goals;
- The Agreement should charge the Parties to set specific binational targets for source water protection;
- The Agreement should commit the Parties to developing an overarching Basin-scale framework to support local development and implementation of watershed-based source protection initiatives; and
- The Agreement should commit the Parties to identifying innovative source water protection programs, and developing mechanisms for sharing best practices in source protection among Great Lakes Basin jurisdictions.

Specific Topic 3: Cage Aquaculture

- The Agreement should include provisions for further research and monitoring in order to assess the contribution of nutrient loading and genetic transfers resulting from cage aquaculture in the Basin and corresponding long-term and long-range water quality and ecosystem impacts;
- The Agreement should state as a goal that cage aquaculture be managed so that it has no negative impact on water quality immediately adjacent to the sites, based on lake background conditions;
- The Agreement should include references to cage aquaculture in Annex 3, "Control of Phosphorus," and Annex 13, "Pollution from Non-Point Sources;" and
- Annex 8, "Discharges from Onshore and Offshore Facilities," should be expanded beyond a concern over discharges of harmful quantities of oil and hazardous polluting substances from offshore facilities to include concerns related to cage aquaculture.

CONCLUSION

Today the waters of the Great Lakes Basin are facing threats from all of the issues described by the SIWG in this report. Each threat is different, but significant, and is either not addressed or not adequately addressed by the current Agreement. These issues deserve specific attention when considering any changes to the Agreement.

2. Introduction

Overview of the Special Issues Working Group

This report conveys the Great Lakes Water Quality Agreement (Agreement) Review, Special Issue Working Group's (SIWG's) final findings and recommendations to the Agreement Review Committee (ARC). The report describes several key issues "affecting the Great Lakes Basin Ecosystem which are not addressed, or are not currently adequately addressed, by the Agreement,"²⁴ and provides recommendations on those issues.

The SIWG membership represents a broad set of stakeholders, experts, and interested parties from the Great Lakes region. SIWG members include representatives from the Canadian and U.S. federal governments, provincial/state governments, municipal agencies, non-governmental organizations (NGOs), industry, and academia. Annex E, SIWG Process and Membership, provides more detail on the SIWG membership and participation.

As noted throughout the report, the SIWG reached consensus on many issues. Where consensus was not reached, this report identifies "prevailing" and "diverging" views.

Method of Analysis

As directed by the Agreement Review Working Group's (RWG's) *Terms of Reference*²⁵, the SIWG focused its review on issues "affecting the Great Lakes Basin Ecosystem which are not addressed, or not adequately addressed, by the Agreement" or by another Agreement RWG. Using this charge, the SIWG, as directed by the ARC, surveyed a list of 29 issues of concern for Great Lakes stakeholders, then formed three Subgroups to scope and address three thematic topics, or "themes," using a step-wise approach outlined in the *Terms of Reference*. The three themes were: Biodiversity Threats and Responses, Climate Change, and Watershed Planning and Land Use. Each Subgroup worked throughout the Summer and Fall of 2006 to respond to the following step-wise questions for their theme:

Step-Wise Questions

1. What is the issue?
2. What is the significance to the Great Lakes Basin Ecosystem?
3. How is the issue currently being addressed by the Governments?
4. Is there a need for further binational cooperation to address the issue?
5. How should Canada and the US cooperate to address the issue?
6. Does the current Agreement address the issue adequately/at all?
7. What are the advantages/disadvantages of including the issue in the GLWQA?
8. Is the GLWQA the most appropriate means of addressing the issue?
9. Does the GLWQA give authority to address these issues?
10. Where are additional authorities needed?

²⁴ Agreement Review Committee, *Terms of Reference to the GLWQA Review Working Groups*. August 9, 2006, p. 18.

²⁵ *Ibid*, p. 19.

The criteria used by the Subgroups to interpret the questions are noted in the footnotes for the corresponding questions in Appendix E. The Subgroup's final responses to the step-wise questions are provided in Annexes A–C.

This report covers specific topics that fall into two categories. The first category covers the results from the three thematic topic areas, and the second covers additional topics that the SIWG felt warranted separate attention (source water protection; invasive species; and cage aquaculture).²⁶ The report also provides more general observations and recommendations that span across topic areas, particularly regarding the Agreement's "ecosystem approach."

The SIWG considered a longer list of specific topics and identified whether each topic fell (a) under the scope of the Subgroup's themes; (b) under the SIWG's scope, but not within the scope of the Subgroups' themes; or (c) under the logical auspices of another Agreement review working group. The ARC provided guidance to the SIWG on how to manage these topics throughout the SIWG's decision-making process.

As noted, the full step-wise approach analysis was completed for each of the three themes, by the SIWG Subgroups. Thus, the themes received greater time, attention, and analysis, than the more specific topics analyzed. The final list of issues reviewed by the SIWG is as follows:

- **Themes:** (1) Watershed Planning and Land Use; (2) Biodiversity Threats and Responses; and (2) Climate Change; and
- **Specific Topics:** (1) Invasive Species; (2) Source Water Protection; and (3) Cage Aquaculture.

The SIWG also considered the Agreement's "ecosystem approach" because this issue informs how the SIWG approached its other topics. Finally, the SIWG answered the "overarching questions" related to its review of the Agreement.

Annex E describes the SIWG's work and process in more detail.

²⁶ The SIWG used the three themes to give attention to a range of related topics from the original list of 29 concerns plus one additional topic that was raised later on (Basin-wide sources for downstream contaminants). Discussion and recommendations on these specific topics are incorporated into the final report under three thematic topic sections as follows:

- Habitat conservation and species management: incorporated into the Biodiversity Threats and Responses section; and
- Agricultural land use (articulated in the final report as significant pollutants that cut across all land uses), near-shore waters and coastal areas, and Basin-wide sources for downstream contaminants (articulated in the final report as upstream sources of downstream contaminants): incorporated into the Watershed Planning and Land Use section.

3. Issues, Findings, and Recommendations

Overarching Observations

The SIWG, through its detailed analyses of a number of issues affecting the waters of the Great Lakes Basin, as well as through discussions of the five key “overarching questions” outlined by the ARC²⁷, has noted a number of significant observations that warrant highlighting separately from the more detailed issue-level findings and recommendations that follow.

While the Agreement’s **purpose statement**, “...to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem,” is still valid and relevant, it should be revised to include more detail, consistency, and clarity.²⁸

The term “ecosystem approach” is one of the areas most in need of clarity and guidance. For years, if not decades, references²⁹ to “ecosystem” and “ecosystem approach” have been discussed and debated, both in the context of the intention of the GLWQA and in terms of how the GLWQA should be implemented. Those working to protect the Great Lakes, under the direction of the Agreement, have various interpretations of what an “ecosystem approach” is and what this kind of approach says about the scope of the Agreement.

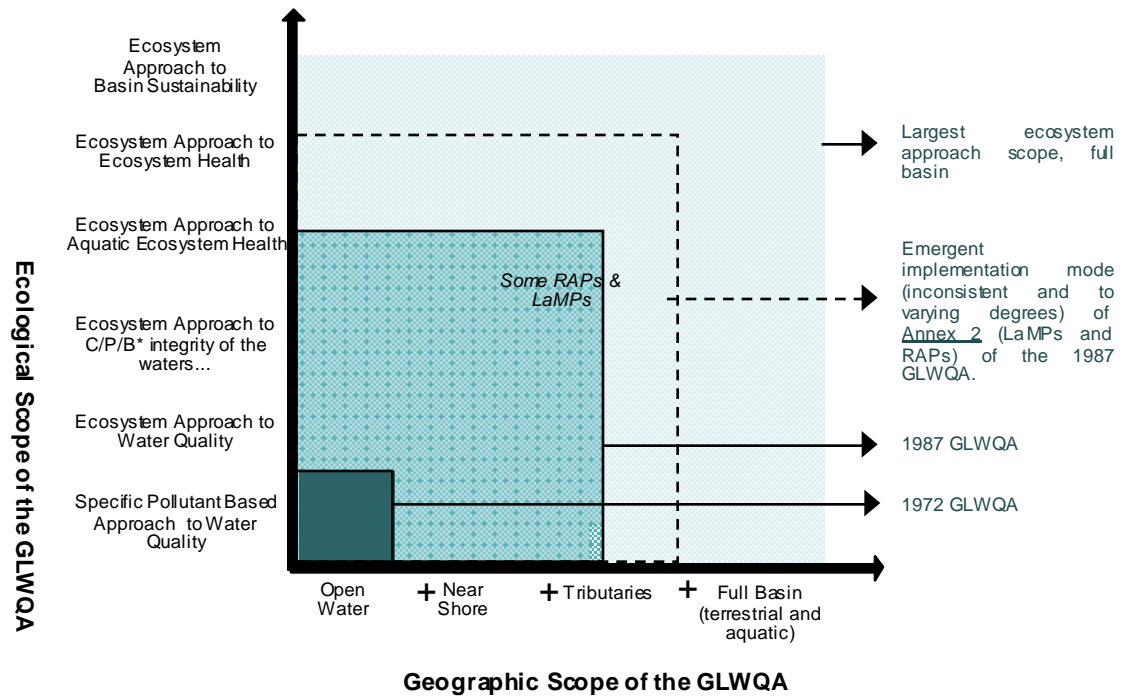
Figure 1 depicts a conceptual continuum of interpretations of the ecosystem approach. On the horizontal axis is the Agreement’s possible geographic scope and on the vertical axis is the possible ecological scope of Great Lakes protection. With regard to the geographic scope, the SIWG’s prevailing view is that of the Agreement should span the open waters, near-shore areas, tributaries, and other aquatic and terrestrial areas (i.e., the full Basin). The SIWG’s diverging view is that the Agreement’s geographic should span the open waters, near-shore areas, and tributaries. With regard to the ecological scope the prevailing view is that the Agreement should take an “ecosystem approach to physical, biological, and chemical integrity of the waters of the Great Lakes Basin”; one diverging view (held by several people) is that the Agreement should take an “ecosystem approach to all biodiversity.” Another diverging view (held by one member) is that the Agreement should take an ecosystem approach to water quality; and another diverging view (held by one member) is that the Agreement should focus on water quality (specific pollutant-based approaches) without an “ecosystem” approach.

²⁷ Agreement Review Committee, *Terms of Reference to the GLWQA Review Working Groups*. August 9, 2006.

²⁸ Complete responses to the five overarching questions, as requested by ARC, and more detail related to Article II of the Agreement, can be found in Annex 5 of this report.

²⁹ The GLWQA, as revised in 1978, describes how the purpose of the Parties is to “restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem” (Article II, Purpose), and, to this end, that Remedial Action Plans and Lakewide Management Plans “shall embody a systematic and comprehensive ecosystem approach to restoring and protecting beneficial uses in Areas of Concern or in open lake waters” (Annex 2).

Figure 1. "Ecosystem Approach" – A Continuum of Interpretations



* C/P/B: Chemical, Physical and Biological

In addition to sharing these views on the ecosystem approach, the SIWG recommends the following regarding the overall Agreement approach:

1. That the term "ecosystem approach" be defined more clearly and clarified in the Agreement as a means to the end of protecting and restoring water quality;
2. That the Agreement consider that the stressors are also upstream and in the watersheds; and; and
3. That the Agreement provides guidance regarding implementation of the ecosystem approach.

Other overarching observations include:

- While recognizing work remains to be done, the Agreement is **successfully fulfilling a number of its stated goals**, especially in addressing the chemical integrity of the waters of the Basin (e.g, achieving significant reductions in chemical contamination and pollution).
- The SIWG view is that **the Agreement is not achieving the desired purpose**. In particular, there is need for more attention to the conditions of and stresses to the physical integrity and biological integrity of the Great Lakes Basin ecosystem.
- The Agreement's **inability to address new, re-emerging and emerging issues**, such as near-shore eutrophication, cumulative impacts, climate change, offshore industry, and

aquatic invasive species, is testament to its current limitations. The SIWG's view is that that the policy goals of the Agreement could be expanded to reflect a broader scope of threats to the Great Lakes and that implementation is hindered by the lack of political will to implement and fund required programs to protect and restore the Great Lakes. (Note that in several instances the SIWG recommends focused research in relation to these issues.)

- **Climate change** can be considered a stressor or threat that exacerbates most, if not all, of the other themes and specific topics identified by the SIWG. To be effective, the Great Lakes management paradigm needs to consider and address actual and prospective climactic changes.
- Throughout its work, the SIWG has recognized that economic benefits accrue to Canada and the U.S. as a result of a vibrant Great Lakes ecosystem. Further, the Working Group took note of the costs of past, current, and future pollution and degradation to the system, the costs of remediation, and the current lack of resources to adequately address Great Lakes issues. **Economic costs and benefits** will need further attention if any revisions to the Agreement are to be considered.

Three themes

Theme 1: Watershed Planning and Land Use

The Issue

Since the Agreement's origin, population growth and sprawl in the Great Lakes Basin have brought massive increases in land development and corresponding changes to land use patterns. Great Lakes water quality is suffering from the lack of connection between local watershed and land use decision-makers, and the binational and national policies and programs related to Great Lakes protection and remediation.

Land use activities throughout the Great Lakes Basin are negatively affecting Great Lakes waters. Urban, urbanizing, and rural land uses have changed much of the Basin's hydrologic regime by decreasing infiltration and groundwater recharge, increasing runoff, and increasing flow through stream channelization. In addition these land uses have created other watershed stressors, including increased non-point pollutant pressures from runoff of oils, greases, heavy metals, and road salts; rising loss and fragmentation of habitat; and increased demand for water and diversions to supply agriculture, municipal, and a variety of economic uses. Although land use activities within urban, urbanizing and rural areas each produce a particular set of stressors, many pollutants, such as nitrogen,³⁰ pesticides, and sediments have sources across all three land use categories.

Taken together, the stressors from urban, urbanizing, and rural land use result in increased consumption of water, decreased groundwater recharge, increased generation of water pollution,

³⁰ The SIWG found nitrogen to warrant specific mention because of the lack of explicit attention to this pollutant in the Agreement.

increased pathways for pollution to reach the Lakes, decreased buffering capacity because of loss of wetlands and other habitat, increased erosion, and increased loadings to near shore and coastal areas. Appendix C (under Question 1) elaborates on the land use stressors and their impacts on the waters of the Great Lakes.

Without effective action to prevent and mitigate damage, water quality in the Great Lakes and their tributaries will continue to decline. Water quantity may also be affected. Great Lakes stakeholders and governments alike have pointed to land use impacts as one of the most significant challenges in attaining a healthy, sustainable Basin ecosystem.³¹ Current land use patterns and trends pose a substantial threat to the chemical, biological, and physical integrity of the waters of the Great Lakes ecosystem today and into the future.

The conditions created by land use stressors exhibit both proximate effects in nearshore areas, and lake-wide effects.³² Impacts include elevated levels of pathogens, algal toxins, mercury, persistent organic pollutants (POPs), chloride, and other chemical contamination in Great Lakes waters; untreated sewage from combined sewer overflows (CSOs) and undersized treatment systems; increased rates of sedimentation; increased water temperatures; contaminated groundwater; increases in anaerobic conditions (e.g., Lake Erie “dead zone”); loss of biodiversity; elevated beach bacteria counts, swimming restrictions, degradation of aesthetics; waterborne disease outbreaks (e.g., from *Cryptosporidium*); drinking water taste and odor impairment; and lack of trust in drinking water.

Impacts are significant in at least four ways:

1. **Geographic scope**, spanning all five Great Lakes Basins, their connecting channels, tributaries and watersheds, as well as the St. Lawrence River and other downstream waters.
2. **Irreversibility**, as both land use stressors and their impacts are often difficult, sometimes impossible, to reverse.³³
3. **Ecosystem breakdown** as land use impacts tax a system also stressed by toxic inputs from past and current point sources, airborne deposition, invasive species, fisheries mismanagement, and climate change.³⁴ Losses associated with ecosystem collapse will likely include degradation of ecosystem services like water purification, soil production,

³¹ Concern about these impacts and the need for watershed approaches to protect Great Lakes water quality have been articulated in several forums, including the 2004 State of the Lakes Ecosystem Conference, The IJC’s 12th biennial report on Great Lakes water quality (2004), and a synthesis report by Great Lakes scientists on the risk of imminent ecosystem collapse (Bails, et al. 2005 (complete reference below)).

³² The SIWG explicitly discussed the effects of land use stressors on near shore waters because the current Agreement focuses primarily on open waters. Near shore waters and coastal areas are significant sources of drinking water and the primary location for human body contact with water, and they are the primary ecological link between watersheds, tributaries and the open waters of the Lakes. However, many BUIs are not explicitly tied to these areas.

³³ Examples include species extinction, ground water contamination, tainted drinking water incidents, and conversion of land to impervious surfaces and infrastructure.

³⁴ Bails, J. A. Beeton, J. Bulkley, M. DePhilip, J. Gannon, M. Murray, H. Regier, and D. Scavia. *Prescriptions for Great Lakes Ecosystem Protection and Restoration: Avoiding the Tipping Point of Irreversible Changes*. 2005. Available: <http://www.precaution.org/lib/06/prescriptionforgreatlakes.051201.pdf> (viewed November, 2006)

maintenance of fisheries, maintenance of nutrient cycles, flood and drought mitigation, pollination, etc.³⁵

4. **Economic and human health costs** that result when degraded watersheds and poor water quality impair economic activities, decrease property values, and reduce the livability and sustainability of communities.³⁶ Human health costs, e.g., from waterborne diseases (from body contact or drinking water) or intake of toxic chemicals and metals (e.g., mercury) through the food chain are also of concern.

Findings and Recommendations

The Governments have developed policies and frameworks to improve the use and results of watershed planning. Initiatives are underway to various degrees at every level of government (for more information on the attention provided at each level of government, see the answer to Question 3 in Annex A).

The current Agreement allows for pursuit of any sources of contamination of Great Lakes water, including land use stressors.³⁷ Statements in Article VI and Annex 13 specifically raise land use activities, thereby acknowledging the legitimacy of the issue for the Agreement. The Agreement also “charges” the parties to implement watershed planning on a pilot basis through the LaMPs.^{38,39}

However, the Agreement does not currently provide or require the needed guidance and direction— nor identify funding needs or mechanisms—to do so consistently or efficiently. It lacks specific language for an overall charge to address the issue, the existing language in Article VI and Annex 13 being too narrow to fulfill that function. It does not express what stressors should be priorities, what the goals or targets should be for reduction of land use stressors, or what BMPs and alternative land use practices should be promoted. Nor does it provide any guidance for how current mechanisms (e.g., LaMPs) can address the issues. There is also a need for consistency in applying watershed planning solutions across the Basin. In other words, the framework currently provided is vague and weak and as such does not sufficiently support the Agreement’s mandate in the face of these stressors. There is also a strong need to connect the binational and national policies and programs with the local, municipal, and regional watershed and land use decisions.

The Subgroup found that the Agreement alone cannot sufficiently address the issue of watersheds and land use, because it must be addressed at all levels of government. However, the Agreement can be *one* of several appropriate means for addressing the issue, by providing high-level goals and

³⁵ Ecological Society of America, A Primer From the **Ecological Society of America**. *Ecosystem Services*. Summer 2000.

³⁶ U.S. Environmental Protection Agency. *Liquid Assets 2000: America's Water Resources at a Turning Point*. EPA-840-B-00-001. Office of Water (4101), United States Environmental Protection Agency, Washington, DC. 2000.

³⁷ In fact, many areas of the Agreement cannot be implemented without attention to watersheds and land use, starting with the general mandate regarding the “chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.”

³⁸ Michigan LaMP 2000, pp.1-6.

³⁹ *Summary Record: Canada-United States Great Lakes Binational Executive Committee (BEC) Meeting July 21-22, 1999, Mississauga, Ontario*, p.4.

objectives of a binational nature. In fact, the Agreement is currently one of the only means for providing a *binational* response and Basin-wide leadership on this issue.

Recommendations

1. The Agreement should define “watershed planning” and “watershed management plans.”
2. The Agreement should establish a broad institutional watershed planning framework with goals, objectives, implementation targets, and mechanisms to coordinate land use decision makers at all levels of government. One framework objective should be the establishment of watershed management plans that (a) are developed and implemented with local partners; (b) include all the tributaries across the Great Lakes Basin; and (c) are clearly linked to larger lake-wide targets, contributing to the goals set out in LaMPs and RAPs.⁴⁰ (See also additional specific recommendations in footnote 20.⁴¹)
3. Annex 13 should be strengthened to address the need for more systematic comprehensive LaMPs that address the threats of land use patterns to water quality
4. Annex 2 should clarify that true implementation of the “ecosystem approach” requires watershed management planning;

Recommendations 1-4 reflect the prevailing view of the SIWG. The diverging view is that existing authorities for RAPs and LaMPs are sufficient for the Parties and others to address watershed management and land use planning.

5. The Agreement should more explicitly address significant pollutants, such as nitrogen, that cut across all land uses from rural to urban.⁴² (See also specific recommendations in footnote 22.⁴³)
6. The Agreement should clarify that its scope covers the effects of land use stressors on the water quality of the Lakes’ near-shore, coastal, and shoreline areas, and their tributaries. (See also, specific recommendations in footnote 23.⁴⁴) There are two divergent views on this subject: first, that the health of the near shore, or the near-shore ecosystem (rather

⁴⁰ In Quebec, these are ZIPs for the St-Lawrence River and “Comités de bassin” or Watershed Committees on the 33 major tributaries.

⁴¹ The Agreement should also: (a) require that the LaMPs provide systematic planning attention at the watershed level by providing a unifying, congruent LaMP framework so that each LaMP serves as the coordinating “bridge” between the Parties and the local jurisdictions in watershed planning efforts; (b) establish mechanisms for implementation of the identified goals and objectives, including programs where states, provinces, Tribes/First Nations, or local governments have the lead; (c) provide guidance for planning agencies and non-governmental organizations; (d) clarify the roles and responsibilities within the current mechanisms for coordinating watershed planning and implementing watershed management plans with local authorities; (e) include direction on the appropriate binational structures for managing, monitoring, and reporting on this aspect of the Agreement; and (f) include language to ensure that the Parties are also including and engaging with relevant federal agencies other than the U.S. EPA and Environment Canada.

⁴² To achieve this, all land use sectors should be examined for their relevant contributions to cross-cutting pollutants as well as their roles in planning and implementing solutions.

⁴³ Annex 1 should be revised to address nitrogen explicitly, and Annexes 13 and 3 (part 5) should cover the need for more targeted programs and measures for the agricultural arena.

⁴⁴ Specifically, the Agreement should: (a) add a definition of “near-shore” in Article 1; and (b) designate LaMPs as the appropriate tool to address near-shore areas. In addition, the Parties should: (1) conduct further research on what water quality impacts will result from lowering lake levels (as a result of climate change) and emerging lands; and (2) hold themselves and other levels of government accountable on issues relating to the health of near-shore and coastal waters.

- than the quality of nearshore, coastal, and shoreline water quality) should be addressed; and second, that the SIWG's recommendations are overly prescriptive, and more should be left to the LaMPs to address.
7. The Agreement should provide a framework for more coordination around upstream sources of downstream contaminants between the Lakes, encouraging monitoring and research on the locations and sources of contaminants that play a role in downstream conditions to help account for and prioritize relative contributions and create better accountability.

Theme 2: Biodiversity Threats and Responses

The Issue

Great Lakes water quality both affects, and is dependent upon, ecological functions and processes of open water, near-shore land and waters, and lake watersheds. One measure of the health of ecosystems, and their attendant functions,⁴⁵ is biodiversity: the diversity of genes, species, and communities present and the processes and energy flows between them.

Most species respond in varying degrees to direct pollution as well as loss of habitat. Moreover, quality of water is maintained through various biotic and abiotic features and processes that are components of biodiverse landscapes and ecosystems. Separation of ecological functions and attributes from water quality impacts can result in incomplete and inherently unfeasible water quality recovery efforts. As noted by Bails et al., "...failure to understand the ecosystem-level disruptions caused by the combination of multiple stresses have led to the false assumption that the Great Lakes ecosystem is healthy and resilient."⁴⁶

Since the 1978 and 1987 amendments to the Agreement, there have been substantial additions to the body of science and new paradigms have emerged in regard to environmental health, both within and outside of the Great Lakes, including an emphasis on ecological integrity and a move to an ecosystem approach. Moreover, biodiversity itself has become a measure of system integrity or health and as a driver of ecological functions. While the Agreement has made progress on certain water quality stressors (e.g., chemical pollutants), new stressors, such as biodiversity, have emerged.

At the very least a diverse ecosystem with a full range of ecological functions and habitats is more resistant to the impacts of impaired water quality and can better resist or cope with such impacts. Examples include the filtering effect of diverse wetlands and the essential role healthy upland forests play in the hydrological cycle. Maintaining indigenous biodiversity will assist in ecosystem recovery. However, as diverse and healthy ecosystems can mitigate and temper impacts from stressors such as aquatic invasive species, resource harvesting, climate change, sedimentation, etc., the integrity of these ecosystems can also be compromised if certain thresholds are passed. After

⁴⁵ Cardinale, Bradley J., et al. *Effects of biodiversity on the functioning of trophic groups and ecosystems*. Nature 443, 989-992. 2006.

⁴⁶ Bails, et al. 2005.

a certain threshold is passed, loss of biodiversity and associated functions can cause fundamental system changes, further exacerbating water quality issues.

Major challenges to biodiversity include aquatic invasive species, terrestrial invasive species, habitat conservation and species management, open cage aquaculture, near shore waters and coastal area management, and declining water levels/submerged lands.

Findings and Recommendations

As discussed in more detail in the AIS section below, AIS are significant threats to biodiversity and possibly the greatest current direct threats to open water and tributary biodiversity. AIS directly affect water quality by the concentration and release of toxins, sediment re-suspension, and food web disruption sometimes leading to algal blooms. AIS also directly impact native biodiversity through competition, habitat degradation, food web disruption, and predation. AIS enter the Lakes through various means including shipping, canals or diversions, home aquariums, and aquaculture.

Terrestrial invasive species (TIS) are, for the purpose of this report, considered to be upland species. While in Canada there is an emerging policy on TIS, these species are a significant threat to terrestrial biodiversity and mechanisms and policy to address them are limited. TIS have an indirect impact on aquatic ecosystems and water quality by compromising the integrity of upland food webs and habitat, contributing to diminished ecological functions. Impacts within the riparian and coastal zones where species dependent on upland habitat for portions of their lifecycle (turtles, certain amphibians, mammals, etc.) may suffer competition, predation, food web disruption, or loss of needed co-existing species. Moreover, certain species, such as Black-Swallowwort, may impede or stop riparian and coastal restoration efforts that in turn would increase buffering, erosion control, and habitat provision.

Few, if any, sentinel species or indicators of water quality are solely impacted by water quality. The health and population status of key species, such as those covered under the Migratory Birds Convention (bald eagle, common tern), federal endangered species legislation, and other federal legislation (e.g., Canada's *Fisheries Act*) are usually determined by a combination of water quality influences (toxins, nutrients) and habitat factors (habitat loss or degradation). Habitat conservation benefits these species but also maintains biodiversity and beneficial ecological functions. Without habitat conservation, water quality effects on species would in many cases be greater, given an overall lower level of species/population health. Species loss represents an overall failure to manage the Great Lakes and would reflect poorly upon the Agreement.

Two issues not explored initially within the Biodiversity Threats and Responses Subgroup, and subsequently raised include, cage aquaculture and submerged lands. As discussed in the cage aquaculture SIWG report section, cage aquaculture has a potential biodiversity impact in terms of (1) possible escapes of non-native species, and (2) introduction of non-native genes into natural populations of species. The impacts on water quality and the deterioration of habitats are also important. This issue requires further study.

The SIWG also considered submerged lands, as they relate to existing submerged contaminants, and exposure of submerged lands resulting in contaminant release. However, with the possibility of lowered lake levels from climate change and with human manipulation of water levels there

exists great potential for the emergence of lands with high potential for natural establishment of wetland and related habitats. There exists the potential for the largest change in shoreline habitat since European settlement—both in terms of loss of many existing coastal wetlands and establishment of new coastal wetlands. The net key functions of coastal wetlands on biota and water quality will be at the mercy of how exposed lands are managed and how invasive species succeed in establishing in these new habitats. This has major implications on both land ownership and mandates of management agencies.

Land use conversion has a great direct impact on terrestrial and tributary biodiversity and attendant ecological functions and a great indirect impact on near-shore and open water biodiversity and ecological functions. For example coastal wetlands along the north shore of Lake Ontario show a marked decline in overall wetland integrity in relation to increased urbanization.⁴⁷ Conversion from natural cover to agricultural land use to intensive agricultural land use to urban land uses results in corresponding habitat loss and degradation and a profound loss of biodiversity and ecological functions.

Recommendations:

1. The Agreement should explicitly address the need for the protection, conservation, and recovery of aquatic and related terrestrial biodiversity as a factor in maintaining or improving water quality.
2. The Agreement should explicitly note biodiversity as key measure and driver of ecosystem processes related to maintenance of water quality.
3. The Agreement should provide for further research on biological (habitat) and water quality implications of emerging lands.
4. In 4th line of the primary Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978 should be amended as follows⁴⁸

“REAFFIRMING their intent to prevent further pollution and degradation of the Great Lakes Basin Ecosystem owing to continuing population growth, resource development and increasing use of water.”

5. The Agreement should include a biodiversity annex to the GLWQA or add biodiversity provisions under a revised Annex 2.
6. The Agreement should define “ecosystem approach” as an approach that addresses ecosystem functions and their relationships to water quality in open waters of the Lakes, near-shore waters, and within tributaries to the Lakes.⁴⁹

Additional biodiversity-related recommendations are included under the AIS section.

⁴⁷ Environment Canada and Central Lake Ontario Conservation Authority. *Durham Regions Coastal Wetland Monitoring Project: Year 2 Technical Report*. March 2004.

⁴⁸ This represents the prevailing view of the SIWG; however, several alternatives were suggested, the most popular of which was changing the language to state: “REAFFIRMING their intent to prevent further pollution and degradation of the Great Lakes Basin Ecosystem by utilizing the principles of sustainable development as we respond to continuing population growth and utilization of water resources.”

⁴⁹ This language, agreed upon by the Biodiversity Subgroup, is divergent from the full SIWG recommendation described under the “overarching observations” section.

Theme 3: Climate Change

The Issue

The impacts of a changing climate are already being observed in the Great Lakes Basin. Projected regional climate change will have further detrimental water supply, water quality, ecosystem functioning, human health, and beneficial use impacts.

Great Lakes Basin climate change scientists have determined that regional climate is already changing: (1) annual average temperatures are increasing, with the largest increases observed in winter and spring; (2) spring melt is beginning earlier, the frost-free period is lengthening, and, in general, winters are getting shorter; (3) annual precipitation is increasing; (4) the depth, area, and duration of snow cover is decreasing; (5) the duration of lake ice cover is decreasing; and (6) heavy precipitation events are becoming more common in the U.S. states (no consistent trend has been observed in the Canadian Great Lakes region).⁵⁰

Projected Great Lakes Basin climate changes include: (1) additional warming of air temperatures with potentially increased evaporation and transpiration; (2) increased total annual precipitation, despite the potential for less precipitation during some seasons; (3) increased rain but less snow; and (4) increased intensity of precipitation events.^{51,52} Nearly all climate change hydrologic assessments project lower Great Lakes water levels. The cumulative effects of these changes are likely to increase pollutant loadings to the Great Lakes, increase ambient concentrations of pollutants even without increased pollutant loadings, and mobilize toxic substances in both submerged and exposed sediment.

Regional institutions have identified climate change as a problem that could dramatically impact the Basin ecosystem, but there are no ongoing binational strategies for building better understanding of those impacts or means for addressing them. Both countries have conducted impact assessment studies in recent years, are parties to the United Nations Framework Convention on Climate Change, and Canada has ratified the Kyoto Protocol. Nevertheless the SIWG views current national and binational climate change activities in the Basin as collectively inadequate.⁵³

Findings and Recommendations

The SIWG agreed that climate change has the potential to have profoundly adverse impacts on the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. Depending on the rate of change, the impacts could be ecologically extensive and economically widespread.

⁵⁰ Great Lakes Water Quality Board, *Climate Change and Water Quality in the Great Lakes Basin*, August 2003, and Union of Concerned Scientists and Ecological Society of America, *Confronting Climate Change in the Great Lakes Region*, 2003, executive summary updated 2005.

⁵¹ See Annex C, Question 2, for more detail on projected climate change impacts.

⁵² Great Lakes Water Quality Board, *Climate Change*, p. 4.

⁵³ See Annex C, Question 3 for a review of binational Basin-level climate change-related activities.

Climate change is projected to have many impacts on water supply, water quality, natural ecosystems, human health, and beneficial uses.

The SIWG notes that the current Agreement does not substantially address climate change,⁵⁴ but is the best means for carrying out Basin-wide climate change-related work binationally as it would capitalize on existing institutional capacity and has existing science-based infrastructure and oversight mechanisms. While the Agreement should not be only means of addressing climate change, including climate change explicitly within the Agreement would strengthen binational research and adaptation strategy development in the Great Lakes Basin.

The prevailing view of the SIWG is that the Agreement is not the appropriate vehicle to address causes of climate change or actions that can be taken to prevent climate change, i.e., climate change mitigation.^{55, 56} A diverging view within the SIWG believes that the Agreement should also address climate change mitigation.

The SIWG therefore recommends that the Parties address climate change in the following ways

1. The Parties should support collaborative research, monitoring and analysis to (a) ascertain more concretely what climate change effects are occurring or might occur in the Great Lakes Basin; and (b) develop and facilitate the mainstreaming of adaptation⁵⁷ and/or remediation strategies that have the best chance of preserving ecosystem functioning in the face of actual or projected climate change effects at the Great Lakes Basin scale.
2. The Parties should create a binational board to coordinate⁵⁸ climate change research and adaptation efforts. This board of experts and partner-stakeholders should have a standing reference to (a) examine the state of Great Lakes climate change knowledge in the areas of climate trends, projections, impacts, vulnerabilities, and adaptation strategies; (b) identify key emerging issues; (c) determine priorities for funding; (d) recommend policies based on the latest states of knowledge; and (e) design and carry out public education efforts.⁵⁹ A diverging view asserts that the function of any such board could be coordinated with the work already being done through the existing U.S.-Canada bilateral working group on climate change⁶⁰ and should not duplicate efforts within other forums.

⁵⁴ See Annex C, Question 6, for a detailed assessment of the current Agreement and climate change.

⁵⁵ By climate change “mitigation” the SIWG means limiting anthropogenic emissions of greenhouse gases and protecting and enhancing greenhouse gas sinks and reservoirs.

⁵⁶ However, outside of the Great Lakes Basin context, the prevailing SIWG view is that the U.S. and Canada should carry out mitigation activities via other binational and international means.

⁵⁷ By “adaptation” to climate change effects the SIWG means taking measures to reduce the impact of climate change on ecological functioning, including human access to ecological services (e.g., levels of natural resource use may need to change).

⁵⁸ There was some SIWG disagreement around the use of the word “coordinate” in this recommendation.

⁵⁹ Adapted from Alliance for the Great Lakes, Biodiversity Project, Canadian Environmental Law Association, and Great Lakes United, coordinating citizen conference calls, *Great Lakes Water Quality Agreement Review: Environmental Community Discussion Paper*, June 2006, http://www.greatlakesforever.org/docs/wqa_discussionpapers.pdf (view ed August 2006).

⁶⁰ See description at <http://usinfo.state.gov/gi/Archive/2005/June/23-333551.html> (view ed December 2006).

The SIWG recommends that the Parties undertake the following additional actions⁶¹ as part of the above recommendations (a) creation of a central repository and distribution system for relevant new climate change research; (b) creation of a central place for scientists to apply for research support for projects of Basin-wide significance; (c) creation of institutional discussion forums for providing input to national and international efforts that are planning new or enhanced remote sensing networks; and (d) the development of tools to support regional resource management decision making.

To effect these changes, the SIWG recommends that the Agreement be revised as follows:

1. The specific objectives in Annex I should be refined so that language related to temperature and thermal discharges provides a direct link to climate change.
2. Additional authority to address climate change should be made in the introductory language, in Article II, "Purpose," particularly subsection (c); in Articles III and IV; in Article VII, referencing the IJC; in Article X, subsections (b) and (c); and in Article XIII.
3. A new annex should be created dealing with climate change-related monitoring and research OR Annex 17, "Research and Development," and Annex 11, "Surveillance and Monitoring," should include specific authorities for joint climate change-related monitoring and research.

Specific Topics

Topic 1: Invasive Species

The Issue

One of the most significant threats to biodiversity, as captured in the SIWG's analyses, is the continued introduction of invasive species.⁶² The Great Lakes are being assaulted by ongoing introductions of invasive species and are suffering significant environmental and economic damages as a result. One mid-range estimate of the combined environmental and economic impacts of AIS in the Great Lakes Basin is \$5.68 billion, \$4.5 billion of which is related to impacts on commercial and sport fisheries.⁶³ As of 2006, at least 182 non-native AIS are established in the Great Lakes and an average of one new species is discovered every 28 weeks.⁶⁴

AIS cause many beneficial use impairments (BUIs). Some species affect water quality by concentrating toxins and releasing them back into the water column (e.g., Zebra and Quagga

⁶¹ Adapted from Alliance for the Great Lakes, et al, June 2006.

⁶² A group of SIWG members analyzed this issue using the step-wise approach as a pilot to inform the analyses of the larger themes. This section represents the results of that pilot plus supplementary reflection on the topic by the full SIWG.

⁶³ Institute of Water Resources, U.S. Army Corps of Engineers (prepared by Limno-Tech, Inc) *Nuisance Species in Freshwaters: Causes, Treatments, and Costs, a literature review. September 21, 2005.* p. 80.

⁶⁴ Ricciardi, Anthony. *Patterns of Invasion in the Laurentian Great Lakes in Relation to Changes in Vector Activity, Diversity and Distributions*, (Diversity Distribution). 2006.12 p. 425.

Mussels), and by increasing turbidity (e.g., Carp, Goby), which can re-suspend sediments. Species that selectively graze (e.g., Zebra Mussels) also increase water clarity, leading to algal blooms.

AIS are a leading cause of biodiversity loss in the Great Lakes. They degrade habitat, compete with native species for food and habitat, kill native and naturalized species, and “short circuit” food webs needed to maintain and rehabilitate biological resources. Impacts are realized more quickly than the scientific community can predict them, similar to historical examples of botulism, dead zones, water clearing, and reduction in forage base.

Invasives can also increase costs to industry and recreational interests in many ways, such as reducing flow rates in water intake pipes, rendering fishing gear useless, and impeding the performance of navigational markers, changing the mix of species, and impairing beaches.

AIS can themselves be considered biological pollutants, which not only create problems directly for the integrity of the Great Lakes, but exacerbate those problems because they reproduce and are generally able to withstand efforts to extirpate them.

AIS are invading through several vectors, including ships (ballast, no-ballast, sediment discharging, flushing, tank transfers, hull-fouling); home aquariums; in-migration through canals or diversions; intra-lake shipping and recreational boating; and aquaculture. While the SIWG focused its discussions on the threat from shipping discharges, which have been the source for many high-visibility invaders, the issue itself is broader, with considerations given to the ecological and economic impacts of introductions from all of these vectors.

Findings and Recommendations

In 2002, The U.S. General Accounting Office and Canada’s Auditor General agreed that, with regards to biodiversity, government has not responded adequately or prevented new introductions, and that there is no binational approach to address the issue, or single domestic agency that is charged with that responsibility.

Because AIS are a form of biological pollution, attention to this problem falls within the terms of the Boundary Waters Treaty. Strong bi-national attention and coordination is critical for any progress to control existing invasives and prevent new invaders. The SIWG agrees that further cooperation is needed to ensure adequate implementation of monitoring, compliance, and enforcement, for prevention of new invasions, as well as dealing with effects once a species is introduced. Such comprehensive cooperation is not occurring.

However, creating a new separate agreement is unnecessary because the GLWQA can serve as the organizing vehicle, if revised. Because AIS have known impacts on water quality and BUIs, they fall under the purview of the Agreement, but its broad mandate does not currently address AIS as stand-alone issues.⁶⁵ There is no discussion of prevention or control in either annex, and no discussion of any other vectors.

⁶⁵ It is mentioned only in two places: Annex 6.1.b, which raises the ship vector, and calls for study but not prevention or control, compliance or enforcement; and Annex 17.2.i, which mentions research.

To expect the Agreement to provide precise authority may be asking too much. Enforcement will not be possible under the Agreement and separate legislation will be needed. Still, the Agreement is the most legitimate means of leading a charge of such magnitude because of the role it has played in guiding Great Lakes agendas and legislation on both sides of the border. Binational coordination and uniformity are also key in any implementation of adequate controls and consistent enforcement for existing or future rules relating to all vectors. However, the authorities, direction, national legislation, and funding to undertake such activities will not occur without the overarching legitimacy and charge the Agreement can provide.

The SIWG therefore recommends the following:

1. A new annex to the Agreement should be created to address invasive species by establishing clear goals and accountability mechanisms.
2. Annex 11 should be amended to include AIS surveillance and monitoring.
3. The Agreement should take into account the goals,⁶⁶ milestones, and specific recommendations included in the Great Lakes Regional Collaboration Strategy and its Aquatic Invasive Species appendix.⁶⁷

Topic 2: Source Water Protection

The Issue

The Great Lakes are the drinking water source for tens of millions of people, and “fishable, swimmable, drinkable” has long been recognized as the encapsulation of a vision for the Lakes. Yet the Agreement does little to address the “drinkable” goal. Annex 2 lists “restrictions on drinking water consumption, or taste and odour problems” under the definition of beneficial use impairments. This definition omits such elements as source water safety, reliability, cost of treatment, sustainability, and public trust in the Great Lakes as source waters. The 1978 phosphorus load reduction supplement to Annex 3 sets a drinking water-related phosphorus target for only one bay (Saginaw Bay), on one of the Lakes (Huron)—and only to address a taste and odor problem. The Agreement is otherwise silent on protection of the Great Lakes as sources of drinking water.

The Great Lakes are generally reliable sources of drinking water, but acute waterborne disease outbreaks from microbial contamination have occurred (e.g., the 1993 *Cryptosporidium* incident that made 400,000 Milwaukee residents ill and caused numerous deaths, or the more recent *Cryptosporidium* outbreak in Collingwood, Ontario). Cyanobacterial blooms producing microcystins (hepatotoxins) have been attributed to the ecological effects of invasive species and nutrient loadings. Industrial activities, household product use, agricultural and urban land uses, sewage treatment plants, and combined sewer overflows all contribute to the loading of contaminants into the Lakes. The contaminant loading includes traditional parameters (e.g.,

⁶⁶ Such goals have precedence in the Agreement (e.g., the goal of “virtual elimination” of toxics)

⁶⁷ The Great Lakes Regional Collaboration, The Great Lakes Regional Collaboration Strategy and Appendix entitled “Aquatic Invasive Species” December, 2005. Available: <http://www.glr.us/strategy.html> (viewed November, 2006).

pathogens, pesticides) and substances of emerging concern (e.g., flame retardants, pharmaceuticals, and personal care products). As the Basin population grows, and as climate change creates additional pressures (more combined sewer overflows, possible increases in waterborne disease, water level impacts, etc.), the importance of planning for sustainable water supplies will grow as well.

Findings and Recommendations

Drinking water is the primary connection between the people of the Great Lakes region, and the waters of the Great Lakes Basin ecosystem. Source protection—protecting the Great Lakes as abundant, high-quality sources of drinking water—is the first barrier in a multi-barrier approach to drinking water protection.⁶⁸ Drinking water is an area where we can and must aim high.

Different jurisdictions around the Great Lakes have taken different approaches to source water protection. The Ontario framework focuses on locally-developed plans for managing threats to municipalities' drinking water sources, within the local watershed ("source protection area"). However, it also provides the provincial Minister of the Environment with powers to require that local plans address source water concerns at the broader scale of the Great Lakes.⁶⁹

The SIWG recommends the following

1. The Agreement should name source protection as one of its primary goals.
2. The Agreement should charge the Parties to set specific binational targets for source water protection. To accomplish this, the Parties must commit to the drinking water risk science and monitoring necessary to set science-based targets for reducing threats and impairments to the quality and reliability of Great Lakes waters. This science and monitoring should include an aggressive program to identify and address pathogens and contaminants of concern (both traditional and emerging).⁷⁰
3. The Agreement should commit the Parties to developing the overarching, Basin-scale framework within which the Parties will support local development and implementation of watershed-based source protection initiatives, recognizing that different approaches and goals may be appropriate for different areas and jurisdictions around the Basin.
4. The Agreement should commit the Parties to identifying innovative source water protection programs, and developing mechanisms for sharing best practices in source protection among Great Lakes Basin jurisdictions. The new Ontario source protection framework is one example of an approach linking local watershed-based action with Great Lakes protection.

⁶⁸ Some participants focused only on water quality issues. Others raised source water quantity concerns as well, such as protection of aquifer recharge.

⁶⁹ For example, the Minister can set Great Lakes targets for a regional or Basin-wide source water issue, and allocate local targets to the source protection areas. Source protection plans for watersheds within the Great Lakes Basin are also required to take larger-scale (federal/provincial) Great Lakes agreements into account, such as the Great Lakes Water Quality Agreement and the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem.

⁷⁰ Looking to the precautionary approach employed in some other jurisdictions, the science and monitoring program should assess the occurrence and impacts of endocrine disruptors, pharmaceuticals, and other parameters that are potentially bioactive at low concentrations.

The above recommendations reflect the prevailing view of the SIWG. A diverging view is that these recommendations are too prescriptive.

Topic 3: Cage Aquaculture

The Issue

Cage aquaculture is the practice of suspending cages in open water as a means of culturing fish. Many components of fish farming—feeding, fish feces deposition, and some types of medical treatment—take place in the body of water in which the cages are suspended. Currently, cage aquaculture operations in the Great Lakes Basin are almost exclusively limited to the Canadian side of Lake Huron, predominantly in Georgian Bay, the North Channel, and in embayments in eastern Manitoulin Island.⁷¹ The only species currently licensed for cage aquaculture (in Ontario) is Rainbow Trout, which is not native to the Great Lakes but has been established and maintained through Basin-wide stocking programs.

The impacts of cage aquaculture are not yet fully understood, but potential problems associated with Great Lakes cage aquaculture operations include:

- Fish waste and excess feed may result in localized elevations of nutrient concentrations, and, if the cage industry is improperly regulated, the wastes could contribute to eutrophication and other nutrient-related problems.⁷² For example, aquaculture operations in Georgian Bay are estimated to discharge of a total of 30 metric tonnes of phosphorus per year.⁷³
- The potential for disease outbreak can be increased in concentrated fish populations, such as in cages, possibly resulting in subsequent risk for pathogens to spread to free-swimming populations. However, there is little evidence that this is a problem in Basin; in almost all circumstances, the direction of disease transfer is from wild fish to cultured fish.⁷⁴
- Antibiotics in excess feed and fish excrement can be released to water.
- Undesirable genetic characteristics of cultured fish could be transferred to wild populations via cultured fish escapees,⁷⁵ which have genetic characteristics significantly different from those of their naturalized or wild counterparts.⁷⁶

⁷¹ There are presently nine commercial cage aquaculture sites operating within Lake Huron.

⁷² There are concerns that ammonia releases from aquaculture facilities could lead to “downstream” accumulation of nitrates [Pat Chow-Fraser, *Second International Symposium on the Lake Huron Ecosystem*, October 11-13, 2006].

⁷³ Personal communication from Dominique Bureau, University of Guelph, OMNR Fish Nutrition Research Lab to Lisa Miller-Dodd, OMNR, November 29, 2006.

⁷⁴ Personal communication from Richard Moccia, University of Guelph, via email on November 21, 2006, and from Doug Geiling and Cheryl Podemski, Fisheries and Oceans Canada, via email on December 4, 2006.

⁷⁵ For example, Georgian Bay cage aquaculture operations lost 233,000 fish in 2005 [OMNR, Lake Huron Management Unit, *Summary of escapes from cage aquaculture facilities into Lake Huron from 1999 to 2005*].

⁷⁶ Evidence to date from ongoing collaborative research investigating the ecological and genetic effects of cage aquaculture escapees in the Manitoulin Island area has documented two genetic groups that are significantly

Findings and Recommendations

At the moment, the Great Lakes cage aquaculture industry is of a scale and dispersion that does not appear to be causing significant effects other than localized waste deposits under and adjacent to cage aquaculture facilities.⁷⁷ Existing cage aquaculture operations in the Great Lakes Basin are not known to have caused far-field effects to water quality, there is no evidence of an Ontario operation transferring pathogens to wild or naturalized fish populations, and there is no evidence of problems caused by their use of antibiotics. However, the SIWG recognizes that cage aquaculture facilities in the wrong place and at the wrong scale can be a concern.

Currently, the Ontario Ministry of the Environment (OMOE) is reviewing its water quality monitoring protocols, and the Ontario Ministry of Natural Resources (OMNR) is developing an overall freshwater cage aquaculture policy.⁷⁸

The Agreement currently specifies phosphorus target loads of 600 metric tonnes per year for Georgian Bay, and 520 metric tonnes per year for the North Channel. Since data on current total phosphorus loadings are not readily accessible, it is unknown how the addition of cage aquaculture to the Great Lakes ecosystem fits in with this commitment. It is difficult to draw conclusions without further research and monitoring in order to assess all sources of nutrient loading to the Basin and corresponding long-term and long-range impacts to water quality.

The SIWG recommends the following regarding cage aquaculture:

1. The Agreement should include provisions for further research and monitoring in order to assess the contribution of nutrient loading and genetic transfers resulting from cage aquaculture in the Basin and corresponding long-term and long-range water quality and ecosystem impacts.
2. The Agreement should state as a goal that cage aquaculture be managed so that it has no negative impact on water quality immediately adjacent to the sites, based on lake background conditions.
3. The Agreement should specifically include references to cage aquaculture in Annex 3, "Control of Phosphorus," and Annex 13, "Pollution from Non-Point Sources," thereby expanding the Agreement's current approach to land-based agriculture to water-based

different from naturalized populations, but virtually no interbreeding with wild fish (< 2%) [Personal communication from Chris Wilson, Trent University, OMNR, to Lisa Miller-Dodd, OMNR, November 28, 2006].

⁷⁷ Studies have found sediment effects directly under and close under aquaculture cages but not extending outside the waterlots of the farms. Similarly, water quality is affected inside the fish farm but effects dissipate outside the water lot to an undetectable level. Nearby shorelines tend to be unaffected in terms of growth of attached algae that should appear given nutrient enrichment [Personal Communication from Murray Charlton, Environment Canada via email on November 14, 2006].

⁷⁸ New cage aquaculture license applications are currently guided by an interim review process that includes *Ontario Environmental Assessment Act* screening and public consultation. An updated review process coordinating requirements of all involved provincial and federal agencies is under development. OMNR's aquaculture interim license application process requires new applicants to complete an acceptable risk analysis of the potential ecological impact, including potential genetic impact, of the cultured species or stock on species in the receiving waters, and to outline the facility security requirements needed to mitigate risks.

sources.⁷⁹ Annex 8, “Discharges from Onshore and Offshore Facilities,” could also be expanded beyond a concern over discharges of harmful quantities of oil and hazardous polluting substances from off-shore facilities to include concerns related to cage aquaculture.

The SIWG discussed, but did not reach agreement on, the following two additional draft recommendations: First, for water bodies that do not currently meet their Agreement goal for total phosphorus loading, the Agreement could state as an objective that cage aquaculture operations in that water body contribute no more phosphorus than currently. Second, the Agreement could state as a goal that cage aquaculture be managed so that escapement approaches zero.

Conclusion

Today the waters of the Great Lakes Basin are facing threats from all of the issues described by the SIWG in this report. Each threat is different, but significant, and is either not addressed or not adequately addressed by the current Agreement. These issues deserve specific attention when considering any changes to the Agreement.

⁷⁹ The SIWG noted that in many respects cage aquaculture can be considered waterborne agriculture.

GREAT LAKES WATER QUALITY AGREEMENT GOVERNANCE AND INSTITUTIONS

Workshop Review Report to the ARC
By the Canadian and U.S. Convenors
January 31, 2007

The views expressed in this report are not necessarily the views of the Government of Canada or the Government of the United States of America, their Departments or Agencies, the States or Provinces or of any other organization or entity.

1. Executive Summary

“[Governance is the] complex art of steering multiple agencies, institutions, and systems which are both operationally autonomous from one another and structurally coupled through various forms of reciprocal interdependence”

Bob Jessop, 1999. *The Governance of Complexity and the Complexity of Governance*.
From G. Francis presentation to IJC WQB June 2005.

“The Great Lakes Water Quality Agreement is only words on paper; it takes people to get things done.”

Frank Ettawageshik, Tribes representative, at the Governance and Institutions Workshop

In April 2006, the Governments of Canada and the United States launched a review of the 1978 Great Lakes Water Quality Agreement (the Agreement), as amended by Protocol in 1987. This report, the *GREAT LAKES WATER QUALITY AGREEMENT GOVERNANCE AND INSTITUTIONS: Workshop Review Report*, has been prepared, at the request of the Governments, to provide independent opinions and advice to the Governments on governance and institutional provisions of the Agreement. This report has been prepared by two, independent Convenors—one from Canada and one from the U.S. – based on input from a group of experts from the Great Lakes region selected by the Governments.

As the primary event in this review, the Canadian and U.S. Convenors conducted a workshop on November 29-30, 2006, in Detroit, Michigan to review the governance and institutions aspects of the Agreement. In addition, the Convenors conducted telephone interviews with a few invitees who were unable to attend the workshop. This report contains a detailed summary of observations and discussions expressed during this process, and includes observations related to the roles and functions of key institutions relevant to the implementation of the Agreement, including the Binational Executive Committee, the International Joint Commission and the IJC’s Great Lakes Regional Office, the Water Quality Board, the Science Advisory Board, and the Council of Great Lakes Research Managers. The Convenors encourage members of the Agreement Review Committee (ARC) and other interested individuals to read the report in its entirety to appreciate the range of perspectives expressed by workshop and interview participants.

The Convenors observed that several themes, which appeared to capture the essence of what was discussed by several participants, emerged from the discussions. At the same time, a number of workshop participants suggested that the draft report would be more useful to the ARC and the Parties if an attempt were made to identify key themes from the discussions. It is important to note, however, that the process was not designed to forge consensus among the participants on any issue under this review and no explicit consensus was achieved. Therefore, any attempt to offer general observations and conclusions must be done with caution. Neither did this process allow for the evolution of collective thinking by the participants as had occurred in other Review Work Groups commissioned by the ARC. The Convenors have sought to balance the spirit of this limitation with the desire to advance as clear as possible a message to the ARC, in light of the process used to conduct this review. After consideration of the remarks made at the workshop, the Convenors proposed a set of themes for consideration by participants. These themes were discussed on a conference call in mid-January with participants, and participants were given an

opportunity to review them in the context of a draft Executive Summary. Key themes that emerged from this process are presented below.

First, most participants' observations focused on governance and institutional functions related to the Great Lakes Water Quality Agreement that could or should be improved. In some cases, participants offered specific suggestions for improving these functions. While the discussions did not focus on governance and institutional 'successes' under the Agreement, several were noted during the discussions. An underlying theme was that the future success of the Agreement hinges on the effectiveness of the governance and institutional framework that supports it, that this governance and institutional framework could and/or should be improved, and that the design of the governance and institutional framework will be influenced by the agreed upon scope and purpose of the Agreement.

Second, participants noted several 'signals' that contribute to a perceived "window of necessity" for seeking improvements in the effectiveness of governance and institutions related to the Agreement. These signals include:

- An awareness that while water quality in the Great Lakes overall has improved significantly since the signing of the Agreement in 1972, some water quality concerns are increasing in some lakes;
- A sense that the Agreement is ill-equipped to effectively accommodate contemporary and/or emerging issues such as invasive species and the impact of climate change on water quality;
- Perceptions by many that the community that coalesced around the existing Agreement has fragmented, undermining concerted action;
- A sense that governance functions as now being carried out by the Parties have weaker links and accountability to the Agreement, decreasing its effectiveness;
- An expansion of institutions and organizations in the Great Lakes basin with an interest in the Agreement increases the complexity of building relationships and makes coordination and effective engagement more difficult, especially in light of what the existing Agreement specifies in this regard;
- The absence of key implementers such as First Nations, Métis, and Tribes, and states, provinces, cities, and other local governments from the governance structure of the Agreement; and
- Perceptions of insufficient resources being devoted to implement the Agreement.

Third, participants identified several key attributes and functions that they believe to be important for the success and effectiveness of the Agreement and the governance and institutional framework supporting it. These attributes and functions include:

- The Agreement should serve as the "North Star" for the protection and restoration of water quality in the Great Lakes, providing a clear, high level vision that will function as a guide for concerted action;

- The Agreement should preserve the "binational" nature of governance and institutions related to the Agreement. This approach should recognize that Canada and the U.S. remain sovereign in the development and implementation of their respective programs, while emphasizing that the success of the Agreement demands that activities be undertaken in a collaborative and coordinated manner;
- Since this is an Agreement pursuant to the U.S.—Canada Boundary Waters Treaty, the International Joint Commission, which provides for equal representation from the two countries, should be maintained as an important binational mechanism in the governance and institutional framework of the Agreement;
- The Agreement should provide a 'continuous improvement framework' that fosters the means to achieve this vision that includes and is driven by routine assessments of (1) the state of the Great Lakes, (2) the state of programs being implemented to improve water quality in the Great Lakes, and (3) the state of progress towards achieving the goals and objectives of the Agreement;
- Accountability for achieving the goals and objectives of the Agreement, and accountability for implementation of programs and actions to achieve these goals and objectives, need to be clearly assigned, made transparent and become an essential component of the Agreement;
- Planning and implementation of programs and initiatives to achieve the goals and objectives of the Agreement should be under the leadership of the Parties, recognizing that they are directly responsible for their own planning and implementation of federal programs;
- The governance and institutional framework under the Agreement must provide for effective coordination and collaboration with other orders of government (e.g., States and Provinces, cities and municipalities, First Nations, Métis, and Tribes), to ensure that planning and implementation activities are aligned effectively to achieve the goals and objectives of the Agreement in a timely manner;
- Recognizing that industry, academia, NGOs, and the interested public have important contributions to make towards implementing the Agreement, the Parties should develop a governance and institutional framework, including action planning and decision-making processes and forums, that provides for more meaningful consultation, engagement, coordination, and collaboration;
- The Agreement should call for the Parties, in collaboration with other entities as appropriate, to develop action plans with specific goals, measurable objectives, and timelines, and to devote the requisite resources to implement these plans;
- The Parties should ensure senior-level representation from all orders of government and other interests in the basin, as appropriate, on binational and bilateral mechanisms that are focused on developing action plans and their implementation to achieve the Agreement's goals and objectives; and

- Mechanisms should be in place to provide for effective input of current, reliable science and observations from monitoring data to inform the design of national program components and their bilateral coordination.

The report explores these and other observations in greater detail, respecting the various viewpoints that were expressed in the workshop and phone interviews. The Introduction of the report describes the review process. The section on Governance summarizes governance needs and other observations. The Institutions section summarizes observations related to the key institutions relevant to implementation of the Agreement, and there is a brief section exploring Information Exchange and Institutional Relationships. The final section summarizes discussions on Options for Alternative Governance and Institutional Models.

The Convenors took great care in attempting to convey in this report to the ARC what the participants actually expressed and not to either overreach in portraying convergence of views or to insert their own perspectives on these critical issues. Any failure to do so is the fault of the Convenors, not of any participant.

2. Introduction

In April 2006, the Governments of the United States and Canada launched a review of the 1978 Great Lakes Water Quality Agreement (GLWQA, or the Agreement), as amended by Protocol in 1987. This report has been prepared, at the request of the Governments, to provide independent opinions and advice to the Governments on governance and institutional provisions of the Agreement. The report has been prepared by two, independent Convenors—one from Canada (Tony Clarke) and one from the U.S. (Bill Ross)—based on input from a group of stakeholders and experts from the Great Lakes region.

As the primary event in this review, the Canadian and U.S. Convenors conducted a workshop on November 29-30, 2006, in Detroit, Michigan to review the governance and institutions aspects of the Agreement. Thirty-three persons, representing governmental agencies, major stakeholders and key implementors in the basin, participated in the 2-day workshop. Invitees to the workshop were selected by the Parties (represented by Environment Canada and the U.S. Environmental Protection Agency's Great Lakes National Program Office) to ensure balanced representation of experts and stakeholders from the two countries and across sectors. In order to let the invitees express their opinions with candour, the representatives of the Parties were not active participants in the workshop. Representatives from the International Joint Commission (IJC) attended the workshop as observers and as sources of information on the work of the IJC under the GLWQA. Those persons who were invited to attend, but were unable to do so, were offered the opportunity of a telephone interview with the Convenors of the workshop, and three persons availed themselves of this opportunity. The list of persons who attended the workshop, including those interviewed over the telephone, is appended (Appendix V).

Workshop participants and those interviewed over the telephone were supplied with a series of suggested questions (Appendix IV) to help them prepare for the workshop. No attempt was made by the Convenors to seek consensus of workshop participants on any issue and no explicit consensus was achieved. Ground rules for the workshop were established to ensure the free and fair flow of discussion. Participants currently employed by or affiliated with any of the institutions addressed in the review were asked to sit as observers and/or serve as resource people—to only answer questions of fact for clarification purposes when asked to do so—during the sessions that focused on those institutions in which they are currently employed or affiliated. It should be noted that several participants were previously employed by or affiliated with these institutions in their professional career and were invited because of their past experience and expertise in matters related to the Agreement.

Although written by the Convenors, this report is a compilation and aggregation of the views of those who attended the workshop (hereafter described as “participants,” excluding those described above as observers) and from the telephone interviews. The Convenors have actively sought to ensure that this report reflects the views of the participants and those interviewed over the telephone and not the views of the Convenors. It should be noted that much of the content of this report reflects observations made by participants as part of this process. The Convenors have not attempted to “fact check” or assess the validity of all statements, although the comment process on the draft of this report was useful for identifying and correcting factual errors. It should also be noted that observations made during telephone interviews may not have also been discussed during the workshop, and many issues that were brought up at the workshop by one

participant were not fully discussed or debated by other participants. Given that workshop participants did not have an opportunity to hear comments made during the telephone interviews, the Convenors have sought to note comments that were uniquely made during the telephone interviews with footnotes in this report. Thus, the Convenors have taken great care to not ‘overreach’ in portraying any potential convergence of views coming from this process.

This report includes four major sections. First, the report summarizes key thematic areas related to governance that the Convenors have drawn from the discussion. Second, the report summarizes the review comments related to specific institutions associated with the Agreement. Third, the report summarizes discussions related to the submission and exchange of information, as well as the relationships between institutions relevant to the Agreement. Fourth, the report summarizes options for improving governance and institutional aspects associated with the Agreement, including perspectives on alternate models of governance and institutions. Several appendices are also attached to this report, including an appendix (Appendix I) that includes additional observations made by participants—deemed by the Convenors to be largely peripheral to this review—that may not be explicitly incorporated into the main body of the report.

3. Governance

Overview

This section presents key governance issues that emerged from the workshop and interview discussions. In general, the issues discussed in this section were articulated as governance *needs* which must receive attention to ensure the continued relevancy and effectiveness of the Agreement.

A strong undercurrent in the discussions on governance issues related to the Agreement was that *change is needed*. Participants cited a variety of reasons that emphasized that this current review of the Agreement by the Parties is a critical “window of necessity” for addressing the key governance needs discussed in this section. Key ‘signals’ driving the sense of urgency around addressing governance and institutional aspects of the Agreement are listed in the box to the right. While there appeared to be considerable convergence in the discussions around the key governance needs described in this section, views on how to address these needs ranged widely. Many of these perspectives are summarized later in this report.

Key governance issues and needs include:

1. Scope and Purpose of the Agreement

Participants at the workshop indicated that any review of governance and institutions (G&I) is influenced by what is defined to be the scope and purpose of the Agreement. Participants noted that interpretation of the scope of the Great Lakes Water Quality Agreement differs among the various stakeholders in the basin. In particular, perspectives differ on the interpretation of an “ecosystem approach”, an issue that has been debated by other Review Work Groups commissioned by the ARC. Since the review of the scope and purpose of the Agreement has been taken up by another work group, the Convenors suggested that the workshop should not spend much time on this topic;

Signals Contributing to Perceived “Window of Necessity” for Improving GLWQA Governance

- > An awareness that while water quality in the Great Lakes overall has improved significantly since the signing of the Agreement in 1972, some water quality concerns are increasing in some lakes;
- > A sense that the Agreement is ill-equipped to effectively accommodate contemporary and/or emerging issues such as invasive species and the impact of climate change on water quality;
- > Perceptions by many that the community that coalesced around the Agreement has fragmented, undermining concerted action;
- > A sense that governance functions as now being carried out by the Parties have weaker links and accountability to the Agreement, decreasing its effectiveness;
- > An expansion of institutions and organizations in the Great Lakes basin increases the complexity and makes coordination and effective engagement more difficult, especially in light of what the existing Agreement specifies in this regard;
- > The absence of key implementers such as First Nations, Métis, and Tribes, and state, provincial, and local governments from the governance structure of the Agreement; and
- > Perceptions of insufficient resources being devoted to implement the Agreement.

nevertheless, observations by participants on scope and purpose are recorded below.

Several participants stated that it is important to understand the objectives to be accomplished through the Agreement before designing the G&I response to meet those objectives. They acknowledged that clear, measurable statements of the objectives of the Agreement are important to guide the efforts of both countries—such that the two sovereign countries can work towards the agreed-upon objectives in different ways, if they wish, as was successfully done on reducing phosphorus loadings to the Great Lakes basin in the early stages of implementation of the 1972 Agreement.

One participant observed that the scope and purpose of the Agreement was never just about water quality—and considers the scope to be inclusive of other factors that impact water quality, such as land use practices in the basin and the long range transport of air pollution into the basin. Moreover, as the Agreement calls for an ecosystem approach to be applied in its implementation, programs need to be geared towards “sustainability”; that is, achieving the goal of sustainable functioning and use of the Great Lakes Ecosystem in addition to restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. On the other hand, another participant observed that the scope of the Agreement and the approach to implementation were interpreted by some to be more complex than was originally intended by the Parties.

Several participants indicated that they would like to see a new or revised Agreement function as a “North Star” or beacon, broad in content, holistic and flexible in approach, with an inspirational vision and common aspirational goals and objectives. Such an Agreement could serve as a high-level guidance document for all organizations operating in the basin. Some participants indicated that such a revised or new Agreement should be uncluttered by too many specifics or details. At the same time, the suggestion to reduce specifics and remove the Annexes in a new or revised Agreement was a concern for other participants. They feared this would undermine commitments and continuity of effort if there were no specific requirements or mechanism(s) identified in a new or revised Agreement for developing a clear set of measurable objectives that could be assigned to accountable parties.

Within the broader concept of scope and purpose of the Agreement, participants did note that the key issues and challenges in the Great Lakes basin have changed and are continuing to change (e.g., phosphorus in the 1970s, contaminants in the 1980s, and invasive species in the 1990s). Many participants believe that the current governance and institutional framework is neither receptive nor flexible enough to address changing priorities and emerging issues on a timely basis.

Many participants view the ecosystem approach as an important concept that needs to be referenced in the scope and purpose of the Agreement. As issues in the Great Lakes Basin Ecosystem become more complex over time, the Parties and other institutions appear to some to having increasing difficulty in incorporating the proper mechanisms into the governance structure of the Agreement to implement the ecosystem approach. As mentioned above, this speaks to the lack of flexibility in the governance and institutions framework of the Agreement and the inability to engage fully those partners who can make a difference in implementing this approach.

2. Spirit of the Agreement

Most participants identified the vital need to retain and reinvigorate two important dimensions of the Agreement. First, participants discussed the importance of having the governance framework reflect and support the binational nature of the Agreement, while at the same time several participants urged that the Agreement be expanded to include Tribes, Métis, and First Nations. The equal footing given to both Parties by the Agreement—Canada and the United States—was cited as an important component of past successes of the Agreement. At the same time, implementation of the Agreement must recognize the sovereignty of the Parties to accomplish their responsibilities in the manner that works best for each Party. This idea that the Agreement was bi-national in direction, but bi-lateral in implementation was a key view that often unified participants' perspectives and occasionally separated them. Second, many participants resonated with the importance of the Agreement retaining and invigorating a “responsibility-based” approach to protecting and sustaining the Great Lakes Basin Ecosystem in which the responsibilities of all partners are clearly stated -- as opposed to a “rights-based” approach in which the interests of competing stakeholders are delineated and optimized. As articulated by some participants, those with the power to make decisions and to spend money under the Agreement should be guided in their actions by a third “wheel” or spiritual value, namely, that the Great Lakes Basin Ecosystem is a part of Mother Earth, life itself, of which we humans are but one element with a responsibility to protect, while utilizing, the ecosystem for all species, for generations to come.

3. Aligning Priorities and Resources for Effective Implementation

The performance of all orders of government in implementing the Agreement, including its Annexes, is a source of frustration and concern for many in the Great Lakes community. Several participants pointed out that, in some cases, the priorities of governments for action in the Great Lakes may not always be consistent with the priorities and goals identified in the Agreement. The level of funding for implementing programs was a key recurring concern and reflects the perceived decreasing priority and commitment being given by governments, and in particular by the Parties, to the Great Lakes in recent years. Several participants noted that without adequate budgets, the job required to implement the Agreement cannot be done regardless of how well the G&I framework of the Agreement is structured; priorities for action under the Agreement need to be more closely aligned with the explicit priorities of governments in order to lever the resources and support necessary for successful implementation. Indeed, some participants argued that governments should take more account of goals under the Agreement in setting their priorities for action in the Basin. Participants recognized that concerted action by the Great Lakes community is needed to ensure that implementation of the Agreement is viewed as a continuing national priority by the Governments of Canada and the U.S.

On the U.S. side, the Great Lakes Regional Collaboration initiative provides an opportunity to the Great Lakes community to enhance the political profile of the Great Lakes. In addition, participants suggested that referencing the Agreement in domestic legislation on both sides of the border may also raise the priority being given to the Great Lakes. (It was noted that the Agreement is already mentioned in the U.S. Clean Water Act.)

The Binational Executive Committee (BEC), on behalf of the Parties, was created in 1992/1993 to provide the leadership and coordination necessary for implementing the Agreement. Some

participants expressed concern that decisions of the BEC and then of the Parties have not always translated into effective implementation “on the ground.” Several participants believe that implementation of the Agreement can be improved if there is an *explicit commitment in the governance of the Agreement* to the establishment of integrated action plans, particularly on the tasks outlined in the Annexes. For those participants who favor a “North Star” type of Agreement that is uncluttered with details (mentioned previously), these action plans would derive from the Agreement but not be a part of the Agreement. Some participants indicated that these action plans should spell out explicit measurable goals and objectives; develop measurable indicators of successful implementation; describe specific tasks, resources and timelines to meet those goals and objectives; identify those responsible for implementing the various tasks; require a periodic review to evaluate progress; and have a process to make the necessary modifications to fix any problems, update the plans, and improve reporting on progress, such that this cycle of continuous improvement and adaptive management can be repeated indefinitely. Such a coordinated approach to implementation would improve and clarify accountability for performance in meeting targets. In so doing, the toolbox for implementing the Agreement would need to be continually reassessed in light of changing circumstances, and the Agreement’s goals and anticipated outcomes would need to evolve through periodic revisions.

Some participants pointed out that the Agreement provides the context for partnership and cooperation. Several participants found the idea of a binational action plan to drive implementation of the Agreement, as recommended by the IJC in its special report to the Parties, to be intriguing.

As new threats to the Great Lakes Basin Ecosystem arise—such as those posed by invasive species, endocrine disrupting chemicals, and climate change—several participants believe that the Parties seem unable to (a) implement an ecosystem approach in dealing quickly and effectively with these issues as they impact public health, fisheries and other forms of life and (b) recognize progress on completion of work on existing programs and reallocate resources accordingly. One participant observed that the Lake Erie initiative is an example where there was a rapid response by the Parties to new threats. Nevertheless, many participants want to see a more flexible governance framework that can allow governments to react quickly to these threats.

4. Improving Accountability for Results

Participants viewed accountability for delivering on commitments as an important aspect of governance. While participants generally accepted that the Parties are ultimately accountable for results, some participants thought that the mechanisms for publicly and periodically accounting for the progress relevant to the commitments of the Agreement are weak and need improvement. Participants observed that there appears to be no requirement of the Parties to conduct regular comprehensive reporting on progress towards achieving the general or specific objectives of the Agreement, although Article VII.3 of the Agreement requires the IJC to make a full report at least biennially concerning progress toward the achievement of General and Specific Objectives of the Agreement. With no explicit commitment to targets and time lines, the Parties could be seen as “not being out of compliance” in terms of meeting their commitments, even if there was little progress on implementing programs and activities that achieved real environmental results.

Participants discussed the critical need for assessment and reporting in three areas: (1) environmental conditions related to the “State of the Lakes”, (2) the performance of programs being implemented to achieve desired outcomes, and (3) progress towards implementing the provisions of the Agreement. Results from these assessments should be used to inform and adjust, when appropriate, objectives, targets, and action plans associated with the Agreement.

Many workshop attendees believe the accountability provisions to be sufficient and clear in that the Parties are to be held to account for their commitments in the Agreement. Pursuant to the 1909 Boundary Waters Treaty, boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other, and each Party is accountable to the other to ensure that this does not occur. The Parties are, therefore, accountable as signatories to the Agreement for ensuring that the goals and objectives of the Agreement are achieved.

Other participants stated, however, that the accountability provisions in the Agreement are not sufficient to ensure that the Parties are publicly and periodically held to account for the commitments made in the Agreement. Apart from delivering on commitments that fall directly within the federal mandates of both countries, given that much of the implementation of the Agreement occurs at the state, provincial, and municipal orders of government, most participants expressed the view that the Parties have an obligation to consult and meaningfully involve these orders of government. This obligation also extends to Aboriginal peoples.⁸⁰ This engagement has not been well executed and because so many jurisdictions and agencies are involved in some aspect of implementation, many participants want to see improved planning, coordinating and management *processes and mechanisms* included in the Agreement to enable preparation and implementation of the integrated action plans necessary to deliver results.

Some claim that differing interpretations of the scope of the Agreement make it more difficult to determine where accountability for delivering results should rest within the governance and institutional framework. This is particularly relevant given that the lead agencies for each of the Parties—Environment Canada and the U.S. Environmental Protection Agency—are not the only federal agencies that are relevant to the effective implementation of the Agreement. It was noted that these lead agencies do not necessarily have strong leverage over other federal agencies to hold

⁸⁰ Aboriginal Peoples include First Nations, Tribes, and Métis.

them accountable. Without strong executive branch or congressional or parliamentary leadership, accountability mechanisms can be fragmented and weak. One participant sees the Agreement as fundamentally flawed and a major impediment to progress in that there are too many institutions and nobody appears to be in charge⁸¹.

Regarding the question of whether municipal governments and cities should be included in the accountability provisions of the Agreement, some participants thought that this should be done only through the states and provinces, others thought they should have their own standing in the Agreement. A number of participants believed that Aboriginal peoples should be dealt with directly in the Agreement.

The Great Lakes Water Quality Agreement is not a treaty as the term is used in the U.S. Constitution, but both countries recognize the Agreement as legally binding in public international law. Moreover, although neither country has enacted a comprehensive statute to incorporate the Agreement into domestic law, both countries have legislation related to obligations undertaken in the Agreement.

As an aside, one participant remarked that public interest groups typically reject the dilution of legislative, public good protection mandates by means of economic imperatives, for example, by applying unaccountable guidelines and policies emphasizing “efficiency”, “competitiveness” and “cost-benefit analysis” to the implementation of legislation, including regulations. The participant noted that such specific provisions make it difficult to hold those implementing legislation or regulations to account for their performance.

5. Engaging and Coordinating Other Orders of Government, Agencies, and Institutions

Participants agreed on the need for wider and deeper engagement and involvement by all orders of government in the implementation of the Agreement. There are a number of organizations in the Great Lakes basin doing work in the basin in a manner that is consistent with the aims of the Agreement, including the application of an the ecosystem approach in their programs and activities. The Great Lakes Fishery Commission was identified as one such institution. Many participants noted that stronger effort at the federal level in Canada and the U.S. is required to engage and coordinate with other agencies and partners. One participant observed that the Agreement is ill-equipped or has been unable to respond to a rapidly changing institutional environment—an environment that has become more complex and where the roles of the various orders of government have changed and are still changing. The participant pointed out that, in Canada, federal and provincial governments are becoming much more policy oriented and ‘enabling’ in nature, and less “doers” on environmental issues. Many participants noted that on both sides of the border, key players are missing from active participation in the implementation of the Agreement, including as cities and Aboriginal peoples. It was suggested that organizations

⁸¹ Convenors note: This last statement was not debated at the workshop. In responding to the draft report, one participant expressed uncertainty over how to interpret this comment. The participant indicated that, for example, Environment Canada cannot realistically be responsible for delivering on the mandate of the Canadian Department of Fisheries and Oceans (DFO). The same is true for U.S. EPA, the Fish and Wildlife Service and others in the U.S. Inevitably, there is a need for one Department to lead with a mechanism to ensure other Departments do not minimize their involvement. The participant indicated that if a new or revised Agreement were to be seen as an Environment Canada’s Agreement in Canada then the other Departments and government interests would surely fade into the mist to an even greater extent.

such as the Council of Great Lakes Governors, the Great Lakes Commission, and the Great Lakes and St. Lawrence Cities Initiative could also be helpful in more formally implementing the Agreement. Since vacuums are abhorred when a need is not being met, organizations tend to move in to meet the need. Many participants indicated it is better to harness that energy in the Agreement than not. A more flexible governance and institutional framework under the Agreement would, therefore, provide a more receptive environment for engaging these partners.

6. Involving Aboriginal Peoples

Several participants identified the need to strengthen opportunities for involvement of Aboriginal peoples in the governance and implementation activities associated with the Agreement. Aboriginal peoples expressed difficulty getting into the Agreement process to provide their input and advice. As a consequence, they claim that many of the real issues of concern to them in the Great Lakes basin are not being addressed—for example, the smuggling of drugs, cigarettes, and alcohol and the dumping of these substances into the lakes on occasion have not been addressed under the Agreement despite its impact on water quality. One participant stressed that the human health concerns for his people were paramount; they utilize fish and wildlife for food more so than any other population group and contamination in the Great Lakes from activities of this modern society have affected not only the Great Lakes ecosystem but also those ecosystems adjacent to it. The migratory populations of animals and birds that cross over the watersheds are contaminated and Aboriginal peoples are harmed by this contamination. The participant stated that these ecosystem and human health effects are not addressed in a meaningful manner by the Agreement, nor have there been adequate studies to address this issue of the health of Aboriginal peoples. Aboriginal participants also identified a limited capacity to participate in Agreement-related activities when opportunities arise due to resource and staffing constraints.

Several participants noted that Aboriginal peoples have valuable and unique perspectives to offer which can complement and enhance efforts to determine and achieve the goals and objectives of the Agreement.

7. Engaging and Consulting with the Public

Participants identified the need to develop more meaningful and transparent mechanisms for engaging and seeking input from the public, including stakeholder organizations such as non-governmental organizations and industry. Several participants indicated that the governance structure, decision-making processes, and accountability provisions associated with the Agreement that are currently in place are unclear and essentially inaccessible to the public. Avenues for public comment are not well defined, and there is often insufficient access to information for effective consultation with the public.

One participant pointed out that the programs on both sides of the border to achieve the phosphorus objective in the Agreement were successful, including from a public engagement and consultation perspective. Implementing the Virtual Elimination/Zero Discharge objective was a more complex challenge. The RAP process, conceived to involve local stakeholders, to assist in the remediation of Areas of Concern (AOCs) was inconsistent and failed although the “impairment of use” concept was an attempt to set specific measurable targets. Some participants noted that the IJC watershed management process, with its emphasis on engaging watershed

interests, should be adopted and supported because it is now delivering results that the RAP process was meant to achieve.

8. Relationships for Effective Governance and Collaboration

There was a consistent view among participants that coordinative and collaborative relationships need to be improved between the key institutions associated with the Agreement, and between these institutions and other institutions inside and outside the basin. Closer relations would encourage activities of all major players in the basin to be in tune with, and supportive of, the goals and objectives of the Agreement. In addition, participants cited the need to improve relationships with the governance and institutional structures that have been established for other international agreements that are relevant to the Great Lakes and the Water Quality Agreement.

To achieve this end, one participant stated that the Agreement needs to provide a vision that encourages other institutions, such as the Great Lakes Fishery Commission (GLFC) and the Council of Great Lakes Governors regarding the Great Lakes Charter Annex, to embrace and integrate aspects of the Agreement into their own structures, laws, and programs on both sides of the border. Sustainability in the management of fisheries and water resources are examples of explicit objectives within an ecosystem approach consistent with the Agreement. An example of where this is beginning to occur is the GLFC's Council of Lake Committees (State, Tribes, and Ontario) which is committed to an "ecosystem approach" through commitment to the Joint Strategic Great Lakes Fisheries Management Plan. This plan actively integrates fish community plans and management actions (e.g. monitoring, science, policy), and includes the state of reporting with GLWQA-related activities such as Lake-wide Management Plans (LaMPs), Remedial Action Plans (RAPs) and State of the Lakes Environment Conference (SOLEC).

4. Institutions

Overview

This section summarizes discussions and observations related to the review of specific institutions associated with implementation of the Agreement. Overall, there was a sense that the Parties and the BEC are responsible, in large part, for any inadequate implementation of the Agreement. Many participants indicated there are too many institutions involved with implementing the Agreement, several of which have mandates and roles that need to be clarified and/or strengthened; peopled by members at not a sufficiently senior level; and not working closely enough together to be as effective as they can be. As multiple interests are involved, the challenge is how to provide for and then manage their involvement and in so doing strong leadership is required.

Binational Executive Committee (BEC)

Much of the dissatisfaction expressed at the workshop on the progress achieved in implementing the Agreement was focused upon the role and functions assigned to the BEC—described by one participant as a “discussion forum”, not a decision-making forum.

BEC Purpose: The creation of the BEC was prompted by the requirement in the Agreement for the Parties to meet twice each year to coordinate their respective work plans with regard to the implementation of the Agreement and to evaluate progress made (Article X.3). The BEC reaffirmed the responsibility of the Parties for implementation and reporting. In 1991, the IJC’s role was confirmed as being an advisor to the Parties and an evaluator of the performance of the Parties in implementing the Agreement (as spelled out in the 1991 report of the IJC to the Parties). As a consequence, the binational approach of the IJC on reporting on progress was replaced by the bilateral approach of the BEC, a change that is not viewed positively by many participants.

Mandate and Authority of the BEC: In the early stages of the BEC, some participants perceived no limitation on its mandate. As issues emerged over time, however, it became clear that where priorities or issues associated with implementing the Agreement were closer to the mandates of Environment Canada and EPA (the co-chairs of the BEC), it was easier to get things done. When issues expanded, however, to areas outside of the mandates of these two agencies (e.g., invasive species, commercial shipping, fisheries, and public health) it became obvious that the BEC’s authority was limited and ‘persuasion’ was the main tool to make things happen on these issues. The BEC has no authority to *ensure* coordination and integration of action plans of the various federal agencies, hence its challenge is to provide the leadership to make this happen. It was observed that in any revised or new Agreement, because of the multitude of partners on the Great Lakes, the mandate, authority and role of the BEC or any similar institution may not dramatically change; hence leadership, persuasion and coordination will still be of paramount importance in accomplishing the broad range of actions needed for successful implementation.

The BEC Process: The Parties established the BEC, in part, to provide the leadership required for achieving the goals and objectives of the Agreement. The mandate of BEC is focused on

implementation of the Agreement—by engaging the many stakeholders in the basin, encouraging greater collaboration of effort and helping to coordinate the programs and actions required to clean up the lakes. Many participants stated that the BEC's leadership was found to be “wanting” in all of these areas. As the BEC members appear to have little or no authority or accountability to deliver results in areas outside of their direct control or management, a significant decrease in public confidence and participation occurred on many fronts, particularly at the local level in the Remedial Action Plan (RAP) process.

Many stakeholders also want a more open and transparent process. Some participants noted that the level of participation by states in the BEC in helping to implement the Agreement is inadequate. It was suggested that this may be a result of funding and travel constraints, as opposed to an indication of interest or commitment. Cities, and more broadly, municipal and local governments, have an important role to play in helping to achieve the objectives of the Agreement and need to be much more involved. Citizen groups are also interested in participating in the BEC process to help influence priorities for action. Aboriginal peoples also want meaningful involvement. At the same time, it was pointed out that there is an inherent conflict between being open and transparent and making BEC more effective, in that one of the criticisms is that there are too many members, participants, and observers. One participant thinks the work of the BEC was compromised when its meetings became open to the public because it is difficult to operate in a fishbowl where everything gets reported, possibly embellished, dismissed, etc. In the view of this participant, the Parties need an opportunity to roll up their sleeves and hammer stuff out “in camera” on occasion and then present and discuss it with a broader audience—in the end, they are the ones who will be held accountable for progress.

Impact of the BEC: Some participants see the creation of the BEC after the 1987 Protocol as one factor contributing to the “withering” of the processes of the Agreement, in that this development led to less accountability on the part of the Parties, less involvement by the NGOs and public, and a decline in the influence of the Agreement on the political agenda in both countries. One participant argued, however, that the driving factor here was the decline of the Great Lakes as a priority for either country. In any event, another participant said that very little was accomplished by the BEC, although it did help the Parties stay connected. Others noted that the BEC has had some success in setting priorities, coordinating voluntary initiatives, getting Stage 1 of the Lake-wide Management Plans (LaMPs) completed, and launching the Binational Toxics Strategy and the State of the Lakes Ecosystem Conference (SOLEC).

Many participants noted that SOLEC filled an important gap with regard to routine reporting on outcomes, the “State of the Lakes.” Some participants indicated that SOLEC meetings provide an important opportunity for members of the Great Lakes community to meet and share information. It was noted that the addition of a fee for SOLEC meetings has discouraged participation by environmental non-governmental organizations, Aboriginal peoples, and others. Some participants, however, perceive SOLEC as an initiative that has contributed to a shift in reporting away from progress on implementation of the Agreement towards progress on a suite of environmental indicators concerning the state of health of the lakes. Some participants observed that there are far too many indicators, of which far too few are measurable, with no plans by the Parties to set and achieve goals related to these indicators. Other workshop participants think that the Parties, through SOLEC, are making a good effort to meet their

reporting obligations and that the IJC should be more supportive of the initiative. Most participants indicated that some mechanism for routinely assessing the “State of the Lakes” is an essential component of efforts to implement the Agreement.

Article X of the Agreement stipulates that, following receipt of reports submitted to the Parties by the IJC, the Parties shall consult on the recommendations in such reports and shall consider such action as may be appropriate. The Parties have generally taken a long time to respond to the IJC reports and one participant said that the BEC has never really used, or related to, the IJC reports.

Membership of the BEC: Some workshop attendees stated that the Great Lakes have declined as a priority of governments in recent times as reflected in the decreased level of participation by senior personnel in institutional arrangements/processes such as the BEC and the Parties’ inadequate funding for implementing the Agreement. A view was expressed that priorities for action on the Great Lakes have to be better aligned with the real priorities of the governments in the basin in order to improve implementation and get more senior people back onto the committees and boards of the Agreement. One participant added that priorities of the governments for action in the Great Lakes may not always be consistent with priorities and goals identified in the Agreement. The participant indicated that in some cases, the governments may need to take more account of goals under the Agreement in setting their priorities for action.

International Joint Commission (IJC)

The International Joint Commission was established by the Boundary Waters Treaty of 1909 and has been given a reference under Article 1X of that treaty and Article VII of the Great Lakes Water Quality Agreement to assist in the implementation of this Agreement and to assess and provide advice and recommendations regarding the effectiveness of the programs and other measures undertaken pursuant to the Agreement.

For purposes of clarity, therefore, the IJC is not an institution created by the Agreement; it is, however, a binational institution that is referenced in the Agreement and it does have powers, responsibilities and functions in assisting in the implementation of the Agreement. It falls, therefore, within the scope of the G&I review of the Agreement.

Most participants acknowledged that the IJC has an important role in the G&I framework of the Agreement. However, several participants stated that the IJC could improve how it carries out its “oversight” role as described in Articles VII and VIII of the Agreement. These participants see the “oversight” function of the IJC in assessing the progress made by the Parties towards implementation of the Agreement as essential and arising from the Boundary Waters Treaty. They state that the assessments are useful but should be at a high level of determining progress towards achieving goals and objectives while staying away from too much detail. These participants also think that the IJC should focus more broadly on helping to identify and address emerging stressors to the basin ecosystem. They view criticism by the IJC in its assessment of the progress made on implementation by the Parties as appropriate, when deserved.

A few participants, however, expressed a lack of confidence in the IJC and saw little or no value in IJC involvement in the governance and institutional framework of the Agreement. This arose, in part, from their perception that the IJC connotes an aura of “regional governance”, a concept that appears, in their view, to be inconsistent with each Party’s sovereign rights to implement the

Agreement as it sees fit, even as the Parties are free to choose and implement their own programs to achieve an objective, as was done for phosphorous. In response, several participants underlined the important role of the IJC in the Agreement; are concerned that parity between the two nations in the G&I framework of the Agreement be maintained; and would like the institutions referenced in the Agreement to be more binational, and less bilateral, in nature.

Some participants believe that the process that informs the IJC's biennial report and its recommendations to the Parties can be improved. In the past, the reports of the Agreement boards were discussed at biennial meetings and public input received on the advice and recommendations of the boards to the IJC. In recent times, the reports of the boards have not come out in advance of the biennial meeting and the meeting is not structured to enhance public discussion and input. Since the biennial report is one means by which the IJC fulfills its function of reporting on progress by the Parties in implementing the Agreement, and the report is seen as one measure of accountability of the Parties, some participants want the process for preparing the Commission's Biennial Report to be more transparent and inclusive.

Some participants believed that the IJC's interest in the work and recommendations of the Agreement's joint boards has been varied, and the IJC's acceptance of advice and recommendations from the boards is mixed. Indeed, some participants perceive that the IJC does not pay enough attention to the advice of the boards in producing its biennial reports to the Parties. One participant pointed out that some of the IJC recommendations in these reports have led to loss of credibility in, and diminution of the status of, the institution in the eyes of some stakeholders. Others felt, however, that the high quality of IJC biennial reports is related to the quality of advice from boards' members, which in turn reflects the amount of effort the Parties, provinces and states put into nominating qualified people to sit on the boards.

Section 6 of Article VII of the Agreement states that "the Commission shall also ensure liaison and coordination between the institutions established under the Agreement and other institutions which may address concerns relevant to the Great Lakes Basin Ecosystem. ..." Some participants interpret this section to mean that the IJC was intended to help facilitate the use of the ecosystem approach. One participant stated that he had expected the ecosystem approach to be more vigorously pursued by the IJC through other agencies but was hopeful that the watershed initiative of the IJC along the Canada-US border, including the Great Lakes basin, would be helpful in this regard as it unfolds.

IJC Great Lakes Regional Office (GLRO)

The GLRO is a binational institution created by the Parties under the Agreement and, according to its Terms of Reference, supports the work of the Agreement's joint boards and provides a public information function.

For many years, the GLRO has been under the direction of the IJC (as opposed to the joint boards) and at the present time, the Director of the GLRO reports through the two secretaries of the IJC's Washington and Ottawa Section offices to the Commissioners. Participants suggested that this has occurred for a number of reasons, including that the Parties increasingly did not hold the GLRO staff accountable for their actions in the 1980s and 1990s, and so the IJC determined that closer supervision was required. Some participants believe that this new relationship has adversely affected the operations of the GLRO in that it is no longer able to effectively carry out

its functions as intended in its Terms of Reference. In particular, these participants cited the GLRO's public information function, and that the GLRO has become isolated from other parts of the IJC and the Parties at a time when greater integration is required.

While there was a sentiment among some workshop participants that the GLRO could be eliminated, many others disagreed. One participant viewed the GLRO as the technical arm of the IJC with respect to the IJC's Agreement functions, and believed it would be a mistake to move its functions to the Section offices in Washington and Ottawa and out of the Great Lakes basin, if this were being considered. Several participants suggested that the Parties should conduct independent audit of the GLRO to determine whether it is fulfilling the expectations of the Parties, and if not, what needs to be done to "fix" the situation. One participant⁸² suggested that the GLRO should be oriented away from just the Great Lakes basin to include the entire Canada-US boundary region.

Water Quality Board (WQB)

Since the 1987 Protocol, the influence of the WQB has changed as the board moved away from assisting the Parties in implementing the GLWQA to principally providing policy advice to the IJC. The creation of the BEC clearly showed that the Parties were responsible for implementation and this removed the perceived conflicting roles of the WQB in assisting in implementation and, at the same time, evaluating the Parties' progress towards achieving the goals and objectives of the Agreement.

Many participants are not satisfied with the current state of affairs surrounding the WQB. They believe that the WQB, has not accomplished much in recent times, and has little to offer through its present role and membership. If the WQB is to be an effective policy advisor on the governments' policies and programs in the basin, then the makeup of the board has to change to include expertise in policy and programs from other groups, and not just from the governments. One participant noted that the recent addition of the Cities' representative was a positive change and that similar expanded membership should be considered in conjunction with effective membership size.

Some participants thought there should be consideration of having a return to the 'WQB of old' with its assessment and analysis function restored; combined with the elimination of the BEC, this change would be consistent with the view of those who advocate reducing the number of Agreement institutions. One participant thought that the WQB should again report biennially on the "state of the programs" type assessment, as was done previously. Others disagreed with a return of the WQB to its pre-1987 state, insisting the BEC, i.e., the Parties, is the appropriate institution to help coordinate the planning and delivery of programs—not the WQB. Many believed that the distinct role of the WQB should be to focus its advice to the IJC on the state of the policies and programs designed to improve the environment of the Great Lakes Basin Ecosystem, so that both the IJC and the Parties could focus on what needs improvement to achieve success for the Great Lakes. In a similar vein, another participant suggested that the WQB's advice should provide the clarity required about what is missing to keep the appropriate focus on basin priorities, supported by science, and what needs to be done to organize accordingly to deal effectively with these priorities.

⁸² Telephone interview comment.

Some participants expressed a view that more senior government personnel should sit on the WQB. One contributing factor to this was expressed as that there are too many boards and committees, as mentioned elsewhere in this report, and too few senior people available to fill these slots. Another factor could be the differing views on the importance of the Agreement between HQ personnel and those responsible for Great Lakes programs in regional offices in both countries—a relationship that needs to be fixed if the Great Lakes are to return to the priority agendas of governments. Many participants believe that, in order to get more senior government personnel appointed to the WQB, the value of the Great Lakes Ecosystem and the Agreement must be made more evident to the Parties, and the number of institutions under the Agreement must be reduced.

While several participants believe that it is helpful for the Parties to have people on the WQB who are responsible for implementation, many believe there is an intrinsic conflict in having the same persons from both governments as the co-chairs of both the BEC and the WQB, despite the IJC request for all appointed members to the WQB to serve in a personal and professional capacity and not as representatives of their organization or nation. Some workshop participants felt that it was not really possible to get independent, objective advice from the WQB, and that the co-chairs of the WQB should not necessarily have to be from Environment Canada and the EPA. Others responded by saying that having senior water agency staff from the states and provinces reporting to and advising the IJC helps raise Great Lakes issues to a higher level of priority, encourages state/provincial information sharing and more fully integrates the states and provinces into the Agreement implementation process. These participants acknowledged that there is a potential conflict of interest but felt that if the “right” people were appointed—senior, “connected” in their organization, and wanting to be on the board trying to make a difference—there won’t be a problem. Most participants favor a mix of Parties’ representatives and outsiders on the WQB—but all should be professionals with sufficient expertise, experience, and influence to catalyze action.

It was pointed out that Article VIII 1(a) refers to the membership of the WQB being “composed of representatives from the Parties and each of the State and Provincial Governments” — language viewed as inappropriate that did not help with the perceived conflict of interest of having the co-chairs wear two hats—and it was suggested that the Agreement needs to clarify that board members do not represent governments but rather are experts providing advice in their personal and professional capacities.

Some participants miss the evaluation previously provided by the WQB on the state of implementation programs and do not view the current Canada and US reports with the same favor, as these latter reports tend to focus on what has gone well, with no mention of what has not. One suggestion made was to go ‘back to the future’—meaning that the BEC should be done away with and its members and roles folded back into the WQB, along with an expanded membership from other stakeholders in the basin.

Many believe that the WQB should be more involved with the basin community, possibly through the venue of public forums on issues of concern. Finally, one participant suggests that there is too much (potential) overlap on advice being given to the IJC by the WQB and the SAB, that the WQB should be replaced by a new Policy Board, with membership from both inside and

outside of governments, and that the mandate of the Policy Board be clearly separated from that of the SAB.

Science Advisory Board (SAB)

Most participants noted the importance of having an effective mechanism for ensuring that current, reliable science advice is available to the Parties and others involved with implementation of the Agreement. Some participants expressed concern over the structure of the board, the make up of its membership, and the quality of its scientific advice. Participants provided a number of reasons for such concerns.

The SAB is involved in many varied issues, has the flexibility to create work groups, and has several of these groups functioning now. Work groups under the SAB, like the Ecosystem Health Work Group, are formed to deal with specific issues. However, several participants indicated that the structure and composition of the SAB itself needs to be more flexible in order to improve bringing together the right mix of expertise from time to time to deal with the variety of complex specific issues as these arise. Some suggested that alternative options to the current system of a standing board should be examined. One suggestion was to look at other models of science advisory bodies, including how the U.S. EPA gets its advice from the scientific community.

One participant⁸³ remarked that there appears to be no established process for identifying potential new members for the SAB when vacancies arise and suggested that, when vacancies occur, a systematic search should be conducted for qualified individuals in the scientific community who can make a contribution to the specific existing and emerging scientific issues under consideration. Others disagreed, noting that the Science Advisory Board appointment process is a rigorous and objective one, and continues to provide the Commission with advice from well-respected scientists. Others suggested, however, that the perceived decline of the IJC and the Agreement has made serving on the SAB less attractive for accomplished scientists with many other responsibilities.

One participant⁸⁴ said the SAB needs a better independent, arms-length peer review process of its scientific work. Others noted, however, that the Science Advisory Board typically incorporates rigorous peer review procedures into its work and publications, which are highly respected within the scientific and lay communities.

A few participants believe that the SAB is currently not receiving the resources necessary to do its job, although it was stated that this does not mean a large influx of funds over and above what is currently budgeted. Some participants suggested that SAB work should be more grounded in the realities of the challenges faced by the agencies. One participant observed that interaction between the SAB and lake-level scientific work happens but coordination is not systematic. Also, there is a need to learn from scientists in other parts of the world who are struggling with some of the same issues as in the Great Lakes basin, and a better connection to the international scientific community is needed than now exists.

⁸³ Telephone interview comment.

⁸⁴ Telephone interview comment.

One participant believes that Article 2 (b) of the Terms of Reference of the SAB “muddies” the role of the SAB and needs to be revised to reflect more closely the criteria for SAB involvement on scientific matters and research as laid out in Article VIII 1(b) of the Agreement on Joint Institutions and the Regional Office.

One participant suggested that the SAB should consider a broadened scope of scientific endeavor including social indicators, political science, economics, and traditional knowledge. This participant believes the current make up of the board is uncomfortable with these aspects. Another noted, in a positive vein, that the SAB was broadening away from traditional scientific “comfort areas” to topics such as the precautionary principle and adaptive management.

In summary, several participants suggested that the SAB be vigilant regarding a number of concerns including: inappropriate advocacy at times on some issues (as opposed to being an arbiter of scientific fact); need for better systemic links to the science and research ongoing in the lakes; and the need for better communication of science, particularly leading edge science, to the basin publics. They also mentioned that there should be a stronger liaison between the WQB and the SAB.

Council of Great Lakes Research Managers (CGLRM)

The CGLRM was created, not by the GLWQA, but by the SAB to assist it in addressing the management, inventory, and evaluation of Great Lakes research. It was later placed directly under the IJC when its membership expanded to members drawn from federal, provincial and state agencies, academia and private industry in both countries. The CGLRM has been instrumental in leveraging partnerships among those agencies/bodies doing research on the lakes for initiatives such as the Great Lakes Research Inventory and providing a database/information to researchers to piggy back on the work of others by linking surveys on the lakes and the planned activities of research vessels.

Participant views on the CGLRM were mixed. Some workshop participants said that they are confused by the proliferation of advisory bodies.

Those participants who have experience with the CGLRM referred to Annex 17 of the GLWQA, which addresses research and development needed to achieve the goals of the Agreement, and were strong supporters of the utility of the Council in helping to make the research happen on the “ground”. Some participants would like to see more leadership in influencing the direction of Great Lakes research and a suggestion was made that other research/management governance models in other initiatives, for example, the U.S. Oceans Action Plan, should be examined for potential lessons.

Some participants felt that the proliferation of scientific bodies shows that something is wrong with the way science is being coordinated in the basin. Others disagreed with this view. Some asked why there is so little interaction between the SAB and the CGLRM, while others questioned the need for the CGLRM and wondered whether it should not be folded into the SAB. One participant believes there is a need for coordination of research in the Basin for obvious reasons but the question is, who should carry out this role. This participant does not believe it should be the SAB and in recent years was not convinced that the CGLRM has performed this function. In this participant’s view, something is broken and needs fixing. As with the WQB, membership on

these two bodies (SAB and CGLRM) is not seen as time well spent by some members—something that needs to change if the best people are to be attracted to serve. One participant does not believe that both SAB and CGLRM are needed and thinks that the SAB and WQB often are in “competition” for attention, and possibly resources. Perhaps one senior board is all that is needed, with task forces or work groups created as necessary to deal with specific issues over a defined time frame.

5. Other Institutional Aspects: Information Exchange and Institutional Relationships

Participants were asked to examine Article IX of the Agreement, which focuses on the submission and exchange of information, as well as the relationship between Agreement institutions and with other institutions in the Great Lakes basin. This section summarizes perspectives that were expressed by participants relevant to these topics.

Submission and Exchange of Information

Article IX of the Agreement spells out the obligations on the IJC, the Parties and State and Provincial governments regarding the submission and exchange of information between one another.

The 1987 Protocol, the creation of the BEC and the subsequent 1991 IJC document on its revised roles resulted, in part according to some participants, from the Parties' belief that the IJC was doing too much work in the pre-1987 era in "assisting" implementation of the Agreement and in so doing, the WQB, in particular, was absorbing a lot of government resources by their requests for information. With the IJC moving to an "advise/assess" role in the post-1987 era, the requests for information decreased. However some participants believed that less, and perhaps insufficient, information is now moving to the IJC regarding progress on what is, and is not, working under the Agreement. Some participants suggested that the IJC's role in the submission and exchange of information between the Parties, states and provinces, as per Article IX, is no longer as important as it was prior to 1987.

The assessment function was retained by the IJC, however, so the need for data/information remains, albeit on a reduced scale. Even so, some participants believed that there is a chronic problem of the IJC not being able to get information they request. Several examples were given at the workshop. To partially overcome this problem of getting information, one participant suggested that the States could assess the progress they are making and provide the information to the IJC through the Great Lakes Commission.

Other participants believe that the need to exchange information goes beyond the IJC institutions to other organizations such as the Council of Great Lakes Governors, the Great Lakes Commission, the Great Lakes Fishery Commission, and universities and other institutes doing work on the lakes. They suggest the boundaries in the Agreement, for exchange of information between organizations, need to be "stretched".

It was pointed out that the reporting requirements of the Agreement can create overwhelming obligations for exchange of information but that much of the information sought is "out there" - though not always easily pulled together even if often available on the Internet on a number of web sites. This brought up the issue of data management and the opportunity for the Parties to develop a data management agenda, taking into consideration the data systems already being utilized by States and Provinces. A great deal of data and information exists on the Great Lakes basin ecosystem but the information is spread across many jurisdictions, agencies and institutions, is not easily accessible or available, and is often not in a readily understandable format. One

suggestion was to have the Great Lakes Commission (GLC) become a central clearinghouse for Great Lakes information on the Agreement. However, it was pointed out that the GLC is not seen as a binational body, nor does it function as one, and given its present constitution may not accord equality to Canadian information and viewpoints. The fact that the GLC confers observer status to Canadian organizations is acknowledged, but it does not operate in the same way as the GLFC and IJC operates. SOLEC was mentioned as an example of a pioneering approach in this field of data collection and management; but it was pointed out that, for an improved data management and exchange initiative to be successful, common approaches to data collection and data exchange protocols are necessary.

Other participants suggested that the problem wasn't insufficient data management, but rather that good data management requires clearly stated goals with associated indicators of progress to create the structural context for data acquisition and management and that the structural problems with implementation noted above has led to more data with less practical meaning. Finally, one participant declared that for many of the reasons above, Article IX, as currently being implemented, is obsolete.

Relationships between Institutions

Article VII.6 speaks to the need to build relationships with institutions that address concerns relevant to the Great Lakes Ecosystem.

There is a consistent view among participants that relationships need to be improved between the institutions associated with the Agreement, and between these institutions and other institutions inside and outside the basin. The objective is to ensure that activities of all major players in the basin are in tune with, and supportive of, the goals and objectives of the Agreement and are capable of actually achieving on-the-ground improvements for the ecosystem of the Great Lakes.

To achieve this end, several participants believed that the Agreement needs to provide a vision that encourages other institutions to embrace and integrate the goals and objectives of the Agreement into their own structures, authorities, priorities and programs on both sides of the border. Some thought that this integration is beginning to occur in a number of basin organizations/initiatives, and in furthering the ecosystem approach, the Agreement should specifically provide for greater interaction between the IJC and other institutions such as the Great Lakes Fishery Commission and the Great Lakes Charter Annex mechanisms.

In general, many participants stated that more effective and perhaps formal collaboration between the IJC and other organizations is required.

Between GLWQA Institutions

Interaction between the various institutions associated with the Agreement is perceived by many participants to be infrequent and insufficient. They believe that relationships can be improved considerably if these institutions would come together from time to time through joint workshops or conferences on issues of mutual interest. If so, then relevant aspects of policy, programs, and science could be discussed in an integrated manner and more effective solutions offered. Such more formal linkages could also be useful in building more productive relationships.

One participant believes that some overlap occurs between the work done by the two Agreement Boards and the Council of Great Lakes Research Managers. The WQB provides policy advice on issues, as does the SAB; for example, one participant noted that the Commissioners have asked both the WQB and the SAB for policy advice on the urban land use issue that could be conveyed to governments. Some think there is some overlap between the work of the SAB and that of the CGLRM (noted earlier as not an Agreement institution but one that comes under the aegis of the IJC). Other participants believe that the various institutions could be merged into a single board, with task forces/work groups created (and disbanded when finished) to deal with specific issues in an integrated fashion, as needed. The institutional system would then be simpler, advice better integrated and linkages improved. Other participants said that it is not obvious to them that such a merger would improve the situation.

A number of workshop participants were unclear as to the nature of the relationship, if any, between the SAB and SOLEC, and SAB and the CGLRM. It was suggested that there appears to be a need for a guidance document that clarifies, at least for the basin public, the roles, responsibilities, and expectations of the IJC, the two Agreement boards, the CGLRM, and SOLEC.

Between GLWQA Institutions and Other Basin Organizations and Initiatives

Many participants expressed the same critique here as above. Applying the ecosystem approach, understanding hydrological and ecosystem function, climate change, state of the Great Lakes, and the need for shared or integrated management objectives are some of the relevant drivers for stronger collaboration among institutions on the Great Lakes. Many believe there should be more effective links between the institutions associated with the Agreement and other organizations both inside and outside the basin. One participant stated that there is a lot to be learned from the experiences and activities of organizations such as the Great Lakes Fishery Commission and the Great Lakes Indian Fish and Wildlife Commission. Some participants would like to see greater collaboration with the St. Lawrence River institutions.

While there are still ongoing issues with point sources of contaminants in the basin including the presence of substances of emerging concern (e.g., endocrine disruptors in municipal and industrial discharges), some participants expressed a need for greater attention to non-point sources such as those arising from the long-range transport of air pollution. They felt that closer connections should be made with international conventions such as those on persistent organic pollutants and climate change where hard international commitments are in place and, in any revision of the Agreement, the Parties need to make the connections to these commitments, where appropriate, to make activities in the Great Lakes consistent and relevant to them. Links have been made between the IJC and the Commission for Environmental Cooperation (CEC) but some believed more is needed to be done to ensure better collaboration on issues of mutual interest while minimizing the potential for duplication and overlap in work projects. In effect, these participants believe that the Great Lakes need to be positioned in their proper global context by the vision, goals and activities of the Agreement.

Some participants commented that there are a number of important initiatives on the Great Lakes but little evidence of specific linkages between such initiatives and the Agreement; for example, the Great Lakes Regional Collaboration initiative and the Great Lakes Restoration initiative in the U.S. made no reference to the commitments of the Parties under the Agreement. Even within the G&I framework of the Agreement, there is no meaningful link between the BEC and the IJC, other than that the IJC sits as an observer at meetings of the BEC. One participant thinks that, in a binational way, the Agreement should strengthen the efforts of the IJC in promoting cooperation in basin management activities.

The monitoring results coming from SOLEC show that some concerns with regard to the health of the Great Lakes persist; and some participants believed that there is no obvious mechanism to get the information generated through SOLEC into the WQB, SAB, the IJC and to governments. There is now a fee to get into SOLEC, resulting in a lack of NGO participation, creating for some participants a negative effect on the exchange of information, and a “loss of community” in the basin. It was felt by some that the science communities of governments and public groups are not working together as well as in the past.

6. Options on Alternate Models of Governance and Institutions

Discussion on how to improve the operation and effectiveness of the governance and institutional framework associated with the Agreement focused on ideas for addressing governance needs, identifying functions needed to support those needs and improving the institutional framework supporting the Agreement. Participants agreed that change is needed to address the key needs described in the “Governance” section above. Differences were evident, however, among participants in how to address these needs. Perspectives varied, with participants indicating that these needs could be addressed through either a new Agreement, revisions to the existing Agreement, or a renewed focus on implementing an effective governance and institutional framework under the auspices of the current Agreement.

This section summarizes some of the key ideas and models for improving the governance and institutional framework associated with the Agreement that were discussed by the participants.

Fostering Commitment to a Shared Vision

Discussions explored ways to build stronger commitment, energy, and connections between the numerous organizations in the basin and Agreement. In referencing how the Agreement could foster a “North Star” vision for the protection and restoration of the Great Lakes, many participants hoped that this vision be such that other organizations in the basin could adapt it into their own vision statements and codify it into their ways of doing business. Further, if the goals of the Agreement were broad and widely applicable, these too could be integrated into other agreements relating to the Great Lakes and/or be helpful in guiding the goals of other organizations. Someone suggested that it would be helpful to illustrate the links/relationships between the institutions associated with the Agreement and those of other Great Lakes institutions/organizations. Further, in developing a “North Star” vision, explicit consultation with these other organizations would be important.

Aligning the Agreement and Government Priorities

While all governments in the basin have clean water policies, resources budgeted for Agreement implementation do not always reflect these policies as priorities for action. One participant observed that it is not that governments see the Great Lakes as unimportant, but rather that there are so many other pressing priorities to address in the face of diminishing resources. Participants

Desired Attributes for GLWQA Governance Framework

- > Visionary in nature
- > Inspirational in intent
- > Clear and agreed-upon goals and objectives
- > Enabling in terms of partnering and cooperating with its own institutions and others engaged in similar efforts for the Great Lakes
- > Specific on processes and mechanisms for implementation
- > Clear in terms of roles and responsibilities and accountability for results
- > Flexible and conducive to consulting,

generally agreed, nevertheless, that significant progress in meeting the goals of the Agreement requires stronger alignment between the Parties' priorities, and domestic agendas, and the goals of the Agreement. Priorities for action under the Agreement need to be aligned more closely with the priorities of governments in order to leverage the resources necessary for implementation. Several participants observed, however, that, in their view, governments usually interpret this to mean that the Agreement should be written to reflect the governments' programs—as opposed to meaning the programs should be revised to meet the aims of the Agreement. In their view, the Agreement should be a leading edge document that pushes governments forward to improve their programs or introduce new programs to move towards the goals and objectives of the Agreement. Participants also indicated that the presence of an informed and concerned public is important for mobilizing the political will to make the protection and restoration of the Great Lakes a priority. Participants noted that a number of factors are currently building support and political will for action, as evidenced by the Great Lakes Regional Collaboration in the U.S. Specific ideas for better aligning the Agreement and government priorities included:

- > Many participants liked those recommendations in the IJC 2006 Special Report to the Parties that aimed to resolve the troubling issue of the low priority given to the Great Lakes by Parties. Ideas included having the Agreement signed by the two heads of State, having the Agreement endorsed by the U.S. Congress and the Parliament of Canada, and establishing a political-level binational Great Lakes Water Quality Agreement Steering Committee. Some participants also liked the recommendation to establish a Binational Coordinating Committee (BCC) with widespread representation of senior-level officials that has clear terms of reference, including the mandate to develop the Binational Action Plan to manage and facilitate collaboration among its members. It was also noted that the SAB has issued a report with recommendations for improving the science that is supported by the governance and institutional framework of the Agreement.
- > Some participants indicated that referencing the Agreement in domestic legislation on both sides of the border would help raise the priority of the Great Lakes much as the U.S. Clean Water Act amendments charged the U.S. EPA with preparing and implementing Remedial Action Plans and Lakewide Management Plans. In Canada, the Canadian Environmental Protection Act (CEPA) and Ontario's Clean Water Act could be examples of legal instruments for referencing the Agreement.
- > Some participants discussed the idea (and challenges) of working to secure high-level representation and participation on the Binational Executive Committee (BEC) as a means to better align priorities and commitment.
- > Some participants noted that, as a result of the 1987 Protocol, the movement of some responsibilities away from the IJC to the BEC was not helpful for a number of reasons, including that it shifted power from a binational focus where the U.S. and Canada shared equal footing to a more asymmetric bi-lateral power sharing arrangement between the Parties. They reiterated the need to reinforce the binational, as opposed to bilateral, nature of institutions in the Agreement. In a "back to the future" scenario, they prefer the pre-1987 role performed by the WQB as being more objective and independent than that of the post-1987 BEC. One participant observed that, to the extent the arrangement has become more

asymmetrical in the basin, it probably reflects the relative level of effort committed by the Parties and their agents.

Enabling Implementation through Action Planning

Participants agreed that *processes* are needed in the Agreement to facilitate the development of integrated action plans to drive implementation. Action plans can spell out targets, actions, roles and responsibilities, timeframes, resources, reporting and evaluation of progress, while remaining flexible over time to respond to emerging needs. Specific ideas for enabling more effective and coordinated implementation through action planning include:

- > As mentioned above, many participants expressed interest in some form of regular, binational action planning. The action planning approach recommended by the IJC in its 2006 Special Report to the Parties was identified by some as an approach warranting consideration.
- > Several participants referenced the U.S. and Canada Ocean Action Plans as useful models for action planning. Another suggested that a model like the Canada-Ontario Agreement, referenced in the next section, may also be an effective way for action planning in addition to coordinating the implementation of action plans. Some participants believe there should be some follow up with LaMP Task Forces and RAP coordinators to gain perspectives on what has worked well, and what has not, in planning and implementing actions in the lakes; in particular, in those instances where Areas of Concern (AOCs) have been de-listed to determine the governance/institutions attributes that have ensured successful implementation.

Important GLWQA Governance Functions

Processes and mechanisms for:

- > Setting measurable goals, objectives, and targets
- > Developing integrated action plans with requisite resources
- > Engaging all basin interests
- > Emphasizing implementation of policies and programs
- > Coordinating programs and focusing on delivery of results
- > Providing policy advice
- > Providing science advice
- > Assessing and reporting on the state of the Lakes, the state of action plans and programs, and the state of progress in implementing the Agreement and achieving its Goals and Objectives

Coordinating Orders of Government to Work in Concert

Participants agreed that improved mechanisms for the involvement and coordination of various orders of government in the Great Lakes basin are needed. Participants noted that cities and municipalities have a major implementation role, particularly linked to issues such as wastewater treatment, storm water management, watershed management, prevention of erosion and agricultural run-off. Specific ideas for better engaging different orders of government in implementation of the Agreement include:

- > The Canada-Ontario Agreements (COAs) were identified as a potential model for improved federal-provincial government coordination, including coordination with cities and other orders of government. The COAs spell out goals and objectives; have management committees in place to oversee implementation; and report progress on a biennial basis. In addition, it appears that activities at the level of Remedial Action Plans (RAPs) and Lake Management Plans (LaMPs) are being better integrated with those of fisheries plans, consistent with Agreement objectives. The situation on the U.S. side is more complex and one suggestion for improving implementation is that an agreement, not unlike the model of the COA, could be pursued between the U.S. federal government and the Great Lakes States, and that such agreements be referenced in the governance and institutional framework of the Agreement.
- > Several participants indicated that improved coordination and alignment with local watershed management plans and activities could provide tighter links between local governments and federal and state/provincial governments.
- > Some participants suggested that the Agreement should include provisions to create a receptive environment for developing relations with other institutions, including Aboriginal peoples, which can be helpful in achieving the aims of the Agreement.

Improving Accountability for Results

Participants discussed the need for improving transparency and accountability under the Agreement. Performance measurement must occur in two important areas. First, assessment of progress towards the achieving the general objectives of the Agreement is needed—the state of the environment of the Great Lakes Ecosystem. Second, assessment of progress towards implementing the specific objectives/provisions of the Agreement (and associated action plans) is needed. Participants also discussed mechanisms, using the results of performance assessment efforts, for holding the Parties more accountable for implementing the Agreement and achieving its goals. Specific ideas included:

- > To improve accountability, some participants would like to see a provision or mechanism in the Agreement for citizens to intervene on specific issues or concerns, and the citizens' petition process of the Commission for Environmental Cooperation (CEC) was raised as a potential model. Articles 14 and 15 of the North American Agreement for Environmental Cooperation (NAAEC) provide for citizens/groups in North America to petition the CEC to investigate alleged non-enforcement of domestic environmental legislation in the United States, Mexico and Canada and to produce a factual record of the investigation. It was suggested by some that incorporating such a provision into the governance and institutional framework of the Agreement might be helpful in addressing concerns about the performance and accountability of the Parties; however, the potential utility of such a petition process in either country requires an effective legal mechanism pertaining to the Agreement to be in place. One participant viewed the petition process as “thorny” and not needed, particularly in the US where enforcement of environmental legislation through citizen law suits are common practice.

- > Some participants indicated that specifically incorporating the Agreement into domestic law on both sides of the border could be helpful for enforcement purposes by assigning liability and, therefore, accountability for non-compliance in achieving results.
- > One participant⁸⁵ introduced a new model of governance by suggesting that an international Board of Directors be established, with a CEO reporting to the Board and supported by a small number of staff. The Board would have the authority to track implementation of the various action plans of the various agencies, to follow up as necessary to ensure that implementation of the plans stayed on schedule, and to hold them to their commitments through some form of performance review or financial reward or punishment. Following on from this, another participant commented that the Board of Directors should report to the IJC, that the Board should be the “old” WQB and BEC combined and that the CEO should be the head of the GLRO. Further, the SAB needs to be re-invigorated and combined with the CGLRM. This combined board should be responsible for organizing SOLEC and for reporting to the above-mentioned Board of Directors and the IJC on implications for programs of SOLEC findings.

Participants also cited a variety of ideas for improving accountability for specific institutions associated with the Agreement. Specific ideas include:

- > Many participants indicated that a more transparent process for producing the IJC’s Biennial Report should be implemented. This process should clarify how input from various IJC advisory boards will be addressed in the development of the Biennial Report and how any public comment throughout the process was considered or used by the IJC
- > Some participants indicated that the IJC should design a flexible SAB such that it can react to, and be capable of providing sound advice on, emerging issues in a timely fashion.
- > Some participants indicated that the membership of the WQB should be expanded beyond government; that its mandate/Terms of Reference should be clarified; and that WQB co-chairs appointed not be the same as those for the BEC.
- > Some participants indicated that the various IJC boards and councils should be simplified or consolidated.
- > Some participants indicated that the Parties should initiate an arm’s length independent audit of the GLRO to assess whether it is delivering its mandate as laid out in its Terms of Reference.

Engaging Aboriginal Peoples

Most, if not all, participants agreed on the need for improved involvement of Aboriginal peoples in the implementation and accountability processes associated with the Agreement. Specific ideas for improving engagement and involvement of Aboriginal peoples include:

- > Some participants indicated that Aboriginal peoples should be referenced in a meaningful manner in the Agreement. Aboriginal peoples want to be formally included in a revised

⁸⁵ Telephone interview comment.

Agreement, and although they do not necessarily expect to be signatories to the Agreement, modifications could be made to the Agreement to help ensure their effective engagement. For example, an Annex could be devoted to the concerns of Aboriginal peoples, and/or a separate bullet could be added in Article VII to address involvement of Aboriginal peoples. Some participants indicated that a Great Lakes Native Advisory Committee to the IJC could be created, and/or more meaningful participation on the BEC for Aboriginal peoples should be spelt out.

Engaging Stakeholders

Most if not all participants agreed on the need for improved involvement of stakeholders in the implementation and accountability processes associated with the Agreement. Mechanisms should allow for productive and informed engagement that enables stakeholders to provide meaningful input at points in processes where the input has potential to inform decision-making. Some participants indicated that dissent should be accommodated, and not discouraged, as an important element of an effective governance framework. Specific ideas for improving engagement and involvement of key stakeholders include:

- › Participants indicated that it would be useful to create a Citizens Advisory Board to the IJC and/or a Joint Public Advisory Committee that provides advice to a Ministerial-level committee, similar to the Commission for Environmental Cooperation (CEC) model that is successful in engaging citizens across North America on matters arising under the North American Agreement for Environmental Cooperation (NAAEC). In addition, a provision in the Agreement, similar in intent to Articles 14 and 15 of the North American Agreement for Environmental Cooperation could be included in a revised or new Agreement.

Concluding Remarks

The Convenors urge the Parties to give serious consideration to the views expressed in this important report. While not conclusionary in its observations, we strongly believe that it represents a thoughtful overview of the critical issues that surround the governance and institutional framework of the GLWQA. This report can be foundational in the future deliberations of the Parties and additional efforts to engage the broad community of people and organizations committed to the restoration and preservation of the health of the Great Lakes Basin Ecosystem.

Appendix I: Other Observations by Workshop Participants and Those Interviewed

This section includes other observations made by workshop participants and interviewees. These observations are deemed by the Convenors to be peripheral to the G&I review but are presented here for the benefit of the ARC's consideration.

Re: The Agreement

The Agreement is only words on paper; it takes people to get things done. The success of the Agreement should be judged not just by achieving goals and objectives but also because it creates a political and social environment to make things happen, as demonstrated by the gathering of people who have come together to participate in this workshop.

The Agreement is still a good model for internationally shared water resources as witnessed by the regular stream of visiting delegations that come to learn from the successes (and failures) of this initiative.

In the future, when and if a new Agreement is launched, it must be rolled out with a big communications strategy.

Groundwater should be addressed in the Agreement.

Re: Institutions

Although the International Air Quality Board is not a part of this review in that its mandate stretches across the entire Canada-US boundary, it has done work in the Great Lakes region through references given to it over the years and also facilitates cooperative studies on airborne toxic substances as required under Annex 15 of the Agreement.

In reference to the question as to whether institution building or modification to existing institutions is required or desirable for improving the involvement/engagement of the basin publics, mention was made of the "Healing our Waters Coalition". This Coalition is trying to get the political support necessary to lever \$20 billion in the United States for the Great Lakes, not unlike what was done for the Everglades project. Connections to NGOs are very important in helping to make things happen and the Coalition is a potential strong and influential partner on the Great Lakes.

One participant suggested that other large water systems exist (e.g., Danube, Rhine) and wondered what can be learned from the institutions in charge of them. It was mentioned that a research project is about to be launched at McMaster University to look at existing agreements around the globe.

Re: Aboriginal Concerns

One participant referred to the lack of attention being paid to Lake St. Clair and the St. Lawrence River – again, mention was made of “orphans” – and the frustration of those people living in these areas who feel disaffected. Lake Nipigon was also mentioned as another “orphan” –and the Long Lac and Ogoki diversions of the 1940s into the Great Lakes watershed have impacted adversely on the traditional lifestyle and health of Aboriginal peoples by dewatering the headwaters of northern rivers flowing into the James Bay-Hudson Bay watershed in Ontario. The participant cautioned that Treaty # 9 will be bringing forward sovereignty and boundary disputes.

Funding support is needed to help Aboriginal peoples participate more fully in the SOLEC process.

Re: Participation in the GLWQA Review Process

One participant was concerned about the absence of input to this review from the agricultural sector on both sides of the border, given the importance of that sector to water quality in the Great Lakes—and wondered whether that sector’s input can be canvassed in order to fill in the information gaps in this review.

One participant observed that the participation by several sectors, such as elders, youth, women, in the review is limited.

Appendix II: Terms of Reference for the Governance and Institutions Review

Terms of Reference For the

GLWQA GOVERNANCE AND INSTITUTIONS GROUP (GROUP I)

1. ROLE

The ARC will create the Governance and Institutions Group to specifically consider provisions of the Agreement relating to governance, including the role of the International Joint Commission (IJC) and its Great Lakes Regional Office, as well as its advisory bodies on the Great Lakes -the Science Advisory Board and Water Quality Board - as they relate to the Agreement, and the role of the Great Lakes Binational Executive Committee (BEC).

- (a) The ARC, through the ARC secretariat - Environment Canada (EC) and the US Environmental Protection Agency (EPA) - will appoint two non-government conveners to the Governance and Institutions Group, one from the U.S. and one from Canada, to act jointly in coordinating and conducting the review of the relevant provisions of the Agreement. EC will appoint the Canadian conducer; EPA will appoint the U.S. Canadian conducer.
- (b) The U.S. and Canadian conveners shall work jointly to provide to the ARC, through the ARC secretariat, the following:
 - (i) Work Plan:
 - In cooperation with the ARC, the conveners shall develop a work plan for the Governance and Institutions Group to conduct a comprehensive review of the following provisions of the Agreement:
 - Article VII (IJC Powers, Responsibilities and Functions)
 - Article VIII (Joint Institutions and Regional Office)
 - Article IX (Submission and Exchange of Information)
 - Terms of Reference for Joint Institutions
 - Great Lakes Binational Executive Committee Terms of Reference (to be provided separately).
 - (ii) Workshop Participation:
 - The conveners shall, in consultation with the ARC Secretariat, develop a list of proposed participants to be invited to participate in workshops to be developed and led by the conveners. These participants should include Canadian and US representatives of non-governmental organizations, cities, industry, academia,

interested members of the public, aboriginal groups, as well as representatives of various levels of government, the IJC and other binational government bodies operating within the Great Lakes Basin.

- (c) The Governance and Institutions Group shall conduct their review in accordance with the Evaluation Framework and other guidelines described in the *Principles and Guidelines for Conducting the Review* in **Appendix 2**.
- (d) The Governance and Institutions Group membership list and work plan shall be finalised and provided to the ARC Secretariat by no later than [12 May 2006] (*to be revised*).

2. WORKSHOP PARTICIPANTS

- (a) In addition to the duties listed above, the conveners shall:
 - (i) Lead Review Working Group through the evaluation framework/questions and collect input from workshop participants relative to the questions.
 - (ii) Document the workshop participants' analysis of the Agreement relative to the evaluation framework/questions and synthesis into a report that will go to ARC.
 - (iii) Based on workshop findings, determine a joint position on the evaluation of the relevant provisions of the Agreement, and on the recommendations to form part of the Group's reports to the ARC. Where the determinations of the conveners diverge significantly, and where there are significant opinions between various stakeholder groups or between Canadian and US participants at the workshops, these varying positions will be brought forward in the reports to ARC
 - (iv) Report on progress as called for under the Terms of Reference
 - (v) Seek clarification from the Agreement Review Committee Co-Chairs on any issues, including process issues or other matters that might come up that are not resolvable by the Review Working Group Co-Chairs. The Agreement Review Committee Co-Chairs will provide responses, or elevate the matter to the Agreement Review Committee or to the Great Lakes Binational Executive Committee Co-Chairs, depending on the issue.
 - (vi) Collect a record of the Review Working Group activities and comments for the files, which will be provided to the Agreement Review Committee Co-Chairs.
 - (vii) Act as spokesperson for Review Working Group at appropriate points in the process.
 - (i) Resolve issues within each Review Working Group as appropriate.

The Government and Institutions Working Group conveners shall develop workshop participant lists, representative of a broad Great Lakes community stakeholder base, in coordination with the ARC secretariat as described in Section 1 (Role) above.

3. MEETINGS AND WORKSHOPS

- (a) The conveners shall be invited to attend an Agreement review "kick-off" meeting to be held on April 28, 2006 in Chicago, IL.

- (b) The conveners shall then coordinate the review of the Governance and Institutions Provisions, including
- Organising workshops (number to be determined) to obtain feedback on the relevant Agreement provisions outlined in Section 1 (Role) above, including views from U.S. and Canadian federal, state and provincial representatives, IJC and relevant binational institutions.
- (c) ARC will convene a full, in person meeting of ARC and Review Working Groups for October 16th, 2006 to allow Review Working Groups to present their draft Reports (see Deliverable 6 below) to the ARC
- (d) ARC will convene another meeting between ARC and Review Working Group co-chairs and conveners for November 6th 2006, to discuss any comments of ARC on the draft Reports.

4. REPORTING

- (a) The conveners shall coordinate the preparation by the Governance and Institutions Group of the following reports for the ARC over the course of the review:
- (i) Summaries (maximum of five pages) of each workshop held by the conveners to cover, amongst other things, a general summary of the workshop objectives, a profile of the participants, key themes/issues discussed and workshop outcomes. Summaries should be delivered to the ARC Secretariat and copying the Communications and Outreach Team within one week following each workshop, for review and subsequent posting to the public on www.binational.net.
- (ii) Quarterly reports, to be delivered by the due dates given under “Deliverables”, below (to be provided to the ARC Secretariat, with a copy to the Communications and Outreach Team). The format of the quarterly reports is more fully described in the Information Package which will be delivered to the conveners prior to the commencement of the work of the Governance and Institutions Group. These reports should contain the following:
- Executive Summary (no more than two pages);
 - Brief summary of meetings or workshops to date (including attendance and agendas);
 - Summary of Evaluations to date (for each theme/article/annex reviewed), using the numbering and subheadings contained in the Evaluation Framework in **Appendix 2**;
 - Next Steps, including identification of issues which require resolution by ARC and/or BEC.
- (iii) Draft Final Report, to be provided to ARC (submitted to the ARC secretariat with a copy to the Communications and Outreach Team) by September 25th, 2006. The draft Final Report shall contain the following elements

- Executive Summary
 - Overview of the Review Working Group: what aspects of the Agreement were reviewed; membership/participants, including conveners, key experts and stakeholder groups represented; manner of conducting the review;
 - Background to the provisions reviewed;
 - Summary Evaluation of provisions reviewed;
 - Path Forward: recommendations and options.
- (i) Final Report:

The Final Report shall be provided to ARC (through the ARC secretariat, with a copy to the Communications and Outreach Team) by no later than 31 December 2006.

- (b) Each Review Working Group is to provide a comprehensive review of the Annexes and Articles they are assigned. A comprehensive review consists of contemplating and answering the questions posed in the Evaluation Framework. Each Review Working Group must document these findings, creating a well-articulated assessment of the clarity, relevancy, results achieved, management framework, and accountability mechanisms for the Annexes and Articles. To the extent possible, Review Working Groups should seek to provide a consensus view on their evaluations of the relevant provisions of the Agreement and their recommendations; however, where there are significant diverging or multiple viewpoints, Review Working Groups should bring these forward in their reports.

It is anticipated that recommendations on revisions to the Agreement may arise from the review. These recommendations can be included in the Review Working Group findings; however, please note that the purpose of this review is to assess the operation and effectiveness of the current Agreement, not to negotiate the terms of a possible new Agreement.

- (c) The conveners shall be responsible for notifying the ARC secretariat promptly if any issues arise which require resolution by ARC and/or the BEC co-chairs.
- (d) All documents should be provided in Microsoft Word, using Arial 12-pitch.
- (e) Data used in the review of the Agreement should stem from reliable, authoritative and verifiable sources. When citing any data or materials, the Governance and Institutions Group shall ensure that appropriate referencing is made to the source of the data or information in the form of footnotes.

5. DELIVERABLES AND MILESTONES

	Deliverable	Due Date	
1	Conveners invited to attend and participate in an Agreement review “kick-off” meeting of the ARC and review working groups.	28 April, 2006	
2	G&I Working Group Workshop Participants and Plan: <ul style="list-style-type: none"> • Conveners develop a proposed membership list for 	12 May, 2006 (<i>to be revised</i>).	

	<p>the G&I Working Group (in coordination with the ARC Secretariat).</p> <ul style="list-style-type: none"> • Conveners obtain and confirm participants with the ARC Secretariat. <p>Conveners develop a plan to conduct the review of the relevant provisions of the Agreement.</p>		
3	<p>G&I Working Group Workshop(s):</p> <ul style="list-style-type: none"> • Organise and coordinate workshops (number to be determined) at the discretion of the conveners, and provide summaries of each workshop. • First Quarterly report to be delivered to the ARC Secretariat. 	<p>28 April to May 30, 2006 (<i>to be revised</i>).</p> <p>May 30, 2006 (<i>to be revised</i>).</p>	
4	<ul style="list-style-type: none"> • Organise and coordinate further workshops as necessary to enable effective review of the G&I Provisions, and provide brief synopses of all meetings and summaries of all workshops. • Second Quarterly report to be delivered to the ARC Secretariat. 	<p>May 30 to August 31, 2006 (<i>to be revised</i>).</p> <p>August 31, 2006 (<i>to be revised</i>).</p>	
5	Submit draft Report to ARC (through ARC secretariat, copy to Communications and Outreach Team)	September 25th, 2006 (<i>to be revised</i>).	
6	Full in-person meeting of ARC and all Review Working Groups to present draft Reports	October 16th, 2006 (<i>to be revised</i>).	
7	ARC-Review Working Group co-chair and convener meeting to discuss comments on draft Reports	November 6th, 2006 (<i>to be revised</i>).	
8	Third Quarterly report to be delivered to the ARC secretariat, together with the draft G&I Working Group Report	November 30, 2006 (<i>to be revised</i>).	
9	Attend and participate in a meeting between the ARC and all review working groups to discuss review working groups' draft Report	Before December 22, 2006 (<i>to be revised</i>).	
10	Submit final G&I Working Group Report to the ARC Secretariat	December 31, 2006 (<i>to be revised</i>).	

6. ADMINISTRATION

- (a) Secretariat support to the ARC and working groups will be supplied by staff of US EPA's Great Lakes National Program Office and Environment Canada's Great Lakes Environment Office.
- (b) The Governance and Institutions Group shall contact the ARC through the ARC secretariat as follows

U.S. EPA: Mark Elster | Tel: 312-885-3857 | Fax: 312-353-2018 | email:
elster.mark@epa.gov

EC: Alison Kennedy | Tel: 416-739-5913 | Fax: 739-4804 | email:
alison.kennedy@ec.gc.ca

Sridhar Marisetti | Tel: 416-739-4960 | Fax: 739-4804 | email:
sridhar.marisetti@ec.gc.ca

- (c) Additional support to the Governance and Institutions Group will be supplied by the Communications and Outreach Team, as well as contractors (where possible).
- (d) It is anticipated that most, if not all, of the Governance and Institutions Group's workshops and meetings will be conducted through toll-free conference calls. The conveners will be able to schedule these conference calls after a short training session provided by the ARC secretariat.
- (e) A software system known as "Sharepoint" will be available to the Governance and Institutions Group to facilitate online sharing and editing of documents. Training on this software will be provided by the ARC secretariat.

Appendix III: Workshop Agenda

Governance and Institutions Workshop

AGENDA

November 29-30, 2006

Metropolitan Hotel (Detroit Airport), Detroit, Michigan, U.S.

Day 1: Wednesday, November 29

AM

08:00 - 08:30 Gathering of workshop participants

08:30 - 09:00 Welcome and Introductions *ARC Co-Chairs* (S. Nameth/V. Thomas)
Convenors (T. Clarke/B. Ross)

- Welcome and introductions of participants
- Overview of the workshop agenda
- Mode of operation and workshop ground rules
- Expected outcomes and next steps

09:00 – 10:15 Governance & Institutions Overview

Brief presentation followed by discussion of overarching G&I needs and goals that could guide workshop deliberations, based on themes from the GLWQA review process to date, including findings from the IJC public comment process and draft Review Work Group reports.

10:15 – 10:30 Break

10:30 – 12:30 GLWQA Parties and the Binational Executive Committee (BEC)

Group Discussion: Assessment of the role, functions, operation and effectiveness of the Parties, as well as the Provinces and States, and the BEC in implementing the GLWQA, as well as preliminary recommendations for addressing needs and gaps. Review questions provided by the Convenors in advance of the workshop will help to guide inquiry. Specific sections of the Agreement and related documents to be reviewed include:

- BEC Terms of Reference
- Articles X and XI

PM

12:30 – 01:30 Lunch

01:30 – 3:30 International Joint Commission (IJC) and Great Lakes Regional Office (GLRO)

Group Discussion: Assessment of the role, functions, operation and effectiveness of the IJC and the GLRO in implementing provisions of the GLWQA, as well as preliminary recommendations for addressing needs and gaps. Review questions provided by the Convenors in

advance of the workshop will help to guide inquiry. Specific sections of the Agreement and related documents to be reviewed include:

- Article VII (IJC Powers, Responsibilities, and Functions)
- Article VIII (Joint Institutions and Regional Office)
- Terms of Reference for Joint Institutions, specifically the GLRO

03:30 – 3:45 Break

03:45 – 5:00 Water Quality Board (WQB)

Group Discussion: Assessment of the role, functions, operation and effectiveness of the WQB in implementing provisions of the GLWQA, as well as preliminary recommendations for addressing needs and gaps. Review questions provided by the Convenors in advance of the workshop will help to guide inquiry. Specific sections of the Agreement and related documents to be reviewed include:

- Terms of Reference for Joint Institutions, specifically the WQB

05:00 – 05:15 Day 1 Wrap-Up

Day 2: Thursday, November 30

AM

08:00 – 08:30 Gathering of workshop participants

08:30 – 10:00 (1) Science Advisory Board (SAB) and Council of Great Lakes Research Managers (CGLRM), and (2) Submission and Exchange of Information (Article IX)

Group Discussion:

(1) Assessment of the role, functions, operation and effectiveness of the SAB and CGLRM in implementing provisions of the GLWQA, as well as preliminary recommendations for addressing needs and gaps, and

(2) Review of how well data and information have been exchanged between institutions implementing the Agreement

Review questions provided by the Convenors in advance of the workshop will help to guide inquiry. Specific sections of the Agreement and related documents to be reviewed include:

- Terms of Reference for Joint Institutions, specifically the SAB
- Terms of Reference for the CGLRM
- Article IX (Submission and Exchange of Information)

10:00 – 10:15 Break

10:15 – 12:00 Relationships between GLWQA Institutions and between GLWQA Institutions with Other Initiatives and Basin Organizations

Group Discussion: This session will review how well the governance structure of the GLWQA has facilitated cooperative relationships with other initiatives and basin organizations (e.g., Great Lakes Fishery Commission, Great Lakes Commission, Council of Great Lakes Governors and Premiers, Commission for Environmental

Cooperation) to achieve the aims of the GLWQA, to yield synergies where possible, and to avoid potential duplication with other initiatives or instruments of a similar nature. Review questions provided by the Convenors in advance of the workshop will help to guide inquiry.

PM

12:00 – 01:00 Lunch

01:00 – 04:00 Exploration of Alternative Governance & Institutional Options

Group Discussion: This session will explore other potential governance and institutional options that could improve the operation and effectiveness of efforts to achieve the goals of the GLWQA. Review questions provided by the Convenors in advance of the workshop will help to guide inquiry. Participants are encouraged to bring and share ideas.

04:00 – 04:30 Wrap-Up and Next Steps

*Convenors (T. Clarke/B. Ross)
ARC Co-Chairs (S. Nameth/V. Thomas)*

Appendix IV: Suggested Review Questions for the Workshop

Suggested Review Questions for the November 29-30, 2006 Great Lakes Water Quality Agreement Governance and Institutions Workshop

Regarding the Review Questions

Note 1: These questions are provided as a guide to workshop attendees in advance of the workshop to help them prepare for the workshop. The questions do not all have to be addressed at the workshop. In addition, workshop attendees may have other questions relevant to the review of GLWQA Governance and Institutions (G&I) and such questions can be addressed also at the workshop.

Note 2: The workshop aims to assess the current structural relevancy of the GLWQA (the Agreement) and the various terms of reference from a G&I perspective, not to evaluate the actual performance of those responsible for the implementation of the Agreement; in doing so, however, the effectiveness of G&I of the Agreement needs to be reviewed in light of the roles of those responsible for implementing the Agreement.

Note 3: Although the scope of the G&I Review focuses on Articles VII, VIII, IX of the Agreement and the Terms of Reference of the Binational Executive Committee (BEC) as reflected generally in Article X of the Agreement, the Parties are signatory to the Agreement and are integral to the governance of the Agreement. This review of G&I of the Agreement includes, therefore, the IJC, joint institutions, BEC and also the Parties that have obligations and commitments under Article XI.

Note 4: The following documents are directly relevant to the topic areas and review questions outlined below. They are included in the background materials that workshop participants should read prior to the workshop.

- GLWQA Articles VII, VIII, and IX;
- Terms of Reference for the BEC;
- Terms of Reference for the Joint Institutions (includes the Great Lakes Water Quality Board (WQB) and Great Lakes Science Advisory Board (SAB)) and the Great Lakes Regional Office (GLRO); and
- Terms of Reference for the Council of Great Lakes Research Managers (CGLRM).

Question Area 1. Governance and Institutions Overview

At the start of the workshop, it may be useful to discuss/consider the broader, more strategic aspects of the Agreement's G&I provisions before delving into greater detail on specific G&I matters. Questions on this topic could include:

- A. From a G&I perspective, is the Agreement being implemented as intended? If not, how is implementation diverging from what is in the Agreement? Is divergence having a positive or negative effect on implementation of the Agreement?
- B. What governance functions (e.g., authority, accountability, transparency in decision making etc.) have been well implemented over the life of the Agreement? What functions, if any, have not, and why not?
- C. What broad G&I functions, if any, are missing from the Agreement that would improve overall implementation of the Agreement?

Question Area 2. The Parties and the BEC

The Parties: Success in implementing the Agreement in order to deliver on its specific objectives requires a collective effort by many jurisdictions and partners; nevertheless, the Parties are at the top of the apex of G&I and are ultimately accountable for the success or failure of the Agreement. Sample questions regarding the role of the Parties and political subdivisions of provinces, states, and municipalities could include:

- A. Is the accountability framework in the Agreement sufficient to ensure that the Parties are publicly and periodically accountable for the commitments made in the Agreement? If not, why not?
- B. Given that much of the implementation of the Agreement occurs at the provincial and state level, do the current accountability mechanisms in the Agreement take account of this reality? What responsibility do the Parties have to include the provinces and states in what the Parties use to demonstrate commitment to the Agreement and accountability for implementation?
- C. Should municipal governments be included in the accountability framework of the Agreement? What about Tribes and First Nations?
- D. Are there any specific recommendations to modify or improve the accountability mechanisms in the Agreement? Are there any institutional changes or adjustments to the governance aspects of the Agreement that would improve accountability?

The BEC: The BEC derives its mandate from the provisions of the Agreement, in particular Article X. The BEC's responsibilities, as outlined in its Terms of Reference, include the following:

- □□ set priorities and strategic direction for binational programming in the basin;
- □□ coordinate binational programs and activities;
- □□ respond to new and emerging issues on the Great Lakes including tasking existing or creating new working groups to undertake designated activities;
- □□ provide input to the Parties' evaluation of progress under the GLWQA; and,
- □□ provide advice, comment or other input for the preparation of various binational reports and presentations.

The BEC describes itself as a discussion forum that works by consensus in implementing its responsibilities and has a leadership role on behalf of the Parties in implementing the Agreement agenda. Although not mentioned per se in the Agreement, it is a required mechanism within the governance structure of the Agreement. How well the BEC has functioned to enable the Parties to meet their commitment to achieve the goals of the Agreement is a critical aspect of the review. Questions on this topic could include:

- E. Is the BEC functioning as intended according to its Terms of Reference? If not, how is it diverging from its Terms of Reference? Is any divergence having a positive or negative effect on implementation of the Agreement? If there are concerns about how well any function is being performed, what are these?
- F. If improved implementation of the Agreement is perceived as needed through the BEC, what functions, if any, are missing from the Agreement that should be included in the Terms of Reference of the BEC to achieve that result or to improve the functioning of the BEC?
- G. Are there any different planning mechanisms or decision-making processes that would improve the Parties' commitment to the Agreement? If so, how might the BEC need to be changed or modified in order to support these improvements?

Question Area 3: The IJC and the GLRO (Articles VII & VIII)

IJC: The powers, responsibilities, and functions of the IJC are described in Article VII and it relies on the joint institutions, namely the WQB, SAB, and GLRO (and the CGLRM) to help it fulfill its mandate. Since the signing of the Protocol in 1987, most of the "assistance" functions in this Article were transferred to the BEC, with the IJC becoming more focused on the "independent advice and assessment" functions specified in the Article (see reference in the background materials entitled "Reconstituted Task Force on Commission's Role and Priorities under the Great Lakes Water Quality Agreement", IJC 1991). These changes do represent a divergence from what is written in the Agreement. Questions on this topic could include:

- A. Is this divergence (or others) having a positive or negative effect on implementation of the Agreement?
- B. Has the governance/institutional structure under Article VII (and VIII) enabled the Parties to achieve the aims of the Agreement? If not, why not, and does the oversight function of the IJC need improvement in Article VII?

The IJC is an independent third party assessor of the effectiveness of the programs undertaken pursuant to the Agreement. The public and media view IJC reports relating to this function as a measure of how well, or poorly, the Parties have performed in the meeting their obligations under the Agreement. Questions on this topic could include:

- C. Should the responsibility of the IJC for assessment of the progress of implementation of the Agreement be maintained in the Agreement; that is, is there value in a binational

assessment function performed by the IJC? Are there other ways to better assess the performance of the Parties?

Great Lakes Regional Office (GLRO): The GLRO provides (1) administrative support and technical assistance for the WQB, the SAB, and the Council of Great Lakes Research Managers (CGLRM) to assist them in discharging effectively the responsibilities, duties and functions assigned to them under the Agreement, and (2) a public information service for the Agreement programs undertaken by the Commission and its Boards/Council. Under the 1987 Protocol to the Agreement, the IJC assumed greater responsibility for the operations of the GLRO and the GLRO is seen as one of three offices of the IJC. Questions on this topic could include:

- D. Are the Terms of Reference of the GLRO as described in the Agreement being implemented as intended? If not, how is implementation diverging from what is written in the Agreement? Is any divergence having a positive or negative effect on implementation of the Agreement?
- E. Is the public information function being delivered by the GLRO as described in its Terms of Reference?
- F. Are the functions of the GLRO sufficient to enable the WQB, SAB, and the CGLRM to deliver their responsibilities in implementing the Agreement?
- G. If not, why not, and what functions should be added to, or eliminated from, its Terms of Reference in the Agreement?
- H. Has the close institutional linkage between the IJC and the GLRO improved the implementation of the Agreement through the work of the Agreement's joint institutions?
- I. If not the GLRO as presently constituted, what other options are there for delivering its functions under the present (or any new) version of the Agreement?

Question Area 4. Joint Institutions (Article VIII)

Article VIII establishes the Water Quality Board (WQB), the Science Advisory Board (SAB) and the GLRO and describes the principal functions of these joint institutions. The roles and responsibilities of these joint institutions are further elaborated in their Terms of Reference. Although the Council of Great Lakes Research Managers (CGLRM) is not described in the Agreement and was established by the IJC, this joint institution works in close cooperation with the WQB and the SAB and is included in this review.

WQB: The Terms of Reference for the WQB are somewhat outdated since the creation of the BEC, with the WQB's role shifting from facilitating Parties' implementation of the Agreement to being a principal advisor to the IJC. Essentially, therefore, the WQB provides the policy advisory function to the IJC. Questions on this topic could include:

- A. Is the WQB functioning as intended under its Terms of Reference in the Agreement? If not, how is implementation diverging from what is written in the Agreement? Is any divergence having a positive or negative effect on the implementation of the Agreement?

The WQB submits reports with recommendations to the IJC and one means of determining the effectiveness and usefulness of the WQB as an institution in the implementation of the Agreement is to examine the extent to which the IJC has found its advice to be relevant and sound. Questions on this topic could include:

- B. Has the IJC generally accepted the advice of the WQB, as demonstrated by the transformation of WQB advice/recommendations into IJC recommendations for transmittal onwards to the Parties for their consideration and action?

Another criterion is to explore the composition of the WQB to ensure that it can adequately deal with the range of issues that may be placed before it for its advice. Questions on this topic could include:

- C. Given that the current membership of the WQB is derived exclusively from government agencies, would the WQB's function of providing independent advice to the IJC on Great Lakes issues be more effectively carried out with the addition of members with appropriate expertise from other sectors?
- D. To facilitate WQB members acting in their "personal and professional capacities", would the WQB be more effective if its Terms of Reference were modified to providing advice on emerging issues and/or focusing on matters in the basin that are not being addressed in any other forum? In so doing, should the composition of expertise needed to address these issues be explicitly addressed in determining the membership of the WQB?

SAB: The SAB is the scientific advisor to the IJC (and the WQB) and is responsible for developing recommendations on all matters related to research and the development of scientific knowledge pertinent to the identification, evaluation, and resolution of current and anticipated problems related to Great Lakes water quality. The composition of the SAB is different to that of the WQB in that the majority of its members are scientists outside of government. Questions on this topic could include:

- E. Is the SAB functioning as intended under its Terms of Reference in the Agreement? If not, how is implementation diverging from what is written in the Agreement? Is any divergence having a positive or negative effect on implementation of the Agreement?

Like the WQB, one yardstick for determining the relevance and effectiveness of the SAB in implementation of the Agreement is to determine how well its advice has been accepted and acted upon by the IJC and governments.

- F. Has the IJC generally accepted the advice of the SAB, as demonstrated by the transformation of SAB advice/recommendations into IJC recommendations for transmittal to the Parties for their consideration and action?

- G. Since sound science is an important, albeit one input into policy and decision-making what is the history of IJC/SAB advice being followed up or acted upon by the Parties?
- H. Taking into consideration the multitude of emerging threats to water quality and the basin ecosystem, are the current Terms of Reference of the SAB sufficient to effectively deliver its responsibilities under the Agreement?

CGLRM: The CGLRM functions under the authority of the IJC to assist the Commission in discharging its responsibilities under the Agreement. The CGLRM promotes inter-jurisdictional and interdisciplinary planning and coordination of research and monitoring related to the implementation of the Agreement. Questions on this topic could include:

- I. Is the CGLRM functioning as intended under its Terms of Reference? If not, how is it diverging from its Terms of Reference? Is any divergence having a positive or negative effect on implementation of the Agreement?
- J. Do the current institutional arrangements under the Agreement, including the SAB and the CGLRM, help or hinder the implementation of the research agenda for the Great Lakes?

Question Area 5. Submission and Exchange of Information (Article IX)

This Article speaks to the importance of exchange of data or other information between institutions that are implementing the Agreement. Questions on this topic could include:

- A. Is this part of the Agreement being implemented as intended? If not, how is implementation diverging from what is written in the Agreement? Are any divergences having negative or positive effects on the implementation of the Agreement?
- B. Are there functions missing from this Article that would improve the submission and exchange of information?

Question Area 6. Relationships between GLWQA Institutions and between GLWQA Institutions and other Institutions

Relationships between GLWQA Institutions: There are many interactions among the various Agreement institutions mentioned above. Questions on this topic could include:

- A. Are the relationships that have evolved over time adequate to support the implementation of the Agreement?
- B. Are structural changes to these relationships warranted to improve the delivery of results envisaged by the Agreement? If so, can such changes be implemented under the current Agreement and Terms of Reference? If not, what changes to the Agreement or Terms of Reference are needed?

Relationships between GLWQA institutions and other Institutions: There are other organizations/institutions, such as the Great Lakes Fishery Commission, the Great Lakes Commission, and the Council of Great Lakes Governors and Premiers that formulate policy initiatives, conduct studies, and implement programs that impact on the Great Lakes ecosystem. These organizations all have an interest in seeing that the objectives of the GLWQA are met. In addition, the Commission for Environmental Cooperation (CEC) has an interest in and conducts programs on a continent-wide basis (and sometimes on a regional basis) that can impact on water resource issues in the Great Lakes basin. There is an assumption that this nexus of cooperation can be helpful to the implementation of the Agreement by building partnerships, engaging more directly a broader cross-section of Great Lakes' interests, reducing potential duplication of activities, and minimizing possible competition among entities. Questions on this topic could include:

- C. Are the relationships that have evolved over time adequate to support implementation of the Agreement?
- D. Should anything be incorporated into the G&I aspects of the Agreement to foster and stimulate improved cooperation between all institutions that operate in the Great Lakes? If so, what?

Question Area 7. Exploration of Alternative Governance & Institutional Options

This part of the G&I workshop is intended to stimulate brainstorming on G&I aspects for both the current and/or any future Agreement. Possible questions on this topic, below, are simply to "kick start" the discussions

- A. Since the intent of the Agreement is to restore and maintain the chemical, physical and biological integrity of the Great Lakes basin, should the Agreement's governance provisions provide methodologies and obligations to link environmental performance objectives with programmatic performance responsibilities in order to learn and adjust over time and to provide clear assignment of accountability?
- B. Are there other options to the current institutions in the Agreement for improving the effectiveness of governance in the Great Lakes? Are there new models that would be more appropriate given the goals, needs, and challenges -- now, and in the future?
- C. If not through the BEC, what other options are there for carrying out the functions described in Article X of the Agreement? Would any different institutional arrangements between the Parties (other than or in addition to the BEC) enable the Parties to perform better than they are through the BEC as it is currently operating under the Agreement?
- D. In looking to the future, are there any other practical or realistic institutional alternatives or models to the joint institutions under Article VIII for effectively providing independent advice to the IJC?

- E. Is there a need in the Agreement to improve science-policy linkages? If so, are modifications needed to the existing Boards and Council or are there other institutional arrangements or models that should be considered?
- F. Is institutional scientific research and monitoring in the Great Lakes basin organized to effectively deliver the science necessary to protect the ecosystem including public health? If improvement is seen as needed, can changes be incorporated in the Agreement to achieve this end?

There appears to be an ongoing discussion as to how the various publics in the basin can be better engaged. Questions on this topic could include:

- G. Is further institution building or modification to existing institutions required or desirable in the Agreement for improving the involvement/engagement of the basin publics? If so, what is envisaged?
- H. Other suggestions?

Appendix V: List of Workshop Participants (including those interviewed over the telephone***) and Observers

1. Workshop Participants

<u>Name</u>	<u>Nationality</u>	<u>Sector</u>	<u>Organizational Affiliation</u>
John Jackson	CAN/US	NGOs	Great Lakes United (GLU)
Robert Wright	CAN	NGOs	Sierra Legal Defence Canadian Environmental Law Association (CELA)
Hugh Benevides	CAN	NGOs	Alliance for the Great Lakes
Lee Botts	US	NGOs	National Wildlife Federation
Michael Murray	US	NGOs	The Nature Conservancy
Lois Morrison	US	NGOs	GL-SL Cities Initiative
Anna Pace	CAN	Cities	GL-SL Cities Initiative
David Ullrich***	US	Cities	Canadian Chlorine Chemistry Council
Allan Jones	CAN	Industry	Council of Great Lakes Industries
George Kuper	US	Industry	URS Corporation
Michael Donahue	US	Industry	McMaster University
Gail Krantzberg	CAN	Academia	University of Guelph
Isobel Heathcote***	CAN	Academia	Great Lakes Research Consortium
Jack Manno	US	Academia	University of Illinois
John Braden	US	Academia	Western Michigan University
Jay Unwin***	US	Academia	Soil and Water Conservation Society
Jim Bruce	CAN	Former Government	
John Mills	CAN	Former Government	
Vic Shantora	CAN	Former Government	
Tom Daggett	US	Former Government	
John Cooley	CAN	Former Government	Former DFO
Henry Lickers	CAN	Aboriginal/Tribes	Environment Dept., Mohawk Council of Akwesasne
Chief Zane Bell	CAN	Aboriginal/Tribes	Chief, Algonquin Woodland Métis Aboriginal Tribe
Frank Ettawageshik	US	Aboriginal/Tribes	Great Lakes Indian Fish and Wildlife Commission
Kelly James McKnight	US	Aboriginal/Tribes	Department of Fisheries and Oceans
Peter Thompson	CAN	Government – Federal	–
Louise Lapierre	CAN	Provincial Government	Québec MDDEP
Sharon Bailey	CAN	Provincial Government	–
Bev Ritchie	CAN	Provincial Government	MOE
Ken Debeaussaert	US	Government – State	MNR
Victoria Pebbles	US	Government – State	Michigan DEQ
Don Pearson	CAN	Government	Great Lakes Commission
		Municipal	–
			Conservation Ontario

***Denotes individuals who were unable to attend the workshop, but participated in a post-workshop telephone interview with one or both of the Convenors.

2. Workshop Observers and Resource People

<u>Name</u>	<u>Nationality</u>	<u>Sector</u>	<u>Organizational Affiliation</u>
Lisa Bourget		IJC	IJC
Murray Clamen		IJC	IJC
Susan Nameth	CAN	ARC	ARC
Vicki Thomas	US	ARC	ARC
Mark Elster	US	ARC	ARC
Alison Kennedy	CAN	ARC	ARC
Sridhar Maniseti	CAN	ARC	ARC

APPENDIX 1

RWG D Technical Subgroup Report

Examination of the Status of the Goals of Annex 3 of the Great Lakes Water Quality Agreement

by

Members of the Annex 3 Technical Sub-group of the RWG D

Joseph V. DePinto (U.S. co-chair), David Lam (Canadian co-chair), Martin Auer, Noel Burns, Stephen Chapra, Murray Charlton, David Dolan, Russ Kreis, Todd Howell, Don Scavia
with assistance from

David Rockwell (U.S. co-chair of RWG D), Eric van Bochove (Canadian co-chair of RWG D)
Tom Looby (RWG D secretary)

Introduction and Background

One of the great successes of the Great Lakes science and management community since the signing of the Great Lakes Water Quality Agreement has been the control of eutrophication in the lakes through the reduction of phosphorus loadings in accordance with model-derived target phosphorus loads for each lake and major embayment. With the signing of the Great Lakes Water Quality Agreement in 1972 and its revision in 1978, the governments of the U.S. and Canada implemented a program of P load reduction that was unprecedented in any region of the world. A description of this program and its success can be found in DePinto et al. 1986.

A great deal of research and modeling led to the preparation and implementation of Annex 3 (“Control of Phosphorus”) of the Agreement, but perhaps the most pivotal analysis was the work of Task Group III (1978) (the full TG III report is presented in Appendix A). This group coordinated the application of a suite of Great Lakes eutrophication models in order to gain a consensus on the loadings of phosphorus to each of the lakes that would be necessary to achieve water quality objectives for those lakes.

The process of establishing the target P loads in Annex 3 first involved first the establishment of goals of phosphorus control. These goals are stated in section 1 of Annex 3 (IJC 1978):

- (a) Restoration of year-round aerobic conditions in the bottom waters of the Central Basin of Lake Erie;
- (b) Substantial reduction in the present levels of algal biomass to a level below that of a nuisance condition in Lake Erie;
- (c) Reduction in present levels of algal biomass to below that of a nuisance condition in Lake Ontario including the International Section of the St. Lawrence River;
- (d) Maintenance of the oligotrophic state and relative algal biomass of Lakes Superior and Huron;
- (e) Substantial elimination of algal nuisance growths in Lake Michigan to restore it to oligotrophic state; and
- (f) The elimination of algal nuisance in bays and in other areas wherever they occur.

Lake Basin	Chlor <i>a</i> (ug/L)	TP (ug/L)	Trophic State
Superior	1.3	5	Oligotrophic
Michigan	1.8	7	Oligotrophic
Huron	1.3	5	Oligotrophic
Saginaw Bay	3.6	15	Mesotrophic
Western Erie	3.6	15	Mesotrophic
Central Erie	2.6	10	Oligomesotrophic
Eastern Erie	2.6	10	Oligomesotrophic
Ontario	2.6	10	Oligomesotrophic

Water quality objectives were then established in order to meet these goals. A description of the process that determined the objectives is presented in Thomas, et al. (1980). The objectives that were established are presented in Table 1. Then a technical Task Group was constituted and charged with applying a suite of eutrophication models of varying complexity to quantitatively determine the phosphorus loading to each lake that would achieve those objectives. The Task Group III report (1978) fully documented this analysis and confirmed the establishment of the target phosphorus loads that appear in Annex 3 and in Table 2 below. In response to these recommendations, the Great Lakes community made significant reductions

Basin	1976 TP Load (mta)	Target TP Load (mta)
Lake Superior	3600	3400
Lake Michigan	6700	5600
Main Lake Huron	3000	2800
Georgian Bay (LH)	630	600
North Channel (LH)	550	520
Saginaw Bay (LH)	870	440
Lake Erie	20000	11000*
Lake Ontario	11000	7000* ³⁷⁵

in TP loads to Lake Michigan and the lower Great Lakes. For Lake Erie, for example, the major load reductions were achieved through phosphate detergent bans and municipal point source controls, which were largely achieved in the Lake Erie basin by the early 1980s. Because point source controls were not sufficient to achieve the target loads, best management practices were implemented on agricultural lands within the basin, and Lake Erie first achieved its target P load in 1981 (DePinto, et al. 1986). Response to P load reductions was rapid, profound, and close to those predicted by DiToro and Connolly (1980). A post-audit of their eutrophication model indicated it predicted concentrations of P, chlorophyll a, and central basin hypolimnion dissolved oxygen quite well (DiToro et al. 1987). Bierman and Dolan (1986) also successfully post-audited their model for Saginaw Bay. However, after the 1980s very little model analysis was done on the Great Lakes, and with the exception of Lake Erie, TP load measurement stopped in 1991.

In the process of reviewing Annex 3 of the GLWQA, a technical sub-group of the Nutrients Review Work Group (RWG D) was formed to revisit the technical basis for the development of Annex 3 and essential post-audit its success to the extent possible through the decade of the 1990's and beyond where possible.

Charge to the Sub-group

Through internal discussions and interaction with the Nutrients Review Work Group co-chairs of, David Rockwell and Eric van Bochove, the Technical Sub-group formulated a set of three fundamental questions to help frame their analysis of Annex 3:

Question 1- Have we achieved the target Phosphorus (P) loads in all of the Great Lakes?

Question 2- Have we achieved the water quality objectives in all of the Great Lakes?

Question 3- Can we define the quantitative relationships between P loads and lake conditions with existing models? Are the models still valid on a whole lake basis or have ecosystem changes to the P- chlorophyll relationship occurred such that new or updated models need to be run?

It should be recognized that the time and resource constraints of the overall Agreement review process, have made it impossible to undertake a rigorous and thorough analysis of these charge questions (especially question 3). However, in an attempt to inform this review we have summarized the information gathered and analysis conducted in this report.

Question 1: Target Phosphorus Loads Achieved?

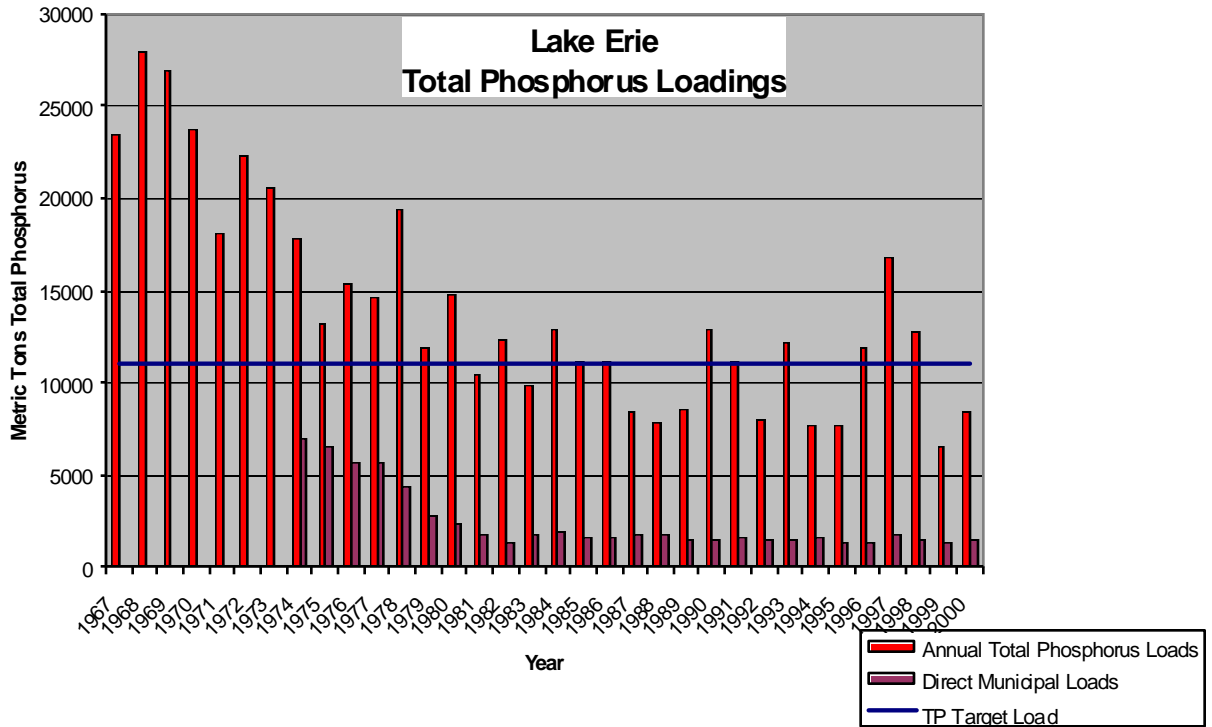
This question asks for an audit of the status of TP loads to the lakes relative to their target loads. We are especially interested in the frequency and extent to which TP loads have met the targets through the 1990s and into the 2000s. Unfortunately, with the exception of Lake Erie, loading data for the lakes has not been collected or compiled in any coordinated fashion since 1991. Therefore, addressing this question can be incomplete at best. Nevertheless, we have used available loading data to make the following assessments:

- TP loading estimates for Lake Superior exist for 1974 – 1991. Lake Superior was occasionally above its target load of 3400 metric tonnes per year (mta) prior the 1981, probably due to lack of state detergent bans up to that point. However, after 1981, there were no reported loads above the target, so it appears that Lake Superior has consistently met its target load since that point.

- TP loading estimates for Lake Huron exist for 1974 – 1991. Lake Huron load was occasionally above its target of 4360 mta through 1985. However, after 1985, there were no reported loads above the target. Based on this information, it appears that the target load has been met for Lake Huron. Some recent Michigan Department of Environment Quality load estimates for Saginaw Bay, an embayment of Lake Huron with an extremely large contributing drainage basin, indicate that this system is not meeting its target load of 440 mta. The MDEQ estimates are 614, 513, 227, 724 mta for 2001 – 2004, respectively. The load is almost directly proportional to the annual mean flow in the Saginaw River, suggesting that variation in precipitation and associated nonpoint source loads from the watershed are responsible for the exceedances of the target load.
- Like the above, TP loading estimates for Lake Ontario exist for 1974 – 1991. Lake Ontario first achieved its target load of 7000 mta in 1983, dropping from values above 20,000 mta prior to the mid-1970s. Since 1983, the Lake Ontario TP load has exceeded its target value five times – in 1984, 1986, 1987, 1990, and 1991. These excursions suggest that Lake Ontario has not been consistently meeting its target load (at least through 1991). Furthermore, it seems that the years when the Lake Ontario target is exceeded align with those years that have a high load to Lake Erie (over its target load).
- Lake Michigan has a record similar to the above three lakes (1974-1991). However, it has been supplemented by results from the Lake Michigan Mass Balance Study (LMMB) in 1994 and 1995. After 1980, there were no reported loads above the target of 5600 MTA. Based on this information, it appears that the target load has been met for Lake Michigan.
- Lake Erie has a continuous P load record from 1967 through 2002. Monitoring data exist for 2003 to the present and estimates will continue to be made despite gaps in the data. After an exponential drop in TP load, due largely to sewage treatment plants coming into compliance with a 1 mg/L effluent standard, the target load of 11000 MTA was first achieved in 1981 (Figure 1). During the period 1982 – 2002, the target has been achieved roughly half the time. A breakdown of the load categories indicates that variability in the load occurs as a result of hydrology during a given year, with loads exceeding the target occurring in years with relatively high precipitation and runoff. Recent data (2003 – 2005) suggest that current loads are at or just under the target. Based on this information, it appears that the target load has not been met consistently for Lake Erie.

In summary, a definitive answer to Question #1 is not possible due to the lack of load estimates in the last 15 years. Even if target loads on a lakewide basis are being met, it seems likely that nearshore areas and embayments may be experiencing excess P loading and the resulting degradation in trophic status. As TMDLs and other local and regional loading targets are developed, the relevant historical record should be examined and updated where necessary.

Figure 1. Total Phosphorus loads to Lake Erie from 1967 – 2001. Estimated direct municipal loads are also presented for the period of record (1974 – 2001).



Question 2: Water Quality Objectives Achieved?

This question deals with an assessment of how Great Lakes data compare in total phosphorus, summer chlorophyll *a* and Secchi depth compare to the objectives stated in Table 1 above.

Total Phosphorus

Data for spring total phosphorus concentration was obtained from two primary sources:

- Environment Canada. Mean spring TP concentrations were obtained from Environment Canada for the following parts of the system: Lake Superior, Lake Huron, Georgian Bay, Lake Ontario and the three basins of Lake Erie. These data provided estimates for the period from 1970 through 2005.
- U.S. EPA. Individual grab measurements collected during April were provided by EPA for Lake Superior, Lake Michigan, Lake Huron, Lake Ontario, and the three basins of Lake Erie. These data were collected for the period from 1983 through 1991 and from 1996 through 2004. Note that several of the lakes had missing years; in particular, several had no data from 1992 through 1995. These data were edited to exclude all (1) flagged values, (2) zero values, and (3) nearshore values. The remaining measurements were then averaged to obtain a mean spring value for each available year.

In addition, the Lake Michigan data was supplemented by values reported by Scavia et al. (1986).

Upper Lakes

As summarized in Figure , the open waters of the Upper Great Lakes as well as Georgian Bay appear to be currently below their respective TP goals. In fact, all areas appear to be at or approaching an oligotrophic state.

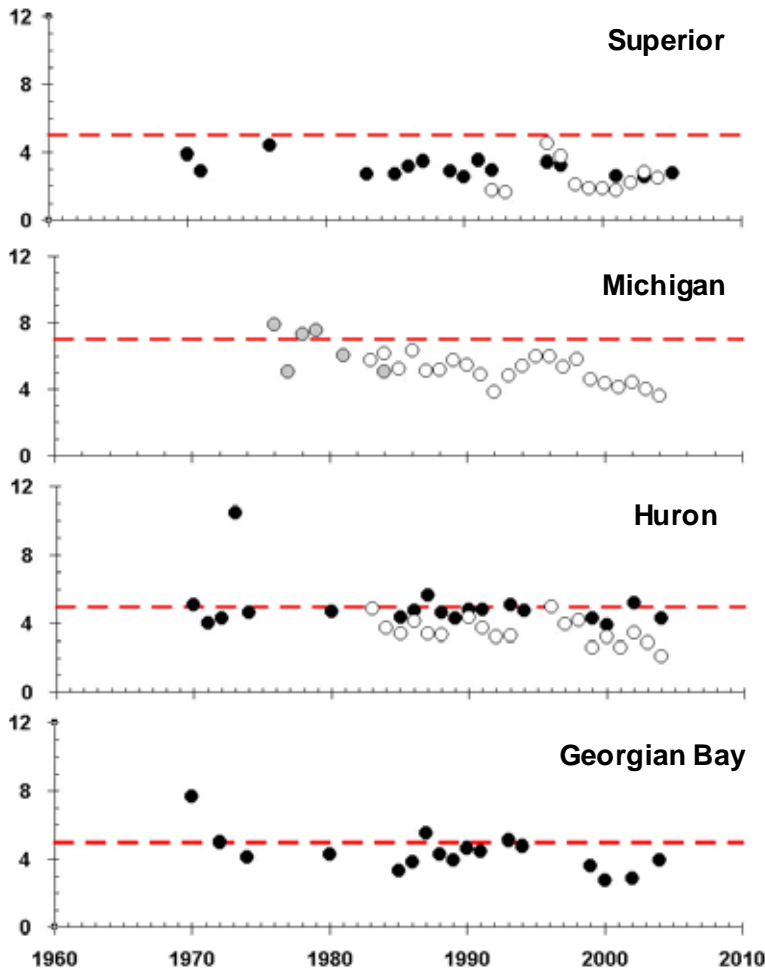


Figure 2 Mean spring TP concentrations ($\mu\text{gP/L}$) for the offshore waters of the Upper Great Lakes and Georgian Bay. The filled and open circles represent Canadian and U.S. data, respectively. The grey circles for Lake Michigan are taken from Scavia et al. (1986). Dashed lines represent the target water quality objectives.

A trend is not apparent in Lakes Superior, Huron and Georgian Bay. This may in part be due to the fact that they were never severely degraded during the late 1960's and early 1970's. In contrast, the levels in Lake Michigan appear to have been reduced from about 7-8 in the mid-1970's to current values of about 4 $\mu\text{gP/L}$.

Lake Erie

As summarized in Figure 3, although the Lake Erie data exhibits much more scattered, a downward trend also appears to have occurred in each of its three basins. However, in contrast to the Upper Lakes, levels have not yet dropped below the water-quality goals. In particular, the Western Basin still appears to be eutrophic with regard to its total phosphorus level.

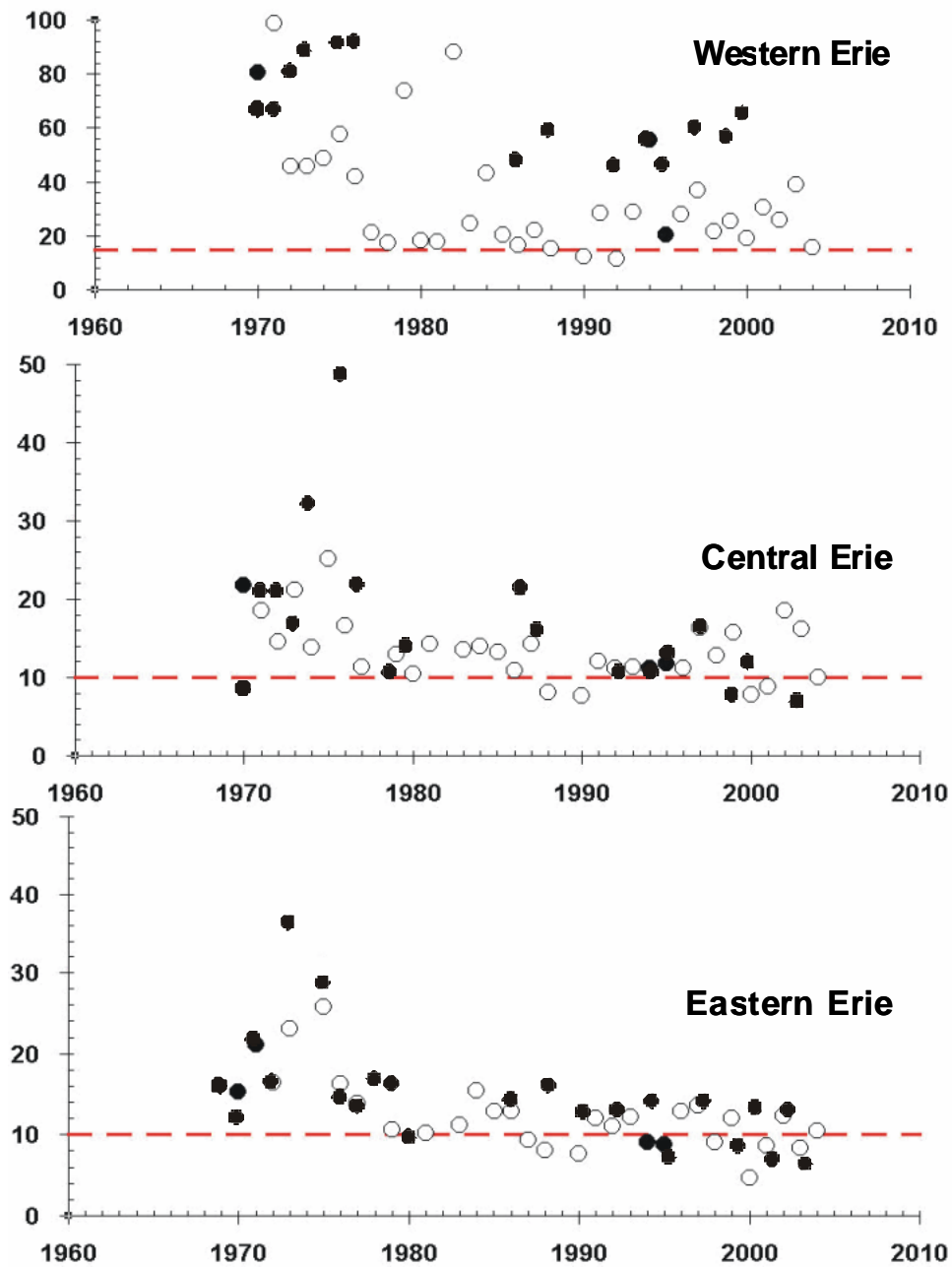


Figure 3 Mean spring TP concentrations ($\mu\text{gP/L}$) for the offshore waters of the three basins of Lake Erie. The filled and open circles represent Canadian and U.S. data, respectively. Dashed lines represent the target water quality objectives.

Lake Ontario

Of all the lakes, the most clear evidence of recovery is exhibited by Lake Ontario. As summarized in Figure 4, its total phosphorus concentration has dropped from levels in the 20-30 $\mu\text{gP/L}$ range down to solidly oligotrophic concentrations well below its 10 $\mu\text{gP/L}$ goal.

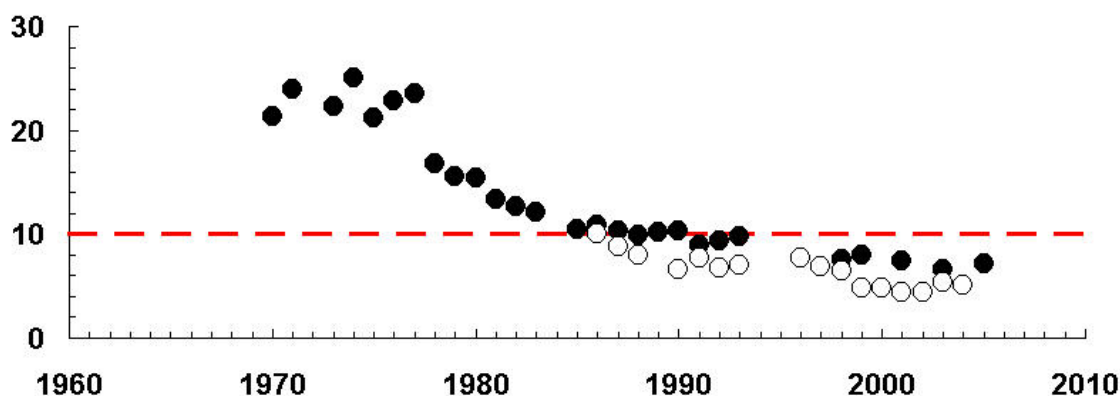


Figure 4 Mean spring TP concentrations ($\mu\text{gP/L}$) for the offshore waters of Lake Ontario. The filled and open circles represent Canadian and U.S. data, respectively. The dashed line represents the target water quality objective.

Inspection of the data for Lakes Superior, Huron and Ontario suggests that the U.S. data is systematically lower than the Canadian measurements. It should be determined whether this bias is real or merely an artifact of the differing approaches used to censor and average the data.

Summer Chlorophyll a

Data for summer chlorophyll a concentration was obtained from two primary sources:

- Environment Canada. Individual grab measurements collected during June, July and August were provided by EC for Lake Superior, Lake Huron, Georgian Bay and Lake Ontario. This data was collected for the period from 1973 through 2004. Note that several of the lakes had missing years; in particular, several had no data for the mid-1990's. These data were edited to include only offshore epilimnetic values. These data were then averaged to obtain a mean summer value for each available year.
- U.S. EPA. Individual grab measurements collected during August were provided by EPA for Lake Superior, Lake Michigan, Lake Huron, the three basins of Lake Erie and Lake Ontario. As with the TP data, values were provided for the period from 1983 through 1991 and from 1996 through 2004 with several of the lakes having missing years. These data were edited to exclude all (1) flagged values, (2) zero values, (3) nearshore values and hypolimnetic readings. The remaining measurements were then averaged to obtain a mean summer value for each available year.

Upper Lakes

As summarized in Figure 5, the open waters of the Upper Great Lakes as well as Georgian Bay appear to be currently below their respective chlorophyll a goals. All areas appear to be solidly oligotrophic or ultraoligotrophic. Note that in contrast to TP, there seems to be no evidence of a trend in Lake Michigan chlorophyll. This may in part be due to the absence of data prior to 1983.

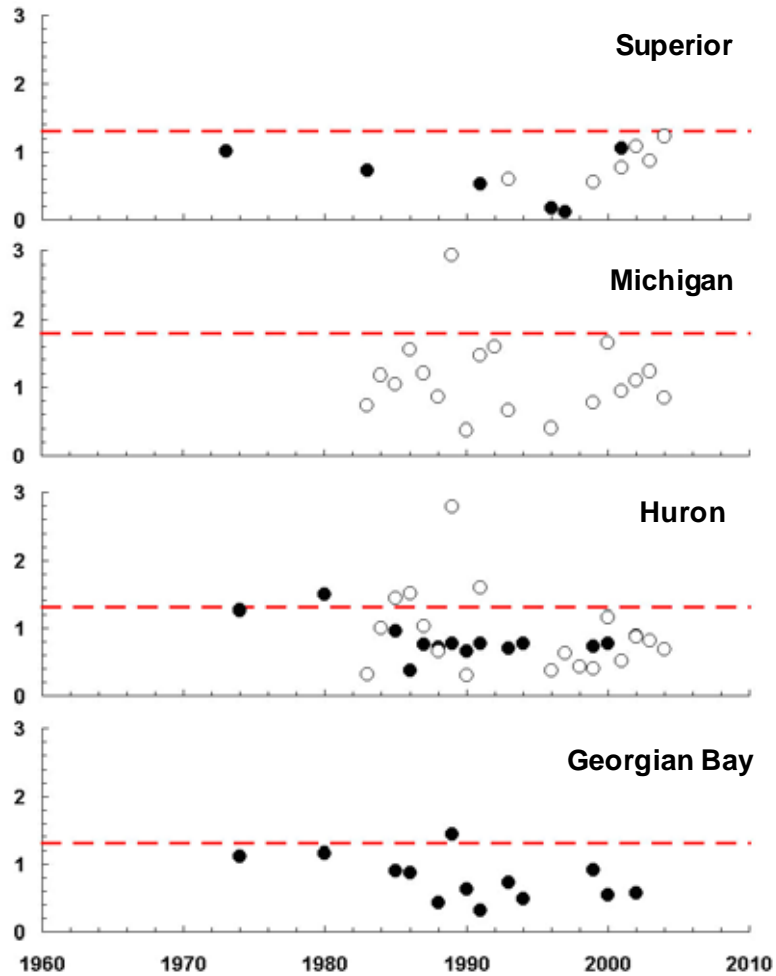


Figure 5 Mean summer chlorophyll a concentrations ($\mu\text{g/L}$) for the offshore waters of the Upper Great Lakes and Georgian Bay. The filled and open circles represent Canadian and U.S. data, respectively.

Lake Erie

As summarized in Figure 6, although the Lake Erie data exhibit much more variability, a downward trend appears to have occurred in each of its three basins. However, in contrast to the Upper Lakes, levels have not yet dropped significantly below the water-quality goals. In particular, the Western *Basin* still appears to be eutrophic. In addition, the data suggest that levels may be increasing in recent years.

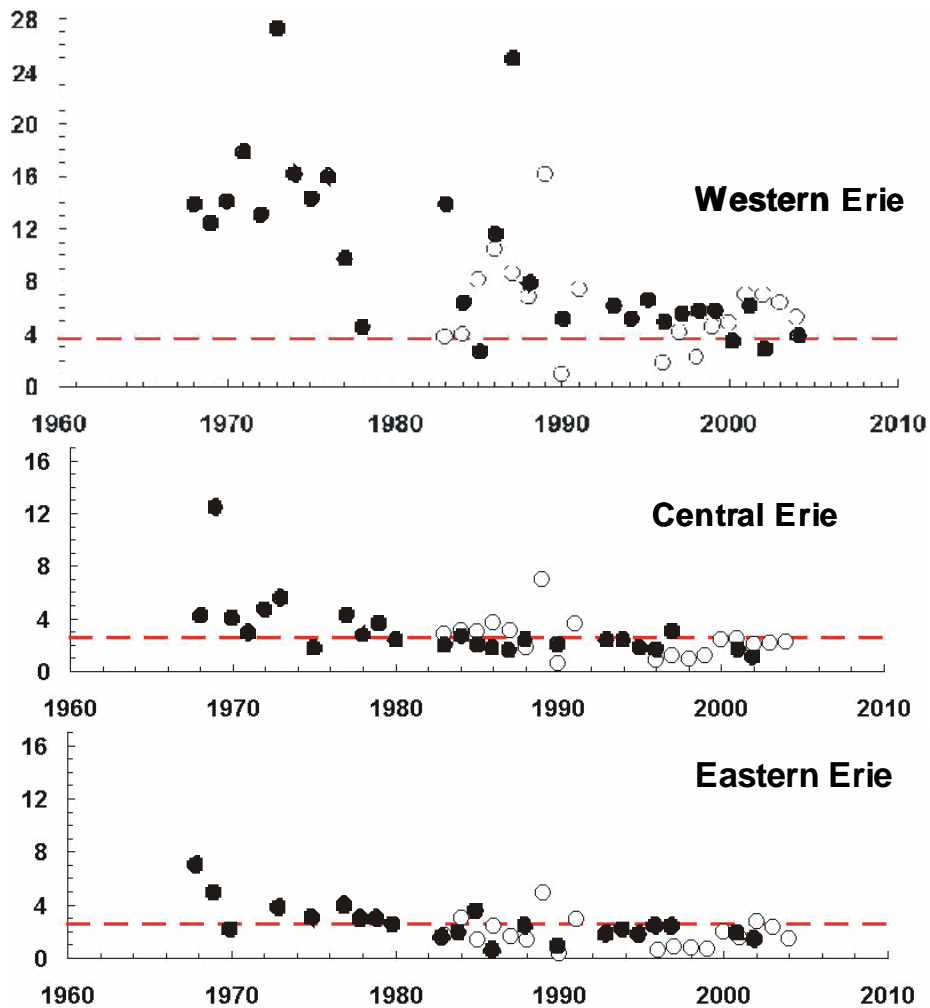


Figure 6 Summer chlorophyll *a* concentrations ($\mu\text{g}/\text{L}$) for the offshore waters of the three basins of Lake Erie. The filled and open circles represent Canadian data for June, July, and August and U.S. August data, respectively. Dashed lines represent the target water quality objectives.

Lake Ontario

Of all the lakes, the clearest evidence of recovery again is exhibited by Lake Ontario. As summarized in Figure 7, its chlorophyll *a* concentration has dropped from levels in the 4-6 $\mu\text{gP}/\text{L}$ range down to the 2-4 $\mu\text{gP}/\text{L}$ level. However, note that whereas the TP levels have dropped well below the water-quality objective, the chlorophyll values are hovering at the goal. Hence, it appears that the chlorophyll reductions are not commensurate with the decreases in phosphorus.

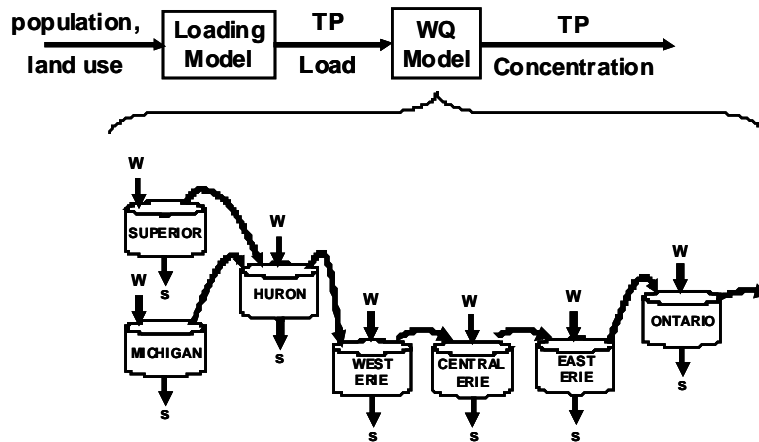


Figure 8 Schematic of a long-term, total phosphorus model for the Great Lakes (Chapra 1977).

The model was subsequently refined in two ways. First, as shown in Figure 9, major embayments were incorporated for Lake Michigan (Lower and Upper Green Bay) and Lake Huron (Saginaw and Georgian Bays) as described in Chapra and Robertson (1977), Chapra (1979), and Chapra and Sonzogni (1979). Second, Great Lakes-specific empirical correlations were developed to compute chlorophyll a as a function of total phosphorus concentration and Secchi depth as a function of chlorophyll a concentration (Chapra and Dobson 1981). The framework was then used, along with several other models, to establish phosphorus loading targets for the Great Lakes Water Quality Agreement (Chapra, 1980a, Bierman 1980, IJC 1980).



Figure 9 Revised segmentation of Great Lakes total phosphorus model (Chapra and Robertson 1977, Chapra and Sonzogni 1979).

In 1980, an initial assessment (Chapra 1980b) of the model's predictive ability was made for Lake Ontario where reductions in detergent phosphorus by New York State and the Province of Ontario had induced a downward trend in the lake's total phosphorus concentration. As in Figure 10, the results of that assessment were promising.

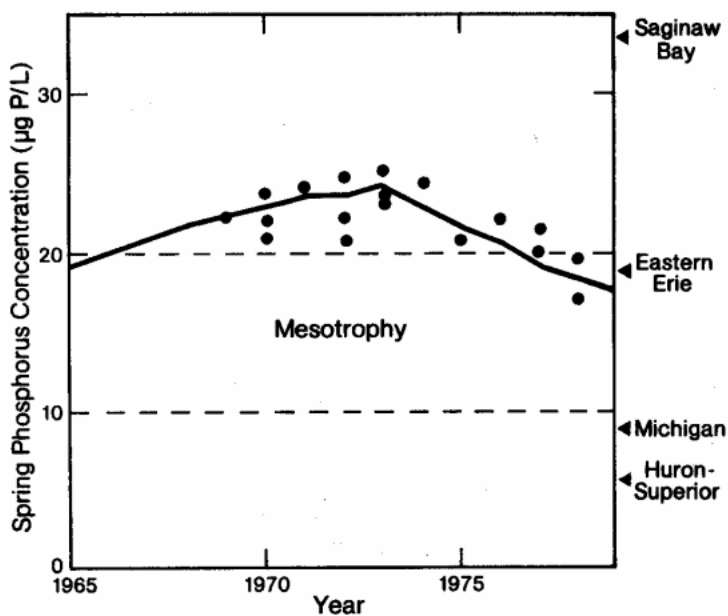


Figure 10 Comparison of model predictions with data for total phosphorus concentration in Lake Ontario (Chapra 1980b).

The present paper describes a more complete assessment by comparing model predictions with data collected over the past thirty years. The primary motivation is to assess whether the model adequately simulates the water-quality improvements that have occurred over this period.

Model Development

Loadings

The current model employs direct measurements of total phosphorus loadings wherever possible. Loadings have been determined for the three basins of Lake Erie from 1976 through 2001. For the other lakes, estimates are available on a whole-lake basis from the 1974 through 1991. The whole-lake values have been disaggregated based on population and drainage areas in order to estimate the bay loadings for Lakes Michigan and Huron.

For the period prior to 1970, historical total phosphorus loadings were computed based on population and land-use trends in the same fashion as originally reported by Chapra (1977). Minor adjustments were made to these trends (< 5%) so that they intersected the direct measurements in the early 1970's.

An exponential decay model was used to extrapolate loadings for the recent periods where data are unavailable. The model was assumed to apply to the loads for each lake over the period from the mid-1970's to the last year of measured data. The rates of decrease, which are listed in Table 3, range from 2.17% for Eastern Lake Erie to 5.19% for Lake Superior. The resulting model was then used to determine loading estimates for the subsequent years.

Table 3 Rates of decrease of loadings in the period from the mid-1970s through the most recent year that data was collected (2001 for Lake Erie and 1991 for all other lakes)

Lake	Rate (%/yr)
Superior	5.19%
Michigan	4.93%
Huron	2.68%
West Erie	4.20%
Central Erie	3.93%
East Erie	2.17%
Ontario	3.35%

The exponential model fits the loading trends relatively well. Figure 11 shows the results for the three basins of Erie along with the total loading. The plot suggests that the loads for all basins have decreased at a consistent rate over the quarter century depicted. In addition, the trend does not appear to be leveling off. Both these results are somewhat surprising. One would have expected that the loads would have dropped precipitously during the 1970s and 1980's due to the installation of phosphorus treatment at basin wastewater treatment plants and the introduction of low phosphate detergents. It is not clear why the loadings have continued to decrease at about the same rate after 1990.

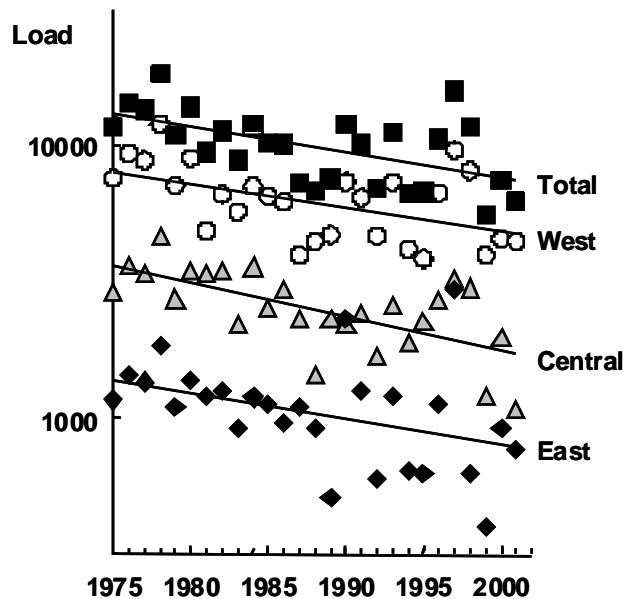


Figure 11. Semi-log plot of Lake Erie loadings versus year as compiled by Dolan.

Budget Model

With the exception of the apparent settling velocity, all model parameters are identical to those used by Chapra and Sonzogni (1979). A constant settling velocity was determined for each lake so that the total phosphorus predictions matched observations in the early 1970's.

Simulation Results

Upper Lakes

Simulation results for total phosphorus concentrations for the upper Great Lakes are depicted in Figure 12. Note that the results for Lakes Michigan and Huron are for the main lakes excluding the bays. All lakes exhibit reduced TP concentrations following load reductions since the mid-1970's. It is clear that all three lakes are now solidly oligotrophic if not ultraoligotrophic. Although the model generally follows the data trend, the latter exhibits considerable variability, which causes some individual observations to exceed the water-quality goal in Lake Huron. In addition, the model predictions for both Michigan and Huron are generally lower than the observations. This is reinforced by Figure 13, which shows the simulation results along with data for chlorophyll *a*. All three lakes exhibit concentrations less than 1 µg/L with observations approaching levels of the type observed in ultraoligotrophic systems such as Lake Tahoe.

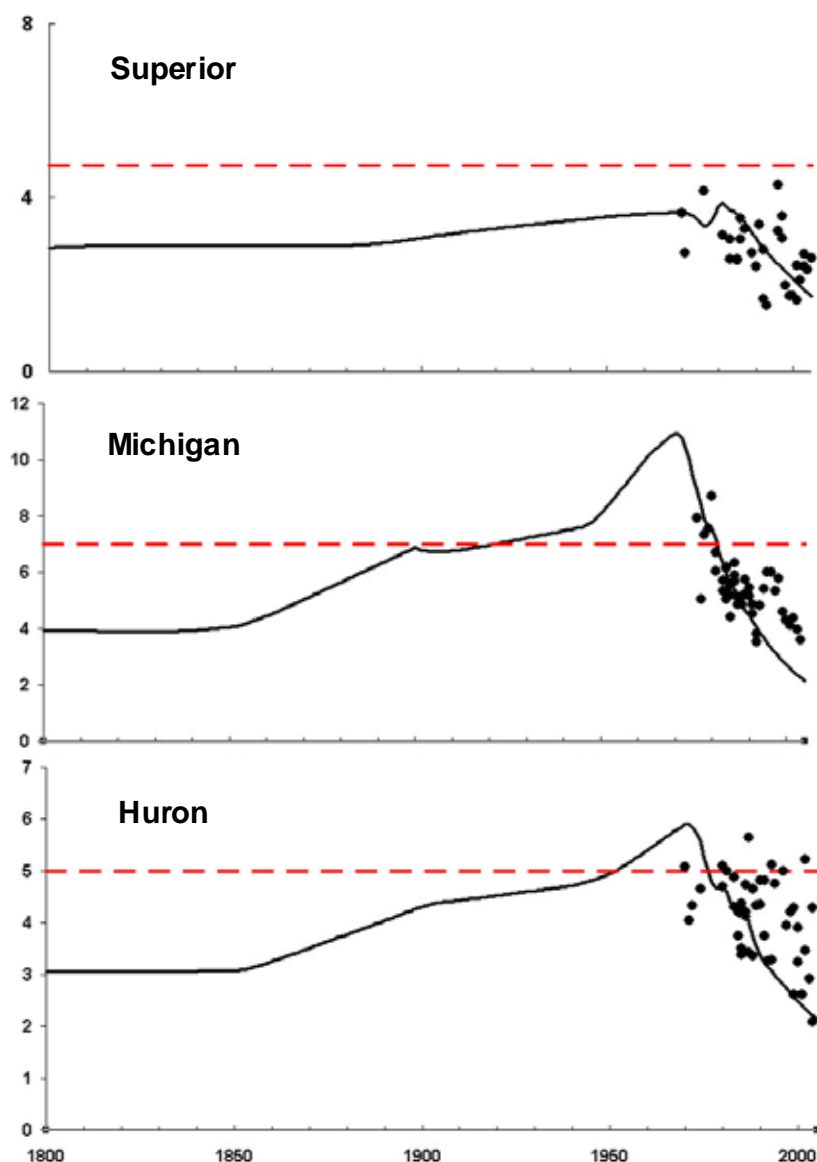


Figure 12. Plots of simulation results and data for TP ($\mu\text{gP/L}$) in the Upper Great Lakes: (a) Superior, (b) Michigan, and (c) Huron. The water-quality objectives are shown as dashed lines.

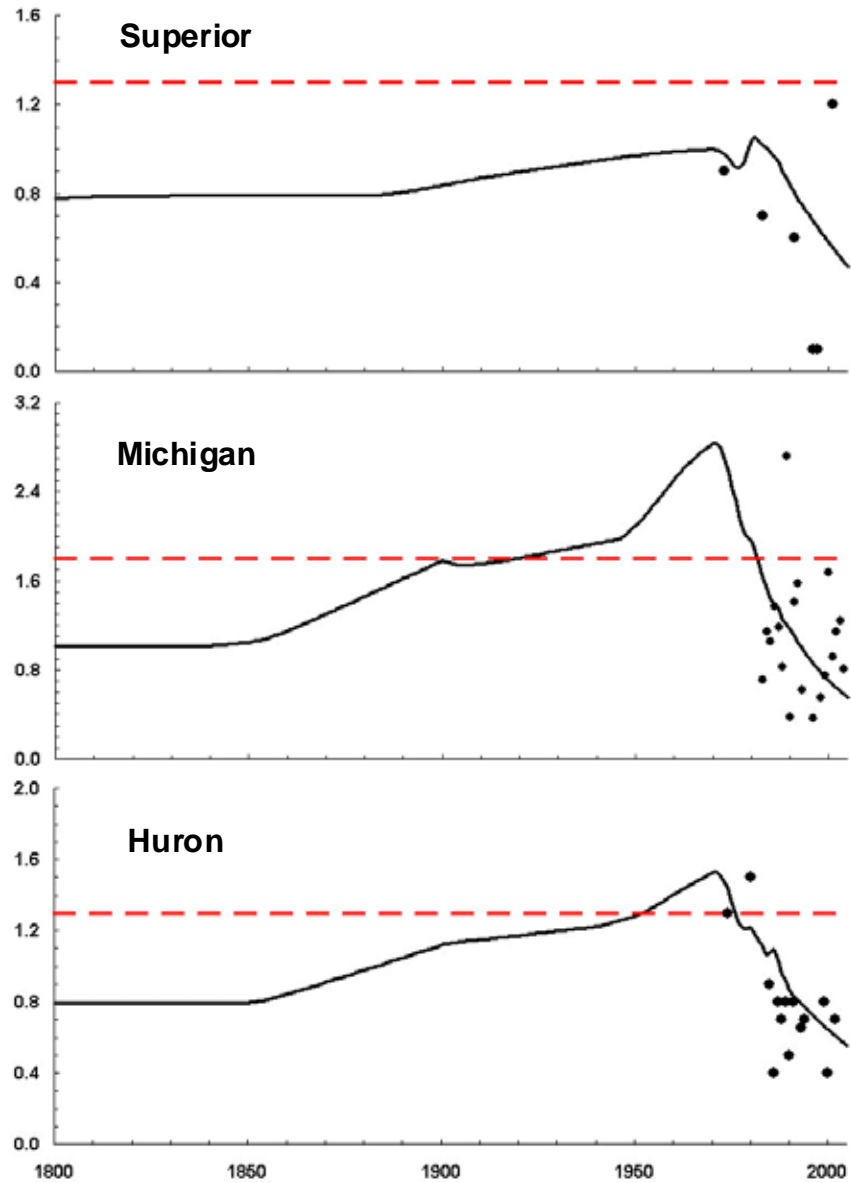


Figure 13. Plots of simulation results and data for chlorophyll a ($\mu\text{gP/L}$) in the Upper Great Lakes: (a) Superior, (b) Michigan, and (c) Huron. The water-quality objectives are shown as dashed lines.

Lake Erie

Simulation results for total phosphorus concentration for the three basins of Lake Erie are depicted in Figure 14. All the basins exhibit significant improvement following load reductions.

However, the levels still remain above the goals of mesotrophy for the Western Basin and oligomesotrophy for the Central and Easter Basins. Further, both model output and data are much more variable than for the other parts of the system. For the model, this is attributable to two factors. First, the basins have shorter residence times than the other lakes and hence are much more sensitive to variations in inputs. Second, the loadings themselves exhibit more variability than the loadings for the other basins.

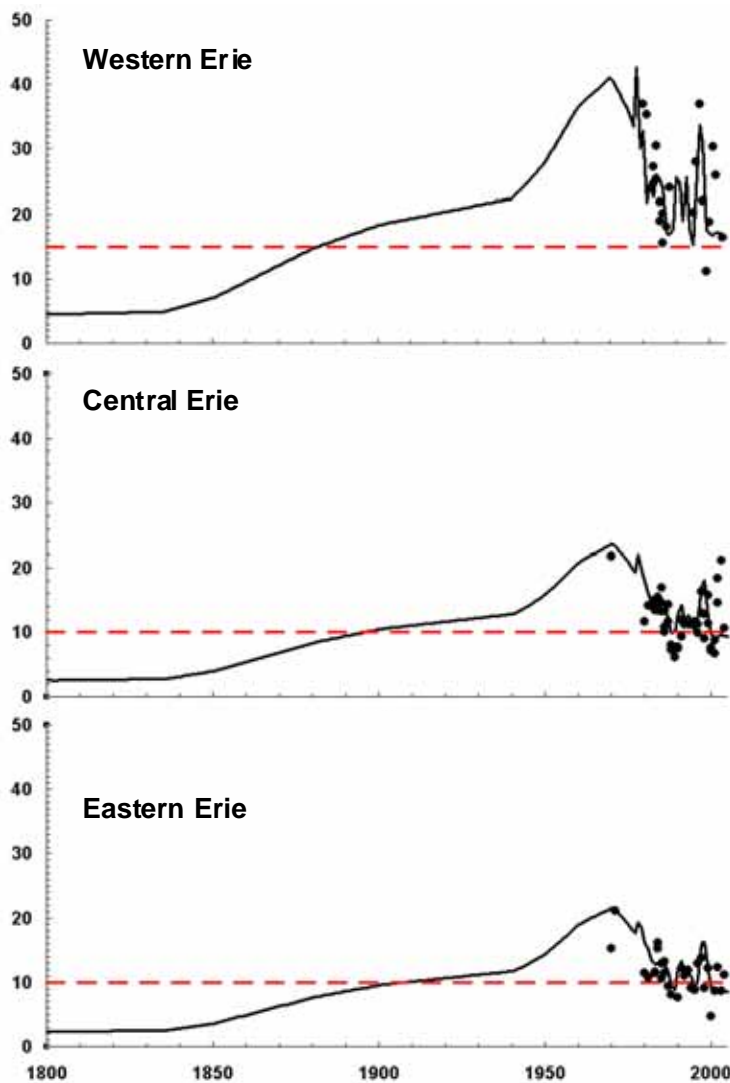


Figure 14. Plots of simulation results and data for TP concentrations ($\mu\text{gP/L}$) for Lake Erie. The water-quality objectives are shown as dashed lines.

Lake Ontario

Simulation results for total phosphorus, chlorophyll a and Secchi depth for Lake Ontario, are depicted in Figure 15. All three parameters exhibit significant reductions following load reductions since the mid-1970s. In contrast to other parts of the system, observations indicate that the lake is improving more than predicted by the model. Whereas the model predicts that the load

reductions should bring the lake to the vicinity of the oligomesotrophic target levels, the data suggests that it is solidly oligotrophic and seems to be approaching the ultraoligotrophic state of the Upper Lakes.

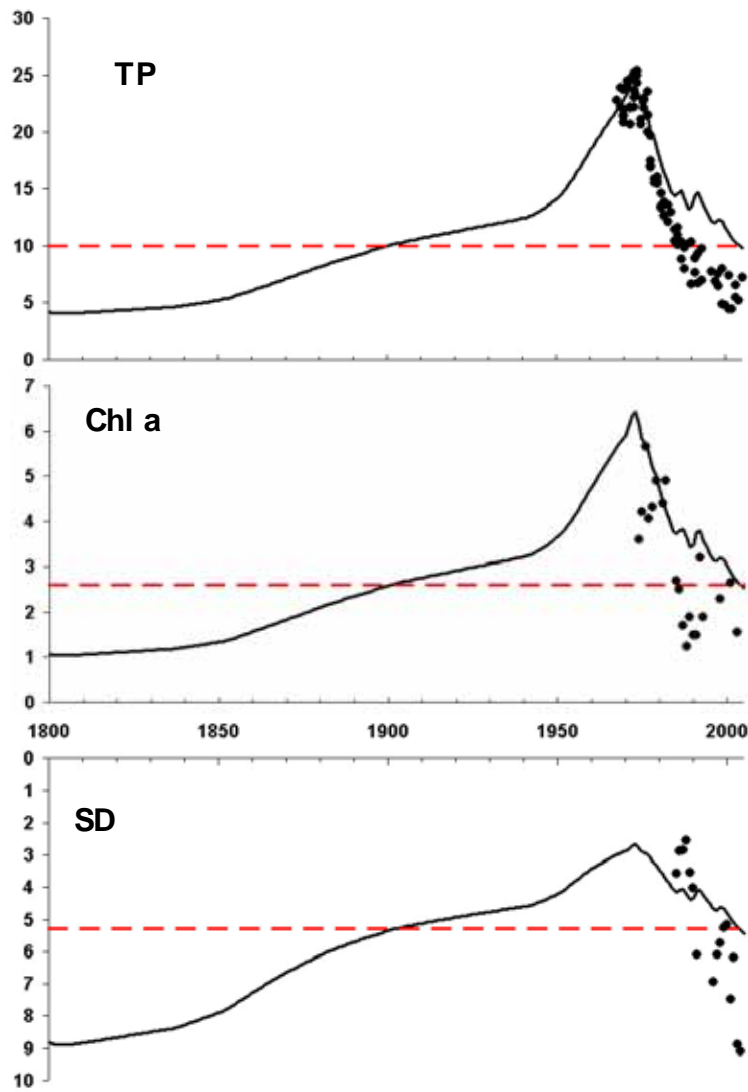


Figure 15. Plots of simulation results and data for (a) TP ($\mu\text{gP/L}$), (b) chlorophyll *a* ($\mu\text{gA/L}$), and (c) Secchi depth (m) for Lake Ontario. The water-quality objectives are shown as dashed lines.

Lam et al. Model on Phosphorus and Dissolved Oxygen for Lake Erie

Lam et al. (1987) developed a basin averaged model called the NWRI Nine-Box Model. It consists of spatial compartments for the west, central and eastern basins in the horizontal and three thermal stratification layers in the vertical dimension. The model variables are: soluble reactive phosphorus (SRP), organic phosphorus (OP), and dissolved oxygen (DO). The total phosphorus (TP) can be calculated as $TP = SRP + OP$. The processes include uptake and respiration of nutrient/planktons, settling of particulate phosphorus, aeration of surface waters, anoxic regeneration of phosphorus from sediment, and physical resuspension of phosphorus due to wind-wave actions. The model includes water temperature, nutrients, and light attenuation for photosynthesis, but does not separate phytoplankton into different species. The model has been verified and validated over the range of conditions during the 16-year period of 1967-1982 (Lam et al., 1987).

Updated results of the NWRI Nine-Box Model

Lam et al. (2006) provide an update of results for 1978, 1984, 1994 and 1997 of the NWRI Nine-Box Model for assessing the current status of the lakes relative to the goals of Annex 3. Using this model, which was calibrated for pre-Dreissena years, with the model coefficients unchanged, the effects of Dreissena on phosphorus and dissolved oxygen can be estimated by the deviation of computed results from observed data. Through sensitivity analysis, a preliminary conclusion was that Dreissena affect total phosphorus concentration in Lake Erie, notably a concentration decrease in the east basin (Figure 16). In contrast, changes in dissolved oxygen (Figure 17) in the central basin hypolimnion are influenced less by Dreissena, because the model was able to simulate the observed oxygen concentration in Post- Dreissena years (1994 and 1997) using the original formulation for oxygen, thermal layer thicknesses, and sediment oxygen demand in the absence of a new Dreissena submodel.

Combined effects of total phosphorus loading and thermal structure on central basin hypolimnetic dissolved oxygen

The combined effects of phosphorus loading and thermal structure on the dissolved oxygen concentration in the central basin hypolimnion just before Fall overturn were analyzed by Lam et al. (1987), using the NWRI Nine-Box model. Figure 17 shows the combined effects on DO concentration represented by three curves in response to lakewide total phosphorus loading under three different stratification conditions: (1) an average condition based on a 12-year (1967-1978) simulation, (2) a shallow hypolimnion and (3) a thick hypolimnion. The observed data for the selected years 1978, 1984, 1994 and 1997 for Figure 16 are also shown in Figure 17, indicating that while DO decreases with increased TP Loading, the observed DO concentration is also affected by the hypolimnion layer thickness. For example, of the four years selected for analysis, 1997 has relatively high TP loading with average stratification conditions, and has the lowest dissolved oxygen concentration. On the other hand, 1994 has very low TP loading combined with a thick hypolimnion layer, resulting in high dissolved oxygen concentration just before overturn. These results are well within the curves bounded by the shallow and thick hypolimnion curves in Figure 17 and are consistent with the computed results shown in Figure 16b. Other environmental factors such as the length of the stratification season may also influence the DO concentration in central basin hypolimnion (Schertzer and Sawchuk, 1990).

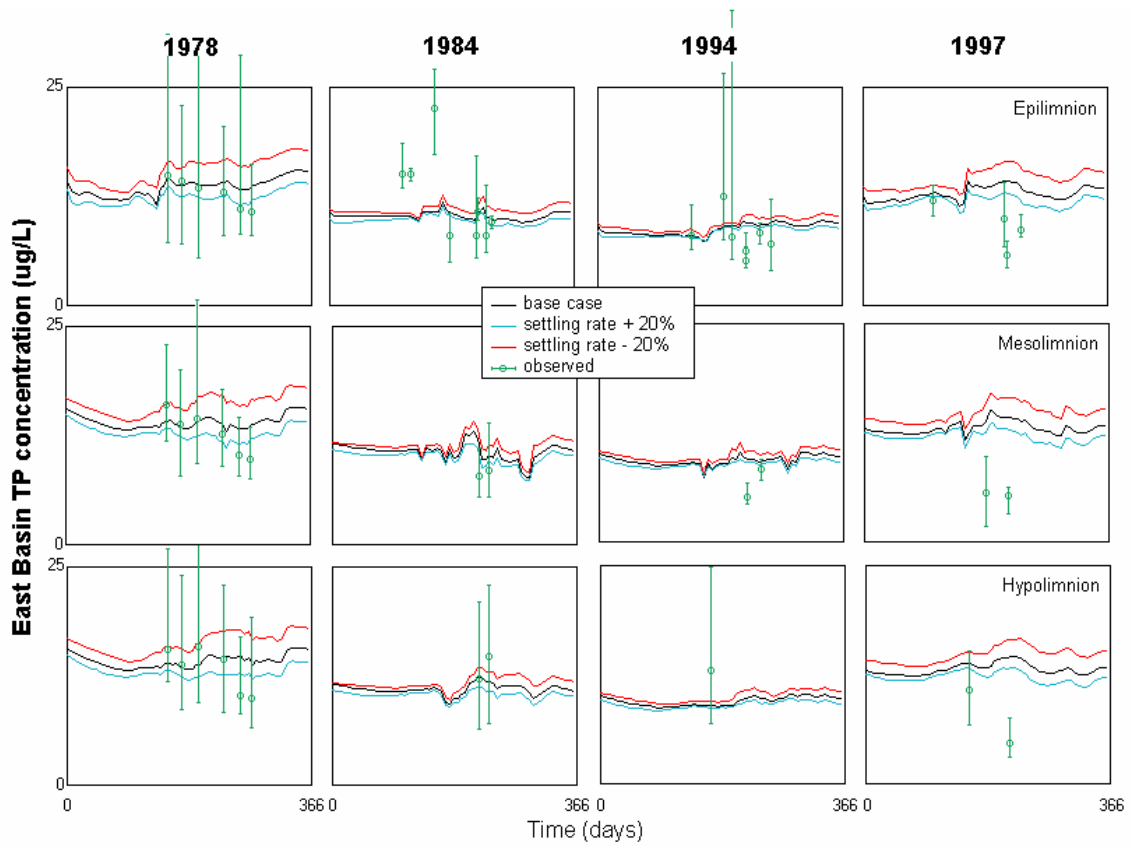


Figure 16a. Lake Erie East basin TP concentration (base case computed by NWRI Nine-Box Model, with hypothetical changes of settling rate $\pm 20\%$, compared to observed means and ranges) for epilimnion, metalimnion and hypolimnion in 1978, 1984, 1994 and 1997.

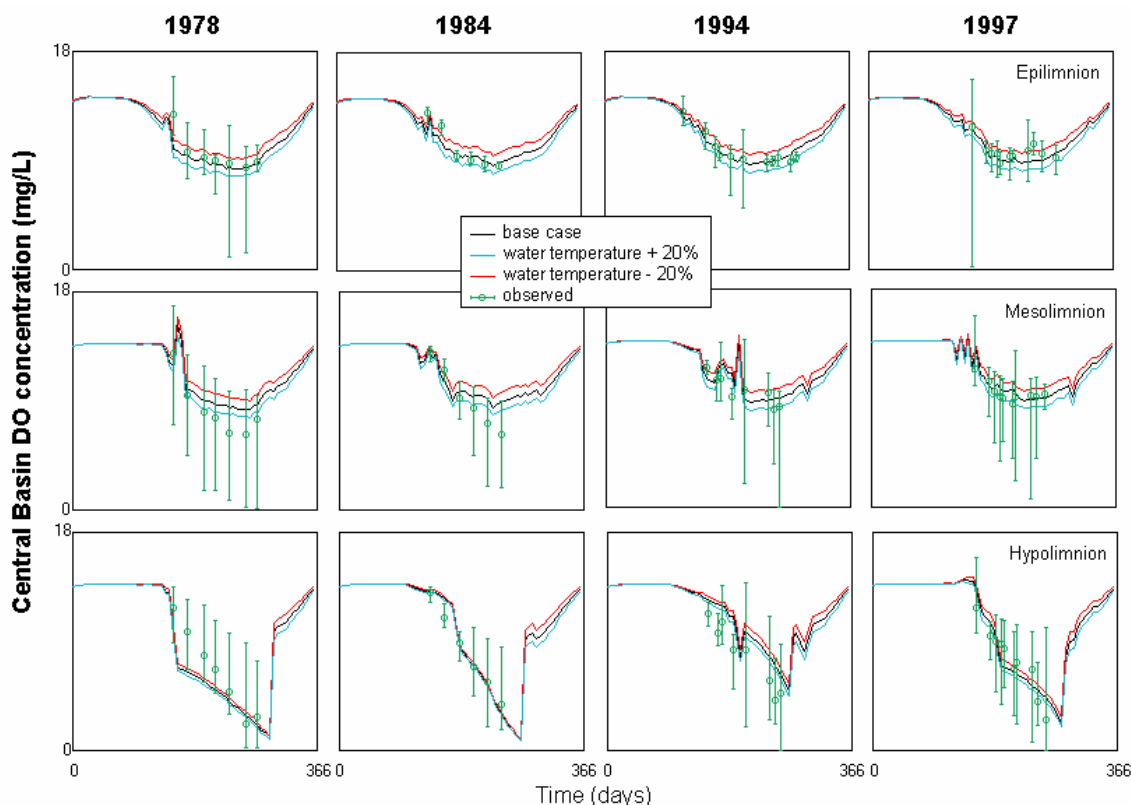


Figure 26b. Lake Erie Central basin DO concentration (base case computed by NWRI Nine-Box Model, with hypothetical changes of water temperature $\pm 20\%$, compared to observed means and ranges) for epilimnion, mesolimnion and hypolimnion in 1978, 1984, 1994 and 1997.

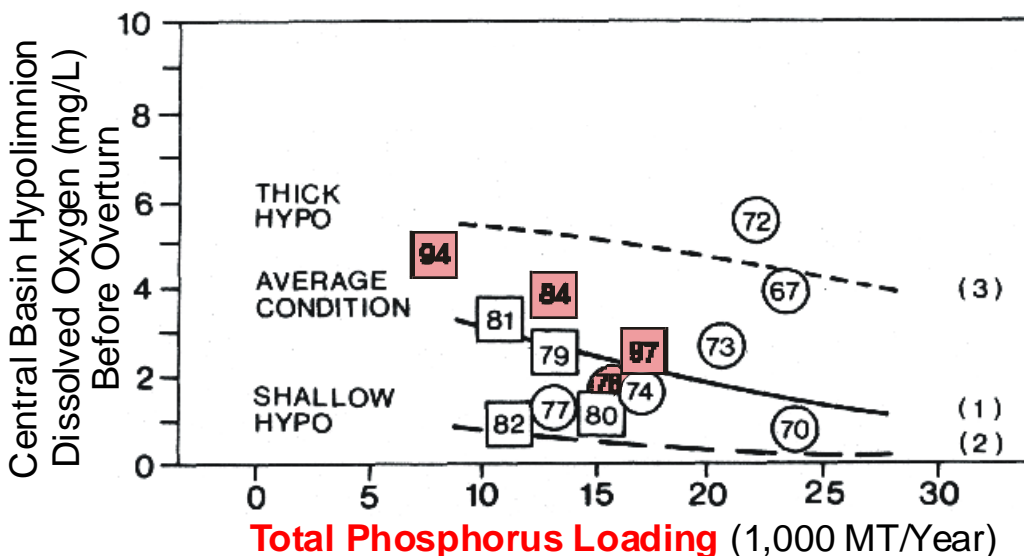


Figure 17. Estimated curves for central basin hypolimnion dissolved oxygen concentration just before overturn in response to lakewide phosphorus loading under three different stratification conditions: (1) an average condition based on a 12-year (1967-1978) simulation, (2) a shallow hypolimnion and (3) a thick hypolimnion. The

circles indicated observed data, if available, for 1967-1978 and the squares for subsequent years as a post audit with those for 1978, 1984, 1994 and 1997 shaded.

Nearshore Attached Algal Growth Modeling

Background and Objectives

Annex 3 of the Great Lakes Water Quality Agreement calls for the development and implementation of phosphorus control programs and measures to reduce algal biomass and to eliminate nuisance conditions, especially in Lakes Erie, Michigan and Ontario. Conditions of nuisance algal growth are a symptom of cultural eutrophication and manifest themselves in nearshore waters through the accumulation of massive quantities of actively growing and sloughed *Cladophora* biomass. Because the problem is a regular feature of sites heavily used for recreation, nuisance growths of this filamentous, attached alga play a major role in forming public perception of Great Lakes water quality.

Cladophora grows attached to solid substrate throughout the Great Lakes. It is typically found proximate to point source discharges of nutrients in Lakes Huron and Superior where whole-lake levels of phosphorus do not support growth. In Lakes Erie, Ontario and Michigan phosphorus enrichment has led to proliferation of the alga wherever solid substrate is available. *Cladophora* has been known to the Great Lakes scientific community for over 150 years, with nuisance conditions noted as early as the mid-20th century. Focus on *Cladophora* peaked in the period 1975-1985 when severe nuisance conditions spurred regulatory interest and subsequent support of field, laboratory and modeling studies. One key conclusion of this effort was that nuisance growth of *Cladophora* (i.e. biomass $>50 \text{ gDW}\cdot\text{m}^{-3}$) could be prevented if soluble reactive phosphorus concentrations in the nearshore were maintained at or below $2 \mu\text{gP}\cdot\text{L}^{-1}$.

Interest in *Cladophora* experienced a marked decline in subsequent years, although it is not clear whether this reflected improvements in nuisance conditions or re-direction of agency priorities. In fact, the absence of any regular and systematic monitoring of phosphorus and biomass conditions in nearshore waters makes it difficult to assess trends in nuisance growth between 1985 and the present. It is clear, however, that significant problems relating to *Cladophora* exist today, with a limited number of scientific studies and considerable anecdotal evidence pointing to continued nuisance growth in Lakes Erie, Michigan and Ontario and perhaps extending into Lake Huron.

Two events have potentially played a significant role in influencing *Cladophora* dynamics in the Great Lakes over the last two decades. The first of these is the implementation of phosphorus control strategies which have, in some parts of the Great Lakes, markedly reduced lake water phosphorus concentrations. The second is invasion by dreissenids with attendant impacts on water clarity and, perhaps, phosphorus cycling. The Annex 3 Technical sub-group has applied two mathematical models to investigate the effects of these two environmental stimuli on *Cladophora* growth, both singly and in concert. The first model is that of Canale and Auer (1982a) presently being used by Lisa Tomlinson and Marty Auer (Michigan Technological University) and Harvey Bootsma (University of Wisconsin – Milwaukee) on Lake Michigan. The second model is that of Higgins et al. (2005) being applied by Scott Higgins and Sairah Malkin (University of Waterloo) to Lakes Erie and Ontario, respectively. Selected results from that effort are summarized here; a full report of this work is included as Appendix B of this report.

Response to Phosphorus Loading Reductions

Here we examined Cladophora growth potential as driven by water column soluble reactive phosphorus levels before and after implementation of phosphorus control measures. Simulations focus on Lake Ontario where growth is driven by whole-lake nutrient levels. We use data for offshore soluble reactive phosphorus concentrations over the period 1969-2005 provided by Violetta Richardson (Environment Canada). A striking reduction in SRP was observed over this interval, with concentrations dropping from $15.3 \mu\text{gP}\cdot\text{L}^{-1}$ in 1973 to $5.7 \mu\text{gP}\cdot\text{L}^{-1}$ in 1982 and then continuing after establishment of dreissenids with reductions to $3.0 \mu\text{gP}\cdot\text{L}^{-1}$ in 1993 and $1.6 \mu\text{gP}\cdot\text{L}^{-1}$ in 2005. Note that whole-lake nutrient concentrations have, in 2005, reached the level predicted to be necessary to eliminate nuisance conditions. Model simulations (Figure 18) point to a 40-50% reduction in Cladophora growth potential, a result consistent with field observations made in Lake Ontario between 1972 and 1982-83 (Painter and Kamitis 1985), but inconsistent with present day observations of nuisance conditions.

Response to Dreissenid Impacts

One significant result of the dreissenid invasion was a marked improvement in water clarity. The vertical light extinction coefficient is estimated to have increased by 36%, on average, for Lakes Erie, Michigan and Ontario, corresponding to a 6m increase in the depth of the photic zone. The impact of this is illustrated in Figure 19 where the depth of colonization by Cladophora and its growth potential integrated over depth increase significantly compared with pre-dreissenid light conditions. The effect here is to potentially increase the area available for colonization, leading to increases in overall production.

A second, and as yet unproven, dreissenid effect is that of changes in phosphorus cycling. Hecky et al. (2004) have hypothesized the existence of a nearshore phosphorus shunt where inputs of particulate phosphorus, previously exported to offshore waters, may be captured by dreissenids and made directly available to Cladophora populations sharing solid substrate. DePinto, et al. (2005) have used an ecosystem model for Saginaw Bay that has incorporated dreissenids to demonstrate how their presence has altered phosphorus cycling in that system and provided excess available phosphate in late summer to stimulate blue-green algal growth. The implications of the nearshore phosphorus shunt, not only as manifested in the lakes, but also in how we model and manage phosphorus, are significant.

Summary

While direct measurements and hard data are not available, it is apparent that phosphorus management actions have not led to the reduction of nuisance levels of Cladophora biomass in Lake Erie, Michigan and Ontario. Modeling results indicate that improvements in the light environment associated with dreissenid activity have offset any reductions in phosphorus levels. It is quite possible, as well, that changes in nearshore phosphorus cycling (the shunt) have further served to offset reductions in external loads.

Our failure to support appropriate monitoring programs with respect to phosphorus and Cladophora is keenly felt when the scientific community is called upon to render recommendations in support of policy development. Further, the mathematical models developed to address this issue two decades ago could not foresee the changes to ecosystem conditions brought on by the invasion of dreissenids.

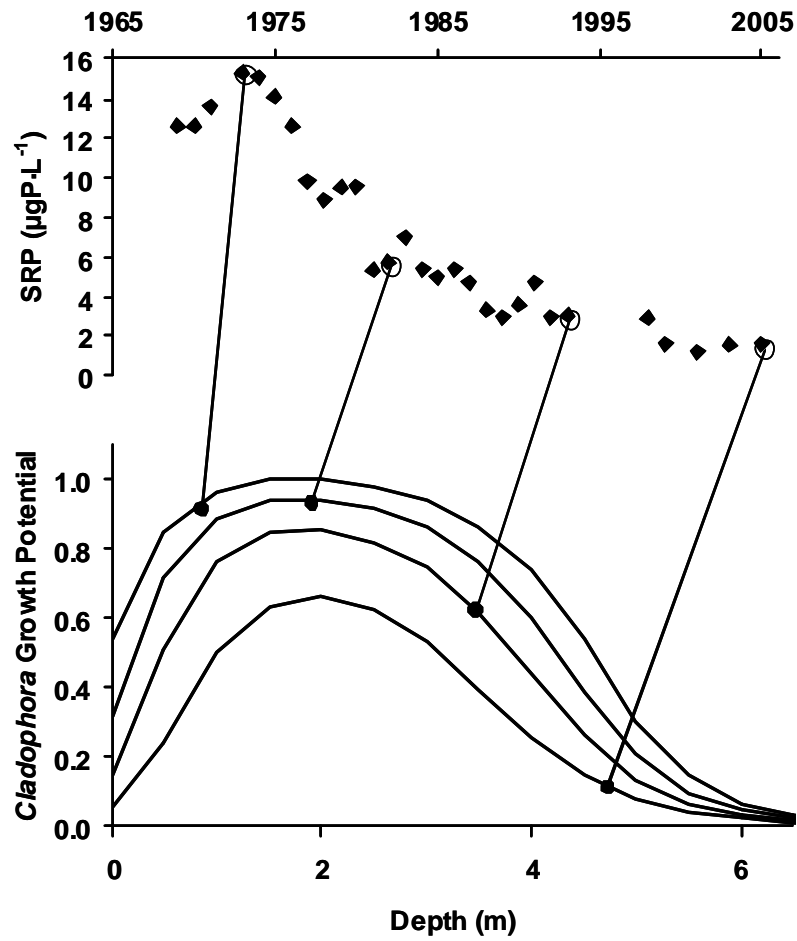


Figure 18. Model-calculated response in *Cladophora* growth potential to observed changes in SRP concentration in Lake Ontario. Simulations are those of the CAM framework for the Lake Ontario temperature regime and the pre-dreissenid light environment. SRP data were provided by Vi Richardson, Environment Canada.

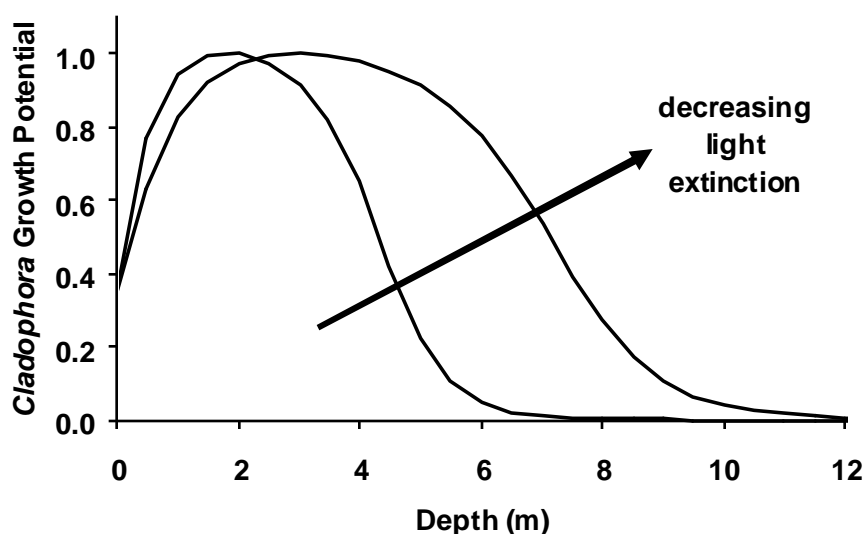


Figure 19. Response of *Cladophora* growth potential to changes in light extinction coefficient; algal populations experience identical SRP conditions.

Conclusions and Recommendations

With regard to the question of the status of phosphorus loadings to the Great Lakes relative to the target loads, all conclusions except those for Lake Erie and perhaps Saginaw Bay must be qualified by the fact that load monitoring and estimation ceased in 1991. Therefore, conclusions can only be made for the status of Lake Superior, Lake Michigan, Lake Huron, and Lake Ontario must be qualified. Having said that, the available data show that all lakes and Saginaw Bay experienced load reductions through the 1970s and achieved their targets in the early to mid-1980s. The upper lakes (Lake Superior, Lake Huron, and Lake Michigan) appeared to have maintained their loads below their respective targets for the period of record. The total phosphorus loads to Lake Erie and Saginaw Bay appear to oscillate around the target depending on variations in non-point source runoff phosphorus loads driven by the hydrological basin supply for a given year. Lake Ontario also exceeded its target load on five occasions between first achieving it in 1983 and the end of our record in 1991. The Lake Ontario high loads may be related to its receiving loads from Lake Erie, a major source of phosphorus to Lake Ontario.

The second question on the status of the lake water quality relate to the objectives that drove the model computation of target phosphorus loads focused on total phosphorus concentration in open waters at spring overturn, chlorophyll a concentration during summer monitoring, and in the case of Lake Erie, dissolved oxygen concentration in the central basin hypolimnion. Annex 3 also refers to elimination of nuisance algal blooms, with particular reference to nearshore blooms and algal mats. The data available from EPA and EC on total phosphorus suggest that all lakes have achieved their objective as stated in Table 1, with the exception of the western and central basins of Lake Erie. Indeed, Lake Huron and Lake Ontario have displayed spring TP concentrations considerably below what would be expected from the models based on their

estimated TP loads (see discussion below). With regard to chlorophyll *a*, again the open-water data have shown a significant response to TP load reductions and appear to have met or exceeded objectives, with the exception of western basin of Lake Erie.

Dissolved oxygen monitoring in the central basin hypolimnion of Lake Erie has demonstrated that the GLWQA goal of “Restoration of year-round aerobic conditions in the bottom waters of the Central Basin of Lake Erie” has definitely not been met. Although the system appeared to respond favorably and predictably to TP load reduction for Lake Erie in the 1970s and 80s, more recent data over the past 10-15 years suggest that this goal may be very difficult to achieve even with significantly lower TP loads because of the morphometric characteristics of the central basin and possibly because of the exacerbating effects of climate change and dreissenid invasions. A relatively thorough investigation of the rate of hypolimnetic oxygen depletion in the central basin by Burns, et al. (2005) found that the volume-corrected rates show a weak tendency to decrease from 1970 to 1989 and a slight trend to increase with time from 1990 to 2003. However, these patterns seem to be related to the previous year’s TP loading to the basin. The observation that central-basin HVO_D (hypolimnetic volume-corrected oxygen depletion rate) tracked the reductions in TP loadings through the 1980s may be the first direct affirmation that central basin oxygen dynamics can be regulated by phosphorus inputs, albeit more weakly than originally hoped. This implies that TP loads must continue to be regulated if we wish to minimize oxygen depletion rates in an effort to reduce frequency of episodic central basin anoxia. It should be mentioned, however, that the relative contributions of various environmental factors to central basin hypoxia is still being quantified through monitoring and research.

One of the significant recent observations of Great Lakes water quality is the apparent re-occurrence of shoreline nuisance algal growth, including *Chlorella*, in all of the lakes except Lake Superior. Again, it is not clear if this recent observation is the result of changes in the nearshore ecosystem of these lakes or the result of increases in nutrient runoff loads from non-point sources that have not been tracked or a combination of both.

Completely addressing question 3 on the utility of historical models as management tools for supporting eutrophication-related objectives in the Great Lakes is far beyond the time and resources available for this sub-group activity. However, we did have the benefit of considerable volunteer efforts on the Chapra basin-wide total phosphorus model and on the *Chlorella* modeling efforts by Auer and Higgins. In general, the Chapra model still does a reasonably good job of simulating TP and chlorophyll *a* open-lake data given measured TP loads prior to 1991 and projected loads after 1991. The major exception is Lake Ontario, where the model appears to over-predict TP and chlorophyll *a* and under-predict Secchi depth. It is not clear whether this is the result of incorrect TP loads through the 1990s and early 2000s or whether the load is not contributing to open-lake nutrient and productivity conditions because of a change in the nearshore processing of nutrient loads entering along the shoreline.

Both the *Chlorella* analysis and the modeling by Lam on Lake Erie and DePinto and Bierman on Saginaw Bay, suggest that there has been a change in the ecosystem structure and functioning of the lakes that will require modification of the models used in the 1970s in order to support nutrient-eutrophication management in the lakes today and in the future.

Given the findings of this sub-group described in this report, we propose the following recommendations for monitoring and modeling to aid nutrient-eutrophication management of the Great Lakes in the face of ecological changes that appear to have occurred:

7. The Great Lakes monitoring programs of the two countries should focus a larger percentage of their efforts on monitoring nearshore conditions in order to compare with the more traditional open-water conditions. It is quite possible for a lake to be experiencing nuisance conditions in the nearshore areas while appearing to be meeting water quality objectives in the open-water.
8. A more thorough investigation of the utility of models developed in the 1970s for future management of Great Lakes nutrient-eutrophication conditions needs to be undertaken. This effort should focus on determining how models should be modified/refined if they are found to be lacking relative to ecosystem structure and function changes that have occurred in the lakes. The improved models will provide more accurate predictions and revised target loads if necessary.
9. There needs to be a concerted research, monitoring and modeling effort to quantitatively understand, in the sense of developing a model that can simulate system-level cause-effect relationships, the simultaneous low productivity and fish carrying capacity in the open water of Lake Ontario and nuisance algal bloom and mat formations in the nearshore areas of the lake. The role of *Dreissena*, which have invaded nearshore areas of all the lakes except perhaps Lake Superior, in this phenomenon should be researched. The research results will be useful for providing advice to integrated environmental and aquatic resources management plans.
10. There needs to be a concerted research, monitoring, and modeling effort to quantify the relative contributions of various environmental factors (total phosphorus loads, changes in the availability of phosphorus loads to the central basin, hydrometeorological impacts on temperature conditions and hypolimnion structure and volume, *Dreissena*-induced alterations of nutrient-phytoplankton-light conditions and oxygen demand functions) to hypoxia in the central basin of Lake Erie. The research may lead to a more achievable goal than the current goal of year-round aerobic condition in Lake Erie central basin.
11. There is a need for a concerted *Cladophora* modeling initiative with the overall goal of providing lake managers with reliable estimates of the response of *Cladophora* growth and accumulated biomass to changes in soluble phosphorus concentrations in the coastal areas affected by *Cladophora* blooms. The initiative should include (1) regular monitoring of *Cladophora* biomass and tissue phosphorus content and soluble reactive phosphorus levels in the nearshore and (2) an integrated program of field and laboratory studies and mathematical modeling to better understand phosphorus cycling and *Cladophora* growth under conditions representative of the post-dreissenid period.

All of the above efforts should be implemented using a well-coordinated, bi-national, ecosystem approach that respects potential interactions between nutrient-eutrophication management and other management issues, such as fisheries, persistent bioaccumulative and toxic chemicals, human health protection relative to water recreation and drinking water supply, sediment reduction, etc.

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APPENDIX 2

RWG D Annex 13 Subgroup Report

Memorandum

To: Review Workgroup D
David Rockwell, GLNPO/US Cochair
Eric van Bochove, Agriculture and Agri-Food Canada/Canadian Cochair

From: Technical Sub-group for Annex 13
Scott Duff, Ontario Ministry of Agriculture, Food and Rural Affairs/Canadian Cochair
Janette Marsh US EPA Region 5 Water Division/US Cochair

Subject: Final Report

The Annex 13 Technical Sub-group of RWG D has been meeting through conference calls since May. The sub-group was established to allow for a more in depth examination of the technical issues associated with Annex 13.

The Annex 13 Technical Sub-group has held three conference calls and co-chairs and other members have participated in numerous additional calls of the full RWG D.

Charges: Through interaction between the co-chairs of RWG D, David Rockwell and Eric van Bochove, and based on the content of Annex 13, the Technical Sub-group formulated a set of “charges” to guide their efforts. The charges are:

1. Compile an inventory of watersheds in the Great Lakes Basin.
2. List the priority hydrologic units that have been identified w/in each watershed in the Great Lakes Basin and prioritize them where feasible.
3. Report on the status of development and/or implementation of watershed management plans for each priority hydrologic unit within each identified watershed.
4. Report on the status of land use abatement activities to reduce nonpoint sources in the Great Lakes watersheds.
5. Examine opportunities to identify substantive goals and objectives as part of its effort to assist RWG D in preparing responses to the Annex 13 TOR questions as might be appropriate to that process.

The Annex 13 Technical Sub-group believes that there is a significant shortcoming in the Agreement insofar as there is a lack of substantive goals and objectives in the Agreement. Given

the lack of substantive direction provided in Annex 13 of the Great Lakes Water Quality Agreement the group has been challenged to find information to properly address all of the proposed charges stated above. Following is a brief discussion regarding the status on each:

1. Watershed Inventory

The Annex is silent on this issue. The sub-group has identified the following information to give better context to review questions. There are approximately 111 watersheds on the U.S. side of the Great Lakes Basin using the 8 digit Hydrologic Unit Codes. There are approximately 53 similar sized watersheds on the Canadian side. See the Sharepoint site for lists and maps. It is important to note that the US EPA recommends watershed planning on a 12 digit HUC level as a more manageable and outcome oriented scale. US Geological Survey will complete verification of 12 HUCs in late October.

3. Priority Hydrologic Units

There appears to be no common definition for what constitutes a “priority hydrologic unit” and it appears that no one has prioritized among the watersheds at any scale. Setting priorities would require the development of binationally agreed to criteria to set the priorities, as well as an agreed to scale to which the criteria might be applied. Examples of looking at prioritization include AOCs, diffuse and non-point source loadings, and impacts to habitat. Additional work would need to be done on the outcomes desired through establishing priority HUCs. Without a shared definition it is difficult to apply a priority setting process, so the group will not be prioritizing watersheds. Further consultation on these issues is highly encouraged to determine a) the appropriateness of prioritizing at the Basin scale and b) the mechanics and coordination of doing so.

5. Watershed Management Plans

The group found it difficult to find a consistent source to identify this kind of information as much of this planning is being accomplished through local governments and local groups with no way of aggregating the information to higher levels of government. In addition, this activity faced the scale issue, while we do Great Lake lakewide plans, at what scale of activity do we need to track the tributary watersheds has not been defined. While the US has established a “Nine Minimum Elements” for their CWA Section 319 Nonpoint Source funded projects (see Sharepoint for this), States and local governments and groups do design their own methods. In *A Survey Report on Watershed Approach in the Great Lakes-St. Lawrence River Basin* by Dr Kai Chen it is stated “ Most of the watershed project managers are now pursuing the entire watershed perspective, not simply isolated issues or single source of the problems. But there are still some deficiencies and gaps..(1) lacking sustainable watershed approaches, and effective monitoring and evaluation, data collection and information exchange; (2) limitation of local water, land and tributary management; (3) shortage of systematic and comprehensive planning, clear targeting and environmental efficiency requirements; (4) poor dialogue, communication and connection with the objectives of the GLWQA”. This perspective is also reinforced by the Review’s Special Issues Work group on Watersheds and Land Use, see their report of additional detailed responses.

4. Land Use Controls to Address Non-point Sources

The Watershed Planning and Land Use Sub-group of the Special Issues Work Group is focusing specifically on this issue. The general observations of the Annex 13 Technical Sub-group on this question are:

Local governments are typically responsible for designing and implementing land use regulations and controls. Only the federal governments are parties to the GLWQA so there is a disconnect between the entities responsible for implementing the Agreement and the entities with the authority to address land use challenges

Local governments utilize a wide variety of land use management tools, only some of which are designed to protect the environment in general, and watersheds in particular.

There appears to be no reliable inventory of land use management approaches to protect watersheds in either the U.S. or Canada. The Great Lakes Atlas on the GLNPO website has some of this information but it is not organized in a way that would assist watershed managers.

Without a specific, scale appropriate inventory it is impossible to determine the status of land use abatement activities. Some general characterization of this is also found in the Great Lakes Atlas, but not at a scale that would provide substantive information on which to judge specific watershed problems or help establish priority hydrologic units.

5. Evaluation questions and establishing goals and objectives

The subgroup has completed its input to the evaluation questions. In order to appropriately frame the Annex a name change has been discussed and generally relates to Watershed Management to Control Diffuse Pollution from Nonpoint Sources. This is not meant to be a comprehensive or all inclusive response, but a place to begin the discussion of providing a more meaningful structure for the Annex. Scott Duff drafted first round of possible goals and objectives, redraft done by Janette Marsh follows

Goal:

To use all appropriate tools for effective watershed management in tributary watersheds of the Great Lakes which will ensure that impacts of diffuse pollution from nonpoint sources do not negatively effect the chemical, physical and biological quality of the Lakes.

Objectives

- 1 - to establish binational criteria for what constitutes the minimum elements of a watershed plan at each scale appropriate for reporting
- 2 - to enable the systematic engagement of and reporting from local governments which implement watershed plans and accomplish pollution reduction projects

- 3 - to establish reduction targets for diffuse pollution, ensure methods and monitoring are available to do this
- 4 - to identify a suite of best management practices for diffuse pollution reduction
- 5 - to establish threshold environmental outcomes and a method and timeline for review of effectiveness
- 6 - to ensure there is sufficient institutional capacity to undertake, coordinate, and integrate the necessary actions and decisions on a watershed basis

APPENDIX 3

SIWG Watershed Planning and Land Use Subgroup Report

WATERSHED PLANNING AND LAND USE SUBGROUP: ANSWERS TO STEP- WISE QUESTIONS

INTRODUCTION

A wide variety of stakeholders in the Great Lakes Basin have raised concerns about the effects of land use patterns on chemical, biological and physical integrity of the waters of the Great Lakes ecosystem, and the need for better watershed planning. The International Joint Commission's (IJC's) interest in the issue dates back to the 1978 study of the Pollution from Land Use Activities Reference Group (PLUARG), which linked urbanization and associated improper land use practices to water quality degradation.⁸⁶ More recently, the IJC Science Advisory Board Workgroup on Priorities Implementation has addressed the issue, which is summarized in the 2001-2003 and 2003-2005 priorities reports.⁸⁷

The IJC's January 2006 "Synthesis of Public Comment on the Forthcoming Review by the Federal Governments of Canada and the United States of the Great Lakes Water Quality Agreement" articulated many of those concerns, including: urban and suburban development, agricultural practices, loss of wetlands, shoreline alterations, the need for consistent approaches to land use planning, better source water protection, dissemination of best management practices, and a need to improve effectiveness of watershed planning in addressing the impacts of land use change on water quality.

Similarly, the Twelfth Biennial Report on the progress of the GLWQA, submitted by the IJC in 2004, voiced concerns about the impacts of urban areas on the physical, chemical, and biological integrity of the waters of the Great Lakes ecosystem and the need for stronger regional approaches.

Discussions between the Agreement Review Committee (ARC) and the Special Issues Workgroup (SIWG) resulted in formation of a Watershed Planning and Land Use Subgroup (Subgroup) to address these thematic issues and ensure that the many issues falling under this thematic topic area are addressed in the review process. The following text represents the Subgroup's responses to the SIWG's step-wise questions provided by the Terms of Reference as they apply to the watershed and land use theme.

QUESTION 1: WHAT IS THE ISSUE?

⁸⁶ IJC, 1980.

⁸⁷ IJC, 2003 and IJC, 2006.

Land use activities are inherently linked to the overall health of the Great Lakes and the region's quality of life. Changes in land use have a cumulative impact on water quality and quantity, and thus on the vitality and resiliency of ecosystems in the Great Lakes region. For example, the conversion of farmland to urban development within the Great Lakes Basin increases the amount of paved surfaces, resulting in increased volumes of stormwater runoff during storms. Increased stormwater runoff impairs water quality, as stormwater (in the form of rain or snow melt) runs off the ground or impervious surfaces, accumulating high concentrations of pollutants and nutrients, and drains into natural or manmade drainage ways. Between 1982 and 1997, the amount of developed, nonfederal land in the Great Lakes states increased by 27 percent and more than 11 million acres of farmland was converted to other uses—an area greater than Lakes Erie and Ontario combined. The Great Lakes provinces followed a similar trend between 1981 and 1996, with a 65-percent increase of urban land and a loss of 2.3 million acres of farmland from 1981 to 1991.⁸⁸

Despite the notable progress that has been made in addressing water quality problems associated with point-source discharges, and some attention on reducing impacts from non-point source pollutants, land use activities throughout the Great Lakes Basin ecosystem are negatively affecting the chemical, physical, and biological integrity of the Lakes. Current government efforts to address land use stressors and their impacts face complex institutional challenges that inhibit their effectiveness. If the current activities on the landscape continue without effective action to prevent and mitigate damages, water quality in the Great Lakes and its tributaries will continue to decline, and water quantity may also be affected.

Several water quality stressors are commonly associated with land use activities in urban, urbanizing, and rural areas of the Basin. Land development for agricultural, urban, and other land uses have changed much of the Basin's hydrologic regime, decreasing infiltration and groundwater recharge and increasing surface water flows, water temperatures, and runoff. In part, this is due to increased impervious surfaces and stream channelization in urban and urbanizing areas. These hydrological impacts are also due to both stormwater management approaches and agricultural drainage systems which seek to remove stormwater from sites.

Chronic non-point pollutant pressures on watersheds include increased runoff of oils, greases, and heavy metals from automobile use; increased use of road salts; rising loss and fragmentation of habitat in areas of population growth and intensified economic activity; and increased water consumption and pressures for diversion to supply agriculture, municipal domestic and commercial uses, manufacturing, the energy sector, and a variety of other uses.

Urban, urbanizing, and rural land use activities within the Great Lakes watershed each produce their own particular mix of stressors as well (the impacts of these stressors are discussed more in the answer to Question 2):

URBAN

Land use activities in built-out urban areas have a number of impacts on the chemical, biological and physical integrity of the Great Lakes ecosystem. For example:

⁸⁸ Great Lakes Commission, 2001.

- Combined sewer overflows (CSOs) and stormwater affect riparian habitat and water quality. High percentages of impervious surface areas channel significant levels of urban runoff into waterways and into the Lakes, providing a pathway for cumulative impacts from chronic non-point loadings;⁸⁹
- Urban areas include a high concentration of potential point sources of pollution, in the form of industrial and municipal (e.g, wastewater treatment) facilities;⁹⁰
- Unaddressed brownfields and sites with hazardous waste also increase the risk of contaminated runoff and groundwater contamination. They further inhibit redevelopment, adding pressure to convert more rural and natural areas that provide inherent water quality benefits;
- Some municipalities in and near the Basin are addressing growing water demands or local water contamination by switching from local (river and groundwater) supplies to “big pipe” solutions, drawing water from and/or discharging sewage into the Lakes⁹¹;
- The loadings and cumulative impacts of the use and misuse of pesticides and fertilizers for urban lawns and corporate campuses are additional concerns; and
- Population pressures from cities located on lake shores are affecting adjacent near-shore littoral processes and habitat.

URBANIZING

The rapid pace of low-density suburban development has been chronicled as a source of increased pollution to the waters of the Great Lakes ecosystem. Farmland in the Basin is undergoing rapid conversion to residential or commercial land uses. Green design approaches are not currently the standard in the Basin, and urbanization therefore leads to many of the stressors noted for existing urban areas. A few other areas of particular concern include:

- Where urbanizing areas face population growth, increased land consumption, or both, they are adding pressure to the carrying capacity of their local natural resources, including drinking water supplies and farmland, and of the areas’ waste assimilation capacities;
- Increased vehicle miles traveled, due to the preponderance of automobile-dependent low-density development, raises airborne toxic emissions and runoff from increased impervious surfaces needed to serve that development;
- Fragmentation and loss of wetlands and natural habitats reduces the buffering effect of riparian vegetation to mitigate pollutants before they enter the Lakes;
- Increased vehicular transportation activity also raises the potential for spills of hazardous materials; and

⁸⁹ Parameters of concern include road salts, oils and metals from cars, pesticides and salts from lawns, sediment from construction sites, pathogens from humans and animals, etc.

⁹⁰ Facilities may discharge pathogens, POPs, heavy metals, endocrine disruptors, etc.

⁹¹ Concerns with such “big pipe” approaches include sustainability of water quantity, changes in Basin hydrology, ecosystem impacts, risks of species invasions, and precedents for future out-of-Basin demand for Great Lakes water.

- Increased water use for lawn and corporate campus irrigation further alters the local hydrology and provides a pathway for increased non-point source pollutant loadings.

RURAL

Rural land use activities present yet another set of stressors to the waters of the Lakes:

- Poor forestry practices can increase flow rates and sedimentation, thereby disrupting local hydrologic cycles, increasing runoff, and stream scouring.
- Second home development is a continuing trend affecting the shorelines of all the Great Lakes, increasing non-point source runoff and wastewater effluent into the Lakes, and decreasing land permeability.
- In spite of the adoption of some best management practices in some regions, agricultural practices continue to be the most significant source of stress in some areas.⁹² Agricultural concerns include:
 - › Poor use and application methods that load fertilizers and pesticides into waterways;
 - › Improper management of Combined Animal Feeding Operations (CAFOs), increasing the risk of animal wastes entering the waterways;
 - › Increased runoff⁹³ delivering nutrients, pathogens, and pesticides to tributary watersheds;
 - › Increased cultivation of more marginal farming areas, as prime farmland is converted to suburban land uses;
 - › Irrigation practices and corresponding increased water demand, which can affect local water quantity, quality, and flows in the Basin; and
 - › Inconsistent agricultural regulations between states, provinces, local authorities, etc.

(Note also that several concerns about agricultural practices are being addressed by Review Work Group D.)

Taken together, all three forms of predominant land use create stressors that result in increasing demand for water,⁹⁴ decreased groundwater recharge, increased generation of water pollution, increased pathways for pollution to reach the Lakes, decreased buffering capacity because of loss of wetlands and other habitat, and increased erosion. Limited resources have been available to undertake watershed planning and implement the needed watershed management practices and other activities required to address these challenges.

⁹² Some participants also cited a concern that non-agricultural open space is often managed (or not) in such a way that natural areas degrade and natural processes are disrupted, which results in increased surface water flow, decreased groundwater recharge, and increased erosion, and other stressors to the lakes.

⁹³ Tile drainage decreases water infiltration, and increases transport of pesticides, fertilizers, and sediments from stormwater runoff into waterways.

⁹⁴ An increasing demand for water and the altered hydrology in much of the Basin may make Basin communities more vulnerable to the predicted impacts of climate change (water level changes, increased storm intensity, increased drought periods, etc.).

QUESTION 2: WHAT IS ITS SIGNIFICANCE TO THE GREAT LAKES BASIN ECOSYSTEM?

SUMMARY OF IMPACTS

Great Lakes stakeholders and governments alike have pointed to land development practices and their corresponding impacts as one of the most significant challenges, if not the most significant challenge, to attaining a healthy and sustainable Great Lakes Basin ecosystem. Concern about land use impacts, and the need for watershed approaches to protect Great Lakes water quality, has been articulated in several important forums, including the 2004 State of the Lakes Ecosystem Conference (SOLEC),⁹⁵ The IJC's 12th biennial report on Great Lakes water quality (2004),⁹⁶ and a major synthesis report by Great Lakes scientists on signs of potential ecosystem collapse (December, 2005⁹⁷). As these and other authorities testify, current development and land use patterns pose a substantial threat to the chemical, biological, and physical integrity of the waters of the Great Lakes ecosystem today and into the future. Water quality impacts are typically costly and, in some areas, impossible to reverse.

The conditions created by land use stressors exhibit both proximate effects in nearshore areas,⁹⁸ and lake-wide effects. Impacts include:

- Pathogens, algal toxins, mercury, POPs, elevated chloride levels, and other chemical contamination increasing in the water column of the Lakes;
- Untreated sewage entering the Lakes due to CSOs and undersized treatment systems;
- Increased rates of sedimentation;
- Increased water temperatures;
- Contaminated groundwater;
- Increases in anaerobic conditions (e.g.; Lake Erie "dead zone" and fish kills);
- Loss of biodiversity;
- Elevated beach bacteria counts, swimming restrictions, degradation of aesthetics, and other Beneficial Use Impairments (BUIs);
- Impaired water quality of Great Lakes nearshore areas;
- Waterborne disease outbreaks (e.g., from *Cryptosporidium*);

⁹⁵ SOLEC 2004 included a workshop on the impacts of urbanization on Great Lakes water quality. Conference materials highlighted the concern that "extensive urbanization in the Great Lakes Basin is degrading surface and groundwater quality and requires the application of new principles, practices, and technologies to address the challenges of urban land and water management."

⁹⁶ The IJC recommended that the Parties take binational actions to address the impacts of urban land use on Great Lakes water quality. Among the key findings of the 2004 report were concerns with impacts of urban area expansion. The key findings also stated: "The governments must focus increased attention on protecting the sources of drinking water supplies. In particular, coordinated action by all those responsible for managing watersheds is required to avoid impacts from expanded land use pressures from agriculture, development, industry and urban centers."

⁹⁷ Bails et al., December 2005.

⁹⁸ Proximate effects, particularly adjacent to conurbations and river outlets.

- Taste and odor incidents in Great Lakes-dependent drinking water systems (e.g., *dadophera*); and
- Lack of trust in drinking water.⁹⁹

SIGNIFICANCE OF IMPACTS

Geographic scope: The scope of this issue spans all five Great Lake's Basins, their connecting channels, tributaries and watersheds, as well as the St. Lawrence River and other downstream hydrologic regimes. Land use stressors affect various parts of the Great Lakes Basin to varying degrees.

Irreversibility: The impacts of land use decisions are in many cases difficult or even impossible to reverse. Examples include impacts such as species extinction; ground water or drinking water contamination; and conversion of natural areas and agricultural land to impervious surfaces and built infrastructure.

Ecosystem breakdown: Land use impacts are taxing an already stressed system, interacting with factors such as toxic inputs from historic and current point-source contaminant loadings, airborne deposition of harmful pollutants, invasive species effects, fisheries mismanagement, and climate change effects. The cumulative impacts of all these stresses acting at once are significant and many are most likely irreversible.¹⁰⁰ Losses associated with ecosystem collapse will likely include a degradation of ecosystem services such as water purification, soil production, maintenance of fisheries, maintenance of nutrient cycles, flood and drought mitigation, pollination, etc.¹⁰¹

Economic and human health costs: Degraded watersheds and poor water quality impair economic activities such as fishing, agriculture, tourism, and recreational industries; decrease property values; and affect the livability and sustainability of communities.¹⁰² Human health costs, e.g., from waterborne diseases (from body contact or drinking water) or consumption of toxins (e.g., mercury) through the food chain are also of concern.¹⁰³

Factors such as nearshore habitat protection¹⁰⁴ and drinking water source protection may require special attention.

⁹⁹ Increased bottled water use is, in part, symptomatic of a lack of trust in drinking water.

¹⁰⁰ For a recent synthesis of the evidence for ecosystem breakdown in the Great Lakes, see "Prescription for Great Lakes Ecosystem Protection and Restoration (Avoiding the Tipping Point of Irreversible Changes)," December 2005, by Jack Bails, Alfred Beeton, Jonathan Bulkley, Michele DePhilip, John Gannon, Michael Murray, Henry Regier and Donald Scavia, and endorsed by over 200 ecosystem scientists and other Great Lakes experts.

¹⁰¹ There is a wealth of published scientific information on ecosystem services and their stressors, as well as their economic importance. For a quick overview, see Ecological Society of America, Summer 2000.

¹⁰² For one summary of such costs, see U.S. Environmental Protection Agency. 2000.

¹⁰³ The multiplicity of impacts from land-use sources means that addressing land-use patterns directly will address many stressors and pathways of degradation at once, creating efficiencies for water quality management efforts.

¹⁰⁴ Near-shore habitat is important to water quality in its function as the buffer to runoff and watershed pollution entering the Lakes. As well as assimilating nutrient loads at the land-water interface, nearshore areas are essential to the protection of many globally-rare species, and are critical in the self-organization of the Great Lakes ecosystems. Yet these shorelines have not received heightened protections in keeping with this status and role, and rather have been degraded by recreational, commercial and other human-induced pressure.

QUESTION 3: HOW IS THE ISSUE CURRENTLY BEING ADDRESSED BY THE GOVERNMENTS?

The Parties and governments at all levels are aware of these issues and their significance for the Great Lakes ecosystem. Both countries have developed policies and frameworks in attempts to improve the use and results of watershed planning and other tools. Initiatives are underway to various degrees at every level of government, from binational relations to local decision-making.

BINATIONAL

Between 2001 and 2005, the IJC's Science Advisory Board (SAB), Workgroup on Priorities Implementation, commissioned several reports and studies on urbanization and its impact on water quality. In 2003, the SAB issued a report entitled *Priorities 2001-2003: Priorities and Progress under the Great Lakes Water Quality Agreement*.¹⁰⁵ Chapter 3 of this report, "Urbanization: the Land Use/Water Quality Linkage," analyzes and documents the land-use/water quality linkage, explores options for the prevention and management of urban water quality impacts, and examines the challenges associated with the issue. The report describes how urban water quality impacts can be reduced with careful site planning to reduce impervious cover and increase water detention. In the report, the SAB recommends to the IJC that the Parties undertake a major binational investigation and research effort on the effects of urban and urbanizing development on Great Lakes water quality and develop a comprehensive response to these effects.¹⁰⁶

In October 2003, the Great Lakes Commission unanimously passed a resolution to endorse a Basin-wide study of land use trends, impacts, and policy responses. The Commission noted that this study would build upon the growing body of urban growth management work presently being implemented at the state, provincial, and municipal levels, and pledged to work in partnership with other relevant agencies and organizations toward that end.¹⁰⁷

In June 2006, the SAB issued *Priorities 2003-2005: Priorities and Progress under the Great Lakes Water Quality Agreement*.¹⁰⁸ Chapter 4 of this report, "Urbanization," describes the results of computer simulations of alternative urban forms and stormwater management options, discusses four related SOLEC indicators, and outlines legal and institutional strategies for the U.S. and Canada. The chapter concludes with two recommendations from the SAB to the IJC:

1. The Commission urge the Parties, through state/provincial agencies as appropriate, to direct agencies that have local planning expertise and responsibility to initiate institutional coordination to limit urban/suburban/exurban development to shared watershed areas where stormwater best management practices and low-impact development can be successfully implemented; and
2. The Commission initiate dialogue involving the Commission, Parties, developers, and financial institutions to explore the environmental implications of urban land-use financing decisions.¹⁰⁹

¹⁰⁵ IJC, 2003.

¹⁰⁶ IJC, 2003.

¹⁰⁷ Great Lakes Commission, 2003. See: <http://glc.org/about/resolutions/03/10landuse.html>

¹⁰⁸ IJC, 2006.

¹⁰⁹ IJC, 2006.

As previously mentioned, the connections between land use and water quality have also received ongoing attention from SOLEC in the form of attention to trends in land use stressors and their impacts, and the indicators needed to understand them.¹¹⁰

FEDERAL

In both countries, land use decisions are generally made at the local level. The federal governments play only a limited direct role in local land use decisions. However, federal policies influence local land use patterns in numerous ways, including federal funding of transportation and water and sewer infrastructure, as well as agricultural and other policies. The Parties also provide for work on these issues through funding the RAPS and LaMPs.¹¹¹

In Canada, the Federal Government's role in land use planning matters, as they impact the Great Lakes, is typically limited to those relating to navigable waterways, impacts on fisheries, designated areas of shoreline, national parks, federally-owned lands, and native reserves.

The 2002 Canada Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA) commits the governments of Canada and Ontario to specific goals and results toward the vision of a "healthy, prosperous and sustainable Great Lakes Basin Ecosystem for present and future generations." Many of the activities identified under the COA pertain to the need for better land use and watershed management practices and enhanced collaboration between the governments and local organizations in the Basin, to deliver results such as reduced impacts/loadings from urban sewage, stormwater, and agricultural sources.

The governments of Canada and Ontario have funded a variety of non-point source control programs, including the Clean-up Rural Beaches (CURB) program, Canada-Ontario Farm Stewardship Program (COFSP), and the Great Lakes Sustainability Fund's Rural Clean Water Program (targeted at AOCs). While these programs have led to localized water quality improvements, they are narrowly focused on the water resource and fall short of directly addressing land use and development policies that drive those development patterns that are compromising the integrity of Great Lakes water quality.

In the U.S., the federal government has put stormwater permitting requirements in place. The Safe Drinking Water Act requires that wellhead protection programs be established by states and local water districts. The U.S. Environmental Protection Agency (EPA) promotes watershed planning nationally with some funding of model projects and with technical assistance and outreach. The U.S. has also begun requiring a Total Maximum Daily Load (TMDL) approach for some specific impaired waterways, but this program is river-reach specific, and does not require a watershed perspective. Plus, the TMDL program lacks the feedback mechanisms to assign responsibility and ensure remedial action where TMDLs are exceeded, and generally, TMDLs are not integrated into local planning and zoning ordinances.

FIRST NATIONS/TRIBAL

¹¹⁰ See earlier citations; IJC, 2006; and <http://www.binational.net/sogl2003/>

¹¹¹ Only some RAPS and LaMPs directly address these land use and watersheds issues.

Thirty-one Tribal governments on the U.S. side of the Great Lakes Basin are independent of state jurisdiction. These governments exhibit such a wide variety of approaches to land use that any generalization is difficult. Some are taking advantage of the EPA's watershed planning funds and technical assistance to develop watershed plans in partnership with neighboring communities.

In Ontario, some First Nation communities are seeking to integrate community-based environmental management plans with larger watershed-based source protection planning. Currently, Environment Canada is contributing to the development of source water protection assessment, monitoring and planning tools, and guidelines for use in First Nation communities. These efforts are being pursued in partnership with Indian and Northern Affairs Canada and Health Canada through the First Nations Water Management Strategy.

STATE/PROVINCIAL

Local vs. Regional Planning

The Great Lakes states and provinces manage land uses within two different political frameworks; all eight Great Lakes states have delegated land use decision-making to the smallest unit of government—a practice known as “home rule”—whereas Canadian municipalities are considered “creatures of the province” and their land use planning is subject to provincial legislation. Neither approach has been successful in entirely halting land use changes that are detrimental to the Lakes; nor has either approach been without some successes.

One major consequence of the home rule framework in the U.S. is that some development decisions can be made without consideration of the impacts on surrounding neighbors or the region. A lack of planning or regional coordination often results in sprawling development patterns, consuming land at rates that outpace population growth. Some localities have no comprehensive plan or zoning in place. However, some regional watershed alliances are able to control coastal and watershed development successfully by using a combination of local, state, and federal regulations.

Ontario has a more centralized framework that assists local governments in planning. The province requires local governments to develop and periodically update “Official Plans” that designate areas for different types of land use (e.g., various agricultural or urban uses). Planning decisions must be consistent with the Provincial Policy Statement (PPS) and conform to and other Provincial Plans. Provincial legislation (Planning Act, Strong Communities Act) makes it easier to adopt and implement urban boundaries.¹¹² This has not, however, entirely eliminated poor development practices.

Smart Growth

While varied in content, stage of implementation and funding, many¹¹³ of the Great Lakes states and provinces have state/province-wide initiatives that promote “smart growth” and/or

¹¹² Great Lakes Commission, 2006 (draft publication), with input from Ontario's Ministry of Municipal Affairs and Housing.

¹¹³ Ontario, Quebec, and six of the eight states. Unfortunately, however, four out of the six states with state-wide land use or smart growth initiatives have experienced setbacks in progress because of a change in the political will among governors and/or state legislators.

comprehensive planning. Among the states, the predominant approach has been to provide incentives in the form of technical assistance or grant programs to local governments who develop or update comprehensive land use plans or incorporate smart growth in their development.¹¹⁴

In the late 1990s and early 2000s, three states (Minnesota, Wisconsin,¹¹⁵ and Pennsylvania) led the Great Lakes region by passing laws to promote smart growth and comprehensive planning in local communities. These vary in the details but each identifies statewide land use planning goals, encourages local communities to develop plans according to those goals in cooperation with other localities, and provides technical assistance for local planning efforts. These initiatives also encouraged state agencies to review their policies and programs to improve interagency coordination in accordance with state planning, smart growth, or local plans that reflect state goals. While Minnesota's comprehensive planning law was repealed in 2001, other Great Lakes states were moving forward on this front. Illinois and New York established state land use task forces that laid the groundwork for state programs that provide technical and financial assistance for local community planning, emphasizing the importance of preserving natural resources, improving quality of life, and revitalizing urban centers. In 2004, the Ohio Lake Erie Commission established the Lake Erie Balanced Growth Program, which calls for the creation of watershed planning partnerships and the development and implementation of balanced growth plans that identify priority development areas and priority conservation areas, among other things.¹¹⁶

In contrast, the provinces have taken a more regulatory approach. Québec released its sustainable development plan in 2004; this provides a process for integrating sustainable development into its activities.¹¹⁷ Ontario launched major smart growth initiatives in 2004 and 2005. Legislation was passed to strengthen the force of provincial and local planning laws and policies.¹¹⁸

Ontario's 2005 Provincial Policy Statement includes a number of watershed considerations, such as protecting hydrological and ecosystem functions and maintaining or restoring pervious surfaces.¹¹⁹ Ontario also released provincial plans for specific areas of the province: the Greenbelt Plan to guide growth and protect a greenbelt of farmland in the Greater Golden Horseshoe¹²⁰

¹¹⁴ Including Illinois, Minnesota, New York, Pennsylvania, and Wisconsin.

¹¹⁵ The Wisconsin Comprehensive Planning Law requires that, by January 1, 2010, all actions that affect land use must be guided and consistent with the community's comprehensive plan which must contain nine elements: issues and opportunities, agriculture and natural and cultural resources, housing, economic development, transportation, intergovernmental cooperation, utilities and community facilities, land use, and implementation.

¹¹⁶ Great Lakes Commission, 2006 (draft publication), with input from Ontario's Ministry of Municipal Affairs and Housing.

¹¹⁷ In 2004, Quebec also released a land use planning guidebook for local governments aimed to reduce anthropogenic greenhouse gases. (GLC 2006, draft publication)

¹¹⁸ Great Lakes Commission, 2006 (draft publication).

¹¹⁹ For example, the PPS requires planning authorities to "protect, improve or restore the quality and quantity of water by: using the watershed as the ecologically meaningful scale for planning; minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts; identifying surface water features, ground water features, hydrologic functions and natural heritage features and areas which are necessary for the ecological and hydrological integrity of the watershed," (etc.). The PPS allows for restrictions on development for watershed and water protection, e.g. to minimize stormwater volumes and contaminant loads. (Ontario PPS 2005)

¹²⁰ A 1.8 million acre greenbelt was established under the Greenbelt Act, 2005. The Places to Grow Act, 2005, provides provincial authority to establish growth plan areas.

(the fastest-growing region of Canada), the Oak Ridges Moraine Plan to protect groundwater infiltration and other ecological features in a major headwaters area,¹²¹ and in December 2005, Bill 43, the Clean Water Act (2005), to establish watershed-based planning for drinking water source protection. Bill 43, requires local drinking water source protection plans in the Great Lakes Basin to take the Great Lakes Water Quality Agreement and other Great Lakes-specific concerns into account.¹²² Note, however, that while Ontario has been developing a stronger land use and watershed planning framework, some Subgroup members described a gradual decrease in Ontario's funding and staff participation in Great Lakes watershed planning activities.

LOCAL/MUNICIPAL

A key challenge for municipal activities in protecting watersheds is that local governmental boundaries do not generally match watershed boundaries.

In the U.S. and Canada, both watershed and land use planning efforts are locally focused and locally implemented. There is wide variation in the amount and type of work being done to take watershed impacts into account in municipal activities. Some local/municipal governments are highly focused on these efforts whereas others do not focus on them at all.

Some Subgroup members noted with concern that local watershed planning is often disconnected from the state, provincial, and federal levels of authority. Some members, however, cited examples of local governments and conservation authorities in Ontario forming linkages between watershed plans and land use/development plans.¹²³

In Ontario, watershed planning is led by conservation authorities, which are local, watershed management agencies that deliver services and programs to protect and manage water and other natural resources. These activities are done in partnership with government, landowners, and other organizations. Conservation authorities are not a level of government, but work with the local municipalities in order to achieve their common goals. But it is municipalities who have the power, through by-laws and zoning, to impact land use development decisions directly. One example cited was the ability of municipalities to pass by laws related to sewer use, which forbid certain substances from being loaded into sewers and into the watershed. Yet, the degree of successful implementation of these powers and abilities varies by municipality.

¹²¹ Oak Ridges Moraine Conservation Plan.

¹²² If passed, Bill 43 will require Ontario communities to collaborate, on a watershed basis, to delineate vulnerable areas (such as significant groundwater recharge areas and drinking water intake protection zones), map potential risks to their water sources (e.g., land use activities), and take action to address these risks (e.g., through zoning and municipal by-laws). The Bill proposes special protections for the Great Lakes, and names the Great Lakes Water Quality Agreement as one of the agreements which local source protection planning would be required to consider. Source protection plans in the Great Lakes Basin would also be required to consider the Canada Ontario Agreement Respecting the Great Lakes Basin ecosystem, and a state-provincial Great Lakes Charter Annex agreement on water quantity. The province would also have powers to set water quality or quantity targets for watersheds that contribute water to the Great Lakes.

¹²³ For example, one participant noted: In Ontario's Waterloo Region, work in the Laurel Creek Subwatershed resulted in the first official plan being modified to require watershed planning and support the adoption of watershed study findings. Guelph and other municipalities in the Credit River quickly followed suit with Subwatershed plans being completed in areas subject to growth pressures. The Toronto Regional Conservation Authority has since begun to consider how best to form linkages to land use planning, and broader support from NGOs, municipalities, and the development industry are evolving.

Subgroup members also pointed to the role of local Comprehensive Land Use Plans (CLUPs) in the U.S., where both watershed planning and CLUPs are undertaken, the watershed planning has been effective in informing local land use decisions.¹²⁴ However, even with well-integrated planning, some locations are unable to direct actual zoning and development decisions in meaningful ways to address land development impacts, particularly at a watershed scale. Land use plans in the U.S. do not have the force of law, nor do watershed plans. Watershed and land use plans are only enforceable to the extent that they have been incorporated into law with zoning ordinances and by-laws.

Another complicating factor is that local authorities themselves are not the only players in local land use decisions. Developers, land-owners, and the public all play roles to various degrees of importance throughout the Basin. Watershed planning groups then have various levels of influence depending upon local conditions.

QUESTION 4: IS THERE A NEED FOR FURTHER BINATIONAL COOPERATION TO ADDRESS THE ISSUE?

Yes. The causes and effects of land use patterns are Basin-wide, with binational impacts; that is, both countries are negatively affecting each others' resources. The solutions require binational attention because they cannot be successful without being applied throughout the Basin.

QUESTION 5: HOW SHOULD CANADA AND THE U.S. COOPERATE TO ADDRESS THE ISSUE?

Efforts in both countries have established a good foundation of watershed planning that can, and have, made positive contributions to help protect Great Lakes water quality. Nevertheless, Canada and the U.S. should cooperate to address the issue by pursuing policies and common goals that improve the consistency of watershed planning across the Basin, and by increasing the role that watershed planning can have on local development decisions, on watersheds, and, ultimately, on the water quality of the Great Lakes.

Watershed planning recognizes watersheds as natural units for planning. Planning is typically a public process that engages multiple stakeholders—local officials, watershed groups, landowners, business owners, environmental groups, the broader public. Plans focus on managing, protecting and improving water resources within an entire watershed (or on managing the human activities that affect the watershed). The process is typically data intensive, requiring information on land uses, land cover, and water quality. To have a positive impact on land use decisions and behaviors, a successful watershed plan should integrate the watershed perspective into local and regional comprehensive land use and development plans, which in turn must be followed by the local decision makers.

¹²⁴ One participant explained: In the U.S., local Comprehensive Land-Use Plans (CLUPs) inform local land-use decisions and watershed planning sometimes provides the hydrologic input and ecosystem parameters into those CLUPs. In some locations, where there is a strong overlap in membership between the two planning groups, CLUPs are finalized with the watershed perspectives and recommendations as an integral part. In other locations, they are separate groups and the input one has on the other is less efficient. In some locations there is only one of these planning processes, or no planning process.

Subgroup participants noted the following as areas and activities requiring cooperation by the governments to address the issues

ESTABLISHING A BROAD INSTITUTIONAL FRAMEWORK WITH GOALS, OBJECTIVES, AND TARGETS

1. The governments should establish shared goals, objectives, and targets around watershed protection and land use planning. Goals and objectives could be Basin-wide or Lake-specific, complete with targets for water quality, ecosystem functions, species, and habitats. Targets could be measured by lake, ecosystem, and sub-watershed level indicators
2. The Parties should then be accountable for ensuring that watershed planning takes place, guided by those goals and objectives, even if it continues to take place at more local levels of government. Given that local problems and solutions will differ, watershed plans will need to be locally tailored.

DEFINING A FRAMEWORK OF MECHANISMS FOR IMPLEMENTATION AND COORDINATION

3. The governments should provide implementation guidance for local and regional watershed planning within the context of the goals and objectives they set, and they should include incentives to create local zoning regulations and by-laws that integrate the goals of watershed management plans into actual land use practice and decisions
4. Canada and the U.S. should identify roles for coordination at different levels of government, starting with the binational level and extending to the regional, state/provincial, tribal and local programs and planning agencies (see also recommendation 7, below.) Once these roles have been identified, the governments could assign tasks for overseeing coordination (e.g., they could task the IJC with specific coordinating roles, and task local planning agencies with others).
5. The governments should agree that their federal transportation and water infrastructure funding should be congruent with meeting the objectives of the Agreement, and they should ensure that infrastructure funding decisions are made with consideration of the Agreement's objectives as well as watershed planning priorities
6. The governments should create a framework for ensuring collaboration and consistency in the approaches to using the shared resource to avoid creating the scenario where actions on one side of the border contradict or negate actions on the other. This can also be true within each of the countries' boundaries
7. The governments should strengthen the legitimacy and roles of existing mechanisms that provide a watershed perspective to planning venues (e.g., LaMPs). LaMPs should be charged with increased roles for coordination, and systematic application of watershed planning across all watersheds that incorporates work already underway. (Note that this process is occurring in places, but is not formalized in the Agreement.)

8. The governments should commit to enhancing the involvement of municipalities in the creation of watershed planning goals that create the infrastructure, framework, and mechanisms for implementation of better watershed management.
9. The governments should commit to supporting and enhancing the roles of non-governmental organizations (NGOs) in this work and should provide mechanisms to help this sector to be involved.

GATHERING, IMPROVING, AND SHARING INFORMATION

10. The governments should improve the understanding of the contributions of land use pressures both in Lake-specific situations, as well as for the larger Great Lakes Basin watershed.
11. The governments should plan for population and economic growth at a Basin-wide level to enhance local and regional watershed planning.
12. The governments should cooperate around monitoring of existing land use and water quality conditions over time and report on the trends of those conditions to help direct future actions.
13. Guided by the goals and objectives of watershed plans, Canada and the U.S. should share more information with each other on key implementation strategies, insights, and lessons learned. (The Boundary Waters Treaty, for example, has provisions for comparing experience by the parties)
14. The governments should promote current smart growth efforts at the state and regional level, and should foster an increase in smart growth approaches where they are lacking. The governments should also promote green design approaches (e.g., low-impact development forms) and innovative Best Management Practices (BMPs) as integral perspectives to incorporate into watershed planning efforts. New urban developments present the opportunity to design for lower watershed impacts¹²⁵
15. Canada and the U.S. should pay strategic attention to near shore parts of the Lakes abutting large conurbations, which are currently underemphasized in the Agreement (e.g., Annex 13).

All of these approaches should be wedded into the concept of effective watershed-level planning and practice across the Basin—planning that reflects a consistent level of effort and demonstrates results. That planning should encourage and facilitate better behaviors in each of the three major land use categories: urban,¹²⁶ urbanizing¹²⁷ and rural.¹²⁸

¹²⁵ Examples of lower-impact development approaches: on-site stormwater management; urban design for lower car dependence; less pesticide, fertilizer and irrigation-dependent landscaping; green roofs; and pervious surfaces. It is important to note that new BMPs are created over time, and our understanding of BMPs changes over time, as well as their applicability to specific situations. The Parties should therefore not be prescriptive about the application of specific BMPs.

¹²⁶ Urban: For example, retrofitting urban structures and streetscapes to improve watershed goals, green roofs, restoration of natural areas, permeable surfaces, park space, alternative stormwater management BMPs for urban settings, etc.

QUESTION 6: DOES THE CURRENT AGREEMENT ADDRESS THE ISSUE ADEQUATELY / AT ALL?

The language in the Agreement provides several opportunities to address land use stressors by means of watershed planning. First, Article II states the purpose of the Agreement is to “restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem,” thereby providing a conceptual justification for attention to land use issues insofar as they have such an impact. Some local and watershed level work is being interpreted within this broad scope of the Agreement. Article II goes on to state that the Parties agree to “develop programs, practices and technology necessary ...to eliminate or reduce...the discharge of pollutants into the Great Lakes System” and to develop and implement “coordinated planning processes and best management practices.”

Many pollutants that stem from land use practices are mentioned throughout the agreement, although land use as a source is not always singled out. However, land use stressors and watershed planning responses are explicitly mentioned in the current Agreement in the following ways

ARTICLE VI

In Section 1 of Article VI, urban drainage into the Great Lakes, stormwater pollution and combined sewer discharges are all mentioned specifically as needing control, abatement, and prevention programs. More directly, statements regarding eutrophication (Article VI 1(d)) and pollution from agriculture, forestry, and other land use activities (VI 1(e)) point to the land use sources of lake pollutants, and call for the development and implementation of control measures, including “Measures to encourage and facilitate improvements in land use planning and management programs to take account of impacts on Great Lakes water quality.” This section also calls for consideration of the recommendations of the “Pollution from Land Use Activities Reference Group” (PLUARG) which convened in 1980.

ANNEX 2

The language describing the roles for RAPs and LaMPs in Annex 2 allows for attention to land use activities, e.g, as sources of loadings of critical pollutants to the areas being addressed. However, attention to land use stressors within a watershed context varies to a significant degree across LaMPs and RAPs.¹²⁹

Section 6 of Annex 2, in particular, provides legitimacy of work on land use stressors in the watershed by calling for information on all sources of critical pollutants and calling for a schedule

¹²⁷ Urbanizing: For example, maximum use of BMPs, conservation or low impact development, smart growth, and alternative stormwater management approaches.

¹²⁸ Rural: For example, maximum dissemination of agricultural and animal feedlot BMPs; (e.g, increased organic agriculture approaches, integrated pest management, buffers); the protection, expansion and restoration of natural open areas; conservation development methods in second home construction; etc.

¹²⁹ For example, Toronto’s RAP pulled upon the elasticity of the Agreement to bring in local level watershed perspectives.

of load reductions and identification of remedial measures from those sources. Progress on the schedules has been inconsistent.

ANNEX 13

Most significantly, Annex 13 calls for both Canada and the U.S. to foster programs for the abatement and reduction of non-point sources of pollution from both urban and rural land use activities. Section 2(a) charged the parties to identify the contribution of land-based activities to water quality issues in AOCs and lakes via the RAPs and LaMPs. Section 2(b) charges the parties to develop watershed management plans (WMPs) for priority hydrological units (“HUCs” in the U.S.). Prioritization has proven difficult, however, without the provision of criteria. In some instances, AOCs have focused on legacy issues; others promote TMDLs, focused on both source and non-point source pollution; and yet others focus on biodiversity. In other words, activities are not uniformly addressing land use challenges in general, let alone addressing them on a uniform watershed basis.

Funding, and therefore implementation, has not been adequate on the whole. The governments of Canada and Ontario have funded a variety of non-point source control programs.¹³⁰ While these programs have led to localized water quality improvements, they have not been undertaken at the comprehensive scale which would assure water quality in the open lakes.

In the U.S., the Clean Water Act, Section 319, addresses non-point source pollution through a “carrot” approach that funds the states and then local watershed groups to do planning. In the U.S., 319 funds have been used to undertake the development of WMPs; however, the funding is inadequate to accomplish watershed planning comprehensively or consistently within each lake basin, due in part to the lack of institutional linkages between planning and plan implementation through enforceable laws.

On the whole, the degree to which WMPs have actually been developed and implemented is unknown. The degree to which watershed planning groups actually communicate or coordinate with each other is also unknown, although some participants feel they do not communicate routinely. Also, coordination and communication is sometimes lacking between those WMP efforts that are underway at HUC level and the higher-level LaMP efforts at broader watershed planning.

ADEQUACY OF THE AGREEMENT’S CURRENT PROVISIONS

Although the Agreement created the LaMPs and does not *limit* the options of the Parties with regards to addressing the issue, most reviewers believe that the Agreement does not adequately serve as a driver for addressing the issue, nor does it provide leadership or clearly promote the goals, infrastructure, and tools needed (see answer to Question 5) to improve the impact of watershed planning on the water quality of the Lakes.

If the Agreement is intended to guide, encourage, promote, and provide consistency and direction to efforts that reduce, mitigate, or control the significant stressors to the water quality of the Great

¹³⁰ Examples include the former Clean Up Rural Beaches (CURB) program, current Environmental Farm Plans (EFPs), and the Great Lakes Sustainability Fund's Rural Clean Water Program (targeted at AOCs).

Lakes Basin, land use stressors and watershed planning approaches are not dealt with adequately. First, in spite of the sections discussed above, the current Agreement does not go into what land use stressors should be priorities, what the goals or targets for reduction of land use stressors should be, or what the specific BMPs and alternative land use practices are that should be promoted. Second, it does not provide any guidance for how current mechanisms (e.g., LaMPs) can address the issues. Third, there is no treatment of the need for consistency in applying watershed planning solutions across the Basin. Ideally, with guidance, these three needs can all be addressed in the process of watershed planning.

A diverging view of reviewers maintain that the Agreement, and in particular the LaMPs, are adequate means for addressing the land use stressors in the Basin, despite recurring funding issues and implementation problems. This diverging view indicated that the Agreement should be a high-level policy document that should not address implementation of watershed planning or management.

See also, the response to Question 10.

QUESTION 7: WHAT ARE THE ADVANTAGES/DISADVANTAGES OF INCLUDING THE ISSUE IN THE GLWQA?

Despite the fact that, as previously described, the Agreement provides some mechanisms to address the issue, most of this Subgroup's members indicated that advantages outweigh disadvantages of enhancing treatment of the issue in the Agreement. The following advantages were noted by group members:

- Improving the ability to address the environmental impacts of land use practices on the Great Lakes;
- Conveying to Great Lakes stakeholders and other actors in the Basin that the Parties recognize that land use/development across the landscape affects the Great Lakes Basin and its water quality;
- Explicitly linking what is occurring in the Lakes and what is occurring at the watershed scale, thereby allowing a broader look at causes of water quality degradation such as non-point source pollution;
- Making the Agreement more relevant and current. As these issues change and evolve, the Agreement will also need to change (e.g, the targets will need to be updated);
- Providing binational and national frameworks and setting goals for land use and watershed planning as if the Lakes matter; and
- Providing federal leadership that is critical to empowering changes at regional and local levels of government.

Depending on how the Agreement might address the issue, disadvantages could include:

- Potentially increasing the scope of the Agreement at the cost of losing focus;
- Limiting flexibility in how parties respond to the issue, particularly at the local level;

- Making the Agreement more cumbersome; and
- Creating jurisdictional and implementation challenges with a binational approach to addressing issues that are local and regional in nature.

On the question of whether the Agreement should include specific targets for the Lakes, some participants noted that watershed planning goals for each Lake could be set within the context of the current Agreement, without opening it to renegotiation. Having specific targets actually in the Agreement would be a more powerful motivation for action on both sides of the border, but there is a risk that targets may become out of date.

While incorporating goals and targets could provide a significant amount of additional direction, some contributors indicated that the Agreement would be going too far if it prescribed how to achieve the goals, for example, through regulatory or voluntary tools, or a combination of these. While some members of the Subgroup prefer a variety of implementation tools along this continuum, Subgroup members on the whole agree that a better articulation of goals and targets would make the Agreement more relevant to today's stressors and adequate as a guidance document.

QUESTION 8: IS THE GLWQA THE MOST APPROPRIATE MEANS OF ADDRESSING THE ISSUE?

The Agreement alone cannot sufficiently address the issue because the issue must be addressed at federal, state/provincial, watershed, and local levels. However, the Agreement can be *one* of several appropriate means for addressing the issue if it focuses on high-level goals and objectives of a binational nature. In fact, the Agreement should be considered an appropriate means because it is currently one of the only means for providing a *binational* response and Basin-wide leadership on this issue.

No other means exist at the present to corroborate the work of states, provinces, tribal and local governments with larger binational goals and strategies for transboundary water bodies. On the other hand, the current Agreement may not be as appropriate for guiding specific watershed planning work at the state, provincial, tribal, or local levels of authorities. Perhaps a new Annex would be needed to address the relationship between a renewed Agreement and the other roles and levels of government on this issue.

Land use choices in the Basin are a concern for Great Lakes water quality, but are simultaneously affecting many other societal endpoints, be they air quality, obesity, or economic losses due to traffic congestion. The Agreement is the best place to look at the water quality endpoints.¹³¹

Diverging Viewpoint: Other than mentioning watershed planning as one tool that LaMPs and RAPs might consider to address impairments, there is no need to include new GLWQA wording on this issue. The most appropriate role for the Agreement is currently being played.

¹³¹ The GLWQA must address water quality impacts from land use, while the myriad of other damaging outcomes of poor land-use practices may be dealt with in other forums.

QUESTION 9: DOES THE GLWQA GIVE AUTHORITY TO ADDRESS THESE ISSUES?

As described in the answer to Question 6, the wording of the Agreement in several places does allow for the pursuit of any and all sources of contamination of Great Lakes water. It does not exclude land use stressors. In fact, many areas of the Agreement cannot be implemented without attention to watersheds and land use, starting with the general mandate regarding the “chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem” (Article II). Statements in Article VI and Annex 13 specifically raise land use activities, thereby acknowledging the legitimacy of the issue for the Agreement.

The Agreement does “charge” the parties to implement watershed planning. However, it does not provide the needed guidance, direction, or funding to do so consistently or efficiently. The Agreement lacks specific language for an overall charge to address the issue, the existing language in Article VI and Annex 13 being too narrow to fulfill that function. In other words, the authority currently provided is vague and weak and as such does not sufficiently support the Agreement’s mandate in the face of these stressors.

In the sense of specific prescriptive authorities, the Agreement does not require watershed planning in the tertiary watersheds. Nor is there any authority to prescribe or otherwise suggest alternative forms of land use behavior that would be more environmentally sensitive.

QUESTION 10: WHERE ARE ADDITIONAL AUTHORITIES NEEDED?

Most participants agreed that additional Agreement-driven authorities, such as those outlined below, are needed. They emphasized the need to connect the binational and national policies and programs with the local/municipal and regional watershed and land use decision makers.

Diverging view: The existing authorities that provide for RAPs and LaMPs are sufficient for the Parties and others to address watershed management and land use planning.

The following are authorities that most participants indicated should either be articulated as part of an updated Agreement or as additional support of the current Agreement.

ESTABLISHING A BROAD INSTITUTIONAL FRAMEWORK AND DIRECTION

1. The Agreement should establish clear goals, objectives, and targets relating to land use practices, stating what development alternatives and land use options are preferable for purposes of protection of the Great Lakes. The Agreement needs to set some ground rules and commit to stronger implementation measures, not in the sense of regulation, but in terms of clearer guidance.
2. The language of Annex 13 should be strengthened to address the need for a stronger, more systematic commitment to comprehensive lake-wide management plans that address the threats of land use patterns to the water quality of the Great Lakes by using watershed planning approach across each Lake basin.
3. The language of Annex 2 should include elaboration to clarify that true implementation of the ecosystem approach must include watershed management planning tools.

DEFINING A FRAMEWORK OF MECHANISMS FOR IMPLEMENTATION AND COORDINATION

4. The Agreement should establish mechanisms for implementing the identified goals and objectives. The mechanisms should include programs where states, provinces, tribes, or local governments have the lead, and should include provision of roles and guidance for metropolitan and regional planning agencies as well as non-governmental organizations.
5. The Agreement should include a charge to create specific watershed management plans as a way to implement actions that pursue the new goals, objectives, and targets, recommended above, much as the current Agreement mandates lakewide targets, LaMPs, and RAPs, but going beyond to provide more direction that would ensure attention to each watershed. The charge for watershed plans could move attention beyond the traditional Beneficial Use Impairments (BUIs) (see Annex 2) to set targets for various types of loadings and means of landscape protection, or perhaps to add new BUIs.
6. The Agreement should clarify the roles and responsibilities within the current mechanisms for coordinating watershed planning and the implementation of those plans with local authorities (e.g., local comprehensive plans, zoning ordinances and by laws, regional transportation plans) across tertiary watersheds, across lakewide watersheds, and across the Great Lakes Basin.
7. The Agreement should include direction on the appropriate binational structures for managing monitoring and reporting on this aspect of the Agreement, recognizing the nested nature of watersheds and the interconnectedness of ground and surface water resources, and including the nested structure of planning institutions and authorities from binational to local levels of government.
8. The Agreement should strengthen the LaMPs themselves, specifically by:
 - a. Charging all the LaMPs to provide systematic planning attention at the watershed level, while confirming where this is already occurring and
 - b. Providing a unifying congruent framework for each LaMP to serve as the coordinating “bridge” between the Parties and the local jurisdictions in watershed planning efforts. This is needed particularly in the sub-basins and watersheds that cross the international border.
9. The Parties should ensure that they are including and engaging with federal agencies other than those that have primary responsibility for water quality (i.e., the U.S. EPA and Environment Canada) to ensure those with a role in land infrastructure and development are partners in implementing the Agreement.

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APPENDIX 4

SIWG Biodiversity Threats and Responses Subgroup Report

BIODIVERSITY THREATS AND RESPONSES SUBGROUP: ANSWERS TO STEP-WISE QUESTIONS

INTRODUCTION

The Biodiversity Threats and Responses Subgroup was established as one of three subgroups formed by the Special Issues Work Group to examine whether the Great Lakes Water Quality Agreement (GLWQA, or the Agreement) might be explicitly amended to include other Great Lakes issues.

Part of this exercise involves examining what changes or additions are necessary to the GLWQA to enable the Parties to best address the purpose of the Agreement. However, there are different interpretations and views of the Agreement's purpose. The two chief views of the purpose are to:

- Focus more narrowly on injury to health and property caused by trans-boundary water pollution, particularly in relation to persistent toxic substances; or
- Restore ecosystem integrity for the waters and/or Basin.

These interpretations lead to a focus on 1) species primarily affected by direct water pollution, or 2) the full suite of ecosystem stressors acting upon species found within the Basin. However, these views are not mutually exclusive nor a continuum of impacts—for example most species respond in varying degrees to direct pollution as well as loss of habitat. Moreover, the quality of water is maintained through various biotic and abiotic features and processes (e.g., food web, habitat) that are components of bio-diverse landscapes and ecosystems.

In addition, the Subgroup discussed considerations of time and context. Since the 1978 and 1987 Agreement reviews, new scientific paradigms have emerged in regard to environmental health, both within and outside of the Great Lakes. In particular, the changes have led to an increased emphasis on ecological integrity and a move toward an ecosystem approach. Moreover, biodiversity itself has arisen as a measure of system integrity and health.

A recurring Subgroup discussion surrounded the Agreement's context, and how well the Agreement addresses binational water quality issues. Many Subgroup members asserted that the GLWQA should not be the vehicle for favoring one paradigm over another. The Agreement is a strong and largely singular mechanism that has been, and continues to be, a leading conservation and protection tool.

QUESTION 1: WHAT IS THE ISSUE?

Great Lakes water quality is dependent on sustaining the processes and functioning of the following Great Lakes systems: open waters, near-shore land and waters, and watersheds. A measure of the health of these systems can be expressed in terms of biodiversity—the diversity of genes, species and communities present, and the processes and energy flows between them. Natural resource use can, has, and does occur in many cases within consumptive limits that allow conservation of biodiversity and ecological functions over many generations, notwithstanding other unforeseen or evolving natural changes to the system. Resource use within the Great Lakes Basin has affected biodiversity since the glacial retreat and has exceeded sustainable levels more regularly in the last 200 years. Unsustainable use of resources has resulted in greater changes to biodiversity of these landscapes and aquatic systems. This has resulted in the loss or degradation of many habitats and threatened the species they support. The threshold of acceptable ecosystem change can be signaled by an accelerated loss of species, loss of genotypes, loss of biologic communities, and loss of ecological functions. Many causes and impacts of habitat and species degradation and loss exist, all of which transcend jurisdictional boundaries. The current major stressors to biodiversity are invasive species, declining water levels and quality, and habitat degradation and loss.¹ These stressors, combined with the effects of historic stressors such as episodes of over-exploitation (e.g., hunting, fishing), require understanding, resources and action.²

QUESTION 2: WHAT IS ITS SIGNIFICANCE TO THE GREAT LAKES BASIN ECOSYSTEM?

The Great Lakes watershed is richly endowed with a broad range of unique fish and wildlife communities and associated valuable habitats. Many of these habitats are found nowhere else in the world. The biodiversity of the Great Lakes is dependent on the health of the open waters, near-shore land and waters, and watersheds. The Great Lakes contain 95% of North America's fresh surface water supply and nearly 20% of the world's fresh surface water supply; and provide water for 40 million people, as well as hundreds of thousands of businesses. More than 30% of the Great Lakes' globally rare species exist along the near shore, which includes more than 31,000 islands and the largest freshwater coastal wetland system on Earth. The watershed is defined by high quality inland lakes, expansive forests, blue-ribbon trout streams, prairies, bogs, and fens.³ From the deep water portions of the lakes to the smallest tributary streams, natural habitats in the Great Lakes watershed support a wide diversity of plant and animal species that generate billions of dollars in economic activity.⁴

QUESTION 3: HOW IS THE ISSUE CURRENTLY BEING ADDRESSED BY THE GOVERNMENTS?

Currently, there is no binational mechanism recognizing regional or binational biodiversity assessments, plans and strategies such as The Nature Conservancy and Nature Conservancy of Canada's *Binational Conservation Blueprint for the Great Lakes*.⁵ Many efforts are species-specific with little coordination among agencies and organizations. There are exceptions. For example, the Governments are coordinating on ballast water invasive species issues as well as the transport and sale of live exotic aquatic species.

Ongoing efforts to address the issue by federal, state, Tribal, local government, non-governmental organizations, industry, and academic entities are incomplete. The policies, laws and regulations for each system are the purview of the federal governments and the state, provincial, and local governments that have established regulatory regimes aimed at addressing many, if not all of, the same issues. Intergovernmental efforts to coordinate these efforts are present and successful to varying degrees.

QUESTION 4: IS THERE A NEED FOR FURTHER BINATIONAL COOPERATION TO ADDRESS THE ISSUE?

Yes. Binational cooperation is needed to continue habitat and species restoration and protection efforts that are vital to the maintenance and recovery of water quality and valuable Great Lakes natural resources. As many cooperative actions have demonstrated, successes can be achieved which increase the feasibility of system-wide improved health. A coordinated, concentrated effort, with a focus on jointly realized biodiversity conservation priorities for protection and restoration, will help address the impacts to the open waters, near-shore land and waters, and watersheds.

QUESTION 5: HOW SHOULD CANADA AND THE U.S. COOPERATE TO ADDRESS THE ISSUE?

The GLWQA may be the only vehicle by which the Parties can commit to cooperatively work toward conserving biodiversity in the Great Lakes—through a coordinated effort between the nations, states and provinces. On national/provincial/state levels much could be done to assess current policies, statutes and policies, identify gaps across political units, and work to fill those gaps. For example, there needs to be better mechanisms to coordinate control and management of invasive species between provinces, states and federal governments. Furthermore, if the U.S. was to ratify the United Nations Convention on Biodiversity then it would match Canada's formal commitment to biodiversity conservation and give weight to existing efforts within relevant federal and state agencies. Currently, Ontario's Biodiversity Strategy supports Canada's formal commitment to both the United Nations Convention on Biodiversity and Great Lakes. Moreover, U.S. ratification would set in place the mechanism for State biodiversity strategies.

Binational cooperation can be accomplished because of the unique nature of the GLWQA. Many elements of biodiversity are trans-boundary (e.g, invasive species, species at risk). Truly effective management can only be achieved if binational action occurs. One mechanism for action would be to include biodiversity conservation considerations within the GLWQA. Other mechanisms could include inclusion of a biodiversity related mandate within bodies such as the Great Lakes Fishery Commission, Great Lakes Commission, North American Joint Ventures and other joint U.S.—Canada activities and programs such as Lakewide Management Plans (LaMPs)⁶ and Remedial Action Plans (RAPs).⁷ However, given that components of Great Lakes biodiversity extend beyond just the open Lake waters, the GLWQA is one of the few mechanisms to jointly cover the tributary to open water biodiversity continuum.

Even if biodiversity does not become an explicit part of the GLWQA, another Basin-wide mechanism such as a binational "Great Lakes Biodiversity Conservation Strategy" is warranted to fully address biodiversity conservation. In addition, the following actions would help to address the issue:

- One binational concern is control of aquatic invasive species. There needs to be coordinated attention paid to strong binational controls and consistent enforcement, given that invasive species are still entering the system under current controls.
- The Nature Conservancy/Nature Conservancy of Canada joint Great Lakes Conservation Blueprint, developed in cooperation with state and provincial agencies, is currently one of the few, if not only, binational biodiversity approaches. Regardless, this significant public/private blueprint provides key direction on protecting and restoring ecological functions and attributes that are key to maintaining the basin hydrological cycle; it needs to be embraced and its results acted upon by relevant agencies. Attention should be paid to pilot attempts to put the Blueprint into a Great Lakes-based context—the ongoing *LaMP Based Lake Ontario Biodiversity Conservation Strategy* undertaken by the TNC/NCC should be monitored and carefully considered as a model for Lake-based biodiversity conservation.
- Governments and respective agencies could improve delivery of biodiversity conservation under the existing patchwork of legislation and policy by better goal setting and more timely delivery. Likewise, more attention could be paid to setting explicit biodiversity-based standards and implementation timelines.
- The current International Joint Commission Science Advisory Board could be expanded or reconfigured to include members with biodiversity expertise.
- Both Canada and the U.S. need to address the major stressors—invasive species, declining water levels, and water quality and habitat degradation—in order to conserve biodiversity. Policies and regulations on these stressors need to include strong language regarding the biodiversity impacts of such stressors. It would be helpful to assess and prioritize/rank stressors arising out of the SIWG exercise in a biodiversity conservation context.

QUESTION 6: DOES THE CURRENT AGREEMENT ADDRESS THE ISSUE ADEQUATELY/AT ALL?

Generally, there is consensus that the GLWQA does not completely address biodiversity nor explicitly recognize the role biodiversity plays in ecosystem integrity and provision of key hydrological and aquatic biotic functions, and a prevailing view believes the Agreement does not address biodiversity at all. Aquatic invasive species are mentioned within the Agreement in Annex 6.1.b and 17.2.i, but with an emphasis on study and research rather than prevention, control, compliance, or enforcement. The closest tie to biodiversity is within Annex 2—LaMPs and RAPs. RAPs have considerable provisions for the protection and restoration of fish and wildlife populations and habitat within Areas of Concern (AOCs). There is a related focus within Annex 13 on wetland preservation. Some observe that the specific objectives that call for protection and restoration of the chemical, physical, and *biological* integrity of the Great Lakes can be interpreted to include a species diversity protection mandate.

It should be noted that knowledge about threats to the Great Lakes ecosystems (e.g. invasive species) have changed significantly since the GLWQA was last amended.

QUESTION 7: WHAT ARE THE ADVANTAGES/DISADVANTAGES OF INCLUDING THE ISSUE IN THE GLQWA?

The *advantages* of including the biodiversity issue in the GLWQA are:

- Stakeholders would gain a better understanding of the issue and the ecosystem context of the issue in terms of currently accepted views such as the United Nations Convention on Biodiversity;
- From a biodiversity conservation viewpoint, binational cooperation would keep this issue visible—inclusion would be a binational recognition of the current international concerns of threats to biodiversity;
- A binational approach would ensure that "newer" and significant ecological stressors are dealt with, starting at the federal levels, but also influencing other levels of governments;
- A primary science-based, reviewed vehicle for understanding Great Lakes water quality is the State of the Lakes Ecosystem Conference (SOLEC), which has already acknowledged larger ecosystem functions and biodiversity – inclusion of biodiversity within GLWQA would bring it in line with the best and latest scientific guidance; and
- Biodiversity indexes are good/relevant indicators of overall Great Lakes ecosystem health, and would complement more specific single parameters such as water quality.

The *disadvantages* of including the biodiversity issue in the GLWQA are:

- Threats to the chemical, physical and biological integrity of the Great Lakes ecosystem go well beyond contaminant impacts to water quality. Therefore, there is a concern that inclusion of the biodiversity issue into the GLWQA may take focus and resources away from the issue of contaminants and water quality. It is noted that in Canada there are other forums that may be better suited for biodiversity conservation (e.g., national Canadian Biodiversity Strategy⁸, Ontario Biodiversity Strategy⁹, and United Nations Convention on Biodiversity¹⁰). In the U.S., however, such forums are currently limited.
- There are existing explicit biodiversity initiatives (Canadian, Ontario and Quebec biodiversity strategies), and various plans, agreements and strategies with biodiversity components. There are implementing agencies and organizations who deal with natural heritage and resources that do not operate on a day-to-day basis within the traditional framework of the GLWQA and Great Lakes issues. It could be said there is a broad policy framework and institutional culture dealing with natural heritage conservation that biodiversity science and conservation has tended to fall within. To a degree, the stakeholders and participants (and individuals) in this 'arena,' are different from those in the GLWQA institutional and policy 'arena.'
- Jurisdictionally and practically there are existing biodiversity conservation mandates and existing and potential mechanisms at the state and provincial, as well as municipal, levels. Any amendments to GLWQA must ensure binational cooperation between federal governments on biodiversity conservation, especially in areas of direct federal mandate such as introduction of Aquatic Invasive species through foreign ballast water species, but also recognize, foster and support existing state/provincial collaborations.

Some of the disadvantages could be addressed by clearly stating the context for including biodiversity within GLWQA; strongly recommending that biodiversity issues also be addressed beyond the GLWQA, with a complementary "Great Lakes Biodiversity Strategy"; respecting jurisdictional boundaries; and working closely with biodiversity agencies, organizations who are

currently 'outside' of the GLWQA, and First Nations/Tribes to both formulate the appropriate language for inclusion within the GLWQA and to discuss strategies and implementation. In this way and through careful coordination and communication, an amended GLWQA could turn the jurisdictional and institutional landscape into a distinct advantage for biodiversity conservation (and perhaps bring traditionally separate stakeholders and practitioners to the same table).

QUESTION 8: IS THE GLWQA THE MOST APPROPRIATE MEANS OF ADDRESSING THE ISSUE?

As noted in the answer to question five, biodiversity is a binational issue and the GLWQA is likely the only existing appropriate mechanism to fully address the complete tributary to open water geography required. Other agreements and acts are also relevant (e.g, Great Lakes Fishery Commission, Great Lakes Fishery Convention Act) in dealing with the issue, particularly in the context of a collaboration between the GLWQA and other binational programs.

The GLWQA appears to be the most appropriate current means to address and commit to the biodiversity issue. To ensure effectiveness and needed cross jurisdictional collaboration an accompanying mechanism would be a binational "Great Lakes Biodiversity Conservation Strategy." A biodiversity agreement would be another way to address the issue; however, such an agreement may not achieve the legislative strength, respect, and/or acceptance that the GLWQA has. In effect, including biodiversity under the GLWQA may be the most effective means of addressing biodiversity issues and related water quality issues.

Some Subgroup members questioned whether including the biodiversity issue in the GLWQA is an appropriate means for stakeholders to pursue their biodiversity conservation goals. Because water quality and quantity are hydrologically tied to ecosystem health and integrity, including biodiversity within the GLWQA would provide greater depth to the GLWQA. In addition, this would allow for a greater diversity of conservation tools to flow out of the GLWQA and would engage a broader spectrum of stakeholders. If the GLWQA is not the most appropriate mechanism for biodiversity conservation, then biodiversity conservation may still be a valuable addition to the GLWQA in fulfilling its water quality mandate. Inclusion would be a benefit to the water quality issue.

QUESTION 9: DOES THE GLQWA GIVE AUTHORITY TO ADDRESS THESE ISSUES?

Yes, the GLWQA provides a general mandate to address biodiversity issues, in particular, issues that pertain to the chemical, physical and biological integrity of the waters of the Great Lakes Basin ecosystem (Article II and III, Purpose and Objectives). In addition, the GLWQA contains provisions for Lakewide Management Plans (LaMPs), Remedial Action Plans (RAPs) in Areas of Concern, and surveillance and monitoring to measure the health of the ecosystem. However, the mandate is weak and not explicit; it is not a driver for action or for biodiversity policy. No specific authorities currently exist within the GLWQA. The power of the GLWQA is in the details of the annexes, and greater and more explicit authority to address biodiversity issues could be done in a separate annex that specifically addresses these issues.

There is a strong argument that the intent of the GLWQA statement, "...to prevent further pollution of the Great Lakes Basin ecosystem owing to continuing population growth, resource development and increasing use of water," should cover aquatic invasive species because such species are considered biological pollution. Moreover, nutrients and sediments also impact water quality as well as impact terrestrial ecosystems, whose integrity can be measured in terms of level of intact indigenous biodiversity.

Whether the GLWQA gives authority to biodiversity issues or not, it is important to consider the timing and context of the 1972 and 1978 GLWQA amendments. Biological diversity was a relatively new concept and was overshadowed by (relatively) new concerns regarding persistent pollutants and nutrients. Since then, biodiversity has become a global conservation concern and there is more science (and policy) linking abiotic and biotic elements to form an "ecosystem" science and policy paradigm. The GLWQA was a product of its time but it was also forward-looking and innovative—if it had been written today, it is likely it would explicitly address biodiversity conservation.

QUESTION 10: WHERE ARE ADDITIONAL AUTHORITIES NEEDED?

In the forward-thinking and innovative spirit of the original Agreement, the GLWQA should be amended to more explicitly address biodiversity issues. Additional authorities to address loss or degradation of Great Lakes habitats and the species they support are needed as follows:

- To incorporate biodiversity, gain a more contemporary and science-based ecosystem approach, and provide for greater consistency between the GLWQA's intent and Annex 2, it is suggested that the 4th line of the primary *Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978* be amended as follows:

“REAFFIRMING their intent to prevent further pollution and degradation of the Great Lakes Basin Ecosystem owing to continuing population growth, resource development and increasing use of water.”
- Legal authorities and communications through the federal governments, the United Nations Convention on Biodiversity, and national and provincial/state biodiversity strategies be improved;
- A biodiversity annex to the GLWQA be added or included under a revised Annex 2; and
- A new annex to the Agreement focus on invasive species.

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APPENDIX 5

SIWG Climate Change Subgroup Report

CLIMATE CHANGE SUBGROUP: ANSWERS TO STEP-WISE QUESTIONS

INTRODUCTION

The relationship between climate change and Great Lakes water quality and ecosystem health has been raised in a number of forums. Participants in the early 2006 public workshops conducted by the International Joint Commission expressed concern about water quantity and climate change and wanted these issues to be addressed in the review of the Agreement.¹³² The June 2006 “Great Lakes Water Quality Review Environmental Community Discussion Paper” published by several environmental groups identifies climate change as an important issue worthy of consideration for inclusion in the Agreement.¹³³ Climate change was also raised in the 2006 *Draft Report: Review of the Canada Ontario Agreement on the Great Lakes Basin Ecosystem*, which recommends that the Canada Ontario Agreement consider adding new annexes that address urgent and emerging issues affecting the Great Lakes Basin, including climate change.¹³⁴

As part of the current GLWQA review process, discussions between the Agreement Review Committee and the Special Issues Work Group (SIWG) resulted in the formation of a Climate Change Subgroup charged with assessing whether climate change merits attention within the Agreement given the Agreement’s purpose and scope as well as the substantive articles and annexes. The following text represents responses of the Climate Change Subgroup to the SIWG step-wise questions provided by the Terms of Reference as they were applied to the issue of climate change.

QUESTION 1: WHAT IS THE ISSUE?

This issue focuses on how changes in the climate of the Great Lakes region are currently affecting and will continue to affect the Great Lakes Basin ecosystem and what can be done to reduce the impacts of such changes on the ecosystem. Subgroup participants expressed a prevailing view that climate change is occurring and human activities are considered to be significant contributors. However, the Subgroup’s prevailing view also agreed that the issue should not focus on either causes of climate change nor on actions that can be taken to prevent or delay the advent of climate change. While causes and mitigation should be addressed on a binational level, the prevailing view of the Subgroup does not consider the Great Lakes Water Quality Agreement to be the appropriate vehicle for doing so.

¹³² International Joint Commission, 2006.

¹³³ www.greatlakesforever.org

¹³⁴ Ogilvie, Ogilvie, and Company, 2006.

There is a diverging view in the Subgroup that believes that the issue should include both looking at causes of climate change and considering and carrying out measures for preventing climate change, specifically, reducing the region's contributions to atmospheric greenhouse gases.

There is another diverging view in the Subgroup that considers any changes in climate to be the result of natural fluctuations and not caused by human activity.

However, all Subgroup participants agree that changes in climate in the Great Lakes region are occurring or are likely to occur in this century.

Climate change is a stressor that impacts physical, chemical and biological processes in the Great Lakes. Growing evidence suggests that the climate of the Great Lakes region is already changing.¹³⁵

- Annual average temperatures are growing warmer, with most warming occurring in the winter and spring and the least warming occurring in the fall;
- The onset of the spring melt (freshet) is earlier, the frost-free period is lengthening and, in general, winters are getting shorter;
- Annual precipitation is increasing;
- Snow cover (depth, area coverage, and duration) is diminishing;
- The duration of lake ice cover is decreasing as air and water temperatures rise; and
- Heavy precipitation events are becoming more common in the U.S. states (no consistent trend has been observed in the Canadian Great Lakes region).

The following additional changes to the climate of the Great Lakes region are projected to occur in the future:¹³⁶

- Warmer air temperatures;
- Decreased ranges in daily air temperatures;
- Increased total annual precipitation, despite the potential for less precipitation during some seasons;
- Increased precipitation in the form of rain and less in the form of snow;
- Increased intensity of precipitation events; and
- Increased potential evapotranspiration with warmer air temperature.

To be effective, the resource management paradigm, which currently assumes relatively stable climate with an observed range of variability, needs to consider and address the impacts of these substantial actual and prospective climatic changes.

¹³⁵ Great Lakes Water Quality Board report to the IJC, 2003 (p. 4), and UCS and EPA, 2005.

¹³⁶ Great Lakes Water Quality Board report to the IJC, p. 33

QUESTION 2: WHAT IS THE ISSUE'S SIGNIFICANCE TO THE GREAT LAKES BASIN ECOSYSTEM?

Climate change has the potential to profoundly impact the chemical, physical, and biological integrity of the Great Lakes Basin ecosystem. Depending upon the rate of change, the impacts could be ecologically extensive and economically widespread. Climate change is projected to have many impacts (summarized below) on water supply, water quality, natural ecosystems, human health and beneficial uses.

Projected *water supply* impacts include:¹³⁷

- Annual runoff decreases in most climate change scenarios, with potential winter runoff increases;
- Water levels in the Great Lakes decline for most scenarios;
- Spring freshet may occur earlier and have less water flow;
- Summer and fall low water flows may lessen and last longer and high water flows may rise due to extreme precipitation events across the Great Lakes watershed;
- The amount and timing of ground water base flow to streams, lakes and wetlands may change, while the ground water recharge levels may decrease;
- Seasonal cycles of water levels may shift; and
- The ice cover season may be reduced or eliminated completely.

Projected *water quality* impacts include:¹³⁸

- Warmer water temperatures affect physical, chemical and biological processes;
- Taste and odor problems in drinking water may increase;
- Changes in mixing depth affect productivity;
- Non-point source pollution increases with higher intensity precipitation events;
- Vulnerability to water-borne pathogens increases;
- Storm water conveyance infrastructure may not perform to design specifications (flooding and combined sewer issues);
- Low flow episodes increase, assimilative capacity decreases and water quality standards for point source discharges may not be met;
- Water quality remediation targets may not be met;
- It may be significantly more costly to meet water quality goals;
- Periods of thermal stratification may be extended with associated declines in dissolved oxygen;

¹³⁷ Ibid., p. 3

¹³⁸ Ibid., p. 4

- Potential for increased conflict between in-stream ecological needs and economic uses of water;
- Already impaired beneficial uses may be further stressed, influencing remediation plans; and
- New stressors within ecologically healthy areas may be created.

Projected impacts on *natural ecosystems* include:¹³⁹

- Biological productivity is expected to increase with moderate temperature increases;
- Zoogeographical boundaries move in a changing climate;
- The invasive species rate of introduction and of the significance of their impacts on the ecosystem may change;
- Existing community structures and interactions may change;
- Fish and waterfowl habitat are expected to change;
- Wetland vegetation communities (type and area), functioning and values may change; and
- Rare and endangered species may be more vulnerable.

Projected *human health* impacts include:¹⁴⁰

- Water-borne diseases may increase;
- Health effects related to extreme weather events may increase;
- Air pollution related health effects could intensify;
- The number of heat related illnesses and deaths may rise; and
- Vector-borne and rodent-borne diseases may become more common.

Potential *beneficial use* impacts include:¹⁴¹

- Restrictions on drinking water consumption or taste or odor problems;
- Greater restrictions on fish and wildlife consumption;
- Impacts to fish and wildlife habitat, health, and population;
- Tainting of fish and wildlife flavor;
- Degradation of benthos, zooplankton, or phytoplankton populations;
- Eutrophication or undesirable algae growth;
- Restrictions on dredging activities;
- More frequent beach closings;
- Degradation of aesthetics; and

¹³⁹ Ibid., p. 5

¹⁴⁰ Ibid., p. 56

¹⁴¹ International Joint Commission, 1991.

- Added costs to agriculture or industry.

These impacts would require, among other responses, major adaptive changes for water use, power production, emergency response, ship transportation, and management of newly emerging shore lands and wetlands.

QUESTION 3: HOW IS THE ISSUE CURRENTLY BEING ADDRESSED BY THE UNITED STATES AND CANADA?

The IJC and its advisory boards have identified climate change as an issue with the potential to dramatically impact the Great Lakes Basin ecosystem and to further impair beneficial uses of the Great Lakes. Nonetheless, there are no ongoing binational strategies for addressing climate change in the Great Lakes Basin. Although both countries have conducted some impact assessment studies in recent years, are parties to the United Nations Framework Convention on Climate Change, and Canada has signed the Kyoto Protocol, on the whole, the SIWG views current national and binational efforts focused on climate change as collectively inadequate. The following are examples of cooperative efforts recently concluded or currently taking place.

- In 2000 a Great Lakes water levels reference study by the IJC examined the potential causes and impacts of water level fluctuations.¹⁴² This report identified climate change as a potential factor to consider in estimating levels and flows as well as net Basin water supplies.
- The IJC's International Lake Ontario - St. Lawrence River Study Board published the results of a five-year study entitled "Options for Managing Lake Ontario and St. Lawrence River Water Levels and Flows" (March 2006). This report examines the regulation of the outflow of Lake Ontario at the St. Lawrence River. It reviews the factors affecting levels and flows and assesses the performance of potential new regulation plans, including plans that consider climate change scenarios and impacts on the ecosystem and human interests (e.g., recreational boating and tourism; hydropower; commercial navigation; municipal, industrial and domestic water use; and the coastal zone).¹⁴³
- The Upper Great Lakes Study is now underway for Lake Superior – Lake Huron, focusing on whether the regulation of Lake Superior outflows can be improved to address the evolving ecosystem and human needs of the Upper Great Lakes system from Lake Superior through to the Niagara River. (It is also looking at the effects of physical changes in the St. Clair River on Lake Superior outflows.) The potential impacts of climate change will certainly be a component of this study, although there has been no formal government announcement to this effect.
- The U.S. Environmental Protection Agency's Global Change Research Program within the Office of Research and Development is working in partnership with Environment Canada to support the efforts of the IJC's Great Lakes Water Quality Board. This work resulted in the recent report, "Climate Change and Water Quality in the Great Lakes Basin" (Report of the Great Lakes Water Quality Board to the IJC).

¹⁴² IJC, "Protection of the Waters of the Great Lakes, Final Report to the Governments of Canada and the United States," 2000, www.ijc.org/php/publications/html/finalreport.html.

¹⁴³ International Lake Ontario - St. Lawrence River Study Board. 2006.

- Regional scientists are partnering across the border when submitting individual grant proposals to national and international funding sources.¹⁴⁴
- The State of the Lakes Ecosystem Conference (SOLEC) has been considering the issue on an ecosystem basis and in the context of managing lake levels.
- The U.S. National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory has an integrated research program focusing on Great Lakes Climate Change and Variability. This effort brings together projects that examine the potential effects of climate change on the Great Lakes water resources and ecosystem.¹⁴⁵
- In 2000, the U.S. Global Change Research Program at Michigan State University published "National Assessment of the Potential Consequences of Climate Variability and Change" for the Great Lakes.¹⁴⁶
- The Province of Ontario has identified climate change as a policy priority.¹⁴⁷
- In April 2003, the Union of Concerned Scientists and The Ecological Society of America in cooperation with the Suzuki Foundation of Canada published a binational report, "Confronting Climate Change in the Great Lakes Region."
- A \$20 million reassessment of the 1958 plan for managing the St. Lawrence River control structures is being conducted.¹⁴⁸
- Lake Erie Lakewide Management Plan identified climate change as an area needing greater binational attention.

QUESTION 4: IS THERE A NEED FOR FURTHER BINATIONAL COOPERATION TO ADDRESS THE ISSUE?

Yes. The Great Lakes region cannot adapt without comprehensive knowledge of projected regional climate changes and a plan that sets priorities for research into both likely changes and measures to adapt to them. While climate change effects are addressed in some binational forums, binational cooperation on climate change needs both greater structure and longer-term stability than provided by current arrangements.¹⁴⁹ Identifying a framework for action now will prevent more harm to the Great Lakes Basin ecosystem and will avoid ineffectual and costly responses later.

A dissenting view within the Subgroup asserts that the Great Lakes region must also have a plan within the GLWQA that sets priorities for preventing the causes of climate change.

¹⁴⁴ "Great Lakes Water Quality Agreement Review: Environmental Community Discussion Paper," June 2006, p. 28.

¹⁴⁵ <http://www.glerl.noaa.gov/res/Programs/ccmain.html> (complete list of publications)

¹⁴⁶ MSU, USGCRP, 2000.

¹⁴⁷ Canadian Ministry of the Environment press release: <http://www.ene.gov.on.ca/envision/news/2004/052102.htm> (viewed, December 2006)

¹⁴⁸ "Environmental Community Discussion Paper," p. 28.

¹⁴⁹ Ibid, p. 29.

QUESTION 5: HOW SHOULD CANADA AND THE UNITED STATES COOPERATE TO ADDRESS THE ISSUE?

Although it is beyond the scope of the GLWQA, the U.S. and Canada should cooperate to develop mitigation strategies and plans to slow the rate and magnitude of climate change. Climate change effects in the Basin can only be prevented if action to do so is taken internationally.

However, on the Great Lakes Basin level, the federal governments should focus on research into climate change effects and climate change adaptation strategies. Currently, the U.S. and Canada do not adequately coordinate scientific research and climate change modeling. Because of the projected impacts to the Great Lakes Basin, the governments need to cooperate both within the Great Lakes Basin and more broadly. The areas listed below are potential focal points for future binational cooperation:

- Both at the Great Lakes Basin level and more broadly, the governments should conduct research, monitoring, and analysis to ascertain more concretely what climate change effects are occurring or might occur;
- Both at the Great Lakes Basin level and more broadly, the governments should work on adaptation and/or remediation strategies that have the best chance of preserving ecosystem functioning in the face of actual or prospective climate change effects; and
- At the Great Lakes Basin level, the governments should establish a binational board to coordinate climate change research and adaptation efforts. This board should be composed of experts and “disinterested” partner-stakeholders and have a standing reference. This board should be charged with examining the state of regional climate change knowledge, determining priorities for funding, recommending policies based on the latest states of knowledge, and designing and carrying out public education efforts.¹⁵⁰

A diverging view asserts that the Subgroup should advocate cooperation only on the Great Lakes Basin level.

QUESTION 6: DOES THE CURRENT AGREEMENT ADDRESS THE ISSUE ADEQUATELY?

The Agreement vaguely and indirectly addresses the issue in the following ways:

Article III, General Objectives, includes the following language (emphasis added):

The Parties adopt the following General Objectives for the Great Lakes System. These waters should be:

- Free from materials *and heat* directly or indirectly entering the water as a result of human activity that alone, or in combination with other materials, will produce color, odor, taste, or other conditions in such a degree as to interfere with beneficial uses; and

¹⁵⁰ Ibid.

- Free from materials *and heat* directly or indirectly entering the water as a result of human activity that alone, or in combination with other materials, will produce conditions that are toxic or harmful to human, animal, or aquatic life.

This language focuses on heat as a pollutant from power plants and other thermal processes, such as industry and municipal wastewater plants. In this context, the Parties recognized that adding heat to the system was detrimental to the physical, chemical and biological integrity of the Great Lakes Basin ecosystem.

Annex 1, Specific Objectives, Part II, Physical (b) Temperature, states that, “There should be no change in temperature that would adversely affect any local or general use of the waters.”

Annex 11, Surveillance and Monitoring requires activities to be undertaken for the purposes of: a) compliance, b) achievement of general and specific objectives, c) evaluation of water quality trends, and d) identification of emerging problems. The broad scope of this Annex provides a basis for binational climate change effects surveillance and monitoring. For example, Section 2 reads:

A joint surveillance and monitoring program necessary to ensure the attainment of the foregoing purpose shall be developed and implemented among the Parties and the State and Provincial Governments. The Great Lakes International Surveillance Plan contained in the Water Quality Board Annual Report of 1975 and revised in subsequent reports shall serve as a model for the development of the joint surveillance and monitoring program.

Although these references in the Agreement recognize temperature and several projected impacts of climate change as potentially harmful to the Lakes, they do not address the much larger issue of climate change itself. No part of the Agreement specifically addresses climate change, although climate change is very likely to affect the chemical, physical and biological integrity of the Great Lakes. Moreover, the Agreement does not adequately provide the necessary structure, direction or institutional tools for the Parties to address the threat. While there is nothing specifically prohibiting the Parties from incorporating the issue into the programs and current measures of the Agreement, this is not being done.

QUESTION 7: WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF INCLUDING THE ISSUE IN THE AGREEMENT?

While there are clear advantages and disadvantages of including climate change in the GLWQA, the advantages outweigh the disadvantages. Climate change will exacerbate most other stressors and further impair beneficial uses. Climate change is an emerging issue and is recognized and addressed as such by the IJC.¹⁵¹ Including climate change explicitly within the Agreement would strengthen binational research and adaptation strategy development. Advantages and disadvantages to doing so are outlined below:

¹⁵¹ Great Lakes Water Quality Board report to the IJC, p. 1.

Potential advantages include:

- Proactively addressing a serious environmental issue, showing leadership, contributing to long-term sustainability in the Basin, and preventing backsliding on environmental advances already made;
- Directing climate change research and adaptation strategies specifically to integrated studies and activities that are relevant to the Great Lakes; and
- Taking advantage of the Great Lakes Water Quality Agreement mechanism because it is institutionally well set-up to assess effects and adaptation research and recommend effects and adaptation research priorities.

A diverging view asserts that another advantage is the opportunity to include climate change prevention activities, in that they would improve the economic competitiveness of the region by making it more energy efficient.

Potential disadvantages include redirecting resources and staff otherwise charged with addressing more manageable problems such as pollutant controls, invasive species, and habitat conservation.

Although the prevailing view of the Subgroup decided against advocating recommending inclusion of climate change prevention measures or mitigation measures in the Agreement, some Subgroup members diverged, and wished to note that including mitigation measures could put the region at an economic competitive disadvantage by causing adoption of new regulations or other prescriptive measures, thereby increasing costs.

QUESTION 8: IS THE AGREEMENT THE MOST APPROPRIATE MEANS OF ADDRESSING THE ISSUE?

The GLWQA is an appropriate means of conducting cooperative research into effects and adaptation in the Great Lakes context, for it is an existing mechanism with a science-based infrastructure and means of oversight, ideal for housing and effecting climate change commitments.¹⁵² The Agreement could also have the necessary flexibility to address potential emerging issues related to climate change. This does not imply, however, that the GLWQA should be the only means of addressing the issue.

Two opposite dissenting views exist within the Group. The first asserts that this issue is already being addressed in other forums, such as the United Nations Framework Convention on Climate Change, and that these efforts should not be duplicated. The second asserts the Agreement is the appropriate venue for cooperative climate change prevention/mitigation efforts.

QUESTION 9: DOES THE AGREEMENT GIVE AUTHORITY TO ADDRESS THESE ISSUES?

¹⁵² "Environmental Community Discussion Paper," p. 30.

Although the Agreement provides no direct charge to address climate change, the Agreement's purpose (Article II) is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem. A changing climate could significantly impede achievement of these goals. The Agreement provides the mandate for the Parties to undertake specific actions, but there is no specific mention of climate change and, as such, the Agreement does not serve as a driver for addressing the issue.

QUESTION 10: WHERE ARE ADDITIONAL AUTHORITIES NEEDED?

A number of areas should be added to or strengthened in the Agreement to make better reference to climate change. Specific areas where additional authority is needed include: Introductory language; Article II purpose statement, particularly subsection (c); Articles III; Article IV; Article VII, in reference to the IJC; Article X, subsections (b) and (c); and Article XIII.

The Agreement should also:

- Broaden and refine the specific objectives in Annex I, particularly related to temperature and thermal discharges to provide a direct link to climate change; and,
- Create a new annex that explicitly addresses climate change-related monitoring and research OR expand Annex 17, "Research and Development," and Annex 11, "Surveillance and Monitoring," to include specific authority for joint climate change science.

A diverging view notes that including prevention/mitigation would also require additional authorities.

Another diverging view asserts that while establishing a binational board to coordinate research and monitoring is potentially valuable, its function could be coordinated with the work already being done through the existing U.S.-Canada bilateral working group on climate change and should not duplicate efforts within other forums.

There is also a substantial need for additional authorities outside of the Agreement. It is critically important that climate change be addressed by governments at the binational, national, state/provincial and local/municipal levels, and that the work at all levels of government (and between federal governments) be coordinated.

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