

**St. Lawrence River at Massena AOC
Remedial Action Plan's
Beneficial Use Impairment (BUI) Indicator Removal of the
Degradation of Phytoplankton and Zooplankton Populations BUI**

- October 2014 -



New York State Department of Environmental Conservation
(AOC Coordination)

St. Lawrence River at Massena Remedial Advisory Committee
(Technical and Advisory Committee Members)

*This BUI indicator redesignation report was compiled by NYSDEC using all available information about plankton within the AOC and established research about the dynamics of plankton in riverine systems. One body of evidence used in this document is the report by Barry Baldigo, of US Geological Survey, titled "Toxicity of waters from the St. Lawrence River at Massena Area-of-Concern to the green algae *Selenastrum capricornutum* and the water flea *Ceriodaphnia dubia*". This study was funded by the Great Lakes Restoration Initiative. AOC Coordination funding to NYSDEC is provided by the United States Environmental Protection Agency. The redesignation of this BUI indicator has involved government agencies, the Saint. Regis Mohawk Tribe, peers, professionals, and the public in review. All substantive comments have been incorporated into this BUI redesignation document. For information or copies please contact the lead RAP Coordinator in the NYSDEC Region 6 Office in Watertown or NYSDEC Division of Water per the committee contact information in Appendix A.*

Table of Contents

Executive Summary

I. Background

- A. Delisting Criteria
- B. Endpoint
- C. BUI Redesignation Comment and Report Preparation

II. BUI Indicator Status Resolution

- A. Strategy, Rationale, and Results
- B. Supporting Data and Assessment
- C. Criteria, Principles, and Guidance Application
- D. Redesignation Statement

III. BUI Redesignation (Delisting) Steps and Follow-up

- A. BUI Redesignation Steps
- B. Post (delisting) Redesignation Responsibilities

Appendix

- A. List of Remedial Advisory Committee members
- B. Public Meeting Notes
- C. Responsiveness Summary
- D. References
- E. Noteworthy Remedial Activity Updates and Special Provisions

List of Figures and Tables

Figure 1 – Map of the St. Lawrence River at Massena Area of Concern

Figure 2 – Map of the St. Lawrence River at Massena Area of Concern showing sampling locations

List of Acronyms.

AICOA	Aluminum Company of America
AOC	Area of Concern
BUI	Beneficial Use Impairment
EPA	Environmental Protection Agency
GLRI	Great Lakes Restoration Initiative
IJC	International Joint Committee
NYSDEC	New York State Department of Environmental Conservation
RAC	Remedial Action Committee
RACER	Revitalizing Auto Communities Environmental Response Trust
RAP	Remedial Action Plan
RIBS	Rotating Intergraded Basin Studies
SPDES	State Pollution Discharge Elimination System
SRMT	Saint Regis Mohawk Tribe
USGS	United State Geological Survey
USPC	United States Policy Committee

Executive Summary

This Beneficial Use Impairment (BUI) Redesignation Report identifies the background, criteria, supporting data, and rationale to redesignate the status of the “Degradation of Phytoplankton and Zooplankton Populations” BUI from “Unknown” to “Not Impaired” for the St. Lawrence River at Massena Area of Concern (AOC).

In the Stage I and Stage II Remedial Action Plans (RAPs) and subsequent Updates, the status of this BUI was listed as “unknown, needs assessment” due to an absence of data. The delisting criteria for this BUI are that “Phytoplankton or zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics; and in the absence of community structure data, plankton bioassays confirm no toxicity impact in ambient waters.”

In the large and physically diverse St. Lawrence River at Massena AOC, any indication of plankton community impairment due to AOC contaminants would be masked by the natural variability in the plankton communities in the AOC. Due to the difficulty of obtaining plankton community structure data within the construct of an experimental design capable of testing the hypothesis that waters of the AOC have no influence on phytoplankton and zooplankton populations, the Remedial Advisory Committee (RAC) has determined that toxicity tests provide the best assessment of the status of this BUI. Therefore, the evidence presented in this redesignation document focuses on the second BUI removal criteria.

In 2011, the U.S. Geological Survey (USGS), NYSDEC, and the Saint Regis Mohawk Tribe (SRMT) initiated a study to assess the toxicity of waters from the St. Lawrence River at Massena AOC to phytoplankton and zooplankton (Baldigo et al., 2012). The results of this study demonstrated that the ambient waters of the AOC were generally no more toxic to the phytoplankton and zooplankton test species than were waters from upstream and downstream control sites outside of the AOC.

Following an evaluation of the results of this study and of other evidence gathered for this BUI as part of the redesignation process, the RAC has determined that the “Degradation of Phytoplankton and Zooplankton Populations” BUI has met the conditions for redesignation listed above to the maximum extent practicable. The RAC fully supports the recommendation that the “Degradation of Phytoplankton and Zooplankton Populations” BUI for the St. Lawrence River at Massena AOC be redesignated from “Unknown, Needs Assessment” to “Not Impaired”.

I. Background

In the Great Lakes Basin, the International Joint Commission (IJC) has identified 43 Areas of Concern (AOCs) where pollution from past industrial production and waste disposal practices has created hazardous waste sites and contaminated sediments. BUIs have been identified for each of the AOCs, and in order for an AOC to be delisted, restoration of each of its BUIs must be documented. This Redesignation Report outlines the available data addressing the status of the “Degradation of Phytoplankton and Zooplankton Populations” BUI at the St. Lawrence River at Massena AOC; the Remedial Action Committee’s (RACs) evaluation of this data; and the recommendation of the RAC that the status of this BUI be redesignated from “Unknown” to “Not Impaired”.

The St. Lawrence River at Massena was identified by the IJC as an AOC in 1987. It encompasses a 12-mile section of the St. Lawrence River including the Moses-Saunders hydropower dam complex and Seaway locks, and the lower reaches of three tributary rivers which enter the St. Lawrence River downstream of the dam. The three tributary rivers are the Grasse River (8 miles), the Raquette River (12 miles), and the St. Regis River (2 miles). In addition, the manmade Power Canal (3 miles) between the Grasse River and the St. Lawrence River is included.

There are three governmental bodies that share jurisdictional responsibilities for the AOC. These are the United States, Canada, and the Saint Regis Mohawk Tribe at Akwesasne. Although the 1978 Great Lakes Water Quality Agreement between the federal governments of Canada and the United States identifies the AOC as binational, it is truly a multinational representation that will require a “transboundary indicator” as well as the inclusion of the SRMT jurisdiction to effectively address the AOC (USEPA 2015).

With 37 river miles on four different rivers, the St. Lawrence River at Massena AOC is unique from other AOCs in both its large size and degree of physical diversity. The four rivers differ in volume, flow rate, substrate, habitat, and water chemistry. This presents a challenge for evaluation and assessments of BUIs for this AOC as a whole. Figure 1 (next page) shows a map of the AOC.

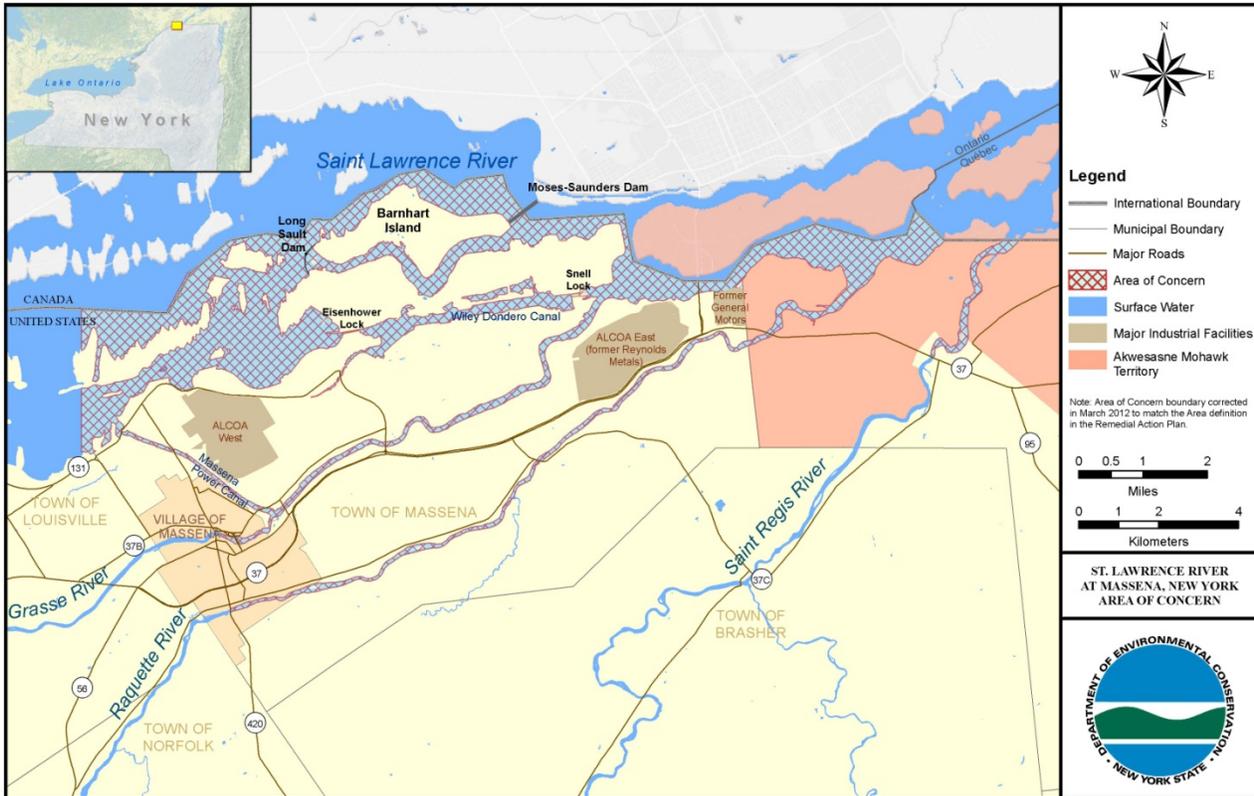


Figure 1. Map of the St. Lawrence River at Massena AOC.

A. Delisting Criteria

In accordance with the St. Lawrence River at Massena RAP Stage I and the IJC Delisting Guidelines for Degradation of Phytoplankton and Zooplankton Populations, the Degradation of Phytoplankton and Zooplankton Populations BUI may be delisted when the following criteria have been met:

1. Phytoplankton or zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics;
AND
2. In the absence of community structure data, plankton bioassays confirm no toxicity impact in ambient waters (i.e. no growth inhibition).

B. Endpoint

The desired endpoint for this BUI identified by the RAC in the 2006 RAP Status Report is to have “plankton populations that are substantially similar to reference communities” (DEC, 2006). The achievement of this endpoint could be demonstrated by a comparison of community structure data, or alternatively through the use of bioassays to confirm the lack of toxicity of AOC waters to phytoplankton and zooplankton test organisms (indicating a lack of impairment of AOC phytoplankton and zooplankton communities).

C. BUI Redesignation Comments and Report Preparation

A Technical Review Team (Stephen Litwhiler, Jennifer Reeher, and Christopher Fidler with NYSDEC) was assembled to evaluate the status change in designation of this BUI. The evaluation included conducting a thorough review of technical reports and supporting documents. Through the evaluation, the Technical Review Team addressed the following questions:

1. Are the methods and results cited in the report or presentation materials technically and scientifically sound?
2. Does the information cited in the report regarding restoration of the impaired beneficial use support the delisting criteria?
3. Concur that the delisting criteria have been met?

Team members prepared this technical report with their conclusions, including whether the evidence and scientific rationales put forward in the report support the position that the delisting criteria have or have not been met for the beneficial use.

II. Indicator Status Resolution

A. Strategy and rationale

The United States Environmental Protection Agency (USEPA) Delisting Guidance document, Restoring United States Great Lakes Areas of Concern: Delisting Principles and Guidelines, adopted by the United States Policy Committee (USPC 2001) states the following:

“Re-designation of a BUI from impaired to unimpaired can occur if it can be demonstrated that:

- Approved delisting criteria for that BUI have been met;
- The impairment is not solely of local geographic extent, but is typical of upstream conditions OR conditions outside of the AOC boundaries on a regional scale. Such re-designation would be contingent upon evidence that sources within the AOC are controlled;
- The impairment is due to natural rather than human causes.”

The IJC delisting guidelines from 1991 state that this Beneficial Use may be deemed Not Impaired “When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters” (IJC, 1991).

Phytoplankton and zooplankton populations are used as an indicator of aquatic ecosystem health because they are at the base of the food web and are sensitive to a variety of environmental stressors, including the presence of toxic substances in the water column (Munawar and Weisse, 1989). Being at the base of the local food web, the health of the phytoplankton and zooplankton populations are also significant to the Mohawk culture of Akwesasne. The Haudenosaunee Thanksgiving Address (DEC 1990, Chapter VII Section C) reflects the cultural importance of the environment and all of the life that it fosters, life that is heavily dependent on the presence and efficiency of the local food web.

This redesignation report contains the information to show that the “Degradation of Phytoplankton and Zooplankton Populations” BUI for the St. Lawrence River at Massena AOC has met the conditions for redesignation listed above to the maximum extent practicable based on present science. Based upon the evidence presented in this document, and the evaluation of this evidence through the Remedial Action Plan process, the RAC supports the redesignation of the “Degradation of Phytoplankton and Zooplankton Populations” BUI from Impaired to Not Impaired.

B. Supporting Data and Assessment

The Stage I (DEC, 1990) RAP identified this BUI as unknown due to lack of data for phytoplankton and zooplankton assemblages within the AOC. The 2006 RAP Status Report (DEC, 2006) describes the need for a study to assess the status of this BUI in the AOC. In the 2010 “Compendium of Delisting Targets for BUIs in US AOCs” (EPA, 2010), the status of this BUI is also listed as “Unknown, needs assessment”.

In 2007 and 2008, Clarkson University researchers Dr. Michael Twiss and Hilary Lockwood conducted a study to assess phytoplankton and zooplankton populations and community composition within the Massena AOC. They concluded that there are no differences in the plankton populations or community composition in the main channel of the St. Lawrence River above or below the Moses-Saunders Dam (Twiss and Lockwood, 2009) and that concentrations of total phosphorus in the water column in the majority of the AOC are normal and are adequate to support normal plankton growth. In addition, by comparing the results of this study to a previous study conducted by Williams (2006), which examined the plankton community composition outside of the AOC boundaries along a transect from the mouth of Brandy Brook across the main channel of the St. Lawrence River, Twiss and Lockwood were able to demonstrate that the differences observed between the plankton communities of the AOC tributaries and the plankton community of the St. Lawrence River within the AOC were substantially similar to differences observed outside of the AOC between the plankton community of Brandy Brook and the plankton community of the St. Lawrence River. Both within the AOC and outside of the AOC, nanoplankton (size 2-20 μ m) dominated community composition in the tributaries and picoplankton (size 0.2-2 μ m) dominated community composition in the St. Lawrence River.

Without standards for what constitutes a “normal” plankton community and what is an acceptable level of variance between physically diverse sites, it is difficult to use plankton community structure data to assess ecosystem impairment. The State of the Great Lakes Ecosystem Conference 2005 report noted that “No assessment of ‘ecosystem health’ is currently possible on the basis of phytoplankton community data since reference criteria and endpoints have yet to be developed” (Environment Canada and USEPA, 2005). In large river systems such as the St. Lawrence, the composition of riverine phytoplankton and zooplankton assemblages can vary considerably both temporally and spatially (Basu et al., 2000; Twiss et al., 2010). This high variability is an important and confounding limitation for removing BUIs (George and Boyd, 2007); it frequently makes many of the quantitative metrics needed to characterize biological communities and to test

for site-to-site differences difficult to generate precisely (Stemberger et al., 2001). This is especially true for the St. Lawrence River at Massena AOC, where the large St. Lawrence River flows through the Moses-Saunders hydropower dam complex and is joined by three tributary rivers (the Grasse, Raquette, and St. Regis), each with its own unique water chemistry and biotic composition (Twiss and Kring, 2009). In a 2008 assessment of the “unimpaired” status of the “Eutrophication and Undesirable Algae BUI”, Michael Twiss and Stefanie Kring collected data which illustrated no impairment due to eutrophication and a variety of different phytoplankton communities in various parts of the AOC (Twiss and Kring, 2009).

In the St. Lawrence River at Massena AOC, any indication of impairment due to AOC contaminants would be masked by the natural variability in the plankton community in this large and physically diverse AOC. Therefore, the evidence presented in this delisting document focuses on the second BUI removal criteria: “in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters”.

As part of the Rotating Integrated Basin Studies (RIBS) statewide water quality monitoring program, NYSDEC conducts toxicity tests (a type of bioassay) of the acute and chronic toxicity of ambient waters to the zooplankton *Ceriodaphnia dubia*, by determining the effect of sampled waters on *C. dubia* survival and reproduction. This monitoring is conducted on a five-year rotating schedule of New York State watersheds, and samples were collected from three sites within the AOC in 2010. At the St. Lawrence River site (immediately upstream of the Moses-Saunders Dam), samples were collected and tested in the fall, and no survival or reproductive impairment of *C. dubia* was observed. Samples were also collected in the spring, summer and fall from a site on the Raquette River within the AOC near Rooseveltown and from a site on the St. Regis River just outside of the AOC near Hogansburg (immediately upstream of the dam forming the AOC boundary). No significant reproductive or survival effects were observed at either of these sites.

In 2011, USGS, NYSDEC, and SRMT initiated a study to assess the toxicity of waters from the St. Lawrence River at Massena AOC to phytoplankton and zooplankton. The purpose of this study was to determine whether the second Plankton BUI delisting criteria, “in the absence of community structure data, plankton bioassays confirm no toxicity impact in ambient waters”, had been achieved. The hypotheses tested were that waters from sites within the AOC were no more toxic to a test phytoplankton species and a test zooplankton species than were waters from upstream (and one downstream St. Lawrence River) reference sites.

The representative organisms selected for toxicity testing were the phytoplankton *Selenastrum capricornutum*¹ and the zooplankton *Ceriodaphnia dubia*. These organisms were selected because: 1) they represent important links in the aquatic food chain, 2) they have short life cycles and are easy to culture in the lab, 3) they are sensitive to a wide range of contaminants (WDNR, 2004), and 4) for both species the USEPA has developed standardized toxicity tests (bioassays) to quantify biota responses to acute or chronic toxicity in freshwater environments (USEPA, 2002b). These USEPA bioassay protocols are used to estimate the toxicity of effluents and receiving (ambient) waters to freshwater organisms, and to identify effluents and receiving waters containing toxic materials in chronically or acutely toxic concentrations (USEPA, 2002a).

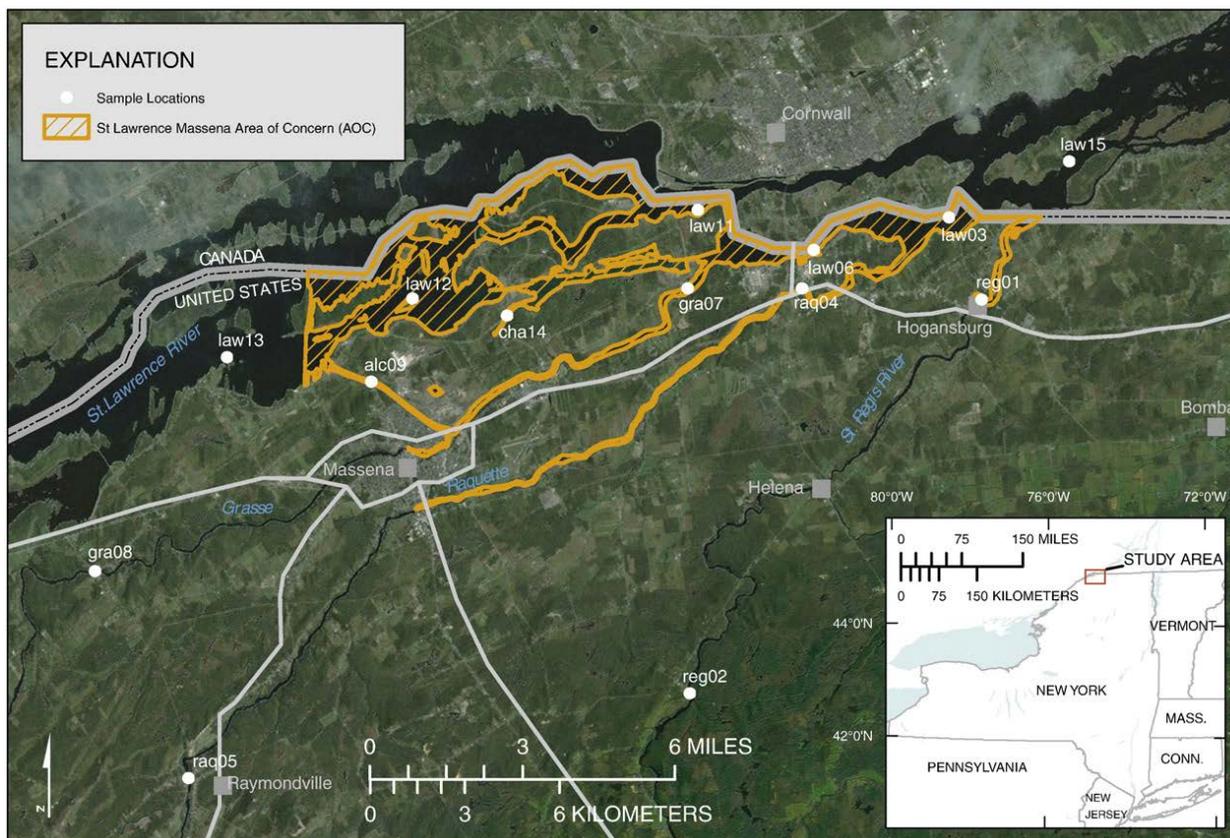


Fig. 2. Map of the St. Lawrence River, major tributaries, sampling sites, and the boundaries of the St. Lawrence River at Massena NY AOC.

Water samples for the toxicity testing were collected in spring, summer, and fall of 2011 from nine study sites within the AOC, four control sites upstream of the AOC, and one control site downstream of the AOC (Fig. 2). The test organisms were exposed to the water samples and controls for a specified amount of time, after which their density (for *S. capricornutum*) or survival and reproduction (for *C. dubia*) were assessed. Comparisons were made using standard

¹ The phytoplankton species previously known as *Selenastrum capricornutum* has been renamed *Pseudokirchneriella subcapitata*. For the purposes of this Redesignation document, we will use the name *S. capricornutum* to maintain consistency with Baldigo et al., 2012.

univariate and multivariate statistical analyses. Statistical analyses were made between AOC sampling locations and ambient controls. Laboratory controls were used only to assure test organisms met standards for acute and chronic endpoints established in USEPA (2002a,b).

The survival of *C. dubia* during exposure to waters from all AOC and control sites ranged from 70 to 100 percent. No significant differences were found in *C. dubia* survival in waters from the AOC as compared to corresponding control sites. The mean number of offspring produced by *C. dubia* in waters from all study sites (AOC and controls) ranged from 19.1-29.2, 30.3-38.2, and 30.7-37.7 during chronic tests done in May, August, and October 2011, respectively. No significant differences were found in the median or mean number of young produced between AOC sites and control sites. An assessment of pooled site data for *C. dubia* offspring produced found significant differences between seasons, but not between rivers or between control sites versus AOC sites.

Survival and reproduction data from the *C. dubia* tests showed that AOC waters were not acutely or chronically toxic to this zooplankton species at any of the sites during any of the sampling periods. In all instances, AOC sites performed as well as their respective controls.

Mean density of *S. capricornutum* ranged from 2.27-4.19, 2.05 -5.37, and 3.24-4.49 x 10⁶ cell/mL at the end of tests conducted with waters collected at the AOC and control sites during May, August, and October 2011, respectively. For 26 out of the 29 comparisons between AOC sites and controls, univariate analyses determined that cell production in waters from AOC sites was not significantly different, or was significantly higher, than cell production in waters from corresponding control sites.

S. capricornutum cell production was significantly lower than controls in samples from three AOC sites: St. Lawrence River sites cha14 and law03 collected in August, and St. Regis River site reg01 collected in October. *S. capricornutum* cell production was significantly higher at two AOC sites (St. Lawrence River sites law03 and law12) as compared to their respective controls during the month of October. A multivariate analysis using pooled site data found that although there were significant differences in mean density between seasons and between rivers, there was no significant difference in mean density between AOC sites and control sites.

The significantly lower density of *S. capricornutum* associated with waters from AOC sites cha14, law03, and reg01 suggests that these particular sites could be seasonally toxic to phytoplankton. For several reasons, these results do not necessarily indicate impairment of the “Degradation of Phytoplankton and Zooplankton Populations” BUI for the AOC as a whole:

1. Site cha14, which had significantly lower production of *S. capricornutum* in August and significantly higher production of *C. dubia* in October, occupies a unique position within the St. Lawrence River system and may not be truly comparable to the upstream or downstream control sites. Site cha14 is a stagnant backwater marsh located off of the main shipping channel between the upper and lower locks on the Seaway, where there are frequent changes in water levels and reversals of flows. According to the State of Wisconsin Aquatic Life Toxicity Testing Methods Manual (WDNR 2004), receiving water samples for the *S. capricornutum* bioassays should not be collected from stagnant areas, or from water close to the sediment interface. In retrospect, the researchers recognize that cha14 was an unrepresentative site for these bioassays and for comparative analyses, and cha14 should not have been selected as a sampling site (B.T. Duffy, personal communication, June 4, 2013).
2. The AOC waters were not toxic to the zooplankton *C. dubia* at any of the sites for any of the sampling periods. Although sensitivities typically vary between species, the absence of toxicity of AOC waters to *C. dubia* suggests that factors other than toxicants may have affected the density of *S. capricornutum* at sites law03, reg01, and cha14.
3. The significantly lower density of *S. capricornutum* cells in waters from sites cha14, law03, and reg01 was observed in only one sampling event (out of three seasonal sampling events) for each of these three sites, with no evidence of toxicity found in the other two seasons at the same locations. Aside from these three instances, at all other times and locations AOC sites performed as well as their respective controls.
4. AOC site law03 is located in the St. Lawrence River below the Moses Saunders Dam, near the downstream AOC boundary in Akwesasne. In August site law03 had significantly lower *S. capricornutum* production than the upstream control site law13 (located above the dam), but there was no significant difference in *S. capricornutum* production between site law03 and the nearby downstream control site, law15.
5. In October, the AOC St. Lawrence River sites law03 and law12 had significantly higher production of *S. capricornutum* than the upstream control site law13. These findings further illustrate the variability that is inherent in sampling and assessing components of biological systems.
6. In addition to the univariate AOC and control site statistical comparisons, a multivariate analysis of pooled site data was performed. The multivariate analysis found no significant difference in *S. capricornutum* densities between pooled AOC and pooled control sites.

In summary, the findings of the USGS study are that in three instances the densities of *S. capricornutum* exposed to AOC waters were significantly lower than their respective control sites, and in two instances the densities of *S. capricornutum* exposed to AOC waters were significantly higher than their respective control sites. Significantly lower densities of *S. capricornutum* were not observed more than once at any AOC site. When the *S. capricornutum* data are pooled, there are no statistical differences between AOC and control sites. For the *C. dubia* bioassays, survival and offspring production data showed that AOC waters were not acutely or chronically toxic to this zooplankton species at any of the sites during any of the sampling times.

These toxicity test results demonstrate that the ambient waters of the St. Lawrence River at Massena AOC are generally no more toxic to the phytoplankton and zooplankton test species than were waters from upstream and downstream control sites outside of the AOC. This indicates a lack of significant toxicity of AOC waters to phytoplankton and zooplankton, and supports the RAC's assessment that the "Degradation of Phytoplankton and Zooplankton Populations" BUI is Not Impaired at the St. Lawrence River at Massena AOC.

C. Criteria, Principles, and Guidance Application

The intent of the RAP process is to assess the status of each Beneficial Use Impairment; and, if existence of an impairment is indicated, to remedy the source of the impairment and subsequently demonstrate that the beneficial use has been restored. The delisting criteria for the "Degradation of Phytoplankton and Zooplankton Populations" BUI has been met in the following manner:

Phytoplankton or zooplankton community structure does not significantly differ from unimpacted control sites of comparable physical and chemical characteristics, AND In the absence of community structure data, phytoplankton and zooplankton bioassays confirm no toxicity impact in ambient waters.

In a large, complex riverine system such as the St. Lawrence River, plankton assemblages vary considerably. Temporal and spatial differences make it difficult to precisely generate the quantitative metrics for phytoplankton and zooplankton communities that are needed to test for site-to-site differences. Therefore, the RAC has determined that toxicity bioassays provide the most robust means to assess the potential effect of AOC conditions on phytoplankton and zooplankton populations. The 2012 USGS study demonstrates that the ambient waters of the St. Lawrence River at Massena AOC are primarily no more toxic to the phytoplankton and zooplankton test species than are waters from upstream and downstream control sites. Additionally, DEC bioassays of *C. dubia* at two sites in the AOC during the spring, summer and fall of 2010 found no evidence of toxicity.

D. Redesignation Statement

The IJC delisting guidelines state that this Beneficial Use may be deemed Not Impaired “When phytoplankton and zooplankton community structure does not significantly diverge from unimpacted control sites of comparable physical and chemical characteristics. Further, in the absence of community structure data, this use will be considered restored when phytoplankton and zooplankton bioassays confirm no significant toxicity in ambient waters” (IJC, 1991).

The “Degradation of Phytoplankton and Zooplankton Populations” BUI was administratively listed as “Unknown” due to a general absence of data, rather than due to any technical evidence of impairment. In the absence of community structure data gathered in an experimental design capable of testing the hypothesis that waters of the AOC have no influence on phytoplankton and zooplankton populations, the RAC has determined that phytoplankton and zooplankton toxicity tests provide the best assessment of the status of this BUI. The results of toxicity tests from AOC and non-AOC sites conducted by USGS in 2012, and by DEC in 2010, confirm that there is no significant toxicity to zooplankton and phytoplankton from ambient waters in the AOC. Based upon an evaluation of these results, and on a lack of evidence to the contrary, the RAC has determined that the “Degradation of Phytoplankton and Zooplankton Populations” BUI has met the conditions for redesignation listed above to the maximum extent practicable. The RAC fully supports the recommendation that the “Degradation of Phytoplankton and Zooplankton Populations” BUI for the St. Lawrence River at Massena AOC be redesignated from “Unknown, Needs Assessment” to “Not Impaired”.

III. BUI Redesignation (Delisting) Steps and Follow-up

A. BUI Redesignation Steps

	<i>Completed</i>	<i>Date</i>	<i>Step Taken</i>
1.	√	12/2008	Delisting criteria completed and finalized with USEPA
2.	√	4/2009	Clarkson provides expert involvement and presentation on plankton study to RAC
3.	√	2/2011	USGS proposes a study to measure the chronic toxicity of waters from the Massena Area-of-Concern using two plankton species and completes the study in 2011 field season
4.	√	3/2012	RAP advisory committee agreed to proceed forward with BUI delisting with the based on existing information and USGS plankton
5.	√	6/2012	Review of technical information assembled with USGS
6.	√	8/2012	Additional/ related monitoring, data review and assessment conducted

7.	√	6/2013	Discussion of redesignation by RAP advisory / oversight committee
8.	√	6 – 8 /2013	Collaboration with USEPA, DEC’s Toxicology Testing Unit, Dr. Twiss with Clarkson U. and other agencies for draft technical report preparation
9.	√	9/2013	Public meeting advertised and held, information, outreach, and comment on redesignation conducted (included a 30-day public comment period)
10.	√	9/2013	Comments assembled, Re-drafted BUI redesignation report prepared to include necessary changes
11.	√	7/2014	NYSDEC (in consultation with USEPA R2) completes final modifications to the Degradation of Phytoplankton and Zooplankton Populations BUI redesignation document.
12.		10/2014	Coordinate the formal transmittal of the BUI redesignation (delisting) with USEPA GLNPO and SRMT. Communicate result with IJC.
13.		12/2014	Communicate results to local RAP Coordination for appropriate recognition and follow-up.

B. Post-Redesignation Responsibilities

Following redesignation of the “Degradation of Phytoplankton and Zooplankton Populations BUI”, the organizations listed below will continue ongoing environmental programs to assure that the restored beneficial use is protected and continues to remain unimpaired. The environmental programs relating to this beneficial use are water quality monitoring, hazardous waste site remediation, and coordination of the St. Lawrence River at Massena Remedial Action Committee.

1. New York State Department of Environmental Conservation

Through the statewide Rotating Integrated Basin Studies (RIBS) ambient water quality monitoring program, NYSDEC will continue to monitor water quality in the AOC. The routine monitoring site on the St. Lawrence River at the Moses-Saunders Dam is sampled 5-6 times per year in spring, summer, and fall. The samples are analyzed for a wide range of potential contaminants. Additional sites in the AOC may be selected every five years for intensive monitoring (6-8 times per year); which includes both testing for contaminants, and bioassays of ambient water toxicity to *C. dubia*.

Through the State Pollutant Discharge Elimination System (SPDES), DEC will continue to regulate point source discharges of industrial and municipal wastewater and stormwater in accordance with the federal Clean Water Act. There are five permittees of point-source discharges in the AOC: ALCOA West, Massena municipal Sewage Treatment Plant, the St.

Lawrence Power Project, former Reynolds Metals (ALCOA East), and former GM Powertrain (RACER Trust).

With Great Lakes Restoration Initiative (GLRI) funding through USEPA, NYSDEC currently provides a part-time Coordinator for the AOC Remedial Action Committee (RAC), and technical assistance for AOC documentation and project design. With ongoing funding support, NYSDEC will continue in these roles to assist the RAC and USEPA in achieving the long-term goal of delisting the St. Lawrence River at Massena AOC.

2. United States Environmental Protection Agency

The USEPA will continue to provide funding for RAC Coordination and technical assistance to the extent that resources are available. The current GLRI grant supporting RAC coordination runs through September 2016. Two other GLRI grants for DEC support of AOC priorities and for St. Regis Mohawk Tribe participation in the RAP process wrap up in September 2014.

Through their Interagency Agreement, USEPA and USGS are monitoring nutrient concentrations in AOC waters in 2013 (limited sampling) and 2014, with sampling sites on the St. Lawrence River and each of the three tributaries. The purpose is to establish a baseline for nutrient levels and basic water chemistry parameters for the AOC.

3. Saint Regis Mohawk Tribe

SRMT will continue water quality monitoring as part of their Water Quality Standards Program, which is implemented by the Tribe under the US Federal Clean Water Act. The SRMT Water Quality Standards Program applies to all surface waters within, partly within, or bordering on Akwesasne Mohawk Territory. In the AOC, this includes sections of the Raquette, St. Regis, and St. Lawrence Rivers.

4. Aluminum Company of America

ALCOA will continue routine water column monitoring at seven sites in the Grasse River within the AOC. Samples have been collected between April and October since the early 1990s, with over 2,000 samples collected to date for this program. Samples are analyzed for PCBs, total suspended solids, and basic water chemistry parameters.

ALCOA will be undertaking remediation (removal and capping) of PCB-contaminated sediments in the Grasse River according to the Record of Decision issued by USEPA in April, 2013. The anticipated completion date of this remediation project is 2020.

At the ALCOA East, land-based remediation activities have been completed for all of the six priority sites identified on the 112 acre property. Contained drainage and a new leachate system have been installed around the landfill for source control, and there is a long-term monitoring and maintenance program for the area.

5. Revitalizing Auto Communities Environmental Response Trust

RACER Trust will continue remediation (removal and onsite or offsite landfiling) of contaminated soil and lagoon sludge with long-term operation, monitoring and maintenance at the former GM Plant.

6. Remedial Action Committee

The Remedial Action Committee will continue to forward the objectives of the Remedial Action Plan by evaluating, supporting, and documenting the restoration of the St. Lawrence River at Massena Area of Concern, until all of the BUIs are restored and the long-term goal of delisting the AOC can be achieved.

Appendix

A. List of Remedial Advisory Committee members

1. Ron McDougall

RAC Chairperson
61 Beach Street
Massena, NY 13662
315-323-1244 (cell)

2. Christopher Fidler

RAP Coordinator Beginning 7/14
NYSDEC
317 Washington Street
Watertown, NY 13601
315-785-2262 (office)

3. Jessica Jock

Program Manager, St. Lawrence River AOC
Saint Regis Mohawk Tribe
Environment Division
412 State Route 37
Akwasasne, NY 13655
518-358-5937 x139

4. Doug Premo

Citizen
Massena, NY

5. Robin McClellan

Citizen
PO Box 470
Potsdam, NY 13676
315-261-2502

6. Luke Dailey

Citizen, League of Women Voters
469 Chapel Hill Road
Colton, NY 13625
315-265-2404

7. Dawn Howard

St. Lawrence County Soil and Water
Conservation District Manager Conservation
District
1942 Old DeKalb Road
Canton, NY 13617
(315) 386-3582

8. Peter Skomsky

St. Lawrence County Environmental
Management Council
Massena, NY
315-764-0119

9. Michael Twiss

Clarkson University
PO Box 5715
Potsdam, NY 13699
315-268-2359

10. Bruce Cook

ALCOA
Massena, NY
315-764-4270

11. Karen Cooper

Remedial Action Plan Transition
Coordinator, St. Lawrence River (Cornwall)
2 St. Lawrence Drive
Cornwall (Ontario) Canada K6H 4Z1
(613) 936-6620 (x.229)

12. Elaine Kennedy

St. Lawrence River Restoration Council
(Cornwall)
RR #1 St. Andrews West
Ontario, Canada K0C 2A0
613-936-2240

13. Gerald Pratt

State AOC Coordinator
NYSDEC
625 Broadway
Albany, NY 12233
518-402-8246

14. Jennifer Reeher

NYSDEC
317 Washington Street
Watertown, NY 13601
315-785-2268 (office)

15. Jessica Tarbell

Saint Regis Mohawk Tribe
Environment Division
412 State Route 37
Akwasasne, NY 13655
518-358-5937 x132

B. Technical Team Members

1. Jennifer Reeher

**NYSDEC
317 Washington Street
Watertown, NY 13601
315-785-2268**

3. Stephen Litwhiler

**NYSDEC
317 Washington Street
Watertown, NY 13601
315-785-2252**

2. Christopher Fidler

**NYSDEC
317 Washington Street
Watertown, NY 13601
315-785-2262**

C. September 2013 Public Meeting Notes

Are Plankton in the Massena Area Impaired?

Mr. Litwhiler reported that the RAC has determined that there is sufficient data to proceed on delisting the plankton BUI. The RAC is seeking public input on the proposal at this meeting. To support the proposal, the RAC has drafted a report on the plankton delisting that Ms. Baker (now Reeher) will summarize at this meeting. The draft report is a compilation of data from different sources.

Ms. Baker explained the technical background about the plankton. Plankton are microscopic organisms that form the base of the aquatic food web. There are two types: plant-like phytoplankton and tiny animals known as zooplankton. Plankton are very sensitive to physical and chemical conditions. The community structure of plankton describes the types that are present in a water system.

When the Massena AOC was listed in 1987, there was insufficient evidence to determine whether the plankton were impaired. Since the 1990s, several areas within the AOC have been remediated, leading the RAC to assess whether the plankton BUI should be delisted. The redesignation criteria are to show that the plankton community structure in the AOC does not differ from that outside the AOC or to use bioassays to prove that the water is not toxic to plankton. A bioassay involves comparing the growth of a test organism in the laboratory in water from the AOC to the growth of the test organism in water from outside the AOC. The challenge for meeting the redesignation criteria in the Massena AOC is that it is large and comprised of diverse water systems.

Ms. Baker reviewed the evidence compiled in the draft report to support the plankton delisting. In 2007 and 2008, researchers Twiss and Lockwood conducted phytoplankton and zooplankton sampling that showed that there were no differences in the populations below the Moses-Saunders Power Dam, the area most affected by pollutant inputs, and above the dam. These results formed the basis of a 2010 BUI redesignation report that was submitted to EPA. The Agency responded that more evidence was needed before the delisting process could proceed.

Because of the large and diverse nature of the Massena AOC, it was decided to develop bioassay data on AOC water toxicity to plankton rather than collect more community structure data. Some bioassay data was already available for the AOC. Statewide water quality monitoring, consisting of bioassays of acute (i.e., survival) and chronic (i.e., reproduction) toxicity of ambient waters to the water flea *Ceriodaphnia dubia*, were conducted in 2010 at the AOC. Two biomonitoring sites within the AOC were sampled in the St. Lawrence River upstream of the dam in the fall and in the Raquette River near Rooseveltown in the spring, summer and fall. No toxicity to *C. dubia* was observed during these tests.

This statewide monitoring only included two sites in the AOC, and did not conduct any phytoplankton bioassays. The RAC determined that in order to support delisting, a full bioassay study of the AOC would be required.

In 2011, additional AOC plankton assays were performed by B. Baldigo from the U.S. Geological Survey (USGS) and B. Duffy from NYSDEC using the same water flea test organism (*C. dubia*) and the green algae *Selenastrum capricornutum*. Samples were collected from the St. Lawrence River and its tributaries.

There were 14 AOC and 5 control sites. The water flea results showed 70 – 100 percent survival. There were no significant differences in survival between AOC and control samples. Reproduction was measured in terms of mean number of offspring and ranged from 19 to 38. The only significant difference between AOC and control samples was one AOC site that had better results (site cha14 in October).

The green algae produced between 2.7 and 5.4 million cells per milliliter (cell/mL). Of the 29 AOC/control site comparisons, the significant differences were two locations in which the AOC sample was less toxic than the control, and three locations in which the AOC sample was more toxic than the control (sites cha14 in August, law03 in August and reg01 in October). The cha14 site was not representative because stagnant water was sampled. The significant difference for one sampling event at the law03 site may be due to its position near the mouth of the Raquette River, where water chemistry parameters could have been influenced by tributary inflow rather than St. Lawrence River characteristics. There were no confounding factors that might explain the more toxic AOC result in the reg01 sample. When the data from all the samples were pooled, there were no significant differences between AOC and control samples.

Ms. Baker summarized the results. The evaluation of the status of the plankton BUI presented in the draft report was based on the three datasets: the 2012 bioassays, the 2010 state water quality monitoring data and the 2009 community assessment report. Based on these results, the RAC concluded that the AOC is not toxic to plankton. She indicated that the RAC is collecting comments on the draft report through October 25, 2013. Based on the comments, the RAC will revise and finalize the report. Ms. Baker provided her contact information and that of Mr. Litwhiler to answer questions or to obtain a copy of the full draft report. Mr. Litwhiler indicated that the public comment period could be extended to November 25, 2013.

Questions:

Can the draft plankton report be accessed online?

Ms. Baker: Currently “no”. It is available by contacting her or Mr. Litwhiler.

During the initial AOC listing, were there any factors suggesting that there might be an impact on the plankton populations?

Ms. Baker: No, there was a lack of data to the contrary.

Mr. Pratt: For all of the Great Lakes AOC, a decision was made after the initial listings to make the conservative assumption that all of the BUIs that were listed as unknown should be considered impaired.

Was there excess phosphorus as has been measured on the Cornwall, Ontario, side of the river?

Mr. Litwhiler: Eutrophication which uses phosphorus as an indicator was determined not to be impaired.

There might be high metal concentrations that might be toxic to plankton. Did you perform water chemistry analyses as part of your toxicity testing?

Ms. Baker: Water chemistry analyses were not performed.

The determination that the Massena AOC eutrophication BUI was not impaired was based on a water sample that is not representative. The RAC might consider reviewing past decisions.

To account for the diversity of water systems within the Massena AOC, comparisons are made between samples internal and external to the AOC within a given river or tributary.

D. Responsiveness Summary

The only additional comments or questions received following the September 2013 public meeting were from a final internal DEC review prior to submitting to EPA and SRMT. Early extensive review of the delisting document both within DEC by Nikki Wright with the Toxicology Testing Unit, comments by Dr. Twiss of Clarkson University who had conducted earlier research on plankton within the AOC, and review by members of the Massena RAC had all helped to clear up arguments within the document. The earlier attempt with a delisting document prepared in 2010 helped with understanding that delisting through a comparison of plankton communities inside and outside the AOC required too expensive a study to be practical and the complexity of the river systems within the AOC may not have led to conclusive results.

Early concerns expressed and responded to included:

The sampling techniques/methods used by USGS were designed for evaluation of water quality impacts on plankton at water discharge points.

Review of the EPA sampling protocol indicates this method is used for ambient water sampling of this type and is the same method which DEC uses for their sampling during their Rotating Integrated Basin Studies (RIBS) statewide water quality monitoring program.

The plankton species used in the bio-assay trials are not native to the area.

The species used are widespread, and are the standard phytoplankton and zooplankton species used for these bioassay studies.

How were the sample sites selected?

Here is what the primary researcher in the 2011 study explained, “Since the water-sampling sites needed only to be either inside or outside the AOC, there were no specific selection criteria for sampling locations. We discussed site priorities and access with J. Jock, T. David, A.J. Smith, and others (via conference call) and determined we would collect water at: (1) prior NYSDEC

(RIBS) sampling locations (where possible), (b) sites that could be easily accessed (generally tributary-river locals with bridges or culverts that permitted access to the center of the channel) or via boat (lower reaches on tributaries or St. Lawrence), (c) at downstream ends of AOC tributary-river reaches, and (d) downstream of confluences on the St. Lawrence River. These locales would be most representative of water-quality conditions throughout the AOC reaches in each tributary, and across the St. Lawrence, where the addition of tributary waters could potentially affect water quality and/or toxicity (of the main stem) most significantly.”

Final DEC review comments and responses:

In any of the plankton sampling locations where populations were subject to toxicity bioassay analysis, does any localized water chemistry data exist to show that ambient water quality is also not conducive to plankton impairment? Ambient water quality is implied by the analytical bioassay method itself, but having localized ambient water chemistry data - especially if of favorable quality - would help lend considerably to the "overall weight of evidence approach" and credibility of resulting conclusion.

Water chemistry information was not specifically collected in these studies used to test the delisting criteria for the Plankton BUI. In an effort to keep the arguments for redesignation to not impaired clear and straightforward, the various pieces of water chemistry information which are available were not used to make any conclusions on impact on plankton populations. Certainly no locations within the AOC have been identified where water quality is impacting plankton.

Along the same water quality line of thought, mentioned in Section B. five SPDES discharges in the AOC and a few ongoing monitoring/remediation activities (RIBS, SRMT, ALCOA, RACER) but these aren't connected to any "possible or suspected causes" of the impairment contained in the background discussion (Section B). They are just tacked on at the end of report and their presence raises question, "OK, although no appreciative toxicity was found in plankton communities within & out of AOC, are any potential/suspected sources still a threat to the plankton?" A brief discussion of possible sources within the AOC contributing to this BUI is needed within Section II.

The discussion about ongoing monitoring and remediation activities which was originally in section II was placed in the appendix as E and using the template seemed the most appropriate place for information which addresses “Noteworthy Remedial Activity Updates and Special Provisions”. The most recent Saint Lawrence River Basin Waterbody Inventory/Priority Waterbodies List Report does not identify any sources within the AOC that would cause issues for plankton. Unfortunately, sources upstream of the AOC, namely failed septic systems and wastewater treatment, are an issue but not within the scope of the RAP.

Should this technical report address transboundary sources/impacts? Previous research by Dr. Michael Twiss explains how river contaminants either are "shoreline/tributary specific and generally hug the shoreline" or are coming from Lake Ontario and subsequently mixed within the central part of river due to the nature and volume of flow. Therefore the justification for BUI removal may need to address potential transboundary impacts.

We have concluded that water within the AOC is not impacting plankton populations, and as it flows downstream into Akwesasne and Quebec it will not be impacting plankton populations

there. As to water quality issues which may exist in the Cornwall portion of the AOC, the river currents preclude any potential contaminants from entering any portion of the Massena AOC or New York waters at all.

E. References

Baldigo, B.P., Duffy, B.T., Nally, C.J., David, A.M. 2012. "Toxicity of waters from the St. Lawrence River at Massena Area-of-Concern to the plankton species *Selenastrum capricornutum* and *Ceriodaphnia dubia*" Journal of Great Lakes Research, article in press.

Basu, B.K., Kalff, J., Pinel-Alloul, B., 2000. The influence of macrophyte beds on plankton communities and their export from fluvial lakes in the St. Lawrence River. *Freshwater Bio.* 45, 373-382.

Department of Environmental Conservation (DEC). 1990. St. Lawrence River at Massena Remedial Action Plan Stage I, November 1990.

Department of Environmental Conservation (DEC). 2006. St. Lawrence River at Massena Remedial Action Plan Status Report, October 2006.

Environment Canada and US. EPA, 2005. State of the Great Lakes 2005. U.S. EPA Report. EPA 905-R-06-001.

George, T.K., Boyd, D., 2007. Limitations on the development of quantitative monitoring plans to track the progress of beneficial use impairment restoration at Great Lakes Areas of Concern. *J. Great Lakes Res.* 33, 686-692.

International Joint Commission (IJC). 1991. Proposed listing/delisting guidelines for Great Lakes Areas of Concern. Focus on International Joint Commission Activities. Volume 14, Issue 1, Insert. 1991.

Mills, E.L., Smith, S.B., and Forney, J.L. 1981. The St. Lawrence River in winter: Population structure biomass and pattern of its primary and secondary food web components. *Hydro.* 79:65-75.

Mills, E.L., and Forney, J.L. 1987. Response of Lake Ontario plankton entering the international section of the St. Lawrence River. *Int'l. Rev. Ges. Hydro.* 67(1):27-43.

Munwar, M., Weiss, T. 1989. Is the "microbial loop" an early warning indicator of anthropogenic stress? *Hydrobiologia* 188/189, 163-174.

Rodgers, J.H., Jr., K.L. Dickson, and J. Cairns, Jr. 1979. A review and analysis of some methods used to measure functional aspects of periphyton. In R.L. Weitzel (editor). *Methods and measurements of periphyton communities: A review*. Special Technical Publication 690. American Society for Testing and Materials.

Stemberger, R.S., Larsen, D.P., Kincaid, T.M., 2001. Sensitivity of zooplankton for regional lake monitoring. *Can. J. Fish. Aquat. Sci.* 58, 2222-2232.

Twiss, M., R., Lockwood, H. A. 2009. Degradation of phytoplankton and zooplankton populations in the St. Lawrence River at Massena area of concern.

Twiss, M.R., Ulrich, C., Kring, S.A., Harold, J., Williams, M.R., 2010. Plankton dynamics along a 180 km reach of the Saint Lawrence River from its headwaters in Lake Ontario. *Hydrobiologia* 647, 7–20.

USEPA, 2010. “A Compendium of Delisting Targets for Beneficial Use Impairments in the US Great Lakes Areas of Concern”. Prepared for the USEPA Great Lakes National Program Office by the Great Lakes Commission, September 2010. Contact: Matt Doss, Great Lakes Commission, mdoss@glc.org.

USEPA, 2002a. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and marine Organisms, Fifth Edition. US Environmental Protection Agency, Office of Water, Washington DC.

USEPA, 2002b. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. US Environmental Protection Agency, Office of Water, Washington DC.

USEPA, 2015. Website <http://www.epa.gov/greatlakes/aoc/st-lawrence/index.html>

USPC. 2001. Restoring United States Areas of Concern: Delisting Principles and Guidelines. Adopted by the US Policy Committee on December 6, 2001.

Wisconsin Department of Natural Resources, 2004. Stat of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition. Wisconsin Department of Natural Resources, Madison, WI.

Williams, M.R. 2006. Phytoplankton communities along a tributary transition zone: Brandy Brook and the St. Lawrence River. Honors B.S. Thesis. Clarkson University, Potsdam, NY.

F. Noteworthy Remedial Activity Updates and Special Provisions

Status of Remediation Actions at the St. Lawrence River at Massena AOC

The AOC contains three industrial sites where hazardous wastes have contaminated soils, river sediments, groundwater, and the biota with PCBs, PAHs, and trace metals. Since 1987, many activities leading to improvements in water quality in the AOC have been undertaken, including remediation of hazardous waste sites, remediation of contaminated sediments, and source control activities.

ALCOA (main plant; west) – The fourteen upland sites listed in two Records of Decision (RODs) for ALCOA West have been remediated, as well as four additional non-ROD sites on the 3500 acre property. The Secure Landfill has been lined and capped, and is monitored with groundwater wells. The wastewater and air discharge systems for the plant have been upgraded, and water use at the plant has been reduced.

Grasse River Remediation – In 1995, 3,000 cubic yards of PCB-contaminated sediments were removed from the Grasse River. In April 2013, the EPA issued a Record of Decision for remediation of the remaining PCB-contaminated sediments in a 7.2-mile stretch of the river. This cleanup will be implemented by ALCOA, with an anticipated completion date around 2020. The plan calls for removal of 109,000 cubic yards of contaminated sediments, most of which will be disposed of on-site in the permitted Secure Landfill. 225 acres of remaining in-situ sediments with elevated PCB levels in the main channel will be capped, and an additional 59 acres will receive an armored cap to protect against disturbance by ice scour. Following dredging and cap construction, habitat and biota recovery will be monitored, and the cap will be monitored and maintained. Alcoa currently monitors water quality and PCB levels in fish in the Grasse River and Power canal.

ALCOA (former Reynolds Metals; east) – At ALCOA East, land-based remediation activities have been completed for all of the six priority sites identified on the 112 acre property. Contained drainage and a new leachate system have been installed around the landfill, and there is a long-term monitoring and maintenance program for the area. As part of the mitigation for loss of wetlands on the Alcoa West facility, 100 acres of wetland habitat were created or enhanced on the non-industrial parts of the Alcoa East property.

St. Lawrence River Sediment remediation – in 2009, the St. Lawrence River Remediation Project was completed by ALCOA with oversight from EPA. 86,600 cubic yards of contaminated sediment were removed from the St. Lawrence River adjacent to ALCOA East, and transported to an off-site disposal facility. Five and a half acres of remaining sediments with elevated PCB or PAH levels were capped in situ with gravel, sand, and stone. Sediment was also removed from a shoreline area (less than 0.5 acres) with elevated PCB and PAH levels, and this area was capped. The caps are monitored and maintained by ALCOA, with reports to NYSDEC and USEPA.

GM (RACER Trust) – Land-based remediation of this site is ongoing. Demolition and removal of structures is complete, and removal of the slabs and contaminated subsurface soil is underway. 297,000 tons of PCB-contaminated wastes have been capped in the Industrial landfill, and 7,800 tons of contaminated soil and materials have been removed from the toe slope of this landfill. 247,447 tons of contaminated sludge and soil have been removed from in and around the on-site lagoons. As remediation is underway, stormwater from the site is being processed and treated. Groundwater at this site is contaminated with PCBs and volatile organic compounds, and

although monitoring wells are in place (an additional 18 were added in 2006), the strategy for addressing the contaminated groundwater has not been determined yet.

23,000 tons of PCB-contaminated sediments have been removed from the St. Lawrence River (including Turtle Cove or County Line cove) and Raquette River, with additional sediments capped in place in the St. Lawrence River. Contaminated soils have been removed from two of three tribal properties adjacent to Turtle Cove.