

An Assessment of the Ontario St. Marys River Area of Concern Beach Closures Beneficial Use Impairment

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Introduction

In 1985, the International Joint Commission (IJC) identified the St. Marys River as one of 43 Areas of Concern (AOC) in the Great Lakes (St. Marys River Stage 1 1992). Being an international waterway, the area was designated a binational area of concern under the *Great Lakes Water Quality Agreement* (GLWQA) in 1987 between Canada and the United States. As outlined in the GLWQA (1987), an AOC is a geographic area that is designated by Parties based on the impairment of beneficial uses that occurred as a result of human activity. The agreement was amended in 2012 and reaffirms the commitment made by both countries to develop and implement a Remedial Action Plan (RAP) for the St. Marys River by taking a collaborative, scientific, and ecosystem-based approach.

Remedial action planning is a three-stage process used to develop a technical planning document that addresses the AOC concerns and processes needed to delist impaired beneficial uses. Initially, stage 1 requires for beneficial use impairments (BUI) to be described and identified. Stage 2 outlines a strategy to remediate BUIs and presents delisting criteria for impaired beneficial uses. Finally, stage 3 involves confirmation of effective restoration for each beneficial use.

As indicated in the GLWQA (1987), a BUI is a reduction in the chemical, physical or biological integrity of water bodies. Each of the 43 AOCs in the Great Lakes was established based on fourteen environmental issues or beneficial use impairments, where each impairment was designated as “Impaired”, “Not Impaired”, or “Requires Further Assessment”. The St. Marys River AOC had nine beneficial uses that were designated as ‘impaired’ in the water body.

This report will only address the Beach Closures BUI. It specifically addresses questions brought up by the BPAC regarding high incidences of *E. coli* and associated beach postings at Marks Bay and other AOC beaches. The report provides an overview for why the BUI was originally deemed impaired in the St. Marys River, how delisting criteria were developed and what the current status is of the Beach Closures BUI.

Reasons for Impairment

The Beach Closures BUI for the St. Marys River was first identified as “Impaired” in the Stage 1 report (1992) of the Remedial Action Plan due to elevated levels of fecal coliform bacteria, particularly *E. coli*. Repeated measurements showed *E. coli* bacterial densities exceeding both the *Provincial Water Quality Objectives* (PWQO) and the *Michigan Water Quality Standards* (MWQS). High levels of bacteria in water bodies may lead to beach closures as human contact with bacteria while swimming may have negative health effects. As indicated in the Stage 1 report (1992), high *E. coli* bacterial densities occurred primarily in Ontario and Michigan waters downstream of storm sewers, combined sewer overflows, industrial outfalls, and the East End Wastewater Treatment Plant.

Recommended Remedial and Monitoring Actions

The Stage 2 RAP report identified a number of recommendations for remedial and monitoring actions to minimize the effects of point source and non-point source discharges to the St. Marys River. In accordance with the Beach Closures BUI, two remedial actions and one monitoring action were established to address the impairment.

One of the two remedial actions is a point source remedial action (PS-2) that aims to reduce storm water infiltration to prevent sewage bypasses at the East End Wastewater Treatment Plant (EEWWTP). According to Kauss and Nettleton (2000), plant capacity expansion and temporary containment of storm water runoff will minimize plant discharge quality and loadings as a result of heavy rainfall events.

The second of the two remedial actions is a point source remedial action (PS-3) that involves upgrading the EEWWTP to secondary treatment. The upgrade will decrease the impact of the EEWWTP on the river, potentially preventing algal blooms, sediment contamination and public beach closings on Sugar Island.

The monitoring action is a non-point source monitoring action (NPSM-7) that involves assessing potential human health risks resulting from floating contaminated masses near and downstream from Bellevue Marine Park. The purpose is to determine if the recreational activities (e.g., swimming, boating) in the region of Bellevue Park and locations downstream have a significant potential to expose public to dermal contact with floating contaminated masses.

Delisting Criteria

To assess the progress in addressing environmental impairments, delisting criteria were established for each BUI. As documented in Stage 2 of the RAP (2002), delisting criteria will provide a decision framework for delisting the St. Marys River AOC. The criteria established are measurable targets for restoring beneficial uses and ultimately the area of concern. The establishment of benchmarks is useful for determining when a beneficial use is no longer considered impaired.

The original delisting criteria for the Beach Closures BUI was specific in addressing high bacterial levels measured in some areas of the St. Marys River AOC. The Stage 2 report of the RAP (2002) stated that the daily geometric mean of *E. coli* levels, as determined from a minimum of 5 samples collected within a 30 day period at designated beaches, should not exceed regulatory standards. As stated by the PWQO (MOE 1999), *E. coli* levels for a sample series at a given site should not exceed 100 *E. coli* per 100 millilitres. If a site exceeds this standard, it will be considered unsuitable for swimming and bathing by local health agencies. For beaches to be considered delisted, they should be free from public health advisories, and should be free of beach closures as a result of sewage discharges from any source for a period of two years. In addition, water should be substantially free from the presence of toxic algae or contaminated sediments, which result from human activities and which threaten human health through dermal exposure. Also free from bacteria, fungi, or viruses that may produce enteric disorders or eye, ear, nose, throat, and skin infections (RAP Stage 2 2002).

Today, potential human health risks associated with using public beaches are assessed and managed under the Algoma Public Health Agency's Beach Warnings program, which is separate from the RAP/AOC program. As indicated in the original delisting criteria, the BUI was deemed impaired in the Stage 1 RAP (1992) due to elevated *E.coli* bacteria within the St. Marys River. At this time, there were no official "public beaches" identified and designated on the Ontario side of the river. The original focus of the BUI was specific to *E. coli* in the river rather than being associated with particular beaches. The initial delisting criteria were considered difficult in measuring environmental health because they were too broad, subjective and immeasurable. The implementation annex (2014) required revisions to the delisting criteria to reflect current scientific research, as well as use a new approach that included using indicators to measure ecosystem health.

The updated delisting criteria are specific to the actions outlined in the Stage 2 Remedial Action Plan to address the original scope of the problem, suggesting that the beach closures BUI beneficial use will no longer be impaired when:

- i) A Stormwater Management Master Plan completed by the City of Sault Ste. Marie that outlines the preferred solution for managing stormwater quantity and quality is in place;
- ii) The East End Wastewater Treatment Plant is upgraded to secondary treatment;

iii) Potential human health risks resulting from floating material near and downstream of Bellevue Marine Park have been assessed and managed, as required.

Assessment of Recent Beach Data

Algoma Public Health (APH) follows the province’s Recreational Water Protocol, where the Protocol states that the board of health must “Conduct routine beach surveillance of all public beaches, including inspection of public beaches after operations commence at least once a week during the period of operation or use” (MHLTC 2014 a). Beaches in Ontario are posted when the geometric mean of a minimum set of 5 samples collected within a 30-day period exceeds 100 *E. coli* / 100 ml of water (MHLTC 2014 b & PWQO).

APH shared the most recent beach monitoring data with the RAP Team, and the results are summarized in the table below:

Table 1: Three-year assessment of PWQO exceedances from beaches within and directly outside the AOC.

Number of PWQO exceedances (for <i>E. coli</i>) by beach / Number of sampling events in given year									
Year	Pointe des Chenes	Marks Bay		Centennial Park	W. I. Park	Haviland (Upstream of AOC)	Harmony (Upstream of AOC)	Big Point Park (Downstream of AOC)	Beech Beach (Downstream of AOC)
		1 [❖]	2 ⁺						
2014	0/9	2/10	2/10	--	0/9	2/9	3/9	3/9	1/9
2013	1/8	1/8	0/8	4/9	0/9	0/8	0/8	0/9	0/9
2012	2/11	2/11		2/11	0/11	2/10	1/11	1/11	0/11
Percentage of PWQO exceedances per beach per year									
2014	0%	20%	20%	--	0%	22.2%*	33.3%*	33.3%*	11.1%
2013	12.5%	12.5%	0%	44.4%*	0%	0%	0%	0%	0%
2012	18.2%	18.2%		18.2%	0%	20%	9.1%	9.1%	0%

* indicates those values that exceeded the PWQO in a given year for greater than 20% of the given sampling season.

❖ indicates the North Entrance of Marks Bay

+ indicates the South Entrance of Marks Bay

Of the four beaches sampled within the AOC (Figure 1), one beach (Centennial Park Beach) did not meet the PWQO for more than 20% of the 2013 sampling season (Table 1). The 20%

threshold is in line with the “Blue Flag” status program (used throughout Ontario, and internationally) (FEE 2014), and is similar to what is being used by many other AOCs within the Great Lakes (such as the St. Clair River RAP, and the Toronto and Region RAP).



Figure 1: Map of the St. Marys River AOC with beach sites indicated

As of 2014, APH is no longer sampling Centennial Park, due to safety concerns attributed to water clarity (Leith 2014). The location of this beach is considered to be the main issue, as the water depth is quite low, and the bottom of Lake George is a mixture of clay, silt, and sand. Minimal wave action has enough of an impact that the clarity of the water is limited to less than 0.5 metres on most days. In addition, elevated *E. coli* results for Centennial Beach are thought to be a result of a large documented waterfowl population in the area (consisting mostly of gulls and some geese) (Leith 2013).

Another interesting note to be made is that two beaches upstream of the AOC (Harmony and Havilland, as seen in the table above), as well as one beach downstream of the AOC (Big Point Park) all had *E. coli* levels exceeding the PWQO for more than 20% of the 2014 sampling season. There were zero exceedances within the AOC for the same year (Table 1). With the only exceedance over the last three years within the AOC being a beach that has been closed for safety reasons, while the remaining beaches have had lower rates of PWQO exceedance than at least 3 beaches directly outside the AOC, it would be reasonable to assume that the beaches within the AOC are at least comparable to reference sites outside the AOC. APH has also documented waterfowl populations affecting each beach within the AOC (Leith 2013), which coupled with wet weather, could be an indication of what is causing the periodic *E. coli* spikes within AOC beaches.

To ensure that the public stays informed on the status of beaches both inside and outside of the AOC, APH posts notification signage at all monitored beaches to inform the public about potential risks to health and safety when using the water. APH also posts information on their websites [Beach Warnings page](#) (indicates whether a beach is Open or Posted), and on the Lake Ontario Waterkeeper websites [Swim Guide](#) (which includes the beach's status, directions to, and historical data).

Current Status of Remedial Actions

To date, there have been significant accomplishments made to each BUI within the St. Marys River. The current status of the remedial actions for the Beach Closures BUI is discussed below. As stated in the implementation annex (2014), the status of Action PS-2 is still underway. In 2002, the Bellevue Park Sanitary Sewer Overflow tank was constructed by the City of Sault Ste. Marie to mitigate the impact of stormwater infiltration into the St. Marys River as well as mitigate impact of stormwater on the EEWTP. In addition, the City updated its Sewer Use By-Law in 2009. This update prohibits the discharge of stormwater and surface water to the sanitary sewer system without prior approval from the City, and the connection of roof leaders to the sanitary system. The City of Sault Ste. Marie is also enforcing stormwater management to address stormwater quantity and quality issues within new and existing development around the city. They have completed a Stormwater Management Master Plan, with the preferred approach including: improvement of snow disposal sites, education, implementation of a point-source monitoring plan, implementation of oil grit separators at various locations throughout the City, improvement of stormwater conveyance at known problem areas and retrofitting of existing stormwater management facilities for quality control. In addition, the City has developed new Stormwater Guidelines. The city has finalized the Stormwater Management Report after soliciting and incorporating comments from the public, and they will seek the City Councils approval of the Stormwater Policy in January of 2015.

The status of Action PS-3 is complete and no further actions are required. The EEWTP facility was upgraded to include a secondary treatment, which featured the first biological nutrient removal system in Ontario (in addition to UV treatment). As a result, there has been an improvement in effluent quality with a reduction in suspended solids by over 89%, phosphorous levels by more than 91%, and biological oxygen demand (BOD) by over 96%, as well as a significant reduction in nitrogen and ammonia.

As mentioned in the implementation annex (2014), the status of the Action NPSM-7 is complete. The binational Sugar Island Monitoring Workshop undertook intensive monitoring in the St. Marys River from 2007 to 2010. It was concluded that the EEWTP is not a source of ongoing elevated *E. coli* bacteria levels or debris in the St. Marys River. Since 2010, there have been no reported incidences of floating masses in the Bellevue Marine Park area.

Next Steps

Exceedances of PWQO *E. coli* levels do not appear to be any more prevalent at beaches within the AOC versus outside the AOC. Therefore, using *E. coli* levels as the sole indicator of environmental degradation within the AOC would actually be a less stringent approach than applying the 3 completed actions approach, as is being currently introduced by the RAP Team in the updated delisting criteria to assess the beach closings BUI.

At this time the RAP team is asking the BPAC to consider the information contained within this report and officially support the updated delisting criteria for the Beach Closures BUI.

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