

ST. CLAIR RIVER AREA OF CONCERN



Status of the Restrictions on Dredging Activities Beneficial Use Impairment

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Executive Summary

The St. Clair River is an important part of the Great Lakes Waterway, connecting Lake Huron to Lake Erie via Lake St. Clair and the Detroit River. To maintain safe shipping depths, routine dredging is required. Within the St. Clair River, dredging is typically undertaken at the South East Bend Cutoff Channel (SEBCC) and occasionally at Stokes Point Shoal and Sarnia Harbour. While Sarnia Harbour is not within the navigational channel, it is included in this assessment as it is a working harbour accommodating large commercial ships that navigate the Great Lakes.

For decades, open water disposal was the routine method of disposal for clean sediment. Otherwise Confined Disposal Facilities (CDFs) or landfills were used. Open water disposal was cost effective and efficient for dredging proponents. In fact, under the 1987 Great Lakes Water Quality Agreement (GLWQA), “open water” disposal of dredged materials was considered a “beneficial use” and became one of the fourteen criteria used to identify “Areas of Concern (AOCs)” by the International Joint Commission (IJC).

In 1991, the IJC provided guidance to AOCs on how to assess the beneficial use “*Restrictions on Dredging Activities*” as well as the thirteen other beneficial uses identified under the GLWQA. The IJC suggested that dredging activities could be considered “impaired” when “*contaminants in sediment exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities*”. While not explicit in the IJC guidance, subsequent interpretation by government agencies and binational committees confirmed that “dredging activities” were specific to commercial navigational dredging. Furthermore, while the guidance suggested a potential restriction on dredging activities, navigational dredging is required and dredging itself is not restricted. Rather disposal options are; specifically open water disposal.

The 1991 Stage 1 Remedial Action Plan (RAP) Report identified impairments within the St. Clair River AOC which included “*Restrictions on Dredging Activities*”. This impairment resulted because concentrations of copper, cadmium, chromium, iron, lead, mercury, nickel, zinc, Polychlorinated Biphenyls (PCBs), total phosphorus and oil and grease along the Ontario shoreline exceeded the provincial Open Water Disposal Guidelines. Exceeding the provincial guidelines for open water disposal required the proponent to dispose of the material in a CDF (which incurred user fees) or an upland facility (which incurred land transportation costs and fees). Both options were more costly compared to open water disposal and were felt to be an economic disadvantage for the proponent and an “impairment” for the AOC. Most exceedances occurred along the Sarnia industrial waterfront and the mouths of Talfourd Creek, Baby Creek and the Murphy Drain. While these sites were not, and are not, subject to navigational dredging, at the time of the Stage 1 RAP, the “*Restrictions on Dredging Activities*” Beneficial Use Impairment (BUI) provided an opportunity to address contaminated sediment. Clarification on where the use impairment should apply was provided in the Stage 2 RAP Report.

In the 1995 Stage 2 RAP Report, dredging in the navigational channel of the St. Clair River and in Sarnia Harbour was undertaken and the materials were disposed of in the local CDF as they were unsuitable for open water disposal. While various task teams and work plans were created to address the contaminated sediment, there was recognition that the “*Restrictions on Dredging Activities*” BUI “...is very specific to areas where dredging takes place in support of navigation and other marine construction purposes.” This revelation influenced the current management of the contaminated zones offshore and downstream from Sarnia’s industrial complex as they are being addressed under the “*Degradation of*

Benthos” BUI, not the “*Restrictions on Dredging Activities*” BUI. The delisting criteria for the “*Restrictions on Dredging Activities*” BUI were also provided and subsequently amended in 2012

1995 Delisting Criteria: *This BUI will be considered restored when there is no limitation on disposal of dredging spoils.*

In the 2005 Update Report (Mayne, 2005), the status of the dredging beneficial use remained “impaired”. In 2007, a review of the BUI was undertaken and a draft report (Mayne, 2007) echoed the recommendation of the Stage 2 RAP Report to apply the BUI to dredging conducted for the purpose of safe navigation and suggested that the 1995 delisting criteria be revised. In 2010, the Canadian RAP Implementation Committee (CRIC) reviewed the criteria and recommended a slight revision:

2011 Delisting Criteria: *This BUI will be considered restored when there is no limitation on disposal of dredging spoils from routine dredging in the St. Clair River.*

The revision specified dredging location and described the frequency of dredging as “routine”, meaning it would occur every few years to restore depths for safe navigation. The revised criteria was finalized in 2012 following consultation and endorsement from the CRIC and Binational Public Advisory Council (BPAC).

In 2013, Environment and Climate Change Canada (ECCC) and the Ontario Ministry of the Environment and Climate Change (OMOECC) co-authored a guidance document to help RAP teams assess the status of the BUI as some AOCs continued to use the dredging BUI as a surrogate for managing contaminated sediment which was not the intent of the BUI. The guidance reiterated that the dredging beneficial use applied only to navigational channels and ports that serve commercial shipping needs. Contaminated sediments outside the navigational channels should be addressed through other beneficial uses such as the “*Degradation of Benthos*”. The guidance document identified three scenarios where a “not impaired” status could be considered by RAP teams. While the guidance was helpful, the CRIC was satisfied with the revised delisting criteria for the dredging BUI and so it maintained its use to assess the status of this beneficial use in the St. Clair River AOC.

Navigational dredging in the Great Lakes is the responsibility of Transport Canada (TC), a federal government department, as per the *Navigation Protection Act*. The Department reviews and authorizes the dumping of fill or the excavation of materials from the bed in consultation with other federal departments, including the Department of Fisheries and Oceans for potential fish habitat impacts. As TC is often the proponent for navigational dredging projects, there is ample oversight and mechanisms to ensure the disposal of dredged material conforms to federal regulations and policies. ECCC has the responsibility to enforce the provisions of the federal Fisheries Act that prevents the deposit of a deleterious substance (e.g., contaminated sediment) into fish bearing waters. In addition, the provincial *Environmental Protection Act* and its regulations provide additional environmental protection, including the disposal of dredged sediment. To determine specific disposal options, proponents are required to collect sediment samples and compare to the Provincial Sediment Quality Guidelines (PSQGs) and others such as the Soil, Groundwater and Sediment Standards. Non-compliance with any legislation can result in penalties to the proponent. In sum, regulatory oversight in navigational dredging activities is largely achieved through the federal and/or provincial environmental protection legislation and approval processes.

Over time, disposal options for dredged materials have expanded to include multiple alternative uses beyond the open water and CDF/landfill disposal options identified during the Stage 1 RAP Report.

Although, technically, open water disposal remains on the list of potential disposal options for “clean” sediment in Ontario, it is no longer considered, as it once was, the common method for disposal due to the potential adverse effects on fish habitat. Open water disposal is discouraged by the provincial government (OMOECC) and is subject to additional conditions, including studies to demonstrate disposal will not have adverse effects. Alternative disposal options for dredged materials include “re-use” for a variety of purposes including beach augmentation, asphalt production and upland fill. Today re-use options are common disposal methods while open water is not. Costs identified in the Stage 1 RAP Report for alternate disposal resulted in the “impairment” however disposal costs are now anticipated by navigational dredging project proponents, most of whom are government agencies.

Since 2000, the dredged material from the St. Clair River was suitable for a variety of alternative uses including beach nourishment and upland fill demonstrating disposal is not restricted.

Year	South East Bend Cutoff Channel (SEBCC)	Year	Stokes Point	Year	Sarnia Harbour
2000	19 of 28 samples suitable for re-use	2005	Three samples were collected however consisted primarily of gravel so chemical analysis could not be performed	2002	7 sediment samples were collected and sent for chemical analysis. Four were submitted for PAH and PCB analysis. PSQG exceedances were observed in five.
2006	Suitable for asphalt and local beach nourishment. Only 1 sample out of 13 had a PSQG exceedance.	2015	Navigational dredging is no longer anticipated/required at this location	2007	9 samples collected in Sarnia Harbour; some spoils were sent to a non-hazardous waste site and some were disposed of in Lake Huron
2012	23 of 30 samples suitable for open water/beach nourishment			2014	25 sediment samples collected with 24 suitable for fill on industrial, commercial and/or community properties
2015	Suitable for beach nourishment and used at Point Pelee			2015	19 samples collected; all suitable for use as upland fill on industrial, commercial and/or community properties.

Government oversight will continue in the management of navigational dredging projects in the St. Clair River to ensure disposal of dredged material is done in accordance with government approved guidelines and in regulated disposal facilities. With multiple disposal options now available, the concept of “no limitation” on disposal as outlined in the delisting criteria has been met. Furthermore, navigational dredging and disposal of dredged material in the St. Clair River AOC is consistent with procedures that occur throughout the Great Lakes.

The “*Restrictions on Dredging Activities*” BUI for the St. Clair River AOC is therefore recommended for re-designation to “not impaired”.

1.0 Introduction

1.1. The St. Clair River Area of Concern

The St. Clair River flows approximately 64 kilometers connecting Lake Huron to Lake St. Clair and serves as an important shipping channel within the Great Lakes Seaway. Some estimates suggest that over 5000 ships pass through the St. Clair River annually (John North, Canadian Coast Guard, personal communication, 2013) carrying commodities including coal, iron ore, limestone and grains (OMOE/MDEQ, 1991). Historically, the river was impacted by industrial and municipal point sources originating primarily from Sarnia, Ontario and Port Huron, Michigan. As a result, in 1987, the St. Clair River was designated as one of 43 Areas of Concern (AOC) identified under the Great Lakes Water Quality Agreement (GLWQA) signed by the governments of Canada and the United States (US). Most recently updated in 2012, the GLWQA commits the two countries to restore and protect water bodies within the Great Lakes Basin.

An AOC is a site where water and the environment have been severely degraded, impacting common uses of the local natural resources. The St. Clair River AOC covers an area of approximately 3350 km² (Figure 1.1). As part of restoring the river, a Remedial Action Plan (RAP) was developed. The Stage 1 RAP report defined the extent and severity of environmental degradation (OMOE/MDEQ, 1991) by assessing fourteen criteria also known as “Beneficial Use Impairments (BUIs)” of the river. The outcome of these efforts was completed in 1991 and resulted in the identification of 12 environmental challenges needing to be addressed within the AOC. Eight of the beneficial uses were considered “impaired” and four required additional research to determine their status. Two BUIs were deemed “not impaired”.

The Stage 2 RAP report, released in 1995, identified 38 recommended remedial actions to restore the “impaired” beneficial uses in the St. Clair River and undertake further research on those that required it (OMOE/MDEQ, 1995). The goal is to re-designate all BUIs to “not impaired”. Once all remedial actions are completed or addressed an AOC can be removed from the list of AOCs in the Great Lakes Basin; this process is commonly referred to as “delisting”. Presently, three AOCs in Canada and 3 AOCs in the US have been “delisted”. For over 20 years, there has been a significant effort from government, First Nations, industry and stakeholders to restore the environmental quality of the St. Clair River through, among others, legislation and improvements to industrial and municipal waste water processing, resulting in the need to re-assess the status of some BUIs initially deemed “impaired”. One of these BUIs is “Restrictions on Dredging Activities”.

1.2. “Restrictions on Dredging Activities” Beneficial Use Impairment

Dredging is a common and required activity in many regions of the Great Lakes Basin. Since the 1960’s, dredging in the St. Clair River has been required to maintain navigation depths for boating and shipping traffic. Prior to this, bottom sediments had been removed by commercial sand and gravel operations and to create new navigation routes such as the South East Bend Cutoff Channel (IUGLS, 2009). In the past, dredged material was often disposed of in open water within the St. Clair River in locations that would not impede navigation. Open water disposal was a preferred method of managing dredged sediment as the costs were low compared to other disposal options.

In 1993, the Ontario Ministry of the Environment (OMOE, now the Ontario Ministry of the Environment and Climate Change (OMOECC)) developed biologically based guidelines (Provincial Sediment Quality

Guidelines (PSQGs)) that put restrictions on the quality of dredged sediment (also referred to as dredgeate) that could be placed in open water (Persaud *et al.*, 1993). This document was revised and updated in 1996 (Jaagumagi & Persaud, 1996) and in 2008 (Fletcher *et al.*, 2008). Sediment that did not meet these guidelines required an alternative form of disposal most often in a Confined Disposal Facility (CDF) or landfill, which constituted a substantial additional cost to the project. In addition to sediment chemistry, dredgeate grain size (texture) was also a limiting factor as open water disposal was only a viable option if the sediment at the disposal location had a texture similar to that of the dredgeate.

Today, due to the inherent environmental impacts open water disposal places on local aquatic habitat (i.e., smothering habitat and aquatic biota), the practice is no longer promoted with some jurisdictions placing severe restrictions on the activity (Golder Associates Limited, 2012a). As such, new options for the management of dredged sediment have been developed including reuse in building material, industrial fill and beach nourishment.

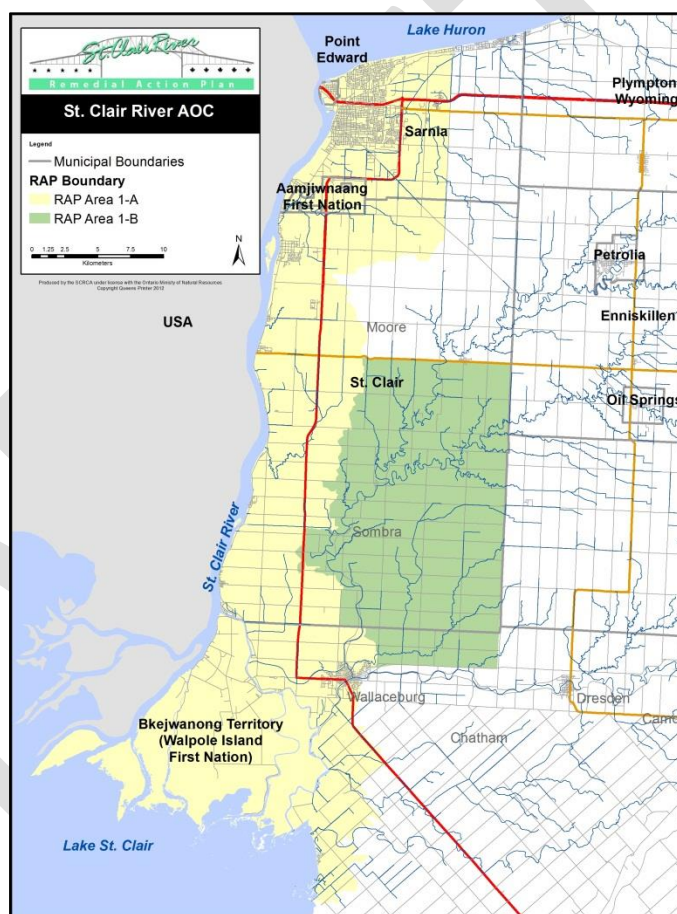


Figure 1.1: Location of the St. Clair River Area of Concern (AOC). The AOC is divided into two areas: Area 1-A (delineated by yellow shading) and Area 1-B (delineated by green shading).

The “Restrictions on Dredging Activities” BUI was listed as “impaired” in the St. Clair River because contaminants in sediment exceeded OMOECC PSQGs for the open water disposal of dredged spoils, and special handling and disposal of the dredgeate was required, resulting in additional costs to proponents. The PSQGs were developed to protect the benthic invertebrate community from the harmful impacts of metals, nutrients and organic compounds found in sediment and are centered around three

contaminant levels and their effect on aquatic biota: the No Effect Level (NEL), Lowest Effect Level (LEL) and the Severe Effect Level (SEL; Fletcher *et al.*, 2008; Table 1.1). If a contaminant exceeds the PSQG LEL, open water disposal is not permitted.

At the time of its listing as an AOC, concentrations of copper, cadmium, chromium, iron, lead, mercury, nickel, zinc, polychlorinated biphenyls (PCBs), total phosphorus and oil and grease exceeded the OMOECC guidelines for the open water disposal of dredged sediment. Most exceedances were observed along the Canadian shoreline, adjacent to the Sarnia industrial complex, downstream to the Lambton Generating Station located south of Courtright, Ontario (OMOE/MDEQ, 1991).

In subsequent updates to the Stage 1 and 2 RAP reports, the “Restrictions on Dredging Activities” BUI continued to be “impaired”. In a 1997 update, concentrations of certain metals, total PCBs, total Polycyclic Aromatic Hydrocarbons (PAHs), Total Kjeldahl Nitrogen (TKN), total phosphorus and oil and grease continued to be above the PSQG LELs in Sarnia Harbour and the South East Bend Cutoff Channel (SEBCC; Geomatics International Inc., 1998). In 2005, some sediment contaminants remained above the PSQG LELs in the SEBCC, however the number of exceeded samples was low and levels were only slightly above guidelines (Mayne, 2007).

Table 1.1: Definitions of the No Effect Level (NEL), Lowest Effect Level (LEL) and Severe Effect Level (SEL) as outlined in the Ontario Ministry of the Environment and Climate Change (OMOECC) Provincial Sediment Quality Guidelines (PSQG; Fletcher *et al.*, 2008).

Level of Effect	Definition
No Effect Level (NEL)	The NEL indicates a concentration of a chemical in the sediment that does not affect fish or sediment-dwelling organisms. At this level negligible transfer of chemicals through the food chain and no effect on water quality is expected. Sediments meeting the NEL are considered clean.
Lowest Effect Level (LEL)	The LEL indicates a level of contamination that can be tolerated by the majority of sediment-dwelling organisms. Sediments meeting the LEL are considered clean to marginally polluted.
Severe Effect Level (SEL)	The SEL indicates a level of contamination that is expected to be detrimental to the majority of sediment-dwelling organisms. Sediments exceeding the SEL are considered heavily contaminated.

For the “Restrictions on Dredging Activities” BUI to be re-designated from “impaired” to “not impaired”, the restoration (“delisting”) criterion developed specifically for the BUI must be met. Delisting criteria are derived locally and are unique to each AOC. For the St. Clair River, delisting targets for BUIs were first published in the 1995 Stage 2 RAP report. In 2010, delisting criteria for all “impaired” BUIs within the AOC were revisited and revised where necessary to ensure they were current, achievable and measurable. Based on this review, the delisting criteria for the “Restrictions on Dredging Activities” BUI was revised and stated that “this BUI will be considered ‘not impaired’ when there is no limitation on the disposal of dredging spoils from routine dredging in the St. Clair River” (CRIC Delisting Subcommittee, 2012).

In 2013, draft guidance was provided by RAP Management at Environment Canada (EC, now Environment and Climate Change Canada) and the OMOECC to ensure the “Restrictions on Dredging Activities” BUI was applied appropriately across Ontario AOCs and that assessments considered the availability of a wider range of options for the management and disposal of dredged material. The guidance emphasized that the BUI was intended to apply to federally regulated commercial navigational channels and ports that serve commercial shipping needs and not dredging activities associated with recreation or capital projects. In addition, it was noted that contaminated sediment outside of the navigational channel was not being neglected as these areas are more appropriately assessed under the scope of the “Degradation of Benthos” and other biota related BUIs (EC/OMOE, 2013).

The guidance document identifies three scenarios that support the re-designation of the “Restrictions on Dredging Activities” BUI from “impaired” to “not impaired”:

- a) Where dredging for commercial navigation is not undertaken; or
- b) Where dredging for commercial navigation may be undertaken and the dredged material is permitted for open water disposal or re-use in accordance with provincial/federal guidelines and regulations; or
- c) Where dredging for commercial navigation may be undertaken and the agency responsible for the dredging activities requires that the dredged material be disposed of in an existing, regulated management facility in accordance with provincial and/or federal guidelines and regulations (EC/OMOE, 2013).

Although the guidance document is referenced in this status assessment, the re-designation recommendation will be based on the revised delisting criteria developed in 2012.

2.0 Purpose of Report

The purpose of this report is to assess the current status of the “Restrictions on Dredging Activities” BUI based on the revised delisting criteria developed by CRIC in 2012 and guidance provided by ECCC and the OMOECC in 2013. This assessment includes:

- i. an overview of actions implemented since the Stage 1 RAP report to address this issue;
- ii. an evaluation of sediment data from past and planned navigational dredging projects since the year 2000;
- iii. a review of current disposal practices and the application of the draft guidance developed by RAP Management at ECCC and OMOECC; and
- iv. recommendations and conclusions regarding re-designation.

3.0 Remedial Actions Completed

The 1995 Stage 2 RAP report recommended remedial actions to address the environmental challenges within the AOC. A work plan for the St. Clair River AOC was published in 2007, building on the actions outlined in the Stage 2 RAP report (CRIC, 2007). A number of actions were outlined in this document that would allow for the re-designation of the “Restrictions on Dredging Activities” BUI to “not impaired”. These actions were to (i) maintain and review point source regulatory monitoring (Municipal Industrial Strategy for Abatement (MISA)) and Environmental Compliance Approvals (formerly

Certificate of Approvals) to ensure timely reporting and information dissemination on environmental concerns; (ii) ensure that Water Pollution Control Plants (WPCPs) continue to meet current regulations and do not negatively affect beneficial uses; (iii) complete programs to eliminate combined sewer overflows (CSOs) and, (iv) continue to work closely with industries to improve spill prevention along the St. Clair River (CRIC, 2007).

Many legislative tools and voluntary initiatives were successfully developed and implemented to reduce and control industrial and municipal sources of pollution. Below is a brief summary of the programs that have been instrumental in improving water and sediment quality and are pertinent to the “Restrictions on Dredging Activities” BUI. These activities, programs and legislation include:

- The introduction of the Municipal Industrial Strategy for Abatement (MISA) legislation by the provincial government in 1988, which regulates the discharge of pollutants from industrial facilities, trends have been steadily decreasing with an 81% loading reduction observed between 1990 and 2013 (Figure 3.1). Additionally, since 2007, seven industrial discharge points originally regulated by MISA have been decommissioned along the river.
- Inputs from Water Pollution Control Plants (WPCPs) within the AOC have been reduced through enhanced treatment technology and a decrease in the number of plant by-passes. (i.e., Courtright and Corunna WPCPs in the Township of St. Clair).
- The separation of combined sewers by the City of Sarnia. Fifteen kilometres of combined sewers have been separated between 2006 and 2014. CSOs discharges (including wastewater treatment plant bypasses) were reduced by 40% with no CSO events along the St. Clair River since 2010. Most recently, the combined sewers at Exmouth and Christina Streets have been separated with future work focusing on Cromwell and Devine Streets (City of Sarnia Engineering Department, 2014).
- The introduction of Spill Prevention and Contingency Plan legislation by the Government of Ontario in 2008 requiring each regulated industry or municipal facility to develop and implement actions that would reduce the risks of a spill and/or if a spill did occur, would address it efficiently and effectively. Decreases in the number and frequency of spills from member industries of the Sarnia-Lambton Environmental Association (SLEA) have resulted from this and the MISA legislation described above (Figure 3.2).
- Initiatives to improve industrial facilities and reduce their impact on the St. Clair River. Efforts have included capital investments to upgrade industrial stormwater retention ponds and the implementation of closed-loop cooling water systems and monitoring and diversion systems.

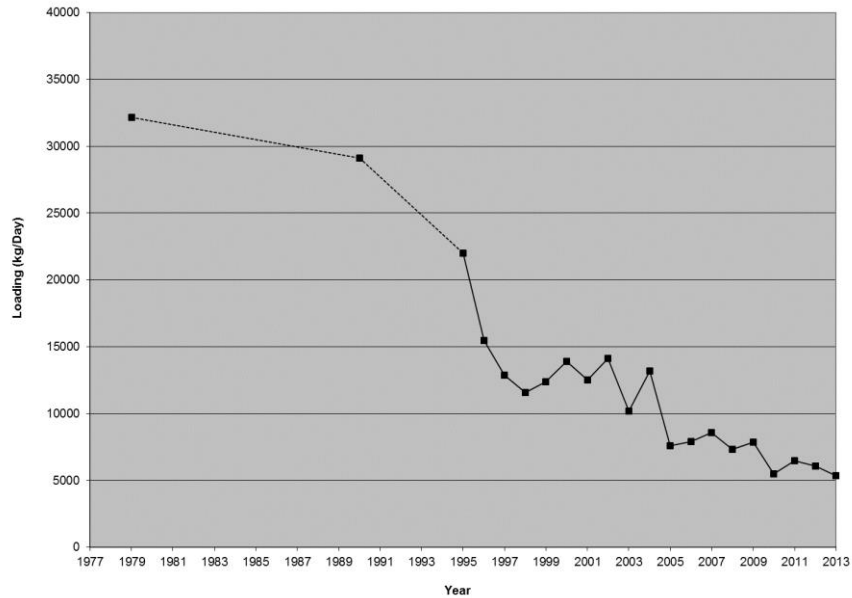


Figure 3.1: Chemical loadings of 19 parameters (suspended solids, solvent extractables, biological oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), ammonia, phenolics, phosphorus, copper, chromium, iron, lead, nickel, zinc, chlorides, fluoride, arsenic, cyanide and sulphates) between 1990 and 2013 for 17 facilities with point source discharges in the St. Clair River Area of Concern (AOC; OMOECC, 2015).

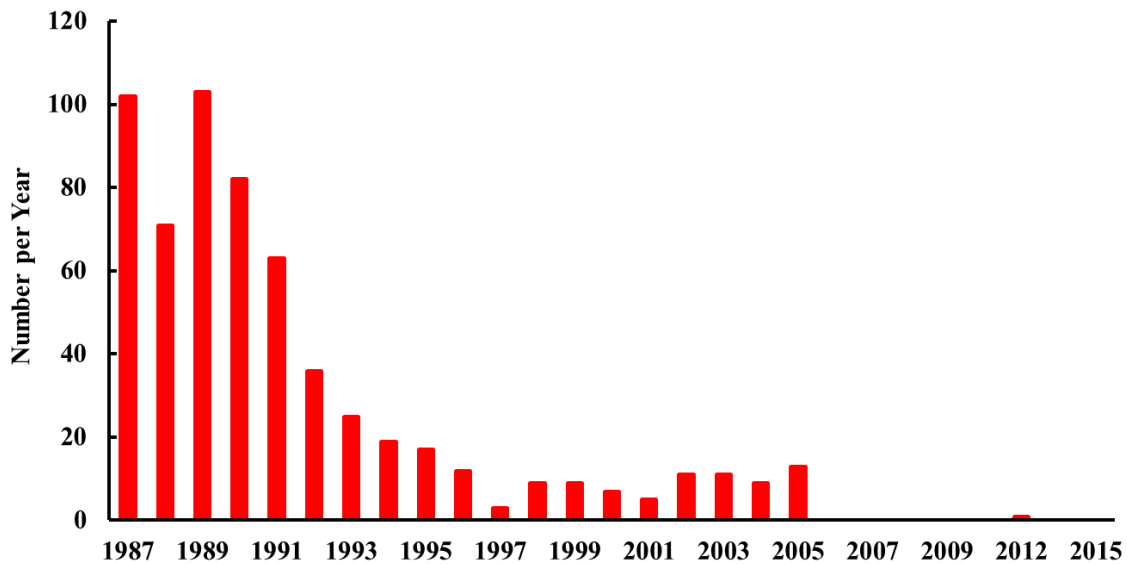


Figure 3.2: Number of spills from the Sarnia-Lambton Environmental Association (SLEA) member industries (1987-2015) requiring a water intake closure based on drinking water quality objectives (SLEA, 2015).

3.1 Implementation Actions on the Michigan Side of the St. Clair River

Many activities and programs have been implemented in the US to reduce point source impacts and contributions to the St. Clair River. Tremendous progress has been made in eliminating combined

sewer outfalls impacting the St. Clair River (only one outfall remains of the 49 identified in the Stage 1 RAP; Foose, 2015). Equivalent to the MISA program in Ontario, industrial and municipal discharges on the Michigan side of the St. Clair River are regulated by the National Pollutant Discharge Elimination System. In addition, spill prevention measures and requirements are outlined in the Michigan Water Resources Act.

In 2010, the “Restrictions on Dredging Activities” BUI was officially re-designated to “not impaired” on the US side of the St. Clair River. This re-designation was based on an assessment of sediment samples collected in 2004 and 2009 by the US Army Corps of Engineers (USACE). They found that none of the contaminant levels exceeded Resource Conservation Recovery Act Ecological Screening Levels.

4.0 St. Clair River Dredging Projects – Assessment and Summary of Sediment Chemistry Results

As part of this review for the “Restrictions on Dredging Activities” BUI in the St. Clair River AOC, sediment chemistry data was collected and synthesized from dredging projects conducted in the federally regulated navigational channel and ports since the year 2000. In the upper portions of the St. Clair River, the navigational passage is characterized as a single deep channel while in the Walpole Island delta, freighters follow the SEBCC to enter or leave Lake St. Clair.

4.1 Data Sources

Prior to receiving approvals and permits that allow for dredging activities to take place, sediment samples are collected from proposed dredging sites and analyzed for a suite of contaminants. Contaminant levels are compared to appropriate guidelines (e.g., PSQGs) to establish suitable disposal or re-use options for the extracted material.

Sediment chemistry data were obtained from Public Works and Government Services of Canada (PWGSC) and the OMOECC for the dredging projects undertaken in the St. Clair River. Dredging projects require the collection and chemical analysis of sediment from the proposed dredging location to determine site-specific contaminant concentrations and development of appropriate disposal options.

Since the year 2000, major dredging projects in the navigational channel of the St. Clair River have been focused in the SEBCC, Stokes Point Shoal (SPS) and Sarnia Harbour (Figure 4.1). Other local dredging activities conducted during the same timeframe, but outside of the navigational channel, occurred at Mitchell’s Bay Marina (Figure 4.1).

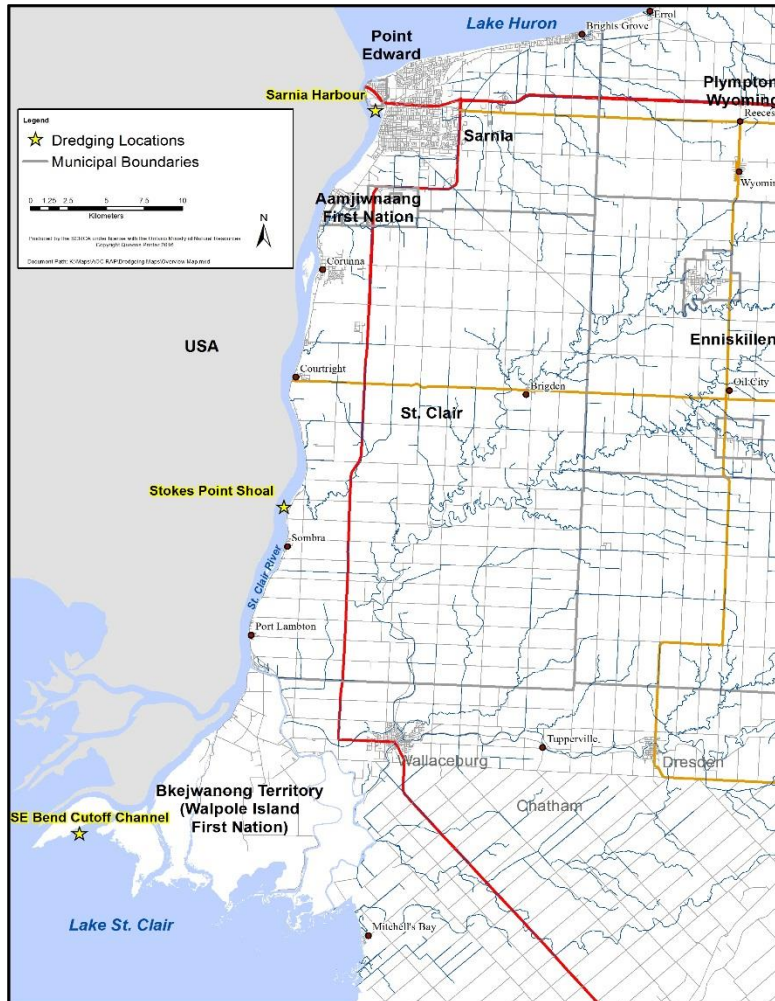


Figure 4.1: Location of major dredging activities in the St. Clair River Area of Concern (AOC) between 2000 and 2013.

4.2 Dredging Location Descriptions

4.2.1 South East Bend Cutoff Channel (SEBCC)

The SEBCC is a man-made passage, approximately 8.5 kilometers in length, cut across Bassett Island, Ontario (Figure 4.2). The channel was constructed to provide a straight corridor for shipping traffic into Lake St. Clair (CRIC Delisting Subcommittee, 2012). Sediment deposition and natural infilling occurs within the SEBCC due to low flow velocities associated with the widening of the channel and decreasing hydraulic gradients when approaching Lake St. Clair (CH2M Hill Canada Limited, 2012). As a result, dredging is routinely required to maintain depths for shipping traffic.

The sediment located in this region of the St. Clair River consists largely of gravel and fine to coarse sands with a small fraction of silt (Mayne, 2007). Dredging is conducted by PWGSC and the USACE for the Canadian and US governments, respectively. Sediment sampling for routine maintenance dredging has occurred in the SEBCC region of the St. Clair River AOC in 2000, 2005-2007 and 2015.

4.2.2 Stokes Point Shoal (SPS)

Stokes Point Shoal (SPS) is located approximately 2 kilometers upstream from the Village of Sombra (CH2M Hill Canada Limited, 2012; Figure 4.3). Historically, this region of the river had not required dredging to maintain navigation but the accumulation of sediment and other material began to impede shipping traffic. As such, it was dredged in 2005 (SNC-Lavalin Engineers & Constructors Inc., 2005). Although dredging of SPS was anticipated as part of an on-going five year (2012-2017) dredging project including the SEBCC, bathymetric surveys conducted in 2015 indicated that dredging at this location was no longer required (Al Beaucage, Department of Fisheries and Oceans, personal communication, 2016).

4.2.3 Sarnia Harbour

Sarnia Harbour is located on the east side of the St. Clair River directly south of Lake Huron (Figure 4.1). It is located upstream of the Sarnia Industrial Complex with two distinct harbour areas: the Government Docks and the North Basin (Figure 4.4.). The Government Docks accommodate five federal warehouses as well as Cargill Grains, a private company with loading docks along the north end of the basin. The North Basin is primarily used during the winter months as a docking area for commercial freighters (Thomas, 2007a).

Dredging last occurred in Sarnia Harbour in 1996 and 1997. Sediment samples were collected and chemically analyzed from the Government Dock and North Basin in 2002 and 2007 for future maintenance dredging. These results were referenced to determine proper disposal options for dredging that was initiated in 2008 (McGibbon, 2008). In 2014, Sarnia Harbour which was owned by Transport Canada was transferred to the City of Sarnia. Sediment samples were collected and analyzed in 2013 prior to the completion of the divestiture and again in 2015 as the City intends to dredge the Harbour in 2016.

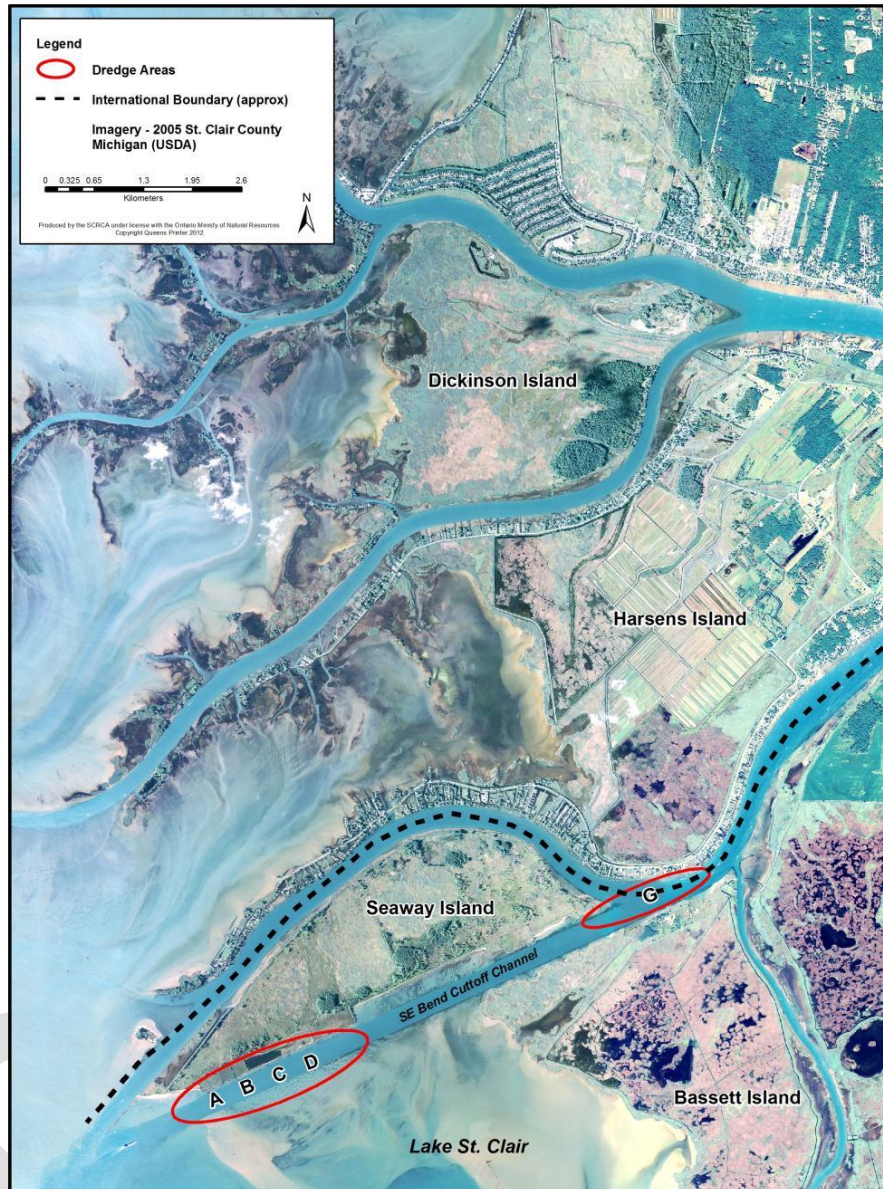


Figure 4.2: Location of the South East Bend Cutoff Channel (SEBCC) in the St. Clair River Area of Concern (AOC). Areas denoted by the letters A, B, C, D and G are dredging locations identified in 2006 and 2012.



Figure 4.3: Location of Stokes Point Shoal (SPS) in the St. Clair River Area of Concern (AOC).

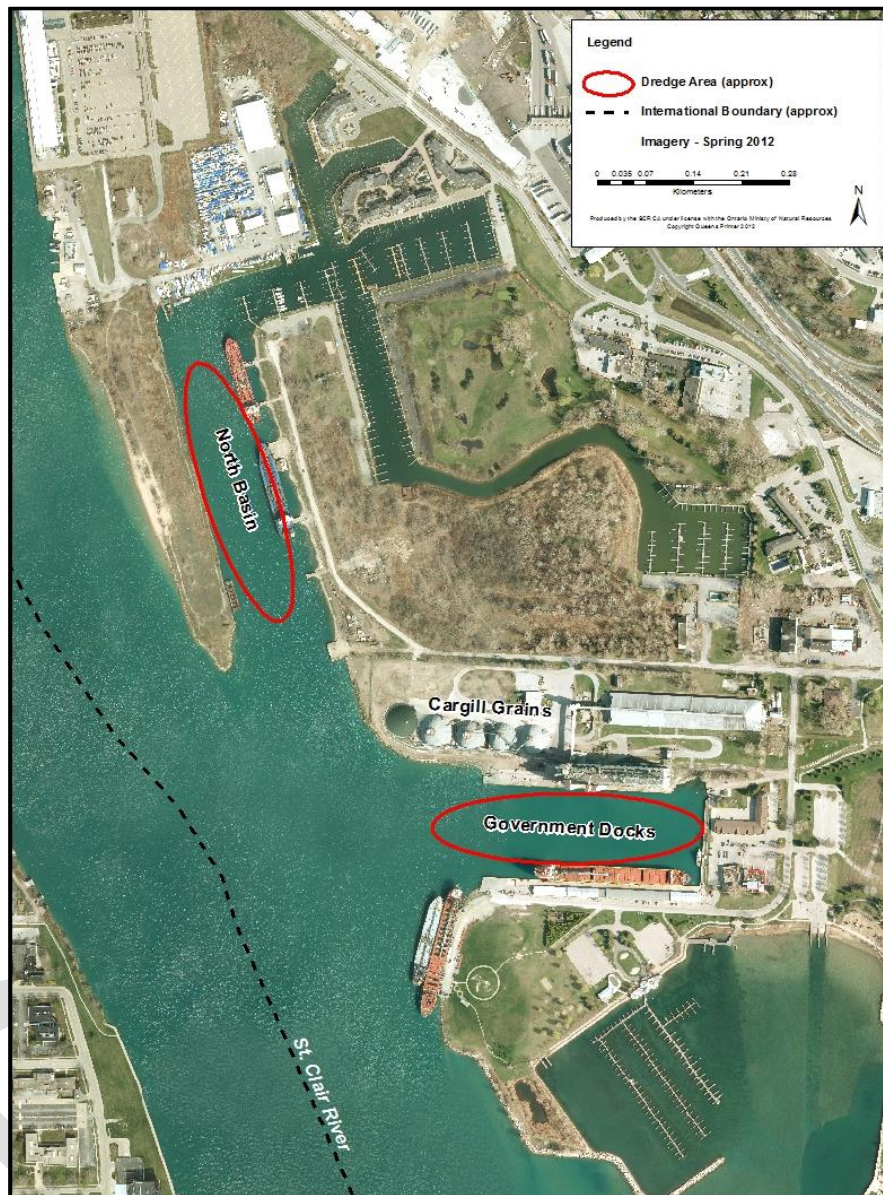


Figure 4.4: The location of the Government Docks and North Basin areas in Sarnia Harbour. Sarnia Harbour is located in the northern reach of the St. Clair River Area of Concern (AOC) directly south of Lake Huron.

4.3 Comparison of Sediment Chemistry Data with Provincial Sediment Quality Guidelines (PSQGs)

4.3.1 South East Bend Cutoff Channel (SEBCC)

4.3.1.1 2000 Sediment Analysis

An Environmental Assessment Screening report was prepared in 2001 for maintenance dredging in the SEBCC (SNC-Lavalin Engineers & Constructors Inc., 2001). Nine dredging locations were proposed that would cover an area of 110 000 m² and a total volume of 60 000 m³. In May of 2000, 16 sediment samples were submitted for analysis with an additional six collected in July. Duplicates of the July samples were also taken and given to representatives of Walpole Island First Nation (WIFN) for analysis at an alternative lab, for an overall total of 28 samples. Sample locations were selected to represent downstream, mid-channel and upstream conditions.

Comparisons with the PSQGs indicate that of the 28 samples sent for analysis, 9 had contaminant(s) levels that exceeded their associated LEL. The elevated levels were observed in the southern reach of the SEBCC (mid- and downstream locations). Exceedances were observed for mercury (1 sample), TKN (5 samples), copper (2 samples), nickel (1 sample), total PCBs (2 samples) and PCB-1260 (2 samples; Figure 4.6; Appendix A). For most, elevated contaminant levels narrowly exceeded their associated LELs and did not approach SELs.

The dredged material was disposed of in the CDF located on Dickenson Island (SNC-Lavalin Engineers & Constructors, Inc., 2001) and included sediment that was not able to be beneficially re-used because of fine grain-size rather than contaminant levels (Riggs Engineering Limited, 2012).

4.3.1.2 2005-2007 Sediment Analysis

In 2006, the requirement for dredging was identified at two locations in the SEBCC: southwest of Seaway Island (Sites A, B, C and D; Figure 4.2) and at the northeastern point of Seaway Island (Site G; Figure 4.2). An area of 112 230 m² was slated for removal with an approximate volume of 70 000 m³ (SNC-Lavalin Engineers & Constructors, Inc., 2006). In total 13 sediment samples were collected prior to the dredging being completed.

Laboratory analysis found only a single exceedance of the PSQG LEL which had a mercury concentration of 0.30 µg g⁻¹ (Appendix A). This dredged sediment was used as an asphalt amendment and for local beach nourishment (Graham, 2007).

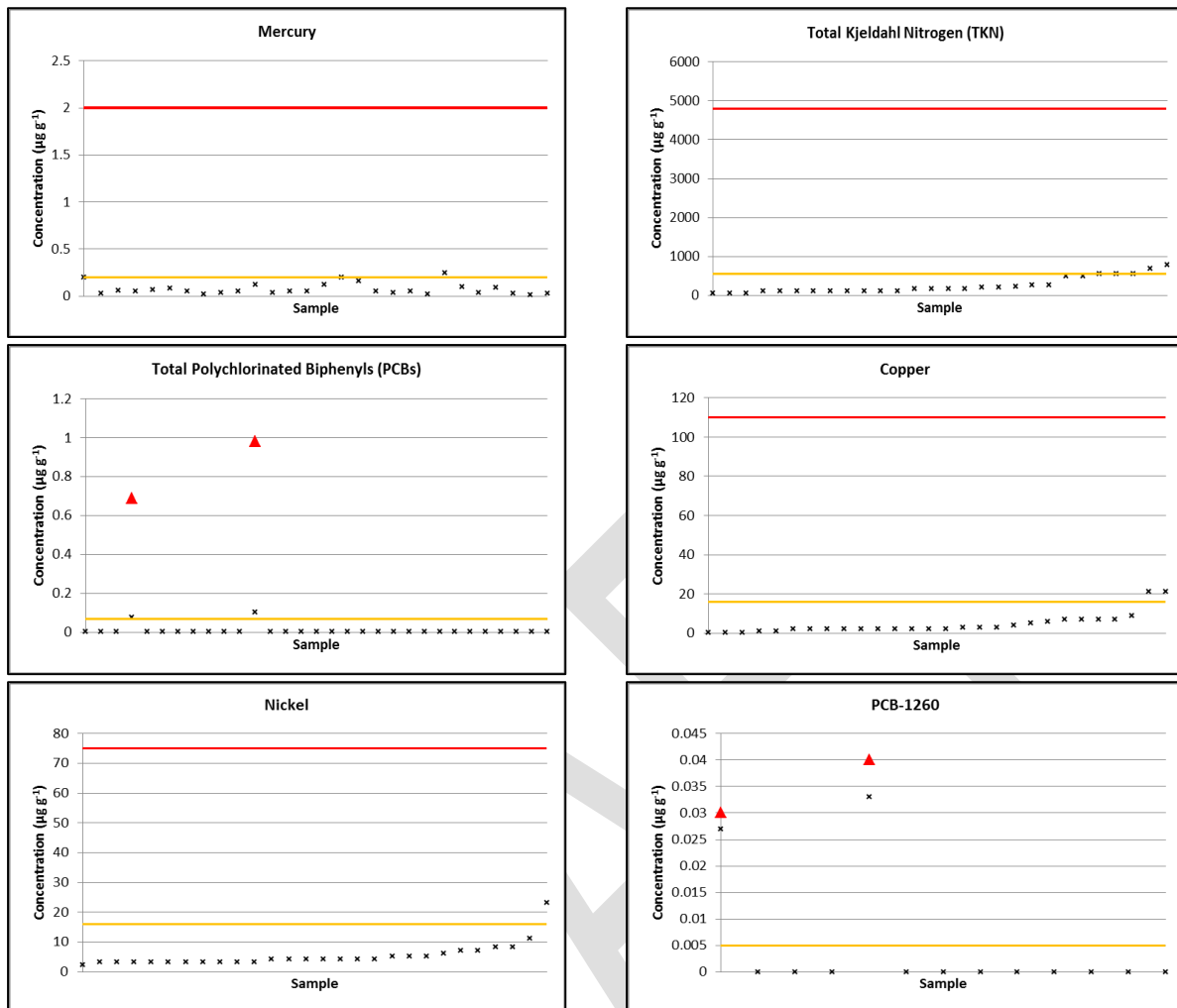


Figure 4.6: Concentrations of sediment contaminants collected in 2000 from the South East Bend Cutoff Channel (SEBCC) that exceeded that exceeded Provincial Sediment Quality Guidelines (PSQGs) for open water disposal. The yellow line represents the PSQG Lowest Effect Level (LEL) and the red line represents the PSQG Severe Effect Level (SEL). Red triangles denote sample-specific SELs calculated when required based on Total Organic Carbon (TOC) as described in Fletcher *et al.* (2008).

4.3.1.3 2012 Sediment Analysis

In July 2012, an Environmental Assessment was drafted, supporting the need for dredging at the same areas identified between 2005 and 2007 in the SEBCC: southwest of Seaway Island (sites A, B, C and D) and at the northeastern point of Seaway Island (site G; CH2M Hill Canada Limited, 2012; Figure 4.2). The proposed timeline would remove over 100 000 m³ of sediment over a 5 year period beginning in 2013 with dredging beginning in July or August of each applicable year. Sediment samples were collected in December of 2011 and in March of 2012 (CH2M Hill Canada Limited, 2012).

Thirty sediment samples were collected from the SEBCC (3 from the northeastern Point of Seaway Island and 27 from the southwestern portion of the SEBCC). Seven samples had contaminant(s) with levels greater than their LEL (Appendix A). These included mercury (3 samples), Total Organic Carbon (TOC; 4 samples) and TKN (7 samples; Figure 4.8). The magnitude of the exceedances were low. The re-use or disposal of the dredged material from this region will be based on federal and provincial suitability

guidelines (i.e., beach nourishment, terrestrial disposal). The most recent dredging in the SEBCC occurred in 2015 with the dredge spoils being re-used as beach nourishment at Point Pelee (Al Beaucage, Department of Fisheries and Oceans, personal communication, 2016). Improvements in sediment chemistry have been observed at the SEBCC throughout the timeframe considered in this status assessment (2000 – 2015).

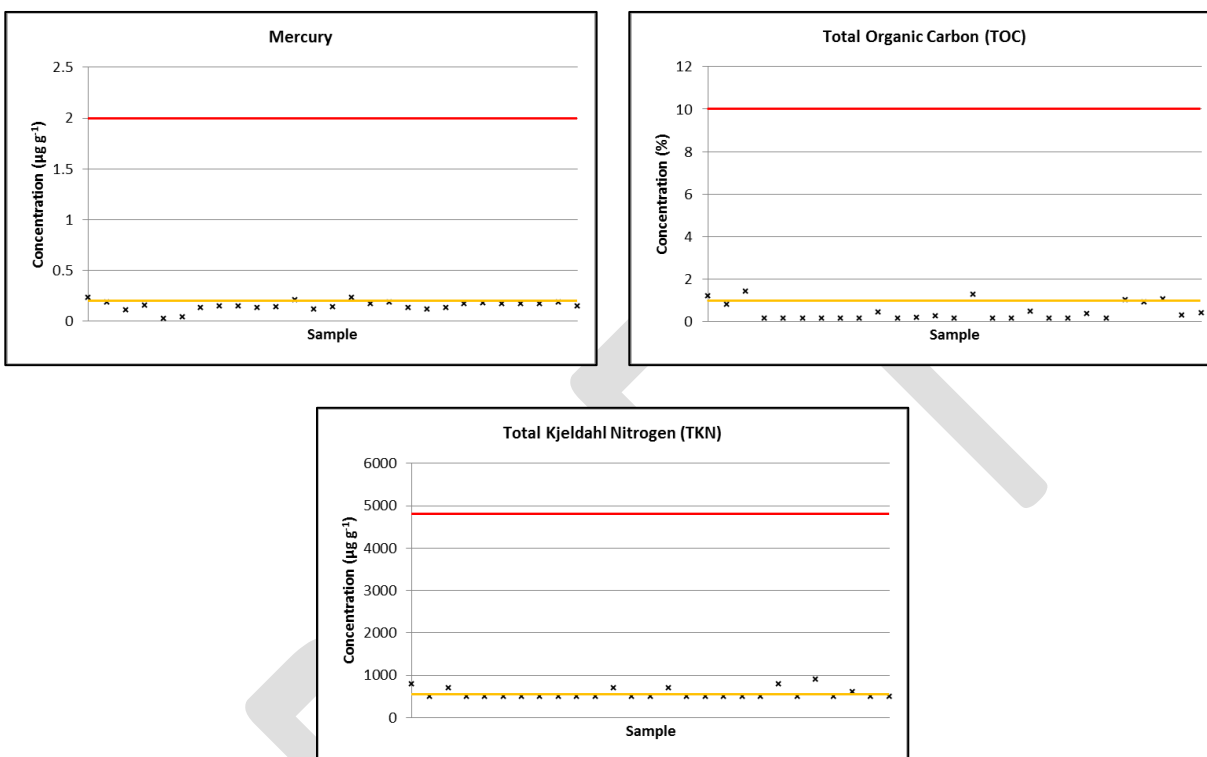


Figure 4.8: Concentrations of sediment contaminants collected in 2012 from the South East Bend Cutoff Channel (SEBCC) that exceeded the Provincial Sediment Quality Guidelines (PSQGs) for open water disposal. The yellow line represents the Provincial Sediment Quality Guideline (PSQG) Lowest Effect Level (LEL) and the red line represents the PSQG Severe Effect Level (SEL).

4.3.2 Stokes Point Shoal (SPS)

4.3.2.1 2005 Sediment Analysis

The 2005 dredging of the SPS covered an area of approximately 53 260 m² with a volume of 14 500 m³. In May of 2005, three sediment samples were collected for chemical analysis. The sediment was found to have less than 10% fine materials and consisted primarily of gravel. As a result, chemical analysis could not be performed on the samples. In general, materials with coarser grained compositions hold less contamination than materials with fine particle sizes. Because of the larger average particle size the dredgeate was used as fish habitat fill in deeper areas within the St. Clair River (SNC-Lavalin Engineers & Constructors, Inc., 2005).

4.3.4 Sarnia Harbour

4.3.4.1 2002 Sediment Analysis

In 2002, seven sediment samples were collected and sent for chemical analysis from Sarnia Harbour. Samples were collected primarily from within the Government Dock area. Chemical analysis indicated

that copper, mercury, TOC and TKN had exceedances (5 samples, 3 samples, 5 samples and 4 samples, respectively). Four of the seven samples were submitted for PAH and PCB analysis. Three of the samples did not exhibit exceedances but one sample had levels of total PAHs and total PCBs above LELs (Figure 4.9). This sample also had 11 individual PAHs with levels greater than their LELs (Appendix A; Thomas, 2007b). No contaminant level was greater than their associated SEL. All exceeded samples were confined to an area of the Government Dock that was influenced by a municipal outfall. No exceedances were observed in samples collected from the North Basin.

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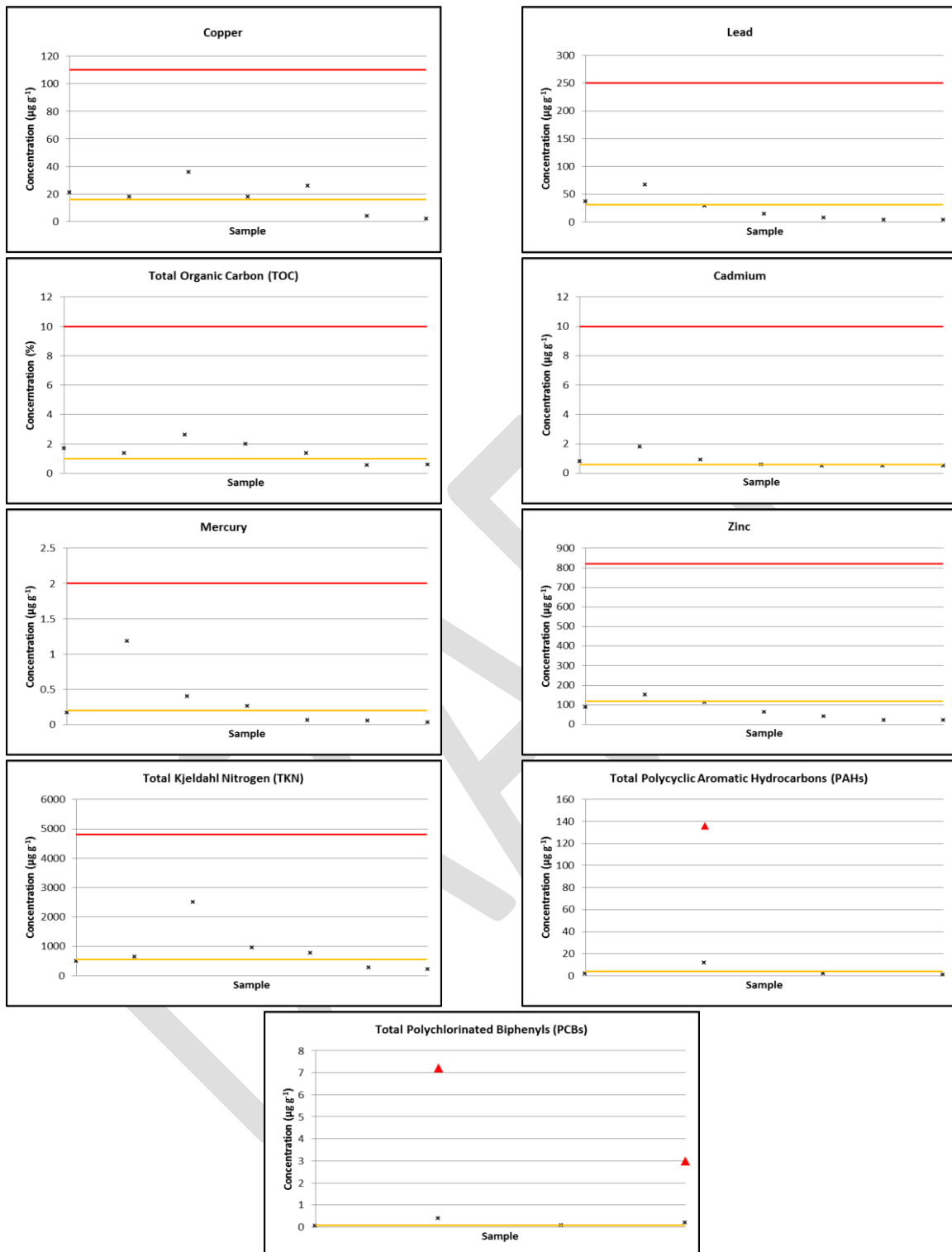


Figure 4.9: Concentrations of those contaminants showing exceedances in sediment samples collected in 2002 from Sarnia Harbour in the St. Clair River Area of Concern (AOC). The yellow line represents the Provincial Sediment Quality Guideline (PSQG) Lowest Effect Level (LEL) and the red line represents the PSQG Severe Effect Level (SEL). Red triangles denote sample specific SELs calculated when required based on Total Organic Carbon (TOC) as described in Fletcher *et al.* (2008).

4.3.4.2 2007 Sediment Analysis

In May of 2007, nine sediment samples were collected in Sarnia Harbour by Riggs Engineering with an additional 5 samples collected in September solely from the Government Dock. Samples collected in May from the Government Dock had levels of copper (1 sample), lead (1 sample), mercury (2 samples) and TOC (4 samples) that exceeded PSQG LELs (Figure 4.10). All nine samples had concentrations of TKN that were higher than provincial guidelines (Figure 4.10). The September samples were only analyzed for metal concentrations of which only mercury and copper had exceeded LELs (Thomas, 2007a; Thomas, 2007b; Appendix A). No PAHs or PCBs were detected at elevated levels. With the exception of TOC and TKN, all samples with contaminant concentrations greater than LELs were located within the Government Dock section of Sarnia Harbour near the municipal outfall. This outfall was connected to the Exmouth combined sewer. In 2009, the City of Sarnia completed work to separate this sewer line.

The Sarnia Harbour dredging project was completed in 2009. Approximately 30 000 m³ of sediment was removed. An estimated 7500 m³ of material was disposed of at an Ontario licensed non-hazardous material receiver in Sarnia. The other 22 500 m³ was placed 15 kilometers offshore in Lake Huron (Ronald Hewitt, PWGSC, personal communication, 2012). The latter was a viable option as nutrient concentrations at the disposal site were similar to or higher than those observed in Sarnia Harbour (e.g., TKN; Figure 4.11; McGibbon, 2008).

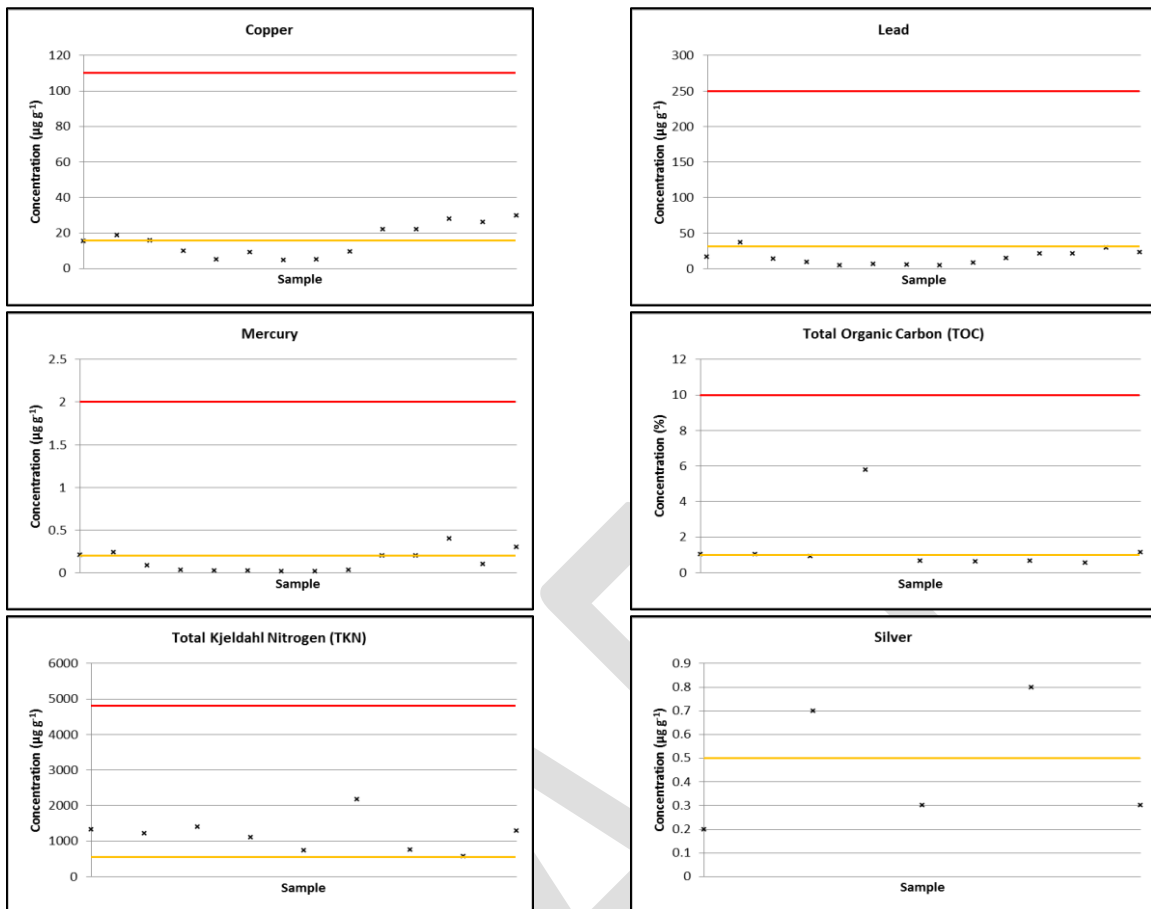


Figure 4.10: Concentrations of those contaminants showing exceedances in sediment samples collected in 2007 from Sarnia Harbour in the St. Clair River Area of Concern (AOC). The yellow line represents the Provincial Sediment Quality Guideline (PSQG) Lowest Effect Level (LEL) and the red line represents the PSQG Severe Effect Level (SEL). No SEL has been established for silver.

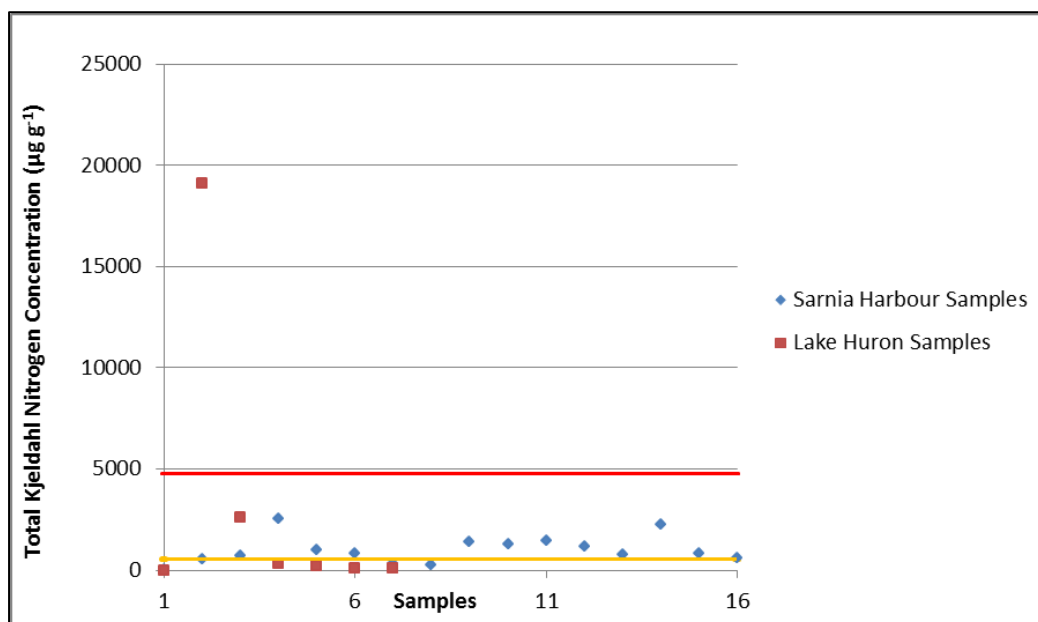


Figure 4.11: Total Kjeldahl Nitrogen (TKN) concentrations in sediment samples collected from Sarnia Harbour and Lake Huron. The yellow line represents the Provincial Sediment Quality Guideline (PSQG) Lowest Effect Level (LEL) and the red line represents the PSQG Severe Effect Level (SEL).

4.3.4.3 2013 and 2015 Sediment Analysis

In 2014, Transport Canada transferred ownership of Sarnia Harbour to the City of Sarnia. Prior to the completion of the transfer, 25 sediment samples were collected by a consultant and analyzed to determine the environmental quality of the sediment and management options if dredging of the harbour was required. Results (Appendix A) indicated that all but one sample would be suitable for use as upland fill on industrial, commercial and/or community properties based on the OMOECC Soil, Ground water and Sediment Standards (OMOE, 2011; Pollutech Enviroquatics Ltd., 2014).

Sediment samples were also collected in 2015 as the City of Sarnia intends to dredge the harbour in 2016 to ensure depths are adequate for shipping traffic. Nineteen samples were collected and analyzed for sediment chemistry (Appendix A). All the dredged material would be acceptable for use as upland fill on industrial, commercial and/or community properties as per the OMOECC Soil, Ground Water and Sediment Standards (Pollutech Enviroquatics Ltd., 2016).

In 2009, the City of Sarnia completed work to separate this sewer line. Comparing pre-2009 sediment chemistry data with those collected in 2013 and 2015 suggests that the main source of contaminants to Sarnia Harbour has been eliminated.

5.0 Past and Present Best Management Practices for Disposal of Dredged Material

As previously noted, when the “Restrictions on Dredging Activities” BUI was assessed in the Great Lakes AOCs in the early 1990s, it examined the economic impact associated with disposing of dredgeate that did not meet the PSQG standards for open water disposal; the primary, preferred and most economical option of disposing of dredged material at that time. The practice of open water disposal has diminished significantly in the Great Lakes due to concerns over impacts from this disposal on aquatic habitats and other concerns. As a result, new best management and disposal practices have developed.

Depending on the chemical characteristics and texture of dredged material, numerous re-use and disposal options are available to proponents such as:

1. Open water
2. Fill for agricultural/residential/parkland areas
3. Fill for commercial/industrial area
4. CDF disposal
5. Approved landfill
6. Hazardous waste facility

The use of dredgeate for agricultural, residential, parkland, commercial or industrial fill is based on guidelines developed by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (1999) and the Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Assessment Act under the OMOECC (2011).

Since 2000, the majority of dredged material from the St. Clair River examined in this status assessment could be beneficially re-used and was not required to be sent to a CDF or hazardous waste facility. Over the last fifteen years, sediment chemistry has improved in the navigational channel with the most recent dredging projects resulting in re-uses including beach nourishment and upland fill. In the context of the St. Clair River AOC, the concept of “no limitation” as outlined in the delisting criteria refers to this fact. Dredging in the St. Clair River AOC is consistent with the best management practices and procedures that occur throughout the Great Lakes.

6.0 ECCC and OMOECC Guidance Document

Dredging activities in the St. Clair River AOC were compared to the scenarios identified in the 2013 guidance document released by RAP Management at ECCC and OMOECC. The purpose of this comparison was to provide an additional line-of-evidence in the assessment of the “Restrictions on Dredging Activities” BUI. The guidance identifies three scenarios that support re-designation. Dredging activities and disposal in the St. Clair River are recognized under two of the scenarios that would support re-designation to “not impaired” (Table 6.1).

Table 6.1: Scenarios that support re-designation of the “Restrictions on Dredging Activities” Beneficial Use Impairment (BUI) based on the guidance document prepared by RAP Management at Environment and Climate Change Canada (ECCC) and the Ontario Ministry of the Environment and Climate Change (OMOECC). St. Clair River dredging projects apply to two out of the three scenarios.

<i>Scenario 1 – Dredging for commercial navigation is not undertaken.</i>	
X	Dredging for commercial navigation <u>does</u> occur in the St. Clair River, therefore this scenario does not apply and/or support the re-designation to “Not Impaired”.
<i>Scenario 2 – Dredging for commercial navigation may be undertaken and the dredged material is permitted for open water disposal or re-use in accordance with provincial/federal guidelines and regulations.</i>	
	Since 2000, dredging projects in the St. Clair River have implemented a number of re-use methods in accordance with provincial/federal guidelines and regulations:
✓	<ul style="list-style-type: none"> • Placement in Lake Huron • Fish Habitat in the St. Clair River • Beach Nourishment • Asphalt Production
<i>Scenario 3 – Dredging for commercial navigation may be undertaken and the agency responsible for the dredging activities requires that the dredged material be disposed of in an existing, regulated management facility in accordance with provincial and/or federal guidelines and regulations.</i>	
	Since 2000, there have been two occasions where dredged material from commercial navigation routes have been disposed of in an existing, regulated management facility in accordance with provincial and/or federal guidelines and regulations. These include:
✓	<ul style="list-style-type: none"> • Disposal in Dickenson Island CDF • Disposal in an upland landfill (Curran Recycling, Sarnia, Ontario).

7.0 Conclusions

Dredging in the navigational channel in the St. Clair River is required to maintain depths for the safe travel of shipping traffic. The “Restrictions on Dredging Activities” BUI was considered “impaired” when the river was identified as an AOC because dredged sediment did not meet the provincial criteria for open water disposal; the preferred and most economical disposal method available at the time. Proponents had to adhere to the additional costs associated with disposing of the dredgeate in a CDF.

The 2012 delisting criteria developed by the local RAP team for the “Restrictions on Dredging Activities” BUI in the St. Clair River AOC states that “this BUI will be considered ‘not impaired’ when there is no limitation on the disposal of dredged spoils from routine dredging in the St. Clair River”. The dredging projects examined in this status assessment did yield sediment sample contaminants that exceeded the PSQG for open water disposal, however the dredged material was appropriate for common management practices (i.e., beach nourishment, asphalt production, upland landfill). Future dredging in the St. Clair River (and other areas of the Great Lakes Basin) will continue to abide by appropriate provincial and/or federal guidelines and regulations and proper disposal based on sound environmental best management practices.

The initial cause of impairment of the “Restrictions on Dredging Activities” BUI in the St. Clair River AOC was related to the additional costs associated with disposing of dredged material in CDFs rather than in

open water. With open water no longer considered a common method for routine disposal, alternative re-use and upland disposal have now become common practices across all the Great Lakes. The limitations once imposed on the disposal of dredged materials no longer exist in present day dredging activities in the St. Clair River AOC.

8.0 Recommendation

Based on the lines-of-evidence presented in this status assessment, it is recommended that the “Restrictions on Dredging Activities” BUI in the St. Clair River AOC be re-designated to “not impaired”. This recommendation is based on the following:

1. Decreases in municipal and industrial discharges and spills and the implementation of more stringent legislation and regulations.
2. Disposal or re-use of dredged material from the St. Clair River since the year 2000 was not prohibited based on sediment chemistry (i.e., no special handling or disposal in a hazardous waste facility was required).
3. The disposal or re-use options implemented (e.g., beach nourishment, asphalt incorporation, fish habitat, commercial/industrial fill material) followed provincial and/or federal guidelines.

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Appendix A

Sediment contaminant data for the St. Clair River Area of Concern (2000-2015)

South East Bend Cutoff Channel:

Table A-1: Contaminant concentrations found in the exceeded sediment sampled in 2000 from the South East Bend Cutoff Channel (SEBCC) in the St. Clair River Area of Concern (AOC; SNC-Lavalin Engineers & Constructors, Inc., 2001).

Sample Date	Contaminant	PSQG LEL ($\mu\text{g g}^{-1}$)	PSQG SEL ($\mu\text{g g}^{-1}$)	Sample ID	Sample Concentration ($\mu\text{g g}^{-1}$)
May 2000	Mercury	0.2	2	25	0.25
	TKN*	550	4800	1	560
				2	560
				3	560
				36	784
	Copper	16	110	36	21
				10	21
July 2000 (WIFN)	Nickel	16	75	10	23
	TKN*	550	4800	1B	689
	PCB-1260	0.005	0.03 [†]	10B	0.027
			0.04 [†]	17B	0.033
	Total PCB	0.07	0.69 [†]	10B	0.074
			0.98 [†]	17B	0.10

*TKN = Total Kjeldahl Nitrogen

† - SEL calculated based on the concentration of Total Organic Carbon (TOC) in the sample (Fletcher *et al.*, 2008)

Table A-2: Contaminant concentrations found in the exceeded sediment sampled from the South East Bend Cutoff Channel (SEBCC) in the St. Clair River Area of Concern (AOC) between 2005 and 2007 (SNC-Lavalin Engineers & Constructors, Inc., 2006; Graham, 2007).

Contaminant	PSQG LEL ($\mu\text{g g}^{-1}$)	PSQG SEL ($\mu\text{g g}^{-1}$)	Sample Date	Sample ID	Sample Concentration ($\mu\text{g g}^{-1}$)
Mercury	0.2	2	April 2007	#9	0.3

Table A-3: Contaminant concentrations found in the exceeded sediment sampled in 2012 from the South East Bend Cutoff Channel (SEBCC) in the St. Clair River Area of Concern (AOC; CH2M Hill Canada Limited, 2012)

Contaminant	PSQG LEL	PSQG SEL	Sample ID	Sample Concentration
Mercury ($\mu\text{g g}^{-1}$)	0.2	2	1	0.23
			2	0.21
			22	0.23
TOC* (%)	1	10	1	1.2
			5	1.02
			7	1.07
			11	1.42
TKN* ($\mu\text{g g}^{-1}$)	550	4800	1	800
			2	700
			3	800
			5	900
			7	600
			11	700
			22	700

*TOC – Total Organic Carbon, TKN = Total Kjeldahl Nitrogen

Sarnia Harbour:

Table A-4: Contaminant concentrations found in the exceeded sediment sampled in 2002 from Sarnia Harbour in the St. Clair River Area of Concern (AOC; Thomas, 2007b).

Sample ID	Contaminant	PSQG LEL [¥]	PSQG SEL [¥]	Sample Concentration [¥]
1	Copper	16	110	21
	Lead	31	250	37
	TOC* (%)	1	10	1.68
2	Cadmium	0.6	10	1.8
	Copper	16	110	18
	Lead	31	250	67
	Mercury	0.2	2	1.18
	Zinc	120	820	150
	TOC* (%)	1	10	1.36
	TKN*	550	4800	650
	Anthracene	0.22	3.82 [†]	0.44
	Benzo[a]anthracene	0.32	15.27 [†]	0.69
	Benzo[k]fluoranthene	0.24	13.83 [†]	0.58
	Benzo[a]pyrene	0.37	14.86 [†]	0.73
	Benzo[g,h,i]perylene	0.17	3.30 [†]	0.41
	Chrysene	0.34	4.75 [†]	0.87
	Fluoranthene	0.75	10.53 [†]	2.3
	Fluorene	0.19	1.65 [†]	0.23
	Indeno[1,2,3-cd]pyrene	0.2	3.30 [†]	0.52
	Phenanthrene	0.56	9.80 [†]	1.8
	Pyrene	0.49	8.77 [†]	1.8
	Total PAHs	4	103 [†]	11.74
	Total PCBs	0.07	5.47 [†]	0.4
3	Copper	16	110	36
	Mercury	0.2	2	0.4
	TOC* (%)	1	10	2.6
	TKN*	550	4800	2500
4	Copper	16	110	18
	Mercury	0.2	2	0.26
	TOC* (%)	1	10	2
	TKN*	550	4800	960
5	Copper	16	110	26
	TOC* (%)	1	10	1.36
	TKN	550	4800	780

* TOC = Total Organic Carbon, TKN = Total Kjeldahl Nitrogen

¥ - All concentrations in $\mu\text{g g}^{-1}$ except where specified otherwise.

† - SEL calculated based on the concentration of Total Organic Carbon (TOC) in the sample (Fletcher *et al.*, 2008)

Table A-5: Contaminant concentrations found in the exceeded sediment sampled from Sarnia Harbour in the St. Clair River Area of Concern (AOC) in May and September of 2007 (Thomas, 2007a; Thomas, 2007b).

Sample Date	Contaminant	PSQG LEL [¥]	PSQG SEL [¥]	Sample ID	Sample Concentration [¥]	Location
May 2007	Copper	16	110	2	18.8	Government Docks
	Lead	31	250	2	36.6	Government Docks
	Mercury	0.2	2	1	0.209	Government Docks
				2	0.235	Government Docks
	TOC* (%)	1	10	1	1.042	Government Docks
				2	1.032	Government Docks
				4	5.783	Government Docks
				9	1.132	North Basin
				1	1330	Government Docks
				2	1220	Government Docks
				3	1390	Government Docks
				4	1110	Government Docks
	TKN*	550	4800	5	735	Government Docks
				6	2180	Government Docks
				7	759	Government Docks (downstream)
				8	566	North Basin
				9	1280	North Basin
September 2007	Copper	16	110	1	22	Government Docks
				2	22	Government Docks
				3	28	Government Docks
				4	26	Government Docks
				5	30	Government Docks
	Mercury	0.2	2	4	0.4	Government Docks
				6	0.3	Government Docks
	Silver	0.5	-	2	0.7	Government Docks
				5	0.8	Government Docks

* TOC = Total Organic Carbon, TKN = Total Kjeldahl Nitrogen

¥ - All concentrations in $\mu\text{g g}^{-1}$ except where specified otherwise.

Table A-6: Contaminant concentrations found in the exceeded sediment sampled in 2013 from Sarnia Harbour in the St. Clair River Area of Concern (AOC; Pollutech Enviroquatics Ltd., 2014). Severe Effect Levels (SELs) for Polycyclic Aromatic Hydrocarbons (PAHs) were not calculated as Total Organic Carbon (TOC) values were not reported (as per Fletcher *et al.*, 2008).

Sample ID	Contaminant	PSQG LEL [¥]	PSQG SEL [¥]	Sample Concentration [¥]
1	Copper	16	110	38.5
	Cadmium	0.6	10	3.05
	Lead	31	250	36.6
	Anthracene	0.22	-	0.254
	Benzo[a]anthracene	0.32	-	0.695
	Benzo[a]pyrene	0.37	-	0.635
	Benzo[k]fluoranthene	0.24	-	0.477
	Benzo[g,h,i]perylene	0.17	-	0.489
	Chrysene	0.34	-	0.895
	Dibenzo[a,h]anthracene	0.06	-	0.11
	Fluoranthene	0.75	-	2
	Fluorene	0.19	-	0.198
	Indeno[1,2,3-cd]pyrene	0.2	-	0.593
	Phenanthrene	0.56	-	1.5
	Pyrene	0.49	-	1.61
2	Copper	16	110	34.5
	Lead	31	250	32.7
	Cadmium	0.6	10	0.66
	Mercury	0.2	2	0.342
	Benzo[g,h,i]perylene	0.17	-	0.221
	Fluoranthene	0.75	-	0.755
	Indeno[1,2,3-cd]pyrene	0.2	-	0.266
	Pyrene	0.49	-	0.611
6	Copper	16	110	17.6
11	Copper	16	110	19.2
	Arsenic	6	33	8.2
	Nickel	16	75	27.1
19	Copper	16	110	19.8
20	Copper	16	110	20.5

¥ - All concentrations in µg g⁻¹ except where specified otherwise.

Table A-7: Contaminant concentrations found in the exceeded sediment sampled in 2015 from Sarnia Harbour in the St. Clair River Area of Concern (AOC; Pollutech Enviroquatics Ltd., 2016). Severe Effect Levels (SELs) for Polycyclic Aromatic Hydrocarbons (PAHs) were not calculated as Total Organic Carbon (TOC) values were not reported (as per Fletcher *et al.*, 2008).

Sample ID	Contaminant	PSQG LEL [¥]	PSQG SEL [¥]	Sample Concentration [¥]
4	Copper	16	110	22
	Mercury	0.2	2	0.22
5	Copper	16	110	24.6
6	Copper	16	110	18.9
	Cadmium	0.6	10	1.4
	Flourine	0.19	-	0.4
	Phenanthrene	0.56	-	0.564
9	Copper	16	110	32
	Cadmium	0.6	10	0.85
	Mercury	0.2	2	3.27**
	Benzo[g,h,i]perylene	0.17	-	0.235
	Silver	0.5	-	2.4
10	Cadmium	0.6	10	0.64
	Lead	31	250	38.6

¥ - All concentrations in $\mu\text{g g}^{-1}$ except where specified otherwise.

** - Detection Limit Raised: Dilution required due to high concentration of test analyte(s)

Appendix B

Consultations and Endorsements:

Partner/Stakeholder	Consultation Activity	Date
Walpole Island First Nation	Consultation Strategy provided by Heritage Centre Committee (included questions/comment on initial draft report)	January 22, 2015
	Answers to questions/comments outlined in Consultation Strategy provided to Heritage Centre Committee	June 11, 2015
	Pre-consultation meeting with Heritage Centre Committee and Joint Dredging Committee	September 18, 2015
	Heritage Centre Open House (display)	October 5, 2015
	Soups-On Event (display)	December 8, 2015
	Community Presentation at Sports Complex	February 3, 2016
	Presentation at Heritage Centre Committee Meeting	February 20, 2017
Aamjiwnaang First Nation	Environment Carnival (presentation and display)	July 12, 2014
	Environment Committee presentation	September 16, 2014
	Environment Committee concurrence with re-designation recommendation to "Not Impaired"	September 16, 2014
	Chief and Council Concurrence/Motion	October 20, 2014
Binational Public Advisory Council	Presentation	March 30, 2016
	Presentation	July 13, 2016
	Answers to questions/comments received by BPAC provided to council members	August 29, 2016
	BPAC approval of re-designation recommendation to "Not Impaired"	September 14, 2016
Four Agency Managers Work Group	United States Environmental Protection Agency review and approval of re-designation recommendation to "Not Impaired"	February 9, 2017
General Public		

Motion/Endorsements:

Aamjiwnaang First Nation:

Environment Committee – Minutes from the September 16, 2014 meeting

RECOMMENDATION – “That this Environment Committee acknowledges the summary and recommendations presented to re-designate the restrictions on dredging activities Beneficial Use Impairment (BUI) to “Not Impaired”.”

Motion Moved, Seconded and Carried

September 16, 2014

Binational Public Advisory Council:

Minutes from the September 14, 2016 meeting

RECOMMENDATION – BPAC vote to accept the recommendation to re-designation the “Restrictions on Dredging Activities” BUI to “Not Impaired”

One opposing vote

September 14, 2016

Appendix C

Questions and Comments from the Binational Public Advisory Council:

Restrictions on Dredging Activities Beneficial Use Impairment (BUI) for the Canadian Side of the St. Clair River Area of Concern (AOC)

Response to Comments and Questions Received from the Binational Public Advisory Council (BPAC)

Comments and Questions:

1. Is there only one navigational channel in the St. Clair River?

Response:

Yes, there is only one navigational channel that is used by freighters and larger shipping traffic. In the upper portions of the St. Clair River north of the Walpole Island delta, the navigational passage is characterized as a single deep channel. In the delta region of the St. Clair River, freighters use the South East Bend Cutoff Channel to enter or leave Lake St. Clair. Smaller recreational boats however are capable of utilizing the smaller channels throughout the delta that branch away from the main navigational route.

****Report Revisions and/or References****

- **Section 4.0: St. Clair River Dredging Projects – Assessment and Summary of Sediment Chemistry Results – Included sentence that speaks to where the navigational channel is located.**
-

2. On the US side, the dredging BUI was removed in 2010, based on 2004 and 2009 USACE dredging of the navigational channel. The Canadian dredging BUI removal criteria pertains to the same navigation channel. The recommendation to remove this BUI is based on dredging in 2000, 2005-2007 and 2012. If we're dredging the same channel, why the disparity in the dates? Why did we not consider 2000 and 2005-2007 data in the US decision? Why are we not looking at 2004 and 2009 data for the Canadian decision? Since it is the same channel, does it matter for the purposes of the BUI who dredges it (USACE or PQGSC)? What determines who dredges? Is it the specific location of the channel segment? Is the work cooperative between the agencies?

Response:

Dredging of the navigational channel in the St. Clair River is undertaken by the United States Army Corps of Engineers (USACE) or Public Works and Government Services Canada (PWGSC) and is dependent on the jurisdiction of the accumulated sediment. In the past and dependent on the dredging requirements of a particular location, USACE and PWGSC have worked cooperatively to maintain the navigational channel (e.g., lower Detroit River). This cooperation was not documented for the St. Clair River in any reports collected in the preparation of this status assessment.

The Canadian status assessment examined dredging projects conducted since the year 2000. This timeline was arbitrarily determined by the Canadian Remedial Action Plan (RAP) Implementation Committee in order to be transparent and thorough. The timeline also provided more assurance that all routine navigational dredging projects would be captured. As American and Canadian guidelines, permits and regulations differ, only dredging undertaken by Canadian agencies and subject to Canadian regulations were included in the report.

Questions regarding the approach taken for the American “Restrictions on Dredging Activities” BUI should be addressed to the American agencies (Michigan Department of Environmental Quality and the United States Environmental Protection Agency).

****Report Revisions and/or References****

- **None required.**
-

3. Of the four locations in the document, the South East Bend Cutoff Channel (SEBCC) is in the navigational channel; Sarnia Harbour and Mitchell’s Bay Marine Park are not. Can you please clarify in the document as to where Stokes Point Shoal is located? If it is in the navigational channel perhaps we need to wait for the sampling for the proposed dredging (to be accomplished in 2017?) and assess those results, particularly as none were assessed in 2005.

Response:

Stokes Point Shoal is located in the navigational channel in the St. Clair River, approximately 2 km north of Sombra. Dredging was anticipated as part of an on-going five year (2012-2017) dredging project lead by PWGSC that included the SEBCC, however bathymetric surveys conducted in 2015 indicate that dredging at this location is no longer required (Al Beaucage, Department of Fisheries and Oceans, personal communication, 2016).

****Report Revisions and/or References****

- **Figure 4.3 – Location of Stokes Point Shoal in the St. Clair River.**
 - **Section 4.2.2: Stokes Point Shoal – Has updated information on Stokes Point Shoal indicating that dredging is no longer required.**
-

4. The data on the non-navigational channel dredging spoils (Sarnia Harbour and Mitchell’s Bay Marine Park) is of great interest, but is it pertinent in this report?

Response:

The data for Mitchell’s Bay Marine Park was removed from the status assessment.

The section on Sarnia Harbour remains in the report despite not being in the “navigational” channel proper. The rationale for its inclusion is twofold: 1) it was identified in the Stage 2 Remedial Action Plan (RAP) as an active dredging location and 2) until 2014 it was owned by a federal department (Transport Canada) as a docking area for commercial freighters. The harbour is now owned by the City of Sarnia.

****Report Revisions and/or References****

- **Section 4.2.3: Sarnia Harbour – Additional information on the divestiture of Sarnia Harbour from Transport Canada to the City of Sarnia is provided.**

- **Section 4.3.4: Sarnia Harbour – Updated sediment chemistry results from 2013 and 2015 as requested at March 30, 2016 Binational Public Advisory Council (BPAC) meeting.**
-

5. Page 3 states “if a contaminant exceeds the PSQG LEL, it is restricted from open water disposal.” “(This) BUI will be considered ‘not impaired’ when ‘there is no limitation on the disposal of dredging spoils from routine dredging in the St. Clair River’”. Seventeen of 72 samples in the SEBCC were above the LEL, so I don’t understand how we can say we meet the criteria.

Response:

Sediment contaminant data from proposed dredging locations is compared to the PSQG LEL in order to determine if it is suitable for open-water disposal, which is no longer a preferred or routine method of disposal in the Great Lakes. However, when the “Restrictions on Dredging Activities” BUI was first assessed in the St. Clair River (Stage 1 and Stage 2 RAPs), open water disposal was the routine method of disposal and because dredged sediment did not meet open water disposal guidelines, dredged spoils were typically disposed of in a CDF which was a common disposal method available at the time. CDF disposal was an extra expense to the proponent, which constituted the impairment.

Today, practices have changed and the day-to-day operations of dredging and disposal of dredged materials are vastly different than what was documented in the Stage 1 and Stage 2 RAPs. What constituted an impairment in the past is not considered an impairment under present practices. Regardless of sediment chemistry (if PSQGs are exceeded or not), open water disposal is no longer considered a common, preferred method of disposal due to the negative environmental impacts associated with the practice. Costs associated with beneficial re-use or disposal of dredged material is an expected and anticipated cost in today’s dredging environment. Despite exceedances of the PSQG LELs (e.g., SEBCC), dredged material could be beneficially re-used and disposal was not limited to a CDF or hazardous waste facility. The concept of “limitation” has changed since the St. Clair River was designated an AOC and as dredging best management practices have evolved in the Great Lakes.

****Report Revisions and/or References****

- **Section 5.0 – Past and Present Best Management Practices for Disposal of Dredged Material: Additional sentences describing the rationale around how the delisting criteria is considered achieved despite some sediment contaminant levels exceeding PSQG LELs.**
-

6. The top two paragraphs on Page 3 describe historical sediment conditions. Are these descriptions of sediment in the navigational channel or elsewhere? If in the non-navigational channel, are they applicable to this document? When the BUI was initially classified as impaired, was it based on navigational channel sediment or the non-navigational channel? Do we know if the navigational channel sediment chemical characteristics would have supported the “impaired” status initially?

Response:

In the Stage 1 RAP report, the rationale for impairment of the “Restrictions on Dredging Activities” BUI speaks to sediment chemistry data that exceeded guidelines for open water disposal, however some of the locations described were outside the navigational channel and did not undergo routine maintenance dredging. The “Restrictions on Dredging Activities” BUI was often a surrogate for

assessing contaminated sediment in AOCs as there was no single specific policy for the management of contaminated sediment in circumstances other than those where dredging was proposed. This is no longer the case. Presently, contaminated sediment and management of these areas are assessed using the Canada-Ontario Decision-Making Framework for Assessment of Great Lakes Contaminated Sediment and as such are related to the “Degradation of Benthos” and “Restrictions on Fish and Wildlife Consumption” BUIs.

The Stage 2 RAP and subsequent updates more clearly identified locations where routine navigational dredging occurred in the St. Clair River. Despite the continued reporting on areas of sediment contamination where dredging did not occur, the Stage 2 RAP did specify that the impairment is applied to areas where dredging takes place in support of navigation. The Stage 2 RAP does identify elevated levels of contaminants in Sarnia Harbour and the South East Bend Cutoff Channel, constituting impairment.

****Report Revisions and/or References****

- **None required.**
-

7. Page 7 – “Until recently, Canadian federal environmental assessment screening was required.” No longer? This seems like a weakening of the protections. Are the provincial requirements comparable?

Response:

In 2012, the new Canadian Environmental Assessment Act came into force, replacing the one developed in 1995. Under the new Act, federal departments or federally linked projects are no longer automatically required to do a federal Environmental Assessment. Exceptions to this include projects regulated by the National Energy Board or the Canadian Nuclear Safety Commission.

With regards to future projects, it is anticipated that dredging projects will continue in the same way as they have in the past. Even if a formal Environmental Assessment is not required, a dredging project needs to meet the regulatory requirements of other federal, provincial and municipal agencies. In addition, it is inherent that sediment samples will continue as this is how appropriate disposal and re-use options are determined (Al Beaucage, Department of Fisheries and Oceans, personal communication, 2015).

The new Act also allows Provincial Environmental Assessments to replace federal assessment requirements. Both assessments require First Nation and public consultation, identification of potential environmental effects and actions they will prevent, reduce and/or manage impacts resulting from the proposed project.

****Report Revisions and/or References****

- **None required.**
-

8. Page 20 – “In the St. Clair River, ‘impaired BUIs may be re-designated to ‘not impaired’ if it can be proven that the impairment is not solely of local geographic extent but typical of other non-AOC areas (CRIC Delisting Subcommittee, 2012).” Is this unique to the St. Clair River. Does this mean

that the delisting criteria cited on Page 3 is invalid or to be ignored? Has the 'new' criteria been approved by BPAC?

Response:

The concept of re-designating BUIs to "not impaired" if they are typical of other non-AOC areas is not unique to the St. Clair River and is a fundamental principle of the AOC program. This concept was identified in 1991 by the International Joint Commission (IJC) in their approval for listing/delisting criteria for Great Lakes Areas of Concern and reinforced by the St. Clair River AOC CRIC when reviewing their delisting criteria in 2012. The revised delisting criteria was reviewed and approved in 2011 by the Binational Public Advisory Council (BPAC).

*****Report Revisions and/or References*****

- ***None required.***

Reference:

International Joint Commission (IJC). 1991. Commission Approves List/Delist Criteria for Great Lakes Areas of Concern. FOCUS On International Joint Commission Activities, 16(1), ISSN 0832-6673.

9. Pages 20-12, Section 5.1 argues against the use of PSQGs for the BUI assessment because PSQG exceedances do not necessarily have a harmful effect on aquatic communities. That may be a valid argument relating to the benthos BUI, but is it a valid argument when considering the dredging BUI which we are told is narrowly focused on the navigational channel spoils disposal? Perhaps the thing to change is not our delisting criteria, but the provincial disposal regulations.

Response:

The purpose of this section of the report was to broach the subject of the appropriateness of the "Restrictions on Dredging Activities" BUI to examine the issue of contaminated sediment. Contaminated sediment today is not necessarily identified through use of the PSQGs and is instead identified through risk-based approaches such as the Canada-Ontario Decision Making Framework for Assessment of Great Lakes Contaminated Sediment.

With regards to dredged material disposal, comparison to PSQG LELs remain to determine if the dredged material is suitable for open water disposal or beach nourishment. Other disposal and re-use options such as soil-like fill follow guidelines developed by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (1999) and the Soil, Ground Water and Sediment Standards developed by the Ontario Ministry of the Environment and Climate Change (OMOECC; 2011).

*****Report Revisions and/or References*****

- ***Section 5.0 – Applicability of the "Restrictions on Dredging Activities" Beneficial Use Impairment: This Section has been revised to "Past and Present Best Management Practices for the Disposal of Dredged Material" and has been shortened to keep the focus of the discussion on disposal of dredged material rather than sediment contamination.***
-

10. Page 22 lists three re-use options and three disposal options. I presume that if the sediment chemical characteristics are such that CDF or hazardous waste facility disposal are required, the BUI is "impaired"? If alternative re-use options allow for better choices for spoils that, due to chemical

characteristics would otherwise be in a CDF, that's great, but we have to be clear then to state that the BUI removal is the result of these newer options and not the result of improved sediment conditions in the navigational channel.

Response:

Sediment conditions have improved drastically in the St. Clair River due to decreased municipal and industrial spills.

CDFs are used for disposal of dredged material throughout the Great Lakes and in some cases are a preferred method of disposal due to convenience and not because the sediment is contaminated. They do not evoke the same financial burden on proponents as was documented when the St. Clair River was identified as an AOC.

The re-use options available today allow for the avoidance of disposal in CDFs which is a benefit for areas where CDFs have limited capacities, such as the Detroit River.

In the time period examined in the "Restrictions on Dredging Activities" status assessment, no material removed from the navigational channel in the St. Clair River required disposal in a hazardous waste facility.

*****Report Revisions and/or References*****

- ***None required.***

-
11. Pages 23-24 discusses sediment "Areas of Interest". As these are not navigational channel areas, this should be noted to avoid confusion regarding the current definition of the BUI.

Response:

Agreed.

*****Report Revisions and/or References*****

- ***In order to avoid any confusion surrounding what the "Restrictions on Dredging Activities" BUI applies to, reference to the three "Areas of Interest" has been removed.***

-
12. Page 1 – Paragraph 3 states that 2 AOCs have been delisted in the US. Actually 3 have been delisted; White Lake, MI, Deer Lake, MI and Oswego River, NY. One AOC is in Recovery, Presque Isle Bay, NY.

Response:

Revised as suggested.

*****Report Revisions and/or References*****

- ***Section 1.1 – The St. Clair River Area of Concern***

-
13. The definitions of the effect levels seems incomplete. The No-Effect-Level (NEL) states that "At this level, negligible transfer of chemicals through the food chain and no effect on water quality is

expected.” Does this mean that at the LEL and Severe-Effect-Level (SEL), transfer of chemicals to the food chain and effect on water quality are expected?

Response:

The definitions provided in the report are direct quotes from the OMOECC’s Guidelines for Identifying, Assessing and Managing Contaminated Sediment in Ontario (Fletcher et al., 2008). The effect levels apply to impacts on benthic invertebrates and do not apply to effects on water quality.

The LEL and SEL are based on long-term effects which the contaminants may have on the sediment-dwelling organisms (i.e., contaminants may be passed through the food chain).

****Report Revisions and/or References****

- **None Required**

Reference:

Fletcher, R., P. Welsh and T. Fletcher. 2008. Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach. Ontario Ministry of the Environment, Environmental Monitoring and Reporting Branch and Standards Development Branch.

14. Page 5-6 – Last bullet on Page 5 states that the Spill Prevention and Contingency Plan legislation passed in 2008 and spills have decreased, but no data was included passed 2005.

Response:

The data provided in the graph (Figure 3.2) identifies spills from Sarnia-Lambton Environmental Association (SLEA) member industries to the St. Clair River that required a water intake shutdown due to the exceedance of a drinking water quality objective. A spill of this magnitude did not occur after 2005.

An updated graph is provided in the report that provides information until 2015.

****Report Revisions and/or References****

- **Section 3.0 – Remedial Actions Completed: Updated Figure 3.2**
-

15. Is Sarnia Harbour considered part of the shipping channel since it is dredged to allow shipping? A definition of what constitutes the “shipping channel” needs to be included.

Response:

Please refer to response to Question 1 and Question 4.

16. My overall objection to delisting the dredging BUI would be open water disposal of dredgeate that exceeds LEL. Most of the exceedances were for mercury and PCBs which are the two chemicals that are still at elevated levels in two species of game fish in the St. Clair River and are keeping us from re-designating the “Restrictions on Fish and Wildlife Consumption” BUI to “not impaired”. Open water disposal of contaminated sediment increases the level of contaminants in the water column and thus increases contamination of the food web. This is more than just a benthos issue. I would

be particularly concerned about open water disposal of dredgeate from Sarnia Harbour with such a high total PAH level of over $10 \mu\text{g g}^{-1}$ as well as several elevated mercury samples.

Response:

Open water disposal is not permitted if a contaminant level exceeds the PSQG LEL.

*****Report Revisions and/or References*****

- ***None required.***
-

17. About the sampling methods – Most were grab samples, does this provide an accurate profile of the contamination of sediment at depth? Is there any data to indicate this is or isn't a problem?

Response:

Sediment sampling methods were identified for the South East Bend Cutoff Channel in 2000 (grab sample) and in 2005 (clam shell dredge). Grab samples ensure the most recent deposited material is analyzed for contaminants as that is the sediment that will be dredged.

The sediment samples collected from Sarnia Harbour in 2013 and 2015 were collected using sediment cores reaching depths of between 1-2 metres. Homogenized samples were analyzed for contaminant levels.

*****Report Revisions and/or References*****

- ***None required.***
-

18. If the "Restrictions on Dredging Activities" BUI is re-designated to not impaired, is testing still required before re-using or disposing of the dredgeate from the shipping channel or elsewhere in the river? Are there other regulations in place that would prevent contaminated sediment from being disposed of in open water?

Response:

Any dredging project conducted in the Great Lakes is required to abide by federal, provincial and municipal guidelines and regulations. Sediment samples will continue to be collected from proposed dredging locations in the St. Clair River prior to dredging occurring regardless of the BUI status (impaired or not impaired) as this is a legislated requirement in order to determine suitable disposal options.

*****Report Revisions and/or References*****

- ***None required.***
-

19. More clarification surrounding how the ECCC and OMOECC Guidance Document was applied in the St. Clair River AOC is required in the report.

Response:

The ECCC and OMOECC Guidance Document was drafted to ensure that the "Restrictions on Dredging Activities" BUI was applied appropriately across Ontario AOCs and that assessments

considered the availability of wider range of options for the management and disposal of dredged material. In some AOCs, such as the Detroit River, the recommendation to re-designate the “Restrictions on Dredging Activities” BUI to “not impaired” has been based on this guidance.

The application of the ECCC and OMOECC Guidance Document in the St. Clair River AOC would support the re-designation of the “Restrictions on Dredging Activities” BUI to “not impaired”, however the status assessment reverts to the revised delisting criteria developed in 2012. It’s inclusion in the report serves as an additional supporting piece of evidence towards the re-designation of the “Restrictions on Dredging Activities” BUI.

*****Report Revisions and/or References*****

- ***Section 1.2 – “Restrictions on Dredging Activities” Beneficial Use Impairment: Clarification on what the re-designation recommendation is based on (the 2012 revised delisting criteria).***
- ***Section 6.0 – Application of ECCC and OMOECC Guidance Document: Clarification surrounding the purpose of applying the guidance to the St. Clair River AOC “Restrictions on Dredging Activities” BUI status assessment.***