



Bay of Quinte

Remedial Action Plan

Healthy Bay • Healthy Community



Bay of Quinte Remedial Action Plan Redesignation Report

Beneficial Use Impairment #7
Restrictions on dredging activities



January 2016

**Bay of Quinte Area of Concern
Beneficial Use: #7 Restrictions on Dredging Activities
Redesignation Report Recommending a Status of 'Not Impaired'**

**Bay of Quinte Remedial Action Plan Restoration Council
January 6, 2016**

Summary

This document is the official report from the Bay of Quinte Area of Concern (AOC) Restoration Council recommending that the status of the Beneficial Use #7: Restrictions on Dredging Activities is changed from 'impaired' to 'not impaired'.

Golder Associates was hired by Environment Canada in 2011 to assess the status of the impaired beneficial use (BUI) "Restrictions on Dredging Activities" in the Bay of Quinte AOC by reviewing existing dredging requirements, and sediment and benthic conditions in the bay and determining the applicability of this BUI to current regulatory approaches.

The original focus of this beneficial uses was on navigational dredging having negative economic consequences if the dredged material was contaminated.

While dredged sediments considered to be 'clean' could be disposed of in open water, contaminated sediments would require containment in a confined disposal facility (CDF) or at upland disposal sites, at often substantial cost. This was considered to be a negative economic consequence of sediment contamination at these sites regardless of whether dredging activities would be undertaken at that location.

Navigational dredging is not a typical activity in the bay, as there are only three harbours within the bay that are suitable for ship traffic: the Glenora Ferry docks at Glenora and Adolphustown, and at the Essroc cement plant near Picton. Quinte Conservation Association reports that no navigational dredging has been requested or undertaken within the Quinte Conservation jurisdiction. Approvals for dredging activity in the Bay of Quinte are typically restricted to private landowners seeking to deepen waters around their properties to facilitate pleasure boat access (Pers. Comm. - Brad McNevin, Quinte Conservation). These applications for dredging are generally limited to a small number of projects (up to 15 per year), and represent small volumes of material that are removed and deposited on land. Approvals are also sought for the installation of geothermal heating loops which require dredging, since the loops are typically installed at least 1.6m (5 feet) below the bottom of the lake. Installation requires trenching, with the dredged material used to backfill the trench. In some cases the Conservation Authority also undertakes dredging for construction of fish habitat.

Review of these small localized projects is initiated through an application to the Conservation Authority. The Conservation Authority reviews the application with respect to potential impacts on fish habitat, flood plain management and shoreline alteration regulations. The Conservation Authority forwards the application to the Ontario Ministry of Natural Resources and Forestry (OMNRF) for review and may also consult with Ministry of the Environment and Climate Change depending on the location of the project. Approval for the project is typically provided through a Letter of Advice that describes specific mitigation measures that the proponent is required to meet. Dredging projects for private recreational boating needs typically require the upland disposal of any dredged material. As noted above, geothermal heat loop installation requires backfilling with the excavated sediment.

The review of sediment studies undertaken in the Bay of Quinte show that aside from localized areas in the Belleville and Trenton waterfronts, sediment contaminants in the bay are low, and

typically are due to metals and some organic compounds that are present at concentrations slightly above the Ontario Ministry of Environment and Climate Change Provincial Sediment Quality Guidelines Lowest Effect Levels (MOECC PSQG LELs) (still suitable for open water disposal). Biological assessment studies note the absence of biological impacts in most areas of the bay, with localized impacts reported only in isolated pockets in the urban industrial areas of Belleville and Trenton.

Because sediment contaminant concentrations are relatively low in non-urban areas of the bay, they would not restrict open-water disposal of sediments from the small localized private residential projects that are typically undertaken in the bay. Rather, the smothering effect of disposal of dredged material on aquatic habitats is the main concern resulting in the requirement for upland disposal of dredged materials for approved projects. The same rationale would apply to requirements for any proposed navigational dredging projects.

Therefore, the typical dredging that is undertaken in the bay is not an activity that is expected to result in release of contaminants from sediments.

As a result of the information above, “Restrictions on Dredging Activities” does not appear to be a BUI that is relevant to the current conditions in the Bay of Quinte and should be considered as ‘not impaired’.

This report is a compilation of information from the following two reports prepared by Golder Associates:

Golder (Golder Associates Ltd.). 2012a. Great Lakes Areas of Concern: Review of the “Restrictions on Dredging” Beneficial Use Impairment. Report to Environment Canada.

Golder (Golder Associates Ltd.). 2012b. Review of Sediment Conditions in the Bay of Quinte. Report to Environment Canada.

Bay of Quinte AOC
BUI #7: Restrictions on Dredging Activities

Recommended BUI Status: Not Impaired

Delisting Criteria

When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.

Background

In the original International Joint Commission listing of beneficial uses, BUI #7 - “Restrictions on Dredging Activities” - was identified in the Bay of Quinte as impaired primarily for economic reasons. While dredged sediments considered to be ‘clean’ could be disposed of in open water, contaminated sediments would require containment in a confined disposal facility (CDF) or at upland disposal sites, at often substantial cost, which was considered to be a negative economic consequence of sediment contamination at these sites regardless of whether dredging activities would be undertaken at that location. The International Joint Commission (1991) determined that this beneficial use would not be impaired “When contaminants in sediments do not exceed standards, criteria, or guidelines such that there are restrictions on dredging or disposal activities.” There were no delisting criteria developed specifically for the Bay of Quinte Area of Concern.

The Bay of Quinte Remedial Action Plan Stage 1 Report (Bay of Quinte Remedial Action Plan Coordinating Committee 1990) identified BUI #7 – Restrictions on Dredging Activities as impaired due to: “...some heavy metal levels (which) exceed dredge spoil disposal guidelines for open waters.” The extent of the problem was not well known, and further studies were recommended.

By 1993 when the Bay of Quinte RAP Stage 2 Report (Bay of Quinte Remedial Action Plan Coordinating Committee 1993) was released, the impaired status of this beneficial use was maintained but no further studies on the levels of toxicity or the extent of the issue had been pursued.

In 1993 the Province of Ontario released the newly developed Lakefill Guidelines. Since then, most new dredging projects have required that dredged sediments be tested prior to removal, their suitability for open water disposal assessed against the procedure included in the guidance document.

“Restrictions on dredging activities” has been identified as a BUI in several Great Lakes AOCs, and concerns have been identified with achieving the delisting target for this BUI. In nearly all cases where sediment concentrations of substances exceed available guidelines, there is potential for listing dredged material disposal as a BUI, irrespective of whether dredging activities would be undertaken at the AOC. As well, the BUI was based on economic and not environmental considerations that in many jurisdictions are no longer applicable. As a result, it is appropriate to review the applicability of the dredging BUI to the Bay of Quinte AOC because navigational dredging is not undertaken in this AOC. A recommendation to the COA Steering Committee was

developed in 1998 identifying this (see attached Fax) although no formal redesignation was undertaken at that time.

This current review is based on a general discussion of current sediment conditions in the Bay of Quinte AOC to provide background to the dredging BUI. This also includes a discussion of the current dredging needs within the AOC.

Dredging Activity in the Bay of Quinte AOC

Dredging activity in the Bay of Quinte is typically restricted to private landowners seeking to deepen waters around their properties to facilitate pleasure boat access (Pers. Comm. - Brad McNevin, Quinte Conservation). The applications for dredging are generally limited to a small number of projects (up to 15 per year), and represent small volumes of material that are removed for recreational boating purposes.

Localized dredging for the installation of geothermal heating loops also requires dredging, since the loops are typically installed at least 1.6m (5 feet) below the bottom of the lake. Installation requires trenching, with the dredged material used to backfill the trench.

Review of these small localized projects is initiated through an application to the Conservation Authority. The Conservation Authority reviews the application with respect to potential impacts on fish habitat, flood plain management and shoreline alteration regulations. The Conservation Authority forwards the application to the Ontario Ministry of Natural Resources and Forestry (OMNRF) for review and may also consult with Ministry of the Environment and Climate Change depending on the location of the project. Approval for the project is typically provided through a Letter of Advice that describes specific mitigation measures that the proponent is required to meet. Dredging projects for private recreational boating needs typically require the upland disposal of any dredged material. As noted above, geothermal heat loop installation requires backfilling with the excavated sediment.

In some cases the Conservation Authority also undertakes dredging for construction of fish habitat. The Conservation Authority reports that no navigational dredging has been requested or undertaken within the Quinte Conservation jurisdiction.

The review of recent sediment studies undertaken in the Bay of Quinte shows that aside from localized areas in the Belleville and Trenton waterfronts, sediment contaminants in the bay are low, and typically are due to metals and some organic compounds that are present at concentrations slightly above the Ministry of the Environment and Climate Change (MOECC) PSQG LELs. Biological assessment studies note the absence of biological impacts in most areas of the bay, with localized impacts reported only in isolated pockets in the urban industrial areas of Belleville and Trenton.

Capital or maintenance dredging is not a typical activity in the bay, as there are only three harbours within the bay that are suitable for ship traffic: the Glenora Ferry docks at Glenora and Adolphustown, and at the Essroc cement plant near Picton; and Quinte Conservation Association reports that no navigational dredging has been requested or undertaken within the Quinte Conservation jurisdiction. As a result most dredging is performed as part of small localized projects to provide pleasure boat access to private properties along the shore and therefore, the

typical dredging that is undertaken in the bay is not an activity that is expected to result in release of contaminants from sediments. As well, sediment contaminant concentrations are low in the bay, and would not restrict open-water disposal of sediments from the small localized projects that are typically approved. Rather, the effects of disposal of dredged material on aquatic habitats is the main concern resulting in the requirement for upland disposal of dredged materials. As a result, “restrictions on dredging activities” does not appear to be a BUI that is relevant to the current conditions in the Bay of Quinte.

Review of Sediment Conditions in the Bay of Quinte Area of Concern

Sediments in the Bay of Quinte have been affected by a number of sources of which nutrients in runoff from adjacent agricultural areas have historically affected the broadest area of the bay. As well, industrial sources in the urban centres around the bay, principally at Trenton and Belleville, have contributed to local sediment contaminant issues.

In order to characterize the severity of contaminants, the Ontario government developed Sediment Quality Guidelines to protect the aquatic environment by setting safe levels for metals, nutrients (substances which promote the growth of algae) and organic compounds. The guidelines establish three levels of effect - No Effect Level, Lowest Effect Level (LEL) and Severe Effect Level (SEL). The Lowest Effect level and Severe Effect Level are based on the long-term effects which the contaminants may have on the sediment-dwelling organisms. The Lowest Effect Level indicates a level of contamination which has no effect on the majority of the sediment-dwelling organisms. At the Severe Effect Level, the sediment is considered heavily polluted and likely to affect the health of sediment-dwelling organisms. The following sediment studies use this guideline to determine whether the contaminants will have an effect on the aquatic ecosystem or human health and safety.

In 1994, the MOECC conducted sediment assessment studies at Deseronto to assess the impacts of an historic coal gasification plant. The study noted elevated levels of PAH compounds in a small area of the shoreline immediately adjacent to the former site. Benthic community assessment noted that there was no impairment that could be attributed to contamination of the sediments. It is also noted that residual coal tar in the sediment occurred as highly weathered material that had solidified, and that no free product was observed in the sediments. The MOECC study indicated that there was little potential for adverse effects to the water column.

In 1995, the MOECC conducted sediment assessment studies in Belleville at the mouth of the Moira River to assess the impacts of an historic coal gasification plant (Jaagumagi and Bedard 1996). PAH compounds were found in localized areas within the existing harbour as well as a small area to the east along the lower reaches of the Moira River. Biological effects testing, which included laboratory sediment bioassay tests, were not able to assign any impacts due to the relatively low levels of PAH compounds in the sediments.

In 1999, a Moira River study was commissioned by the MOECC to investigate the impact of the former Deloro mine site on the Moira River system, including the Bay of Quinte to which the Moira River drains (Golder 2001). Residual contamination due to arsenic was determined in the lower reaches of the Moira River and at the mouth of the river, though there was no indication of impairment of benthic communities due to the relatively low concentrations of arsenic in the sediments and there was no risk to human health or safety. The studies on the Moira River

(Golder 2001) showed that arsenic contamination of the sediments exists throughout the Moira River system, and indicate that the material that has recently been transported downstream, and likely is still being transported by the river, is likely from sediments historically deposited in the river that are being re-suspended and gradually flushed out of the system.

Copper concentrations were also elevated above the Provincial Sediment Quality Guideline (PSQG) Severe Effect Level (SEL) at a limited number of sites at the mouth of the Moira River (Biberhofer and Dunnett 2006), but appear to be more related to historic industrial activities in the Belleville area than upstream sources in the watershed. Copper concentrations also show a gradual reduction in the surficial sediments compared to the deeper layers. Lead concentrations showed a similar pattern, with exceedances of the PSQG SEL only at a small number of locations in the lower Moira River near the mouth (Biberhofer and Dunnett 2006). Core data showed surficial concentrations were much lower than subsurface levels, an indication that the material was deposited as a result of historic activities.

In 2005, assessment of the potential risks due to dioxins and furans in sediments at the mouth of the Trent River showed negligible risks to human health or ecological receptors due to PCDD/Fs in sediments (Dillon 2007). Contamination appeared to be due to historical sources, with higher concentrations of PCDD/Fs in the deeper layers of the sediment.

Dove *et al.* (2004) conducted sediment sampling at a number of tributaries to the Bay of Quinte, and found concentrations of a number of metals (arsenic, copper, lead, nickel and zinc) above the MOECC PSQG Lowest Effect Level (LEL) at the mouths of the Napanee (excluding arsenic), Moira, and Trent (lead only) Rivers. The data indicate that sources of metals include not just urban areas along the Bay of Quinte, but also sources within the contributing watersheds. However, given the variable geology within these watersheds, sources could include natural geologic features, particularly since exceedances of the LELs in most cases were minor.

While many of the other metals (cadmium, chromium, mercury, nickel and zinc), were recorded at concentrations above the PSQG LEL, there were no exceedances of the SEL for these metals. The distribution of these metals generally showed higher concentrations in the areas around Trenton and Belleville, with lower concentrations in remaining areas of the Bay of Quinte (though many of these areas had concentrations above the LEL). Core data for these metals (Biberhofer and Dunnett 2006), showed variable concentrations between surficial and subsurface sediments, but a general pattern emerged in which concentrations in areas close to the shoreline in both Trenton and Belleville were higher in the subsurface compared to the surface sediments, while sediment locations slightly offshore from these locations often showed higher concentrations in the surficial sediments. The pattern suggests some off-shore transport of the nearshore sediments, likely through re-suspension due to wind/wave action, and settling of particles in the slightly deeper offshore areas.

PAH compounds, which are typically associated with not only specific industrial sources such as the former coal gasification plant at Belleville, and a wood treatment plant at Trenton, but also general urban sources (e.g., runoff from asphalt surfaces), were noted in sediments around both Trenton and Belleville. Dove *et al.* (2004) noted higher concentrations of a number of PAH compounds in sediment in the lower reaches of the Trent, Moira, and Napanee Rivers. Biberhofer and Dunnett (2006), showed that in surficial sediment PAHs (as total PAH) were

generally less than the LEL at all sites, with occasional exceedances of up to 8 µg/g for total PAH. Isolated “hotspots” were noted at both the Trenton and Belleville areas, generally near known historical sources of PAHs (e.g., former coal gasification sites and wood treatment sites). Sediment core data (Biberhofer and Dunnett 2006) showed that at most sites, concentrations in surficial sediments were lower than in subsurface sediments, suggesting that surficial levels of PAHs have in more recent times been decreasing as newer sediments accumulate. Except for the isolated hotspots, surficial sediment PAHs are generally very low throughout the bay.

Similarly, PCB concentrations, while above the LEL at most sites along the Belleville waterfront, showed an increase with depth in the sediments, an indication that concentrations of these compounds have been decreasing over time.

Milani and Grapentine (2006) considered benthic community health in the sampling areas within the Bay of Quinte. They classified the majority of the sites in the Bay of Quinte as “unstressed”, with limited sites at Trenton and Belleville as “possibly different”. They noted that the main differences at these latter sites were a change in benthic community composition, which did not necessarily indicate impairment. Three sites were noted as being toxic to *Hyalella azteca* based on low survival of this species in laboratory toxicity tests. However, the other three test organisms (*Chironomus riparius*, *Hexagenia* sp., and *Tubifex tubifex*) did not indicate either significant growth reduction or decreased survival. Typically, concordance among test species results (i.e., weight-of-evidence) is needed in order to firmly establish that the sediments are exerting a toxic influence.

A more recent sediment survey at the Trent River mouth undertaken by Environment Canada (Marvin 2015) shows that PCDD/F concentrations and corresponding TEQs are relatively low, compared to PCDD/F concentrations in typical Lake Ontario sediments and sediments previously sampled near the mouth of the Trent River in 2008 and 2011. All TEQ concentrations were below the CCME Canadian Federal Probable Effect Level (PEL, 21 pg/g TEQ); in fact all TEQ concentrations were less than half the PEL value (Marvin 2015).

A comprehensive survey of sediment undertaken in 2013 at 20 Belleville waterfront sites showed that although PCBs and PAHs can be found along the waterfront, there were no sites where the levels of PCBs exceeded the Canadian Federal Probable Effect Level and no sites where PAHs exceeded the Canadian Federal Severe Effect Level (MOECC 2014).

The available sediment data for the Bay of Quinte indicate that with respect to contaminants, only a few areas that were located along the waterfronts of the main urban-industrial areas had elevated levels of some metals and organic substances, but that concentrations of these contaminants are decreasing compared to historical levels. The concentrations of these contaminants were generally low, and none of the biological tests indicated that levels of contaminants were exerting a negative effect on biota. The bay has clearly been influenced by decades of agricultural development within its watershed, and this is reflected in the higher nutrient and silt content of the sediments, that occur throughout the bay. However, the effects of urbanization and industrial development are localized around the Trenton and Belleville areas, and are reflected in the higher contaminant concentrations in confined areas adjacent to these

centres. Core data shows that the influence of these activities has been decreasing, with more recent sediments indicating an improvement in conditions (Golder 2012b).

Thus, even if navigational dredging was undertaken in the Bay of Quinte, the level of contaminants is so low that it would not exceed dredge spoil disposal guidelines for open water except for in a limited number of sites.

Remediation Initiatives

In order to address these localized contaminant issues, there are several initiatives being undertaken:

1) Trent River Mouth

Dioxins, furans, PAHs and heavy metals found in the sediment at the mouth of the Trent River are from historic industrial activity that took place upstream at the former Domtar wood processing plant which operated between 1913 and 1995. Starting in the mid-1990s and still continuing, efforts to control the off-site migration of contaminants from the site to the Trent River through improvements to waste water control and treatment systems and the installation of silt barriers has resulted in concentrations of contaminants which increase with sediment depth, indicating lower loadings of contaminants over time. The more contaminated sediment is confined to protected areas along the margins of the river where river currents are reduced. Because there is no significant ecological or human health risk from existing contaminant concentrations in the surficial sediment at the mouth of the Trent River, there is no justification for removal of the sediment. However, to ensure that the deeper, more contaminated sediments remain undisturbed, a Trent River sediment management strategy was developed. Any activity which may expose or re-suspend this contaminated sediment would be formally assessed and any project approvals would attempt to ensure that the contaminated sediment is not exposed. When activities within the contaminated areas cannot be avoided, proper mitigation measures will be required (Trent River Administrative Controls Committee 2011).

2) Moira River

Contaminants such as arsenic, cobalt, copper and nickel have been leaching from the former Deloro Mine site into the upper reaches of the Moira River and transported down to the Bay of Quinte, and are being found at in sediment at the mouth of the Moira River.

Although there is no evidence of impact on aquatic life and no risk to human health and safety due to the low levels of contaminants found, extensive clean-up of the former mine site at Deloro is being undertaken and is expected to be completed in 2017. Work is focusing on isolating and containing contamination on the former mine site to keep it from getting into the environment. The contaminated sediment is being put into on-site containment cells and covered with geo-synthetic liners; rain and melting snow is directed away from the engineered covers to keep water from getting to the contaminated material; and an arsenic treatment plant continuously pumps then treats contaminated groundwater. The site will eventually be turned into a controlled, closed hazardous waste facility (Noble 2015).

3) Belleville Waterfront – Former Bakelite Thermosets Ltd Property

The former Bakelite factory was located on the east side of Belleville in the late 1940s. Touted as the first truly synthetic plastic, the production of the material unfortunately created toxic

chemical waste such as PCB that was stored on-site in drums, deposited into holding tanks or pools, or just left to be absorbed into the ground. In 2005 a partial demolition of the site was undertaken by the site owner, resulting in PCB-contaminated soil migrating into the adjacent wetlands and into the Bay of Quinte. The owner of the property at that time did remove a significant amount of contaminated sediment from the bay. The current owners purchased the property in 2011 and have initiated further remediation efforts. All the asbestos has been securely removed, and the owners are developing plans to manage contaminated sediment. Recent sediment samples from the bay around the Bakelite site (2012) show that the PCB concentrations are quite low, either below or marginally above the LEL and there is no evidence of impact on aquatic life and no risk to human health and safety due to the low levels of PCBs found (Golder 2012b).

4) Belleville Waterfront - Coal Gasification Plant

The area bounded by Church, St. Paul, Pinnacle and Dundas Streets was the original site of a coal gasification plant originally owned by the Belleville Gas Company. The plant operated between 1854 through to 1948, and studies have found a variety of toxins, including PAHs, hydrocarbons and volatile organic compounds such as benzene and toluene, underground, some just 1.5 metres (four feet) beneath the surface at the site. Studies of the site have determined that the contaminants are spreading to adjacent properties, as well as to the Moira River through groundwater. MOECC is requiring that past and current property holders to develop plans to manage the contamination at the site and on adjacent properties.

Determination of BUI Status

The existing data on sediment conditions in the Bay of Quinte show that a few localized areas around the larger urban areas have higher concentrations of a limited number of contaminants, with very few samples showing levels that exceed the PSQG. At the sites where the contaminants do exceed the PSQG, concentrations of the chemicals of concern in surficial sediments were lower than in subsurface sediments, suggesting that contamination has in more recent times been decreasing as newer sediments accumulate.

An additional line of evidence that confirms sediment contamination in the Bay of Quinte AOC as having a minimal impact is the lack of biological effects on benthos despite the moderate levels of contaminant concentrations in localized areas.

Dredging is an infrequent activity, and when conducted is on a small scale, typically for private recreational properties. Where dredging is undertaken, the responsible agencies require upland disposal of the material, and open water disposal is not practiced. Large scale navigational capital or maintenance dredging is not undertaken. Therefore, the “restrictions on dredging activities” BUI is not directly applicable to this AOC.

Recommendation

Based on the above review, the conditions in the Bay of Quinte AOC show that the “restrictions on dredging activities” BUI should be considered as not impaired in the Bay of Quinte AOC.

References

- Bay of Quinte Remedial Action Plan Coordinating Committee. 1990. Stage 1: Environmental Problem Setting and Problem Definition.
- Bay of Quinte Remedial Action Plan Coordinating Committee. 1993. Time to Act - The Bay of Quinte Remedial Action Plan Stage 2 Report.
- Biberhofer, J. and M.P. Dunnett. 2006. Summary of Recent Sediment Investigations for the Bay of Quinte, Lake Ontario. Environment Canada, National Water Research Institute.
- Dillon (Dillon Consulting Ltd.). 2007. Ecological Risk Assessment for the Trent River Mouth Sediment Depositional Areas. Report to the Ontario Ministry of the Environment.
- Dove, A., S. Painter and J. Kraft. 2004. Sediment Quality in Canadian Lake Ontario Tributaries: Part Two (Bay of Quinte and St. Lawrence River). Environment Canada, Environmental Conservation Branch, Ecosystem Health Division. Report No. ECB/EHD-OR/04-01/I.
- Golder (Golder Associates Ltd.). 2001. Moira River Study. Report to the Ontario Ministry of the Environment.
- Golder (Golder Associates Ltd.). 2012a. Great Lakes Areas of Concern: Review of the “Restrictions on Dredging” Beneficial Use Impairment. Report to Environment Canada.
- Golder (Golder Associates Ltd.). 2012b. Review of Sediment Conditions in the Bay of Quinte. Report to Environment Canada.
- International Joint Commission. 2015. Originally at: <http://www.ijc.org/focus/listdelist/>.
- Jaagumagi, R. and D. Bedard. 1996. Preliminary Sediment and Biological Investigations of the Former Deseronto Coal Gasification Plant Site, July 1994. Ontario Ministry of the Environment.
- Marvin, C.H. 2015. 2014 Trent River Suspended Sediment Survey Report. Environment Canada.
- Milani, D. and L.C. Grapentine. 2006. Assessment of Sediment Quality in the Bay of Quinte Area of Concern, 2000. Report by Environment Canada, National Water Research Institute Contribution No. 04-002.
- Noble, R. “Handled with Care. Historic Mine Returns to Nature.” Canadian Mining Journal February/March 2015: 20-23. Print.
- Ontario Ministry of Environment and Climate Change. 2014. City of Belleville Waterfront Sediment Survey.
- Trent River Administrative Controls Committee. 2011. Lower Trent River Sediment Strategy Evaluation of Administrative Controls. Report to Environment Canada.