

CASE
STUDY

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*Economic Benefits of Remediating Contaminated
Sediments at Hamilton Harbour's Randle Reef*

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Hamilton Harbour is a 5,313-acre (2,150-hectare) embayment located at the west end of Lake Ontario, connected to the lake by a single ship canal across the barrier sandbar that forms the bay. Hamilton, Ontario has over a 100-year history of heavy industrial and urban development. In the middle of the 19th century, the Great Western Railway was founded in the city, making Hamilton the center of Canadian industry. This long industrial history resulted in substantial environmental degradation of surrounding ecosystems.

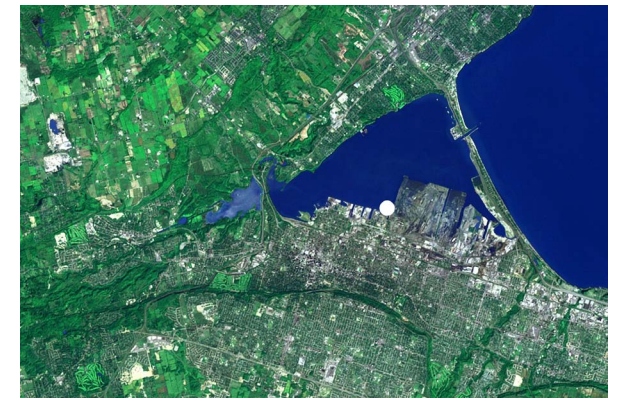
Prior to modern environmental laws, industries dumped waste into the harbor. This waste continues to threaten public health, contaminate fish and wildlife, and restrict the use of the waterfront. Over the past century, contaminants such as metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and other hazardous chemicals have been released into the harbor, leading to extensive sediment contamination.

Damage done to Hamilton Harbour through industrial development and population growth has resulted in it being designated a Great

Lakes Area of Concern (AOC) with impaired beneficial uses. These impaired beneficial uses include restrictions on fish consumption; degradation of fish populations; degradation of wildlife populations; degradation of benthos; eutrophication or undesirable algae; beach closings and water contact sports; degradation of aesthetics; and loss of fish and wildlife habitat (Table 1).

Hamilton Harbour Remedial Action Plan

In 1985, local stakeholders working with the federal and provincial governments committed to developing a Remedial Action Plan (RAP) to restore all beneficial use impairments using an ecosystem approach. A Stage 1 RAP completed in 1989 described conditions and impaired beneficial uses. A Stage 2 RAP completed in 1992 identified actions needed to restore impaired beneficial uses (HHRAP, 1989; 1992). In the Stage 2 RAP, the stakeholder group made 50 recommendations to encourage partnerships and guide cleanup efforts. The stakeholder



Satellite image depicting Hamilton Harbour, located at the west end of Lake Ontario. Dot depicts location of Randle Reef. Credit: PC WorldSat International, Inc.

group was formalized as the Hamilton Harbour Stakeholder Forum in 1998. A revised Stage 2 RAP was released in 2003 and included 57 recommendations and 159 tasks (HHRAP, 2003).

Considerable progress has been made in implementing the RAP and restoring impaired beneficial uses (Table 1). For example, prior to 1990, industry and government spent \$600 million on RAP actions (HHRAP, 2014). Between 1990 and 2010, a total of \$610 million was spent on remedial actions, including a 77% investment by local government and private sources, an 11% investment by provincial government, and an

IMPAIRED BENEFICIAL USE	STATUS (2018)
Fish consumption advisories	Still impaired; health advisories still in effect, mainly due to PCBs; priority is being placed on control of contaminants at source
Degradation of fish populations	Still impaired; Index of biotic integrity (IBI) values have increased from 24 in 1990 to 36 in 2016; delisting target: 55-60; ongoing efforts to reintroduce walleye as a native, top predator
Degradation of wildlife populations - colonial waterbirds	Targets generally being met for black-crowned night herons, Caspian terns, common terns, and herring gulls; continued management needed to maintain reductions in double-crested cormorants and ring-billed gulls; redesignation to be pursued
Degradation of benthos	Still impaired; priority is being placed on control of contaminants at source; Randle Reef Contaminated Sediment Remediation Project underway
Eutrophication or undesirable algae	Still impaired; 50% reduction in phosphorus loading since 1980s; two large wastewater treatment plants upgrading to tertiary treatment by 2022
Beach closings and water contact sports	Still impaired; significant challenges with the two man-made beaches due to E. coli and toxins from cyanobacteria may necessitate changes to delisting targets
Degradation of aesthetics	Status under evaluation in 2018
Loss of fish and wildlife habitat	Still impaired; improvements have been made in aquatic vegetation, littoral edge, and wildlife habitat; more is needed in our coastal wetland, Cootes Paradise

Table 1. Summary of the status of beneficial use impairments in Hamilton Harbour.

11% investment by federal government (HHRAP, 2014). In addition, between 2006 and 2017 another \$622 million was committed and work has begun on three major projects: Randle Reef sediment remediation (\$139 million); Skyway Wastewater Treatment Plant (\$153 million); and

Woodward Wastewater Treatment Plant (\$330 million).

Those involved predict that by the time Hamilton Harbour is ready for delisting, nearly \$2 billion will have been invested in controlling contaminants at their source;

upgrading wastewater treatment plants; controlling combined sewer overflows; managing urban stormwater; assessing and remediating contaminated sediment; restoring fish and wildlife habitat; restoring and protecting wetlands; and more.

Randle Reef Contaminated Sediment Remediation

For more than 100 years, Hamilton has been the “steel capital” of Canada. This industrial legacy has resulted in considerable contaminated sediments, the most significant being near Randle Reef. The Randle Reef contamination site is approximately 148 acres (60 hectares) in size and contains approximately 2.45 million cubic feet (695,000 cubic meters) of contaminated sediment at the bottom of the harbor, a volume that would

fill a major hockey arena three times over (www.randlereef.ca).

Randle Reef is the largest contaminated sediment remediation project in the Canadian Great Lakes. It is projected to cost \$139 million and will be completed in 2022. The Government of Canada and the Province of Ontario have each committed \$46.3 million, with the final third coming from the City of Hamilton, City of Burlington, Regional Municipality of Halton, Hamilton Port Authority, and Stelco (formerly U.S. Steel Canada).



Construction of an engineered containment facility for contaminated sediments in Randle Reef, Hamilton Harbour. Credit: Hyperactive Productions.

This project is located along the south shore of Hamilton Harbour in the vicinity of Piers 14, 15, and 16. It involves constructing an engineered containment facility (ECF). This specially designed, double, steel-walled and sealed “box” is approximately 15.3 acres (6.2 hectares) in size and is being constructed to contain the most heavily contaminated sediment.

The project, led by Environment and Climate Change Canada, has three stages. The first stage involves reconstructing an adjacent harbor pier wall and constructing the facility. This stage began in 2015 with the pier wall reconstruction, which will allow for sediment to be dredged from this area in the second stage of the project. The in-water construction of the facility began in 2016 and was effectively completed in 2017.

The second stage involves dredging contaminated sediment from the surrounding areas and placing them in the facility via an underwater pipeline. This stage is expected to begin in 2018 and except for a winter shutdown, be completed in 2019.

The third stage involves removing the water from the ECF, compacting the contained sediment, and then constructing an impermeable cap on the facility. This stage is expected to begin in 2020 and be completed in 2022.

Real-time environmental monitoring systems are being used to measure air and water quality in

the construction area throughout these stages. Air and water quality criteria have been established to ensure that human health and the environment are protected.

The Randle Reef Contaminated Sediment Remediation Project will improve water quality and reduce contamination in Hamilton Harbour, which will benefit fish, wildlife and people.

Economic Benefits

The Randle Reef Contaminated Sediment Remediation Project is considered a pivotal effort that will spur other projects necessary to restore impaired beneficial uses and eventually delist Hamilton Harbour as an AOC. As contamination is reduced and the stigma of a contaminated harbor is removed, business development may be accelerated with more companies willing to set up in the Hamilton area. The project is also expected to generate economic returns through the creation of valuable port lands for the Hamilton Port Authority, allowing them to expand port operations. New public spaces and amenities along with new residential and commercial waterfront development in the Piers 5-8 area shown in the cover photo are also expected to encourage more tourism in the area.

To help make the case for this project and other remedial actions, Environment and



Rendering of expansion of Hamilton Port Authority operations as a result of the Randle Reef Contaminated Sediment Remediation Project. Credit: Environment and Climate Change Canada.

Climate Change Canada retained the Institute for Research and Innovation in Sustainability and Schulich School of Business at York University (York, 2006) to assess potential benefits.

Benefits and beneficiaries were identified and systematically organized in a comprehensive framework to identify who will benefit from remediation and in what ways, with a particular emphasis on the Randle Reef Contaminated Sediment Remediation Project.

The accumulated gross benefits realized by different beneficiaries are substantial. Completion of the Randle Reef Contaminated Sediment Remediation Project is projected to realize estimated economic benefits (by 2032) of \$96 million to local property owners, \$38 million to

local businesses, and \$29 million to municipal governments (York, 2006; Table 2). Completion of all sediment remediation, wastewater treatment, and habitat projects for Hamilton Harbour is projected to generate estimated economic benefits (by 2032) of \$592 million to local businesses, \$496 million to recreational users, and \$338 million to the federal government (York, 2006; Table 2).

However, the authors (York, 2006) note that the gross benefits presented in Table 2 are not additive and their study was not designed to produce benefit estimates for a conventional social cost-benefit analysis. If one assumes that the scope or jurisdiction of interest for such a cost-benefit analysis is the local area and a number of key assumptions are made concerning

the benefits flowing to each beneficiary, an approximate benefit total suitable for cost-benefit analysis can be derived. The result is a cumulative total benefit for the local area of \$126 million (by 2032) with the implementation of the Randle Reef project alone and \$914 million with full implementation of all remedial projects (York, 2006).

In summary, the Randle Reef Contaminated Sediment Remediation Project is removing and containing the most significant legacy contamination in Hamilton Harbour. This will reduce ecological and human exposure to the contaminants and provide improvements for the fish and aquatic habitat in the harbor as a result of this cleanup. A collaborative approach to funding, among the Government of Canada, Province of Ontario, City of Hamilton, City of Burlington, Regional Municipality of Halton, Hamilton Port Authority, and Stelco, was essential to the success of the \$139 million project. The final uses of the facility are projected to provide \$245 million in economic benefits and many social benefits to stakeholders. The project will also provide for short-term employment opportunities in the local area during the construction and long-term operation of the facility. The cleanup of Hamilton Harbour is an integral and essential part of the region's revitalization strategy. The vision is for

Beneficiary	Randle Reef Project	All Sediment Remediation, Wastewater Treatment, and Habitat Projects
Federal Government	\$21 million	\$338 million
Provincial Government	\$19 million	\$297 million
Municipal Governments	\$29 million	\$60 million
Hamilton Port Authority	\$11 million	\$11 million
Stelco	\$15 million	\$15 million
Dofasco	\$0	\$0.1 million
Local Businesses	\$38 million	\$592 million
Under-employed people	\$13 million	\$206 million
Recreational users	\$3 million	\$496 million
Local property owners	\$96 million	\$124 million

Table 2. Total estimated benefits by beneficiary for the Randle Reef project and all other remedial projects for Hamilton Harbour (York, 2006).

Hamilton Harbour to be a vibrant centerpiece in the community by improving the potential for recreational uses while maintaining its essential economic function.



Conceptual rendering of Hamilton's Western Waterfront redevelopment. Credit: City of Hamilton.

Literature Cited

Hamilton Harbour Remedial Action Plan (HHRAP). 2014. 2006-2010 Stakeholder Investments. Burlington, Ontario, Canada.

HHRAP (Hamilton Harbour Remedial Action Plan Stakeholder Forum). 2012. Hamilton Harbour Remedial Action Plan Beneficial Uses: Fact Sheets. Burlington, Ontario, Canada.

HHRAP (Hamilton Harbour Stakeholder Forum). 2003. Remedial Action Plan for Hamilton Harbour: Stage 2 Update. Burlington, Ontario, Canada.

HHRAP (Hamilton Harbour Stakeholder Group and Remedial Action Plan Technical Team). 1992. Remedial action plan for Hamilton Harbour: Goals, options, and recommendations. Burlington, Ontario, Canada.

HHRAP (Hamilton Harbour Stakeholder Group and Remedial Action Plan Technical Team). 1989. Remedial action plan for Hamilton Harbour: Environmental conditions and problem definition. Burlington, Ontario, Canada.

York University (Institute for Research and Innovation in Sustainability and Schulich School of Business). 2006. Benefits assessment: Randle Reef Sediment Remediation. Toronto, Ontario, Canada.

Cover photo shows aerial view of the marina, parks, greenway trails, and other amenities created on Hamilton's Western Waterfront that are projected to attract nearly \$1 billion of economic development. Credit: City of Hamilton.

All monetary amounts are in Canadian dollars.

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The Hamilton Harbour case study is part of a larger project to evaluate achievements and lessons learned from 32 years of efforts to clean up Great Lakes AOCs. Case studies will be used to help sustain support for cleaning up AOCs and to inspire and motivate others to restore other degraded aquatic ecosystems.

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