

# **Contaminated Sediment Remediation in the U.S. Portion of the Detroit River**

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## **Background**

The Detroit River was designated as a Great Lakes Area of Concern (AOC) due to recognized impairments of at least nine beneficial uses (Michigan Department of Natural Resources and Ontario Ministry of the Environment, 1991). The history of contamination of the Detroit River is complex as it receives inputs from upstream waters (Lake St. Clair and the St. Clair River) as well as point and nonpoint source inputs from two major urban centers (Detroit, Michigan and Windsor, Ontario) that include effluents from multiple industries, hazardous waste sites, wastewater treatment plants, combined sewer overflows, and urban runoff. Priority pollutants identified in the Detroit River include several metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), organochlorine pesticides, dioxins and furans, and mercury (UGLCCS, 1988; Green et al., 2010).

## **Sediment Contamination**

Several beneficial use impairments, including restrictions on fish and wildlife consumption, degraded fish and wildlife populations, fish tumors or other deformities, degradation of benthos, bird or animal deformities and reproductive problems, and restrictions on dredging activities, have direct cause-effect linkages with sediment contamination in the AOC (Green et al., 2010). The Detroit River is also identified as a main source of contamination to Lake Erie, especially during storm events which can resuspend and transport contaminated particles from accumulated contaminated sediment deposits (Zarull et al., 2001; Reitsma et al., 2003). As such, contaminated sediments are a main factor in the cleanup strategies recommended by the Stage II Remedial Action Plan for the Detroit River and the subject of past clean-up efforts (Hartig et al., 2009).

Studies to identify contaminated sediment repositories in the AOC began in 1985 as part of the binational Upper Great Lakes Connecting Channels Study (UGLCCS,

1988). Additional, sediment chemistry surveys and comprehensive geospatial mapping projects were conducted in 1999, 2008/2009, and 2013 that enabled the establishment of baseline conditions, mass inventories and the identification of local contamination zones (Szalinska et al., 2006; Drouillard et al., 2006; Szalinska et al., 2013). Although there is evidence for declines in some priority pollutants including PAHs, PCBs, lead, mercury, and zinc between the 1980s and present, the rate of decline post-1999 has declined with most contaminants showing no change between 1999 and 2013.

To facilitate hazard assessment, sediment concentrations for thirteen priority pollutants collected from 1999-2013 were indexed to consensus-based sediment quality guidelines (MacDonald et al., 2000) to generate a multi-pollutant hazard score as described in McPhedran et al. (2017). Hazard scores less than 40 are considered non-toxic, values of 40-79 reflect some toxicity, values of 80-119 are likely toxic, values of 120-249 are toxic, and values 250 or greater are considered highly toxic (MacDougal, 2019). Figure 1 presents a map of hazard scores for priority pollutants in surficial sediments from monitoring stations in the Detroit River AOC. Areas with high hazard scores are found along much of the U.S. nearshore region commencing downstream of Belle Isle through to Mud Island located to the west of Fighting Island and throughout the Trenton Channel and downstream of Grosse Isle to the mouth of the river at Lake Erie.

## **History of Contaminated Sediment Remediation**

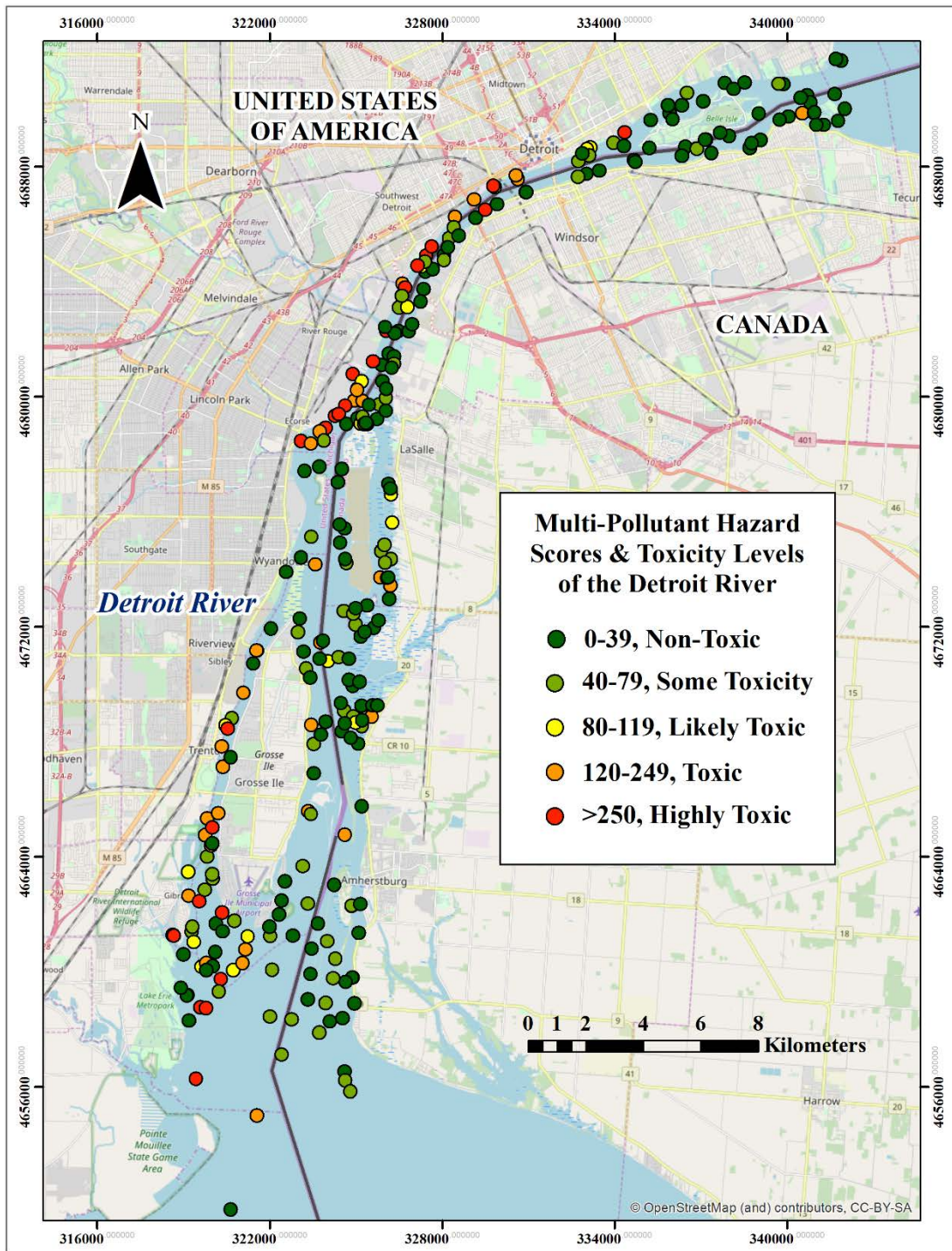
Metropolitan Detroit's long history of human and industrial development has resulted in substantial sediment contamination along the U.S. shoreline. Between 1986 and 2020 there has been 396,800 m<sup>3</sup> of contaminated sediment remediated in the lower Rouge River at a cost of \$62.75 million (Table 1). Between 1993 and 2020 there has been 287,570 m<sup>3</sup> of contaminated sediment remediated along the U.S. shoreline of the Detroit River at a cost of \$56.3 million (Table 2). In addition, there is a capping project that will be undertaken in 2020 along the Detroit River shoreline of the old Uniroyal site that will cap approximately 4,650 m<sup>2</sup> of sediment at a cost of \$1.5 million.

All of these sediment remediation projects were the result of enforcement actions, with the exception of: the Lower Rouge River-Old Channel and the Black Lagoon and Uniroyal site on the Detroit River that were remediated through the Great Lakes Legacy Act; and Conner Creek that was remediated through a Supplemental Environmental Project (i.e., an environmentally beneficial project that is included as part of a settlement for environmental violations) with the Detroit Water and Sewerage Department.

## **Sediment Remediation Priority Setting**

In 2012, a binational group of federal, state, local, nongovernmental, and university stakeholders worked together to compile data collected over last 30 years on sites of known sediment contamination in the Detroit River. From this preliminary exercise, six areas were targeted for further assessment:

- Harbortown Upstream
- Harbortown
- Riverbend



**Figure 1.** Multi-pollutant hazard scores for priority pollutants in surficial sediments from selected stations in the Detroit River AOC.

Table 1. Contaminated sediment remediation in the Rouge River, 1986-2020.

<b>Location or Site</b>	<b>Nature of Project</b>	<b>Volume of Sediment</b>	<b>Year</b>	<b>Cost</b>
Lower River near Double Eagle Steel	Dredging and disposal	30,000 m <sup>3</sup>	1986	\$1 million
Evans Products ditch	Dredging and disposal	7,300 m <sup>3</sup>	1997	\$750,000
Newburgh Lake	Dredging and disposal	306,000 m <sup>3</sup>	1997-1998	\$11 million
Lower River – Old Channel	Dredging and disposal	53,500 m <sup>3</sup>	2019-2020	\$50 million

Table 2. Contaminated sediment remediation in the U.S. portion of the Detroit River, 1993-2020.

<b>Location or Site</b>	<b>Nature of Project</b>	<b>Volume of Sediment</b>	<b>Year</b>	<b>Estimated Cost</b>
Carter Industrial Site	Removal of PCB-contaminated soils and disposal	35,100 m <sup>3</sup>	1986-1987	\$19.5 million
Elizabeth Park Marina	Dredging and disposal	3,100 m <sup>3</sup>	1993	\$1.3 million
Monguagon Creek	Dredging and disposal	19,300 m <sup>3</sup>	1997	\$3 million
Conner Creek	Dredging and disposal	111,630 m <sup>3</sup>	2004	\$4 million
Black Lagoon – Trenton Channel	Dredging and disposal	88,440 m <sup>3</sup>	2004-2005	\$9 million
BASF Riverview	Removal of contaminated soils, creation of an on-site disposal cell with an inward hydraulic gradient, removal and disposal of contaminated sediments, and creation of shoreline habitat and 0.4-ha of fish spawning habitat	30,000 m <sup>3</sup>	2007-2008	\$19.5 million
Old Uniroyal Site near MacArthur Bridge	Capping	Approximately 4,650 m <sup>2</sup> of sediment along 640 m of shoreline	2020	\$1.5 million

- River Rouge/Ecorse Shoreline
- Mid-Lower Trenton Channel
- Celeron Island Area

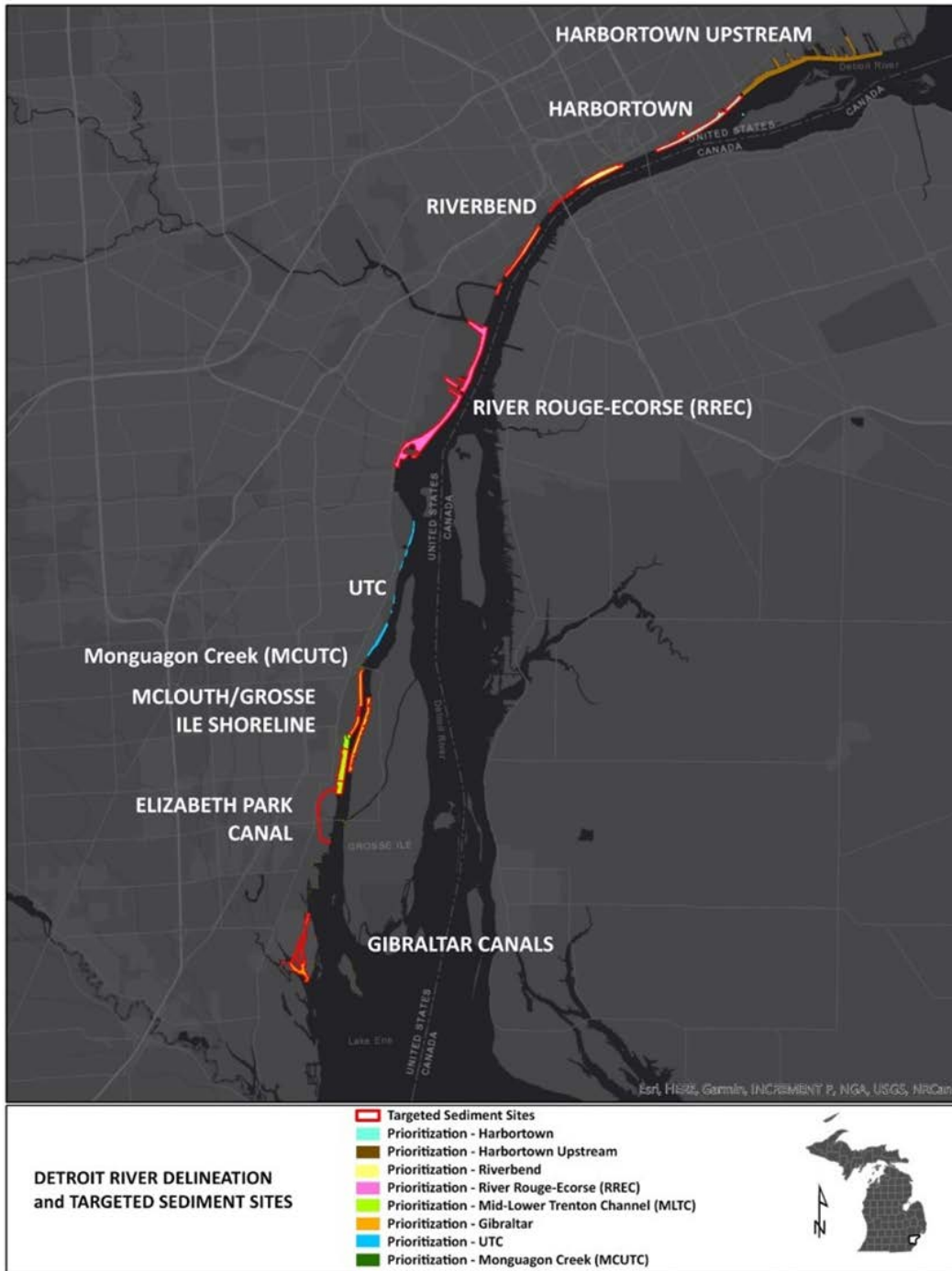
In 2013, U.S. Environmental Protection Agency and the State of Michigan initiated site characterization at these target areas. Characterization was completed in fall 2018. In total, 219 core samples and 191 ponar samples were collected generating 873 samples for analysis of toxic substances, including heavy metals and persistent organochlorine compounds. Data were compared to known standards and modeling was performed to further delineate contaminated areas.

In general, where sediments were present in the nearshore areas of the Detroit River on the U.S. side, they were contaminated. The enhanced monitoring survey was also able to get closer to the shore/river interface than previous river-wide sediment chemistry surveys demonstrating much higher chemical gradients at the shoreline margins compared to deeper regions. Despite high water volume, flow rate, and time, contamination was highest near historical industrial and municipal outfalls.

From this exercise, nine areas have been targeted for contaminated sediment remediation along the U.S. shoreline of the Detroit River by U.S. Environmental Protection Agency and Michigan Department of Environment, Great Lakes, and Energy (Figure 2 and Table 3). In total, an additional 5.1 million m<sup>3</sup> of contaminated sediment has been targeted for remediation to help meet long-term goals for restoring beneficial use impairments. These designated areas capture a large portion of the previously designated hazard score regions identified in Figure 1.

### **Management Next Steps**

Control of contaminants at source remains the primary imperative for action. Following control of contaminants at their source, additional contaminated sediment remediation will be undertaken using sediment assessment and modeling techniques. U.S. Environmental Protection Agency and Michigan Department of Environment, Great Lakes, and Energy will be undertaking further delineation of contaminated sediments, performing selected remedial investigations/feasibility studies to support sediment remediation, tracking sources of contamination, and initiating partner discussions. For example, U.S. Environmental Protection Agency entered into a partner agreement with the Detroit Riverfront Conservancy to provide the necessary 35% non-federal match on a Great Lakes Legacy Act capping project that will be undertaken in 2020 at the former Uniroyal site near Belle Isle. Similarly, additional partners will need to be recruited to provide non-federal match funding on any Great Lakes Legacy Act sediment remediation projects. An investigation for potential partners was finalized in February 2019 that brought to light industries that may be potential partners for future sediment remediation projects. In addition, a cooperative agreement has been signed between U.S. Environmental Protection Agency and Michigan Department of Environment, Great Lakes and Energy for the necessary remedial investigation work on both the Detroit and Rouge River AOCs.



**Figure 2.** Targeted contaminated sediment remediation sites along the U.S. shoreline of the Detroit River identified by U.S. Environmental Protection Agency and Michigan Department of Environment, Great Lakes, and Energy.

Table 3. Estimated volumes of contaminated sediment prioritized for remediation by U.S. Environmental Protection Agency and Michigan Department of Environment, Great Lakes, and Energy.

<b>Target Sites for Contaminated Sediment Remediation</b>	<b>Estimated Volume of Contaminated Sediments to be Remediated (m<sup>3</sup>)</b>
Harbortown Upstream	665,421
Harbortown Shoreline	565,770
Riverbend Shoreline	573,416
River Rouge/Ecorse Shoreline	1,682,021
Upper Trenton Channel	175,848
Monguagon Creek	30,582
McLouth Steel/Grosse Ile Shoreline	718,681
Elizabeth Park Canal	649,872
Gibraltar Canals	40,521
	<b>Estimated Total: 5,102,132 m<sup>3</sup></b>

There are several anticipated benefits associated with the above remediation activities. These include improvements to the number and degree of restrictiveness of fish consumption advisories, decrease in fish tumor prevalence and generation of healthy benthic invertebrate communities. Indirectly, these successes are also expected to have positive impacts on fish and wildlife populations through reduction of toxic stress but also in association with habitat improvements that coincide with sediment remediation efforts.

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