

# STATE OF THE STRAIT MONITORING FOR SOUND MANAGEMENT



## A BINATIONAL CONFERENCE ON THE DETROIT RIVER ECOSYSTEM

Convened December 2004 by Great Lakes Institute for Environmental Research, University of Windsor, The Greater Detroit American Heritage River Initiative of Metropolitan Affairs Coalition, The Detroit River Canadian Cleanup, The Detroit River International Wildlife Refuge, The Detroit Water and Sewerage Department, and other organizations.

**Cover photos:** photos left and center (upper and lower): Recreational fishing in the Huron-Erie Corridor (lower center photo by Kurt Byers, Michigan Sea Grant Extension, courtesy of United States Environmental Protection Agency, Great Lakes National Program Office; other photos courtesy of OMNR); upper right: Scientist sampling water, benthic invertebrates and sediment in Lake Erie (photo courtesy of Environment Canada and University of Windsor); lower right: Longear sunfish (*Lepomis megalotis*) (photo courtesy of Nicolas Lapointe)

STATE OF THE STRAIT  
MONITORING FOR SOUND MANAGEMENT

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## 6.1. UTILIZATION OF WATER QUALITY MONITORING DATA TO SUPPORT THE CITY OF DETROIT'S LONG TERM COMBINED SEWER OVERFLOW CONTROL PLAN

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### Introduction

The City of Detroit was required to develop a Combined Sewer Overflow (CSO) control plan to eliminate or adequately treat CSO discharges. This was done in response to the National Pollution Discharge Elimination System (NPDES) Permit issued to the Detroit Water and Sewerage Department (DWSD) by the Michigan Department of Environmental Quality (MDEQ). DWSD developed a Long Term CSO Control Plan in July 1996, which recommended using water quality monitoring data from both the Rouge and Detroit Rivers to support a demonstrative approach in developing their final Long Term CSO Control Plan. The demonstrative approach uses both receiving water quality data and treatment performance data from pilot CSO control facilities to predict the level of control required to meet water quality objectives. Therefore, four CSO pilot facilities and a water quality monitoring program of the Detroit and Rouge Rivers were recommended. Information from these four pilot facilities, three existing DWSD demonstration CSO basins (located at the upper portion of the Rouge River), and other CSO control facilities in southeast Michigan will be used to develop the final CSO control plan due in December 2008.

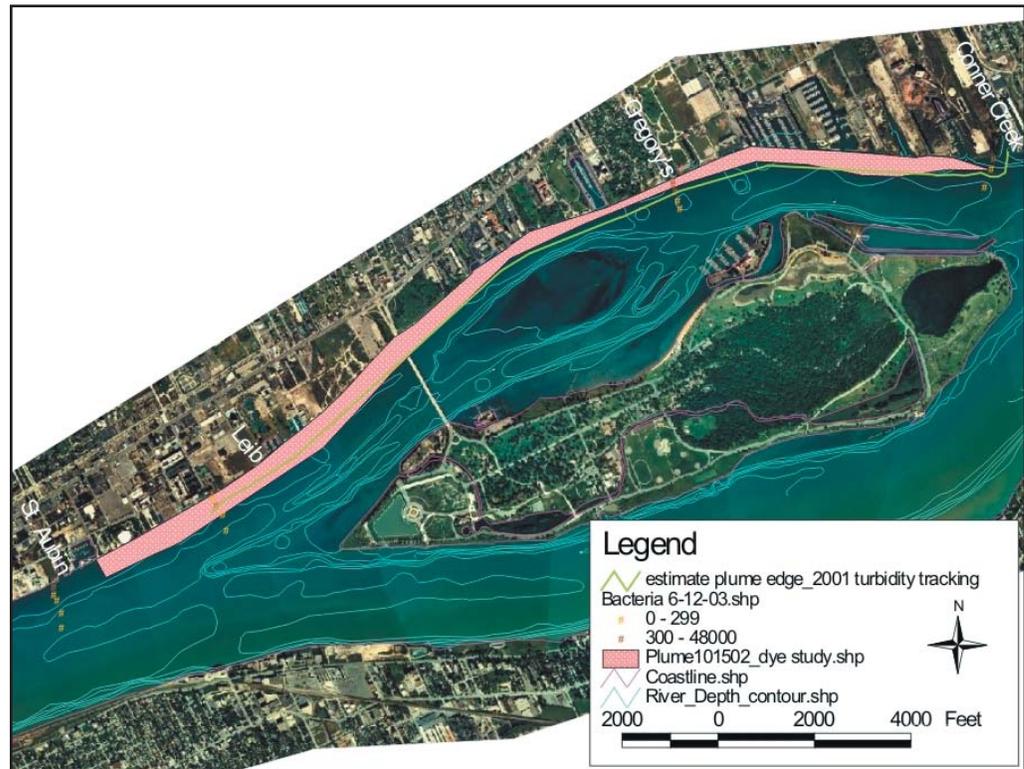


Figure 1. Water Quality Monitoring Study Area.

Figure 1 illustrates the extent of the study area, locations of the CSO control pilot facilities within the study area, and the remaining uncontrolled outfalls. The Detroit River study area extends from Windmill Pointe in Grosse Pointe Park and was chosen to represent conditions in the Detroit River upstream of potential influence of DWSD CSOs to the confluence with the Rouge River. The Rouge River study area extends from Dix Avenue to the confluence with the Detroit River. The entire study area includes four pilot CSO facilities, 36 uncontrolled CSO outfalls along the Detroit River, six uncontrolled CSO outfalls along the Rouge River, and water intakes for the cities of Detroit and Windsor.

This extended abstract focuses on the Detroit River data only. It explains the objectives of the water quality monitoring program, the level of effort involved, the parameters being monitored, and the sampling methodology/approach.

### **Objectives**

Review of the existing water quality data for the 1996 Long Term CSO Control Plan identified high levels of bacteria and floatable materials as potential CSO impacts on the Detroit River. Dissolved Oxygen (DO) and potential oxygen demand from CSOs were key concerns of the MDEQ. Therefore, the DWSD monitoring objectives are to determine:

1. The presence and extent of DO levels that are below the cold water fisheries standard of 7 mg/L that can be attributed to upstream CSOs
2. The extent of aesthetic and other use impairments (recreational water contact, water supply, etc.) directly resulting from CSOs
3. The ecological impacts of untreated and treated CSO discharges on aquatic communities, especially benthic macroinvertebrates
4. The extent of the CSO discharge plumes

### **Methods and Results**

The following is a summary of the monitoring and evaluation performed to address the Detroit River water quality monitoring objectives.

#### **1. Dissolved Oxygen Depression**

Four continuous water quality monitors were installed along the shoreline of the Detroit River from 2000-2004. At each monitor location (Figure 1), the depth, DO, pH, temperature, specific conductivity, and turbidity were continuously measured and recorded during the warmest months, when DO saturation is the lowest and there is greatest potential for DO levels to fall below the water quality standard.

The DO data collected by the continuous in-situ monitoring show that there can be temporary, localized DO impacts from CSOs, but they do not reduce DO to below the applicable water quality standard of 7 mg/L. Based on the travel time expected between the continuous monitoring stations (USACOE 1974), DO reductions are attributed to the low DO concentration in the CSOs themselves, not the DO demand of the discharges. In the example shown in Figure 2, the minimum DO levels at downstream

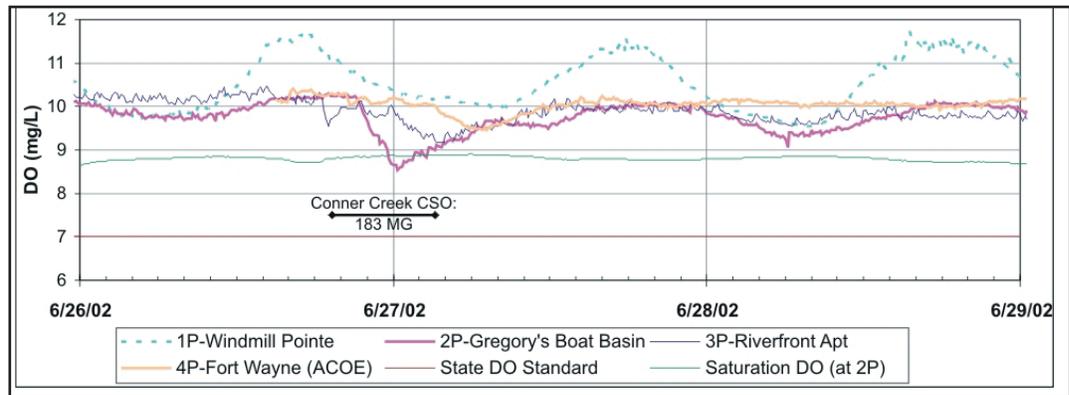


Figure 2. Continuous DO data (June 2002) at four monitoring stations.

stations were observed to increase further from the CSO discharge. This did not indicate the exertion of significant oxygen demand from the CSOs.

## 2. Aesthetic and Other Use Impairments

Rule 50 of Michigan Water Quality Standards “restricts the presence of unnatural physical properties including turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, and deposits to the extent that they are or may become injurious to any designated use.” Shoreline surveys were performed in 1999 and 2000 to evaluate the appearance of the water body and any debris that may have been deposited along the shore, and to collect bacteria samples. Detroit River water was found to be clear and colorless, and generally had no odor during dry weather or following major rain events. The majority of locations had no debris or only natural debris. Foam and oil films were observed at a few locations during the several dry and wet weather expeditions, but sources could not be identified. Bacteria concentrations higher than the total body contact standards were found during some of the surveys conducted within two days after major rain events.

## 3. Ecological Impacts on Benthic Macroinvertebrates

The procedure for the benthic macroinvertebrate surveys included placement of multi-plate artificial substrate macroinvertebrate samplers at eight locations along the Detroit River shoreline and seven additional locations further offshore. This method was used because it was effective for sampling both areas of soft sediment and hard substrate. Divers deployed and retrieved the artificial substrate samplers. The continued inclusion of monitoring sites both near shore and offshore provides benthic data within areas influenced by CSO discharges and further offshore, outside the expected area of influence. Surveys have been performed in this manner from 2000 to the present.

No direct impact from uncontrolled CSO discharge on benthic macroinvertebrates was consistently observed at the near shore stations. However, there was an observable decrease in the number and quality of organisms from the head of the Detroit River (Windmill Pointe station) to the near shore stations in the urban area downstream. These surveys will continue after the pilot facilities are in operation to evaluate the ecological impacts, if any, of the treated CSO effluent.

#### 4. Extent of CSO Plume

CSO plume tracking provides off-shore information on river water quality during CSO discharges, and defines the extent of the CSO plume area. Wet weather or CSO plume tracking surveys were refined after a fluorescent dye-tracer study during dry weather. The CSO plumes were delineated by collecting data on eight key water quality parameters while the sonde was towed by a boat in and out of the visible plume. The sonde depth was kept constant at approximately 90 cm (3 ft) so that changes in the measured parameters could be observed. Precise position information was collected every second using a Global Positioning System (GPS) unit. The data collected were used to define the outer edge of the CSO plumes. The surveys also included collection of *E. coli* bacteria samples.

The plume tracking surveys and dye tracer study indicated that discharges originating at the largest CSO location remained within 150 m (500 ft) of the shoreline and impacted 20 percent or less of the total Detroit River channel width and approximate volume (Figure 3). This is a significant finding since there is a City of Detroit water intake located on the opposite shoreline about 1,070 m (3,500 ft) downstream of the monitored outfall. Vertical profile data was also collected in the dye plume study and during CSO plume tracking, and indicated that the plume was well mixed in the water column.

Investigations of total residual chlorine (TRC) levels downstream of the screening and disinfection facilities are planned following the startup of each facility.

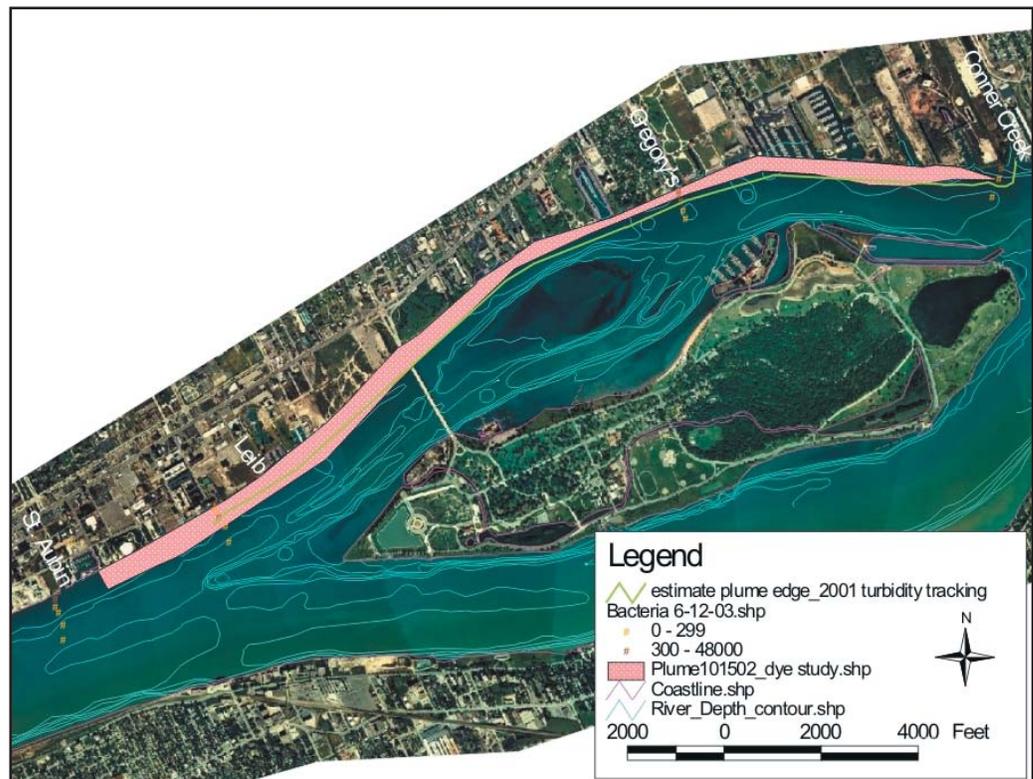


Figure 3. CSO Estimated Plume Edge from Multiple Survey Data.

## Conclusions

- The CSO plume affected up to 150 m (500 ft) of channel extending from the shoreline; 20 percent of Detroit River width.
- Dissolved oxygen levels in the Detroit River did not fall below the minimum water quality standard of 7 mg/L.
- Bacteria levels exceeded standards within the CSO plume.
- The Detroit River water was found to be clear and colorless and generally had no odor during the aesthetics surveys. Foam and oil films were observed at few locations during surveys, but sources could not be identified.
- No direct impact from uncontrolled CSO discharge on benthic community was consistently observed. However, there was an observable decrease in the number and quality of organisms from the head of the Detroit River to the urban area downstream.
- Water quality monitoring is planned to continue through 2006 to evaluate the impact of treated discharge from pilot CSO control facilities on the Detroit River. Information from the water quality monitoring will support the development of the City of Detroit final Long Term CSO Plan due in December 2008.

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