Presentation Outline

• Introduction

• Windsor Pollution Control Planning (PCP) Study

• Windsor CSO Treatability Study

• High-rate (chemical enhanced) Retention Treatment Basin (RTB) for Windsor Waterfront East
Introduction

• The Detroit River was identified by the Canada & US International Joint Commission on Great Lakes Water Quality as an Area of Concern (AOC)

• Combined sewer overflows (CSO) are a significant source of pollution into the Detroit River and the Great Lakes

• Much attention has been directed towards reducing the amount of pollutants discharged from CSOs over the last 30 years

• With funding from senior levels of government, the City of Windsor initiated a series of studies to reduce CSO’s and pollutant loadings into the Detroit River along its old riverfront district
Combined Sewer Overflows

- As with many cities in North America, the older areas of the City of Windsor are serviced by combined sewers.

Typical Combined Sewer System

- Combined sewer is a wastewater collection system that conveys both municipal wastewater and storm water runoff in a single pipe system.
- During wet weather events, there may be insufficient capacity to convey all the flow to the WWTP and/or insufficient treatment capacity at the plant.
- Excess untreated wet weather flow discharged directly to the Detroit River, generating combined sewer overflows (CSOs).
CSO is significant source of pollution into the Detroit River

Annual Flow Volume from Windsor - 18,730 MGL (70,890 Mega litres)

Annual Total Suspended Solids from Windsor – 5,358,000 lbs
Note: Excludes background loading entering the study area

CSOs represent less than 5% of the total annual volume discharged to the Detroit River, but contribute 37% of the total annual solids load.
Windsor Pollution Control Plan Study

The PCP study started in late 1992

- Undertaken to develop a pollution control strategy for the Windsor Riverfront District
- Specific Objective to Reduce CSOs and Pollutant Loading to Detroit River

Completed in early 1999, the PCP study

- Presented alternative CSO control strategies
- Identified a preferred long term CSO control plan

Windsor Riverfront District
Recommended Control Measures of Pollution Control Plan Study

1. Increase pumping capacity at the Caron Avenue Pumping Station
   - Pumping capacity was increased in 2003 from 70 MGD to 85 MGD so that spare capacity in the downstream sewer collection system and Lou Romano Water Reclamation Plant (LRWRP) could be fully utilized.

2. Provision of additional primary treatment capacity at the LRWRP to treat wet weather flows
   - Plant upgraded and expanded during 2001-2011 from primary treatment with capacity of 50 MGD to secondary treatment with capacity of 70 MGD.
   - Provide a total peak primary treatment capacity of 174 MGD including 36 MGD for wet weather flow treatment.

3. Provide tunnel storage (or possibly RTB’s) west of Caron Avenue Pumping Station This component has not yet been initiated

4. Provide 3 satellite treatment facilities known as retention treatment basins (RTB’s) along Windsor waterfront east of Caron Avenue
Different options were evaluated to capture and treat CSOs in the riverfront drainage area east of Caron Avenue.
Constraints for CSO Control in Windsor Riverfront East

• For the pure storage option, a storage tank volume of approximately **106 MG** would be needed.

• RTBs of conventional design (SORs of 1440-2888 gpd/ft²) with a total surface area of **62,300 -124,700 ft²** were required.

• Limited space available on the Windsor waterfront for CSO control facilities - therefore an effective and space saving solution is required.
  – possibility of using high-rate CSO control facilities (high-rate RTB, vortex separator, etc.)
Windsor CSO Treatability Study

Objectives

• Identify preferred high rate treatment option; and
  Determine design parameters

Settling Column Tests

➢ Obtain site-specific data on settling characteristics of solids with and without chemical addition
➢ Investigate appropriate polymer and dosage

Pilot-Scale RTB Tests

➢ Verify performance characteristics
➢ Determine design parameters

CFD Model Study

➢ Determine facility size and geometry based on results of field tests
Preferred CSO Control Technology Identified in Treatability Study

- Use chemically enhanced high-rate RTB Facility high-rate RTB with a SOR of 12,000gpd/ft$^2$
- Consolidate three conventional RTBs identified in the PCP study to one high-rate RTB
- Conventional RTB basin sizing was based on an assumed SOR of 2,000gpd/ft$^2$, which was equivalent to the design criteria for primary settling facilities with typical design SORs of 1,500 to 3,000gpd/ft$^2$.
- A high rate RTB designed with a SOR of 12,000gpd/ft$^2$ will be less than one fifth (1/5) the size of a RTB designed with a conventional SOR of 2,000gpd/ft$^2$.
Plan View of High-Rate RTB Facilities

How High-Rate RTB’s Work

- **Small CSO Events**
  - Contain CSO flows in RTB without discharging to Detroit River
  - Stored flows are returned to existing Interceptor Sewer system after storm event
  - Draining and flushing of RTB facilities after CSO events

- **Large CSO Events**
  - Same as small CSO event, however, CSO flows receive equivalent to primary treatment prior to discharge to Detroit River
Sectional View of High-Rate RTB Facilities
Main Components of CSO Control Facility For Windsor Waterfront East

- Five new CSO Interceptor Chambers downstream of five existing CSO Interceptor Chambers to capture CSO to RTB via tunnel sewer.

- New CSO Collection Sewer tunnelled along riverfront varying in diameter from 66 to 90 inch at depths over 30 feet over a length of approximately 7,900 feet to collect, store and convey CSO to RTB.

- New chemically enhanced high-rate Retention Treatment Basin Facility under existing riverfront parking lot with storage capacity of 4 MG and primary treatment capacity of 180 MGD at surface overflow rate (SOR) of 12,000gpd/ft² (63 ft/hr).
High-Rate Retention Treatment Facility

• New chemically enhanced high-rate RTB Facility under existing riverfront parking lot with storage capacity of 4 MG

• Primary treatment capacity of 180 MGD at surface overflow rate (SOR) of 12,000gpd/ft$^2$ (63 ft/hr)
Other Main Components of RTB Facility

Polymer storage & feed equipment including ancillary mechanical, electrical and control systems required for proper operation of CSO pumping station and RTB facilities

Flushing gate equipment to flush accumulated solids from RTB after storm event
RTB Facilities Integrated with the Existing Riverfront Facilities

Pre-Construction

Post-Construction
Aerial View of High-Rate RTB Facility
Acknowledgements

This project was partially funded by Canada-Ontario Infrastructure Stimulus Fund (ISF), City of Windsor, Ontario Ministry of the Environment (MOE) and Environment Canada through the Great Lakes Sustainability Fund, Essex Region Conservation Authority (ERCA).
Questions?

- If you would like to learn more about this project please contact the presenter by email at jian.li@stantec.com or by phone at (519) 966-2250