Windsor Riverfront West CSO Control
“Schedule C” Class EA Environmental Study Report

Project No. 165620132

Prepared for:
City of Windsor

Prepared by:
Stantec Consulting Ltd.

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Sign-off Sheet

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GENERAL

Some areas of the City of Windsor, as is typical with older areas in most cities, are serviced by a combined sewer system. A combined sewer system is a wastewater collection system that conveys a mixture of municipal wastewater and stormwater runoff through a single-pipe system to a wastewater treatment plant. During some wet weather events there is insufficient capacity to carry all of the flow to the wastewater treatment plant with the result that excess untreated flow is discharged directly to the river. This is defined as a combined sewer overflow (CSO).

The City of Windsor, with participation and funding assistance from the Province of Ontario and from the Federal Government through the Great Lakes Cleanup Fund (now the Great Lakes Sustainability Fund), commissioned a study in late 1992 to investigate direct municipal discharges to the Detroit River from the riverfront area within the City of Windsor boundaries and north of Riverside Drive. This project, known as the Windsor Riverfront Pollution Control Planning (PCP) Study, was undertaken to develop a pollution control strategy for the Windsor Riverfront District with the specific objective of reducing CSOs and total pollutant loadings to the Detroit River.

The completed PCP Study recommended several pollution prevention and control measures and infrastructure management initiatives. One of the main recommended control measures to comply with the Ontario Ministry of the Environment, Conservation and Parks (MECP) guidelines for CSO control was the provision of tunnel storage or Retention Treatment Basins (RTBs), along the Windsor waterfront west of Caron Avenue.

The project objective is to select the preferred means and preferred design to control Combined Sewer Overflows (CSOs) in the Riverfront Area west of Caron Avenue and revisit wet weather flow conditions at the Lou Romano Water Reclamation Plant (LRWRP) to determine if any CSO control alternatives may also help to alleviate wet weather flows at the LRWRP.

This Environmental Assessment report is the documentation of the Class Environmental Assessment (Class EA) process outlined by the Municipal Engineers Association (MEA) for the Windsor Riverfront West CSO Control as well as wet weather flow control at the LRWRP.

This report comprises **Sections 1 to 10** inclusive and **Appendices A to E** inclusive. A brief description of each section follows.

SECTION 1: INTRODUCTION

This section provides background information and a description of the Class EA process. The Class EA process is comprised of five phases. The study has been carried out in accordance with Phases 1, 2, 3 and 4 of the Class EA process.

SECTION 2: STUDY AREA CONDITIONS

Projects identified through this Class EA process must be evaluated based on the potential impact on the existing environmental conditions of the study area. This section provides a general description of the existing natural, social and economic environmental conditions in the study area.

SECTION 3: PROBLEM STATEMENT

This section provides an overview of the existing wastewater collection system, identifies the problem statement, and establishes the project objective.

SECTION 4: DEVELOPMENT AND SELECTION OF ALTERNATIVES FOR CSO AND WWF CONTROL

This section presents the details of the work undertaken under Phase 2 of the Class EA process. Phase 2 involves the identification and evaluation of various conceptual alternatives with the objective of determining alternative solutions which best address the identified problems and needs based on the potential impact to the natural, social, and economic environments. Further to consultation/review with agencies and public, leads to the identification of the preferred control solution and completion of Phase 2 of the process.

SECTION 5: ALTERNATIVE DESIGN CONCEPTS AND RECOMMENDATIONS

This section presents the details of the work undertaken to support Phase 3 of the Class EA process. In this section of the report alternative designs for the CSO and WWF storage and treatment facilities, which are part of the overall preferred solution identified under Phase 2, are identified and evaluated leading to the selection of a preferred design for this application. The evaluation of alternative designs includes consideration of potential environmental, social and economic impacts and recognizes the need to design the facilities in such a way that they will be as unobtrusive as possible and blend in with existing and proposed uses on the Windsor waterfront.

SECTION 6: ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section identifies the environmental impacts of the preferred solution and describes the recommended mitigation measures.

SECTION 7: PROPERTY REQUIREMENTS

This section describes the property requirements for the preferred alternative solution. The City is required to acquire any property and/or easements needed for the proposed improvements.

SECTION 8: PUBLIC PARTICIPATION

This section documents agency and public consultations that occurred during Phases 2 and 3 of the process. This section includes documentation of consultation with the public and review agencies. In order to complete Phase 4 of the Class EA process, this report will be made available for review and comment by the public and review agencies as a part of the consultation process.

SECTION 9: OPINION OF PROBABLE COST

This section summarizes the preferred solution with respect to probable capital costs (in 2019 dollars), and anticipated phasing.

Table E-1: Summary of Preferred Solution Probable Cost

Item	Description	Probable Cost
1	**Upgrade Interceptor Chambers A, D and F**	$4,000,000
2	**CSO Collector Sewer from Chamber A to RTB**	$10,000,000
3	**Influent Pumping Station, RTB and Outfall Sewer**	$36,000,000
Sub-total Construction Cost		$50,000,000
Contingency Allowance (10%)		$5,000,000
Engineering Allowance (15%)		$7,800,000
TOTAL CAPITAL COST (excluding taxes)		$62,800,000
HST (13%)		$8,200,000
TOTAL PROBABLE CAPITAL COST (including taxes)		$71,000,000

SECTION 10: SUMMARY

This section summarizes recommendations that are made with respect to this study.

ABBREVIATIONS

BOD	**Biochemical Oxygen Demand**
CRIP	**Central Riverfront Implementation Plan**
CSO	**Combined Sewer Overflow**
DWF	**Dry Weather Flow**
EA	**Environmental Assessment**
ERCA	**Essex Region Conservation Authority**
ESR	**Environmental Study Report**
GHIB PAR	**Gordie Howe International Bridge perimeter access road**
ha	**hectares**
HRT	**High Rate Treatment**
HGL	**Hydraulic grade line**
kg	**kilogram**
kW	**kilowatt**
L	**litres**
L/c/d	**litres per capita per day**
LCBA	**LaFontaine, Cowie, Buratto and Associates (now Stantec Consulting)**
LRWRP	**Lou Romano Water Reclamation Plant, formerly known as the WWPCP**
m	**metre**
mg	**milligrams**
MECP	**Ministry of the Environment, Conservation and Parks, formerly known as MOECC, MOE**
Mg/L	**Milligrams per litre**
MIG	**million Imperial gallons**
MIGD	**million Imperial gallons per day**
mL	**millilitres**
ML/d or MLD	**million litres or megalitres per day**
mm	**millimetre**
MOE	**Ministry of Environment, now Known as MECP**
PCP	**Pollution Control Plan**
PS	**Pumping Station**
RAP	**Remedial Action Plan**
RTB	**Retention Treatment Basin**
SOR	**Surface Overflow Rate**
SWD	**Side Wall Depth**
TSS	**Total Suspended Solids**
UV	**Ultraviolet**
WDBA	**Windsor-Detroit Bridge Authority**
WWF	**Wet Weather Flow**
WWPCP	**West Windsor Pollution Control Plant, now known as the LRWRP**

1.0 INTRODUCTION

1.1 BACKGROUND

1.1.1 General

The Detroit River is one of 43 Areas of Concern (AOC) identified by the International Joint Commission (IJC) in the Great Lakes basin. An AOC is a location with specific beneficial use impairments due to environmental degradation. Combined sewer overflows (CSOs) were identified as a significant source of pollution.

Some areas of the City of Windsor, as is typical with older areas of many cities, are serviced by a combined sewer system. A combined sewer system is a wastewater collection system that conveys a mixture of municipal wastewater and stormwater runoff through a single-pipe system to a wastewater treatment plant. During some wet weather events there is insufficient capacity to carry all of the flow to the wastewater treatment plant and/or insufficient treatment capacity at the plant with the result that excess untreated flow is discharged directly to the river. This is defined as a CSO.

The wastewater collection system serving the study area extending generally from Caron Avenue on the east to the Lou Romano Water Reclamation Plant (LRWRP) on the west is shown in **Figure 1.1** of **Appendix A**. Combined sewers carry flow from the drainage area towards the river. Flow in the sewers is captured at Interceptor Chambers and directed to the Riverfront Interceptor Sewer that flows to the LRWRP. The Interceptor Chambers were generally designed to capture and divert 2.5 to 4 times dry weather flow (DWF) from the combined sewers to the Riverfront Interceptor Sewer. **Figure 1.2** of **Appendix A** shows a typical combined sewer system. During dry weather conditions all wastewater flow is captured and directed to the LRWRP for treatment. During some storm events there is insufficient capacity to accommodate the total flow in the system with the result that flow volumes in excess of the capture capacity at the Interceptor Chambers are directed to the river as CSOs.

1.1.2 Windsor Riverfront Pollution Control Planning (PCP) Study

To address the CSO issue, the City, with funding assistance from both senior levels of government, carried out a comprehensive study known as the Windsor Riverfront Pollution Control Planning Study (PCP study). The Windsor Riverfront PCP Study was initiated in 1992. The purpose of this study was to develop an overall pollution control strategy for the Windsor Riverfront District with the specific objective of reducing combined sewer overflows and total pollutant loadings to the Detroit River in keeping with the requirements of MECP Procedure F-5-5. The Study was carried out under the direction of a Technical Steering Committee that included representatives from Environment Canada, the MECP and the City of Windsor.

Although not undertaken specifically as a Class EA project, development of the PCP Study was carried out generally in accordance with the Class EA planning and design process and included public open house consultation sessions to provide information on the study findings and solicit input on preferred control options. The PCP study was carried out in three phases described as follows:

Phase 1 work, which was completed in 1995, documented the quantity and quality of wastewater being discharged under both dry and wet weather conditions and estimated their impact on the Detroit River. This work, which parallels the Phase 1 "problem definition" component in the Class EA process, identified combined sewer overflows to the Detroit River as a significant source of pollution. A copy of the Executive Summary from the Phase 1 report is included in **Appendix B**.

In Phase 2 of the PCP Study, various pollution control measures were evaluated and alternative CSO control strategies were presented for the Riverfront District. Through this work, and with public consultation, a preferred CSO control plan was identified. This phase of the PCP Study is similar to Phase 2 of the Class EA process where information on alternative solutions is presented leading to the selection of a preferred solution. Copies of the Executive Summary and Technical Summary from the Phase 2 report are included in **Appendix B**.

Phase 3 of the study, completed in 1999, presented an implementation plan for CSO control in the context of the overall pollution control program for the City of Windsor. A copy of the Executive Summary from the Phase 3 report is included in **Appendix B**.

The preferred long term CSO control plan identified in the PCP study included the following main components.

1. Upgrading the Caron Avenue Pumping Station (now Known as C.M.H. Woods Pumping Station) to provide additional pumping capacity.
2. Upgrading the Lou Romano Water Reclamation Plant (LRWRP) to secondary treatment.
3. Provision of additional primary treatment capacity at the LRWRP to capture and treat wet weather flows prior to discharge to the Detroit River.
4. Three satellite RTBs east of Caron Avenue to capture and treat wet weather flows prior to discharge to the Detroit River.
5. Tunnel storage (or possibly RTBs) west of Caron Avenue to capture (or capture and treat in the case of RTBs) wet weather flows prior to discharge to the Detroit River.

Item No. 1 in the City's CSO control plan was completed in 2002 and the facilities described in Items No. 2 and 3 were constructed as part of the completed LRWRP Upgrade and Expansion Project in 2010.

The work in Item No.4 was completed in 2011. The Class EA for Item No.4, which was initiated in 2000 and completed in accordance with the Class Environmental Assessment process in 2009, recommended that the construction of one RTB in the vicinity of Louis/Aylmer Avenue area and installation of a new collection sewer to collect and treat CSOs in the riverfront catchment area east of Caron Ave. Subsequent to the completion of Class EA, the design and construction of the RTB and new collector sewer was started in September 2009 and completed in October 2011 at a cost of $67 million funded by the Federal Government's Infrastructure Stimulus Fund, the Province of Ontario and the City of Windsor.

This Class EA for Item No. 5 started in 2017. The City of Windsor, with funding assistance from the Ministry of the Environment, Conservation, and Parks (MECP) and from the Federal Government through the Great Lakes Sustainability Fund, has initiated this Class EA as the next step in implementing the CSO control program for the riverfront catchment area west of Caron Ave as well as wet weather flow control at the LRWRP.

1.1.3 MECP Procedure F-5-5

The Ontario Ministry of the Environment, Conservation and Parks (MECP) developed Procedure F-5-5 (**Appendix B**) as a supporting document for Guideline F-5 "Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters" and, more specifically, for the determination of treatment requirements for municipal and private combined and partially separated sewage systems. Procedure F-5-5 requires that each municipality or operating authority of a combined sewer system will be expected to:

a) develop a Pollution Prevention and Control Plan (PPCP);

b) meet minimum CSO controls, which specifies that 90% of wet-weather flow is to be captured and treated to primary treatment equivalency; and

c) provide additional controls for beaches impaired by CSOs, and where required by receiving water quality conditions.

The specific targets of the MECP guidelines that determine the level of control required are:

- During a seven month period starting within 15 days of April1, capture and treat at a level equivalent to primary treatment the average dry weather flow plus 90% of average wet weather flow.

- Primary treatment is defined as 50% removal of suspended solids and 30% removal of Biochemical Oxygen Demand (BOD).

- In addition, effluent suspended solids concentrations from a satellite treatment device shall not exceed 90 mg/L more than 50% of the time for an average year for the April to October period.

1.1.4 Purpose of Report

This is an Environmental Study Report (ESR) for controlling combined sewer overflows (CSOs) along the Windsor waterfront between Caron Avenue and the LRWRP as well as wet weather control at the LRWRP.

This Report presents the completed planning and decision making process from the identification of the problem, through the selection of the preferred solution and evaluation of technical alternatives, to the recommendation of a specific design concept. The findings of the PCP Study have been used to re-state the need for this project and to revisit the process followed in selection of the preferred control option. Alternative design approaches are presented and evaluated leading to the selection of a preferred design to control CSOs west of Caron Avenue and wet weather flow control at the LRWRP.

The decision making process is based upon minimizing undesirable impacts on the natural, social and economic environments and the ESR presents the rationale for decisions made. Where impacts on the environment are unavoidable, proposed mitigating measures are presented for consideration to minimize those impacts.

1.2 CLASS ENVIRONMENTAL ASSESSMENT PROCESS

1.2.1 General

The Environmental Assessment Act (the Act) was passed in 1975 by the Province of Ontario to provide a mechanism for public participation in public projects.

The Act provides a means for the public or interested groups to receive the needed assurances that the environment is being protected from adverse effects on any significant public project. If there are necessary adverse effects on the environment, the public also needs assurances that all essential measures are being taken to minimize these impacts. The proponent is to weigh the impacts of several possible alternative ways to achieve the desired objective and to select the best alternative based on a thorough examination of each.

The Act recognized that certain municipal undertakings occur frequently, are small in scale, have a generally predictable range of effects or have relatively minor environmental significance. To ensure that a degree of standardization in the planning process is followed throughout the Province, the Act contemplated the use of the Class EA procedure for projects which require approval under the Act but which are not considered to be major environmental works. The work undertaken in preparation of this study report follows the planning and design process of the Municipal Engineers Association (MEA) Class EA, October 2000, as amended in 2007, 2011 and 2015.

This report also serves as a statement for public use in the decision making process under the Act. Municipal staff and consultants can use the Class EA process in planning, design and construction of projects to ensure that the requirements of the Act are met. As part of the Class EA procedure, the proponent is required to state how the project is to proceed and gain approval under the Act. There are four approval mechanisms available to the proponent under the Class EA:

- **Schedule A** projects are limited in scale, have minimal adverse environmental affects and include several normal or emergency municipal maintenance and operational objectives. These projects are pre-approved and can proceed directly to implementation without following the full Class EA planning process.
- **Schedule A+** projects are a new sub-class of activities introduced as part of the 2007 MEA Class EA amendments. Schedule A+ projects are also pre-approved similar to Schedule A, however; the public is to be advised prior to project implementation. Advising the public of the project implementation is a means to inform the public of what is being undertaken in their local area. The manner in which the public is advised is to be determined by the proponent.
- **Schedule B** projects generally include improvements and minor expansions to existing facilities. In these cases, there is a potential for some adverse environmental impacts and therefore the proponent is required to proceed through a screening process including consultation with those who may be affected.
- **Schedule C** projects generally include the construction of new facilities and major expansions to existing facilities. These projects proceed through the environmental assessment planning process outlined in the Class EA and require preparation of an Environmental Study Report (ESR) to document the planning process.

The preferred solution has multiple activities identified under multiple Class EA schedules. Therefore, this project is being completed under the Municipal Class EA as a **Schedule C** activity, which is the highest identified schedule. Upon completion of Phase 1, Phase 2, Phase 3 and Phase 4 for Schedule C projects, the Owner may proceed directly to Phase 5 and implement the preferred solution.

1.2.2 Phases in Municipal Class EA Process

Figure 1.3 in **Appendix A** illustrates the steps followed in the planning and design of projects covered by the Municipal Class EA. The Class EA for municipal projects follows a five phase planning process that can be summarized as follows:

Phase 1 – Identification of the problem

Phase 2 – Identification of alternative solutions to the problem, consultation with review agencies and the public, selection of the preferred solution, and identification of the project as a Schedule A, A+, B or C activity.

Phase 3 – Identification of alternative design concepts (technical alternatives) for the preferred solution, evaluation of the alternative designs and their impacts on the environment, consultation with review agencies and the public and selection of the preferred design.

Phase 4 – Preparation of an Environmental Study Report (ESR) to document the planning, design and consultation process for the project. The ESR is placed on the public registry for scrutiny by review agencies and the public.

Phase 5 – Final design, construction and commissioning of the selected technical alternative. Monitoring of construction for adherence to environmental provisions and commitments.

2.0 STUDY AREA CONDITIONS

Alternative approaches to address the identified problems must be evaluated based on the potential impact on the existing natural, social and economic environments. The following sections provide a background and description of existing conditions in the study area.

2.1 GENERAL DESCRIPTION OF THE STUDY AREA

The City of Windsor, with a population of 210,000 and an area of 12,063 hectares, is located at the Western end of Lake St. Clair on the south bank of the Detroit River. The riverfront area of the City extends from Lake St. Clair approximately 22.5 km downstream to the west limit of the City. The long term average discharge of the Detroit River is 5,200 m^3/s with mid-channel surface currents of 1 to 1.2 m/s at the Ambassador Bridge. Flow travel time along the riverfront study area from Lake St. Clair to the western City limit is approximately 8 to 9 hours.

There are numerous existing uses of the Detroit River as described in the "Detroit River Remedial Action Plan, Stage 1" dated 1991.

- The river is heavily used for commercial navigation as part of the Great Lakes-St. Lawrence Seaway system with Detroit being the busiest port on the Great Lakes.
- The river is used as a source of cooling water supply for several industries.
- There are five municipal drinking water intakes in the river including the City of Windsor intake in the study area and the Town of Amherstburg intake in the lower reaches of the river near Lake Erie.
- The river supports over sixty species of resident and migratory fish with an associated strong sport fishery.
- The river provides habitat for many resident and migratory birds.
- The Detroit River is an important recreational resource used for activities such as swimming, water skiing, jet skiing, scuba diving, fishing, boating, waterfowl viewing and waterfowl hunting.
- The only two bathing beaches on the Canadian shore of the river are both upstream of the study area (Sand Point Beach and Stop 26).
- The river serves as a receiving water for municipal and industrial discharges.
- There are extensive park areas in the City of Windsor bordering on the river.

The drainage area considered in the study area is shown on **Figure 1-1** of **Appendix A** and is generally described as the lands lying between the E. C. Row Expressway and the Detroit River extending from Caron Avenue on the east to the LRWRP on the west. The topography of the land in the study area is relatively low lying and flat with a fall of 2 to 2.5 metres per kilometre from the south limit of the study area to the river.

Settlement in the Windsor area dates back to the 1700's with a population of 200 being reported in 1836 and 2,500 in 1892. Development generally started along the riverfront and progressed southerly away from the river. As the City grew, it was serviced by a combined sewer system originally designed to convey both sanitary and storm discharges directly to the Detroit River. The West Windsor Pollution Control Plant (WWPCP) now known as the Lou Romano Water Reclamation Plant (LRWRP), and the Riverfront Interceptor Sewer were constructed and put into service in 1970 to eliminate dry weather, along with frequent combined sewer discharges during smaller wet weather events, in order to protect water quality in the Detroit River.

2.2 LAND USE

The study area for this project is comprised of the Riverfront Interceptor Sewer shed along the Detroit River from the LRWRP easterly to C.M.H Woods Pumping Station. This comprises the western core area of the City and includes a portion of the City's industrial area. Most of the developed lands within this area are serviced with combined sewers that discharged directly to the Detroit River prior to completion of the Riverfront Interceptor Sewer and the LRWRP in 1970.

2.3 EXISTING WASTEWATER FACILITIES

2.3.1 Lou Romano Water Reclamation Plant (LRWRP)

The LRWRP (formerly known as the West Windsor Pollution Control Plant) is located on a 14.6 hectare site at the intersection of Ojibway Parkway and Sandwich Street in the City of Windsor. It services an area of approximately 11,450 hectares that includes all of the City of Windsor west of Pillette Road and the northern portion of the Town of LaSalle. The population served by the LRWRP is about 140,000 persons with an additional 22,000 people in LaSalle.

The plant was placed in service in 1970 as a 109,090 m^3/day primary treatment plant. In 1974, the City of Windsor added chemical treatment to the process to remove phosphorus. The addition of the chemical treatment facilities not only satisfied the requirement with respect to achieving an effluent phosphorous level of 1 mg/l or less but also substantially improved the quality of the effluent with respect to BOD (biochemical oxygen demand) and suspended solids concentrations. In 1981 the plant was expanded to a capacity of 163,636 m^3/day to accommodate additional flows from the South Windsor area and to accept sanitary sewage from the adjacent Town of LaSalle.

In 2002 an Environmental Study Report (ESR) was completed for capacity expansion and upgrading of the LRPCP. The ESR called for expansion of the plant to a treatment capacity of 218,200 m^3/day and upgrading the level of treatment to provide secondary biological treatment facilities. Expansion and upgrading of the LRWRP was completed in 2010. Expansion and upgrading of the LRWRP also included the provision of 108,080 m^3/day primary treatment capacity for WWF treatment.

As shown on **Figure 1-1** of **Appendix A**, the LRWRP receives wastewater from the 1800mm diameter Riverfront Interceptor Sewer, servicing the original core section of the City. It also receives wastewater from the Western Main Trunk Sanitary Sewer (also known as the Western-Grand Marais Sanitary Trunk), presently servicing the existing and recently developed areas of South Windsor. Sewage treatment services are also being provided for the Town of LaSalle. The 750mm diameter sanitary forcemain from the Town of LaSalle discharges to a drop manhole and a 1050mm diameter sewer connection to the Western Main Trunk Sanitary Sewer.

The Riverfront Interceptor and Western Main Trunk Sanitary Sewer discharge wastewater into an Inlet Chamber. Flow out of the Inlet Chamber is through two 2400mm x 2400mm sluice gates to the plant inlet sewers. The two 2400mm diameter plant inlet sewers convey water from the Inlet Chamber to two 2400mm wide x 3960mm high inlet channels, each containing a coarse bar screen and isolating sluice gates.

2.3.2 Riverfront Interceptor Sewer and C.M.H Woods Pumping Station

The Riverfront Interceptor sewer was constructed and placed in service along the Windsor waterfront in 1970. The purpose of the sewer is to intercept flows from combined sewers that formerly discharged directly to the Detroit River and convey this flow to LRWRP for treatment.

The Riverfront Interceptor in the study area, as shown on **Figure 1-1** of **Appendix A**, extends from Caron Avenue on the east to the LRWRP in the west end of the City. The monolithic concrete sewer is 1.68 metres in diameter between the Caron Avenue pumping station and Curry Avenue. The Interceptor Sewer is 1.83 metres in diameter between Curry Avenue and Detroit Street and 2.00 metres in diameter from that point to the inlet chamber at the LRWRP.

Sewage flow from the east of Caron Avenue is lifted at the C.M.H Woods Pumping Station (formerly Caron Avenue Pumping Station) and discharged to the downstream interceptor for gravity flow from that point to the inlet chamber at the LRWRP. The C.M.H Woods Pumping Station is equipped with four raw sewage pumps and standby diesel electrical generator facilities. There is no bypass of sewage from the C.M.H Woods Pumping Station.

2.3.3 Interceptor Chambers

There are 12 interceptor chambers in the study area. The locations of the Interceptor Chambers are shown on **Figure 1-1** of **Appendix A**. The interceptor chambers were generally designed to divert 2.5 to 4 times dry weather flow (DWF) from the combined sewers to the Riverfront Interceptor Sewer. Ten of the chambers use static flow control devices. **Figure 2-1** of **Appendix A** provides a sketch showing the functional design of this type of chamber. In these chambers, the amount of discharge to the interceptor sewer is controlled by the position of a sluice or stop gate on the pipe connecting the chamber to the Interceptor Sewer. As flows increase and exceed the interceptor setting, liquid level in the chamber increases and overflows a fixed weir. The flow passing over the fixed weir is discharged to the Detroit River as a combined sewer overflow (CSO). **Figure 2-2** of **Appendix A** illustrates different flow conditions in an Interceptor Chamber.

Two of the chambers - Bridge Avenue (Chamber F) and Elm Avenue (Chamber H) are automated chambers equipped with hydraulically actuated sluice gates. A level differential sensing and control mechanism regulates the position of the interceptor gate and the by-pass gate to direct 2½ to 4 times dry weather flow to the interceptor sewer and prevent backflow from the Detroit River into the interceptor chamber.

2.3.4 Windsor Riverfront RTB Facility

The Retention Treatment Basin (RTB), which is located in the vicinity of Louis/Aylmer Avenue area, is a facility for the collection and treatment of combined sewer overflows from the riverfront area east of Caron Avenue. This RTB was designed and constructed to comply with the requirements of Procedure F-5-5, which was developed to address water quality problems resulting from CSOs.

This RTB collection and treatment facility, which was constructed in 2010, consists of 1,650 mm and 2,250 mm diameter collection/conveyance sewers over a length of 2,400 m, a 9 m deep 7,850 L/s influent pumping station with four identical screw pumps, as well as a high-rate RTB with a peak design flow of 7.85 m^3/s. The facility also includes five (5) CSO Interceptor Chambers designed to capture and direct the peak CSO flows to the RTB via. the Interceptor Sewer:

This RTB is a high-rate treatment facility with polymer flocculation, which is approximately 15% of the size of conventional RTB designs for primary settling facilities. This was shown to lead to significant construction cost savings and markedly reduce the potential impacts on the natural environment because of the smaller overall footprint. The RTB basin is an underground concrete structure with a prestressed precast concrete slab roof. It consists of 12 (36.9m x 4.75m x 3.55m) storage/treatment cells with a total storage capacity of 8000 m^3. The roof of the RTB is used as a Municipal Parking lot with enhanced landscaping to compliment the beauty of the Windsor Riverfront.

2.3.5 Western Main Trunk Sewer

The Western Main Trunk Sanitary Sewer (also known as the Western-Grand Marais Sanitary Trunk) presently services the existing and recently developed areas of South Windsor. Sewage treatment services are also being provided for the Town of LaSalle. The 750mm diameter sanitary forcemain from the Town of LaSalle discharges to a drop manhole and a 1050mm diameter sewer connection to the Western Main Trunk Sanitary Sewer.

The Western Main Trunk Sanitary Sewer system is a separate sanitary sewer system that was designed to carry domestic wastewater to the LRWRP. However, extraneous flows into the sanitary sewer system results in significant flow increases during snow melt and storm events. Potential sources of extraneous flows included rainfall-dependent inflow and infiltration (i.e. entry of surface water through manhole lids, illicit connection of drains from private proprieties), and ground infiltration (i.e. groundwater entering through damaged pipe and manhole walls).

2.4 NATURAL ENVIRONMENT

2.4.1 Climate

The climate in Essex County is classified as modified humid continental, which has hot and humid summers with mild winters and adequate precipitation. In comparison with the other areas in the Province, Essex County's southerly latitude and proximity to the lower Great Lakes provides for warmer summer and winter temperatures with a longer growing season. Because the area is also on one of the major continental storm tracks, it experiences wide variations in day-to-day weather including severe summer thunderstorms. The normal minimum and maximum temperatures are –9 ^{0}C and +28 ^{0}C respectively and the mean daily temperature is above 6 ^{0}C, which tends to increase temperatures in surface waters.

2.4.2 Geology and Physiography

The City of Windsor is located in the physiographic region of Southwestern Ontario known as the St. Clair Clay Plains. As the name suggests the area is covered with extensive clay plains. The Topography of the area is extremely flat with elevations ranging from 175 to 204 meters above sea level.

Most of the bedrock under the region is sedimentary limestone of the Devonian age which has a high calcium and magnesium content. The bedrock in the majority of Essex County is covered by glacial drift with a thickness ranging from 3 m to 45 m from west to east. The parent soil material is a heavy ground moraine and lacustrine deposition containing a considerable amount of limestone, appreciable amounts of shale and some igneous rock.

2.4.3 Soils and Subsurface Conditions

Soils within the County of Essex were formed from heavy ground moraine which has been altered by glacial lake wave action and lacustrine deposition. The majority of the area is part of a smooth clay plain and the predominant soil types are Perth and Brookston clays and their associated clay loams. Developed from dolomitic limestone intermixed with shale, the imperfectly drained member is the Perth clays and the poorly drained member is the Brookston clays.

The clay deposits found in the majority of the Windsor area consist of a stiff silty clay to clayey silt deposited without significant stratification and possessing a distinctively till-like structure with a small fraction of sand and gravel sized particles distributed randomly throughout. In the west end of Windsor, this till-like deposit is overlain by a lacustrine deposit of soft to firm, layered silty clay. This deposit was laid down in the glacial lakes in front of the ice sheet during their retreat in the post glacial period, when the level of Lake Erie was considerably higher than it is at present. These layered strata, of varying thicknesses and strengths, are known to exist up to 30 meters in total depth.

There have been a number of soils investigations in this area over the past 30 years in conjunction with various construction projects. **Figure 2-3** of **Appendix A** shows the location of geotechnical investigations carried out by Golder Associates for the City of Windsor in the past 30 years.

The study area has generally very poor soil conditions for construction purposes. The area is characterized by low shear strengths (25 kPa or less) low penetration resistance (as low as 1 blow per 0.3 metres), and high water contents.

The soil report for the existing riverfront interceptor sewer from Caron Avenue on the east to the LRWRP on the west is included in **Appendix D**. Subsurface conditions vary significantly in short distances throughout this area of the City. Prior to the start of any construction, project specific geotechnical investigations should be carried out to confirm the findings of previous reports, fill in any gaps not tested in previous studies and evaluate any changes in the water table levels.

2.4.4 Natural Vegetation

The County lies completely within the Niagara section of the Deciduous Forest Region of Ontario. Favourable soil and climatic conditions have allowed for the extension of many species of Carolinian and prairie flora which makes the region unique in Canada.

The riverfront study area consists mainly of open green space, parking lots and garden areas with paved walking and cycling paths.

2.4.5 Terrestrial Animal Life

The residential, commercial and industrial land uses in the study area only support a very limited number of small animals such as squirrels and rabbits that have adapted to human's activity.

2.5 CULTURAL, SOCIAL AND ECONOMIC ENVIRONMENT

2.5.1 Study Area

The study area, within the boundaries of the City of Windsor, can be described as an urban community. The study area contains a mixture of residential, commercial and industrial developments.

Air quality in the area is poor which has been partially attributed to heavy industry on the American side of the Detroit River. Noise levels are typical of City settings.

The study area is well served with a good road system and a full range of utilities including electrical power, water, natural gas and telephone.

2.5.2 Official Plan

The City of Windsor has an Official Plan and zoning by-laws that regulate and control development and planning policies in the service area. These documents are revised from time to time as necessary to take into account physical and social changes affecting the City.

A key element in the City's planning for the riverfront area is the Central Riverfront Implementation Plan, September 2000. The Central Riverfront area represents approximately 95 acres over 6-kilometers of riverfront extending from McKee Park on the west to the Hiram Walker lands in the east. This area includes the proposed sites for the CSO control facilities. Careful consideration needs to be given in planning and development of the CSO control facilities to ensure they are compatible with and complementary to the existing and proposed future uses of the waterfront.

2.5.3 Archeological

Windsor is an area rich in cultural heritage resources, and diversified cultural traditions. **Figure 2.4** of **Appendix A**, which is adapted from Figure 4: 'Archaeological Potential' of the City of Windsor Archaeological Master Plan, shows land containing archaeological resources or areas of archaeological potential within the City of Windsor. There are a number of recognized heritage resources, including Fort Gowie, on the west side of the Caron Avenue Pumping Station (now Known as C.M.H. Woods Pumping Station). Fort Gowie was a stockaded house that was burned by the Americans in August 1812 at the start of the War of 1812.

In accordance with the Checklist for Determining Archaeological Potential from the Ministry of Tourism and Culture, a Stage 1 Archaeological Assessment is to be conducted for lands impacted by this project. If the Stage 1 Archaeological Assessment concludes that these areas have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources, a further Stage will be conducted to determine if any archaeological resources are on the property using either pedestrian survey or test pit survey.

There are the following two alternative sites for the construction of CSO/WWF control facility:

- Alternate Site No.1 site on the Riverfront at Huron Church Road
- Alternate Site No. 2 Site on the south side of Sandwich Street and Ojibway Pkwy intersection

The first alternative site is located on the Riverfront at Huron Church Road; immediately to the east of the Ambassador Bridge. The second alternative site is located across the road from the LRWRP and just East of the Prism Berlie Biosolids Management Facility. The site is bordered by Ojibway Parkway to the East, Sandwich Street to the West and West Windsor Power and Prism Berlie to the South.

A Stage 1 archaeological assessment was undertaken on March 11, 2019 by Stantec for the above two alternative work sites. The Stage 1 archaeological assessment consists of a review of geographic, land use and historical information for the property and the relevant surrounding area, a property visit to inspect its current condition and contacting MTCS to find out whether there are any known archaeological sites on or near the property. Its purpose is to identify areas of archaeological potential and further archaeological assessment (e.g. Stage 2-4) as necessary. The Stage 1 archaeological assessment is included in **Appendix D**.

The Stage 1 archaeological assessment indicates that the two alternative sites were found to be undisturbed areas which have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources and are recommended for further Stage 2 Archaeological Assessment during final design phase prior to proceeding with construction. The Stage 2 Archaeological Assessment is to determine if any archaeological resources are on the property using test pit survey.

Besides the CSO/WWF control facility, the proposed work also consists of an outfall sewer and a tunneled sewer. As per 'Archaeological Potential' map of the City of Windsor Archaeological Master Plan, these areas have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources. A Stage 1 and Stage 2 Archeological assessment will be completed at locations where the proposed work is to take place. These investigations will need to be undertaken during final design phase when the exact locations of proposed work have been determined.

2.5.4 Build Heritage and Cultural Heritage Landscapes

Figure 2.5 of **Appendix A** is an aerial plan showing the build heritage and cultural heritage Landscapes around the potential proposed work area. The heritage resources around the proposed work area were identified based on the Windsor Municipal Heritage Register provided by the City of Windsor. The City of Windsor's Planning and Building Services Department was also consulted to determine the location and details of Built Heritage and Cultural Heritage Landscapes.

As shown in **Figure 2.5** of **Appendix A**, there is no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas. The nearest one would be the Battle of Lake Erie Mural, which is located on the other side of Russel Street where a new 6-8 m deep sewer is to be constructed by tunneling under the existing road. There is an existing tunneled sewer, which was constructed between the Battle of Lake Erie Mural and the new proposed sewer.

The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was completed for this project. The completed checklist is included in **Appendix D**. As shown in **Figure 2.5** of **Appendix A**, the proposed work is located away from these built heritage and cultural heritage landscapes, the proposed work is not expected to impact heritage resources in the area.

3.0 PROBLEM STATEMENT

3.1 PROBLEM IDENTIFICATION

Flows in combined sewer systems during storm events are generally much larger than those under dry weather conditions. Because of limited sewer and treatment plant capacity, the combined sewer systems were designed to overflow occasionally and discharge excess flows directly to nearby receiving waters. In most cases, CSO are discharged from the collection systems without treatment. Frequent CSOs are considered to be a major source of water quality impairment for the receiving waters. Since the 1990s, much attention has been directed to reducing the amount of pollutants discharged. The PCP study investigated pollutant loads discharged from the riverfront area within the City of Windsor to the Detroit River. Windsor's CSOs represent less than 5% of the total annual volume discharged to the Detroit River, but contribute 27% of the total annual solids load. CSO events occur at random, and with varying duration and intensity. The CSOs tend to have high solid concentrations when compared with other major sources of pollution in the Detroit River.

In recent years, the LRWRP frequently experienced periods of high flow for extended durations during storm events. The plant inlet sewers and inlet chamber are often surcharged due to excess wet weather flows during extreme storm events. **Figure 3.1** of **Appendix A** shows Rainfall Amounts and Sewage Flows Received at the LRWRP. During the extreme storm event of August 29, 2017, the maximum water level in the LRWRP Inlet Chamber was recorded at 175.1m, which almost reached the Screening and Grit Removal Building lower floor elevation of 175.26 m. Flows from the Riverfront Interceptor Sewer and from the Western Main Trunk Sewer both meet at the plant's inlet chamber and during severe storm events, often exceed plant pumping capacity. This causes water levels in the Western Main Trunk Sewer to rise which could potentially lead to basement flooding.

The LRWRP doesn't have flow balancing at the treatment plant inlet area, flow diversion from the treatment plant to perform maintenance and some potential for wet weather flow relief. The present window of 3 to 4 hours during the night makes for extremely difficult logistics and maintenance in the raw sewage well is almost impossible.

3.2 PROJECT OBJECTIVE

The City of Windsor, with funding assistance from the Ministry of the Environment, Conservation, and Parks (MECP) and from the Federal Government through the Great Lakes Sustainability Fund, has initiated this Class EA as the next step in implementing CSO control for the Windsor Riverfront West of the Caron Avenue recommended in the PCP study.

Problem Statement
July 17, 2019

The purpose of this EA study will be to investigate and report on alternative means of controlling CSO in the riverfront area between the CMH Woods Pumping Station and the LRWRP and wet weather flows received at the LRWRP. The standards for controlling the CSO are set out by the Ministry of the Environment and Climate Change in Procedure F-5-5.

An auxiliary but very important aspect of the work will be to determine if any of the CSO control alternatives can also be used to reduce water levels at the inlet chamber to the LRWRP during severe storm events. It would certainly be beneficial if any of the potential CSO control alternatives could also be used to alleviate the high-water conditions and reduce the potential for flooding in the areas served by the Western Main Trunk Sewer.

A value-added objective of the work is to provide an emergency backup in the event of a catastrophic failure or extremely difficult logistics and maintenance at the plant.

4.0 DEVELOPMENT AND EVALUATION OF ALTERNATIVE SOLUTIONS

4.1 INTRODUCTION

The previous section along with the background materials included in Appendix B described and demonstrated the problems of the combined sewer system in the study area and wet weather flows at the LRWRP under Phase 1 of the Class EA process.

The following sections present details of work undertaken under Phase 2 of the Class EA process. Phase 2 involves the identification and evaluation of various conceptual alternatives with the objective of determining alternative solutions which best address the identified problems and needs based on the potential impact to the natural, social, and economic environments.

The Municipal Class EA process in Ontario defines the requirements for the development of a reasonable range of alternatives including a Do-Nothing option to provide a benchmark for the evaluation of alternatives. The development of potential alternatives should also consider the methods of implementation.

This section outlines the process that was taken to identify a suite of alternatives for the Project. The purpose of this section is to consider reasonable solutions to the defined problem. Some solutions may be touched upon briefly, but not considered as options to be evaluated for one reason or another, as explained below. However, some alternatives were not economical and/or not feasible in comparison to other viable solutions, and thus not discussed in detail in this report.

4.2 ALTERNATIVE SOLUTIONS TO ADDRESS PROBLEM

Several conceptual alternative solutions may be proposed to address the identified problems and needs of the project. The following broad planning level alternative solutions have been considered for providing adequate control of the combined sewer system in the study area and wet weather flows at the LRWRP:

1. Do nothing
2. Sewer Separation (sanitary – storm)
3. Storage (underground/surface storage)
4. Treatment
5. A Combination of Storage and Treatment

Each alternative solution is discussed in the following sections.

4.2.1 Alternative 1: Do Nothing

The "Do Nothing" option provides a benchmark for the evaluation and is a required component of the environmental assessment process. This option assumes that nothing is done to address the stated problem. If nothing is done, the pollutant loading discharges into the Detroit River will not be reduced. Further, if nothing is done to handle extreme wet weather flow at the LRWRP, the surcharges in the combined and sanitary sewer systems, the potential risk of flooding, and property damage will not be effectively controlled, particularly during periods of heavy rain events.

4.2.2 Alternative 2: Sewer Separation

Sewer separation has traditionally been adopted by many municipalities to address CSO control. The cost of sewer separation can in many cases be significantly more than other control measures. However, there are circumstances where separation is advantageous when local flooding is an issue. As an alternative for the Riverfront long term control plan sewer separation is considered. The level of CSO control that would be achieved is 100%. However, a consequence of sewer separation is the creation of new stormwater flows. The new stormwater flows would contribute to pollutant loadings in the Detroit River. The results of the PCP study showed that, for most of the pollutant parameters evaluated, if the new stormwater flows are not appropriately controlled, sewer separation would result in a 5 to 10% increase in pollutant loadings to the Detroit River. It was found that sewer separation would impact the River the most and in many cases increase the pollutant loadings while the storage and treatment options have a positive effect of reducing pollutant loadings to the River.

Sewer separation requires installation of new separate storm sewers, connection of existing catch basins to new sewers, and disconnect existing catch basin from combined sewer system. Sewer separation is very costly and very disruptive to the community. During construction, there is disruption to local and through traffic, bus routes, businesses, pedestrians and the community at large.

4.2.3 Alternative 3: Storage

Alternative 3 Storage is to buffer peak flow rates and retain some of the runoff until treatment capacity becomes available. This reduces uncontrolled discharges to the receiving water by sending more of the combined sewage to the treatment plant.

4.2.3.1 In-line Storage

In-line storage, often operated with real time control (RTC), involves retaining wet-weather flow in the sewer pipe for smaller rainstorms. It is beneficial in reducing the amount of CSO by managing flows in the system to maximize the existing facilities. Where in-line storage is extremely beneficial is in managing flows for the smaller and more frequent events that would result in overflow even though there is system capacity.

In-line storage uses gates or similar devices to reduce conveyance to combined sewer overflow locations during wet weather and allows flow to back up into and be stored within the otherwise unoccupied portions of the combined sewer pipe. The structure of the Riverfront collection system and regulators are well suited to in-line storage with the ability to regulate and store flow in upstream facilities. However, currently there is insufficient real time flow information to establish a set of operating criteria.

Typically, large old trunk sewers offer potential storage for combined sewage during smaller storms. However, the existing trunk sewer in the study area was built in 1960 and has a limited capacity for in-line storage. In-line storage can also potentially threaten basement flooding.

4.2.3.2 Off-Line Near Surface Storage

This comprises large, near-surface tanks located at the end of the combined sewer trunks or overflow locations. Off-line storage facilities are typically located at local overflow sites where only local area flow is captured. The stored runoff is drained to the interceptor sewer as capacity is available.

Through an assessment of the study area and discussions with the City staff, two potential sites for near surface storage were identified (refer to **Figure 5.1, Figure 5-3A and Figure 5-3B**)

- Huron Church Site
- LRWRP Site

The site constraints limit the size of the potential storage units and therefore restricts the percentage of control that can be achieved with each storage option. The above tributary storage sites will not be able to meet the 90% wet weather volume control requirement based on the restricted site space. Tunnel storage only is considered to be possible to meet 90% wet weather volume control requirements.

The off-line near surface storage scenario can potentially capture both combined sewer overflows from the Riverfront Interceptor Sewer and excess wet weather flow from the Western Main Truck Sanitary Sewer. However, the site constraints limit space available for sufficient surface storage.

4.2.3.3 Off-Line Tunnel Storage

Large tunnels can be used to collect and store combined sewage from overflow locations for subsequent treatment at the plant when capacity is available. This tunnel storage system would parallel the existing interceptor.

Tunnel storage would collect and store combined sewage from Caron Avenue on the east to the Lou Romano Water Reclamation Plant (LRWRP) on the west for later treatment at the plant. A hydrologic-hydraulic computer model was developed to determine the CSO volume from the Windsor waterfront study area during the long-term average precipitation year. The results of this model study indicate that the required 90% capture of CSOs from the area west of Caron Avenue can be achieved with a tunnel storage of 47,100 m^3 by capturing CSO at Chambers A, D, F, H and LRWRP that currently bypass these locations during wet weather events. Results of the computer model analysis is included in **Appendix E**. This tunnel would be 3.3m in diameter and would extend 5.5km long from Caron Ave to LRWRP to store the required volume to meet the 90% capture rate.The primary advantage of tunnel storage as a pollution control option is that it is capable of very high degrees of control as long as sufficient capacity can be provided. Secondary benefits may include flow balancing at the treatment plant, flow diversion from the treatment plant to perform maintenance and some potential for flood relief during moderate storm events. The disadvantage to tunnel storage is that although it reduces CSO to the River, the City's combined sewer system service area is large enough that the tunnel would not provide a robust system to handle extreme storm events because it only has sufficient volume to store the required CSO volume during the average year. As a result, extreme storms would still generate flows that exceed the pumping capacity at LRWRP. Once exceeded this would create a backwater condition on the sewer system that can contribute to basement flooding. Also, tunnel storage requires large capital investment and a commitment to on-going operation and maintenance, easements through private property, and significant cost to construct a tunnel sewer of the required size.

4.2.4 Alternative 4: Treatment

Alternative 4 is to reduce the pollutant load in CSO to receiving waters. The following treatment technologies are used in the treatment of CSOs:

4.2.4.1 Off-line Near Surface Sedimentation Tank

Sedimentation basins are similar to off-line storage tanks except a limited level of sedimentation treatment is provided for flows in excess of the tank volume. Coarse screening, floatables control and disinfection are commonly provided as part of the facility.

The performance of sedimentation basins is based on volumetric control and pollutant reduction. TSS is used as the measure of pollutant removal which is consistent with the objectives set out by the MECP F-5-5 Guidelines. The objective of the analysis is to meet or exceed the guideline requirement of 90% volumetric control with an equivalent to primary treatment (50% TSS removal). The 30% removal of BOD is assumed with a 50% reduction in TSS.

The Windsor CSO Characterization and Treatability Study developed the settling rate curves for the wet-weather sewage solids at the LRWRP, and reported that an average of 70% of TSS was non-settleable at an equivalent surface-loading rate of 10 m/hr. The settling rate curves show that the characteristics of the wet-weather sewage at the LRWRP during CSO events were similar to those of samples collected at actual overflow sites along the Windsor Riverfront.

Since Windsor CSO contains an average of 70% non-settleable solids at an equivalent surface-loading rate of 10 m/hr, a smaller sedimentation tank only will not be able to achieve a desired level of treatment. As surface-loading rates decreases, the removal efficiency increases. Typical loading rates range from 1.0 m/hr to 3.3 m/hr (25 to 80 $m^3/d/m^2$) to achieve a 50% of TSS reduction. Chemical additions would have the effect of reducing the size of basin and potentially, the overall cost.

4.2.4.2 Vortex Technologies

Vortex solids separation is achieved by inducing a vortex motion in a vessel. Separators are typically designed for loading rates of 1,000 to 5,000 $m^3/d/m^2$. Vortex devices are installed as high rate treatment facilities where site constraints restrict the use of storage/sedimentation facilities. Removal efficiencies of vortex devices can vary significantly and depend greatly on the influent solids characteristics and surface loading rates.

The advantage of vortex separators is in providing a level of treatment higher than that of sedimentation basins during high flow periods where the loading rates to the sedimentation basin exceed the capacity of the basin. Vortex separators can be used in conjunction with sedimentation basins to achieve a higher overall level of removal for a wider range of flows.

It is possible to consider vortex devices alone, or in combination with sedimentation basins, however, the solid characteristics has significant impact on the treatment performance. Due to the higher percentage of non-settleable solids in Windsor CSOs and wet weather flows at the LRWRP, it is impossible to achieve a desired level of treatment by the vortex technology without a combination with chemical addition to improve solids/liquid separation.

4.2.4.3 Ballasted Clarifiers

Ballasted flocculation, also known as high rate clarification, is a physical/chemical treatment process that uses continuously recycled media and a variety of additives to improve the settling properties of suspended solids through improved floc bridging.

Ballasted flocculation units function through the addition of a coagulant or polymer and a ballast material such as microsand or magnetic powder or chemically enhanced sludge. When combined with chemical addition such as ferric sulfate or anionic polymer, this ballast material can reduce coagulation-sedimentation time. Because of the typically high coagulant and coagulant aid dosages employed, these technologies may also yield a greater degree of pollutant removal.

The main advantage of these processes is the very high rate of treatment possible that allows a reasonably small footprint. It is reported that ballasted flocculation units have operated with overflow rates of 50 to 195 m/hr while achieving 80% to 95% of TSS removal. This technology has been applied both within traditional treatment trains, as a parallel treatment train in new or existing sewage works, and as overflow treatment for peak wet weather flow.

Ballasted flocculation requires more operator judgement and more complex instrumentation and controls than other treatment processes. Ballasted flocculation has low removal rates during the start-up period (typically 15 to 20 minutes after a wet weather event). Ferric coagulants used in ballasted flocculation may have the risk of coating UV lamps in UV disinfection process at the PRWRP. Extensive pilot testing is to be required to collect data to be used in the design of the full-scale installation.

4.2.4.4 Chemically Enhanced Primary Treatment

Chemically enhanced primary treatment (CEPT) consists of coagulation/flocculation, followed by sedimentation. The CEPT involves the addition of coagulant chemicals (such as metal salts and/or polymers in the form of organic polyelectrolytes) to the influent of CSO/WWF treatment facilities. Chemicals typically used aluminum sulfate (alum) and polymer. The addition of these chemicals can increase the removal efficiency of TSS and associated BOD_5 of a CSO/WWF treatment facility. In addition, the addition of these chemicals can increase the capacity of the treatment facility as well as removal efficiencies. Performance of CEPT is a function of chemical dosage as well as other factors (e.g., CSO/WWF characteristics, system design, and surface overflow rate).

Due to the high percentage of non-settleable solids in Windsor CSO and wet weather flow at the LRWRP, chemical additions would have the effect of reducing the size of basin, improving treatment, and potentially, the overall cost. The Windsor CSO Characterization and Treatability Study investigated the need and effectiveness of chemical additions on a site specific basis, and demonstrated that the use of polymer coagulation significantly improved TSS removal and allowed the SOR in the settling basins to be significantly increased, resulting in smaller treatment units.

The advantage of CEPT is in providing a level of treatment higher than that of sedimentation basins during high flow periods where the loading rates to the sedimentation basin exceed the capacity of basin. The CEPT can be used in conjunction with sedimentation basins to achieve a higher overall level of removal for a wider range of flows.

The CEPT uses the same clarifier configuration as the ballasted clarifications systems. Since no ballast is added, a significantly less amount of equipment and labour required to operate the CEPT system. The CEPT relies on chemical addition and a larger area for settling. This results in a larger treatment area than the ballasted systems but a smaller area than the conventional settling tanks. This CEPT system has been successfully applied for wet weather flow treatment at the LRWRP.

4.2.4.5 Disinfection

Chlorine, liquid sodium hypochlorite, chlorine dioxide, ultraviolet radiation (UV) and ozone are some of the more common disinfection technologies. According to Procedure F-5-5, implementation of effluent disinfection is required where the effluent affects swimming and bathing beaches and other areas where there are public health concerns.

Disinfection is used where bacteria is a concern to public health. The potential CSO effluent discharges to the Detroit River between Prospect Avenue and McKEE Street where there are no public health concerns. Therefore, disinfection is not considered necessary.

4.2.5 Alternative 5: A Combination of Storage and Treatment

In addition to the above alternatives, there are other possibilities which combine sewer improvement alternatives. The CSO and wet weather control can be achieved by combining "Alternative No.3: Storage" with "Alternative No.4: Treatment".

CSO events occur at random and their characteristics depend on the intensity and duration of the rainfall, among other factors. Large volumes of CSO can occur in a relatively short time. For the storage option, huge storage tanks are required to capture and store the volume of the CSO from the Riverfront Interceptor Sewer and the WWF from the West Main Trunk Sanitary Sewer for later treatment when treatment capacity is available at the LRWRP. Alternatively, conventional retention-treatment basins (RTBs) may be used to capture some of the CSO and to provide flow-through treatment of the remaining volume. However, in urban areas, sufficient land is generally not available for building storage tanks or conventional RTBs. Furthermore, the results obtained from the treatability and characterization study indicate that Windsor CSO shows poor settling characteristics, and the treatment requirements specified in Procedure F-5-5 can't be met without chemical enhancement. Therefore, it appears that smaller, chemically-aided RTBs with high surface overflow rates (SOR) are the preferred approach to CSO control.

The chemically-aided RTB is an established technology for CSO treatment. It has been constructed for controlling CSOs from the area east of Caron Avenue, and in operation since 2010. The existing chemically-aided RTB has proven to be effective for CSO control.

This alternative is to construct a chemically-aided RTB to temporarily store water and then release it at a controlled rate to the LRWRP for treatment during smaller storm events and provide flow-through treatment of the excess volume during heavy storm events. **Figure 4-1** of **Appendix A** shows a sketch of a typical RTB. It can provide CSO/WWF control while enhancing water quality. The chemically-aided RTB is used to store or treat CSOs during storm events with the contents of the tanks being discharged to the LRWRP after the storm event has subsided. The

RTB would not only serve to achieve CSO control along the Riverfront Interceptor Sewer but would also help to accommodate wet weather input from the Western Main Trunk Sewer and protect the LRWRP from wet weather overload conditions. This would aid in the prevention of surcharging of the Western Main Trunk Sewer thereby reducing the incidence of sewer back-up.

Secondary benefits may include flow balancing at the treatment plant and flow diversion from the treatment plant to perform maintenance. The present window of 3 to 4 hours during the night makes for extremely difficult logistics and maintenance in the raw sewage well is almost impossible. The RTB could provide significant flexibility and redundancy to help facilitate maintenance activities.

The chemically-aided RTB provides primary treatment of wet weather flows and the accumulated sediment is usually flushed to the treatment plant during low flow periods. It has been determined that all flows reaching the RTB facility receive a sufficient level of primary treatment to satisfy Procedure F-5-5 for CSO control.

With the combination of storage and treatment it is feasible to achieve a desired level of treatment while providing certain storage capacity and requiring a smaller footprint and less capital cost. There is a direct relationship between the volume of RTB storage required for CSO control and the treatment rate. The greater the treatment rate, the more effective the facility becomes at reducing the storage volume required.

4.3 SCREENING AND EVALUATION OF ALTERNATIVE SOLUTIONS

4.3.1 Evaluation Criteria

To determine the preferred alternative, each alternative will be evaluated using the same set of evaluation criteria. The criteria used to develop the alternatives were based on generally accepted principles and previous experience. There are the following three major evaluation categories for these alternatives:

- Socio-economic Environment
- Natural Environment
- Technical Suitability and Other Engineering Aspects

Each major category had its own subset of specific criteria. Each criterion was considered based on how important or adverse the impact would be if left unmitigated, and the duration of the impact and its effects.

4.3.2 Socio-Economic Environment

4.3.2.1 Economic Considerations

Alternative 1 Do Nothing planning solution involves retaining the combined sewer system and carrying out no improvements, expansions, or new works to remedy the identified problems and needs. It eliminates the need for large capital expenditures; however, it does not address the problems and needs of pollution control in the study area.

Alternative 2 Sewer Separation and Alternative 3 Storage planning solutions have traditionally been adopted by many municipalities to address CSO control. The cost of sewer separation and storage is significantly more than other alternative solutions. It would require a large capital investment, resulting in a large total life cycle cost.

Alternative 4 and 5 planning solutions would require a moderate capital investment resulting in less financial burden on the city. These alternative solutions can cost-effectively address riverfront CSO as well as wet weather flow at the LRWRP.

4.3.2.2 Heritage and Archaeological Resources

Alternative 1 would have no impact on heritage or archaeological features as there would be no major construction on the existing property or expansion to other properties.

Alternative 2 Sewer separation would have significant impact on heritage or archaeological features as it covers the entire study area including riverfront and historic Sandwich town centre. Construction activities would have significant disturbances and impacts along the waterfront and historic streets.

Alternative 3, 4 and 5 would be constructed in selected locations. They would have moderate impact on heritage or archaeological features. If Alternatives 3, 4 or 5 were selected as the preferred alternative, heritage and archaeological assessment would be required to confirm if there were any heritage and archaeological interests in the exact site location.

4.3.2.3 Acceptability to the Public

Alternative 1 Do Nothing involves retaining the existing wastewater plant and carrying out no improvements, expansions, or new works to remedy the identified problems and needs. This alternative will limit future growth in the community and does not provide an acceptable solution to the problems and needs. Therefore, it would not be acceptable to the public.

Alternative 2 Sewer separation is to separate the combined, single pipe system into separate sewers for sanitary and storm water flows. This alternative would have significant disturbance to the community as it covers the entire study area. Negative impacts associated with sewer separation include extensive construction and construction related impacts (e.g., noise, dust, erosion), disruption to residents and businesses, possible disruptions in sewer service. Therefore, it would be less acceptable to the public.

Alternative 3, 4 and 5 would be constructed in selected locations. Compared to Alternative 2 Sewer separation, they would have less impact on the community.

4.3.3 Natural Environment

Alternative 1 would not require any construction activities and there would be therefore no impacts on terrestrial or aquatic environment. However, because there would be no improvement to the water quality, this Alternative would have long term negative impact on the aquatic environment.

Alternative 2, Sewer Separation, may contribute to improvements to water quality due to the reduction or elimination of sanitary discharges to receiving water bodies. However, the increased storm water discharges resulting from sewer separation could decrease the positive impacts of the Separation unless storm water discharges are mitigated. Unless stormwater management facilities are constructed as part of sewer separation, sewer separation does not reduce pollutant loading to the Detroit River. Therefore, Alternative 2 would have moderate long-term impacts on the terrestrial and aquatic environment. This alternative would also cause disturbance to the terrestrial and aquatic environment during construction.

Alternative 3, 4 and 5 planning solutions would cause disturbance to the terrestrial and aquatic environment during construction. All of these alternative solutions would reduce pollutant loadings to the Detroit River, which would be a positive impact for the aquatic environment.

4.3.4 Technical Suitability and Other Engineering Aspects

Each alternative planning solution is evaluated against one another in the following subset of specific criteria.

- Ability to meet Procedure F-5-5
- Ability to address plant inlet sewer surcharge during extreme storm events
- Feasibility of implementation
- Easy of operation & maintenance

4.3.4.1 Do Nothing

Do Nothing planning solution involves retaining the combined sewer system and carrying out no improvements, expansions, or new works to remedy the identified problems and needs. It eliminates the need for large capital expenditures; however, it does not address the problems and needs of pollution control in the study area. Under this alternative, due to limited capacity of existing sewer infrastructure and the increasing rainfalls in recent years, the Do Nothing alternative would ultimately result in the capacities of existing sewer system being significantly below the desired capacities to comply with MECP F-5-5 requirements.

The Do Nothing alternative is therefore not considered a viable option and will not be considered further in this study; however, it can serve as a benchmark to evaluate the implications if none of the other planning alternatives are implemented.

4.3.4.2 Sewer Separation (sanitary – storm)

Sewer Separation has traditionally been adopted by many municipalities to address CSO control. The cost of sewer separation is significantly more than other alternative solutions. Sewer separation would achieve 100% CSO control. However, a consequence of sewer separation is the creation of new stormwater flows. Sewer separation does not reduce pollutant loading to the Detroit River unless stormwater treatment facilities are constructed as part of sewer separation. Sewer separation also has significant disturbances to residents and businesses, and potentially encounters areas of archaeological significance during construction. Sewer separation is therefore not considered to be a viable alternative solution for CSO control.

4.3.4.3 Storage (underground/surface storage)

Storage is capable of very high degrees of control as long as sufficient capacity can be provided. The effect of the storage alternative on the treatment plant would be to prolong elevated wastewater flows after wet weather events. The increased hydraulic loading on the plant would restrict the plant to accommodate the future growth and development of the study area. Therefore, the storage alternative should consider increasing the plant capacity. Otherwise, if there is significant increase in the dry weather flows from the LRWRP servicing area, it will reduce the treatment capacity available to drain the stored flows resulting in increased storage requirements to achieve the 90% objective for wet weather flow control. The storage alternative requires a large capital investment and can't handle excessive wet weather flow due to climate changes if sufficient capacity is not provided. The storage option is therefore not considered to be a viable alternative solution.

4.3.4.4 Treatment

Treatment of CSO/WWF is generally referred to as high rate clarification treatment. It is intended to reduce the pollutant load to the receiving waters. Available high rate treatment technologies include vortex technologies, ballasted clarifiers and chemically enhanced primary treatment. The high rate treatment option can achieve a desired level of treatment while requiring a smaller footprint.

The treatment performance of vortex technologies greatly relies on the solid characteristics. Windsor CSOs and wet weather flows at the LRWRP contain a higher percentage of non-settleable solids, it is impossible to achieve a desired level of treatment by the vortex technology without a combination with chemical addition to improve solids/liquid separation.

The high rate ballasted clarification treatment is a complex interaction of chemical, physical and hydraulic processes. It requires pretreatment and more complex instrumentation and controls than other technologies. The treatment option has low flexibility and resilience for CSO/WWF under a wide range of heavy rain events. It also has low removal rates during the start-up period. The treatment option is therefore not considered to be a viable alternative solution.

The CEPT uses the same clarifier configuration as the ballasted clarifications systems. Since no ballast is added, a significantly less amount of equipment and labour required to operate the CEPT system. The CEPT relies on chemical addition and a larger area for settling. This results in a larger treatment area than the ballasted systems but a smaller area than the conventional settling tanks. The CEPT can be combined with storage to form a preferred solution as described below.

4.3.4.5 A Combination of Storage and Treatment

A Combination of Storage and chemically enhanced primary treatment temporarily store water during smaller storm events and then release it at a controlled rate to the LRWRP for treatment when the LRWRP has spare capacity; and provide flow-through treatment of the excess volume during heavy wet weather events. It is feasible to achieve a desired level of treatment and storage while requiring a smaller footprint and less capital cost. The combination of storage and treatment solution offers the provision of a greater degree of flow control and pollution control and will enhance the hydraulics and quality of the wastewater collection systems and improve the natural environment to a great extent.

This planning alternative represents a viable solution to the identified problems and will be considered further in this study.

4.3.5 Decision Matrix of Alternatives

A comparative summary of the five conceptual planning level alternative solutions and their ability to meet the needs is presented in **Table 4.1**. The ranking matrix presented in **Table 4.1** provides an evaluation of each of the three alternatives in relation to specific evaluation categories. For each category, the alternatives were ranked from 1 to 3, with 3 being the highest ranked option. The alternative with the highest total score at the end of the evaluation would be the preferred alternative.

Throughout the course of this study, the above five alternatives were reviewed and evaluated in detail with the City to ensure that the most cost effective, viable long-term solution was identified. Based on the evaluation of the above alternatives with the City, Alternative 5:

chemically-aided RTB, a combination of Storage and Treatment has been identified as the preferred alternatives. This alternative can address wet weather flow at the LRWRP while satisfying Procedure F-5-5 for CSO control.

it is anticipated that the recommended solution will not have any significant adverse effect on wildlife, vegetation or the habitat characteristics of any particular species. In fact, it is anticipated that the provision of a greater degree of CSO/WWF storage and treatment will enhance the quality of local watercourses and improve the natural environment to a great extent. The main impact on the socio-economic environment is related to the disruption that residents and businesses may experience during the course of construction. However, this potential inconvenience and disruption would be temporary and should not significantly affect the environment.

With respect to other socio-economic impacts, the recommended solution is also not considered to have any serious impacts on existing land uses, cultural activities, heritage resources or any other community program except to the extent that it will permit the ongoing implementation of development and other activities as envisaged in planning documents which have positive impacts on the socio-economic environments.

Table 4-1: Comparative Summary of Conceptual Planning Alternatives

Alternative Solutions	**1.Do Nothing**	**2.Sewer Separation (sanitary – storm)**	**3.Storage (underground/surface storage)**	**4.Treatment**	**5.Retention Treatment Basin**
Economic considerations	**3** none	**1** High capital cost	**1** High capital cost	**2** Moderate capital cost	**2** Moderate capital cost
Impact on heritage and archaeological	**3** No	**1** High	**2** Moderate	**2** Moderate	**2** Moderate
Acceptability to the public	**1** Low – no construction means no growth	**1** Low - involves greater community disruption	**2** Moderate	**2** Moderate	**2** Moderate
Impact on natural environment	**1** High – no reduction in pollutant load	**2** Moderate level of pollutant reduction	**2** Moderate level of pollutant reduction	**3** High level of pollutant reduction	**3** High level of pollutant reduction
Ability to meet Procedure F-5-5	**1** Not met	**3** Achieve 100% CSO control	**3** Will be met	**3** Will be met	**3** Will be met
Ability to address plant inlet surcharge	**1** Surcharge can't be addressed	**2** Will be partially addressed	**1** Surcharge can't be addressed	**3** Will be addressed with new outfall	**3** Will be addressed with new outfall
Feasibility of implementation	**3** no implementation	**1** complicated	**1** Limited space available	**1** Pilot test required to size full-scale system	**3** Proven technology
Easy of operation & maintenance	**3** Less O&M required	**3** Less O&M required	**2** Moderate	**1** higher level equipment & control	**2** Moderate
Total Score	**16**	**14**	**14**	**17**	**20**
Recommendation	**NR**	**NR**	**NR**	**NR**	**R**

*** R = Recommended NR = Not Recommended**

4.4 SCREENING SUMMARY AND RECOMMENDED ALTERNATIVE SOLUTIONS

A comparative summary of the five standalone conceptual planning level alternative solutions and their ability to meet Procedure 5-5 CSO requirements and address plant inlet sewer surcharge at the LRWRP during extreme wet weather events is presented in **Table 4.1**. The recommended alternative solution is to ensure adequate infrastructure is in place for sewer servicing in the study area. Each planning level alternative and its ability to reduce pollutant discharge into the Detroit River, and also possibly reduce the risk and extent of sewer surcharge and basement flooding was thoroughly evaluated during the course of this study. The results of the preliminary screening clearly indicate that the recommended alternative solutions which address the identified problems and study objectives are as follows:

Alternative 5: A Combination of Storage and Treatment, a chemically-aided RTB

- temporarily store water during smaller storm events and then release it at a controlled rate to the LRWRP for treatment when the LRWRP has spare capacity
- provide flow-through treatment of the excess volume during heavy storm events

The recommended alternative solution is capable of

- meeting Procedure 5-5 CSO requirements;
- addressing inlet sewer surcharge at the LRWRP during extreme wet weather events; and
- providing an emergency backup in the event of a catastrophic failure or extremely difficult logistics and maintenance at the Lou Romano Water Reclamation Plant.

The following sections identify and evaluate the alternative design concepts of the recommended solutions.

5.0 ALTERNATIVE DESIGN CONCEPTS AND RECOMMENDATIONS

In this section of the report alternative designs for the recommended solution are identified and evaluated leading to the selection of a preferred design for this application. The recommended solution consists of the following main elements for which alternative designs need to be evaluated:

- CSO collection system
- RTB facility
- An effluent outfall to carry treated effluent from the RTB to the Detroit River.

The evaluation of alternative designs includes consideration of potential environmental, social and economic impacts and recognizes the need to design the facilities in such a way that they will be as unobtrusive as possible and blend in with existing and proposed uses on the Windsor waterfront.

5.1 ALTERNATIVE CSO COLLECTION SYSTEM

5.1.1 General

The Minimum Combined Sewer Overflow (CSO) Controls set out Procedure F-5-5 include the need to:

“…. capture and treat for an average year all the dry weather flow plus 90% of the volume resulting from wet weather flow that is above the dry weather flow. The volumetric control criterion is applied to the flows collected by the sewer system immediately above each overflow location unless it can be shown through modelling and on-going monitoring that the criterion is being achieved on a system-wide basis.”

From the foregoing, the general alternatives available for CSO collection are to collect CSOs at each existing overflow point or to collect CSOs at only selected overflow points to achieve the 90% system-wide control criteria. As noted in Section 4.3.1, the preferred long term CSO control plan developed as part of the Windsor Riverfront Pollution Control Planning Study was formulated based on achieving 90% system wide volumetric control rather than 90% control at each outfall location. This approach achieves the same degree of pollution control while reducing construction costs and minimizing construction related impacts along the waterfront. Accordingly, the following sections review alternative designs to achieve 90% system-wide control of CSOs rather than at each existing overflow location. This is discussed further in Section 5.1.2

5.1.2 CSO Interception

The function of the upgraded interception facilities is to capture CSOs that currently bypass the existing Riverfront Interceptor Chambers during wet weather events and direct the captured flows to the new CSO/WWF storage and treatment facilities. The upgraded Interceptor Chambers will be designed to capture sufficient flow to meet the 90% system wide control requirement.

There are presently twelve (12) Interceptor Chambers on the Riverfront Interceptor Sewer west of Caron Avenue (refer to **Figure 1-1** of **Appendix A**). The total land area tributary to these chambers is 956.6 hectares. **Table 5.1**, taken in part from Table 6.3 in the Phase 1 Report for the Windsor Riverfront PCP Study, provides a listing of the interceptor chambers showing the land area served by each chamber. Individual interceptor chambers serve tributary areas ranging from a high of 234 hectares for Chamber South to a low of 1.5 hectares for Chamber B2.

Table 5.1 also shows the existing interception ratio at each chamber. The Interception Ratio for each chamber is determined by dividing the measured dynamic interception capacity of the chamber by the average dry weather flow to the chamber. For example, Chamber H captures a flow of 6,400 m^3/d which is equivalent to 6.7 times dry weather flow from that drainage area. The 6.7 Interception Ratio means that the chamber is currently capturing all dry weather flow plus a significant amount of runoff during storm events.

The hydrologic-hydraulic computer model developed as part of this EA study was used to determine the amount of CSOs from the Windsor waterfront during the long-term average precipitation year. Use of this model indicates that the required 90% capture of CSOs from the area west of Caron Avenue can be achieved by:

- Maintaining the existing capture rates to the Riverfront Interceptor Sewer
- Increasing capture rates at existing Interceptor Chambers A, D and F to capture CSOs that currently bypass these chambers during wet weather events.

The capture rates needed at Interceptor Chambers A, D and F to achieve 90% basin wide control are summarized in **Table 5.2** and shown in **Figure 5-1** of **Appendix A**. Results of the computer model analysis is included in **Appendix E**.

Capture rates are proposed to be increased at these three (3) interceptor chambers. The chambers will be designed to intercept wet weather flows that currently bypass the Riverfront Interceptor Chambers and direct the captured CSO volumes to the new CSO collector sewer and Riverfront Interceptor Sewer.

Table 5-1 Interceptor Chambers on Riverfront West of Caron Avenue

Chamber	Drainage Area (ha)	Dynamic Interception Capacity (m^3/d)	Measured or Calculated Average DWF (m^3/d)	Interception Ratio
A (Hill)	208.9	9,800	815	12.0
South	234.0	Sewer separation with storm relief		
B1 (Brock) (1)	1.5	n/a	n/a	n/a
B2 (Brock)	1.5	1,700	40	42.5
Huron	19.8	12,700	522	24.3
C (Mill)	5.7	3,700	50	74.0
D (Detroit)	84.4	10,500	2,500	4.2
E (Askin)	76.4	12,200	950	12.8
F (Bridge)	161.9	24,500	4,600	5.3
G (Curry)	26.6	7,100	702	10.1
H (ELM)	120.0	6,400	960	6.7
I (Crawford)	15.9	7,300	419	17.4

Notes:
(1) Chamber B1 has been replaced with a maintenance hole and no longer functions as an interceptor chamber

Table 5-2 Existing and proposed Capture Rates of Chambers A, D and F

Chamber	Volumetric Capture Rate (%)	
	Existing	Proposed
A (Hill)	70	**87**
D (Detroit)	75	**90**
F (Bridge)	69	**92**
System-wide Capture Rate	74%	**91%**

The three (3) upgraded Interceptor Chambers will be required to capture higher flow volumes than the existing Interceptor Chambers. It should noted that the three interceptor chambers will be upgraded to increase capture without raising the water level over the fixed weirs. The proposed upgrades to Chambers A, D and F are generally described as follows:

Chamber A & D

The existing Riverfront Interceptor Chambers A and D have fixed overflow weirs to the River and adjustable control gates on the outlet connection to the Riverfront Interceptor Sewer. The control gates on the outlet sewers are to be removed to increase Chamber A and D’s interception rates.

Chamber F

Existing Interceptor Chamber F is an automated control interceptor chamber. It is not anticipated that modifications to the existing interceptor chamber will be required. Plant Gate C2 control settings are to be adjusted to increase the CSO capture rate. A hydraulic analysis was completed to assess impacts to the downstream sewer system at higher interception rates and is discussed in **Section 5.1.3**.

5.1.3 CSO Collection System

5.1.3.1 CSO Collection System Configurations

The function of the CSO Collection System is to transport CSOs from Interceptor Chambers A, D and F to the RTB facilities near the LRWRP. The new CSO Collection System will be located on the north side of the existing chambers running generally parallel to the alignment of the existing Interceptor Sewer.

Figure 5-2 of **Appendix A** provides a plan and sectional view of existing sewer system infrastructure along the riverfront between Caron Avenue and the LRWRP. The profile view shows the existing Riverfront Interceptor Sewer draining from east to west into the Inlet Chamber at the LRWRP. As can be seen there are several combined sewers and storm sewers flowing from south to north towards the river and crossing above the Interceptor Sewer.

The alternative design possibilities that have been considered for the CSO Collection System are summarized as follows:

- Construct pumping facilities at CSO Interceptor Chambers A, D and F to lift CSOs up into a shallow gravity sewer leading to the RTB or complete with forcemains to carry CSOs from the Interceptor Chambers to the RTB.

- ➢ Utilize the existing riverfront interceptor sewer and construct a deep sewer from Chamber A to the RTB together with pumping facilities at the RTB to either lift flow into the RTB or to convey treated effluent from the RTB to the river.

The potential advantage of the first alternative is that it may be possible to route the forcemains or the gravity sewer at a shallow enough depth to avoid interference with the existing sewer system infrastructure. A detailed layout has not been done to determine if it is feasible to avoid interferences along the entire route. The disadvantages of this alternative is that it would require construction of major pumping facilities at three locations along the waterfront and would also involve open cut construction for installation of forcemains or a shallow gravity sewer through the areas occupied by Sandwich Street and other areas of potential archaeological significance. The impact on the waterfront both during construction and also with ongoing operating and maintenance activities at the pumping stations would be significant.

The advantage of the second alternative is that pumping facilities will be required only at the RTB site and construction of a deeper sewer by tunnelling will significantly minimize disturbances along the waterfront and Sandwich Street. The disadvantage of this alternative is that sewer construction by tunnelling is generally more costly than by open cut method.

Environmental and social considerations definitely favour use of the second alternative. Also, although detailed costing of the alternatives has not been undertaken, a general cost comparison indicates there are several factors that will offset the cost of constructing a deeper sewer by tunnelling. There will be major savings in economy of scale and in other factors associated with eliminating three large pumping stations along the waterfront and Sandwich Street and consolidating all pumping and control requirements at the RTB site. These savings not only relate to initial construction costs but also to ongoing operating and maintenance costs. There will also be a very significant reduction in cost to mitigate disturbances along the waterfront.

Based on the foregoing, the first alternative has not been carried forward for further consideration as alternative designs. A CSO Collection System consisting of a deep gravity sewer from the CSO Interceptor Chambers to the RTB site with pumping facilities at the RTB is recommended as the preferred design. Additional details of this alternative are provided in the following sections.

5.1.3.2 CSO Collector Sewer Sizing

The existing Riverfront Interceptor sewer will be utilized to convey increased CSO flows from Interceptor Chambers A, D and F. To ensure no adverse impacts to the Riverfront Interceptor sewer's hydraulic grade line a hydraulic analysis was completed for all storms, including the 100-year and ERCA's urban stress test which exceeds the 100-year storm (used for analysing system resiliency due to potential climate change impacts). The hydraulic profile of the Riverfront

Interceptor sewer PRE (existing conditions) and POST (with improvements) is included in **Appendix E**. The result of the analysis was that a new CSO collector sewer will be constructed from Chamber A to the LRWRP to carry increased flow from Chambers A, D and F. The existing riverfront interceptor sewer will be utilized to convey CSOs from the Interceptor Chambers D and F to the CSO collector sewer at Interceptor Chamber A. The new CSO Collector sewer increases the hydraulic capacity of the Riverfront Interceptor sewer to accommodate the increased CSO flows to ensure no adverse impact on the City's combined and sanitary sewer system, including the Riverfront Interceptor Sewer and sanitary sewers west of LRWRP. The hydraulic profile in **Appendix E** shows the level of service in the area immediately near LRWRP and near Interceptor Chambers A (Hill – Sandwich), D (Detroit – Sandwich) and F (Elm – Riverside) improves as a result of the preferred design.

Figure 5-2 of **Appendix A** shows a conceptual plan and profile view of the proposed new CSO Collector Sewer (shown in red) superimposed on the existing sewer system infrastructure plan. The general alignment of the new collector sewer is parallel to and north of the existing Riverfront Interceptor Sewer. The profile shows the new sewer to be generally at the same depth and grade as the Riverfront Interceptor Sewer. Notes on preliminary sizing and grades for the new sewer are shown on the drawing.

Two objectives to be met in selecting an appropriate depth and grade for the new CSO Collector Sewer are to have it deep enough to avoid existing utilities and, at the same time, maintain a shallow enough depth to allow gravity drainage to the Inlet Chamber after a storm event. The proposed CSO Collector Sewer profile, as shown on **Figure 5-2**, satisfies these criteria with the new sewer passing under the existing north-south sewers and providing an interconnection to the Inlet Chamber at the LRWRP. The following utilities shown in **Figure 5-2** and discussed below will need to be carefully reviewed and verified during final design to avoid interference with the new Tunnel Sewer:

- High voltage (HV) overhead hydro (OVH) transmission lines that run west to east from Prospect to Chappell and then run northerly across the Detroit River. These OVH lines are within a Hydro One easement. A portion of the Hydro One easement contains the existing Riverfront Interceptor. This Hydro One power corridor connecting the aerial OVH lines that cross the Detroit River to interconnect DTE Energy's Delray Energy Center in Detroit to the Hydro One J.C. Keith Transformer Station in Windsor are an imperative component of the electrical transmission system which provides power to millions of people in both Canada and the USA. The tunnel sewer will cross the OVH lines at Chappell and Prospect, and generally run parallel to them between Chappell and Prospect.
- Essex Terminal Railway (ETR) train tracks running west to east between Prospect Ave to Hill Ave. This section of railway services Windsor Salt Co., Van de Hogan Cartage Ltd, K-Scrap Resources Ltd, Miller Aggregates and Sterling Fuels. The tunnel sewer will cross the ETR Railway in multiple locations.

- Utopia/Windsor-Sarnia high pressure ethane feedstock pipeline which runs along the east side of Prospect Ave. The pipeline feeds NOVA Chemicals refinery in Sarnia from producers in Ohio and Michigan. Kinder Morgan is the owner and operator of this pipeline in the USA and Plains Midstream Canada is the Canadian owner and operator. The Cochin Batch ID Station where this pipeline rises above grade is located east of the LRWRP property line just south of Sandwich St. The invert of the pipeline is to be investigated during detailed design. It is anticipated that the tunnel sewer will cross under the high-pressure ethane pipeline.
- Future Prince Road Storm Pumping Station at the intersection of Russell St and Chappell Ave. The new tunnel sewer must be tunnelled south of the future pump station because the invert of the pump station is at similar elevation as the proposed tunnel sewer's invert. Refer to **Figure 5-2**.
- Work around existing 1050mm dia. combined sewer servicing lots on Russel St between Chappell and Hill. Details to be determined during design.

The size of the proposed collector sewer is 1.950 metre diameter from Hill Street to the RTB. The collector sewer will be constructed by tunnelling. The tunnelled sewer will be approximately 5 to 8 metres below ground level and, as such, should not impact any archaeological resources. Stage 2 archaeological assessment investigations will be required at access shaft locations along the tunnelled portion of the sewer. These investigations will need to be undertaken during final design when the exact route of the sewer and the location of chambers and access shafts have been determined.

5.2 RTB DESIGN CONSIDERATIONS

5.2.1 RTB Site

The alternative RTB sites that have been considered are summarized as follows:

- Alternate No.1 Proposed RTB Site on the Riverfront at Huron Church Road
- Alternate No. 2 Site Adjacent to the LRWRP

The first alternative is located on the Riverfront at Huron Church Road; immediately to the east of the Ambassador Bridge, refer to **Figure 5-3A** of **Appendix A**. This site would be far too conflicting with current infrastructure. There is a major Fiber Optic cable that runs east along the riverfront and may run through the proposed site. The design and construction of the outfall may have special requirements due to the proximity to the Ambassador Bridge and the pier/walkway which extends 65 meters from the shore. Providing power to the proposed RTB site will require an overhead pole line or underground feeder with a maximum length of 200 meters from University Ave to the site.

The second alternative using the area adjacent to the LRWRP site is designated for future construction of retention tanks as per the PCP study, refer to **Figure 5-3B** of **Appendix A**. The proposed site is located across the road from the LRWRP and just East of the Prism Berlie Biosolids Management Facility. The site is bordered by Ojibway Parkway to the East, Sandwich Street to the West and West Windsor Power and Prism Berlie to the South. An RTB outfall sewer along Prospect Avenue in parallel with the existing LRWRP outfall sewer has been found to be more feasible. Also, power supply is available from an existing 3 phase 27.6KV overhead power line that crosses Ojibway Parkway near gate 3 of the LRWRP and runs between Prism Berlie and the Trucking Company site. This site offers several advantages compared to the Ambassador Bridge site and is carried forward as the preferred option.

The main components of the proposed RTB system are

- A pumping station to lift CSO into the RTB or to discharge treated effluent from the RTB
- A retention treatment basin
- An outfall to the Detroit River

Alternative designs for these components are discussed in the following sections.

5.2.2 CSO Pumping Station

5.2.2.1 Pumping Station Configurations

Two alternatives are available for pumping at the RTB site. The influent pumping alternative consists of pumping flow from the CSO Collector Sewer up into the RTB with gravity flow from that point through the RTB and the effluent outfall into the river. The effluent pumping alternative consists of gravity flow from the CSO Collector Sewer through the RTB with a pumping station to lift effluent from the RTB into the outfall to the river. **Figure 5-4A** of **Appendix A** shows a schematic diagram for the influent pumping alternative and **Figure 5-4B** of **Appendix A** illustrates the effluent pumping alternative.

The size of the pumping station with respect to pumping head and horsepower will be the same in both cases. From a process viewpoint the main difference between the two is that the influent alternative will be pumping raw CSO flows and the effluent alternative will be handling treated effluent from the RTB. Pump selection for the two alternatives may therefore differ to suit the material being pumped. Solids handling type pumps would be appropriate to accommodate the coarser material in the CSO influent flow but would not necessarily be required for the treated effluent stream from the RTB.

The most significant difference between the two alternatives is illustrated in **Figures 5-4A** and **Figure 5-4B** of **Appendix A**. From **Figure 5-4A** it can be seen that the bottom of the RTB will be 3 to 5 metres (10 to 15 feet) below ground level for the influent pumping alternative. By comparison, the effluent pumping alternative in **Figure 5-4B** shows that the bottom of the RTB will be over 7.5 metres (25 feet) below ground. A preliminary cost comparison indicates that the construction cost for the deeper RTB will be approximately five million dollars more than the shallower basin. The comparison is based on construction of both alternatives taking place in a sheet pile enclosure to control water seepage from the river and to limit the area impacted by construction activities.

The construction cost comparison strongly favours the influent pumping alternative. Founding the basin at a higher elevation also has other beneficial effects including:

- Provides more available headloss to drain and thoroughly flush the basin back to the Inlet Chamber after a storm event.

- Providing easier access for operating and maintenance activities.

- Reduces provisions needed to counteract basin uplift and flotation when the RTB is empty.

Based on the foregoing the influent pumping alternative is recommended as the preferred design. One potential drawback associated with influent pumping is that raw CSO can contain solids, rags and other debris that could cause operating and maintenance problems with the influent pumps. However, these concerns with solids handling can be largely eliminated by using screw pumps to lift CSO into the RTB. The City is familiar with screw pumps and has had good experience in using this type of pump in stormwater and wastewater pumping applications similar to this proposed CSO application. An added inherent advantage of screw pumps is that they provide smooth output flow variations to match the influent flow rate to the station. This will provide better hydraulic conditions and treatment efficiency in the RTB than would be achieved by using constant speed centrifugal pumps. It is therefore recommended that screw pumps be used in design of the influent pumping station.

5.2.2.2 Pumping Station Sizing

The design alternatives that have been considered for sizing the RTB Facility are summarized as follows:

- Size the RTB in accordance with MECP F-5-5 guidelines for CSO control. This would involve sizing the facility for peak flow generated during the average year 1967.

- Size the RTB for peak flow from 100-year storm plus some additional system resiliency for potential climate change. The 100-year with climate change resiliency design storm has 39% more volume than the 100-year storm (150mm over 24hr as compared to 108mm over 24hr).

The hydrologic-hydraulic computer model developed as part of this EA study was used to determine the peak flow generated from the average year, and from the 100-year with climate change resiliency storm**. Table 5-3** shows the results of the analysis. The table shows that the required RTB firm capacity is much higher if sizing for 100yr with climate change resiliency as compared to the average year. The firm capacity of the RTB is the peak flow from the sewer system minus the desired peak flow treated at LRWRP.

Table 5-3: Peak Flow Generated from Design Alternatives for Sizing RTB

Description	**Design Storm**		
	Alternative No.1 1967 Average Year Storm (CMS)	**Alternative No.2 100 Year Storm (CMS)**	**Alternative No.3 100yr + Climate Change Resiliency (CMS)**
Sewer System Peak Flow	8.6	11.9	15.6
Peak Flow to LRWRP	6.4 (1) (550MLD)	6.9 (2) (736MLD)	6.9 (2) (736MLD)
Peak Flow to RTB ($Q_{SYSTEM} – Q_{LRWRP}$)	2.2	5.0	8.7
Notes: (1) Selected based on meeting MECP’s F-5-5 guidelines for 90% capture and treatment (2) Selected based on treating all flow at LRWRP to preliminary level of treatment			

The potential advantage of sizing the RTB for the average year is that the capital cost to construct the infrastructure would be significantly less than Alternative No.2. Although Alternative No.1 has lower capital cost, the disadvantage is that it would not provide the plant with a robust system to handle extreme storms. Through discussions with the City there have been several historical rainfall events that have exceeded plant capacity and the inlet sluice gates had to be throttled closed to prevent damage to the plant. Extreme storms would generate flows that exceed the pumping capacity of Alternative No.1. Once exceeded this would create a backwater condition on the sewer system that can contribute to basement flooding.

The advantage of Alternative No.2 is that pumping facilities would be sized for the extreme 100-year storm with some additional safety factor for system resiliency due to potential climate change. This design would not only meet MECP F-5-5 guidelines, but would also significantly improve sewer system capacity in the immediate area surrounding the LRWRP. The second alternative addresses MECP and ERCA review comments received from the Draft ESR Report, and is also consistent with ERCA’s recommended approach to assess system resiliency and vulnerability, due to recent extreme rainfall experiences in the Essex County region. The disadvantage is that the capital cost to construct the infrastructure would generally be higher than Alternative No.1.

Although detailed costing of the alternatives has not been undertaken, a general cost comparison indicates there are several factors that will offset the cost of constructing Alternative No.3. Environmental and social considerations definitely favour use of Alternative No.3. A more robust sewer system and improved level of service in areas immediately surrounding the LRWRP would result in societal benefits. Environmentally, more CSO can be captured and treated than 90% of the average year during extreme storm events, which would otherwise bypass primary treatment. Alternative No.3 includes RTB with a peak hydraulic capacity equivalent to the total firm capacity of the LRWRP influent pumping station. An added and very significant benefit is that Alternative No.3 will provide an emergency backup in the event of a catastrophic failure or extremely difficult logistics and maintenance at the LRWRP.

Based on the foregoing, Alternative No.3 has been carried forward for further consideration as alternative designs. The new RTB is sized to handle wet weather flow exceeding LRWRP hydraulic capacity under 100-year with climate change resiliency design storm. A detailed hydraulic analysis of the RTB system and final sizing and selection of pumps will be undertaken during final design. The preliminary analysis carried out in preparing this report is based on sizing the influent pumping facilities to lift the design flow of 8.7 CMS up approximately 7.5 metres into the RTB. At this point it is assumed that the RTB influent pumping station will consist of three duty pumps each rated at 2.90 CMS with a fourth identical standby pump. The station will have approximately 1600 total installed pumping horsepower and approximately 1200 operating horsepower. Provision is included in the preliminary design for standby power facilities since infrequent, short term interruptions in electrical supply will adversely affect wet weather flow control at the LRWRP. It is anticipated that infrequent, short term interruptions in electrical supply will adversely affect the RTB system or the Procedure F-5-5 objective of 90% basin wide CSO control.

5.2.3 Retention Treatment Basin

5.2.3.1 Basin Sizing

A review of RTB technology and experience in North American and European jurisdictions was undertaken to gather information to support preliminary design of the Windsor RTB facilities. This review indicated that there are established RTB design criteria in Europe (Germany) but there are no specific standards for sizing of RTB facilities either in the United States or Canada. In Ontario, MECP Procedure F-5-5 governs performance but no specific criteria exist for RTB sizing.

The German standard for design of RTBs specifies a design surface overflow rate (SOR) of 10 m/hr with tank length to width ratio of at least two for rectangular tanks. Specific design criteria exist in North America for the design of primary sedimentation facilities that, in many ways, are similar to RTBs. Design criteria for primary sedimentation tanks are based on long experience of operating these facilities at wastewater treatment plants. Recommended design SORs for primary settling tanks are generally in the range of 2 to 5 m/hr and minimum tank depths are typically 3 to 5 metres. The preliminary RTB basin sizing used in the Windsor Riverfront PCP study was based on an assumed SOR of 3.3 m/hr.

The Windsor CSO Characterization and Treatability Study is described in Section 1.2.5 of this report and a copy of the Abstract from a copy of the "Windsor Combined Sewer Overflow Treatability Study Comprehensive Report" is included in **Appendix B**. A copy of a paper titled "Windsor CSO Treatability Study – Modelling of a Retention Treatment Basin (RTB)" is also included in **Appendix E**. The findings of this work indicate that, with polymer addition to enhance settling and flotation, good removal (>70%) of suspended solids can be achieved for SOR < 30 m/hr. It is further noted that removal at SOR values higher than 25 m/hr is highly dependent on the fraction of the influent in the floatable class. The City of Windsor has an RTB facility located on the riverfront between Aylmer Avenue and Glengarry Avenue. The existing RTB facility was designed using a peak design SOR of 20 m/hr for a CSO flow of 7.65 CMS.

The conclusion drawn from the Windsor CSO Characterization and Treatability Study and from the performance of the existing RTB facility, is that it is appropriate to design the proposed RTB facilities using a peak design SOR of 20 m/hr. Applying a peak design SOR of 20 m/hr to a CSO flow of 8.7 m^3/s results in a basin with a net surface area of approximately 1,566 square metres.

5.2.3.2 Basin Configuration and Features

Figure 5-5A and **Figure 5-5B** of **Appendix A** provide conceptual plan and sectional views respectively of the proposed RTB facilities and influent pumping station. The dimensions and elevations shown on the sketches are intended to provide an indication of the overall size of the facilities. These dimensions are for illustration purposes and will be subject to verification and modifications during final design. **Figure 5-6B** of **Appendix A**, showing the proposed RTB facilities superimposed on an aerial photograph of the City owned land located on the south side of Sandwich Street and Ojibway Pkwy intersection, gives an indication of the scale of the facilities with respect to existing features on the site.

A general functional description of the RTB facilities and the various features shown in **Figure 5-5A** and **Figure 5-5B** of **Appendix A** is provided as follows.

- Flow from the CSO Collector Sewer as well as excess wet weather flow from the LRWRP Inlet Chamber is conveyed into the RTB inlet well, and then lifted through the influent pumping station up into the inlet distribution channel of the RTB. The interconnection sewer between the RTB and the LRWRP Inlet Chamber is sloped from the RTB back to the LRWRP Inlet Chamber. This reverse slope provides positive drainage of the RTB contents back to the LRWRP Inlet Chamber after a storm event.

- Polymer is added in the screw pumping/influent distribution channel area to promote flocculation of solids in the CSO stream and enhance solids removal in the RTB.

- The influent distribution channel is designed to distribute flow equally to all of the individual cells in the RTB.

- Flow passes over a weir on the wall of the inlet distribution channel and through an inlet baffle system designed to reduce velocity currents and achieve uniform flow conditions across the basin.

- Flow enters the flushing water storage compartments. There is one storage compartment for each cell in the RTB. The compartments are fitted with flushing gates that are maintained in a closed position while the basin is in operation.

- Flow fills the storage compartments and then overflows into the main basin of the RTB. The basin fills and solids are removed from the CSO by settling to the bottom of the basin or floating to the water surface.

- A scum baffle is located near the outlet end of the basin to capture floating material and prevent it from reaching the effluent weir.

- Treated effluent from the basin flows under the scum baffle and over the effluent weir system to an effluent chamber. The effluent weir is shown as a finger weir arrangement. This arrangement increases the length of the effluent weir to reduce weir overflow velocities and enhance solids retention in the basin.

- Treated effluent flows from the effluent chamber through an outfall to the Detroit River.

- After a storm event the CSO collector sewer and pumping station inlet well are drained to the LRWRP Inlet Chamber through an interconnection pipe between the RTB and the LRWRP Inlet Chamber. Timing for drainage and the rate of drainage are controlled to correspond with available capacity in the LRWRP.

- The contents of the RTB are then drained through the pumping station inlet well and the interconnection pipe back to the LRWRP Inlet Chamber.

- After the basin is completely drained, the flushing gates on the individual cells in the RTB are activated in sequence to open and flush solids from the basin back to the LRWRP Inlet Chamber.

The foregoing description refers to flushing gates being used to remove accumulated solids from the RTB after a storm event. The selection of flushing gates as the preferred design was made after a review of alternative methods of solids removal. The alternatives considered include manual cleaning, spray nozzle systems and flushing systems.

The manual cleaning alternative, although very flexible and effective, was discarded because it is very labour intensive, involves frequent entry into a potentially dangerous space and requires large volumes of high pressure water.

Spray systems utilize high pressure spray oriented in such a manner that the spray causes scouring and movement of the accumulated sediment toward the basin outlet. Nozzles can be fixed to the tank structure or mounted on travelling bridges. Because of the high flow and pressure demands, cleaning of the tank may have to be carried out in sections. The spray cleaning method was not selected as a preferred alternative due to the requirement for large volumes of high pressure water, the complexity of pumping, supply and control systems, and the need to enter the tank on a routine basis to adjust and maintain the system.

Two types of flushing mechanisms that have been widely used are tipping flushers and gate flushers. Both systems operate on the principle of quickly releasing a sufficient quantity of water to create a flushing wave that cleans the tank bottom. The main difference between the two systems is that gate flushers use detained CSO to flush the basin, while tipping flushers require an external water source. Both systems impose requirements in terms of basin bottom configuration including maximum channel width and length and minimum slope.

In tipping flusher systems either potable or surface water can be used to fill a series of flushing tanks located along the end wall at the inlet end of the RTB. The flushing tanks are pivotally balanced so that when they are full they become unbalanced and tip thereby discharging their contents in a flushing wave. These systems do require an external water source and infrequent entry into the tank is needed for equipment inspection and maintenance.

In gate flushing systems a portion of the liquid entering the RTB is retained when the facility is filling. When the basin is empty after a storm event the retained liquid is released quickly through the flushing gate causing a wave that flushes accumulated solids and debris to the tank outlet. Since this system uses the detained CSO for flushing, water consumption is not a concern. Personal entry into the tank is only required infrequently to inspect the flushing gates.

It was concluded from the comparison of flushing gate and tipping flusher technology that either system would be suitable for the Windsor RTB. The flushing gate system was selected as the preferred design since it does not require an external water source.

The RTB facilities shown on **Figures 5-5A** and **5-5B** include a Mechanical/Electrical room to house mechanical and electrical equipment and process equipment including polymer storage and feed facilities.

5.3 OUTFALL TO DETROIT RIVER

The alternative design possibilities that have been considered for the outfall are summarized as follows:

- Alternate No.1 New Outfall along McKee Street sharing same easement with Windsor-Detroit Bridge Authority (WDBA) storm sewer outfall (**Figure 5-6A** of **Appendix A**)

- Alternate No. 2 New Outfall along Prospect Avenue in parallel with existing LRWRP outfall sewer (**Figure 5-6B** of **Appendix B**)

The first alternative of using McKee Street leads to conflict with the existing Gordie Howe International Bridge perimeter access road (GHIB PAR) storm water outlet and the property to the north's GHIB PAR storm water outlet. Not to mention other construction and access restrictions due to other utility infrastructure and their proposed easements (Hydro One). There is no easement/right-of-way to accommodate a new outfall sewer for CSO control and control of WWF at the LRWRP. The McKee St storm sewer (which is currently under construction) and owned by WDBA is not able to accommodate flow from the proposed RTB facility.

The second alternative using Prospect Avenue in parallel with existing LRWRP outfall sewer avoids major conflicts and would be more feasible. The existing 7 Mile sewer and Sandwich St sewer will need to be reworked to avoid interference with the new outfall. This outfall provides redundancy to the existing LRWRP outfall. The City would need to acquire an easement for the new outfall sewer. This alternative is considered as the preferred option.

5.4 PREFERRED DESIGN

The main elements in the recommended design, as shown on **Figure 5-7** and **Figure 5-8** of **Appendix A**, are summarized as follows:

- A CSO Collection Sewer extending from Chamber A on Hill Avenue at Russell Street to LRWRP to carry increased flow from Chambers A, D and F. Flow is split to the Riverfront interceptor and new CSO Collector Tunnel sewer at Hill Ave. Flow in the new tunnel sewer flows to RTB inlet pump station and then to LRWRP by gravity during low flow conditions. During high flow conditions the RTB pump station will operate in conjunction with the LRWRP Main Pumphouse.
- A valved interconnection across Ojibway Parkway between the LRWRP Inlet Chamber and the RTB to allow diverting excess wet weather flow into the RTB during heavy storm events that exceed plant design capacity and can cause sewer surcharge; and permit drainage of the CSO Collector Sewer and RTB to the LRWRP Inlet Chamber after a storm event.

- Upgrade existing Chambers A (Hill), D (Detroit), and F (Bridge) to intercept more CSO.

- An RTB, located on the south side of Sandwich Street and Ojibway Pkwy intersection, sized to treat a maximum CSO and wet weather flow of 8.7 m^3/s, which is similar to the firm capacity of LRWRP influent pumping station.

- A CSO pumping station with a firm pumping capacity of 8.7 m^3/s utilizing screw pumps to raise flow from the CSO Collector Sewer and the LRWRP inlet chamber into the RTB

- Flushing gate equipment to flush accumulated solids from the RTB after a storm event.

- An effluent outfall along Prospect Avenue in parallel with existing LRWRP outfall sewer to the Detroit River. It also provides sufficient capacity and redundancy for existing LRWRP outfall sewer

- Polymer storage and feed equipment and ancillary mechanical, electrical and control systems required for operation of the CSO pumping station and RTB facilities.

6.0 ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

6.1 OVERVIEW

Table 6.1 provides a summary of potential environmental impacts and proposed mitigating measures for the preferred design. In general, the preferred design will have a limited effect on the environment and that effect will be mostly due to construction activities. Other than the environmental effects listed in **Table 6.1**, it is anticipated that the preferred work will not have a significant effect on the natural environment such as wildlife, vegetation, or the habitat characteristics of any particular species. The main impact that the alternatives for the proposed work will have on the socio-economic environment is the disruption that residents may experience during the construction. However, this inconvenience and disruption will only be temporary and should not significantly impact the environment.

With respect to other socio-economic impacts, it is anticipated that the preferred servicing alternative will not have any serious impact on existing land uses, cultural activities, heritage resources or any other community program except to the extent that it will permit the ongoing implementation of development and other activities as envisioned in planning documents which have positive impacts on the socio-economic environment.

Table 6-1 Environmental Effects and Mitigating Measures

OPERATION	*EFFECT*	*MITIGATING MEASURES*
Cutting, digging, or trimming ground covers, shrubs and trees	Reduced terrestrial wildlife habitat quality (i.e., diversity, area, function) and increased fragmentation of habitat.	➢ This is not a concern as there is no significant existing terrestrial wildlife habitat in the proposed area of construction
	Loss of unique or otherwise valued vegetation features	➢ There are no known unique vegetation features in the area that may be disturbed by construction activities. ➢ Where possible, existing vegetation features will be restored to a preconstruction condition.
Trenching / tunnelling for sewers, excavation and construction for retention treatment basin	Soil erosion and sediment transport to adjacent water bodies causing sedimentation and turbidity of adjacent water bodies and drainage ditches	➢ Use of erosion control measures (i.e. sediment traps, silt fences, etc.) ➢ Collect contaminated runoff ➢ Restore vegetation growth quickly ➢ Stage construction activities to minimize potential of adverse impacts

OPERATION	***EFFECT***	***MITIGATING MEASURES***
facility, and interceptor chamber upgrades	Reduced water quality and clarity due to increased erosion and sedimentation, and transport of debris.	➢ Apply wet weather restrictions to construction activity. ➢ Comply with any local regulations, policies and guidelines that stipulate a minimum acceptable buffer width (the allowable distance from a water body). Maximum buffer widths are desirable. ➢ If possible, direct surface drainage away from working areas and areas of exposed soils. To the maximum extent possible, promote overland sheet flow to well vegetated areas. ➢ Install and maintain silt curtains, sedimentation ponds, check dams, cofferdams or drainage swales, and silt fences around soil storage sites and elsewhere, as required.
	Loss of vegetation and topsoil and mixing topsoil and subsoil	➢ Restore site by replacing topsoil and reinstate vegetation to prevent erosion
	Removal and/or disturbance of trees and ground flora	➢ Avoid treed areas where possible ➢ Employ tree protection measures ➢ Replace trees and provide site landscaping
	Temporary disruption of pedestrian and vehicle traffic	➢ Provide and maintain detours ➢ Provide for safe alternate routes ➢ Select alternate routes to minimize inconvenience
	Temporary disruption and inconvenience during construction to adjacent properties, buildings and inhabitants	➢ Notify public agencies and neighbouring owners of construction activities ➢ Prepare program for reporting and resolving problems ➢ Ensure access is provided for emergency vehicles and personnel ➢ Apply noise and vibration control measures ➢ Apply dust control measures ➢ Control emissions from construction equipment and vehicles ➢ Use silencers to reduce noise ➢ Require compliance with municipal noise by-laws
	Possible need to remove petroleum contaminated excavated material.	➢ Sample material. ➢ Handle and dispose of contaminated material in an acceptable manner

OPERATION	***EFFECT***	***MITIGATING MEASURES***
	Decreased ambient air quality due to dust and other particulate matter.	➢ Avoid site preparation or construction during windy and prolonged dry periods. ➢ Cover and contain fine particulate materials during transportation to and from the site. ➢ Instruct workers and equipment operators on dust control methods. ➢ Spray water to minimize dust off paved areas or exposed soils. ➢ Stabilize high traffic areas with a clean gravel surface layer or other suitable cover material. ➢ Cover or otherwise stabilize construction materials, debris and excavated soils against wind erosion.
	Disturbance to microscopic organisms in the soil.	➢ Limit the size of stockpiles to avoid anaerobic conditions. ➢ Protect stockpiled soils from exposure to and sterilization by solar radiation (or stockpile in an uncovered shaded area).
	Reduced soil capability through compaction and rutting, and mixing of topsoil and layers below.	➢ Avoid working during wet conditions and/or confine operation to paved or gravel surfaces. ➢ Whenever possible, strip and store topsoil separately from the layers below and return to excavation in sequence.
	Removal and/or disturbances of trees and flora.	➢ Avoid treed areas ➢ Employ tree protection measures ➢ Avoid areas with significant vegetation
	Industrial disruption of field/facility access.	➢ All driveways, roadways and field access will be restored to pre-construction condition ➢ Staging of construction and advance notice to property owners prior to disruption of construction to minimize inconvenience
	Disruption of tile and surface drainage systems.	➢ Provide for temporary drainage systems until final restoration is accomplished. ➢ Avoid disturbing drainage systems during critical periods. ➢ All existing culverts, tiles and drainage systems to be restored to pre-construction conditions following construction.
	Reduced water quality of nearby surface waters having value as wildlife habitat.	➢ Use sediment control techniques for stockpiled materials to minimize degradation of water quality.
	Modifications or removal of aquatic habitat.	➢ Stage construction to minimize potential for adverse impacts.

OPERATION	***EFFECT***	***MITIGATING MEASURES***
	Residential impacts.	➢ Construction noise and dust impacts will be controlled through noise by-laws and dust control measures in contract specification. ➢ Inconvenience due to temporary loss of property access will be minimized through proper communication and advance notice of disruption. ➢ Pedestrian safety will be maintained through excavation barricades and construction fencing
	Traffic disruption.	➢ Construction activities will attempt to maintain a minimum of one lane of open traffic at all times with necessary detour signage and flag persons. ➢ If complete closure is required, emergency services will be advised in advance and access will be restored at the end of each working day.
	Visual aesthetics.	➢ Tunnel sewer and RTB will be buried and have no impact on aesthetics.
	Recreation.	➢ Maintain access to recreational sites during construction. ➢ Locate water and wastewater infrastructure components to minimize impact.
	Archaeological and heritage resources.	➢ Assess archaeological significance in areas undisturbed by previous activities. Complete Stage 1 & 2 Land Archaeological Assessment if required and follow mitigative measures outlined in cooperation with the Ministry of Tourism, Culture and Sport. ➢ The MTCS's "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was reviewed. Proposed work is located away from any built heritage and cultural heritage landscapes, and thus is not expected to impact heritage resources in the area.
Use of construction equipment	Contamination of surface waters, drains and public roadways from spills, leaks or equipment refuelling.	➢ Use containment facilities ➢ Inspect equipment regularly for fuel and oil leaks ➢ Clean equipment before it travels off site
	Decreased air quality due to vehicular emissions causing increased concentrations of chemical pollutants.	➢ Minimize operation and idling of vehicles and gas-powered equipment, particularly during local smog advisories. ➢ Use well-maintained equipment and machinery within operating specifications.
	Disruption to wildlife migration and movement patterns, breeding, nesting or hibernation.	➢ There are no known areas containing sensitive vegetation and wildlife. ➢ There are no known areas where migratory birds are breeding.

OPERATION	*EFFECT*	*MITIGATING MEASURES*
	Introduction of non-native vegetation, including opportunistic species.	➢ Clean heavy machinery and equipment prior to transporting to new location.
	Loss of unique or otherwise valued vegetation features	➢ Avoid or minimize trampling vegetation with equipment. ➢ Minimize physical damage to vegetation by avoiding push-outs and avoiding the placement of splash onto living vegetation.
	Reduced water quality and clarity due to increased erosion and sedimentation, and transport of debris.	➢ Operate heavy machinery on the shore above the normal water level. ➢ Where possible, conduct activities in the dry, above the actual water level and above any expected rises in water level that may occur during a rainfall or snowmelt event.
	Reduced water quality due to inputs of contaminants from surface runoff during construction and operation.	➢ Refuel equipment off slopes and well away from water bodies. ➢ Securely contain and store all oils, lubricants, fuels and chemicals. If necessary, use impermeable pads or berms.

6.2 NATURAL ENVIRONMENT IMPACTS AND MITIGATING MEASURES

6.2.1 Aquatic and Terrestrial Habitat

The proposed work area may contain natural features that may support habitat of endangered species and threatened species. As per Section 2.1.7 of the Provincial Policy Statement (PPS 2014) – "Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements." All issues related to the provincial Endangered Species Act and its regulations shall be addressed prior to the construction of the proposed work.

A field investigation shall be carried out to document existing conditions (terrestrial and aquatic) at the proposed work site. The field investigation shall consist of vegetation and wildlife habitat assessments. The number, location and species of Barn Swallow and other bird nests found in trees or vegetated areas that may be affected by the proposed work will be documented. Potential tree or vegetation removals is to be reviewed to identify potential species at risk, such as Butternut, and special habitat features such as bat maternity roosts. Blanding's Turtle and Eastern Fox Snake (both protected under the Endangered Species Act) are known to occur in this area. As such, an assessment of potential habitat provided by the proposed outfall outlet may be undertaken. The single season field investigation to document aquatic habitat can be combined with the terrestrial field visit and will document existing conditions and habitat suitability for fish and aquatic species at risk within potential in-water work areas in the Detroit River.

A biological survey work plan is to include the following tasks:

1. Compile data from a variety of secondary sources, including the Land Information Ontario (LIO) database, Natural Heritage Information Centre (NHIC) database, the Species at Risk in Ontario List, Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Maps, the Essex Region Natural Heritage System Study (ERHNSS), ERCA's study reports and mapping including mapping studies, fish assessment data, current extents of the ERCA Limit of Regulated Area, and digital mapping from the ERHNSS, various wildlife atlases, municipal Official Plans and other planning reports.
2. Conduct a one-day field investigation (May to July) to document existing conditions (terrestrial and aquatic) in the outfall site (i.e., the existing outfall, proposed outfall and the area within a 120 m radius of the outfall sewer installation).
3. Since in-water works are required, a DFO Self-Assessment will be undertaken to determine potential impacts of the project to fish and fish habitat and provide mitigation measures to reduce the risk of serious harm to fish.
4. Prepare a memo identifying environmental constraints and permit needs. The technical Memo is to be prepared to document background information, field data and constraints (i.e., one memo combining terrestrial and aquatic habitats). The memo is to describe existing conditions within 120 m of the predicted work area, recommend general mitigation measures to include during design, and identify permits that may be required prior to construction of the new storm sewer, water quality unit and outfall.

6.2.2 Floodplain Hazard Management

The proposed work site is under the jurisdiction of the Essex Region Conservation Authority (ERCA). The preferred route and location of this project was reviewed in accordance with ERCA's floodplain mapping of this area, and it has been determined that the western limits fall within the Limit of Regulated Area of the Detroit River and McKee Drain. The proposed excavations, construction of structures, drain crossings, and placement and grading of fill, within the regulated area will require permits from the ERCA under Ontario Regulation 158/06, (Development, Interference with Wetlands and Alteration to Shorelines and Watercourse Regulations - Section 28 of the Conservation Authorities Act).

In the final design phase, an application of flood proofing measures must be submitted to the ERCA for review and approval. The permit application shall meet the following requirements:

- Specific "Best Management Practices" regarding erosion control measures, sedimentation, and the removal of vegetation, which is provided in the MECP Stormwater Management Planning and Design Manual (2003)

- Water quality measures shall be considered to ensure no adverse impact on the downstream watercourse. The new preferred outfall sewer will run parallel to the existing LRWRP outfall sewer that is located along Prospect Ave, and outletting to the Detroit River. Surface water monitoring program is to be implemented to verify no adverse impact on the downstream watercourse.

- Items listed in Table 6-1 "Environmental Effect and Mitigation Measures" described in this ESR Report

6.2.3 Surface Water Quality

6.2.3.1 General Approach

The RTB effluent discharges to the Detroit River via the proposed outfall. The water quality and benthic macroinvertebrate survey of Detroit River is to be implemented for the proposed outfall.

- The "before" monitoring to establish the baseline shall be completed during the autumn or spring period prior to starting construction of the proposed RTB outfall; and
- The "after" monitoring would occur once in the same season after the outfall has been operational for at least a year.

The "before" monitoring provides baseline benthic community information in the vicinity of the proposed RTB outfall to which subsequent "after" monitoring data can be compared.

The surface water quality program is proposed to be comparable to that which has been collected in the vicinity in previous studies.

6.2.3.2 Sampling Locations

Field samples are to be collected at the following two locations organized as paired upstream reference and downstream exposure stations at the proposed RTB outfall:

- Detroit River, upstream of the proposed RTB outfall, and
- Detroit River, downstream of the proposed RTB outfall.

Sampling locations are to be chosen in an effort to minimize variation in habitat between paired stations. Riffle habitats with cobble, gravel and sand substrates and moderate to fast water velocity were targeted for each sampling station.

6.2.3.3 Water Quality Sampling and Analysis

The surface water sampling is to be performed in conjunction with benthic macroinvertebrate sampling. Grab samples are to be sent for laboratory analysis of parameters of interest and in-situ measurements of temperature, pH, conductivity, and DO are also to be taken.

The water quality parameters include TSS, TP, anions (including NO2, NO3, PO4), and Ammonia-N. Laboratory results are to be summarized and analyzed to generate 75th percentile concentrations for water quality parameters of interest.

6.2.3.4 Benthic Macroinvertebrate Sampling

Quantitative benthic macroinvertebrate samples are to be collected from Detroit River using a standard PONAR sampler (9x9 inches). Three samples are to be collected at each site both before and after the construction of new outfall sewer. If the bottom is difficult to sample, then 5 samples are to be collected at each site to compensate for the reduced abundance of macroinvertebrates, or 2 or 3 samples should be composited into a single sample and 3 composite samples collected at each site.

The following supporting measurements and observations are to be made at each of the benthic sampling stations: pH, dissolved oxygen, conductivity, water and air temperature, water depth, and water velocity. Substrate and aquatic habitat characteristics were recorded.

6.2.3.5 Laboratory Methods and Taxonomy for Benthic Macroinvertebrate Survey

The sorting and identification of benthic macroinvertebrates is to be conducted in a benthic taxonomy laboratory. Samples are to be stained with Eosin-B and Biebrich Scarlet. Staining facilitates sorting by preferentially staining the organisms so they can be more easily distinguished from the sample debris. The samples are to be washed in a 500 µm sieve to remove formalin and the remaining sample material is to be washed from the sieve into a plastic gridded sorting tray. Organisms is to be sorted from the tray using a 10 - 40x stereomicroscope.

All macroinvertebrates are to be identified to the lowest practical level; usually genus. Chironomids and oligochaetes are to be mounted on glass slides in a clearing medium prior to identification. Following detailed identification, organisms are to be re-preserved in a solution of 70 to 80% ethanol in glass vials and labeled by station, replicate and contents. Data are to be tabulated in an Excel spreadsheet to facilitate analysis and interpretation.

6.2.3.6 Data Analysis of Benthic Macroinvertebrate

Each sample may contain hundreds of individuals and numerous different taxa, therefore, biotic indices that incorporate various community attributes are to be used to compare benthic communities both spatially (between stations) and temporally (within stations over time). The following community measures and indices are to be used to interpret the benthic macroinvertebrate data for this survey.

- Organism density;
- Taxa richness;
- EPT Index;
- BioMAP Water Quality Index;
- Hilsenhoff Biotic Index; and
- Relative abundance of selected taxonomic groups.

The macroinvertebrates are to be identified to the lowest taxonomic level as proposed. A BACI statistical design is to be used to analyze all metrics (e.g. abundance, richness, BioMAP score, HBI, BC similarity).

6.2.4 Source Water Protection

6.2.4.1 Source Water Protect

For the protection of local municipal drinking water sources, the Essex Region Source Protection Plan (SPP), which has been established under the Clean Water Act, 2006 (Ontario Regulation 287/07), came into effect on October 1, 2015.

The Clean Water Act (2006) refers to four types of Vulnerable Areas, which include:

- Intake Protection Zones
- Wellhead Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Areas

The types of Vulnerable Areas are addressed further below in relation to this project location.

6.2.4.2 Intake Protection Zones (IPZs)

There are two municipal Water Treatment Plants (WTPs) in the region, the A. H. Weeks (Windsor) and Amherstburg WTPs, having their intakes in the Detroit River (refer to Map 3 of the Essex Region Source Protection Plan). Intake Protection Zones are areas of land and water, where run-off from streams or drainage systems, in conjunction with currents in lakes and rivers, could directly impact the source water at the municipal drinking water intakes.

An Intake Protection Zone can be described as a defined area surrounding a surface water body intake. The size and shape of each zone in an IPZ represents either a set distance around the intake pipe, or the length of time it would take water and contaminants to reach the intake:

- IPZ-1 is the area closest to the intake pipe and is a set distance which extends one kilometre upstream and 120 metres onto the shore.
- IPZ-2 includes the on and offshore areas where flowing water and any pollution would reach the intake pipe within two hours.
- IPZ-3 is an area where contaminants could reach the intake pipe during and after a large storm.

According to Approved Source Protection Plan for Essex region source protection area, the Detroit River in the study area is characterized to be an Intake Protection Zone 3 (IPZ-3). Refer to Map 10 of the Essex Region Source Protection Plan)

The purpose of this EA study is to investigate and report on alternative means of controlling CSO in the riverfront area between Caron Avenue on the east to the Lou Romano Water Reclamation Plant (LRWRP) on the west and wet weather flows received at the LRWRP. The proposed project for the collection and treatment of CSOs and WWF will have an important beneficial impact on the source of drinking water quality.

6.2.4.3 Wellhead Protection Areas

Wellhead Protection Areas are not applicable in the Essex Region, as no municipal drinking water systems are supplied by groundwater.

6.2.4.4 Highly Vulnerable Aquifers (HVAs)

Highly Vulnerable Aquifers (HVAs) are defined as aquifers on which external sources have or are likely to have a significant adverse impact, and include the land above the aquifer.

In the ERSPA these HVAs are generally located in the sandy soil areas in the southern part of the region, including most of Pelee Island (refer to Map 4 of the Essex Region Source Protection Plan). There are no HVAs located in or close to the proposed work area.

6.2.4.5 Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRAs) are defined as per Regulation 287/07 as areas within which it is desirable to regulate or monitor drinking water threats that may affect the recharge of an aquifer. Groundwater recharge occurs where rain or snowmelt percolates into the ground and flows to an aquifer. The greatest recharge usually occurs in areas which have loose or permeable soil such as sand or gravel that allows the water to seep easily into the aquifer.

Most of the SGRAs in the ERSPA are located in the sandy soil areas of the southern part of the Essex Region, in the Harrow area, parts of Leamington and Kingsville, and limited parts of the Turkey Creek and Pelee Island subwatersheds (refer to Map 5 of the Essex Region Source Protection Plan). There are no HVAs located in the northern part of the Essex Region including City of Windsor area.

6.2.4.6 Overall Vulnerability Assessment Summary

Project activities in vulnerable areas need to be assessed to determine the risk they pose. The Clean Water Act requires that significant threats be managed to reduce the threat to a point where it is no longer significant. Action may be taken to address low and moderate threats at the discretion of the Source Protection Committee. Table 6.2 provides a summary of threats to vulnerable areas and the subsequent actions to be taken, relating to this project.

Table 6-2 Summary of Threats to Vulnerable Areas

Vulnerable Area	Threat Potential	Action Taken
Intake Protection Zone	Low	None
Wellhead Protection Areas	Not applicable	None
Highly Vulnerable Aquifer	Not applicable	None
Significant Ground Water Recharge Areas	Not applicable	None

6.2.5 Permits to Take Water

Some areas with sandy subsoils and high water tables have been identified in the RTB site where well point dewatering systems will be required to facilitate RTB construction.

The use of these dewatering systems will require the acquisition of a Permit to Take Water from the MECP.

6.2.6 Active / Former Waste Sites

The existence and location of any active and/or former waste disposal sites within the study area was carefully reviewed. A listing of information about large and small landfills in Ontario that includes open/closed status, site owner, site location, and Certificate of Approval number are available from Government of Ontario 's website.

There is no large waste disposal site in the region. Table 6-4 shows one small former waste disposal site which is in proximity to the study area. However, any active/former small waste disposal sites including the Western Inert (Malden Road) Landfill listed in Table 6-4 are located far away from the proposed work area. As the proposed work includes sewer construction within the road right-of-way and the proposed wastewater treatment facility is located far away from any active/former waste disposal sites, the proposed work is not expected to have any impact on the migration of methane and/or leachate from nearby active and/or former waste sites.

Table 6-3 List of Active and/or Former Waste Disposal Sites within the Study Area

ECA	Site Name	Site Location	Status
A010102	Western Inert (Malden Road) Landfill City of Windsor	Bounded By Matchette Road, Chappell and Sun Valley Drives, and Malden Road	Closed

6.2.7 Climate Change

Climate encompasses all aspects of weather, including: temperature, precipitation, air pressure, humidity, wind speeds, and cloudiness. Weather and climate are not static processes and variability is often normal. Weather, for example, changes on a daily and sometimes hourly basis. Weather can also change on a monthly basis, through the changing of seasons. When climate changes on a global scale, it is referred to as Climate Change.

Since the beginning of the industrial revolution in the 18th century, excessive emission of greenhouse gases, like carbon dioxide and methane, have been released through human activities, causing an increased percentage of solar radiation to be trapped in our atmosphere. In recent decades the effect of this on climate has become clearer. As more energy is retained within the atmosphere, a general increasing trend in global temperatures has occurred.

Regardless of the cause, the average temperature in Windsor has increased by almost 1°C since 1940. As air temperatures increases, so does the capacity of the air to hold more water leading to more intense rainfall events. The Environment Canada weather station located at Windsor Airport has been monitoring and recording weather data since 1941. Since this time, an increasing trend in annual precipitation has been documented.

The effects of climate change are expected to include an increase in the number and severity of storms, leading to increased precipitation. Since 1970, there has been increasing evidence of heavier short duration (24 hours or less) rain events in southern Ontario.

Climate changes related to increasing rainfall in the region have a significant impact on municipal sewer systems. The City of Windsor recently experienced a significant rainfall event that inundated and overwhelmed the area's sanitary and storm sewer system/facilities. In the last decade alone, this region has experienced six (6) significant storm events that have surpassed current 1:100 year regulatory standards, and have resulted in urban flooding issues and sewer backups that have impacted hundreds of homes and businesses in the region. As such, historical data regarding the likelihood of major flooding events must be reconsidered. It is important that the proposed work for CSO control continues to operate effectively in the future. A solution needs to be identified to provide resiliency to the impacts of climate change.

The City's own Climate Change Adaptation Policy notes that focus needs to be directed towards climate change impacts such as: operating/maintenance demands to deal with climate extremes, flooding to basements, roads and infrastructure, and operation demands during severe storms. Table 6-3, which is obtained from City of Windsor Climate Change Adaption Plan (September 2012), summarizes the average trends in the amount of annual maximum rain events.

Table 6-4 Summary of the observed and projected increases in rainfall over time in Windsor

	Observed trends 1970 – 2000	Projected trends to 2050 (High Emissions)
30 minute extremes	• 5% increase per decade • 4.5% increase per decade to 1996	• 5% increase per decade
Daily extremes	• 7% per decade (May, June, July) • 5% increase per decade (over the year) to 1996	• 3% per decade over the year (20 year return period) • 2.5 to 6% increase per decade (rainfall with probability <5 %)
Annual rainfall	• 1% to 3% increase per decade	• 1% increase per decade

In conjunction with the regional municipalities including City of Windsor, the ERCA has developed a set of regional stormwater management guidelines that take into account adjustments for the impacts of Climate Change. The recommendations from this guidance document have also been considered and endorsed in these potential future works.

The City of Windsor has initiated the following two other sewer study projects in the study area:

- The Sewer Master Plan

  The sewer master plan will take a system-wide approach to identify specific improvement projects that can be undertaken by the City to improve sewer efficiency and reduce the risk of flooding caused by wet weather.

- The Campbell/University Combined Sewer Separation and Stormwater Management Strategy

  The proposed sewer separation is to provide storm relief to alleviate basement flooding risk while also reducing the volume of wet weather flow to the RTB facility and overflow to the Detroit River. Water quality control in the targeted sewer separation area is achieved by capturing a portion of the runoff into the Riverside Combined Sewer Interceptor to be treated at the LRWRP.

The proposed work for CSO control, which was coordinated with the above two studies, was recommended based on current standards with a conservative design method that provides a safety margin for extreme rainfall events above and beyond the average year design storms. The proposed RTB facility is designed to handle a peak flow of 8.7 m^3/s, which is approximately 30% higher than the predicted flow during the 100 year storm event. Thus, the modeled peak flows and storage/treated volume requirements are greater than expected values to mitigate the impact of climate changes.

The City of Windsor as well as the ERCA are in support of long term goals of achieving storm and sanitary sewer separation. While full separation would be an ideal outcome, it requires significant effort on privately owned land and is extremely difficult to economically achieve. As there is an increase in the number and intensity of storm events affecting the region, climate change needs to be considered in the evaluation of alternative solutions, and the opportunity for partial sewer separation is considered where feasible.

6.3 SOCIO-ECONOMIC IMPACTS AND MITIGATING MEASURES

6.3.1 Built Heritage Resources and Cultural Heritage Landscapes

Figure 2-5 of **Appendix A** is an aerial plan showing the heritage resources around the proposed work areas. As shown in the aerial plan, there are no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas. The nearest one would be the Battle of Lake Erie Mural, which is located on the opposite side of Russel Street from where a new 6-8 m deep sewer is to be constructed by tunneling in parallel with the existing tunneled sewer.

The existing sewer (6-8 below the ground level, closer to the Battle of Lake Erie Mural) was constructed by tunneling in 1967. The City of Windsor also constructed a tunneled sewer between Dougal Avenue and Devonshire Road along Riverfront Drive in the City of Windsor downtown area in 2010. Standard best-practice construction techniques were used to mitigate vibrations.

The construction techniques used for the above previous tunnel sewer projects will be applied to the construction of the proposed tunnel sewer to mitigate vibration. The vibration limits set for the project will ensure that all buildings, including those with heritage features, are protected. Monitoring during construction will ensure that vibration is kept below the established limit.

6.3.2 Archaeological Resources

The following future archaeological assessment shall be implemented when the exact location and alignment of the proposed sewer, outfall and RTB facility have been determined at the final design phase.

6.3.2.1 Retention Treatment Basin Facility Site

The Stage 1 Archaeological Assessment was completed for the proposed RTB site, which is located on the south side of Sandwich Street and Ojibway Pkwy intersection.

The proposed RTB site was found to be an undisturbed area which has moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources and is recommended for further Stage 2 Archaeological Assessment prior to proceeding with construction. The Stage 2 Archaeological Assessment is to determine if any archaeological resources are on the property using a test pit survey.

6.3.2.2 Outfall Sewer

An RTB outfall sewer is to be constructed along Prospect Avenue in parallel with the existing LRWRP outfall sewer. A Stage 1 and Stage 2 Archaeological Assessment is to be undertaken during final design when the exact location and alignment of the outfall sewer has been determined.

6.3.2.3 Tunnel Sewer

The tunnelled sewer is to be approximately 6 to 8 metres below ground level. Construction of a deeper sewer by tunneling will significantly minimize disturbances along the waterfront and Sandwich Street. Stage 2 archaeological assessment investigations will be required at access shaft and interceptor chamber locations along the tunnelled portion of the sewer. These investigations will need to be undertaken during final design when the exact route of the sewer and the location of chambers and access shafts have been determined.

6.3.2.4 Work in Existing Chamber A Site

Since this stretch of Detroit Street has very high archaeological potential as it is additionally located in close proximity to several known and registered archaeological site, no construction activities are to be proposed on Detroit Street. Any work is to be implemented inside the existing interceptor chamber. Therefore, Stage 1 and Stage 2 archaeological assessment investigation will not be required at existing interceptor chamber A.

6.3.2.5 Coordination with First Nations on Archaeological Assessment

Consultation with First Nations has been implemented in accordance with the Municipal Class EA First Nations Consultation requirements. Response received from Chippewas of the Thames First Nation (COTTFN) noted that the proposed project is located within the Mckee Treaty Area (1790) to which COTTFN is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory. It has been advised by COTTFN that they have very minimum concern with the proposed project. As per responses received from COTTFN, an Archaeology Field Liaison on behalf of COTTFN shall be invited to participate in any field archaeology assessment for this project.

6.3.3 Community

6.3.3.1 Disruption of Traffic

Construction of the proposed RTB facility and the outfall will result in temporary detours or lane restrictions that will disrupt traffic in the area and interfere with access for some residents and businesses. All emergency services will be notified of detours prior to commencement of construction. Services that may experience temporary detours or delays include school buses, mail delivery and garbage collection. Crossing of the outfall sewer and the interconnecting sewer between the RTB and the LRWRP under Ojibway Parkway is not expected to cause traffic disruption.

Construction of the proposed CSO collector sewer and upgrading of the CSO interceptor chambers will result in temporary detours or lane restrictions that will disrupt traffic in the area and interfere with access for some residents and businesses. All emergency services will be notified of detours prior to commencement of construction. Services that may experience temporary detours or delays include school buses, mail delivery and garbage collection. Where the alignment for the CSO collector sewer follows a City Road, approval of the alignment would be obtained from the City of Windsor.

Mitigating measures are to provide and maintain detours, provide for safe alternate routes, and select alternate routes to minimize inconvenience.

6.3.3.2 Inconvenience During Sewer Construction

Construction activities will create noise and traffic from construction vehicles resulting in temporary inconvenience to residents and businesses.

The best available construction techniques shall be applied to the construction of the proposed tunnel sewer to mitigate noise and vibration. The noise and vibration limits set for the project will ensure that the community, all buildings, including those with heritage features, are protected. Monitoring during construction will ensure that noise and vibration are kept below the established limit.

6.3.3.3 Proximity to Existing Dwellings

Since the RTB is buried and flushed clean after storm events it does not represent a significant odour or noise source and should not be subject to the 300 m buffer zone requirement.

Based on the criteria discussed above, the proposed site as illustrated in **Figure 5-3B** of **Appendix A** is suitable for construction of the RTB to control CSOs for the riverfront catchment area west of Caron Avenue as well as wet weather flow control at the LRWRP.

6.3.3.4 Proximity to Arterial Roadway

The EC Row Expressway and Highway 401 are major arterial roadways that provide direct access to the Windsor Communities and neighboring areas. It is not expected that there will be any significant traffic disruptions during the construction of the proposed work.

7.0 PROPERTY REQUIREMENTS

7.1 GENERAL

There does not appear to be any property requirements for construction of the CSO control facilities. However, permanent easements and temporary construction easements will be required in some areas.

The City will acquire property (if required) and easement at fair market value, which basically means that it is sold at the price that other real estate is selling for in that area. The City may obtain the services of an accredited appraiser to assist in establishing the fair Market value and related compensation for any 'land' required for the Project.

Below is a brief description of typical process for the property acquisition:

a) Identify and contact effected property owners
b) Procure the services of qualified appraiser
c) Present Letter of Offer to property owner
d) Negotiate agreement with property owner
e) Obtain appropriate Municipal approval for acquisition of property
f) Present an Agreement of Purchase and Sale to property owner
g) Conduct any required survey work and due diligence for the property
h) Close on the property acquisition

The City will pay for all costs of acquiring the property and easements for its purposes, including the cost of the appraisal of the property, compensation related to the land, survey costs, and reasonable closing fees.

7.2 UPGRADES OF CHAMBER A, D AND F

7.2.1 Chamber A

There are no property requirements for upgrading Chamber A. All upgrades are to be implemented within the property that is currently owned by the City of Windsor.

7.2.2 Chamber D

There are no property requirements for upgrading Chamber D. All upgrades are to be implemented within the property that is currently owned by the City of Windsor.

7.2.3 Chamber F

There are no property requirements for upgrading Chamber F. All upgrades are to be implemented within the property that is currently owned by the City of Windsor.

7.3 TUNNEL SEWER FROM CHAMBER A TO THE RTB

The tunnel sewer between Prospect Ave and Chappell Ave is required to be constructed within a new permanent easement on private properties in order to operate and access the Tunnel Sewer once it is constructed. Easement requirements for the new Tunnel Sewer are shown in **Figure 7.1** in **Appendix A**. The Tunnel Sewer's proposed easement runs parallel to and north of the adjacent existing Riverfront Interceptor Sewer easement, and Hydro One easement. Temporary construction easements will also be required in some areas during construction.

Property requirements for the new Tunnel Sewer are listed in **Table 7-1**. Proposed easements are preliminary and based on available information at this time; they are subject to change once a legal survey has been completed.

Table 7-1: Property requirements for the tunnel sewer

No.	Type of Easement	Mun. Address. No.	Property Owner
1	Sewer	30 Prospect Ave	Windsor Salt Co. Ltd.
2	Sewer	4020 Sandwich St W	Sandwich Entity in partnership with The Canadian Transit Company and Central-McKinlay International Ltd (ultimately owned by the Bridge Company)
3	Sewer	4016 Sandwich St W	Coco Aggregates
4	Sewer	3800 Russell St	Van de Hogan Cartage Ltd.

7.4 RETENTION TREATMENT BASIN AND PUMPING STATION

It can be seen from **Figure 5-3B** of **Appendix A** that the City owned property on the South side of Ojibway Parkway is sufficient to accommodate the proposed construction of an RTB, influent pumping station and associated facilities.

There are no property requirements for the RTB since it will be located adjacent to the LRWRP on property that is currently owned by the City of Windsor.

7.5 OUTFALL SEWER

The outfall sewer is required to be constructed within a new permanent easement on private properties in order to operate and access the outfall sewer once it is constructed. Easement requirements for the new outfall sewer are shown in **Figure 7.1** in **Appendix A.** The proposed RTB outfall sewer easement runs along the south side of Prospect Ave. Once the outfall sewer is west of Prospect Ave the proposed easement is parallel and adjacent to the existing LRWRP outfall sewer easement (refer to **Figure 7.1**). Temporary construction easements will also be required in some areas during construction.

Property requirements for the new outfall sewer are listed in **Table 7-2**. As discussed above, proposed easements are preliminary and based on available information at this time; they are subject to change once a legal survey has been completed.

Table 7-2: Property requirements for the outfall sewer

No.	Type of Easement	Mun. Address. No.	Property Owner
1	Sewer	35 Prospect Ave	Southwestern Sales Corp. Ltd.
2	Sewer	4100 Sandwich St	United Rentals Canada Inc.

8.0 PUBLIC CONSULTATION

The Municipal Class Environmental Assessment process provides a minimum of three points of contact for a Schedule C undertaking where members of the public and review agencies have the opportunity to review the project findings and submit comments for consideration in development of the project. The following sections summarize the approach that has been taken with respect to public participation during this project.

8.1 PUBLIC PARTICIPATION

A notice of commencement was originally published in the December 9, 2017 edition of the Windsor Star advising of the initiation of this Class EA undertaking and inviting public input. A copy of the notice is contained in **Appendix C**.

In addition to this discretionary point of contact, there are three points for mandatory public contact during the Class EA process, namely:

- Phase 2: Public Consultation and Information Centre #1
- Phase 3: Public Consultation and Information Centre #2
- Phase 4: Notice of Completion

A public Open House was held on April 19, 2018 to provide information regarding this undertaking and to invite input and comment from interested persons. A copy of the open house notice as published in the Windsor Star on April 14, 2018 is included in **Appendix C** together with a list of persons who attended the open house and a copy of the material that was given to all attendees.

A second public Open House was held on February 27, 2019 to review progress made since the first open house. Information on alternative concepts for the preferred design selected in Phase 3 of the Class EA process was available for review. A copy of the open house notice as published in the Windsor Star on February 23, 2019 is included in Appendix C together with a list of persons who attended the open house and a copy of the material that was given to all attendees.

8.2 REVIEW AGENCIES

The Class EA provides for the involvement in the project by the MECP's various branches as well as other provincial and federal ministries and outside agencies. The list of Review Agencies varies depending upon the scope of the project, its location and the potential environmental impacts.

A letter dated December 4, 2017, advising of the initiation of this project was sent to review agencies. Copies of the letter, notice and the list of review agencies are contained in **Appendix C**.

Information on alternative designs for the preferred option selected in Phase 2 of the Class EA process were distributed to review agencies and mandatory contacts under cover of a letter dated April 20, 2018. A copy of the letter and distribution list is included in **Appendix C**.

Copies of this Draft ESR Report are being distributed to review agencies and mandatory contacts under cover of letters in March 2019.

8.3 RESPONSE FROM PUBLIC AND REVIEW AGENCIES

8.3.1 Notice of Project Initiation

The notice of initiation of the project did not generate any public response. The following responses (copies included in **Appendix C**) were received from review agencies and mandatory contacts.

- Ministry of the Environment - advised by emails on December 14, 2017, January 30, 2018 and February 1, 2018 that the MECP has comments and concerns regarding this project. Responses to the MECP's comments/concerns have been addressed.

- Ministry of Natural Resources and Forestry, Aylmer District – advised in an email dated December 12, 2017 that the Class EA should identify and address potential impacts to natural heritage including species at risk or other resource values.

- Ministry of Tourism, Culture and Sport – advised in an email dated January 11, 2018 that the Class EA should identify and address potential impacts to Archaeological resources, including land-based and marine; built heritage resources, including bridges and monuments; and Cultural heritage landscapes.

- Environment Canada – advised in an email dated January 8, 2018 that this project does not appear to be described in the Regulations Designating Physical Activities under the Canadian Environmental Assessment Act, 2012.

- Transport Canada – advised in an email dated January 8, 2018 that Transport Canada does not require receipt of all individual or Class EA related notifications. The project proponent is requested to self-assess if the project will interact with a federal property and/or waterway, and require approval and/or authorization under any Acts administered by Transport Canada.

- Windsor Port Authority - requested in a letter dated January 3, 2018 that the Windsor Port Authority be kept informed of progress of this project.

- Essex Region Conservation Authority – advised in a letter dated January 19, 2018 that ERCA has an interest in the project and can provide inputs on the project.

- Hydro One - advised in an email dated January 12, 2018 that Hydro One has high voltage transmission facilities within the study area. However, at this point in time Hydro One does not have enough information about the project to provide with meaningful input with respect to the impacts that this project may have on Hydro One's infrastructure.

- Town of LaSalle - advised in an email dated January 02, 2018 that the Town of LaSalle has an interest in the project and asked to be kept on the mailing list.

8.3.2 Public Open House # 1

A total of one (1) person attended the Open House held on April 19, 2018. No one expressed any objection to the proposed undertaking.

The written comments (copies included in **Appendix C**) were received from the following review agencies and mandatory contacts.

- Windsor Police - advised in an email dated May 1, 2018 that this project is unlikely to create issues of significance that would impact public safety. It is noted that proper measures will need to ensure physical site security once construction commences for this project.

- Enwin Utilities- advised in a letter dated April 27, 2018 that Enwin Utilities shall be consulted to confirm availability of hydro services and associated estimated cost during the evaluation of the preferred location for the proposed work.

- Hydro One - advised in an email dated May 4, 2018 that Hydro One has high voltage transmission facilities within the study area. The location of high voltage transmission facilities was provided.

- Union Gas - a verbal request was received to update Union Gas contact.

- ERCA - advised in a letter dated April 30, 2018 that
    - The western limits of the study area fall within the Limit of Regulated Area of the Detroit River and McKee Drain. Any excavations, construction of structures, drain crossings, or the placement and grading of fill, undertaken within the regulated area would require permits from the Essex Region Conservation Authority (ERCA) under Ontario Regulation 158/06.

- The City shall consider matters related to watershed management.
- The study area may contain natural features that may support habitat of endangered species and threatened species.

8.3.3 Public Open House # 2

A total of four (4) people attended the Open House held on February 27, 2019. A list of attendees is included in **Appendix C**. Display material at the open house described the design options considered leading to selection of the recommended design. Based on verbal comments received at the open house there seems to be general agreement with the preferred design as described in this draft ESR Report.

8.3.4 Draft ESR

Written comments on draft ESR were received from the following:

1. Ministry of the Environment, Conservation and Parks, Southwest Region
2. Ministry of Tourism, Culture and Sport, Culture Division, Programs and Services Branch, Heritage Planning Unit
3. Ministry of Natural Resources and Forestry, Aylmer District
4. Essex Region Conservation Authority
5. Chippewas of the Thames First Nation

All written comments were acknowledged in writing with appropriate responses.

Copies of written comments and acknowledgements are in **Appendix C**.

8.4 FIRST NATIONS CONSULTATION

Consultation with First Nations is ongoing in accordance with the Municipal Class EA First Nations Consultation requirements. As part of this Environmental Assessment, communications with First Nations agencies and communities is being undertaken in parallel with the other stakeholder communications and consultations. This report will be sent to the First Nations groups and organizations to solicit their interest or non-interest in the study.

First nations consultation is to be completed in accordance with the Municipal Class EA First Nations Consultation requirements. As part of this Class EA, communications with First Nations agencies and communities are being undertaken in parallel with the other stakeholder communications and consultations. Letters were sent to the following First Nations groups and organizations at study commencement and public open house to solicit their interest or non-interest in the study.

Documentation of consultation with First Nations communities during the Environmental Assessment Process is located in **Appendix C**.

9.0 OPINION OF PROBABLE COST

This section discusses an opinion of probable cost for the preferred solution. An opinion of probable cost can be prepared as an attempt to project what someone else will be willing to contract for in the future to do construction work which has not yet been defined and which is subject to changes in scope, design, and market conditions.

9.1 LEVEL OF ACCURACY

Opinions of probable cost are typically provided throughout various stages of a project's life cycle. There are a number of classifications for estimates that identify typical minimum and maximum probable costs or levels of accuracy. These classifications vary widely by industry but all are based on the fact that the level of accuracy is directly proportional to the level of detail available at each stage of the project.

The level of accuracy increases as the project moves through the various stages from planning to preliminary design to final design. A wide range of accuracy would be expected at the planning stage of a project development because a number of details would be unknown. As the project moves closer to completion of final design, the estimate would become more accurate due to the increased level of detail available and the reduced number of unknowns.

Table 9-1 includes a summary of typical estimate classifications used throughout a project's development including a description of the project stage and range of accuracy. The opinions of probable cost in this study are estimated at the study stage (Class 2) and the corresponding level of accuracy could range from –15% to +30% from the opinion presented in the report.

Table 9-1: Classification of Cost Estimates

Class	***Description***	***Level of Accuracy***	***Stage of Project Lifecycle***
1	Conceptual Estimate	+50% to -30%	Screening of alternatives.
2	Study Estimate	+30% to -15%	Treatment system master plans.
3	Preliminary Estimate	+25% to -10%	Pre-design report.
4	Detailed Estimate	+15% to -5%	Completed plans and specifications.
5	Tender Estimate	+10% to -3%	This is the actual tender price and it can vary depending on the amount of contingency allowance consumed.

9.2 OPINION OF PROBABLE COST FOR PREFERRED SOLUTION

In addition to the level of accuracy discussed, the opinion of probable cost was prepared taking into consideration the following factors.

- All estimates are first quarter, 2019 dollars based on an Engineering News Record (ENR) Construction Cost Index of 1200 (Average in March 2019).
- It is assumed that the Contractor will have unrestricted access to the site and will complete the work during normal working hours from 7:00 am to 6:00 pm Monday to Friday. There is no allowance for premium time included.
- Labour costs are based on union labour rates for the Windsor area.
- An allowance is included for mobilization and demobilization and the Contractor's overhead and profit.
- Equipment costs are based on vendor supplied price quotations and historical pricing of similar equipment.
- Bulk material and equipment rental costs used are typical for the Windsor area.
- The estimate does not include the cost of application or permit fees.
- HST is included at 13%.
- Allowances for engineering and contingency allowances (approximately 15% and 10%, respectively) are included in the estimate.
- No allowance is included for interim financing costs or legal costs.
- No allowance is included for escalation beyond the date of this report.
- It is not known whether contaminated soil conditions may be encountered in the areas proposed for the CSO/WWF control facilities. The potential impact cannot reasonably be determined at this point and no allowance is included in the estimate for this possible eventuality.
- Another factor that could impact the estimate is the possible presence of archaeological resources at the RTB site or at access shaft and interceptor chamber locations along the CSO collector sewer. The potential impact cannot reasonably be determined at this point and no allowance is included in the estimate for this eventuality.

A capital budget estimate (in 2019 dollars) is summarized in **Table 9-2**.

Table 9-2: Opinion of Probable Capital Cost for Preferred Solution

Item	*Description*	*Probable Cost*
1	**Upgrade Interceptor Chambers A, D and F**	$4,000,000
2	**CSO Collector Sewer from Chamber A to RTB**	$10,000,000
3	**Influent Pumping Station, RTB and Outfall Sewer**	$36,000,000
Sub-total Construction Cost		$50,000,000
Contingency Allowance (10%)		$5,000,000
Engineering Allowance (15%)		$7,800,000
TOTAL CAPITAL COST (excluded taxes)		$62,800,000
HST (13%)		$8,200,000
TOTAL ANTICIPATED CAPITAL COST (including taxes)		$71,000,000

10.0 SUMMARY

10.1 RECOMMENDATIONS

The recommended alternative designs that form the preferred solution are summarized in **Figure 5-7** and **Figure 5-8** of **Appendix A**. The recommended design not only meets Procedure F-5-5 CSO requirements but also greatly reduce the impact on the LRWRP of wet weather flows from both the Riverfront Interceptor and the Western Trunk Sewer. The new pumping, RTB and outfall are oversized to handle flows equivalent to the design flows of the LRWRP. An added and very significant benefit is that the proposed pumping station, RTB and new outfall sewer will provide an emergency backup in the event of a catastrophic failure or extremely difficult logistics and maintenance at the plant.

When capital budget funding becomes available, it is recommended that the following work described in the ESR proceed to Phase 5 with final design and construction:

- Upgrade interceptor chambers A and D to automated flow control, and increase volumetric interception rate at Interceptor Chambers A, D and F
- Deep sewer from Chamber A on Hill Avenue at Russell Street to LRWRP to carry increased flow from Chambers A, D and F.
- A RTB, located on the south side of Sandwich Street and Ojibway Pkwy intersection, sized to treat a maximum CSO and wet weather flow of 8.7 m^3/s, which is proposed to be equivalent to total capacity of the LRWRP influent pumping station.
- A new pumping station with a firm pumping capacity of 8.7 m^3/s utilizing screw pumps to raise flow from the CSO Collector Sewer into the RTB.
- A valved interconnection across Ojibway Parkway between the LRWRP Inlet Chamber and the RTB to divert wet weather flow during a storm event or drain the RTB to the LRWRP Inlet Chamber after a storm event
- An effluent outfall to carry treated effluent from the RTB to the Detroit River. It also provides sufficient capacity and redundancy for the existing LRWRP outfall sewer

10.2 PERMITS & APPROVALS

Table 10-1 shows the permit and approval requirements for the preferred design. The permit requirements are based on past experience with similar projects and may change at the discretion of the regulatory authorities. The applications shall be prepared upon completion of the detailed design drawings and specifications.

Table 10-1: Permit requirements for implementing the preferred design

Infrastructure	Regulatory Authority or Owner	Permit
Tunnel Sewer	Ministry of Environment Conservation and Parks (MECP)	ECA for sewer construction
	Hydro One	Encroachment approval for construction near and crossing HV OVH
	Kinder Morgan (USA owner and operator) and Plains Midstream Canada (Canada owner and operator)	High pressure hydrocarbon pipeline crossing Approval
	Essex Terminal Railway (ETR)	Encroachment and crossing Approval
	Essex Region Conservation Authority (ERCA)	Approval for construction in floodplain
RTB	MECP	ECA for RTB construction
Outfall	MECP	ECA for outfall construction
	Windsor Port Authority, Canadian Coast Guard, Transport Canada	Review and approval
	ERCA	Approval for outfall construction
	Fisheries and Oceans Canada (DFO)	Approval for outfall construction
	Hydro One	Encroachment approval for construction crossing HV OVH

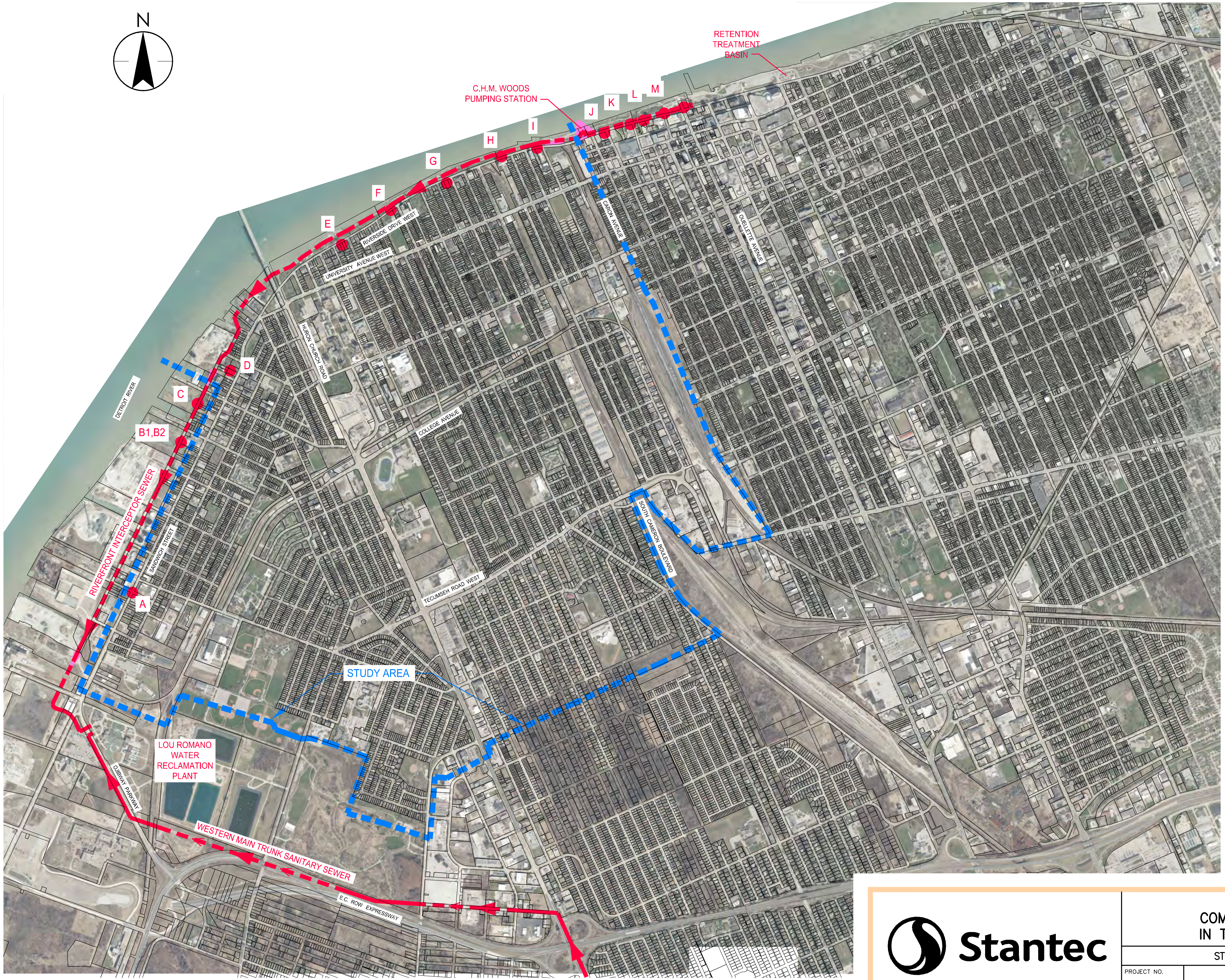
APPENDICES

APPENDIX A

- **Figures**

APPENDIX A

Figures



LEGEND

- ▬ ▬ ▬ STUDY AREA
- ▬ ▬ ▬ RIVERFRONT INTERCEPTOR
- ● E INTERCEPTOR CHAMBERS

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2019-7-12 09:55am BY: qkha

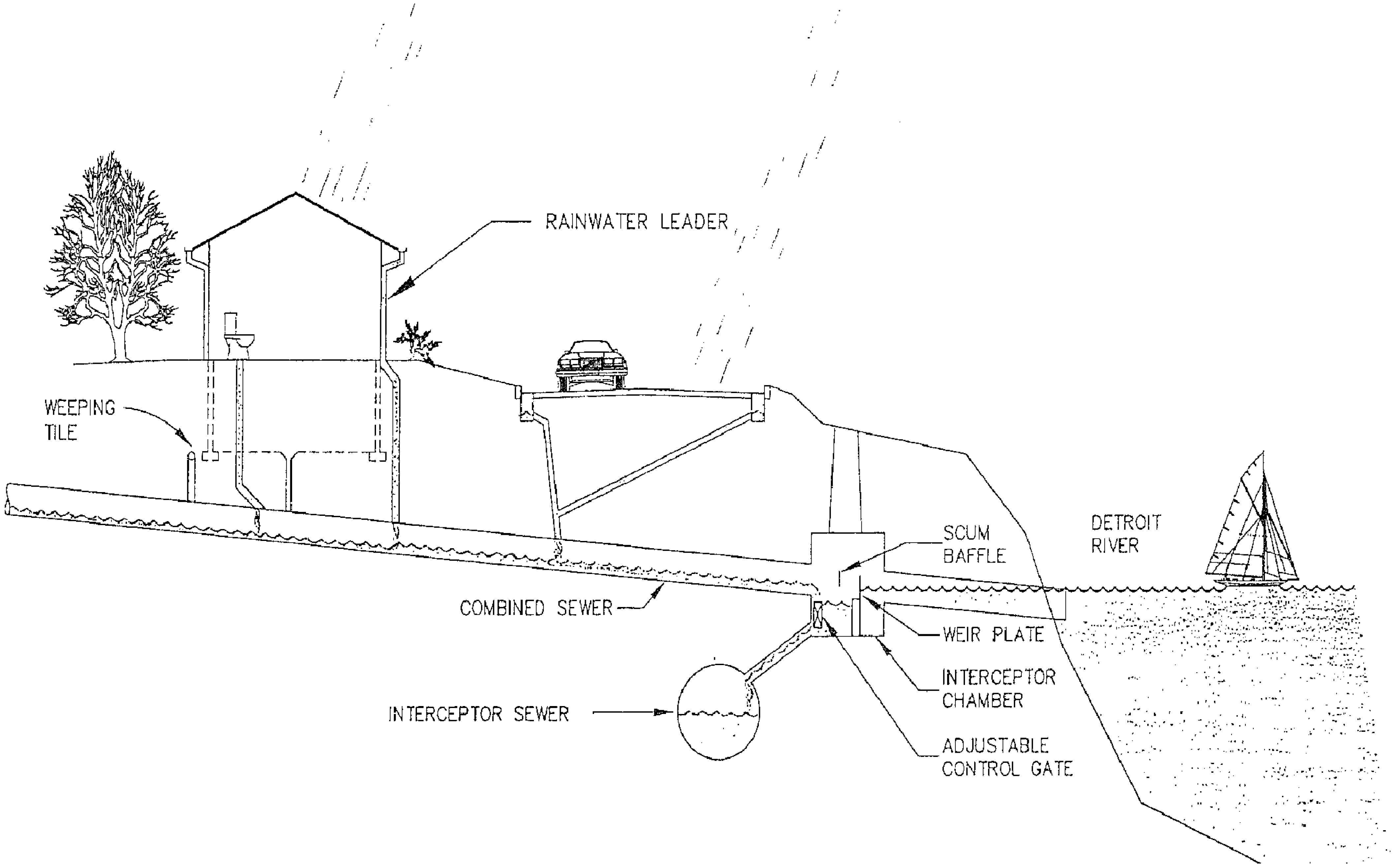
Stantec

CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

STUDY AREA AND INTERCEPTOR CHAMBER LOCATIONS

PROJECT NO.		DRAWING NO.
165620132		FIGURE 1-1

TYPICAL COMBINED SEWER SYSTEM



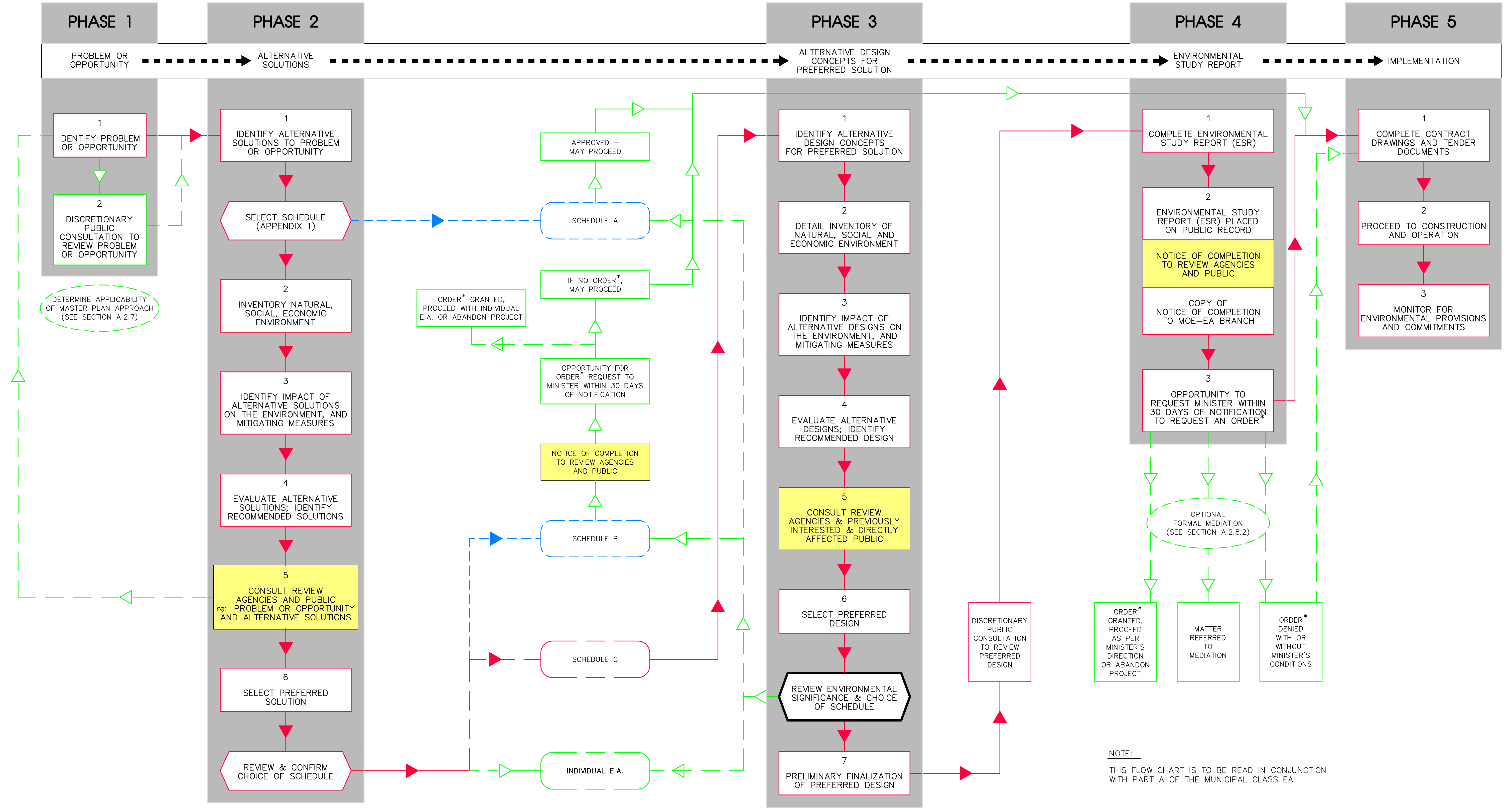
Stantec

CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

TYPICAL COMBINED SEWER SYSTEM

PROJECT NO. 165620132	DRAWING NO. FIGURE 1-2

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_1-2.dwg
2019-7-12 09:56am BY: qkha



NOTE:

THIS FLOW CHART IS TO BE READ IN CONJUNCTION WITH PART A OF THE MUNICIPAL CLASS EA

INDICATES MANDATORY EVENTS

INDICATES POSSIBLE EVENTS

INDICATES PROBABLE EVENTS

MANDATORY PUBLIC CONTACT POINTS (SEE SECTION A.3 CONSULTATION)

DECISION POINTS ON CHOICE OF SCHEDULE

OPTIONAL

* PART II ORDER (SEE SECTION A.2.8)

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

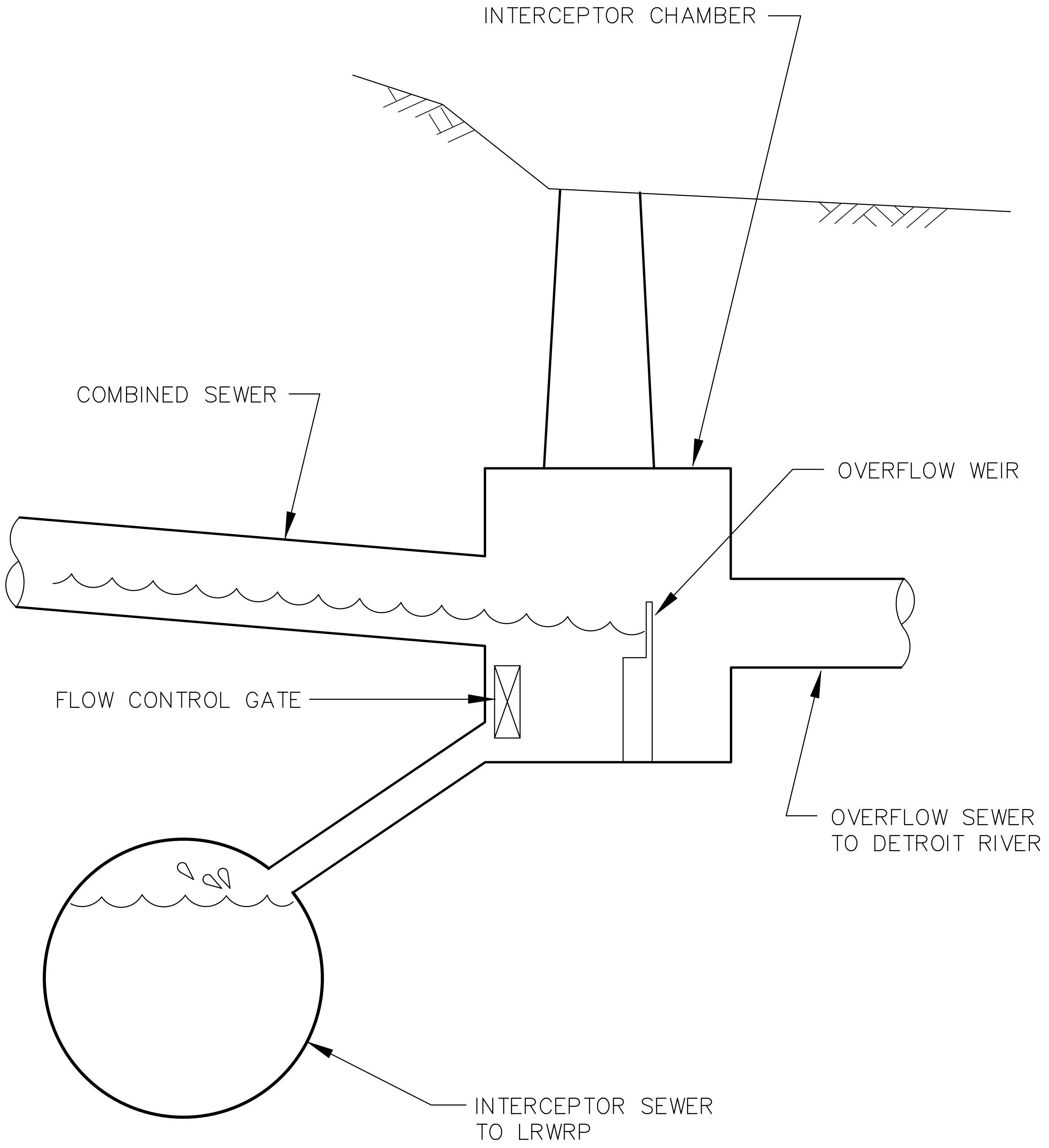
MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

PROJECT NO.
165620132

DRAWING NO.
FIGURE 1-3

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_1-3.dwg
2019-7-12 09:56am BY: qkha

INTERCEPTOR CHAMBER SCHEMATIC



CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

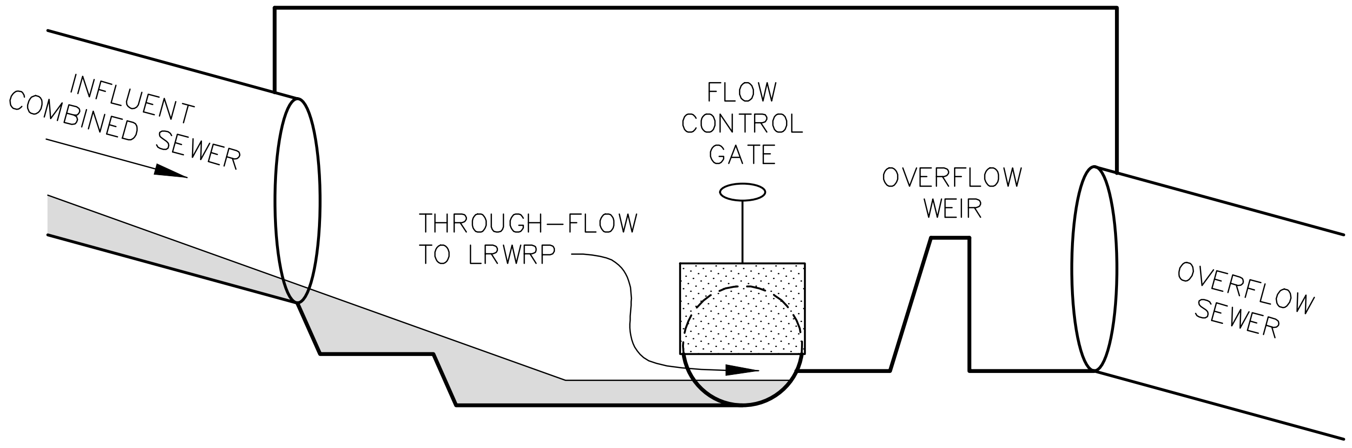
SKETCH OF TYPICAL INTERCEPTOR CHAMBER

PROJECT NO.
165620132

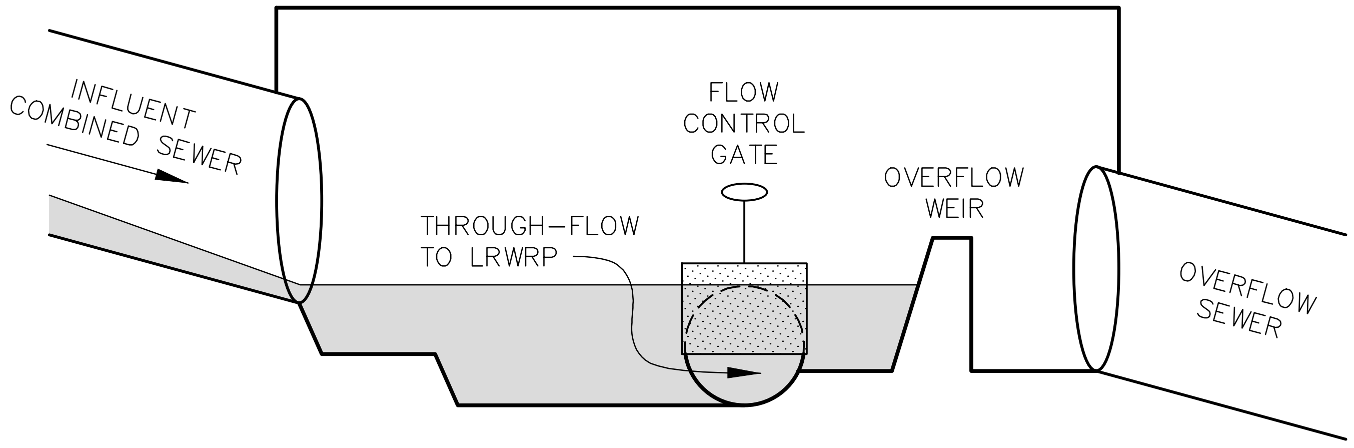
DRAWING NO.
FIGURE 2-1

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_2-1.dwg
2019-7-12 09:58am BY: qkha

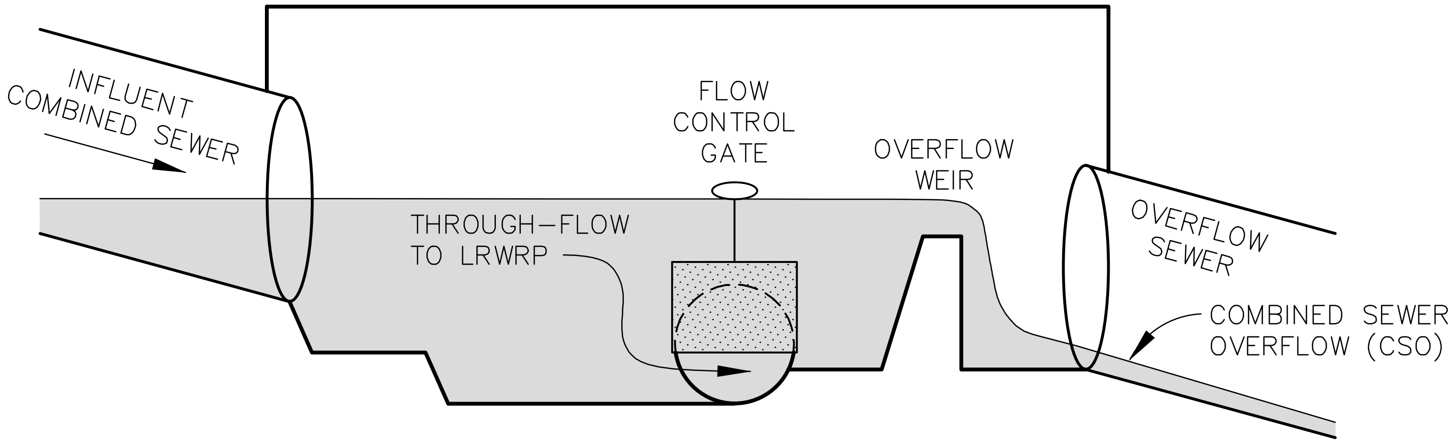
INTERCEPTOR CHAMBER FLOW CONDITIONS



DRY WEATHER FLOW (DWF)



2 1/2 TO 4 TIMES DWF



GREATER THAN 2 1/2 TO 4 TIMES DWF

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

DIFFERENT FLOW CONDITIONS IN TYPICAL INTERCEPTOR CHAMBER

PROJECT NO.
165620132

DRAWING NO.
FIGURE 2-2

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_2-2.dwg
2019-7-12 09:58am BY: qkha

GOLDER REPORT NO.'S
921-4230
891-4164
764111

GOLDER REPORT NO.'S
801-4110
791-4217

GOLDER REPORT NO.'S
70483
72569
72512
72512/1
72569/1
951-4037

GOLDER REPORT NO.'S
891-4153
901-4252
901-4049
911-4221
931-4235
941-4155

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

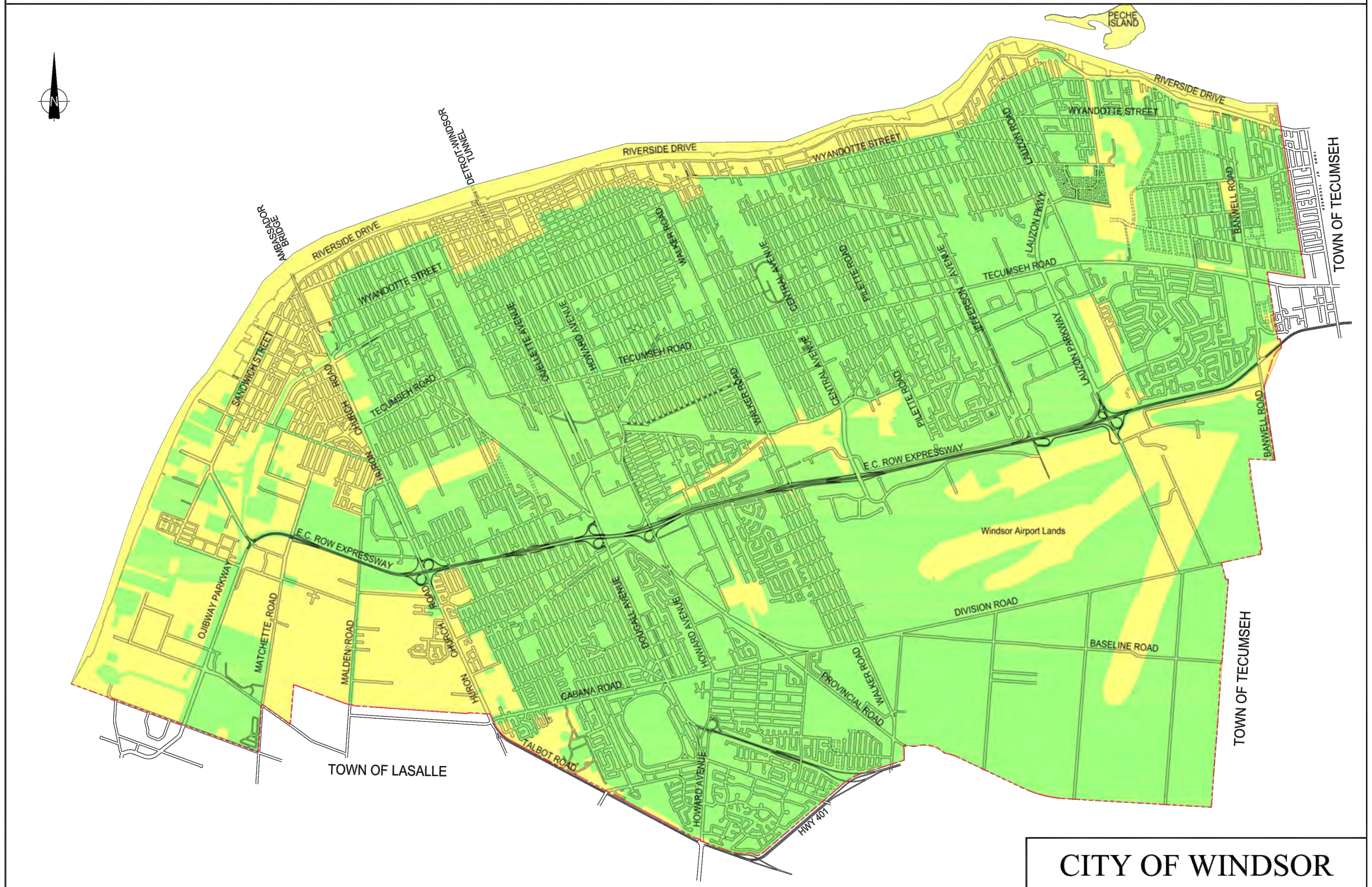
LOCATIONS OF PREVIOUS GEOTECHNICAL INVESTIGATIONS

PROJECT NO.
165620132

DRAWING NO.
FIGURE 2-3

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_2-3.dwg
2019-7-12 09:59am BY: qkha

WINDSOR ARCHAEOLOGICAL MASTER PLAN: FIGURE 4.0 - ARCHAEOLOGICAL POTENTIAL



LEGEND:

🟩 LOW POTENTIAL

🟨 HIGH POTENTIAL

▬ ▪ ▬ CITY BOUNDARY (APPROXIMATE)

MAPPING BASED ON OBM FILES COMPILED BY
PHOTOMAP AIR SURVEYS FROM 1985/86 PHOTOGRAPHY.

0 500 1000m

basemap.dwg 01/08/07 14:16:05 G:\CAD\956660\Windsor April 2001\

CITY OF WINDSOR

JUNE 2005
SCALE: 1:20 000

CRM Group
Cultural Resource Management Group Ltd.

FISHER ARCHAEOLOGICAL CONSULTING

HISTORIC HORIZON INC.

DILLON CONSULTING LIMITED

Stantec

CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

ARCHAEOLOGICAL POTENTIAL IN THE CITY OF WINDSOR AREA

PROJECT NO.
165620132

DRAWING NO.
FIGURE 2-4

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_2-4.dwg
2019-7-12 10:01am BY: qkha

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_2.5.dwg
2019-7-12 09:57am BY: qkha

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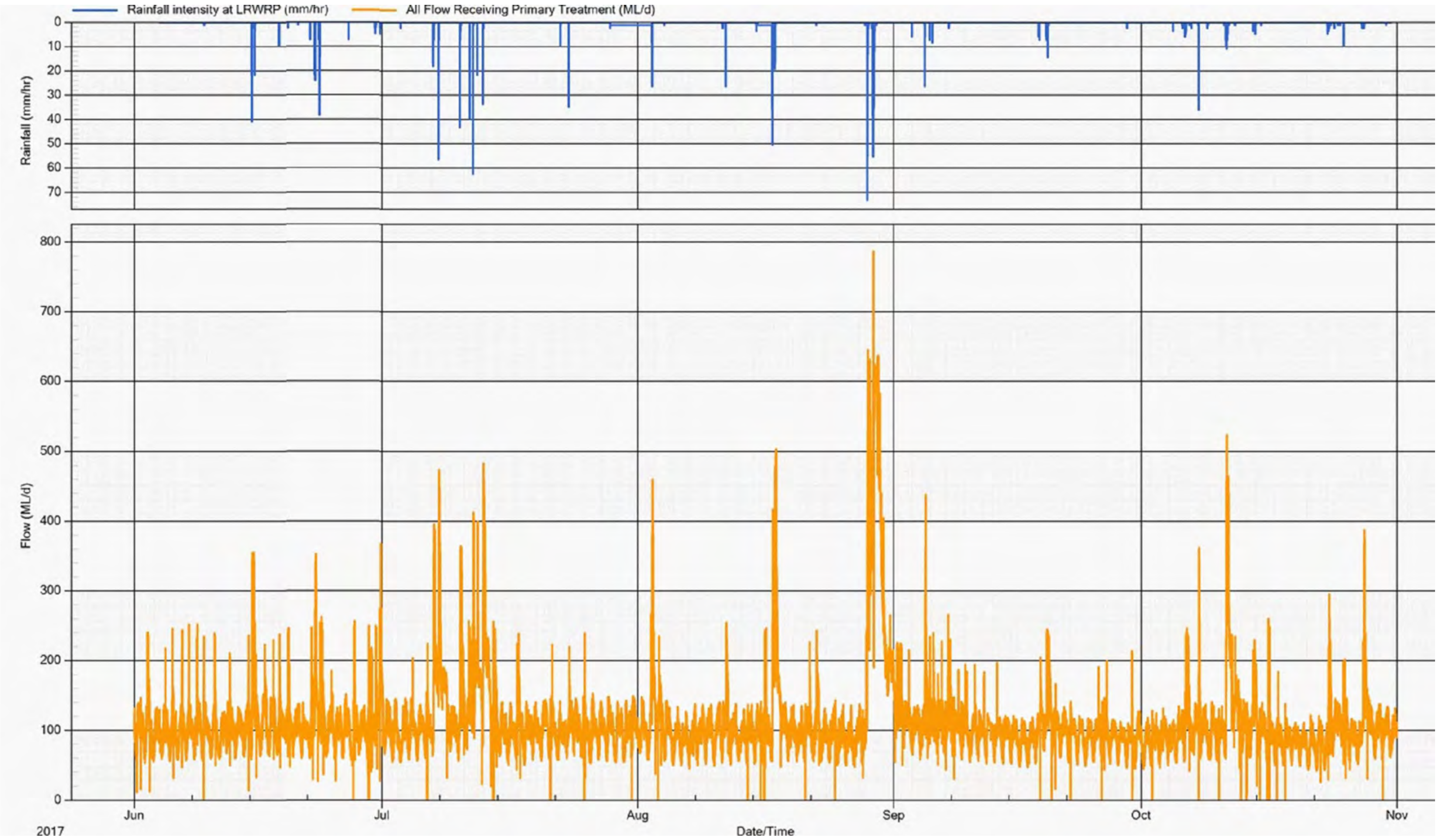
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

AERIAL PLAN OF WINDSOR'S CULTURAL HERITAGE SITES

PROJECT NO.
165620132

DRAWING NO.
FIGURE 2.5



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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

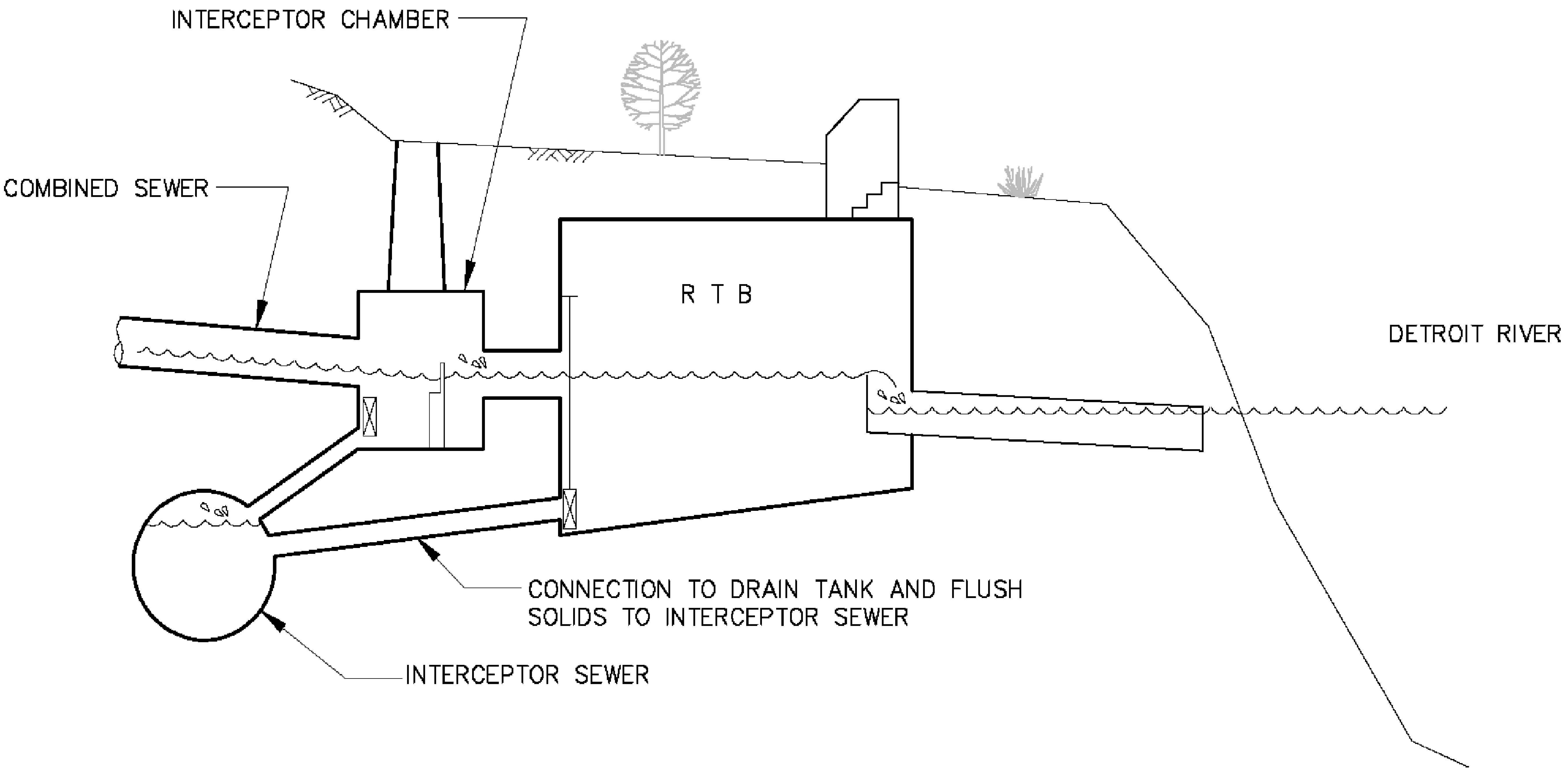
RAINFALL AMOUNTS AND SEWAGE FLOWS RECEIVED AT THE LRWRP

PROJECT NO.
165620132

DRAWING NO.
FIGURE 3-1

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_3-1.dwg
2019-7-12 10:01am BY: qkha

SKETCH OF A RETENTION TREATMENT BASIN (RTB)



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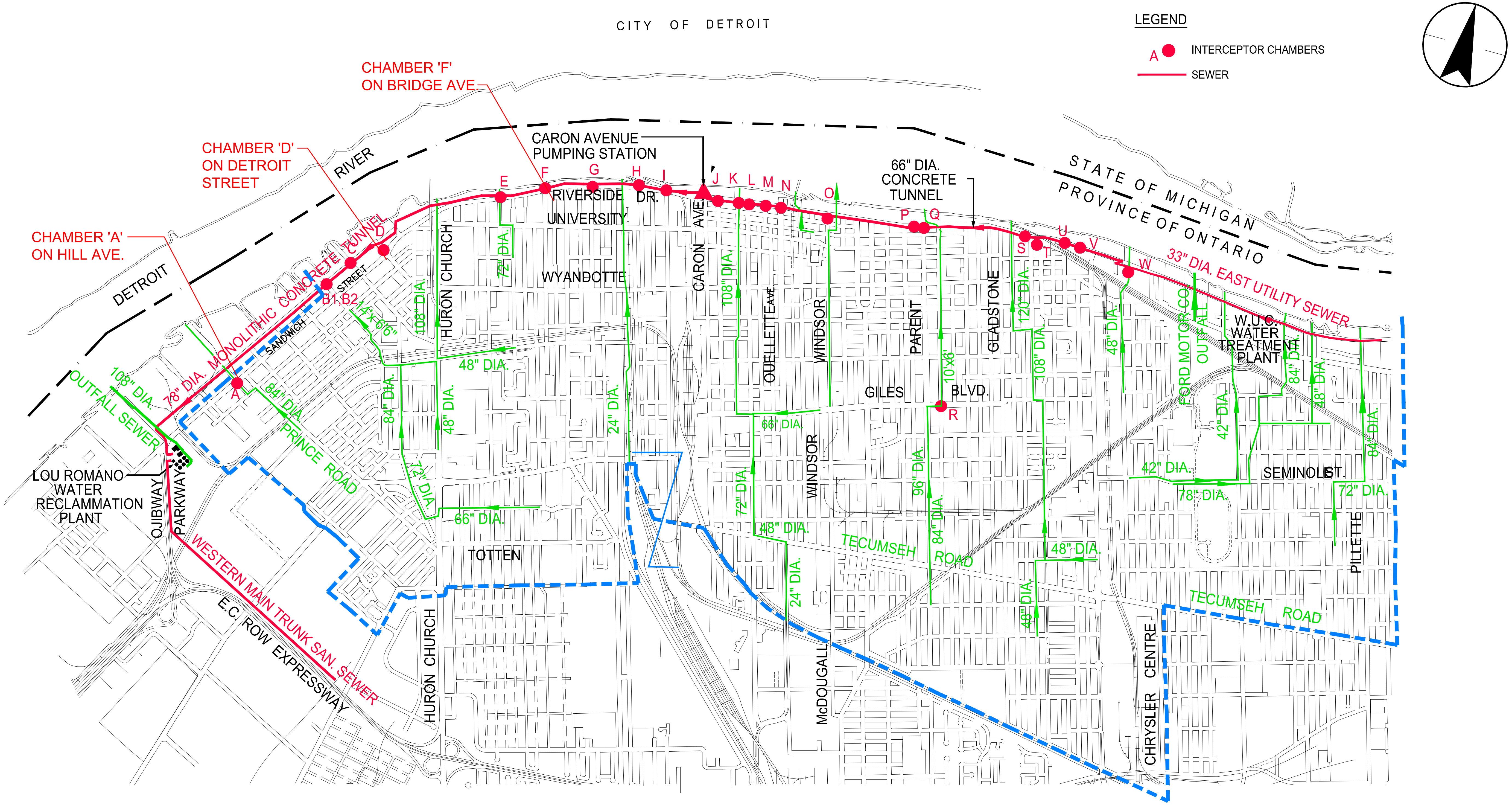
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

SKETCH OF TYPICAL RETENTION TREATMENT BASIN

PROJECT NO.	DRAWING NO.
165620132	FIGURE 4-1

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_4-1.dwg
2019-7-12 10:02am BY: qkha

DESIGN ALTERNATIVES - CSO INTERCEPTION



Increasing Volumetric Interception rate at Chambers A, D and F

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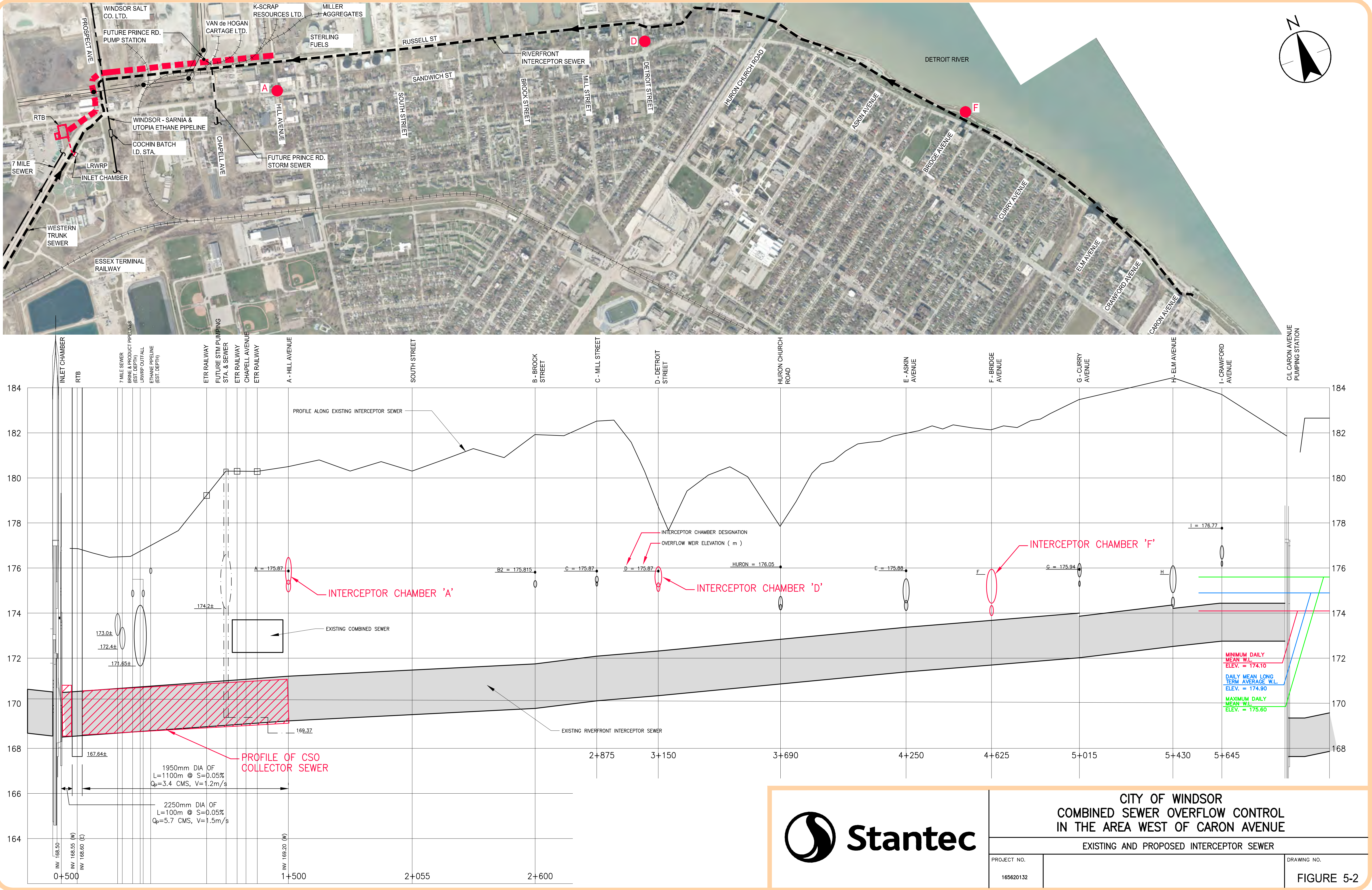
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

DESIGN ALTERNATIVES FOR CSO INTERCEPTION

PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-1

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-1.dwg
2019-7-12 10:02am BY: qkha



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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

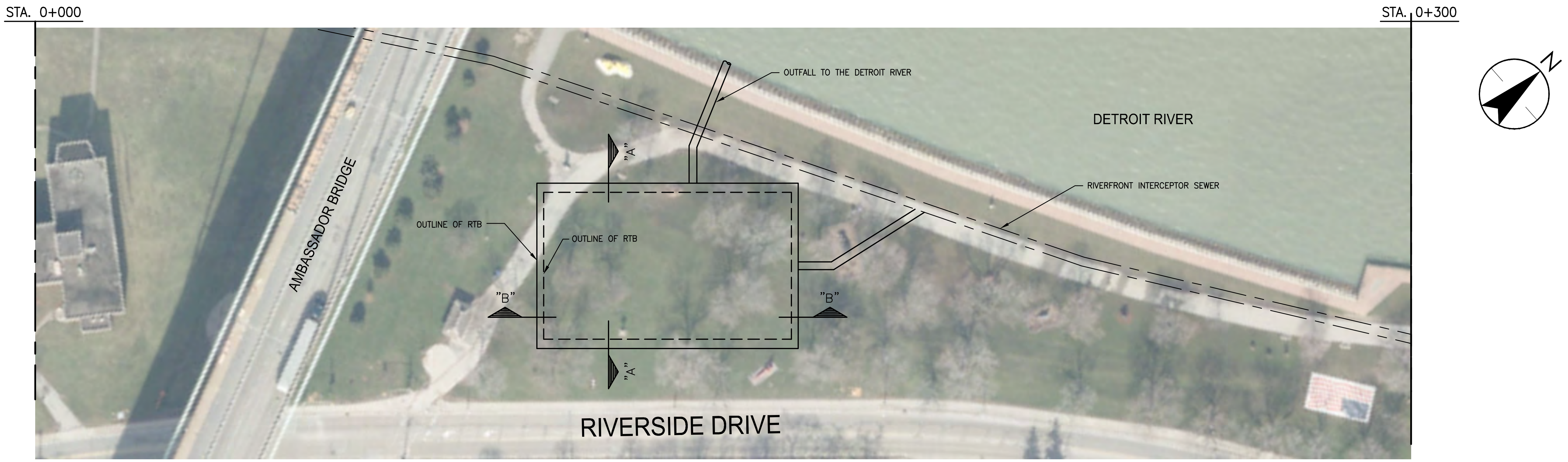
EXISTING AND PROPOSED INTERCEPTOR SEWER

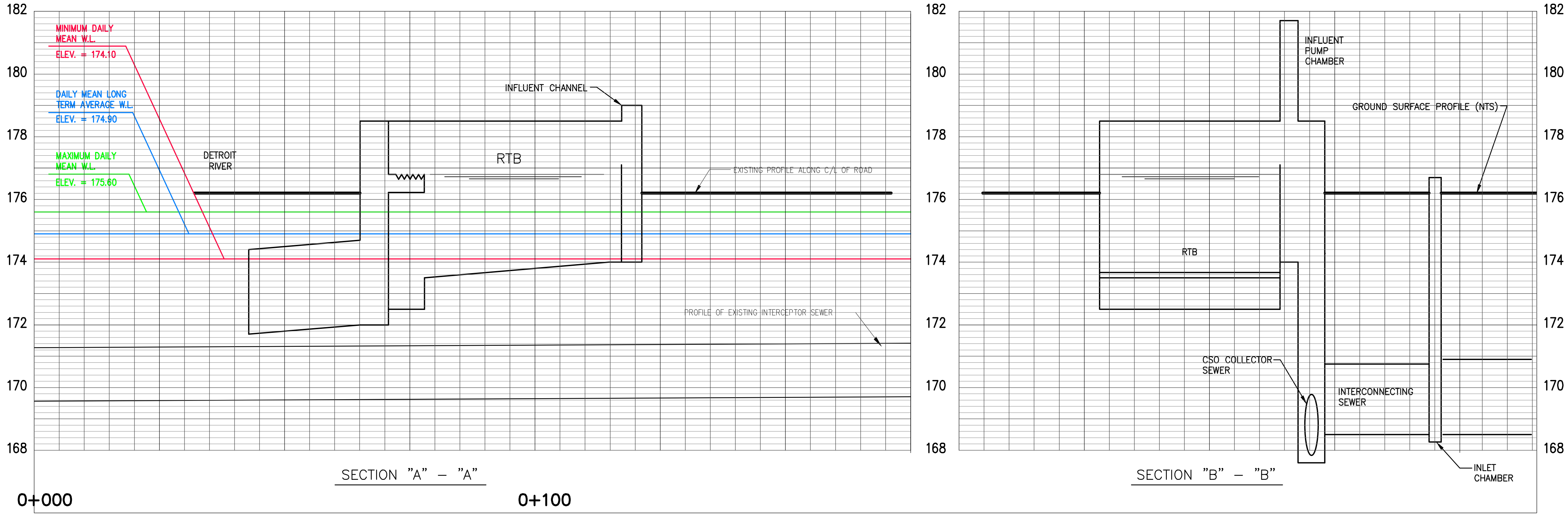
PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-2

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-2.dwg
2019-7-12 10:03am BY: qkha

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-3A-B.dwg
2019-7-12 10:05am BY: qkha





NOTE:
THIS A CONCEPT PLAN OF A RETENTION TREATMENT BASIN (RTB)
THE EXACT LOCATION, SIZE AND CONFIGURATION ARE SUBJECT
TO MODIFICATIONS DURING FINAL DESIGN.

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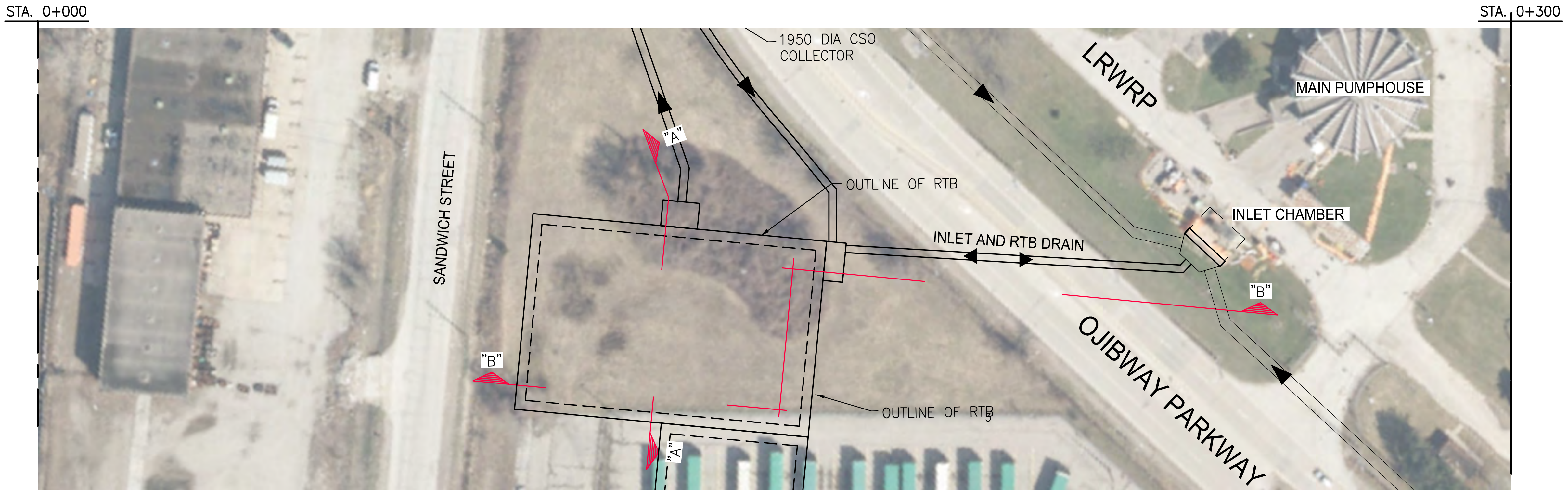
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

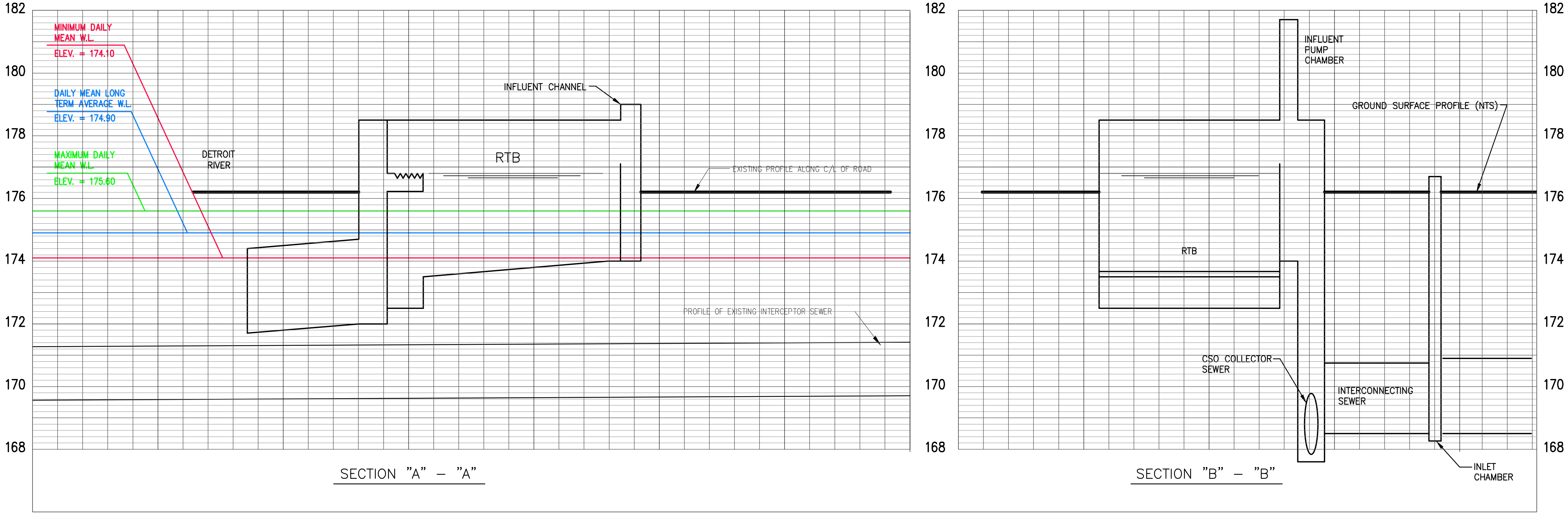
POSSIBLE RTB SITE ON THE RIVERFRONT AT HURON CHURCH ROAD

PROJECT NO.
165620132

0 10 30 50m
1:1000

DRAWING NO.
FIGURE 5-3A





NOTE:
THIS A CONCEPT PLAN OF A RETENTION TREATMENT BASIN (RTB)
THE EXACT LOCATION, SIZE AND CONFIGURATION ARE SUBJECT
TO MODIFICATIONS DURING FINAL DESIGN.

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

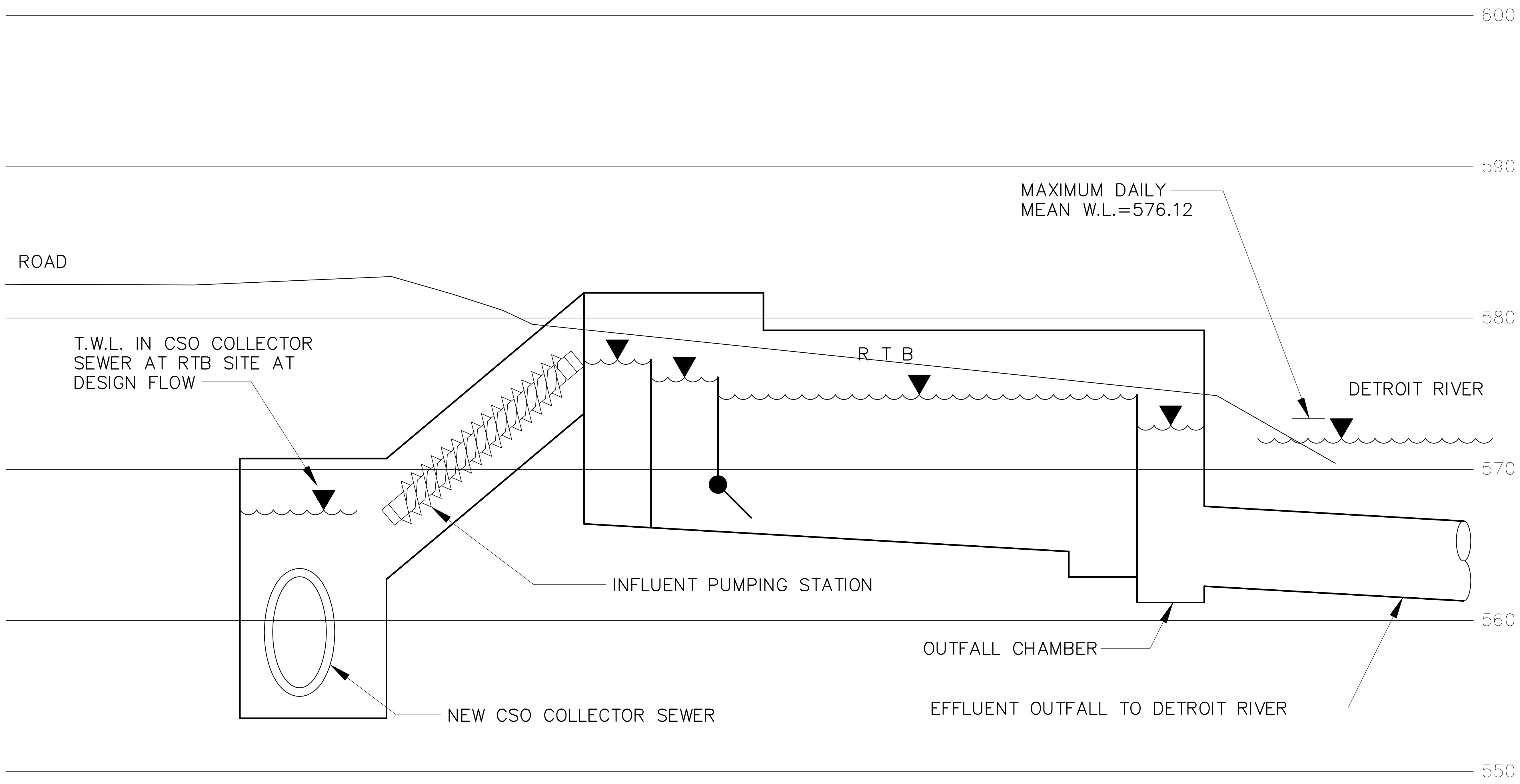
POSSIBLE RTB SITE ACROSS OJIBWAY PARKWAY FROM THE LRWRP

PROJECT NO.
165620132

0 10 30 50m
1:1000

DRAWING NO.
FIGURE 5-3B

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-3A-B.dwg
2019-7-12 10:06am BY: qkha



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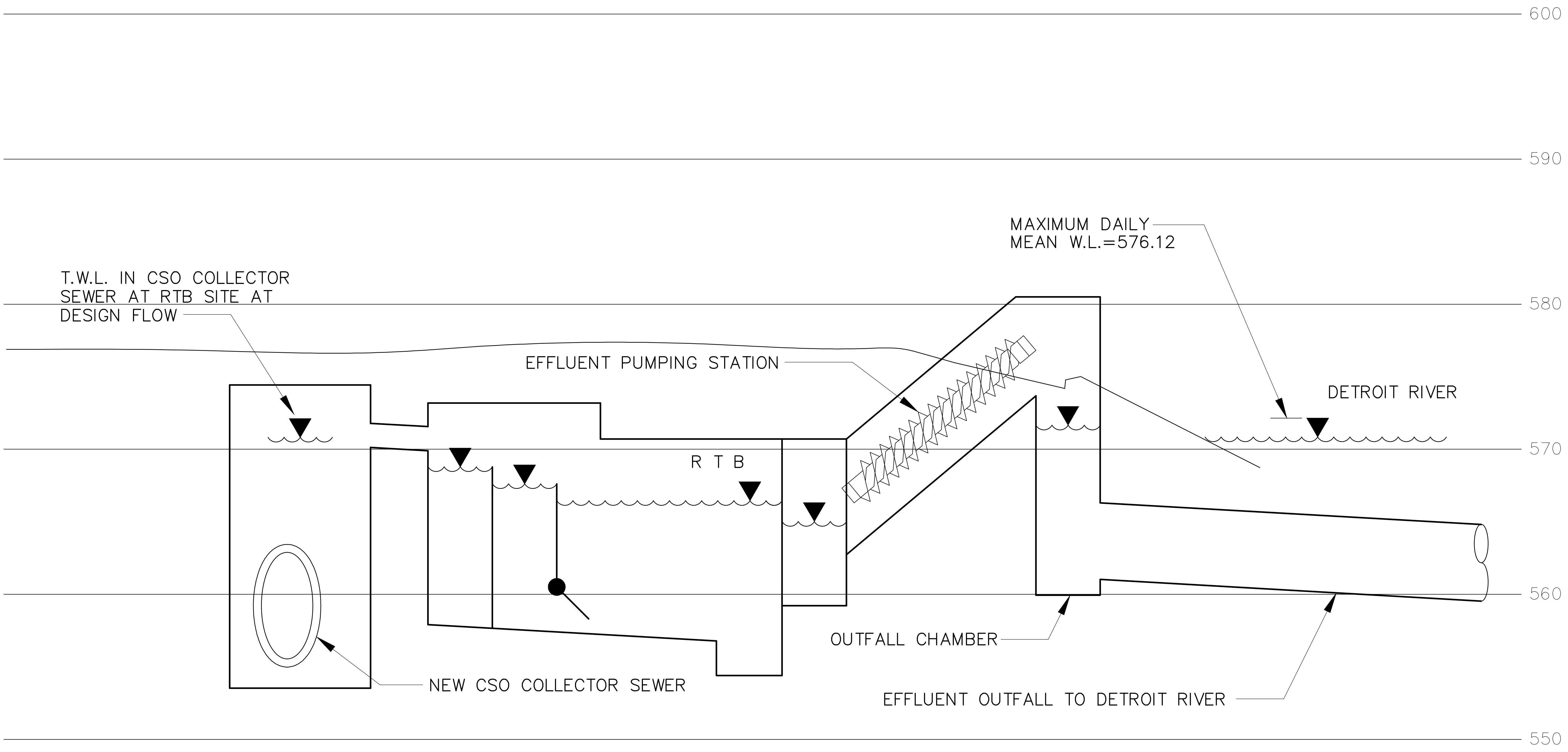
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

SCHEMATIC DIAGRAM FOR INFLUENT PUMPING ALTERNATIVE

PROJECT NO.	DRAWING NO.
165620132	FIGURE 5-4A

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-4A-B.dwg
2019-7-12 10:06am BY: qkha



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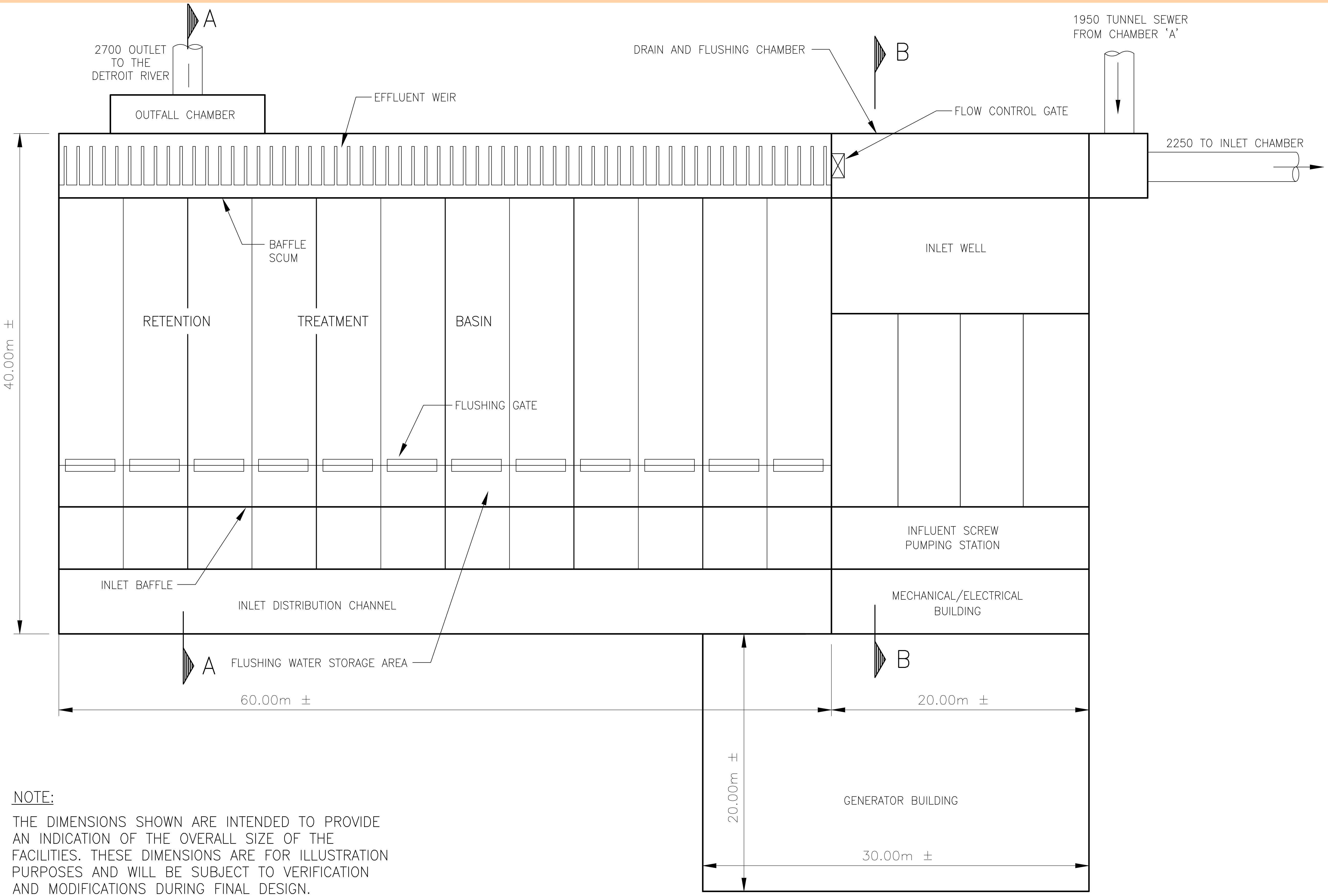
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

SCHEMATIC DIAGRAM FOR EFFLUENT PUMPING ALTERNATIVE

PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-4B

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-4A-B.dwg
2019-7-12 10:06am BY: qkha



NOTE:

THE DIMENSIONS SHOWN ARE INTENDED TO PROVIDE AN INDICATION OF THE OVERALL SIZE OF THE FACILITIES. THESE DIMENSIONS ARE FOR ILLUSTRATION PURPOSES AND WILL BE SUBJECT TO VERIFICATION AND MODIFICATIONS DURING FINAL DESIGN.

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-5A-B.dwg
2019-7-12 10:07am BY: qkha

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

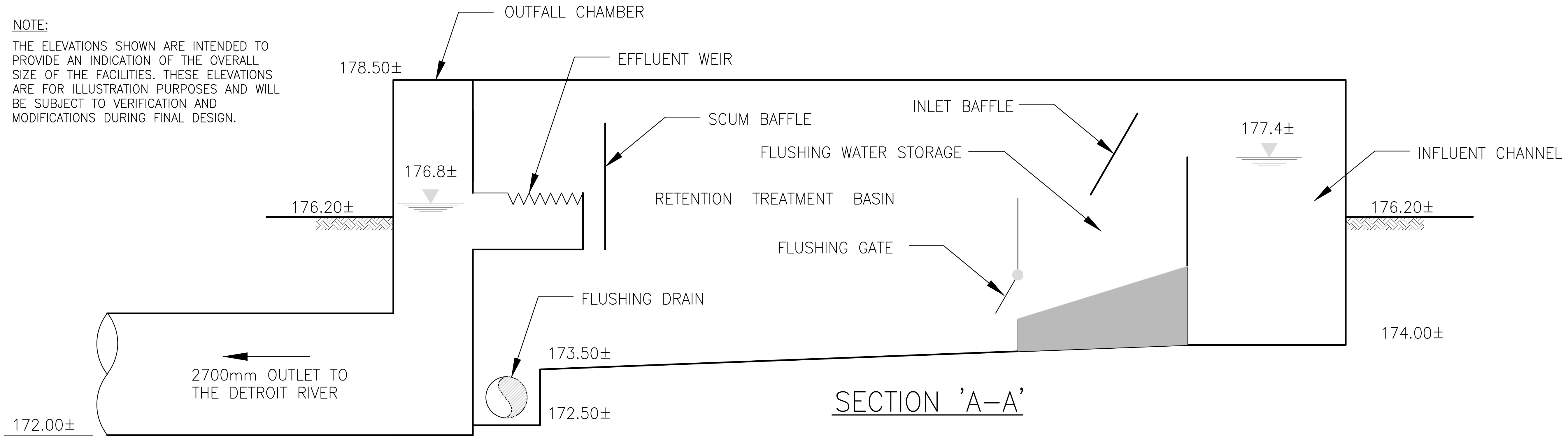
PLAN VIEW OF PROPOSED RTB FACILITIES AND INFLUENT PUMPING STATION

PROJECT NO.
165620132

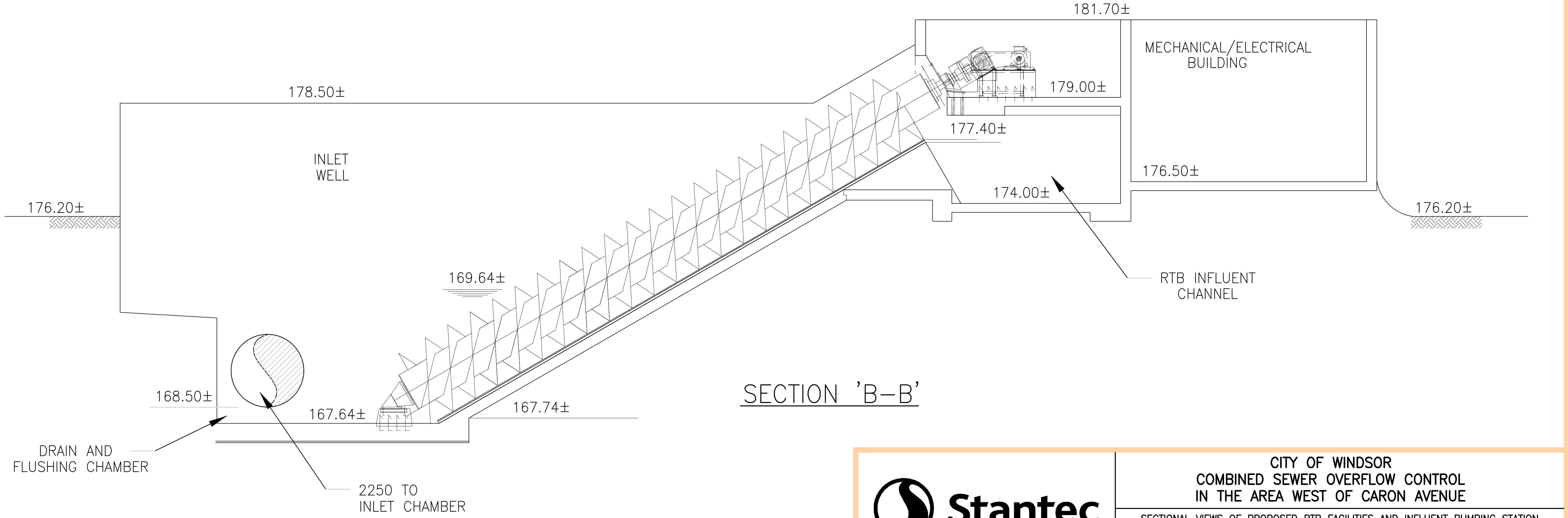
DRAWING NO.
FIGURE 5-5A

NOTE:

THE ELEVATIONS SHOWN ARE INTENDED TO PROVIDE AN INDICATION OF THE OVERALL SIZE OF THE FACILITIES. THESE ELEVATIONS ARE FOR ILLUSTRATION PURPOSES AND WILL BE SUBJECT TO VERIFICATION AND MODIFICATIONS DURING FINAL DESIGN.



SECTION 'A–A'



SECTION 'B–B'

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-5A-B.dwg
2019-7-12 10:07am BY: qkha

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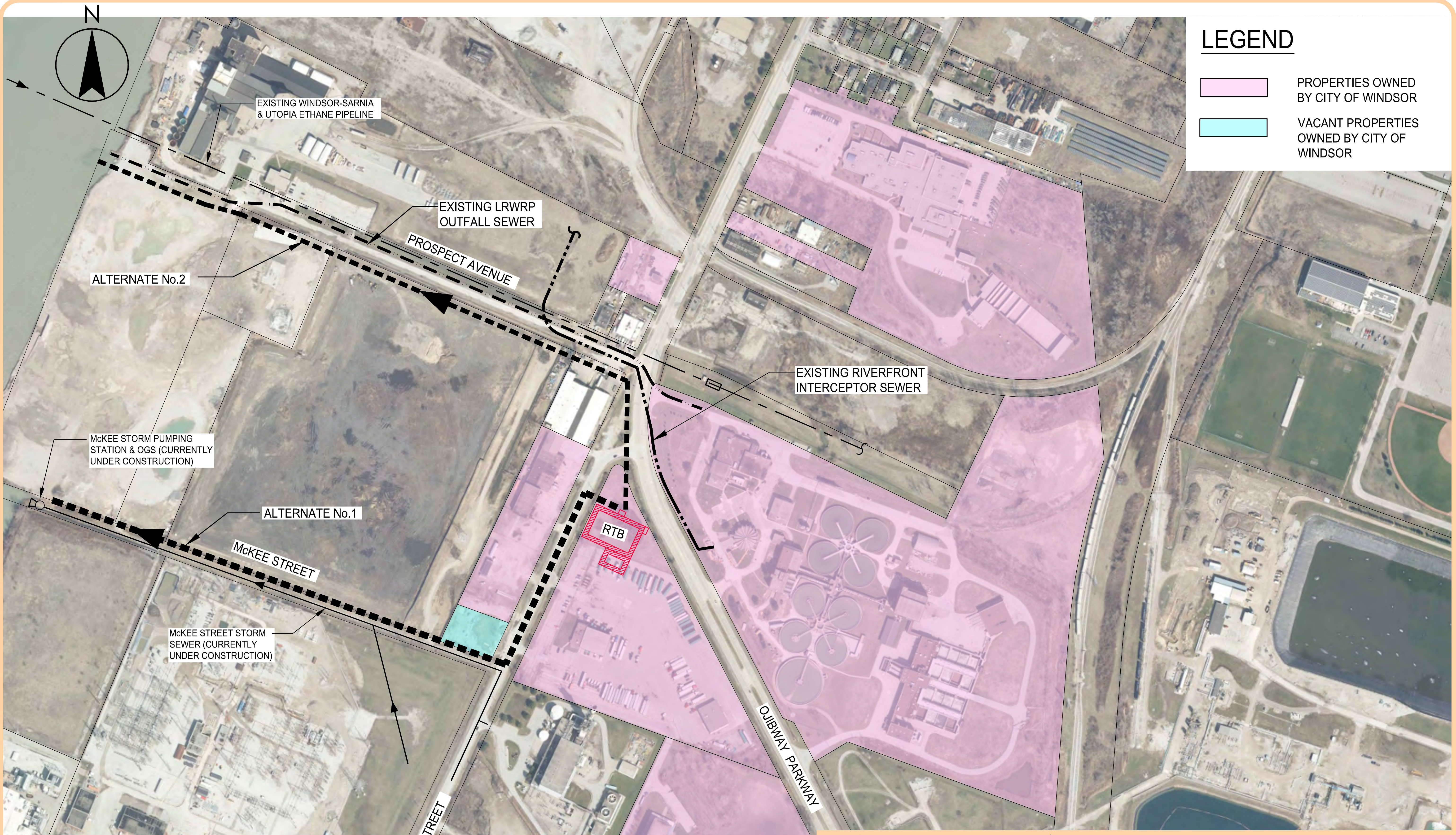
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

SECTIONAL VIEWS OF PROPOSED RTB FACILITIES AND INFLUENT PUMPING STATION

PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-5B



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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

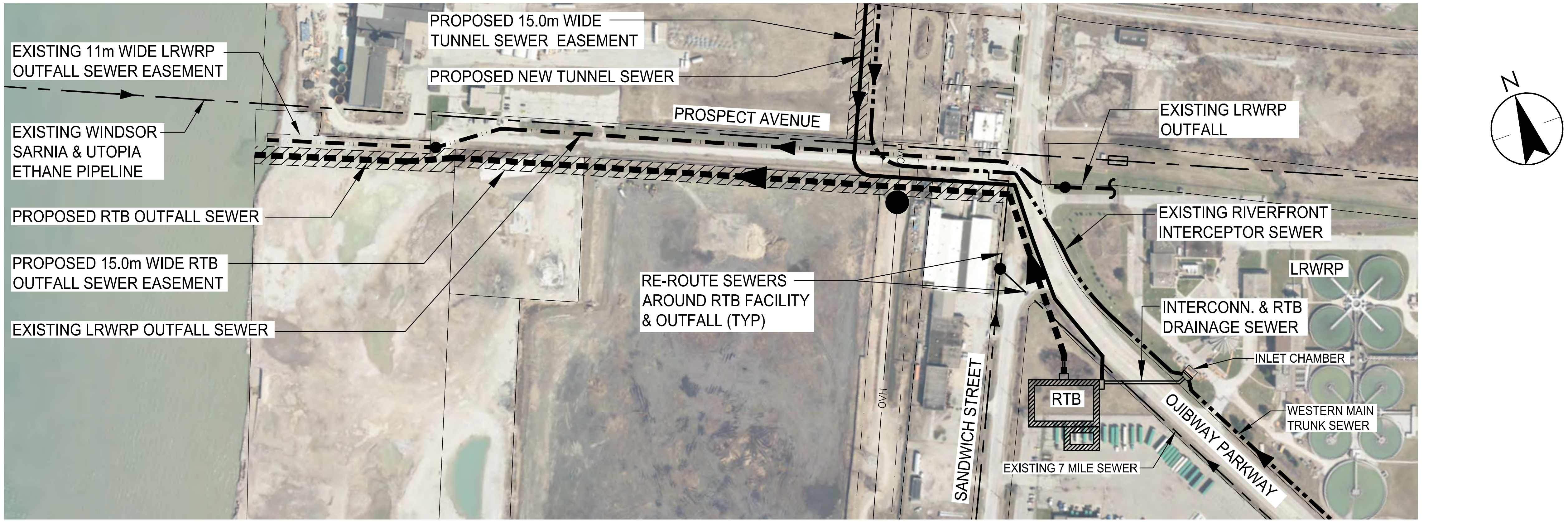
DESIGN – ALTERNATIVE FOR RTB OUTFALL SEWER

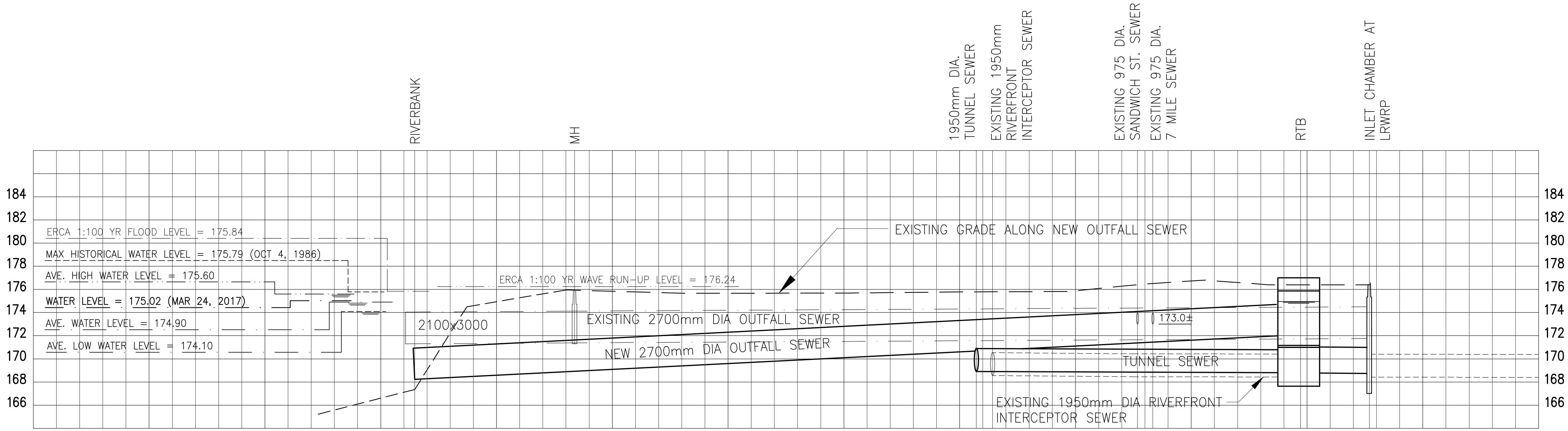
PROJECT NO.
165620132

0 10 30 50m
1:1000

DRAWING NO.
FIGURE 5-6A

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-6A.dwg
2019-7-12 10:08am BY: qkha





NOTE:

1. PROPOSED EASEMENTS ARE PRELIMINARY AND BASED ON AVAILABLE INFORMATION AT THIS TIME. THEY ARE SUBJECT TO CHANGE ONCE A LEGAL SURVEY HAS BEEN COMPLETED.

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

OUTFALL ALONG PROSPECT AVENUE

PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-6B

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-6B.dwg
2019-7-12 10:10am BY: qkha

NOTE:

1. PROPOSED EASEMENTS ARE PRELIMINARY AND BASED ON AVAILABLE INFORMATION AT THIS TIME. THEY ARE SUBJECT TO CHANGE ONCE A LEGAL SURVEY HAS BEEN COMPLETED.

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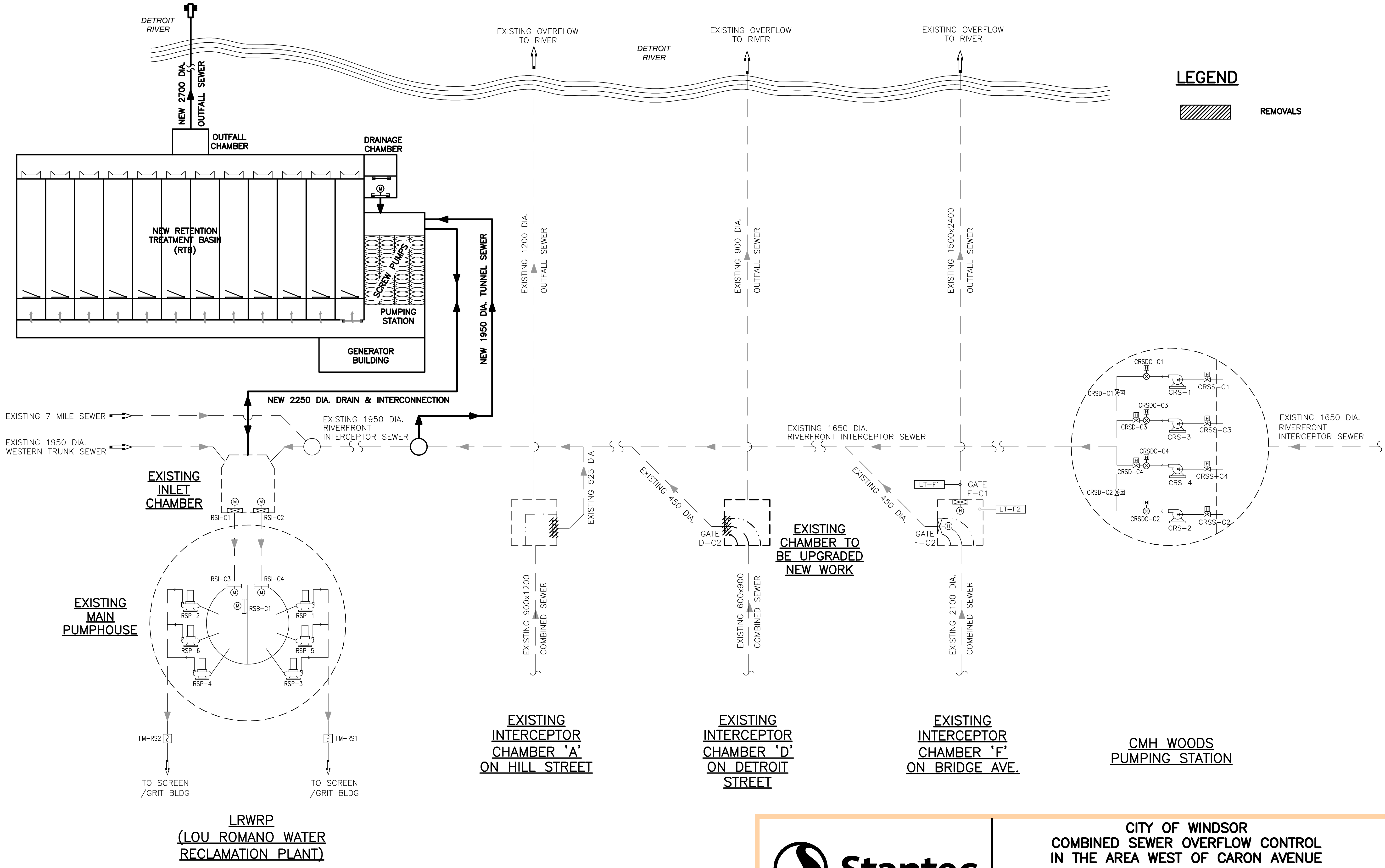
CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

AERIAL PLAN OF PREFERRED CSO COLLECTOR SEWER, RTB AND OUTFALL

PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-7

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-7.dwg
2019-7-12 10:11am BY: qkha



V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_5-8.dwg
2019-7-12 10:11am BY: qkha

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

PROCESS CONTROL SCHEMATIC OF PREFERRED CSO COLLECTOR SEWER, RTB AND OUTFALL

PROJECT NO.
165620132

DRAWING NO.
FIGURE 5-8

NOTE:

1. PROPOSED EASEMENTS ARE PRELIMINARY AND BASED ON AVAILABLE INFORMATION AT THIS TIME. THEY ARE SUBJECT TO CHANGE ONCE A LEGAL SURVEY HAS BEEN COMPLETED.

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CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

AERIAL PLAN OF PROPOSED EASEMENT REQUIREMENTS FOR PROPOSED WORK

PROJECT NO.
165620132

DRAWING NO.
FIGURE 7-1

V:\01656\active\165620132\planning\Final ESR\drawings\20132_FIGURE_7-1.dwg
2019-7-12 10:12am BY: qkha

APPENDIX B

- MOE Procedure F-5-5
- Windsor Riverfront P.C.P. Study
  - Phase 1 – Problem Definition Executive Summary
- Windsor Riverfront P.C.P. Study
  - Phase 2 – Control Options Executive Summary
- Windsor Riverfront P.C.P. Study Phase 2 – Control Options Technical Summary
- Windsor Riverfront P.C.P. Study
  - Phase 3 – Implementation Plan Executive Summary
- Windsor Combined Sewer Overflow Treatability Study Comprehensive Report – Abstract
- Windsor CSO Treatability and Characterization Study Journal Paper

APPENDIX B

MOE Procedure F-5-5

Environment and energy (https://www.ontario.ca/environmentandenergy) →

F-5-5 Determination of treatment requirements for municipal and private combined

The rules for treating municipal and private combined and partially separated sewage systems.

Rationale (1)

Procedure F-5-5 is a supporting document for Guideline F-5 "Levels of Treatment for Municipal and Private Sewage Treatment Works Discharging to Surface Waters".

A Combined Sewer System (CSS) is a wastewater collection system designed to convey both sanitary wastewater and stormwater runoff through a single-pipe system to a sewage treatment works. During dry weather, it conveys sanitary wastewater. During a precipitation event (rainfall or snowmelt) the capacity of the CSS and/or treatment facility may be exceeded by the total wastewater flow. This results in the occurrence of a combined sewer overflow (CSO) which is an untreated mixture often containing high levels of floatables, pathogenic microorganisms, suspended solids, oxygen-demanding organic compounds, nutrients, oil and grease, toxic contaminants and other pollutants. The CSOs represent a potential health hazard and can have adverse effects on aquatic life, recreational uses and water supplies. The goals of this Procedure are to:

a. eliminate the occurrence of dry weather overflows
b. minimize the potential for impacts on human health and aquatic life resulting from CSOs
c. achieve as a minimum, compliance with body contact recreational water quality objectives (Provincial Water Quality Objectives (PWQO) for Escherichia coli (E. coli)) at beaches impacted by CSOs for at least 95% ofthe four-month period (June 1 to September 30) for an average year.

Definitions (2)

combined sewer system (CSS)
: a wastewater collection system which conveys sanitary wastewaters (domestic, commercial and industrial wastewaters) and stormwater runoff through a single pipe system to a Sewage Treatment Plant (STP) or treatment works. Combined sewer systems which have been partially separated and in which roof leaders or foundation drains contribute stormwater inflow to the sewer system conveying sanitary flows are still defined as combined sewer systems in this Procedure.

combined sewer overflow (CSO)
: a discharge to the environment from a combined sewer system that usually occurs as a result of a precipitation event when the capacity of the combined sewer is exceeded. Itconsists of a

mixture of sanitary wastewater and stormwater runoff and often contains high levels of floatables, pathogenic microorganisms, suspended solids, oxygen-demanding organic compounds, nutrients, oil and grease, toxic contaminants and other pollutants.

overflow event

occurs when there is one or more CSOs from a combined sewer system, resulting from a precipitation event. An intervening time of twelve hours or greater separating a CSO from the last prior CSO at the same location is considered to separate one overflow event from another.

Dry weather flow

is sewage flow resulting from both:

1. Sanitary wastewater (combined input of industrial, domestic and commercial flows); and
2. Infiltration and inflows from foundation drains or other drains occurring during periods with an absence of rainfall or snowmelt.

Wet weather flow

is the combined sewage flow resulting from:

1. Sanitary wastewater; and
2. Infiltration and inflows from foundation drains or other drains resulting from rainfall or snowmelt; and
3. Stormwater runoff generated by either rainfall or snowmelt that enters the combined sewer system.

regulator

is any structure that in dry weather permits the passage of all flows to treatment and in wet weather permits discharge to an outfall or relief sewer of all flows in excess of some specific flowrate.

average year

refers to:

1. the long term average of flow based on using simulation of at least twenty years of rainfall data and/or
2. a year in which the rainfall pattern (e.g. intensity, volume and frequency) is consistent with the long-term mean of the area; and/or
3. a year inwhich the runoff pattern resulting from the rainfall (e.g. rate, volume and frequency) is consistent with the long-term mean of the area.

swimming and bathing beach

is a strip of shoreline with the physiographic, climatic, access, and ownership attributes necessary to accommodate significant water contact and non-contact recreation under favourable aquatic conditions.

Separate versus combined sewers (3)

The Ministry "Guidelines for the Design of Sanitary Sewage Systems, July 1985" states that

> "All new sewer construction within the Province of Ontario should be of the 'separate' type, with all forms of storm and groundwater flow being excluded to the greatest possible extent. New 'combined' sewer systems will not be approved."

However, existing combined sewers may undergo rehabilitation or be replaced by new combined sewers provided the municipality or operating authority has met the Ministry requirements as set out in this document.

Ministry requirements for municipal & private combined sewer systems (4)

To meet the goals of this Procedure each municipality or operating authority of a combined sewer system will be expected to:

a. develop a Pollution Prevention and Control Plan (PPCP) as outlined in Section 5;
b. meet minimum CSO controls as outlined in Section 6; and
c. provide additional controls
    - for beaches impaired by CSOs where water quality is not meeting the PWQO for E. coli as outlined in Section 9
    - where required by receiving water quality conditions as specified in Procedure B-1-1 "Water Management - Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy, July 1994".

The site-specific nature and impacts of CSOs are recognized in this Procedure. There is flexibility for selecting controls for local situations.

Pollution prevention and control plan (PPCP) (5)

A Pollution Prevention and Control Plan (PPCP) should be developed to meet the goals of the Procedure by:

- outlining the nature, cause and extent of pollution problems;
- examining alternatives and proposing remedial measures; and,
- recommending an implementation program.

Water quality problems may be caused primarily by combined sewer overflows or by a combination of sources including CSOs. Where the pollution problem is due to a combination of sources, the discharges will be investigated and prioritized based on the relevant significance of the various discharges. Insome cases the receiving water quality and pollutant transport mechanisms will be assessed in the PPCP.

To address the impact of CSOs the components of the PPCP shall include:

a. characterization of the combined sewer system (CSS);

    Monitoring, modelling and other appropriate means shall be used to characterize the CSS and the response ofthe CSS to precipitation events. The characterization shall include the determination of the location, frequency and volume of the CSOs as well as the concentrations and mass of pollutants resulting from CSOs. Through this process the existence and severity of suspected deficiencies will be confirmed. Records shall be kept for combined sewer systems including the following:

  - location and physical description of CSO outfalls in the collection system, emergency overflows at pumping stations, and bypass locations at STPs;
  - location and identification of receiving water bodies for all combined sewer outfalls;
  - combined sewer system flow and STP treatment capacities; present and future expected peak flow rates during dry weather and wet weather;
  - capacity of all regulators; and
  - location of cross-connections.

  Operational procedures shall be developed for combined sewer systems including the following:

  - combined sewer maintenance programs; and,
  - regulator inspection and maintenance programs.

b. an examination of non-structural and structural CSO control alternatives that may include:
  - source control;
  - inflow/infiltration reduction;
  - operation and maintenance improvements;
  - control structure improvements; collection system improvements; storage technologies;
  - treatment technologies;
  - sewer separation.

c. an implementation plan with cost estimates and schedule of all practical measures to eliminate dry weather overflows and minimize wet weather overflows.

  The implementation plan should show how the minimum CSO prevention and control requirements and other criteria in this Procedure are being achieved.

Minimum combined sewer overflow (CSO) controls (6)

The minimum CSO controls consist of the following :

1. Eliminate CSOs during dry-weather periods except under emergency conditions.

   Each municipality shall demonstrate that the combined sewer system, including the regulators, and associated treatment facilities are adequate for the transmission and treatment of all peak dry weather flows from the service area. An emergency condition would exist when e.g. basement flooding, damage to equipment at treatment works or pumping stations, or treatment process washout was occurring or was imminent.

2. Establish and implement Pollution Prevention programs that focus on pollutant reduction activities at source e.g. reduced use of potential pollutants like fertilizer and pesticides in parks; public education programs on e.g. anti-littering and illegal dumping of used motor oil and other materials into catchbasins; water conservation to reduce dry weather sanitary flow and hence CSOs; street cleaning to reduce CSO floatables; roof-leader disconnection and installing rain barrels to reduce flows into the sewer system; education/assistance for industries to minimize the use/discharge of pollutants; and enforcement of municipal by-laws or regulations.
3. Establish and implement proper operation and regular inspection and maintenance programs for the combined sewer system in order to ensure continued proper system operation.
4. Establish and implement a floatables control program to control coarse solids and floatable materials e.g. by reducing the amount of street litter that enters the catchbasins and the CSS; by

removing debris from CSOs at the outfalls using measures such as trash racks and screens; and by removing floatables from the surface of the receiving water after a CSO occurs.

5. Maximize the use ofthe collection system for the storage of wet weather flows which are conveyed to the Sewage Treatment Plant for treatment when capacity is available e.g. by adjusting regulator settings.
6. Maximize the flow to the Sewage Treatment Plant for the treatment of wet weather flows e.g. by removing obstructions to flow.

   The secondary treatment capacity should be utilized as much as possible for treating wet weather flows with the balance of flows being subject to primary treatment. Measures to increase the wet weather hydraulic capacity at the Sewage Treatment Plant (e.g. Step Feed operation) should be investigated.

7. During a seven-month period commencing within 15 days of April 1, capture and treat for an average year all the dry weather flow plus 90% of the volume resulting from wet weather flow that is above the dry weather flow. The volumetric control criterion is applied to the flows collected by the sewer system immediately above each overflow location unless it can be shown through modelling and on-going monitoring that the criterion is being achieved on a system-wide basis. No increases in CSO volumes above existing levels at each outfall will be allowed except where the increase is due to the elimination of upstream CSO outfalls. During the remainder of the year, at least the same storage and treatment capacity should be maintained for treating wet weather flow. The treatment level for the controlled volume is described in Section 7.

Level of treatment (7)

The treatment processes of the sewage treatment plants should be optimized to minimize the pollutant loadings under wet weather conditions. The Pollution Prevention and Control Planning study should evaluate the operation ofthe Sewage Treatment Plant under wet weather conditions in consultation with Ministry Regional staff This may lead to wet weather-specific operating conditions which may produce lower overall pollutant loadings.

During wet weather, the minimum level of treatment required for flows above the dry weather flow (as specified in sections 6 and 9) from combined sewer systems is primary treatment or equivalent. The effluent guideline for primary treatment is 30% carbonaceous biochemical oxygen demand (BOD) removal and 50% total suspended solids (TSS) removal for an average year during the seven month period as specified in section 6(g). The baseline for the calculation of the average pollutant removal is the influent passing the headworks of the treatment facility under wet weather conditions.

The dry weather flow from combined sewer systems is subject to the process effluent concentration criteria of the STP whether they are primary treatment plants or secondary treatment plants. During wet weather, for secondary treatment plants, the flows through the secondary treatment capacity will be subject to the process effluent concentration criteria of the STP. The flows in the STP which bypass the secondary treatment will be subject to a minimum level of primary treatment.

The treatment of wet weather flows from combined sewer systems may occur at the central Sewage Treatment Plant or at other locations such as satellite treatment facilities. Satellite treatment facilities may be built to treat wet weather flows where there are space limitations or limited capacity in the collection system to get the wet weather flows to the STP. There are a number of satellite treatment technologies some examples of which are vortex separators, high-rate sedimentation, dissolved air flotation and high-rate filtration. Satellite treatment facilities when used to treat wet weather flows from combined sewer systems are subject to the minimum level of primary treatment requirements specified above. In addition, for satellite treatment facilities the effluent concentration for total suspended solids should not exceed 90 mg/l for more than 50 % of the time for an average year during the seven-month period as specified in section 6(g).

Effluent disinfection (8)

Effiuent disinfection is required where the effluent affects swimming and bathing beaches and other areas where there are public health concerns. The local Medical Officer of Health identifies public health concerns such as e.g. whether recreational beaches are safe for swimming.

The interim effluent quality criterion for disinfected combined sewage during wet weather is a monthly geometric mean not exceeding 1000 E. coli per 100 ml. This criterion may be modified by the Regional staff of the Ministry on a case-by-case basis due to site-specific conditions.

In cases where chlorination is used as the disinfection process, subsequent dechlorination of the sewage works effluents shall be used to minimize the adverse effects of chlorine residuals on public health and the aquatic environment where necessary.

All bypasses at the Sewage Treatment Plant should be subjected to the disinfection process where available in order to reduce the bacterial loadings at discharge.

Beach protection (9)

Additional controls above the minimum CSO controls (section 6) are required for swimming and bathing beaches affected by CSOs and consist of the following:

1. There should be no violation of the body contact recreational water quality objective (Provincial Water Quality Objectives (PWQO)) for E. coli of 100 E. coli per 100 ml. based on a geometric mean at swimming and bathing beaches as a result of CSOs for at least 95% of the four-month season (June 1 to September 30) for an average year.
2. Controlling to not more than two overflow events per season (June 1 to September 30) for an average year in a combined sewer system with the combined total duration of the CSOs at any single CSO location being less than 48 hours and ensuring that the controlled combined sewage which does not overflow receives a level of treatment (as specified in section 7) plus disinfection (as specified in section 8) is deemed to satisfy section 9(a). An additional overflow event per season may be allowed if the proponent can demonstrate that section 9(a) will still be satisfied and the combined total duration of the CSOs at any single CSO location will be less than 48 hours.

Monitoring (10)

Monitoring of wastewater flows and overflows should be undertaken at locations within the sewer system for the purposes of assessing upgrading requirements and determining compliance with Ministry requirements. The nature of monitoring programs shall be specified in the Pollution Prevention and Control Plan or as determined by the Ministry through its Regional staff The responsibility for providing monitoring shall rest with the municipality or operating authority of the combined sewer system.

New sanitary connections to combined sewer systems (11)

When and where significant combined sewer system deficiencies exist, the Regional Office of the Ministry shall require that the provision of sanitary servicing for additional development tributary to the deficient system be curtailed to prevent aggravation of the problem until the necessary upgrading, as outlined by a Pollution Prevention and Control Plan is carried out in keeping with the requirements of this Procedure. Some development is allowed as upgrading proceeds, conditional upon its progress. The staged upgrading should at a minimum provide for the transmission and treatment of all flows from the additional development. This provision applies to significant development i.e. not to simple, one lot infill cases.

New storm connections to combined sewer systems (12)

New storm drainage systems shall not be pennitted to connect to existing combined systems if that increases the gross area serviced by the combined sewer system except where evaluations indicate that circumstances allow no other practical alternative. The evaluations must be documented as part of a Pollution Prevention and Control Plan.

"Piece-meal" construction on existing combined sewer systems will be permitted only with overridingjustification such as for the purpose of relocation (e.g., to accommodate underground utilities, subway structures, new buildings and pedestrian tunnels, etc.) or for the purpose of capacity improvement (e.g., to relieve basement flooding or to provide emergency additional conveyance capacity to treatment works to reduce overflows) or for rehabilitating deteriorated sewer conditions.

Enforcement (13)

Procedure F-5-5 will be used to:

1. review applications for approval to ensure that the proponent is in compliance with the Procedure prior to the issuance of a Certificate of Approval.
2. assist regional staff in setting minimum requirements in preparing Control Orders to bring systems into compliance with the Procedure.
3. assist enforcement staff in evaluating a combined sewer system operator's due diligence when investigating violations of the Environmental Protection Act and/or the Ontario Water Resources Act.

Any deviation or relaxation from this Procedure should be reviewed by the Regional Director and the Director, Program Development Branch.

Updated: April 25, 2018
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APPENDIX B

Windsor Riverfront P.C.P. Study
- Phase 1 – Problem Definition Executive Summary

EXECUTIVE SUMMARY

BACKGROUND

The Detroit River has been listed as one of 43 Great Lakes Areas of Concern (AOC's) by the International Joint Commission (IJC) because degraded water quality conditions impair certain beneficial uses. Michigan and Ontario are developing a joint Remedial Action Plan (RAP) to address water quality concerns in the Detroit River.

The RAP process has identified municipal wastewater discharges along the Detroit and Windsor waterfronts including combined sewer overflows (CSOs) and stormwater discharges as probable significant sources of pollution which need to be addressed particularly with respect to bacterial contamination and heavy metals input.

The City with participation and funding assistance from the Province of Ontario and from the Federal Government through the Great Lakes Clean-Up Fund commissioned a study in late 1992 to investigate direct municipal discharges to the Detroit River along the riverfront area in the City of Windsor north of Riverside Drive.

The study, which is identified as the Windsor Riverfront Pollution Control Planning Study is to be completed in three phases generally described as follows:

- Phase 1 involves identification of all points of wastewater discharge into the Detroit River, determination of the quantity and quality of the wastewaters being discharged under both dry and wet weather conditions and an estimate of their impact on the Detroit River.
- Phase 2 will consist of a review of various pollution abatement measures and an evaluation of their application in Windsor with respect to performance, economic, environmental and social implications.
- Phase 3 will involve development of recommendations including a list of preferred alternatives and a schedule for implementation.

This Phase 1 report summarizes the information gathered and generated during the first phases of study. Each of the chapters in this report dealing with technical matters contains an executive summary to assist the reader in review of the chapter.

STUDY APPROACH

The key elements in the study program are described in Chapter 2 and summarized as follows:

- A **field inspection program** was undertaken during which a field crew inspected, photographed and prepared sketches and descriptions of each interceptor chamber, each point of discharge to the River and of selected significant chambers in the collection system. Booklets summarizing the findings of the inspection program were issued and reviewed with the City.

- A **collection system monitoring program** as described in Chapter 4 was undertaken to obtain flow monitoring and sampling information needed to characterize hydraulic behaviour of the collection system and to determine the nature and magnitude of discharges to the Detroit River. The monitoring results give a direct indication of loadings and are used to calibrate sewer system models.

- The **in-stream monitoring component** of the study is described in Chapter 5. The monitoring program included collection and analysis of water and sediment samples and biomonitoring using fresh water mussels.

- **Collection system model development and calibration** was undertaken to predict outputs of the sewer system under various rainfall events. The types of models used in the collection/treatment system analysis are described in Chapters 6 and 7. These models will be used in Phase 2 of the study to assess possible modification/improvements to the system.

- **Receiving water modelling**, as described in Chapter 9, was undertaken to predict pollutant transport in the Detroit River to assess and predict the impact created in the river by CSOs and other discharges.

- A **loadings assessment** is provided in Chapters 8 and 10 ranking the relative significance of all known pollution inputs to the Detroit River including stormwater, CSOs, industrial discharges and pollution control plant effluent during wet and dry weather conditions.

- Phase 1 work included a **public participation** program to disseminate information to the public and invite public input on pollution control issues and priorities. Phase 1 public participation events included presentations to the Binational Public Advisory Council (BPAC), distribution of information brochures and an open house held as part of "Day at the River" activities. The public participation program is ongoing and will be documented in the final report.

STUDY AREA

The study area is comprised of the Riverfront Interceptor Sewer Shed which includes 3,340 hectares of land along the Detroit River extending from Pillette Road on the east to the West Windsor Pollution Control Plant (WWPCP) on the west. This area includes the commercial centre of the City and a substantial portion of the City's industrial development. The total population in the study area is approximately 100,000 persons housed in a range of single family and multiple family residences including highrise apartment buildings. The study area fronts on approximately 15.5 km of Detroit River shoreline.

The Riverfront Interceptor Sewer was constructed along the Windsor waterfront in 1970 to intercept flows from combined sewers that formerly discharged to the river and convey this flow to the West Windsor Pollution Control Plant for treatment. Sewage flows by gravity from Albert Road on the east to Caron Avenue, is lifted at the Caron Avenue Pumping Station and discharged to the downstream interceptor for gravity flow from that point to the inlet chamber at the WWPCP.

There are 26 interceptor chambers on the Riverfront Interceptor Sewer and the Eastern Utilities Trunk Sewer. The interceptor chambers were designed to divert 2 1/2 times dry weather flow (DWF) from the combined sewers to the Riverfront Interceptor System. Flows in excess of the capacity of the interceptor chambers are discharged to the Detroit River as combined sewer overflows (CSOs).

The portion of the study area east of Walker Road is served by the Eastern Utilities Trunk Sewer which conveys sewage from Pillette Road to Walker Road where it discharges to the Riverfront Interceptor Sewer. There is a unique "over and under" arrangement of separate storm and sanitary sewers in part of the area served by the Eastern Utilities Trunk Sewer. This system is a continuing maintenance problem and for all intents and purposes functions as a combined sewer system.

The storm drainage infrastructure in the City of Windsor includes storm relief sewers that have been constructed to alleviate the serious problem of basement flooding which causes extensive damage and is a serious public health concern. Storm relief sewers address this problem by providing overflow points where, during storm events, the overloaded combined sewer system can discharge to the storm relief sewer rather than into basements.

The West Windsor Pollution Control Plant was constructed in 1970 and has subsequently been expanded to a DWF design capacity of 163,600 m^3/day and has a hydraulic capacity of 2.5 DWF. Treatment components include coarse and fine bar screening, grit removal, sedimentation and effluent disinfection. Chemical treatment facilities were added in 1974 to achieve an effluent phosphorous level of 1 mg/l or less. These facilities together with polymer addition to enhance flocculation and sedimentation achieve an effluent quality with respect to BOD_5 and suspended solids concentrations comparable to a physical - chemical treatment facility.

COLLECTION SYSTEM MONITORING PROGRAM

The monitoring program was designed to characterize the hydraulic behaviour of the collection system including interceptor chambers, interceptor sewers, pumping stations and treatment facilities and to determine the nature and magnitude of pollutant discharges to the Detroit River from the study area. The key element in the monitoring program included:

- A field inspection program to verify the physical dimensions of regulating chambers and to identify suitable monitoring locations.
- A flow monitoring program covered over 90% of the drainage areas in the Riverfront Study Area. Flow monitoring was conducted at 15 interceptor chambers, 5 interceptor or trunk sewer locations and in 11 storm relief systems.
- A sampling program was conducted at representative locations to characterize wastewater quality at CSO chambers and in storm relief systems during dry and wet weather conditions. Sampling was carried out at 7 locations on 22 occasions and supplemental samples were collected for the City at a number of additional locations.

The data obtained in the Collection System Monitoring Program is used as a direct measurement of loadings contributed from CSOs and storm relief discharges and is also used to provide calibration data for computer simulation models.

IN-STREAM MONITORING

The In-Stream Monitoring Program was designed to assess contaminant loadings and evaluate their effects on the Detroit River. The program included collection of sediment and water samples as well as deployment of caged mussels for biomonitoring purposes at four sites called for in the Terms of Reference as follows:

- Upstream of Little River east of the study area to provide an assessment of background conditions.
- At the foot of Ouellette Avenue in a commercial area of the City approximately at the centre of the study area.
- Off Chewitt Park just downstream of the Ambassador Bridge.
- At the foot of McKee Street near the west end of the study reach and downstream of the WWPCP outfall.

The purpose of sediment sampling and analysis is to determine if there is an in-stream gradient of sediment quality along the riverfront indicative of important pollutant sources associated with the City of Windsor. Sediment samples were obtained at the four monitoring sites and analyzed for organo-chlorines, metals and bacteria. In general, the lack of sediment made it difficult to obtain samples especially from the Ouellette Avenue site.

The highest levels of bacteria in sediment appear at the McKee site, downstream of the WWPCP. Further investigation would be required to determine whether the different levels of bacteria observed during the sampling period are attributable to the Pollution Control Plant's disinfection program or are related to other sources.

The levels of organo-chlorines and metals in the sediment range from low to moderate with the higher levels appearing at the Ouellette Avenue site. Arrangements were made with the MOEE to resample several sites including the Ouellette Avenue site in July 1994. A report on the resampling program which is contained in an appendix to this report indicates contaminated sediments are sparse in the Detroit River and are found only in small deposition areas and there is therefore probably no effective "in-stream" remediation possible or required.

Freshwater clams were used as biomonitors to monitor the effects of stormwater on the river during wet events and to measure background levels during dry periods. Biomonitoring results coincide with those of the sediment survey showing low to moderate pollution occurring along the riverfront. Contaminant levels in the mussel tissue did not reflect levels found in the sediment obtained at the Ouellette Avenue site.

Water samples taken at the four monitoring sites during both dry and wet weather showed consistently low levels of E.Coli at the Little River site, with higher counts present at near shore locations during wet weather sampling at the downstream locations.

The overall findings of the in-stream monitoring work indicate the effects of the City of Windsor CSOs on the Detroit River are likely minimal. Pollution associated with sediment and water quality is low to moderate. The patchiness of the sediment made it difficult to relate elevated levels of contaminants to a particular source. Long term biomonitoring is recommended as a cost effective means of fully evaluating the contribution of CSOs to pollution in the Detroit River.

SYSTEM HYDRAULIC EVALUATION

A system hydraulic evaluation was undertaken to:

- Analyze the dynamic capacity of the CSO regulator chambers and develop overflow and through-flow rating curves.
- Assess the performance of the Riverfront Interceptor Sewer under dynamic conditions.

The hydraulic model used in this evaluation will also be used to assess operational and design details of recommended pollution control measures in Phase 2 of the study.

The original design of the interceptor chambers on the Riverfront Interceptor Sewer was based on capturing 2.5 x average design dry weather flow (DWF). Hydraulic modelling and flow measurements at the chambers established that:

- Smaller drainage areas tend to have higher interception ratios.

- Chambers upstream of Caron Avenue Pumping Station have interception rates averaging 8 times measured DWF. The interception ratio of chambers downstream of the pumping station average 20 x DWF.

- The Riverfront Interceptor is intercepting more flow than its original design. Flows entering the interceptor sewer upstream of the Caron Avenue Pumping Station exceed the capacity of the station.

The findings of an assessment of the dynamic capacity of the Riverfront Interceptor Sewer are summarized as follows:

- Surcharge conditions first occur upstream of the Caron Avenue Pumping Station when the sewage flow to the station is approximately equal to the station's firm capacity. When the Caron Avenue Pumping Station capacity is exceeded the hydraulic grade line (HGL) rises quickly.

- The Eastern Utilities Sewer becomes surcharged as a result of surcharging of the Riverfront Interceptor Sewer.

- The first "failure" occurs at Chambers W and U when the interceptor HGL rises into the chambers. At this point, the inflow to the Caron Avenue Pumping Station is approximately 251,000 m^3/d (100 cfs) and to the WWPCP approximately 310,000 m^3/d MLD (125 cfs).

- Flow in the Riverfront Interceptor upstream of the Eastern Utilities Sewer connection is restricted by unregulated flow from the Eastern Utilities Sewer.

- The first failure at a non-automated chamber between Caron Avenue and the WWPCP would occur at Chamber G resulting from a high HGL in the interceptor.

SYSTEM HYDROLOGICAL SIMULATION

A hydrologic simulation model was developed to predict municipal discharges (combined sewer overflows and stormwater discharges) to the Detroit River. The model was calibrated to existing conditions and used to predict the contribution of all point discharges to the Detroit River under various rainfall events. In Phase 2 of the study, the model will be used to assess various pollution abatement measures and system management options.

In Phase 1 of the study the hydrologic model has been used to:

- estimate the frequency and volume of overflows/by-passes on an annual basis.

- Determine CSOs, plant by-pass and stormwater discharge characteristics.

- Generate event flows and loadings for input to the Detroit River model.

Model development included the following steps:

- Division of the study area into 12 lumped catchment areas. The Western Main Trunk Sewer, the Caron Avenue Pumping Station and the WWPCP plant by-pass were also included in the model.
- Calibration of total system flows and flows to subcatchment outlets based on monitored data.
- For those areas which did not have complete monitored data, calibrated parameters and relationships from the monitored areas were used according to similarity of drainage system characteristics and land uses.
- Calibration of water quality concentrations to field data and literature.
- Testing of the total system model to the WWPCP records of treated effluent volumes and by-passes volumes.

The model exhibits very good agreement between simulated output and field monitoring data. The model can predict flow and loadings on an individual catchment basis with subsequent breakdown to a chamber by chamber level. The model can also be used to assess various pollution abatement measures for reduction in overflow loadings to the receiving waters.

RECEIVING WATER MODELLING

The main purpose of this element of the Phase 1 study was to translate the results of the hydrologic and pollutant generation modelling results to exposure impacts on the Detroit River. The in-stream modelling focused on loadings due to CSOs along the Windsor waterfront although the Detroit River receives contaminant loads from both the Windsor and Detroit sides.

In the River, the CSO and stormwater discharges experience two general types of mixing:

- Outlet dominated mixing process (near field).
- River dominated mixing process (far field).

The modelling study included a numerical prediction of both of these processes.

Loadings for fecal coliform, suspended solids and BOD_5 for two storm events were supplied from the hydrological system model. The rainfall events were 20.8 and 88.2 mm respectively corresponding to a typical summer storm and a very severe storm. Modelling for a typical summer storm produced the following loading predictions.

- Elevated bacterial counts would occur along most of the near shore zone of the Windsor waterfront with the downtown area being the most impacted portion of the study reach. There would be minimal or no impact at the international boundary or along the U.S. shoreline.

- The only predicted significant impacts of suspended solids and BOD_5 are in the near field zones of the individual outfalls. In the far field zones along the Windsor riverfront, suspended solids and BOD_5 are in the range of 2 to 20 mg/l above background levels. The average increase in suspended solids along the Windsor shoreline is approximately 3 mg/l above background. By comparison, turbidity from resuspension of sediment in Lake St. Clair can produce suspended solids concentrations of 40 to 100 mg/l along the Windsor shoreline.

- Predicted near field concentrations of suspended solids are in the range of 20 to 300 mg/l within an outfall mixing zone of about 30 m wide by 50 m long.

- The duration of the simulated impacts is approximately 6 hours after the cessation of overflows.

The predicted impacts for the extreme storm event are similar to those for the typical summer storm for fecal coliforms. Suspended solids and BOD_5 levels are approximately twice those predicted for the typical summer storm. There would be minimal impact on the U.S. side from any of the three parameters.

CONCLUSIONS

The following observations, conclusions and recommendations are drawn from Phase 1 inspection, monitoring and modelling activities.

Sewage Collection and Treatment Infrastructure

- There is no evidence of dry weather surcharge conditions or CSOs from any of the interceptor chambers. During field investigations, a cross connection between the combined and storm relief sewers in the Wyandotte-Langlois area was discovered and subsequently corrected by the City.

- The riverfront interceptor is capturing significantly more flow than the original design of 2.5 x design DWF.

- Excessive wet weather input from the Eastern Utilities Sewer and from higher than design interception rates at regulator chambers is a very serious condition causing surcharging of the Riverfront Interceptor and the Eastern Utilities Sewer, overtaxing of the Caron Avenue Pumping Station and flooding east of Caron Avenue.

- Overloading of the interceptor sewer has serious implications with respect to capacity available to serve new development/redevelopment proposals.

- It is **imperative for flood protection purposes** that immediate consideration be given to solving the severe hydraulic overload condition in the Eastern Utilities Sewer.

- The setting of all interceptor chambers on the Riverfront Interceptor Sewer should be reviewed and adjusted as required to take into account existing land uses and dry weather flows.

- New and alternative regulator technology should be investigated to regulate interception rates particularly in small catchment areas.

- The need for and impact of upgrading the Caron Avenue Pumping Station should be assessed.

- Storm relief sewers are an essential part of the sewer system infrastructure to prevent basement flooding.

- There are numerous interconnections between combined and storm relief sewer systems. A comprehensive inspection program should be undertaken of all connection points to assess the condition and setting of the relief mechanisms.

- There may be an opportunity to make use of excess capacity in the storm relief system during less intense storm events to temporarily store combined sewage flow and return it to the interceptor after the storm event.

- Treatment components at the WWPCP include course and fine bar screening, grit removal, sedimentation and effluent disinfection. Chemical addition for phosphorus removal and polymer addition to enhance sedimentation produce an effluent with average suspended solids, BOD_5 and phosphorus levels of 24 mg/l, 37 mg/l and 0.6 mg/l respectively. Removal efficiencies of 83% for suspended solids and 65% for BOD_5 are well within MOEE effluent guidelines.

- The WWPCP is currently hydraulically loaded to approximately 76% of its DWF design capacity of 163,600 m^3/d. The plant is being used to its full potential to accept and treat storm flows up to 2.5 x DWF.

- Phase 2 of this study will include consideration of the need for and benefits of upgrading the level of treatment at the WWPCP.

Water Resources

- Existing uses of the Detroit River as listed in Chapter 3 include:
    - commercial shipping
    - cooling water and potable water supplies
    - habitat for resident and migratory fish and waterfowl
    - recreational uses including fishing, boating, waterfowl viewing and hunting, swimming, water skiing etc.
    - receiving water for municipal and industrial treated waste water discharges
- The only two beaches on the Canadian shore are upstream of the study area. There is reportedly a limited amount of unauthorized swimming/jet skiing, scuba diving activity occurring on an intermittent basis in the study area.
- There are extensive park areas and walking paths bordering the river in the City of Windsor.
- In general, wet weather inputs to the river contribute to water quality impairment in the form of elevated bacterial counts and increased suspended solids and BOD_5 loads. These impacts are most evident in the near field zones of the study area and last for approximately 6 hours after cessation of overflows. Alternative means of reducing wet weather loadings in keeping with Provincial CSO policies will be considered in Phase 2 of the study.
- Elevated fecal coliform levels and floatable materials present in wet weather inputs to the river have the potential to interfere with body contact recreational uses and aesthetic enjoyment of the river.
- The four most significant urban pollutant sources discharging to the Detroit River from the study area are:
    - West Windsor Pollution Control Plant (WWPCP)
    - Ford Motor Company Windsor Casting Plant
    - CSO's
    - Storm Relief sewer outlets

- Loading evaluations presented in Chapter 8 indicate:
    - The WWPCP is the dominant flow source and contributes the highest loading with respect to BOD_5, total phosphorus, cadmium, copper and mercury
    - Ford's effluent contributes the highest loading of zinc, lead and PCBs
    - Suspended solids loadings are split fairly evenly among CSO, Storm Relief and WWPCP sources
    - CSO's are the major source of bacterial loading

  Both the WWPCP and the Ford Windsor Complex treatment facilities are approved by the MOEE and discharges are monitored to ensure compliance with approval criteria.

  Ford has reviewed the Executive Summary of the Phase 1 Report and requested the following paragraph be added for purposes of clarification:

  "The MOEE MISA Metal Casting Sector Regulation promulgated in August 1994 after several years of development identifies zinc as a candidate for control. The 12 month MISA monitoring period found that lead and PCBs were not used in the Ford processes and the effluent concentrations were below the levels considered for control. Improvements to Ford's treatment facilities are to be completed by August 1997."

- Comparison of loadings determined in Phase 1 of this study to loadings contained in the Stage I RAP document indicate:
    - Windsor pollutant sources account for approximately 0.1% to 4.0% of the total annual load to the Detroit River.
    - Excluding upstream boundary loads, Windsor contributes approximately 0.3% up to 6.0% of annual pollutant loads to the Detroit River.
    - Annual CSO and WWPCP loads reported in the Stage I RAP compare well with findings of this Study.
    - The comparison between the findings of this study and the Stage I RAP verify that pollutant sources from Windsor account for a small portion of the total pollutant loads to the Detroit River. Evaluating the relative contributions from this study area, typically only 1% to 5% of contaminants in the Detroit River can be attributed to sources in the Windsor Riverfront study area.

- The overall conclusions from the in-stream monitoring program is that the effects of the City of Windsor's CSOs on the quality of water and sediment of the Detroit River appear to be minimal. There are few areas of sediment deposition along the Detroit River because of the high velocity flow. Three attempts to collect sediment resulted in samples near outfalls and in a depositional area downstream of the WWPCP, biasing the samples to be representative of more polluted areas and not representative of the overall quality in the river. Pollution of sediments from these sites was low to moderate, and no significant sources were identified.

- Long term biomonitoring with freshwater clams deployed upstream and downstream of the study area is recommended as a cost effective means of monitoring total inputs to the river and the relative health of the near shore waters of the river.

- The City of Windsor is attempting to address a localized area of solids deposition downstream of the WWPCP outfall and has initiated discussions with the MOEE regarding modifications to the plant outfall to provide improved effluent dispersion.

APPENDIX B

Windsor Riverfront P.C.P. Study
- Phase 2 – Control Options Executive Summary

Windsor Riverfront Pollution Control Planning Study
Phase 2 - Control Options

Executive Summary

1. BACKGROUND

The Detroit River has been listed as one of 43 Great Lakes Areas of Concern by the International Joint Commission because degraded water quality conditions impair certain beneficial uses. Michigan and Ontario are developing a joint Remedial Action Plan (RAP) to address water quality concerns in the Detroit River.

The City of Windsor with participation and funding assistance from the Province of Ontario and from the Federal Government through the Great Lakes Clean Up Fund commissioned a study in late 1992 to investigate direct municipal discharges to the Detroit River from the Riverfront area within the City of Windsor boundaries and north of Riverside Drive. The purpose of this study is to develop a pollution control strategy for the Windsor Riverfront District with the specific objective of reducing combined sewer overflows (CSO) and total pollutant loadings to the Detroit River.

The Riverfront area is one of three watersheds in the City for which Pollution Control Plans are being or have been developed. The other two are the Little River catchment, for which a Pollution Control Plan (PCP) was completed in 1993, and the Turkey Creek-Grand Marais Drain catchment area. The individual plans for all of these areas will be considered as components of an overall PCP for the City of Windsor.

This study, which is called the Windsor Riverfront Pollution Control Planning Study consists of three phases. The Phase 1 work, which was completed in 1995, determined the quantity and quality of the wastewater being discharged under both dry and wet weather conditions and estimated their impact on the Detroit River. In Phase 2, an evaluation of various pollution control measures for the Riverfront District was carried out and alternative control plans are presented. Phase 3 will present the preferred plan and develop an implementation program.

2. PHASE I FINDINGS

Among the significant findings of the Phase I study, it was concluded that there is no evidence of dry weather discharges from any of the Riverfront Interceptor chambers and pollutant sources from Windsor account for a small portion of the total pollutant loads to the Detroit River under both wet and dry weather conditions. Typically, only 1% to 5% of contaminant loadings to the Detroit River can be attributed to sources in the Windsor Riverfront study area. The in-stream monitoring program also verified that the effect of the City of Windsor CSO's on the quality of water and sediment of the Detroit River is minimal.

3. PHASE 2 STUDY OBJECTIVES

The Phase 2 study has evaluated options to develop a pollution control plan (PCP) for the Riverfront District to satisfy regulatory guidelines for CSO control and to reduce the pollutant loading to the Detroit River to levels consistent with the RAP objectives and acceptable to the public. An additional critical criterion is that the pollution control measures must not increase basement flooding.

The City of Windsor has adopted the Ministry of Environment (MOE) Guidelines for CSO control. The specific target of these guidelines is that 90% of the wet weather flows from the combined sewer system is to receive at least primary level treatment defined as 50% reduction of suspended solids loads and 30% reduction of BOD loads.

4. EVALUATION OF POLLUTION CONTROL OPTIONS

The PCP is comprised of two components considering both short term and long term measures. The short term program is the foundation for long term plan components. The short term program addresses the immediate operational concerns identified in the Phase 1 report. It identifies opportunities for non-structural measures pertaining to improved maintenance and operation of the existing system that are both low in capital expense and relatively simple to implement over a five year period. The long term CSO control program will build on the short term program to achieve the Pollution Control Plan objective of 90% volumetric control of wet weather CSO to the Detroit River.

Non-structural methods of pollution control are not sufficient in themselves to achieve the level of pollution control required to meet the MOEE criteria or the study objectives for the City of Windsor. It was concluded that these measures should be pursued as supplementary to the principal needs of the long term pollution control program. The principal control methods considered for the long term control program are: 1) storage facilities which detain wet weather flows for eventual treatment at the West Windsor Pollution Control Plant and 2) satellite treatment using Retention Treatment Basins (RTB's) located at individual CSO locations.

In the evaluation of options, a range of options and scenarios were considered, including:

- Treatment of combined system flows with and without storm relief flows,
- Storage tanks at CSO locations and deep tunnel storage parallel to the Riverside interceptor,
- Restoration of the separated over/under system in the East Utilities area,
- Increased pumping capacity at the Caron Ave. station,
- Increased primary treatment capacity at the West Windsor Pollution Control Plant,
- Use of in-system storage for both the existing system and possible additional storage through over-sized storm relief sewers and
- Optimization of system storage and performance through Real Time Control operation.

5. POLLUTION CONTROL PLAN ALTERNATIVES

The Pollution Control Plan alternatives consist of four long term alternatives and a number of short term programs which are common to all. The four alternatives are:

1A.) Tunnel storage to control CSO's from the entire Riverfront District consisting of approximately 10 km of 2 m diameter conduit parallelling the existing Riverfront Interceptor and drained by pumping to the WWPCP at a total cost of about $61 million.

1B.) The same as Alternative 1A except that storm relief flows are included in the first stage control plan resulting in significantly larger facility sizes. The cost estimate for this alternative is $148 million.

2A.) Three Retention-Treatment Basins (RTB's) 7,200 m^3, 12,000 m^3 and 5,000 m^3 in size constructed at the Hiram Walker, Marina and Caron Ave. sites respectively to control overflows upstream of Caron Ave. and tunnel storage downstream of Caron Ave. consisting of approximately 4.8 km of 2.5 m diameter pipe parallelling the Riverfront Interceptor for a total cost of about $47.7 million.

2B.) This alternative is the same as Alternative 2A except storm relief flows are considered in the control plan resulting in larger facility sizes. The cost estimate for this alternative is about $93 million.

6. LOADING ASSESSMENT

For storage options 1A and 1B, representative loading reductions would range from 30% for suspended solids, about 8% for BOD and 70% to 90% for bacteria. With the use of satellite treatment combined with tunnel storage (options 2A and 2B), TSS loadings to the Detroit River are reduced by a total of 23% and 27% for options 2A and 2B respectively.

The pollution control benefits of CSO control were also compared to sewer separation and the upgrade of the West Windsor Pollution Control Plant to secondary treatment. Both storage and treatment options generally reduce loadings to River whereas sewer separation does not. Sewer separation is therefore not considered to be a viable pollution control option.

The unit cost for removal of suspended solids with secondary treatment is $127 per kilogram removed while both the storage and satellite treatment options have a lower unit cost per kilogram removed of $75. However, for BOD and Phosphorus removal, secondary treatment has a lower cost per kilogram removed, especially for BOD. Considering capital cost only, the cost of the treatment plant upgrade to secondary treatment lies between the costs for the two CSO control options and it might be considered a more cost-effective pollution control option. However, the CSO control plan is more amenable to a staged implementation that may be more practical to carry out. All factors must be considered in prioritizing the implementation of the long term Pollution Control Plan for the City of Windsor.

7. SELECTION OF THE PREFERRED ALTERNATIVE

The four Pollution Control Plan Alternatives along with the results of the Phase 2 study and the evaluation of alternatives will be presented at the next Public Open House to receive public input to the process. After this input, the Steering Committee will report back to Council with a preferred alternative for the development of the Implementation Plan in Phase 3 of the study.

APPENDIX B

Windsor Riverfront P.C.P. Study Phase 2 – Control Options Technical Summary

TECHNICAL SUMMARY

TS.1 BACKGROUND

The Detroit River has been listed as one of 43 Great Lakes Areas of Concern (AOC) by the International Joint Commission (IJC) because degraded water quality conditions impair certain beneficial uses. Michigan and Ontario are developing a joint Remedial Action Plan (RAP) to address water quality concerns in the Detroit River.

The City of Windsor with participation and funding assistance from the Province of Ontario and from the Federal Government through the Great Lakes Clean Up Fund commissioned a study in late 1992 to investigate direct municipal discharges to the Detroit River along the Riverfront area within the City of Windsor boundaries and north of Riverside Drive. The purpose of this study is to develop a pollution control strategy for the Windsor Riverfront District with the specific objective of reducing combined sewer overflows and total pollutant loadings to the Detroit River. The Riverfront Interceptor Sewer Area as shown on Figure TS-1.

The Riverfront area is one of three watersheds in the City for which Pollution Control Plans are being or have been developed. The other two are the Little River catchment, for which a PCP was completed in 1993, and the Turkey Creek-Grand Marais Drain catchment area. The individual plans for each of these areas will be considered as components of an overall Pollution Control Plan (PCP) for the City of Windsor.

This study, which is called the Windsor Riverfront Pollution Control Planning Study consists of three phases:

- **Phase 1** involved the identification of all points of wastewater discharge into the Detroit River along the City of Windsor riverfront north of Riverside Drive, determination of the quantity and quality of the wastewaters being discharged under both dry and wet weather conditions and an estimate of their impact on the Detroit River.

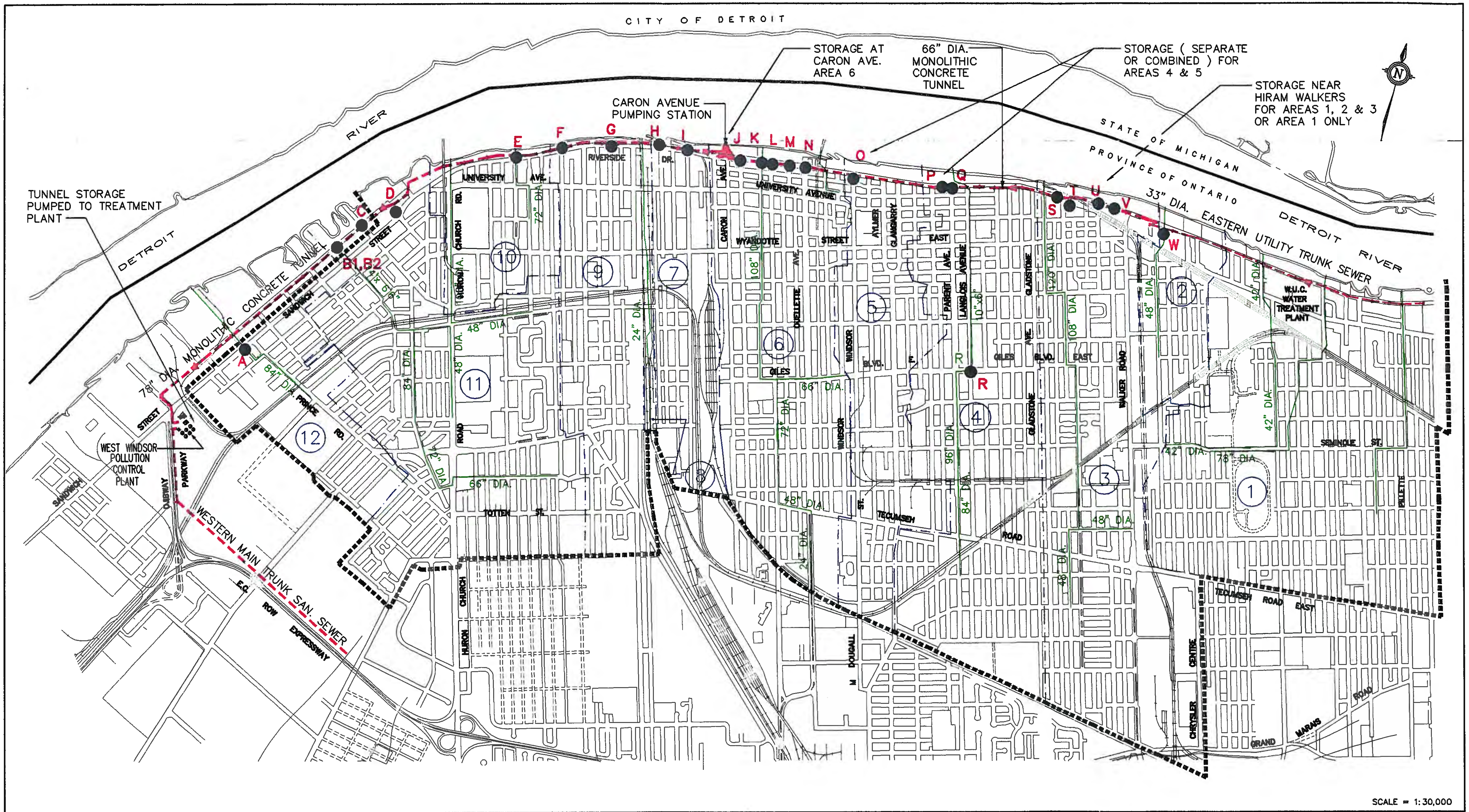
  Phase 1 work was completed in 1995 with the findings being documented in a report entitled "Windsor Riverfront Pollution Control Planning Study - Phase 1 - Problem Definition"

- **Phase 2** of the study, which is the subject of this report, consists of a review of various pollution abatement measures together with an evaluation of their application in Windsor with respect to performance as well as economic, environmental and social implications. Alternative control plans are presented as part of the final Phase 2 Report.

- **Phase 3** will present the preferred plan and develop an implementation program.

TS.2 DESCRIPTION OF THE STUDY AREA

The Riverfront Interceptor Sewer Area includes 3,340 hectares of land along the Detroit River extending from Pillette Road on the east to the West Windsor Pollution Control Plant (WWPCP) on the west. This area includes the commercial centre of the City and a substantial portion of the City's industrial development. The total population in the study area is approximately 100,000 persons.



CITY OF WINDSOR

SUBCATCHMENT BOUNDARIES AND POSSIBLE STORAGE SITES

LEGEND

------------	STUDY AREA BOUNDARY
—·—·—·—	SUBCATCHMENT BOUNDARY
– – – – –	RIVERFRONT INTERCEPTOR
————	STORM RELIEF INTERCEPTORS
● W	OVERFLOW CHAMBERS
⑧	SUBCATCHMENT NUMBERS

FIGURE TS•1

The Riverfront Interceptor Sewer intercepts flows from combined sewers and conveys these flows to the West Windsor Pollution Control Plant. Sewage flows by gravity from Albert Road on the east to Caron Avenue, is lifted at the Caron Avenue Pumping Station and discharged to the downstream interceptor for gravity flow from that point to the inlet chamber at the WWPCP.

The 26 interceptor chambers on the Riverfront Interceptor Sewer and the Eastern Utilities Trunk Sewer were designed to intercept 2.5 times dry weather flow (DWF). Flows in excess of the capacity of the interceptor chambers are discharged to the Detroit River as combined sewer overflows (CSO's).

The portion of the study area east of Walker Road is served by the Eastern Utilities Trunk Sewer which discharges to the Riverfront Interceptor Sewer. There is a unique "over and under" arrangement of separate storm and sanitary sewers in part of the Eastern Utilities area which is in poor condition and, as a result, this system functions as a combined sewer system.

The Riverfront District in the City of Windsor includes a number of storm relief sewers that have been constructed to alleviate serious basement flooding problems. Storm relief sewers address the basement flooding problem by providing overflow points in the combined sewer system where excess flow during storm events can discharge to the storm relief sewer rather than flooding basements.

The West Windsor Pollution Control Plant was constructed in 1970 and has subsequently been expanded to a DWF design capacity of 163,600 m^3/d (36 MIGD) and has a hydraulic capacity of 2.5 DWF. A number of improvements have been added so that the present effluent quality from the plant with respect to BOD_5 and suspended solids concentrations is comparable to a physical - chemical treatment facility.

TS.3 SUMMARY OF PHASE I FINDINGS

The significant findings of the Phase I study are summarized below:

- There is no evidence of dry weather surcharge conditions or dry weather overflows from any of the interceptor chambers.
- The Riverfront Interceptor is capturing significantly more flow than the original design of 2.5 x design DWF.
- Wet weather input from the Eastern Utilities Sewer exceeds the 2.5 DWF design interception rate causing surcharging of the Riverfront Interceptor and the Eastern Utilities Sewer, overtaxing of the Caron Avenue Pumping Station and flooding east of Caron Avenue. Immediate consideration should be given to solving the severe hydraulic overload condition in the Eastern Utilities Sewer.
- The setting of all interceptor chambers on the Riverfront Interceptor Sewer should be reviewed and adjusted where appropriate to capture a greater proportion of the "first flush" in the system as a whole.
- All new storm relief sewers should be designed so that there is a reduction or at least no net increase in combined sewer overflow volumes from the system.
- The WWPCP currently operates with removal efficiencies of 83% for suspended solids and 65% for BOD_5 which are well within MOEE effluent guidelines. The WWPCP is

currently hydraulically loaded to approximately 76% of its DWF design capacity and the plant is being used to its full potential to accept and treat storm flows up to 2.5 x DWF.

- In general, wet weather inputs to the river contribute to water quality impairment in the form of elevated bacterial counts and increased suspended solids and BOD_5 loads in outfall mixing zones lasting for approximately 6 hours after an overflow event.
- Pollutant sources from Windsor account for a small portion of the total pollutant loads to the Detroit River. Evaluating the relative contributions from this study area, typically only 1% to 5% of contaminants in the Detroit River can be attributed to sources in the Windsor Riverfront study area.
- The overall conclusions from the in-stream monitoring program is that the effects of the City of Windsor's CSO's on the quality of water and sediment of the Detroit River appear to be minimal.

TS.4 PURPOSE OF THE PHASE 2 STUDY

The Phase 2 study has evaluated options to develop a pollution control plan (PCP) to satisfy regulatory guidelines/requirements for CSO's and to address the specific problem issues identified during Phase 1 of the study. The approach used in developing the PCP is as follows:

- The goals and objectives to be satisfied by the PCP were identified.
- The performance of the existing sewer system infrastructure was evaluated with respect to the identified goals and objectives.
- Opportunities were identified for short term corrective actions to improve pollution control and minimize CSO discharges.
- A comprehensive "long list" of possible pollution control measures was prepared and evaluated to discard inappropriate measures and to select a "short list" of options to be given more detailed consideration.
- The "short list" of possible pollution control measures was investigated in more detail including conceptual design, analysis of feasibility and constraints and preparation of planning level cost estimates.
- The identified feasible pollution control measures were evaluated in more detail to assess their application in Windsor with respect to performance, economic, environmental and social implications. This resulted in the identification of alternative Pollution Control Plans.
- The evaluation of options and the alternatives in the Phase 2 report will be presented for public review and input to the selection of the Preferred Plan.

TS.5 REGULATORY REQUIREMENTS AND CONTROL OBJECTIVES

The primary objectives of the Windsor Riverfront PCP will be to achieve a level of CSO control that reduces the pollutant loading to the Detroit River, is consistent with the RAP and is acceptable to both the regulatory agencies and the public.

To achieve CSO control, the City of Windsor has adopted the MOEE CSO Guidelines. The specific target of these guidelines that governs the evaluation of CSO control requirements is that 90% of the wet weather flows from the combined sewer system is to receive at least primary level treatment defined as 50% reduction of suspended solids loads and 30% reduction of BOD loads. In addition, Total Suspended Solids (TSS) concentrations are to be less than 90 mg/L at least 50% of the time.

A PCP must address both the immediate concerns of the City, regulatory agencies and the public, as well as the long term control objectives. To this end, the PCP is comprised of two components considering both short term and long term measures.

TS.6 SHORT TERM POLLUTION CONTROL PROGRAM

The development of a short term program addresses the immediate operational concerns identified in the Phase 1 report. Typically, the elements of a short term plan include opportunities for non-structural measures pertaining to improved maintenance and operation of the existing system that are both low in capital expense and relatively simple to implement over a five year period. The short term plan is the foundation for long term plan components.

The recommended short term control program is based on the MOEE Procedure F-5-5 which specifies minimum CSO controls to be implemented as part of an overall control program. The minimum controls are defined as follows:

- Establish effective operation and maintenance programs,
- Maximize the use of sewerage facilities,
- Maximize the use of the sewage treatment plant,
- Eliminate dry weather flow overflows,
- Minimize solid and floatable materials,
- Establish Pollution Prevention and educational programs and
- Monitor CSO's.

The City of Windsor already practices many of these procedures to some degree as part of their regular operations. In some cases, expansion or modification of the programs are recommended to improve system performance, understanding, reliability, CSO control and overall water quality. The specific recommendations for the short term program are given in Section TS.12 which describes the overall pollution control plan.

TS.7 LONG TERM CSO CONTROL PROGRAM

The long term CSO control program will build on the short term program to achieve the Pollution Control Plan objective of 90% volumetric control of wet weather CSO to the Detroit River.

Non-structural methods of pollution control such as street sweeping, roof leader disconnection and other source control and "Best Management Practices" were considered as part of the long term control program. However, while these measures can contribute on a site specific basis, they are not sufficient in themselves to achieve the level of pollution control required to meet the MOEE criteria or the study objectives for the City of Windsor. It was concluded that these measures should be pursued as supplementary to the principal needs of the long term pollution control program.

The principal control methods considered for the long term control program are:

1) Storage facilities which detain wet weather flows for eventual treatment at the West Windsor Pollution Control Plant and

2) Satellite treatment using Retention Treatment Basins (RTB's) located at CSO locations.

In the evaluation of options, a base condition was defined as follows:

- combined system flows without storm relief flows are used,
- restoration of the separated over/under system in the East Utilities area is assumed because this is required for structural reasons,
- the pumping capacity at the Caron Ave. station is increased by 10% which is required for system security and
- the existing primary treatment capacity at the WWPCP is used.

Various other considerations were included in the analysis of alternatives:

- Use of in-system storage for both the existing system and the possible additional storage through over-sized storm relief sewers,
- Increased firm capacity of the Caron Ave. pumping station up to 50% to reduce storage requirements,
- Increased primary treatment capacity through the addition of up to four new primary clarifiers at the West Windsor treatment plant to reduce storage requirements,
- Provision of enough storage and treatment capacity to control the storm relief flows to meet the 90% control criterion and
- Optimization of system storage and performance through Real Time Control operation.

TS.7.1 EVALUATION OF STORAGE OPTIONS

There are two basic options for controlling CSO's using storage:

<u>Option 1</u> - Utilize sites with available land to locate local storage tank facilities. Three sites have been identified upstream of Caron Ave. as shown in Figure TS-1. These sites are:

i) Hiram Walker Site - with approximately 11,900 m^3 of potential storage volume,

ii) Marina Site - with approximately 180,000 m^3 of potential storage volume and

iii) Caron Ave. Site - with approximately 11,000 m^3 of potential storage volume.

Downstream of Caron Avenue no local sites have been identified and tunnel storage is proposed to control CSO's in these locations for this option.

Option 2 - Use tunnel storage for the whole system. When considering tunnel storage options it is assumed a tunnel would be located along the same general alignment as the existing interceptor sewer. To assist in visualizing the extent of the tunnel storage options reference can be made to Figure TS-1 where the distance between the WWPCP and Caron Ave. is approximately 5.2 km and from Caron Ave. to Chamber W is approximately 5.7 km.

It was determined that all flows reaching the West Windsor treatment plant during wet weather receive at least primary equivalent levels of treatment. Therefore, all of the storage options which drain to the WWPCP will meet the requirement of the MOEE guidelines for primary treatment. In both options, the requirement for additional conveyance capacity to accommodate the increased flows to the treatment plant is provided by the storage element itself.

In Option 1, the physical site constraints limit the size of the potential local storage tanks and therefore restrict the percentage of local control that can be achieved with this option. Table TS.1 summarizes the local storage scenarios and the storage required to achieve 90% control of CSO compared to the available site storage. Only the Marina site can provide enough storage to meet the 90% CSO control requirement. Even considering an increase in the Caron Ave. pumping capacity by 10% and eliminating the storm flows from the over/under system, the other two sites still do not provide sufficient storage capacity due to the restricted site space.

The level of CSO control achieved upstream of Caron Ave for this option is 76% basin wide with no control downstream of Caron Ave. The cost of the tanks with a total volume of 77,900 m^3 is estimated to be $27.4 million. It was found that increasing the Caron Ave. pumping capacity further was not cost-effective for reducing the storage tank requirements.

To increase the level of control basin wide, additional storage would be required in the form of tunnel storage between the Caron Pumping Station and the WWPCP. Tunnel storage sized to provide 90% control of CSO's downstream of the pumping station would result in a basin wide level of control of 81%. Considering the existing West Windsor treatment rate, the treatment rate available to the downstream storage element is only 0.289 m^3/s after deducting the Caron Ave. pumping rate. With this very small treatment rate the required tunnel storage volume for 90% control downstream of Caron Ave. is 1,156,000 m^3. However, if the plant capacity is increased by adding four primary clarifiers, and the additional capacity is all allocated to the downstream storage element, the treatment rate increases to 1.7 m^3/s and the storage volume is dramatically reduced to only 12,000 m^3 with a cost of about $24 million. This storage volume represents about 4.8 km of 2.0 m diameter pipe. The restoration of the over/under system has a negligible effect on the tunnel storage required downstream of Caron Ave.

The costs of the various tunnel storage elements considered are summarized in Table TS.2

Table TS.1
Local Storage Requirements

Storage Scenario	**Storage Required for 90% CSO Control Existing Caron P.S. (m^3)**		**Storage Required for 90% CSO Control 10% Increase in Caron P.S. (m^3)**		**Available Site Storage (m^3)**	**Proposed Storage Option 1 (m^3)**	**Cost Estimate ($x10^6$)**
	without over/under rehab.	**with over/under rehab.**	**without over/under rehab.**	**with over/under rehab.**			
1. Hiram, Districts 1+2+3	36,000	27,000	32,000	23,000	11,900	11,900	5.95
2. Marina, Districts 4+5	64,000	N/A	55,000	N/A	180,000	55,000	15.95
3. Caron, District 6	52,000	N/A	51,000	N/A	11,000	11,000	5.50
Combined Scenarios 1, 2 & 3	152,000	27,000	138,000	23,000	N/A	77,900	27.40

Note: (1) Storage Tanks < 20,000 m^3 use \$500/m^3
For Tanks > 20,000 m^3 use \$290/m^3

Table TS.2
Tunnel Storage Requirements for 90% CSO Control

Option	**Storage Option**	**Control Options**				
		Combined Only Existing Treatment	**Combined Only + Increased Treatment**		**Combined + Storm Relief + Increased Treatment**	
			33%	**66%**	**33%**	**66%**
1	**Tunnel Storage For Districts 7 - 12 (Downstream of Caron)**					
	Volume (1,000 m^3)	1,156 m^3	52 m^3	12 m^3	154 m^3	96 m^3
	Estimated Cost (Million \$)	\$ 307	\$41	\$24	\$75	\$62
2	**Tunnel Storage For Districts 1- 12**					
	Volume (1,000 m^3)	159 m^3	136 m^3	25 m^3	400 m^3	230 m^3
	Estimated Cost (Million \$)	\$ 101	\$96	\$50	\$159	\$137

Therefore the total cost of storage Option 1 with the over-under system restored and including upgrading the Caron Ave. pumping station ($1 million) adding primary capacity to the West Windsor Treatment Plant ($10 million), tank storage at $27 million and tunnel storage at $24 million is estimated to be $62 million. For this cost, an overall level of control of 81% would be achieved.

Storage Option 2, consisting of tunnel storage both upstream and downstream of Caron Ave., can meet the 90% control objective. With the treatment plant capacity increased by 66%, the storage requirement is 25,000 m^3 which could be achieved in a 2.0 m diameter pipe over a length of 10 km at a total cost of about $61 million, including plant and pumping station upgrades.

TS.7.2 CONTROL OF STORM RELIEF FLOWS

Storage Option 1 with the local storage tanks cannot meet the 90% control objective for the combined sewer flows alone, as discussed in Section TS.7.1 above. Therefore, only Option 2 is considered for the control of storm relief flows using storage alone. However, a storage tunnel downstream of Caron Avenue to control storm relief flows is considered in conjunction with the CSO treatment options discussed in Section TS.8.1.

To control all of the flows in the storm relief system to meet the 90% MOEE CSO control objective using tunnel storage Option 2 and a 66% increase in the plant capacity requires a storage volume 230,000 m^3 which translates into a tunnel of 5.5 m diameter and 9.9 km in length. The total estimated cost of this option is $148 million. The additional cost to accommodate storm relief flows in this option is therefore about $87 million.

The cost of each of the storage options is summarized in Table TS.3.

Table TS.3
Summary of Costs for Storage Options
for CSO Control

Option	Level of Control Achieved	Costs in $Millions				
		Tanks	Tunnel	Caron Ave. Upgrade	WWPCP Upgrade	Total
1. Option 1						
i) Combined flow only	81%	27	24	1	10	62
ii) With storm relief flows (Districts 7-12 only)	-	-	63	N/A	N/A	63
2. Option 2						
i) Combined flow only	90%	-	50	1	10	61
ii) With storm relief flows	90%	-	137	1	10	148

TS.7.3 CONCLUSION OF THE EVALUATION OF STORAGE OPTIONS

The conclusions of the analysis of the storage options are as follows:

1) Increasing the primary treatment capacity of the West Windsor treatment plant has a significant benefit in reducing the volume and cost of the storage requirements. All of the storage options should consider increasing the plant capacity by adding up to four new clarifiers. This would result in a wet weather capacity of about 4.5 m^3/s or 84 MGD. This increased capacity would also reduce loadings from the other districts tributary to the plant.

2) Upgrading the firm capacity of the Caron Ave. pumping station should be carried out to improve the system security. This can be accommodated in the present building and would add about 10% to the existing capacity at a cost of about $1 million.

3) Storage Option 1 (tank storage for districts upstream of Caron Ave. plus tunnel storage for districts downstream of Caron Ave.) achieves 81% CSO control for combined sewer flow only at a cost of about $62 million including the expansion of the WWPCP primary capacity and the upgrade of the Caron Ave. pumping station.

4) Storage Option 2 (tunnel storage for all districts) meets the 90% control objective at a cost of $61 million considering combined sewer flow only and including the expansion of the WWPCP primary capacity.

5) Expanding the CSO control program to include the storm relief flows adds about $87 million to the cost of the tunnel system (Option 2) for a total cost of $148 million. Option 1 is not appropriate to the control of the storm relief flows.

6) Control of storm relief flows should be considered a lower priority, to be implemented only after control of the combined sewer flows has been completed.

7) The potential existing in-system storage in the Riverfront system may represent a significant portion of the storage requirement to control CSO from the combined sewer system if storm relief flows are not considered. However, until detailed investigations are carried out, in-system storage should be considered as a possible secondary measure to enhance the operation of the other storage schemes.

8) A pilot project should be considered to test the feasibility of in-system storage and real time control operation in the City of Windsor.

9) There is little opportunity to add in-system storage through over-sizing new storm relief pipes since this program is virtually completed. There may be an opportunity in the over/under system area to incorporate over-sized pipes as part of the rehabilitation scheme if the design analysis determines that it is feasible and practical.

10) Rehabilitation of the over/under system as a separated system has little effect on the overall storage requirements for the CSO control program system wide. There is some benefit for Option 1 in a higher level of control achievable with the limited storage available with the site constraints. This is offset, however, by the increased loads resulting from the untreated separated storm runoff from the restored area.

TS.8 TREATMENT OPTIONS

CSO treatment can be a cost effective method of providing treatment at source to reduce the pollutant load discharged to receiving waters. The following High Rate Treatment (HRT) technologies were considered in this study:

- Off-line Near Surface Storage/Sedimentation basins (Retention-Treatment Basins). These are similar to off-line storage tanks except sedimentation is provided for flows in excess of the tank volume.
- Vortex Technologies which separate solids by inducing a vortex motion in a vessel. Vortex devices are installed as high rate treatment facilities where site constraints restrict the use of storage/sedimentation facilities.
- Coarse Screening is usually employed upstream of other technologies (storage, vortex) or at end-of-pipe.
- Disinfection is employed where bacteria is a concern to public health. It may be carried out using Chlorine, liquid sodium hypochlorite, chlorine dioxide, ultraviolet radiation (UV) or ozone.
- Chemical addition is used to enhance removal efficiencies of sedimentation and/or vortex processes.

The use of vortex devices or chemical additions, requires a detailed knowledge of the solids characteristics in the flow at each site making decisions on the appropriateness of these method difficult. Therefore, only Retention Treatment Basins (RTB's) without chemical additions have been considered in the evaluation. A cost allowance of 5% has been added for disinfection, however, to make these options comparable to the storage options in this regard.

The same three sites as considered in the storage option were considered for RTB locations. The treatment options evaluated included various combinations of local drainage areas and an assessment of the impact of including storm relief flows in the treatment systems.

TS.8.1 EVALUATION OF TREATMENT OPTIONS

The performance of the sedimentation basins was evaluated on the basis of the level of volumetric control and pollutant reduction. The objective of the analysis is to meet the CSO guideline requirement of 90% volumetric control at each location with an equivalent to primary treatment (50% TSS removal). A 30% removal of BOD is assumed with a 50% reduction in TSS. Table TS.4 summarizes the evaluation of the treatment options.

Table TS.4
Treatment Options Costs

Options	Description	%Control Local	%Control Basin Wide	Unit Cost	Total Cost (Million $)[2]
Treatment Option 1	Hiram RTB - 7,220 m^3	90%	76%	525 $/$m^3$	$ 3.8
	Marina RTB - 12,000 m^3			525 $/$m^3$	$ 6.3
	Caron RTB - 5,000 m^3			525 $/$m^3$	$ 2.6
TOTAL					$ 12.7
Treatment Option 2 (storm relief included)	Hiram RTB - 9,000 m^3	90%	76%	525 $/$m^3$	$ 4.7
	Marina RTB - 17,000 m^3			525 $/$m^3$	$ 8.9
	Caron RTB - 11,500 m^3			525 $/$m^3$	$ 6.1
TOTAL					$ 19.7
Treatment+ Storage Option 1	Hiram RTB - 7,220 m^3	90%	90%	525 $/$m^3$	$ 3.8
	Marina RTB - 12,000 m^3			525 $/$m^3$	$ 6.3
	Caron RTB - 5,000 m^3			525 $/$m^3$	$ 2.6
	WWTP upgrade(add 4 primary clarifiers)			$2.5 m ea.	$10.0
	Tunnel Storage D/S of Caron - 12,000 m^3			500 $/$m^3$	$24.0
TOTAL					$ 46.7
Treatment+ Storage Option 2 (storm relief included)	Hiram RTB - 9,000 m^3	90%	90%	525 $/$m^3$	$ 4.7
	Marina RTB - 17,000 m^3			525 $/$m^3$	$ 8.9
	Caron RTB - 11,500 m^3			525 $/$m^3$	$ 6.1
	WWTP upgrade(add 4 primary clarifiers)			$2.5 m ea.	$10.0
	Tunnel Storage D/S of Caron - 96,000 m^3			525 $/$m^3$	$63.0
TOTAL					$92.7

Notes: (1) RTB = Retention-Treatment Basin
(2) Not including $1 million cost of Caron Ave. Pumping Station Upgrade

Treatment Option 1 provides treatment for CSO flows from areas 2, 3, 4, 5 and 6. The total storage volume required to provide 90% volumetric control locally is 24,120 m^3 at a cost of about $12.7 million. This volume is sufficient to provide a reduction of 60% to 67% in TSS loading from the combined sewer system in the areas upstream of Caron Ave giving a 12% reduction basin wide. This reduction is calculated on the basis of flows to satellite treatment, intercepted flows to the WWPCP, underflow that goes to the WWPCP and satellite treatment by-pass.

In Treatment Option 2, storm relief flows from area 3, 4 and 6 are included in addition to the CSO flows from areas 2, 3, 4, 5 and 6. Considering these storm flows, the storage required to achieve 90% volumetric control locally increases to 31,990 m^3 at a cost of about $19.7 million and providing a reduction 56% to 64% in TSS loadings including storm relief flows from the areas upstream of Caron Ave. The resulting TSS loading reduction basin wide with this option is 17%.

The satellite CSO treatment facilities will provide 90% volumetric control locally since there is sufficient site area at all three locations to accommodate the sedimentation basin volumes required. To achieve a basin wide level of control of 90%, additional tunnel storage is required to control CSO's downstream of Caron Ave. The volume required for this storage element was presented previously in Section TS.7.1. Assuming an increase in the primary treatment capacity at the WWPCP of 66%, the storage volume required is 12,000 m^3 to provide 90% volumetric control for local service areas downstream of Caron Avenue for combined sewer flows only. The estimated cost of this facility is $24 million. In conjunction with the three treatment satellite facilities this would result in a 90% level of control basin wide for a total cost of $46.7 million. If storm relief flows are included, the required tunnel storage to achieve the 90% level of control would be 96,000 m^3 resulting in a total cost of $92.7 million for this option. The incremental cost for controlling the storm relief flows with this option is $46 million.

TS.8.2 TREATMENT OPTIONS CONCLUSIONS

1) A volumetric control of 90% and treatment equivalent to primary can be achieved for the CSO's upstream of the Caron Avenue Pumping Station using satellite treatment in the form of sedimentation basins with a total volume of 24,220 m^3 or 37,500 m^3 if storm relief systems are included.

2) Additional controls are required downstream of the Caron Avenue Pumping Station to achieve a basin wide control level of 90%. Considering combined sewer flows only, a storage tunnel segment providing 12,000 m^3 in addition to the three treatment facilities would provide a 90% volumetric control level. Considering storm relief flows, the tunnel storage requirement increases to 96,000 m^3.

3) TSS loadings to the Detroit River will be reduced with the satellite treatment facilities by 50% to 65% from the area upstream of Caron Ave. The removal of other pollutants can not be reliably estimated. Bacteria loadings to the Detroit River would also be reduced with the addition of disinfection.

4) The cost of implementing satellite treatment upstream of Caron Ave. to achieve 76% volumetric control basin wide with disinfection but without chemical addition is $12.7 million for combined sewer flows only. This increases to $19.7 million if storm relief flows are included.

5) To achieve a control level of 90% basin wide, the costs increase to $46.7 million for combined sewer flows and $92.7 million including storm relief flows. This additional cost is for tunnel storage downstream of Caron Ave. and the increase in the primary treatment capacity at the WWPCP.

TS.9 SEWER SEPARATION

Sewer separation has traditionally been adopted by many municipalities to address CSO control. The cost of sewer separation can in many cases be significantly more than other control measures. However, since separation can be advantageous when local flooding is an issue, sewer separation was evaluated as an alternative for the Riverfront District long term control plan. The level of CSO control that would be achieved is 100%. However, a consequence of sewer separation is that the increase in untreated stormwater flows would contribute additional pollutant loadings to the Detroit River. Pollutant loadings are discussed in Section TS.10. As a result of the increased loadings, sewer separation does not meet the pollution control plan objectives and it is also a very high cost measure. As a result, separation is only considered as an option in the rehabilitation of the over/under system in the Eastern Utility area of the system where the existing system was designed as a separated system.

The cost of separation is estimated to be approximately $120/m^3 of CSO removed based on recent work in the City of Cincinnati in the development of their long term facility plan. This translates into an order of magnitude cost of $475 Million for sewer separation in the Riverfront District.

TS.10 POLLUTANT LOADING ASSESSMENT

The loadings assessment conducted in Phase 1 was used as the basis for assessing the impact of CSO control on pollutant loadings to the Detroit River. The results of this assessment are presented in Figure TS-2 which shows the ratio between total pollutant loading to the Detroit River for each option and the total loading for existing conditions. For the storage options, it was possible to use the West Windsor plant data to estimate the loadings to the Detroit River for a variety of parameters. TSS is the only water quality parameter for which removal rates can be reliably estimated in satellite treatment facilities and this parameter was used as an indicator of overall performance. However, since this option is used in conjunction with a storage tunnel downstream of Caron Ave., BOD and phosphorus removals were assumed to be comparable to the storage option.

For the storage options, all stored and intercepted flows are conveyed to the West Windsor PCP. As a result, these options provide a somewhat better level of treatment than the satellite treatment options. Representative loading reductions range from 30% for suspended solids, about 8% for BOD and 70% to 90% for bacteria. Storage Option 2, which achieves an 90% volumetric control results in a slightly larger reduction in loadings than Option 1 which achieves only an 81% volumetric control.

With the use of satellite treatment for the CSO's servicing areas 2, 3, 4, 5 and 6 (Treatment Option 1), TSS loading to the Detroit River can be reduced up to 12% and another 5% reduction can be achieved if Storm Relief flows are included (Treatment Option 2). With the addition of a tunnel segment to achieve 90% control basin wide (Treatment/Storage Options 1 and 2), TSS loadings to the Detroit River are reduced by a total of 23% and 27% respectively.

Using disinfection with the satellite treatment facilities, reductions in Faecal Coliform counts would be comparable to the storage options.

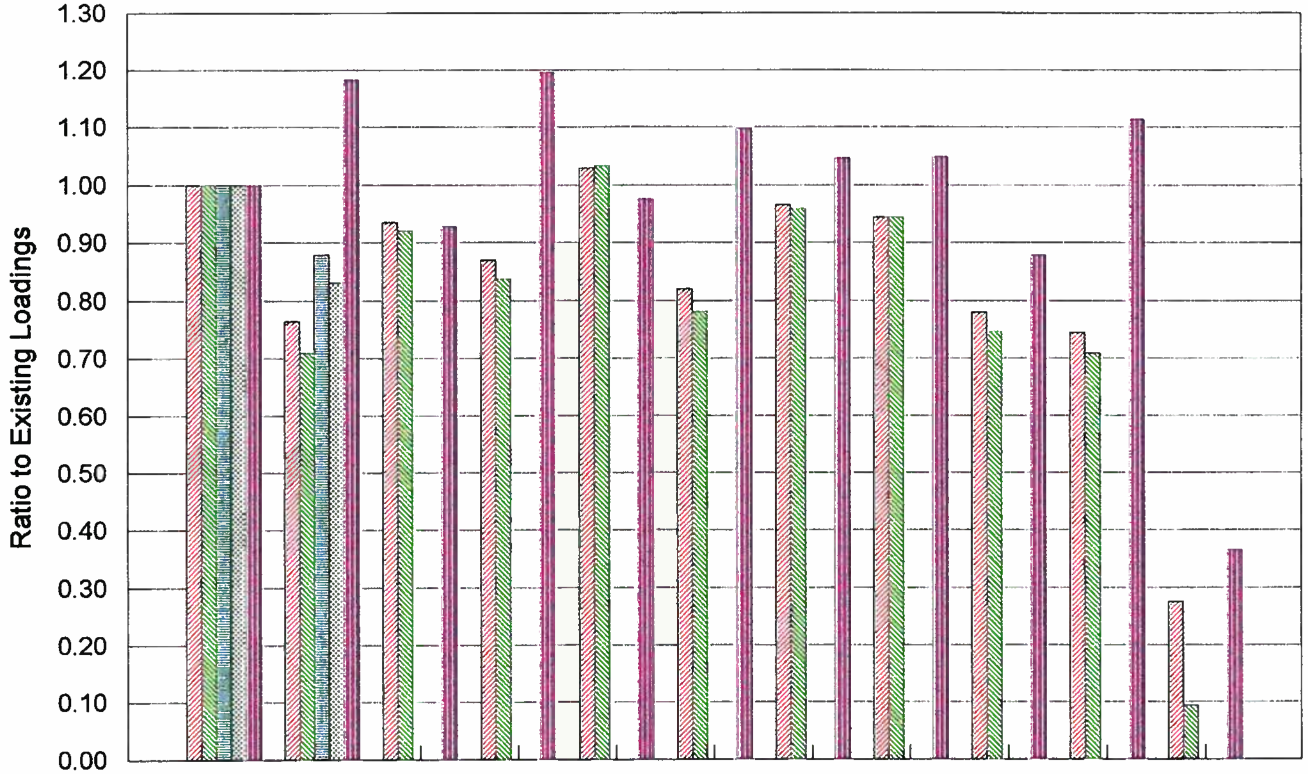
Considering the sewer separation option, for most of the pollutant parameters evaluated there is a general increase in pollutant loadings while both the storage and treatment options generally reduce pollutant loadings to the River.

TS.11 COMPARISON OF CSO CONTROL AND SECONDARY TREATMENT

The West Windsor Pollution Control Plant is one of the plants on the Great Lakes that will be required to provide Best Available Treatment Economically Feasible (BATEA) at some time in the future. This effectively means an upgrade to secondary treatment using biological processes. As part of this long range plan, the City has already carried out pilot testing of a number of treatment processes at the plant to determine the most economical approach. As part of the Phase 2 PCP study, the relative benefits of upgrading the plant to secondary treatment have been compared to the benefits of CSO control.

The possible upgrade of the West Windsor treatment plant to secondary treatment is not a factor in the comparison of different CSO control options for the Riverfront District since flows in excess of the primary capacity of the plant are bypassed. However, the relative benefits that may be realized for the cost expenditure on CSO control versus the benefits and costs of upgrading to secondary treatment was determined. This cost/benefit assessment is presented in Table TS.5. For consistency with the other

Figure TS.2
Pollutant Loadings with Storage Options



Pollutants	VOLUME	SS	BOD5	Total P	Cd	Cu	Zn	Pb	Hg	PCB's	FC
▨ Storage Option 1	1.00	0.76	0.94	0.87	1.03	0.82	0.97	0.94	0.78	0.75	0.28
▧ Storage Option 2	1.00	0.71	0.92	0.84	1.03	0.78	0.96	0.94	0.75	0.71	0.09
▥ Treat Option 1	1.00	0.88	-	-	-	-	-	-	-	-	-
▩ Treat Option 2	1.00	0.83	-	-	-	-	-	-	-	-	-
■ Full Separation	1.00	1.18	0.93	1.19	0.98	1.10	1.05	1.05	0.88	1.11	0.37

options considered in this study, the loadings and cost for the treatment plant have been pro-rated to represent the portion of the plant flow allocated to the Riverfront system, representing 70% of the plant totals.

Table TS.5
Annual Loading Reductions and Costs
for CSO Control Compared to Secondary Treatment Upgrade

	Kg x 1,000		
	SS	**BOD**	**P**
Total of All Existing Windsor Sources (1)	2,794	1,756	38
With Upgrade/90% Control:			
A.CSO Storage Tunnel (Option 2) (3)	1,981	1,616	32
Load Reduction	813	140	6
Cost x 10^6	$61		
Cost/Kg Removed	$75	$436	$10,200
B.CSO Satellite Treatment + Tunnel (3)	2,151	-	-
Load Reduction	643	140(4)	6(4)
Cost x 10^6	$47.7		
Cost/Kg Removed	$74	341	7,950
C.Upgrade of West Windsor PCP to Secondary Treatment(2)	2,375	1,375	31
Load Reduction	419	381	7
Cost x 10^6	$53		
Cost/Kg Removed	$127	$139	$7,571

Note:
(1) From the Phase 1 report
(2) Costs and loadings are 70% of the totals for the WWPCP representing the allocation to the Riverfront District.
(3) Includes cost for adding four primary clarifiers at the WWPCP
(4) BOD and phosphorus removal for satellite treatment + tunnel is assumed to be comparable to the Storage Tunnel Option.

For suspended solids, both the storage and satellite treatment options have a lower unit cost per kilogram removed of $74 to $75 compared to $127 for secondary treatment. However, for BOD and Phosphorus removal, secondary treatment has a lower cost per kilogram removed, especially for BOD. Considering capital cost only, the cost of the treatment plant upgrade to secondary treatment lies between the costs for the two CSO control options and it might be considered a more cost-effective pollution control option. However, the CSO control plan is more amenable to a staged implementation that may be more practical to carry out. All factors must be considered in prioritizing the implementation of the city wide long term Pollution Control Plan for the City of Windsor.

TS.12 POLLUTION CONTROL PLAN ALTERNATIVES

Pollution Control Plan alternatives have been developed for the Riverfront District based on the Phase 2 study results on the principle that there will be no net increase in either CSO's or basement flooding. The alternatives consist of a number of short term programs for immediate implementation and several long term alternatives. There are four alternatives presented for the long term control program while the short term program is common to all alternatives.

TS.12.1 SHORT-TERM CONTROL PROGRAM

The short term control program consists of the continuation of the current City practices with respect to operation and maintenance of the system, and the expanded implementation of stormwater management and Best Management Practices for specific site developments as opportunities arise. While these measures are to be implemented as part of the short term program, it is expected that they will continue as part of the long term program where appropriate.

The MOEE minimum controls identified in Procedure F-5-5 and listed in Section TS.6 above are to be implemented as part of an overall pollution control program. To implement these minimum controls, the following specific measures are recommended in the short term program:

1. Establishing a formal manhole and sewer line inspection program on a 5 to 10 year cycle,
2. "Chalking" of storm relief chambers to monitor the occurrence and magnitude of overflows,
3. Observing automated chambers during actual wet weather events,
4. Replacing worn or inoperative chamber controls with vortex throttles or the equivalent as they come due for repair,
5. Implementing a 5 year cycle of system and chamber monitoring,
6. Installation of permanent flow monitoring stations at key locations in the system,
7. Re-instating the three overflows along Eastern Utility sewer as an interim measure to alleviate local flooding and increasing interception rates at downstream chambers to maintain or reduce total overflow volumes from the Riverfront District,
8. Monitoring the three re-opened overflow points on the Eastern Utilities Trunk Sewer and the modified downstream chambers to verify operation and confirm that overflow volume are not increased,
9. Initiating a water quality sampling program to improve base line data for monitoring trends in loadings (reductions) resulting from the implementation of the Pollution Control Plan,

10. Continuation of biomonitoring in the Detroit River to monitor the general health of the river as an indicator of the effectiveness of the overall pollution control initiatives in the region,

11. Continuation of the storm relief construction program considering design options to reduce pollutant loadings such as source controls, in-system storage and over-sizing,

12. Continue rehabilitation of the over and under system in the Eastern Utility district considering design options which will reduce pollutant loadings to the river and

13. Extension of the Riverfront Interceptor East to George Avenue to relieve part of the overloaded Eastern Utilities Sewer.

TS.12.2 ALTERNATIVES FOR LONG TERM CSO CONTROL

Four alternatives have been identified for the long term CSO control program. Each of these alternatives would build on and be integrated into the short term controls and other on-going programs of the City of Windsor to achieve the long term control objectives.

Alternative 1A - Storage Plus Central Treatment - Combined System Flows Only

The description of this alternative is as follows:

- Tunnel storage to control CSO's from the entire Riverfront District consisting of approximately 10 km of 2 m diameter conduit drained by pumping to the WWPCP and paralleling the existing Riverfront Interceptor to provide a storage volume of 25,000 m^3.
- Control of combined sewer flows initially; the control of storm relief flows is implemented at a later stage after combined sewer flow control is completed.
- Rehabilitation of the over/under system with new separated sewers.
- The addition of four primary clarifiers at the WWPCP and the addition of a 10% increase in the firm capacity at the Caron Ave. pumping station.
- The total cost of this alternative, excluding the rehabilitation of the over/under system, is estimated to be about $61 million.

Alternative 1B - Storage Plus Central Treatment - Including Storm Relief Flows

This alternative is the same as Alternative 1A except that storm relief flows are included in the first stage control plan resulting in larger facility sizes. The cost estimate for this alternative is $148 million.

Alternative 2A - Satellite Treatment - Combined Sewer Flows Only

The description of this alternative is as follows:

- Three Retention-Treatment Basins (RTB's) of 7,200 m^3, 12,000 m^3 and 5,000 m^3 constructed at the Hiram Walker, Marina and Caron Ave. sites respectively to control overflows upstream of Caron Ave.
- Tunnel storage downstream of Caron Ave. consisting of approximately 4.8 km of 2.5 m diameter pipe paralleling the Riverfront Interceptor to provide a total storage volume of 12,000 m^3. Stored flows are pumped to the WWPCP for treatment.
- Control of the combined sewer flows initially; the control of storm relief flows is implemented at a later stage, after combined sewer flow control is completed.
- The addition of four primary clarifiers at the WWPCP and the addition of a 10% increase in the firm capacity at the Caron Ave. pumping station.
- The estimated cost for this alternative is about $47.7 million.

Alternative 2B - Satellite Treatment - Including Storm Relief Flows

This alternative is the same as Alternative 2A except storm relief flows are considered in the control plan resulting in larger facility sizes. The cost estimate for this alternative is about $92.7 million.

TS.13 EVALUATION OF ALTERNATIVES

Table TS.6 summarizes the long term control alternatives. This information along with the evaluation of alternatives will be carried over to the next stage of public review at the next Public Open House to receive public input to the process. After this input, a preferred alternative will be identified by the Steering Committee for the development of the Implementation Plan in Phase 3 of the study.

TABLE TS.6
Evaluation of Long Term CSO Control Alternatives

Alt. No.	Description (1),(2)	Tank Volume (1000m3)	Tunnel Volume (1000m3)	Volumetric Control for (%)	Bacteria Control (3)	Capital Cost ($Mil.)	Annual Operating Needs	Potential for Staging
1A	Tunnel Storage Combined Sewers Only - 10km @ 2.0m dia.	-	25	90 (4)	yes	61	Pumping & Flushing	yes
1B	Tunnel Storage Including Storm Relief - 9.9km. @ 5.5m dia.	-	230	90 (5)	yes	148	Pumping & Flushing	yes
2A	Satellite Treatment Plus Tunnel Storage d/s of Caron Ave. (4.8km @2.0m dia.) Combined Sewer Flows Only	24.2	12	90 (4)	yes	46.7	Pumping & Flushing	yes
2B	Satellite Treatment Plus Tunnel Storage d/s of Caron Ave. (5.1km @ 5.0m dia.) Including Storm Relief Flows	37.5	96	90 (5)	yes	92.7	Pumping & Flushing	yes

Notes:

(1) All Alternatives include rehabilitation of the over\under system. Costs for this rehabilitation are not included in the CSO control cost.

(2) All alternatives include increasing Caron Ave. pumping capacity by 10% and adding four primary clarifiers to the WWPCP to increase plant wet weather capacity allocated to the Riverfront Interceptor by 66%.

(3) All flows reaching the WWPCP receive disinfection. CSO's and satellite treatment flows are disinfected at the site.

(4) Considering combined sewer flows only

(5) Considering combined sewer and storm relief flows.

97/06/09

APPENDIX B

Windsor Riverfront P.C.P. Study
- Phase 3 – Implementation Plan Executive Summary

Windsor Riverfront Pollution Control Planning Study
Executive Summary

1. BACKGROUND

The Detroit River has been listed as one of 43 Great Lakes Areas of Concern by the International Joint Commission because degraded water quality conditions impair certain beneficial uses. Michigan and Ontario are developing a joint Remedial Action Plan (RAP) to address water quality concerns in the Detroit River.

The City of Windsor with participation and funding assistance from the Province of Ontario and from the Federal Government through the Great Lakes Clean Up Fund commissioned a study in late 1992 to investigate direct municipal discharges to the Detroit River from the Riverfront area within the City of Windsor boundaries and north of Riverside Drive. The purpose of this study is to develop a pollution control strategy for the Windsor Riverfront District with the specific objective of reducing combined sewer overflows (CSO) and total pollutant loadings to the Detroit River.

The Riverfront area is one of three watersheds in the City for which Pollution Control Plans (PCPs) are being or have been developed. The other two are the Little River catchment, for which a PCP was completed in 1993, and the Turkey Creek-Grand Marais Drain catchment area. The individual plans for all of these areas will be considered as components of an overall Pollution Control Plan (PCP) for the City of Windsor.

This study, which is called the Windsor Riverfront Pollution Control Planning Study was carried out in three phases. The Phase 1 work, which was completed in 1995, determined the quantity and quality of the wastewater being discharged under both dry and wet weather conditions and estimated their impact on the Detroit River. In Phase 2, completed in 1997, various pollution control measures for the Riverfront District were evaluated and alternative CSO control strategies were presented. Phase 3 presented the preferred CSO control plan and developed an implementation plan in the context of the overall pollution control program for the City of Windsor.

2. PHASE I FINDINGS

Among the significant findings of the Phase I study, it was concluded that there is no evidence of dry weather discharges from any of the Riverfront Interceptor chambers and pollutant sources from Windsor account for a small portion of the total pollutant loads to the Detroit River under both wet and dry weather conditions. Typically, only 1% to 5% of contaminant loadings to the Detroit River can be attributed to sources in the Windsor Riverfront study area. The in-stream monitoring program also verified that the effect of the City of Windsor CSO's on the quality of water and sediment of the Detroit River is minimal.

3. PHASE 2 STUDY OBJECTIVES

The Phase 2 study evaluated options to develop a pollution control plan (PCP) for the Riverfront District to satisfy regulatory guidelines for CSO control and to reduce the pollutant loading to the Detroit River to levels consistent with the RAP objectives and acceptable to the public. An additional critical criteria is that the pollution control measures must not increase basement flooding.

The City of Windsor has adopted the MOE Guidelines for CSO control. The specific target of these guidelines is that 90% of the wet weather flows from the combined sewer system is to receive at least primary level treatment defined as 50% reduction of suspended solids loads and 30% reduction of BOD loads.

4. EVALUATION OF CSO CONTROL OPTIONS

The CSO control plan is comprised of two components considering both short term and long term measures. The short term program is the foundation for long term plan components. The short term program addresses the immediate operational concerns identified in the Phase 1 report. It identifies opportunities for non-structural measures pertaining to improved maintenance and operation of the existing system that are both low in capital expense and relatively simple to implement over a five year period. The long term CSO control program will build on the short term program to achieve the Pollution Control Plan objective of 90% volumetric control of wet weather CSO to the Detroit River.

Non-structural methods of pollution control are not sufficient in themselves to achieve the level of pollution control required to meet the MOE criteria or the study objectives for the City of Windsor. It was concluded that these measures should be pursued as supplementary to the principal needs of the long term pollution control program.

The principal control methods considered for the long term control program are: 1) storage facilities which detain wet weather flows for eventual treatment at the West Windsor Pollution Control Plant (WWPCP) and 2) satellite treatment using high rate treatment devices such as Retention Treatment Basins (RTB's) located at individual CSO locations.

In the evaluation of alternatives, a range of options and scenarios were considered, including:

- Treatment of combined system flows with and without storm relief flows,
- Storage tanks at CSO locations and deep tunnel storage parallel to the Riverside interceptor,

- Restoration of the separated over/under system in the Eastern Utilities area,
- Increased pumping capacity at the Caron Ave. station,
- Increased primary treatment capacity at the West Windsor Pollution Control Plant for treatment of CSO,
- Use of in-system storage for both the existing system and possible additional storage through over-sized storm relief sewers and
- Optimization of system storage and performance through Real Time Control operation.

5. *ALTERNATIVE CSO POLLUTION CONTROL PLANS*

The Pollution Control Plan alternatives consist of four long term alternatives and a number of short term programs which are common to all. The four long term alternatives are:

1A.) Tunnel storage to control CSO's from the entire Riverfront District consisting of approximately 10 km of 2 m diameter conduit parallelling the existing Riverfront Interceptor and drained by pumping to the West Windsor Pollution Control Plant at a total cost of about $61 million.

1B.) The same as Alternative 1A except that storm relief flows are included in the first stage control plan resulting in significantly larger facility sizes. The cost estimate for this alternative is $148 million.

2A.) Three Retention-Treatment Basins (RTB's) 7,200 m^3, 12,000 m^3 and 5,000 m^3 in size constructed at the Hiram Walker, Marina and Caron Ave. sites respectively to control overflows upstream of Caron Ave. and tunnel storage downstream of Caron Ave. consisting of approximately 4.8 km of 2.5 m diameter pipe parallelling the Riverfront Interceptor for a total cost of about $47.7 million.

2B.) This alternative is the same as Alternative 2A except storm relief flows are considered in the control plan resulting in larger facility sizes. The cost estimate for this alternative is about $93 million.

6. *LOADING ASSESSMENT*

For storage options 1A and 1B, representative loading reductions would range from 30% for suspended solids, about 8% for BOD and 70% to 90% for bacteria. With the use of satellite treatment combined with tunnel storage (options 2A and 2B), TSS loadings to the Detroit River are reduced by a total of 23% and 27% for options 2A and 2B respectively.

The pollution control benefits of CSO control were also compared to sewer separation and the upgrade of the West Windsor Pollution Control Plant to secondary treatment. Considering sewer separation, for most of the pollutant parameters evaluated there is a general increase in pollutant loadings while both the storage and treatment options generally reduce pollutant loadings to the River. Sewer separation is not considered a viable pollution control option.

The unit cost for removal of suspended solids with secondary treatment is $127 per kilogram removed while both the storage and satellite treatment options have a lower unit cost per kilogram removed of $75. However, for BOD and Phosphorus removal, secondary treatment has a lower cost per kilogram removed, especially for BOD. Considering capital cost only, the cost of the treatment plant upgrade to secondary treatment lies between the costs for the two CSO control options and it might be considered a more cost-effective pollution control option. All factors must be considered in prioritizing the implementation of the long term Pollution Control Plan for the City of Windsor.

7. *SELECTION OF THE PREFERRED ALTERNATIVE*

The four CSO Pollution Control Plan Alternatives along with the results of the Phase 2 study and the evaluation of alternatives were presented at a series of Public Open Houses in early 1998 to receive public input to the process. The public was asked to comment on the alternatives and indicate their preference. A majority of those responding (53%) indicated a preference for the Retention/Treatment Basin approach (Alternative 2) over the Storage tunnel approach. Based on the conclusions of the Phase 2 study, cost considerations and the input from the Public, the City has selected Alternative 2, the Retention/Treatment Basin option, as the preferred option for CSO control in the Riverfront District. This alternative was carried forward for the development of the Implementation Plan in Phase 3 of the study.

8. *DEVELOPMENT OF THE IMPLEMENTATION PLAN (PHASE 3)*

The Phase 3 study developed the implementation plan in the context of the City-wide pollution control programs, regulatory requirements, existing commitments, the City's financial resources and the public input. The process used to develop the implementation plan was:

- Define priorities,
- Identify opportunities,
- Identify existing resources, sources of funding and constraints,
- Define implementation tasks,
- Define resource requirements and
- Develop the implementation schedule.

9. *CITY OF WINDSOR PRIORITIES*

In addition to the proposed CSO control program, the City of Windsor has other requirements for pollution control and related infrastructure management such as:

- Upgrading the West Windsor Pollution Control Plant to secondary treatment (required by the Canada/Ontario Agreement),
- Extension of the Riverfront Interceptor,
- Upgrading the Caron Ave. Pumping Station,
- Restoration of the Eastern Utilities area 'over/under' system,
- Completion of the storm relief program,
- On-going maintenance and restoration of the existing sewer system infrastructure
- On-going monitoring and inspection.

In addition, works related to the implementation of the Little River Pollution Control Plan and the installation of sanitary sewers in the Turkey Creek/Grand Marais Drain watershed are also in progress.

The implementation strategy for the Riverfront District considers all of these on-going and proposed programs and the resources required for each. The current programs for maintenance and storm relief are essential to the operation of the City's existing sewer system. These are considered to be the 'base program' upon which the PCP programs will be built. The base program will continue to be funded from the existing financial resources of the City. The new works identified for the PCP are in addition to the base program. Since the historical City expenditures on maintenance and restoration works using current resources are generally not sufficient to keep up with the needs of the system, new funding will be required by the City to implement the PCP programs. If funding is available from the Provincial and Federal Governments, this will serve to expedite the overall implementation schedule.

The total cost of the PCP works including CSO control, upgrading the WWPCP to secondary treatment and related works is about $184 Million. By comparison the costs to complete the storm relief work is about $50 Million and the cost for the rehabilitation of the Eastern Utilities District over/under system is about $100 Million.

10. OPPORTUNITIES

A number of infrastructure and development proposals in the Riverfront District may provide opportunities to complement or contribute to the implementation of the PCP. This potential is related to the location and time frame of the projects. In addition to the on-going infrastructure projects, other potential projects that may contribute to the implementation of the PCP program are:

- Development of the Marina site,
- Re-development of the downtown area and
- In-filling and re-development in other areas.

11. IMPLEMENTATION SCHEDULE

The implementation tasks for the PCP have been listed and divided into immediate, short term and long term categories based on City priorities, cost/effectiveness, regulatory requirements, and the need for additional study. In addition, a range of implementation time frames from 10 years to 25 years has been considered to illustrate the potential impact of the PCP implementation on the City's capital expenditures and the level of additional funding that will be required. For planning purposes, it has been assumed that the program will begin in 1999 with the implementation of the various monitoring programs and pilot studies. The schedule has also been defined in 5 year stages with a review at the end of each stage to monitor the progress and effectiveness of the program and to assess any changed circumstances that could alter the plan.

For the 25 year implementation time frame, the average annual expenditure required beyond the current City expenditures on the base program would be about $7.4 Million ($37 per capita). If the time frame is compressed to 10 years the annual expenditure increases to $18.3 Million ($92 per capita). For comparison, the current City levy on the water bill for sanitary sewer construction and treatment plant operation is about $15 Million per year.

APPENDIX B

Windsor Combined Sewer Overflow Treatability Study Comprehensive Report – Summary

SUMMARY

Combined sewer overflows (CSOs) are considered to be a significant source of pollution in the Detroit River. CSO control measures for the riverfront area within the City of Windsor have been evaluated in previous studies commissioned by the City of Windsor and funded in part by the Federal Government. Retention Treatment Basins (RTBs) were proposed as a key component of an overall CSO control program. Chemical coagulation can improve settling characteristics of the suspended solids, increase surface-loading rate of the RTBs, and lower the capital cost. Results of previous studies indicated that RTBs combined with polymer coagulation would be feasible to achieve the requirements of the Ontario Ministry of the Environment guidelines (Procedure F-5-5) for CSO treatment. However, additional information was required to determine if an RTB combined with chemical coagulation can be designed for the site that will reasonably treat Windsor CSO to achieve the requirements of MOE Procedure F-5-5.

During the period between the initiation of the project and March 2002, a series of batch and pilot-scale studies have been undertaken. The work was conducted at the Lou Romano Water Reclamation Plant (LRWRP) in Windsor. Subsequently, the tests results were used in a numerical simulation program to size and predict the seasonal performance of a full-scale RTB facility.

Jar Tests

During the period of March 20, 2001 to August 19, 2001, jar tests were undertaken at the LRWRP in Windsor. The objectives of the jar tests were to establish the boundary conditions for a polymer coagulation process and to select the appropriate polymers and the dosage that would provide optimum settling characteristics.

Compared to other coagulants (alum, ferric chloride, etc.), the use of polymer flocculation significantly improved settling characteristics of the suspended solids and increased the surface-loading rate applicable to the sedimentation basins. Seven types of cationic polymers were tested in the jar test program. The results demonstrated that greater solid removal efficiency would be achieved with polymer addition than without. A 5 mg/g-TSS or higher polymer dosage gave the best TSS removal for wet-weather sewage during CSO events. When the polymer dosage was 5 mg/g-TSS or higher, the different types of cationic polymers tested had essentially the same effect on TSS removal efficiency.

The results of the jar tests determined the appropriate polymer and the dosage that would provide optimum settling characteristics.

Settling Column Tests

Settling column tests were conducted on wet-weather sewage at the LRWRP for 9 CSO events that occurred during the period between April 6, 2001 and June 19, 2001. The objectives of the settling column

tests were to develop settling rate distribution curves under both chemically aided and unaided conditions, and to examine the performance of polymer flocculation in improving settleability.

The results of the settling column tests showed that the characteristics of the wet-weather sewage at the LRWRP during CSO events were similar to those of samples collected at actual overflow sites along the Windsor Riverfront. Settling rate distributions demonstrated that polymer addition to CSO significantly improved the settling characteristics. It was concluded that greater solid removal efficiency would be achieved with polymer addition than without.

The results from the batch settling tests provided essential information on the selection of polymer type, optimal dosage and settling rate distribution curves to be used in the evaluation of a pilot plant comprised of a RTB.

Pilot Plant Tests

A series of pilot plant tests were conducted for 9 CSO events that occurred during the period from July 21 to November 30, 2001. The wet weather sewage at the LRWRP during CSO events was used for the pilot plant tests. The objective of the pilot plant tests was to examine the performance of an RTB utilizing polymer-aided flocculation for the treatment of CSO. The pilot plant was designed and constructed at the LRWRP. The key elements of the pilot plant were a constant-head tank for flow distribution, a polymer feeding system, two mixing systems, and a RTB in the form of a rectangular clarifier. Only one of the two mixing systems, an in-line static mixer or a mechanical mixer, was in operation at any given time. The use of cationic polymeric flocculants was to increase the surface-loading rate of the RTB and lower the capital cost of constructing RTBs.

The effects of polymer dosages on effluent quality from the RTB were investigated. As observed in the jar tests, a 5 mg/g-TSS or higher polymer dosage gave the best TSS removal. A relationship between hydraulic loading rate and total suspended solids (TSS) removal was established. The results demonstrated that the use of polymer allowed the surface loading rate through the RTB to be increased significantly, resulting in smaller treatment units. When treating an influent with a TSS concentration of 260 mg/l at an OFR of 12.5 m/hr, the effluent of the RTB was found to satisfy the Procedure F-5-5 TSS requirement of 90 mg/l.

The results from this study will provide essential information for determining facility size and geometry, polymer dosage and predicted treatment efficiency to comply with MOE Procedure F-5-5.

Modeling Studies

The objective of model studies is to determine if an RTB facility can be designed for the site that will reasonably treat CSOs to MOE F-5-5 standards. The models studies have been conducted Based on the results obtained from the above batch and pilot plant tests. The model studies included:

- Reviewed the most recent pilot studies to determine the most likely treatability characteristics of the proposed RTB facility at prescribed polymer doses
- Used available flow and TSS data to model a TSS time series that corresponds with the flow time series for a typical year
- Determined the size of the RTB at the proposed site that will comply with MOE F-5-5 guidelines
- Conducted a sensitivity analysis of the proposed RTB size to determine the effects of modelling assumptions and operating variables

The results of the modeling studies have been presented in the Technical Memorandum provided by Hydromantis.

APPENDIX B

Windsor CSO Treatability and Characterization Study Journal Paper

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Windsor Combined Sewer Overflow Treatability Study with Chemical Coagulation

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Long column settling and jar tests were undertaken as part of a treatability study of combined sewage at the Lou Romano Water Reclamation Plant (LRWRP) in Windsor, Ontario. Different types of cationic polymers were examined in jar tests, and the appropriate dosage and its relationship with the TSS removal were determined for the polymer coagulation process. Settling column tests were used to develop settling rate distribution curves under both chemically aided and unaided conditions, and to examine the performance of polymer coagulation in improving the settleability of wet-weather sewage during CSO events. The results of the long column settling tests for settling rate distributions show that the characteristics of the wet-weather sewage at the LRWRP during CSO events were similar to those of samples collected at actual overflow sites along the Windsor Riverfront. Settling rate distributions demonstrated that polymer addition to the wet-weather sewage significantly improved the settling characteristics.

Key words: **CSO treatment, settling column, wet-weather sewage, polymer, chemical coagulation, CSO**

Introduction

Background

Combined sewer overflow (CSO) is considered to be a major source of pollution in the Detroit River. LaFontaine, Cowie, Buratto & Associates Limited (1994) investigated pollutant loads discharged from the riverfront area within the City of Windsor (Ontario, Canada) to the Detroit River. CSOs represent less than 5% of the total annual volume discharged to the Detroit River, but contribute 27% of the total annual solids load. CSO events occur at random, and with varying duration and intensity. The CSO tends to have high solid concentrations when compared with other major sources of pollution in the Detroit River.

Most pollutants appear to have a strong affinity to suspended solids (SS), and the removal of suspended material will very often remove many of the other pollutants found in urban stormwater (Stahre and Urbonas 1990). A settling process would be an efficient way of treatment, because

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suspended solids are a main vector of pollution. In 1997, the Ontario Ministry of the Environment (MOE) promulgated Procedure F-5-5 as a means of documenting its objectives for CSO control. Procedure F-5-5 specifies that 90% of wet-weather flow is to be treated to primary treatment equivalency, which is defined as a seasonal average of at least 50% removal of total suspended solids (TSS) and 30% removal of 5-day biochemical oxygen demand (BOD_5). Furthermore, the seasonal average TSS concentration in the effluent of the treatment systems should not exceed 90 mg/L.

The City of Windsor (1999) evaluated CSO control measures for the riverfront area within the City. The pollution control plan that resulted from that study included several measures to comply with Procedure F-5-5. The use of retention treatment basins (RTBs) was identified as the preferred approach to CSO treatment, based on the current state of proven reliable technology. Meanwhile, the study also recognized that research into high rate settling facilities such as vortex separators is ongoing and recommended that the latest experience with this technology be considered before the selection of a preferred treatment system is finalized.

Determination of the settleability of CSO suspensions is of primary importance for the design of CSO treatment facilities. Several types of settling apparatus, including a rotating settling column, the Brombach settling apparatus and a conventional (stationary) settling column have been used for obtaining solids settling velocity distributions for dry and wet weather wastewater (Pisano 1996; Wastewater Technology Centre 1999). The most common settling apparatus is a conventional settling column having side withdrawals along the column length. In this study, conventional long columns were used for obtaining solids settling velocity distributions for Windsor CSO.

The use of a polymer as the sole coagulant has been shown to improve settling characteristics of the suspended solids and provide good solid/liquid separation in a simple high-rate settling process (Wastewater Technology Centre 1999; Water Technology International 1999; Questor Veritas 2000). The peak hydraulic load (surface loading rate) attainable was about 50 m/h, or more than 10 times that used in conventional primary clarifiers. Solid/liquid separation combined with chemical coagulation, as a space-saving option, would be feasible to treat wet-weather flows during CSO events in Windsor where limited space is available for the construction of CSO control/treatment facilities. However, treatability tests need to be conducted to optimize the process variables for polymeric coagulation, and predicted treatment efficiency to comply with Procedure F-5-5. Furthermore, some questions remained from the earlier high-rate treatment studies concerning process mechanisms and the availability of suitable treatability test protocols.

The objectives of this study were to select an appropriate polymer and the optimal dosage for the polymer coagulation process, develop settling rate distribution curves under both polymer aided and unaided conditions, and examine the performance of polymer coagulation in improving the settling characteristics of CSO suspensions.

Materials and Methods

Samples

Experiments were conducted at the LRWRP in Windsor. During CSO events, the influent at the LRWRP was used to represent actual CSO for the batch tests and the continuous flow tests. A CSO event was deemed to have occurred when the gates opened at one or more of the three automated interceptor chambers causing an overflow into the Detroit River (Fig. 1). The overflows were indicated on the interceptor computer screen at LRWRP. It was estimated that the first flush of CSO flow during the storm event took 45 minutes to travel from the interceptor chambers to the LRWRP. At 45 minutes after the overflow was detected, samples of the influent at LRWRP were collected from the grit chamber for the treatability tests on Windsor CSO. Dry weather sewage at LRWRP was also used in preliminary jar tests to evaluate the effectiveness of the targeted polymers.

Polymers

Four polymers, shown in Table 1, were used in this study. All of these polymers are of high molecular weight, polyacrylamide-based flocculants that exhibit a low degree of cationic charge. Gric and Lric (1978) reported that good mixing of the polymer solution into the wastewater stream could be achieved by diluting the polymer as much as possible; the best performance was achieved at the concentration of polymer solution equal to or less than 0.1%. Based on the literature review, a 0.1% polymer solution was employed in this study.

For high concentration polymers with high viscosity, high intensity mixing is necessary to dissolve the polymer solids (granular form) or dilute the concentrated stock polymer to a lower concentration (0.1%) polymer solution. A magnetic stir bar was employed to disperse 0.1 g of the stock polymers into 100 mL of tap water for the preparation of 0.1% polymer solution for the jar tests. For the preparation of 0.1% of polymers for settling column tests, a high-speed mixer operated at 600 rpm was used to mix 0.8 g of the stock polymer into 800 mL of plant tap water.

Jar Tests

The jar test method has been used for the evaluation of the effectiveness, optimum conditions and required doses of targeted polymers (Kawamura 1991; Young et al. 2000). In this study, the jar test method was employed for establishing the reference conditions including the appropriate polymer and the relationship of the polymer dosages to the removal efficiency for polymer coagulation process.

A standard jar test apparatus with 2-litre square jars and flat-blade propellers was used in this study. Samples were placed in the beakers, and polymer was added by pipette. Then, the samples were mixed at 150 rpm for 1 minute. This rapid mixing phase was followed by a

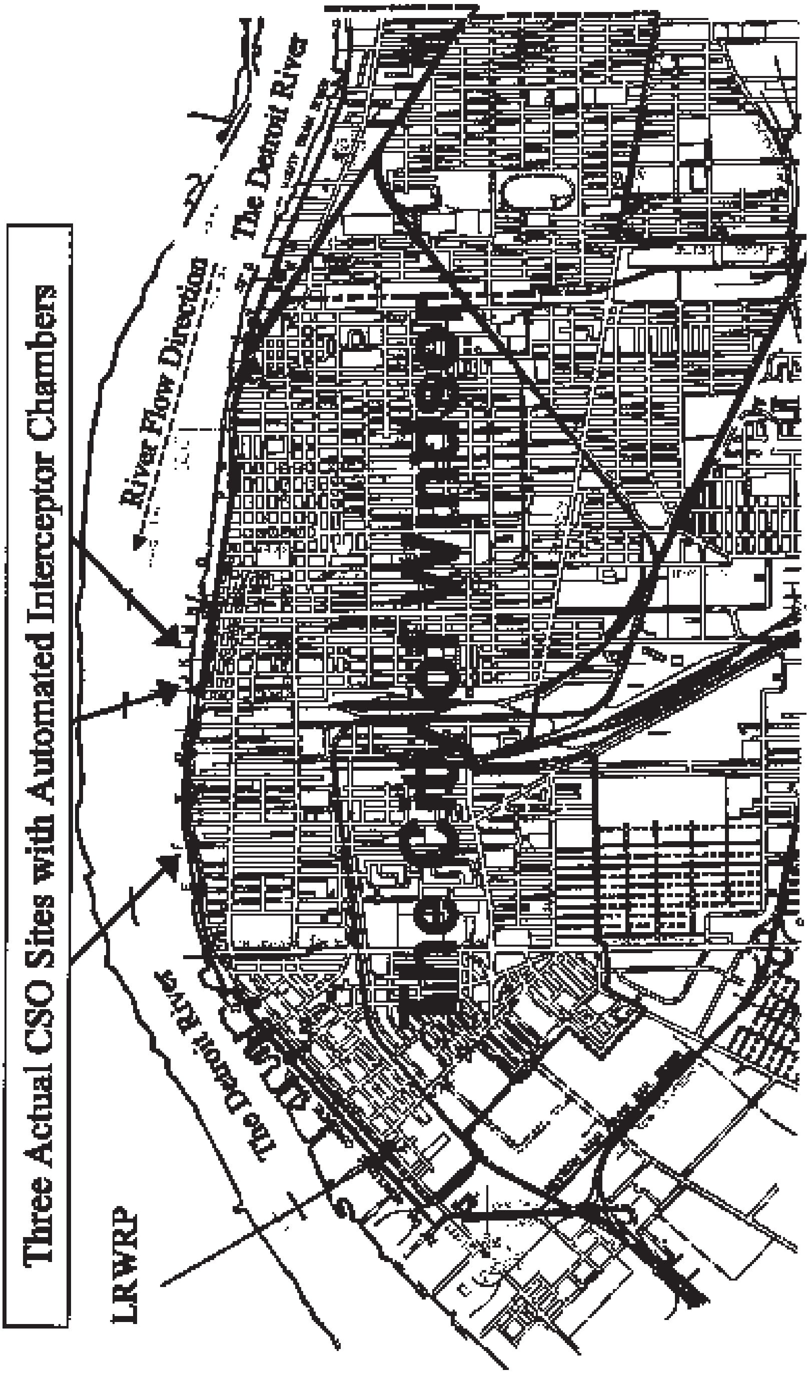

Fig. 1. The Riverfront Area within the City of Windsor.

5-minute period of slow mixing (30 rpm) to promote floc formation. The mean velocity gradient (G) values at 150 and 30 rpm, calculated by Rushton's method (Rushton 1952), were 180 and 20 s^{-1}, respectively. The suspension was allowed to settle for a period of 10 minutes, after which time the supernatant liquid was collected for TSS analysis. Comparison of initial (raw) and final (treated) TSS results determined the choice and effective doses of the polymers.

Settling Column Tests

Settling column tests were conducted to obtain settling rate distribution curves under both chemically aided and unaided conditions. A schematic diagram of the settling column apparatus is shown in Fig. 2. The apparatus consisted of two long settling columns of 3-m height and 200-mm diameter, and a 200-litre drum. Both settling columns were used for the settling column tests. One column was employed without polymer (without coagulation), and the other was used with polymer (with coagulation). Six sampling ports were located at uniform intervals of 305 mm up from the base of the column.

The drum, fitted with a mixer, was used as a sample storage tank, as well as a mixing tank for the batch operation of polymer flocculation. Two flat paddles, mounted on the same shaft, were employed for mixing. One paddle contained 2 blades. Each blade was 28 mm wide and 148 mm in length. For the drum with a volume of 90 litres, the G values at 150 and 30 rpm, calculated by Rushton's method (Rushton 1952), were 170 and 15 s^{-1}, respectively. To discharge CSO samples from the drum to the set-

Table 1. Polymers used in this study[a]

Name	Type	M.W. range	Shelf life
POLYDYNE Clarifloc C3223P	Dry cationic polymer (100% active)	—	—
CIBA Zetag 7692	Dry cationic polymer (100% active)	11–13 million	—
CIBA Zetag 7822	Cationic emulsion liquid polymer (33% active, 33% oil, 34% water)	13 million	3 months
CIBA Zetag 7873	Cationic dispersion liquid polymer (50% active, 50% mineral oil)	9–13 million	1 year +

[a] Adapted from the technical data sheets and "Material Safety Data Sheet" provided by POLYDYNE and CIBA.

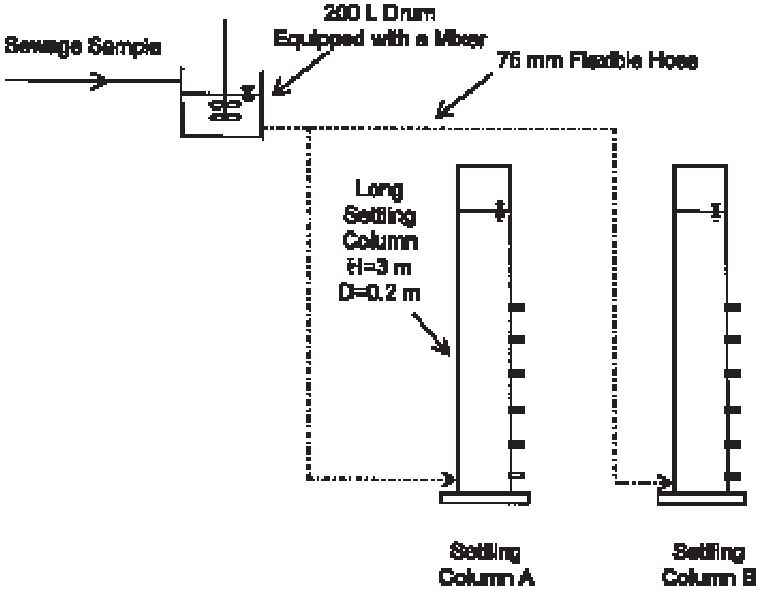

Fig. 2. Schematic diagram of the equipment for settling column tests.

tling columns via gravity; the drum was located on the upper level mezzanine while the settling columns were located on the lower floor. The drum could be connected to one of the two settling columns by using a flexible 3'' diameter hose.

The following procedure was used for the settling column tests:

(1) The grit channel pump was started up at the beginning of the first flush of CSO to pump sewage into the drum. The samples were mixed at 150 rpm once the drum had been filled to the appropriate height.

(2) For settling column tests with polymer flocculation, the required volume of 0.1% polymer solution was introduced into the drum. The polymer was mixed into the CSO sample in the drum at 150 rpm for approximately 1 minute followed by a 5-minute period of slow mix at 30 rpm to promote formation of flocs. This step was not required for settling column tests without flocculation.

(3) The CSO sample mixture was discharged via gravity into the settling column from the drum. Once the column was filled, samples were drawn from each column sampling port into 250-mL sample jars and the time was noted and established as time zero.

(4) At time intervals of 1, 2, 5, 10, 20, 60 and 120 minutes, about 250-mL samples were drawn from each targeted port. Each sample jar was labeled with the column number, settling time and port number.

(5) The samples were analyzed for TSS concentrations. The TSS results (representing treated effluent) of each sample were compared at cer-

> tain time intervals against the initial TSS averaged from each port at time zero. TSS, percentage removal, port depth, and time were recorded and tabled.

The analysis of the data of settling column tests was conducted following the procedures outlined by various researchers (Pisano 1996; Aiguier et al. 1996; Wastewater Technology Centre 1999). A time-depth matrix of concentration data was converted to percent removal values and ranked. The corresponding settling rates were based on the incremental depths between sampling ports and the sampling interval times. A plot of settling rate distribution curves on a grid of settling velocity versus percent mass less than the corresponding settling velocity was developed. This analysis method does not employ the integration over depth calculation typically used to estimate the performance of a horizontal-flow clarifier with a vertically uniform influent flow. Consequently, the resulting settling rate distribution might apply to an upflow clarifier or to a high-rate separator with a less well-defined influent flow pattern.

Data Analysis

Each data point shown is the average of two sets of results that were obtained from the same sample. All statistical analysis of data obtained from settling column tests were conducted using regression analysis method (Scheaffer and McClave 1990) and Microsoft Excel spreadsheets. The confidence levels were set at 95%.

Results and Discussion

Effectiveness and Appropriate Dosage of Targeted Polymers

The effectiveness and appropriate dosages of targeted polymers were evaluated on the basis of TSS removal efficiency. The polymer dosages were based on the active polymer material (excluding the mass of carrier material) and were calculated relative to the initial TSS concentration in the wastewater. For a sample with initial TSS concentration of 400 mg/L, the volumetric polymer dosage equivalent to 5 mg/g-TSS would be approximately 2 mg/L as active polymer.

Figure 3 shows the performance of the polymers (Clarifloc C-3223P, Zetag 7822, Zetag 7692, and Zetag 7873) on dry-weather sewage. All results show improved removal efficiency up to a dosage of approximately 5 mg/g-TSS. For each of the four polymers, when the polymer dosage was increased to 12.5 mg/g-TSS, the TSS removal efficiency rose to approximately 80%. When the dosage was greater than 12.5 mg/g-TSS, all of the polymers showed little improvement in TSS removal efficiencies with increasing polymer dosage. All polymers depicted similar removal efficiency.

TSS removal efficiencies for the two polymers (Zetag 7822 and Clarifloc C-3223P) on wet-weather sewage during CSO events are illus-

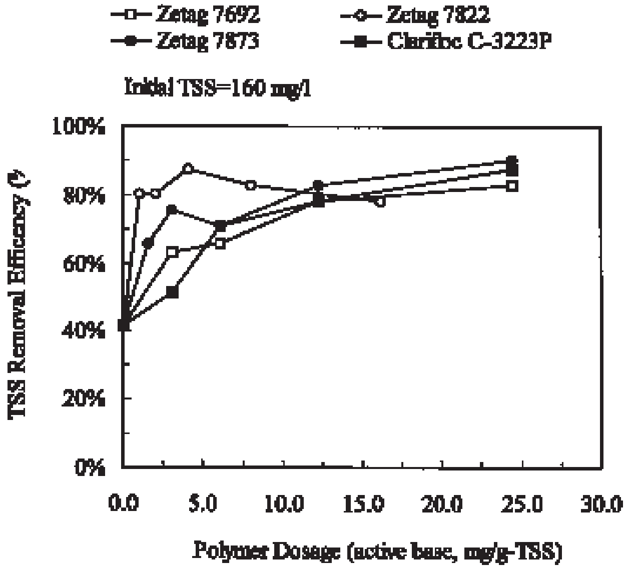

Fig. 3. Jar test results for different types of polymers on dry-weather sewage.

trated in Fig. 4. Similar to the results obtained from the jar tests on dry-weather sewage (Fig. 3), both these polymers showed little difference in the improvement of TSS removal efficiencies with increasing polymer

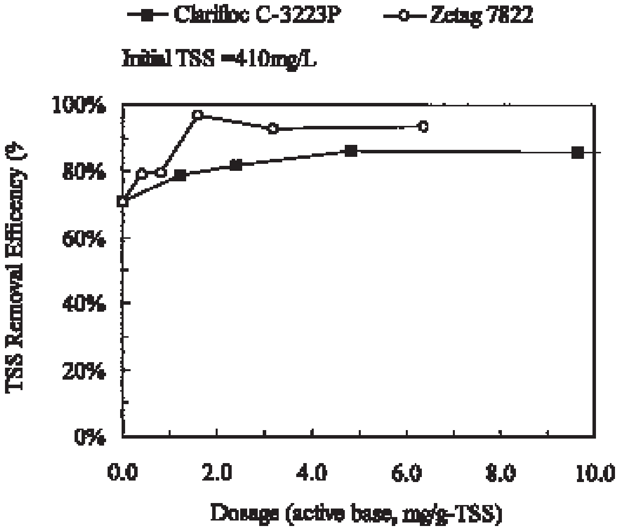

Fig. 4. Jar test results for different types of polymers on wet-weather sewage during CSO event.

dosage. Removal efficiency for the two polymers was observed to increase up to a dosage of 5 mg/g-TSS, after which no significant improvement was noted.

Effect of Sewage Type on Treatability with Polymer Coagulation

Figure 5 shows TSS removal efficiencies of wet-weather sewage during CSO events compared with that of dry-weather flow for Zetag 7822. As seen from Fig. 5, the removal efficiency of TSS in wet-weather sewage is greater than that of dry-weather sewage. The appropriate dosages that would give the best TSS removal efficiency are approximately 10 mg/g-TSS for dry-weather sewage and approximately 5 mg/g-TSS for wet-weather sewage. However, the difference in treatment efficiency for wet-weather and dry-weather sewage is reduced with the increase of the polymer dosage.

Wet-weather sewage is generally more settleable than dry-weather sewage because large inert particles are flushed from the sewers by storms (Stahre and Urbonas 1990). Dry-weather sewage may also be considered to contain more colloidal solids with a negative electrical surface charge than wet-weather sewage. Charge neutralization by adsorption of the cationic polymer to the colloidal solids with a negative electrical surface charge is a key mechanism for optimizing removal of waterborne solids from water (Penniman 1981). Based on the mechanism of charge neutralization, wet-weather sewage would require less cationic polymer dosage to achieve the best TSS removal in comparison with dry-weather sewage. The initial TSS concentration of wet-weather sewage was

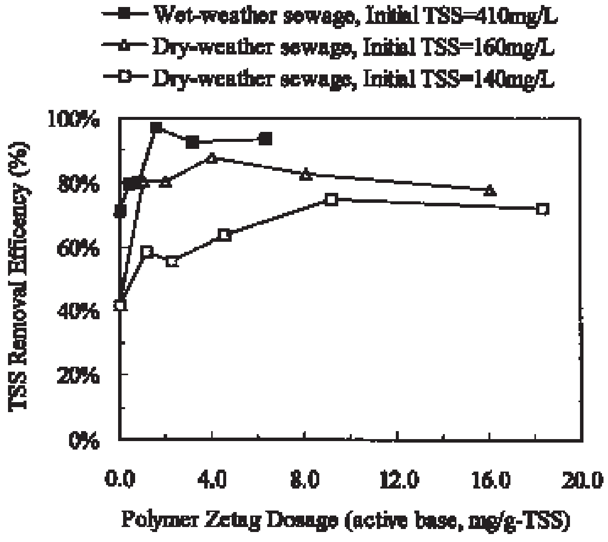

Fig. 5. Effect of different types of sewages on TSS removal (Zetag 7822).

410 mg/L, and dry-weather sewage varied between 140 and 160 mg/L (Fig. 5). Presumably, this difference in the initial TSS concentrations would also influence the results of the polymer coagulation tests. Additional research is needed to identify the impact of initial TSS concentration on the efficiency of polymer coagulation.

The pH and temperature may also affect the performance of polymer coagulation. The results of this study indicate that the pH of the sewage sample ranged from 6.7 to 7.5. The pH varying in this very narrow range is expected to have less impact on coagulation results when the primary coagulant is a polymer. A representative monthly average temperature during the seven-month period ranged between 8.1 and 22.4°C. The temperature of the CSO as well as the raw sewage was around 18°C for these test runs. Variance of temperature would have some impact on coagulation results but is expected to be less significant.

Importance of Slow Mixing on the Overall Performance of Polymer Coagulation

Young et al. (2000) recently showed that during polymer coagulation, rapid mixing followed by sedimentation alone could achieve the necessary level of suspended solids removal. This process train is cheaper because it eliminates the flocculation stage. The effect of mixing conditions on the performance of polymer coagulation has been studied by the jar test procedure. Figure 6 shows the impact of slow mixing time on the performance of polymer coagulation, evaluated by the efficiency of TSS removal. Several runs were carried out when the time of slow mixing ranged from 0 to 60 seconds. In all of these tests rapid mixing (50 seconds) was carried out at a velocity gradient of 180 s^{-1}. As shown in Fig. 6, slow

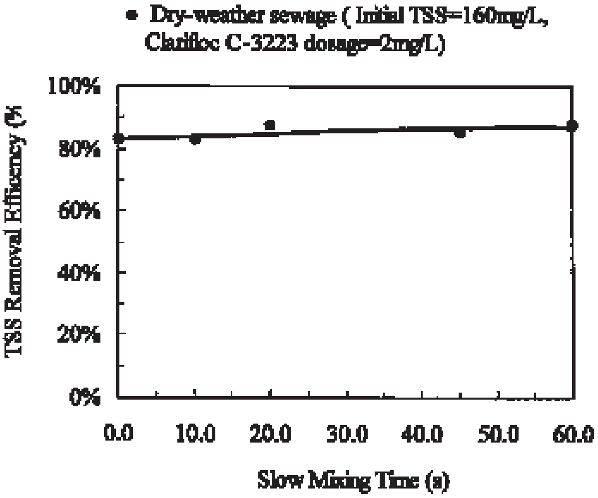

Fig. 6. Effect of slow mixing on TSS removal.

mixing (G = 20 s^{-1}) has little effect on TSS removal. The jar test results indicate that a slow mixing step (i.e., a flocculation) could be eliminated, and a single rapid-mixing step would be enough to rapidly disperse polymer throughout the sewage to ensure maximum contact between the polymer and suspended solids. In a further study, the effect of mixing conditions on the performance of polymer coagulation will be examined using a continuous-flow pilot-scale apparatus in field conditions.

Elimination of the flocculation operation is consistent with the results of the earlier high-rate treatment study, when elevated dosages of polymer are employed (Wastewater Technology Centre 1999). Young et al. (2000) also arrived at the same conclusion where polymer was used as a coagulant aid. They concluded that polymer as a coagulant aid strengthens the flocs, which would eliminate the use of a tapered mixing regime that requires a series of flocculation basins. Hence, polymer use leads to less capital cost in both the high-rate and the conventional coagulation/ flocculation operations.

Settling Characteristics of Wet-Weather Sewage during CSO Events

Figure 7 shows settling rate distributions of wet-weather sewage for 8 CSO events for which settling column tests were conducted without polymer coagulation. Initial TSS concentration for column tests without coagulation was in the range of 120 to 470 mg/L, with an average of 303 mg/L. As has been observed in other studies, initial TSS concentration and the settling rates of CSO suspensions vary widely (Stahre and Urbonas 1990). In general, short intense storm events flush readily settleable material out of the sewers. Prolonged storm events, or events occurring after a short inter-event time period, often transport poorly settleable material with lower concentration. A trend-line with the square of the correlation coefficient (R^2) of 0.7, shown in Fig. 7, has been used to represent the results of the settling column tests performed in this study. The behaviours of SS in wet-weather sewage showed poor settleability, with approximately 50% of the suspension being non-settleable at a typical primary clarifier loading rate of 2 m/h. At an equivalent surface-loading rate of 10 m/h, an average of 70% of TSS was non-settleable.

Pisano (1996) summarized the settling rate curves of the wet-weather sewage solids at 7 locations across the U.S. and Canada, and reported that non-settleable solids ranged from 30 to 90% at an equivalent surface-loading rate of 10 m/h. Obviously, the Windsor wet-weather sewage solids has an average level of settleability compared to those reported in the literature.

The average residual TSS concentrations, calculated from the average initial TSS concentration and non-settleable solids percentage, were 210 and 150 mg/L at equivalent surface-loading rates of 10 and 2 m/h, respectively. One of the requirements of MOE Guideline F-5-5 is that the seasonal average TSS in the effluent of the treatment systems should not exceed 90 mg/L. The results of this study show that a settling process

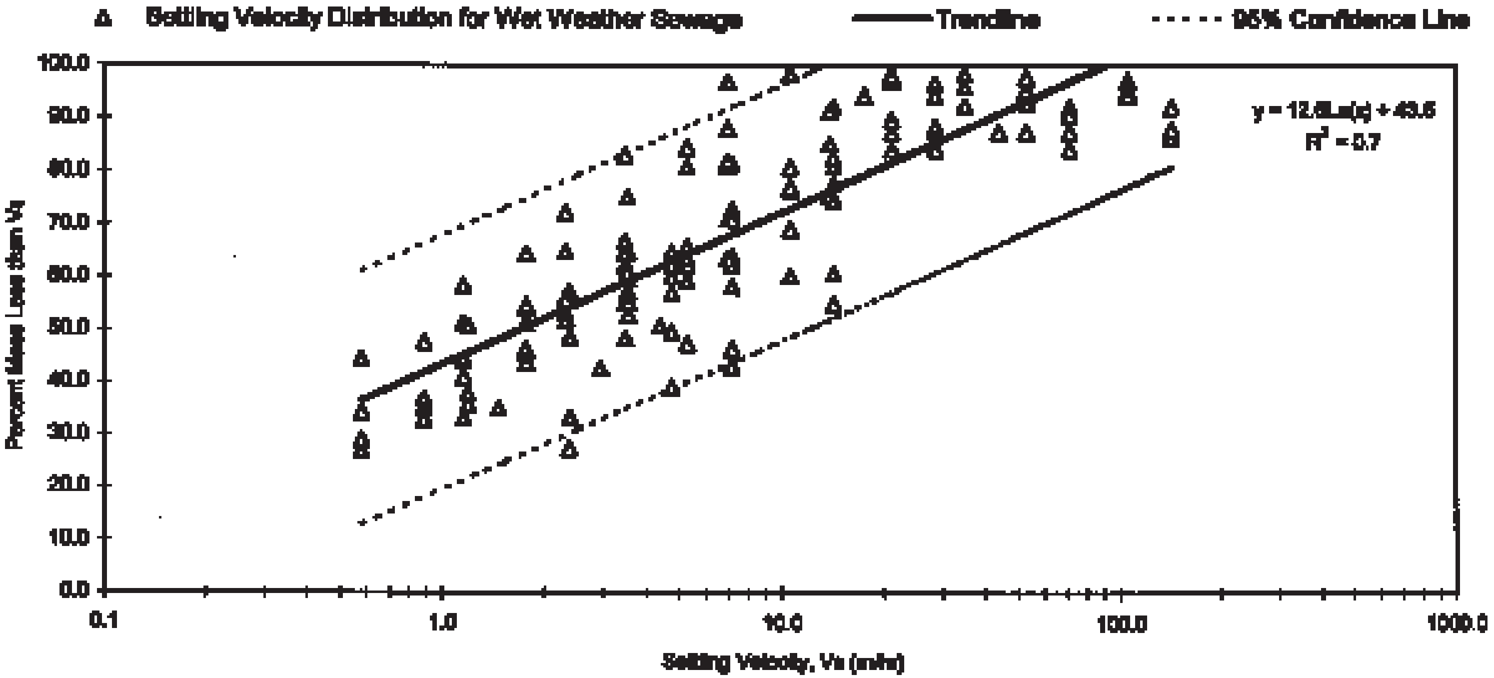

Fig. 7. Probability distribution of particle settling velocity in wet-weather sewage during CSO event.

without the use of coagulant aid would not be feasible to achieve the requirements of Procedure F-5-5.

Comparison of Settling Characteristics between Wet-Weather Sewage and CSO

Stantec Consulting Ltd. (2001) has investigated settling characteristics of CSO collected at actual overflow sites along the Windsor Riverfront. Figure 8 presents the comparison between the settling rate of wet-weather sewage at the LRWRP and the settling rate distributions obtained from the CSO sites. All data are from settling column tests without polymer coagulation. Settling rate distributions show little difference between two locations. Both trend lines for wet-weather sewage and CSO have 95% confidence lines attached (Fig. 8). At an equivalent surface-loading rate of 10 m/h, the 95% prediction interval for non-settleable solids was 48% to 96% for wet-weather sewage, and 28% to 94% for CSO, respectively. This favorable comparison of wet-weather sewage to actual CSO led to the conclusion that wet-weather sewage at LRWRP could be substituted for CSO in this treatability study, and then avoided collection from the actual CSO sites.

The settling rate distributions of the actual CSO were obtained from the column tests for 5 CSO events, and the wet-weather sewage for 8 CSO events. The initial TSS concentration geometric means and ranges for the wet-weather sewage were 310 mg/L and 120 to 470 mg/L, when as for the actual CSO these were 510 mg/L and 250 to 750 mg/L, respectively. The small difference between wet-weather sewage and the actual CSO settling rate distributions could have resulted from the difference in initial TSS concentrations. Higher initial TSS concentrations would accompany an increase in particle size and particle density and, hence, an increase in settling rate.

Improvement in Settling Characteristics with Polymer Coagulation

Figures 9 and 10 show the results of column tests for settling rate distributions with polymer coagulation (Zetag 7822 and Clarifloc C-3223P), compared to the column tests without polymer coagulation. Results of the settling column tests with polymer coagulation show higher settleability, with 20% to 50% of TSS being non-settleable as opposed to 70% of TSS being non-settleable without coagulation at an equivalent surface-loading rate of 10 m/h. The results demonstrate that polymer coagulation significantly improved the settling characteristics of wet-weather sewage.

In the column tests with the addition of 25 mg/g-TSS (4 mg/L at an initial TSS of 160 mg/L) of Clarifloc C-3223P coagulation, 50% of TSS removal was achieved at an equivalent surface load of about 15 m/h. With 10 mg/g-TSS (4 mg/L at an initial TSS of 410 mg/L) of Zetag 7822, 50% of TSS removal was achieved in essentially all samples. The residual

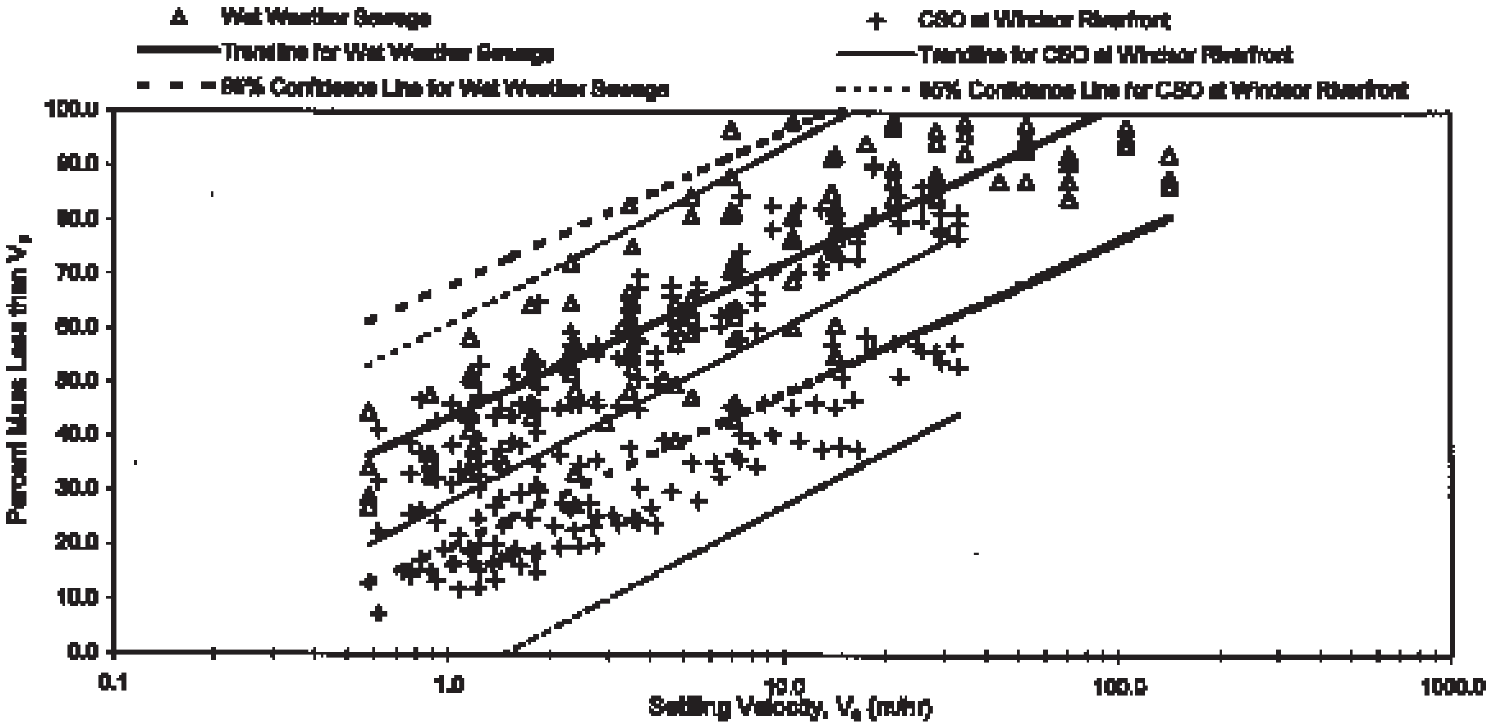

Fig. 8. Comparison between wet-weather sewage during CSO event and CSO at the actual CSO site along Windsor Riverfront.

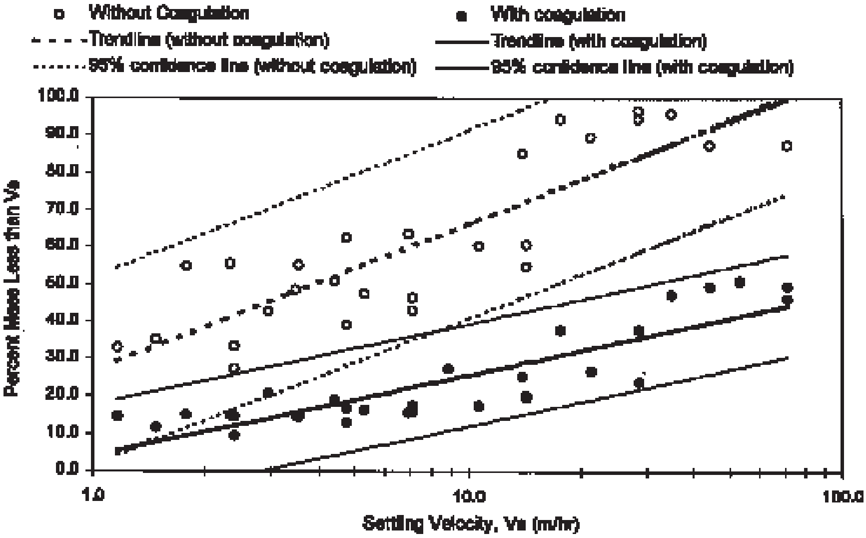

Fig. 9. Effect of polymer coagulation with Zetag 7822 on settling characteristics.

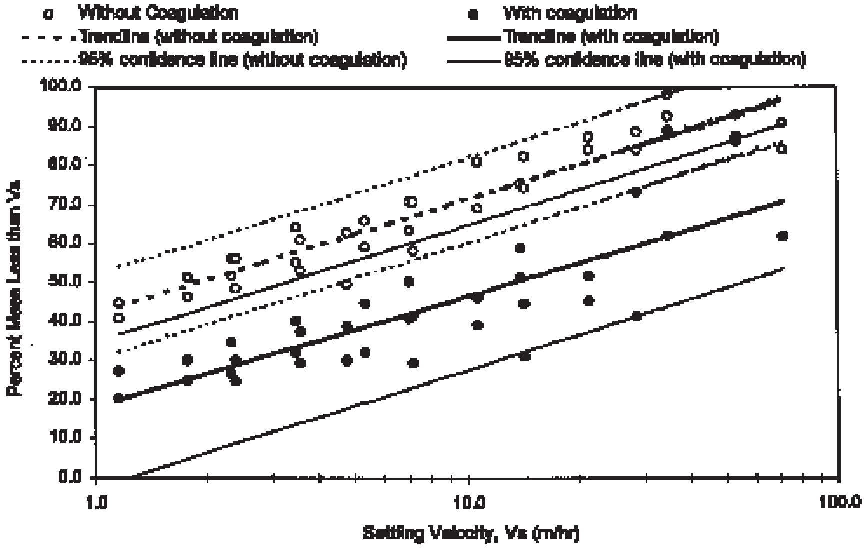

Fig. 10. Effect of polymer coagulation with Clarifloc C-3223 on settling characteristics

TSS in all samples of the column tests was less than 90 mg/L. This result shows that a high-rate settling process with polymer coagulation would be feasible to achieve the requirements of Procedure F-5-5 in TSS removal, which is very significant.

Overall Relevance and Extension of Present Study

As discussed in the introductory section of this paper, the initial hypothesis was that the use of retention treatment basins (RTBs) would be suitable for the control of CSOs in the City of Windsor. Earlier studies (e.g., Wastewater Technology Centre 1999) had indicated that a high-rate polymer coagulation process may be feasible at surface loading rates approaching 50 m/h using a cationic polymer dosage of approximately 8 mg/L. In the City of Windsor study, consideration was initially given to treatability test methods that might reproduce the effects previously seen at pilot scale with combinations of high dosage, short contact time and high mixing energy. No such procedures were identified and a protracted methodology development program was beyond the scope of the Windsor CSO study. Jar test methods were reported in earlier studies (e.g., Wastewater Technology Centre 1999) to be inappropriate for simulation of the high-rate treatment scenario. Jar tests were, however, considered by authors to be appropriate for more conventional process designs as applied to the RTB scenario at low to intermediate loading rates.

The results of this study have indicated that a polymer dosage of approximately 2 mg/L (5 mg/g-TSS at an initial TSS of 400 mg/L) will be sufficient to achieve the best TSS removal efficiency, given the one-stage mechanical mixing system simulated in the jar tests and column settling tests. In the quiescent long-column settling tests, the settling velocity was up to 70 m/h (Fig. 9). With the Zetag 7822 polymer, at a surface loading rate of 30 m/h, the 95% prediction interval for TSS removal efficiency is 50% to 78% (Fig. 9). However, the 95% prediction interval for the similar polymer (Clarifloc C-3223P) is 21% to 59% at 30 m/h (Fig. 10). The average initial TSS concentrations in the column tests with Clarifloc C-3223P coagulation and Zetag 7822 coagulation were 160 and 410 mg/L, respectively. The difference between Zetag 7822 and Clarifloc C-3223P in TSS removal efficiency would result from the difference in the initial TSS concentrations. In a next stage of this study removal efficiency will be examined in a continuous-flow pilot-scale apparatus.

The 0.1% polymer solution applied to the wastewater in the jar tests and long column tests may be difficult to achieve at full scale. CSO treatment facilities are intermittently operated and require both the ability to start up very quickly in response to an overflow event, and the ability to endure long periods of inactivity. A high concentration polymer solution with a long shelf-life must be stored on site, and polymer dilution must be provided on demand and almost instantly. Subsequent stages of the study will examine appropriate polymer handling equipment.

Conclusions

This study has addressed various aspects of the characterization and treatability of Windsor combined sewage at the City of Windsor. The effects of the polymer types and dosages on the TSS removal efficiency were investigated in jar tests. The different types of cationic polymers tested had little effect on TSS removal. A polymer dosage of approximately 5 mg/g-TSS would give the best TSS removal for wet-weather sewage during CSO events. Wet-weather sewage would require less cationic polymer dosage (on a mass/mass basis) to achieve the best TSS removal in comparison with dry-weather sewage. The results of jar tests indicated that slow mixing could be eliminated, and a single rapid-mixing step would be adequate in the polymer coagulation process.

The results of the long settling column tests show that the characteristics of the wet-weather sewage at the LRWRP during CSO events were similar to those of samples collected at actual overflow sites along the Windsor Riverfront. At an equivalent surface-loading rate of 10 m/h, the 95% prediction interval for non-settleable solids was 48% to 96% for wet-weather sewage, and 28% to 94% for CSO. The wet-weather sewage contained an appreciable fraction of poorly settleable material. Attainment of the Procedure F-5-5 goal for a residual TSS concentration of 90 mg/L was shown to be impossible to achieve without chemical coagulation.

Settling rate distributions with polymer coagulation were compared with chemically unaided conditions. Settling rate distributions demonstrated that polymer coagulation significantly improved the settling characteristics of wet-weather sewage during CSO events.

The results from this study provided essential information on the selection of polymer type, the relationship of the polymer dosage to the TSS removal efficiency, and settling rate distribution curves to be used in the evaluation of CSO treatment system. The next stage of the study will be directed toward the determination of process design parameters based on a pilot-plant operated under continuous-flow conditions.

Acknowledgements

The Windsor Combined Sewer Overflow Treatability Study—Chemical Coagulation was funded by the City of Windsor and by the Government of Canada through the Great Lakes Sustainability Fund. We gratefully acknowledge the advice and help received from Thomas Touralias and Harold Horneck of Stantec Consulting Ltd., Paul Drca, Kit Woods, T. Murray and D. Dukelow of the City of Windsor; S. Kok, P. Seto and J. Marsalek of Environment Canada; K. Ferguson of the Ontario Ministry of the Environment; and J. Drummond of the Detroit River Canadian Clean-Up Committee. Finally we wish to thank the staff at the Lou Romano Water Reclamation Plant for setting up the laboratory for field studies and analyzing TSS in samples.

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Water Technology International (WTI). 1999. Combined sewer overflow treatment at the North Toronto Storage Tank Facility, interim report-1998. A report submitted to the City of Toronto, the Ontario Ministry of the Environment, the Great Lakes 2000 Cleanup Fund and Environment Canada, Burlington, Ontario, Canada.

Young S, Stanley SJ, Smith DW. 2000. Effect on mixing on the kinetics of polymer-aided flocculation. J. Water Supply **49:**1–8

APPENDIX C

- **Project Initiation**
- **Open House # 1**
- **Open House # 2**
- **Draft Environmental Study Report**
- **Notice of Completion**

APPENDIX C-1

Project Initiation

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

December 4, 2017
File: 165620132

Attention: Attention

Dear Recipient's Name,

Reference: **Notice of Study Commencement**
Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

The City of Windsor has initiated a Municipal Class Environmental Assessment (Class EA) to investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP). The Class EA will also include revisiting wet weather flow conditions at the LRWRP to determine if any CSO control alternatives may also help to alleviate wet weather flows at the plant. A copy of the Notice of Study Commencement for the project is attached.

This study is being carried out in accordance with the planning and design process for Schedule 'C' projects outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011), which is approved under the Ontario Environmental Assessment Act. The Class EA planning process includes public and agency consultation, an assessment of the potential effects of the proposed improvements, and the identification of measures required to mitigate any adverse effects. Upon completion of the study, an Environmental Study Report (ESR) will be prepared and made available for a 30-day public review period.

On behalf of the City of Windsor, we are inviting you to participate in this project and to assist us in identifying the environmental, social and cultural values your community may have within the Project Area. A reply by January 18, 2018 would be appreciated so that we may consider your comments early in the design stage. A comment form is enclosed to facilitate your input.

If you have any comments or concerns regarding this project and wish to provide input into the Study, please contact either the undersigned or one of the individuals named in the enclosed material.

Regards,

STANTEC CONSULTING LTD.

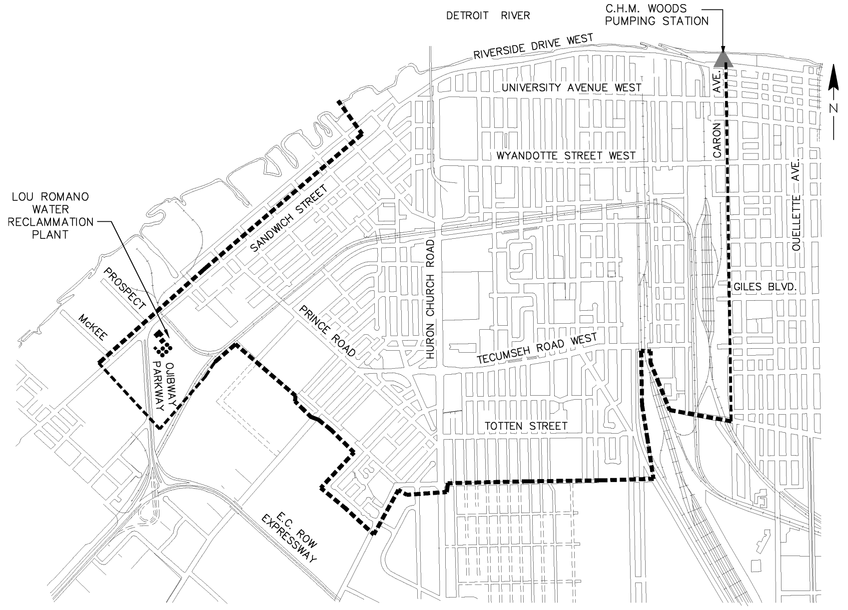
Jian Li, Ph.D., P. Eng., PE
Project Manager
Phone: (519) 966-2250
Fax: (519) 966-5523
jiian.li@stantec.com

Attachment: Notice of Study Commencement, Response Form

c. Mr. Ed Valdez, Manager of Process Engineering & Maintenance, City of Windsor

NOTICE OF STUDY COMMENCEMENT
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

The City of Windsor has initiated a Municipal Class Environmental Assessment (Class EA) to investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station (CMHWPS) at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP).The Class EA will also include revisiting wet weather flow conditions at the LRWRP to determine if any CSO control alternatives may also help to alleviate wet weather flows at the plant.



This Class EA is the final piece in an overall pollution control strategy that was set out in the Windsor Riverfront Pollution Control Planning Study (PCP Study). The PCP Study, which was completed by the City in 1992, established a pollution control plan for the Riverfront area consisting of four main recommendations to reduce CSOs and other pollutant loadings to the Detroit River. Three of the recommendations in the PCP Study, namely increased pumping capacity at the CMHWPS, upgrading and expansion of the LRWRP, and facilities to control CSOs in the Riverfront area east of Caron Avenue have been put in place.

This Class EA will assess alternative means of providing CSO control in the study area to meet the requirements set out in Ministry of Environment and Climate Change Guidelines “Procedure F-5-5”. A variety of potential CSO control options will be assessed to select the preferred option. The preferred option will then be further refined with an evaluation of alternative design concepts leading to selection of a recommended design.

The study is being undertaken in accordance with the planning and design process for ‘Schedule C’ projects outlined in the Municipal Class Environmental Assessment (June 2000, as amended in 2007, 2011 and 2015) under the Ontario *Environmental Assessment Act*.

A key component of the study will be consultation with interested stakeholders. Public Information Centres (PIC) will be held during the course of this project. The PICs will be held to review existing study area conditions, present and discuss study findings, and provide an assessment of alternative solutions and design concepts. Notice of planned PICs will be advertised. Anyone wishing to be directly advised of planned PICs should contact one of the project team members listed below.

If you wish to comment on this project, have your name added to the project mailing list, or have any questions about this project, please contact one of the individuals identified below:

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Under the *Municipal Freedom of Information and Protection of Privacy Act* and the *Ontario Environmental Assessment Act*, unless otherwise stated in the submission, with the exception of personal information, all comments will become part of the public record and will be released, if requested, to any person.

Stantec

Class Environmental Assessment
Combined Sewer Overflow Control in the
Riverfront Area West of Caron Avenue
The Corporation of the City of Windsor

RESPONSE FORM – PLEASE RETURN BY JANUARY 18, 2018

Date: ______________

☐ Please remove my group/agency from the study mailing list.

☐ I would like to provide the following comments.

Please consider the following environmental (i.e., natural, social, economic or cultural) information and permit/approval requirements:

Additional comment space is provided on the back of this form.

Please return the completed form to:
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Windsor Star Dec. 9, 2017

THE CITY OF WINDSOR ONTARIO, CANADA

NOTICE OF STUDY COMMENCEMENT
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

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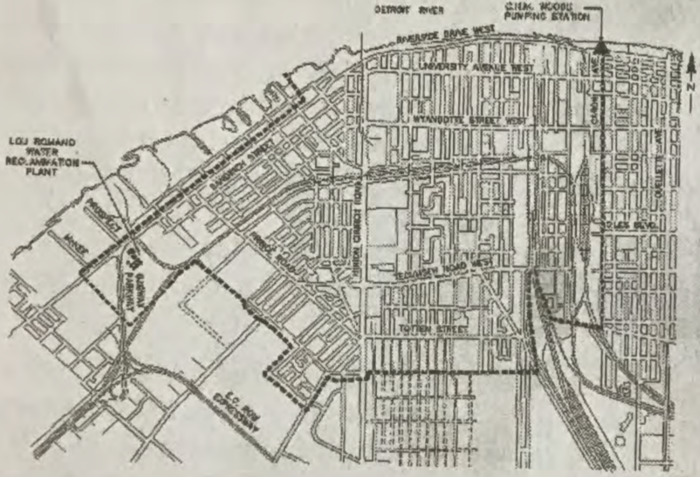

This Class EA is the final piece in an overall pollution control strategy that was set out in the Windsor Riverfront Pollution Control Planning Study (PCP Study). The PCP Study, which was completed by the City in 1992, established a pollution control plan for the Riverfront area consisting of four main recommendations to reduce CSOs and other pollutant loadings to the Detroit River. Three of the recommendations in the PCP Study, namely increased pumping capacity at the CMHWPS, upgrading and expansion of the LRWRP, and facilities to control CSOs in the Riverfront area east of Caron Avenue have been put in place.

This Class EA will assess alternative means of providing CSO control in the study area to meet the requirements set out in Ministry of Environment and Climate Change Guidelines "Procedure F-5-5". A variety of potential CSO control options will be assessed to select the preferred option. The preferred option will then be further refined with an evaluation of alternative design concepts leading to selection of a recommended design.

The study is being undertaken in accordance with the planning and design process for 'Schedule C' projects outlined in the Municipal Class Environmental Assessment (June 2000, as amended in 2007, 2011 and 2015) under the Ontario *Environmental Assessment Act.*

A key component of the study will be consultation with interested stakeholders. Public Information Centres (PIC) will be held during the course of this project. The PICs will be held to review existing study area conditions, present and discuss study findings, and provide an assessment of alternative solutions and design concepts. Notice of planned PICs will be advertised. Anyone wishing to be directly advised of planned PICs should contact one of the project team members listed below.

If you wish to comment on this project, have your name added to the project mailing list, or have any questions about this project, please contact one of the individuals identified below:

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Under the *Municipal Freedom of Information and Protection of Privacy Act* and the *Ontario Environmental Assessment Act,* unless otherwise stated in the submission, with the exception of personal information, all comments will become part of the public record and will be released, if requested, to any person.

From: Eckert, Anneleis (MOECC)
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Cc: Smith, Mark (MOECC); Bechard, Marc (MOECC); Salustro, Cara (MOECC); Abernethy, Scott (MOECC); Newton, Craig (MOECC); Lafrance, Crystal (MOECC)
Subject: Reissuance of MOECC acknowledgment of Combined Sewage Overflow Control Notice of Commencement
Date: Thursday, February 01, 2018 11:58:29 AM
Attachments: MOECC-Reissuance-Response-Notice-of-Comm-SewageControl-2018-02-01.pdf

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Good Morning Ed Valdez,

It has come to our attention that two MOECC responses to the Notice of Commencement for the Combined Sewage Overflow Control were sent to the City. One was sent on December 14th 2017, the other on January 30th 2018.

The Notice of Commencement had been submitted to more than one regional staff person including staff in our drinking water and surface water units both of whom had special interest in this particular file. While, typically, that level of detail on those program area interests are not explored or provided at the Notice of Commencement stage, given that we had it available, we shared it for the City's information in our December 14th response. The Notice of Commencement was then re-received from an internal source and, due to staff change over, we didn't realise a response had already been sent until after the second response was sent on Jan 30th. We apologise for this oversight and any confusion this may have caused. MOECC encourages the City to utilise the information in both letters and, to that end, we have combined the letters for ease of use.

Again, we apologise for the duplication of correspondence and any confusion. Please do not hesitate to contact me if you have any questions or concerns.

Thank you,

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Ministère de l’Environnement et de l’Action en matière de changement climatique

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Ontario

February 1, 2018

Corporation of the City of Windsor
City Engineers Department - Process Engineering & Maintenance
350 City Hall Square West
Windsor, Ontario
N9A 6S1

Attention: Ed Valdez, Manager of Process Engineering & Maintenance

Re: Reissuance of MOECC Response to Notice of Commencement Class EA – Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor

Dear Ed Valdez:

This letter is a reissuance of the ministry’s combined correspondence of December 14, 2017 and January 30, 2018. It acknowledges this ministry’s receipt of the Notice of Commencement for the above noted project, and Stantec Consulting Ltd.’s (City of Windsor’s consultant for this project) accompanying December 4th, 2017 request for this ministry’s comments / concerns regarding this project.

It is this ministry’s understanding that the City of Windsor has initiated a Schedule C Municipal Class EA to investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP). The Class EA will also reportedly include revisiting wet weather flow conditions at the LRWRP to determine in any CSO control alternatives may also help to alleviate wet weather flows at the plant.

This Class EA is reportedly the final piece in an overall pollution control strategy that was set out in the Windsor Riverfront Pollution Control Planning Study (PCP Study). The PCP study was reportedly completed in 1992.

The City of Windsor’s Implementation of Existing Riverfront CSO and Collection and Treatment Facility (RTB):

The Notice of Commencement for this project states that this Class EA is purportedly the last step of the Windsor PCP Study. As such, please provide this ministry with an update on the progress that has been made to date with implementation of the City’s Riverfront Pollution Control Plan Study.

Has the pollution control strategy, to this stage, had the modelled impact that it was designed to have? Please include in your response to this ministry’s foregoing query, an overall assessment to ensure the targeted level of control is / will be met.

Related General Comments

This year the City of Windsor reported having issues with their existing Riverfront CSO Collection and Treatment Facility (RTB) which was designed for the treatment and disposal of CSOs from the riverfront area east of Caron Avenue. Due to the rise in river levels the city has become aware of a design flaw that allows river water to enter the RTB through an old CSO outfall. Please ensure this issue and the city's plan to address this issue is included in the overall assessment.

Surface Water Quality Monitoring

The Class EA should include a surface water quality monitoring component to identify where the greatest water quality impact and pollutant loading are occurring. This monitoring information would be one of the factors used to identify the high priority combined sewer overflows to further assess for control alternatives.

Aboriginal Consultation

As you know, the Class Environmental Assessment (Class EA) planning process includes consultation with interested stakeholders, evaluation of alternatives, assessment of the effects of the proposed works and identification of measures to mitigate any adverse impacts. In addition to consultation with public agencies and the general public, consultation with Aboriginal communities is required.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

Your proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to your proposed project**, the MOECC is delegating the procedural aspects of rights-based consultation to you through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information you have provided to date and the Crown`s preliminary assessment you are required to consult with the following communities who have been identified as potentially affected by your proposed project:

Nation	Contact Information
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Bkejwanong Territory (Walpole Island First Nation)	Bkejwanong Territory 117 Tahgahoning Road R.R.#3 Wallaceburg, ON N8K 4K9 519-627-1481 Chief Dan Miskokomon drskoke@wifn.org Other Contacts: Dean Jacobs, Consultation Manager Walpole Island Heritage Centre 2185 River Road R.R.#3 Wallaceburg, ON N8K 4K9 519-627-1475 dean.jacobs@wifn.org and Janet Macbeth, Project Review Coordinator janet.macbeth@wifn.org
Chippewas of Kettle and Stony Point First Nation	Chippewas of Kettle and Stony Point First Nation 6247 Indian Lane, R.R.#2 Forest, ON N0N 1J1 519-786-2125 Chief Tom Bressette thomas.bressette@kettlepoint.org Other Contact: Valerie George Consultation Coordinator valerie.george@kettlepoint.org
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Caldwell First Nation	Caldwell First Nation P.O. Box 388 Leamington, ON N8H 3W3 519-322-1766 or 1-800-206-7522 Director of Operations, Allen Deleary allen.deleary@caldwellfirstnation.ca
Oneida Nation of the Thames ONYOTA'A:KA	Oneida Nation of the Thames 2212 Elm Ave. Southwold, ON N0L 2G0 519-652-3244 Chief Randall Phillips randall.phillips@oneida.on.ca Political Chief Assistant: Catherine Cornelius catherine.cornelius@oneida.on.ca

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You must contact the Director of Environmental Approvals Branch under the following circumstances subsequent to initial discussions with the communities identified by MOECC:

- aboriginal or treaty rights impacts are identified to you by the communities;
- you have reason to believe that your proposed project may adversely affect an aboriginal or treaty right;
- consultation has reached an impasse;
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The Director of the Environmental Approvals Branch can be notified either by email with the subject line "Potential Duty to Consult" to EAASIBgen@ontario.ca or by mail or fax at the address provided below:

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Fax:	416-314-8452
Address:	Environmental Approvals Branch 135 St. Clair Avenue West, 1st Floor Toronto, ON, M4V 1P5

The MOECC will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play in them.

Source Water Protection

As per the recent amendments to the Municipal Engineers Association (MEA) Class Environmental Assessment parent document approved October 2015, proponents undertaking a Municipal Class EA project must identify early in the process whether a project is occurring within a source water protection vulnerable area. This must be clearly documented in a Project File report or ESR. If the project is occurring in a vulnerable area, then there may be policies in the local Source Protection Plan (SPP) that need to be addressed (requirements under the Clean Water Act). The proponent should contact and consult with the appropriate Conservation Authority/Source Protection Authority (CA/SPA) to discuss potential considerations and policies in the SPP that apply to the project.

Please include a section in the report on Source Water Protection. Specifically, it should discuss whether or not the project is located in a vulnerable area or changes or creates new vulnerable areas, and provide applicable details about the area. If located in a vulnerable area, proponents should document whether any project activities are a prescribed drinking water threat and thus pose a risk to drinking water (this should be consulted on with the appropriate CA/SPA). Where an activity poses a risk to drinking water, the proponent must document and discuss in the Project File Report/ESR how the project adheres to or has regard to applicable policies in the local SPP. If creating or changing a vulnerable area, proponents should document whether any existing uses or activities may potentially be affected by the implementation of source protection policies. This section should then be used to inform and should be reflected in other sections of the report, such as the identification of net positive/ negative effects of alternatives, mitigation measures, evaluation of alternatives etc. As a note, even if the project activities in a vulnerable area are deemed not to be a drinking water risk, there may be other policies that apply and so consultation with the local CA/SPA is important.

Climate Change

The Municipality is strongly encouraged to include climate change in this EA. Climate change should be considered in the context of mitigation and the context of adaptation. The Ministry has recently released a guidance document to support proponents in including climate change in environmental assessments. The guide can be found online: https://www.ontario.ca/page/considering-climate-change-environmental-assessment-process . It should be noted that Climatic Features is identified in Appendix 2 of the Municipal Class EA page 2-7 (2015).

Conclusion

Thank you for the opportunity to comment on this project. Please keep myself, and staff of this Ministry's Windsor Area Office, fully informed of the status of this project as it proceeds through the Class EA process.

Please send all future correspondence with respect to this project to my attention, as I am this ministry's one window contact for this project: Anneleis Eckert, Regional Environmental Planner / Regional EA Coordinator at the address below; email address: anneleis.eckert@ontario.ca; telephone number: 519-873-5115.

A draft copy of the Environmental Study Report should be forwarded to my attention prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments. Please also forward the Notice of Completion and final ESR to me when completed. Thank you in advance.

Yours truly,

Anneleis Eckert

Anneleis Eckert
Regional Environmental Planner / Regional EA Coordinator
Ministry of Environment and Climate Change
733 Exeter Road
London ON, N6E 1L3
519 873-5115

Copy:
Jian Li, Project Manager, Stantec Consulting Ltd., Windsor
Cara Salustro, Provincial Officer, Safe Drinking Water Branch, MOECC Windsor
Marc Bechard, Supervisor, Safe Drinking Water Branch, MOECC Sarnia
Mark Smith, Supervisor, MOECC Windsor Area Office
Scott Abernethy, Surface Water Group Leader, MOECC SWR, London

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January 30, 2018

City of Windsor
4155 Ojibway Parkway
Windsor, Ontario
N9C 4A5

Attention: Ed Valdez, Manager of Process Engineering & Maintenance

Re: Class EA for the Combined Sewer Overflow Control

Dear Ed Valdez:

This letter acknowledges this ministry's receipt of the Notice of Commencement for the above noted project.

It is this ministry's understanding that the City of Windsor is initiating a Class EA process to investigate preferred means to control combined sewage overflows on lands extending from the C.M.H. Woods Pumping Station to the Lou Romano Water Reclamation Plant.

As you know, the Class Environmental Assessment (Class EA) planning process includes consultation with interested stakeholders, evaluation of alternatives, assessment of the effects of the proposed works and identification of measures to mitigate any adverse impacts. In addition to consultation with public agencies and the general public, consultation with Aboriginal communities is required.

Aboriginal Consultation

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Yours truly,

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Regional Environmental Planner / Regional EA Coordinator
Ministry of Environment and Climate Change
733 Exeter Road
London ON, N6E 1L3
519 873-5115

Copy:
Jian Li, Project Manager, Stantec
Mark Smith, Supervisor, MOECC Windsor Area Office
Marc Bechard, Supervisor, MOECC Safe Drinking Water Branch, MOECC Sarnia

Ministry of the Environment and Climate Change

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Ontario

December 14th, 2017

Corporation of the City of Windsor
City Engineers Department - Process Engineering & Maintenance
350 City Hall Square West
Windsor, Ontario
N9A 6S1

Attention: Mr. Edward Valdez, Manager of Process Engineering & Maintenance

Re: MOECC Response to Notice of Commencement Class EA – Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor

Dear Mr. Valdez:

This letter acknowledges this ministry's receipt of the Notice of Commencement for the above noted project, and Stantec Consulting Ltd.'s (City of Windsor's consultant for this project) accompanying December 4th, 2017 request for this ministry's comments / concerns regarding this project.

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Yours truly,

Craig Newton
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Ms. Cara Salustro, Provincial Officer, Safe Drinking Water Branch, MOECC Windsor
Mr. Marc Bechard, Supervisor, Safe Drinking Water Branch, MOECC Sarnia
Mr. Mark Smith, Supervisor, MOECC Windsor Area Office
Mr. Scott Abernethy, Surface Water Group Leader, MOECC SWR, London

From: MNRF Ayl Planners (MNRF)
To: Li, Jian
Subject: MNRF Comments - Notice of Commencement - Combined Sewer Overflow Control
Date: Tuesday, December 12, 2017 9:23:49 AM
Attachments: 2017-04_SAR Screening Process_Technical Bulletin.pdf
2017-05_SAR Reference Material Memo_AylmerDistrict.pdf
Windsor SAR Reference Guide.pdf

Ministry of Natural Resources and Forestry

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Aylmer, ON N5H 2S8
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Fax: 519-773-9014

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Tél: 519-773-9241
Téléc: 519-773-9014

December 12, 2017

Dr. Jian Li, Consultant Project Manager
Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON N8X 1L9

Subject: Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue – Notice of Study Commencement – Class EA

Dear Dr. Jian Li,

Ministry of Natural Resources and Forestry (MNRF) Aylmer District received the Notice of Study Commencement for the combined sewer overflow control in the Riverfront area west of Caron Avenue on December 8, 2017. Thank for you for circulating this notice to our office, however, **please note that we have not completed a screening of natural heritage (including species at risk) or other resource values for the project at this time**. Please also note that it is your responsibility to be aware of and comply with all relevant federal or provincial legislation, municipal by-laws or other agency approvals.

This response provides information to guide you in identifying and assessing natural features and resources as required by applicable policies and legislation, and engaging with MNRF Aylmer District for advice as needed.

Natural Heritage & Endangered Species Act

- Please refer to the attached *Species at Risk Reference Guide* for a list of threatened and endangered species that may occur in your area to further inform an initial background information review for your project. Also attached is Aylmer District's *Species at Risk Reference Material Memo* intended to introduce and explain the reference guide that is attached

- Please refer to Aylmer District's *Species at Risk Screening Process Technical Bulletin* (attached) for information about the process for seeking *Endangered Species Act 2007* advice, including the information required and where to submit a request.

Petroleum Wells & Oil, Gas and Salt Resource Act

There may be petroleum wells within the proposed project area. Please consult the Ontario Oil, Gas and Salt Resources Library website (www.ogsrlibrary.com) for the best known data on any wells recorded by MNRF. Please reference the 'Definitions and Terminology Guide' listed in the publications on the Library website in order to better understand the well information available. Any oil and gas wells in your project area are regulated by the *Oil, Gas and Salt Resource Act*, and the supporting regulations and operating standards. If any unanticipated wells are encountered during development of the project, or if the proponent has questions regarding petroleum operations, the proponent should contact the Petroleum Operations Section at 519-873-4634.

Public Lands Act & Lakes and Rivers Improvement Act

Some Municipal projects may be subject to the provisions of the *Public Lands Act* or *Lakes and Rivers Improvement Act*. Please review the information on MNRF's web pages provided below regarding when an approval is required or not. Please note that many of the authorizations issued under the *Lakes and Rivers Improvement Act* are administered by the local Conservation Authority.

- For more information about the *Public Lands Act*: https://www.ontario.ca/page/crown-land-work-permits
- For more information about the *Lakes and Rivers Improvement Act*: https://www.ontario.ca/document/lakes-and-rivers-improvement-act-administrative-guide

After reviewing the information provided, if you have not identified any of MNRF's interests stated above, there is no need to circulate any subsequent notices to our office. If you have any questions or concerns, please feel free to contact me.

Sincerely,

Laura Warner
Planning Intern
Ministry of Natural Resources and Forestry, Aylmer District
615 John St. N. Aylmer, ON, N5H 2S8
Phone: (519) 773-4741
E-mail: MNRF.Ayl.Planners@ontario.ca

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Technical Bulletin: Aylmer District Species at Risk Screening Process

This technical bulletin outlines the process for engaging the Ministry of Natural Resources and Forestry (**MNRF**) Aylmer District Office regarding the *Endangered Species Act, 2007* (**ESA**).

The ESA provides protection for species listed as Endangered or Threatened on the Species at Risk in Ontario List. Individuals receive protection under Section 9 and their habitat is protected under Section 10. The ESA is a law of general application that is binding on everyone in the province of Ontario, and applies to both private and public lands. MNRF Aylmer District provides review of a project's compliance under the ESA by responding to species at risk (**SAR**) information requests (Stage 1) and project screening requests (Stage 2) only when both of the following conditions are met:

1. The request comes directly from the property owner or their delegate (e.g. consultants) on their behalf; and,
2. A specific project/activity is proposed.

MNRF Aylmer District Contact Information

All ESA-related requests must be submitted to MNRF Aylmer District via our ESA inbox at ESA.Aylmer@ontario.ca

> ***NOTE:*** *MNRF response time is between 8 and 10 weeks after receipt of all required information, due to the high volume of requests received.*

Stage 1: Information Request

To ensure due diligence under the ESA, MNRF encourages property owners and/or their delegates proposing to conduct site alteration (such as construction, vegetation/debris removal, site grading, etc.) to request SAR information from Aylmer District prior to beginning site alteration and/or conducting SAR surveys. For MNRF to respond to an information request, the following information is required:

- Proponent information (name, mailing address, and email address);
- Property location and mapping (municipal address and/or lot and concession);
- Digital photos of the property, including the vegetation on-site, if available;
- General description of all proposed activities and extent of development footprint (e.g. residential, driveway, vegetation clearing). Maps / site layout drawings are beneficial;
- Current state of vegetation, property maintenance/management (e.g. frequency of mowing), and recent property landscape history/changes (within the last five years);
- Timing and duration of proposed activities;
- Copies of past correspondence with MNRF about the property, if applicable; and,
- Status of municipal planning or Environmental Assessment process, if any.

Once the above information has been provided, MNRF will review available SAR data to determine if SAR species and/or their habitat(s) are known or likely to occur on or in the general area of the property. MNRF's response will be one of the following:

1. There is a **low** likelihood for SAR species and/or habitat to occur and/or be impacted
    - Further project screening will not be needed unless recommendations to avoid impacts cannot be followed or significant changes to the project are made (e.g. natural vegetation proposed to be removed).

2. SAR species and/or habitat are **known** to occur on or near the property, or there is a **high** likelihood for SAR species and/or habitat to occur
    - MNRF may recommend that field assessments by a qualified biologist are needed to determine whether the proposed project may contravene the ESA.
        - It is expected that the retained qualified biologist will use the information provided by MNRF to scope and design the field assessments, including identifying appropriate species-specific survey methodologies and timing.
        - MNRF can provide guidance on field assessments (i.e. protocols or proposed work plans). Some field assessment methodologies may require MNRF authorizations under the ESA and the *Fish and Wildlife Conservation Act*.
    - After field assessments have been completed, proceed to Stage 2.

***NOTE:** MNRF strongly recommends that no on-site activity (i.e. site alteration, vegetation/debris removal, etc.) occur until Stage 2 is complete, in order for proponents to demonstrate due diligence and remain in compliance with the ESA. Failure to comply with this recommendation could result in a contravention of the ESA and possible compliance / enforcement action.*

Stage 2: Project Screening / IGF Review

Following MNRF's recommendations, a qualified biologist should complete appropriate field assessments and submit the results in an Information Gathering Form (**IGF**) to initiate a project screening request.

Link to IGF:
http://www.forms.ssb.gov.on.ca/mbs/ssb/forms/ssbforms.nsf/MinistryResults?Openform&SRT=T&MAX=5&ENV=WWE&STR=1&TAB=PROFILE&MIN=018&BRN=21&PRG=31

MNRF will review the IGF to determine whether the project is likely to contravene the ESA (Section 9 and/or Section 10). MNRF's response will be one of the following:

1. Contravention under the ESA is **not likely** to occur:
    - A response will be provided, which could include recommendations necessary to avoid impacts to SAR; or,

2. Contravention under the ESA is **likely** to occur:
    - MNRF will recommend options for seeking approval under the ESA, such as applying for a permit or assessing eligibility for alternative regulatory processes. Please be advised that applying for a permit does not guarantee approval and processes can take several months before a permit may be issued.

Ministry of Natural Resources and Forestry

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May 2017

Re: Aylmer District Species at Risk Reference Material for Species and Habitat Information

The Ministry of Natural Resources and Forestry (**MNRF**) has created reference material for species at risk (**SAR**) specific to each municipality in Aylmer District. This document is intended to introduce and explain the reference material that is attached.

Intended use of the reference material

- The reference material is targeted towards landowners, municipalities, consultants, and developers in Aylmer District.
- The material is meant to provide awareness of endangered and threatened SAR that have potential to occur in a specific municipality, along with brief descriptions of typical habitat and general survey recommendations for each SAR species.
- It is MNRF's expectation that consultants and their proponents will refer to the reference material prior to completing SAR field assessments, since it outlines MNRF-approved survey protocols that should be followed in order to work towards MNRF Aylmer District's expectations for ensuring due diligence under the *Endangered Species Act, 2007* (**ESA**).
- The material is not meant to replace species and/or habitat surveys conducted by a qualified biologist, but help scope the field assessments.
- If you are intending to conduct a project that has known occurrences of SAR or a high likelihood of SAR in the area, MNRF (ESA.Aylmer@ontario.ca) should be contacted early in the process; see our attached SAR Screening Process Technical Bulletin outlining how to submit a screening request.
- During the SAR screening process, MNRF can provide site-specific information regarding:
    - likelihood of SAR species and/or habitat occurring;
    - whether a qualified professional should be retained for field assessments;
    - SAR survey methodologies to demonstrate due diligence under the ESA; and,
    - options to avoid contravening the ESA or ways to acquire approval, if required.

General information and disclaimers

- The Species at Risk in Ontario (**SARO**) List is prescribed by Ontario Regulation 230/08 issued under the ESA. The ESA provides protection for endangered and threatened species listed on the SARO List, and their habitats. The ESA is a law of General Application that is binding on everyone (e.g. landowners, corporations, municipal and provincial governments) in the province of Ontario and applies to both private and public lands.
- Please note that the province has not been comprehensively surveyed and MNRF data relies on observers to report sightings. As such, the absence of a species from the municipal list does not guarantee the absence of SAR species or habitat in the specific municipality.

- It is important to note that the reference material may be updated annually but MNRF's guidance on SAR occurrences and field assessments can change throughout the year as policies, regulations, survey protocols, SAR data, and other SAR documents are finalized.

Species and habitat information

The Committee on the Status of Species at Risk in Ontario (COSSARO) meets regularly to evaluate species for listing and/or re-evaluate species already listed. As a result, species designations may change that could in turn change the level of protection they receive under the ESA. Additionally, habitat protection provisions for a species may change over time.

- Detailed information on all species on the SARO List can be found on the MNRF website
- Ontario Regulation (O. Reg.) 242/08 should be consulted for a complete and current list of SAR habitat regulations.
- MNRF (ESA.Aylmer@ontario.ca) should be contacted for guidance on identifying habitat for species that do not have habitat regulations, general habitat descriptions, or recovery strategies available.
    - Aylmer District recommends consulting federal recovery strategies if provincial ones are not available (http://www.registrelep-sararegistry.gc.ca/sar/recovery/recovery_e.cfm)

Conducting adequate surveys

- SAR surveys must be undertaken by a qualified professional who has experience with the target species and/or habitat.
- MNRF approvals or authorizations (e.g. permit under clause 17(2)(b) of the ESA or registry under O. Reg. 242/08, authorization under the *Fish and Wildlife Conservation Act*, and an approved animal care protocol) may be required to conduct SAR surveys.
- MNRF has finalized survey protocols for some SAR species, which are specified in the reference material, and these protocols can be obtained from Aylmer District upon request.
- It is strongly recommended that Aylmer District be consulted prior to conducting species surveys to confirm if surveys are necessary to determine if a project may contravene the ESA, and that surveys are conducted using appropriate methods and effort.

Additional information sources

The reference material was populated using Natural Heritage Information Centre (NHIC) data and additional information available to MNRF Aylmer District. There are additional sources of SAR information, including for species of special concern and provincially rare species that both receive consideration under the Provincial Policy Statement (2014), such as:

- Your local Conservation Authority
- Land Information Ontario
- Ontario Make a Natural Heritage Map tool
- Fisheries and Oceans Canada
- Breeding Birds of Ontario
- eBird
- Ontario Reptile and Amphibian Atlas

City of Windsor

Municipal Species at Risk Reference Guide

Birds

Acadian Flycatcher

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Occupies a broad spectrum of deciduous and mixed woodlands of variable size across its breeding range. Refer to the Provincial Recovery Strategy (2016).	Migratory bird that may be present in Ontario from April through September.	Follow Breeding Bird Survey Protocol as applicable, conducting three rounds of surveys during the breeding window.
https://www.ontario.ca/page/acadian-flycatcher		http://www.ec.gc.ca/reom-mbs/default.a

Bank Swallow

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Bank swallows nest in burrows in natural and human-made settings where there are exposed and inclined areas of erodable substrate like silt or sand, such as banks of rivers and lakes, roadsides, aggregate pits, and stock-piled materials. Refer to the Provincial Recovery Strategy (2016) and contact ESA.Aylmer@Ontario.ca for the General Habitat Description (not yet available online).	Migratory bird most commonly seen in Ontario from April through September.	Survey for burrows in potential habitat features and identify habitat according to the species general habitat description. Follow Breeding Bird Survey Protocol to assess habitat occupancy, conducting three rounds of surveys during the breeding window.
https://www.ontario.ca/page/bank-swallow		http://www.ec.gc.ca/reom-mbs/default.a

Barn Owl

Endangered

Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information

Barn Owls are known to nest in both natural structures (e.g. hollows in trees or banks) and human-made structures (e.g. nest boxes, barns and other shelters with access). Refer to the Provincial Recovery Strategy (2010) and Ontario Regulation 242/08.

https://www.ontario.ca/page/barn-owl

Timing Windows

May be present year-round. Egg dates recorded in Ontario have occurred from March through October.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

Barn Swallow

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Barn Swallow nests in Ontario are commonly situated inside or outside of buildings and other man-made shelters, under bridges and piers and in road culverts. Refer to the Provincial Recovery Strategy (2014) and the General Habitat Description.

https://www.ontario.ca/page/barn-swallow

Timing Windows

Migratory bird most commonly seen in Ontario from April through September.

Survey Protocol

Survey structures for the presence of nest cups. Identify habitat according to the species general habitat description.

http://www.ec.gc.ca/reom-mbs/default.a

Bobolink

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Nests in grassland-like habitats typically greater than 2 hectares, such as hayfield, pasture, alfalfa, winter wheat, old/overgrown fields, prairie, savannah, and meadow or meadow marsh. Refer to the Provincial Recovery Strategy (for Bobolink and Eastern Meadowlark; 2013).

https://www.ontario.ca/page/bobolink

Timing Windows

Migratory bird most commonly seen in Ontario from May to September.

Survey Protocol

Contact ESA.Aylmer@ontario.ca to obtain a copy of the MNRF draft Bobolink breeding survey protocol (2011).

Cerulean Warbler

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Typically occur in mature deciduous woodlands. Has been found breeding in tracts as small as 10 hectares in Ontario. Refer to COSEWIC Assessment and Status Report (2010).

https://www.ontario.ca/page/cerulean-warbler

Timing Windows

Migratory bird most commonly seen in Ontario from May to August.

Survey Protocol

Follow Breeding Bird Survey Protocol as applicable, conducting three rounds of surveys during the breeding window.

http://www.ec.gc.ca/reom-mbs/default.a

Chimney Swift

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
They typically nest and roost in chimneys and other man-made structures. Can also nest in hollow trees or tree cavities. Refer to COSEWIC Assessment and Status Report (2007) and the General Habitat Description.	Migratory bird most commonly seen in Ontario from mid-April to mid-October.	Follow the Ontario Swift Watch Protocol by Bird Studies Canada (2015). Identify habitat according to the general habitat description.
https://www.ontario.ca/page/chimney-swift		http://www.bsc-eoc.org/volunteer/ai/res

Eastern Meadowlark

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Breed primarily in grassland-like habitats, such as pastures and hayfields (including alfalfa), meadow and meadow marsh, old/overgrown fields, prairie, savannah, weedy borders of croplands, roadsides, orchards, gold courses, and other open areas, typically greater than 3 hectares. Refer to the Provincial Recovery Strategy (for Bobolink and Eastern Meadowlark; 2013).	Migratory bird most commonly seen in Ontario from March through October.	Contact ESA.Aylmer@ontario.ca to obtain a copy of the MNRF draft Eastern Meadowlark breeding survey protocol (2013) .
https://www.ontario.ca/page/eastern-meadowlark		

Least Bittern

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Found in marshes, often where vegetation cover is interspersed with areas of open water. They can be found in smaller isolated marshes though most known occurrences are in larger wetlands. Refer to the Provincial Recovery Strategy (2016). **https://www.ontario.ca/page/least-bittern**	Migratory bird most commonly seen in Ontario from May through September.	Follow the National Least Bittern Survey Protocol, CWS Technical Report Series no. 519 (2011). Contact ESA.Aylmer@ontario.ca for more information if needed. **http://ec.gc.ca/Publications/default.asp**

Prothonotary Warbler

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Key features are presence of water near wooded area with suitable cavity nest sites or nest boxes. Nests usually occur near large bodies of standing or slow-moving water, such as seasonally flooded forest, swamps, rivers, streams, ponds, or lakes. Refer to the Provincial Recovery Strategy (2012). **https://www.ontario.ca/page/prothonotary-warbler**	Migratory bird most commonly seen in Ontario from May through August.	Follow Breeding Bird Survey Protocol as applicable, conducting three rounds of surveys during the breeding window.

Yellow-breasted Chat

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
A wide variety of early-successional habitats are used (i.e., dense, low deciduous or coniferous vegetation), including early shrubby regrowth on abandoned agricultural fields, power-line corridors, clear-cuts, fencerows, forest edges and openings, and areas near streams, ponds and swamps. Refer to the COSEWIC Assessment and Status report (virens subspecies; 2012).	Migratory bird most commonly seen in Ontario from May through August.	Follow Breeding Bird Survey Protocol as applicable, conducting three rounds of surveys during the breeding window.

https://www.ontario.ca/page/yellow-breasted-chat

Fish and Mussel SAR

Fish and Mussel SAR

Threatened and Endangered | Species Protection ☑ | Regulated Habitat Protection ☑ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Consult DFO mapping (http://www.dfo-mpo.gc.ca/species-especes/fpp-ppp/index-eng.htm) to determine if species at risk and/or their habitat may be in or near the proposed project area, and contact ESA.Aylmer@ontario.ca (and/or DFO) for site-specific information or advice as applicable.		
https://www.ontario.ca/environment-and-energy/species-		http://www.dfo-mpo.gc.ca/species-espe

Fishes

Lake Sturgeon (Great Lakes - Upper St. Lawrence po

Threatened | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Lakes and Rivers. Bottom dweller, preferring softer substrates of mud, sand or gravel. Spawns in fast flowing water - usually near waterfalls, dams, or rapids with gravel or boulders.	Spawns in the spring,	Contact your local CA or DFO.

https://www.ontario.ca/page/lake-sturgeon-species-risk

Northern Madtom

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Large creeks to rivers; moderate to swift current; sand, gravel or muddy substrate.	Spawning and feeding usually occurs at night. Spawns at the end of July.	Contact your local CA or DFO.

https://www.ontario.ca/page/northern-madtom

Silver Shiner

Threatened | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Found in medium to large streams, with swift currents, clear water and a wide variety of substrate including gravel, pebble, cobble, boulder, sand, mud and clay. In Ontario the Silver Shiner can be found in the Thames and Grand Rivers, and in Bronte Creek and Sixteen Mile Creek.	Spawning is known to occurs in the United States but has not been observed in Ontario.	Contact your local CA or DFO

https://www.ontario.ca/page/silver-shiner

Herbaceous

American Ginseng

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

American Ginseng typically grows in rich, moist, but well-drained, and relatively mature, deciduous woods dominated by Sugar Maple, White Ash and American Basswood. It usually grows in deep, nutrient rich soil over limestone or marble bedrock. Refer to the general habitat description (2013) and the federal recovery strategy (2015).

https://www.ontario.ca/page/american-ginseng

Timing Windows

American Ginseng plants are typically found from May to late September. Refer to protocol for details.

Survey Protocol

Draft Site Occupancy Survey Protocol for American Ginseng in Ontario (2013) - contact MNRF Aylmer District for more information.

http://ibis.geog.ubc.ca/biodiversity/eflor

Colicroot

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Grows in open, sunny, and moist habitats with sandy or mucky soil, such as prairies and old abandoned fields. Also found along roadsides and forest edges. It does not tolerate shade or competition from other plants and appears to do well in areas that are kept open by fire, drought, grazing and other disturbances. Refer to the federal recovery strategy (2015).

https://www.ontario.ca/page/colicroot

Timing Windows

Flowers from late June to late July.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

Dense Blazing Star

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Grows in moist prairies, grassland savannahs, wet areas between sand dunes, and abandoned fields. This plant does not do well in the shade and is usually found in areas that are kept open and sunny by fire, floods, drought, or grazing. Refer to the provincial recovery strategy (2016).	Flowers from mid-July to mid-September.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/dense-blazing-star

Eastern Prairie Fringed-orchid

Endangered

Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information	Timing Windows	Survey Protocol
Grows in wetlands, fens, swamps and tallgrass prairie. It has been found in ditches and railroad rights of way. Refer to the provincial recovery strategy (2010) and Ontario Regulation 242/08.	The Eastern Prairie Fringed-orchid can lie dormant for several years in between flowering. Flowers occur from late June to late July.	Draft Eastern Prairie Fringed-orchid survey protocol (2012) - contact MNRF Aylmer District for more information.

https://www.ontario.ca/page/eastern-prairie-fringed-orch

Pink Milkwort

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Grows in moderately moist to dry, sandy, prairie habitats, where it is often found growing with Little Bluestem grass. Refer to the provincial recovery strategy (2016).	Flowers mid-July - mid-August	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/pink-milkwort

Purple Twayblade

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Found in a variety of habitats including open oak woodland and savannah, mixed deciduous forest, shrub thicket, shrub alvar, deciduous swamp, and even conifer plantations. Grows in partial shade, but does not like dense shade and depends on natural disturbances, such as storms and fire, to keep its habitat relatively open and sunny. Refer to the draft federal recovery strategy (2016).	Flowers between early May and early July.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/purple-twayblade

Slender Bush-clover

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information

Grows on dry, sandy soil in tallgrass prairies. Does not do well in the shade and can be harmed by other plants that compete for light and space. Refer to the provincial recovery strategy (2013).

Timing Windows

Flowers in August-September. The fruit remains on the plant for a large part of the winter.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/slender-bush-clover

Spotted Wintergreen

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information

Occurs in dry oak-pine woodland habitats with sandy soils. Typically, dominant tree species include White Pine, Red Oak, Black Oak, and American Beech. Does best in semi-open habitats. Refer to the provincial recovery strategy (2010).

Timing Windows

Flowers in late July to early August

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/spotted-wintergreen

Willowleaf Aster

Threatened | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information

Found in openings of oak savannahs. Also been found along railways, roadsides and in abandoned farm fields. Refer to the provincial recovery strategy (2013).

Timing Windows

Flowers from late September through October, and sometimes into November.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/willowleaf-aster

Mammals

Eastern Small-footed Myotis

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Will roost in a variety of habitats changing day to day, including in trees or under tree bark, under rocks or in rock outcrops, in buildings, under bridges, etc. Over-winter in caves and abandoned mines.	Typically over-winter from about October to April.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/eastern-small-footed-bat

Little Brown Myotis (formerly little brown bat)

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Roost habitat may include human structures such as houses, bridges, and barns, or natural features such as rock crevices and forests. May over-winter in buildings, caves, or mines. Refer to the draft federal recovery strategy (2015).	They feed at night and are most active in the two or three hours after sunset. Typically over-winter from about October to April.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/little-brown-bat

Northern Myotis (formerly Northern Long-eared Bat)

Endangered — Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Roosts in tree cavities, under tree bark, in natural and artificial crevices such as rock outcrops and roof shingles. Over-winters in caves and mines. Refer to the draft federal recovery strategy (2015).	Typically over-winter from about October to April.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/northern-long-eared-bat

Molluscs

Eastern Pondmussel

Endangered — Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Generally inhabit sheltered areas of lakes or slow streams in substrates of fine sand and m.ud	Active year-round.	Please reference: Mackie, G, T.J Morris, and D Ming. "Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario Great Lakes Area (OGLA)." Fisheries and Oceans Canada. (2008).

https://www.ontario.ca/page/eastern-pondmussel

Fawnsfoot

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Found in shallow (1-5m) slow-flowing water of medium to large rivers. Found in areas with gravel, sand and muddy substrates.	Contact DFO.	Please reference: Mackie, G, T.J Morris, and D Ming. "Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario Great Lakes Area (OGLA)." Fisheries and Oceans Canada. (2008).

https://www.ontario.ca/page/fawnsfoot

Kidneyshell

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Found in small to medium sized rivers with clear water and swift currents. Associated substrates are gravel and sand. Fish hosts: Blackside Darter, Fantail Darter, and Johnny Darter.	Active year-round.	Please reference: Mackie, G, T.J Morris, and D Ming. "Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario Great Lakes Area (OGLA)." Fisheries and Oceans Canada. (2008).

https://www.ontario.ca/page/kidneyshell

Northern Riffleshell

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Freshwater mussel that lives in riffle areas of rivers with sand and gravel bottoms. It can also be found in shoal habitats of lakes that are washed by wave action and currents.	Active year-round.	Please reference: Mackie, G, T.J Morris, and D Ming. "Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario Great Lakes Area (OGLA)." Fisheries and Oceans Canada. (2008).

https://www.ontario.ca/page/northern-riffleshell

Proud Globelet

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
In Ontario the species has been located from dead shells in a sandy oak forest (Black Oak Heritage Park) and a nearby former industrial area in Windsor.	Hibernates from approximately early October to mid-April in shallow soils, or shallow depressions covered with leaf litter.	No standardized species protocol available; contact Aylmer MNRF (ESA.Aylmer@Ontario.ca) prior to conducting surveys.

https://www.ontario.ca/page/proud-globelet

Round Hickorynut

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Prefers rivers with steady, moderate flows, and sand and gravel substrates at depths of up to 2 m.	Active year-round.	Please reference: Mackie, G, T.J Morris, and D Ming. "Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario Great Lakes Area (OGLA)." Fisheries and Oceans Canada. (2008).

https://www.ontario.ca/page/round-hickorynut

Round Pigtoe

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

In small rivers, this species can be found in areas of moderate flow on substrates of gravel, cobble and boulder. In larger rivers, it is found in mud, sand and gravel at varying depths. Known fish hosts: Bluegill, Spotfin shiner, Bluntnose minnow, and Northern redbelly dace.

https://www.ontario.ca/page/round-pigtoe

Timing Windows

Contact DFO.

Survey Protocol

Please reference: Mackie, G, T.J Morris, and D Ming. "Protocol for the Detection and Relocation of Freshwater Mussel Species at Risk in Ontario Great Lakes Area (OGLA)." Fisheries and Oceans Canada. (2008).

Snakes

Butler's Gartersnake

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Butler’s Gartersnake habitat includes prairie, grassland, old fields, meadow, thicket, wet areas such as marshes, drains, seasonal wet areas, and small bodies of water, as well as vacant sites, parklands, treed edges, and hedgerows. This species is also commonly found near rock piles, old stonewalls, brush piles, debris piles, crayfish burrows, ant hill mounds, and small mammal burrows. Refer to the draft federal recovery strategy (2016).

https://www.ontario.ca/page/butlers-gartersnake

Timing Windows

Active: early April to October. Emerge and mate early - late April. Young born early summer (June - July). Depending on weather conditions, can be found as early as March and as late as mid-November.

Survey Protocol

Survey Protocol for Ontario's Species at Risk Snakes (December 2016) - contact ESA.Aylmer@Ontario.ca for more information

Eastern Foxsnake (Carolinian population)

Endangered

Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information	Timing Windows	Survey Protocol
Generally use old fields, prairie, savannah, shorelines, wetlands, rock barrens, dunes, hedgerows, drains and canals, as well as anthropogenic features such as old foundations, bridges, and wells. Refer to the provincial recovery strategy (2010), Ontario Regulation 242/08, and the habitat protection summary (2012).	Egress from over-wintering sites usually occurs from April to mid May, mating occurs from late May to mid June, egg-laying occurs from late June to mid-July, and hatching occurs from late August to early October. Ingress to over-wintering sites usually occurs in September and October.	Survey Protocol for Ontario's Species at Risk Snakes (December 2016) - contact ESA.Aylmer@Ontario.ca for more information

https://www.ontario.ca/page/eastern-foxsnake

Massasauga (Carolinian population)

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Habitat includes open areas such as prairie, rock barrens, sparse forests, forest clearings and edges, grasslands, thickets, and wetlands. Massasaugas over-winter underground in features such as rock crevices, sphagnum swamps, tree root cavities, crayfish burrows, and animal burrows where they can get below the frost line but stay above the water table. Refer to the provincial recovery strategy (2016), and the general habitat description (2013).	Emerges from over-wintering sites generally late April - mid-May; live young born August; mating early September; over-wintering begins late-September to early October.	Survey Protocol for Ontario's Species at Risk Snakes (December 2016) - contact MNRF Aylmer District for more information

https://www.ontario.ca/page/massasauga-rattlesnake

Trees

American Chestnut

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
In Ontario, it is only found in the Carolinian Zone between Lake Erie and Lake Huron. American Chestnut grows alongside Red Oak, Black Cherry, Sugar Maple, American Beech and other deciduous tree species. Refer to the provincial recovery strategy (2012).	Trees typically flower in late May to early July. Nuts mature by mid-October.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/american-chestnut-species-

Blue Ash

Threatened Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Blue Ash grows in floodplains, river valleys, alvar and limestone, and beaches. Refer to the draft federal management plan (2016).	Flowering occurs in April and May, prior to leaf-out. Seed crops are produced every 3-4 years in late fall.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/blue-ash-species-risk

Butternut

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Butternut usually grows alone or in small groups in forests and woodlands. It prefers moist, well-drained soil and is also found on well-drained gravel sites. This species does not do well in the shade, and often grows in sunny openings and near forest edges. Refer to the provincial recovery strategy (2013).	Flowers from April to June. Fruits reach maturity during the month of September or October in the year of pollination and usually remain on the tree until after leaf fall.	A certified butternut health assessor must assess Butternut trees. Contact ESA.Aylmer@Ontario.ca for more information.

https://www.ontario.ca/page/butternut-species-risk

Eastern Flowering Dogwood

Endangered Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information	Timing Windows	Survey Protocol
Grows in deciduous or mixed forests, open woodlands, forest edges, floodplains, slopes, bluffs, ravines, roadsides, hedgerows, and along drains. Refer to the provincial recovery strategy (2010) and Ontario Regulation 242/08.	Flowering occurs from mid-May to early June, as the leaves begin to develop. The fruits mature in August and September.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/eastern-flowering-dogwood

Kentucky Coffee-tree

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Generally grows in woodlands, floodplains, forest and wetland edges, hedgerows, roadsides and urban areas. Refer to the federal recovery strategy (2014).	Flowers appear in May and June. Fertilized flowers form seed pods which remain on the tree through the winter.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/kentucky-coffee-tree-specie

Red Mulberry

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Grows in forests, often in areas where forest canopy is open, but will also tolerate some shade. Also found in floodplains, river valleys, and forest edges. Refer to the provincial recovery strategy (2013) and the general habitat description (2013).	Flowers emerge with leaves in the spring. Fruit matures in mid to late July.	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

https://www.ontario.ca/page/red-mulberry

Turtles

Blanding's Turtle

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Blanding's Turtle lives in shallow water, usually in large wetlands and shallow lakes with lots of water plants. May travel long distances from nearest waterbody, usually while searching for mates or traveling to nesting or overwintering sites. Hibernate in the mud at the bottom of permanent water bodies from late October until the end of April. Refer to the general habitat description (2013) and the draft federal recovery strategy (2016). https://www.ontario.ca/page/blandings-turtle	Mating prior to and right after overwintering, typically in April to early May, and from the end of August to end of October. Eggs are laid in from late May to early July, with hatchlings emerging in throughout September and October. Overwinter from October to April.	Survey Protocol for Blanding's Turtle (Emydoidea blandingii) in Ontario (August 2015) - contact MNRF Aylmer District for more information.

Spiny Softshell

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information	Timing Windows	Survey Protocol
Found in large lakes, rivers, creeks, drainage ditches, ponds, but can also occur in marshes, ponds, oxbows as well as wetlands and ponds next to large bodies of water. Overwinter in aquatic habitat in underwater hibernacula, often in the stream or lake they spend the majority of time during active season. Nest in areas of sand/gravel substrate with low vegetation density and slope. Refer to the draft federal recovery strategy (2016). https://www.ontario.ca/page/spiny-softshell	Active from late March/early April to October. Mate in spring (late April or May) after emergence. Nests from early June to mid-July. Hatchlings emerge in late summer. Overwintering starts in mid-October (females) and end of November (males).	No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

Spotted Turtle

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Semi-aquatic preferring ponds, marshes, bogs and even ditches with slow-moving, unpolluted water and abundant supply of aquatic vegetation. Other aquatic habitat can include vernal pools, seeps, sloughs, creeks, stormwater ponds, sheltered edges of bays, channels and drainage ditches. Strong preference for marsh meadows as well. Nests will be found in well-drained, sunny locations that are bare or have sparse vegetation. Hibernates in wetlands or seasonally wet areas associated with structures including overhanging banks, hummocks, tree roots, or aquatic animal burrows. Refer to the draft federal recovery strategy (2016) for more information.

https://www.ontario.ca/page/spotted-turtle

Timing Windows

Overwinters in underwater hibernacula for 7 to 8 months of the year, from mid-September/October to mid-late April. Basks in April. Mates begins in early spring as soon as ice/snow melt and can occur from late May through to early July.

Survey Protocol

Survey Protocol for Spotted Turtle (Clemmys guttata) in Ontario (August 2015) - contact MNRF Aylmer District for more information.

This report was produced May, 2017

Please refer to the associated Municipal Species at Risk Reference Material Memo for instructions on how to use this guide.

The Committee on the Status of Species at Risk in Ontario (COSSARO) meets regularly to evaluate new species for listing and/or re-evaluate species already on the SARO List. As a result, species designations may change, which could in turn change the protection they receive under the ESA and whether proposed projects may have adverse effects on SAR. Habitat protection provisions for a species may also change if a species-specific habitat regulation comes into effect, or as new general habitat guidance is developed based on the best available information. Additionally, the province has not been comprehensively surveyed and MNRF data relies on observers to report sightings. As such, the absence of an occurrence does not indicate the absence of SAR species or habitat, and new occurrence information may affect whether a proposed project may contravene the ESA.

Ministry of Tourism,
Culture and Sport

Heritage Program Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314 7145
Fax: 416 212 1802

Ministère du Tourisme,
de la Culture et du Sport

Unité des programmes patrimoine
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314 7145
Téléc: 416 212 1802

January 11th, 2018 (EMAIL ONLY)

Dr. Jian Li, P.Eng.
Stantec Consulting Limited
100-140 Oullette Place
Widsor, ON N8X 1L9
E: jian.li@stantec.com

RE: MTCS file #: 0008250
Proponent: City of Windsor
Subject: Notice of Commencement, Municipal Class Environmental Assessment Combined Sewer Overflow Control, Riverfront Area West of Caron Ave.
Location: City of Windsor, Ontario

Dear Dr. Jian Li:

Thank you for providing the Ministry of Tourism, Culture and Sport (MTCS) with the Notice of Commencement for your project. MTCS's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- Archaeological resources, including land-based and marine;
- Built heritage resources, including bridges and monuments; and,
- Cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on cultural heritage resources. While some cultural heritage resources may have already been formally identified, others may be identified through screening and evaluation. Indigenous communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Indigenous communities includes a discussion about known or potential cultural heritage resources that are of value to these communities. Municipal Heritage Committees, historical societies and other local heritage organizations may also have knowledge that contributes to the identification of cultural heritage resources.

Archaeological Resources

Your EA project may impact archaeological resources and you should screen the project with the MTCS *Criteria for Evaluating Archaeological Potential* to determine if an archaeological assessment is needed. MTCS archaeological sites data are available at *archaeology@ontario.ca*. If your EA project area exhibits archaeological potential, then an archaeological assessment (AA) should be undertaken by an archaeologist licenced under the *OHA*, who is responsible for submitting the report directly to MTCS for review.

Built Heritage and Cultural Heritage Landscapes

The MTCS *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether your EA project may impact cultural heritage resources. The Clerk for the City of Windsor can provide information on property registered or designated under the *Ontario Heritage Act*. Municipal Heritage Planners can also provide information that will assist you in completing the checklist.

If potential or known heritage resources exist, MTCS recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, should be completed to assess potential project impacts. Our Ministry's *Info Sheet #5: Heritage Impact Assessments and Conservation Plans* outlines the scope of HIAs. Please send the HIA to MTCS for review, and make it available to local organizations or individuals who have expressed interest in review.

Environmental Assessment Reporting

All technical heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MTCS whether any technical heritage studies will be completed for your EA project, and provide them to MTCS before issuing a Notice of Completion. If your screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Thank-you for consulting MTCS on this project: please continue to do so through the EA process, and contact me for any questions or clarification.

Sincerely,

Joseph Muller, RPP/MCIP
Heritage Planner
Joseph.Muller@Ontario.ca

Copied to: Ed Valdez, Process Engineering and Maintenance, City of Windsor

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. MTCS makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MTCS be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Please notify MTCS if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the Ontario Heritage Act and the Standards and Guidelines for Consultant Archaeologists.

If human remains are encountered, all activities must cease immediately and the local police as well as the Registrar, Burials of the Ministry of Government and Consumer Services (416-326-8800) must be contacted. In situations where human remains are associated with archaeological resources, MTCS should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

Canadian Environmental Assessment Agency
Ontario Regional Office
55 St. Clair Avenue East,
Room 907
Toronto, ON M4T 1M2

Agence canadienne d'évaluation environnementale
Bureau régional de l'Ontario
55, avenue St-Clair est,
bureau 907
Toronto (Ontario) M4T 1M2

January 8, 2018 Sent by email

Jian Li
Stantec
100-140 Ouellette Place
Windsor, ON N8X1L9
Jiian.li@stantec.com

Dear Mr. Li:

Re: Information on the *Canadian Environmental Assessment Act, 2012*

Thank you for your correspondence of December 4, 2017 regarding the Combined Sewer Overflow Control in the City of Windsor.

The *Canadian Environmental Assessment Act, 2012* (CEAA 2012) focuses federal environmental reviews on projects that have the potential to cause significant adverse environmental effects in areas of federal jurisdiction and applies to physical activities described in the *Regulations Designating Physical Activities* (the Regulations). Based on the information provided, your project does not appear to be described in the Regulations. **Kindly review the requirements of CEAA 2012, including the Regulations.** Given the ongoing review of the federal environmental assessment process, if your project does not proceed immediately, please review your project against any future federal environmental assessment act to confirm applicability to your project.

If you believe the project is not subject to a federal environmental assessment, and do not submit a project description, we kindly request that you remove the Canadian Environmental Assessment Agency from your distribution list.

If you have questions, please get in touch with our office through the switchboard at 416-952-1576. The attachment that follows provides web links to useful legislation, regulation, and guidance documents.

Sincerely,

Anjala Puvananathan
Regional Director, Ontario
Attachment – Useful Legislation, Regulation, and Guidance Documents

Attachment – Useful Legislation, Regulation, and Guidance Documents

For more information on the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), please access the following links on the Canadian Environmental Assessment Agency's (the Agency) website:

Overview of CEAA 2012
http://www.ceaa.gc.ca/default.asp?lang=En&n=16254939-1

Regulations Designating Physical Activities, and
Prescribed Information for a Description of a Designated Project Regulations
http://www.ceaa.gc.ca/default.asp?lang=En&n=9EC7CAD2-1

If your project is in a federally designated wildlife area or migratory bird sanctuary please check section 1 of the Regulations, which details the designated projects specific to those locations.

If it appears that CEAA 2012 may apply to your proposed project, you must provide the Agency with a description of the proposed project. Please see the link below to the Agency's guide to preparing a project description.

Guide to Preparing a Description of a Designated Project
http://www.ceaa.gc.ca/default.asp?lang=En&n=3CA9CEE5-1

For information on the ongoing review of the federal environmental assessment process
https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews.html

From: EnviroOnt
To: Li, Jian; evaldez@city.windsor.on.ca
Subject: NEATS 46273: Combined sewer overflow control in the Riverfront Area West of Caron Avenue, City of Windsor
Date: Monday, December 18, 2017 9:11:43 AM
Attachments: NEATS 46273.pdf

Greetings,

Thank you for your correspondence.

Please note Transport Canada **does not** require receipt of all individual or Class EA related notifications. We are requesting project proponents to self-assess if their project:

1. Will interact with a federal property and/or waterway by reviewing the Directory of Federal Real Property, available at at www.tbs-sct.gc.ca/dfrp-rbif/; **and**
2. Will require approval and/or authorization under any Acts administered by Transport Canada* available at http://www.tc.gc.ca/eng/acts-regulations/menu.htm.

Projects that will occur on federal property prior to exercising a power, performing a function or duty in relation to that project, will be subject to a determination of the likelihood of significant adverse environmental effects, per Section 67 of the *Canadian Environmental Assessment Act, 2012*.

If the aforementioned does not apply, the Environmental Assessment program should not be included in any further correspondence and future notifications will not receive a response. If there is a role under the program, correspondence should be forwarded *electronically* to: EnviroOnt@tc.gc.ca with a **brief description of Transport Canada's expected role**.

*Below is a summary of the most common Acts that have applied to projects in an Environmental Assessment context:

- ***Navigation Protection Act (NPA)*** – the Act applies primarily to works constructed or placed in, on, over, under, through, or across scheduled navigable waters set out under the Act. The Navigation Protection Program administers the NPA through the review and authorization of works affecting scheduled navigable waters. Information about the Program, NPA and approval process is available at: http://www.tc.gc.ca/eng/programs-621.html. Enquiries can be directed to NPPONT-PPNONT@tc.gc.ca or by calling (519) 383-1863.

- ***Railway Safety Act (RSA)*** – the Act provides the regulatory framework for railway safety, security, and some of the environmental impacts of railway operations in Canada. The Rail Safety Program develops and enforces regulations, rules, standards and procedures governing safe railway operations. Additional information about the Program is available at: https://www.tc.gc.ca/eng/railsafety/menu.htm. Enquiries can be directed to RailSafety@tc.gc.ca or by calling (613) 998-2985.

- ***Transportation of Dangerous Goods Act (TDGA)*** – the transportation of dangerous goods by air, marine, rail and road is regulated under the TDGA. Transport Canada, based on risks, develops safety standards and regulations, provides oversight and gives expert advice on dangerous goods to promote public safety. Additional information about the transportation of dangerous goods is available at: https://www.tc.gc.ca/eng/tdg/safety-menu.htm. Enquiries can be directed to TDG-TMDOntario@tc.gc.ca or by calling (416) 973-1868.

- ***Aeronautics Act*** – Transport Canada has sole jurisdiction over aeronautics, which includes aerodromes and all related buildings or services used for aviation purposes. Aviation safety in Canada is regulated under this Act and the Canadian Aviation Regulations (CARs). Elevated Structures, such as wind turbines and communication towers, would be examples of projects that must be assessed for lighting and marking requirements in accordance with the CARs. Transport Canada also has an interest in projects that have the potential to cause interference between wildlife and aviation activities. One example would be waste facilities, which may attract birds into commercial and recreational flight paths. The *Land Use In The Vicinity of Aerodromes* publication recommends guidelines for and uses in the vicinity of aerodromes, available at: https://www.tc.gc.ca/eng/civilaviation/publications/tp1247-menu-1418.htm. Enquires can be directed to CASO-SACO@tc.gc.ca or by calling 1 (800) 305-2059 / (416) 952-0230.

Please advise if additional information is needed.

Thank you,

Environmental Assessment Program, Ontario Region
Transport Canada / Government of Canada / 4900 Yonge St., Toronto, ON M2N 6A5
EnviroOnt@tc.gc.ca / Facsimile : (416) 952-0514 / TTY: 1-888-675-6863

Programme d'évaluation environnementale, Région de l'Ontario
Transports Canada / Gouvernement du Canada / 4900, rue Yonge, Toronto, ON, M2N 6A5
EnviroOnt@tc.gc.ca / télécopieur: (416) 952-0514

Stantec

Class Environmental Assessment
Combined Sewer Overflow Control in the
Riverfront Area West of Caron Avenue
The Corporation of the City of Windsor

RESPONSE FORM – PLEASE RETURN BY JANUARY 18, 2018

RECEIVED
JAN 10 2018
STANTEC CONSULTING LTD.
Consulting Engineers

Date: January 3, 2018

☐ Please remove my group/agency from the study mailing list.

☑ I would like to provide the following comments.

As the steward and administrator of the Federal lands & waterlots affected, we are very interested in ensuring that the proposed plans fully meet all provincial and Federal government requirements. Please include us in all consultations as the process proceeds.

Please consider the following environmental (i.e., natural, social, economic or cultural) information and permit/approval requirements:

Additional comment space is provided on the back of this form.

Please return the completed form to:
Dr. Jian Li, Consultant Project Manager, Stantec Consulting Ltd.
100-140 Ouellette Place
Windsor ON N8X 1L9
Tel. (519) 966-2250 x 240,
Fax (519) 966-5523
Email: jian.li@stantec.com

Key Project Contact: DAVID CREE
Job Title: PRESIDENT, WINDSOR Port AUTHORITY
Name of Group/Agency: WINDSOR PORT AUTHORITY
Mailing Address: 3190 SANDWICH STREET, WINDSOR, ONT
Tel: 519-258-5741 **Fax:** 519-258-5905 **E-mail:** wpa@portwindsor.com

Stantec

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

December 4, 2017
File: 165620132

Attention: Mr. David Cree
President & CEO
Windsor Port Authority
3190 Sandwich Street
Windsor, ON N9C 1A6

Dear, Mr. Cree

Reference: Notice of Study Commencement
Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

The City of Windsor has initiated a Municipal Class Environmental Assessment (Class EA) to investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP). The Class EA will also include revisiting wet weather flow conditions at the LRWRP to determine if any CSO control alternatives may also help to alleviate wet weather flows at the plant. A copy of the Notice of Study Commencement for the project is attached.

This study is being carried out in accordance with the planning and design process for Schedule 'C' projects outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011), which is approved under the Ontario Environmental Assessment Act. The Class EA planning process includes public and agency consultation, an assessment of the potential effects of the proposed improvements, and the identification of measures required to mitigate any adverse effects. Upon completion of the study, an Environmental Study Report (ESR) will be prepared and made available for a 30-day public review period.

On behalf of the City of Windsor, we are inviting you to participate in this project and to assist us in identifying the environmental, social and cultural values your community may have within the Project Area. A reply by January 18, 2018 would be appreciated so that we may consider your comments early in the design stage. A comment form is enclosed to facilitate your input.

If you have any comments or concerns regarding this project and wish to provide input into the Study, please contact either the undersigned or one of the individuals named in the enclosed material.

Regards,

STANTEC CONSULTING LTD.

Jian Li, Ph.D., P. Eng., PE
Project Manager
Phone: (519) 966-2250
Fax: (519) 966-5523
jiian.li@stantec.com

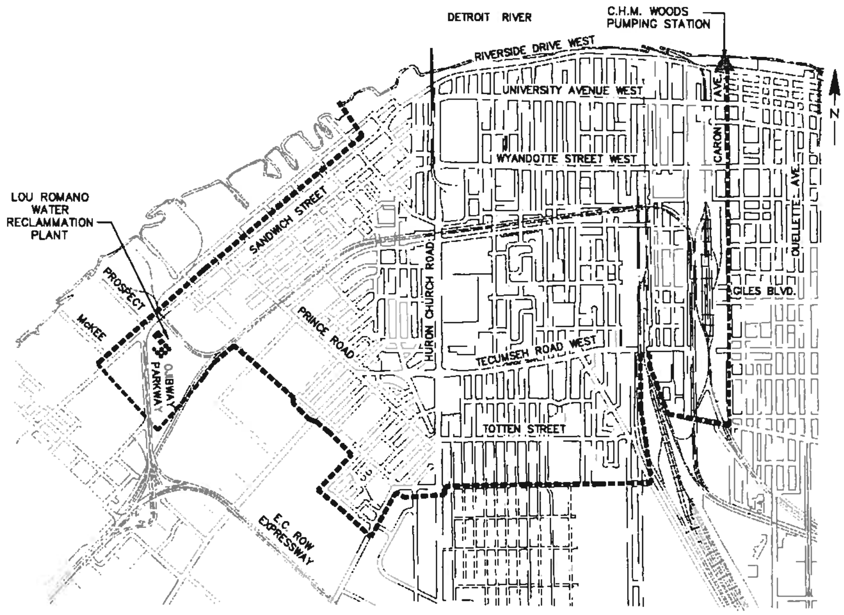
Attachment: Notice of Study Commencement, Response Form

c. Mr. Ed Valdez, Manager of Process Engineering & Maintenance, City of Windsor

THE CITY OF WINDSOR

NOTICE OF STUDY COMMENCEMENT
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

The City of Windsor has initiated a Municipal Class Environmental Assessment (Class EA) to investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station (CMHWPS) at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP).The Class EA will also include revisiting wet weather flow conditions at the LRWRP to determine if any CSO control alternatives may also help to alleviate wet weather flows at the plant.



This Class EA is the final piece in an overall pollution control strategy that was set out in the Windsor Riverfront Pollution Control Planning Study (PCP Study). The PCP Study, which was completed by the City in 1992, established a pollution control plan for the Riverfront area consisting of four main recommendations to reduce CSOs and other pollutant loadings to the Detroit River. Three of the recommendations in the PCP Study, namely increased pumping capacity at the CMHWPS, upgrading and expansion of the LRWRP, and facilities to control CSOs in the Riverfront area east of Caron Avenue have been put in place.

This Class EA will assess alternative means of providing CSO control in the study area to meet the requirements set out in Ministry of Environment and Climate Change Guidelines "Procedure F-5-5". A variety of potential CSO control options will be assessed to select the preferred option. The preferred option will then be further refined with an evaluation of alternative design concepts leading to selection of a recommended design.

The study is being undertaken in accordance with the planning and design process for 'Schedule C' projects outlined in the Municipal Class Environmental Assessment (June 2000, as amended in 2007, 2011 and 2015) under the Ontario *Environmental Assessment Act*.

A key component of the study will be consultation with interested stakeholders. Public Information Centres (PIC) will be held during the course of this project. The PICs will be held to review existing study area conditions, present and discuss study findings, and provide an assessment of alternative solutions and design concepts. Notice of planned PICs will be advertised. Anyone wishing to be directly advised of planned PICs should contact one of the project team members listed below.

If you wish to comment on this project, have your name added to the project mailing list, or have any questions about this project, please contact one of the individuals identified below:

Dr. Jian Li, P. Eng.
Consultant Project Manager
Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON N8X 1L9
Tel.: (519)966-2250 x 240
E-mail : jian.li@stantec.com

Mr. Ed Valdez, P. Eng.
Manager of Process Engineering & Maintenance
City of Windsor
4155 Ojibway Parkway
Windsor, Ontario N9C 4A5
Tel.: (519) 253-7111 x 3366
E-mail : evaldez@city.windsor.on.ca

Under the *Municipal Freedom of Information and Protection of Privacy Act* and the *Ontario Environmental Assessment Act*, unless otherwise stated in the submission, with the exception of personal information, all comments will become part of the public record and will be released, if requested, to any person.

Essex Region Conservation
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admin@erca.org
P.519.776.5209
F.519.776.8688
360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

January 19, 2018

Dr. Jian Li, Ph.D., P.Eng., PE
Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor, Ontario, N8X 1L9

Dear Dr. Li,

RE: Class Environmental Assessment - Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue - Notice of Study Commencement

Thank you for circulating the Notice of Study Commencement for the Class Environmental Assessment for the Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue in the City of Windsor. We understand that the intent of this project is to establish a preferred means of addressing combined sewer overflows in the study area roughly between the C.M.H. Woods Pumping Station and the Lou Romano Water Reclamation Plan in the Town of Lakeshore.

The Essex Region Conservation Authority (ERCA) agrees with the principles of successful environmental assessment planning under the *Environmental Assessment Act*. Further, ERCA shares this intent and interest in furthering its program of conservation and protection of natural resources through watershed planning and providing comment on environmental assessments.

In order to advance this shared interest, ERCA intends to provide specific input towards the review of environmental assessment projects on a cost recovery basis. The ERCA Board of Director's has directed that a fee for service be collected for the review of these types of undertakings (attached BD27/17). The following key areas and disciplines will inform our review of this undertaking:

- Providing information upon receipt of a request for data (e.g., mapping, species records, floodplain hazard locations, etc.);
- Providing comments at an early stage of the process (e.g., respond to the notice of study commencement, attending public open house meetings, etc.);
- Providing detailed comments through the review of the detailed technical report (e.g., Environmental Study Report or alternative applicable report); and,
- Offering to participate in meetings with in-house staff to discuss any comments in detail.

Our comments on environmental assessment and related undertakings reflect our role in the environmental assessment process as outlined in appropriate provincial guidance documents. The most up to date ERCA Board policy and program direction will inform our comments in the areas of natural hazards management, watershed planning and floodplain management, natural heritage and natural heritage systems planning, and other areas as applicable.

Thank you in advance for sharing the GIS shapefile of the project location. We look forward to providing preliminary comments in response to the notice and offering our services to assist in this important study. Please advise of the schedule of planned public information centre meetings as they are available.

Per the direction in the attached ERCA Board Report, the appropriate fee category for this type of project is in the ‘Municipal Infrastructure’ category. Should you wish for ERCA to provide these services, please remit payment of $2500 to the attention of planning@erca.org referencing the “Combined Sewer Overflow Control in the Riverfront Area” It should be noted that this fee may be adjusted later to reflect additional levels of input of staff time and effort. This fee does not include future ERCA permit application fees for activities occurring within the Limit of the Regulated Area.

If you have any questions, please contact the undersigned.

Thank you,

Mike Nelson

Michael Nelson, Watershed Planner

CC: Ed Valdez, P. Eng., Manager of Process Engineering & Maintenance, City of Windsor
Tim Byrne, Director Watershed Management Services, ERCA

Attachment:

- **ERCA BD27/17** “Draft ERCA 2018 Fee Schedule”

Essex Region Conservation Authority Board of Directors BD27/17

From:	Richard Wyma, General Manager/Secretary-Treasurer
Date:	December 1, 2017
Subject:	Draft ERCA 2018 Fee Schedule
Strategic Action:	ERCA's Fee Schedule addresses all priorities and actions identified in the Strategic Plan
Recommendation:	THAT the draft 2018 ERCA Fee Schedule, as described herein, be approved; and further, THAT Administration post notice of the Fee Schedule in ERCA's administrative offices and on ERCA's website and other social media, and be distributed to member municipalities.

Summary

- In keeping with Board direction, ERCA charges fees for its services on a basis, consistent with the Fees Policy (BD 24/15).
- ERCA monitors and reviews its fees on an ongoing basis, considering costs to deliver the program or provide the service, a competitive analysis where similar services are provided locally (education programs, camping etc.); and peer analysis, considering fee schedules for similar sized/focused Conservation Authorities and municipal fee schedules. Additionally, ERCA staff regularly receives comments from users and clients regarding fees and considers those comments in recommending fees.

Discussion

ERCA charges fees for its services in accordance with the Fees Policy. ERCA monitors and reviews its fees on an ongoing basis, considering costs to deliver the program or provide the service, a competitive analysis where similar services are provided locally (education programs, camping etc.); and peer analysis, considering fee schedules for similar sized/focused Conservation Authorities and municipal fee schedules. Additionally, ERCA staff regularly receive comments from users and clients regarding fees and considers those comments in recommending fees.

Based on this review, administration is proposing increases in fees in the following areas:

Conservation Services:

<u>Conservation Areas</u>

The conservation area annual pass fee provides unlimited access to the John R. Park Homestead, Hillman Marsh and Holiday Beach Conservation Areas, including regular events. In 2017, ERCA sold 135 Annual Passes at $70 each (incl. HST) which generated

$9,450 in revenues for Conservation Areas. Point Pelee National Park ($88) and Wheatley Provincial Park ($175) similarly offer annual passes to access their sites. Based on those prices, Administration is proposing a $5 increase to ERCA's annual Pass, recognizing that activities offered at our locations are comparable to those provincially and federally funded park systems.

Similarly, Administration proposes increasing overnight camping fees at Holiday Beach $2.00 to keep pace with Parks Ontario and private campground fees.

Administration is also recommending an increase of $10 for fire wood sales (to $85.00) at Holiday Beach based on supplier cost increases.

Land Leases

ERCA enters into land leases for its properties. Lease rates are based on percentage of appraised value. Administration is proposing that lease rates be based on comparable market value where the cost of the appraisal may cost more than the value of the lease.

John R Park Homestead

Administration is proposing minor increases to the site use rental fees to more accurately reflect the staff time required to ready the site for these rentals.

Restoration Program

The cost of trees from suppliers has increased incrementally over the past few years. To keep pace with these costs, there are proposed increases to our seedling and large stock public costs. As we do not want to deter tree sales, we continue to provide trees to the public wanting to undertake restoration at a low cost that only allows for modest revenue.

Watershed Management Services:

In keeping with direction from the Board, Administration is increasing its emphasis on its watershed planning functions with municipalities. This is purposeful in that it ensures ERCA's commenting authorities under the *Conservation Authorities Act*, and the *Planning Act* related to natural hazards and heritage are received proactively and addressed prior to a regulatory process, where it is often difficult to address ERCA issues. It also reflects the increased role of ERCA in engineering, planning and environmental studies (as described in Report BD23/17).

This has been a shift in focus for ERCA and municipalities, but is resulting in more efficient planning and permitting processes for applicants, municipalities, and Administration.

In keeping with this, Administration is proposing some modifications to existing categories to more accurately reflect staff time required, and the increased complexities of responses.

- Lawyers requests for information on properties have increased as has the complexity of the requests and the expected timelines for review. Administration is proposing the proposed fee change is to increase the existing fee of $125.00 to $175.00 to more accurately reflect costs. This is also consistent with rates charged for this service by similar Conservation Authorities.

- With increased numbers of permits, ERCA is also increasing its numbers of site surveys to set elevations on site, and facilitate permits and development. This is also requiring additional time and costs to offset vehicle use and equipment upgrades required to maintain the service. Administration is proposing to increase the existing fee of $275.00 to $425.00.

  Applicants can also arrange to have their own surveys done through private sector, which, depending on timelines, costs $500 or more. If a survey is completed by or through the applicant, ERCA does need to confirm the elevations as set by the applicant.

- Fees associated with reviews under the Drainage and Regulation Team Protocols (DART). In its review under this protocol, Administration is spending additional time to research municipal drainage by-laws to complete the DART protocol submissions. Administration is proposing to increase DART reviews from $150 to $200.

- Administration proposes that large-scale municipal servicing plans, master drainage studies, subwatershed plans, and Environmental Assessments be included in the 'Municipal Infrastructure' category, which was created to facilitate cost recovery for ERCA time on large-scale development in municipalities (e.g. wind turbine studies). As noted in Report BD23/17, Administration is increasingly being asked to participate on, or coordinate these studies, which are development driven or focused, or to address specific areas in a municipality, but not at the same scale as Official Plans or Zoning By-Law input, which is captured through levy.

  Administration is proposing that studies in areas under 20 hectares be assessed the base cost of $2,500. For studies encompassing larger areas and or multi-disciplinary technical issues, Administration proposes the fees be assessed up to a maximum of $6,500.

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Approved By:

Richard J.H. Wyma, CSLA
General Manager/Secretary Treasurer

Attachments:

- ERCA's 2018 Proposed Fee Schedule

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2018 FEE SCHEDULE

Category	Detail	**2018**	2017	HST	**Total**
CONSERVATION SERVICES					
Conservation Areas					
Conservation Areas Annual Pass					
Annual Pass	Holiday Beach/Hillman CAs	**$ 66.37**	$ 61.95	$ 8.63	**$ 75.00**
	Deposit (key fob)	**$ 10.00**	$ 10.00	N/A	**$ 10.00**
Holiday Beach Conservation Area					
Daily Permits					
Daily vehicle permit	per vehicle	**$ 8.85**	$ 8.85	$ 1.15	**$ 10.00**
Special events	per vehicle	**$ 13.27**	$ 13.27	$ 1.73	**$ 15.00**
Daily bus permit	per bus	**$ 53.10**	$ 53.10	$ 6.90	**$ 60.00**
	+ per person	**$ 1.77**	$ 1.77	$ 0.23	**$ 2.00**
~~Daily walk-in/cycle in~~	~~per person/per family~~	~~$ -~~	~~$ -~~	~~$ -~~	~~$ -~~
Camping					
Camping	unserviced per night	**$ 32.74**	$ 30.97	$ 4.26	**$ 37.00**
	20 amp service per night	**$ 37.17**	$ 35.40	$ 4.83	**$ 42.00**
	50 amp service per night	**$ 41.59**	$ 39.82	$ 5.41	**$ 47.00**
	additional vehicle per night	**$ 8.85**	$ 8.85	$ 1.15	**$ 10.00**
Group camping	per night	**$ 53.10**	$ 53.10	$ 6.90	**$ 60.00**
	+ cost per person	**$ 1.77**	$ 1.77	$ 0.23	**$ 2.00**
Seasonal camping	15 amp service	**$ 1,780.00**	$ 1,780.00	$ 231.40	**$ 2,011.40**
	50 amp service	**$ 1,780.00**	$ 1,780.00	$ 231.40	**$ 2,011.40**
	Outdoor Winter Storage	**$ 160.00**	$ 160.00	$ 20.80	**$ 180.80**
Facilities Rental					
Property Rental (Wedding, etc.)	per event	**$ 1,000.00**	$ 1,000.00	$ 130.00	**$ 1,130.00**
Firewood		**$ 75.22**	$ 61.95	$ 9.78	**$ 85.00**
Cottage Rental	Peak Season Nightly - 2 night minimum	**$ 200.00**	200.00	**$ 26.00**	**$ 226.00**
	Peak Season Weekly	**$ 1,100.00**	1,100.00	**$ 143.00**	**$ 1,243.00**
	Shoulder Season Nightly - 2 night minimum	**$ 125.00**	125.00	**$ 16.25**	**$ 141.25**
	Shoulder Season Weekly	**$ 700.00**	700.00	**$ 91.00**	**$ 791.00**
	Cleaning Fee	**$ 100.00**	100.00	**$ 13.00**	**$ 113.00**
	Damage Deposit	**$ 200.00**	250.00	**$ -**	**$ 200.00**
Hillman Marsh Conservation Area					
Daily Permits					
Daily vehicle permit	per vehicle	**$ 5.31**	$ 5.31	$ 0.69	**$ 6.00**
Special Events	per vehicle	**$ 8.85**	$ 8.85	$ 1.15	**$ 10.00**
Camping					
Group camping	per night	**$ 44.25**	$ 44.25	$ 5.75	**$ 50.00**
	+ cost per person	**$ 1.77**	$ 1.77	$ 0.23	**$ 2.00**
Facilities Rental					
Visitor Centre (organized groups)	if open	**$ 50.00**	$ 50.00	$ 6.50	**$ 56.50**
	if closed and staff come in	**$ 110.00**	$ 110.00	$ 14.30	**$ 124.30**
	Damage deposit (refundable)	**$ 110.00**	$ 110.00	N/A	**$ 110.00**
Pavillion barn rental (organized groups)	per day	**$ 30.00**	$ 30.00	$ 3.90	**$ 33.90**
Property Rental (Wedding, etc.)	per event	**$ 1,000.00**	$ 1,000.00	$ 130.00	**$ 1,130.00**

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2018 FEE SCHEDULE

Category	Detail	**2018**	2017	HST	**Total**
John R. Park Homestead Conservation Area					
Daily Permits					
Per person	Admission	**By Donations**			
Special Events	Adult	**$ 5.31**	$ 5.31	$ 0.69	**$ 6.00**
	Child 3-16	**$ 3.54**	$ 3.54	$ 0.46	**$ 4.00**
	Child 2 and under	**$ -**	$ -	$ -	**$ -**
	Family maximum	**$ 17.70**	$ 17.70	$ 2.30	**$ 20.00**
Group Tours	per person	**$ 4.42**	$ 4.42	$ 0.58	**$ 5.00**
	if requires site opening by staff	**$ 132.74**	$ 132.74	$ 17.26	**$ 150.00**
Facilities (Visitor Centre) Rental					
Less than 40 people/3 hours or less	Meeting/Event Rental	**$ 75.00**	$ 75.00	$ 9.75	**$ 84.75**
	Damage deposit (refundable)	**$ 250.00**	$ 250.00	-	**$ 250.00**
More than 40 people/up to 8 hours no tent, food or alcohol	Meeting/Event Rental	**$ 550.00**	$ 500.00	$ 71.50	**$ 621.50**
	Damage deposit (refundable)	**$ 1,000.00**	$ 1,000.00	-	**$ 1,000.00**
More than 40 people/up to 48 hours with tent, food and	Meeting/Event Rental	**$ 2,750.00**	$ 2,500.00	$ 357.50	**$ 3,107.50**
	Damage deposit (refundable)	**$ 5,000.00**	$ 5,000.00	-	**$ 5,000.00**
Miscellaneous					
Commercial & Wedding Photography (full site rental)	if open (90 minutes)	**$ 132.74**	$ 132.74	$ 17.26	**$ 150.00**
	if closed and staff come in (90 minutes)	**$ 221.24**	$ 221.24	$ 28.76	**$ 250.00**
Site Use Photography Permit	per hour	**$ 22.12**	$ 20.00	$ 2.88	**$ 25.00**
Birthday Parties	up to 20 children, 90 minutes	**$ 175.00**		$ 22.75	**$ 197.75**
Costume Rental	per costume	**$ 60.00**	$ 60.00	$ 7.80	**$ 67.80**
	Damage deposit (refundable)	**$ 100.00**	$ 100.00	N/A	**$ 100.00**
Food/Craft Vendors	per day	**$ 35.00**	$ 35.00	$ 4.55	**$ 39.55**
	weekend (indoors)	**$ 80.00**	$ 80.00	$ 10.40	**$ 90.40**
	weekend (outdoors)	**$ 50.00**	$ 50.00	$ 6.50	**$ 56.50**
Greenways					
Land Leases	Market Value				
~~Assistance and permits to landowners~~		~~**$ 175.00**~~	~~$ 175.00~~	~~N/A~~	~~**$ 175.00**~~
Hunting Programs					
Waterfowl Hunting					
Holiday Beach Conservation Area	half day	**$ 26.55**	$ 26.55	$ 3.45	**$ 30.00**
	full day	**$ 44.25**	$ 44.25	$ 5.75	**$ 50.00**
	non-refundable draw fee	**$ 15.04**	$ 15.04	$ 1.96	**$ 17.00**
	HBCA east beach discounted fee	**$ 26.55**	$ 26.55	$ 3.45	**$ 30.00**
Hillman Marsh Conservation Area	Seasonal hunting permit	**$ 630.00**	$ 630.00	$ 81.90	**$ 711.90**
	non-refundable draw fee	**$ 15.04**	$ 15.04	$ 1.96	**$ 17.00**
	day use hunting (full day)	**$ 44.25**	$ 44.25	$ 5.75	**$ 50.00**
	Annual trapping permit	**$ 100.00**	$ 100.00	$ 13.00	**$ 113.00**
Cedar Creek	5-Year Hunting Lease ($1,000 annual)	**$ 5,000.00**	$ 5,000.00	$ 650.00	**$ 5,650.00**
Big Creek	Seasonal hunting (minimum reserve)	**$ 650.00**	$ 650.00	$ 84.50	**$ 734.50**
Deer Hunting					
Various Properties	10-24 acre woodlot	**$ 525.00**	$ 525.00	$ 68.25	**$ 593.25**
	25-49 acre woodlot	**$ 775.00**	$ 775.00	$ 100.75	**$ 875.75**
	50 acre plus woodlot	**$ 1,025.00**	$ 1,025.00	$ 133.25	**$ 1,158.25**
	non-refundable draw fee	**$ 15.04**	$ 15.04	$ 1.96	**$ 17.00**

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2018 FEE SCHEDULE

Category	Detail	**2018**	2017	HST	**Total**
Forestry Program					
Seedlings					
Cost of trees (per tree)	from	**$ 0.70**	$ 0.70	$ 0.09	**$ 0.79**
	to	**$ 1.50**	$ 1.50	$ 0.20	**$ 1.70**
Tree Planting	Machine Plant by ERCA (per tree)	**$ 0.65**	$ 0.65	$ 0.08	**$ 0.73**
	Hand Plant by ERCA (per tree maximum)	**$ 1.00**	$ 1.00	$ 0.13	**$ 1.13**
Maintenance/Guarantee Program	per seedling	**$ 0.40**	$ 0.40	$ 0.05	**$ 0.45**
Shipping & Handling Charge		**$ 25.00**	$ 25.00	$ 3.25	**$ 28.25**
Site Delivery Fee		**$ 50.00**	$ 50.00	$ 6.50	**$ 56.50**
Large Stock					
Trees provided for hand planting by landowner	from	**$ 13.00**	$ 13.00	$ 1.69	**$ 14.69**
	to	**$ 40.00**	$ 40.00	$ 5.20	**$ 45.20**
Hand planting by ERCA	Bare root trees (per tree)	**$ 23.50**	$ 23.50	$ 3.06	**$ 26.56**
	Potted/Balled & Burlapped trees/shrubs (per tree)	**$ 10.00**	$ 10.00	$ 1.30	**$ 11.30**
Mulch	per tree	**$ 5.00**	$ 5.00	$ 0.65	**$ 5.65**
Forestry Extension Services					
Tree assessments, Managed Forest Tax Incentive Program approvals, hazard/danger tree assessments or tree health assessments and related activities for municipalities	first hour	**$ 90.00**	$ 90.00	$ 11.70	**$ 101.70**
	each additional hour	**$ 65.00**	$ 65.00	$ 8.45	**$ 73.45**
Tree pruning	per hour	**$ 30.00**	$ 30.00	$ 3.90	**$ 33.90**
	minimum charge	**$ 60.00**	$ 60.00	$ 7.80	**$ 67.80**
Equipment rental	**MTO rental rates + administration and Transportation Costs**				
COMMUNITY AND OUTREACH SERVICES					
School Programs					
Conservation Area Programs (Hillman Marsh/Holiday Beach/John R. Park Homestead Conservation Areas)					
Half Day	per program	**$ 175.00**	$ 175.00	-	**$ 175.00**
Full Day	per program	**$ 285.00**	$ 285.00	-	**$ 285.00**
	additional parents	**$ 8.50**	$ 8.50	-	**$ 8.50**
Special High Skills Major Certification Programs	per program, plus applicable special materials costs if required	**$ 309.73**	$ 309.73	$40.27	**$ 350.00**
Summer Camp programs	2 hours (per program)	**$ 150.00**	$ 150.00	-	**$150.00**
	4 hours (per program)	**$ 250.00**	$ 250.00	-	**$250.00**
Offsite Presentations					
School camps and in-class programs (not at a Conservation Area)	Half Day (per program)	**$ 150.00**	$ 150.00	-	**$150.00**
	Second class: same day/same school	**$ 100.00**	$ 100.00	-	**$100.00**
Travel fee to offsite presentation (not at a Conservation Area)	per kilometre	**$ 0.40**	$ 0.40	0.05	**$0.45**

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2018 FEE SCHEDULE

Category	Detail	2018	2017	HST	Total
WATERSHED MANAGEMENT SERVICES					
Floodplain Regulations and Related Development Applications					
Requests for information on regulations for property transaction (lawyers, owners, purchasers or agents)		**$ 175.00**	$ 125.00	$ 19.50	**$ 194.50**
Applications for renewal of existing permits within one calendar year of expiration of original permit		**$ 115.00**	$ 115.00	-	**$ 115.00**
Technical review and clearance where permit or site visit is not required		**$ 115.00**	$ 115.00	-	**$ 115.00**
Placing or grading of fill within regulated areas, light repair of existing breakwalls, small out buildings not requiring a survey		**$ 150.00**	$ 150.00	-	**$ 150.00**
Completing files required for approvals complying with the DART Protocol for Municipal Darainage Act/Section 28		**$ 200.00**			**$ 200.00**
Technical evaluations (elevation, setback survey or site report; property evaluation for tax assessment; ecological evaluation and/or report)		**$ 775.00**	$ 775.00	$ 100.75	**$ 875.75**
Alteration to waterways/shorelines including breakwalls, finger docks less than 15 square metres , crossings, outlets, etc. (not requiring engineering or other detailed analysis)		**$ 500.00**	$ 500.00	-	**$ 500.00**
Alteration to waterways/shorelines including breakwalls, crossings, outlets, etc. (requiring engineering or other detailed analysis) and docks exceeding 15 square metres that include lifts/ PWC platforms/or other accessories		**$ 800.00**	$ 800.00	-	**$ 800.00**
Applications for new building construction including renovations and for sites not directly abutting shorelines or watercourses		**$ 500.00**	$ 500.00	-	**$ 500.00**
Applications for building construction sites directly abutting shorelines or watercourses (including additional impacting on setback)		**$ 800.00**	$ 800.00	-	**$ 800.00**
Application for non-inhabitable garage/storage building <53.5 m^2)and for building additions not including other interior renovations		**$ 250.00**	$ 250.00	-	**$ 250.00**
Applications involving more than one regulated activity, or those requiring engineering studies/designs, environmental studies		**$ 1,200.00**	$ 1,200.00	-	**$ 1,200.00**
Applications where work has proceeded without authorization and/or prior to application of permit		**Double noted fees to reflect costs in these situations**			
Development proposals involving multiple dwelling units (more than 5 lots) where stormwater management or other engineering evaluations are required.	Base cost (up to 5 lots)	**$ 2,000.00**	$ 2,000.00	-	**$ 2,000.00**
	Cost per additional lot	**$ 160.00**	$ 160.00	-	**$ 160.00**
	Maximum	**$ 5,000.00**	$ 5,000.00	-	**$ 5,000.00**
Commercial/industrial/institutional developments where stormwater management or other engineering evaluations are required.	Base cost (up to one hectare)	**$ 1,750.00**	$ 1,750.00	-	**$ 1,750.00**
	Cost per additional hectare	**$ 400.00**	$ 400.00	-	**$ 400.00**
	Maximum	**$ 4,000.00**	$ 4,000.00	-	**$ 4,000.00**
Municipal Infrastructure/Recreational Projects involving one or more regulated activities or those requiring specific engineering design and or Environmental studies.	Base Cost for projects less than 20ha	**$ 2,500.00**	$ 2,500.00	-	**$ 2,500.00**
	Maximum Cost for multidisciplinary activities and or ones larger than 20 ha	**$ 6,500.00**	$ 6,500.00	-	**$ 6,500.00**
Input/review/comment on full Environmental Impact Assessments (EIAs) done by consultants		**$ 1,025.00**	$ 1,025.00	-	**$ 1,025.00**
Input/review/comment on scoped EIAs done by consultants		**$ 500.00**	$ 500.00	-	**$ 500.00**
Technical review and clearance where EIA is not required		**$ 115.00**	$ 115.00	-	**$ 115.00**
Input, review, clearances on substantial drainage proposals in defined areas of environmental concern		**$ 800.00**	$ 800.00	-	**$ 800.00**
Input, review, clearances on other drainage proposals		**$ 150.00**	$ 150.00	-	**$ 150.00**
Other Development Services					
Survey services		**$ 425.00**	$ 275.00	$ 55.25	**$ 480.25**
Technical review fee assessed on resubmission of previously reviewed technical or environmental studies		**$ 250.00**	$ 250.00	N/A	**$ 250.00**

Essex Region
Conservation Authority
sustaining the place for life

2018 FEE SCHEDULE

Category	Detail	**2018**	2017	HST	**Total**
Watershed Planning					
Planning Act Applications					
Minor Variance		**$ 115.00**	$ 115.00	-	**$ 115.00**
Draft Plan of Subdivision/Condominium Approval		**$ 300.00**	$ 300.00	-	**$ 300.00**
Clearance Letters for Subdivision/Condominium Approval (applies to each phase of subdivision requested)		**$ 115.00**	$ 115.00	-	**$ 115.00**
Consent		**$ 200.00**	$ 200.00	-	**$ 200.00**
Multiple Consent applications on a single application (up to 3)		**$ 200.00**	$ 200.00	-	**$ 200.00**
Multiple Minor Variance applications on a single application (up to 3)		**$ 115.00**	$ 115.00	-	**$ 115.00**
Minor Official Plan/Zoning By-Law Amdendment (E.g., Single Family Residence)		**$ 200.00**	$ 200.00	-	**$ 200.00**
Major Official Plan/Zoning By-Law Amendment (E.g., Industrial,Commercial,Institutional, Subdivision etc)		**$ 300.00**	$ 300.00	-	**$ 300.00**
Site Plan Control		**$ 200.00**	$ 200.00	-	**$ 200.00**
Official Plan Amendment and Zoning By-law Amendment Combination		**$ 275.00**	$ 275.00	-	**$ 275.00**
Part Lot Control Exemption		**$ 115.00**	$ 115.00	-	**$ 115.00**
Consent with Zoning By-Law Amendment Combination		**$ 250.00**	$ 250.00	-	**$ 250.00**
Consent with Minor Variance Combination		**$ 250.00**	$ 250.00	-	**$ 250.00**

CORPORATE SERVICES

Category	Detail	**2018**	2017	HST	**Total**
Other Fees					
Scan to file (wide format)	original sheet	**$ 15.00**	$ 15.00	$ 1.95	**$ 16.95**
	each additional sheet	**$ 2.00**	$ 2.00	$ 0.26	**$ 2.26**
Scan to print (wide format)	original sheet	**$ 15.00**	$ 15.00	$ 1.95	**$ 16.95**
	each additional sheet	**$ 10.00**	$ 10.00	$ 1.30	**$ 11.30**
NSF cheque fee		**$ 35.00**	$ 35.00	$ 4.55	**$ 39.55**

From: philip.wu@HydroOne.com
To: Li, Jian; evaldez@city.windsor.on.ca
Cc: enza.cancilla@HydroOne.com; Gian.Minichini@HydroOne.com
Subject: Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor - EA impact
Date: Friday, January 12, 2018 3:28:48 PM

Dear Dr. Jian Li and Mr. Ed Valdez,

In our initial review, we have confirmed that Hydro One has high voltage transmission facilities within your study area. At this point in time we do not have enough information about your project to provide you with meaningful input with respect to the impacts that your project may have on our infrastructure. As such, this response does not constitute any sort of approval for your plans and is being sent to you as a courtesy to inform you that we must be consulted on your project.

In addition to the existing infrastructure mentioned above, the affected transmission corridor may have provisions for future lines or already contain secondary land uses (i.e. pipelines, water mains, parking, etc). Please take this into consideration in your planning.

Please allow the appropriate lead-time in your project schedule in the event that your proposed development impacts Hydro One infrastructure to the extent that it would require modifications to our infrastructure.

In planning, please note that developments should not reduce line clearances or limit access to our facilities at any time in the study area of your Proposal. Any construction activities must maintain the electrical clearance from the transmission line conductors as specified in the Ontario Health and Safety Act for the respective line voltage.

The integrity of the structure foundations must be maintained at all times, with no disturbance of the earth around the poles, guy wires and tower footings. There must not be any grading, excavating, filling or other civil work close to the structures.

We reiterate that this message does not constitute any form of approval for your project. Once more details about your plans are known and it is established that your development will affect Hydro One facilities including the rights of way, please submit your plans to:

Enza Cancilla, Hydro One Real Estate Management
185 Clegg Road, Markham L6G 1B7
Phone: (416) 345-5892
Enza.Cancilla@HydroOne.com

Please note that the proponent will be held responsible for all costs associated with modification or relocation of Hydro One facilities, as well as any added costs that may be incurred due to increase efforts to maintain our facilities.

Regards,

Liping Wu (Philip) P.Eng

Network Management Engineer
Secondary Land Use, Asset Optimization
Strategy & Integrated Planning
Hydro One Networks Inc.
483 Bay St. | North Tower | 13th Floor
Toronto, ON | M5G 2P5
Tel: 416.345.6666
Email: Philip.Wu@HydroOne.com

On behalf of
Secondary Land Use
Strategy & Integrated Planning
Hydro One Networks

From: Peter Marra
To: Li, Jian
Cc: "evaldez@city.windsor.on.ca"
Subject: CSO Control - EA, Riverfront area west of Caron Ave
Date: Tuesday, January 02, 2018 11:05:01 AM
Attachments: image003.png
image005.png
image006.png
image008.png

Good morning gentlemen,

I have received your notice of study commencement for this project.

I would like to be continually informed of the project status during the EA process and of any public meetings, and/or recommendations.

I would like to know along the way if there will be any affects of this proposed project and/or recommendations coming out of the study that will affect the existing agreement between the City of Windsor and LaSalle for wastewater discharged. As you may know, LaSalle does not have any combined sewer, we are a completely separated system.

Regards,

Peter Marra, P.Eng.
Director of Public Works
Town of LaSalle

5950 Malden Road, LaSalle, Ontario N9H 1S4
Phone: 519-969-7770 ext. 1475 Fax: 519-969-4469
Email: pmarra@lasalle.ca
www.lasalle.ca

Visit Us On Social Media:

APPENDIX C

Phase 1 and Phase 2 Consultation

- Copy of Open House # 1 Advertisement published on April 14, 2018

- List of Open House # 1attendees and responses

- 1st Open House Display

- Distribution list and letter dated April 20, 2018 distributing Phase 1 & 2 consultation material to review agencies

- Information handout and responses

NOTICES

LEGALS & TENDERS NOTICES

LEGALS & TENDERS NOTICES

THE CITY OF WINDSOR
ONTARIO, CANADA

TENDER NO. 42-18 DEVON ROAD REHABILITATION – PHASE II: Closing TUESDAY, MAY 1, 2018.

TENDER NO. 66-18 MCDOUGALL STREET PAVEMENT REHABILITATION: Closing FRIDAY, MAY 4, 2018.

TENDER NO. 84-18 FULL SIZE, 3/4 TON CARGO VANS: Closing MONDAY, APRIL 30, 2018.

PREQUALIFICATION NO. 85-18 TRAFFIC SIGNAL/ATMS FIBRE OPTIC CABLE INSTALLATION AND INTEGRATION: Closing WEDNESDAY, MAY 2, 2018.

TENDER NO. 88-18 UTILITY VEHICLES: Closing MONDAY, APRIL 30, 2018.

Tenders/Proposals, will be received at Purchasing up to and including ELEVEN-THIRTY FIFTY-NINE (11:30:59) A.M. (E.D.T.), on their closing date.

For further information visit www.citywindsor.ca or www.biddingo.com/windsor.

C1495131

THE CITY OF WINDSOR
ONTARIO, CANADA

NOTICE OF PUBLIC INFORMATION CENTRE
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

The City of Windsor has initiated a Municipal Class Environmental Assessment (Class EA) to investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station (CMHWPS) at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP).The Class EA will also include revisiting wet weather flow conditions at the LRWRP to determine if any CSO control alternatives may also help to alleviate wet weather flows at the plant. Alternative means of providing CSO control in the study area is being assessed to meet the requirements set out in Ministry of Environment and Climate Change Guidelines "Procedure F-5-5". A variety of potential CSO control options will be assessed to select the preferred option. The preferred option will then be further refined with an evaluation of alternative design concepts leading to selection of a recommended design.

This project is being planned as a **Schedule C** undertaking following the provisions of the **Municipal Class Environmental Assessment** document, June 2000. A public Open House is planned to provide further information to the public on the proposal and to receive input and comment from interested persons:

Open House
Thursday, April 19, 2018
3:00 p.m. to 7:00 p.m.
Mackenzie Hall Cultural Centre
3277 Sandwich Street West
Windsor, Ontario

The public is invited to attend the Open House and submit comments related to this project in order that any concerns can be taken into account and addressed in the Environmental Study Report. When preliminary comments have been received and a preferred alternative solution determined, the public will have additional opportunities for participation in the project.

Further information may be obtained from the Consulting Engineer, Stantec Consulting Ltd. or the City of Windsor.

City of Windsor
4155 Ojibway Parkway
Windsor, Ontario N9C 4A5
Tel. (519) 253-7217
Fax (519) 253-0464
ATTN: Mr. Ed Valdez, P. Eng.
Manager of Process Engineering & Maintenance

Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON N8X 1L9
Tel. (519) 966-2250
Fax (519) 966-5523
ATTN: Dr. Jian Li, P. Eng.
Consultant Project Manager

C1494269

The classic Fleetwood Mac lineup included drummer Mick Fleetwood, left, vocalist Stevie Nicks, guitarist Lindsey Buckingham, keyboardist Christine McVie and bass player John McVie.

COMMENT

The Buckingham stops here

Former Fleetwood Mac frontman has turbulent history with women and band

TRAVIS M. ANDREWS

It's rare for Fleetwood Mac — formed in 1967 — to make headlines in 2018. The news that Lindsey Buckingham reportedly was fired shook the rock community.

There's little question the iconic band is losing a visionary musician in Buckingham. As pop culture re-examines its heroes, it's important to remember that the guitarist and songwriter's personal reputation is littered with allegations of controlling, belittling and abusive behaviour.

Rock 'n' roll is often steeped in mythology, so, like any stories about the genre, it comes down to who you choose to believe: the camp that thinks Buckingham is a misunderstood genius or the camp that believes he's a jerk.

Many of the stories concerning Buckingham come from former romantic partners. Buckingham and fellow band member Stevie Nicks might be the most famous star-crossed lovers since Romeo and Juliet, only their story ends with them playing in the same rock band and singing songs about each other. The dissolution of their years-long relationship added creative fuel to the writing and recording of 1977's Rumours, Fleetwood Mac's most successful album.

But tension existed between the two long before the breakup. The young lovers released a single, eponymous album as Buckingham Nicks two years before joining Fleetwood Mac. The couple appeared nude on the album cover, something Nicks was highly uncomfortable with.

The studio said it wanted a sexy cover, so Nicks "with her last hundred dollars bought a loose, filmy white blouse that exposed a little skin, figuring that would do it," according to her biography, Gold Dust Woman by Stephen Davis.

It wasn't sexual enough for the photographer, who asked her to remove it and bare her breasts for the camera. Nicks protested, calling herself a prude and saying her family wouldn't approve. The photographer pushed and Buckingham eventually snapped at Nicks, according to the book.

"Don't be a f--king child!" Buckingham yelled. "This is art!"

Eventually, feeling "trapped," Nicks removed her shirt and bra for the shoot. Nicks felt "mortified" by the cover, particularly when it hit shelves in 1973 and her father disapproved. She almost quit music at the age of 25.

"From the beginning, Lindsey was very controlling and very possessive," Nicks said in the biography.

Things didn't improve after their breakup. Buckingham wrote Go Your Own Way in 1976 about Nicks, even though Nicks had to help perform the song. The lyrics are full of vitriol, from the bluntly cruel ("Loving you isn't the right thing to do") to the character-questioning ("Packing up, shacking up's all you wanna do").

"I very, very much resented him telling the world that 'packing up, shacking up' with different men was all I wanted to do," Nicks told Rolling Stone. "He knew it wasn't true. It was just an angry thing he said. Every time those words would come out onstage, I wanted to go over and kill him. He knew it, so he really pushed my buttons through that. It was like, 'I'll make you suffer for leaving me.'"

Things grew worse. During a 1980 tour for Tusk, Buckingham allegedly mocked Nicks onstage, tried to trip her and attempted to kick her. Bandmate Christine McVie was furious. She found Buckingham after the show and hit him.

"I think he's the only person I ever, ever slapped," McVie told Rolling Stone. "I actually might have chucked a glass of wine, too."

He later threw "a Les Paul (guitar) at Nicks's head during the show," McVie and Nicks told the magazine. While tension continued to grow, both Buckingham and Nicks said it fuelled their creativity.

"Relations with Lindsey are exactly as they have been since we broke up," Nicks told Rolling Stone in 1981. "He and I will always be antagonizing to each other, and we will always do things that will irritate each other, and we really know how to push each other's buttons. We know exactly what to say when we really want to throw a dagger in."

Also concerning are the stories Buckingham's next serious girlfriend, Carol Ann Harris, shared in her memoir, Storms: My Life with Lindsey Buckingham and Fleetwood Mac. In one, Harris hung out with the band's crew members only to discover that a jealous Buckingham had ordered them not to talk to her. "And in their eyes I saw a sense of fear that I recognized — fear of Lindsey's anger. Nobody wanted to be the target of Lindsey's fury — and this I understood."

Throughout the book, Harris described in great detail Buckingham verbally and physically abusing her. In one instance, he "raised his arm and hit me hard enough to knock me off the staircase into the wall." In another, she wrote, he grabbed a fistful of her hair, got in a car and drove down the driveway, dragging her across the pavement.

Eventually, Harris said, a doctor told her she had to leave Buckingham for her own safety. So she did.

The Washington Post

Cycling couple embarking on the trip of a lifetime

KELLY GERALDINE MALONE

WINNIPEG A Winnipeg couple planning the trip of a lifetime realized they would need some help along the way, so they put up an online advertisement looking for a very specific person — a qualified caregiver with a serious love for cycling.

Jill Oakes, 66, sat down at her computer and thought about how to best explain the job: A four-month-long bicycle trip with her 76-year-old husband Rick Riewe, a retired senior biologist with Parkinson's disease.

Oakes typed into the Kijiji ad, "Duties include: helping wife monitoring external catheter or Depends; taking care of personal hygiene and dressing; keeping a watch out for safety," and the caregiver should have experience working with seniors, a health-care aid certificate, love cycling and have experience camping.

"It looks like we have several people who would like to come either for a month or two, or the full four months," Oakes said with a beaming smile.

Parkinson's is a neurodegenerative disease where the cells that produce dopamine, a chemical that carries signals between the nerves in the brain, start to die. Symptoms include tremors, stiffness, problems with balance and, as it progresses, cognitive changes.

Riewe was diagnosed in 2013 and his doctors suggested cycling could reduce symptoms.

"When I found out I had Parkinson's, I decided I better get off my backside and start exercising," Riewe said.

Cycling at a high rate of speed pushes information from the muscles Riewe is using to the brain, which triggers the release of neurotrophic factors.

"There's synapses between the cells and new pathways get formed. Just like when you wreck your ankle and you get new tendons sewn in from somewhere else, the brain has to tell that tendon to do something else," Oakes said.

They started biking together daily and it made a big difference. Not only was Riewe more mobile after a good ride, but his speech improved.

He could chat about his time as a professor and reminisce about the years the couple spent working with the Inuit to help select lands that would eventually become Nunavut.

They biked all winter and each summer they would do a longer trip, along the California coast or through British Columbia. As Riewe's balance started to fail, he moved to a special adult tricycle. For the upcoming trip, they will be using a tandem tricycle.

They realized it was time to go big — this trip could be their last.

Starting in Winnipeg in May, they plotted a path south along backroads to North Dakota, then to South Dakota and the Black Hills, a mountain range that stretches into Wyoming.

"There's a whole bunch of stuff we can't do anymore, I don't even go there anymore. That doesn't help at all," Oakes said. "But there is so much that we can do."

The Canadian Press

CITY OF WINDSOR
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

OPEN HOUSE
Mackenzie Hall Cultural Centre
April 19, 2018 – 3:00 p.m. to 7:00 p.m.
SIGN-IN SHEET

No.	Name (Please Print)	Address	Telephone Number
1	MIKE CARDINAL	2285 RIVERSIDE DR-W	519-818-6453
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE CLASS ENVIORNMENTAL ASSESSMENT

PHASE 1 & 2 PUBLIC OPEN HOUSE

You are invited to provide comments about the proposed undertaking to install CSO treatment facilities to control combined sewer overflows (CSOs) in the Windsor Riverfront area west of Caron Avenue. The Phase 1 & 2 Class Environmental Assessment Report Draft describes the need to control CSOs and reviews potential alternative means for achieving the necessary controls. Input from this public Open House and from review agencies will be included in the evaluation process to select the preferred alternative and to finalize the Phase 1 & 2 report. Thereafter, a separate Phase 3 report will be prepared to evaluate alternative designs. Another public open house will be held during Phase 3 to solicit public input in selecting the preferred design for the chosen alternative.

Copies of the Draft Phase 1 & 2 Report are available on USB. Hard copies of the report can be made available for review upon request.

Please return your completed questionnaire on or before May 17, 2018 to:

Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON
N8X 1L9
Attention: Dr. Jian Li, P. Eng.

COMMENTS OR CONCERNS:

IT IS SMART AND RESPONSIBLE TO DO AS MUCH AS POSSIBLE, AS SOON AS POSSIBLE TO PROTECT THE RIVER FROM CSO OVERFLOWS.

(Attach additional sheets if needed)

NAME MIKE CARDINAL

ADDRESS 2285 RIVERSIDE DR. W

TELEPHONE NO. ( ) 519 818 6453

FAX NO. (IF ANY) ( )

AFFILIATION OR GROUP (IF ANY)

DATE 19/4/2018 SIGNATURE

Mr. Richard Wyma
General Manager
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex, ON N8M 1Y6

Mr. Tim Byrne Director,
Watershed Management Services
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex, ON N8M 1Y6

Mr. John Henderson
Water Resources Engineer
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex, ON N8M 1Y6

Mr. Michael Nelson
Watershed Planner
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex, ON N8M 1Y6

Chief Bruce Krauter
Chief
Essex-Windsor EMS
360 Fairview Ave West
Essex, ON N8M 1Y6

Mr. Dean Wilkinson
Deputy Chief
Essex-Windsor EMS
920 Mercer Street
Windsor, ON N9A 1N6

Mr. Barry Horrobin
Director of Planning & Physical Resources
Windsor Police Service
150 Goyeau Street, PO Box 60
Windsor, ON N9A 6J5

Fire Chief Stephen Laforet
Fire Chief
Windsor Fire and Rescue
815 Goyeau Street
Windsor, ON N9A 1H7

Mr. Doug Gooding
Deputy Chief of Operations
Windsor Fire and Rescue
815 Goyeau Street
Windsor, ON N9A 1H7

Mr. Beth Krauter
Central Ambulance Communications Centre
4510 Rhodes Drive, Suite 320
Windsor, ON N8W 5K5

Sgt. Rick Tonial Detachment Commander
Ontario Provincial Police
963 Lesperance Road
Tecumseh, ON N8N 1W9

Staff Sgt Ed Marocko
Ontario Provincial Police
1219 Hicks Road, PO Box 910
Essex, ON N8M 2Y2

Ms. Larry Horwitz
Operations Manager
Downtown Windsor Business Improvement Association
419 Pelissier St.
Windsor, ON N9A 4L2

Mr. Matt Marchand
President & CEO
Windsor-Essex Regional Chamber of Commerce
2575 Ouellette Place
Windsor, ON N8X 1L9

Mr. Brent Groves
Coordinator
Essex County Stewardship Network
870 Richmond Street West, PO Box 1168
Windsor, ON N7M 5L8

Mr. Derek Coronardo
Coordinator
Citizens Environmental Alliance of Southwestern Ontario
1950 Ottawa Street
Windsor, ON N8Y 1R7

Ms. Lisa Tulen
President
Citizens Environmental Alliance
of Southwestern Ontario
1950 Ottawa Street
Windsor, ON N8Y 1R7

Mr. Paul Pratt
Vice-President
Essex County Field Naturalist's Club
C/O Ojibway Nature Centre
5200 Matchette Road
Windsor, ON N9C 4E8

Mr. Jesse Gardner Costa
President
Essex County Field Naturalist's Club
5200 Matchette Road
Windsor, ON N9C 4E8

Ms. Melanie Coulter
Detroit River Canadian Cleanup
360 Fairview Avenue West, Suite 311
Windsor, ON N8M 1Y6

Mr. Tom Henderson
Detroit River Canadian Cleanup
360 Fairview Avenue West, Suite 311
Windsor, ON N8M 1Y6

Ms. Averil Parent
Coordinator
Windsor Essex Environment Committee
c/o 350 city hall square west
Windsor, ON N9A 6S1

Mr. Marvio Vinhaes
Director, Engineering
ENWIN Utilities
787 Ouellette Avenue, PO Box 1625 Stn A
Windsor, ON N9A 5T7

Mr. Randy Matis
Bell Canada
1149 Goyeau Street, PO Box 1601
Windsor, ON N9A 1H9

Mr. David Cowing
Coordinator
Bell Canada
1149 Goyeau Street, PO Box 1601
Windsor, ON N9A 1H9

Mr. Clifford Trepanier
Bell Canada
1149 Goyeau Street, PO Box 1601
Windsor, ON N9A 1H9

Mr. Tyson Fuerth
Bell Canada
1149 Goyeau Street, PO Box 1601
Windsor, ON N9A 1H9

Mr. Bill Sorrell
Cogeco Cable Services
2225 Dougall Avenue
Windsor, ON N8X 5A7

Ms. Shirley Brundritt
Lands Support Analyst
Union Gas
50 Keil Drive North
Chatham, ON N7M 5M1

Mr. Stan Bulkiewicz
Operations Manager
Hydro One
125 Irwin Avenue
Essex, ON N8M 2T3

Mr. Paul Dockrill
Hydro One
P.O. Box 4300
Markham, ON L3R 5Z5

Ms. Susan Budden
Business Development Manager
Ontario Clean Water Agency
1 Yonge Street, Suite 1700
Toronto, Ontario M5E 1E5

Mr. Norbert Poggio
Director
Windsor Utilities Commission
4545 Rhodes Drive, PO Box 1625, Stn A
Windsor, ON N9A 5T7

Ms. Louise Knox
Regional Director
Environment Canada
55 St Clair Ave East, 9th Floor
Toronto, ON M4T 1M2

Mr. Rob Dobos
Environment Canada, Ontario Region
867 Lakeshore Road, P.O. Box 5050
Burlington, ON L7R 4A6

Mr. Ralph Jessup
Environment Canada, Ontario Region
4905 Dufferin Street
Downsview. ON M3H 5T4

Mr. John Shaw
Manager
Great Lakes Sustainability Fund
867 Lakeshore Road, PO Box 5050
Burlington, ON L7R 4A6

Superintendent
Canadian Coast Guard
201 North Front Street, Suite 703
Sarnia, ON N7T 8B1

Referrals Coordinator
Fisheries and Oceans Canada
867 Lakeshore Road
Burlington, ON L7R 4A6

Ms. Christine Simard
Administrative Assistant
Fisheries and Oceans Canada
201 North Front Street, Suite 703
Sarnia, ON N7T 8B1

Ms. Sara Eddy
Fish Habitat Biologist
Fisheries and Oceans Canada –
Central and Arctic Region
867 Lakeshore Road, PO Box 5050
Burlington, ON L7R 4A6

Mr. David Cree
President & CEO
Windsor Port Authority
3190 Sandwich Street
Windsor, ON N9C 1A6

Environmental Coordinator
Transport Canada – Ontario Region
4900 Yonge Street, 4th Floor (PHE)
Toronto, ON 2N 6A5

Mr. Neil Harris
Heritage Planner / Archeologist
Ministry of Culture
900 Highbury Avenue
London, ON M5Y 1A4

Ms. Karla Barboza
Ministry of Tourism, Culture and Sport
401 Bay Street, Suite 1700
Toronto, ON M7A 0A7

Ms. Suzanne Shea
Transport Canada Marine
100 Front Street South
Sarnia, ON N7T 2M4

Mr. Vince Diano
Manager of Procurement
Windsor-Detroit Bridge Authority
100 Ouellette Ave, Suite 400
Windsor, ON N9A 6T3

Mr. Darren Winger
Regional Advisor
Ministry of Citizenship,
Immigration & International Trade /
Ministry of Tourism, Culture & Sport
221 Mill Street
Windsor, ON N9C 2R1

Mr. Joseph Muller
Heritage Planner
Ministry of Tourism, Culture and Sport
401 Bay Street, Suite 1700
Toronto, ON M7A 0A7

Mr. Joseph Muller
Heritage Planner
Ministry of Tourism, Culture and Sport
401 Bay Street, Suite 1700
Toronto, ON M7A 0A7

Ms. Maya Harris
Manager (Acting) - Growth, Planning, and Analysis
Ministry of Economic Development, Employment
and Infrastructure
777 Bay Street, 4th Floor, Suite 425
Toronto, ON M5G 2E5

Ms. Annamaria Cross
Manager of Environmental Assessment Services
Ministry of the Environment and Climate Change
1st Flr, 135 St Clair Ave W, Toronto, ON M4V 1P5
Toronto, ON M4V 1P5

Mr. Mark Smith
Supervisor
Ministry of the Environment and Climate Change
4510 Rhodes Drive, Unit 620
Windsor, ON N8W 5K5

Mr. Scott Abernethy
Surface Water Evaluator/Team Leader
Ministry of the Environment and Climate Change
733 Exeter Road
London, ON N6E 1L3

Mr. Craig Newton
Regional Environmental Planner/EA
Ministry of the Environment and Climate Change
733 Exeter Road
London, ON N6E 1L3

Ms. Carolyn O'Neill
Manager
Ministry of the Environment and Climate Change
Foster Bldg 10th Floor, 40 St Clair Ave W
Toronto, ON M4V 1M2

Mr. Ken Yaraskavitch
Supervisor
Ontario Ministry of Natural Resources
870 Richmond Street, P.O. Box 910
Chatham, ON N7M 5L3

Mr. Stephen Douglas
District Planner
Ministry of Natural Resources and Forestry
615 John Street North
Aylmer, ON N5H 2S8

Ms. Sherry Pineo
Resources Management Supervisor
Ministry of Natural Resources and Forestry
615 John Street North
Aylmer, ON N5H 2S8

Ms. Amanda McCloskey
District Planner
Ministry of Natural Resources and Forestry
615 John Street North
Aylmer, ON N5H 2S8

Ms. Marion-Frances Cabral
Planner - Community Planning and Development
Ministry of Municipal Affairs and Housing
659 Exeter Road, 2nd Floor
London, ON N6E 1L3

Mr. Bruce Curtis
Manager
Ministry of Municipal Affairs and Housing
659 Exeter Road, 2nd Floor
London, ON N6E 1L3

Ms. Tammie Ryall
Planner
Community Planning and Development
Ministry of Municipal Affairs and Housing
659 Exeter Road, 2nd Floor
London, ON N6E 1L3

Mr. John Maddox
Manager
Ministry of Municipal Affairs and Housing
659 Exeter Road, 2nd Floor
London, ON N6E 1L3

Mr. Dwayne Evans
Rural Planner
Ontario Ministy of Agriculture & Food
667 Exeter Road
London, ON N6E 1L3

Mr. Jim Founk
Regional Information Coordinator
Ontario Ministy of Agriculture & Food
P.O. Box 400
Ridgetown, ON N0P 1A0

Ms. Donna Mundie
Land Use Policy Specialist Resources
Ontario Ministy of Agriculture & Food
1 Stone Road West
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Mr. Kevin Bentley
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Mr. Bill King
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LaSalle, Ontario N9H 1S4

Ms. Antonietta Giofu
Director of Engineering & Public Works
Town of Amherstburg
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Mr. Phil Bartnik
Manager Engineering Services
Town of Tecumseh
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Ms. Leslie Brewer-Palhazi
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Ms. Allison Berman
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Mr. Corwin Troje
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Ms. Janet MacBeth
Project Review Coordinator
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Ms. Nikki Orosz
Acting Director of Operations
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Chief
Aamjiwnaang First Nation
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Ms. Sharilyn Johnston
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Political Chief
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Southwold, ON N0L 2G0

Ms. Catherine
Cornellus Assistant
Onelda Nation of the Thames ONYOTA'A:KA
2212 Elm Avenue
Southwold, ON N0L 2G0

Sir/Madam
Métis Nation of Ontario
500 Old St. Patrick Street,Unit 3
Ottawa, ON K1N 9G4

Sir / Madam
Municipal Property Assessment Corporation
1695 Manning Road Unit 195
Tecumseh, ON N8N 2L9

Essex Terminal Railway Company
1601 Lincoln Road
Windsor, ON
N8Y 2J3

Stantec

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

April 20, 2018
File: 165620132

Attention:

Dear ,

Reference: **Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor**

We are in the process of the Phase 1 & 2 Class Environmental Assessment (EA)to identify the need and evaluate potential alternative solutions for achieving the necessary control of combined sewer overflow (CSO) along the Windsor Riverfront area west of Caron Avenue as well as wet weather flow received at the LRWRP. A public open house has been held on April 19, 2019 to provide information on the Phase 1 & 2 Class EA and to solicit public input. The objective is to identify the problem and finalize the preferred alternative, so the Phase 1 and Phase 2 study can be completed. A copy of the first open house display posters and handout material is attached.

On behalf of the City of Windsor, we are inviting you to provide comments about the Phase 1 & 2 Class EA. Inputs from the public and review agencies will be included to select the preferred alternative solution. Thereafter, we will be moving forward into the Phase 3 and Phase 4 Class EA. Alternative designs for CSO, wet weather flow storage and treatment facilities will be identified and evaluated to select the preferred design. Another public open house will be held during Phase 3 to solicit public input in selecting the preferred design for the chosen alternative. An environmental study report (ESR) will then be prepared to document the activities and recommendations from the Class EA process.

A reply by June 6, 2018 would be appreciated so that we may consider your comments early in the design stage. A comment form is enclosed in the enclosed handout material to facilitate your inputs.

Sincerely,

STANTEC CONSULTING LTD.

Jian Li, Ph.D., P. Eng., PE
Project Manager
Phone: (519) 966-2250
Fax: (519) 966-5523
jiian.li@stantec.com

Attachment: 1st Open House Posters, Handout Material

c. Mr. Ed Valdez, Manager of Process Engineering & Maintenance, City of Windsor

Stantec

Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Class Environmental Assessment

Phase 1 & 2 Public Consultation

OPEN HOUSE

Thursday, April 19, 2018
3:00 p.m.– 7:00 p.m.

Mackenzie Hall Cultural Centre
3277 Sandwich Street West
Windsor, Ontario

Prepared for:

The City of Windsor

Prepared by:

Stantec Consulting Ltd.
Windsor, Ontario

165620132

April 19, 2018

PHASE 1 & 2 PUBLIC OPEN HOUSE

BACKGROUND

Some areas in the City of Windsor, are serviced by a combined sewer system, which is typical with older areas in most cities,. A combined sewer system is a wastewater collection system that conveys a mixture of municipal wastewater and stormwater runoff through a single-pipe system and transfer it to a wastewater treatment plant. During some wet weather events there is insufficient capacity to carry all of the flow to the wastewater treatment plant with the results being that the excess untreated flow is discharged directly to the river. This is defined as a combined sewer overflow (CSO).

The Windsor Riverfront Pollution Control Planning Study (PCP Study) was undertaken by the City to develop a pollution control strategy for the riverfront area of the City with the specific objective of reducing combined sewer overflows (CSOs) as well as the total pollutants being loaded into the Detroit River.

The preliminary alternatives identified in the CSO control consisted of tunnel storage and/or Retention Treatment Basins at various locations along the waterfront. In addition to CSO control the PCP Study identified other pollution control requirements including upgrading the C. M. H Woods Pumping Station (Pumping Station) as well as expanding and upgrading the Lou Romano Water Reclamation Plant (LRWRP) as secondary treatment.

Extensive progress has been made since completion of the PCP Study. Work at the Pumping Station has been completed as has the expansion and upgrading of the LRWRP. CSO control within the riverfront area east of the Pumping Station, has also been achieved through the provision of a CSO collector sewer, a CSO pumping station and a Retention Treatment Basin (RTB).

CLASS ENVIRONMENTAL ASSESSMENT

The City of Windsor, with funding assistance from the Federal Government through the Great Lakes Sustainability Fund, has initiated preparation of this Class Environmental Assessment and functional design report as the next step in implementing the Riverfront West CSO control program. This project is being planned as a Schedule C undertaking following the provisions of the Municipal Class Environmental Assessment process.

The purpose of this study will be to investigate and report on alternative means of controlling CSO in the riverfront area between the Pumping Station and the LRWRP and wet weather flows received at the LRWRP. The standards for controlling the

CSO is set out by the Ministry of the Environment and Climate Change in Procedure F-5-5.

An auxiliary but very important aspect of the work will be to determine if any of the CSO control alternatives can also be used to reduce water levels at the inlet chamber to the LRWRP during severe storm events. The Riverfront Interceptor Sewer and the Western Main Trunk Sewer meet at the inlet chamber in the plant. During severe storm events, these levels exceed the pumping capacity of the plant. This causes the water level in the Western Main Trunk Sewer to rise and could, potentially, lead to basement flooding. It would certainly be beneficial if any of the potential CSO control alternatives could also be used to alleviate the high-water conditions and reduce the potential for flooding in the areas served by the Western Main Trunk Sewer.

The following criteria is used to screen and evaluate alternative solutions

1. Social-Cultural Environment
    - Acceptable to the public
    - No increase in potential for basement flooding
    - No significant impacts on community features, archaeological site and heritage resources
2. Natural Environment
    - Consistent with City planning policies and, in particular, the implementation strategy and design guidelines set out in the Central Riverfront Implementation Plan (CRIP)
    - No significant impacts on vegetation, fish and wildlife, drainage, areas of natural and scientific interest, environmentally sensitive areas, and soils/geology.
3. Technical suitability and other engineering aspects
    - Constructability, phasing, level of service, security and reliability, climate change adaptation
    - NO impacts on existing infrastructure, operations and maintenance.
    - Satisfy CSO control requirements
4. Financial Costs

- Construction, operations, maintenance (lifecycle) costs and flexibility for scheduling the works.

Alternative Solutions for CSO collection and wet weather flow treatment considered in this study are as follows:

- Alternative 1: Do Nothing
- Alternative 2: Sewer Separation (storm – sanitary)
- Alternative 3: Pure Storage (underground/surface storage)
- Alternative 4: Treatment
- Alternative 5: Combination Storage and Treatment

Evaluation of these alternatives indicates that Alternative 5: Combination Storage and Treatment facilities offers several advantages as compared to the other alternatives and is therefore proposed as the preferred alternative solution.

Possible locations of CSO storage and treatment facilities:

1. A potential offsite location in the general area on the south side of Sandwich Street and Ojibway Pkwy intersection.
2. Inside the LRWRP.
3. City owned land along the riverfront

Provision of infrastructure to collect and carry CSO flows to the treatment and storage site(s). The alternatives include:

1. Installation of a new, “stand alone” CSO interceptor sewer that would be used exclusively for conveyance of CSO flows
2. Installation of a new CSO interceptor sewer to operate in conjunction with the existing riverfront interceptor sewer.

Locations of CSO storage and treatment facilities will be further evaluated and finalized in the Phase 3 study.

PHASE 1 & 2 PUBLIC OPEN HOUSE

FURTHER PLANNING

Once Phase 1 and Phase 2 of the Class Environmental Assessment have been fully completed, we will be moving forward into Phase 3 and Phase 4, planning and design requirements. Alternative designs for CSO, wet weather flow storage and treatment facilities will be identified and evaluated to select the preferred design. The design will be one that satisfies CSO, wet weather flow storage and treatment criteria as well as minimizes undesirable impacts on the natural, social and economic environment. All these criteria’s will need to be found as acceptable to the public and regulatory agencies.

Thereafter, a draft study report will be prepared to evaluate alternative designs. Another public open house will be held during Phase 3 to solicit public input in selecting the preferred design for the chosen alternative. At that time, copies of the draft study report will be distributed to mandatory contacts and review agencies. Feedback from review agencies and input gained through the public Open Houses will be included in the evaluation process which will lead to the selection of the preferred design.

THANK YOU

Thank you for your interest in this project and attendance at this open house.

COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE CLASS ENVIORNMENTAL ASSESSMENT

PHASE 1 & 2 PUBLIC OPEN HOUSE

You are invited to provide comments about the proposed alternative solutions for CSO control and wet weather flow treatment in the Windsor Riverfront area west of Caron Avenue. The Phase 1 & 2 Class Environmental Assessment identifies the need to control CSOs and reviews potential alternative means for achieving the necessary controls. Input from this public Open House and from review agencies will be included in the evaluation process to select the preferred alternative and to complete the Phase 1 & 2 study. Thereafter, we will be moving forward into Phase 3 and Phase 4 planning and design requirements. Alternative designs for CSO, wet weather flow storage and treatment facilities will be identified and evaluated to select the preferred design. Another public open house will be held during Phase 3 to solicit public input in selecting the preferred design for the chosen alternative. An environmental study report (ESR) will be prepared to document the activities and recommendations from the Class EA process.

Please return your completed questionnaire on or before June 6, 2018 to:

Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON
N8X 1L9
Attention: Dr. Jian Li, P. Eng.

COMMENTS OR CONCERNS: ____

____

____

____

____

(Attach additional sheets if needed)

NAME ____

ADDRESS ____

TELEPHONE NO. ( ) ____

FAX NO. (IF ANY) ( ) ____

AFFILIATION OR GROUP (IF ANY) ______________________________

DATE ______________________ SIGNATURE ______________________

City of Windsor

COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

PUBLIC OPEN HOUSE #1

WELCOME

Municipal Class Environmental Assessment

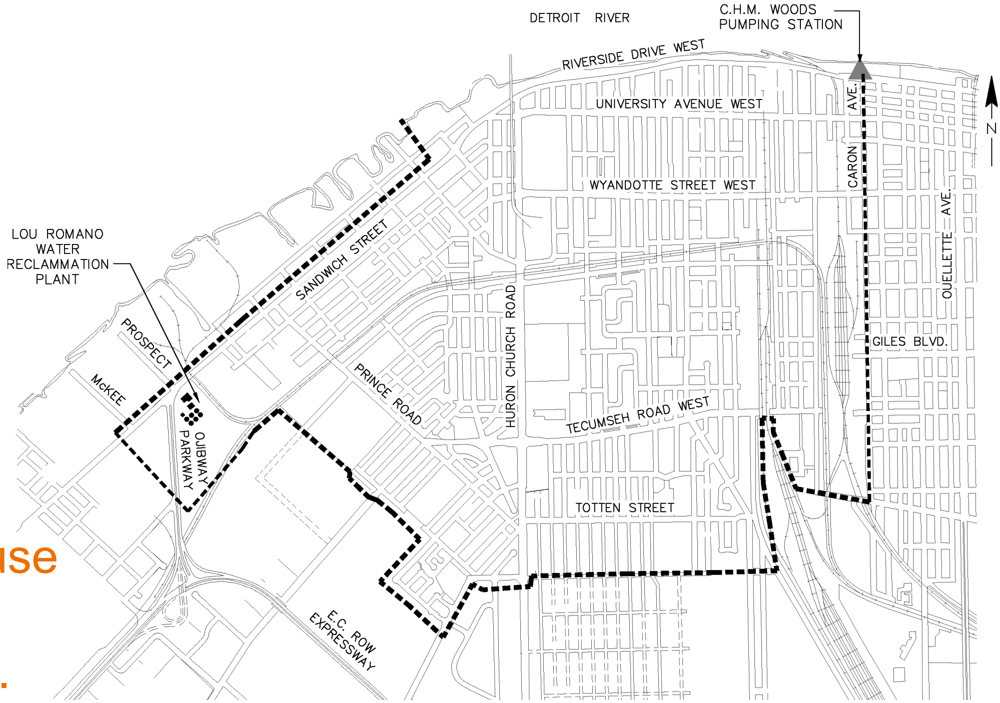
April 19, 2018

3:00pm -7:00pm

Study Overview

Purpose of this project is to

- *Investigate and report on the preferred means of controlling combined sewer overflows (CSOs) in the study area along the Riverfront lands extending from the C.M.H. Woods Pumping Station (CMHWPS) at Caron Avenue west to the Lou Romano Water Reclamation Plant (LRWRP)*
- *Revisit wet weather flow conditions at the LRWRP to determine if any CSO control alternatives may also help to alleviate wet weather flows at the LRWRP*



The purpose of this first Public Open House is to introduce the project, describe work completed to date, and obtain comments.

Background – Study Area

Riverfront Interceptor Sewer – Approx. 6 km long, conveys combined sewage flow to the LRWRP

- 13 Interceptor Chambers with CSOs to the Detroit River
- Designed to capture between 2.5 and 4 times dry weather flow

Western Main Trunk Sanitary Sewer conveys separate sewage flows to the LRWRP

- Sewer surcharged caused by excessive inflow and infiltration during wet weather periods

Problem Statement - Combined Sewer Overflows

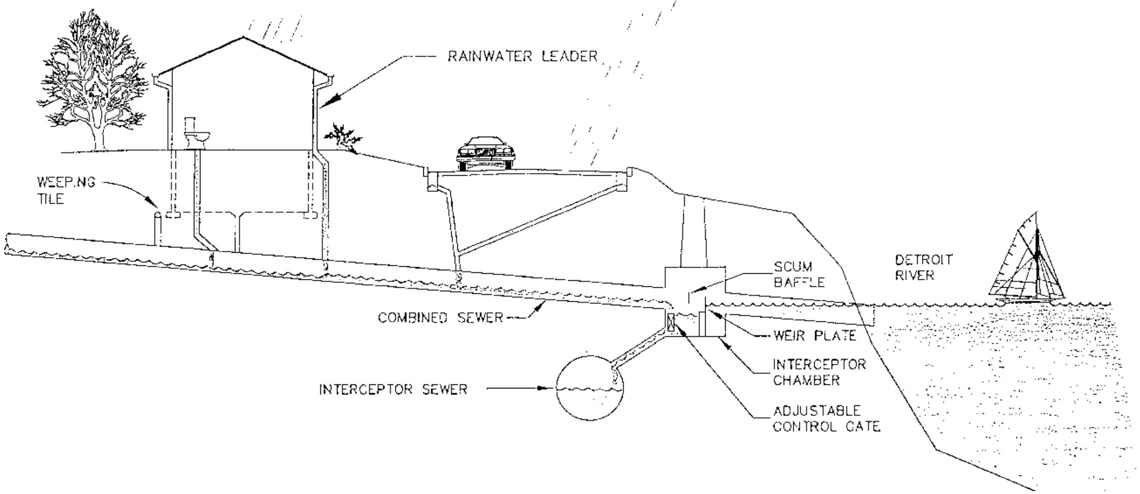
- **As with many cities in North America, the older areas of the City of Windsor are serviced by Combined Sewer Systems**

- **Combined sewer systems convey a mixture of municipal wastewater and storm water through a single pipe system to a wastewater treatment plant.**

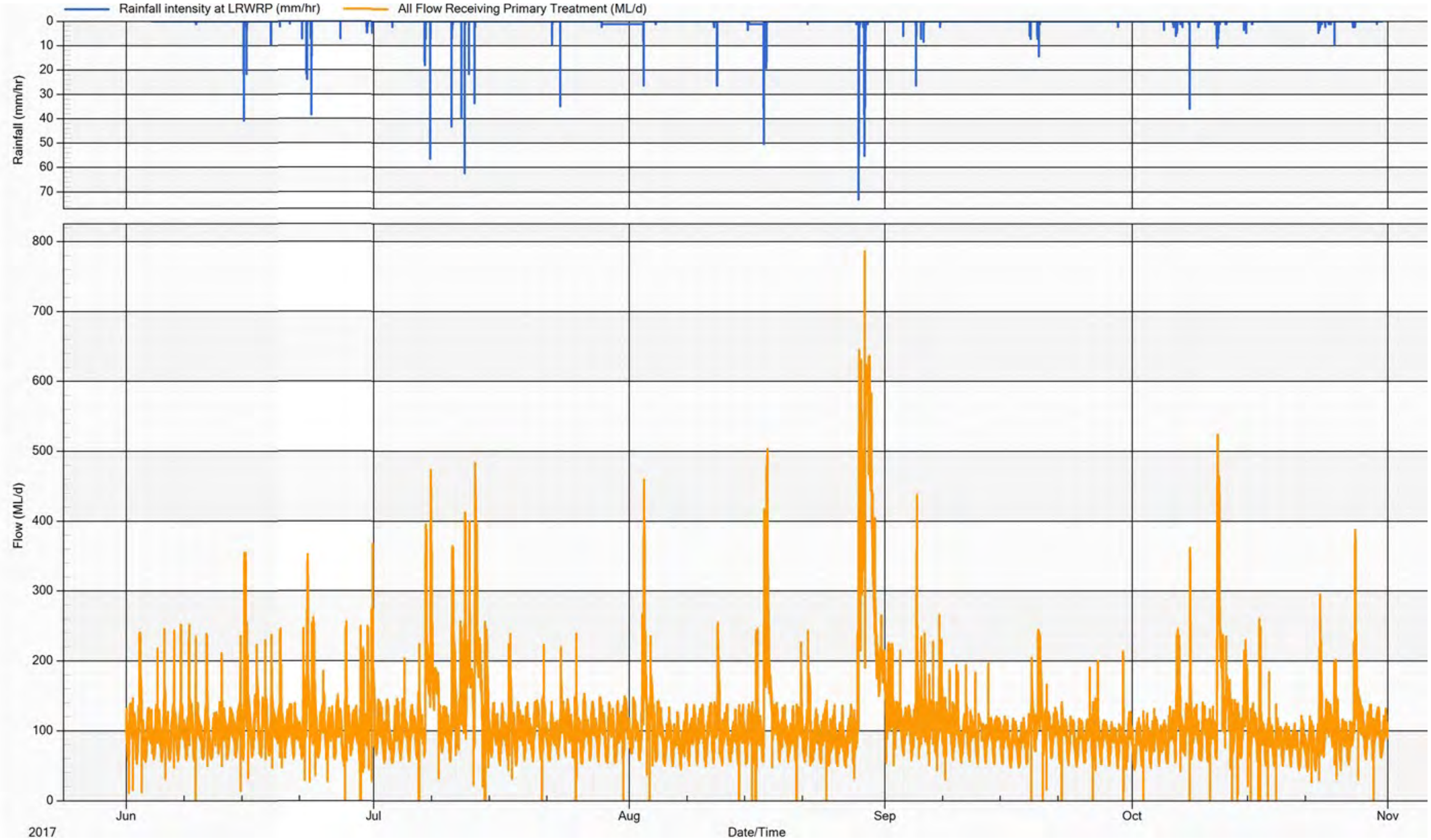
- **During wet weather events, there may be insufficient capacity to convey all the flow to the treatment plant and/or there may be insufficient treatment capacity at the plant**

- **This results in the excess flows being discharged directly into the Detroit River. Untreated flows are referred to as Combined Sewer Overflows (CSOs).**

Typical Combined Sewer System



Problem Statement – Wet Weather Flows



Graph Showing Rainfall Amounts and Sewage Flows Received at the LRWRP

- **Frequently experiences periods of high flow for extended durations during storm events**
- **Very high levels of rainwater entering City's sanitary sewer system**

Average Dry Daily flow 92 MLD, Maximum Wet Weather Daily flow 786 MLD
Peak Factor 8.5

Problem Statement

- CSO's are a significant source of pollution in the Detroit River and the Great Lakes leading to environmental degradation.

- The Detroit River is identified by the Canada and United States International Joint Commission on Great Lakes Water Quality (IJC) as an area of concern (AOC) in the Great Lakes basin.

- Frequently experiences periods of high infiltration and inflow (I/I) entering sanitary sewer system during storm events.

- Capacity of existing sewers, pumping station and treatment plant unable to accommodate handle all wet weather flows during severe storm events.

- Failure to have adequate infrastructure in place may result in the inability to accommodate community growth.

CSO Control Guidelines

MOECC PROCEDURE F-5-5

- **The Ontario Ministry of Environment and Climate Change (MOECC) publishes guidelines that outline the requirements for CSO control in Ontario under "PROCEDURE F-5-5" that includes:**
  - ➢ **Development of a Pollution Prevention and Control Plan**
  - ➢ **During a seven-month period commencing within 15 days of April 1, capture & treat for an average year all the dry weather flow plus 90% of the volume resulting from wet weather flow above the dry weather flow**
  - ➢ **Provide primary treatment or equivalent - i.e. – 50% total suspended solids (TSS) removal & 30% biochemical oxygen demand (BOD5) removal**
  - ➢ **TSS of the effluent not to exceed 90 mg/l for more than 50% of the time**

BACKGROUND

Windsor Pollution Control Planning (PCP) Study

- To address CSO concern, the City of Windsor developed and implemented a long-term pollution control strategy with the specific objective of reducing CSOs and total pollutant loadings into the Detroit River.

- 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

Main Components in Long Term CSO Control Plan

1. **Increase pumping capacity at the Caron Avenue Pumping Station - Completed**
2. **Add primary clarifiers at the LRWRP to treat wet weather flows - Completed**

3. **Provide retention treatment basin (RTB) to control CSOs in the area east of Caron Avenue**
   - **Completed**

4. **Provide tunnel storage (or possibly RTB's) west of Caron Avenue**
   - **EA process underway to identify preferred option for control of CSO in the area west of Caron Avenue as well as wet weather flows at the LRWRP**

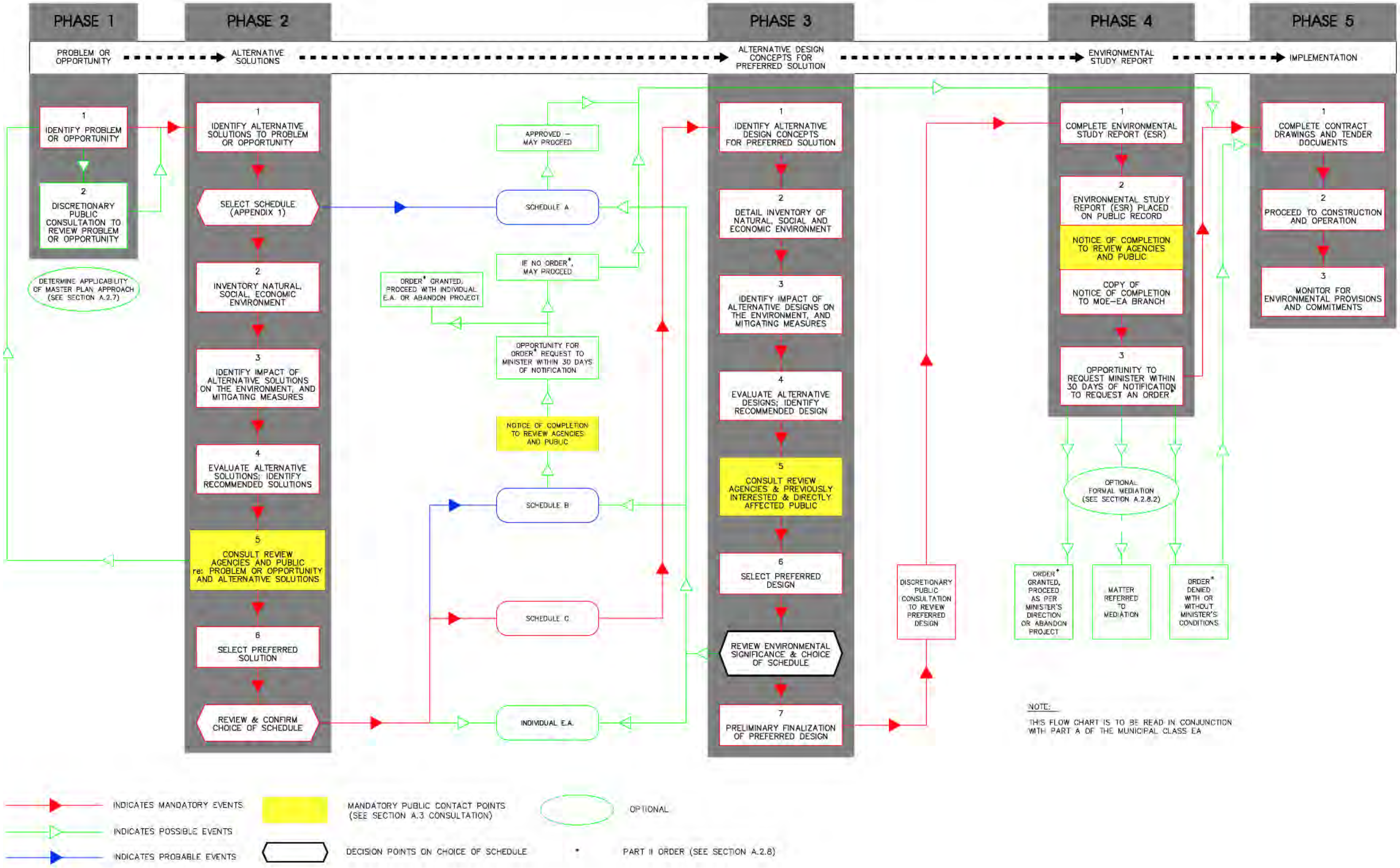
KEY FEATURES OF THE CLASS EA PROCESS

The project is being conducted in accordance with the Class EA requirements for Schedule “C projects”, which is to be approved subject to completion of Phase 1, 2, 3, 4 and 5 Class EA, including:

- *Phase 1 – Review and identify problem or opportunity*
- *Phase 2 – Alternative solutions to problem*
- *Phase 3 – Alternative design concepts for the preferred solution*
- *Phase 4 – Environmental Study Report*
- *Phase 5 – Implementation of the preferred design*

This open house is held as part of the above Phases 1 and 2

OVERVIEW OF THE CLASS ENVIRONMENTAL ASSESSMENT PROCESS



PHASE 1

PROBLEM OR OPPORTUNITY

1 IDENTIFY PROBLEM OR OPPORTUNITY

2 DISCRETIONARY PUBLIC CONSULTATION TO REVIEW PROBLEM OR OPPORTUNITY

DETERMINE APPLICABILITY OF MASTER PLAN APPROACH (SEE SECTION A.2.7)

PHASE 2

ALTERNATIVE SOLUTIONS

1 IDENTIFY ALTERNATIVE SOLUTIONS TO PROBLEM OR OPPORTUNITY

SELECT SCHEDULE (APPENDIX 1)

2 INVENTORY NATURAL, SOCIAL, ECONOMIC ENVIRONMENT

3 IDENTIFY IMPACT OF ALTERNATIVE SOLUTIONS ON THE ENVIRONMENT, AND MITIGATING MEASURES

4 EVALUATE ALTERNATIVE SOLUTIONS; IDENTIFY RECOMMENDED SOLUTIONS

5 CONSULT REVIEW AGENCIES AND PUBLIC re: PROBLEM OR OPPORTUNITY AND ALTERNATIVE SOLUTIONS

6 SELECT PREFERRED SOLUTION

REVIEW & CONFIRM CHOICE OF SCHEDULE

APPROVED – MAY PROCEED

SCHEDULE A

IF NO ORDER*, MAY PROCEED

ORDER* GRANTED, PROCEED WITH INDIVIDUAL E.A. OR ABANDON PROJECT

OPPORTUNITY FOR ORDER* REQUEST TO MINISTER WITHIN 30 DAYS OF NOTIFICATION

NOTICE OF COMPLETION TO REVIEW AGENCIES AND PUBLIC

SCHEDULE B

SCHEDULE C

INDIVIDUAL E.A.

PHASE 3

ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION

1 IDENTIFY ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION

2 DETAIL INVENTORY OF NATURAL, SOCIAL AND ECONOMIC ENVIRONMENT

3 IDENTIFY IMPACT OF ALTERNATIVE DESIGNS ON THE ENVIRONMENT, AND MITIGATING MEASURES

4 EVALUATE ALTERNATIVE DESIGNS; IDENTIFY RECOMMENDED DESIGN

5 CONSULT REVIEW AGENCIES & PREVIOUSLY INTERESTED & DIRECTLY AFFECTED PUBLIC

6 SELECT PREFERRED DESIGN

REVIEW ENVIRONMENTAL SIGNIFICANCE & CHOICE OF SCHEDULE

7 PRELIMINARY FINALIZATION OF PREFERRED DESIGN

DISCRETIONARY PUBLIC CONSULTATION TO REVIEW PREFERRED DESIGN

PHASE 4

ENVIRONMENTAL STUDY REPORT

1 COMPLETE ENVIRONMENTAL STUDY REPORT (ESR)

2 ENVIRONMENTAL STUDY REPORT (ESR) PLACED ON PUBLIC RECORD

NOTICE OF COMPLETION TO REVIEW AGENCIES AND PUBLIC

COPY OF NOTICE OF COMPLETION TO MOE–EA BRANCH

3 OPPORTUNITY TO REQUEST MINISTER WITHIN 30 DAYS OF NOTIFICATION TO REQUEST AN ORDER*

OPTIONAL FORMAL MEDIATION (SEE SECTION A.2.8.2)

ORDER* GRANTED, PROCEED AS PER MINISTER'S DIRECTION OR ABANDON PROJECT

MATTER REFERRED TO MEDIATION

ORDER* DENIED WITH OR WITHOUT MINISTER'S CONDITIONS

PHASE 5

IMPLEMENTATION

1 COMPLETE CONTRACT DRAWINGS AND TENDER DOCUMENTS

2 PROCEED TO CONSTRUCTION AND OPERATION

3 MONITOR FOR ENVIRONMENTAL PROVISIONS AND COMMITMENTS

NOTE:

THIS FLOW CHART IS TO BE READ IN CONJUNCTION WITH PART A OF THE MUNICIPAL CLASS EA

🟥 ▶	INDICATES MANDATORY EVENTS
🟩 ▷	INDICATES POSSIBLE EVENTS
🟦 ▶	INDICATES PROBABLE EVENTS
🟨	MANDATORY PUBLIC CONTACT POINTS (SEE SECTION A.3 CONSULTATION)
⬭	DECISION POINTS ON CHOICE OF SCHEDULE
○	OPTIONAL
*	PART II ORDER (SEE SECTION A.2.8)

Evaluation Criteria

Component	Evaluation Criteria
Social-Cultural Environment	• Acceptable to the public • No increase in potential for basement flooding • No significant impacts on community features, archaeological site and heritage resources
Natural Environment	• Consistent with City planning policies and, in particular, the implementation strategy and design guidelines set out in the Central Riverfront Implementation Plan (CRIP) • No significant impacts on vegetation, fish and wildlife, drainage, areas of natural and scientific interest, environmentally sensitive areas, and soils/geology.
Technical suitability and other engineering aspects	• Constructability, phasing, level of service, security and reliability, climate change adaptation • No adverse impacts on existing infrastructure and operations and maintenance. • Satisfy CSO control requirements
Financial Costs	• Construction, operations, and maintenance (lifecycle) costs and flexibility for scheduling the works.

Identification of Alternative Solutions

Alternative Solutions for CSO collection and wet weather flow treatment considered in this phase are as follows:

- Alternative 1: Do Nothing
- Alternative 2: Sewer Separation (sanitary – storm)
- Alternative 3: Pure Storage (underground/surface storage)
- Alternative 4: Treatment
- Alternative 5: Combination Storage and Treatment

Screening of Alternatives

ALTERNATE	SCREENING RESULT
Alternative 1: Do Nothing	Not Carried Forward since it clearly does not meet CSO control requirements.
Alternative 2: Sewer Separation	Not Carried Forward due to significant cost and impact on the public
Alternative 3: Pure Storage (underground/surface storage)	Not Carried Forward due to significant cost and large foot print required
Alternative 4: Treatment	Not Carried Forward due to very significant cost
Alternative 5: Combination Storage and Treatment	Carried forward to detailed evaluation

Storage and Treatment Facility Locations

Treatment and storage facilities to be located at City Owned Lands in the riverfront or/and adjacent to the Lou Romano Water Reclamation Plant.

Preferred locations to be identified based on social, cultural, natural heritage, technical, and financial factors.

Future Class EA Work

Complete Phase 3 and 4 Class EA

- Review alternative designs for CSO and wet weather flow storage and treatment facilities
- Select the preferred design, which is one that satisfies CSO and wet weather flow storage and treatment criteria, minimizes undesirable impacts on the natural, social and economic environment, and is acceptable to the public and regulatory agencies
- Prepare Environmental Study Report (ESR) documenting the activities and recommendations from the Class EA process.
- Complete ESR including all relevant input
- Place ESR on public record

From: Horrobin, Barry
To: Li, Jian
Subject: Windsor Police Input - Class Environmental Assessment for Combined Sewer Overflow Control: Riverfront area near Caron Avenue
Date: Tuesday, May 01, 2018 5:51:40 PM

Jian:

I recently received correspondence from you regarding the above noted project and wanted to express my gratitude that you included the Windsor Police Service in your circularizatuon of stakeholders for input.

I was not able to attend the recent public open house held on April 19, 2018 but have reviewed the relevant open house posters and handout documents and would advise as follows:

- The Windsor Police Service does not anticipate much in the way of discernible public safety impact from our perspective associated with this project. It is of a nature that is unlikely to create issues of significance that would impact public safety.
- The only issue I would raise at this time is that of physical site security once construction commences for this project. Proper measures will need to be in place to control trespassing and unplanned access by unauthorized individuals, particularly during off hours. In this regard, a security and incident response plan may be something worth preparing at the outset of the construction phase for the project. This would include the provision of proper lighting to facilitate POLICE response during night hours when necessary.

Respectfully,

BARRY HORROBIN, **B.A, M.A., CLEP, CMM-III**
Director of Planning & Physical Resources
WINDSOR POLICE SERVICE

Sent from my Samsung Galaxy smartphone.

RECEIVED

MAY 03 2018

STANTEC CONSULTING LTD.
Consulting Engineers

COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE CLASS ENVIORNMENTAL ASSESSMENT

PHASE 1 & 2 PUBLIC OPEN HOUSE

You are invited to provide comments about the proposed alternative solutions for CSO control and wet weather flow treatment in the Windsor Riverfront area west of Caron Avenue. The Phase 1 & 2 Class Environmental Assessment identifies the need to control CSOs and reviews potential alternative means for achieving the necessary controls. Input from this public Open House and from review agencies will be included in the evaluation process to select the preferred alternative and to complete the Phase 1 & 2 study. Thereafter, we will be moving forward into Phase 3 and Phase 4 planning and design requirements. Alternative designs for CSO, wet weather flow storage and treatment facilities will be identified and evaluated to select the preferred design. Another public open house will be held during Phase 3 to solicit public input in selecting the preferred design for the chosen alternative. An environmental study report (ESR) will be prepared to document the activities and recommendations from the Class EA process.

Please return your completed questionnaire on or before June 6, 2018 to:

Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON
N8X 1L9
Attention: Dr. Jian Li, P. Eng.

COMMENTS OR CONCERNS:

Please consider consulting EnWin Utilities during the evaluation of the preferred location in regards to availability of hydro service and associated estimated costs.

(Attach additional sheets if needed)

NAME Marvio Vinhaes

ADDRESS 4545 Rhodes Dr., Windsor, ON, N9A 5T7

TELEPHONE NO. (519 251-7300 ext 213

FAX NO. (IF ANY) ( ) email: mvinhaes@enwin.com

AFFILIATION OR GROUP (IF ANY) EnWin Utilities

DATE April 27, 2018 SIGNATURE

Stantec

From: Jenny.SEO@HydroOne.com on behalf of SecondaryLandUse@HydroOne.com
To: Li, Jian
Subject: Class Environmental Assessment - Combined Sewer Overflow Contro in the Riverfront Area West of Caron Ave, City of Windsor - EA - Impact
Date: Friday, May 04, 2018 1:46:31 PM
Attachments: Class Environmental Assessment - City of WIndsor.pdf

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From: SEO Jenny
Sent: Friday, May 04, 2018 1:41 PM
To: jiian.ll@stantec.com; clerks@citywindsor.ca
Cc: CANCILLA Enza; SECONDARY LAND USE Department
Subject: Class Environmental Assessment - Combined Sewer Overflow Contro in the Riverfront Area West of Caron Ave, City of Windsor - EA - Impact

Dear Mr. Jian Li and Ed Valdez,

In our initial review, we have confirmed that Hydro One has high voltage transmission facilities within your study area. At this point in time we do not have enough information about your project to provide you with meaningful input with respect to the impacts that your project may have on our infrastructure. As such, this response does not constitute any sort of approval for your plans and is being sent to you as a courtesy to inform you that we must be consulted on your project.

In addition to the existing infrastructure mentioned above, the affected transmission corridor may have provisions for future lines or already contain secondary land uses (i.e. pipelines, water mains, parking, etc). Please take this into consideration in your planning.

Please allow the appropriate lead-time in your project schedule in the event that your proposed development impacts Hydro One infrastructure to the extent that it would require modifications to our infrastructure.

In planning, please note that developments should not reduce line clearances or limit access to our facilities at any time in the study area of your Proposal. Any construction activities must maintain the electrical clearance from the transmission line conductors as specified in the Ontario Health and Safety Act for the respective line voltage.

The integrity of the structure foundations must be maintained at all times, with no disturbance of the earth around the poles, guy wires and tower footings. There must not be any grading, excavating, filling or other civil work close to the structures.

We reiterate that this message does not constitute any form of approval for your project. Once more details about your plans are known and it is established that your development will affect Hydro One facilities including the rights of way, please submit your plans to:

-

Transmission Contact:

Enza Cancilla, Hydro One Real Estate Management
185 Clegg Road, Markham L6G 1B7
Phone: (416) 345-5892

Enza.Cancilla@HydroOne.com

Please note that the proponent will be held responsible for all costs associated with modification or relocation of Hydro One facilities, as well as any added costs that may be incurred due to increase efforts to maintain our facilities.

Regards,

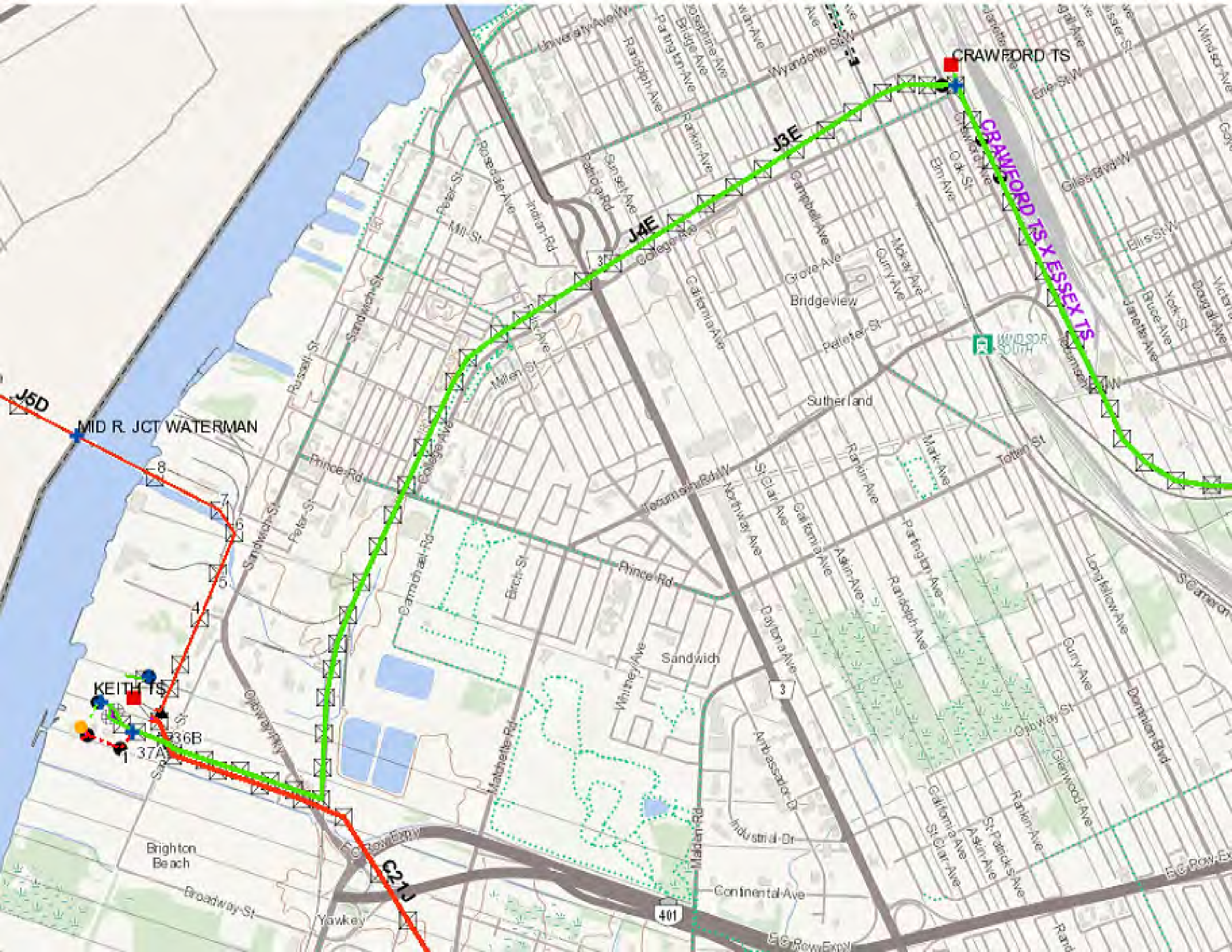
Jenny

Jenny SEO
Network Management Officer, Secondary Land Use

Hydro One Networks Inc.
483 Bay St. | North Tower | 13th Floor
Toronto, ON | M5G 2P5

Tel: 416.345.5676
Email: Jenny.Seo@Hydroone.com

www.HydroOne.com


CRAWFORD TS
J3E
J4E
CRAWFORD TS X ESSEX TS
MID R. JCT WATERMAN
J5D
KEITH TS
36B
37A
C21J
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5
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1
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Bridgeview
Sutherland
Sandwich
Brighton Beach
Yawkey
WINDSOR SOUTH
401
3

From: Knight, Mark
To: Li, Jian
Subject: Class EA
Date: Friday, May 04, 2018 4:18:45 PM

Hi Jian,

I'm the account manager for Union Gas. I just got a call from Union Gas about a Class EA that you sent out, addressed to Shirley Brundit (likely not spelled correctly). Apparently Shirley hasn't worked there for 5 years or so. Their recommendation for future mailouts is to address generically to the Lands Department, Union Gas Limited, 50 Keil Drive.

Regards,

Mark

Mark Knight
MA, MCIP, RPP
Associate, Environmental Planner
Team Leader - Assessment and Permitting

Direct: (519) 585-7430
Mobile: (519) 400-9618

Stantec Consulting Ltd.
100-300 Hagey Blvd.
Waterloo ON N2L 0A4 CA

Essex Region Conservation
the place for life

regs@erca.org
P.519.776.5209
F.519.776.8688
360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

June 6, 2018

Dr. Jian Li, P. Eng, Consultant Project Manager
Stantec Consulting Ltd
140 Ouellette Place, Suite 100
Windsor, ON, N8X 1L9

Dear Mr. Li:

RE: Class EA - Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue
Municipal Class EA Notice of Public Meeting

This letter is in response to our review of the Notice of Public Meeting/Open House (Phase 1 & 2) for the Class EA - Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue. It is our understanding that this process is following the Municipal Class EA in accordance with the planning and design process for "Schedule C" projects as outlined in the Municipal Class Environmental Assessment (June 2000, as amended in 2007, 2011 and 2015) under the Ontario Environmental Assessment Act.

It is our understanding that these phases (1 & 2) of the Class EA process will identify the preferred alternative solution for Combined Sewer Overflows (CSO) collection and wet weather flow treatment for the study area identified. According to the information provided at the April 19, 2018 Open House, we understand that there may potentially be 2 new sites along the current sanitary sewer corridor that may be used for CSO storage and treatment facilities additional to the Lou Romano Water Reclamation Plant, as well as a potential new 'stand alone' CSO interceptor sewer line that would run along the existing CSO interceptor sewer.

We acknowledge that further studies will be forthcoming with regard to the details of these facilities, we therefore provide the following preliminary information, and ask to be included in the circulation of any further reports regarding this proposal.

We have reviewed the study area, and comment based on the mandate and existing board-approved policies and procedures of the Essex Region Conservation Authority (ERCA). These comments are grouped based on our provincial delegated responsibilities and public agency commenting roles.

FLOODPLAIN HAZARD MANAGEMENT - REGULATORY RESPONSIBILITY, Conservation Authorities Act

The following comments reflect our role as representing the provincial interest in natural hazards management under the Provincial Policy Statement of the Planning Act, as well as our regulatory role in permitting under Section 28 of the Conservation Authorities Act.

April 30, 2018

We have reviewed our floodplain mapping for this area and it has been determined that the western limits of the study area fall within the Limit of Regulated Area of the Detroit River and McKee Drain. Any excavations, construction of structures, drain crossings, or the placement and grading of fill, undertaken within the regulated area would require permits from the Essex Region Conservation Authority (ERCA) under Ontario Regulation 158/06, (Development, Interference with Wetlands and Alteration to Shorelines and Watercourse Regulations - Section 28 of the Conservation Authorities Act).

WATERSHED BASED RESOURCE MANAGEMENT AGENCY

The following comments are provided in our capacity as a public commenting body on matters related to watershed management.

Upon review of the information provided at the Public Open House on April 19, 2018, we understand that "Alternative 5 - Combination Storage and Treatment" has been assessed as the preferred alternative solution to satisfy Ministry of the Environment and Climate Change - CSO control requirements, for collection and wet weather flow treatment. Although we have no objections to this proposal as a potential solution to reduce combined sewer overflow, improve wet weather flow capacity, and reduce sewer back up and flooding into basements, we do offer the following additional information for the City of Windsor's consideration.

The City of Windsor recently experienced a significant rainfall event that inundated and overwhelmed the area's sanitary and storm sewer system/facilities. In the last decade alone, this region has experienced 6 significant storm events that have surpassed current 1:100 year regulatory standards, and have resulted in urban flooding issues and sewer backups that have impacted hundreds of homes and businesses in the region. As we understand the financial cost and complexity of undertaking "Alternative 2: Sewer Separation (storm - sanitary), we also understand that the City of Windsor as well as the ERCA are in support of long term goals of achieving storm and sanitary sewer separation. The City's own Climate Change Adaptation Policy notes that focus needs to be directed towards climate change impacts such as: operating/maintenance demands to deal with climate extremes, flooding to basements, roads and infrastructure, and operation demands during severe storms. As we are already experiencing an increase in the number and intensity of storm events affecting our region, we strongly recommend that Climate Change modelling be applied to the capacity analysis of these upgrades, and that the opportunity for sewer separation is considered where feasible.

As the City of Windsor is aware, ERCA has been working in conjunction with the regional municipalities to develop a set of regional stormwater management guidelines that take into account adjustments for the impacts of Climate Change. This work is in the final draft stage and is anticipated to be finalized in the near future. The recommendations from this guidance document should be considered and endorsed in these potential future works.

NATURAL HERITAGE & NATURAL HERITAGE SYSTEMS ADVISORY SERVICE TO MUNICIPALITIES

The following comments are provided from our perspective as a service provider to the City of Windsor and regional municipalities on matters related to natural heritage and natural heritage systems policy review. The comments in this section do not necessarily represent the provincial position and are advisory in nature for the consideration of the City of Windsor as the planning authority.

According to a review of our mapping, we advise that the study area may contain natural features that may support habitat of endangered species and threatened species. As per Section 2.1.7 of the PPS 2014 – "Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements." It is the proponent's responsibility to exercise due diligence in ensuring that all issues related to the provincial Endangered Species Act and its regulations have been addressed. For further information regarding the Endangered Species Act, we would advise that the project managers to contact the Ministry of Natural Resources and Forestry, Aylmer District at ESA.Aylmer@ontario.ca.

INFORMATION REQUESTS

Should the municipality and project managers be interested in receiving mapping data or other studies that ERCA is in possession of, please contact the undersigned. Certain reports are also available on our website: http://erca.org/resource-info/resources/ such as the Essex Region Natural Heritage System Study (ERHNSS). Data requests can also be provided for information such as: floodplain mapping studies, fish assessment data, current extents of the ERCA Limit of Regulated Area, and digital mapping from the ERHNSS.

If you should have any questions or require any additional information, please do not hesitate to contact me at the ERCA office by phone at (519) 776-5209 ext 330, or via email: cchiasson@erca.org.

Sincerely

Corinne Chiasson
Resource Planner
/cor
CC: Mr. Ed Valdez, Manager of Process Engineering & Maintenance,
City of Windsor, email: evaldez@citywindsor.ca

APPENDIX C

Open House # 2

- Advertisement
- List of Attendees
- Information handout and responses

Public Notices

NOTICE OF PUBLIC INFORMATION CENTRE
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

The Windsor Riverfront Pollution Control Planning Study (PCP Study), completed by the City in 1999, contains a comprehensive pollution prevention and control plan for the Riverfront area of the City of Windsor. The PCP Study identified combined sewer overflows (CSOs) to the Detroit River as being a significant source of pollution and presented alternative CSO control strategies while establishing the preferred pollution control plan with the four recommended initiatives. Significant progress has been made since completion of the PCP Study. To date, three of the four recommended initiatives have been implemented and in operation with the exception of the last remaining recommended initiative implementing CSO control program for the riverfront catchment area west of Caron Avenue.

The City of Windsor, with funding assistance from the Ministry of the Environment, Conservation, and Parks (MECP) and from the Federal Government through the Great Lakes Sustainability Fund, has initiated this Class EA as the next step in implementing the last remaining initiative recommended in the PCP study as well as wet weather flow control at the Lou Romano Water Reclamation Plant (LRWRP). This project is being planned as a **Schedule C** undertaking following the provisions of the **Municipal Class Environmental Assessment** document. Alternative means of providing CSO control in the study area has been assessed to meet the requirements set out in the MECP Guidelines "Procedure F-5-5". A variety of potential CSO control options has evaluated to select the preferred option.

The project is now in Phase 3 of the Class EA process which involves evaluation of alternative designs for the combined sewer overflow (CSO) collection and treatment facilities leading to selection of a preferred design for this application.

A public Open House is planned to provide further information to the public on the project and to receive input and comment from interested persons:

Open House
Wednesday, February 27, 2019
3:00 p.m. to 7:00 p.m.
Mackenzie Hall Cultural Centre
3277 Sandwich Street West
Windsor, Ontario

The public is invited to attend the Open House and submit comments related to this project in order that any concerns can be taken into account and addressed in the Environmental Study Report.

Further information may be obtained from the Consulting Engineer, Stantec Consulting Ltd. or the City of Windsor.

City of Windsor
4155 Ojibway Parkway
Windsor, Ontario N9C 4A5
Tel. (519) 253-7217
Fax (519) 253-0464
ATTN: Mr. Ed Valdez, P. Eng.
Manager of Process Engineering & Maintenance

Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON N8X 1L9
Tel. (519) 966-2250
Fax (519) 966-5523
ATTN: Dr. Jian Li, P. Eng.
Consultant Project Manager

Duchene to Columbus? Canada's top teams glad

MICHAEL TRAIKOS
Toronto

Does anyone know what type of flowers Pierre Dorion prefers?

We ask on behalf of Maple Leafs GM Kyle Dubas, Jets GM Kevin Cheveldayoff and Flames GM Brad Treliving, who owe the Senators general manager the biggest bouquet you can find for sending Matt Duchene to the Columbus Blue Jackets on Friday.

While they are at it, they better pick out a card. Maybe the three of them can save money and sign it together. After all, it's Toronto, Calgary and Winnipeg — not Columbus or Ottawa — that benefit the most from this trade, which not only sent Duchene to Columbus for a package of prospects and draft picks, but made it so that the Blue Jackets will likely also hang onto Artemi Panarin for the duration of the season.

In the process, two of the top three potential rentals effectively were taken off the market. That they ended up in a non-threatening place such as Columbus just happened to be a huge bonus.

While they are at it, maybe the Blue Jackets can acquire Mark Stone, Wayne Simmonds and Mats Zuccarello.

Better them than a team that can actually win the Stanley Cup — much less advance past the first round.

That's the big takeaway here.

The trade deadline isn't always

CITY OF WINDSOR
CLASS ENVIRONMENTAL ASSESSMENT
COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

OPEN HOUSE NO.2
Mackenzie Hall Cultural Centre
February 27, 2019 – 3:00 p.m. to 7:00 p.m.
SIGN-IN SHEET

No.	Name (Please Print)	Address	Telephone Number
1	Laura Herlehy	Dillon Consulting	519-948-4243 x3216
2	JOHN ZUCCIATTI	146 CAMERON	5199810585.
3	Ian Wilson	8890 Little River Rd	519-903-2428
4	Flavio Frost	3200 Deziel Dr	
5			
6			
7			
8			
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10			
11			
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Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Class Environmental Assessment

Phase 3 Public Consultation

OPEN HOUSE

Wednesday, February 27, 2019
3:00 p.m.– 7:00 p.m.

Mackenzie Hall Cultural Centre
3277 Sandwich Street West
Windsor, Ontario

Prepared for:

The City of Windsor

Prepared by:

Stantec Consulting Ltd.
Windsor, Ontario

165620132

February 27, 2019

COMBINED SEWER OVERFLOW CONTROL IN THE
RIVERFRONT AREA WEST OF CARON AVENUE
CLASS ENVIORNMENTAL ASSESSMENT

PHASE 3 PUBLIC OPEN HOUSE

BACKGROUND

Some areas in the City of Windsor, are serviced by a combined sewer system, which is typical with older areas in most cities. A combined sewer system is a wastewater collection system that conveys a mixture of municipal wastewater and stormwater runoff through a single-pipe system and transfers it to a wastewater treatment plant. During some wet weather events there is insufficient capacity to carry all of the flow to the wastewater treatment plant with the results being that the excess untreated flow is discharged directly into the Detroit River. This is defined as a combined sewer overflow (CSO).

The Windsor Riverfront Pollution Control Planning Study (PCP Study), completed by the City in 1999, developed a pollution control strategy for the riverfront area of the City with the specific objective of reducing combined sewer overflows (CSOs) as well as the total pollutants being discharged into the Detroit River.

The PCP Study identified CSOs to the Detroit River as being a significant source of pollution and presented alternative CSO control strategies while establishing the preferred pollution control plan with the following four recommendations:

1. Increase pumping capacity at the CMH Woods Pumping Station (CMHWPS)
2. Provide additional primary treatment capacity at the Lou Romano Water Reclamation Plant (LRWRP) to treat wet weather flows.
3. Provide three satellite treatment facilities known as retention treatment basins (RTBs) along the Windsor riverfront east of CMHWPS.
4. Provide tunnel storage or possibly RTBs west of CMHWPS.

Significant progress has been made since completion of the PCP Study. To date, three of the above four recommendations have been implemented and are in operation with the exception being the fourth recommendation; provide tunnel storage or possibly RTBs west of CMHWPS.

CLASS ENVIRONMENTAL ASSESSMENT

The City of Windsor, with funding assistance from the Ministry of the Environment, Conservation, and Parks (MECP) and from the Federal Government through the Great Lakes Sustainability Fund, has initiated this Class EA as the next step in implementing the last remaining initiative recommended in the PCP study as well as wet weather flow control at the Lou Romano Water Reclamation Plant (LRWRP). This project is being planned as a **Schedule C** undertaking following the provisions of the **Municipal Class Environmental Assessment** document. The overall objective of this project is to identify a preferred solution and design that will satisfy CSO regulatory requirements for the riverfront catchment area west of Caron Avenue as well as wet weather flow control at the Lou Romano Water Reclamation Plant (LRWRP) and is acceptable to the public and all concerned review agencies.

Phases 1 & 2 of the Class EA process involve identification of the problem that needs to be addressed and consideration of alternative solutions leading to selection of the preferred solution.

Alternative means of providing CSO control in the study area has been assessed in order to meet the requirements set out in the MECP Guidelines “Procedure F-5-5”. A variety of potential CSO control options were evaluated to select the preferred option.

Handout material of Phase 1 & 2 study was prepared outlining alternative means of controlling combined sewer overflows. The handout material was circulated to review agencies for comment and a Public Open House was held in April of 2018 to provide information on the project and solicit public input. Through this process, the **preferred solution** to control CSOs was identified as follows:

- Combination Storage and Treatment – Retention Treatment Basin
- A potential RTB location in the general area on the south side of Sandwich Street and Ojibway Pkwy intersection.

The purpose of Phase 3 of the Class EA process is to identify alternative design concepts for the preferred solution leading to selection of a preferred design.

A draft study report has been prepared which presents a number of possible alternative designs for the preferred solution. The merits and disadvantages of these alternatives are discussed with the decision-making process being structured to select the design that minimizes undesirable impacts on the natural, social and economic environments. Through this evaluation process a recommended design has been identified and is provided for consideration as the preferred design. The recommended design consists of the following main elements:

- Upgrade interceptor chambers A and D to automated flow control, and increase volumetric interception rate at Interceptor Chambers A, D and F
- Deep sewer from Chamber A on Hill Avenue at Russell Street to LRWRP to carry increased flow from Chambers A, D and F.
- A RTB, located on the south side of Sandwich Street and Ojibway Pkwy intersection, sized to treat a maximum CSO and wet weather flow of 9.1

m^3/s, which is proposed to be equivalent to total capacity of LRWRP influent pumping station.

- A new pumping station with a firm pumping capacity of 9.1 m^3/s utilizing screw pumps to raise flow from the CSO Collector Sewer into the RTB.
- A valved interconnection across Ojibway Parkway between the LRWRP Inlet Chamber and the RTB to divert wet weather flow during a storm event or drain the RTB to the LRWRP Inlet Chamber after a storm event
- An effluent outfall to carry treated effluent from the RTB to the Detroit River. It also provides sufficient capacity and redundancy for existing LRWRP outfall sewer

Copies of a draft study report have been distributed to mandatory contacts and review agencies. Feedback from review agencies and input gained through this public Open House will be included in the evaluation process to finalize selection of the preferred design.

FURTHER PLANNING

The Environmental Study Report will be finalized with modifications, as necessary, to reflect input from the public and review agencies. The completed Environmental Study Report will then be placed on the public record for a 30 day review period and notice of completion will be issued to review agencies, the public and the Ministry of the Environment, Conservation, and Parks Environmental Approvals Branch.

THANK YOU

Thank you for your interest in this project and attendance at this open house.

COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE CLASS ENVIORNMENTAL ASSESSMENT

PHASE 3 PUBLIC OPEN HOUSE

You are invited to provide comments about the proposed alternative designs for CSO control and wet weather flow treatment in the Windsor Riverfront area west of Caron Avenue.

Copies of the Open House material are available on the FTP site below:

Login Information
Browser link: https://projsftp.stantec.com
FTP Client Hostname: projsftp.stantec.com
Login name: CSO0645
Password: 3274549
Expiry Date: 6/28/2019

Hard copies of the report can be made available for review on request. Input from this public Open House and from review agencies will be included in the evaluation process to select the preferred design alternative and finalize the study report. Thereafter the Environmental Study Report will be placed on the public record for a 30 day review period and notice of completion will be issued to review agencies, the public and the Ministry of the Environment, Conservation, and Parks Environmental Approvals Branch.

Please return your completed questionnaire on or before March 13, 2019 to:

Stantec Consulting Ltd.
140 Ouellette Place, Suite 100
Windsor ON N8X 1L9
Attention: Dr. Jian Li, P. Eng.

COMMENTS OR CONCERNS: ____

____

____

____

(Attach additional sheets if needed)

NAME ____

ADDRESS ____

TELEPHONE NO. ( ) ____

FAX NO. (IF ANY) ( ) ____

AFFILIATION OR GROUP (IF ANY) ______________________________

DATE ______________________ SIGNATURE ______________________

City of Windsor

COMBINED SEWER OVERFLOW CONTROL IN THE RIVERFRONT AREA WEST OF CARON AVENUE

PUBLIC OPEN HOUSE #2

WELCOME

Municipal Class Environmental Assessment

February 27, 2019

3:00pm -7:00pm

Study Overview

Purpose of this Study

Select the preferred means and preferred design to control Combined Sewer Overflows (CSOs) in the Riverfront Area west of Caron Avenue

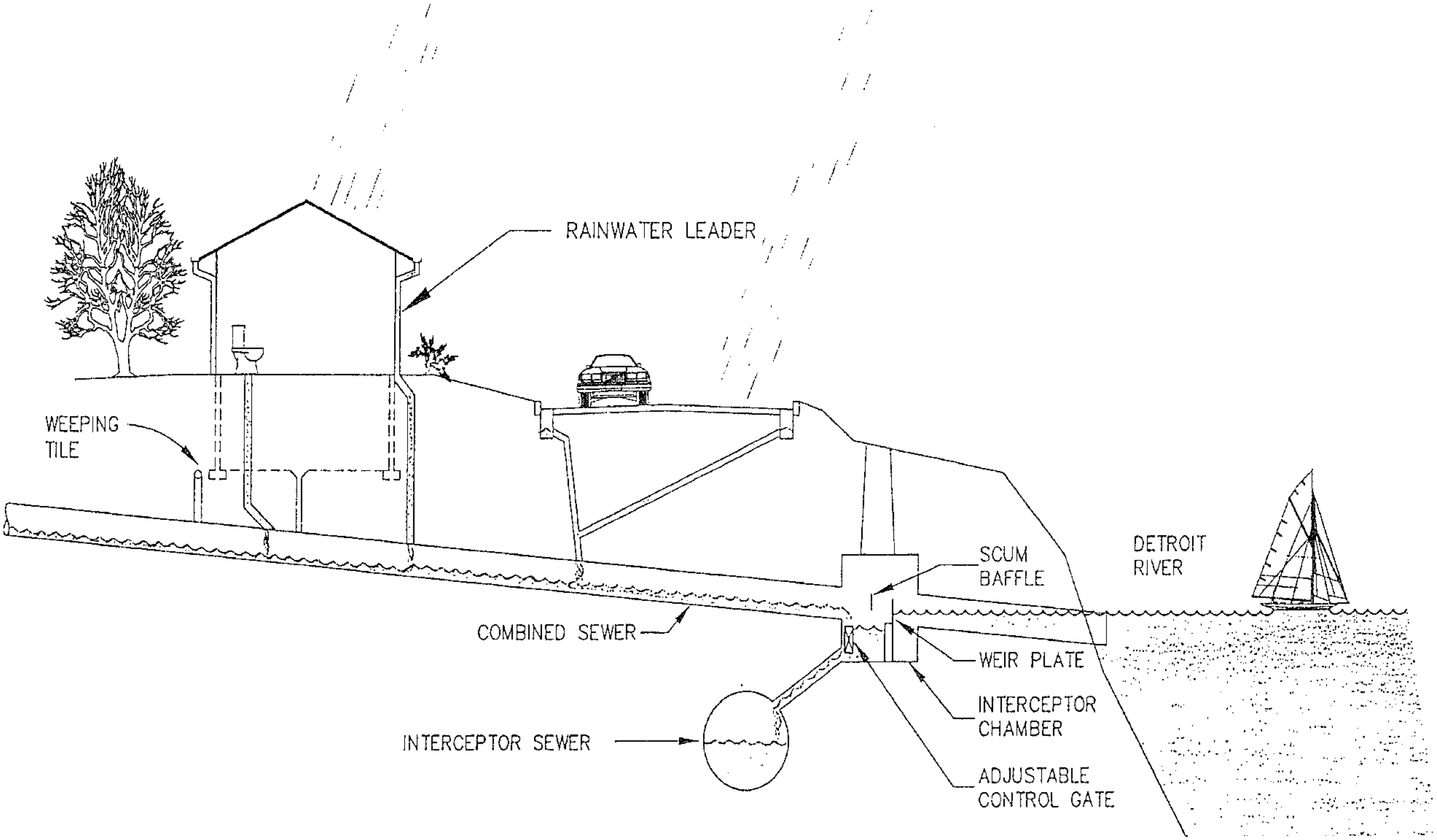
Revisit wet weather flow conditions at Lou Romano Water Reclamation Plant (LRWRP) to determine if any CSO control alternatives may also help to alleviate wet weather flows at the LRWRP

Purpose of this Open House

- Review alternative designs for CSO collection and treatment facilities
- Input gained through this public Open House and feedback from review agencies and will be included in the evaluation process to finalize the selection of the preferred design.
- Preferred design is one that satisfies CSO control criteria, minimizes undesirable impacts on the natural, social and economic environment, and is acceptable to the public and regulatory agencies.

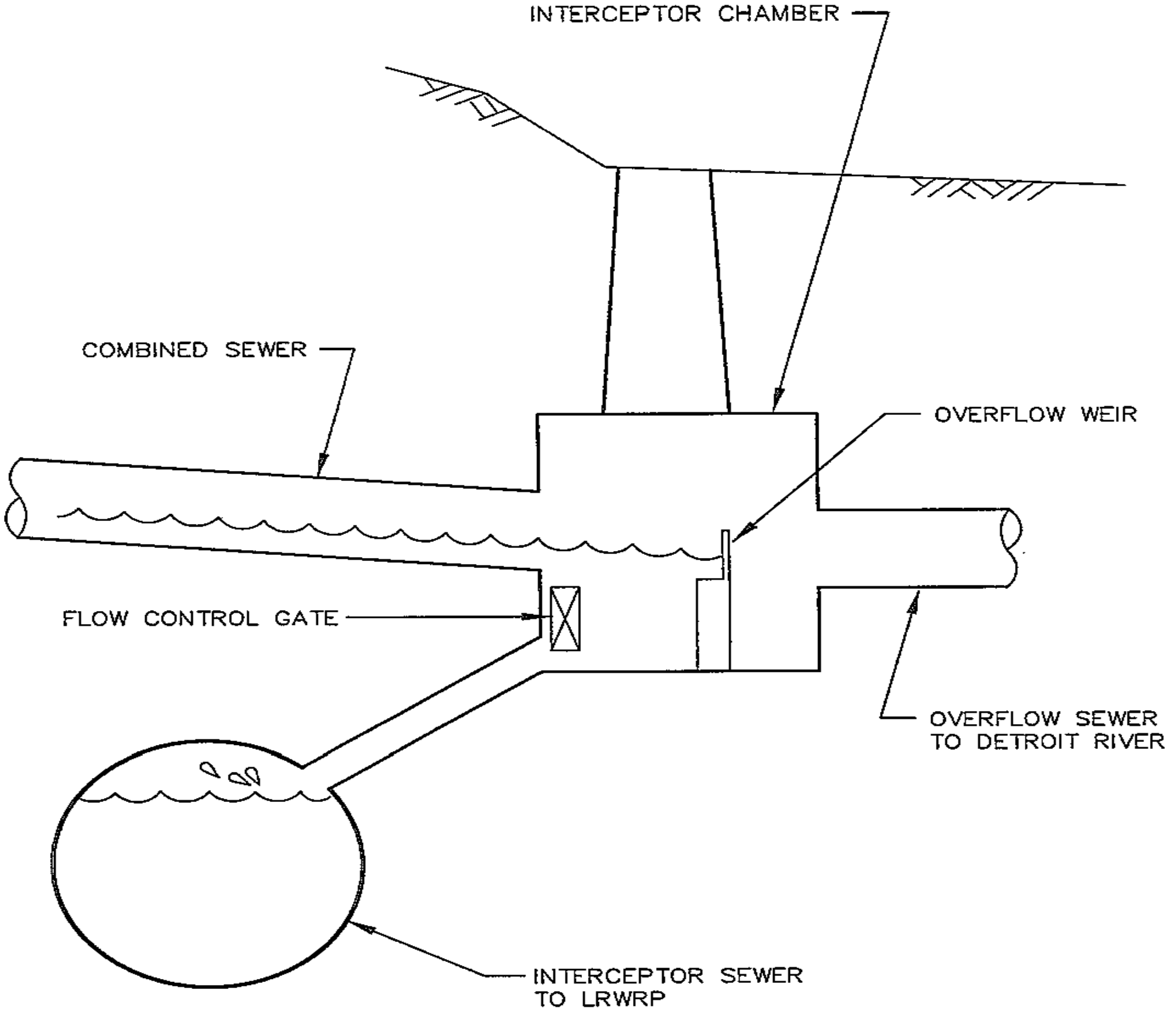
BACKGROUND

TYPICAL COMBINED SEWER SYSTEM



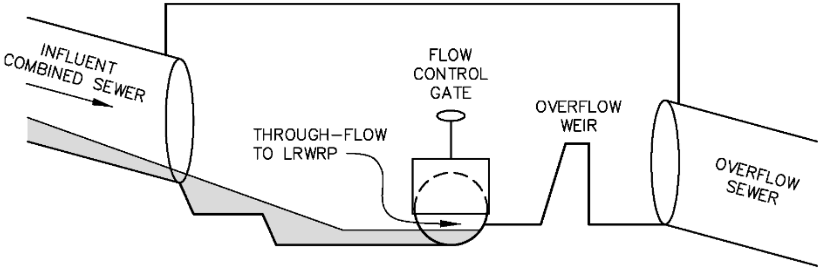
BACKGROUND

INTERCEPTOR CHAMBER SCHEMATIC

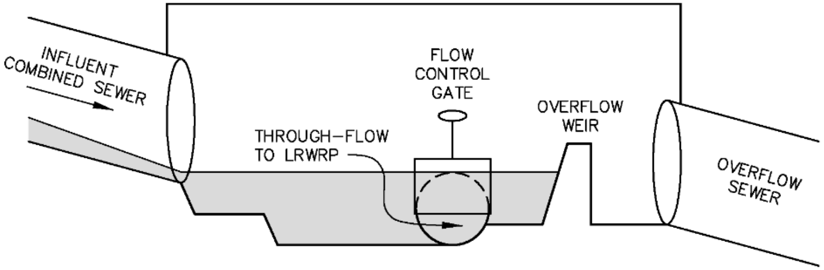


BACKGROUND

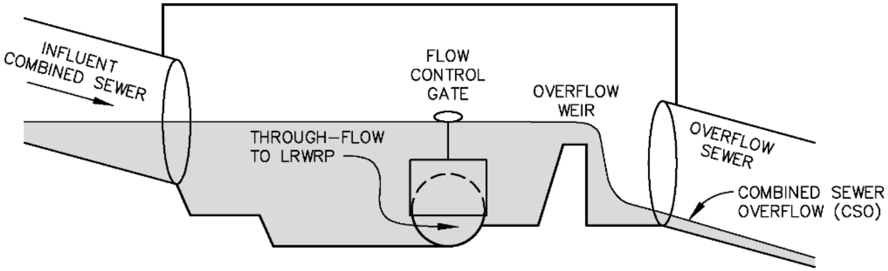
INTERCEPTOR CHAMBER FLOW CONDITIONS



DRY WEATHER FLOW (DWF)



2 1/2 TO 4 TIMES DWF



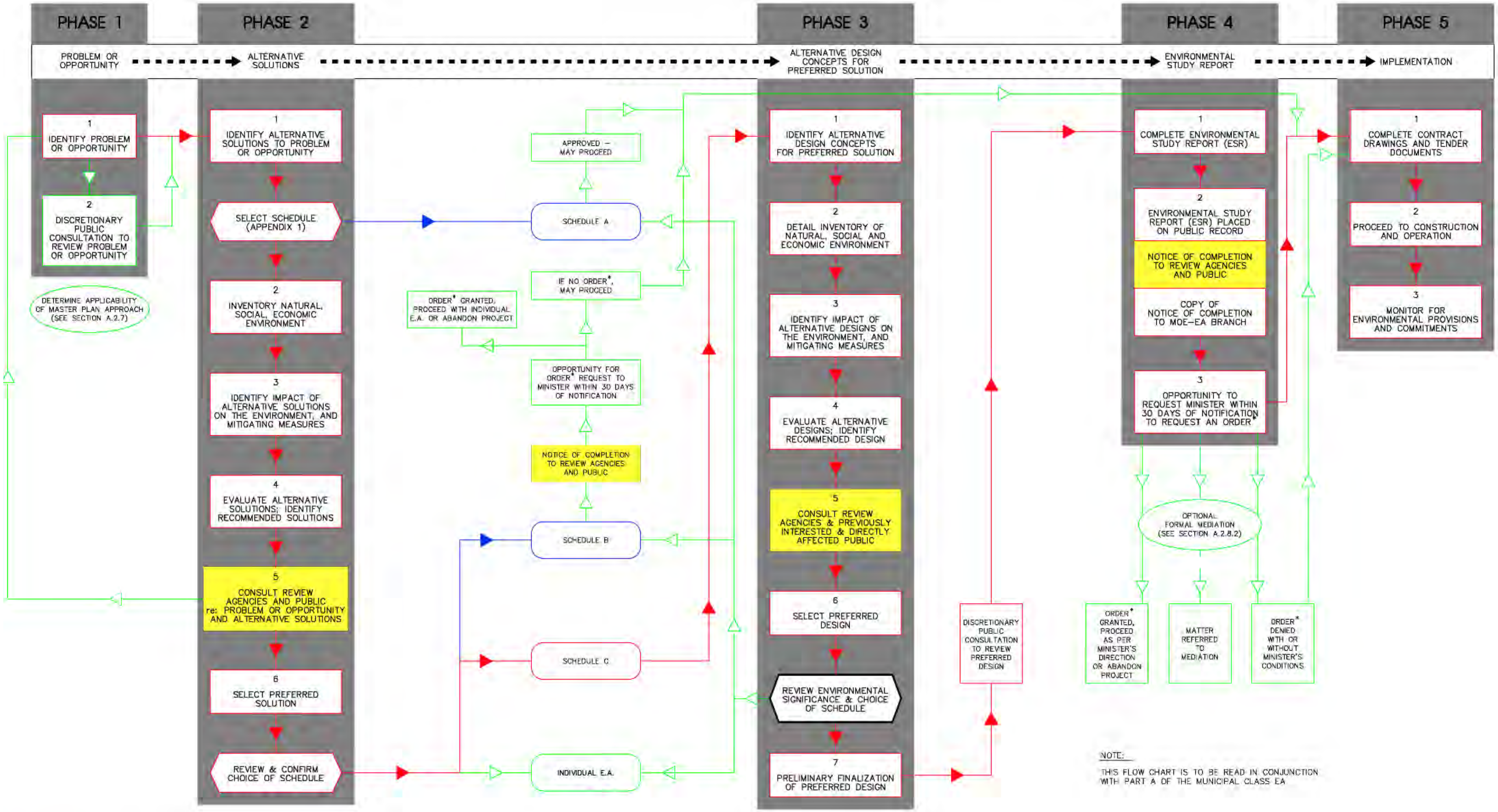
GREATER THAN 2 1/2 TO 4 TIMES DWF

CSO Control Guidelines

MOECC PROCEDURE F-5-5

- The Ontario Ministry of the Environment, Conservation and Parks (MECP), [formerly the Ontario Ministry of the Environment and Climate Change (MOECC)], publishes guidelines that outline the requirements for CSO control in Ontario under "PROCEDURE F-5-5" that includes:
  - Development of a Pollution Prevention and Control Plan
  - During a seven-month period commencing within 15 days of April 1, capture & treat for an average year all the dry weather flow plus 90% of the volume resulting from wet weather flow above the dry weather flow
  - Provide primary treatment or equivalent - i.e. – 50% total suspended solids (TSS) removal & 30% biochemical oxygen demand (BOD5) removal
  - TSS of the effluent not to exceed 90 mg/l for more than 50% of the time

OVERVIEW OF THE CLASS ENVIRONMENTAL ASSESSMENT PROCESS



PHASE 1

PROBLEM OR OPPORTUNITY

1 IDENTIFY PROBLEM OR OPPORTUNITY

2 DISCRETIONARY PUBLIC CONSULTATION TO REVIEW PROBLEM OR OPPORTUNITY

DETERMINE APPLICABILITY OF MASTER PLAN APPROACH (SEE SECTION A.2.7)

PHASE 2

ALTERNATIVE SOLUTIONS

1 IDENTIFY ALTERNATIVE SOLUTIONS TO PROBLEM OR OPPORTUNITY

SELECT SCHEDULE (APPENDIX 1)

2 INVENTORY NATURAL, SOCIAL, ECONOMIC ENVIRONMENT

3 IDENTIFY IMPACT OF ALTERNATIVE SOLUTIONS ON THE ENVIRONMENT, AND MITIGATING MEASURES

4 EVALUATE ALTERNATIVE SOLUTIONS; IDENTIFY RECOMMENDED SOLUTIONS

5 CONSULT REVIEW AGENCIES AND PUBLIC re: PROBLEM OR OPPORTUNITY AND ALTERNATIVE SOLUTIONS

6 SELECT PREFERRED SOLUTION

REVIEW & CONFIRM CHOICE OF SCHEDULE

APPROVED – MAY PROCEED

SCHEDULE A

IF NO ORDER*, MAY PROCEED

ORDER* GRANTED, PROCEED WITH INDIVIDUAL E.A. OR ABANDON PROJECT

OPPORTUNITY FOR ORDER* REQUEST TO MINISTER WITHIN 30 DAYS OF NOTIFICATION

NOTICE OF COMPLETION TO REVIEW AGENCIES AND PUBLIC

SCHEDULE B

SCHEDULE C

INDIVIDUAL E.A.

PHASE 3

ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION

1 IDENTIFY ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION

2 DETAIL INVENTORY OF NATURAL, SOCIAL AND ECONOMIC ENVIRONMENT

3 IDENTIFY IMPACT OF ALTERNATIVE DESIGNS ON THE ENVIRONMENT, AND MITIGATING MEASURES

4 EVALUATE ALTERNATIVE DESIGNS; IDENTIFY RECOMMENDED DESIGN

5 CONSULT REVIEW AGENCIES & PREVIOUSLY INTERESTED & DIRECTLY AFFECTED PUBLIC

6 SELECT PREFERRED DESIGN

REVIEW ENVIRONMENTAL SIGNIFICANCE & CHOICE OF SCHEDULE

7 PRELIMINARY FINALIZATION OF PREFERRED DESIGN

DISCRETIONARY PUBLIC CONSULTATION TO REVIEW PREFERRED DESIGN

PHASE 4

ENVIRONMENTAL STUDY REPORT

1 COMPLETE ENVIRONMENTAL STUDY REPORT (ESR)

2 ENVIRONMENTAL STUDY REPORT (ESR) PLACED ON PUBLIC RECORD

NOTICE OF COMPLETION TO REVIEW AGENCIES AND PUBLIC

COPY OF NOTICE OF COMPLETION TO MOE–EA BRANCH

3 OPPORTUNITY TO REQUEST MINISTER WITHIN 30 DAYS OF NOTIFICATION TO REQUEST AN ORDER*

OPTIONAL FORMAL MEDIATION (SEE SECTION A.2.8.2)

ORDER* GRANTED, PROCEED AS PER MINISTER'S DIRECTION OR ABANDON PROJECT

MATTER REFERRED TO MEDIATION

ORDER* DENIED WITH OR WITHOUT MINISTER'S CONDITIONS

PHASE 5

IMPLEMENTATION

1 COMPLETE CONTRACT DRAWINGS AND TENDER DOCUMENTS

2 PROCEED TO CONSTRUCTION AND OPERATION

3 MONITOR FOR ENVIRONMENTAL PROVISIONS AND COMMITMENTS

NOTE:

THIS FLOW CHART IS TO BE READ IN CONJUNCTION WITH PART A OF THE MUNICIPAL CLASS EA

🟥 ▶ INDICATES MANDATORY EVENTS

🟩 ▷ INDICATES POSSIBLE EVENTS

🟦 ▶ INDICATES PROBABLE EVENTS

🟨 MANDATORY PUBLIC CONTACT POINTS (SEE SECTION A.3 CONSULTATION)

⬡ DECISION POINTS ON CHOICE OF SCHEDULE

◯ OPTIONAL

* PART II ORDER (SEE SECTION A.2.8)

ENVIRONMENTAL STUDY REPORT (ESR) PROCESS

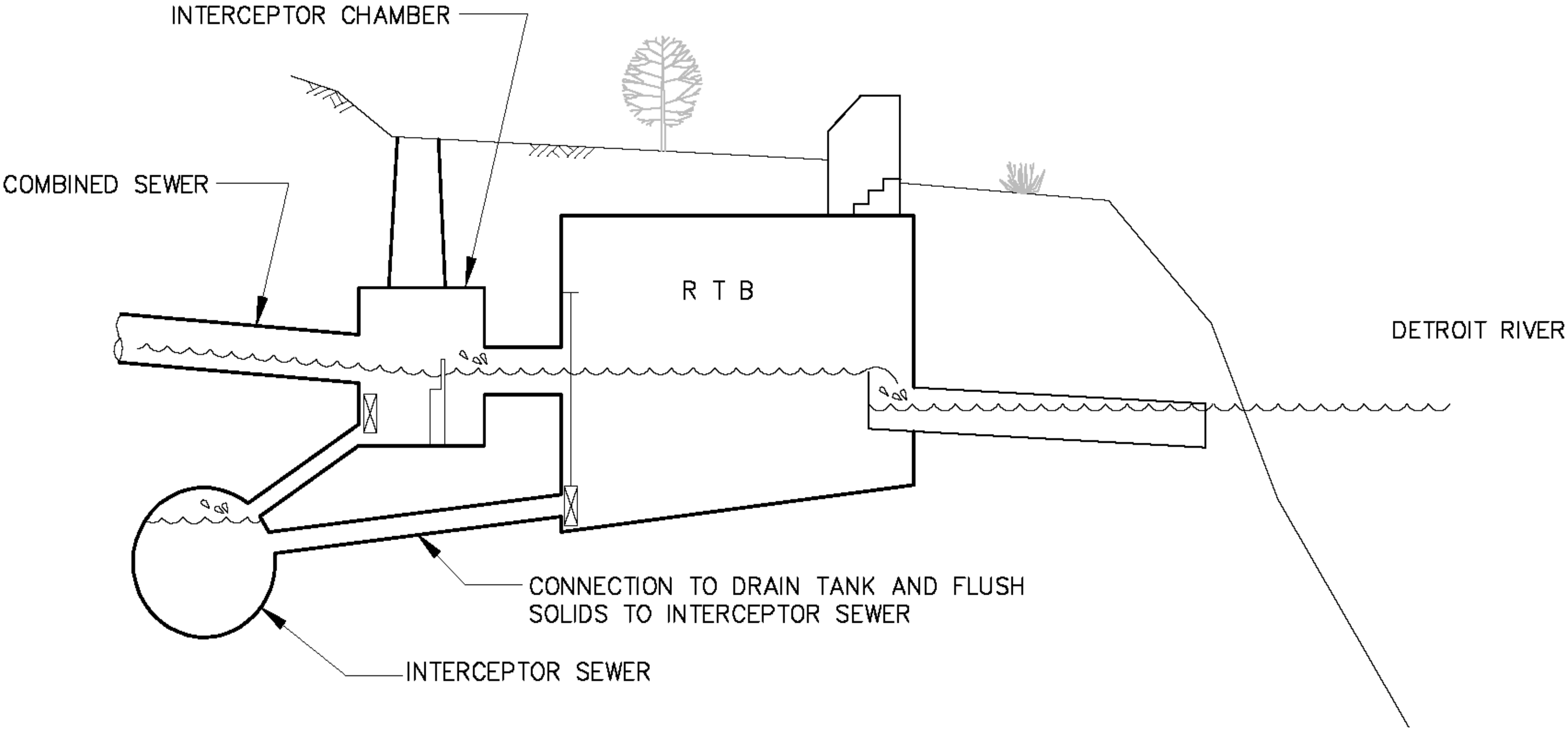
Phase 1 & 2 Class EA

Identified the preferred means of implementing CSO control west of Caron Avenue:

- Retention Treatment Basin (RTB) - Combination of storage and treatment
- Treatment and storage facilities to be located on City owned Lands on the riverfront and/or adjacent to the Lou Romano Water Reclamation Plant (LRWRP).

BACKGROUND

SKETCH OF A RETENTION TREATMENT BASIN (RTB)



ENVIRONMENTAL STUDY REPORT (ESR) PROCESS

Phase 3 Class EA Report

- Review alternative designs for CSO collection and treatment facilities

- Select the preferred design

- Preferred design is one that satisfies CSO control criteria, minimizes undesirable impacts on the natural, social and economic environment, and is acceptable to the public and regulatory agencies

DESIGN ALTERNATIVES

Overview

CSO COLLECTION

- Interceptor Chambers
- Conveyance Sewer

CSO TREATMENT

- Pumping Station
- Retention Treatment Basin and appurtenances
- Effluent outfall to river

DESIGN ALTERNATIVES

CSO INTERCEPTION

- 12 existing Interceptor Chambers on Riverfront Interceptor Sewer west of Caron Avenue
- Chambers serve areas ranging in size from 1.5 ha to 234 ha
- Procedure F-5-5 calls for 90% capture of CSOs at each overflow point or 90% system-wide capture
- Windsor Riverfront PCP Study based on 90% system-wide criteria
- Computer model determined that 90% system-wide control can be achieved by increasing CSO capture at 3 locations
- Same degree of pollution control, reduced construction and operating costs, reduced impacts along the waterfront

DESIGN ALTERNATIVES

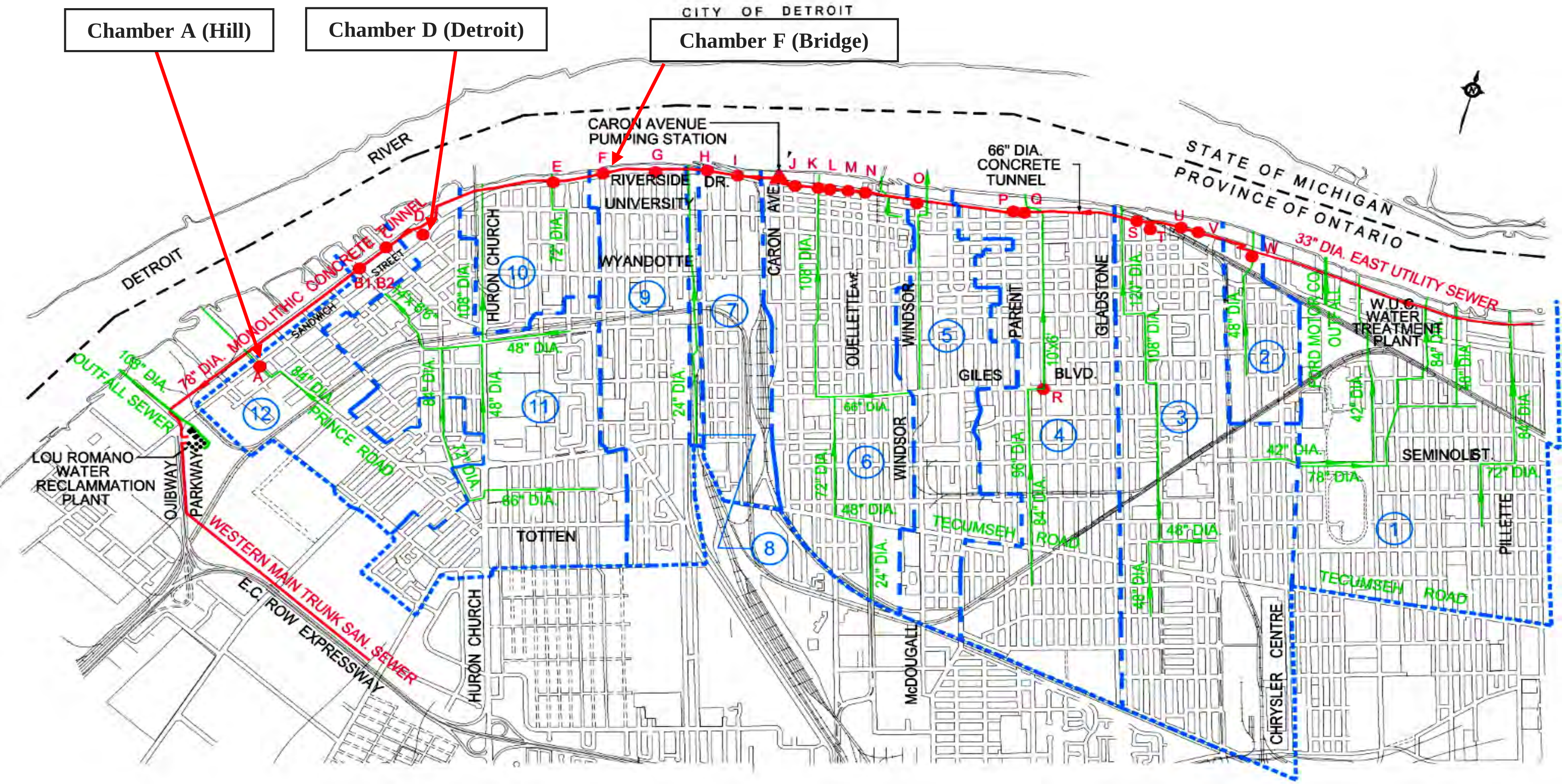
CSO INTERCEPTION

CSO Interceptor Chambers	Volumetric Interception Rate	
	Existing	Proposed
A (Hill)	49%	88%
D (Detroit)	53%	90%
F (Bridge)	69%	93%

Required 90% capture of CSOs from area west of Caron Avenue can be achieved by increasing volumetric interception rate at Chambers A, D and F

DESIGN ALTERNATIVES

CSO INTERCEPTION



Chamber A (Hill)

Chamber D (Detroit)

Chamber F (Bridge)

Increasing volumetric interception rate at Chambers A, D and F

DESIGN ALTERNATIVES

CSO Collection

- Transport CSOs from interceptor chambers A,D and F to the RTB, extending from Bridge Avenue on the east to the LRWRP on the west
- Alignment generally north of and parallel to existing Riverfront Interceptor Sewer
- Congested area - numerous existing north-south sewers crossing the path of the proposed new CSO Collector
- Must include pumping at some point in the collection and treatment system – cannot flow by gravity from the interceptor chambers to the RTB and then through the RTB to the river.

DESIGN ALTERNATIVES

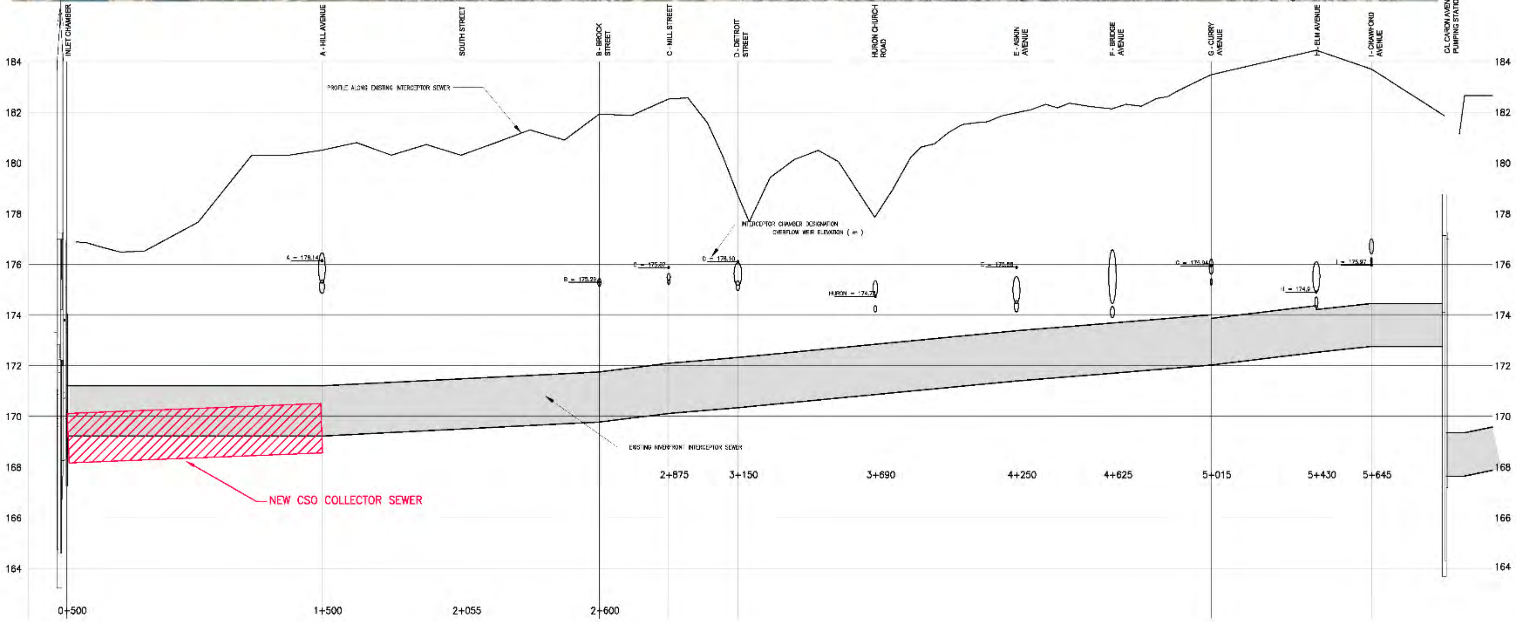
CSO COLLECTION - Alternative Design Possibilities

1. Construct pumping facilities at CSO Interceptor Chambers A, D and F to lift CSOs up into a shallow gravity sewer leading to the RTB or complete with forcemains to carry CSOs from the Interceptor Chambers to the RTB.

2. Utilize existing riverfront interceptor sewer and construct a deep sewer from Chamber A to the RTB together with pumping facilities at the RTB to either lift flow into the RTB or to convey treated effluent from the RTB to the river.

DESIGN ALTERNATIVES

EXISTING AND NEW RIVERFRONT INTERCEPTOR SEWER



DESIGN ALTERNATIVES

CSO COLLECTION

Alternative 1 – multiple pumping stations & shallow sewer(s)

+ May be possible to cross above existing sewers

+ Shallower and potentially less costly sewer construction

- 3 major pumping stations – initial and ongoing impact on waterfront and surrounding area

- Open cut construction through existing waterfront features and areas of archaeological significance

Not carried forward for detailed consideration

DESIGN ALTERNATIVES

CSO COLLECTION

Alternative 2 – Deep sewer and single pumping station

+ Construction of deep sewer from Chamber A to the LRWRP to carry increased flow from Chambers A, D and F
+ Construction of deep sewer by tunneling under existing utilities will significantly reduce surface disturbances and impacts along the waterfront and existing streets
+ Utilize existing riverfront interceptor sewer to convey CSOs from the Interceptor Chambers D and F to the CSO collector sewer at Chamber A
+ Pumping facilities only required at RTB site – savings in economy of scale and ongoing O&M costs
- Sewer construction by tunneling generally more expensive than open cut construction – offsetting factors include reduced cost for pumping facilities and less cost to mitigate disturbances along the waterfront and areas of archaeological significance

This alternative recommended as the preferred design

PREFERRED DESIGN

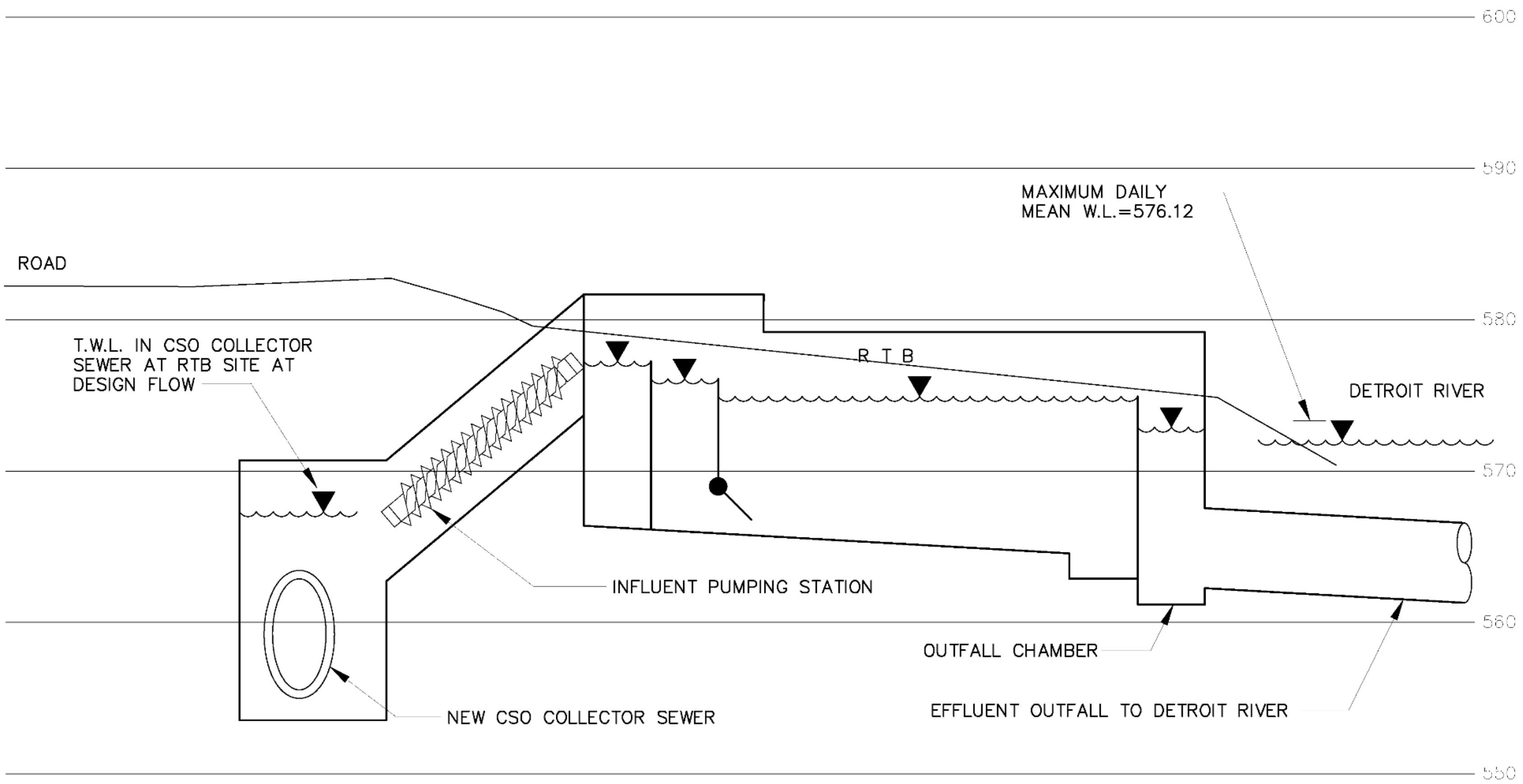
Aerial Plan showing Proposed CSO Collector and RTB

THE CITY OF WINDSOR

Stantec

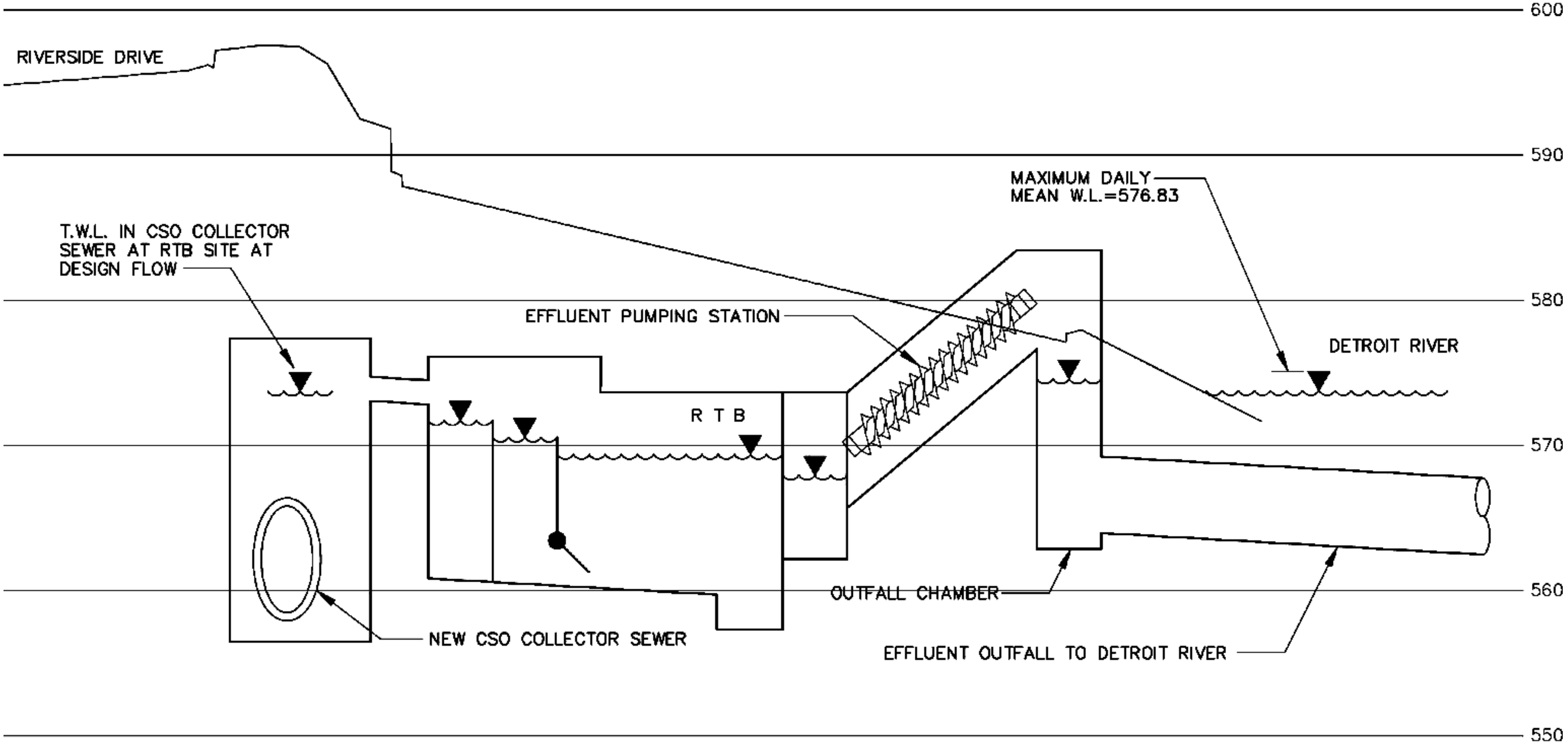
DESIGN ALTERNATIVES

CSO PUMPING - INFLUENT PUMPING ALTERNATIVE



DESIGN ALTERNATIVES

CSO PUMPING - Effluent Pumping Alternative



DESIGN ALTERNATIVES

CSO PUMPING - COMPARISON OF ALTERNATIVES

INFLUENT Pumping Station	EFFLUENT Pumping Station
Pumping CSO	Pumping cleaner RTB effluent
Bottom of RTB 3 to 4.5 m below grade	Bottom of RTB over 7.5 m below grade below grade ~ $5 million higher construction cost
Provides better drainage and flushing conditions for RTB	
Easier access to shallower RTB	
Reduces provisions needed to prevent basin uplift and floatation	

RECOMMENDED DESIGN – *influent pumping station using screw pumps to handle solids and debris in CSO*

DESIGN ALTERNATIVES

RETENTION TREATMENT BASIN

Basin Sizing

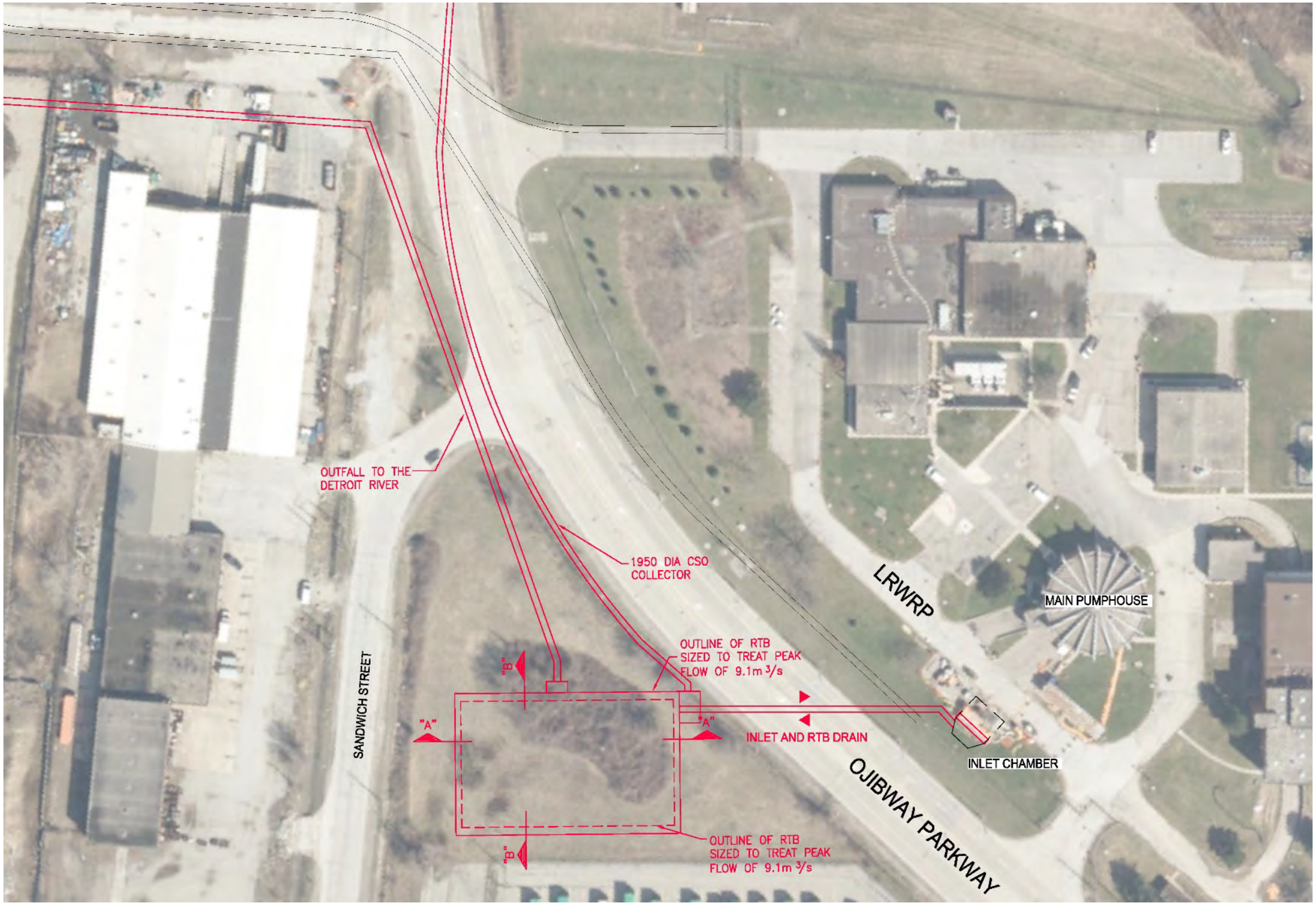
- Sized to handle a flow of 9.1 m^3/s for both CSO and wet weather flow, which is proposed to be equivalent to total capacity of LRWRP influent pumping station

Basin Features

- Influent distribution channel, overflow weir and baffle system
- Multi RTB cells each complete with a flushing water storage compartment and two flushing gates
- Scum baffle and effluent finger weir arrangement
- Sloping floor, training walls, drainage channel, sluice gates
- Mechanical/Electrical room integrated with pumping station headworks to house mechanical, electrical and process equipment including polymer storage and feed facilities

PREFERRED DESIGN

Aerial Plan showing Proposed RTB at the LRWRP



DESIGN ALTERNATIVES

OUTFALL SEWER

Alternative 1 – Outfall Sewer Along McKee Street

- Conflicts with current Gordie Howe International Bridge and perimeter access road (GHIB PAR) storm water outlet and the property to the north's new outlet
- Conflicts with other construction and access restrictions due to other utility infrastructure and their proposed easements (Hydro One)

Not carried forward for detailed consideration

THE CITY OF WINDSOR

Stantec

DESIGN ALTERNATIVES - OUTFALL SEWER

Alternative 2 – Outfall Sewer Along Prospect Avenue

- New outfall sewer in parallel with existing LRWRP outfall sewer
- New outfall sewer to match existing LRWRP outfall sewer for redundancy and backup under emergency situation
- Need easement for new outfall sewer
- Final design subject to review and approval by local, provincial and federal regulatory agencies

This alternative recommended as the preferred design

SUMMARY OF RECOMMENDED DESIGN

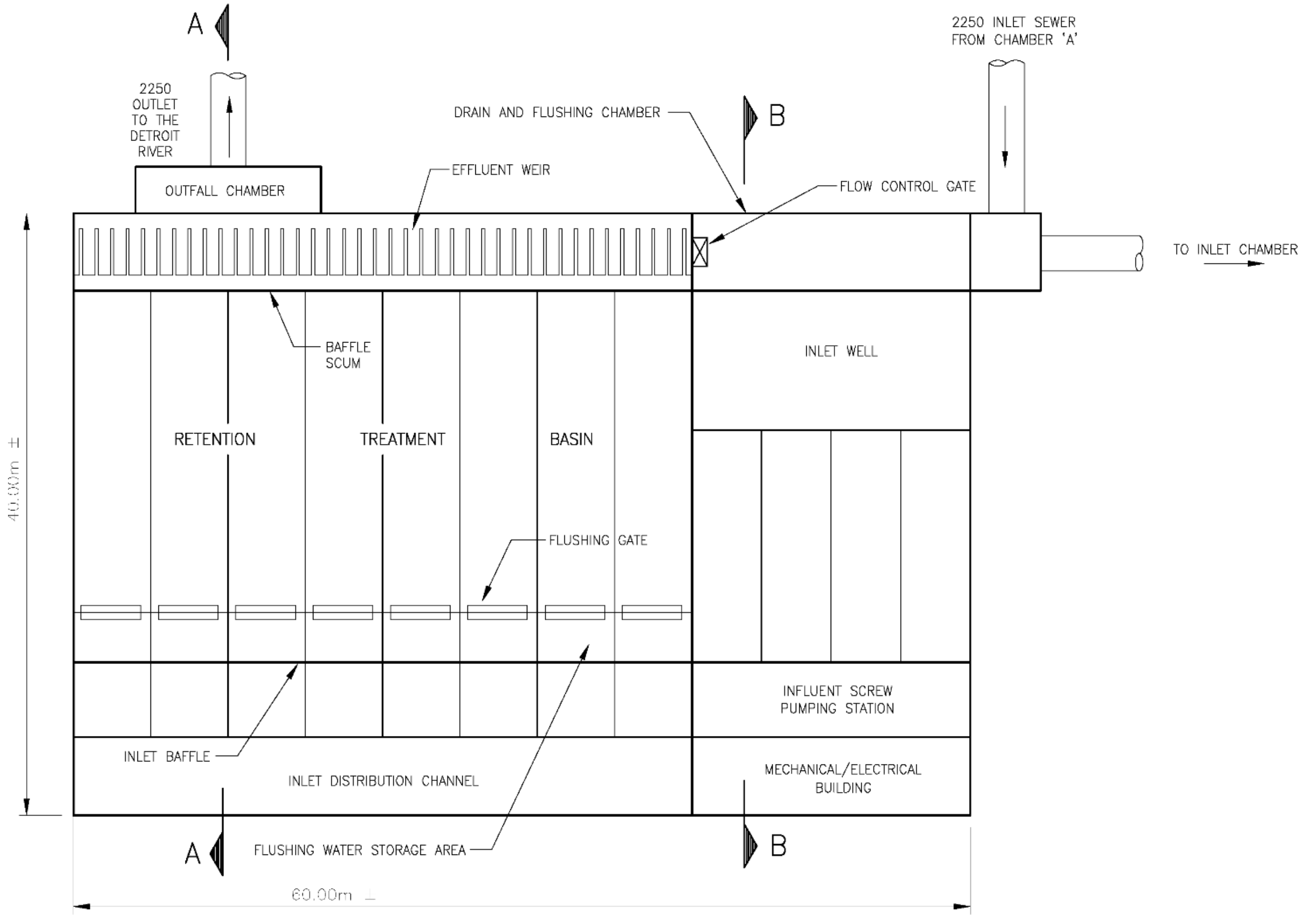
- Upgrade interceptor chambers A and D to automated flow control
- A CSO Collection Sewer extending from Chamber A to RTB west of LRWRP across Ojibway Parkway
- A valved interconnection across Ojibway Parkway between the LRWRP Inlet Chamber and the RTB to divert wet weather flow during a storm event or drain the RTB to the LRWRP Inlet Chamber after a storm event
- A RTB, on the west of the LRWRP between Ojibway Parkway and Sandwich Street, sized to handle a maximum wet weather flow of 9.1 m^3/s

SUMMARY OF RECOMMENDED DESIGN

- A pumping station with a firm pumping capacity of 9.1 m^3/s utilizing screw pumps to raise flow from the Riverfront Interceptor Sewer into the RTB
- Flushing gate equipment to flush accumulated solids from the RTB after a storm event
- An effluent outfall to the Detroit River
- Polymer storage and feed equipment and ancillary mechanical, electrical and control systems required for operation of the CSO pumping station and RTB facilities.

DESIGN ALTERNATIVES

PLAN VIEW OF RTB

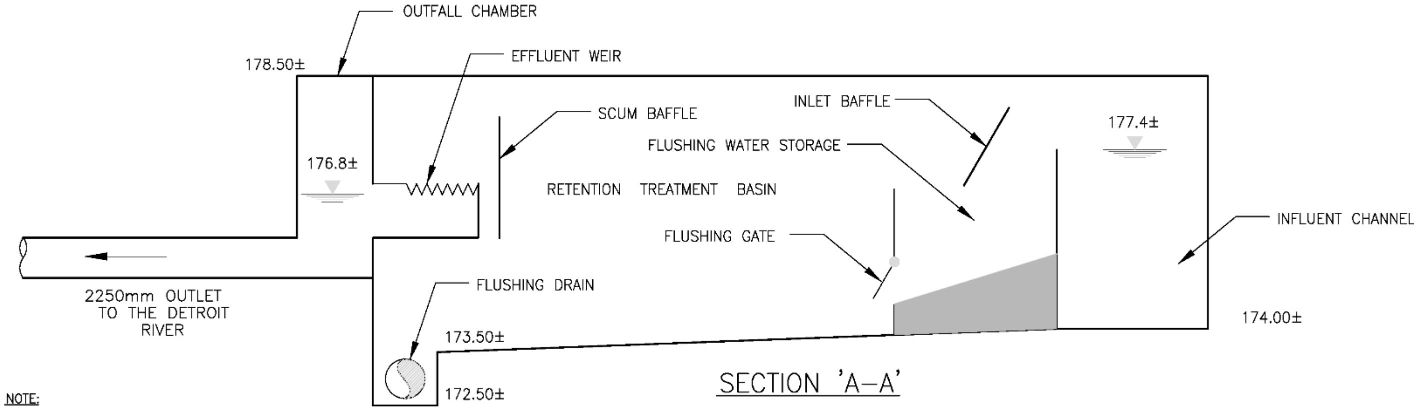


NOTE:

THE DIMENSIONS SHOWN ARE INTENDED TO PROVIDE AN INDICATION OF THE OVERALL SIZE OF THE FACILITIES. THESE DIMENSIONS ARE FOR ILLUSTRATION PURPOSES AND WILL BE SUBJECT TO VERIFICATION AND MODIFICATIONS DURING FINAL DESIGN.

DESIGN ALTERNATIVES

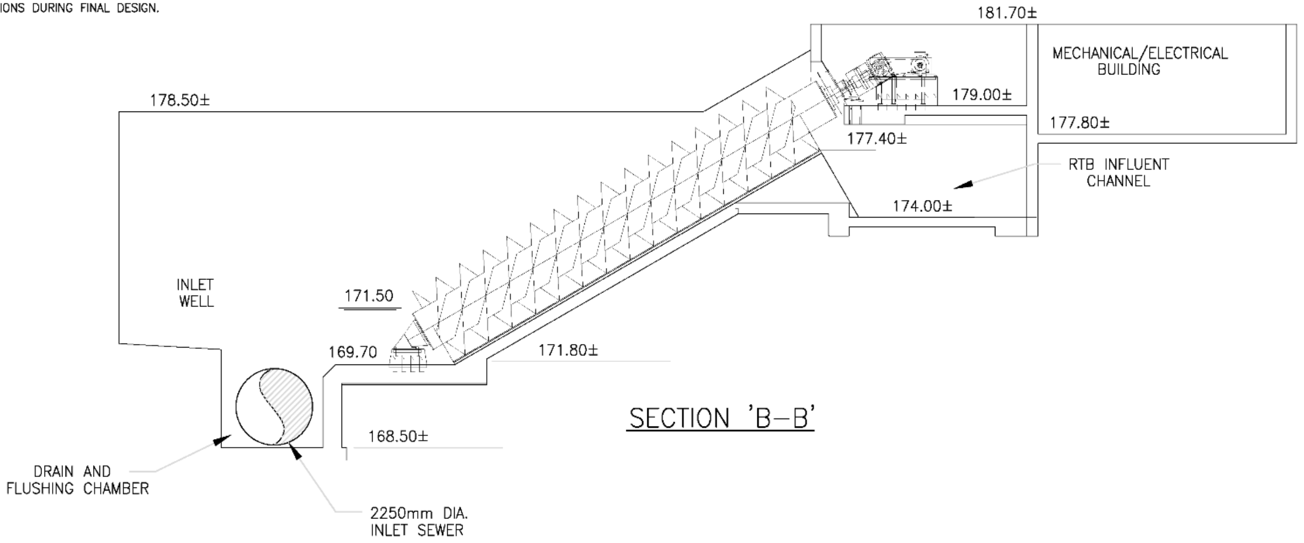
SECTIONAL VIEW OF RTB



SECTION 'A–A'

NOTE:

THE ELEVATIONS SHOWN ARE INTENDED TO PROVIDE AN INDICATION OF THE OVERALL SIZE OF THE FACILITIES. THESE ELEVATIONS ARE FOR ILLUSTRATION PURPOSES AND WILL BE SUBJECT TO VERIFICATION AND MODIFICATIONS DURING FINAL DESIGN.



SECTION 'B–B'

OPINION OF PROBABLE COST

ITEM	PROBABLE COST
Upgrade Interceptor Chambers A, D and F	$4,000,000
CSO Collector Sewer from Chamber A to RTB	$10,000,000
Influent Pumping Station, RTB and Outfall Sewer	$36,000,000
Contingency Allowance	$5,000,000
Engineering Allowance	$7,800,000
HST (13%)	$8,200,000
Total	$71,000,000

STEPS TO COMPLETE CLASS EA WORK

- Open house being held to present information and solicit public input on preferred design
- Draft Environmental Study Report (ESR) being distributed to mandatory and discretionary contacts and agencies for review
- Complete the ESR including modifications as necessary to reflect inputs from the public and review agencies
- Place ESR on public record and issue notice of completion

APPENDIX C-4

Draft ESR Report

- **Distribution lists and letters dated March 14, 2019 distributing Draft ESR report to review agencies**
- **Responses and correspondence regarding Draft ESR Report**

Stantec

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

March 14, 2019
File: 165620132

Attention:

Reference: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

The City of Windsor, with funding assistance from the Ministry of the Environment, Conservation, and Parks (MECP) and from the Federal Government through the Great Lakes Sustainability Fund, has initiated this Class EA to implement combined sewer overflows (CSOs) control program for the riverfront catchment area west of Caron Avenue as well as wet weather flow (WWF) control at the Lou Romano Water Reclamation Plant (LRWRP). This project is being planned as a **Schedule C** undertaking following the provisions of the Municipal Class Environmental Assessment document. Alternative means of providing CSO and WWF control in the study area has been assessed to meet the requirements set out in the MECP Guidelines "Procedure F-5-5". A variety of potential CSO and WWF control options has evaluated to select the preferred option.

The project is now in Phase 3 of the Class EA process which involves evaluation of alternative designs for the CSO and WWF control facilities leading to selection of a preferred design for this application.

A draft study report has been prepared which presents a number of possible alternative designs for the preferred solution. The merits and disadvantages of these alternatives are discussed with the decision-making process being structured to select the design that minimizes undesirable impacts on the natural, social and economic environments. Through this evaluation process a recommended design has been identified and is provided for consideration as the preferred design. As shown in the attached aerial plan, the proposed design consists of the following main elements:

- Upgrade interceptor chambers A and D to automated flow control, and increase volumetric interception rate at Interceptor Chambers A, D and F
- Deep sewer from Chamber A on Hill Avenue at Russell Street to LRWRP to carry increased flow from Chambers A, D and F.
- A RTB, located on the south side of Sandwich Street and Ojibway Pkwy intersection, sized to treat a maximum CSO and wet weather flow of 9.1 m^3/s, which is proposed to be equivalent to total capacity of LRWRP influent pumping station.
- A new pumping station with a firm pumping capacity of 9.1 m^3/s utilizing screw pumps to raise flow from the CSO Collector Sewer into the RTB.
- A valved interconnection across Ojibway Parkway between the LRWRP Inlet Chamber and the RTB to divert wet weather flow during a storm event or drain the RTB to the LRWRP Inlet Chamber after a storm event
- An effluent outfall to carry treated effluent from the RTB to the Detroit River. It also provides sufficient capacity and redundancy for existing LRWRP outfall sewer

Your agency is invited to submit comments on the *"Draft"* Environmental Study Report. In an effort to conserve paper and reduce printing costs, the report is being distributed in electronic format as a PDF file on the FTP site below. If you would prefer, a hard copy of the draft report will be provided on request.

Login Information
Browser link: https://projsftp.stantec.com
FTP Client Hostname: projsftp.stantec.com
Login name: CSO0645
Password: 3274549
Expiry Date: 6/28/2019

A public open house was held on February 27, 2019 to provide information on this project and to solicit public input. Copies of the Open House material are also available on the FTP site above.

We would appreciate receiving any comments you care to offer on the draft report within one month of receipt of this letter. Any comments or questions should be submitted to the following:

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Sincerely,

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Attachment: Aerial Plan of Proposed Design

c. Mr. Ed Valdez, Manager of Process Engineering & Maintenance, City of Windsor

Reference: **Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor**

Aerial Plan of Proposed Design

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Ms. Cara Salustro
Provincial Officer, Safe Drinking Water Branch, MOECC Windsor
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Mr. James Bryant
Water Resources Engineer
Essex Region Conservation Authority
360 Fairview Avenue West, Suite 311
Essex, ON N8M 1Y6

From: Valdez, Ed
To: Li, Jian
Cc: Drca, Paul
Subject: RE: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor
Date: Saturday, April 13, 2019 12:02:17 PM

The City fully intends to comply with the MECP request to implement the surface water quality monitoring program as outlined below by the MECP (Mr. Craig Newton) when this project comes to fruition.

Ed Valdez, PE, P.Eng. | Manager of Process Engineering & Maintenance

THE CITY OF WINDSOR
ONTARIO, CANADA

Office of the City Engineer I Pollution Control
4155 Ojibway Parkway, Windsor, ON, N9C 4A5
519-253-7111 ext.3366
Mobile: 519-890-1088

From: Li, Jian <jian.li@stantec.com>
Sent: Friday, April 12, 2019 3:52 PM
To: Valdez, Ed <evaldez@citywindsor.ca>
Subject: FW: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Hi Ed,

Please confirm the City commit to undertake the surface water quality Monitoring Program as amended below by MECP. It appears the amendments requested by MECP are reasonable.

Thanks,
Jian

From: Newton, Craig (MECP) <Craig.Newton@ontario.ca>
Sent: Thursday, April 11, 2019 2:06 PM
To: Li, Jian <jian.li@stantec.com>; 'evaldez@city.windsor.on.ca' <evaldez@city.windsor.on.ca>
Cc: Abernethy, Scott (MECP) <Scott.Abernethy@ontario.ca>; Bechard, Marc (MECP)

<Marc.Bechard@ontario.ca>; Howard, Shawn (MECP) <Shawn.Howard@ontario.ca>
Subject: FW: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Dear Dr. Li & Mr. Valdez:

This e-mail acknowledges this ministry's receipt, with thanks, of Stantec Consulting Ltd's preceding e-mail of April 8th, 2019 and accompanying letter (attached) which is also dated April 8th, 2019.

In response, the ministry provides the following comments:

MECP SWR Comments On The City of Windsor's Proposed Surface Water Quality Monitoring Program:

Before and after benthic monitoring upstream and downstream of the discharge point to the Detroit River is an adequate monitoring program for this undertaking and the proposal is generally acceptable subject to a few clarifications and changes as follows. A Surber sampler will not likely be the appropriate collecting device because of the depth of water and current velocity at the proper sites. The water depth will likely be between 1 and 3 metres. The downstream site should be positioned in the plume of the discharge, which may be well offshore. Grab samples for chemical analyses of river water must be collected from the plume on a day when the outfall is discharging to the river after the undertaking is completed. The upstream site will have to be located between the discharge point and the sewage plant outfall located just upstream.

Based on past studies, a standard PONAR sampler (9x9 inches) should be used for this monitoring. Three samples should be collected at each site both before and after. If the bottom is difficult to sample, then 5 samples should be collected at each site to compensate for the reduced abundance of macroinvertebrates, or 2 or 3 samples should be composited into a single sample and 3 composite samples collected at each site. The macroinvertebrates should be identified to the lowest taxonomic level as proposed. A BACI statistical design should be used to analyze all metrics (e.g. abundance, richness, BioMAP score, HBI, BC similarity). The proposed program, amended as indicated above, will make the data more useful and it will be comparable to that which has been collected in the vicinity in previous studies.

Please ensure that the Final ESR notes the City of Windsor's commitment to undertake this Monitoring Program as amended above.

MECP SWR Comments On Indigenous Consultation:

The response provided in Stantec Consulting Ltd.'s letter to this ministry of April 8th, 2019 is satisfactory to MECP SWR. That said, and as previously noted in MECP's comments of March 27th, 2019, proponents should as a matter of course, make follow-up phone calls with each Indigenous Community, make offers to meet to discuss the project, and answer any questions posed and document same in the Consultation Log of the Final ESR).

MECP SWR Comments On Source Water Protection:

The response provided in Stantec Consulting Ltd.'s letter to this ministry of April 8th, 2019 is satisfactory to MECP SWR.

MECP SWR Comments On Climate Change

The response provided in Stantec Consulting Ltd.'s letter to this ministry of April 8th, 2019 is satisfactory to MECP SWR.

MECP SWR Comments On Active / Former Waste Sites:

The response provided in Stantec Consulting Ltd.'s letter to this ministry of April 8th, 2019 is satisfactory to MECP SWR.

Yours truly,

Craig Newton
Regional Environmental Planner / Regional EA Coordinator
Ministry of the Environment, Conservation and Parks
Southwestern Region
733 Exeter Road
London, Ontario
N6E 1L3

Telephone: (519) 873-5014
E-mail: craig.newton@ontario.ca

From: Li, Jian <jian.li@stantec.com>
Sent: April-08-19 12:42 PM
To: Newton, Craig (MECP) <Craig.Newton@ontario.ca>
Cc: Abernethy, Scott (MECP) <Scott.Abernethy@ontario.ca>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Howard, Shawn (MECP) <Shawn.Howard@ontario.ca>; 'evaldez@city.windsor.on.ca' <evaldez@city.windsor.on.ca>
Subject: RE: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Dear Mr. Craig,

We appreciate your comments on the Marth 11th, 2019 Draft ESR for Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor.

Please find the attached responses to your comments offered in your email below dated March 27, 2019. We hope it will meet your expectations.

The ESA for the subject EA will be finalized and notice of completion will be issued upon your acceptance of our responses to your review comments.

Thanks,
Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Newton, Craig (MECP) <Craig.Newton@ontario.ca>
Sent: Wednesday, March 27, 2019 1:31 PM
To: Li, Jian <jian.li@stantec.com>; 'evaldez@city.windsor.on.ca' <evaldez@city.windsor.on.ca>
Cc: Abernethy, Scott (MECP) <Scott.Abernethy@ontario.ca>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Howard, Shawn (MECP) <Shawn.Howard@ontario.ca>
Subject: FW: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Dear Mr. Valdez and Dr. Li:

I am writing to you today in response to Stantec's immediately preceding e-mails of March 18th and March 21st, 2019, and accompanying attachments, wherein Stantec requested the Ministry of Environment, Conservation and Parks (MECP) comments, if any, on the Draft Windsor Riverfront West CSO Control Schedule C Class EA Environmental Study Report (ESR), dated March 11th, 2019, by no later than March 28th, 2019. Your March 21st, 2019 e-mail included two attachments, a general covering letter dated March 14th, 2019 from Stantec for this Draft ESR; as well as a separate letter to MECP, from Stantec also dated March 14th, 2019, in direct response to MECP's previous comments of February 1st, 2018 to the City of Windsor and Stantec (which combined MECP correspondence of December 14th, 2017 and January 30th, 2018 to Stantec and the City of Windsor into a single combined MECP letter).

The MECP is generally provided at least 30 days to review and comment on Draft ESR's, especially for Schedule C Class EAs. This 30 day review period request was denoted in MECP's previous letters to the City of Windsor and Stantec dated

December 14th, 2017, January 30th, 2018 and February 1st, 2018. In this case, MECP was provided 11 days to review and comment on the March 11th, 2019 Draft ESR. Please ensure for future Draft EA review requests, that the MECP is provided at least 30 days to review and comment.

The MECP offers the following comments for the City of Windsor and Stantec's due consideration and action. MECP comments follow the same order as those in Stantec's letter of March 14th, 2019:

Windsor Riverfront Pollution Control Planning (PCP) Study – Related General Comments:

The MECP, in its previous comments to the City of Windsor and Stantec noted that the City of Windsor was reportedly having issues with their existing Riverfront CSO Collection and Treatment Facility (RTB) which was reportedly designed for the treatment and disposal of CSOs from the riverfront area east of Caron Avenue. Due to the rise in river levels the City reportedly became aware of a design flaw that allowed river water to enter the RTB through an old CSO outfall. The Ministry asked that this issue and the City's Plan to address this issue be included in the overall assessment.

In response, Stantec's letter to this Ministry of March 14th, 2019 indicated the above noted issue, in 2017, was attributed to an extreme inflow and infiltration through one of the City's existing old brick outfalls. MECP is pleased to hear that a temporary repair has been made to the outfall to prevent the extraneous flow into the RTB, and further, that the City of Windsor is reportedly in the process of retaining a Consulting Engineer to complete the design and tender for a permanent resolution of this issue.

Surface Water Quality Monitoring:

The MECP previously commented to the City of Windsor and Stantec that the Class EA should include a water quality monitoring component to identify the nature and extent of CSO impacts to assist with the selection of the preferred alternative. In response, Stantec Consulting, in their March 14, 2019 letter, state that the PPCP investigated pollutant loading and that CSO's were identified as a major source of impact.

Pollutant loading is not a measure of impact. The PPCP was done many years ago and if it did present any surface water monitoring data then that data now would not be representative of current conditions. Stantec's letter and the Class EA document (Stantec, March 11 2019) state the project will benefit the environment but this is a qualitative statement with no plan to gather evidence to demonstrate the benefit. One of the main goals of Procedure F-5-5 is to minimize impacts on surface water. Under this Procedure additional controls on CSO's may be needed where required by receiving water conditions. Unfortunately, this draft environmental assessment lacks information on the environment necessary to meet F-5-5 requirements.

The Class EA document proposes a new outfall sewer to the Detroit River next to that of the Lou Romano sewage treatment plant. For this Class EA to be acceptable for surface water concerns the City needs to summit to the MECP Regional Office a terms of reference for a river monitoring program. Monitoring would occur before and after the new outfall is operational and it would include monitoring locations upstream and downstream of the outfall. Monitoring of the benthic macroinvertebrate community is necessary using fixed-area sampling and the lowest practical level of taxonomic resolution to ensure a rigorous assessment. The "before" monitoring to establish the baseline could be done this autumn or next spring and the "after" monitoring would occur once in the same season after the outfall has been operational for at least a year. Specific details can be worked out in a terms of reference. A commitment by the City of Windsor to do this needs to be included in the Final Class EA documentation. Once an acceptable terms of reference is in-place, the MECP Regional Office will consider surface water aspects of the Class EA to be satisfactory, and we will have a basis to sign-off on subsequent sewage works approval applications for the project.

Indigenous Consultation:

Section 8.4 First Nations Consultation of the Draft EA outlines, in general, the proponent's efforts to date with respect to First Nations Consultation. Appendix C outlines the various First Nations and respective contact names that were reportedly forwarded Notices. The proponent must ensure that First Nations are provided ample opportunity to consult with the proponent with respect to what interests they may have with respect to this proposed project. It is not suffice to just send Notices to First Nations. All of the opportunities and requests (notices, phone Calls, offers to meet in person) to consult with First Nations associated with this proposed project should be fully documented in the Final ESR. If any issues are raised, the Final ESR should identify those issues, and how those issues were addressed / mitigated. If the proponent has undertaken this level of consultation effort, such should be formally documented in the Final EA. If this level of consultation effort has not yet been undertaken (ie phones calls, offers to meet in person), this needs to be undertaken prior to issuance of the Notice of Completion, and those efforts, responses received, and how any issues raised have been addressed must be documented in the Final EA. Such consultation efforts are usually documented in a Consultation Log, and said Log provided in the Final EA for review.

With respect to First Nations Consultation, this ministry offers general advice on this ministry's website. The proponent should follow the advice provided on the ministry's web site (see link below):

https://www.ontario.ca/document/consultation-ontarios-environmental-assessment-process

Source Water Protection:

The MECP previously advised the City of Windsor, and Stantec, that as per amendments to the Municipal Engineers Association Municipal Class EA, proponents undertaking a Municipal Class EA project must identify whether a project is occurring within a source water protection vulnerable area. The must be clearly documented in the ESR.

A review of the Table of Contents of the Draft ESR does not make any reference to Source Protection in the Draft ESR. The only reference that MECP could locate with respect to Source Protection and this project are the two paragraph description provided in Stantec's letter of March 14th, 2019 addressed to MECP; outside of the text of the Draft ESR itself. This is not sufficient. The Final ESR itself must identify whether a project is occurring within a source water protection vulnerable area. If the project is occurring in a vulnerable area, then there may be policies in the local Source Protection Plan (SPP) that need to be addressed (requirements under the Clean Water Act). The proponent should contact and consult with the appropriate Conservation Authority/Source Protection Authority (CA/SPA) to discuss potential considerations and policies in the SPP that apply to the project. The outcome of this contact to be identified in the Final ESR, including but not limited to any policies in the SPP that apply to the project. The Final ESR should discuss whether or not this project changes or creates new vulnerable areas, and provide applicable details about the area. If located in a vulnerable area, proponents should document whether any project activities are a prescribed drinking water threat and thus pose a risk to drinking water (this should be consulted on with the appropriate CA/SPA). Where an activity poses a risk to drinking water, the proponent must document and discuss in the Final ESR how the project adheres to or has regard to applicable policies in the local SPP. If creating or changing a vulnerable area, proponents should document whether any existing uses or activities may potentially be affected by the implementation of source protection policies. This section should then be used to inform and should be reflected in other sections of the Final EA, such as the identification of net positive/ negative effects of alternatives, mitigation measures, evaluation of alternatives etc. As a note, even if the project activities in a vulnerable area are deemed not to be a drinking water risk, there may be other policies that apply and so consultation with the local CA/SPA is important. All of the foregoing needs to be presented and discussed in the Final EA.

Climate Change:

The MECP previously advised the City of Windsor, and Stantec, that the ESR must address Climate Change. A review of the Table of Contents of the Draft ESR does make any reference to Climate Change. Climate change should be considered in the context of mitigation and the context of adaptation. The Ministry has recently released a guidance document to support proponents in including climate change in environmental assessments. The guide can be found online: https://www.ontario.ca/page/considering-climate-change-environmental-assessment-process. It should be noted that Climatic Features is identified in Appendix 2 of the Municipal Class EA page 2-7 (2015). All of the foregoing still needs to be presented and discussed in the Final EA.

Additional Comment – Active / Former Waste Sites

The Final Class EA should identify the existence and location of any active and/or former waste disposal sites within the study area and what impact if any those waste sites have on the proposed project. That is, the Final EA should include a discussion as to whether the installation of any of the physical works proposed by this project will act as a conduit for the migration of methane and/or leachate from nearby active and/or former waste sites, and if so, what impact if any will result, and what mitigative measures will be put in place to address such impact(s).

Finally, thank you for providing this ministry the opportunity to review and comment on this Draft ESR, prior to the formal public, agency, and indigenous communities review of the Final ESR. Should you have any questions, please feel free to approach me and I will do my best to answer them.

Yours truly,

Craig Newton
Regional Environmental Planner / Regional EA Coordinator
Ministry of the Environment, Conservation and Parks
Southwestern Region
733 Exeter Road
London, Ontario
N6E 1L3

Telephone: (519) 873-5014
E-mail: craig.newton@ontario.ca

From: Li, Jian <jian.li@stantec.com>
Sent: March-21-19 12:10 PM
To: Newton, Craig (MECP) <Craig.Newton@ontario.ca>
Subject: FW: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Hi Craig,

Please review and advise of any comments on “draft” environmental study report on combined sewer overflows (CSOs) control project for the riverfront catchment area west of Caron Avenue as well as wet weather flow (WWF) control at the Lou Romano Water Reclamation Plant (LRWRP), City of Windsor.

I will send all future correspondence with respect to this project to your attention, as you are the MECP's contact for this project:

Thanks,
Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec

100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Li, Jian
Sent: Monday, March 18, 2019 11:07 AM
To: 'Eckert, Anneleis (MOECC)' <Anneleis.Eckert@ontario.ca>
Cc: Smith, Mark (MOECC) <Mark.Smith@ontario.ca>; Bechard, Marc (MOECC) <Marc.Bechard@ontario.ca>; Salustro, Cara (MOECC) <Cara.Salustro@ontario.ca>; Abernethy, Scott (MOECC) <Scott.Abernethy@ontario.ca>; Newton, Craig (MOECC) <Craig.Newton@ontario.ca>; Lafrance, Crystal (MOECC) <Crystal.Lafrance@ontario.ca>; evaldez@city.windsor.on.ca; Richters, Karina <krichters@citywindsor.ca>
Subject: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Hi Anneleis,

Please find attached letter soliciting MECP's comments on "draft" environmental study report on combined sewer overflows (CSOs) control project for the riverfront catchment area west of Caron Avenue as well as wet weather flow (WWF) control at the Lou Romano Water Reclamation Plant (LRWRP). Responses to your comments received on Feb 1, 2018 is also attached.

The City of Windsor has initiated this Class EA to implement CSOs control program for the riverfront catchment area west of Caron Avenue as well as WWF control at the LRWRP. This project is being planned as a **Schedule C** undertaking following the provisions of the Municipal Class Environmental Assessment document. Alternative means of providing CSO and WWF control in the study area has been assessed to meet the requirements set out in the MECP Guidelines "Procedure F-5-5". A variety of potential CSO and WWF control options have been evaluated to select the preferred option.

The project is now in Phase 3 of the Class EA process which involves evaluation of alternative designs for the CSO and WWF control facilities leading to selection of a preferred design for this application. A draft study report has been prepared which presents a number of possible alternative designs for the preferred solution. The merits and disadvantages of these alternatives are discussed with the decision-making process being structured to select the design that minimizes undesirable impacts on the natural, social and economic environments. Through this evaluation process a recommended design has been identified and is provided for consideration as the preferred design.

Your agency is invited to submit comments on the *"Draft"* Environmental Study Report. In an effort to conserve paper and reduce printing costs, the report is being distributed in electronic format as a PDF file on the FTP site below. If you would prefer, a hard copy of the draft report will be provided on request.

Login Information
Browser link: https://projsftp.stantec.com
FTP Client Hostname: projsftp.stantec.com
Login name: CSO0645

Password: 3274549
Expiry Date: 6/28/2019

We would appreciate receiving any comments you care to offer on the draft report by March 28, 2019.

Sincerely,

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Eckert, Anneleis (MOECC) <Anneleis.Eckert@ontario.ca>
Sent: Thursday, February 1, 2018 11:58 AM
To: evaldez@city.windsor.on.ca; Li, Jian <jian.li@stantec.com>
Cc: Smith, Mark (MOECC) <Mark.Smith@ontario.ca>; Bechard, Marc (MOECC) <Marc.Bechard@ontario.ca>; Salustro, Cara (MOECC) <Cara.Salustro@ontario.ca>; Abernethy, Scott (MOECC) <Scott.Abernethy@ontario.ca>; Newton, Craig (MOECC) <Craig.Newton@ontario.ca>; Lafrance, Crystal (MOECC) <Crystal.Lafrance@ontario.ca>
Subject: Reissuance of MOECC acknowledgment of Combined Sewage Overflow Control Notice of Commencement

Good Morning Ed Valdez,

It has come to our attention that two MOECC responses to the Notice of Commencement for the Combined Sewage Overflow Control were sent to the City. One was sent on December 14th 2017, the other on January 30th 2018.

The Notice of Commencement had been submitted to more than one regional staff person including staff in our drinking water and surface water units both of whom had special interest in this particular file. While, typically, that level of detail on those program area interests are not explored or provided at the Notice of Commencement stage, given that we had it available, we shared it for the City's information in our December 14th response. The Notice of Commencement was then re-received from an internal source and, due to staff change over, we didn't realise a response had already been sent until after the second response was sent on Jan 30th. We apologise for this oversight and any confusion this may have caused. MOECC encourages the City to utilise the information in both letters and, to that end, we have combined the letters for ease of use.

Again, we apologise for the duplication of correspondence and any confusion. Please do not hesitate to contact me if you have any questions or concerns.

Thank you,

Anneleis Eckert
Environmental Assessment Coordinator
519-873-5115 | anneleis.eckert@ontario.ca
Air, Pesticides and Environmental Planning | Drinking Water and Environmental Compliance Division | Southwest Region | Ministry of the Environment and Climate Change | 733 Exeter Road, London ON

Stantec

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

April 8, 2019
File: 165620132

Attention: Mr. Craig Newton, Regional Environmental Planner and Regional EA Coordinator

Ministry of the Environment, Conservation and Parks
733 Exeter Road
London ON, N6E 1L3

Dear Mr. Newton,

Reference: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Thank you for your prompt response to the March 11th, 2019 Draft ESR for Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor. The following is in response to your comments on the draft ESR, which was received on March 27, 2019.

1. Surface Water Quality Monitoring

On the behalf of the City, we summit the following terms of reference for a river monitoring program as per your request.

1.1 General Approach

The water quality and benthic macroinvertebrate survey of Detroit River is to be implemented for the proposed retention treatment basin (RTB) outfall.

- The “before” monitoring to establish the baseline shall be completed during the autumn or spring period prior to starting construction of the proposed RTB outfall; and
- The “after” monitoring would occur once in the same season after the outfall has been operational for at least a year.

The “before” monitoring provides baseline benthic community information in the vicinity of the proposed RTB outfall to which subsequent “after” monitoring data can be compared.

1.2 Sampling Locations

Field samples are to be collected at the following two locations organized as paired upstream reference and downstream exposure stations at the proposed RTB outfall:

- Detroit River, upstream of the proposed RTB outfall, and
- Detroit River, downstream of the proposed RTB outfall.

Sampling locations are to be chosen in an effort to minimize variation in habitat between paired stations. Riffle habitats with cobble, gravel and sand substrates and moderate to fast water velocity were targeted for each sampling station.

1.3 Water Quality Sampling and Analysis

The surface water sampling is to be performed in conjunction with benthic macroinvertebrate sampling. Grab samples are to be sent for laboratory analysis of parameters of interest and in-situ measurements of temperature, pH, conductivity, and DO are also to be taken.

The water quality parameters include TSS, TP, anions (including NO_2, NO_3, PO_4), and Ammonia-N. Laboratory results are to be summarized and analyzed to generate 75th percentile concentrations for water quality parameters of interest.

1.4 Benthic Macroinvertebrate Sampling

Quantitative benthic macroinvertebrate samples are to be collected from Detroit River using a Surber sampler (area = 0.093 m^2) equipped with a 500 µm mesh bag. Two replicates are also to be collected at each of the two locations and preserved separately in the field in 10% buffered formalin.

The following supporting measurements and observations are to be made at each of the benthic sampling stations: pH, dissolved oxygen, conductivity, water and air temperature, water depth, and water velocity. Substrate and aquatic habitat characteristics were recorded.

1.5 Laboratory Methods and Taxonomy for Benthic Macroinvertebrate Survey

The sorting and identification of benthic macroinvertebrates is to be conducted in a benthic taxonomy laboratory. Samples are to be stained with Eosin-B and Biebrich Scarlet. Staining facilitates sorting by preferentially staining the organisms so they can be more easily distinguished from the sample debris. The samples are to be washed in a 500 µm sieve to remove formalin and the remaining sample material is to be washed from the sieve into a plastic gridded sorting tray. Organisms is to be sorted from the tray using a 10 - 40x stereomicroscope.

All macroinvertebrates are to be identified to the lowest practical level; usually genus. Chironomids and oligochaetes are to be mounted on glass slides in a clearing medium prior to identification. Following detailed identification, organisms are to be re-preserved in a solution of 70 to 80% ethanol in glass vials and labeled by station, replicate and contents. Data are to be tabulated in an Excel spreadsheet to facilitate analysis and interpretation.

1.6 Data Analysis of Benthic Macroinvertebrate

Each sample may contain hundreds of individuals and numerous different taxa, therefore, biotic indices that incorporate various community attributes are to be used to compare benthic communities both spatially (between stations) and temporally (within stations over time). The following community measures and indices are to be used to interpret the benthic macroinvertebrate data for this survey.

- Organism density;

- Taxa richness;
- EPT Index;
- BioMAP Water Quality Index;
- Hilsenhoff Biotic Index; and
- Relative abundance of selected taxonomic groups.

We will include the above terms of reference for a river monitoring program in the final ESR.

2. Indigenous Consultation

Consultation with First Nations is being implemented in accordance with the Municipal Class EA First Nations Consultation requirements. As part of this Class EA, communications with First Nations agencies and communities are being undertaken in parallel with the other stakeholder communications and consultations. Letters were sent to the First Nations groups and organizations at study commencement and public open house to solicit their interest or non-interest in the study.

Draft EA reports were forwarded to the First Nations groups and organizations for comments. Response received from Fallon Burch, Consultation Coordinator, Chippewas of the Thames First Nation. Fallon advised that the proposed project is located within the Mckee Treaty Area (1790) to which Chippewas of the Thames First Nation (COTTFN) is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory. Fallon indicated that they have very minimum concern with the proposed project. If any Archaeology studies are required, the Thames First Nation would like to participate by sending an Archaeology Field Liaison on behalf of COTTFN.

Follow-up reminders will be sent to other First Nations groups prior to the issuance of the Notice of Completion.

Indigenous consultation efforts are documented in a Consultation Log, and appended to this letter. The Consultation Log will be included in the final ESR for review.

3. Source Water Protection

We will include a section below in the final ESR on Source Water Protection.

3.1 Source Water Protect

For the protection of local municipal drinking water sources, the Essex Region Source Protection Plan (SPP), which has been established under the Clean Water Act, 2006 (Ontario Regulation 287/07), came into effect on October 1, 2015.

The Clean Water Act (2006) refers to four types of Vulnerable Areas, which include:

- Intake Protection Zones
- Wellhead Protection Areas

- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Areas

The types of Vulnerable Areas are addressed further below in relation to this project location.

3.1.1 Intake Protection Zones (IPZs)

There are two municipal Water Treatment Plants (WTPs) in the region, the A. H. Weeks (Windsor) and Amherstburg WTPs, having their intakes in the Detroit River (refer to Map 3 of the Essex Region Source Protection Plan). Intake Protection Zones are areas of land and water, where run-off from streams or drainage systems, in conjunction with currents in lakes and rivers, could directly impact the source water at the municipal drinking water intakes.

An Intake Protection Zone can be described as a defined area surrounding a surface water body intake. The size and shape of each zone in an IPZ represents either a set distance around the intake pipe, or the length of time it would take water and contaminants to reach the intake:

- IPZ-1 is the area closest to the intake pipe and is a set distance which extends one kilometre upstream and 120 metres onto the shore.
- IPZ-2 includes the on and offshore areas where flowing water and any pollution would reach the intake pipe within two hours.
- IPZ-3 is an area where contaminants could reach the intake pipe during and after a large storm.

According to Approved Source Protection Plan for Essex region source protection area, the Detroit River in the study area is characterized to be an Intake Protection Zone 3 (IPZ-3). Refer to Map 10 of the Essex Region Source Protection Plan)

The purpose of this EA study is to investigate and report on alternative means of controlling CSO in the riverfront area between Caron Avenue on the east to the Lou Romano Water Reclamation Plant (LRWRP) on the west and wet weather flows received at the LRWRP. The proposed project for the collection and treatment of CSOs and WWF will have an important beneficial impact on the source of drinking water quality.

3.1.2 Wellhead Protection Areas

Wellhead Protection Areas are not applicable in the Essex Region, as no municipal drinking water systems are supplied by groundwater.

3.1.3 Highly Vulnerable Aquifers (HVAs)

Highly Vulnerable Aquifers (HVAs) are defined as aquifers on which external sources have or are likely to have a significant adverse impact, and include the land above the aquifer.

In the ERSPA these HVAs are generally located in the sandy soil areas in the southern part of the region, including most of Pelee Island (refer to Map 4 of the Essex Region Source Protection Plan). There are no HVAs located in or close to the proposed work area.

3.1.4 Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRAs) are defined as per Regulation 287/07 as areas within which it is desirable to regulate or monitor drinking water threats that may affect the recharge of an aquifer. Groundwater recharge occurs where rain or snowmelt percolates into the ground and flows to an aquifer. The greatest recharge usually occurs in areas which have loose or permeable soil such as sand or gravel that allows the water to seep easily into the aquifer.

Most of the SGRAs in the ERSPA are located in the sandy soil areas of the southern part of the Essex Region, in the Harrow area, parts of Leamington and Kingsville, and limited parts of the Turkey Creek and Pelee Island subwatersheds (refer to Map 5 of the Essex Region Source Protection Plan). There are no HVAs located in the northern part of the Essex Region including City of Windsor area.

3.1.5 Overall Vulnerability Assessment Summary

Project activities in vulnerable areas need to be assessed to determine the risk they pose. The Clean Water Act requires that significant threats be managed to reduce the threat to a point where it is no longer significant. Action may be taken to address low and moderate threats at the discretion of the Source Protection Committee. Table 4.1 provides a summary of threats to vulnerable areas and the subsequent actions to be taken, relating to this project.

Table 3.1 Summary of Threats to Vulnerable Areas

Vulnerable Area	Threat Potential	Action Taken
Intake Protection Zone	Low	None
Wellhead Protection Areas	Not applicable	None
Highly Vulnerable Aquifer	Not applicable	None
Significant Ground Water Recharge Areas	Not applicable	None

4. Climate Change

We will include a section below in the final ESR on Climate Change.

Climate encompasses all aspects of weather, including: temperature, precipitation, air pressure, humidity, wind speeds, and cloudiness. Weather and climate are not static processes and variability is often normal. Weather, for example, changes on a daily and sometimes hourly basis. Weather can also change on a monthly basis, through the changing of seasons. When climate changes on a global scale, it is referred to as Climate Change.

Since the beginning of the industrial revolution in the 18th century, excessive emission of greenhouse gases, like carbon dioxide and methane, have been released through human activities, causing an increased percentage of solar radiation to be trapped in our atmosphere. In recent decades the effect of this on climate has become clearer. As more energy is retained within the atmosphere, a general increasing trend in global temperatures has occurred.

Regardless of the cause, the average temperature in Windsor has increased by almost 1°C since 1940. As air temperatures increases, so does the capacity of the air to hold more water leading to more intense rainfall events. The Environment Canada weather station located at Windsor Airport has been monitoring and recording weather data since 1941. Since this time, an increasing trend in annual precipitation has been documented.

The effects of climate change are expected to include an increase in the number and severity of storms, leading to increased precipitation. Since 1970, there has been increasing evidence of heavier short duration (24 hours or less) rain events in southern Ontario. The following table, which is obtained from City of Windsor Climate Change Adaption Plan (September 2012), summarizes the average trends in the amount of annual maximum rain events.

Table 4.1 Summary of the observed and projected increases in rainfall over time in Windsor

	Observed trends 1970 – 2000	Projected trends to 2050 (High Emissions)
30 minute extremes	• 5% increase per decade • 4.5% increase per decade to 1996	• 5% increase per decade
Daily extremes	• 7% per decade (May, June, July) • 5% increase per decade (over the year) to 1996	• 3% per decade over the year (20 year return period) • 2.5 to 6% increase per decade (rainfall with probability <5 %)
Annual rainfall	• 1% to 3% increase per decade	• 1% increase per decade

Climate changes related to increasing rainfall in the region have a significant impact on municipal sewer systems. As such, historical data regarding the likelihood of major flooding events must be reconsidered. It is important that the proposed work for CSO control continues to operate effectively in the future. A solution needs to be identified to provide resiliency to the impacts of climate change.

The proposed work for CSO control were recommended based on current standards with a conservative design method that provides a safety margin for extreme rainfall events above and beyond the average year design storms. Thus, the modeled peak flows and storage/treated volume requirements are greater than expected values to mitigate the impact of climate changes.

5. Active / Former Waste Sites

We will include a section below in the final ESR on active and/or former waste disposal sites.

The existence and location of any active and/or former waste disposal sites within the study area was carefully reviewed. A listing of information about large and small landfills in Ontario that includes open/closed status, site owner, site location, and Certificate of Approval number are available from Government of Ontario ‘s website.

There is no large waste disposal site in the region. Table 4-1 shows one small former waste disposal site which is in proximity to the study area. However, any active/former small waste disposal sites including the Western Inert (Malden Road) Landfill listed in Table 4-1 are located far away from the proposed work area. As the proposed work includes sewer construction within the road right-of-way and the proposed wastewater treatment facility is located far away from any active/former waste disposal sites, the proposed work is not expected to have any impact on the migration of methane and/or leachate from nearby active and/or former waste sites.

Table 5-1 List of Active and/or Former Waste Disposal Sites within the Study Area

ECA	Site Name	Site Location	Status
A010102	Western Inert (Malden Road) Landfill City of Windsor	Bounded By Matchette Road, Chappell and Sun Valley Drives, and Malden Road	Closed

Respectfully yours,

Stantec Consulting Ltd.

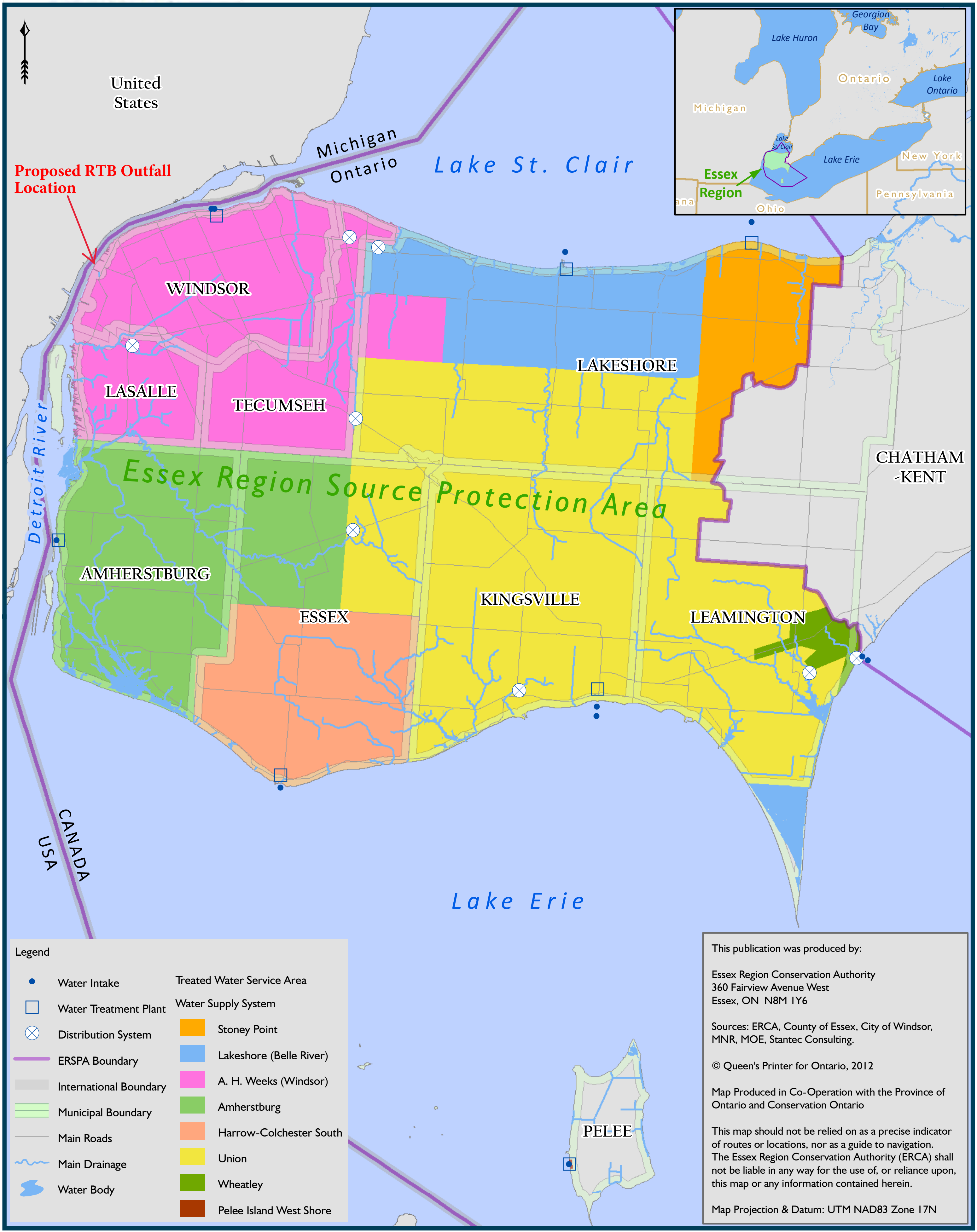
Jian

Jian Li Ph.D., P.Eng., PE
Project Manager
Phone: 519 966 2250
Fax: 519-966-5523
jian.li@stantec.com

c. Mr. Ed Valdez, Manager of Process Engineering & Maintenance, City of Windsor

Map 3: Drinking Water Systems

Made possible by the Government of Ontario



This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, Stantec Consulting.

Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Essex Region Conservation Authority (ERCA) shall not be liable in any way for the use of, or reliance upon, this map or any information contained herein.

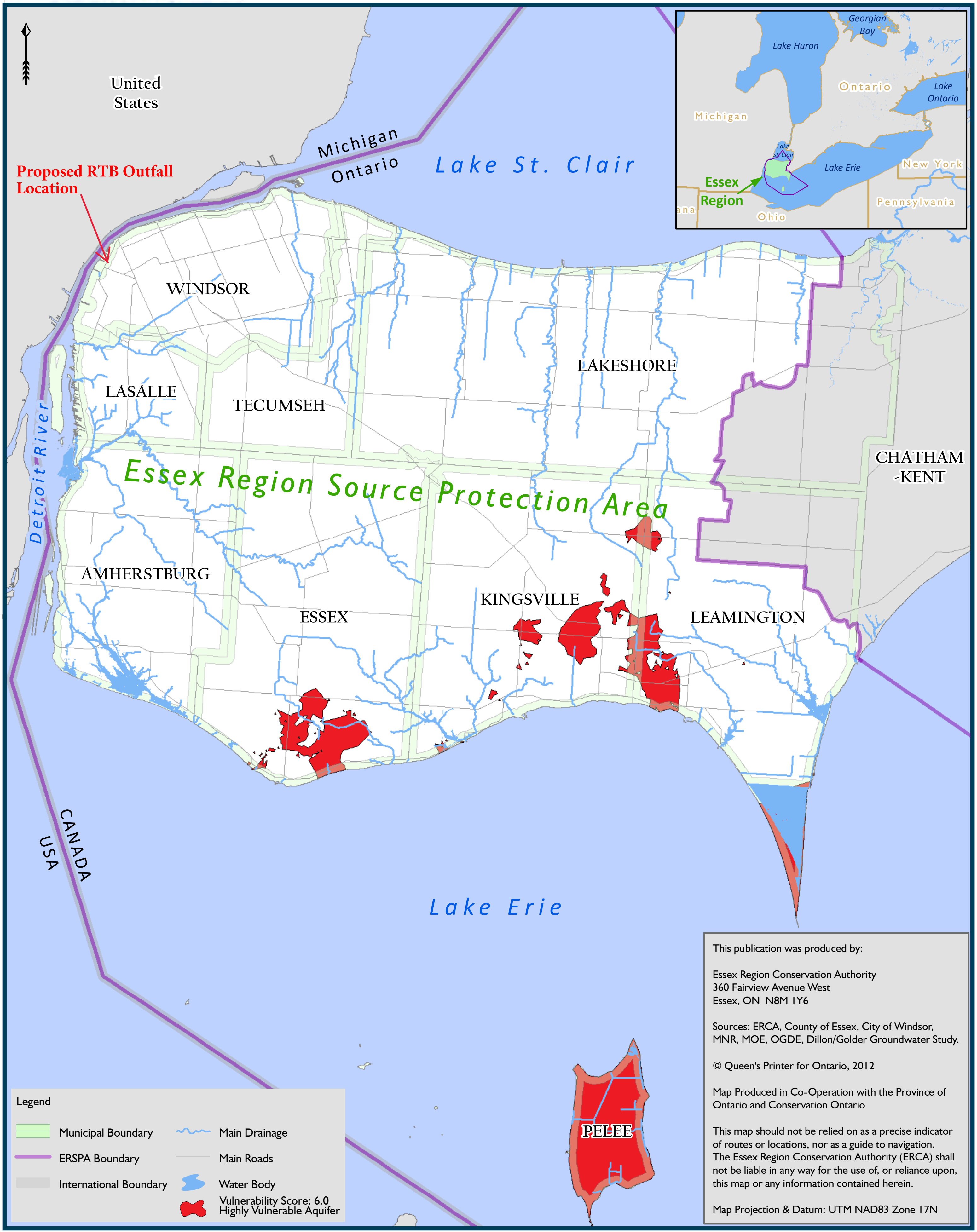
Map Projection & Datum: UTM NAD83 Zone 17N

1:320,000

0 10 Kilometers

Map 4: Highly Vulnerable Aquifers

Made possible by the Government of Ontario



This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, OGDE, Dillon/Golder Groundwater Study.

Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario

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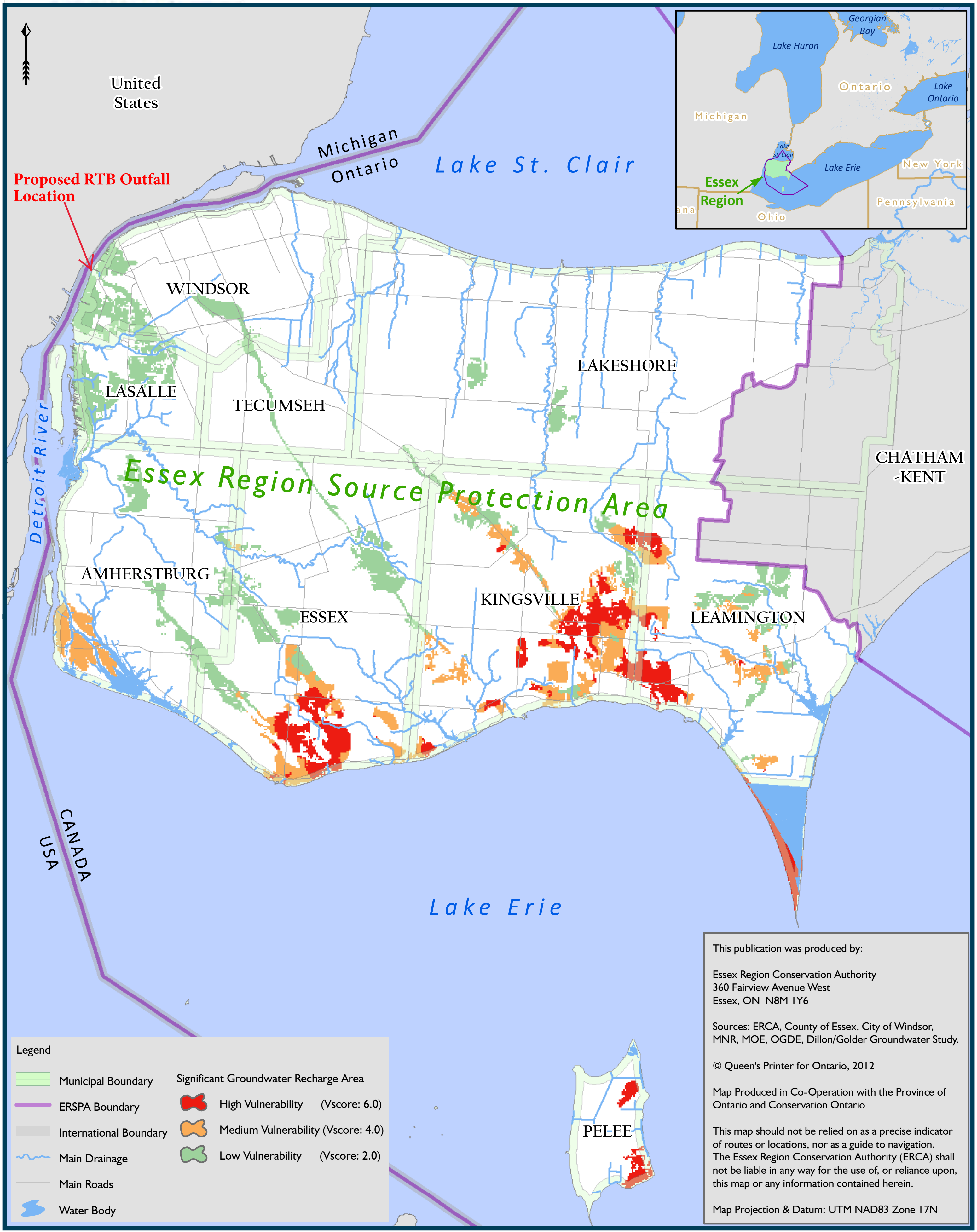
Map Projection & Datum: UTM NAD83 Zone 17N

1:320,000

Map 5: Significant Groundwater Recharge Areas

Made possible by the Government of Ontario



Legend

- Municipal Boundary
- ERSPA Boundary
- International Boundary
- Main Drainage
- Main Roads
- Water Body

Significant Groundwater Recharge Area

🟥	High Vulnerability	(Vscore: 6.0)
🟧	Medium Vulnerability	(Vscore: 4.0)
🟩	Low Vulnerability	(Vscore: 2.0)

This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, OGDE, Dillon/Golder Groundwater Study.

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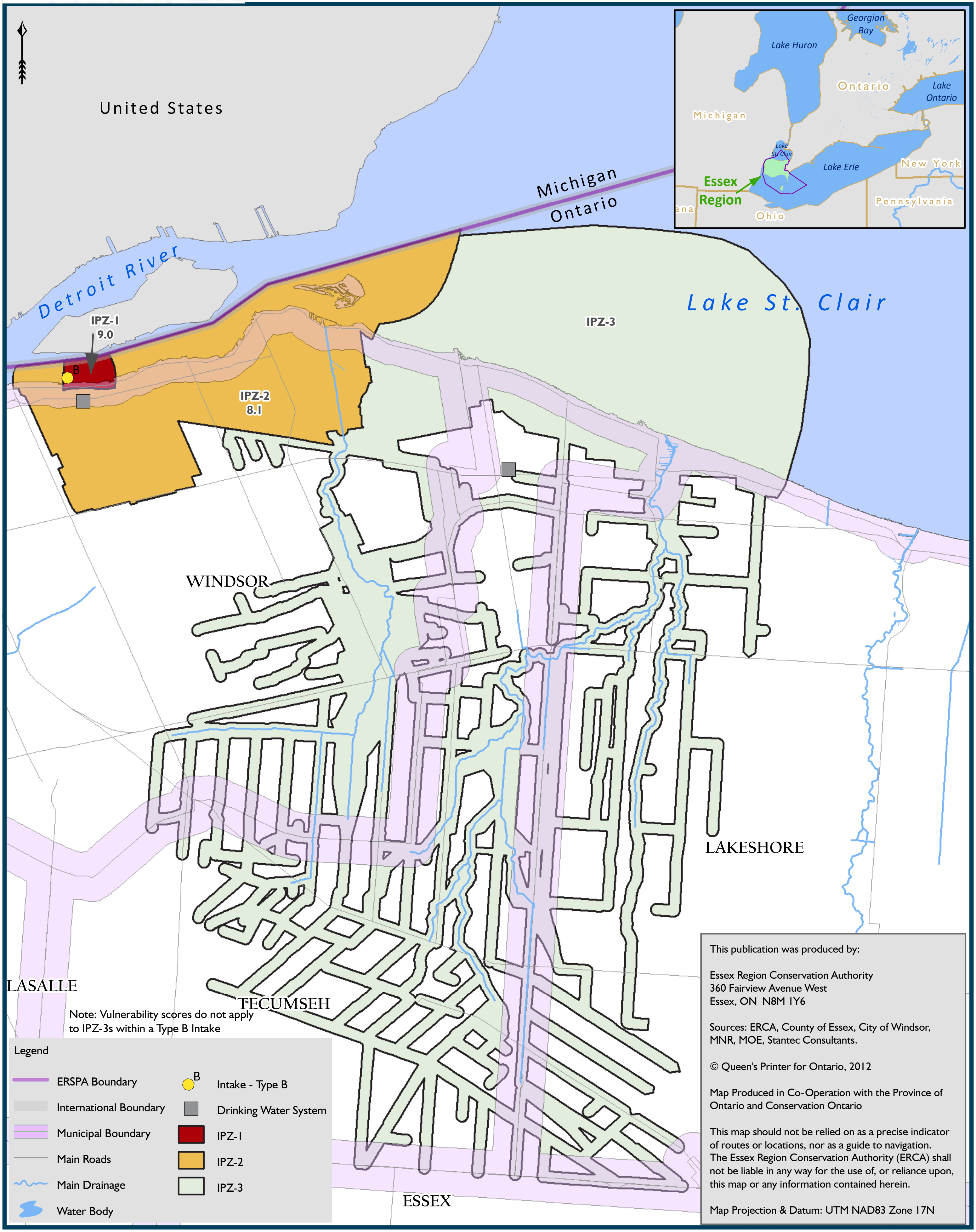
Map Projection & Datum: UTM NAD83 Zone 17N

1:320,000

0 10
Kilometers

Map 9: A. H. Weeks (Windsor) Water Treatment Plant (West Intake) IPZs and Vulnerability Scoring

Made possible by the Government of Ontario



Note: Vulnerability scores do not apply to IPZ-3s within a Type B Intake

Legend

━	ERSPA Boundary	● B	Intake - Type B
▬	International Boundary	■	Drinking Water System
▨	Municipal Boundary	🟥	IPZ-1
─	Main Roads	🟧	IPZ-2
〜	Main Drainage	🟩	IPZ-3
●	Water Body		

This publication was produced by:

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360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, Stantec Consultants.

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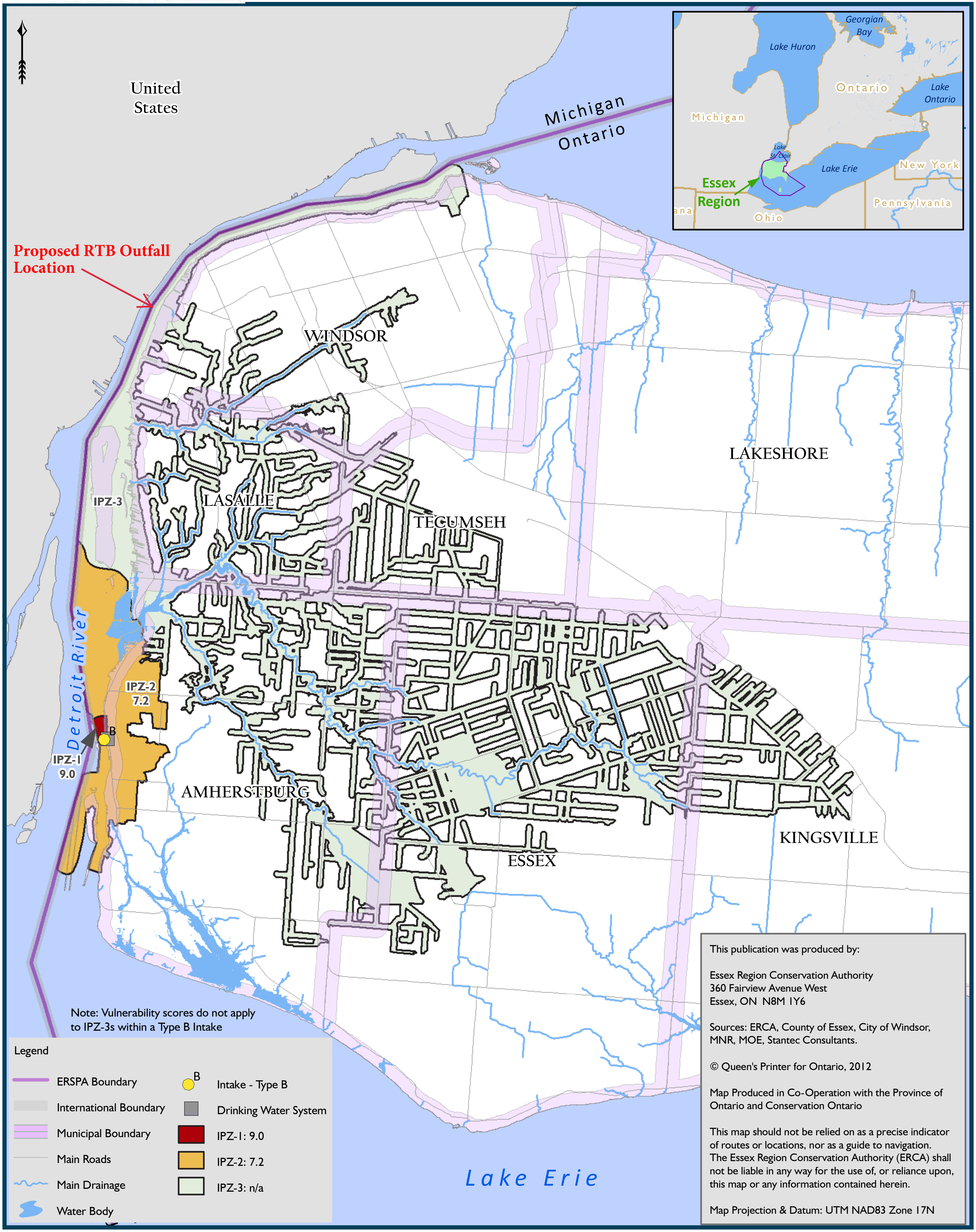
Map Projection & Datum: UTM NAD83 Zone 17N

1:100,000

0 5
Kilometers

Made possible by the Government of Ontario

Map 10: Amherstburg Water Treatment Plant IPZs and Vulnerability Scoring



Note: Vulnerability scores do not apply to IPZ-3s within a Type B Intake

Legend

▬	ERSPA Boundary	● B	Intake - Type B
▬	International Boundary	■	Drinking Water System
▬	Municipal Boundary	🟥	IPZ-1: 9.0
―	Main Roads	🟧	IPZ-2: 7.2
〰	Main Drainage	🟩	IPZ-3: n/a
●	Water Body		

This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, Stantec Consultants.

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Map Projection & Datum: UTM NAD83 Zone 17N

1:200,000

0 5
Kilometers

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Ministry of Aboriginal Affairs Corwin Troje Ashley Johnson Ministry Partnerships Unit, Aboriginal Relations and Ministry Partnerships Branch	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Corwin Troje and Ashley Johnson on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	
Ministry of Aboriginal Affairs and Northern Development Canada Allison Berman Consultation and Accommodation Unit	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Allison Berman on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to Ms. Allison Berman to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to Ms. Allison Berman to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to Ms. Allison Berman to solicit comments and inputs on March 14, 20119.	
Southern First Nations Secretariat Jennifer Whiteye 22361 Austin Line Bothwell ON N0P 1C0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Jennifer Whiteye on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Bkejwanong Territory (Walpole Island) First Nation Chief Daniel Miskokomon (drskoke@wifn.org) Janet Macbeth (janet.macbeth@wifn.org) 117 Tahgahoning Road, RR#3 Wallaceburg ON N8A 4K95 Dean Jacobs (dean.jacobs@wifn.org) R.R. #3 , Wallaceburg, ON N8A 4K9	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Dan Miskokomon, Jared Macbeth, Dean Jacobs and Janet Macbeth on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Caldwell First Nation Mary Duckworth (reception@caldwellfirstnations.ca) Nikki Orosz (nikki.orosz@caldwellfirstnation.ca) 14 Orange Street Leamington, ON N8H 1P5	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Louise Hillier and Allen Deleary on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Aamjiwnaang First Nation Chief Joanne Rogers (jrogers@aamjiwnaang.ca) Sharilyn Johnston (sjohnston@aamjiwnaang.ca) Christine Rogers ((crogers@aamjiwnaang.ca) 978 Tashmoo Avenue Sarnia ON N7T 7H5	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Joanne Rogers, Sharilyn Johnston and Christine Rogers on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Delaware Nation (Moravian of the Thames) Chief Greg Peters (gpeters@mnsi.net) 14760 School House Line Thamesville ON N0P 2K0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Greg Peters, Justin Logan and Tina Jacobs on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Metis Nation of Ontario Aly Alibhai (alya@metisnation.org) 75 Sherbourne Street, Unit 311 Toronto ON M5A 2P9	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Aly Alibhai and Doug Wilson on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Chippewas of Kettle and Stony Point First Nation Chief Tom Bressette (Thomas.bressette@kettlepoint.org) Valerie George (Valerie.george@kettlepoint.org) 6247 Indian Lane, R.R. #2 Forest, ON N0N 1J1	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Tom Bressette and Valerie George on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Chippewas of the Thames First Nation Chief Myeengun Henry (myeengun@cottfn.com) Kelly Riley (kriley@cottfn.com) Rochelle Smith (rsmith@cottfn.com) 320 Chippewa Road Muncey ON N0L 1Y0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Myeengun Henry, Kelly Riley and Rochelle Smith on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	Received a voice message from Rochelle on April 26, 2018, requesting updates on the project. Returned phone call on May 1, 2018 and provided updates on the project.
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	Response received from Fallon Burch, Consultation Coordinator, Chippewas of the Thames First Nation. Fallon advised that the proposed project is located within the Mckee Treaty Area (1790) to which Chippewas of the Thames First Nation (COTTFN) is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory. Fallon indicated that they have very minimum concern with the proposed project. If any Archaeology studies are required, the Thames First Nation would like to participate by sending an Archaeology Field Liaison on behalf of COTTFN.
Onelda Nation of the Thames ONYOTA'A:KA Chief Randall Philips (randall.phillips@oneida.on.ca) Catherine Cornellus (catherine.cornellus@oneida.on.ca) 2212 Elm Avenue Southwold, ON N0L 2G0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Philips Randall, Catherine Cornellus on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	

CHIPPEWAS OF THE THAMES FIRST NATION

March 29, 2019

VIA EMAIL

Mr. Ed Valdez
City of Windsor
4155 Ojibway Parkway
Windsor, ON N9C 4A5

RE: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Dear Mr Valdez,

The proposed project is located within the Mckee Treaty Area (1790) to which Chippewas of the Thames First Nation (COTTFN) is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory.

Thank you for forwarding the *"Draft" Environmental Study Report*. We have reviewed the Report, based on this review we have very minimal concern with the proposed project. However, we do ask that if there are any substantive changes to this project, we wish to be notified. We would like any future notices or reports sent to consultation@cottfn.com. If any Archaeology Studies are required, we like to the opportunity to participate by sending an Archaeology Field Liaison on behalf of COTTFN.

We look forward to continuing this open line of communication. To implement meaningful consultation, COTTFN has developed its own protocol — a document and a process that will guide positive working relationships. We would be happy to meet with you to review COTTFN's Consultation Protocol.

Please do not hesitate to contact me if you need further clarification of this letter.

Sincerely,

Fallon Burch
Consultation Coordinator
Chippewas of the Thames First Nation
(519) 289-5555 Ext. 251
consultation@cottfn.com

c: Dr. Jian Li, P.Eng., Consultant Project Manager, Stantec Consulting

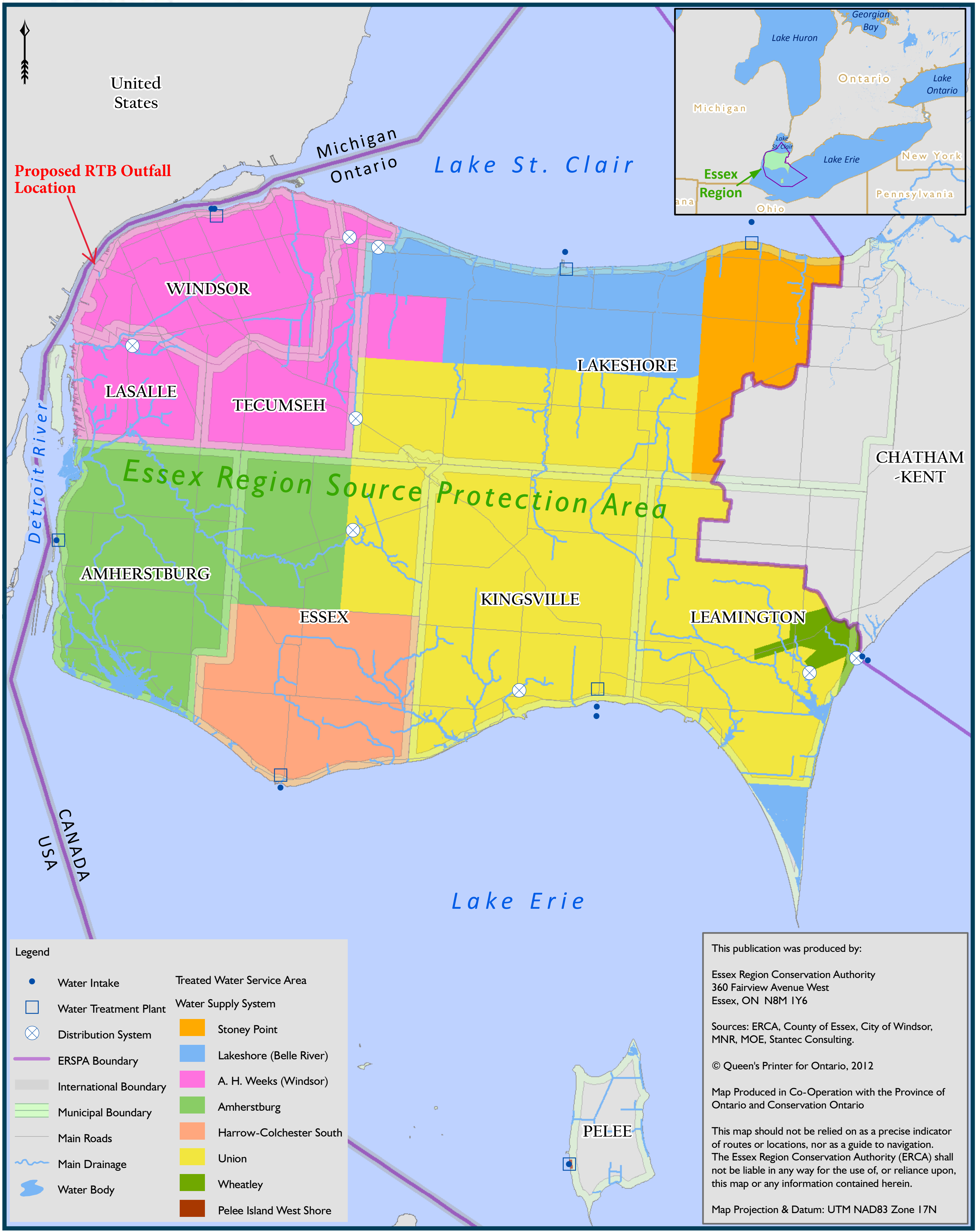
320 Chippewa Road, Muncey, ON, N0L 1Y0
Ph. 519-289-5555 Fax. 519-289-2230
info@cottfn.com www.cottfn.com

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

Map 3: Drinking Water Systems

Made possible by the Government of Ontario

Ontario



This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, Stantec Consulting.

Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Essex Region Conservation Authority (ERCA) shall not be liable in any way for the use of, or reliance upon, this map or any information contained herein.

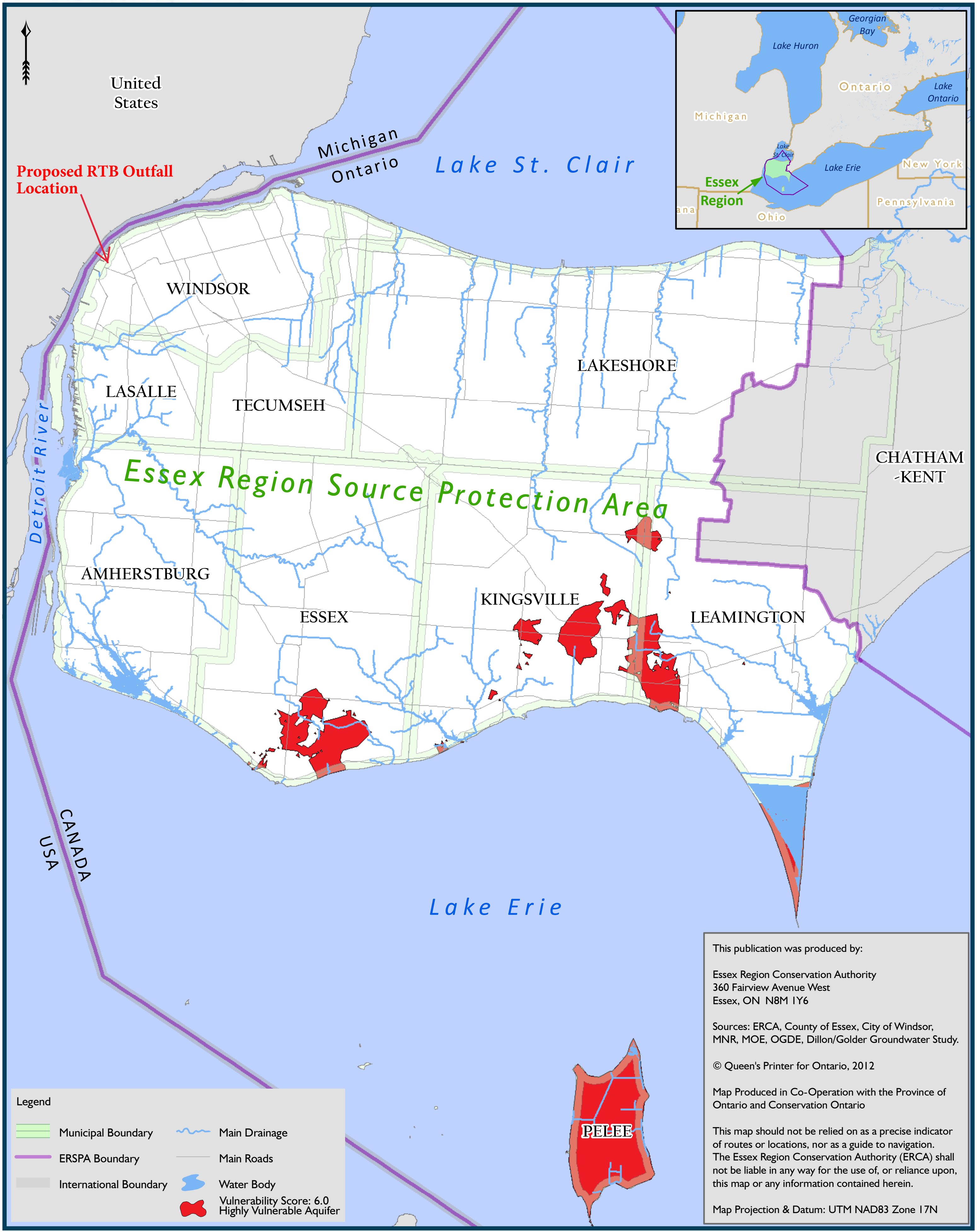
Map Projection & Datum: UTM NAD83 Zone 17N

1:320,000

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

Map 4: Highly Vulnerable Aquifers

Made possible by the Government of Ontario
Ontario



This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, OGDE, Dillon/Golder Groundwater Study.

Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario

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Map Projection & Datum: UTM NAD83 Zone 17N

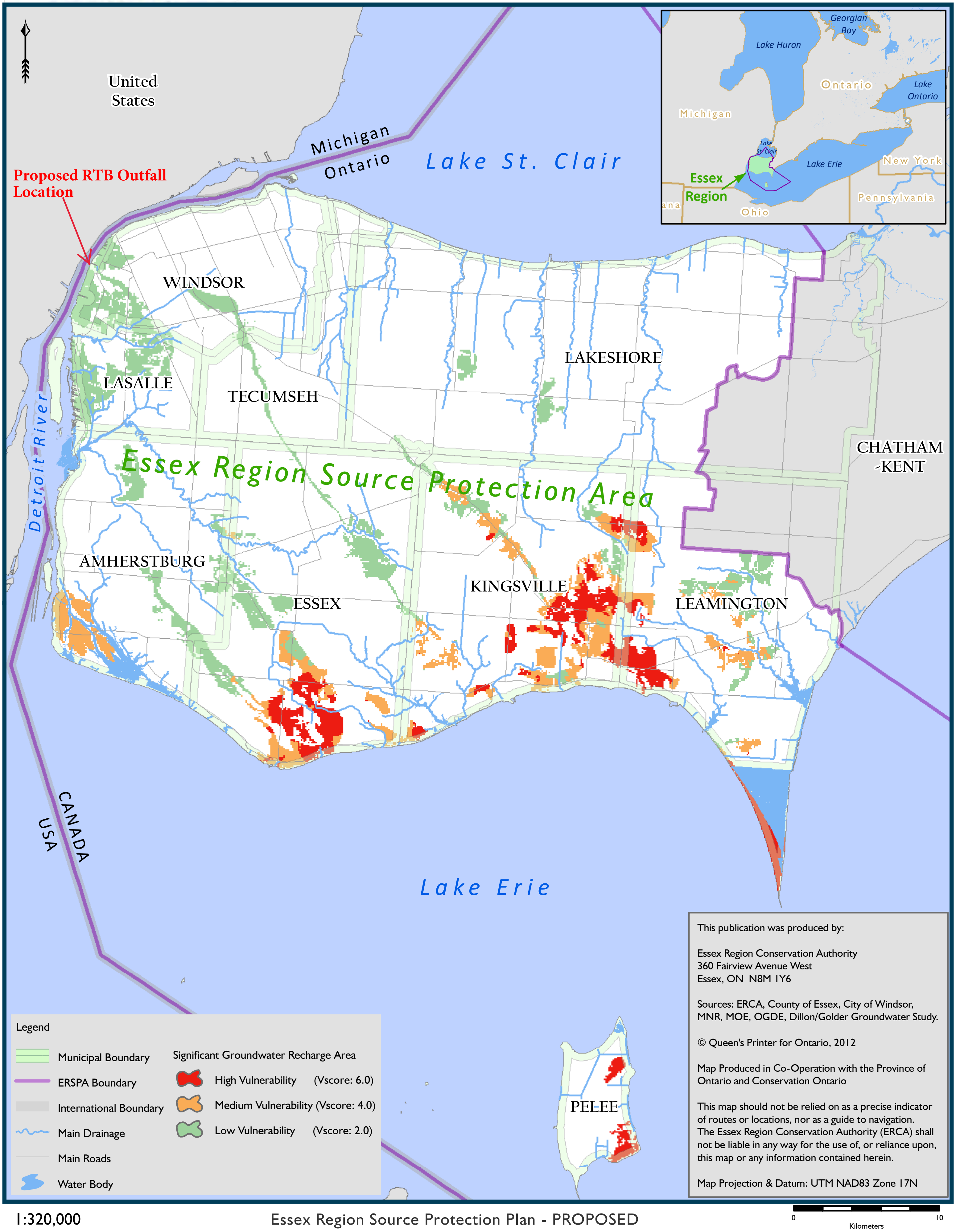
1:320,000

0 10
Kilometers

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

Map 5: Significant Groundwater Recharge Areas

Made possible by the Government of Ontario



This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, OGDE, Dillon/Golder Groundwater Study.

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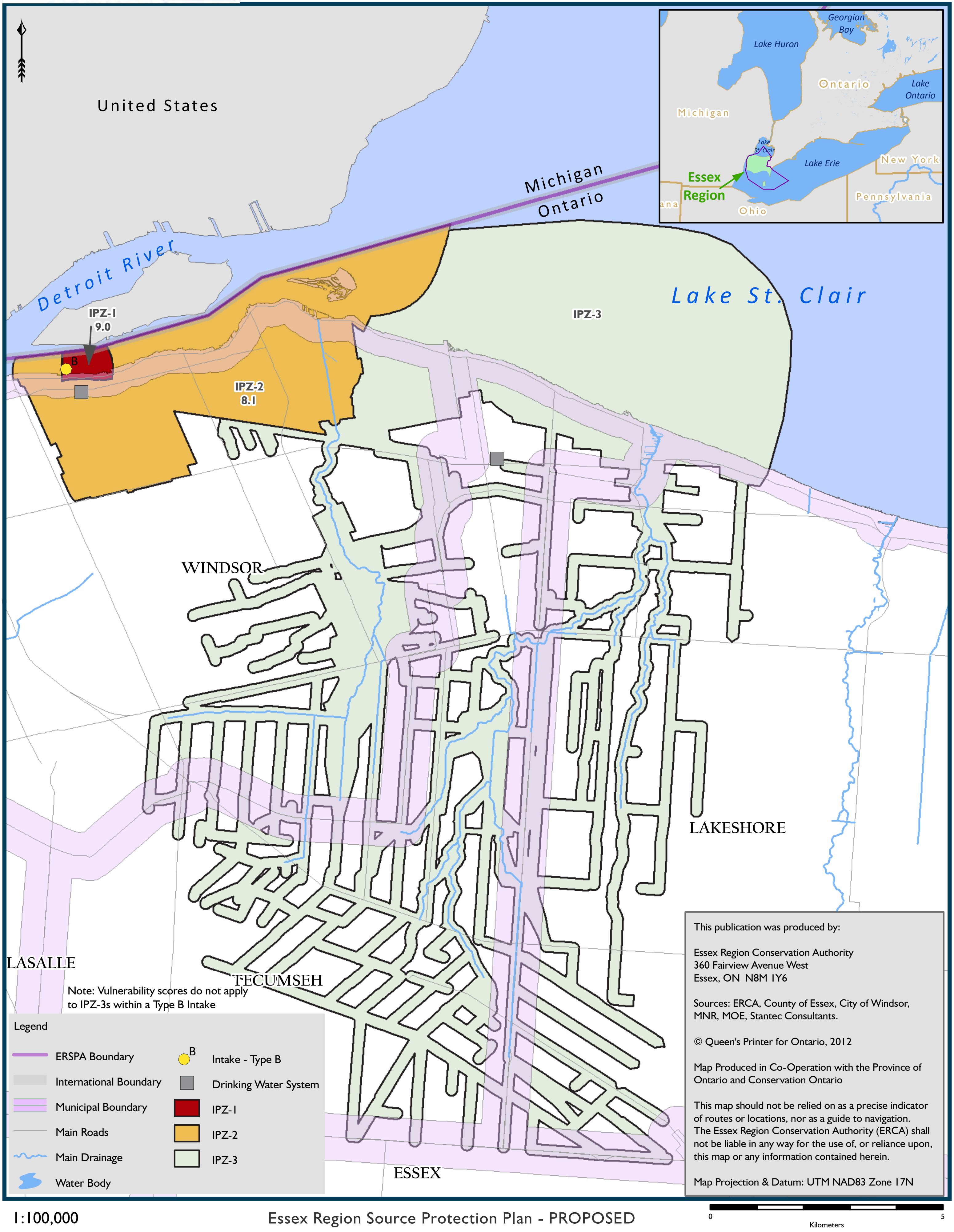
Map Projection & Datum: UTM NAD83 Zone 17N

Map 9: A. H. Weeks (Windsor) Water Treatment Plant (West Intake) IPZs and Vulnerability Scoring

Made possible by the Government of Ontario



Note: Vulnerability scores do not apply to IPZ-3s within a Type B Intake

Legend

ERSPA Boundary
International Boundary
Municipal Boundary
Main Roads
Main Drainage
Water Body
● B Intake - Type B
■ Drinking Water System
🟥 IPZ-1
🟧 IPZ-2
🟩 IPZ-3

This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, Stantec Consultants.

Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario

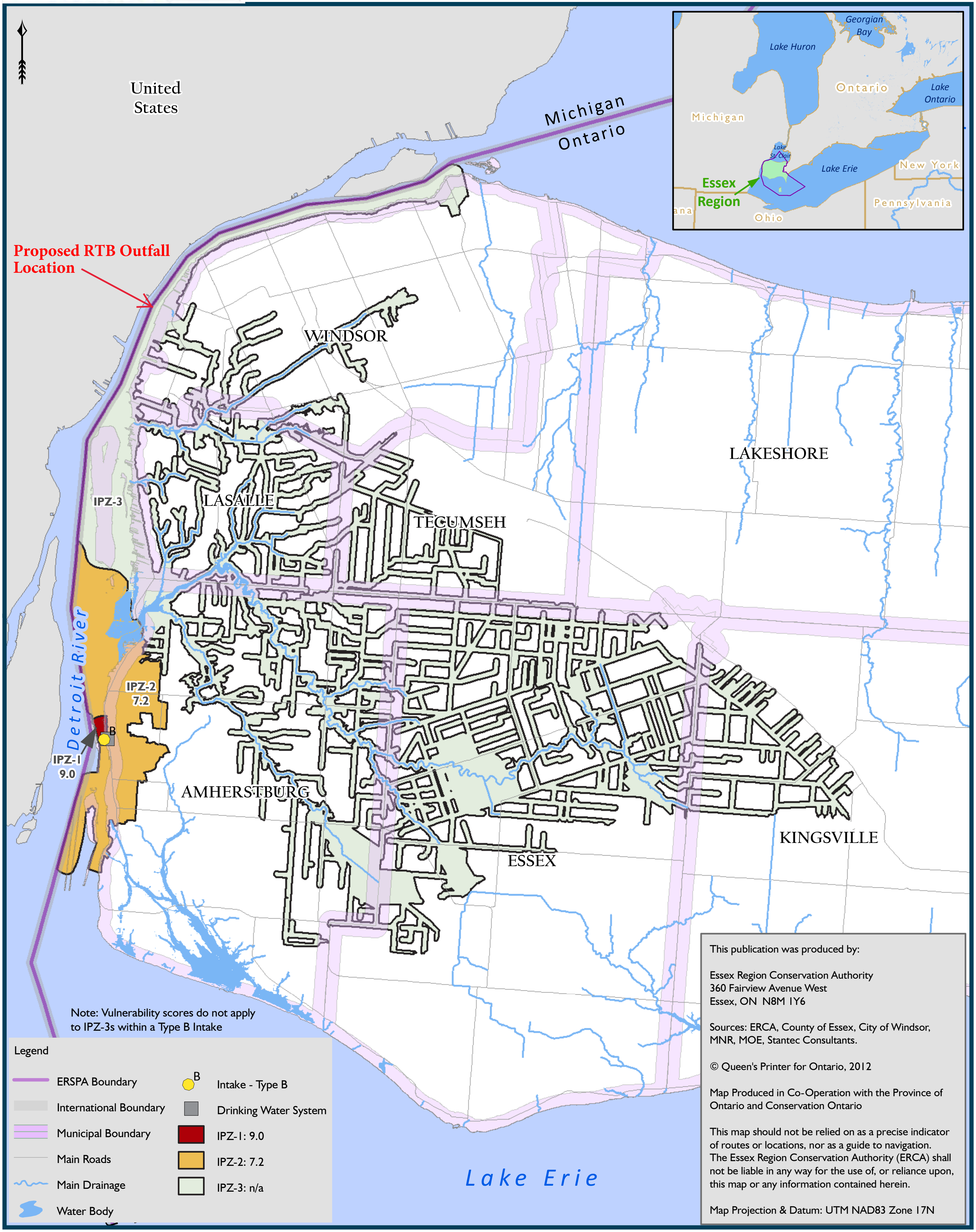
This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Essex Region Conservation Authority (ERCA) shall not be liable in any way for the use of, or reliance upon, this map or any information contained herein.

Map Projection & Datum: UTM NAD83 Zone 17N

1:100,000

Map 10: Amherstburg Water Treatment Plant IPZs and Vulnerability Scoring

Made possible by the Government of Ontario



Note: Vulnerability scores do not apply to IPZ-3s within a Type B Intake

Legend

	ERSPA Boundary	● B	Intake - Type B
	International Boundary	■	Drinking Water System
	Municipal Boundary	🟥	IPZ-1: 9.0
	Main Roads	🟧	IPZ-2: 7.2
	Main Drainage	🟩	IPZ-3: n/a
	Water Body		

This publication was produced by:

Essex Region Conservation Authority
360 Fairview Avenue West
Essex, ON N8M 1Y6

Sources: ERCA, County of Essex, City of Windsor, MNR, MOE, Stantec Consultants.

Map Produced in Co-Operation with the Province of Ontario and Conservation Ontario

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Essex Region Conservation Authority (ERCA) shall not be liable in any way for the use of, or reliance upon, this map or any information contained herein.

Map Projection & Datum: UTM NAD83 Zone 17N

1:200,000

0 5
Kilometers

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Ministry of Aboriginal Affairs Corwin Troje Ashley Johnson Ministry Partnerships Unit, Aboriginal Relations and Ministry Partnerships Branch	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Corwin Troje and Ashley Johnson on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	
Ministry of Aboriginal Affairs and Northern Development Canada Allison Berman Consultation and Accommodation Unit	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Allison Berman on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to Ms. Allison Berman to solicit comments and inputs on April 23, 2018.	N/A
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to Ms. Allison Berman to solicit comments and inputs on March 14, 20119.	N/A
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to Ms. Allison Berman to solicit comments and inputs on March 14, 20119.	
Southern First Nations Secretariat Jennifer Whiteye 22361 Austin Line Bothwell ON N0P 1C0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Jennifer Whiteye on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	**Date/Method of Communication**	**Correspondence Received and/or Project Information Distributed**	**Consultant Response**
Bkejwanong Territory (Walpole Island) First Nation Chief Daniel Miskokomon (drskoke@wifn.org) Janet Macbeth (janet.macbeth@wifn.org) 117 Tahgahoning Road, RR#3 Wallaceburg ON N8A 4K95 Dean Jacobs (dean.jacobs@wifn.org) R.R. #3 , Wallaceburg, ON N8A 4K9	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Dan Miskokomon, Jared Macbeth, Dean Jacobs and Janet Macbeth on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Caldwell First Nation Mary Duckworth (reception@caldwellfirstnations.ca) Nikki Orosz (nikki.orosz@caldwellfirstnation.ca) 14 Orange Street Leamington, ON N8H 1P5	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Louise Hillier and Allen Deleary on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Aamjiwnaang First Nation Chief Joanne Rogers (jrogers@aamjiwnaang.ca) Sharilyn Johnston (sjohnston@aamjiwnaang.ca) Christine Rogers ((crogers@aamjiwnaang.ca) 978 Tashmoo Avenue Sarnia ON N7T 7H5	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Joanne Rogers, Sharilyn Johnston and Christine Rogers on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Delaware Nation (Moravian of the Thames) Chief Greg Peters (gpeters@mnsi.net) 14760 School House Line Thamesville ON N0P 2K0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Greg Peters, Justin Logan and Tina Jacobs on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Metis Nation of Ontario Aly Alibhai (alya@metisnation.org) 75 Sherbourne Street, Unit 311 Toronto ON M5A 2P9	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Aly Alibhai and Doug Wilson on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	
Chippewas of Kettle and Stony Point First Nation Chief Tom Bressette (Thomas.bressette@kettlepoint.org) Valerie George (Valerie.george@kettlepoint.org) 6247 Indian Lane, R.R. #2 Forest, ON N0N 1J1	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Tom Bressette and Valerie George on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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Aboriginal Consultation Log
Municipal Class Environmental Assessment
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Chippewas of the Thames First Nation Chief Myeengun Henry (myeengun@cottfn.com) Kelly Riley (kriley@cottfn.com) Rochelle Smith (rsmith@cottfn.com) 320 Chippewa Road Muncey ON N0L 1Y0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Myeengun Henry, Kelly Riley and Rochelle Smith on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	Received a voice message from Rochelle on April 26, 2018, requesting updates on the project. Returned phone call on May 1, 2018 and provided updates on the project.
	2nd Open House Date: February 23, 2019 Method: Newspaper and Canada Post	The Notice of 2nd Open House was published in the Windsor Star on February 23, 2019. 2nd Open House was held on February 27, 2019. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119.	
	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	Response received from Fallon Burch, Consultation Coordinator, Chippewas of the Thames First Nation. Fallon advised that the proposed project is located within the Mckee Treaty Area (1790) to which Chippewas of the Thames First Nation (COTTFN) is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory. Fallon indicated that they have very minimum concern with the proposed project. If any Archaeology studies are required, the Thames First Nation would like to participate by sending an Archaeology Field Liaison on behalf of COTTFN.
Onelda Nation of the Thames ONYOTA'A:KA Chief Randall Philips (randall.phillips@oneida.on.ca) Catherine Cornellus (catherine.cornellus@oneida.on.ca) 2212 Elm Avenue Southwold, ON N0L 2G0	**Notice of Commencement** Date: December 7, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Philips Randall, Catherine Cornellus on December 7, 2017 via Canada Post. It was published in the Windsor Star on December 9, 2017.	N/A
	1st Open House Date: April 19, 2018 Method: Newspaper and Canada Post	The Notice of 1st Open House was published in the Windsor Star on April 14, 2018. 1st Open House was held on April 19, 2018. The print copy of open house displays and handout materials was mailed to individual Aboriginal communities to solicit comments and inputs on April 23, 2018.	N/A
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	Draft ESR Date: March 14, 2019 Method: Canada Post	The electronic copy of draft ESR report was mailed to individual Aboriginal communities to solicit comments and inputs on March 14, 20119. No response was received.	

CHIPPEWAS OF THE THAMES FIRST NATION

March 29, 2019

VIA EMAIL

Mr. Ed Valdez
City of Windsor
4155 Ojibway Parkway
Windsor, ON N9C 4A5

RE: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Dear Mr Valdez,

The proposed project is located within the Mckee Treaty Area (1790) to which Chippewas of the Thames First Nation (COTTFN) is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory.

Thank you for forwarding the *"Draft" Environmental Study Report*. We have reviewed the Report, based on this review we have very minimal concern with the proposed project. However, we do ask that if there are any substantive changes to this project, we wish to be notified. We would like any future notices or reports sent to consultation@cottfn.com. If any Archaeology Studies are required, we like to the opportunity to participate by sending an Archaeology Field Liaison on behalf of COTTFN.

We look forward to continuing this open line of communication. To implement meaningful consultation, COTTFN has developed its own protocol — a document and a process that will guide positive working relationships. We would be happy to meet with you to review COTTFN's Consultation Protocol.

Please do not hesitate to contact me if you need further clarification of this letter.

Sincerely,

Fallon Burch
Consultation Coordinator
Chippewas of the Thames First Nation
(519) 289-5555 Ext. 251
consultation@cottfn.com

c: Dr. Jian Li, P.Eng., Consultant Project Manager, Stantec Consulting

320 Chippewa Road, Muncey, ON, N0L 1Y0
Ph. 519-289-5555 Fax. 519-289-2230
info@cottfn.com www.cottfn.com

From: Newton, Craig (MECP)
To: Li, Jian; "evaldez@city.windsor.on.ca"
Cc: Abernethy, Scott (MECP); Bechard, Marc (MECP); Howard, Shawn (MECP)
Subject: FW: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor
Date: Wednesday, March 27, 2019 1:31:43 PM
Attachments: Windsor West CSO Draft ESR - Letter to MECP Review.pdf
Responses to MECP Comments March 14 2019.pdf

Dear Mr. Valdez and Dr. Li:

I am writing to you today in response to Stantec's immediately preceding e-mails of March 18th and March 21st, 2019, and accompanying attachments, wherein Stantec requested the Ministry of Environment, Conservation and Parks (MECP) comments, if any, on the Draft Windsor Riverfront West CSO Control Schedule C Class EA Environmental Study Report (ESR), dated March 11th, 2019, by no later than March 28th, 2019. Your March 21st, 2019 e-mail included two attachments, a general covering letter dated March 14th, 2019 from Stantec for this Draft ESR; as well as a separate letter to MECP, from Stantec also dated March 14th, 2019, in direct response to MECP's previous comments of February 1st, 2018 to the City of Windsor and Stantec (which combined MECP correspondence of December 14th, 2017 and January 30th, 2018 to Stantec and the City of Windsor into a single combined MECP letter).

The MECP is generally provided at least 30 days to review and comment on Draft ESR's, especially for Schedule C Class EAs. This 30 day review period request was denoted in MECP's previous letters to the City of Windsor and Stantec dated December 14th, 2017, January 30th, 2018 and February 1st, 2018. In this case, MECP was provided 11 days to review and comment on the March 11th, 2019 Draft ESR. Please ensure for future Draft EA review requests, that the MECP is provided at least 30 days to review and comment.

The MECP offers the following comments for the City of Windsor and Stantec's due consideration and action. MECP comments follow the same order as those in Stantec's letter of March 14th, 2019:

Windsor Riverfront Pollution Control Planning (PCP) Study – Related General Comments:

The MECP, in its previous comments to the City of Windsor and Stantec noted that the City of Windsor was reportedly having issues with their existing Riverfront CSO Collection and Treatment Facility (RTB) which was reportedly designed for the treatment and disposal of CSOs from the riverfront area east of Caron Avenue. Due to the rise in river levels the City reportedly became aware of a design flaw that allowed river water to enter the RTB through an old CSO outfall. The Ministry asked that this issue and the City's Plan to address this issue be included in the overall assessment.

In response, Stantec's letter to this Ministry of March 14th, 2019 indicated the above noted issue, in 2017, was attributed to an extreme inflow and infiltration through one of the City's existing old brick outfalls. MECP is pleased to hear that a temporary repair has been made to the outfall to prevent the extraneous flow into the RTB, and further, that the City of Windsor is reportedly in the process of retaining a Consulting Engineer to complete the design and tender for a permanent resolution of this issue.

Surface Water Quality Monitoring:

The MECP previously commented to the City of Windsor and Stantec that the Class EA should include a water quality monitoring component to identify the nature and extent of CSO impacts to assist with the selection of the preferred alternative. In response, Stantec Consulting, in their March 14, 2019 letter, state that the PPCP investigated pollutant loading and that CSO's were identified as a major source of impact.

Pollutant loading is not a measure of impact. The PPCP was done many years ago and if it did present any surface water monitoring data then that data now would not be representative of current conditions. Stantec's letter and the Class EA document (Stantec, March 11 2019) state the project will benefit the environment but this is a qualitative statement with no plan to gather evidence to demonstrate the benefit. One of the main goals of Procedure F-5-5 is to minimize impacts on surface water. Under this Procedure additional controls on CSO's may be needed where required by receiving water conditions. Unfortunately, this draft environmental assessment lacks information on the environment necessary to meet F-5-5 requirements.

The Class EA document proposes a new outfall sewer to the Detroit River next to that of the Lou Romano sewage treatment plant. For this Class EA to be acceptable for surface water concerns the City needs to summit to the MECP Regional Office a terms of reference for a river monitoring program. Monitoring would occur before and after the new outfall is operational and it would include monitoring locations upstream and downstream of the outfall. Monitoring of the benthic macroinvertebrate community is necessary using fixed-area sampling and the lowest practical level of taxonomic resolution to ensure a rigorous assessment. The "before" monitoring to establish the baseline could be done this autumn or next spring and the "after" monitoring would occur once in the same season after the outfall has been operational for at least a year. Specific details can be worked out in a terms of reference. A commitment by the City of Windsor to do this needs to be included in the Final Class EA documentation. Once an acceptable terms of reference is in-place, the MECP Regional Office will consider surface water aspects of the Class EA to be satisfactory, and we will have a basis to sign-off on subsequent sewage works approval applications for the project.

Indigenous Consultation:

Section 8.4 First Nations Consultation of the Draft EA outlines, in general, the proponent's efforts to date with respect to First Nations Consultation. Appendix C outlines the various First Nations and respective contact names that were reportedly forwarded Notices. The proponent must ensure that First Nations are provided ample opportunity to consult with the proponent with respect to what interests they may have with respect to this proposed project. It is not suffice to just send Notices to First Nations. All of the opportunities and requests (notices, phone Calls, offers to meet in person) to consult with First Nations associated with this proposed project should be fully documented in the Final ESR. If any issues are raised, the Final ESR should identify those issues, and how those issues were addressed / mitigated. If the proponent has undertaken this level of consultation effort, such should be formally documented in the Final EA. If this level of consultation effort has not yet been undertaken (ie phones calls, offers to meet in person), this needs to be undertaken prior to issuance of the Notice of Completion, and those efforts, responses received, and how any issues raised have been addressed must be documented in the Final EA. Such consultation efforts are usually documented in a Consultation Log, and said Log provided in the Final EA for review.

With respect to First Nations Consultation, this ministry offers general advice on this ministry's website. The proponent should follow the advice provided on the ministry's web site (see link below):
https://www.ontario.ca/document/consultation-ontarios-environmental-assessment-process

Source Water Protection:

The MECP previously advised the City of Windsor, and Stantec, that as per amendments to the Municipal Engineers Association Municipal Class EA, proponents undertaking a Municipal Class EA project must identify whether a project is occurring within a source water protection vulnerable area. The must be clearly documented in the ESR.

A review of the Table of Contents of the Draft ESR does not make any reference to Source Protection in the Draft ESR. The only reference that MECP could locate with respect to Source Protection and this project are the two paragraph description provided in Stantec's letter of March 14th, 2019 addressed to MECP; outside of the text of the Draft ESR itself. This is not sufficient. The Final ESR itself must identify whether a project is occurring within a source water protection vulnerable area. If the project is occurring in a vulnerable area, then there may be policies in the local Source Protection Plan (SPP) that need to be addressed (requirements under the Clean Water Act). The proponent should contact and consult with the appropriate Conservation Authority/Source Protection Authority (CA/SPA) to discuss potential considerations and policies in the SPP that apply to the project. The outcome of this contact to be identified in the Final ESR, including but not limited to any policies in the SPP that apply to the project. The Final ESR should discuss whether or not this project changes or creates new vulnerable areas, and provide applicable details about the area. If located in a vulnerable area, proponents should document whether any project activities are a prescribed drinking water threat and thus pose a risk to drinking water (this should be consulted on with the appropriate CA/SPA). Where an activity poses a risk to drinking water, the proponent must document and discuss in the Final ESR how the project adheres to or has regard to applicable policies in the local SPP. If creating or changing a vulnerable area, proponents should document whether any existing uses or activities may potentially be affected by the implementation of source protection policies. This section should then be used to inform and should be reflected in other sections of the Final EA, such as the identification of net positive/ negative effects of alternatives, mitigation measures, evaluation of alternatives etc. As a note, even if the project activities in a vulnerable area are deemed not to be a drinking water risk, there may be other policies that apply and so consultation with the local CA/SPA is important. All of the foregoing needs to be presented and discussed in the Final EA.

Climate Change:

The MECP previously advised the City of Windsor, and Stantec, that the ESR must address Climate Change. A review of the Table of Contents of the Draft ESR does make any reference to Climate Change. Climate change should be considered in the context of mitigation and the context of adaptation. The Ministry has recently released a guidance document to support proponents in including climate change in environmental assessments. The guide can be found online: https://www.ontario.ca/page/considering-climate-change-environmental-assessment-process. It should be noted that Climatic Features is identified in Appendix 2 of the Municipal Class EA page 2-7 (2015). All of the foregoing still needs to be presented and discussed in the Final EA.

Additional Comment – Active / Former Waste Sites

The Final Class EA should identify the existence and location of any active and/or former waste disposal sites within the study area and what impact if any those waste sites have on the proposed project. That is, the Final EA should include a discussion as to whether the installation of any of the physical works proposed by this project will act as a conduit for the migration of methane and/or leachate from nearby active and/or former waste sites, and if so, what impact if any will result, and what mitigative measures will be put in place to address such impact(s).

Finally, thank you for providing this ministry the opportunity to review and comment on this Draft ESR, prior to the formal public, agency, and indigenous communities review of the Final ESR. Should you have any questions, please feel free to approach me and I will do my best to answer them.

Yours truly,

Craig Newton
Regional Environmental Planner / Regional EA Coordinator
Ministry of the Environment, Conservation and Parks
Southwestern Region
733 Exeter Road

London, Ontario
N6E 1L3

Telephone: (519) 873-5014
E-mail: craig.newton@ontario.ca

From: Li, Jian <jian.li@stantec.com>
Sent: March-21-19 12:10 PM
To: Newton, Craig (MECP) <Craig.Newton@ontario.ca>
Subject: FW: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Hi Craig,

Please review and advise of any comments on “draft” environmental study report on combined sewer overflows (CSOs) control project for the riverfront catchment area west of Caron Avenue as well as wet weather flow (WWF) control at the Lou Romano Water Reclamation Plant (LRWRP), City of Windsor.

I will send all future correspondence with respect to this project to your attention, as you are the MECP's contact for this project:

Thanks,
Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Li, Jian
Sent: Monday, March 18, 2019 11:07 AM
To: 'Eckert, Anneleis (MOECC)' <Anneleis.Eckert@ontario.ca>
Cc: Smith, Mark (MOECC) <Mark.Smith@ontario.ca>; Bechard, Marc (MOECC) <Marc.Bechard@ontario.ca>; Salustro, Cara (MOECC) <Cara.Salustro@ontario.ca>; Abernethy, Scott (MOECC) <Scott.Abernethy@ontario.ca>; Newton, Craig (MOECC) <Craig.Newton@ontario.ca>; Lafrance, Crystal (MOECC) <Crystal.Lafrance@ontario.ca>; evaldez@city.windsor.on.ca; Richters, Karina <krichters@citywindsor.ca>
Subject: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Hi Anneleis,

Please find attached letter soliciting MECP's comments on "draft" environmental study report on combined sewer overflows (CSOs) control project for the riverfront catchment area west of Caron Avenue as well as wet weather flow (WWF) control at the Lou Romano Water Reclamation Plant (LRWRP). Responses to your comments received on Feb 1, 2018 is also attached.

The City of Windsor has initiated this Class EA to implement CSOs control program for the riverfront catchment area west of Caron Avenue as well as WWF control at the LRWRP. This project is being planned as a **Schedule C** undertaking following the provisions of the Municipal Class Environmental Assessment document. Alternative means of providing CSO and WWF control in the study area has been assessed to meet the requirements set out in the MECP Guidelines "Procedure F-5-5". A variety of potential CSO and WWF control options have been evaluated to select the preferred option.

The project is now in Phase 3 of the Class EA process which involves evaluation of alternative designs for the CSO and WWF control facilities leading to selection of a preferred design for this application. A draft study report has been prepared which presents a number of possible alternative designs for the preferred solution. The merits and disadvantages of these alternatives are discussed with the decision-making process being structured to select the design that minimizes undesirable impacts on the natural, social and economic environments. Through this evaluation process a recommended design has been identified and is provided for consideration as the preferred design.

Your agency is invited to submit comments on the *"Draft"* Environmental Study Report. In an effort to conserve paper and reduce printing costs, the report is being distributed in electronic format as a PDF file on the FTP site below. If you would prefer, a hard copy of the draft report will be provided on request.

Login Information
Browser link: https://projsftp.stantec.com
FTP Client Hostname: projsftp.stantec.com
Login name: CSO0645
Password: 3274549
Expiry Date: 6/28/2019

We would appreciate receiving any comments you care to offer on the draft report by March 28, 2019.

Sincerely,

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Eckert, Anneleis (MOECC) <Anneleis.Eckert@ontario.ca>
Sent: Thursday, February 1, 2018 11:58 AM

To: evaldez@city.windsor.on.ca; Li, Jian <jian.li@stantec.com>
Cc: Smith, Mark (MOECC) <Mark.Smith@ontario.ca>; Bechard, Marc (MOECC) <Marc.Bechard@ontario.ca>; Salustro, Cara (MOECC) <Cara.Salustro@ontario.ca>; Abernethy, Scott (MOECC) <Scott.Abernethy@ontario.ca>; Newton, Craig (MOECC) <Craig.Newton@ontario.ca>; Lafrance, Crystal (MOECC) <Crystal.Lafrance@ontario.ca>
Subject: Reissuance of MOECC acknowledgment of Combined Sewage Overflow Control Notice of Commencement

Good Morning Ed Valdez,

It has come to our attention that two MOECC responses to the Notice of Commencement for the Combined Sewage Overflow Control were sent to the City. One was sent on December 14th 2017, the other on January 30th 2018.

The Notice of Commencement had been submitted to more than one regional staff person including staff in our drinking water and surface water units both of whom had special interest in this particular file. While, typically, that level of detail on those program area interests are not explored or provided at the Notice of Commencement stage, given that we had it available, we shared it for the City's information in our December 14th response. The Notice of Commencement was then re-received from an internal source and, due to staff change over, we didn't realise a response had already been sent until after the second response was sent on Jan 30th. We apologise for this oversight and any confusion this may have caused. MOECC encourages the City to utilise the information in both letters and, to that end, we have combined the letters for ease of use.

Again, we apologise for the duplication of correspondence and any confusion. Please do not hesitate to contact me if you have any questions or concerns.

Thank you,

Anneleis Eckert
Environmental Assessment Coordinator
519-873-5115 | anneleis.eckert@ontario.ca
Air, Pesticides and Environmental Planning | Drinking Water and Environmental Compliance Division | Southwest Region | Ministry of the Environment and Climate Change | 733 Exeter Road, London ON

Ministry of Tourism,
Culture and Sport

Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416.314.7643

Ministère du Tourisme,
de la Culture et du Sport

Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416.314.7643

31 May 2019 Email Only

Jian Li, P. Eng.
Consultant Project Manager
Stantec Consulting Ltd.
140 Ouellette Place, Ste 100
Windsor, ON N8X 1L9
jian.li@stantec.com

MTCS File : 0008250
Proponent : City of Windsor
Subject : Review of Draft Environmental Study Report
Project : Windsor Riverfront CSO (Caron Avenue to LRWRP)
Location : Area generally bounded by the Detroit River, Quebec Street/Malden Road, east of E. C. Row Expressway and Sandwich Street, City of Windsor

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Dear Jian Li:

Thank you for your letter of May 10, 2019, which provided a response to the Ministry of Tourism, Culture and Sport's (MTCS) comments of May 03, 2019 on the Draft Environmental Study Report (ESR).

MTCS finds that the commitments to include updated wording in the final ESR addresses our comments.

MTCS would like to point out that the Duff-Baby House at 221 Mill Street (northeast corner of Russell Street and Mill Street) is a designated heritage property owned by the Ontario Heritage Trust (OHT). Should any amendments be made to the proposed project to extend work along Russell Street to the vicinity of the Duff-Baby House, the proponent must contact the OHT and the City of Windsor to discuss any potential negative impacts.

Should you have any questions, please contact the undersigned.

Regards,

Katherine Kirzati
Heritage Planner
katherine.kirzati@ontario.ca

c: Kevin DeMille, Ontario Heritage Trust

Stantec

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

May 10, 2019
File: 165620132

Attention: Ms. Katherine Kirzati, Heritage Planner

Programs and Services Branch
Ministry of Tourism, Culture and Sport
401 Bay St, Suite 1700
Toronto, ON M7A 2R9

Dear Ms. Kirzati,

Reference: Class Environmental Assessment – Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor

Thank you for your prompt response to the March 11th, 2019 Draft ESR for Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor. The following is in response to your comments on the draft ESR, which was received on May 3, 2019.

Responses to General Comments

1) Description of Proposed Work Area

Attached is an aerial plan showing the above proposed work areas. The following work areas are proposed in the environmental study report (ESR):

- A retention treatment facility on the south side of Sandwich Street and Ojibway Pkwy intersection;
- An effluent outfall sewer along Prospect Avenue in parallel with existing Lou Romano Water Reclamation Plant outfall sewer;
- Deep tunneled sewer (6-8 m below ground level) from Chamber A on Hill Avenue at Russell Street to Lou Romano Water Reclamation Plant on the north side of Sandwich Street and Ojibway Pkwy intersection;
- Interceptor chamber A on Detroit Street at Russell Street; and
- Interceptor chamber D on Hill Avenue at Russell Street

2) Built Heritage Resources and Cultural Heritage Landscapes

The attached aerial plan also shows the heritage resources around the proposed work areas. The heritage resources around the proposed work areas were identified based on the Windsor Municipal Heritage Register provided by the City of Windsor. The City of Windsor's Planning and Building Services Department was also consulted to determine the location and details of Built Heritage and Cultural Heritage Landscapes.

There is no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas. The nearest one would be Battle of Lake Erie Mural, which is located on the other side of Russel Street where a new 6-8 m deep sewer is to be constructed by tunneling in parallel with existing tunneled sewer under existing road. The existing tunneled sewer, which was constructed in 1960s, is located between the Battle of Lake Erie Mural and proposed sewer as part of the proposed work.

The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was completed for this project. Refer to the attached.

The attached aerial plan and the MTCS checklist will be included in the final ESR.

3) Archaeological Resources

Retention Treatment Basin Facility Site

The Stage 1 Archaeological Assessment was completed for the proposed RTB site, which is located on the south side of Sandwich Street and Ojibway Pkwy intersection.

The proposed RTB site was found to be undisturbed areas which have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources, and are recommended for further Stage 2 Archaeological Assessment prior to proceeding with construction. The Stage 2 Archaeological Assessment is to determine if any archaeological resources are on the property using test pit survey.

Outfall Sewer

An RTB outfall sewer is to be constructed along Prospect Avenue in parallel with the existing LRWRP outfall sewer. A Stage 1 and Stage 2 Archaeological Assessment is to be undertaken during final design when the exact location and alignment of the outfall sewer has been determined.

Tunnel Sewer

The tunnelled sewer is to be approximately 6 to 8 metres below ground level. Construction of a deeper sewer by tunneling will significantly minimize disturbances along the waterfront and Sandwich Street. Stage 2 archaeological assessment investigations will be required at access shaft and interceptor chamber locations along the tunnelled portion of the sewer. These investigations will need to be undertaken during final design when the exact route of the sewer and the location of chambers and access shafts have been determined.

Interceptor Chambers A and D

A Stage 1 and Stage 2 archaeological assessment investigations will be required at new interceptor chambers located in the downstream of existing interceptor chamber A and D. These investigations will need to be undertaken during final design when the exact location of new interceptor chambers and associated diversion sewers have been determined.

Responses to Detailed Comments

1. ***2.5.3 Archaeological p. 2.7, First Paragraph***
2. ***2.5.3 Archaeological p. 2.7 Second Paragraph***
3. ***2.5.3 Archaeological, p. 2.7, Second Paragraph***

To address Detailed Comments No.1, 2 and 3, Section 2.5.3 Archeological is revised as follows:

2.5.3 Archeological

Windsor is an area rich in cultural heritage resources, and diversified cultural traditions. ***Figure 2.4*** *of* ***Appendix A****, which is adapted from Figure 4: 'Archaeological Potential' of the City of Windsor Archaeological Master Plan, shows land containing archaeological resources or areas of archaeological potential within the City of Windsor. There are a number of recognized heritage resources, including Fort Gowie, on the west side of the Caron Avenue Pumping Station. Fort Gowie was a stockaded house that was burned by the Americans in August 1812 at the start of the War of 1812.*

In accordance with the Checklist for Determining Archaeological Potential from the Ministry of Tourism and Culture, a Stage 1 Archaeological Assessment is to be conducted for lands impacted by this project. If the Stage 1 Archaeological Assessment concludes that these areas have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources, a further Stage will be conducted to determine if any archaeological resources are on the property using either pedestrian survey or test pit survey.

There are the following two alternative sites for the construction of CSO/WWF control facility:

- *Alternate Site No.1 site on the Riverfront at Huron Church Road*
- *Alternate Site No. 2 Site on the south side of Sandwich Street and Ojibway Pkwy intersection*

The first alternative site is located on the Riverfront at Huron Church Road; immediately to the east of the Ambassador Bridge. The second alternative site is located across the road from the LRWRP and just East of the Prism Berlie Biosolids Management Facility. The site is bordered by Ojibway Parkway to the East, Sandwich Street to the West and West Windsor Power and Prism Berlie to the South.

A Stage 1 archaeological assessment was undertaken on March 11, 2019 by Stantec for the above two alternative work sites. The Stage 1 archaeological assessment consists of a review of geographic, land use and historical information for the property and the relevant surrounding area, a property visit to inspect its current condition and contacting MTCS to find out whether there are any known archaeological sites on or near the property. Its purpose is to identify areas of archaeological potential and further archaeological assessment (e.g. Stage 2-4) as necessary. The Stage 1 archaeological assessment is included in ***Appendix D****.*

The Stage 1 archaeological assessment indicates that the two alternative sites were found to be undisturbed areas which have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources and are recommended for further Stage 2 Archaeological Assessment during final design phase prior to proceeding with construction. The Stage 2 Archaeological Assessment is to determine if any archaeological resources are on the property using test pit survey.

Besides the CSO/WWF control facility, the proposed work also consists of outfall sewer, tunneled sewer and new interceptor chambers. As per 'Archaeological Potential' map of the City of Windsor Archaeological Master Plan, these areas have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources. A Stage 1 and Stage 2 Archeological assessment will be completed at locations where the proposed work is to take place. These investigations will need to be undertaken during final design phase when the exact locations of proposed work have been determined.

4. 2.5.4 Built Heritage and Cultural Heritage Landscapes, p. 2.8

To address Detailed Comment No.4, Section 2.5.4 Built Heritage and Cultural Heritage Landscapes is revised as follows:

2.5.4 Build Heritage and Cultural Heritage Landscapes

Figure 2.5 *of* ***Appendix A*** *is an aerial plan showing the build heritage and cultural heritage Landscapes around the potential proposed work area. The heritage resources around the proposed work area were identified based on the Windsor Municipal Heritage Register provided by the City of Windsor. The City of Windsor's Planning and Building Services Department was also consulted to determine the location and details of Built Heritage and Cultural Heritage Landscapes.*

As shown in ***Figure 2.5*** *of* ***Appendix A****, there is no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas. The nearest one would be Battle of Lake Erie Mural, which is located on the other side of Russel Street where a new 6-8 m deep sewer is to be constructed by tunneling under existing road. There is existing tunneled sewer, which was constructed between the Battle of Lake Erie Mural and proposed sewer.*

The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was completed for this project. The completed checklist is included in ***Appendix D****. As shown in* ***Figure 2.5*** *of* ***Appendix A****, the proposed work is located away from these built heritage and cultural heritage landscapes, the proposed work is not expected to impact heritage resources in the area.*

5. 4.3 Environmental Impacts and Mitigation Measures, p. 4.12

The following will be included in Environmental Impacts and Mitigation Measures Section:

- The MTCS's "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was reviewed. Proposed work is located away from any built heritage and cultural heritage landscapes, and thus is not expected to impact heritage resources in the area.

6. *6.1 CSO Conveyance System, p.*

As shown in the attached aerial plan, there is no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas. The nearest one would be Battle of Lake Erie Mural, which is located on the other side of Russel Street where a new 6-8 m deep sewer is to be constructed by tunneling in parallel with the existing tunneled sewer, which is closer to the Battle of Lake Erie Mural.

The existing sewer (6-8 below the ground level) was constructed by tunneling in 1967. The City of Windsor also constructed a tunneled sewer between Dougal Avenue and Devonshire Road along Riverfront Drive in the City of Windsor downtown area in 2010. Standard best-practice construction techniques were used to mitigate vibrations.

The construction techniques used for the above previous tunnel sewer projects will be applied to the proposed work to mitigate vibration. The vibration limits set for the project will ensure that all buildings, including those with heritage features, are protected. Monitoring during construction will ensure that vibration is kept below the established limit.

7. *Appendix A, Figures*

As shown in the attached aerial plan, there is no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas.

The figures in Appendix A illustrates the location of existing monolithic concrete tunnel, the east utility sewer, the chambers and the outflow pipes, which were constructed in 1960s and 2010.

8. *Appendix D, Archaeological Assessment*

The excavations for the outfall sanitary sewer may impact archaeological resources. The Stage 1 and Stage 2 Archeological assessment shall be completed at locations where the proposed work is to take place. These investigations will need to be undertaken during final design phase when the exact locations of proposed work have been determined.

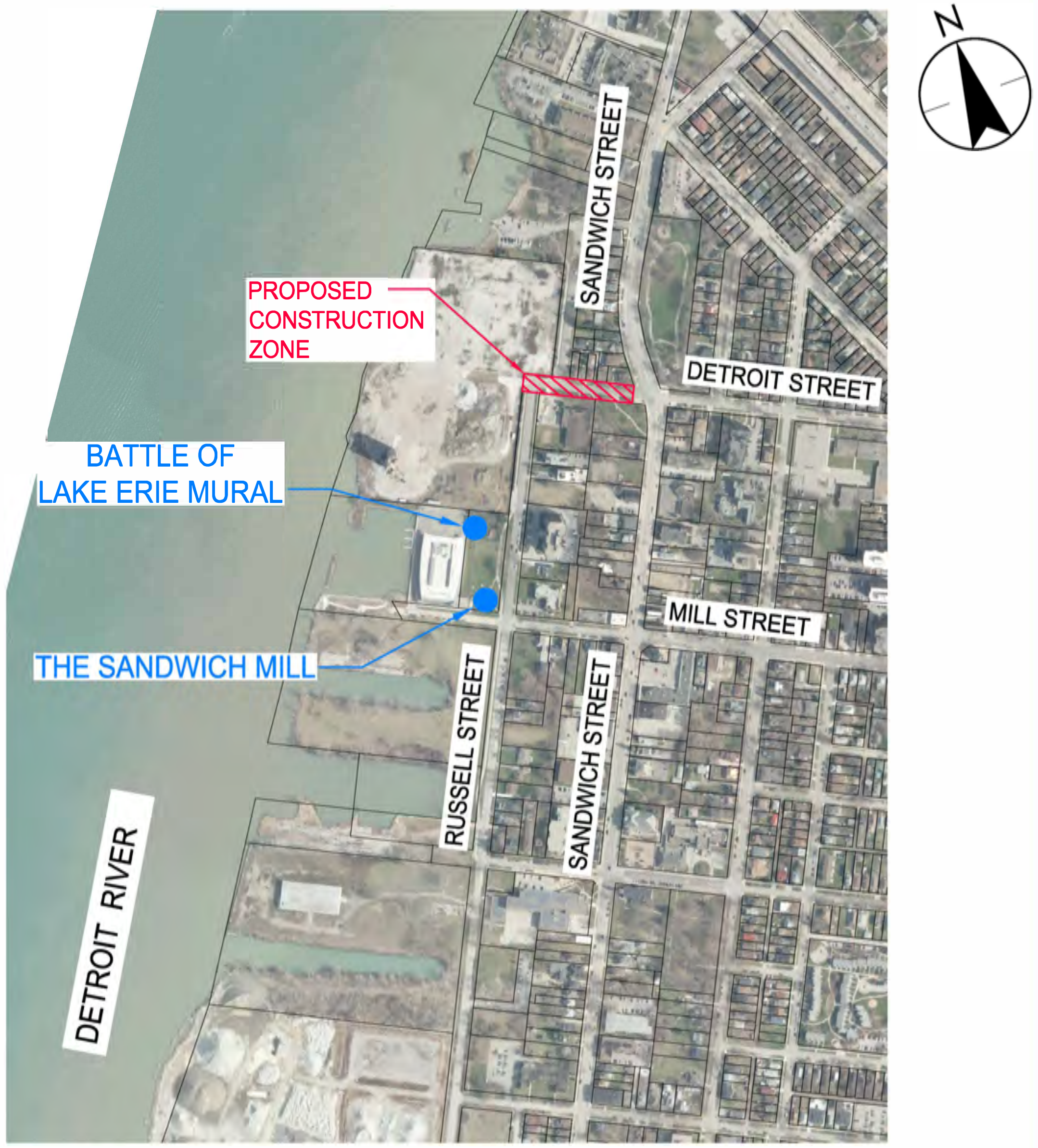
The above statement will be included in the final ESR report.

Respectfully yours,

Stantec Consulting Ltd.

Jian Li Ph.D., P.Eng., PE
Project Manager
Phone: 519 966 2250
Fax: 519-966-5523
jian.li@stantec.com

c. Mr. Ed Valdez, Manager of Process Engineering & Maintenance, City of Windsor
Mr. Craig Newton, Regional Environmental Planner/Regional EA Coordinator, Ministry of the Environment, Conservation and Parks



Stantec

CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

AERIAL PLAN OF WINDSOR'S CULTURAL HERITAGE SITES

PROJECT NO.
165620132

DRAWING NO.
FIGURE 2-5

W:\active\165620132\planning\Draft ESR Report\Drawings\20132_FIGURE_6-1.dwg
2019-5-08 11:18am BY: jholmes

Ontario

Ministry of Tourism,
Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

Project or Property Name
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor

Project or Property Location (upper and lower or single tier municipality)
City of Windsor

Proponent Name
Ed Valdez, P. Eng., Manager of Process Engineering & Maintenance, City of Windsor

Proponent Contact Information
Address: 4155 Ojibway Pkwy. Windsor, Ontario N9C 4A5 Canada Email: evaldez@city.windsor.on.ca

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☐	☑
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	☐	☑
b. has or is adjacent to a known burial site and/or cemetery?	☐	☑
c. is in a Canadian Heritage River watershed?	☐	☑
d. contains buildings or structures that are 40 or more years old?	☐	☑

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?	☐	☑
b. has a special association with a community, person or historical event?	☐	☑
c. contains or is part of a cultural heritage landscape?	☐	☑

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
  - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

---

ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
- prevent its destruction, demolition or loss

For more information, contact:

- Ontario Heritage Trust - for an agreement, covenant or easement [clause 10 (1) (c) of the *Ontario Heritage Act*]
- municipal clerk – for a property that is the subject of an easement or a covenant [s.37 of the *Ontario Heritage Act*]
- local land registry office (for a title search)

---

iii. listed on a register of heritage properties maintained by the municipality

Municipal registers are the official lists - or record - of cultural heritage properties identified as being important to the community.

Registers include:

- all properties that are designated under the *Ontario Heritage Act* (Part IV or V)
- properties that have not been formally designated, but have been identified as having cultural heritage value or interest to the community

For more information, contact:

- municipal clerk
- municipal heritage planning staff
- municipal heritage committee

---

iv. subject to a notice of:

- intention to designate (under Part IV of the *Ontario Heritage Act*)
- a Heritage Conservation District study area bylaw (under Part V of the *Ontario Heritage Act*)

A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

- section 29 of the *Ontario Heritage Act*
- section 34.6 of the *Ontario Heritage Act.* **Note**: To date, the only applicable property is Meldrum Bay Inn, Manitoulin Island. [s.34.6]

An area designated by a municipal by-law made under section 40.1 of the *Ontario Heritage Act* as a **heritage conservation district study area**.

For more information, contact:

- municipal clerk – for a property that is the subject of notice of intention [s. 29 and s. 40.1]
- Ontario Heritage Trust

v. included in the Ministry of Tourism, Culture and Sport's list of provincial heritage properties

Provincial heritage properties are properties the Government of Ontario owns or controls that have cultural heritage value or interest.

The Ministry of Tourism, Culture and Sport (MTCS) maintains a list of all provincial heritage properties based on information provided by ministries and prescribed public bodies. As they are identified, MTCS adds properties to the list of provincial heritage properties.

For more information, contact the MTCS Registrar at registrar@ontario.ca.

3b. Is the property (or project area) a National Historic Site (or part of)?

National Historic Sites are properties or districts of national historic significance that are designated by the Federal Minister of the Environment, under the *Canada National Parks Act*, based on the advice of the Historic Sites and Monuments Board of Canada.

For more information, see the National Historic Sites website.

3c. Is the property (or project area) designated under the *Heritage Railway Stations Protection Act*?

The *Heritage Railway Stations Protection Act* protects heritage railway stations that are owned by a railway company under federal jurisdiction. Designated railway stations that pass from federal ownership may continue to have cultural heritage value.

For more information, see the Directory of Designated Heritage Railway Stations.

3d. Is the property (or project area) designated under the *Heritage Lighthouse Protection Act*?

The *Heritage Lighthouse Protection Act* helps preserve historically significant Canadian lighthouses. The Act sets up a public nomination process and includes heritage building conservation standards for lighthouses which are officially designated.

For more information, see the Heritage Lighthouses of Canada website.

3e. Is the property (or project area) identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office?

The role of the Federal Heritage Buildings Review Office (FHBRO) is to help the federal government protect the heritage buildings it owns. The policy applies to all federal government departments that administer real property, but not to federal Crown Corporations.

For more information, contact the Federal Heritage Buildings Review Office.

See a directory of all federal heritage designations.

3f. Is the property (or project area) located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?

A UNESCO World Heritage Site is a place listed by UNESCO as having outstanding universal value to humanity under the Convention Concerning the Protection of the World Cultural and Natural Heritage. In order to retain the status of a World Heritage Site, each site must maintain its character defining features.

Currently, the Rideau Canal is the only World Heritage Site in Ontario.

For more information, see Parks Canada – World Heritage Site website.

Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

- municipalities
- provincial ministries or agencies
- federal ministries or agencies
- local non-government or non-profit organizations

For more information, contact:

- municipal heritage committees or local heritage organizations – for information on the location of plaques in their community
- Ontario Historical Society's Heritage directory – for a list of historical societies and heritage organizations
- Ontario Heritage Trust – for a list of plaques commemorating Ontario's history
- Historic Sites and Monuments Board of Canada – for a list of plaques commemorating Canada's history

4b. Does the property (or project area) contain a parcel of land that has or is adjacent to a known burial site and/or cemetery?

For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

For more information, contact the Canadian Heritage River System.

If you have questions regarding the boundaries of a watershed, please contact:

- your conservation authority
- municipal staff

4d. Does the property (or project area) contain a parcel of land that contains buildings or structures that are 40 or more years old?

A 40 year 'rule of thumb' is typically used to indicate the potential of a site to be of cultural heritage value. The approximate age of buildings and/or structures may be estimated based on:

- history of the development of the area
- fire insurance maps
- architectural style
- building methods

Property owners may have information on the age of any buildings or structures on their property. The municipality, local land registry office or library may also have background information on the property.

Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

- buildings or landscape features accessible to the public or readily noticeable and widely known
- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has a special association with a community, person or event of historic interest, for instance:

- Aboriginal sacred site
- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

5c. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) contains or is part of a cultural heritage landscape?

Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

For example, an Aboriginal trail, historic road or rail corridor may have been established as a key transportation or trade route and may have been important to the early settlement of an area. Parks, designed gardens or unique landforms such as waterfalls, rock faces, caverns, or mounds are areas that may have connections to a particular event, group or belief.

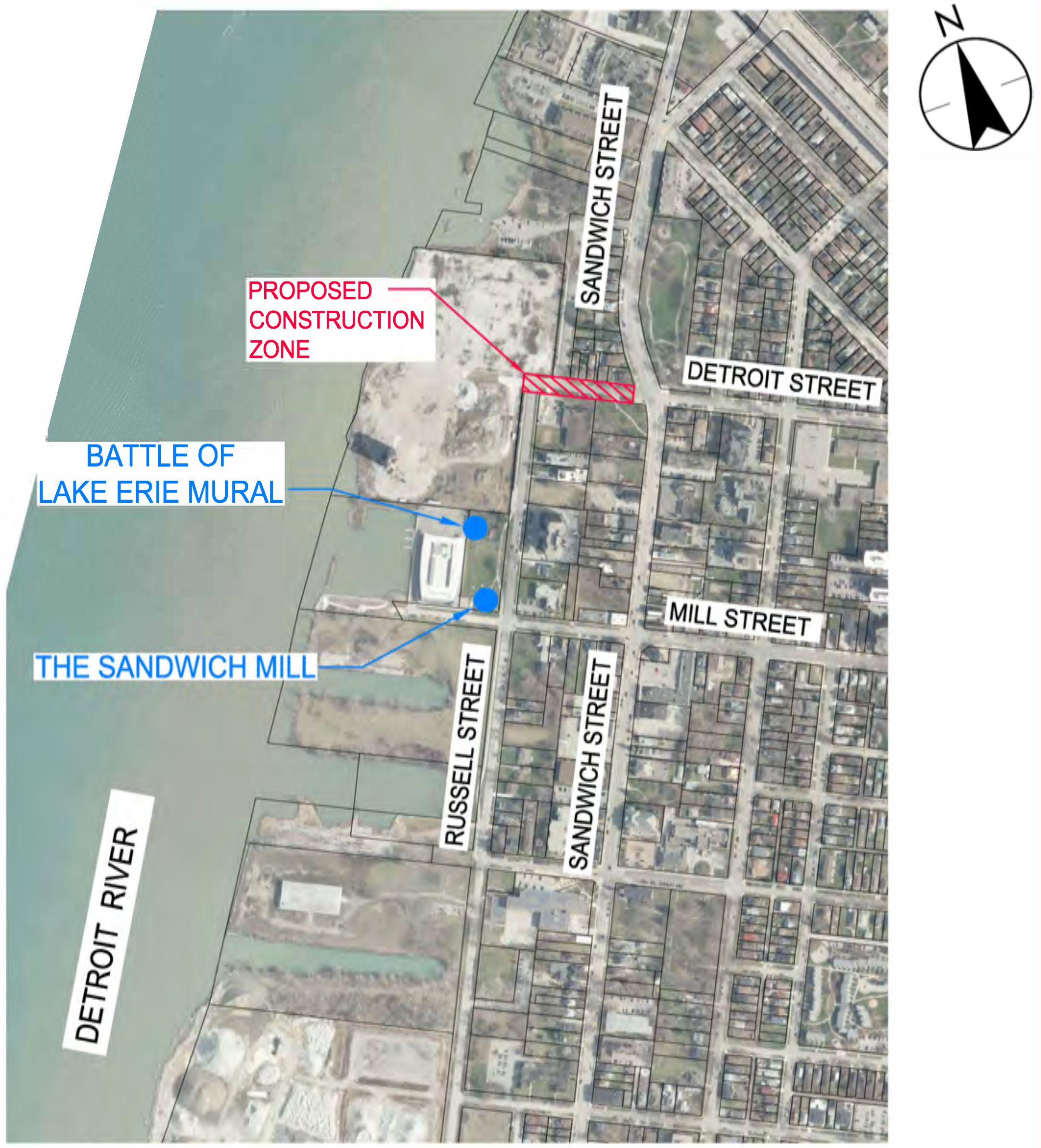
For more information on Questions 5.a., 5.b. and 5.c., contact:

- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
- Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province

An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.



Stantec

CITY OF WINDSOR
COMBINED SEWER OVERFLOW CONTROL
IN THE AREA WEST OF CARON AVENUE

AERIAL PLAN OF WINDSOR'S CULTURAL HERITAGE SITES

PROJECT NO.
165620132

DRAWING NO.
FIGURE 2-5

W:\active\165620132\planning\Draft ESR Report\Drawings\20132_FIGURE_6-1.dwg
2019-5-08 11:18am BY: jholmes

Ontario

**Ministry of Tourism,
Culture and Sport**

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

Project or Property Name
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor

Project or Property Location (upper and lower or single tier municipality)
City of Windsor

Proponent Name
Ed Valdez, P. Eng., Manager of Process Engineering & Maintenance, City of Windsor

Proponent Contact Information
Address: 4155 Ojibway Pkwy. Windsor, Ontario N9C 4A5 Canada Email: evaldez@city.windsor.on.ca

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☐	☑
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	☐	☑
b. has or is adjacent to a known burial site and/or cemetery?	☐	☑
c. is in a Canadian Heritage River watershed?	☐	☑
d. contains buildings or structures that are 40 or more years old?	☐	☑

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?	☐	☑
b. has a special association with a community, person or historical event?	☐	☑
c. contains or is part of a cultural heritage landscape?	☐	☑

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
  - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
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For more information, contact:

- Ontario Heritage Trust - for an agreement, covenant or easement [clause 10 (1) (c) of the *Ontario Heritage Act*]
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For more information, contact:

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iv. subject to a notice of:

- intention to designate (under Part IV of the *Ontario Heritage Act*)
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A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

- section 29 of the *Ontario Heritage Act*
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An area designated by a municipal by-law made under section 40.1 of the *Ontario Heritage Act* as a **heritage conservation district study area**.

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The *Heritage Railway Stations Protection Act* protects heritage railway stations that are owned by a railway company under federal jurisdiction. Designated railway stations that pass from federal ownership may continue to have cultural heritage value.

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Currently, the Rideau Canal is the only World Heritage Site in Ontario.

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Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

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For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

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- architectural style
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Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

- buildings or landscape features accessible to the public or readily noticeable and widely known
- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has a special association with a community, person or event of historic interest, for instance:

- Aboriginal sacred site
- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

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Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

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- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
- Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province

An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.

Ministry of Tourism,
Culture and Sport

Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 314-7643

Ministère du Tourisme,
de la Culture et du Sport

Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto ON M7A 0A7
Tél: 416 314-7643

03 May 2019   Email Only

Jian Li, P. Eng.
Consultant Project Manager
Stantec Consulting Ltd.
140 Ouellette Place, Ste 100
Windsor, ON N8X 1L9
jian.li@stantec.com

MTCS File	**:**	**0008250**
Proponent	**:**	**City of Windsor**
Subject	**:**	**Review of Draft Environmental Study Report**
Project	**:**	**Windsor Riverfront CSO (Caron Avenue to LRWRP)**
Location	**:**	**Area generally bounded by the Detroit River, Quebec Street/Malden Road, east of E. C. Row Expressway and Sandwich Street, City of Windsor**

Dear Jian Li:

Thank you for circulating Stantec's draft Environmental Study Report (ESR, dated March 2019) for the above-referenced project to the Ministry of Tourism, Culture and Sport (MTCS) for its review. Please find our comments below.

Project Summary

The City of Windsor is proposing a project to control combined sewer overflow (CSO) along the Windsor waterfront between the CMH Woods Pumping Station (CMHWPS) at Caron Avenue and the Lou Romano Water Reclamation Plant (LRWRP) and to control wet weather effects at the LRWRP that have resulted in excess untreated flow being discharged directly into the Detroit River.

This project is the final component of the Windsor Riverfront Pollution Control Planning Study (completed in 1999) that established a pollution control plan for the Riverfront area. The current project seeks to meet "Procedure F-5-5" requirements for providing CSO control in the study area and is proceeding as a Schedule C undertaking via the Municipal Class Environmental Assessment process.

General Comments

As part of the EA process, proponents are required to identify existing environmental conditions, assess impacts and propose the appropriate mitigation measures should any negative impacts be identified. The ESR addresses only a portion of the archaeology that may be impacted.

The ESR does not address built heritage resources and cultural heritage landscapes. As such, a

Cultural Heritage Assessment Report (CHAR) which describes the existing heritage conditions and provides a preliminary impact assessment, should be undertaken to account for all the properties (both known and potential) within the study area. The findings of the CHAR should be included in the ESR when the notice of completion is issued.

Detailed Comments

The attached table provides detailed comments, which we are willing to discuss at your convenience.

Thank you again for the opportunity to review and comment on the draft Environmental Study Report. Should you have any questions, please contact the undersigned.

Regards,

Katherine Kirzati
Heritage Planner
katherine.kirzati@ontario.ca

c: Craig Newton, MECP
Ed Valdez, City of Windsor

Please notify MTCS if archaeological resources are impacted by EA project work. All activities impacting archaeological resources must cease immediately, and a licensed archaeologist is required to carry out an archaeological assessment in accordance with the *Ontario Heritage Act* and the *Standards and Guidelines for Consultant Archaeologists*.

If human remains are encountered, all activities must cease immediately and the local police as well as the Registrar, Burials of the Ministry of Government and Consumer Services (416-326-8800) must be contacted. In situations where human remains are associated with archaeological resources, MTCS should also be notified to ensure that the site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

Windsor Combined Sewer Overflow Control -Riverfront Area (Caron Ave to LRWRP)

MTCS Comments on the Draft ESR May 2019

Item No.	Section/ Page	Issue/ Entry	MTCS Comments
1	2.5.3 Archaeological p. 2.7 First Paragraph	"There is a recognized heritage resource, Fort Gowie, on the west side of the Caron Avenue Pumping Station. Fort Gowie was a stockade house that was burned by the Americans in August 1812 at the start of the War of 1812. No archaeological assessment has been completed at this location. It is not anticipated that the preferred CSO control plan will have any impact on the Fort Gowie Site."	Clarify whether this site is a potential archaeological resource because remains or ruins exist, or a cultural heritage site that has no remains but is the known location of the fort. If it is an archaeological site, provide a rationale, with documentation that supports the statement: "No archaeological assessment has been completed at this location. It is not anticipated that the preferred CSO control plan will have any impact on the Fort Gowie Site". As a recognized heritage site, its exact location should be mapped, showing its proximity to the project and the project components (main line and alternative outflow lines).
2	2.5.3 Archaeological p. 2.7 Second Paragraph	"The potential sites for the construction of CSO and WWF control facilities are located within a "High Potential" area identified in Figure 2.4 of Appendix A, which is adapted from Figure 4: "Archaeological Potential", of the City of Windsor Archaeological Master Plan. In accordance with the Checklist for Determining Archaeological Potential from the Ministry of Tourism, Culture and Sport, a Stage 1 Archaeological	This entry implies that the proposed undertaking is located within areas that have moderate to high archaeological potential will be subject to a Stage 1 Archaeological Assessment. However, the Stage 1 report which is included in Appendix D speaks only to two properties. Clarify why the Stage 1 report did not assess the potential impacts of this project on known archaeological sites that exist within the study area, particularly between Huron-Church Road

Item No.	Section/ Page	Issue/ Entry	MTCS Comments
		Assessment is to be conducted for lands impacted by this project."	and Brock Street, both north and south of Sandwich Street. Additionally, the ESR should describe the existing conditions of the areas of archaeological potential, include a map depicting those areas and state the purpose of a Stage 1 archaeological assessment. For example: *A Stage 1 archaeological assessment was undertaken on [date] by [consultant archaeologist] for [state property or study area]. A Stage 1 AA consists of a review of geographic, land use and historical information for the property and the relevant surrounding area, a property visit to inspect its current condition and contacting MTCS to find out whether there are any known archaeological sites on or near the property. Its purpose is to identify areas of archaeological potential and further archaeological assessment (e.g. Stage 2-4) as necessary. The Stage 1 AA is included in Appendix X.* *[Then include the outcomes and recommendations of the report, as in Executive Summary]*
3	2.5.3 Archaeological p. 2.7 Second Paragraph	"If the Stage 1 Archaeological Assessment concludes that these areas have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources, a further Stage will be conducted to determine if any archaeological resources are on the property using either pedestrian survey or test pit survey."	As it stands, this sentence implies a future undertaking; it should be modified to speak to the main findings of the assessment when that assessment has been included as part of the ESR report (see sample text above).

Item No.	Section/ Page	Issue/ Entry	MTCS Comments
4	2.5.4 Built Heritage and Cultural Heritage Landscapes p. 2.8	Identification of 4 designated resources: 3 individual properties and 1 heritage conservation district	The draft ESR does not offer any rationale or documentation supporting the statement that "…the preferred CSO control plan is not expected to impact heritage resources in the area". A search via the City of Windsor's online mapping feature www.mappmycity.ca resulted in numerous cultural heritage resources within the study area. An ESR is to describe the existing conditions within and adjacent to the study area and not be limited to only formally recognized (i.e. designated) properties. As such, properties listed on the municipal register and properties with potential for cultural heritage value should be included. In addition to planning staff, the City's heritage planner and the municipal heritage committee should be consulted for information on cultural heritage resources. Although the work for this project is expected to take place within the existing right-of-way, it entails heavy machinery for soil removal, installation of pipes and backfilling of soil – all of which result in ground-borne vibrations which have been shown to negatively impact built heritage resources. As such, a Cultural Heritage Evaluation Report (CHER), which evaluates all known and potential built heritage resources and cultural heritage landscapes within the study area should be undertaken. A Heritage Impact Assessment (HIA) should follow, describing the exact type of impact and recommending the

Item No.	Section/ Page	Issue/ Entry	MTCS Comments
			appropriate mitigation measures. Each report should be appended to the final ESR, and a summary of the findings and recommendations be inserted in the body of the ESR. The final ESR should speak to the need for a qualified engineer to establish maximum acceptable vibration levels, or peak particle velocity (PPV) levels, prior to any construction activity and for properties to be monitored so that acceptable levels are not exceeded; all construction activities should cease if levels exceed the acceptable limit.
5	4.3 Environmental Impacts and Mitigation Measures p. 4.12	Table 4-1: Environmental Effects and Mitigation Measures Archaeological and heritage resources	This entry speaks only to undisturbed areas for archaeology and not at all to built heritage resources and cultural heritage landscapes. Given MTCS comments above in Item 4, this entry should be expanded to discuss the need for a further archaeology and for a CHER and HIA.
6	6.1 CSO Conveyance System p.	"The tunnelled sewer will be approximately 5 to 8 metres below grown level. Construction of a deeper sewer by tunnelling will significantly minimize disturbances along the waterfront and Sandwich Street. Stage 2 archaeological assessment investigations will be required at access shaft and interceptor chamber locations along the tunnelled portion of the sewer. These investigations will need to be undertaken during final design when the exact route	Since tunnelling results in ground vibration, built heritage resources and cultural heritage landscapes may also be negatively impacted. As such, they should be included in the discussion in the CHAR (Cultural Heritage Existing Conditions and Preliminary Impact Assessment) – as noted in the cover letter.

Item No.	**Section/ Page**	**Issue/ Entry**	**MTCS Comments**
		of the sewer and the location of chambers and access shafts have been determined."	
7	Appendix A Figures	Figure 5-1 Increasing Volumetric Interception rate at Chambers A, D and F	This figure illustrates the location of the monolithic concrete tunnel, the east utility sewer, the chambers and the outflow pipes. Many of these routes are adjacent to cultural heritage resources, which may be impacted negatively by excavation and resulting vibrations. Using this figure as a base, a CHAR and CHER would indicate the specific heritage resources that could be impacted and would need to have appropriate mitigation measures put in place.
8	Appendix D Archaeological Assessment	Stage 1 Archaeological Assessment	Clarify why the Stage 1 did not include the entire study area. It appears that the excavations for the outfall sanitary sewer may impact known archaeological resources, thus requiring appropriate assessment <u>for this project</u>.

From: Li, Jian
To: "Barboza, Karla (MTCS)"
Cc: Kirzati, Katherine (MTCS); evaldez@citywindsor.ca
Subject: RE: MTCS File 0008250 - Windsor Combined Sewer Overflow (CSO) Control
Date: Thursday, March 21, 2019 11:22:00 AM

Hi Karla,

Thank you very much for your comments on the draft Environmental Study Report for Windsor Combined Sewer Overflow (CSO) Control.

Section 2.5.3 (Archaeological Resources)

- In accordance with the Checklist for Determining Archaeological Potential from the Ministry of Tourism and Culture, a Stage 1 Archaeological Assessment was conducted for lands potentially impacted by this project. The Stage 1 Archaeological Assessment report can be viewed in *Appendix D* of the draft Environmental Study Report.
- Stage 2 archaeological assessment investigations will be required to determine if any archaeological resources are on the property using test pit survey. These investigations will need to be undertaken during final design when the exact route of the sewer and the location of proposed facility, chambers and access shafts have been determined.

Section 2.5.4 (Built Heritage and Cultural Heritage Landscapes)

- The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was reviewed. Cultural Heritage Assessment Report was not prepared for this project. Any built heritage and cultural heritage landscapes are located far away from the proposed work area. As the proposed work includes sewer construction within the road right-of-way and the proposed wastewater treatment facility is located far away from any built heritage and cultural heritage landscapes, the proposed work is not expected to impact heritage resources in the area.

I would appreciated it very much if you and Katherine can forward us any additional comments by march 28, 2019.

Thanks,
Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Barboza, Karla (MTCS) <Karla.Barboza@ontario.ca>

Sent: Wednesday, March 20, 2019 8:58 AM
To: Li, Jian <jian.li@stantec.com>; evaldez@citywindsor.ca
Cc: Kirzati, Katherine (MTCS) <Katherine.Kirzati@ontario.ca>
Subject: MTCS File 0008250 - Windsor Combined Sewer Overflow (CSO) Control

Hi Dr. Li and Mr. Valdez,

Thanks for sending the FTP site link with the Draft Environmental Study Report and Open House materials for the Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue in the City of Windsor to the Ministry of Tourism, Culture and Sport.

I was able to download the materials but have a couple of preliminary questions and observations:

- What is the deadline to provide comments on the draft Environmental Study Report?
- Section 2.5.3 (Archaeological Resources) – The draft report states that the potential sites for the control facilities are located within a 'High Potential' area and that a Stage 1 archaeological assessment is to be conducted. Could you please advise the status of this archaeological assessment?
- Section 2.5.4 (Built Heritage and Cultural Heritage Landscapes) – The draft report indicates that there are a number of known (recognized) built heritage/cultural heritage landscapes within the study area. Has a Cultural Heritage Assessment Report (Existing Conditions and Preliminary Impact Assessment) been prepared?
- Please note that Joseph (Joe) Muller is no longer with the ministry. I reassigned this file to Katherine Kirzati, MTCS Heritage Planner – copied above. Please continue to send any notifications and/or information about this project for both Katherine and I.

Thanks in advance,
Karla

Karla Barboza MCIP, RPP, CAHP | (A) Team Lead, Heritage
Ministry of Tourism, Culture and Sport
Culture Division | Programs and Services Branch | Heritage Planning Unit
T. 416.314.7120 | Email: karla.barboza@ontario.ca

From: Tang, Kristina
To: Li, Jian
Cc: Valdez, Ed
Subject: RE: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.
Date: Friday, May 17, 2019 4:32:38 PM
Attachments: image001.png

Hi Jian,

Thanks.

Please have the archaeologist copy me on the final report and also the Ministry of Tourism Culture and Sport review letter.

Thanks,

KRISTINA TANG, MCIP, RPP
Heritage Planner
Planning & Building Services
350 City Hall Square West
3rd Floor (For Deliveries, Suite 210)
Windsor, ON N9A 6S1
Phone: 519-255-6543, ext. 6179
Email: ktang@citywindsor.ca

From: Li, Jian <jian.li@stantec.com>
Sent: Monday, May 13, 2019 6:26 PM
To: Tang, Kristina <ktang@citywindsor.ca>
Cc: Valdez, Ed <evaldez@citywindsor.ca>
Subject: RE: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.

Hi Kristina,

Thank you very much for your responses. Here is my response to your comments:

1. Description of Proposed Work Area
   Attached is an aerial plan showing the above proposed work areas. The following work areas are proposed in the environmental study report (ESR):
   - A retention treatment facility on the south side of Sandwich Street and Ojibway Pkwy intersection;
   - An effluent outfall sewer along Prospect Avenue in parallel with existing Lou Romano Water Reclamation Plant outfall sewer;
   - Deep tunneled sewer (6-8 m below ground level) from Chamber A on Hill Avenue at Russell Street to Lou Romano Water Reclamation Plant on the north side of Sandwich Street and Ojibway Pkwy intersection;

   There is some improvements to flow control components inside existing Interceptor chamber A on Detroit Street at Russell Street; and existing Interceptor chamber D on Hill Avenue at Russell Street. There is no construction activities outside exiting interceptor chambers.

2. Archaeological Assessment
    - The Stage 1 Archaeological Assessment was completed for the proposed RTB site, which is located on the south side of Sandwich Street and Ojibway Pkwy intersection. The proposed RTB site was found to be undisturbed areas which have moderate to high potential for the discovery of Aboriginal or Euro-Canadian resources, and are recommended for further Stage 2 Archaeological Assessment prior to proceeding with construction. The Stage 2 Archaeological Assessment is to determine if any archaeological resources are on the property using test pit survey.
    - An RTB outfall sewer is to be constructed along Prospect Avenue in parallel with the existing LRWRP outfall sewer. A Stage 1 and Stage 2 Archaeological Assessment is to be undertaken during final design when the exact location and alignment of the outfall sewer has been determined.
    - The tunnelled sewer is to be approximately 6 to 8 metres below ground level along Russel Street between Hill Avenue and the proposed RTB site on the south side of Sandwich Street and Ojibway Pkwy intersection. Archaeological assessment investigations will be required at access shaft and interceptor chamber locations along the tunnelled portion of the sewer. These investigations will need to be undertaken during final design when the exact route of the sewer and the location of chambers and access shafts have been determined.

3. Proposed work on Detroit Street
   Since this stretch on Detroit has very high archaeological potential as it is additionally located in close proximity to several known and registered archaeological site, no construction activities is to be proposed on Detroit Street. Attached is a revised aerial plan showing proposed work.

4. Properties between the stretch between Ojibway Parkway and Hill Avenue
    - As shown in the attached aerial plan, there is no built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed work areas. The nearest one would be Battle of Lake Erie Mural, which is located on the other side of Russel Street where a new 6-8 m deep sewer is to be constructed by tunneling in parallel with the existing tunneled sewer, which is closer to the Battle of Lake Erie Mural.
    - The construction techniques used for the above previous tunnel sewer projects will be applied to the proposed work to mitigate vibration. The vibration limits set for the project will ensure that all buildings, including those with heritage features, are protected. Monitoring during construction will ensure that vibration is kept below the established limit.
    - The existing sewer (6-8 below the ground level) was constructed by tunneling in 1967. The City of Windsor also constructed a tunneled sewer between Dougal Avenue and Devonshire Road along Riverfront Drive in the City of Windsor downtown area in 2010. Standard best-practice construction techniques were used to mitigate vibrations.

I trust that you will find the above responses adequately address your comments. Should you have any questions or wish like to clarify anything within the proposed work area, please contact the undersigned.

Best Regards,

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

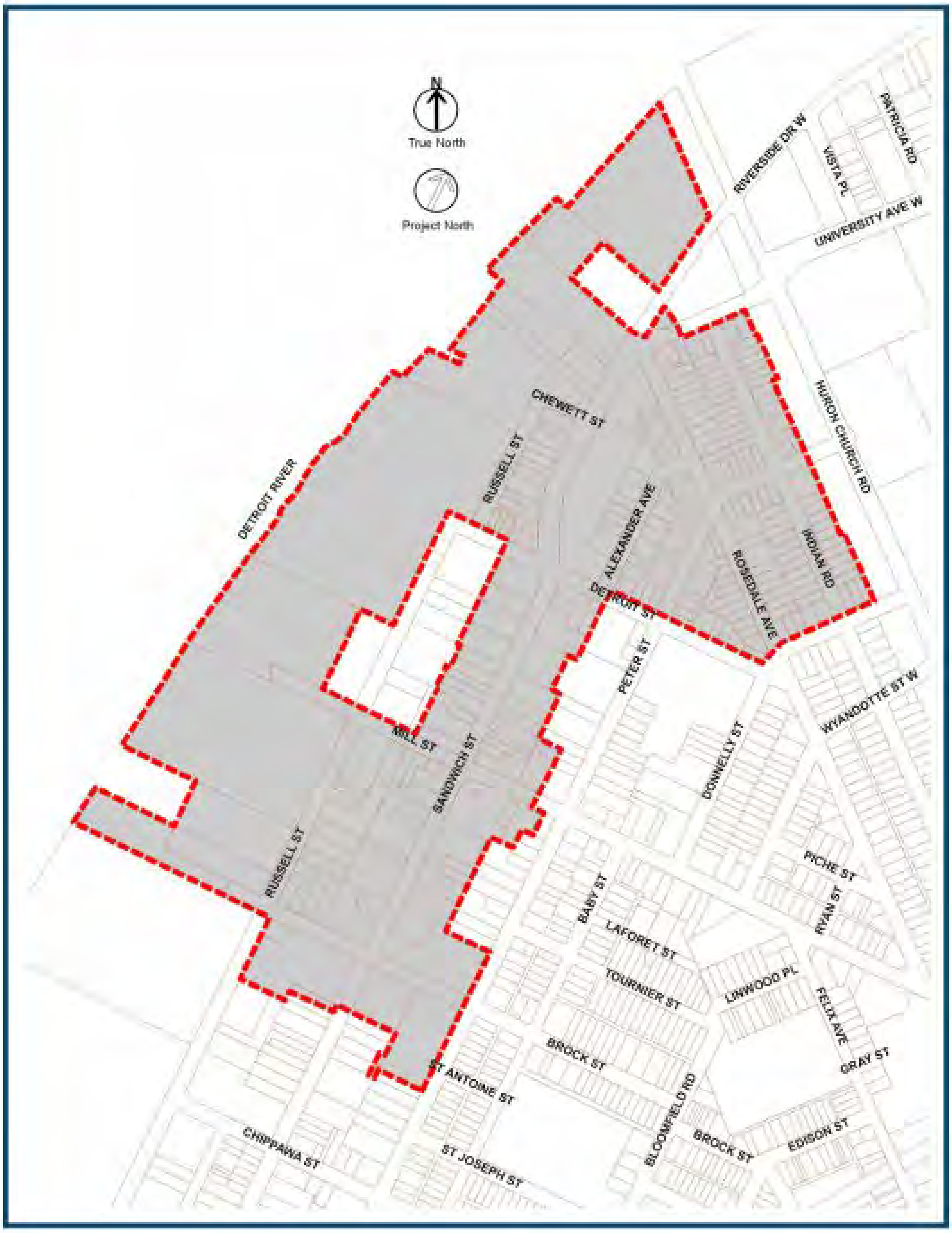
Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Tang, Kristina <ktang@citywindsor.ca>
Sent: Friday, May 10, 2019 6:10 PM
To: Li, Jian <jian.li@stantec.com>
Cc: Valdez, Ed <evaldez@citywindsor.ca>
Subject: RE: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.

Hi Jian,
Thanks for your email.
I do not currently have any list of properties between the stretch between Ojibway Parkway and Hill Avenue that is planned on being added to the Municipal Heritage Register. However, what would be the impact of the proposed work on the properties there? This area is identified as high archaeological potential, so I am not sure if there has been archaeological assessment that will be conducted prior to the proposed works?
https://www.citywindsor.ca/residents/planning/Plans-and-Community-Information/Know-Your-Community/Heritage-Planning/Pages/Windsor-Archaeological-Master-Plan.aspx

The other area you show to be on Detroit Street between Russell and Sandwich. Part of the construction area is designated under the Part V of the *Ontario Heritage Act* as part of the Sandwich Heritage Conservation District. The HCD Plan can be referenced here.
https://www.citywindsor.ca/residents/planning/Plans-and-Community-Information/Know-Your-Community/Heritage-Planning/Pages/Sandwich-Heritage-Conservation-District.aspx
Please refer to section 4.5 Public Realm and section 5.6.2 Approvals for Public Property and Infrastructure. I would need more details on what is being proposed and their impacts to let you know if a Heritage Alteration Permit is required or not.
This stretch on Detroit has very high archaeological potential as it is additionally located in close proximity to several known and registered archaeological site. I would advise that there should definitely be archaeological considered as part of the due diligence and budget.

Thanks
KRISTINA TANG, MCIP, RPP
Heritage Planner
Planning & Building Services
350 City Hall Square West
3rd Floor (For Deliveries, Suite 210)
Windsor, ON N9A 6S1
Phone: 519-255-6543, ext. 6179
Email: ktang@citywindsor.ca



From: Li, Jian <jian.li@stantec.com>
Sent: Thursday, May 09, 2019 11:39 AM
To: Tang, Kristina <ktang@citywindsor.ca>
Cc: Valdez, Ed <evaldez@citywindsor.ca>
Subject: RE: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.

Hi Kristina,

We are in the process of finalizing environmental study report for the subject project. Attached is an aerial plan showing the nearest heritage resources around the proposed work (in red font and lines).

The nearest heritage resources in the proposed work area were identified based on the online Windsor Municipal Heritage Register. The closest one would be Battle of Lake Erie Mural, which is located on the other side of Russel Street where a new 6-8 m deep sewer is to be constructed by tunneling under existing road.

Does the proposed work area have any other properties you may potentially be adding to the register? Please advise.

Thanks,
Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Tang, Kristina <ktang@citywindsor.ca>
Sent: Wednesday, January 30, 2019 4:06 PM
To: Valdez, Ed <evaldez@citywindsor.ca>
Cc: Sweetingham, Christopher <Christopher.Sweetingham@stantec.com>; Li, Jian <jian.li@stantec.com>; Mannina, Sergio <smannina@citywindsor.ca>
Subject: RE: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.

Hi Ed,

Is the EA boundaries the attached image file? It is a huge area for EA, and there will be many heritage properties identified within that boundary. We have paper files for each of the heritage properties on the Municipal Heritage Register. Let me know what you are looking for, like would it be a list of everything on the Windsor Municipal Heritage Register or are you looking for actual information about the property. If you want to look at the information, you will have to come in for it. We can arrange and set aside a time for the viewing.

If not, everything up-to-date about the Register is online here

https://www.citywindsor.ca/residents/planning/Plans-and-Community-Information/Know-Your-Community/Heritage-Planning/Pages/Windsor-Municipal-Heritage-Register.aspx
See the *Windsor Municipal Heritage Register* (Updated October 2017)

The list online does not include some properties we may potentially be adding to the register.(my or may not be included in the near future)

As for archaeology, the high archaeological potential areas are listed on the map in the Windsor Archaeological Master Plan. Other archaeologically sensitive areas will be areas close to confidential known archaeological sites. That confidential information would be known to you if you were to engage in a consultant licenced archaeologist through an archaeological assessment/study filed through the Ministry of Tourism, Culture and Sport, if needed for your EA. At a glance, your project area includes the Huron Village area which has been identified as having unusually high archaeological potential and would probably require some sort of archaeological review if land disturbance was to take place in that area.
https://www.citywindsor.ca/residents/planning/Plans-and-Community-Information/Know-Your-Community/Heritage-Planning/Pages/Windsor-Archaeological-Master-Plan.aspx

Thanks,

KRISTINA TANG, MCIP, RPP
Heritage Planner (Acting)
Planning & Building Services
350 City Hall Square West
3rd Floor (For Deliveries, Suite 210)
Windsor, ON N9A 6S1
Phone: 519-255-6543, ext. 6179
Email: ktang@citywindsor.ca

From: Valdez, Ed <evaldez@citywindsor.ca>
Sent: Wednesday, January 30, 2019 3:21 PM
To: Tang, Kristina <ktang@citywindsor.ca>
Cc: Sweetingham, Christopher <Christopher.Sweetingham@stantec.com>; 'Li, Jian' <jian.li@stantec.com>; Mannina, Sergio <smannina@citywindsor.ca>
Subject: Fw: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.
Importance: High

Good afternoon Kristina.

Referring to the e-mail below from Chris Sweetingham of Stantec could you please provide assistance? I was informed that you are the lead in regards to Heritage

Planning.

Chris,

Kristina's e-mail is attached and her phone number is 519-255-6543 x6179

Thanks.

Ed Valdez

Manager, Process Engineering & Maintenance

From: Sweetingham, Christopher <Christopher.Sweetingham@stantec.com>
Sent: Tuesday, January 29, 2019 4:46 PM
To: clerks <clerks@citywindsor.ca>
Subject: Windsor Riverfront Combined Sewer Overflow Control, Area West of Caron Ave.

Good afternoon,

Stantec is currently performing an Environmental Assessment (EA) project in the Windsor Riverfront area West of Caron Avenue, to control combined sewer overflows (CSOs). As part of the EA process Stantec is to determine potential Archaeological Resources, and Built Heritage and Cultural Heritage Landscapes.

Could you please provide information (or directions to access information) of properties registered as listed above. Could you also please provide the same assistance with respect to Archaeological Resources.

Attached is a keyplan of the area the EA encompasses.

Thank you,

Christopher Sweetingham

Engineering Intern

Direct: 519 966-2250 ext 326
Mobile: 519-551-7538
Christopher.Sweetingham@stantec.com

Stantec

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April 16, 2019

Dr. Jian Li, P.Eng
Consultant Project Manager
Stantec Consulting Ltd
100-140 Ouellette Place,
Windsor, ON, N8X 1L9

Dear Mr. Li:

<u>RE: Combined Sewer Overflow (CSO) Riverfront West of Caron Ave - Municipal Class EA Review of Environmental Report</u>

This letter is in response to our receipt and review of the "Review of Environmental Report for the EA - CSO Riverfront W of Caron Ave". It is our understanding that this Municipal Class EA is in accordance with the planning and design process for "Schedule C" projects as outlined in the Municipal Class Environmental Assessment (June 2000, and as amended in 2007, 2011 and 2015) under the Ontario Environmental Assessment Act.

We support the purpose of this EA study as a means of controlling combined sewer overflows (CSO) into the Detroit River, and to deal with wet weather flows (WWF) to the Lou Romano Water Reclamation Plant (LRWRP). We also support this initiative to help alleviate pollution into the Detroit River Area of Concern (AOC). This project reflects key actions and recommendations identified in the Detroit River Canadian Remedial Action Plan Stage 2 Report, such as the reduction of waste water treatment plant loadings, and minimizing or eliminating combined sewer overflows. We acknowledge this project will reduce sewer surcharge, increase storage capacity volumes during severe storm events, and help alleviate basement flooding. It is our opinion that these works will improve water quality and benefit the natural environment of the downstream Detroit River. We provide the following additional comments as an update to our previous correspondence dated June 6, 2018 which has been attached for your convenience.

<u>FLOODPLAIN HAZARD MANAGEMENT - REGULATORY RESPONSIBILITY, Conservation Authorities Act</u>

The following comments reflect our role as representing the provincial interest in natural hazards management under the Provincial Policy Statement of the Planning Act, as well as our regulatory role in permitting under Section 28 of the Conservation Authorities Act.

We have reviewed the preferred route and location of this project in accordance with our floodplain mapping of this area, and it has been determined that the western limits fall within the Limit of Regulated Area of the Detroit River and McKee Drain. The proposed excavations, construction of structures, drain crossings, and placement and grading of fill, within the regulated area will require permits from the Essex Region Conservation Authority (ERCA) under Ontario Regulation 158/06, (Development, Interference with Wetlands and Alteration to Shorelines and Watercourse Regulations - Section 28 of the Conservation Authorities Act).

Our concerns with regards to works being undertaken in areas identified as hazards lands (Limit of Regulated Area), will be able to be satisfied through our permit process and through the completion of the items listed in Table 4-1 " Environmental Effect and Mitigation Measures" described in the ESR Report. Accordingly, we advise that the application of these specific "Best Management Practices" regarding erosion control measures, sedimentation, and the removal of vegetation, will form a component of our permit approval. We understand that the new preferred outfall sewer will run parallel to the existing LRWRP outfall sewer that is located along Prospect Ave, and outletting to the Detroit River. Please be advised that a requirement of our permit approval will be the inclusion of water quality measures to ensure no adverse impact on the downstream watercourse.

NATURAL HERITAGE & NATURAL HERITAGE SYSTEMS ADVISORY SERVICE TO MUNICIPALITIES

The following comments are provided from our perspective as a service provider to the City of Windsor and regional municipalities on matters related to natural heritage and natural heritage systems policy review.

According to a review of our mapping, we advise that the study area may contain natural features that may support habitat of endangered species and threatened species. As per Section 2.1.7 of the PPS 2014 – "Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements." We advise it is the proponent's responsibility to exercise due diligence in ensuring that all issues related to the provincial Endangered Species Act and its regulations have been addressed. For further information regarding the Endangered Species Act, we would advise that the project managers to contact the Ministry of Environment Conservation and Parks at SAROntario@ontario.ca.

CLEAN WATER ACT - SOURCE WATER PROTECTION

The following comments are provided in our capacity as the Essex Region Source Protection Authority. The study area identified for this project is within an Intake Protection Zone (IPZ-3) and considered a vulnerable area with regards to Significant Drinking Water Threats in the Essex Region (Please see attached maps).

Upon our review of the information provided in this EA, there are no Source Water related concerns specific to this project at this time. We do however provide the following information, and ask that you continue to consult with Source Protection staff on this project as necessary.

April 18, 2019

Significant Drinking Water Threats (SDWT)

This project is located within the Intact Protection Zone (IPZ-3) and Event Based Area (EBA) for the Amherstburg Water Treatment Plant. In this area, the above grade handling and storage of liquid fuel in volumes greater than 15,000 L is identified as a Significant Drinking Water Threat (SDWT). Based on the information provided, it does not appear that fuel of this volume will be used or installed as a direct result of the proposed project. Should fuel of this volume be necessary during or as a result of the proposed project, a Risk Management Plan will be required and the proponent would need to consult with the Risk Management Official.

Transport Pathways

The EBA and other vulnerable areas are delineated using the best available mapping of drains and other watercourses. The proposed project does not appear to include the creation, relocation or removal of drains and/or other open watercourses and sewers, which could alter the delineation of vulnerable areas in the Essex Region. Should the project plan result in any of the above actions that could affect the delineation of the vulnerable area, the proponent is asked to inform the Essex Region Source Protection Authority for further discussion.

Groundwater

The proposed project area is located within a Significant Ground Water Recharge Area with a score of 2. There are no associated SDWTS or policies within these areas.

We thank you for the opportunity to comment on this project. If you should have any questions or require any additional information, please do not hesitate to contact me at the ERCA office by phone at (519) 776-5209 ext. 330, or via email: cchiasson@erca.org.

Sincerely,

Corinne Chiasson
Resource Planner
/cor
Attachment: June 6, 2018 ERCA Correspondence, Maps (Source Water Protection)

cc: Mr. Ed Valdez, P. Eng, Manager of Process Engineering &
Maintenance, City of Windsor

Essex Region Conservation
the place for life

regs@erca.org
P.519.776.5209
F.519.776.8688
360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

June 6, 2018

Dr. Jian Li, P. Eng, Consultant Project Manager
Stantec Consulting Ltd
140 Ouellette Place, Suite 100
Windsor, ON, N8X 1L9

Dear Mr. Li:

RE: Class EA - Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue
Municipal Class EA Notice of Public Meeting

This letter is in response to our review of the Notice of Public Meeting/Open House (Phase 1 & 2) for the Class EA - Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue. It is our understanding that this process is following the Municipal Class EA in accordance with the planning and design process for "Schedule C" projects as outlined in the Municipal Class Environmental Assessment (June 2000, as amended in 2007, 2011 and 2015) under the Ontario Environmental Assessment Act.

It is our understanding that these phases (1 & 2) of the Class EA process will identify the preferred alternative solution for Combined Sewer Overflows (CSO) collection and wet weather flow treatment for the study area identified. According to the information provided at the April 19, 2018 Open House, we understand that there may potentially be 2 new sites along the current sanitary sewer corridor that may be used for CSO storage and treatment facilities additional to the Lou Romano Water Reclamation Plant, as well as a potential new 'stand alone' CSO interceptor sewer line that would run along the existing CSO interceptor sewer.

We acknowledge that further studies will be forthcoming with regard to the details of these facilities, we therefore provide the following preliminary information, and ask to be included in the circulation of any further reports regarding this proposal.

We have reviewed the study area, and comment based on the mandate and existing board-approved policies and procedures of the Essex Region Conservation Authority (ERCA). These comments are grouped based on our provincial delegated responsibilities and public agency commenting roles.

FLOODPLAIN HAZARD MANAGEMENT - REGULATORY RESPONSIBILITY, Conservation Authorities Act

The following comments reflect our role as representing the provincial interest in natural hazards management under the Provincial Policy Statement of the Planning Act, as well as our regulatory role in permitting under Section 28 of the Conservation Authorities Act.

We have reviewed our floodplain mapping for this area and it has been determined that the western limits of the study area fall within the Limit of Regulated Area of the Detroit River and McKee Drain. Any excavations, construction of structures, drain crossings, or the placement and grading of fill, undertaken within the regulated area would require permits from the Essex Region Conservation Authority (ERCA) under Ontario Regulation 158/06, (Development, Interference with Wetlands and Alteration to Shorelines and Watercourse Regulations - Section 28 of the Conservation Authorities Act).

WATERSHED BASED RESOURCE MANAGEMENT AGENCY

The following comments are provided in our capacity as a public commenting body on matters related to watershed management.

Upon review of the information provided at the Public Open House on April 19, 2018, we understand that "Alternative 5 - Combination Storage and Treatment" has been assessed as the preferred alternative solution to satisfy Ministry of the Environment and Climate Change - CSO control requirements, for collection and wet weather flow treatment. Although we have no objections to this proposal as a potential solution to reduce combined sewer overflow, improve wet weather flow capacity, and reduce sewer back up and flooding into basements, we do offer the following additional information for the City of Windsor's consideration.

The City of Windsor recently experienced a significant rainfall event that inundated and overwhelmed the area's sanitary and storm sewer system/facilities. In the last decade alone, this region has experienced 6 significant storm events that have surpassed current 1:100 year regulatory standards, and have resulted in urban flooding issues and sewer backups that have impacted hundreds of homes and businesses in the region. As we understand the financial cost and complexity of undertaking "Alternative 2: Sewer Separation (storm - sanitary), we also understand that the City of Windsor as well as the ERCA are in support of long term goals of achieving storm and sanitary sewer separation. The City's own Climate Change Adaptation Policy notes that focus needs to be directed towards climate change impacts such as: operating/maintenance demands to deal with climate extremes, flooding to basements, roads and infrastructure, and operation demands during severe storms. As we are already experiencing an increase in the number and intensity of storm events affecting our region, we strongly recommend that Climate Change modelling be applied to the capacity analysis of these upgrades, and that the opportunity for sewer separation is considered where feasible.

As the City of Windsor is aware, ERCA has been working in conjunction with the regional municipalities to develop a set of regional stormwater management guidelines that take into account adjustments for the impacts of Climate Change. This work is in the final draft stage and is anticipated to be finalized in the near future. The recommendations from this guidance document should be considered and endorsed in these potential future works.

NATURAL HERITAGE & NATURAL HERITAGE SYSTEMS ADVISORY SERVICE TO MUNICIPALITIES

The following comments are provided from our perspective as a service provider to the City of Windsor and regional municipalities on matters related to natural heritage and natural heritage systems policy review. The comments in this section do not necessarily represent the provincial position and are advisory in nature for the consideration of the City of Windsor as the planning authority.

According to a review of our mapping, we advise that the study area may contain natural features that may support habitat of endangered species and threatened species. As per Section 2.1.7 of the PPS 2014 – "Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements." It is the proponent's responsibility to exercise due diligence in ensuring that all issues related to the provincial Endangered Species Act and its regulations have been addressed. For further information regarding the Endangered Species Act, we would advise that the project managers to contact the Ministry of Natural Resources and Forestry, Aylmer District at ESA.Aylmer@ontario.ca.

INFORMATION REQUESTS

Should the municipality and project managers be interested in receiving mapping data or other studies that ERCA is in possession of, please contact the undersigned. Certain reports are also available on our website: http://erca.org/resource-info/resources/ such as the Essex Region Natural Heritage System Study (ERHNSS). Data requests can also be provided for information such as: floodplain mapping studies, fish assessment data, current extents of the ERCA Limit of Regulated Area, and digital mapping from the ERHNSS.

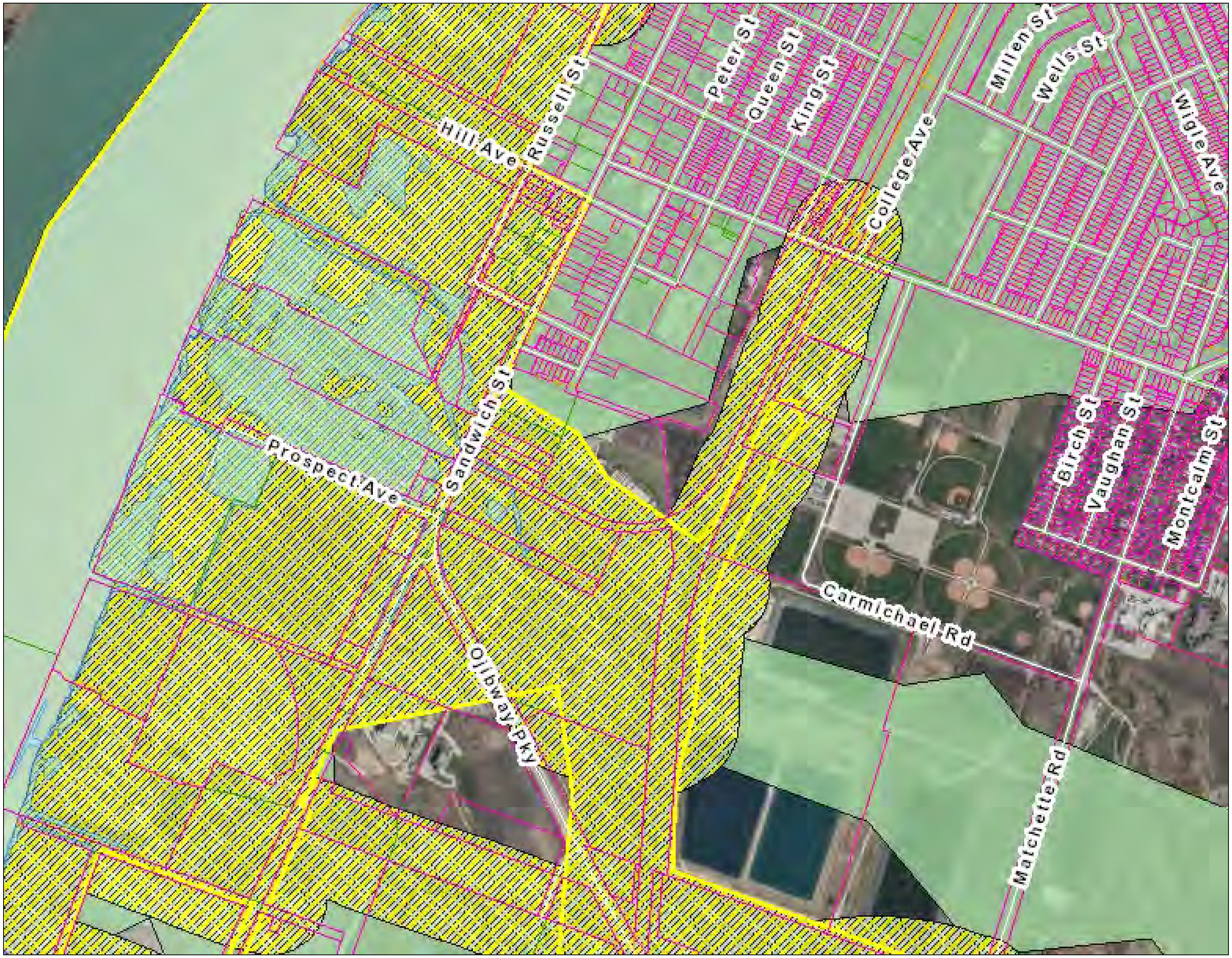
If you should have any questions or require any additional information, please do not hesitate to contact me at the ERCA office by phone at (519) 776-5209 ext 330, or via email: cchiasson@erca.org.

Sincerely

Corinne Chiasson
Resource Planner
/cor
CC: Mr. Ed Valdez, Manager of Process Engineering & Maintenance,
City of Windsor, email: evaldez@citywindsor.ca

Essex Region Conservation Authority
sustaining the place for life

ERCA Internet Mapping

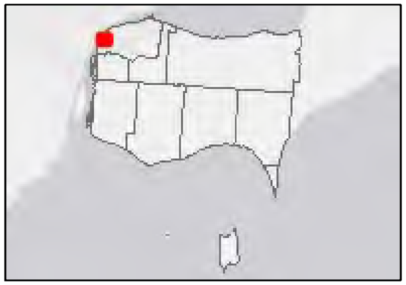


Essex Region Conservation Authority

Legend

- ☐ City Assessment
- ☐ Regional Assessment (ARN) Ownersh
- ☐ Ownership Parcels (PIN)
- ■ 1:100 yr Flood Line
- ☐ Limit of Regulated Area
- ▣ ERCA Owned or Managed Land - Exte
- ☐ Pelee Assessment
- ▨ Event Based Area (EBA)
- Surface Water Intake Protection Zone
  - ■ 1
  - ■ 2
  - ■ 3
- ■ Highly Vulnerable Aquifer (HVA)
- Significant Groundwater Recharge Ar
  - ■ 2
  - ■ 4
  - ■ 6

Location



0 285.75 571.5

Meters

1: 12,857

4/18/2019

Notes

ERCA Geomatics

THIS MAP IS INTENDED FOR INTERNAL USE ONLY.

Aerial photography copyright the City of Windsor/County of Essex/Ontario Ministry of Natural Resources and Forestry, Queen's Printer for Ontario/ERCA.

Stantec

Stantec Consulting Ltd.
100-140 Ouellette Place, Windsor ON N8X 1L9

May 13, 2019
File: 165620132

Attention: Ms. Corinne Chiasson, Resource Planner

Essex Region Conservation Authority
360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

Dear Ms. Chiasson,

Reference: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Thank you for your review comments on the March 11th, 2019 Draft ESR for Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor. The following is in response to your comments on the draft ESR, which was received on April 16, 2019. This is also in response to your comments on June 6, 2018.

1.0 FLOODPLAIN HAZARD MANAGEMENT

We will include a section below in the final ESR on Floodplain Hazard Management:

The proposed work site is under the jurisdiction of the Essex Region Conservation Authority (ERCA). The preferred route and location of this project was reviewed in accordance with ERCA's floodplain mapping of this area, and it has been determined that the western limits fall within the Limit of Regulated Area of the Detroit River and McKee Drain. The proposed excavations, construction of structures, drain crossings, and placement and grading of fill, within the regulated area will require permits from the ERCA under Ontario Regulation 158/06, (Development, Interference with Wetlands and Alteration to Shorelines and Watercourse Regulations - Section 28 of the Conservation Authorities Act).

In the final design phase, an application of flood proofing measures must be submitted to the ERCA for review and approval. The permit application shall meet the following requirements:

- Specific "Best Management Practices" regarding erosion control measures, sedimentation, and the removal of vegetation, which is provided in the MECP Stormwater Management Planning and Design Manual (2003)
- Water quality measures shall be considered to ensure no adverse impact on the downstream watercourse. The new preferred outfall sewer will run parallel to the existing LRWRP outfall sewer that is located along Prospect Ave, and outletting to the Detroit River. Surface water monitoring program is to be implemented to verify no adverse impact on the downstream watercourse.

- Mitigation measures listed in Table 6-1 “Environmental Effect and Mitigation Measures” described in this ESR Report

2.0 NATURAL HERITAGE & NATURAL HERITAGE SYSTEMS

We will include a section below in the final ESR on Natural Heritage & Natural Heritage Systems:

The proposed work area may contain natural features that may support habitat of endangered species and threatened species. As per Section 2.1.7 of the Provincial Policy Statement (PPS 2014) – “Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.” All issues related to the provincial Endangered Species Act and its regulations shall be addressed prior to the construction of the proposed work.

A field investigation shall be carried out to document existing conditions (terrestrial and aquatic) at the proposed work site. The field investigation shall consist of vegetation and wildlife habitat assessments. The number, location and species of Barn Swallow and other bird nests found in trees or vegetated areas that may be affected by the proposed work will be documented. Potential tree or vegetation removals is to be reviewed to identify potential species at risk, such as Butternut, and special habitat features such as bat maternity roosts. Blanding’s Turtle and Eastern Foxsnake (both protected under the Endangered Species Act) are known to occur in this area. As such, an assessment of potential habitat provided by the proposed outfall outlet may be undertaken. The single season field investigation to document aquatic habitat can be combined with the terrestrial field visit and will document existing conditions and habitat suitability for fish and aquatic species at risk within potential in-water work areas in the Detroit River.

A biological survey work plan is to include the following tasks:

1. Compile data from a variety of secondary sources, including the Land Information Ontario (LIO) database, Natural Heritage Information Centre (NHIC) database, the Species at Risk in Ontario List, Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Maps, the Essex Region Natural Heritage System Study (ERHNSS), ERCA’s study reports and mapping including mapping studies, fish assessment data, current extents of the ERCA Limit of Regulated Area, and digital mapping from the ERHNSS, various wildlife atlases, municipal Official Plans and other planning reports.
2. Conduct a one-day field investigation (May to July) to document existing conditions (terrestrial and aquatic) in the outfall site (i.e., the existing outfall, proposed outfall and the area within a 120 m radius of the outfall sewer installation).
3. Since in-water works are required, a DFO Self-Assessment will be undertaken to determine potential impacts of the project to fish and fish habitat and provide mitigation measures to reduce the risk of serious harm to fish.
4. Prepare a memo identifying environmental constraints and permit needs. The technical Memo is to be prepared to document background information, field data and constraints (i.e., one memo combining terrestrial and aquatic habitats). The memo is to describe existing conditions within 120 m of the predicted work area, recommend general mitigation measures to include during design, and identify permits that may be required prior to construction of the new storm sewer, water quality unit and outfall.

3.0 CLEAN WATER ACT - SOURCE WATER PROTECTION

We will include a section below in the final ESR on Source Water Protection:

3.1 SOURCE WATER PROTECT

For the protection of local municipal drinking water sources, the Essex Region Source Protection Plan (SPP), which has been established under the Clean Water Act, 2006 (Ontario Regulation 287/07), came into effect on October 1, 2015.

The Clean Water Act (2006) refers to four types of Vulnerable Areas, which include:

- Intake Protection Zones
- Wellhead Protection Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Areas

The types of Vulnerable Areas are addressed further below in relation to this project location.

3.2 INTAKE PROTECTION ZONES (IPZS)

There are two municipal Water Treatment Plants (WTPs) in the region, the A. H. Weeks (Windsor) and Amherstburg WTPs, having their intakes in the Detroit River (refer to Map 3 of the Essex Region Source Protection Plan). Intake Protection Zones are areas of land and water, where run-off from streams or drainage systems, in conjunction with currents in lakes and rivers, could directly impact the source water at the municipal drinking water intakes.

An Intake Protection Zone can be described as a defined area surrounding a surface water body intake. The size and shape of each zone in an IPZ represents either a set distance around the intake pipe, or the length of time it would take water and contaminants to reach the intake:

- IPZ-1 is the area closest to the intake pipe and is a set distance which extends one kilometre upstream and 120 metres onto the shore.

- IPZ-2 includes the on and offshore areas where flowing water and any pollution would reach the intake pipe within two hours.

- IPZ-3 is an area where contaminants could reach the intake pipe during and after a large storm.

According to Approved Source Protection Plan for Essex region source protection area, the Detroit River in the study area is characterized to be an Intake Protection Zone 3 (IPZ-3). Refer to Map 10 of the Essex Region Source Protection Plan)

The purpose of this EA study is to investigate and report on alternative means of controlling CSO in the riverfront area between Caron Avenue on the east to the Lou Romano Water Reclamation Plant (LRWRP) on the west and wet weather flows received at the LRWRP. The proposed project for the collection and treatment of CSOs and WWF will have an important beneficial impact on the source of drinking water quality.

3.3 WELLHEAD PROTECTION AREAS

Wellhead Protection Areas are not applicable in the Essex Region, as no municipal drinking water systems are supplied by groundwater.

3.4 HIGHLY VULNERABLE AQUIFERS (HVAS)

Highly Vulnerable Aquifers (HVAs) are defined as aquifers on which external sources have or are likely to have a significant adverse impact, and include the land above the aquifer.

In the ERSPA these HVAs are generally located in the sandy soil areas in the southern part of the region, including most of Pelee Island (refer to Map 4 of the Essex Region Source Protection Plan). There are no HVAs located in or close to the proposed work area.

3.5 SIGNIFICANT GROUNDWATER RECHARGE AREAS

Significant Groundwater Recharge Areas (SGRAs) are defined as per Regulation 287/07 as areas within which it is desirable to regulate or monitor drinking water threats that may affect the recharge of an aquifer. Groundwater recharge occurs where rain or snowmelt percolates into the ground and flows to an aquifer. The greatest recharge usually occurs in areas which have loose or permeable soil such as sand or gravel that allows the water to seep easily into the aquifer.

Most of the SGRAs in the ERSPA are located in the sandy soil areas of the southern part of the Essex Region, in the Harrow area, parts of Leamington and Kingsville, and limited parts of the Turkey Creek and Pelee Island subwatersheds (refer to Map 5 of the Essex Region Source Protection Plan). There are no HVAs located in the northern part of the Essex Region including City of Windsor area.

3.6 OVERALL VULNERABILITY ASSESSMENT SUMMARY

Project activities in vulnerable areas need to be assessed to determine the risk they pose. The Clean Water Act requires that significant threats be managed to reduce the threat to a point where it is no longer significant. Action may be taken to address low and moderate threats at the discretion of the Source Protection Committee. Table 6.2 provides a summary of threats to vulnerable areas and the subsequent actions to be taken, relating to this project.

Table 6-1 Summary of Threats to Vulnerable Areas

Vulnerable Area	Threat Potential	Action Taken
Intake Protection Zone	Low	None
Wellhead Protection Areas	Not applicable	None
Highly Vulnerable Aquifer	Not applicable	None
Significant Ground Water Recharge Areas	Not applicable	None

4.0 CLIMATE CHANGE - WATERSHED BASED RESOURCE MANAGEMENT

We will include a section below in the final ESR on Climate Change:

Climate encompasses all aspects of weather, including: temperature, precipitation, air pressure, humidity, wind speeds, and cloudiness. Weather and climate are not static processes and variability is often normal. Weather, for example, changes on a daily and sometimes hourly basis. Weather can also change on a monthly basis, through the changing of seasons. When climate changes on a global scale, it is referred to as Climate Change.

Since the beginning of the industrial revolution in the 18th century, excessive emission of greenhouse gases, like carbon dioxide and methane, have been released through human activities, causing an increased percentage of solar radiation to be trapped in our atmosphere. In recent decades the effect of this on climate has become clearer. As more energy is retained within the atmosphere, a general increasing trend in global temperatures has occurred.

Regardless of the cause, the average temperature in Windsor has increased by almost 1°C since 1940. As air temperatures increases, so does the capacity of the air to hold more water leading to more intense rainfall events. The Environment Canada weather station located at Windsor Airport has been monitoring and recording weather data since 1941. Since this time, an increasing trend in annual precipitation has been documented.

The effects of climate change are expected to include an increase in the number and severity of storms, leading to increased precipitation. Since 1970, there has been increasing evidence of heavier short duration (24 hours or less) rain events in southern Ontario.

Climate changes related to increasing rainfall in the region have a significant impact on municipal sewer systems. The City of Windsor recently experienced a significant rainfall event that inundated and overwhelmed the area's sanitary and storm sewer system/facilities. In the last decade alone, this region has experienced six (6) significant storm events that have surpassed current 1:100 year regulatory standards, and have resulted in urban flooding issues and sewer backups that have impacted hundreds of homes and businesses in the region. As such, historical data regarding the likelihood of major flooding events must be reconsidered. It is important that the proposed work for CSO control continues to operate effectively in the future. A solution needs to be identified to provide resiliency to the impacts of climate change.

The City's own Climate Change Adaptation Policy notes that focus needs to be directed towards climate change impacts such as: operating/maintenance demands to deal with climate extremes, flooding to basements, roads and infrastructure, and operation demands during severe storms. Table 6-3, which is obtained from City of Windsor Climate Change Adaption Plan (September 2012), summarizes the average trends in the amount of annual maximum rain events.

Table 6-1 Summary of the observed and projected increases in rainfall over time in Windsor

	Observed trends 1970 – 2000	Projected trends to 2050 (High Emissions)
30 minute extremes	• 5% increase per decade • 4.5% increase per decade to 1996	• 5% increase per decade
Daily extremes	• 7% per decade (May, June, July) • 5% increase per decade (over the year) to 1996	• 3% per decade over the year (20 year return period) • 2.5 to 6% increase per decade (rainfall with probability <5 %)
Annual rainfall	• 1% to 3% increase per decade	• 1% increase per decade

In conjunction with the regional municipalities including City of Windsor, the ERCA has developed a set of regional stormwater management guidelines that take into account adjustments for the impacts of Climate Change. The recommendations from this guidance document have also been considered and endorsed in these potential future works.

The City of Windsor has initiated the following two other sewer study projects in the study area:

- The Sewer Master Plan

  The sewer master plan will take a system-wide approach to identify specific improvement projects that can be undertaken by the City to improve sewer efficiency and reduce the risk of flooding caused by wet weather.

- The Campbell/University Combined Sewer Separation and Stormwater Management Strategy

  The proposed sewer separation is to provide storm relief to alleviate basement flooding risk while also reducing the volume of wet weather flow to the RTB facility and overflow to the Detroit River. Water quality control in the targeted sewer separation area is achieved by capturing a portion of the runoff into the Riverside Combined Sewer Interceptor to be treated at the LRWRP.

The proposed work for CSO control, which were coordinated with the above two studies, were recommended based on current standards with a conservative design method that provides a safety margin for extreme rainfall events above and beyond the average year design storms. The proposed RTB facility is designed to handle a peak flow of 9.1 m^3/s, which is approximately 30% higher than the predicted flow during the 100 year storm event. Thus, the modeled peak flows and storage/treated volume requirements are greater than expected values to mitigate the impact of climate changes.

The City of Windsor as well as the ERCA are in support of long term goals of achieving storm and sanitary sewer separation. While full separation would be an ideal outcome, it requires significant effort on privately owned land and is extremely difficult to economically achieve the full sewer separation in practice. As there is an increase in the number and intensity of storm events affecting the region, climate change needs to be considered in the evaluation of alternative solutions, and the opportunity for partial sewer separation is considered where feasible.

I trust that you will find the above responses adequately address your comments. Should you have any questions or wish like to clarify anything, please contact the undersigned.

Regards,

Stantec Consulting Ltd.

Jian Li Ph.D., P.Eng., PE
Project Manager
Phone: 519 966 2250
Fax: 519-966-5523
jian.li@stantec.com

c. Cara Salustro, Provincial Officer, Safe Drinking Water Branch, MOECC Windsor

From: Valdez, Ed
To: "Fallon Burch"
Cc: Li, Jian
Subject: RE: Combined Sewer Outflow Control in The River Front Area W. of Caron Avenue
Date: Friday, March 29, 2019 3:50:39 PM
Attachments: image005.png
image002.png

Thank you for your review and reply.
Your Invoice shall be addressed.

Ed Valdez, PE, P.Eng. | Manager of Process Engineering & Maintenance

THE CITY OF WINDSOR
ONTARIO, CANADA

Office of the City Engineer I Pollution Control
4155 Ojibway Parkway, Windsor, ON, N9C 4A5
519-253-7111 ext.3366
Mobile: 519-890-1088

From: Fallon Burch <fburch@cottfn.com>
Sent: Friday, March 29, 2019 3:41 PM
To: Valdez, Ed <evaldez@citywindsor.ca>
Cc: jian.li@stantec.com
Subject: Combined Sewer Outflow Control in The River Front Area W. of Caron Avenue

Good afternoon Ed,

I have attached a response in regards to the Review of the DRAFT Environmental Study Report on behalf of Chippewas of the Thames First Nation. Please find attached INV 3-005-19, a per *appendix D* of the *Wiindamaagewin*. If you have any questions, please do hesitate to contact me.

Thank you,

Fallon Burch
Consultation Coordinator, Chippewas of the Thames First Nation
320 Chippewa Rd Muncey, ON N0L 1Y0 | 519-289-5555 |
www.cottfn.com/consultation

CHIPPEWAS OF THE THAMES FIRST NATION

March 29, 2019

VIA EMAIL

Mr. Ed Valdez
City of Windsor
4155 Ojibway Parkway
Windsor, ON N9C 4A5

RE: Class Environmental Assessment – Combined Sewer Overflow Control in The Riverfront Area West of Caron Avenue, City of Windsor

Dear Mr Valdez,

The proposed project is located within the Mckee Treaty Area (1790) to which Chippewas of the Thames First Nation (COTTFN) is a signatory, it is also located within the Big Bear Creek Additions to Reserve (ATR) land selection area, as well as COTTFN's Traditional Territory.

Thank you for forwarding the *"Draft" Environmental Study Report*. We have reviewed the Report, based on this review we have very minimal concern with the proposed project. However, we do ask that if there are any substantive changes to this project, we wish to be notified. We would like any future notices or reports sent to consultation@cottfn.com. If any Archaeology Studies are required, we like to the opportunity to participate by sending an Archaeology Field Liaison on behalf of COTTFN.

We look forward to continuing this open line of communication. To implement meaningful consultation, COTTFN has developed its own protocol — a document and a process that will guide positive working relationships. We would be happy to meet with you to review COTTFN's Consultation Protocol.

Please do not hesitate to contact me if you need further clarification of this letter.

Sincerely,

Fallon Burch
Consultation Coordinator
Chippewas of the Thames First Nation
(519) 289-5555 Ext. 251
consultation@cottfn.com

c: Dr. Jian Li, P.Eng., Consultant Project Manager, Stantec Consulting

320 Chippewa Road, Muncey, ON, N0L 1Y0
Ph. 519-289-5555 Fax. 519-289-2230
info@cottfn.com www.cottfn.com

Chippewas of the Thames First Nation
Treaties, Lands & Environment Department

320 Chippewa Rd.
Muncey, Ontario N0L 1Y0

P: 519-289-5555
F: 519-289-2230

Consultation@cottfn.com
www.cottfn.com/consultation

Bill To:	City of Windsor	Phone: (519) 253-7217	Invoice #: 3-005-19
Address:	4155 Ojibway Parkway	Fax: (519) 253-0464	Invoice Date: 3-29-2019
	Windsor, ON N9C 4A5	Email: evaldez@citywindsor.ca	

Invoice For: Combined Sewer Overflow Control in The Riverfront Area West-REVIEW

Item #	Description	Qty	Unit Price	Discount	Price
1	Filing Fee	1	$ 125.00	$ -	**$ 125.00**
2	1 - Consultation Coordinator	2	$ 85.00	-	**170.00**

Invoice Subtotal	$ 295.00
Administration Fee	15.00%
Other	
Deposit Received	
TOTAL	**$ 339.25**

Make all checks payable to:
Chippewas of the Thames First Nation
320 Chippewa Rd. Muncey, ON N0L 1Y0
Attn: Wiindmaagewin

** Charges comply with the *Consultation Service Fees Schedule, Appendix D of the* Wiindmaagewin

From: Li, Jian
To: Cerniavskaja, Karina (MNRF)
Cc: evaldez@citywindsor.ca
Subject: RE: City of Windsor - Combined Sewer Overflow Control in Riverfront Area West of Caron Avenue Class EA
Date: Friday, April 12, 2019 4:01:00 PM

Thanks, Karina. We have been communicating with the Ministry of Environment, Conservation and Parks (MECP) to ensure the MECP's comments/concerns on the proposed project are to be addressed..

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
100-140 Ouellette Place
Windsor ON N8X 1L9 CA

From: Cerniavskaja, Karina (MNRF) <Karina.Cerniavskaja@ontario.ca>
Sent: Friday, April 12, 2019 3:51 PM
To: evaldez@citywindsor.ca; Li, Jian <jian.li@stantec.com>
Subject: City of Windsor - Combined Sewer Overflow Control in Riverfront Area West of Caron Avenue Class EA

Good afternoon Ed and Jian,

Thank you for circulating the attached Class Environmental Assessment Notice to the Ministry of Natural Resources and Forestry (MNRF) office. Please note, the Ministry of Environment, Conservation and Parks (MECP) has now assumed responsibility for the Endangered Species Act (ESA), including species at risk (SAR) in Ontario. All future correspondence related to ESA or SAR should be sent to SAROntario@ontario.ca to reach the MECP directly.

MNRF will continue to review projects for matters that fall within the scope of the ministry's mandate and provide guidance with respect to legislation under the ministry's jurisdiction. I just wanted to make sure that you are aware of the above changes.

Please let me know if you have any questions.

Thank you,
Karina

Karina Cerniavskaja, District Planner
Ministry of Natural Resources and Forestry, Aylmer District
615 John St. N. Aylmer, ON N5H 2S8
Tel: 519-773-4757 | Cell: 519-630-5292 | Fax: 519-773-9014 | Email: karina.cerniavskaja@ontario.ca

As part of providing accessible customer service, please let me know if you have any accommodation needs or require communication supports or alternate formats.

APPENDIX D

- Geotechnical Investigations
- Archaeological Assessment
- Heritage Screening Checklist

APPENDIX D

Geotechnical Investigations

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD SCARBOROUGH, ONTARIO TELEPHONE 421-2567

BRANCH
3 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3851

FOUNDATION ENGINEERS

PO. BOX 933
SAULT STE. MARIE
ONTARIO
TELEPHONE AL. 4-2615

Scarborough, Ontario,
March 20th, 1964.

OUR REF: 4-1-1

C. G. Russell Armstrong,
Consulting Engineers,
Bartlet Building,
WINDSOR, Ontario.

Att'n: Mr. E. O. LaFontaine, P.Eng.

Re: Soil Conditions & Foundations,
Proposed Interceptor Sewer,
CITY OF WINDSOR, Ontario.

Dear Sirs:

This letter accompanies our detailed report on the soil investigation carried out at the above site recently.

The investigation has shown that the proposed sewer will be located within a sandy clay deposit generally of firm to very stiff consistency except at the south end where a very soft clay is encountered. Detailed properties of the soil strata are given in the report.

As discussed in the report, we believe that tunneling may be carried out using the liner-plate method in free air although certain precautions should be observed. However, special attention should be given to the first tunnel section at the south end of the sewer. The report gives also recommendations for tunnel design based on the soil conditions encountered.

Open-cut sections of the sewer should present little problem for construction. The design of the structure and of the construction procedures for the pumping station should be based on the results of Borehole No. 20 since this represents the most unfavourable conditions encountered in this locality. Recommendations for this structure are given in the report.

We trust that this report contains all of the subsurface information required for design and construction. However, should you have any questions, or if we can be of assistance in any other way, please do not hesitate to call on us.

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In conclusion, we would like to express our pleasure in having been associated with you on this project.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

K H King

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K. H. King, P. Eng.,
CHIEF ENGINEER.

REGISTERED PROFESSIONAL ENGINEER
CIVIL
K. H. KING
PROVINCE OF ONTARIO

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INTRODUCTION

Dominion Soil Investigation Limited was retained by letter of authorization dated December 13th, 1963 to investigate and report on the subsurface conditions between stations 17+96 and 300+00 on the proposed Riverside sanitary interceptor sewer in the City of Windsor, Ontario.

Generally, the scope of the investigation was in accordance with our proposal dated September 3rd, 1963 and was designed to provide information on the soil and ground-water conditions along the route necessary for the safe and economical design of the temporary and permanent works involved.

PROCEDURE

A total of thirty-one (31) exploratory boreholes was carried out between January 7th and February 5th, 1964 at locations shown on the site plans attached. One further borehole, designated 19A, was drilled close to Borehole #19. This was performed without sampling for the purpose of vane testing only. Generally, the boreholes were taken to a depth of at least 10 feet below the proposed invert level of the sewer as shown on Drawings Nos. 3F-370-P1; 2 and 3 prepared by C. G. Russell Armstrong, the Consulting Engineers for the project. However, at the location of the proposed pumping station the adjacent boreholes (Nos. 19 & 20) were taken down to bedrock in accordance with the requirements of the Engineers.

The borings were advanced by augering or by washboring using whichever method was appropriate to the conditions encountered. Soil samples were recovered by driving a standard 2 inch diameter split-spoon sampler into the soil after cleaning out the borehole. The number of

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blows of a 140 pound hammer falling 30 inches required to drive this sampler down one foot is recorded as the standard penetration resistance or "N" value of the soil. This bears an empirical relationship to the relative density of granular soils and to the consistency of cohesive soils. Since this method yields samples which are inherently disturbed, they are of value only for purposes of laboratory examination and classification. Therefore, in order to determine the strength and compressibility properties of cohesive soil in the laboratory, representative undisturbed samples of clay were recovered using a thin-walled tube sampler which was pushed into the soil. Even with this method, some disturbance of the samples is unavoidable, particularly that part due to the removal of overburden in boring. For this reason, shear strength determinations were made in the clay strata in-situ using a vane tester. General experience with the use of this apparatus shows that the results are generally close to the in-situ shear strength of the soil although they may on occasion be somewhat on the high side, thus they should always be reviewed in the light of laboratory compression and classification test results.

Detailed results of the individual boreholes are given on the Geotechnical Data Sheets in Appendix I attached. The results of laboratory tests are presented on the borehole logs and on the Table and Figures in Appendix II.

Some observations of water level were made when the boreholes were being advanced. However, since these are likely to be influenced by the boring operations, reliable observations of ground water levels are being made in piezometers installed in selected boreholes. The results obtained to date are presented on the borehole logs and discussed under "GROUND WATER CONDITIONS".

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The locations and elevations of all of the boreholes were determined by C. G. Russell Armstrong, Consulting Engineers for the project.

GENERALIZED SOIL CONDITIONS

The following paragraphs present a general picture of the soil conditions encountered along the length of the interceptor sewer presently under investigation. Details of the soil conditions encountered are given on the borehole logs and they are discussed in relation to the design and construction problems for various sections under the separate headings in "DISCUSSION".

Fill

In many of the boreholes, a surface deposit of fill was encountered having a maximum depth of 11 feet in Borehole No. 22. The fill consists generally of clayey, silty sand with some gravel and occasional pieces of timber, brick and concrete rubble and ashes. As might be expected, the relative density of the fill, as estimated from "N" values ranging between 1 and 54 blows per foot, is very variable. It appears that the fill has been placed at random without any compaction and the relative density determined on the basis of the above "N" values ranges from very loose to very dense.

Brown, Fine Sand.

In Boreholes Nos. 1, 2 and 3, the uppermost soil stratum is a brown, fine sand between 7 and 11 feet in thickness. "N" values obtained from standard penetration tests in the sand stratum ranged from 4 to 20 blows per foot indicating that the relative density ranges from loose to compact.

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Brown and Grey, Sandy Clay

The main soil stratum encountered throughout the length of the sewer under consideration, and within which the construction will take place, is a sandy clay. This stratum, which is of glacial origin, is typical of the Windsor area. Commonly, it is an unstratified, well-graded soil containing about 20% clay; 30% silt; 45% sand and 5% gravel particles. Typical grain-size distribution curves are plotted on Enclosure No. 38 in Appendix II. Scattered at random throughout the deposit are occasional pockets or seams of fine to medium sand and silt.

Although the proportion of clay-sized particles appears small from the grain-size distribution curves, it is sufficient to impart cohesive and plastic properties to the soil. This is demonstrated by the results of Atterberg Limit tests which are quoted in the Table of Enclosure No. 37 and plotted on the Classification Chart of Enclosure No. 39 in Appendix II. These tests gave values of Liquid Limit ranging between 15.3 and 51.1; of Plastic Limit ranging between 10.4 and 20.2; and of Plasticity Index ranging between 4.8 and 30.9. In general, the higher values of plasticity were obtained at the south end of the sewer and the plasticity decreases in a northerly direction. In spite of the wide range of values obtained, the results when plotted on the Classification Chart define a straight line parallel to and somewhat above the "A" line. It is generally accepted that in this case the points represent different samples from the same soil stratum (Reference 1 - page 35). From the information quoted in the same reference, it may be seen that the present results are in close agreement with others obtained in glacial clays from Boston, Chicago and Detroit, thereby indicating a similarity between the clay deposits found at all of these localities. The present results are

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typical generally of sandy clays of low plasticity and compressibility, increasing to medium to high plasticity and compressibility in Boreholes Nos. 1 and 2 at the south end of the sewer.

The shear strength of the clay has been determined by means of vane tests performed in-situ in the boreholes and by laboratory compression tests carried out under both unconfined and undrained triaxial conditions. All of the results are plotted on the borehole logs and are quoted on the Soil Profile in Appendix III. Furthermore, the laboratory test results are tabulated on Enclosure No. 37 in Appendix II. The results of undrained triaxial compression tests performed on two samples at different confining pressures are plotted as Mohr's circles of stress at failure on Enclosure No. 40. The failure envelope to the circles shows that the clay has an apparent angle of shearing resistance of about 2.5 degrees based on total stresses. For practical purposes it may be assumed therefore that the clay behaves under undrained conditions with an apparent angle of shearing resistance equal to zero (i.e. $\emptyset = 0^{o}$ condition). From this, it follows that the shear strength may be taken as one-half of the compressive strength as determined in the laboratory tests, and the values quoted have been determined in this manner. In general, the results of the two types of test, namely vane and compression tests, show fairly close agreement although a few of the vane test results may be on the high side due to the presence of gravel or sand seams. At the same time, some of the laboratory test results are probably low due to unavoidable sample disturbance. The results show a very wide range of shear strength values throughout the length and depth explored in this investigation, the minimum and maximum values of shear strength obtained being 120 and 5,900 pounds per square foot respectively. Based on these values, the consistency of the clay

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ranges between very soft and hard. The sensitivity of the clay (defined as the ratio of the undisturbed shear strength to the remoulded shear strength) as determined by the vane tests ranges between 1.0 and 3.3 with a general value of about 1.5. Thus the sandy clay is of low to medium sensitivity.

In general, two trends are noticed: firstly, the clay at the south end (Boreholes Nos. 1, 2 and 3) is very soft and becomes stiffer in a northerly direction; and secondly, in most of the boreholes, the clay has a crust of hard or very stiff clay consistency overlying softer material. Since the colour of the clay changes from grey to brown in the crust, it is believed that this is due to desiccation. Apart from these trends, the shear strength variations in both the horizontal and vertical directions appear to be erratic. For this reason, it has not been possible to plot a general shear strength versus elevation profile representing the stratum as a whole although this plot has been made on the individual borehole logs. This erratic variation in consistency appears to be typical of these glacial clay deposits and is reported by several authorities, notably Terzaghi in References Nos. 3 and 4. Previous experience of our own confirms the trend from softer, more plastic clays in the Ojibway area to stiffer, less plastic clays in Windsor and north towards Lake St. Clair.

Typical stress versus strain curves for unconfined compression tests are plotted on Enclosure No. 41 in Appendix II. These show that the softer clay samples failed at fairly high values of axial strain and that a "plastic" form of failure occurred with no apparent loss of strength after the peak stress was reached. By contrast, the stiffer clay samples exhibited a "brittle" type of failure in which there was a significant loss of strength after the peak stress was passed.

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The results of consolidation tests performed on two samples are plotted as curves of void-ratio versus the logarithm of pressure on Enclosures Nos. 42 and 43 in Appendix II. These show that both samples are normally consolidated or lightly over-consolidated, having been subjected in the past to consolidation pressures of up to about one-half ton per square foot in excess of the existing overburden pressures. The tests give values for the compression index (C_c) of 0.06 and 0.09 and for the modulus of compressibility (m_v) of 0.009 and 0.019 square feet per ton for Borehole No. 19, Sample No. 11 and for Borehole No. 20, Sample No. 4 respectively. The values of the modulus of compressibility have been computed for an arbitrary load increment of one ton per square foot above the existing overburden pressure.

The effective shear stress parameters of the clay were determined from consolidated-undrained triaxial compression tests in which pore-pressures in the clay were measured. The results expressed as Mohr's circles of effective stress at failure are presented on Enclosure No. 44 of Appendix II. The tests gave an angle of shearing resistance of 31 degrees and a cohesion intercept of 0 p.s. ft. based on the effective stresses. It is believed that these values are representative of the clay stratum as a whole.

Determinations of natural water content and of natural unit weight of clay samples are tabulated on Enclosure No. 37. It can be seen that the water content ranges from 59% to 11% although values between 15% and 25% would be more typical for most of the length of the sewer. The liquidity index ranges from zero (i.e. natural water content at the Plastic Limit) to 1.4 (i.e. natural water content in excess of Liquid Limit) although generally it is about 0.5 (i.e. natural water content midway between the

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Plastic and Liquid Limits). The natural unit weights range from 104 to 150 pounds per cubic foot with values of 120 and 135 pounds per cubic foot being typical for the softer and stiffer parts of the stratum respectively.

The properties of the clay as disclosed in the present investigation have been compared with those reported in Reference No. 2 as being typical of the Windsor area and they were found to be in substantial agreement.

The relevant engineering properties of the clay recommended for use in the design of permanent and temporary works are given in the appropriate sections of the "DISCUSSION".

With the exception of Boreholes Nos. 19 and 20 which were taken deeper for the proposed pumping station, the boreholes were terminated within the sandy clay stratum. The thickness of the clay stratum as encountered in Boreholes Nos. 19 and 20 was about 80 feet.

Layers of Sandy Clay and Fine Sand

Below a depth of 80 feet (i.e. approximate elevation 502) in Boreholes Nos. 19 and 20, the character of the soil changes. The sandy clay becomes hard (based on "N" values in excess of 30 blows per foot) and it is associated, in Borehole No. 20 in particular, with a considerable amount of grey-brown,silty, fine sand present in the form or layers or lenses.

Grey, Sandy Till

With increasing depth, the soil becomes more granular until below approximate elevation 486 it consists of a gravelly sand with some silt and a trace of clay. Because of the wide range of grain sizes present and the lack of structure in the soil, it is classified as a glacial till, the main component of which is a sand. The "N" values obtained in the till

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are in excess of 100 blows per foot, thus the relative density is very dense.

Limestone Bedrock

Limestone bedrock was encountered in Boreholes No. 19 and 20 below depths of 113.5 feet and 109.0 feet respectively. The rock was diamond core-drilled and the recovery was 100% indicating that the rock is generally sound and hard.

Ground-Water Conditions

Water level observations made during the course of the boring operations are given on the borehole logs. However, because of the impermeable nature of the subsoil, probably these do not reflect the true ground-water conditions. For this reason, piezometers were installed in several of the boreholes so that by taking observations over a period of time, the piezometric water level in the ground can be determined accurately. After installation, the piezometers were filled with a special anti-freeze solution.

The results of the observations obtained to date are tabulated and plotted on Enclosure No. 48 in Appendix III. These show that after some initial fluctuation necessary for the water levels to reach equilibrium, the readings in the individual piezometers are now generally steady at about elevation 577, except for the piezometer installed in Borehole No. 27 which shows a water level at about elevation 587. However, this water level is continuing to drop, possibly because for some reason this piezometer is slower to react than the others.

So far, only one observation of the water level in the nearby Detroit River has been obtained. This showed that the river level on January 9th, 1964 was at elevation 571.5. It is expected that the ground-

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water level will reflect the river levelpossibly being a few feet higher for significant periods of time. Therefore, it is suggested that future observations of the piezometers include also the level of the Detroit River.

DISCUSSION

The following discussion, which deals with the soil mechanics aspect of the design and construction of the proposed sanitary interceptor sewer, is divided into sections dealing separately with the features relevant to the various construction works such as "Tunnels"; "Open Cuts" and "Pumping Station". The sections open with a discussion of the general considerations of the factors involved in the light of general soil conditions encountered. This is followed by more detailed discussions for the particular lengths of sewer involved on the basis of the specific soil conditions contained therein.

(1) Tunnels - General Considerations

Three lengths of tunnel are proposed within the sewer under consideration between approximate stations 10+80 and 30+70; 100+80 and 120+70; 190+40 and 290+95. The tunnels range in internal diameter between 5 feet, 0 inches and 6 feet, 6 inches and the invert level ranges between elevation 553 and 563 approximately. The depth of cover over the tunnel sections ranges between about 13 feet and about 41 feet as shown in profile on Enclosure No. 47.

The investigation has shown that the significant soil stratum underlying the route of the proposed sewer is a sandy clay of variable consistency, but generally having a very stiff or hard crust decreasing to a firm consistency with depth. Reference to the soil profile (Enclosure No. 47) shows that the major part of the tunnel lengths will be within the firm to stiff part of the clay underneath the crust. An exception occurs at the south end (stations 10+80 to 30+70) where the clay is very soft to firm at the tunnel location. In the following discussion, the significance of the soil conditions in relation to design and construction is discussed.

(2) Tunnels - Construction Procedures

There are at present no established analytical methods available by which to determine the most suitable tunneling method for a given set of circumstances. Thus it is common practice to adopt the most widely available techniques and to modify them if necessary on the basis of previous experience in a particular area or under similar soil conditions. Earlier in this report, it was shown that the soil conditions encountered here are similar in many respects to those prevailing in Detroit and Chicago where tunnel construction has been well documented.

With the exception of the short tunnel section at the south end of the sewer (stations 10+80 to 30+70 approximately), the soil conditions elsewhere generally appear similar to the more favourable conditions encountered in the Chicago Subway (Reference No. 4). Since liner-plate tunneling was performed satisfactorily with the application of moderate air pressures in Chicago, it is inferred that this method would be successful also under the present conditions. This is confirmed from other sources (References Nos. 5 and 6) which relate the construction of small-diameter tunnels in Detroit using the liner-plate method, again under compressed air. With regard to the use of air, however, the Chicago tunnels were of large cross-sectional and many of the Detroit tunnels reported were in clay of much softer consistency than that encountered generally in Windsor. In the present case, the need for compressed air has been investigated using the approximate method

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of analysis put forward by Terzaghi in Reference No. 4. With the soil strengths encountered throughout the tunneled sections except between 10+80 and 30+70, the computations show that air pressure is not required generally to ensure stability of the unsupported soil. Apart from providing support, a secondary requirement for air pressure is to reduce the deformation of soil into and towards a tunnel heading. This is particularly important in built-up areas since these deformations, if unchecked, can lead to excessive settlement and damage to structures and services. In the present case, the clay has generally a desiccated crust of hard or very stiff consistency and this has a marked effect in reducing the magnitude of settlements by virtue of its comparative rigidity. In fact, the studies carried out in Chicago suggested that the effect of the crust there was to nullify any attempt to control settlement by means of adjusting the air pressure or even the size of the face mined. The above reasoning suggests that the general use of compressed air is not required in the present case; nevertheless it is recommended that a special provision be made in the contract for air to be used at the discretion of the Engineer. This is to provide for unforeseen conditions which may be encountered, bearing in mind the large and erratic variations in soil conditions and the wide spacing of the boreholes. It is felt that this procedure will put contractors tendering for the work on a more equitable footing thereby reducing substantially the contingencies. Apart from some seams or pockets of sand, the sandy clay stratum is relatively impermeable. Since it is likely that these sand pockets are contained, the amount of water inflow into the tunnel should be small and not require any special provisions other than normal pumping from sumps or open drainage channels. To sum up then, it is concluded that the proposed tunnel sections between

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approximate stations 100+80 and 120+70, and between 190+40 and 290+95 may be constructed using the liner-plate method without the general use of compressed air.

With regard to the short length of tunnel at the south end of the present sewer project between approximate stations 10+80 and 30+70, it is understood that this will be about 6 feet, 6 inches internal diameter with the invert at approximate elevation 556. Thus the crown of the tunnel will be at approximate elevation 563. Since the existing ground surface is at approximate elevation 578 throughout most of the proposed length, the height of cover over the tunnel is generally about 15 feet, increasing locally at Chappell Avenue to about 28 feet.

As mentioned previously, the soil conditions in this length are poor. Based on the results of Boreholes Nos. 3, 2 and 1, there appears to be a trend towards a very soft, highly plastic clay in a southerly direction. The existence of a considerable surface deposit of this material in Ojibway is known from previous experience and this confirms the trend noted above. Because of the very soft consistency of the clay, combined with the lack of a stiff crust and the shallow depth of earth cover, it is believed that tunneling by the liner-plate method in free air is not feasible in this section. The use of compressed air to stabilize the clay is ruled out because there is a very real danger of a blowout due to the inadequate earth cover. Furthermore, very close control of the air pressures would be required to keep ground settlements within tolerable limits. Therefore, if other considerations dictate the use of a tunnel in this section, it will be necessary to construct this with a shield. However, under the conditions prevailing at this site, even the use of a shield creates problems in that the resulting heave and settlement of the

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ground surface are likely to exceed tolerable limits and the variations in consistency of the clay across the face will make control of alignment and elevation difficult.

For the above reasons, it is recommended that consideration should be given to alternate schemes for the sewer at this location. Although strictly beyond our terms of rederence, we mention here for your guidance the possibilities which come to mind, as follows:-

(i) Construct the sewer in open-cut. The presence of firm to stiff clay below the invert level indicates that this is feasible.

(ii) If an open-cut is not practicable at this location for other reasons, the sewer might be relocated.

(iii) If the present alignment is the most desirable, consideration should be given to placing the sewer at a lower elevation where the boreholes indicate a stiffer clay suitable for liner-plate construction.

(iv) If it is most desirable that a tunnel be built at the presently proposed alignment and elevation, then it is suggested that the present contract be extended southwards since it is believed that the soil conditions there will require the further use of a shield in tunneling. For reasons of economy, it is desirable to get the maximum use from a shield if one has to be provided.

The success of a tunnel lining depends to a very great extent on the workmanship during construction. Based on our own and reported experience by others, one of the prime considerations is the avoidance of excessively uneven pressures on the primary or secondary linings or both. One of the disadvantages of the liner-plate method which uses open-faced mining is that generally large and uneven gaps are left behind the primary lining. If left unattended for any length of time, the ground will deform until it bears on the tunnel, generally starting at the crown. If the secondary

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lining is in place, the resulting uneven loads may cause a failure of the concrete and in any case, it is desirable to restrict this movement of the clay since it contributes to further ground settlement. Therefore, it is recommended that the voids left outside of the primary liner be filled by pea gravel or light-pressure grouting, or a combination of both, as soon as possible after erection of the primary lining. The final high-pressure grouting should be carried out later when the secondary lining has hardened sufficiently. Furthermore, whenever construction is suspended for any period of time, such as over weekends or on public holidays, the face of the tunnel should be supported by a temporary bulkhead wedged against the soil.

From experience, it appears that even with the most careful workmanship and control of construction some settlement of the ground surface above a tunnel is to be expected. For this reason, it is recommended that detailed pre-construction and post-construction inspections be made at least of important structures likely to be affected. The results of such inspections will be of value in evaluating any possible subsequent claims for damage. At the same time, check levels should be taken on transverse cross-sections at intervals along the route in order to assess the effects of tunneling and to adjust construction procedures if deemed necessary.

(3) Tunnels - Design

A tunnel structure is perhaps unique in the degree to which the structure and the surrounding soil interact, the pressures and deformations induced in one medium having a profound influence on the other. Only by a study of the structural problems involved can a soils consultant assist the structural designer to a rational solution by interpreting and presenting the relevant characteristics and properties of soil behaviour. Thus we

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feel that the following discussion is appropriate in the present case although it is realized that problems of structural design are strictly beyond our terms of reference.

Early methods of designing tunnel sections were based on several assumptions which may have been valid if the walls were thick and hence also rigid. Under these conditions, the external soil pressures on the lining are assumed to be independent of the behaviour of the tunnel itself and they are generally chosen from a "rule-of-thumb" or on the basis of previous experience under similar conditions. It is now recognized that tunnel linings generally possess a degree of flexibility sufficient to result in deformations which give rise to significant adjustments in the soil pressures to which they are subjected. The effect of this is to reduce the inequality of the vertical and lateral pressures as the flexibility increases. Thus a thin and highly flexible section may be successful since it is called upon to resist the most favourable pressure distribution which approximates to the hydrostatic case.

Several authorities have presented methods of analysis (References Nos. 7 and 8) based on this approach, and as an example, we quote in Appendix IV the design method given in Reference No. 8. This is possibly the simplest method presently available and is presented herewith briefly to illustrate the use of the soil properties which we recommend on the basis of our investigation. In using the equations given, the value of the coefficient of subgrade reaction may be taken as 100 tons per cubic foot.

Although certain analytical procedures have been developed, one example of which has been given, it is believed that the structural design of tunnel linings is still largely a matter of individual experience and judgment. This is so because theory presumes an idealized elastic behaviour of the soil which is rarely even approximately correct. Perhaps of greater significance is the wide variation in soil properties which may occur within one length of tunnel and this is particularly true in the present case. Finally, a theoretical approach, if it is to lead to economical sections, must assume that the tunnel lining is in even contact with the soil at all points of the perimeter. Thus, in order to realize the design conditions, the workmanship must be carefully controlled. If a tunnel is designed by a theoretical analysis, such as the one given, it is recommended that the section be checked to determine the deformation limits which it can withstand without cracking and that measurements be made during and after construction to ensure that these deformations are not exceeded. As a guide to the amount of deformation likely to be experienced, a review of available information in the References was made. This showed that a decrease in the vertical diameter of a tunnel by about 0.2% and an increase in the horizontal diameter by about the same amount is common. For = 66'Ø/100 = 1·32 ins

A tunnel lining designed according to theory is likely to be thinner than usual local practice dictates, in fact it may be too thin for economical construction. Therefore, in view of the limitations of a theoretical approach as discussed above, it would be hazardous to proceed with the full-scale construction of such a lining without some evidence that it would be successful. Probably this would require the construction of a trial tunnel section followed by observations of its behaviour over a period of at least several months.

If a trial section is not feasible and there is no other evidence to indicate that the tunnel would be satisfactory, then the design should be based on a well-established empirical procedure. One of the most commonly accepted of such procedures assumes that the lining is subjected to a vertical pressure equal to the weight of overburden above the crown and to a lateral horizontal pressure equal to some proportion of this vertical pressure. On the basis of our own experience and on that reported by others, it is recommended that the ratio of horizontal to vertical pressure be taken as 2/3 to 1 in the present case for all of the tunnel sections. The unit weight of the soil should be taken as 135 pounds per cubic foot in the design.

(4) Pumping Station

The proposed pumping station will be located at approximate chainage 190+40. The ground level at this location is at about elevation 582 and the bottom of the pumping station will be at about elevation 542. Thus the excavation will be about 40 feet deep. Further, it is understood that the pumping station will measure about 40 feet by 60 feet in plan as presently proposed.

The subsoil conditions at the pumping station site are given by Boreholes Nos. 19, 19A and 20. Particular attention should be given to Borehole No. 20 in which the clay stratum was generally of softer consistency than in Boreholes Nos. 19 and 19A; therefore, the results of this borehole should be used in the design of any temporary and permanent works. For these purposes, the shear strength of the clay may be taken as 600 pounds per square foot at elevation 580 increasing linearly with depth to 1,000 pounds per square foot at elevation 520 as shown on the figure of Enclosure No. 45 in Appendix II. The unit weight of the soil may be taken as 135 pounds per cubic foot for purposes of design.

The excavation for the pumping station must be supported by adequate sheeting and bracing. This should be designed, or the design checked, in

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accordance with the soil pressure distribution as shown on Enclosure No. 45. This has been obtained in accordance with the procedure given on page 350 in Reference No. 1. In order to minimize the inevitable ground settlements, it is recommended that the struts be prestressed by wedging or jacking.

Calculations of the stability of the base of the excavation against upheaval due to shear failure of the underlying soil shows that the factor of safety based on the dimensions given above and on the assumed shear strength profile is only about 1.2. This is less than the minimum desirable factor of safety of 1.5 and thus, although the sides of the excavation may be adequately braced, there remains a danger of upheaval of the bottom. Therefore, provision must be made in the design and execution of the temporary works to achieve the factor of safety of 1.5. This is necessary not only for stability but also to minimize the deformations and remoulding of the soil which could lead to excessive and unpredictable settlements of the surrounding ground and of the structure. There are several methods available to achieve this, the choice between them depending largely on economics and the contractor's method of operation. One method would be to drive the sheet piling below the bottom of the excavation thereby developing the necessary resistance to soil movement by the bending resistance of the piling. Unfortunately, in the present case, the consistency of the soil does not improve significantly within a considerable depth below the excavation. For this reason, the piling will have to develop the necessary resistance by cantilever action and under these conditions, it is often found that the required length and section modulus of the piling becomes excessive. Possibly a more favourable alternative then is to reduce the width of the excavation which is open at any one time. In the present case it is computed that the required Factor of Safety of 1.5 is given by

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an excavation 20 feet in width. Further computations show that if one half of the excavation is taken to the full depth, the the Factor of Safety of 1.5 for the full width of 40 feet is achieved by having a surcharge of 22 feet of soil on the other half. The above reasoning suggests that a practicable excavation scheme could be worked out combining limited penetration of the piling with excavation in stages. Of course the stability can be improved also by excavation at the top to reduce the surcharge, but since this excavation is not required for any other purpose, this procedure is wasteful.

The permanent walls of the pumping station should be designed to resist lateral earth and hydrostatic pressures. In this case, the lateral earth pressure is governed by long-term or drained conditions in the clay for which the effective shear stress parameters are applicable. Thus the shear strength profile and pressure distribution already given for construction do not apply. Based on the effective angle of shearing resistance of the clay of 31 degrees, the computed coefficient of lateral earth pressure for use in design is 0.5. The unit weight of the soil should be taken as 135 pounds per cubic foot above the ground water level and 70 pounds per cubic foot submerged. Based on the piezometer observations obtained in Borehole No. 19, the ground-water level may be taken at about elevation 580. Below this elevation, the hydrostatic pressures due to the head of water must be taken into account. The base slab of the pumping station must be designed to resist a hydrostatic uplift pressure given by the water level at elevation 580.

580
80
56 × 135

(5) Open Cuts

The main factors to be considered in open cuts are the stability of the excavation and the water inflow. In the present case, the soil conditions are generally favourable in that most of the cuts will be within the hard or very stiff parts of the clay stratum where the danger of upheaval due to overstressing the underlying soil does not exist. Also the strength of the clay is such that cuts down to a depth greater than 20 feet will stand temporarily unsupported at near vertical slopes. However, some settlement of the ground surface will result and where this will be detrimental to existing services or structures, it is recommended that the settlement be minimized by supporting the faces of the excavation with sheeting and bracing. This should be designed in accordance with the normally accepted rules given on page 350 of Reference No. 1 using as a basis the minimum shear strength profile obtained from an adjacent borehole.

Because of the relatively impermeable nature of the clay, water inflow into the excavations is not anticipated to be a problem. However, provision should be made for pumping from sumps to handle any surface water infiltration and seepage from sand seams or pockets.

Because the clay is moderately sensitive to disturbance, care should be exercised in finishing excavations to the required grade and it is recommended that the final trimming be carried out by hand. It is particularly important also to avoid over-excavation. Clay material excavated from the site is not suitable for use as backfill under or around the sides of the pipes.

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(6) Generator Building

It is understood that it is proposed to construct a diesel generator building measuring about 40 feet by 60 feet in plan adjacent to the pumping station. It is further understood that this building together with the generating equipment will probably be carried on a raft foundation, the base of which will be at approximate elevation 575.

The exact location of this building has not yet been determined; however, assuming that Borehole No. 20 represents the most unfavourable conditions in this area, the raft will be founded over sandy clay having an average shear strength of about 700 pounds per square foot. Thus, it is considered that the site is suitable for this type of foundation provided the bearing pressure under the raft does not exceed one ton per square foot. This will ensure a Factor of Safety of at least two against shear failure of the underlying soil and this is considered adequate in the present circumstances. The settlement of a raft having the dimensions given and loaded to the value of one ton per square foot is calculated to be about 2 inches. This is generally tolerable for raft foundations.

CONCLUSIONS

(1) Generally, the site is underlain by a sandy clay of firm to stiff consistency with a desiccated crust of very stiff to hard consistency.

(2) As planned, the greater part of the sewer will be within the firm clay underlying the crust.

(3) Most of the proposed tunnel sections can be constructed by the liner-plate method in free air. However, the tunnel section at the south end of the sewer requires special consideration as discussed.

(4) Analytical design procedures with recommended soil properties for use in the design of tunnel linings are given in the report. If these procedures are not used, it is recommended that the tunnel be designed to resist the lateral earth pressure equal to two-thirds of the vertical pressure.

..... 23

(5) The proposed pumping station will be excavated to a depth of 40 feet in clay having an average shear strength of 700 pounds per square foot which extends with a slight increase of strength to a significant depth below the bottom.

(6) Recommendations for construction procedures and soil properties for use in the design of the pumping station are given in the report.

(7) Open-cut construction should present little difficulty although adequate sheeting and bracing will be required, particularly close to the existing structures.

(8) The proposed generator building may be supported on a raft foundation loaded up to one ton per square foot.

DOMINION SOIL INVESTIGATION LIMITED

KHKing

K. H. King, P.Eng.,
CHIEF ENGINEER.

REGISTERED PROFESSIONAL ENGINEER
CIVIL
K. H. KING
PROVINCE OF ONTARIO

KHK/oed

REFERENCES

(1) "Soil Mechanics in Engineering Practice" by Terzaghi & Peck, p.35, John Wiley & Sons, Inc. - 1948.

(2) "Geotechnical Properties of Glacial Clay in Lake St. Clair Region of Ontario" by L. G.Soderman, T. C. Kenney and A. K. Loh. Proceedings of the Fourteenth Canadian Soil Mechanics Conference, October 1960.

(3) "Shield Tunnels of the Chicago Subway" by K. Terzaghi. Journal of the Boston Society of Civil Engineers, Vol. XXIX, No. 3, July 1942.

(4) "Liner-Plate Tunnels on the Chicago (Ill.) Subway" by K. Terzaghi. Transactions of the American Society of Civil Engineers, Vol. 108, 1943.

(5) "Earth Pressure on Tunnels" by W.S. Hausel. Transactions of the American Society of Civil Engineers, Vol. 108, 1943.

(6) Discussion by M. E. Chamberlain on the above Paper by Hausel.

(7) "A Contribution to the Analysis of Stress in a Circular Tunnel" by H. D. Morgan. Geotechnique Vol. XI, No. 1, p.37.

(8) "Alagútépitéstan" by Dr. Szechy Karoty, Budapest 1961 (in Hungarian).

(9) "Stability of Strutted Excavations in Clay" by L. Bjerrum and O. Eide. Geotechnique, Vol. VI, No. 1, March 1956.

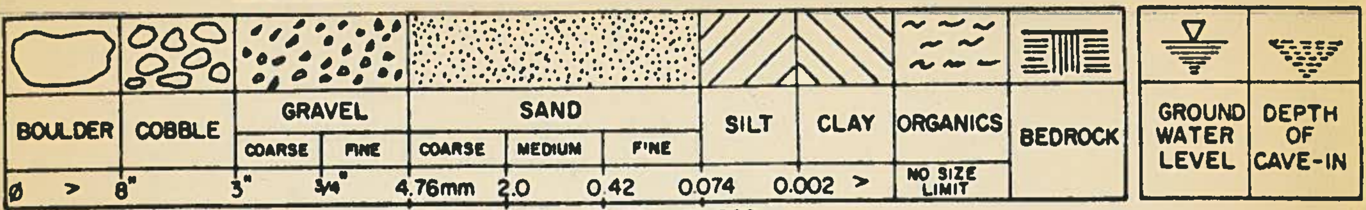
(10) "Investigations Into the Design of Pressure Tunnels in London Clay" by Tattersall, Wakeling & Ward. Paper No. 6027, The Institution of Civil Engineers, London, Nov. 1954.

APPENDIX I

Enclosure No. 1.

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.



BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
		COARSE	FINE	COARSE	MEDIUM	FINE						

Ø > 8" 3" 3/4" 4.76mm 2.0 0.42 0.074 0.002 > NO SIZE LIMIT

U.S. Standard Sieve Size: No.4 No.10 No.40 No.200

SAMPLE TYPES.

AS	Auger sample	RC	Rock core	TP	Piston, thin walled tube sample
CS	Sample from casing	%	Recovery	TW	Open, thin walled tube sample
ChS	Chunk sample	SS	Split spoon sample	WS	Wash sample

SAMPLER ADVANCED BY static weight : w
" pressure : p
" tapping : t

OBSERVATIONS MADE WHILE CORING
- Steady pressure
- No pressure
- Intermittent pressure
- Washwater returns
- Washwater lost

PENETRATION RESISTANCES.

SYMBOL:

DYNAMIC PENETRATION RESISTANCE: to drive a 2"ϕ, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

STANDARD PENETRATION RESISTANCE, -N-: to drive a 2" outside dia, split spoon sampler 1 foot into the ground, expressed in blows per foot. ○ ○ ○

EXTRAPOLATED -N- VALUE 322

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SOIL PROPERTIES.

W %	Water content	γ	Natural bulk density (unit weight)	k	Coeff. of permeability
LL %	Liquid limit	e	Void ratio	C	Shear strength — in terms of total stress
PL %	Plastic limit	RD	Relative density	ϕ	Angle of int. friction — in terms of total stress
PI %	Plasticity index	C_v	Coeff. of consolidation	C'	Cohesion — in terms of effective stress
LI	Liquidity index	m_v	Coeff. of volume compressibility	ϕ'	Angle of int. friction — in terms of effective stress

UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

TRIAXIAL COMPRESSION TEST ▲

UNCONFINED COMPRESSION TEST △ St

LABORATORY VANE TEST X St

FIELD VANE TEST ● St

POCKET PENETROMETER TEST St

Strain at failure is represented by direction of stem: 20% (up), 5% (right), 10% (down), 15% (left)

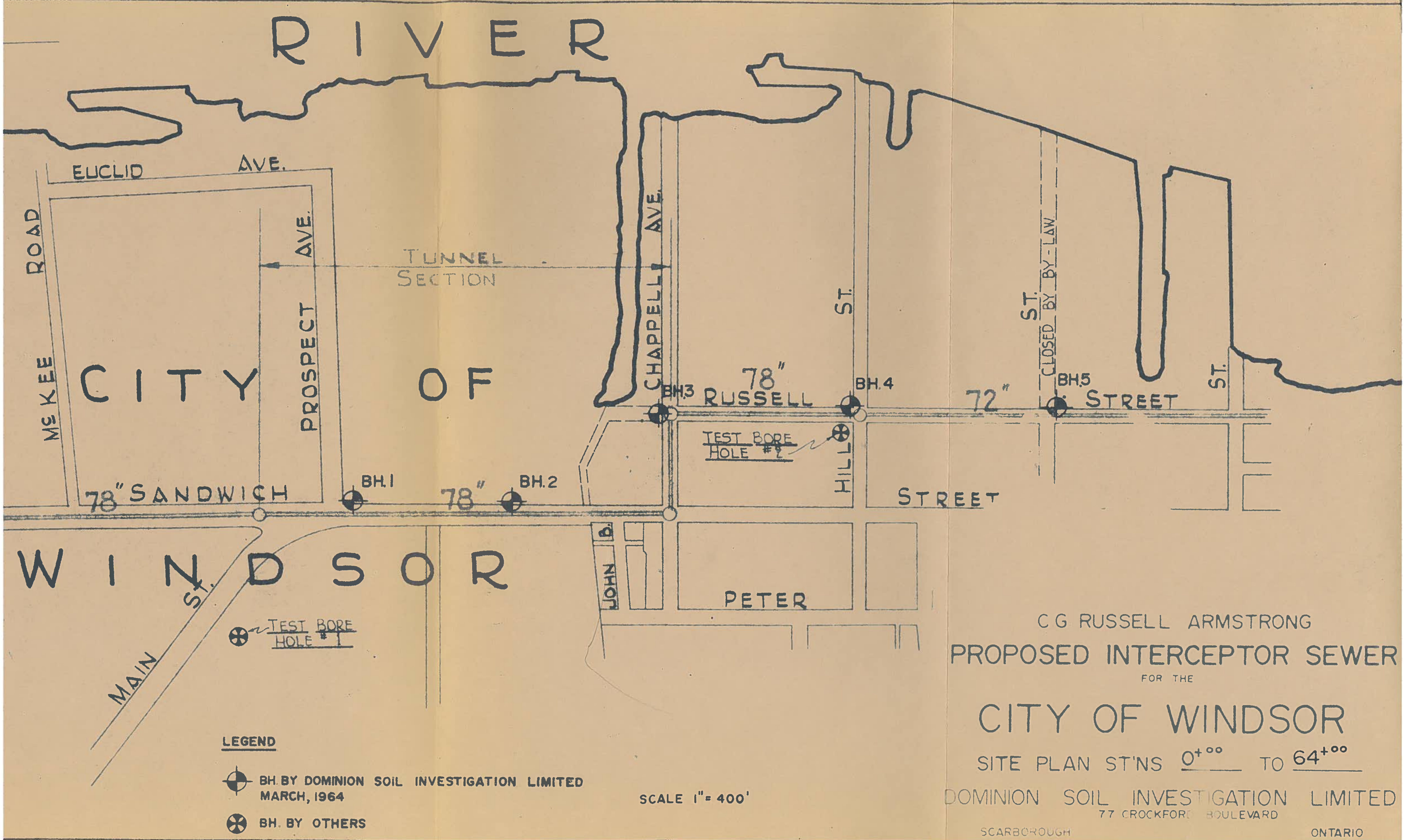
St : sensitivity = $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

SOIL DESCRIPTION.

COHESIONLESS SOILS:	RD:
Very loose	0 – 15 %
Loose	15 – 35 %
Compact	35 – 65 %
Dense	65 – 85 %
Very dense	85 – 100 %

COHESIVE SOILS:	C lbs/sq.ft.
Very soft	less than 250
Soft	250 – 500
Firm	500 – 1000
Stiff	1000 – 2000
Very stiff	2000 – 4000
Hard	over 4000

DOMINION SOIL INVESTIGATION LIMITED



C G RUSSELL ARMSTRONG

PROPOSED INTERCEPTOR SEWER

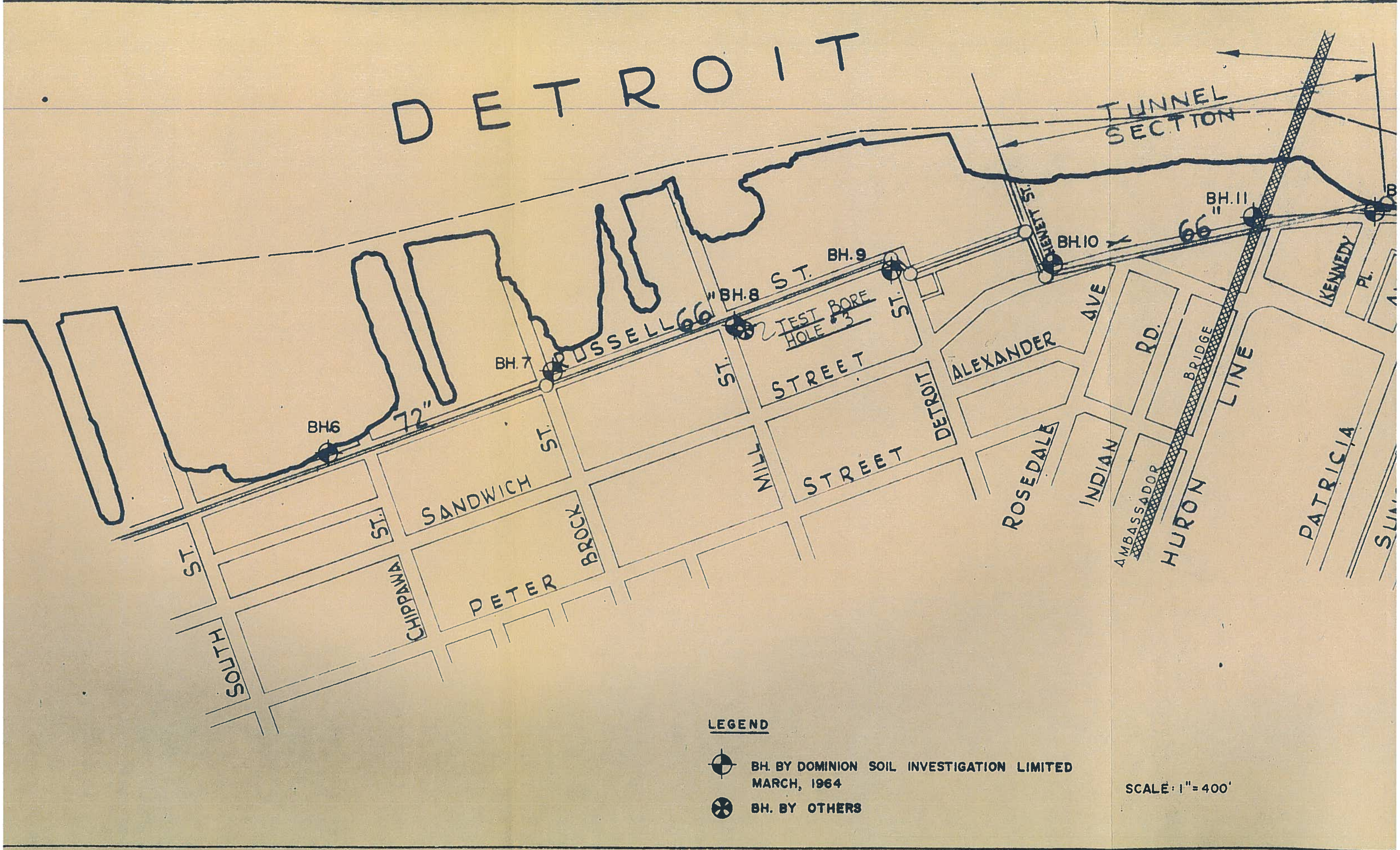
FOR THE

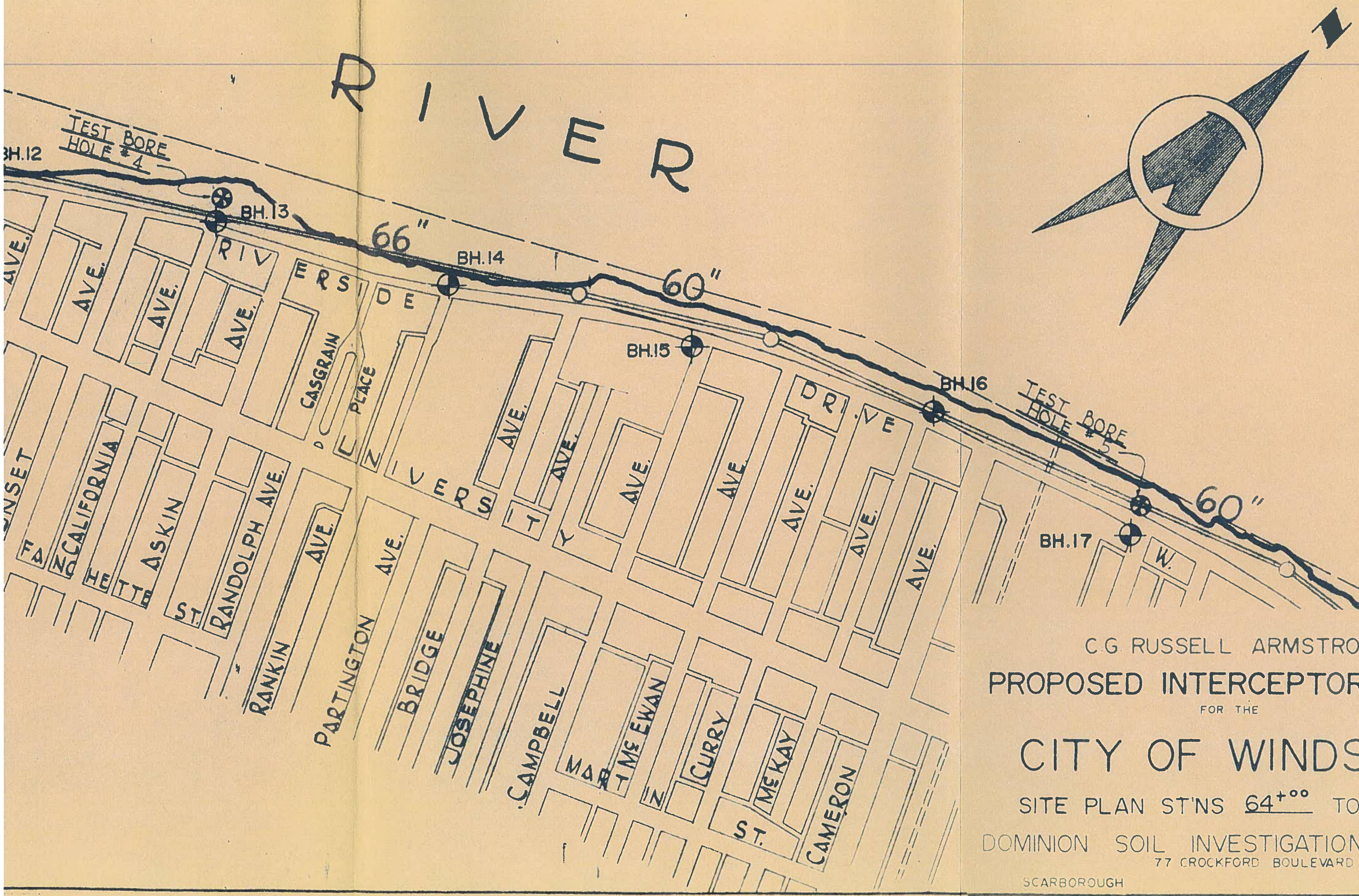
CITY OF WINDSOR

SITE PLAN ST'NS 0^{+00} TO 64^{+00}

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD
SCARBOROUGH ONTARIO

REF NO 4-H


DETROIT
TUNNEL SECTION
BH.6
72"
BH.7
RUSSELL
66"
BH.8
ST.
2 TEST BORE HOLE #3
BH.9
HEWETT ST.
BH.10
66"
BH.11
SOUTH ST.
CHIPPAWA ST.
SANDWICH ST.
PETER
BROCK
ST.
MILL
STREET
STREET
ST.
DETROIT
ALEXANDER
AVE
ROSEDALE
INDIAN
RD.
AMBASSADOR
BRIDGE
HURON
LINE
PATRICIA
KENNEDY
PL.
LEGEND
BH. BY DOMINION SOIL INVESTIGATION LIMITED MARCH, 1964
BH. BY OTHERS
SCALE: 1" = 400'



C.G. RUSSELL ARMSTRONG

PROPOSED INTERCEPTOR SEWER

FOR THE

CITY OF WINDSOR

SITE PLAN ST'NS 64+00 TO 184+00

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD
SCARBOROUGH ONTARIO

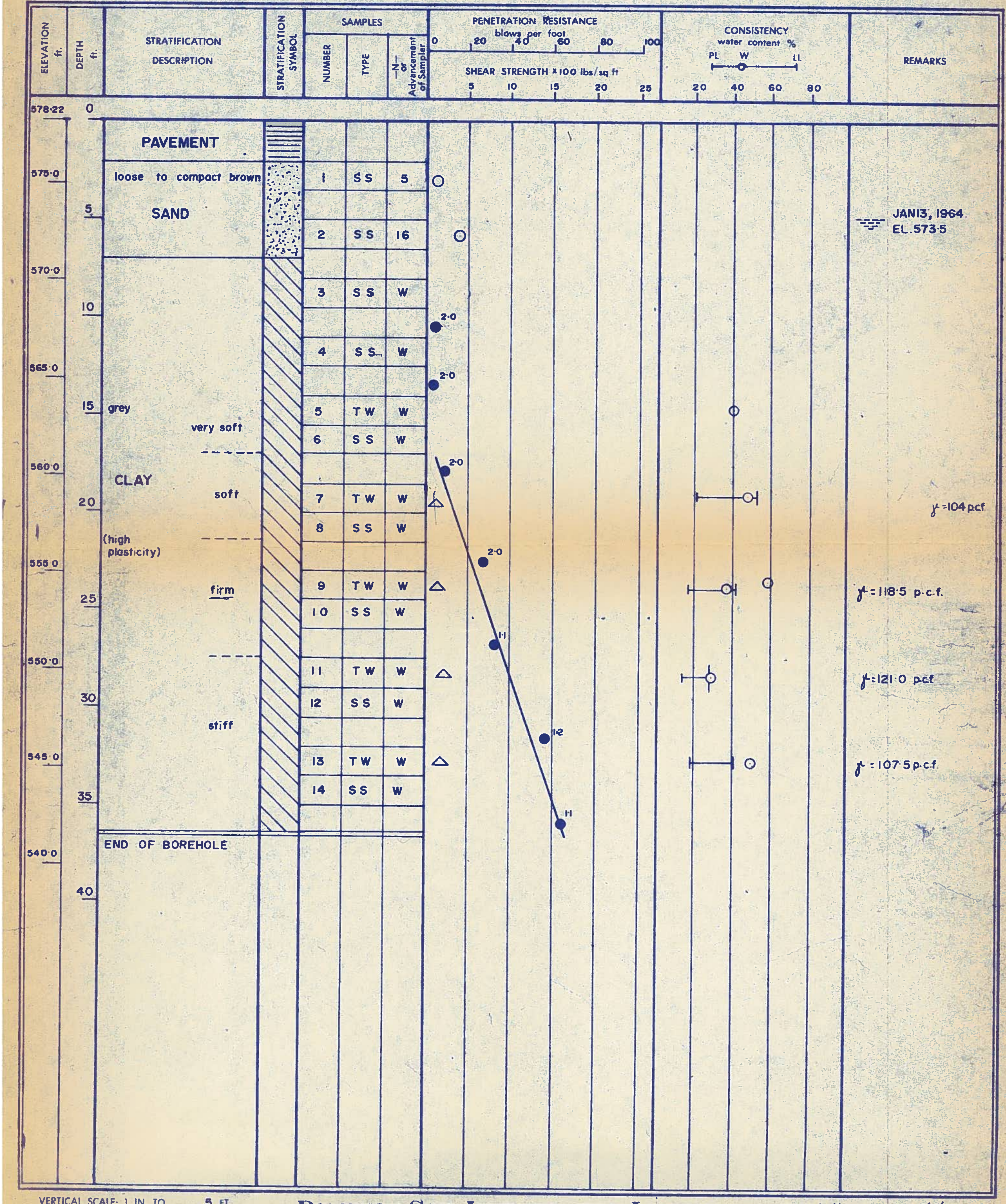
REF NO 4-1-1

GEOTECHNICAL DATA SHEET FOR BOREHOLE . .1. . . .

OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL & WASHBORING
DIAMETER OF BOREHOLE: 6" & 2 7/8"
DATE: JAN. 13 – 18, 1964
ENCLOSURE NO. 2



STRATIFICATION DESCRIPTION	NUMBER	TYPE	N or Advancement of Sampler	REMARKS
PAVEMENT				
loose to compact brown SAND	1	SS	5	
	2	SS	16	JAN13, 1964 EL. 573·5
grey CLAY (high plasticity) very soft	3	SS	W	
	4	SS	W	
	5	TW	W	
	6	SS	W	
soft	7	TW	W	γ =104 pcf
	8	SS	W	
firm	9	TW	W	γ : 118·5 p.c.f.
	10	SS	W	
stiff	11	TW	W	γ :121·0 pcf
	12	SS	W	
	13	TW	W	γ : 107·5 p.c.f.
	14	SS	W	
END OF BOREHOLE				

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L·K CH'D: KL

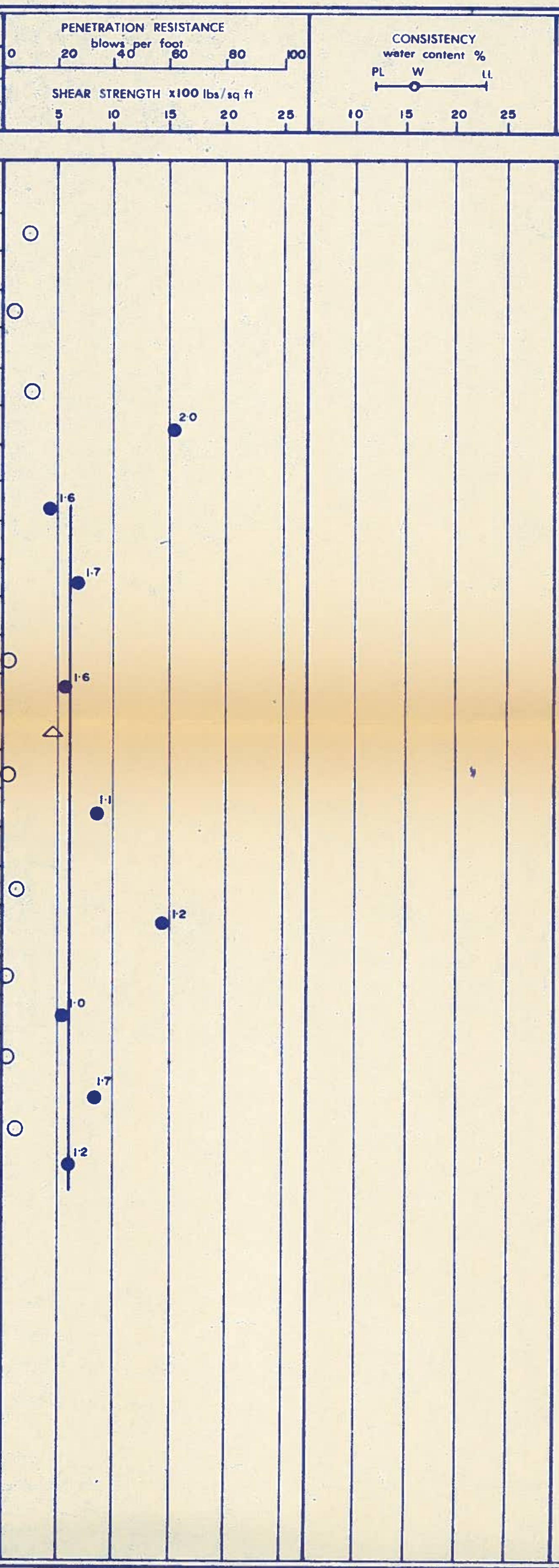
GEOTECHNICAL DATA SHEET FOR BOREHOLE . .2. . .

OUR REFERENCE NO. 4-I-I

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 15, 1964

ENCLOSURE NO. 3



ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	SAMPLES NUMBER	SAMPLES TYPE	N or Advancement of Sampler	REMARKS
582·83	0					
		loose brown				
580·0			1 A B	SS	9	
		FINE SAND				
	5					
			2	SS	4	
575·0						
			3	SS	10	
	10					
		stiff	4	TW	W	
570·0						
		firm				
	15		5	SS	W	
		grey				
565·0			6	TW	W	
		SILTY CLAY				
			7	SS	3	
	20					
		(medium plasticity)				
			8	TW	W	W= 33·9% γ_t=118p.c.f. LL= 37·4 PL 16·4
560·0						
			9	SS	3	
	25					
			10	TW	W	W= 20·9%
555·0						
			11	SS	5	
	30					
			12	SS	2	
550·0						
	35		13	SS	2	
545·0						
			14	SS	5	
	40					
		END OF BOREHOLE				
540·0						

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L·K·

CH'D: K.K.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 3 . . .

OUR REFERENCE NO. 4-1-1

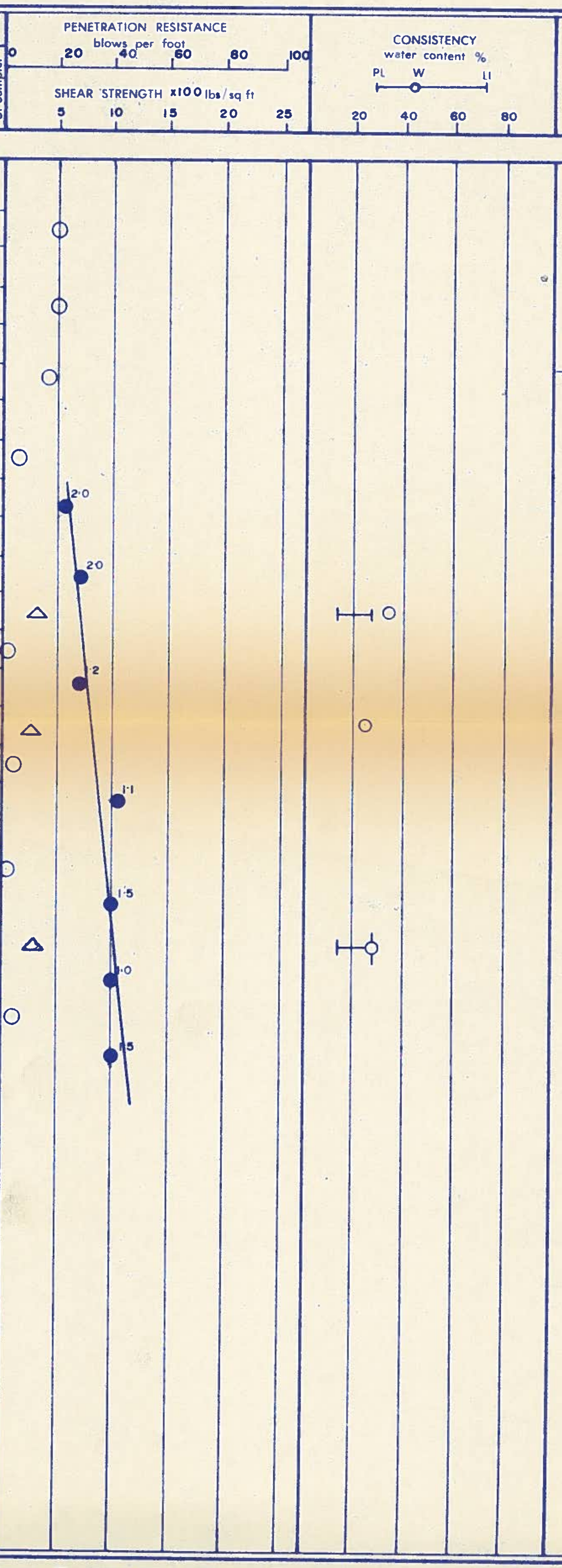
CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR , ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 14, 1964

ENCLOSURE NO. 4

ELEVATION ft.	DEPTH ft.
578·18	0
575·0	
	5
570·0	
	10
565·0	
	15
560·0	
	20
555·0	
	25
550·0	
	30
545·0	
	35
540	
	40
535·0	

STRATIFICATION DESCRIPTION	SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler
compact brown SAND	1	S S	20
	2	S S	20
	3	S S	16
firm to stiff grey SILTY CLAY (medium plasticity)	4	S S	5
	5	S S	W
	6	T W	W
	7	S S	2
	8	T W	W
	9	S S	4
	10	S S	2
	11	T W	W
	12	S S	4
	13	T W	W



REMARKS

JAN 15, 1964
EL 570·0

γ:127p.c.f.

γ:120p.c.f.

γ =122·5 p.c.f.

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L.K.
CH'D: K.L.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . .4. . .

OUR REFERENCE NO. 4-1-1

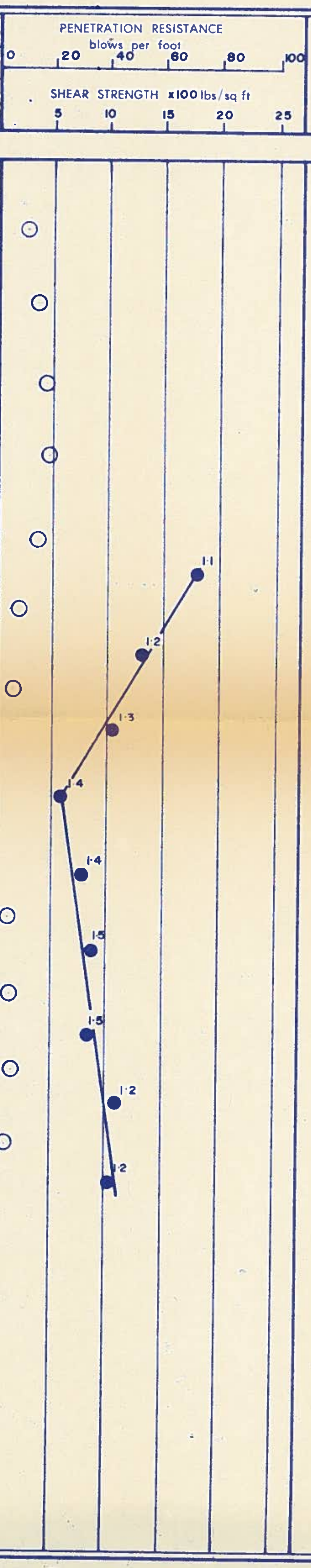
CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 14-15, 1964.

ENCLOSURE NO. 5

ELEVATION ft.	DEPTH ft.
579.14	0
575.0	5
570.0	10
565.0	15
560.0	20
555.0	25
550.0	30
545.0	35
540.0	40
535.0	45

STRATIFICATION DESCRIPTION	SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler
compact FILL	1	SS	11
	2	SS	14
grey SILTY CLAY (medium plasticity) — very stiff	3	SS	18
	4	SS	19
	5	SS	13
stiff	6	SS	8
	7	SS	6
firm	8	TW	W
	9	SS	W
	10	SS	4
	11	SS	5
stiff	12	SS	6
	13	SS	4
END OF BOREHOLE			



CONSISTENCY
water content %
PL W LL
10 15 20 25

REMARKS

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L.K. CH'D: LK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 5 . . .

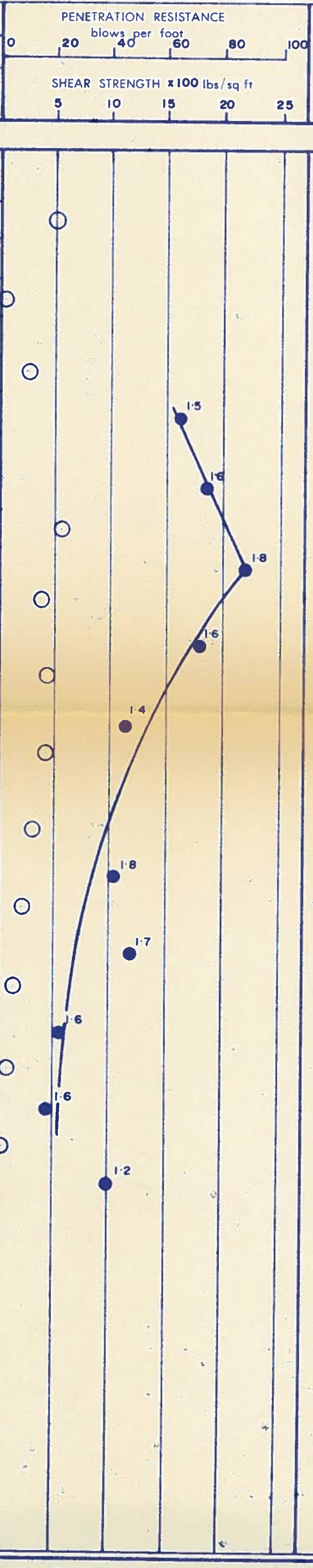
OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 16, 1964.

ENCLOSURE NO. 6

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler
584.81	0				
		very loose to compact			
			1	SS	20
580.0	5	FILL			
			2	SS	2
			3	SS	11
575.0	10				
			4	TW	W
570.0	15				
			5	SS	23
		grey	6	SS	15
565.0	20				
		SILTY CLAY	7	SS	17
		(medium plasticity)	8	SS	17
560.0	25				
			9	SS	12
		stiff			
555.0	30	firm	10	SS	8
			11	SS	6
550.0	35				
			12	SS	4
			13	SS	2
545.0	40				
		END OF BOREHOLE			



CONSISTENCY
water content %
PL W LI
10 15 20 25

REMARKS

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L.K.
CH'D: KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 6 . . .

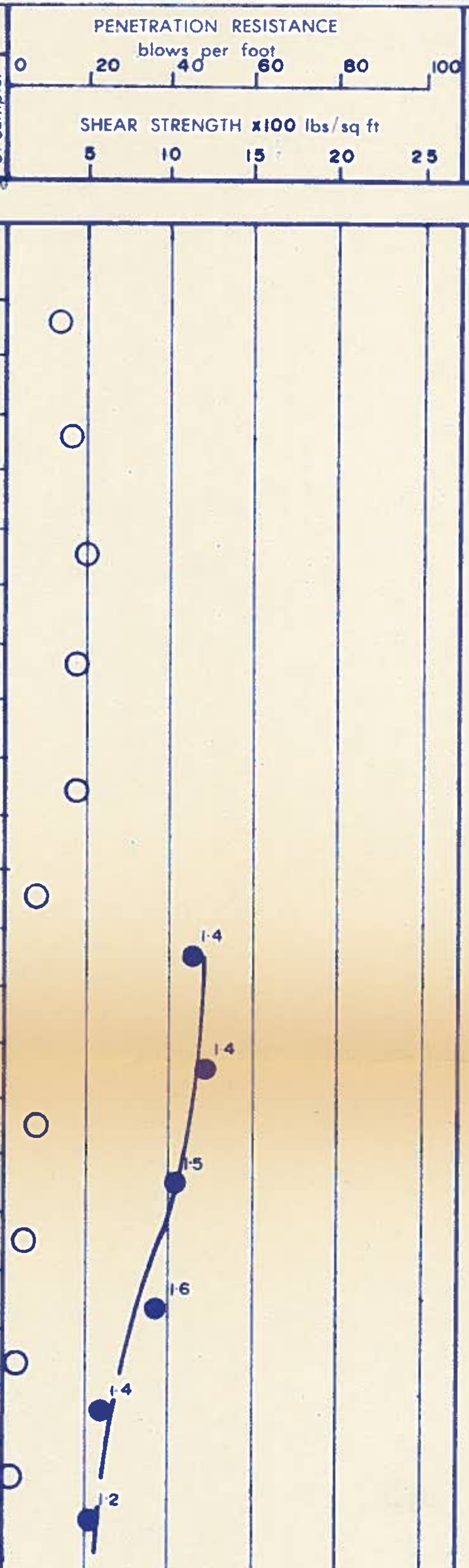
OUR REFERENCE NO. 4-I-I

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 17, 1964

ENCLOSURE NO. 7

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES —N— or Advancement of Sampler	REMARKS
576·83	0					
575·0						
			1	SS	13	
	5	very stiff brown				
			2	SS	16	
570·0		SILTY CLAY				
			3	SS	20	
	10					
565·0			4	SS	18	
	15					
			5	SS	18	
		grey				
560·0						
		SILTY CLAY	6	SS	8	
	20					
		(medium plasticity)	7	TW	W	
555·0						
			8	SS	8	
	25	stiff				
550·0		firm	9	SS	5	
	30		10	SS	3	
545·0						
			11	SS	2	
	35					
		END OF BOREHOLE				
540·0						



CONSISTENCY
water content %
PL W LL
10 15 20 25

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L·K.

CH'D KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . .7. . .

OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

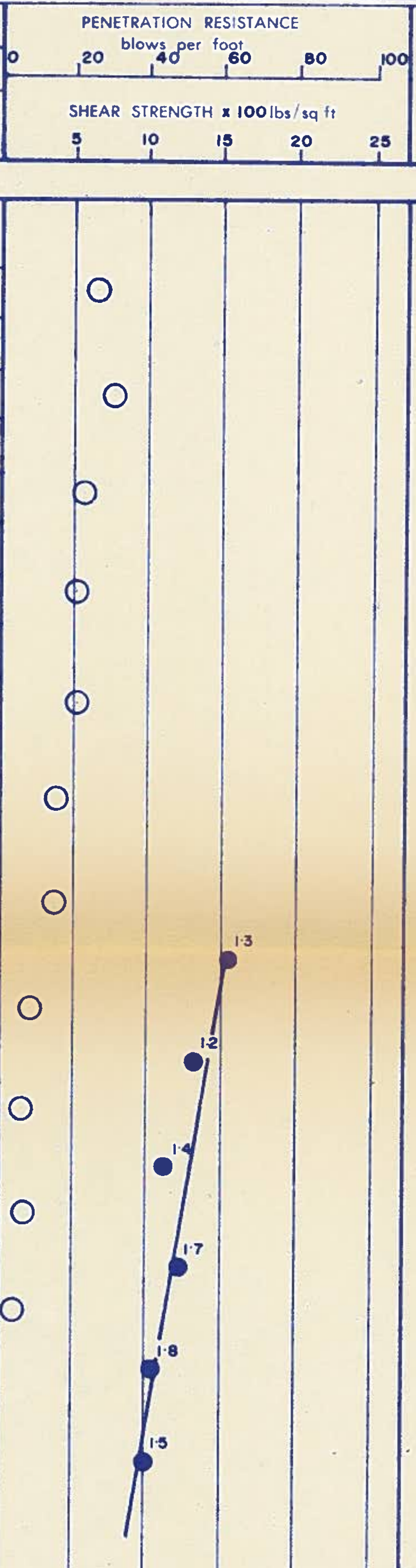
METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 17, 1964.

ENCLOSURE NO. 8

ELEVATION ft.	DEPTH ft.
580·09	0
580·0	
575·0	5
570·0	10
565·0	15
560·0	20
555·0	25
550·0	30
545·0	35
540·0	40

STRATIFICATION DESCRIPTION
compact FILL
very stiff brown SANDY CLAY
stiff grey grey SILTY CLAY (medium plasticity)
END OF BOREHOLE

SAMPLES NUMBER	TYPE	N or Advancement of Sampler
1	SS	26
2	SS	30
3	SS	23
4	SS	21
5	SS	21
6	SS	16
7	SS	15
8	SS	8
9	SS	6
10	SS	6
11	SS	4
12	TW	W



CONSISTENCY water content % PL W LL				REMARKS
10	15	20	25	

VERTICAL SCALE: 1 IN TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L·K.
CH'D: KK

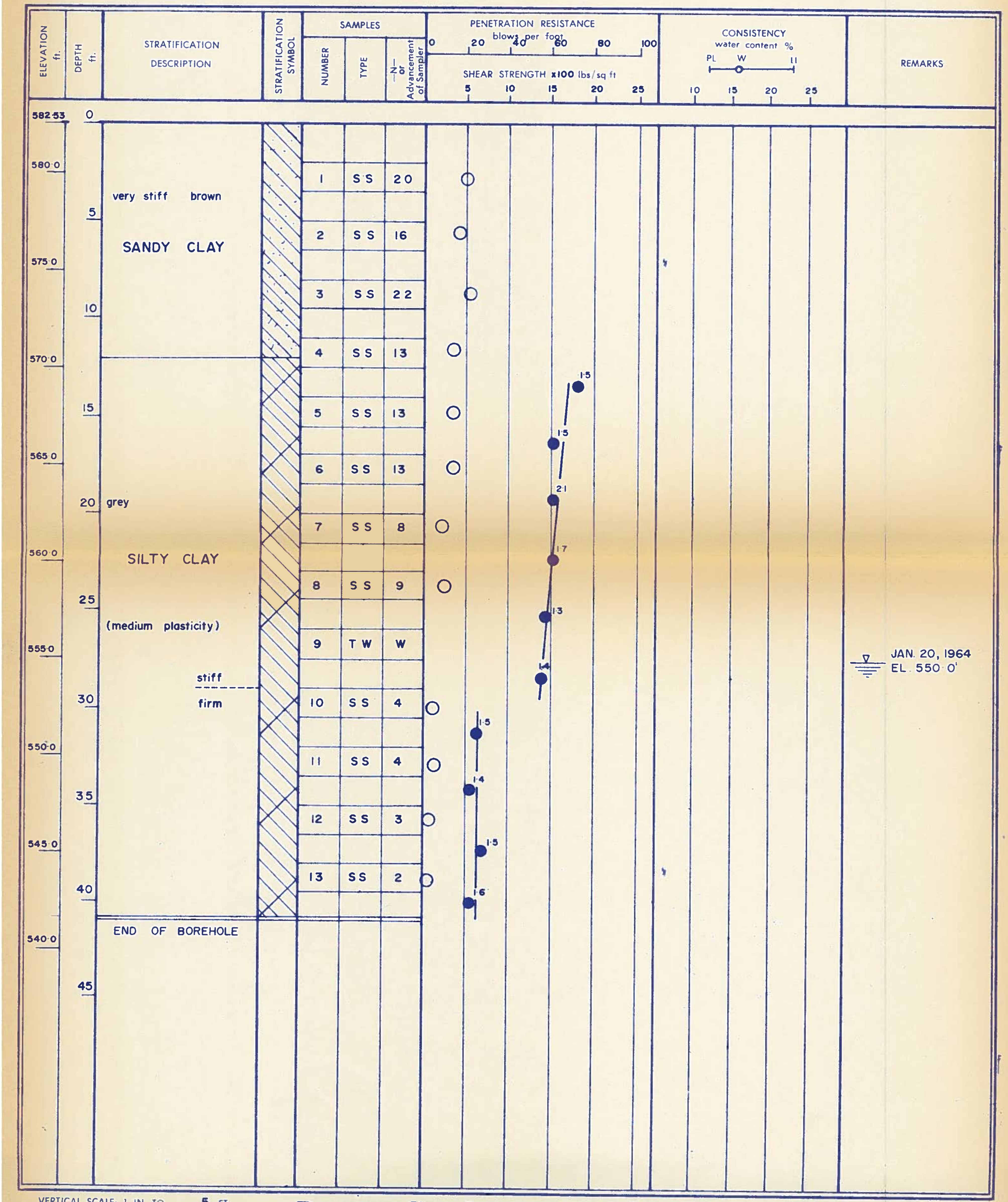
GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 8 . . .

OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 18, 1964.

ENCLOSURE NO. 9



NUMBER	TYPE	—N— or Advancement of Sampler
1	S S	20
2	S S	16
3	S S	22
4	S S	13
5	S S	13
6	S S	13
7	S S	8
8	S S	9
9	T W	W
10	S S	4
11	S S	4
12	S S	3
13	S S	2

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L.K.

CH'D: KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 9 . . .

OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 18- 20, 1964

ENCLOSURE NO. 10

ELEVATION ft.	DEPTH ft.
580.37	0
580.0	
575.0	5
570.0	10
565.0	15
560.0	20
555.0	25
550.0	30
545.0	35
540.0	40
535.0	45

STRATIFICATION DESCRIPTION

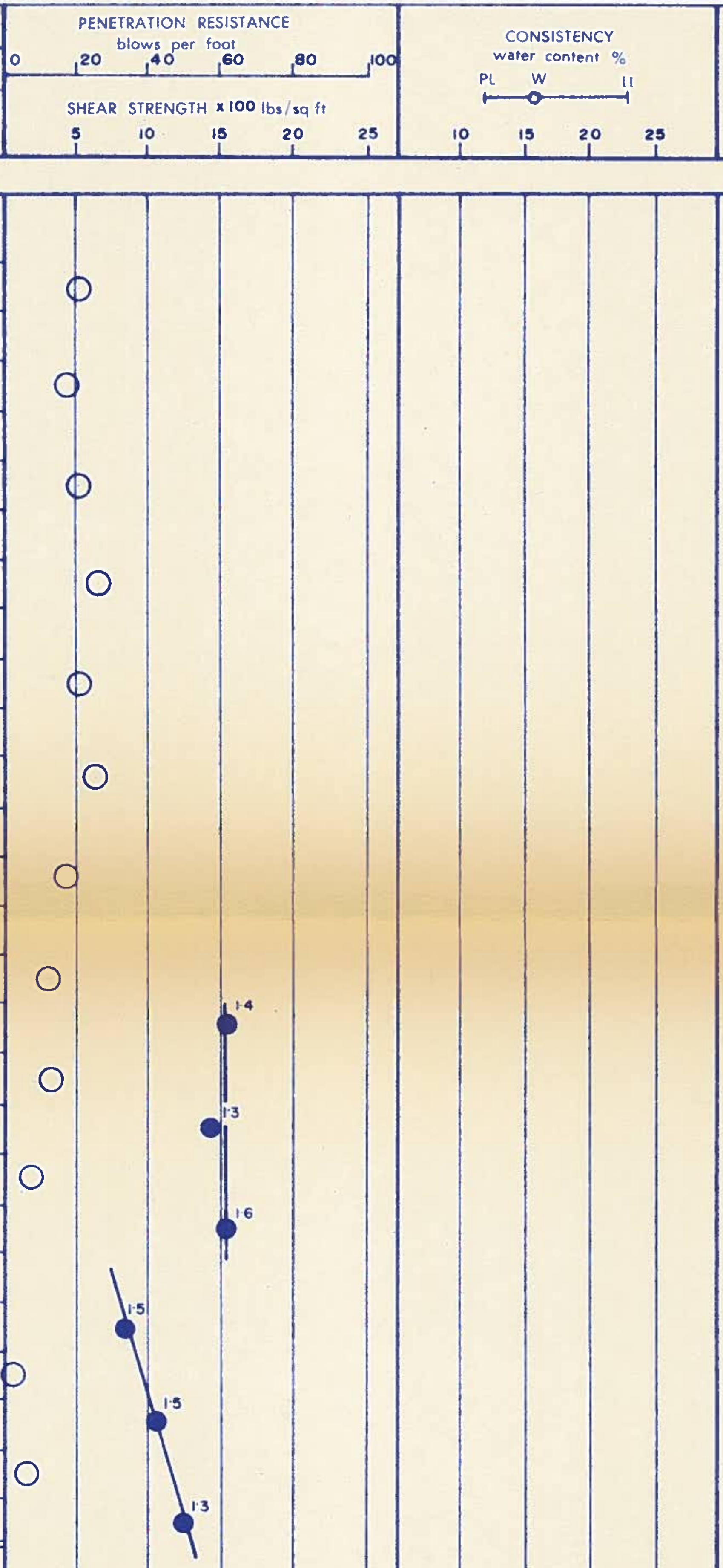
8" TOPSOIL

very stiff brown SANDY CLAY

grey SILTY CLAY (medium plasticity)
very stiff
stiff

END OF BOREHOLE

SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler
1	S S	21
2	S S	18
3	S S	21
4	S S	26
5	S S	21
6	S S	24
7	S S	17
8	S S	11
9	S S	12
10	S S	7
11	TW	W
12	S S	2
13	S S	6



REMARKS

JAN. 20, 1964
EL. 555.0'

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L·K· CH'D KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 10 . . .

OUR REFERENCE NO. 4-1-1

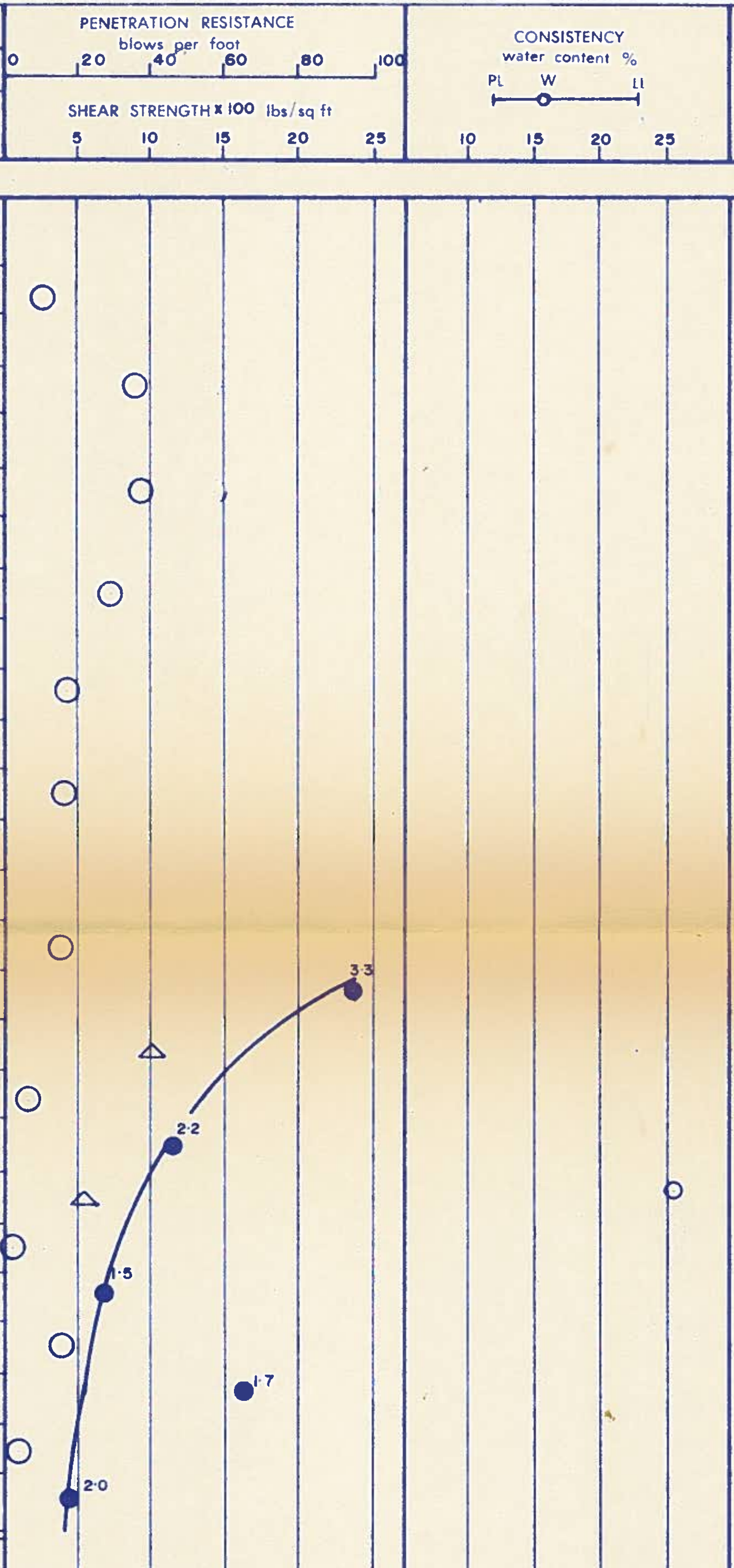
CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 7/8"
DATE: JAN. 18, 1964.

ENCLOSURE NO. 11

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION
591·13	0	6" TOPSOIL
590·0		compact FILL
585·0	5	very stiff brown SILTY CLAY
580·0	10	
575·0	15	grey SILTY CLAY (medium plasticity) stiff
570·0	20	
565·0	25	
560·0	30	firm
555·0	35	
550·0	40	END OF BOREHOLE

SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler
1	SS	10
2	SS	36
3	SS	38
4	SS	28
5	SS	18
6	SS	16
7	TW	W
8	SS	15
9	TW	W
10	SS	7
11	TW	W
11A	SS	2
12	SS	15
13	SS	4



REMARKS

W = 23·6 % γ =128 p.c.f.
LL = 31·4
PL 14·3

γ =125 p.c.f.

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L. K. CH'D: KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 11 . . .

OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

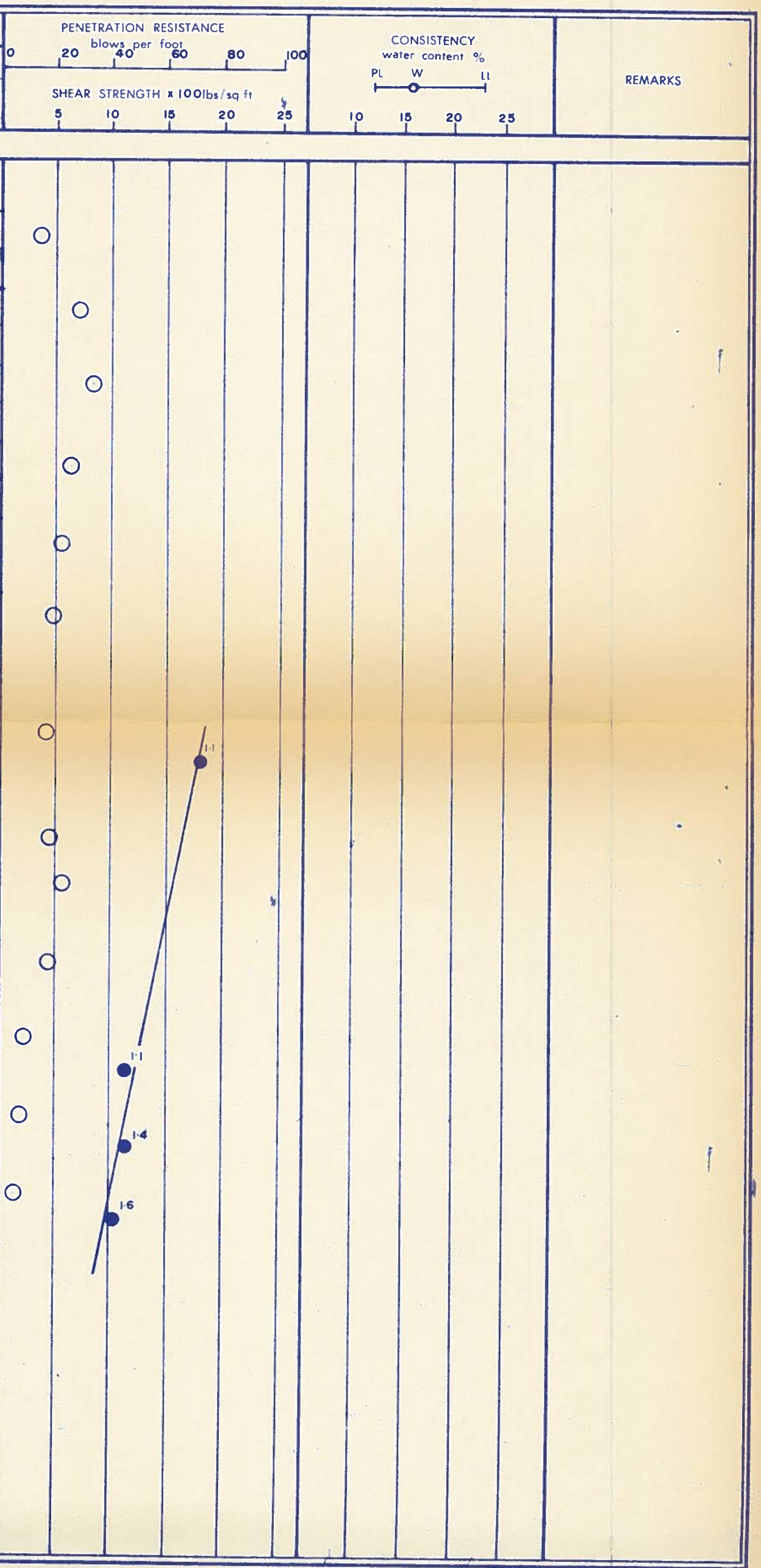
METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 20, 1964.

ENCLOSURE NO. 12

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION
588·42	0	compact FILL
585·0	5	very stiff brown SILTY CLAY
580·0	10	
575·0	15	grey SILTY CLAY
570·0	20	very stiff
565·0	25	stiff
560·0	30	
555·0	35	
550·0	40	
545·0	45	END OF BOREHOLE

SAMPLES

NUMBER	TYPE	—N— or Advancement of Sampler
1	S S	13
2	S S	27
3	S S	33
4	S S	25
5	S S	22
6	S S	19
7	T W	W
8	S S	17
9	T W	W
10	S S	18
11	S S	23
12	T W	W
13	S S	18
14	S S	9
15	S S	8
16	S S	6



VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L. K. CH'D: KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE . J2 . . .

OUR REFERENCE NO. 4-1-1

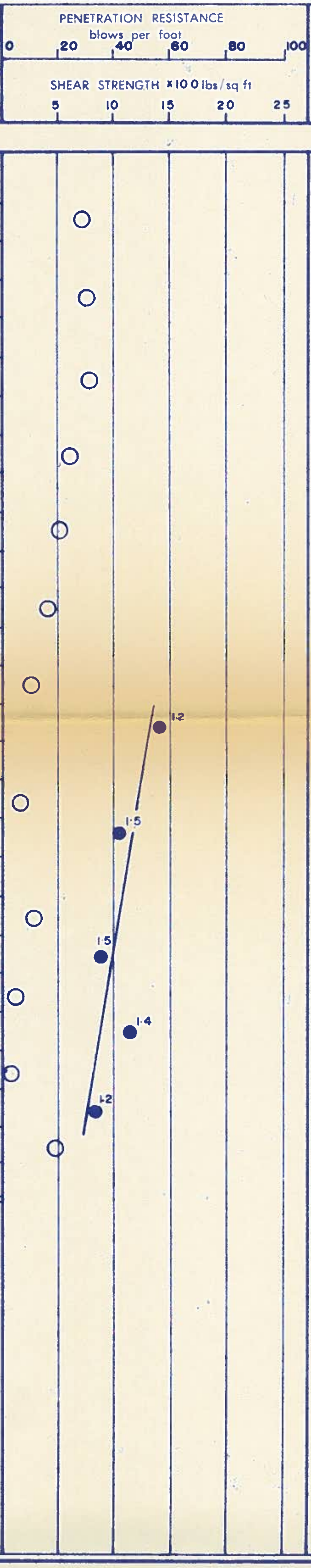
CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 21, 1964.

ENCLOSURE NO. 13

ELEVATION ft.	DEPTH ft.
591·66	0
590·0	
	5
585·0	
	10
580·0	
	15
575·0	
	20
570·0	
	25
565·0	
	30
560·0	
	35
555·0	
	40
550·0	
	45

STRATIFICATION DESCRIPTION	SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler
6" TOPSOIL			
very stiff brown SANDY CLAY	1	S S	28
	2	S S	30
	3	S S	31
	4	S S	25
grey SANDY CLAY very stiff	5	S S	21
	6	S S	17
	7	S S	10
stiff	8	T W	W
	9	S S	6
	10	T W	W
	11	S S	11
firm	12	S S	5
	13	S S	4
	14	S S	19
END OF BOREHOLE			



CONSISTENCY
water content %
PL W Ll
10 15 20 25

REMARKS

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L. K. CH'D: LK

GEOTECHNICAL DATA SHEET FOR BOREHOLE 13

OUR REFERENCE NO. 4-1-1

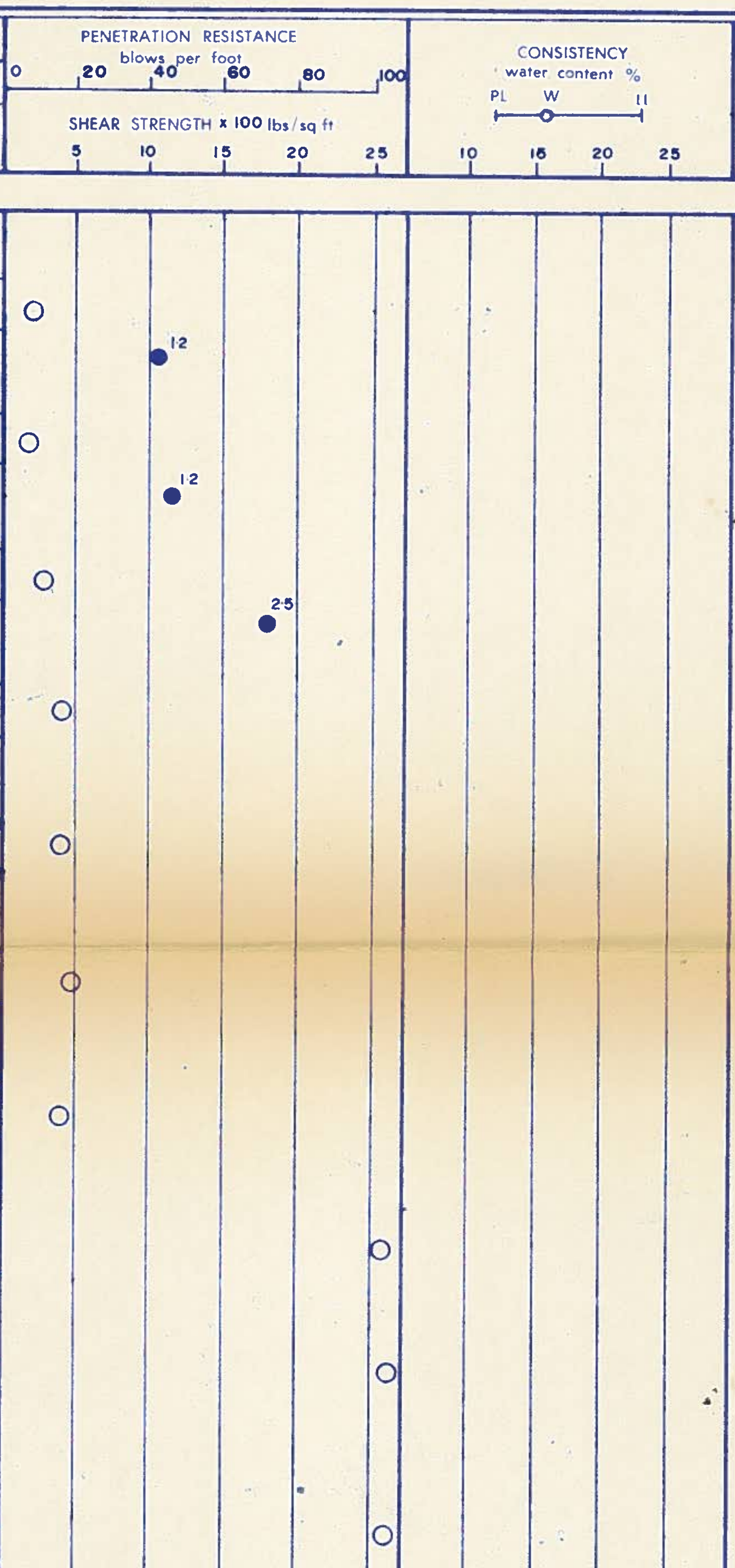
CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTECEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 21, 1964.

ENCLOSURE NO. 14

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION
595.64	0	
595.0		6" TOPSOIL
590.0	5	firm to stiff brown SILTY CLAY
585.0	10	
580.0	15	
575.0	20	stiff to very stiff grey SANDY CLAY
570.0	25	
565.0	30	layers of very dense grey SILTY TILL & FINE SAND
560.0	35	
555.0	40	END OF BOREHOLE

SAMPLES NUMBER	TYPE	N or Advancement of Sampler
1	S S	7
2	S S	7
3	S S	10
4	S S	17
5	S S	17
6	S S	19
7	S S	17
8	S S	132
9	S S	180
10	S S	280



REMARKS

JAN. 21, 1964
EL 572.0'

DETAILS OF EXTRAPOLATED N-VALUES

Sa #	Blows
9	90/6"
10	70/4"

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L.K. CH'D: KK

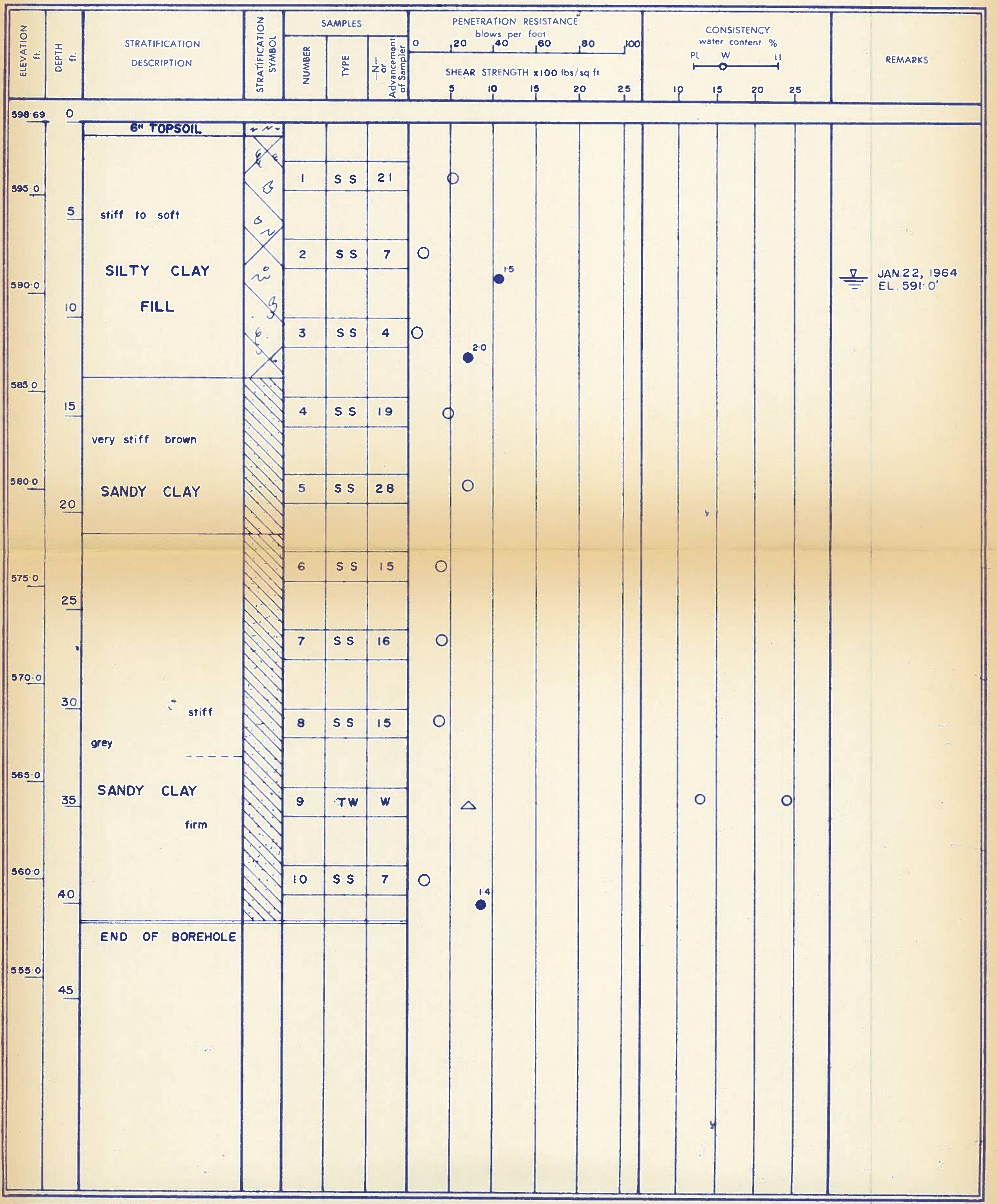
GEOTECHNICAL DATA SHEET FOR BOREHOLE . .14. . .

OUR REFERENCE NO. 4-1-1

CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 21-22, 1964

ENCLOSURE NO. 15



ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	NUMBER	TYPE	—N— or Advancement of Sampler	REMARKS
598·69	0	6" TOPSOIL				
		stiff to soft SILTY CLAY FILL	1	S S	21	
			2	S S	7	JAN 22, 1964 EL. 591·0'
			3	S S	4	
		very stiff brown SANDY CLAY	4	S S	19	
			5	S S	28	
		grey SANDY CLAY stiff	6	S S	15	
			7	S S	16	
			8	S S	15	
		firm	9	TW	W	
			10	S S	7	
		END OF BOREHOLE				

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: L.K. CH'D: KK

GEOTECHNICAL DATA SHEET FOR BOREHOLE 15 . . .

OUR REFERENCE NO. 4-1-1

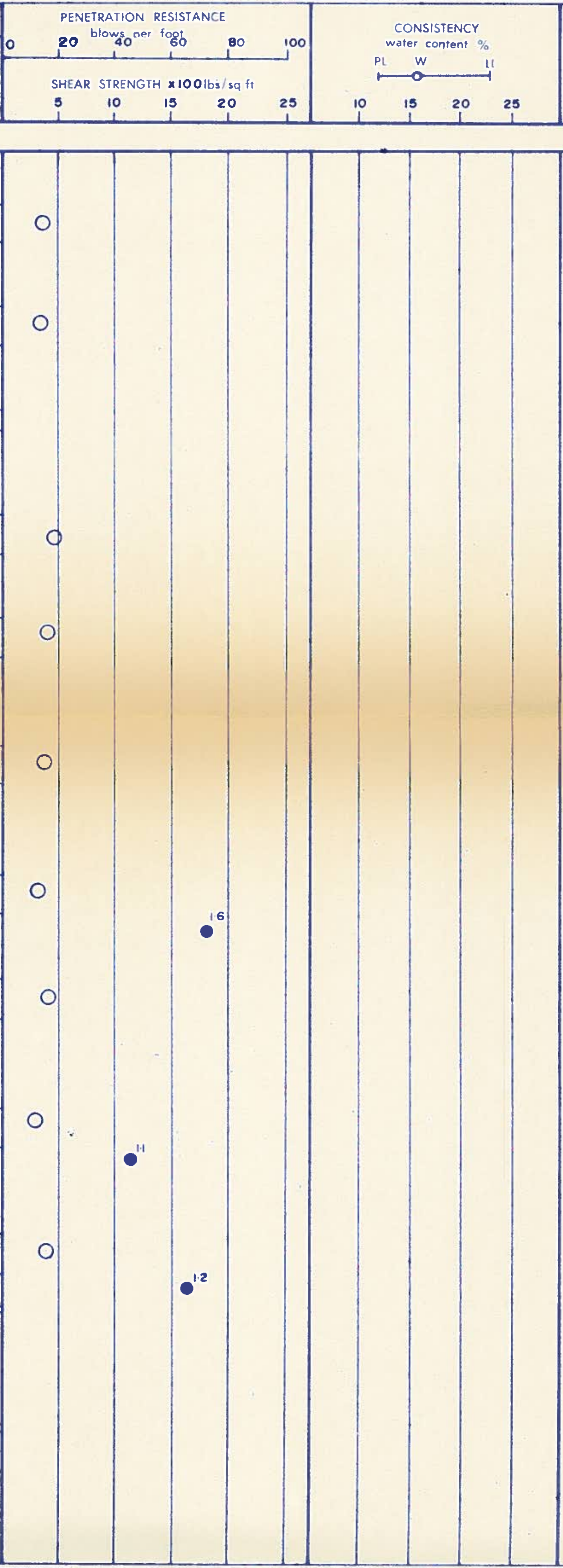
CLIENT: C.G. RUSSELL ARMSTRONG
PROJECT: PROPOSED INTERCEPTOR SEWER
LOCATION: CITY OF WINDSOR, ONTARIO
DATUM ELEVATION: GEODETIC

METHOD OF BORING: PENNDRILL
DIAMETER OF BOREHOLE: 6"
DATE: JAN. 22, 1964.

ENCLOSURE NO. 16

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION
599.45	0	9" TOPSOIL
595.0	5	stiff to very stiff brown SANDY CLAY
590.0	10	
585.0	15	
580.0	20	
575.0	25	stiff to very stiff grey SANDY CLAY
570.0	30	
565.0	35	
560.0	40	
555.0	45	END OF BOREHOLE

SAMPLES NUMBER	TYPE	—N— or Advancement of Sampler	REMARKS
1	SS	15	
2	SS	13	
3	TW	W	
4	SS	19	
5	SS	16	
6	SS	15	
7	SS	12	
8	SS	16	
9	SS	11	
10	SS	15	



VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

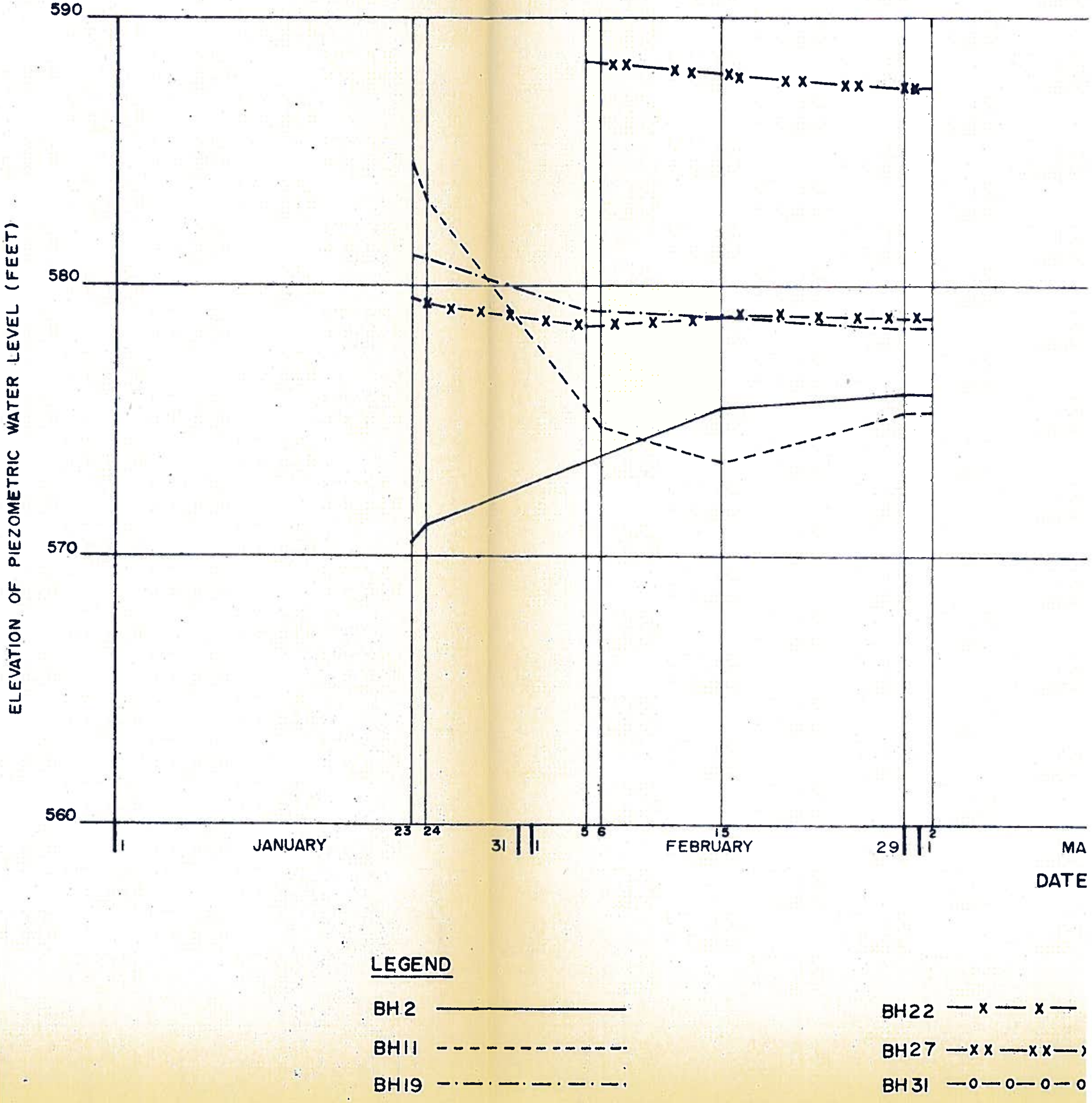
MADE: L.K. CH'D. KK

REF NO 4-1-1

ENCLOSURE NO 48

OBSERVATIONS OF PIEZOMETRIC WATER LEVELS

DATE OF OBSERVATION	BH2		BH11		BH19		BH22		BH27		BH31		LEVEL OF DETROIT RIVER
	DEPTH	ELEV.	DEPTH	ELEV.	DEPTH	ELEV.	DEPTH	ELEV.	DEPTH	ELEV.	DEPTH	ELEV.	
JAN. 9/1964	—	—	—	—	—	—	—	—	—	—	—	—	571·5
JAN. 23/1964	12·3	570·5	3·9	584·5	1·1	581·1	11·2	579·6	—	—	—	—	
JAN. 24/1964	11·6	571·2	5·2	583·2	1·2	581·0	11·3	579·5	—	—	—	—	—
FEB. 5/1964	—	—	—	—	3·1	579·1	12·2	578·6	3·5	588·5	—	—	—
FEB. 6/1964	7·3	575·5	13·6	574·8	—	—	—	—	—	—	—	—	—
FEB. 15/1964	6·8	576·0	14·9	573·5	3·4	578·8	12·0	578·8	4·1	587·9	—	—	—
FEB. 29/1964 MAR. 2/1964	6·7	576·1	13·1	575·3	3·7	578·5	12·1	578·7	4·5	587·5	—	—	—


ELEVATION OF PIEZOMETRIC WATER LEVEL (FEET)
590
580
570
560
1
JANUARY
23
24
31
1
5
6
15
FEBRUARY
29
2
1
MA
DATE
LEGEND
BH2
BH11
BH19
BH22
BH27
BH31

APPENDIX D

Archaeological Assessment (Stage 1)

Stantec

Stage 1 Archaeological Assessment: Windsor Riverfront Combined Sewer Overflow Control Facilities

Part of Lot 59, Concession 1 Petite Côte,
and Lot 63, Concession 1 Petite Côte,
Geographic Township of Sandwich,
former Essex County,
now City of Windsor, Ontario

April 24, 2019

Prepared for:

Ed Valdez, P.Eng. - Manager
Process Engineering and Maintenance
City of Windsor
4155 Ojibway Parkway
Windsor, ON N9C 4A5

Prepared by:

Stantec Consulting Ltd.
600-171 Queens Avenue
London, ON N6A 5J7

Licensee: Parker Dickson, MA
Licence Number: P256
PIF Number: P256-0563-2019
Project Number: 165620132

ORIGINAL REPORT

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by the City of Windsor (the City) to complete a Stage 1 archaeological assessment for the Windsor Riverfront Combined Sewer Overflow (CSO) Control, Area West of Caron Avenue Project (the Project). The Stage 1 archaeological assessment was undertaken by Stantec, on behalf of the City, in the preliminary planning and design process as part of the Environmental Study Report (ESR) for the Municipal Class Environmental Assessment (Class EA) for the Project under the Ontario *Environmental Assessment Act* (Government of Ontario 1990a). The study area for the Project comprises two potential locations for the construction of the proposed CSO control facilities, Parcel 1 and Parcel 2. Parcel 1 comprises approximately 0.76 hectares and is located in part of Lot 59, Concession 1, Petite Côte, Geographic Township of Sandwich, former Essex County, now City of Windsor, Ontario. Parcel 2 comprises approximately 0.87 hectares and is located in part of Lot 63, Concession 1, Petite Côte, Geographic Township of Sandwich, former Essex County, now City of Windsor, Ontario.

The Stage 1 archaeological assessment was completed under Project Information Form (PIF) number P256-0563-2019, issued to Parker Dickson, MA, by the Ministry of Tourism, Culture and Sport (MTCS). A property inspection was conducted on February 7, 2019.

The Stage 1 archaeological assessment has led to the determination that portions of the Parcel 1 study area have been subject to extensive land disturbance (i.e., municipal road ROW drainage ditching) which has removed the potential for the identification of archaeological resources. Thus, in accordance with Section 1.3.2 and Section 7.7.4 Standard 1b of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), **no further archaeological work is required for the disturbed portions of the Parcel 1 study area.**

In addition to the above, the Stage 1 archaeological assessment has determined that the remaining portions of the Parcel 1 study area retain potential for the identification of archaeological resources. Thus, in accordance with Section 1.3.1 and Section 7.7.4 Standard 1a of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), **Stage 2 archaeological assessment is required for portions of the Parcel 1 study area which retain archaeological potential.**

The Stage 1 archaeological assessment has determined that the Parcel 2 study area retains potential for the identification of archaeological resources. Thus, in accordance with Section 1.3.1 and Section 7.7.4 Standard 1a of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), **Stage 2 archaeological assessment is required for the Parcel 2 study area.**

The objective of the Stage 2 archaeological assessment will be to document archaeological resources within the study area and to determine whether these archaeological resources require further assessment. The Stage 2 archaeological assessment will include a test pit survey in accordance with Section 2.1.2 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). The MTCS standards require that each test pit be approximately 30 centimetres in diameter, excavated to at least five centimetres in to subsoil, and have soil screened through six millimetre hardware cloth to facilitate the recovery of any cultural material that may be present. Prior to backfilling, each test pit will be examined for stratigraphy, cultural features, or evidence of fill.

If the archaeological field team determines any lands to be low and wet, steeply sloped, or disturbed during the Stage 2 field work, those areas will not require survey, but will be photographically documented in accordance with Section 2.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011).

The MTCS is asked to review the results presented and to accept this report into the *Ontario Public Register of Archaeological Reports*. Archaeological sites recommended for further archaeological fieldwork remain subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990c) and may not be altered, or have artifacts removed, except by a person holding an archaeological licence.

The Executive Summary highlights key points from the report only; for complete information and findings, the reader should examine the complete report.

Project Personnel

Licensed Archaeologist:	Parker Dickson, MA (P256)
Project Manager:	Jian Li, Ph.D., P.Eng., PE
Licensed Field Director:	Darren Kipping, MA (R422)
GIS Specialist:	Kent Buchanan, H.B.Sc., OCGC
Report Writers:	Darren Kipping, MA (R422), Frank Smith, MA
Quality Review:	Jeffrey Muir, BA, CAHP (R304)
Licensee Review:	Parker Dickson, MA (P256)
Independent Review:	Colin Varley, MA, RPA

Acknowledgments

The City of Windsor:	Ed Valdez, P.Eng – Manager, Process Engineering and Maintenance
Ministry of Tourism, Culture And Sport:	Robert von Bitter – Archaeological Sites Database Coordinator

1.0 PROJECT CONTEXT

1.1 DEVELOPMENT CONTEXT

Stantec Consulting Ltd. (Stantec) was retained by the City of Windsor (the City) to complete a Stage 1 archaeological assessment for the Windsor Riverfront Combined Sewer Overflow (CSO) Control, Area West of Caron Avenue Project (the Project). The Stage 1 archaeological assessment was undertaken by Stantec, on behalf of the City, in the preliminary planning and design process as part of the Environmental Study Report (ESR) for the Municipal Class Environmental Assessment (Class EA) for the Project under the Ontario *Environmental Assessment Act* (Government of Ontario 1990a).

The study area for the Project comprises two potential locations for the construction of the proposed CSO control facilities, Parcel 1 and Parcel 2 (Figure 1). The Parcel 1 study area comprises approximately 0.76 hectares and is located in part of Lot 59, Concession 1, Petite Côte, Geographic Township of Sandwich, former Essex County, now City of Windsor, Ontario (Figure 2a). The Parcel 2 study area comprises approximately 0.87 hectares and is located in part of Lot 63, Concession 1, Petite Côte, Geographic Township of Sandwich, now City of Windsor, Essex County, Ontario (Figure 2b).

1.1.1 Objectives

In compliance with the provincial standards and guidelines set out in the Ministry of Tourism, Culture and Sport's (MTCS) 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), the objectives of the Stage 1 archaeological assessment are as follows:

- To provide information about the study area's geography, history, previous archaeological fieldwork, and current land conditions;
- To evaluate the study area's archaeological potential, which will support recommendations for Stage 2 survey for the property; and
- To recommend appropriate strategies for Stage 2 survey.

To meet these objectives, Stantec archaeologists employed the following research strategies:

- A review of relevant archaeological, historic, and environmental literature pertaining to the study area;
- A review of the land use history, including pertinent historic maps;
- A review of the City of Windsor's *Archaeological Master Plan* (Cultural Resource Management Group Limited *et al*. 2005);
- An examination of the *Ontario Archaeological Sites Database* to determine the presence of known archaeological sites in and around the study area; and
- A property inspection of the study area.

Permission to enter the study area and document features of archaeological potential was provided by the City.

1.2 HISTORICAL CONTEXT

1.2.1 Post-contact Indigenous Resources

“Contact” is typically used as a chronological benchmark in discussing Indigenous archaeology in Canada and describes the contact between Indigenous and European cultures. The precise moment of contact is a constant matter of discussion. Contact in what is now the province of Ontario is broadly assigned to the 16th century (Loewen and Chapdelaine 2016).

At the turn of the 16th century, the study area is documented to have been occupied by the Western Basin Tradition archaeological culture (see Section 1.3.2). Following the turn of the 17th century, the region of the study area is understood to have been within the territory of the historic Fire Nation, an Algonkian group occupying the western end of Lake Erie. It is argued, however, that the Attiwandaron (Neutral) expanded extensively westward, displacing the Fire Nation (Lennox and Fitzgerald 1990:418-419). It is debated whether the Fire Nation was descendent from the archaeologically described Western Basin Tradition, or if they migrated into the western part of Lake Erie, displacing a previous Indigenous culture (Murphy and Ferris 1990:193-194). Historians understand that the displaced Fire Nation moved across the St. Clair and Detroit Rivers into what is modern-day lower Michigan and their populations are synonymous with the later historic Kickapoo, Miami, Potawatomi, Fox, and Sauk (Heidenreich 1990: Figure 15.1). Bkejwanong (Walpole Island) First Nation oral tradition states that Nations of the Three Fires (a political confederacy constituted of the Potawatomi, Ojibwa, and Ottawa) have occupied the delta of the St. Clair River and the surrounding region continually for thousands of years (Walpole Island First Nation [WIFN] n.d.). In 1649, the Seneca, with the Mohawk, led a campaign into southern Ontario and dispersed the resident populations and the Seneca used the lower Great Lakes basin as a prolific hinterland for beaver hunting (Heidenreich 1978; Trigger 1978:345).

By 1690, Ojibwa-speaking people had begun to displace the Seneca from southern Ontario. The Indigenous economy, since the turn of the 18th century, focused on fishing and the fur trade, supplemented by agriculture and hunting (Konrad 1981; Rogers 1978). The study area falls within the traditional territory of the WIFN, the Aamjiwnaang (Sarnia) First Nation (Aamjiwnaang First Nation), the Wiiwkwedong and Aazhoodena (Kettle Point and Stony Point) First Nation (Lytwyn 2009), and the Deshkaan Ziibing Anishnaabeg (Chippewas of the Thames First Nation). Some populations of Wyandot (an Indigenous population of historically amalgamated Petun and Huron-Wendat individuals) also had moved to the region of Lake St. Clair at the turn of the 18th century and resided with the Three Fires Nations (Tooker 1978:398).

In Essex County, and specifically in the Windsor region, a splinter group of Ottawa settled in the area (Cultural Resource Management Group Limited *et al*. 2005:2-14 to 2-15). Also, the surviving remnants of the Huron and Petun were settling in the Windsor region as the Wyandot, exhibiting continuities with their 16th and 17th century predecessors from the Midland and Blue Mountain regions (Garrad 2014; Steckley 2014). Given the amalgamated nature of the Wyandot people, sometimes one of the contributing Indigenous peoples was recognized over another, the Wyandot were known as Huron in the Windsor region (Garrad 2014:16-54). Therefore, the Wyandot settlement in the Windsor region is commonly referred to as the “Huron Village” and related place names survive in Windsor today, such as Huron Church Road (but also note Wyandotte Street). A 1749 French map of the Detroit River region (Chaussegros de Léry 1752) depicts both the Ottawa and the Huron villages on the waterfront of the Windsor region. The 1749 map identifies the Ottawa village as “B” and the Huron village as “C” in close proximity to the Parcel 2 study area (see Figure 3).

Despite the dispersal and movement of Indigenous groups throughout southern Ontario during the 17th and 18th centuries, archaeologically they can be characterized by continuity with their pre-contact Indigenous counterparts. These peoples still maintained a Terminal Woodland archaeological culture, albeit with some features of European material culture. While there was cultural and social change occurring due to contact with European colonial powers, there was equally a definite persistence of Indigenous socio-cultural practices since these groups were not so profoundly affected by European contact that they left their former lifeways behind (Ferris 2009).

In the middle of the 18th century, the Chippewa were located on the south shores of Lake Huron, the east shores of Georgian Bay, and on the west end of Lake Ontario. Indigenous peoples and their communities continue to play a large role in the occupation of the study area and its environs. Under British administration in the 19th century, the various Indigenous groups were divided into separate bands. The Anishinaabe included the western Algonquian peoples, among them the Chippewa and the Ottawa. Until the 18th century, the central Algonquian-speaking peoples, including the Potawatomi, were located in the Michigan Peninsula (Blackbird 1887).

Following the American Revolutionary War, Britain focused on the settlement of European immigrants into what became the province of Upper Canada in 1791. To enable widespread settlement, the British government negotiated a series of treaties with the First Nations peoples. One of the earliest treaties involving lands located in close proximity to the study area was made on May 19, 1790 (Figure 4). Originally identified as the Detroit Treaty, the chiefs of the Ottawa, Chippewa, Potawatomi, and Huron Nations and representatives of the British Crown established a vast tract of land “…from the Detroit River easterly to Catfish Creek and south of the river La Tranche [now Thames River] and Chenail Ecarte [now St. Clair River], and contains Essex County except Anderdon Township and Part of West Sandwich; Kent County except Zone Township, and Gores of Camden and Chatham; Elgin County except Bayham Township and parts of South Dorchester and Malahide…[i]n Middlesex County, Del[a]ware and Westminster Township and part of North Dorchester” (Morris 1943:17). Today, this treaty is identified as Treaty Number 2, illustrated by the letter “C” on Figure 5. A plaque erected by the Historic Sites and Monuments Board of Canada further identifies this treaty as *McKee’s Purchase*. A commemorative plaque located in Blenheim Memorial Park in Blenheim, Ontario reads (Brown 2019a):

> *In May 1790 Alexander McKee, Deputy Agent of the British Indian Department, and the principal chiefs of the Ottawa, Potawatomi, Chippewa and Wyandot negotiated a treaty whereby the British Crown acquired title to what is now southwestern Ontario. This treaty completed the process begun with Niagara treaties of 1781 and 1784, with the result that most of the Ontario peninsula was soon opened to British and Loyalist settlement.*

In addition to the above, Figure 6 reproduces a map from the *History of the Windsor Border Region* (Lajeunesse 1960) which depicts several Indigenous sites and trails documented in Essex County during the late 18th century. The Parcel 1 study area is illustrated along "Trail F" identified as the River Shore path, now Highway 18. The Parcel 2 study area is illustrated adjacent to "Site 14", a Huron village on Huron Church line (Lajeunesse 1960: xxxix), likely the same Huron site illustrated as "C" on the 1749 map (see Figure 3). Figure 6 also illustrates the Ottawa village ("Site 16") previously depicted on the 1749 map (see Figure 3). Trail G represents an early path along the south shore of Lake St. Clair, connecting the Thames River to Sandwich (now, the City of Windsor). This road was also travelled by Governor Simcoe in 1793 (Lajeunesse 1960: xxxix).

The nature of Indigenous settlement size, population distribution, and material culture shifted as European settlers encroached upon Indigenous territory. However, despite this shift, "written accounts of material life and livelihood, the correlation of historically recorded villages to their archaeological manifestations, and the similarities of those sites to more ancient sites have revealed an antiquity to documented cultural expressions that confirms a deep historical continuity to…systems of ideology and thought" (Ferris 2009:114). As a result, Indigenous peoples have left behind archaeologically significant resources throughout the region which show continuity with past peoples, even if they have not been explicitly recorded in Euro-Canadian documentation.

1.2.2 Euro-Canadian Resources

The first French settlers arrived in the Detroit-Windsor area in 1701 when the Sieur De Lamothe Cadillac and roughly 100 military and civilian personnel established Fort Pontchartrain on the Detroit side of the Detroit River (Fuller 1972:6-8). The French settlement remained on the Detroit side until 1748 when the Jesuit mission to the Huron (or Wyandot) was established on the south shore near the foot of the present-day Huron Church Road and the Ambassador Bridge. Fort Pontchartrain surrendered to the British in 1760 and remained under British control until 1796, although it was officially a part of the United States from 1783 onwards. During this period, the settlement continued to grow, but remained predominantly French. The area (now in present-day Windsor) across the river from Fort Pontchartrain (later to become Detroit) was called "Petite côte" and served the agricultural needs of the fort (Archives of Ontario 2014). The street pattern of the City of Windsor still reflects the French method of agricultural land division; for example, the long narrow parcels fronting the river where the "Petite côte" was located (Morrison 1954:3-4). In 1796, the original townsite of Sandwich was established to accommodate new immigrants of both French and British origin from the United States who wished to remain under British rule following American occupation of Detroit. This constituted the first urban settlement in what is now the City of Windsor and the first significant migration of English-speaking people into the Windsor area (Neal 1909:86-87).

Essex County was originally part of the of the District of Hesse, and in 1792 was renamed the Western District. On January 1, 1800, in the *Act for the Better Division of the Province*, the Townships of Rochester, Mersea, Gosfield, Maidstone, Sandwich, and Malden were created as part of the County of Essex. The townships of Essex County were surveyed by Patrick McNiff, Abraham Iredell, and Thomas Smith (Clarke 2010:60, 70).

As the area began to attract more Euro-Canadian interest, Patrick McNiff was assigned to survey and organize the area into a township, also to be named Sandwich. His survey of the township was completed in 1793. The form of the concessions noted as “Petite côte” were dictated by the land divisions already used by the French farmers in the “Petite côte” area, in what was to become Concession 1 Petite Côte. In fact, on his original township map where he measured the Concession 1 lots, Patrick McNiff notes that “on my measuring the farms in front from No. 1 to No. 154 found their division Lines to run in the very irregular manner they appear on the Plan” (McNiff 1793). The most accurate map produced of the township at this time was completed by Abraham Iredell in 1797, who resurveyed the area and renumbered the lots from Lot 82 onwards in Concessions 1 to 3 Petite Côte (Morris 1929), reproduced here as Figure 7a (Iredell 1797) and Figure 7b (Iredell 1803). Lot 58, containing the Parcel 1 study area, is listed as belonging to Colonel Alexander McKee (Figure 7a). Lot 63, containing the Parcel 2 study area, is listed as belonging to the Huron Church (Figure 7b).

The 1815 Royal Navy survey of the Detroit River by Captain W.F.W. Owen, published in 1828 (Owen 1828), depicts a relatively developed township and illustrates various structures/buildings, windmills, and roads/trails focused along the river’s edge (Figure 8). The Parcel 1 study area is illustrated east of structures fronting the river and an existing road/trail and immediately adjacent to a ridge lying northeast of Parcel 1. The Parcel 2 study area is illustrated encompassing an existing building and existing/road trail, on top of a ridge overlooking the Detroit River. The 1828 map also identifies this area and one of the structures as a church, which by this time would be the Church of Our Lady of the Assumption, previously known as the Huron mission (Figure 8). A map of the Western District from 1847 (Billyard and Parr 1847) depicts a more developed township and road system, with the Parcel 2 study area in close proximity to the church (Figure 9).

By the mid-1850s, the community of Windsor became more established and grew large enough to compete with the adjacent community of Sandwich for important industrial development. For example, the Great Western Railway chose Windsor over Sandwich as its termination point in 1854. The arrival of the railway also allowed for the foundation of Walkerville, the third oldest settlement that is now part of the City of Windsor. In 1857, Hiram Walker established his distillery in the downtown area of Windsor where the Great Western Railway first met the waterfront (Morrison 1954:26).

In 1858, both Windsor and Sandwich were incorporated as towns (Morrison 1954:42). In 1861, the Township of Sandwich was subdivided into the Townships of Sandwich West, Sandwich East, and Sandwich South (Neal 1909:12). The 1877 *Map of Essex County, Ontario* (Walling 1877) lists no landowners for either of the lots associated with the study area (Figure 10). However, the 1877 map does demonstrate the growing development of the township with more robust transportation routes and named streets. A fish hatchery establishment is illustrated just west of the Parcel 1 study area.

The 1881 Essex Supplement in the *Illustrated Atlas of the Dominion of Canada* (Belden & Co. 1881) also lists no landowners for either of the lots associated with the study area. However, the fish hatchery west of the Parcel 1 study area and the Huron Church south of the Parcel 2 study area are depicted within the respective lots (Figure 11). Additionally, Figure 11 provides a general idea of the study area as it would have appeared in the mid-to-late 19th century. The Essex County historical atlas of 1881 documents a total population of 36,258 for Essex County at that time (Belden & Co. 1881:8). Of the total population, 25,303 settlers lived in rural settings, while 10,955 lived in urban settings (Belden & Co. 1881:8).

In discussing 18th and 19th century historical mapping it must be remembered that many historical county atlases were produced primarily to identify factories, offices, residences, and landholdings of subscribers and were funded by subscription fees. Landowners who did not subscribe were not always listed on the maps (Caston 1997:100). As such, all structures were not necessarily depicted or placed accurately (Gentilcore and Head 1984). Further, review of historic mapping has inherent accuracy difficulties due to potential error in georeferencing. Georeferencing is conducted by assigning spatial coordinates to fixed locations and using these points to spatially reference the remainder of the map. Due to changes in “fixed” locations over time (e.g., road intersections), errors/difficulties of scale and the relative idealism of the historic cartography, historic maps may not translate accurately into real space points. This may provide obvious inconsistencies during the historic map review.

1.2.2.1 Parcel 1 Study Area - Lot 59, Concession 1 Petite Côte

According to land registry records, Lot 59, Concession 1 Petite Côte was granted by the Crown to Colonel Alexander McKee in 1798 (ONLand 2019a) (Plate 1). Compared to other lots fronting the Detroit River in the Township of Sandwich, Lot 59, Concession 1 Petite Côte is larger than average. The lot’s northern border is the original plot for the Town of Sandwich.

Alexander McKee was born in 1735 on the Pennsylvania frontier. His father was a trader from Ireland and his mother was Shawnee (Horsman 1979). Growing up on the frontier and among Indigenous people, McKee became an accomplished woodsman and learned several Indigenous languages. His skill and knowledge led to his attainment of the rank of Lieutenant during the Seven Years War. During the conflict he worked closely with the British military and their Indigenous allies. In 1760, he joined the Indian Department and in 1772 was promoted to Chief Indian Agent at Fort Pitt (Horsman 1979; Hoberg 1934). At the start of the American Revolution, McKee was considered a trusted supporter of the Crown by colonial officials (Hoberg 1934). His loyalty forced him to flee Pittsburgh in 1778. He escaped to Detroit where he joined the British Army and became a captain and interpreter (Horsman 1979).

After the war, McKee became a prominent official in Essex County. Initially, he resided in Detroit, which remained under British occupation until 1796. He served as a deputy agent in the Indian Department, was a lieutenant-colonel in the militia, a justice of the court, and a member of the District Land Board. (Horsman 1979). McKee had one son, Thomas McKee, who inherited Lot 59, Concession 1 Petite Côte after Alexander’s death in 1799 (ONLand 2019a).

Thomas McKee was born in 1770 in the Ohio Valley. His mother was likely Indigenous, and, like his father, he learned several Indigenous languages. Using his father’s connections, he received land grants in Essex County in 1785 and 1788, including the lease of Point Pelee Island. In 1796, he was appointed Superintendent General of Indian Affairs for the Northwestern District and in 1797 was also appointed the Superintendent of Indian Affairs in Amherstburg (Clarke 1983). In 1799, McKee married Therese Askin and they settled on Lot 59, Concession 1 Petite Côte (Lajeunesse 1960:205). McKee had a checkered record at the Indian Department, but this was overlooked because of his fluency in Indigenous languages (Clarke 1983).

When the War of 1812 began, McKee retained his rank of Major from the militia and was attached to the 2nd Essex Department (Clarke 1983). In August 1812, Sir Isaac Brock and the Shawnee chief Tecumseh arrived in Essex County to prepare an attack on the American forces stationed in Detroit (Taylor 2010:163). Brock's forces amassed at McKee's homestead, known as McKees Point (Parks Canada n.d.). His army consisted of 1,925 men, including 600 Indigenous warriors (Taylor 2010:163). Thomas McKee was among the soldiers and was tasked with liaising with the Indigenous warriors (Clarke 1983). On August 16th, Brock led an attack of 1,330 men, including Thomas McKee, on the American positions at Detroit from McKee's Point (Taylor 2010:164). This event is commemorated by a historical plaque (Brown 2019b) located approximately 22 metres north of the Parcel 1 study area. The location of the plaque is illustrated as a reference point on Figure 13a. A photo of the plaque was obtained during the Stage 1 property inspection (see Plate 2). The Americans surrendered the fort to the British and McKee was congratulated by the Prince Regent of Britain for the commendable performance of the Indigenous warriors. However, McKee performed poorly for the remainder of the war and died in Montreal in 1814 after he was removed from active combat by his superiors (Clarke 1983).

After the death of Thomas McKee, Lot 59, Concession 1 Petite Côte became the property of his son, Alexander McKee. During the 1820s, Alexander began to subdivide and sell the lot as half-acre to nine-acre parcels. By 1851, the bulk of the lot, 358 acres, was owned by Thomas McKee (ONLand 2019b). Thomas McKee was born on Lot 59, Concession 1 Petite Côte in 1826 and was likely the son of Alexander McKee. He became a prominent citizen in the community and was appointed county clerk in 1865 and customs officer in 1880, positions he retained until his death in 1902 (Neal 1909:105).

In 1875, the Dominion Fish Hatchery was opened in Lot 59, Concession 1 Petite Côte along the Detroit River. The hatchery was the fourth to be established in Canada and hatched whitefish and pickerel (Neal 1909:61-62). The hatchery operated until 1915, when it was moved to Kingsville (Morrison 1954). Historical mapping from the late 19th century shows that Lot 59, Concession 1 Petite Côte was within the Town of Sandwich and had been subdivided into many smaller plots, with the largest parcel on the lot belonging to the Dominion Fish Hatchery (Figures 10 and 11). However, the parcels containing the Parcel 1 study area are not labeled. In 1883, James McKee, likely the son of Thomas McKee, sold the remainder of the McKee family land on the lot, totaling 259 acres, to Solomon White (ONLand 2019b).

In 1902, the Essex Terminal Railway was constructed between Windsor and Amherstburg and ran through Lot 59, Concession 1 Petite Côte, facilitating the development of industry in the area (ETR 2013). In 1904, the Saginaw Lumber and Salt Company began operations in Lot 59, Concession 1 Petite Côte. The company later became the Canadian Salt Company and is presently the Windsor Salt Company (Morrison 1954:197). The Windsor Salt Company continues to operate on Lot 59, Concession 1 Petite Côte.

1.2.2.2 Parcel 2 Study Area – Lot 63, Concession 1 Petite Côte

Lot 63, Concession 1 Petite Côte contains Our Lady of the Assumption Catholic Parish. The parish traces its origins to the first Jesuit mission to the Huron and associated church founded on the north shore (current Detroit) of the Detroit River as part of New France's attempts to convert the Indigenous population in the area. A cement cross erected in 1922 within the study area memorializes the Jesuit mission and the first cross erected in 1748 (see Section 7.2, Photo 23). By 1750, it was increasingly utilized as a place of worship by the French settlers in Detroit (Fuller 1972:42). In 1765, 60 French families on the south side of the river petitioned for a second church to be constructed, allowing them more convenient access to church services (Morgan 1991:18). In 1767, the Huron Mission became the Church of Our Lady of the Assumption and was opened under the stewardship of Father Pierre Potier. A new church was constructed on the site between 1784 and 1787 (Plate 3). This event is commemorated by a historical plaque (Brown 2019c) located within the Parcel 2 study area. The location of the plaque is illustrated as a reference point on Figure 13b. A photo of the plaque was obtained during the Stage 1 property inspection (see Plate 4). However, this church soon proved insufficient and in 1835 work on a larger church began. The present-day Our Lady of the Assumption Church was completed on July 20, 1846 (Morgan 1991:20).

The Crown grant for Lot 63, Concession 1 Petite Côte is dated December 29, 1830 to Reverend Alexander MacDonell (ONLand 2019c). He was the First Bishop of Upper Canada and his nephew, Angus MacDonald, served as the pastor of Assumption Parish. Angus was born in 1799 in St. Raphael's, Quebec and entered the priesthood in 1822. Angus was moved to the Assumption Parish in 1831 to serve the predominantly French-speaking congregation and would remain pastor of the church for 12 years. The influence of the Baby family upon the parish is reflected in the land registry records, which show that William Baby had an indenture with the church in 1856 (ONLand 2019c). MacDonell left in 1843 when the Jesuits took over the parish (Carmichael 2018).

The Jesuit order at Assumption Church was led by Father Pierre Point. Father Point was born in 1802 and was educated in France and immigrated to Quebec in 1843. Point desired to create a regional centre for Catholic education in Essex County and in 1855 received permission to open Assumption College. The first classes were held in 1857 (Morgan 1991:53). In 1856, the Diocese of Toronto was divided and the western portion became the new Diocese of London (Neal 1909:174). The Assumption Parish was chosen as the Cathedral for the diocese under Bishop Pinsonneault and the Jesuits departed the parish. In 1869, the Cathedral for the Diocese was transferred to London (Lajeunesse n.d.).

After the transfer of the Diocesan seat, the Basillian Fathers of Toronto took charge of the Parish under Father Denis O'Connor. In 1874 the present-day tower and sanctuary were added to the church. The original sacristy and retreat chapel were demolished in 1907 because of their poor condition and a new chapel was built west of the original church (Lajeunesse n.d.). During the 20th century, Assumption College would continue to expand within Lot 63, Concession 1 Petite Côte and is today part of the University of Windsor, which encompasses much of Lot 63, Concession 1 Petite Côte (Morgan 1991:53-54).

The Parcel 2 study area is presently located on land owned by the City of Windsor. This land was previously owned by Assumption College and the University of Windsor. Based on a review of historic mapping, the location of the original church and associated buildings are likely to the south of the Parcel 2 study area, on the south side of Riversidde Drive West. Assumption Park, which is located just south of the Parcel 2 study area, was opened as a city park in 1952 and formally deeded to the City in 1990 (City of Windsor 2019). Presently, the Parcel 2 study area is located within the Windsor Sculpture Park, which is part of the larger Centennial Park. The park opened in 1967 and according to land registry records from 1966 show the Diocese selling the associated land in Lot 63, Concession 1 Petite Côte to the City of Windsor in 1963 and 1966 (ONLand 2019d).

1.2.3 Aerial Photography

Aerial photography of the study area was obtained from Wayne State University Library's DTE Aerial Photo Collection (Wayne State 2019). The air photos from 1949 to 1997 for the Parcel 1 study area illustrate the area being consistently used as agricultural land or left as scrubland (Figure 12a). At some point between 1961 and 1981, a small laneway or other linear disturbance is seen running northwest to southeast through the Parcel 1 study area. However, by 1997 this laneway is grown over with vegetation.

The air photos from 1949 to 1997 for the Parcel 2 study area also illustrate a relatively consistent use of the area as parkland (Figure 12b). However, between 1961 and 1981 land reclamation along the river's edge created more parkland, and the waterfront is artificially straightened. Prior to reclamation this portion of the Parcel 2 study area would been inundated and not inhabited. A pier, adjacent to the Ambassador Bridge, was also installed at this time. Additional pathways through the park were also added from 1961 to 1981 and a more permanent breakwater constructed by 1997.

1.3 ARCHAEOLOGICAL CONTEXT

1.3.1 The Natural Environment

The study area is situated in the St. Clair Clay Plains physiographic region, as identified by Chapman and Putnam (1984). This region is described as:

> *Adjoining Lake St. Clair in Essex and Kent County Counties and the St. Clair River in Lambton County are extensive clay plains covering 2,270 square miles. The region is one of little relief, lying between 575 and 700 feet a.s.l., except for the moraine at Ridgetown and Blenheim which rises 50 to 500 feet higher….Glacial Lake Whittlesey, which deeply covered all of these lands, and Lake Warren which subsequently covered nearly the whole area, failed to leave deep stratified beds of sediment on the underlying clay till except around Chatham, between Blenheim and the Rondeau marshes, and in a few other smaller areas. Most of Lambton and Essex Counties, therefore, are essentially till plains smoothed by shallow deposits of lacustrine clay which settled in the depressions while the knolls were being lowered by wave action.*

(Chapman and Putnam 1984:147)

The closest potable water source is the Detroit River. The Parcel 1 study area lies approximately 650 metres east of the Detroit River and the Parcel 2 study area is directly adjacent to the south side of the Detroit River. Use of the Detroit River has evolved over time from being a transportation route used by early Indigenous inhabitants and Euro-Canadian explorers and settlers, to an industrial power source to support the early mills of the area, to a commercial shipping route, and finally to a water course used for recreational purposes throughout the 20th and 21st centuries.

1.3.2 Pre-contact Indigenous Resources

This portion of southwestern Ontario has been occupied by Indigenous peoples since the retreat of the Wisconsin glacier approximately 11,000 years ago. Much of what is understood about the lifeways of Indigenous peoples is derived from archaeological evidence and ethnographic analogy. In Ontario, Indigenous culture prior to the period of contact with European peoples has been distinguished into cultural periods based on observed changes in material culture. These cultural periods are largely based in observed changes in formal lithic tools, and separated into the Early Paleo-Indian, Late Paleo-Indian, Early Archaic, Middle Archaic, and Late Archaic periods. Following the advent of ceramic technology in the Indigenous archaeological record, cultural periods are separated into the Early Woodland, Middle Woodland, and Late Woodland periods, based primarily on observed changes in formal ceramic decoration. It should be noted that these cultural periods do not necessarily represent specific cultural identities but are a useful paradigm for understanding changes in Indigenous culture through time. The current understanding of Indigenous archaeological culture is summarized in Table 1, based on Ellis and Ferris (1990). The provided time periods are based on the “Common Era” calendar notation system, i.e., Before Common Era (BCE) and Common Era (CE).

Table 1: Cultural Chronology for Essex County

Period	Characteristics	Time Period	Comments
Early Paleo-Indian	Fluted Projectiles	9,000 – 8,400 BCE	spruce parkland/caribou hunters
Late Paleo-Indian	Hi-Lo Projectiles	8,400 – 8,000 BCE	smaller but more numerous sites
Early Archaic	Kirk and Bifurcate Base Points	8,000 – 6,000 BCE	slow population growth
Middle Archaic	Brewerton-like Points	6,000 – 2,500 BCE	environment similar to present
Late Archaic	Narrow Point	2,000 – 1,800 BCE	increasing site size
	Broad Point	1,800 – 1,500 BCE	large chipped lithic tools
	Small Point	1,500 – 1,100 BCE	introduction of bow hunting
Terminal Archaic	Hind Points	1,100 – 950 BCE	emergence of true cemeteries
Early Woodland	Meadowood Points	950 – 400 BCE	introduction of pottery
Middle Woodland	Couture Corded Pottery	400 BCE – 500 CE	increased sedentism
	Riviere au Vase Phase	500 – 800 CE	seasonal hunting and gathering
Late Woodland	Younge Phase	800 – 1200 CE	incipient agriculture
	Springwells Phase	1200 – 1400 CE	agricultural villages
	Wolf Phase	1400 – 1550 CE	earth worked villages, warfare

Period	Characteristics	Time Period	Comments
Contact Indigenous	Various Algonkian and Iroquoian Groups	1600 – 1875 CE	early written records and treaties
Historic	French/Euro-Canadian	1749 CE – present	European settlement

Between 9000 and 8000 BCE, Indigenous populations were sustained by hunting, fishing and foraging and lived a relatively mobile existence across an extensive geographic territory. Despite these wide territories, social ties were maintained between groups. One method in particular was through gift exchange, evident through exotic lithic material documented on many sites (Ellis 2013:35-40).

By approximately 8000 BCE, evidence exists and becomes more common for the production of ground-stone tools such as axes, chisels and adzes. These tools themselves are believed to be indicative specifically of woodworking. This evidence can be extended to indicate an increase in craft production and arguably craft specialization. This latter statement is also supported by evidence, dating to approximately 7000 BCE, of ornately carved stone objects which would be laborious to produce and have explicit aesthetic qualities (Ellis 2013:41). This is indirectly indicative of changes in social organization which permitted individuals to devote time and effort to craft specialization. Since 8000 BCE, the Great Lakes basin experienced a low-water phase, with shorelines significantly below modern lake levels (Stewart 2013: Figure 1.1.C). It is presumed that the majority of human settlements would have been focused along these former shorelines. At approximately 6500 BCE the climate had warmed considerably since the recession of the glaciers and the environment had grown more similar to the present day. By approximately 4500 BCE, evidence exists from southern Ontario for the utilization of native copper (naturally occurring pure copper metal) (Ellis 2013:42). The known origin of this material along the north shore of Lake Superior indicates the existence of extensive exchange networks across the Great Lakes basin.

At approximately 3500 BCE, the isostatic rebound of the North American plate following the melt of the Laurentide glacier had reached a point which significantly affected the watershed of the Great Lakes basin. Prior to this, the Upper Great Lakes had drained down the Ottawa Valley via the French-Mattawa river valleys. Following this shift in the watershed, the drainage course of the Great Lakes basin had changed to its present course. This also prompted a significant increase in water-level to approximately modern levels (with a brief high-water period); this change in water levels is believed to have occurred catastrophically (Stewart 2013:28-30). This change in geography coincides with the earliest evidence for cemeteries (Ellis 2013:46). By 2500 BCE, the earliest evidence exists for the construction of fishing weirs (Ellis *et al*. 1990: Figure 4.1). Construction of these weirs would have required a large amount of communal labour and are indicative of the continued development of social organization and communal identity. The large-scale procurement of food at a single location also has significant implications for permanence of settlement within the landscape. This period is also marked by further population increase and by 1500 BCE evidence exists for substantial permanent structures (Ellis 2013:45-46).

By approximately 950 BCE, the earliest evidence exists for populations using ceramics. Populations are understood to have continued to seasonally exploit natural resources. This advent of ceramic technology correlated, however, with the intensive exploitation of seed foods such as goosefoot and knotweed as well as mast such as nuts (Williamson 2013:48). The use of ceramics implies changes in the social organization of food storage as well as in the cooking of food and changes in diet. Fish also continued to be an important facet of the economy at this time. Evidence continues to exist for the expansion of social organization (including hierarchy), group identity, ceremonialism (particularly in burial), interregional exchange throughout the Great Lakes basin and beyond, and craft production (Williamson 2013:48-54).

By approximately 550 CE, evidence emergences for the introduction of maize into southern Ontario. This crop would have initially only supplemented the Indigenous diet and economy (Birch and Williamson 2013:13-14). Maize-based agriculture gradually became more important to societies and by approximately 900 CE permanent communities emerge which are primarily focused on agriculture and the storage of crops, with satellite locations oriented toward the procurement of other resources such as hunting, fishing and foraging. By approximately 1250 CE, evidence exists for the common cultivation of historic Indigenous cultigens, including maize, beans, squash, sunflower and tobacco. The cultural affiliation of populations within the region of the study area at this time period is debated, whether they may have spoken a form of Iroquoian language or Algonquian (Murphy and Ferris 1990). The extant archaeological record demonstrates many cultural traits similar to historic Indigenous nations (Williamson 2013:55).

By the Late Woodland period there was a distinctive cultural occupation in southwestern Ontario, including Essex, Kent, and Lambton counties. The primary Late Woodland occupants of the Windsor area were populations described by archaeologists as belonging to the Western Basin Tradition. Murphy and Ferris (1990:189) indicate that these people had ties with populations in southeastern Michigan and northwestern Ohio and represent an *in situ* cultural development from the earlier Middle Woodland groups. The Western Basin Tradition seems to have been centered in the territory comprising the eastern drainage basin of Lake Erie, Lake St. Clair, and the southern end of Lake Huron. The Western Basin Tradition is divided into four phases based on differences in settlement and subsistence strategies and pottery attributes. By the time of increased European interaction in the last half of the 16th century and early 17th century, there were no Western Basin Tradition sites in the Essex County area, having moved west into Michigan (Ferris 2009:32-33).

1.3.3 Known Archaeological Sites and Surveys

In Canada, archaeological sites are registered within the Borden system, a national grid system designed by Charles Borden in 1952 (Borden 1952). The grid covers the entire surface area of Canada and is divided into major units containing an area that is two degrees in latitude by four degrees in longitude. Major units are designated by upper case letters. Each major unit is subdivided into 288 basic unit areas, each containing an area of 10 minutes in latitude by 10 minutes in longitude. The width of basic units reduces as one moves north due to the curvature of the earth. In southern Ontario, each basic unit measures approximately 13.5 kilometres east-west by 18.5 kilometres north-south. In northern Ontario, adjacent to Hudson Bay, each basic unit measures approximately 10.2 kilometres east-west by 18.5 kilometres north-south. Basic units are designated by lower case letters. Individual sites are assigned a unique, sequential number as they are registered. These sequential numbers are issued by the MTCS who maintain the *Ontario Archaeological Sites Database*. The study area under review is within Borden Block AbHs.

Information concerning specific site locations is protected by provincial policy and is not fully subject to the *Freedom of Information and Protection of Privacy Act* (Government of Ontario 1990b). The release of such information in the past has led to looting or various forms of illegally conducted site destruction. Confidentiality extends to media capable of conveying location, including maps, drawings, or textual descriptions of a site location. The MTCS will provide information concerning site location to the party or an agent of the party holding title to a property, or to a licensed archaeologist with relevant cultural resource management interests.

1.3.3.1 Parcel 1 Study Area

An examination of the *Ontario Archaeological Sites Database* has shown that there are six registered archaeological sites located within a one-kilometre radius of the Parcel 1 study area (Government Ontario 2019a). Table 2 summarizes the registered archaeological sites within one kilometre of the study area. There are no registered archaeological sites within 50 metres of the Parcel 1 study area; however, the Nordic Power site (AbHs-21) is located approximately 300 metres away (see Tile 1 in the Supplementary Documentation).

Table 2: Registered Sites within One Kilometre of the Parcel 1 Study Area

Borden Number	Site Name	Site Type	Cultural Affiliation
AbHs-5	Not applicable (n/a)	Homestead	Euro-Canadian
AbHs-6	Morton Terminal 2	Homestead	Euro-Canadian
AbHs-19	Ojibway 3	Homestead	Euro-Canadian
AbHs-20	Ojibway 4	Campsite / Homestead	Indigenous / Euro-Canadian
AbHs-21	Nordic Power	Dump	Euro-Canadian
AbHs-58	Sideline	Indeterminate	Euro-Canadian

A query of the *Ontario Public Register of Archaeological Reports* (Government of Ontario 2019b) identified two archaeological assessments within 50 metres of the study area. Table 3 provides a summary of the archaeological assessments completed within 50 metres of the Parcel 1 study area.

Table 3: Previous Archaeological Assessments within 50 Metres of the Parcel 1 Study Area

Company	Report	Project Information Form (PIF) Number	Year
Archaeological Services Inc. (ASI)	*Stage 1 Archaeological Assessment Report, Detroit River International Crossing, City of Windsor and Essex County (Town of LaSalle and Town of Tecumseh), Ontario*	P057-141	2006
ASI	*REVISED: Stage 2 Archaeological Assessment of the Detroit River International Crossing (DRIC), City of*	P057-0270-2006 P057-0454-2007	2010

Company	Report	Project Information Form (PIF) Number	Year
	Windsor and County of Essex, (Town of LaSalle and Town of Tecumseh), Ontario.	P057-0441-2007	

In 2005, Archaeological Services Inc. (ASI) conducted a Stage 1 archaeological assessment for the Detroit River International Crossing (DRIC) project (ASI 2006). The Stage 1 archaeological assessment covered a large corridor of the City of Windsor focused on lands to be impacted for the construction of the DRIC project, including the Parcel 1 study area property. ASI determined that the Parcel 1 study area retained archaeological potential Indigenous and Euro-Canadian resources (ASI 2006: Figures 5 to 7).

Subsequently, in 2006 and 2007 ASI conducted a Stage 2 archaeological assessment for the DRIC project. During the Stage 2 assessment, ASI conducted a visual examination of the Parcel 1 study area and determined it to be previously disturbed (ASI 2010). There is no detailed archaeological discussion in ASI's (2010) report as to what topographical characteristics were considered during the visual examination to determine that the Parcel 1 study area had been previously disturbed.

1.3.3.2 Parcel 2 Study Area

An examination of the *Ontario Archaeological Sites Database* has shown that there are 14 registered archaeological sites located within a one-kilometre radius of the Parcel 2 study area (Government Ontario 2019a). Tables 4 summarizes the registered archaeological sites within one kilometre of the study area. There are two registered archaeological sites located within 50 metres of the Parcel 2 study area, i.e., AbHs-27 and AbHs-34 (see Tile 2 in the Supplementary Documentation).

Table 4: Registered Sites within One Kilometre of the Parcel 2 Study Area

Borden Number	Site Name	Site Type	Cultural Affiliation
AbHs-10	Duff-Baby House	Homestead	Euro-Canadian
AbHs-12	Mackenzie Hall	Administrative / jail	Euro-Canadian
AbHs-16	Heritage Park Windmill Reconstruction	Midden	Euro-Canadian
AbHs-27	Huron Mission Site	Village	Indigenous
AbHs-28	n/a	Indeterminate	Indigenous / Euro-Canadian
AbHs-29	n/a	Indeterminate	Indigenous / Euro-Canadian
AbHs-30	n/a	Indeterminate	Indigenous / Euro-Canadian
AbHs-31	n/a	Indeterminate	Indigenous / Euro-Canadian
AbHs-32	n/a	Indeterminate	Indigenous / Euro-Canadian
AbHs-33	n/a	Indeterminate	Indigenous / Euro-Canadian
AbHs-34	n/a	Village	Indigenous
AbHs-60	Mille Cove Marine Location 1	Indeterminate	Indeterminate
AbHs-63	Essex County Jail	Jail yard burial	Euro-Canadian

Borden Number	Site Name	Site Type	Cultural Affiliation
AbHs-64	n/a	Indeterminate	Euro-Canadian

A query of the *Ontario Public Register of Archaeological Reports* (Government of Ontario 2019b) identified four archaeological assessments within 50 metres of the Parcel 2 study area. Table 5 provides a summary of the archaeological assessments completed within 50 metres of the study area.

Table 5: Previous Archaeological Assessment within 50 Metres of the Parcel 2 Study Area

Company	Report	PIF Number	Year
AMICK Consultants Ltd.	*Report on the 2004 Stage 1-2 Archaeological Assessment of the Proposed Improvements to the Waterfront Villa Property, Part of Lots 1, 2 and 3, Registered Plan 410, Part of the Indian Reserve, Part of the Water Lot in Front Thereof, City of Windsor, County of Essex*	P058-032	2005
London Museum of Archaeology, now Museum of Ontario Archaeology	*Stage 1 and Stage 2 Archaeological Assessment of Lands to be Potentially Impacted by the Ambassador Bridge Enhancement Project, City of Windsor, Essex County*	P014-0056-2007	2007a
London Museum of Archaeology, now Museum of Ontario Archaeology	*ADDENDUM: Stage 3 Archaeological Investigations at Four Sites to be Potentially Impacted by the Ambassador Bridge Enhancement Project, City of Windsor, Essex County*	P014-0059-2007	2007b
Ontario Heritage Trust	*Assumption Park, Part Farm Lot 63, Concession 1 (Sandwich): Lots 1-6, Plan 1141, and Parts 1 & 2, Registered Plan 12R-11839, City of Windsor, Essex County – Stage 1 Archaeological Assessment*	P096-0060-2010	2011

In 2004, AMICK Consultants Ltd. (AMICK) conducted a Stage 1-2 archaeological assessment for proposed improvements to the waterfront villa property on the land directly west of the current Ambassador Bridge (AMICK 2005). The assessment resulted in 14 positive test pits consisting of 39 Indigenous and Euro-Canadian artifacts (AMICK 2005: Figure 9). The archaeological site was registered with the MTCS as the Huron Mission Site (AbHs-27). Due to the nature of the finds and the property being within a portion of the former Huron Mission, AMICK (2005) determined that the site was temporally affiliated to the Jesuit Mission and associated Huron Village of the 18th century. AMICK (2005) recommended Stage 3 archaeological assessment for the Huron Mission site (AbHs-27).

In 2007, the London Museum of Archaeology, now the Museum of Ontario Archaeology (MOA), conducted a Stage 1-2 archaeological assessment for lands to be potentially impacted by the Ambassador Bridge Enhancement Project. The field assessment was led by Robert J. Pearce, Ph.D., and assessed portions of properties adjacent to the current Ambassador Bridge. This assessment included the property previously assessed by AMICK (2005) as discussed above. It is likely the MOA was not aware of AMICK’s (2005) previous assessment as no previously registered archaeological sites are identified within their Stage 1 archaeological background study (MOA 2007a). Prior to 2011, archaeological site registration forms were not required at the time of report submission. Thus, the registration of AbHs-27 with the MTCS may have occurred following the MOA's (2007a) inquiry with the *Ontario Archaeological Sites Database.* Regardless, the MOA recorded 55 positive test pits in the same area that AMICK had previously identified the Huron Mission Site (AbHs-27) (MOA 2007a: Figure 18). The 55 positive test pits consisted of 714 Indigenous and Euro-Canadian artifacts. The MOA registered the archaeological site with the MTCS as AbHs-34. The MOA did not directly link their archaeological findings to the Jesuit Mission and associated Huron Village of the 18th century, but rather interpreted the Indigenous material culture as being affiliated with the Younge and Springwell Phases of the Western Basin Tradition and the Euro-Canadian material culture as being affiliated with an early 19th century occupation (MOA 2007a). Given the above, however, it is likely that the Huron Mission Site (AbHs-27) and AbHs-34 are associated with each other or may represent different occupational periods of the same site. The MOA (2007a) recommended Stage 3 archaeological assessment for AbHs-34.

Subsequently, the MOA conducted a Stage 3 archaeological assessment of AbHs-34. MOA's (2007b) Stage 3 archaeological assessment report is not available in the *Ontario Public Register of Archaeological Reports* (Government of Ontario 2019b). A request has been made to the Archaeology Programs Unit for a copy of the report, however, at the time of this writing it has not yet been received (Personal communication, MTCS 2019).

Currently, Stage 4 archaeological mitigation of the Huron Mission Site (AbHs-27/AbHs-34) is being conducted by AECOM for the Ambassador Bridge Enhancement Project (CTV News Windsor 2019). The mitigation is ongoing and expected to be complete by the end of 2019. No further information regarding the Stage 4 mitigation of the site is available from the *Ontario Public Register of Archaeological Reports*.

In 2011, the Ontario Heritage Trust (OHT) conducted a Stage 1 archaeological assessment of Assumption Park for the City of Windsor (OHT 2011). Assumption Park is located directly south of the Parcel 2 study area on the south side of Riverside Drive. The OHT (2011) determined that the entire limits of Assumption Park exhibit potential for Indigenous and Euro-Canadian archaeological resources. A geophysical electrical resistivity survey of Assumption Park conducted for the OHT was also examined as part of the Stage 1 archaeological assessment. The geophysical survey identified several anomalies, including two subsurface features in the northern portion of the property which may represent the building foundations associated with the second church or the mission house for the Jesuit mission The OHT (2011) recommended Stage 2 archaeological assessment for Assumption Park.

1.3.4 City of Windsor's Archaeology Master Plan

The City of Windsor's *Archaeological Master Plan Study Report* (CRM Group Limited *et al*. 2005) discusses the City of Windsor's and the northern portion of the Town of LaSalle's archaeological context in general. As of 2005, archaeologists had registered only 23 archaeological sites within the city limits or within the immediate vicinity (CRM Group Limited *et al*. 2005). However, the authors of the archaeological management plan recognized that a number of poorly documented sites exist and there are many sites still to be documented, especially since the majority of the archaeological studies discussed in the archaeological management plan maps are concentrated along the Detroit River or in southwest Windsor

(CRM Group Limited *et al*. 2005:3-1 to 3-23). Additionally, a number of newly identified archaeological sites have been registered within the city limits since the time of the study report. Both the Parcel 1 study area and Parcel 2 study area are in areas identified as having high archaeological potential on the archaeological management plan's archaeological potential mapping (CRM Group Limited *et al*. 2005: Figure 4).

1.3.5 Existing Conditions

The Parcel 1 study area comprises approximately 0.76 hectares and consists of a portion of Lot 59, Concession 1 Petite Côte, Geographic Township of Sandwich, former Essex County, now City of Windsor, Ontario (Figure 1). The study area is triangular in shape and is bounded by Ojibway Parkway to the northeast, by Sandwich Street to the west, and by a parking lot for a commercial transportation business to the south (Figure 2a). The study area comprises scrubland, an overgrown stand of trees and brush, and municipal road right-of-way (ROW) drainage ditches.

The Parcel 2 study area comprises approximately 0.87 hectares and consists of a portion of Lot 63, Concession 1 Petite Côte, Geographic Township of Sandwich, former Essex County, now City of Windsor, Ontario (Figure 1). The study area is bounded by the Ambassador Bridge to the west, the Detroit River to the north, parkland to the east, and Riverside Drive West to the south (Figure 2b). The study area comprises parkland and manicured lawn, an existing municipal building, walking paths, modern art installations, sloped terrain, and subsurface municipal infrastructure.

2.0 FIELD METHODS

The Stage 1 archaeological assessment compiled information concerning known and/or potential archaeological resources within the study area. A property inspection was conducted on February 7, 2019 under PIF P256-0563-2019 issued to Parker Dickson, MA, by the MTCS. The property inspection involved examining the entirety of the study area to identify the presence or absence of any features of archaeological potential, in accordance with Section 1.2 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). During the property inspection on February 7, 2019, the weather was overcast and cold and visibility of land features was excellent. Field, lighting, and weather conditions were not detrimental to the identification of features of archaeological potential in accordance with Section 1.2 Standard 2 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). The photography from the property inspection (see Section 7.1) confirms that the requirements for a Stage 1 property inspection were met, as per Section 1.2 and Section 7.7.2 Standard 1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011).

The property inspection of the Parcel 1 study area demonstrated an area consisting of scrubland and an overgrown stand of trees and brush. The property inspection also identified areas of previous disturbance from municipal road ROW drainage ditches. Photos 1 through 7 illustrate the general conditions of the Parcel 1 study area consisting of scrubland and an overgrown stand of trees and brush. Photos 8 to 11 illustrate the previously disturbed drainage ditches.

The property inspection of the Parcel 2 study area demonstrated areas of previous surficial disturbance due to existing pathways, modern art installations, and subsurface municipal infrastructure. A small portion of the study area is sloped terrain. The majority of the study area comprises manicured lawn associated with municipal parkland. The land reclamation, as described in Section 1.2.3, could not be identified through visual examination. Photos 12 through 20 illustrate the parkland, pathways, and sloped terrain within the study area. Photos 11 to 25 illustrate the subsurface municipal infrastructure, existing building, and modern art installations. Photo 26 illustrates the *Jesuit Mission to the Hurons* Ontario historical plaque and Photo 27 illustrates the 1922 cement cross which was erected to commemorate the original 1748 cross placed by the Jesuit missionaries.

3.0 ANALYSIS AND CONCLUSIONS

Archaeological potential is established by determining the likelihood that archaeological resources may be present on a subject property. Stantec applied archaeological potential criteria commonly used by the MTCS (Government of Ontario 2011) to determine areas of archaeological potential within the region under study. These variables include proximity to previously identified archaeological sites, distance to various types of water sources, soil texture and drainage, glacial geomorphology, elevated topography, and the general topographic variability of the area.

Potable water is the single most important resource for any extended human occupation or settlement and since water sources in southwestern Ontario have remained relatively stable over time, proximity to drinkable water is regarded as a useful index for the evaluation of archaeological site potential. In fact, distance to water is one of the most commonly used variables for predictive modeling of archaeological site location in Ontario. Distance to modern or ancient water sources is generally accepted as the most important determinant of past human settlement patterns and, considered alone, may result in a determination of archaeological potential. However, any combination of two or more other criteria, such as well-drained soils or topographic variability, may also indicate archaeological potential. Finally, extensive land disturbance can eradicate archaeological potential (Government of Ontario 2011).

When evaluating distance to water it is important to distinguish between water and shoreline, as well as natural and artificial water sources, as these features affect sites locations and types to varying degrees. The MTCS categorizes water sources in the following manner:

- Primary water sources: lakes, rivers, streams, creeks;
- Secondary water sources: intermittent streams and creeks, springs, marshes, and swamps;
- Past water sources: glacial lake shorelines, relic river or stream channels, cobble beaches, shorelines of drained lakes or marshes; and
- Accessible or inaccessible shorelines: high bluffs, swamp or marshy lake edges, sandbars stretching into marsh.

In addition to proximity to water, soil texture can be an important determinant of past settlement, usually in combination with other factors such as topography, particularly elevated topography. Storck (1982) notes that archaeological sites, particularly Paleo-Indian sites, tend to be in situated in areas of elevated topography as these areas would possess better drainage and would provide a broad view of the surrounding terrain for game watching. The proximity of registered archaeological sites also provides an opportunity to evaluate archaeological potential. For Euro-Canadian sites, archaeological potential can be extended to areas of early Euro-Canadian settlement, including places of military or pioneer settlements; early transportation routes; and properties listed on the municipal register or designated under the *Ontario Heritage Act* (Government of Ontario 1990c) or property that local histories or informants have identified with possible historical events, activities, or occupations.

3.1 PARCEL 1 ARCHAEOLOGICAL POTENTIAL

The closest primary source of extant potable water is the Detroit River, approximately 650 metres west of the Parcel 1 study area. Additional ancient and/or relic tributaries of water sources may have existed but are not identifiable today and are not indicated on historic mapping. There is one previously registered Indigenous archaeological site within one kilometre of the study area. Due to the close proximity of the Parcel 1 study area to a primary water source, the presence of a registered Indigenous archaeological site near the Parcel 1 study, and based upon background research, including an examination of the City of Windsor's *Archaeological Master Plan Study Report* (CRM Group Limited *et al*. 2005), the Parcel 1 study area is judged to retain potential for Indigenous archaeological resources.

In addition to noted Indigenous sites and trails, the historic map review in Section 1.2.2 demonstrates that the Parcel 1 study area is located in proximity to Euro-Canadian building, mills, and roadways. The Parcel 1 study area is specifically associated with the meeting point for Brock and Tecumseh's forces before the siege and capture of Detroit during the War of 1812. Further, the Parcel 1 study area is within one kilometre of six registered Euro-Canadian archaeological sites. The Parcel 1 study area is judged to retain potential for Euro-Canadian archaeological resources.

As discussed in Section 1.3.3.1, the Parcel 1 study area has been previously assessed and determined to be disturbed through visual inspection (ASI 2010). However, there is no detailed archaeological discussion in ASI's (2010) report as to what topographical characteristics were considered during the visual examination to determine that the Parcel 1 study area had been previously disturbed. As a result, and given the deep history of the Parcel 1 study area, Stantec has determined that the Parcel 1 study area retains archaeological potential.

To assist in the determination of archaeological potential, a property inspection was completed for the Parcel 1 study area. The property inspection determined that areas of archaeological potential remain within the study area and includes the portions of the study area consisting of scrubland and the overgrown stand of trees and brush (Figure 13a). The property inspection also determined that portions of the study area had been previously disturbed from right-of-way drainage ditches (see Photos 8 to 11) (Figure 13a).

To summarize, the majority of the Parcel 1 study area retains potential for the identification of Indigenous and Euro-Canadian archaeological resources. Thus, in accordance with Section 1.3.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), a Stage 2 archaeological assessment is required.

3.2 PARCEL 2 ARCHAEOLOGICAL POTENTIAL

The closest primary source of extant potable water is the Detroit River, directly adjacent to the north side of the Parcel 2 study area. Additional ancient and/or relic tributaries of water sources may have existed but are not identifiable today and are not indicated on historic mapping. There are eight registered Indigenous archaeological sites within one kilometre of the study area, including AbHs-27/AbHs-34 which is located directly to the west of the study area. This archaeological site is illustrated on historic maps of the study area as a Huron village. As noted in Section 1.3.3.2, Stage 4 mitigation of the archaeological site is in progress. It is likely that the archaeological site may extend east into the Parcel 2 study area. Due to the close proximity of the study area to a primary water source, the presence of registered archaeological sites in the vicinity, and based upon background research, including an examination of the City of Windsor's *Archaeological Master Plan Study Report* (CRM Group Limited *et al*. 2005), the Parcel 2 study area is determined to retain potential for Indigenous archaeological resources.

In addition to noted Indigenous sites and trails, the historic map review provided in Section 1.2.2 demonstrates that the study area is located in proximity to Euro-Canadian buildings, churches, mills, and roadways. The first Jesuit mission to the Hurons was located within the vicinity of the study area. Further, the study area is within one kilometre of 11 registered Euro-Canadian archaeological sites. The Parcel 2 study area is determined to retain potential for Euro-Canadian archaeological resources .

To assist in the determination of archaeological potential for the Parcel 2 study area, a property inspection was completed. The property inspection noted areas of surficial disturbance associated with the existing pathways, modern art installations, and subsurface municipal infrastructure (see Photos 21 to 24). These areas were determined, generally, to be previously disturbed on the surface. However, the depth and extent of disturbance could not be determined through visual inspection alone. Moreover, the property inspection noted small areas of sloped terrain with the Parcel 2 study area. While sloped terrain often signifies an area of low to no archaeological potential, due to the proximity of the Detroit River, the historical significance of the area, and the Indigenous archaeological site identified adjacent to the study area in a similar landscape, it was determined that these areas (e.g., sloped terrain and surficial disturbances) retain potential for archaeological resources. The land reclamation identified through aerial photography in Section 1.2.3 could not be determined through visual inspection and will require further archaeological assessment to determine the extent and nature of fill material.

To summarize, the Parcel 2 study area retains potential for the identification of Indigenous and Euro-Canadian archaeological resources. Thus, in accordance with Section 1.3.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), a Stage 2 archaeological assessment is required.

4.0 RECOMMENDATIONS

4.1 PARCEL 1 RECOMMENDATIONS

The Stage 1 archaeological assessment, including an associated property inspection, has led to the determination that portions of the study area have been subject to extensive land disturbance (i.e., municipal road ROW drainage ditching) which has removed the potential for the identification of archaeological resources. Thus, in accordance with Section 1.3.2 and Section 7.7.4 Standard 1b of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), **no further archaeological work is required for the disturbed portions of the Parcel 1 study area (Figure 13a).**

In addition to the above, the Stage 1 archaeological assessment has determined that the majority of the study area retains potential for the identification of archaeological resources. Thus, in accordance with Section 1.3.1 and Section 7.7.4 Standard 1a of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), **Stage 2 archaeological assessment is required for portions of the Parcel 1 study area which retain archaeological potential (Figure 13a).**

The objective of the Stage 2 archaeological assessment will be to document archaeological resources within the study area and to determine whether these archaeological resources require further assessment. The Stage 2 archaeological assessment will include a test pit survey in accordance with Section 2.1.2 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). The MTCS standards require that each test pit be approximately 30 centimetres in diameter, excavated to at least five centimetres in to subsoil, and have soil screened through six millimetre hardware cloth to facilitate the recovery of any cultural material that may be present. Prior to backfilling, each test pit will be examined for stratigraphy, cultural features, or evidence of fill.

If the archaeological field team determines any lands to be low and wet, steeply sloped, or disturbed during the Stage 2 field work, those areas will not require survey, but will be photographically documented in accordance with Section 2.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011).

4.2 PARCEL 2 RECOMMENDATIONS

The Stage 1 archaeological assessment, including an associated property inspection, has determined that the Parcel 2 study area retains potential for the identification of archaeological resources. This includes the area of land reclamation that could not be determined to be extensively disturbed through visual inspection. Thus, in accordance with Section 1.3.1 and Section 7.7.4 Standard 1a of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011), **Stage 2 archaeological assessment is required for the Parcel 2 study area (Figure 13b).**

The objective of the Stage 2 archaeological assessment will be to document archaeological resources within the study area and to determine whether these archaeological resources require further assessment. The Stage 2 archaeological assessment will include a test pit survey in accordance with Section 2.1.2 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011). The MTCS standards require that each test pit be approximately 30 centimetres in diameter, excavated to at least five centimetres in to subsoil, and have soil screened through six millimetre hardware cloth to facilitate the recovery of any cultural material that may be present. Prior to backfilling, each test pit will be examined for stratigraphy, cultural features, or evidence of fill.

If the archaeological field team determines any lands to be low and wet, steeply sloped, or disturbed during the Stage 2 field work, those areas will not require survey, but will be photographically documented in accordance with Section 2.1 of the MTCS' 2011 *Standards and Guidelines for Consultant Archaeologists* (Government of Ontario 2011).

The MTCS is asked to review the results presented and to accept this report into the *Ontario Public Register of Archaeological Reports*. Archaeological sites recommended for further archaeological fieldwork remain subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990c) and may not be altered, or have artifacts removed, except by a person holding an archaeological license.

5.0 ADVICE ON COMPLIANCE WITH LEGISLATION

This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c. O.18 (Government of Ontario 1990c). The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* (Government of Ontario 1990c) for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act* (Government of Ontario 1990c).

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990c). The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act* (Government of Ontario 1990c).

The *Funeral, Burial and Cremation Services Act,* 2002, S.O. 2002, c.33 (Government of Ontario 2002), requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of Cemeteries at the Ministry of Consumer Services is also immediately notified

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48(1) of the *Ontario Heritage Act* (Government on Ontario 1990c) and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.

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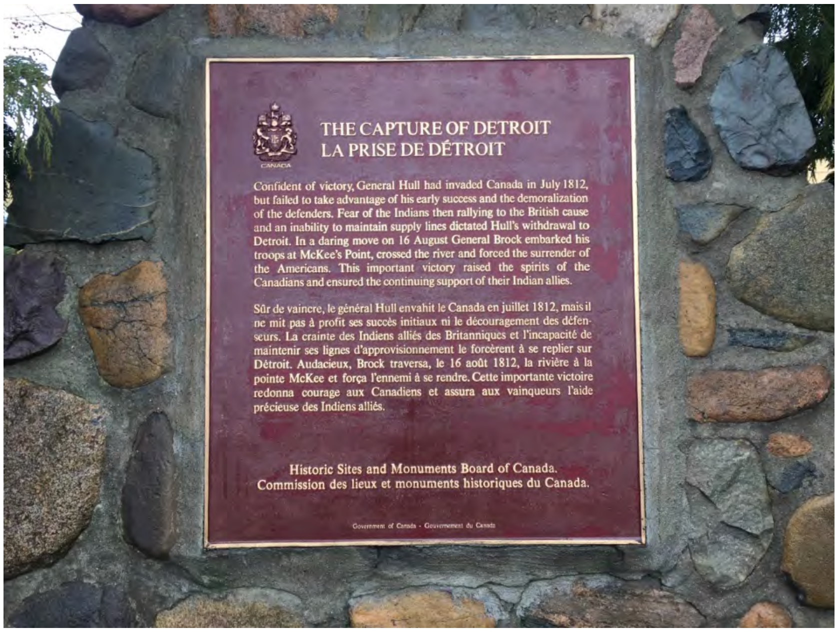
7.0 IMAGES

7.1 PLATES

Plate 1: Portrait of Alexander McKee, *circa* 1757 (Neal 1909)

Plate 2: Ontario Historical Plaque – *The Capture of Detroit*



THE CAPTURE OF DETROIT
LA PRISE DE DÉTROIT

Confident of victory, General Hull had invaded Canada in July 1812, but failed to take advantage of his early success and the demoralization of the defenders. Fear of the Indians then rallying to the British cause and an inability to maintain supply lines dictated Hull's withdrawal to Detroit. In a daring move on 16 August General Brock embarked his troops at McKee's Point, crossed the river and forced the surrender of the Americans. This important victory raised the spirits of the Canadians and ensured the continuing support of their Indian allies.

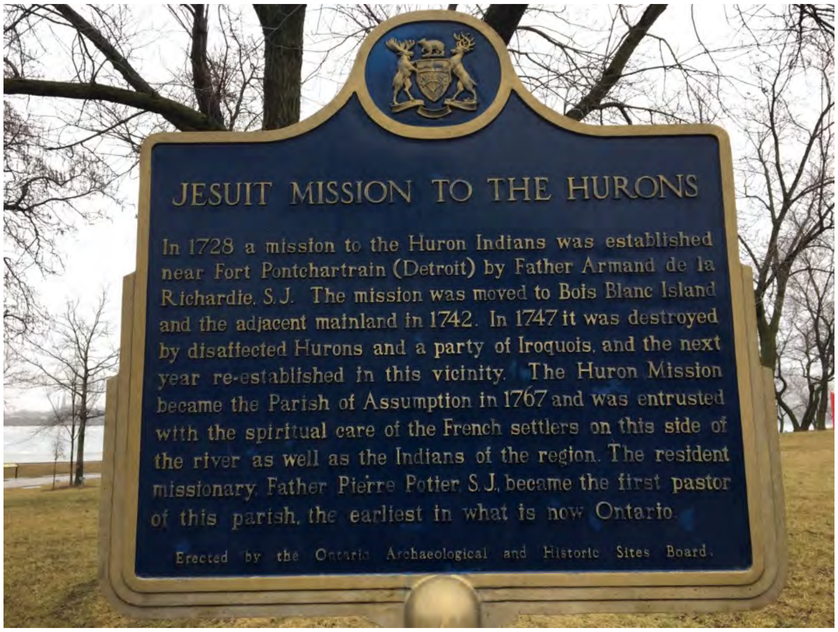
Sûr de vaincre, le général Hull envahit le Canada en juillet 1812, mais il ne mit pas à profit ses succès initiaux ni le découragement des défenseurs. La crainte des Indiens alliés des Britanniques et l'incapacité de maintenir ses lignes d'approvisionnement le forcèrent à se replier sur Détroit. Audacieux, Brock traversa, le 16 août 1812, la rivière à la pointe McKee et força l'ennemi à se rendre. Cette importante victoire redonna courage aux Canadiens et assura aux vainqueurs l'aide précieuse des Indiens alliés.

Historic Sites and Monuments Board of Canada.
Commission des lieux et monuments historiques du Canada.

Government of Canada - Gouvernement du Canada

Plate 3: Our Lady of the Assumption Church, *circa*1804, looking north towards the Detroit River (Morgan 1992)

Plate 4: Ontario Historical Plaque – *Jesuit Mission to the Hurons*



JESUIT MISSION TO THE HURONS

In 1728 a mission to the Huron Indians was established near Fort Pontchartrain (Detroit) by Father Armand de la Richardie, S.J. The mission was moved to Bois Blanc Island and the adjacent mainland in 1742. In 1747 it was destroyed by disaffected Hurons and a party of Iroquois, and the next year re-established in this vicinity. The Huron Mission became the Parish of Assumption in 1767 and was entrusted with the spiritual care of the French settlers on this side of the river as well as the Indians of the region. The resident missionary, Father Pierre Potier, S.J., became the first pastor of this parish, the earliest in what is now Ontario.

Erected by the Ontario Archaeological and Historic Sites Board.

7.2 PHOTOGRAPHS

Photo 1: View of Parcel 1 Study Area Illustrating Scrubland, facing east-southeast

Photo 2: View of Parcel 1 Study Area Illustrating Scrubland, facing north

Photo 3: View of Parcel 1 Study Area Illustrating Scrubland and Overgrown Tree Stand, facing south-southeast

Photo 4: View of Parcel 1 Study Area Illustrating Scrubland and Overgrown Tree Stand, facing northwest

Photo 5: View of Parcel 1 Study Area Illustrating Overgrown Tree Stand, facing northwest

Photo 6: View of Parcel 1 Study Area Illustrating Overgrown Tree Stand, facing north

Photo 7: View of Ontario Historical Plaque – *The Capture of Detroit*, facing northwest

Photo 8: View of Parcel 1 Study Area Illustrating Disturbed Drainage Ditch, facing north-northeast

Photo 9: View of Parcel 1 Study Area Illustrating Disturbed Drainage Ditch, facing south-southwest

Photo 10: View of Parcel 1 Study Area Illustrating Disturbed Drainage Ditch, facing south-southeast

Photo 11: View of Parcel 1 Study Area Illustrating Disturbed Drainage Ditch, facing north-northwest

Photo 12: View of Parcel 2 Study Area Illustrating Parkland, facing north-northwest

Photo 13: View of Parcel 2 Study Area Illustrating Parkland and Paved Pathways, facing southeast

Photo 14: View of Parcel 2 Study Area Illustrating Pathways and Area of Land Reclamation, facing east-northeast

Photo 15: View of Parcel 2 Study Area Illustrating Parkland and Sloped Terrain, facing southwest

Photo 16: View of Parcel 2 Study Area Illustrating Parkland and Sloped Terrain, facing northwest

Photo 17: View of Parcel 2 Study Area Illustrating Parkland, facing southwest

Photo 18: View of Parcel 2 Study Area Illustrating Parkland, facing south

Photo 19: View of Parcel 2 Study Area Illustrating Parkland and Pathways, facing northwest

Photo 20: View of Parcel 2 Study Area Illustrating Parkland and Sloped Terrain, facing west-southwest

Photo 21: View of Subsurface Municipal Infrastructure Adjacent to Parcel 2 Study Area, facing north-northwest

Photo 22: View of Parcel 2 Study Area Illustrating Existing Municipal Building, facing northwest

Photo 23: View of Parcel 2 Study Area Illustrating Modern Art Installation, facing north-northwest

Photo 24: View of Parcel 2 Study Area Illustrating Subsurface Municipal Infrastructure and Area of Land Reclamation, facing east-northeast

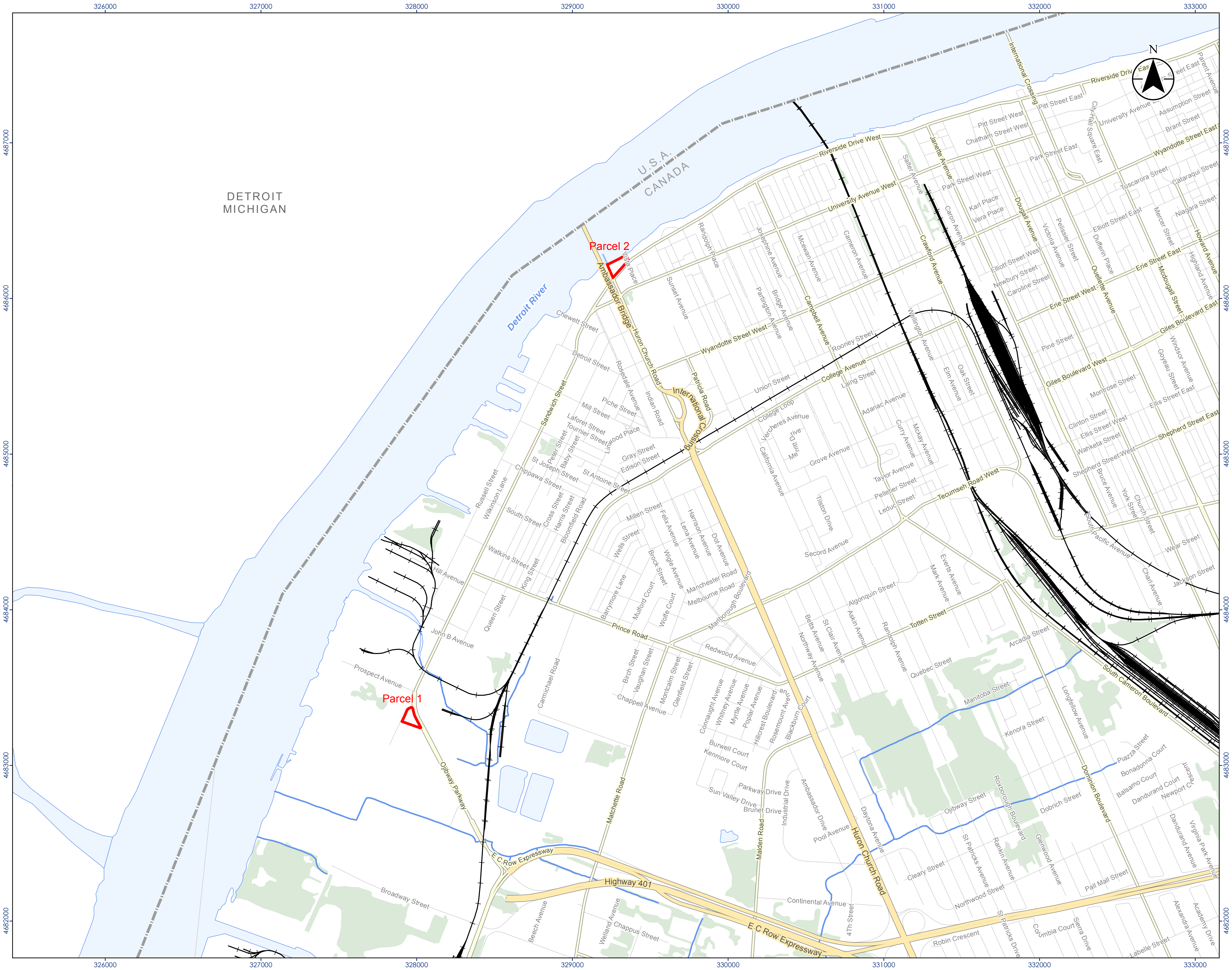
Photo 25: View of Parcel 2 Study Area Illustrating Modern Art Installation, facing southeast

Photo 26: View of Parcel 2 Study Area Illustrating Ontario Historical Plaque – *Jesuit Mission to the Hurons*, facing north

Photo 27: View of Parcel 2 Study Area Illustrating Cement Cross, facing south-southeast

8.0 MAPS

General maps of the study area follow on succeeding pages. Maps illustrating the location of archaeological sites within close proximity of the study area are provided in the Supplementary Documentation.



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Legend

🟥 Study Area

0 250 500
metres
1:25,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Contains information licensed under the Open Government License - Ontario.

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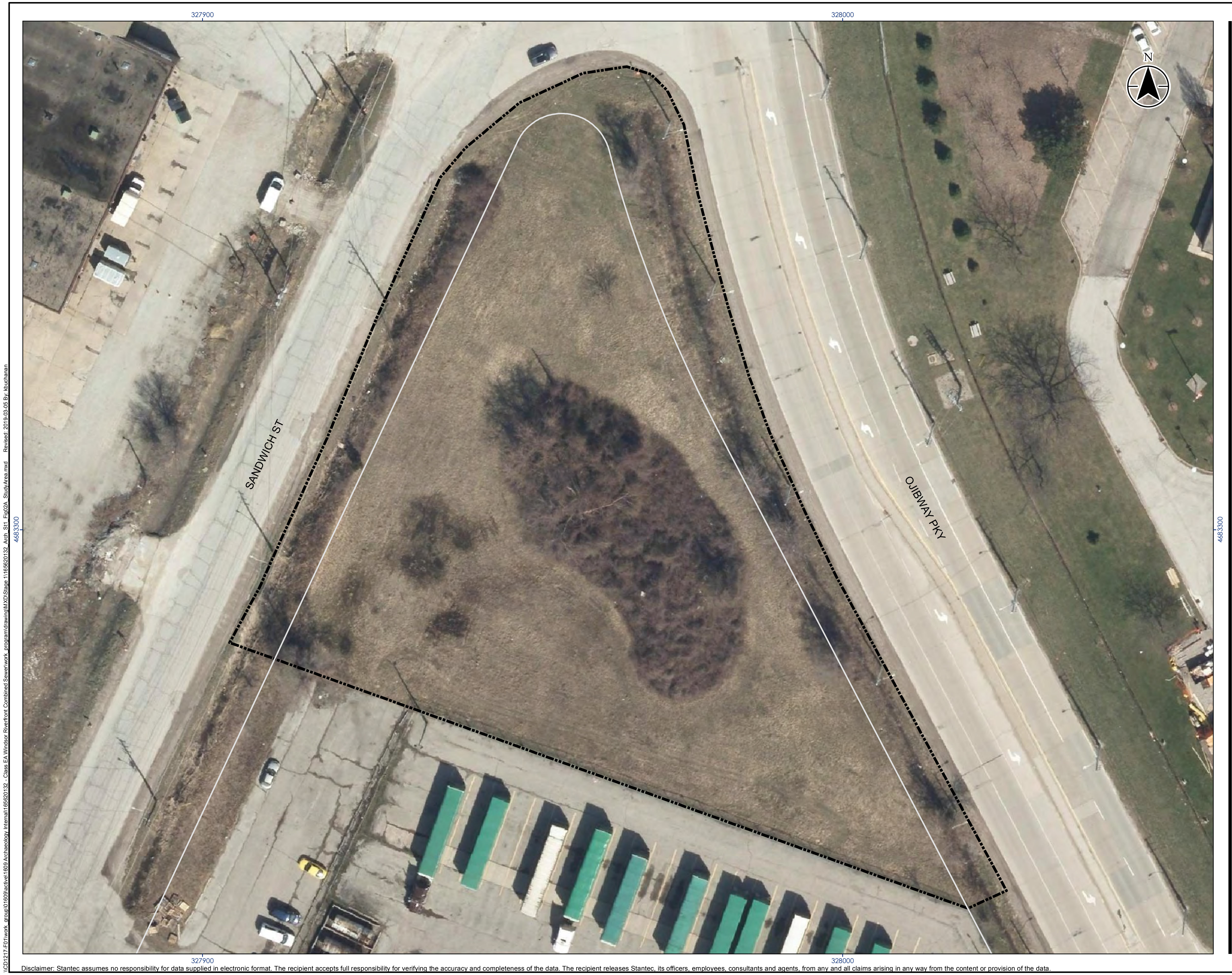
Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
1

Title
Location of the Project



Stantec

Legend

▭ Study Area

— Property Boundary

0 10 20 metres

1:600 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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3. 2017 imagery © First Base Solutions Inc., 2019.

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STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
2a

Title
Location of the Study Area - Parcel 1

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig02A_StudyArea.mxd Revised: 2019-03-05 By: kbuchanan

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Legend

▭ Study Area

— Property Boundary

0 10 20 metres

1:750 (At original document size of 11x17)

Notes

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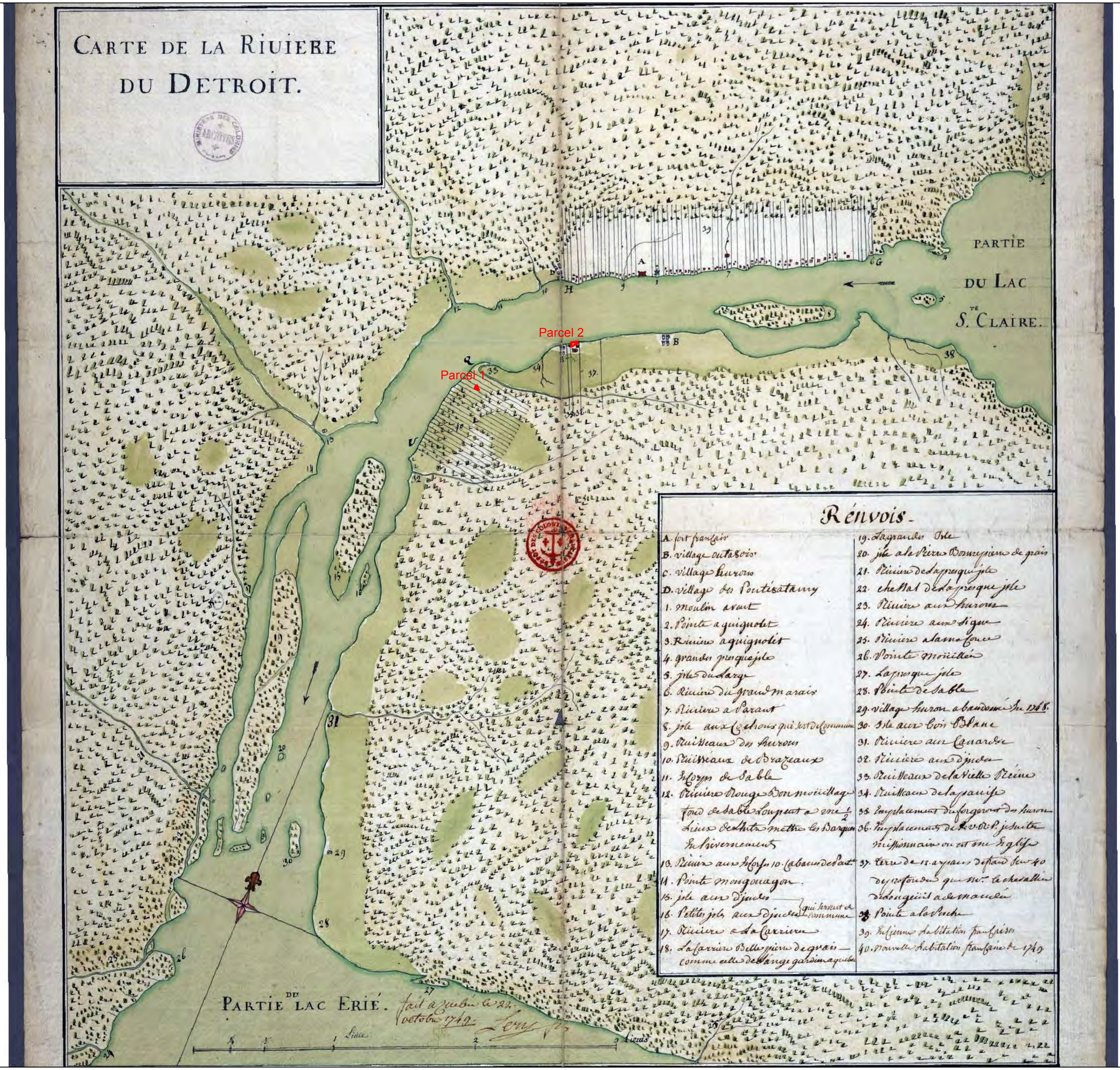
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
2b

Title
Location of the Study Area - Parcel 2

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig02B_StudyArea.mxd Revised: 2019-03-05 By: kbuchanan



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Legend

🟥 Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Chaussegros de Lery, Gaspar-Joseph. 1752. *Carte de La Riviere du Detroit depuis de le Lac Erie jusques au Lac S. Claire*. Department of Marine, Paris.

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Client/Project
CITY OF WINDSOR
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STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
3

Title
Portion of the 1749 Map of the Detroit River

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig03_Hist1949.mxd Revised: 2019-03-05 By: kbuchanan

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Legend

🟥 Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Government of Canda. n.d.a. *Map of Treaty Areas in Upper Canada*. Ottawa: Department of Indian Affairs. Survey Branch.

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Client/Project
CITY OF WINDSOR
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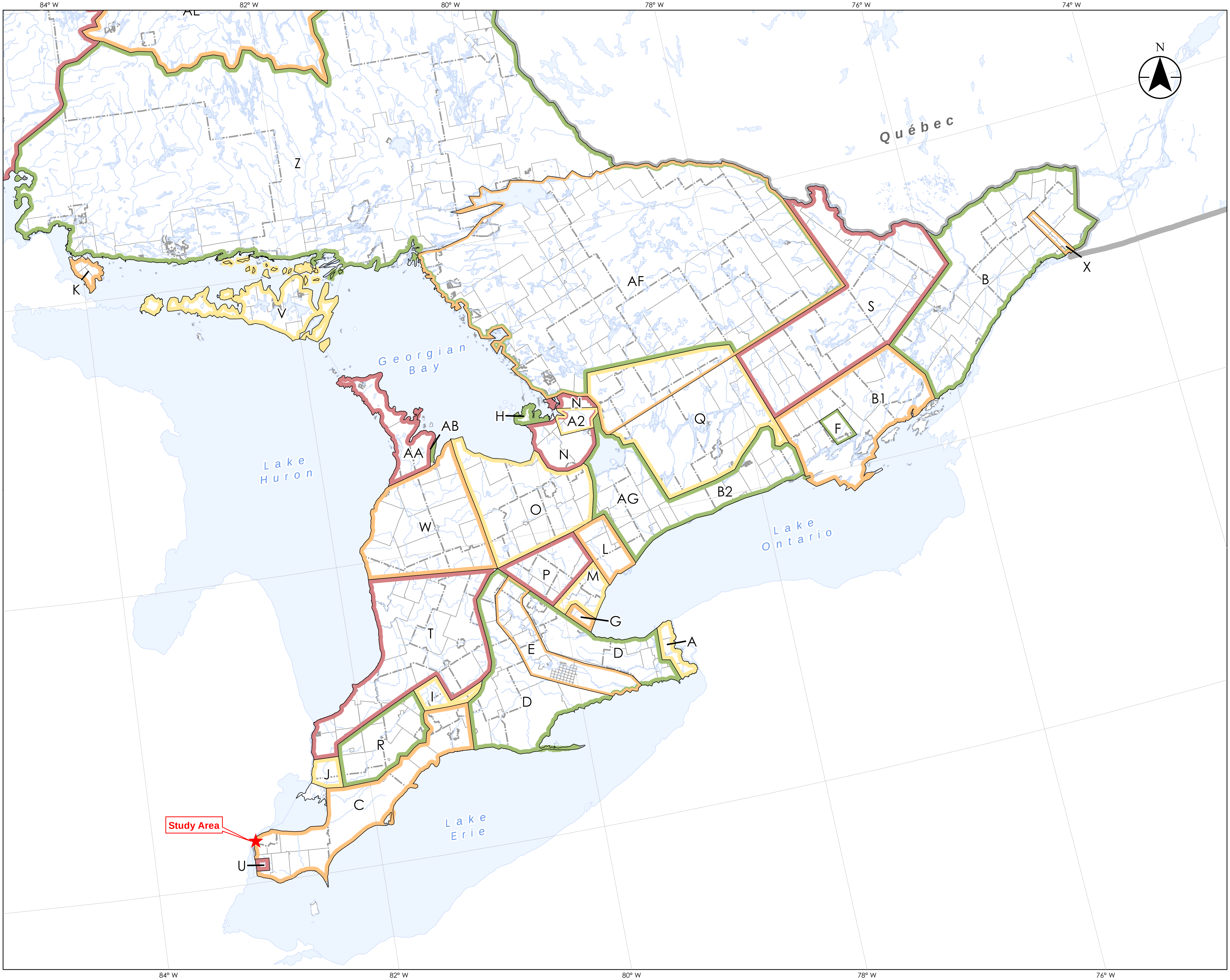
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
4

Title
Map of Treaty Areas in Upper Canada

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig04_UpperCanadaTreaties.mxd Revised: 2019-03-05 By: kbuchanan



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Legend

★	Study Area
—	Watercourse
▭	Waterbody
▭	Municipal Boundary - Upper Tier
▭	Municipal Boundary - Lower or Single Tier

A	Treaty No. 381, May 9th, 1781 (Mississauga and Chippewa)
B	Crawford's Purchase, October 9th, 1783 (Algonquin and Iroquois)
B1	Crawford's Purchase, October 9th, 1783 (Mississauga)
B2	Crawford's Purchases, 1784, 1787 And 1788 (Mississauga)
A2	John Collins' Purchase, 1785 (Chippewa)
C	Treaty No. 2, May 19th, 1790 (Odawa, Chippewa, Pottawatomi, and Huron)
D	Treaty No. 3, December 2nd, 1792 (Mississauga)
E	Haldimand Tract:from the Crown to the Mohawk, 1793
F	Tyendinaga:from the Crown to the Mohawk, 1793
G	Treaty No. 3 3/4:from the Crown to Joseph Brant, October 24th, 1795
H	Treaty No. 5, May 22nd, 1798 (Chippewa)
I	Treaty No. 6, September 7th, 1796 (Chippewa)
J	Treaty No. 7, September 7th, 1796 (Chippewa)
L	Treaty No. 13, August 1st, 1805 (Mississauga)
M	Treaty No. 13A, August 2nd, 1805 (Mississauga)
N	Treaty No.16, November 18th, 1815 (Chippewa)
O	Treaty No. 18, October 17th, 1818 (Chippewa)
P	Treaty No. 19, October 28th 1818 (Chippewa)
Q	Treaty No. 20, November 5th, 1818 (Chippewa)
R	Treaty No. 21, March 9th, 1819 (Chippewa)
S	Treaty No. 27, May 31st, 1819 (Mississauga)
T	Treaty No. 27½, April 25th, 1825 (Ojibwa and Chippewa)
U	Treaty No. 35, August 13th, 1833 (Wyandot or Huron)
V	Treaty No. 45, August 9th, 1836 (Chippewa and Odawa, "For All Indians To Reside Thereon")
W	Treaty No. 45½, August 9th, 1836 (Saugeen)
X	Treaty No. 57, June 1st, 1847 (Iroquois of St. Regis)
Z	Treaty No. 61, September 9th, 1850 (Robinson Treaty:Ojibwa)
AA	Treaty No. 72, October 30th, 1854 (Chippewa)
AB	Treaty No. 82, February 9th, 1857 (Chippewa)
AF	Williams Treaty, October 31st and November 15th, 1923 (Chippewa and Mississauga)
AG	Williams Treaty, October 31st, 1923 (Chippewa)

0 50 100 Km
1:3,000,000 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 Statistics Canada Lambert
2. Contains information used under the Open Government License - Ontario.

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CITY OF WINDSOR
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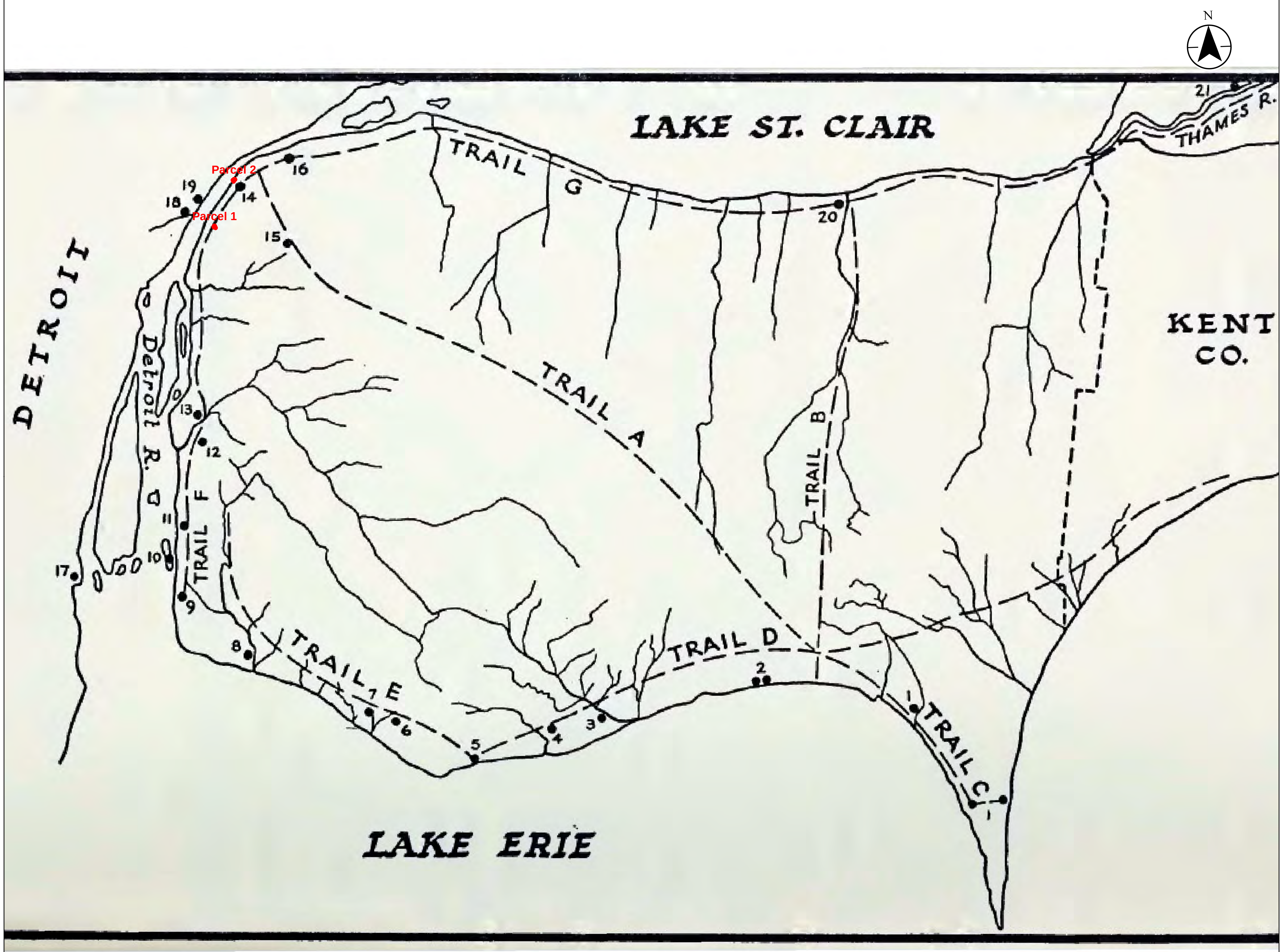
Figure No.
5

Title
Treaties and Purchases
(Adapted from Morris 1943)

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig05_Treaties.mxd Revised: 2019-03-01 By: kbuchanan



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Legend

🟥 Approximate Location of Study Area

Indigenous Places Found in Essex County and Vicinity

1. Village, cornfields, and portage, Point Pelee (plan by Iredell 1799)
2. Two Indigenous entrenchments, Gosfield Township (plan by McNiff 1794)
3. Village on Cedar Creek, entrenched, Gosfield Township
4. Village, Colchester, South Township
5. Indigenous encampment, Colchester Township (McNiff 1794)
6. Village and mound, Daniel Wright farm, Colchester Township
7. Several mounds, Colchester Township
8. Village, Big Creek (plan by Iredell 1796)
9. Former village of the Hurons abandoned in 1748 (map by Chaussegros de Léry, fils, 1749)
10. Camping site used by all tribes, Bois Blanc Island
11. Village above Fort Malden (McNiff's map of 1790)
12. Huron village, Anderdon Township (McNiff 1790)
13. Cornfields, Anderdon Township (McNiff 1790)
14. Huron village, Huron Church Line
15. Burial mound, Huron Church Line and Third Concession, Sandwich West Township (excavated by W.J. Wintemberg for National Museum of Canada 1936)
16. Ottawa village and cemetery, Louis Avenue, Windsor (Chaussegros de Léry 1754)
17. Huron village, Brownstowe, Wayne County, Michigan
18. The great mound at the mouth of the Rouge River, Wayne County, Michigan
19. Circular mound and several smaller mounds at old Fort Wayne
20. Indigenous village, Ruscom River, Rochester Township (plan by Col. Burwell 1823)
21. Chippewa town reported by Major E.B. Littlehales in 1793

Indigenous Trails and Paths

A. Talbot Road, through the county from beyond Wheatley to Sandwich (shown on McNiff's map of 1791)
B. From Lake Erie to Lake St. Clair, following the Ruscum River (Burwell's map 1823)
C. From Point Pelee to Talbot Road
D. Lake Erie trail connecting shoreline settlements
E. From Lake Erie shoreline to Amherstburg area
F. River shore path, now Highway 18
G. River and lake shoreline to the Thames River and eastward, followed by Governor Simcoe in 1793

Notes

1. Historical mapping not to scale.
2. Source: Lajeunesse, Ernest J. 1960. *The Windsor Border Region: Canada's Southernmost Frontier.* The Champlain Society. Toronto: University of Toronto Press.

Project Location
City of Windsor

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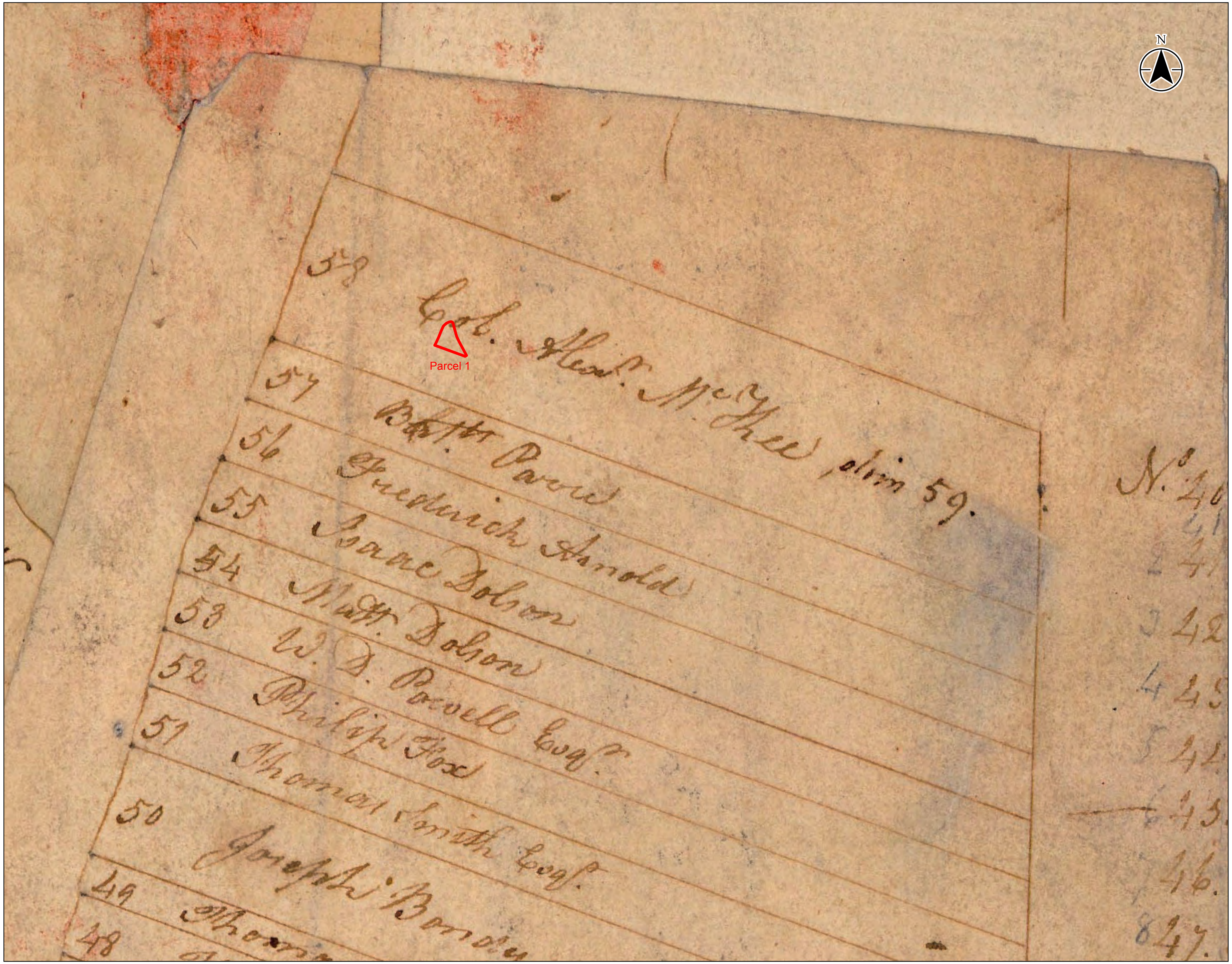
Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
6

Title
Documented Indigenous Activity in Essex County

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig06_IndigenousActivity.mxd Revised: 2019-03-05 By: kbuchanan



Legend

□ Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Iredell, Abraham. 1797. Sandwich. Unpublished map, on file with the Ministry of Natural Resources Crown Land Survey Records Office, Peterborough, Ontario.

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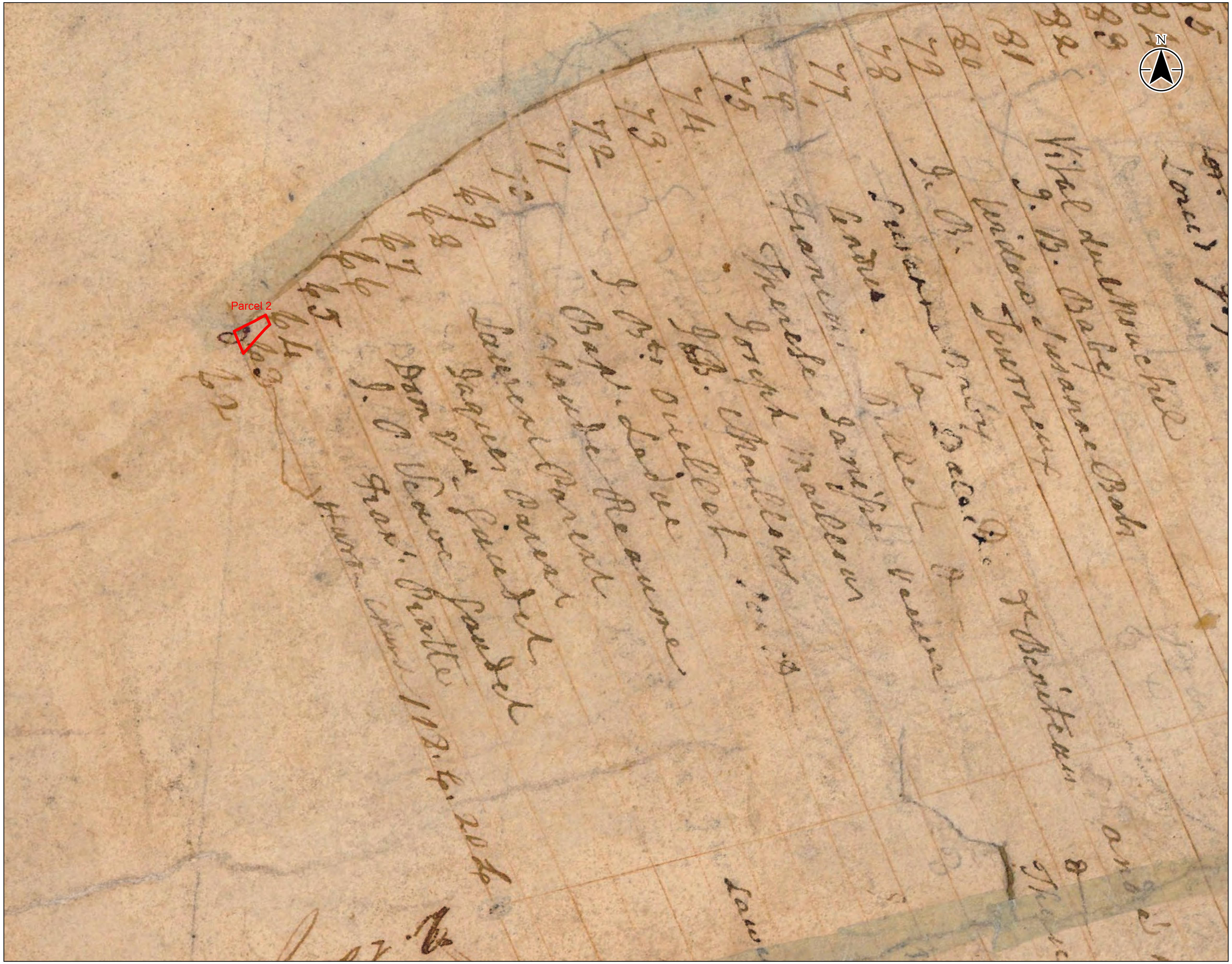
Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
7a

Title
Portion of the 1797 Plan of a Portion of Sandwich Township - Parcel 1

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig07A_Hist1797.mxd Revised: 2019-03-05 By: kbuchanan



Stantec

Legend

🟥 Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Iredell, Abraham. 1803. Sandwich. Unpublished map, on file with the Ministry of Natural Resources Crown Land Survey Records Office, Peterborough, Ontario.

Project Location
City of Windsor

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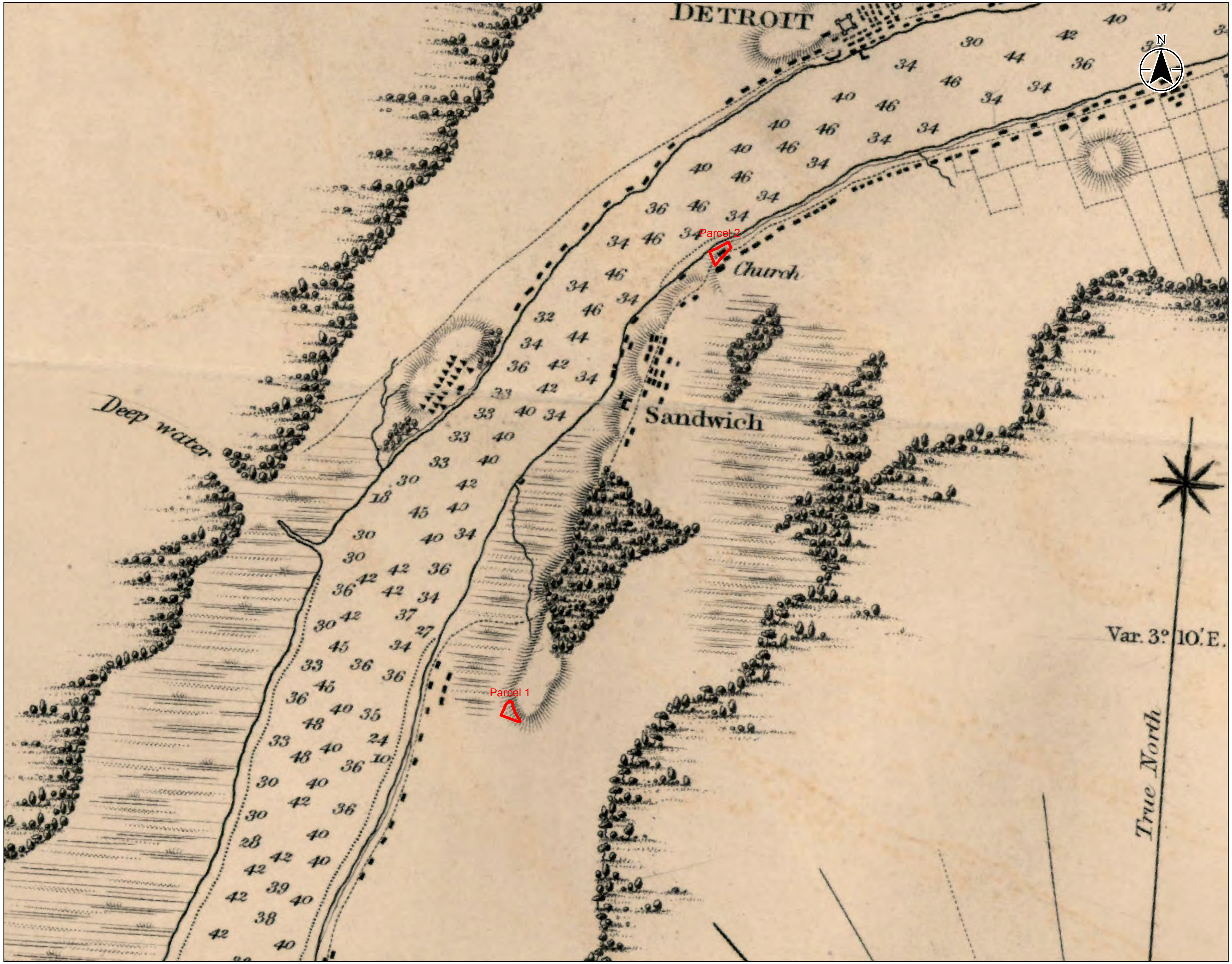
Prepared by KDB on 2019-03-05

Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
7b

Title
Portion of the 1803 Plan of a Portion of Sandwich Township - Parcel 2

\\CD1217-F01\work_group\01609\active\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig07B_Hist1803.mxd Revised: 2019-03-05 By: kbuchanan



Legend

▭ Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Owen, W.F.W., Capatin R.N. 1828 *A Survey of the River Detroit: From Lake Erie to Lake St. Clair.* J and C Walker. Library and Archives Canada.

Project Location
City of Windsor

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Prepared by KDB on 2019-03-05

Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
8

Title
Portion of the 1828 Historical Map of a Survey of the Detroit River

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig08_Hist1828.mxd Revised: 2019-03-05 By: kbuchanan

Stantec

Legend

🟥 Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Billyard, William and Richard Parr. 1847. *Map of the Western District in the Province of Canada.* Toronto: Scobie and Balfour.

Project Location
City of Windsor

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Prepared by KDB on 2019-03-05

Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
9

Title
Portion of the 1847 Historical Map of Western District

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig09_Hist1847.mxd Revised: 2019-03-05 By: kbuchanan

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Legend

🟥 Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Walling, H.F. 1877. *Map of Essex County, Ontario.* R.M. Tackabury.

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City of Windsor

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Prepared by KDB on 2019-03-05

Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
10

Title
Portion of the 1877 Historical Map of Essex County

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig10_Hist1877.mxd Revised: 2019-03-05 By: kbuchanan

Legend

▭ Approximate Location of Study Area

Notes

1. Historical mapping not to scale.
2. Source: Belden, H. and Co. 1881. *Essex Supplement in Illustrated Historical Atlas of the Dominion of Canada.* Toronto: Belden and Co.

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CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
11

Title
Portion of the 1881 Historical Map of Sandwich Township

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig11_Hist1881.mxd Revised: 2019-03-05 By: kbuchanan

Stantec

Legend

▭ Approximate Location of Study Area

Notes
1. Non-orthorectified imagery not to scale.
2. Source: DTE Aerial Photo Collection at Wayne State University.

Project Location
City of Windsor

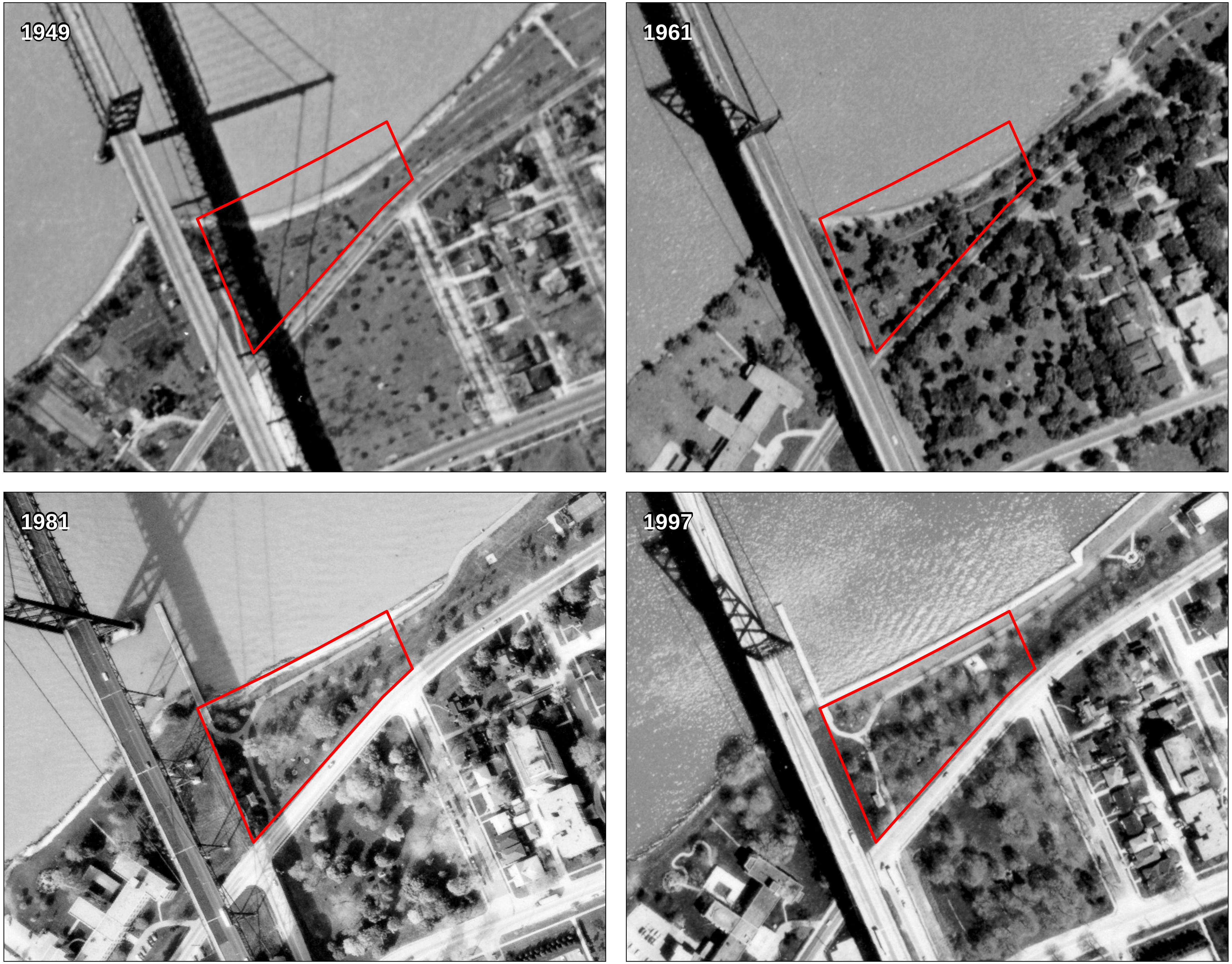
Prepared by KDB on 2019-03-01

Client/Project
165620132 REVA
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
12a

Title
Aerial Photography - Parcel 1

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig12A_Photos.mxd Revised: 2019-03-01 By: kbuchanan



Stantec

Legend
🟥 Approximate Location of Study Area

Notes
1. Non-orthorectified imagery not to scale.
2. Source: DTE Aerial Photo Collection at Wayne State University.

Project Location
City of Windsor
Prepared by KDB on 2019-03-01

Client/Project
165620132 REVA
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
12b

Title
Aerial Photography - Parcel 2

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig12B_Photos.mxd Revised: 2019-03-01 By: kbuchanan

Stantec

Legend

⬚ Study Area

Photo Location and Direction

⊗ Reference Point (Historic Plaque)

Property Boundary

Stage 2 Archaeological

Archaeological Potential

🟧 Retains Archaeological Potential - Stage 2 Required, Test Pit Survey

🟪 Previously Disturbed - No Furhter Archaeological Work Required

0 10 20 metres

1:750 (At original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Contains information licensed under the Open Government License - Ontario.
3. 2017 imagery © First Base Solutions Inc., 2019.

Project Location
City of Windsor

165620132 REVA
Prepared by KDB on 2019-03-05

Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
13a

Title
Parcel 1 Stage 1 Results -
Areas of Archaeological Potential

\\CD1217-F01\work_group\01609\active\1609 Archaeology Internal\165620132 - Class EA Windsor Riverfront Combined Sewer\work_program\drawing\MXD\Stage 1\165620132_Arch_St1_Fig13A_Results.mxd Revised: 2019-03-05 By: kbuchanan

Stantec

Legend

- ⬚ Study Area
- ♁ Photo Location and Direction
- ⊗ Reference Point (Historic Plaque)
- — Property Boundary

Stage 2 Archaeological

Archaeological Potential

- 🟧 Retains Archaeological Potential - Stage 2 Required, Test Pit Survey
- 🟩 Land Reclamation - Stage 2 Required, Test Pit Survey to Confirm Disturbance

0 10 20
metres
1:750 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Contains information licensed under the Open Government License - Ontario.
3. 2017 imagery © First Base Solutions Inc., 2019.

Project Location City of Windsor	165620132 REVA Prepared by KDB on 2019-03-05

Client/Project
CITY OF WINDSOR
RIVERFRONT WEST CSO CONTROL MCEA
STAGE 1 ARCHAEOLOGICAL ASSESSMENT

Figure No.
13b

Title
Parcel 2 Stage 1 Results -
Areas of Archaeological Potential

9.0 CLOSURE

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential archaeological resources associated with the identified property.

All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report and are based solely on the scope of work described in the report, the limited data available and the results of the work. The conclusions are based on the conditions encountered by Stantec at the time the work was performed. Due to the nature of archaeological assessment, which consists of systematic sampling, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire property.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report. We trust this report meets your current requirements. Please do not hesitate to contact us should you require further information or have additional questions about any facet of this report.

Quality Review Jeffrey Muir
(signature)

Jeffrey Muir, Senior Archaeologist

Independent Review
(signature)

Colin Varley, Senior Associate, Senior Archaeologist

APPENDIX D

Heritage Screening Checklist

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
  - is a recognized heritage property
  - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
  - the main project area
  - temporary storage
  - staging and working areas
  - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Cultural Heritage Evaluation Report (CHER)

If you are not sure how to answer one or more of the questions on the checklist, you may want to hire a qualified person(s) (see page 5 for definitions) to undertake a cultural heritage evaluation report (CHER).

The CHER will help you:

- identify, evaluate and protect cultural heritage resources on your property or project area
- reduce potential delays and risks to a project

Other checklists

Please use a separate checklist for your project, if:

- you are seeking a Renewable Energy Approval under Ontario Regulation 359/09 – separate checklist
- your Parent Class EA document has an approved screening criteria (as referenced in Question 1)

Please refer to the Instructions pages for more detailed information and when completing this form.

Project or Property Name
Combined Sewer Overflow Control in the Riverfront Area West of Caron Avenue, City of Windsor

Project or Property Location (upper and lower or single tier municipality)
City of Windsor

Proponent Name
Ed Valdez, P. Eng., Manager of Process Engineering & Maintenance, City of Windsor

Proponent Contact Information
Address: 4155 Ojibway Pkwy. Windsor, Ontario N9C 4A5 Canada Email: evaldez@city.windsor.on.ca

Screening Questions

	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?	☐	☑

If Yes, please follow the pre-approved screening checklist, methodology or process.

If No, continue to Question 2.

Part A: Screening for known (or recognized) Cultural Heritage Value

	Yes	No
2. Has the property (or project area) been evaluated before and found **not** to be of cultural heritage value?	☐	☑

If Yes, do **not** complete the rest of the checklist.

The proponent, property owner and/or approval authority will:

- summarize the previous evaluation and
- add this checklist to the project file, with the appropriate documents that demonstrate a cultural heritage evaluation was undertaken

The summary and appropriate documentation may be:

- submitted as part of a report requirement
- maintained by the property owner, proponent or approval authority

If No, continue to Question 3.

	Yes	No
3. Is the property (or project area):		
a. identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value?	☐	☑
b. a National Historic Site (or part of)?	☐	☑
c. designated under the *Heritage Railway Stations Protection Act*?	☐	☑
d. designated under the *Heritage Lighthouse Protection Act*?	☐	☑
e. identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?	☐	☑
f. located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐	☑

If Yes to any of the above questions, you need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report, if a Statement of Cultural Heritage Value has not previously been prepared or the statement needs to be updated

If a Statement of Cultural Heritage Value has been prepared previously and if alterations or development are proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No, continue to Question 4.

Part B: Screening for Potential Cultural Heritage Value

	Yes	No
4. Does the property (or project area) contain a parcel of land that:		
a. is the subject of a municipal, provincial or federal commemorative or interpretive plaque?	☐	☑
b. has or is adjacent to a known burial site and/or cemetery?	☐	☑
c. is in a Canadian Heritage River watershed?	☐	☑
d. contains buildings or structures that are 40 or more years old?	☐	☑

Part C: Other Considerations

	Yes	No
5. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?	☐	☑
b. has a special association with a community, person or historical event?	☐	☑
c. contains or is part of a cultural heritage landscape?	☐	☑

If Yes to one or more of the above questions (Part B and C), there is potential for cultural heritage resources on the property or within the project area.

You need to hire a qualified person(s) to undertake:

- a Cultural Heritage Evaluation Report (CHER)

If the property is determined to be of cultural heritage value and alterations or development is proposed, you need to hire a qualified person(s) to undertake:

- a Heritage Impact Assessment (HIA) – the report will assess and avoid, eliminate or mitigate impacts

If No to all of the above questions, there is low potential for built heritage or cultural heritage landscape on the property.

The proponent, property owner and/or approval authority will:

- summarize the conclusion
- add this checklist with the appropriate documentation to the project file

The summary and appropriate documentation may be:

- submitted as part of a report requirement e.g. under the *Environmental Assessment Act, Planning Act* processes
- maintained by the property owner, proponent or approval authority

Instructions

Please have the following available, when requesting information related to the screening questions below:

- a clear map showing the location and boundary of the property or project area
  - large scale and small scale showing nearby township names for context purposes
- the municipal addresses of all properties within the project area
- the lot(s), concession(s), and parcel number(s) of all properties within a project area

For more information, see the Ministry of Tourism, Culture and Sport's Ontario Heritage Toolkit or Standards and Guidelines for Conservation of Provincial Heritage Properties.

In this context, the following definitions apply:

- **qualified person(s)** means individuals – professional engineers, architects, archaeologists, etc. – having relevant, recent experience in the conservation of cultural heritage resources.
- **proponent** means a person, agency, group or organization that carries out or proposes to carry out an undertaking or is the owner or person having charge, management or control of an undertaking.

1. Is there a pre-approved screening checklist, methodology or process in place?

An existing checklist, methodology or process may already be in place for identifying potential cultural heritage resources, including:

- one endorsed by a municipality
- an environmental assessment process e.g. screening checklist for municipal bridges
- one that is approved by the Ministry of Tourism, Culture and Sport (MTCS) under the Ontario government's Standards & Guidelines for Conservation of Provincial Heritage Properties [s.B.2.]

Part A: Screening for known (or recognized) Cultural Heritage Value

2. Has the property (or project area) been evaluated before and found not to be of cultural heritage value?

Respond 'yes' to this question, if all of the following are true:

A property can be considered not to be of cultural heritage value if:

- a Cultural Heritage Evaluation Report (CHER) - or equivalent - has been prepared for the property with the advice of a qualified person and it has been determined not to be of cultural heritage value and/or
- the municipal heritage committee has evaluated the property for its cultural heritage value or interest and determined that the property is not of cultural heritage value or interest

A property may need to be re-evaluated, if:

- there is evidence that its heritage attributes may have changed
- new information is available
- the existing Statement of Cultural Heritage Value does not provide the information necessary to manage the property
- the evaluation took place after 2005 and did not use the criteria in Regulations 9/06 and 10/06

Note: Ontario government ministries and public bodies [prescribed under Regulation 157/10] may continue to use their existing evaluation processes, until the evaluation process required under section B.2 of the Standards & Guidelines for Conservation of Provincial Heritage Properties has been developed and approved by MTCS.

To determine if your property or project area has been evaluated, contact:

- the approval authority
- the proponent
- the Ministry of Tourism, Culture and Sport

3a. Is the property (or project area) identified, designated or otherwise protected under the *Ontario Heritage Act* as being of cultural heritage value e.g.:

i. designated under the *Ontario Heritage Act*

- individual designation (Part IV)
- part of a heritage conservation district (Part V)

Individual Designation – Part IV

A property that is designated:

- by a municipal by-law as being of cultural heritage value or interest [s.29 of the *Ontario Heritage Act*]
- by order of the Minister of Tourism, Culture and Sport as being of cultural heritage value or interest of provincial significance [s.34.5]. **Note**: To date, no properties have been designated by the Minister.

Heritage Conservation District – Part V

A property or project area that is located within an area designated by a municipal by-law as a heritage conservation district [s. 41 of the *Ontario Heritage Act*].

For more information on Parts IV and V, contact:

- municipal clerk
- Ontario Heritage Trust
- local land registry office (for a title search)

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ii. subject of an agreement, covenant or easement entered into under Parts II or IV of the *Ontario Heritage Act*

An agreement, covenant or easement is usually between the owner of a property and a conservation body or level of government. It is usually registered on title.

The primary purpose of the agreement is to:

- preserve, conserve, and maintain a cultural heritage resource
- prevent its destruction, demolition or loss

For more information, contact:

- Ontario Heritage Trust - for an agreement, covenant or easement [clause 10 (1) (c) of the *Ontario Heritage Act*]
- municipal clerk – for a property that is the subject of an easement or a covenant [s.37 of the *Ontario Heritage Act*]
- local land registry office (for a title search)

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iii. listed on a register of heritage properties maintained by the municipality

Municipal registers are the official lists - or record - of cultural heritage properties identified as being important to the community.

Registers include:

- all properties that are designated under the *Ontario Heritage Act* (Part IV or V)
- properties that have not been formally designated, but have been identified as having cultural heritage value or interest to the community

For more information, contact:

- municipal clerk
- municipal heritage planning staff
- municipal heritage committee

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iv. subject to a notice of:

- intention to designate (under Part IV of the *Ontario Heritage Act*)
- a Heritage Conservation District study area bylaw (under Part V of the *Ontario Heritage Act*)

A property that is subject to a **notice of intention to designate** as a property of cultural heritage value or interest and the notice is in accordance with:

- section 29 of the *Ontario Heritage Act*
- section 34.6 of the *Ontario Heritage Act.* **Note**: To date, the only applicable property is Meldrum Bay Inn, Manitoulin Island. [s.34.6]

An area designated by a municipal by-law made under section 40.1 of the *Ontario Heritage Act* as a **heritage conservation district study area**.

For more information, contact:

- municipal clerk – for a property that is the subject of notice of intention [s. 29 and s. 40.1]
- Ontario Heritage Trust

v. included in the Ministry of Tourism, Culture and Sport's list of provincial heritage properties

Provincial heritage properties are properties the Government of Ontario owns or controls that have cultural heritage value or interest.

The Ministry of Tourism, Culture and Sport (MTCS) maintains a list of all provincial heritage properties based on information provided by ministries and prescribed public bodies. As they are identified, MTCS adds properties to the list of provincial heritage properties.

For more information, contact the MTCS Registrar at registrar@ontario.ca.

3b. Is the property (or project area) a National Historic Site (or part of)?

National Historic Sites are properties or districts of national historic significance that are designated by the Federal Minister of the Environment, under the *Canada National Parks Act*, based on the advice of the Historic Sites and Monuments Board of Canada.

For more information, see the National Historic Sites website.

3c. Is the property (or project area) designated under the *Heritage Railway Stations Protection Act*?

The *Heritage Railway Stations Protection Act* protects heritage railway stations that are owned by a railway company under federal jurisdiction. Designated railway stations that pass from federal ownership may continue to have cultural heritage value.

For more information, see the Directory of Designated Heritage Railway Stations.

3d. Is the property (or project area) designated under the *Heritage Lighthouse Protection Act*?

The *Heritage Lighthouse Protection Act* helps preserve historically significant Canadian lighthouses. The Act sets up a public nomination process and includes heritage building conservation standards for lighthouses which are officially designated.

For more information, see the Heritage Lighthouses of Canada website.

3e. Is the property (or project area) identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office?

The role of the Federal Heritage Buildings Review Office (FHBRO) is to help the federal government protect the heritage buildings it owns. The policy applies to all federal government departments that administer real property, but not to federal Crown Corporations.

For more information, contact the Federal Heritage Buildings Review Office.

See a directory of all federal heritage designations.

3f. Is the property (or project area) located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?

A UNESCO World Heritage Site is a place listed by UNESCO as having outstanding universal value to humanity under the Convention Concerning the Protection of the World Cultural and Natural Heritage. In order to retain the status of a World Heritage Site, each site must maintain its character defining features.

Currently, the Rideau Canal is the only World Heritage Site in Ontario.

For more information, see Parks Canada – World Heritage Site website.

Part B: Screening for potential Cultural Heritage Value

4a. Does the property (or project area) contain a parcel of land that has a municipal, provincial or federal commemorative or interpretive plaque?

Heritage resources are often recognized with formal plaques or markers.

Plaques are prepared by:

- municipalities
- provincial ministries or agencies
- federal ministries or agencies
- local non-government or non-profit organizations

For more information, contact:

- municipal heritage committees or local heritage organizations – for information on the location of plaques in their community
- Ontario Historical Society's Heritage directory – for a list of historical societies and heritage organizations
- Ontario Heritage Trust – for a list of plaques commemorating Ontario's history
- Historic Sites and Monuments Board of Canada – for a list of plaques commemorating Canada's history

4b. Does the property (or project area) contain a parcel of land that has or is adjacent to a known burial site and/or cemetery?

For more information on known cemeteries and/or burial sites, see:

- Cemeteries Regulations, Ontario Ministry of Consumer Services – for a database of registered cemeteries
- Ontario Genealogical Society (OGS) – to locate records of Ontario cemeteries, both currently and no longer in existence; cairns, family plots and burial registers
- Canadian County Atlas Digital Project – to locate early cemeteries

In this context, adjacent means contiguous or as otherwise defined in a municipal official plan.

4c. Does the property (or project area) contain a parcel of land that is in a Canadian Heritage River watershed?

The Canadian Heritage River System is a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage.

Canadian Heritage Rivers must have, and maintain, outstanding natural, cultural and/or recreational values, and a high level of public support.

For more information, contact the Canadian Heritage River System.

If you have questions regarding the boundaries of a watershed, please contact:

- your conservation authority
- municipal staff

4d. Does the property (or project area) contain a parcel of land that contains buildings or structures that are 40 or more years old?

A 40 year 'rule of thumb' is typically used to indicate the potential of a site to be of cultural heritage value. The approximate age of buildings and/or structures may be estimated based on:

- history of the development of the area
- fire insurance maps
- architectural style
- building methods

Property owners may have information on the age of any buildings or structures on their property. The municipality, local land registry office or library may also have background information on the property.

Note: 40+ year old buildings or structure do not necessarily hold cultural heritage value or interest; their age simply indicates a higher potential.

A building or structure can include:

- residential structure
- farm building or outbuilding
- industrial, commercial, or institutional building
- remnant or ruin
- engineering work such as a bridge, canal, dams, etc.

For more information on researching the age of buildings or properties, see the Ontario Heritage Tool Kit Guide Heritage Property Evaluation.

Part C: Other Considerations

5a. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) is considered a landmark in the local community or contains any structures or sites that are important to defining the character of the area?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has potential landmarks or defining structures and sites, for instance:

- buildings or landscape features accessible to the public or readily noticeable and widely known
- complexes of buildings
- monuments
- ruins

5b. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) has a special association with a community, person or historical event?

Local or Aboriginal knowledge may reveal that the project location is situated on a parcel of land that has a special association with a community, person or event of historic interest, for instance:

- Aboriginal sacred site
- traditional-use area
- battlefield
- birthplace of an individual of importance to the community

5c. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area) contains or is part of a cultural heritage landscape?

Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community.

For example, an Aboriginal trail, historic road or rail corridor may have been established as a key transportation or trade route and may have been important to the early settlement of an area. Parks, designed gardens or unique landforms such as waterfalls, rock faces, caverns, or mounds are areas that may have connections to a particular event, group or belief.

For more information on Questions 5.a., 5.b. and 5.c., contact:

- Elders in Aboriginal Communities or community researchers who may have information on potential cultural heritage resources. Please note that Aboriginal traditional knowledge may be considered sensitive.
- municipal heritage committees or local heritage organizations
- Ontario Historical Society's "Heritage Directory" - for a list of historical societies and heritage organizations in the province

An internet search may find helpful resources, including:

- historical maps
- historical walking tours
- municipal heritage management plans
- cultural heritage landscape studies
- municipal cultural plans

Information specific to trails may be obtained through Ontario Trails.

APPENDIX E

- Windsor CSO Treatability Study Modelling of a Retention Treatment Basin (RTB)
- Model Analysis of Required CSO Capture Rates

APPENDIX E-1

Windsor CSO Treatability Study Modelling of a Retention Treatment Basin (RTB)

Modeling a Retention Treatment Basin for CSO

J. Alex McCorquodale[1]; Alonso Griborio[2]; JianGuo Li[3]; Harold Horneck[4]; and Nihar Biswas[5]

Abstract: Combined sewer overflows (CSOs) result in hazardous and unsightly contamination of receiving waters, particularly swimming areas. The removal of suspended solids and associated biological oxygen demand (BOD) can accelerate the recovery following a CSO event. This paper presents a numerical model to simulate the solids removal efficiency of a retention treatment basin (RTB) that utilizes polymers to improve the flocculation and settling rates for the suspended solids. The model includes settleable, nonsettleable, and floatable solids. The sludge is treated as a non-Newtonian fluid. Discrete, zone, and compression settling/floatation regimes are included. In-tank flocculation and a storage zone for sludge flushing are also included in the model. The model was calibrated and validated with data from a RTB pilot plant, and was applied to evaluate preliminary designs for a prototype RTB for the City of Windsor. The calibrated model showed that the optimum location of the target baffle was approximately 30% of the distance to the scum baffle. For design flows of 20 m/h and run durations of up to 2 h, it was found that the removal was insensitive to slopes from −1 to −3% and depths greater than 2.5 m $(L/H=10)$. The simulations indicate that 70 to 78% of solids removal can be achieved at surface overflow rates up to 25 m/h.

DOI: 10.1061/(ASCE)0733-9372(2007)133:3(263)

CE Database subject headings: Combined sewer overflow; Polymers; Flocculation; Numerical models; Retention basins; Wastewater management.

Introduction

The intermittent discharges from combined sewer overflows (CSOs) have been recognized as a source of surface water pollution for several decades. Recently, a number of high-rate treatment technologies have been proposed that permit primary level treatment of CSOs. One of the methods of achieving primary treatment is referred to as retention treatment basin (RTB) (Li et al. 2004). In this method the CSO is treated with a polymer that greatly enhances the flocculation process and results in settling rates over 100 m/h for some fractions of the waste flow. These basins are designed to remove the majority of the floatables and the grit. As a result, the effluent has a reduced suspended solids and biological oxygen demand (BOD).

In the preparation for the design of a RTB for the CSOs along the interceptor sewer for Windsor, Ontario, Canada, an experimental program was conducted to determine the settleability of the polymer treated CSO. Settling column, pilot settler, and rheology tests were completed. The pilot plant operated at various surface overflow rates (SORs) using actual CSO water at its point of entry to the Lou Romano Water Reclamation Plant in Windsor, ON. The results of this study are reported elsewhere by Li et al. (2003, 2004). Figs. 1 and 2 show the pilot tank that was used. Figs. 3(a and b) provide a typical settling velocity distribution that was derived from the settling tests and fraction of floatables that were trapped in the basin at low SORs. A significant fraction of the influent suspended solids is nonsettleable, i.e., either it did not flocculate sufficiently and/or its rise velocity was too low to be removed with the floatables. In a raw waste system without polymer addition this nonsettleable fraction is of the order of 40% (Bewtra and McCorquodale 1978); the addition of flocculating/coagulation agents can reduce this fraction to 10–15% (Li et al. 2003, 2004). This fraction determines the minimum effluent solids concentration that can be achieved in a settling tank.

The objective of this paper is to develop a modeling tool that can be used to scale up the pilot plant results to a full scale RTB. The model is calibrated and validated using the pilot plant results.

Model Development

The model that was used for this project was a modification of the secondary settling tank model that was developed by McCorquodale et al. (2004) under a U.S. EPA contract. The secondary settling tank version of the model was calibrated to the Marrero WWTP, Marrero, Louisiana, and validated with stress test data presented by Ekama and Marais (2002). The full details of the model theory are given in the report by McCorquodale et al. (2004). The following is a brief summary of the aspects of the model development that apply to this project.

The model solves a two-dimensional (2D) unsteady version of the stream function-vorticity equations with the density terms retained. A Smagorinski-type turbulence model is used with a Poisson equation to determine the mixing length subject to a complete

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[4] Stantec Consulting Ltd., 3260 Devon Dr., Windsor ON, Canada N8X 4L4.

[5] Dept. of Civil and Environmental Engineering, Univ. of Windsor, 401 Sunset Ave., Windsor ON, Canada N9B 3P4 (corresponding author). E-mail: biswas@uwindsor.ca

Note. Discussion open until August 1, 2007. Separate discussions must be submitted for individual papers. To extend the closing date by one month, a written request must be filed with the ASCE Managing Editor. The manuscript for this paper was submitted for review and possible publication on April 8, 2005; approved on July 10, 2006. This paper is part of the ***Journal of Environmental Engineering***, Vol. 133, No. 3, March 1, 2007. ©ASCE, ISSN 0733-9372/2007/3-263–270/$25.00.

Fig. 1. Flushing box and RTB

set of boundary conditions on the hard surfaces, free surface, and open boundaries.

As shown by Larsen (1977) the pressure terms in the momentum equations can be eliminated by using the vorticity-stream function formulation. This method was selected because it guarantees fluid continuity (Ji et al. 1996; Gerges and McCorquodale 1997). The vorticity ω is defined as

$$\omega = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} \tag{1}$$

The stream function formulation defines the two-dimensional flow field and guarantees liquid continuity. The net flow per unit width passing through two points in the grid is given by the difference in the stream function between the two given points. The mean velocity component in the x- and y-directions can be obtained from the stream function ψ using the following equations:

$$u = \frac{\partial \psi}{\partial y}; \quad v = -\frac{\partial \psi}{\partial x} \tag{2}$$

The field equation for stream function ψ can be generated by combining Eqs. (1) and (2)

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} = -\omega \tag{3}$$

The following vorticity transport equation has been used:

$$\frac{\partial \rho \omega}{\partial t} + \frac{\partial \rho u \omega}{\partial x} + \frac{\partial \rho v \omega}{\partial y} = \frac{\partial}{\partial x}\left(\rho v_{\mathrm{eff}} \frac{\partial \omega}{\partial x}\right) + \frac{\partial}{\partial y}\left(\rho v_{\mathrm{eff}} \frac{\partial \omega}{\partial y}\right) + \rho \frac{\partial g'}{\partial x} + \hat{S}_{\omega} \tag{4}$$

where $g' = \rho - \rho_r / \rho_r g$ and $\hat{S}_{\omega}$ is a vorticity source term.

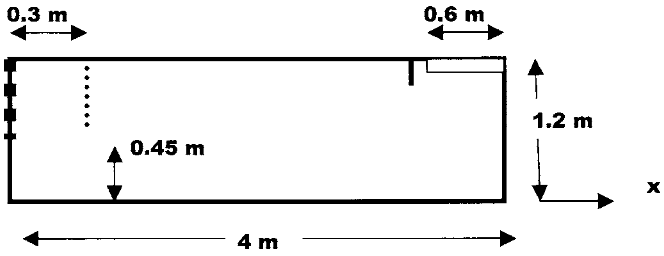

Fig. 2. Longitudinal section of pilot RTB (width=0.65 m)

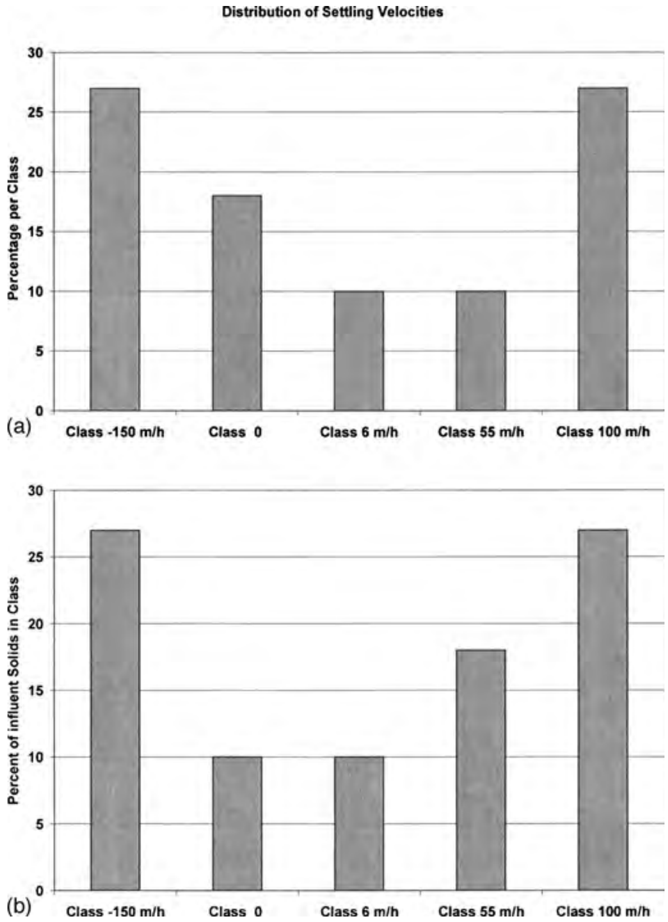

Fig. 3. (a) Assumed distribution of solids by settling classes (incomplete or poor flocculation 18% nonsettleables); (b) assumed distribution of solids by settling classes (good flocculation 10% nonsettleable)

The mixture density ρ is related to the water reference density and suspended solids concentration through the following equation of state (Larsen 1977):

$$\rho = \rho_{\mathrm{ref}} + \left(1 - \frac{1}{Ss}\right) X \tag{5a}$$

or for multiple classes

$$\rho = \rho_{\mathrm{ref}} + \left(\Sigma X_i - \Sigma \left[\frac{X_i}{S_{si}}\right]\right) \tag{5b}$$

where X_i=suspended solids concentration for class i in mass per unit volume of mixture; S_{si}=specific gravity of the dry solids for class i; and ρ_{ref}=water reference density which is a function of water temperature (T) and water dissolved solids content (TDS), i.e.

$$\rho_{\mathrm{ref}} = [999.8396 + 18.224944 \times T - 0.00792221 \times T^2 - 55.4486 \times 10^{-6} \times T^3 + 14.97562 \times 10^{-8} \times T^4 - 39.32952 \times 10^{-11} \times T^5 + (0.802 - 0.002 \times T)\mathrm{TDS}]/[1 + 0.018159725 \times T] \tag{6}$$

Typical reported Ss values for activated sludges range from 1.2 to 1.70 (e.g., Larsen 1977; Smith and Coackley 1984; Li and Ganczarczyk 1986, 1987, 1992; Namer and Ganczarczyk 1993; Hilligard and Hoffman 1997; Kinnear 2002). Due to the presence of grit in the CSO an average $Ss = 2.0$ was used for the settleable solids and 0.9 for the floatables while the nonsettleable solids were assigned $\mathrm{Ss} = 1.0$. Stamou et al. (1989) showed that density currents could exist in primary settling tanks with influent concentrations less than 100 mg/L. The influents suspended solids (SS) in the pilot plant study ranged from 100 to over 400 mg/L.

The advection–diffusion equation for solids transport is

$$\frac{\partial \rho_i X_i}{\partial t} + \frac{\partial \rho_i u X_i}{\partial x} + \frac{\partial \rho_i v X_i}{\partial y} = \frac{\partial \rho_i v_{sx}}{\partial x}\frac{\partial X_i}{\partial x} + \frac{\partial \rho_i v_{sy}}{\partial y}\frac{\partial X_i}{\partial y} + \frac{\partial \rho_i V_{si} X_i}{\partial y} \tag{7}$$

Eq. (7) is applied independently for each class of solids where X_i=concentration of SS in Class i; v_{sx}=eddy diffusivity of suspended solids in the x-direction; v_{sy}=eddy diffusivity of suspended solids in the y-direction; and V_{si}=particle settling velocity for in Class i. Discrete settling was assumed up to a concentration of 0.6 g/L. At higher concentrations, zone settling is assumed. With a single class the settling rates have been described by the Takacs equation (Takacs et al. 1991). This is similar to the Vesilind equation (Vesilind 1968) but includes a "colloidal" component, which is not very important at high concentrations. A correction for compression was included at $X > 5$ g/L.

The effective viscosity v_{eff} presented is used to represent both the molecular viscosity v and the turbulent eddy viscosity v_t, i.e.

$$v_{\mathrm{eff}} = v + v_t \tag{8}$$

The eddy diffusivity term is often been presented as the ratio of the eddy viscosity v_t and the turbulent Schmidt number σ_s and assumed to be an isotropic property (Lakehal et al. 1999; Stamou et al. 2000; Armbruster et al. 2001; DeClercq 2003) with similar Schmidt numbers in the x and y directions; however, Larsen (1977) reported that turbulence is damped in the vertical direction and the diffusion coefficient of momentum and solids transport are reduced in stratified flows. Therefore, different Schmidt numbers should be used in the two directions (Samstag et al. 1992; Zhou et al. 1994).

In this study, the eddy diffusivity is defined as

$$v_{sx} = v + \Gamma_r v_t \tag{9}$$

$$v_{sy} = v + \Gamma_y v_t \tag{10}$$

where Γ_x and Γ_y=inverse of the turbulent Schmidt numbers in the x- and y-directions, respectively. The molecular viscosity v=property of the fluid-solids mixture, defined by the rheology of the sludge. The eddy viscosity v_t is not a fluid property but depends on the structure of the turbulence.

Several models have been proposed to simulate the rheology of non-Newtonian sludges, e.g., the Ostwald (pseudoplastic model), Bingham (plastic model), and Herschel-Bulkley equations (yield pseudoplastic model). The plastic and yield pseudoplastic models include a yield stress as the initial resistance of the sludge to deformation. Other approaches have been presented by Bokil and Bewtra (1975) and DeClercq (2003). There does not appear to be a consensus on which model is best for wastewater. This study uses the Bokil and Bewtra (1975) model and is validated with a limited number of rheological results. The Bokil model is selected for the following reasons:

1. DeClercq (2003) showed that a true yield stress does not exist (the Bingham model supposes a yield stress while the Bokil model does not). When comparing their model (a Herschel-Bulkley-type model) to the Bingham model and to the Bokil model, they found that the Bokil model resulted in the best prediction of the sludge blanket height.
2. Three-parameter models do not seem to have any advantage over two-parameter models. Hence for simplicity it is better to select a two-parameter model. The Bokil model is straightforward and easy to implement. It suggests an exponential function for the effective molecular kinematic viscosity based on sludge concentration.

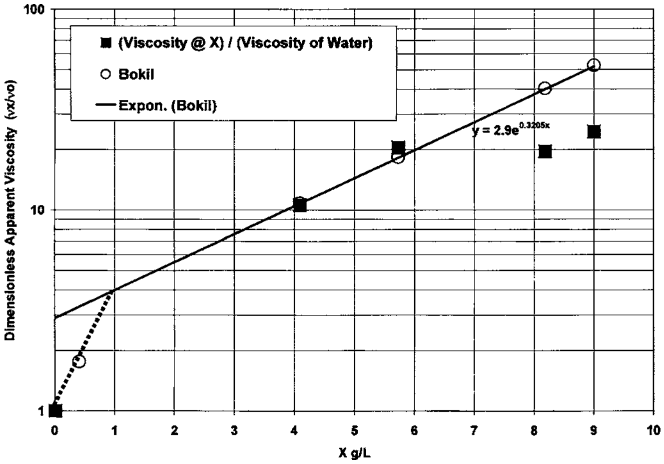

Fig. 4. Viscosity function for RTB sludge (after Bokil and Bewtra 1975; Li et al. 2003)

The relationship proposed by Bokil and Bewtra (1975) is presented in Fig. 4 (adapted from Ekama et al. 1997) as the effective molecular kinematic viscosity versus sludge concentration. The following relationships are derived from Fig. 4:

$$\begin{aligned} v &= 1 \times 10^{-6}\, e^{1.386X} \quad X \leq 1 \text{ g/L} v \\ &= 2.9 \times 10^{-6}\, e^{0.322X} \quad X > 1 \text{ g/L} \end{aligned} \tag{11}$$

in which X=SS in grams per liter and v=mixture kinematic viscosity in meters squared per second.

Three different approaches to modeling turbulence have been used in clarifier models: (1) a constant eddy viscosity; (2) relation of the eddy viscosity to the local mean velocity gradient G and the mixing length l_m; and (3) relation of the eddy viscosity to the turbulence kinetic energy (k) and the turbulence dissipation rate (ε).

A constant eddy viscosity does not account for the heterogeneous nature of the eddy viscosity in settling tanks, while models based on mixing length and k-ε theory do. Both models (mixing length and k-ε) have been successfully used in settling tank modeling, predicting similar removal efficiencies. However, Rodi (1980) and Imam et al. (1983) reported that mixing length models are not satisfactory for recirculating flows due to the difficulty in describing l_m; however, Imam et al. (1983) argued that a mixing length model could be useful if it is experimentally calibrated. Larsen (1977) and Abel-Gawad and McCorquodale (1984a,b, 1985a,b) showed that the solids removal is not very sensitive to the actual distribution of the diffusion coefficient, and the main hydraulic features of flow in clarifiers could be reproduced with a simple modification of the mixing length model. The k-ε model, although better for recirculating flows, is considerably more demanding than the mixing-length model with respect to computational time and storage. Based on this discussion, the initial approach in this study will be to use a modified-calibrated mixing length model.

The mixing length hypothesis relates the eddy viscosity υ_t to the mixing length l_m and the local mean velocity gradient G

$$\upsilon_t = G l_m^2 \tag{12}$$

where G is defined as the mean gradient of the horizontal and vertical velocities

$$G = \sqrt{\left(\frac{\partial u}{\partial y}\right)^2 + \left(\frac{\partial v}{\partial x}\right)^2} \tag{13}$$

The l_m field is obtained by means of a calibration parameter in a Poisson equation, i.e.

$$\frac{\partial^2 l_m}{\partial x^2} + \frac{\partial^2 l_m}{\partial y^2} = K_{l_m} \tag{14}$$

where K_{l_m}=calibration parameter. Eq. (14) is solved subject to the following boundary conditions: the inlet mixing length; wall roughness; free surface damping; and radiation at withdrawal boundaries.

Using the single-phase flow assumption (which implies that the volume occupied by the solids is negligible), the equations described above can be considered as the theoretical model to represent the major physical processes of solids movement (McCorquodale et al. 2004). Eqs. (3) and (6) (momentum) and Eq. (7) (mass transfer equation) can be described as a combination of an unsteady term (variation of the property with respect to time), two advective transport terms (describing the fluid-mass transfer process due to convection or flow movement in the plane), two terms related to the eddy diffusion (mixing processes due to turbulent diffusion in two directions), and a source term. For example, Eq. (6) includes a source term for the simulation of buoyancy effects and Eq. (7) has a term for the simulation of the particle settling process. Moreover, the source term in Eq. (7) is also used for the simulation for flocculation processes.

The equations of motion and transport are discretized using the finite volume method (Versteeg and Malalasekera 1995). The hybrid approach was used for the transport equations. The model monitors the mass conservation; fluid conservation is ensured by the stream function approach while the control volume formulation is based on conservation of mass for each cell. The computational mesh consisted of rectangular cells with constant Δx and Δy with typical meshes of 60×25.

Model Calibration and Validation

The pilot plant was operated for SOR values from 5 to 33 m/h based on the area of the settling zone in the pilot tank. The results of the pilot study have been published elsewhere (Li et al. 2004). Fig. 1 shows a picture of the pilot plant. The numerical model was calibrated to simulate the pilot plant settling basin data for SOR of approximately 10 m/h. The remainder of the pilot plant data was used to validate the model. The calibration parameters were: (1) the rise velocity of the floatables; (2) the settling velocity of the "grit," i.e., fastest settling class; (3) the relative fractions of the settling classes; (4) the zone settling parameter; (5) compression rate parameter; and (6) turbulence damping at the sludge interface.

Model inputs include: (1) the tank geometry (Fig. 2); (2) the relative fractions of floatables, settleable solids, and nonsettleable solids (35, 47, and 18%, respectively) as published by Li et al. (2004); (3) SOR; (4) influent suspended solids; (5) flocculation parameters; (6) specific gravity of settleable solids and floatable solids; (7) longitudinal and vertical inverse Schmidt numbers; (8) consolidation parameters; and (9) water temperature. The separation of the settleable solids into three classes was based on settling column tests with suspended solids treated with polymer [ZETAG 7873, cationic polyacrylamide dispersed in light oil, Li et al. (2003)]. These results gave a range of settling velocities from 2 to over 100 m/h. The following classes were selected: 5, 50, and 120 m/h. The highest class was based on the column data and the settling velocity for typical grit [120 m/h, Simons and Senturk (1992)]. The flocculation and floc breakdown were assumed to follow the model proposed by Parker et al. (1970, 1972) and Das et al. (1993). Influent concentrations in the range of 200 to 400 mg/L were simulated. The consolidation parameters were set to ensure that the sludge layer concentration was of the order of 10% as observed on the pilot basin. Hindered settling was assumed to start at 600 mg/L as has been observed in activated sludge. A transition from discrete to fully hindered settling is modeled between 600 and 1,500 mg/L. The floatable solids rise velocity was not measured in the field; the estimated rise velocity of 150 m/h was based on calibration runs to simulate the observed floating solids in the pilot basin.

Fig. 4 compares the apparent viscosity of the CSO solids with the Bokil function. It is noted that the Bokil equation represents an upper limit for the CSO solids. The Bokil function was used for this study but with a maximum apparent viscosity of 10^{-3} m^2/s.

Fig. 3(a) shows the derived classes for the suspended solids. A review of the observed removal efficiency for SOR <10 m/h indicates that the actual nonsettleable fraction could be as low as 10 to 18%. Fig. 3(b) indicates the suspended solids classes for the case of 10% nonsettleable solids. This variability may relate to the differences in settleability and chemical flocculation potential amongst CSO events.

Typical pilot tank flow and deposition patterns in the pilot RTB are shown in Fig. 5. The numerical model was run for SORs ranging from 6 to 33 m/h. Fig. 6 shows the agreement between the accumulated floatables in the model and pilot tanks for SOR =10 m/h. The calibration and validation presented in Fig. 7 used 18% nonsettleable solids. A few simulations with only 10% nonsettleables at SOR=6 to 20 m/h were made to verify that the model could simulate the highest observed removal efficiencies shown in Fig. 7. The model appears to give a conservative estimate of the removal efficiencies at high SORs; this could be due to the tendency for the model to underestimate the resistance of the sludge to erosion.

Application of the Model to the Design of a Prototype RTB

The calibrated model was used to test the removal efficiency of a full scale RTB. A suggested profile through a proposed basin is shown in Fig. 8. The clarifier model had a flocculation submodel [after Parker et al. (1970)]. The settling velocity distribution obtained during the pilot studies included the flocculation that occurred during the mixing with the polymer; however, since it is possible that additional flocculation could occur in the RTB, the flocculation submodel was turned on with default parameter from typical wastewater. The model was used to estimate the removal of suspended solids at various SORs from 2 to 40 m/h. Downward slopes of 1 and 3% in the direction of the mean flow were modeled. The slope was included to aid in the flushing of the basin following a CSO event. A storage zone at the entrance to the

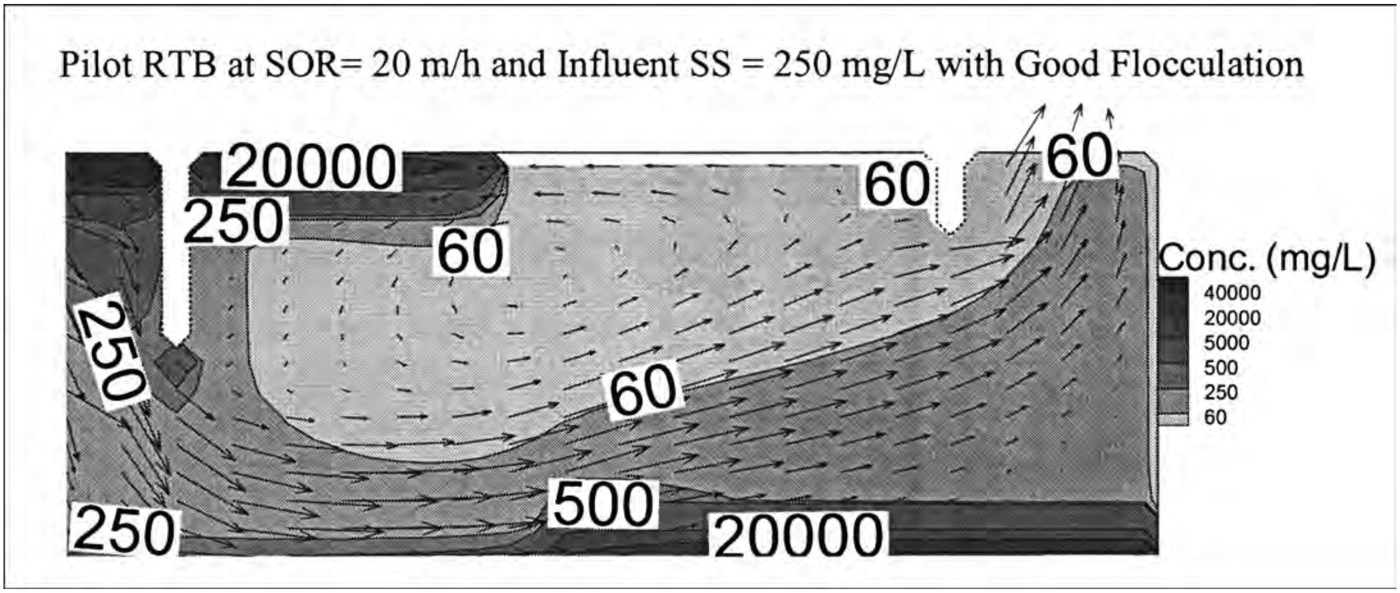

Fig. 5. Predicted flow and deposition patterns in model of pilot RTB

basin was included in the simulation. This liquid will remain after the CSO event and will be used to flush the sludge from the bottom of the basin. A hopper is located at the downstream wall. The removal was insensitive to the bottom slope for the range −1 to −3%. Three inlets were modeled: (1) a 1-m-deep 50% porous inlet; (2) a 0.5-m-deep inlet; and (3) a 1-m-deep inlet. A 0.5-m-deep porous inlet was found to give excessive inlet velocities that made it impractical. The selected inlet target baffle was modeled as solid; a perforated baffle was modeled but abandoned because of concerns about clogging. A deep scum baffle was used to help prevent the loss of floatables over the launder. The length/depth (L/H) for the tank geometry report here varied from 7 to 10. The removal was relatively insensitive to depth (L/H) over this range. Increasing the aspect ratio for the same SOR increases the inlet and average tank velocities leading to head loss and scouring problems. Significant deterioration was noted when L/H was increased to 20.

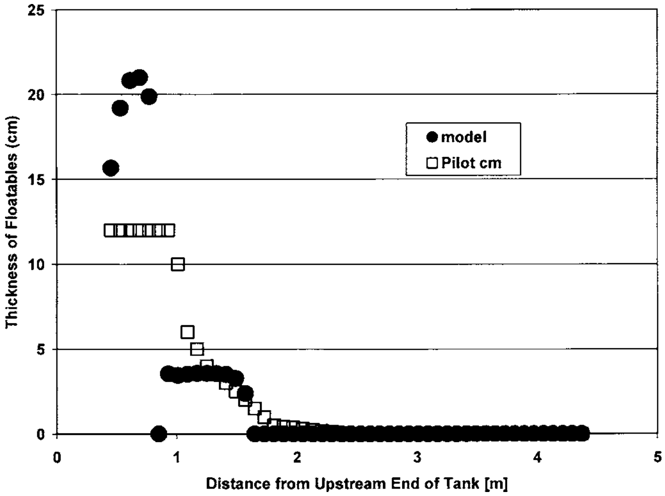

Fig. 6. Predicted and measure distribution floatable solids in pilot RTB

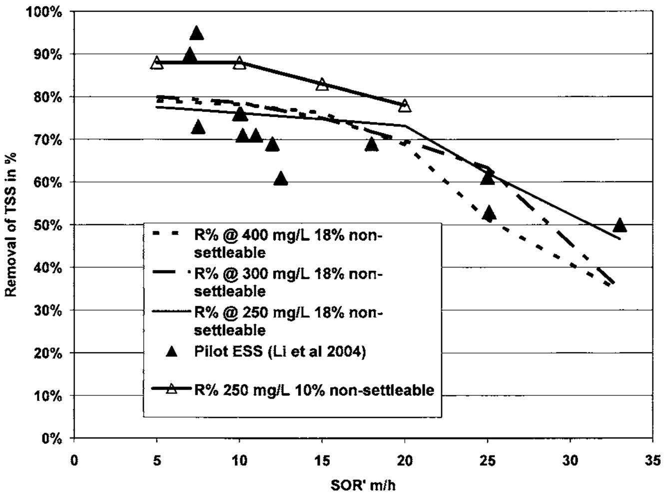

Fig. 7. Comparison of pilot RTB with model results (SOR is defined as flow/area of settling zone)

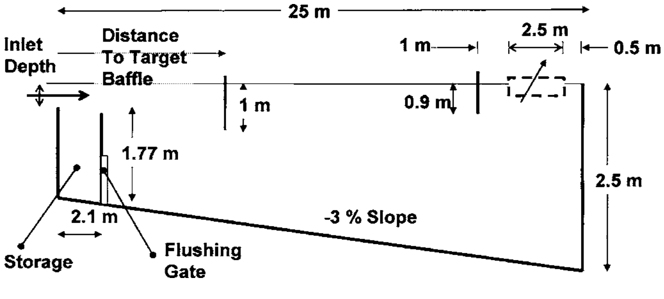

Fig. 8. Preliminary layout for prototype RTB

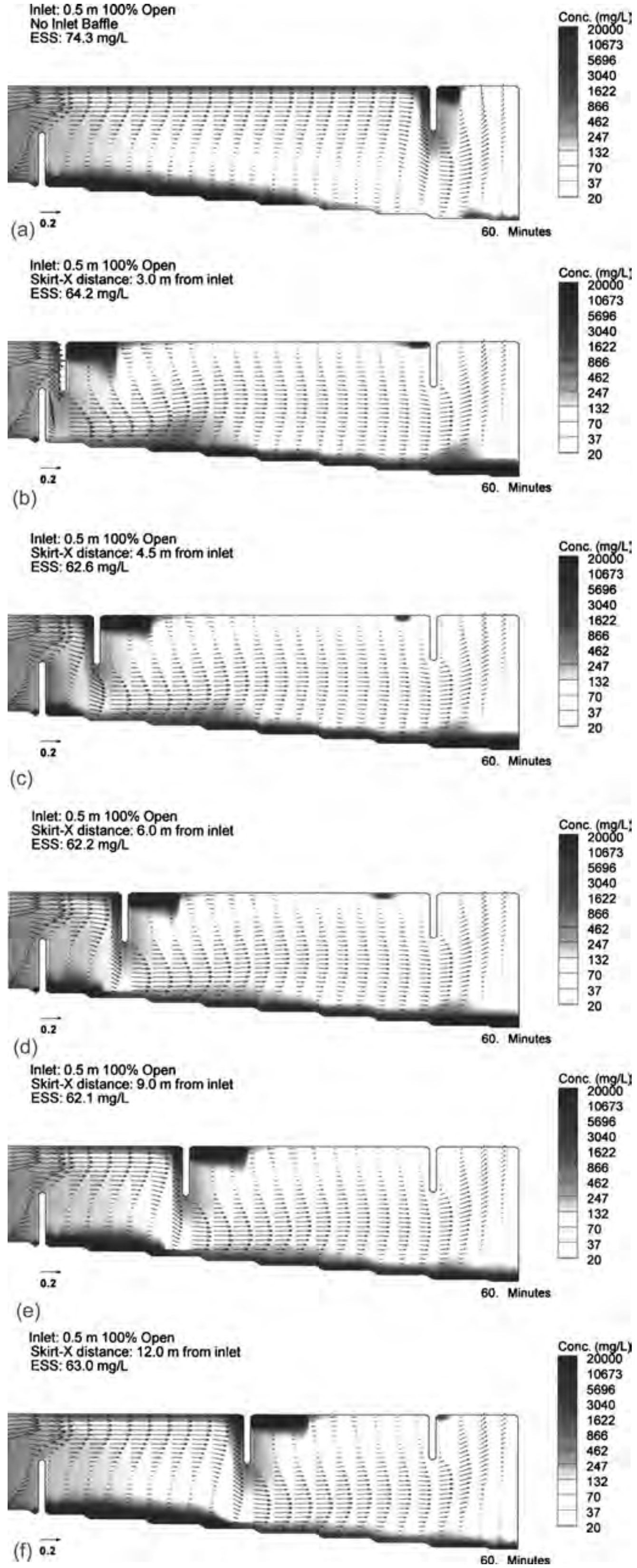

Fig. 9. Flow and solids patterns for following target baffle distances from inlet: (a) no baffle; (b) $x=3$ m; (c) $x=4.5$ m; (d) $x=6$ m; (e) $x=9$ m; and (f) $x=12$ m

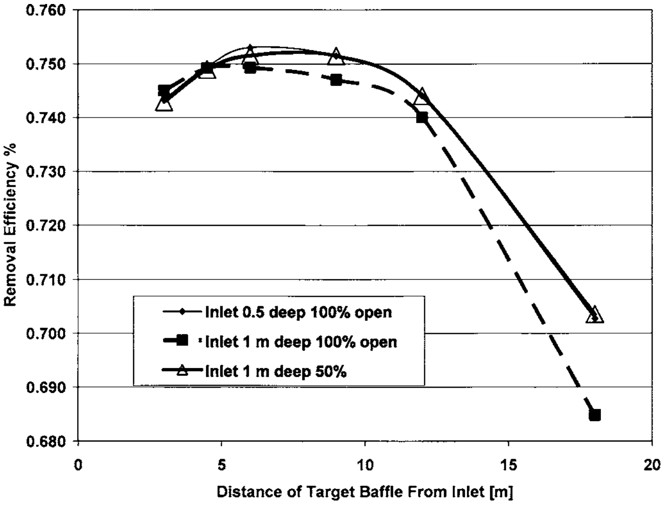

Fig. 10. Optimization of target baffle position for SOR=20 m/h and −3% bed slope and MLSS=250 mg/L

The model indicated that the −1 and −3% bottom slopes gave almost the same effluent suspended solids (ESS) at a SOR of 20 m/h. Figs. 9(a–f) show the effect of the inlet target baffle location on the flow pattern and the solids distribution for a −3% bottom slope and a 0.5-m-deep 100% open inlet. Fig. 9(a) had no inlet target baffle and had the worst ESS, mainly because the accumulation of floatables at the scum baffle which were subsequently forced under the scum baffle and into the overflow. Fig. 9(b) shows a baffle that is too close to the inlet; this caused an adverse interaction with the storage zone and a tendency for floatables to collect at the scum baffle. Figs. 9(c–f) show the effect of increasing baffle distance from the inlet; although all arrangements are acceptable, the 6-m case gave slightly best results as indicated in Fig. 10. This figure also indicates that all three inlet arrangements give very similar results with the porous 1-m deep option being slightly better. Simulations without the storage zone showed a greater sensitivity to the inlet design.

Fig. 11 shows the prototype performance as a function of SOR with a 1-m deep 50% porous inlet and 10% nonsettleable solids

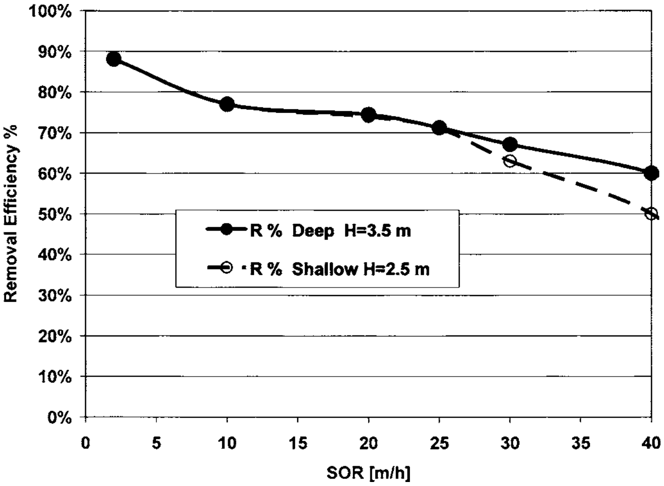

Fig. 11. Removal efficiency as function of SOR for tank depths of 2.5 and 3.5 m for MLSS=250 mg/L and 1-m deep 50% porous inlet with target baffle at $x=6$ m

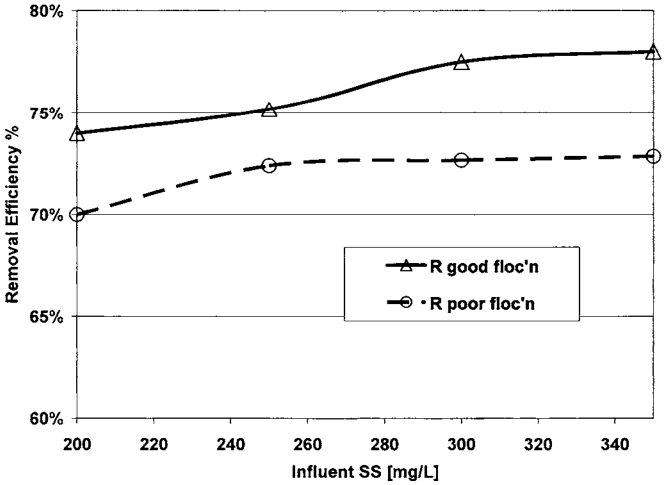

Fig. 12. Effect influent concentration of performance of prototype RTB after 2 h of operation (SOR=20 m/h; optimized design for H=2.5 m and slope −1%)

with an influent concentration of 250 mg/L (similar results were obtained for the 100% open inlets). The model indicated good removal efficiency (>70% for good initial flocculation) up to a SOR of 25 m/h. Fig. 12 indicates the sensitivity of the removal efficiency to the influent SS for a SOR of 20 m/h with good and poor initial flocculation. The removal efficiency improves slightly with increasing influent suspended solids, possibly due to an increase in tank flocculation.

Conclusions

A computational fluid dynamics (CFD)-type model was used to scale the results of a pilot RTB to design a full scale prototype tank. The enhanced settlement and floatation was achieved by adding cationic polymer (ZETAG 7873) to the CSO. The model incorporated: discrete settling and floatation; hinder settling; consolidation; non-Newtonian flow; and density currents. The process of scaling involved: (1) derivation of settling characteristics of the CSO water from column settling tests and trapped solids in the pilot tank; (2) calibration of the numerical model to reproduce over 18 field tests on the pilot tank; and (3) application of the calibrated model to simulate various prototype designs.

The model of the preliminary prototype tank showed that good removal (>70%) can be achieved for SOR <25 m/h. The simulations indicate that 70 to 78% of solids removal can be achieved at SORs of up to 25 m/h depending on the initial state of flocculation. Above 25 m/h, the model showed that the removal started to deteriorate with the loss of trapped solids being mainly from the floatables. Pilot tests indicated that the settled sludge and the floating solids had a high resistance to erosion. The removal at SOR values higher than 25 m/h was dependent on the tank depth and the fraction of the influent in the floatable and nonsettleable classes.

The model was used to optimize the location of a target baffle at approximately 30% of the distance to the scum baffle. For design flows of 20 m/h and run durations of up to 2 h, it was found that the removal was insensitive to slopes from −1 to −3% and to depths equal to or greater than 2.5 m (L/H⩾10).

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APPENDIX E-2

Model Analysis of Required CSO Capture Rates

LRWRP Service Area Hydrologic-Hydraulic Wastewater Collection System Model

City of Windsor

Prepared for:
Corporation of the City of
Windsor, Pollution Control

Prepared by:
Stantec Consulting Ltd.

May 13, 2019

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Abbreviations

WWF	Wet weather flow
DWF	Dry weather flow
I/I	Inflow and infiltration
GWI	Groundwater infiltration
RDI/I	Rainfall dependent inflow and infiltration
IDF curve	Intensity duration frequency curve
PS	Pumping station
HGL	Hydraulic grade line
PCP Study	Windsor Riverfront Pollution Control Planning Study, 1994
LRWRP	Lou Romano Water Reclamation Plant
CSO	Combined sewer overflow
MECP	Ministry of Environment, Conservation and Parks
ESR	Environmental Study Report

1.0 APPROACH AND METHODOLOGY

1.1 MODEL APPROACH

In 2013 a hydrologic-hydraulic model of the Windsor Riverfront area combined and sanitary sewer system was developed for federal reporting of CSO volumes (RTB Evaluation Report, 2014). The approach used in the current undertaking was to further develop and calibrate this hydrologic-hydraulic model to incorporate the City's entire combined and sanitary sewer system at a trunk level and evaluate alternatives for achieving the MECP F-5-5 guidelines for pollution control in the Riverfront area west of CMH Woods Pumping Station. The analysis was performed using PCSWMM 2019 Professional 2D software version 7.2.2780. PCSWMM utilizes the U.S. EPA SWMM5 engine (currently 5.1.013).

A site plan of the City's sanitary and combined sewer system in the model is shown in **Figure 1.1.**

1.2 RAINFALL MONITORING

Rainfall data was collected at six (6) private City of Windsor rain gauges in the study area during the periods of flow monitoring. **Table 1-1** shows the rain gauges assigned to each catchment/sewershed. The location of the rain gauges are shown in **Figure 1.2**.

Table 1-1: Rain gauge assigned to each subcatchment/service area

CATCHMENT	**RAIN GAUGES**		
West of LRWRP			
West Main	Lou Romano WRP	Wellington PS	
7 Mile Sewer, LaSalle Forcemain	Lou Romano WRP		
Bridge Plaza & Industrial Area Trunk Sewer	Lou Romano WRP		
Riverfront Area – East of LRWRP			
EU, U	Drouillard PS	Grand Marais PS	
W, S, T, V	Drouillard PS		
Q, R	Drouillard PS	Grand Marais PS	Wellington PS
J, K, Caron, L, M, I, G, P, E	CMH Woods PS		
F, N, H, O	CMH Woods PS	Wellington PS	
Huron, D, C, B1, B2, A, Sandwich St Sewer, South St trunk	Lou Romano WRP		
South	Lou Romano WRP	Wellington PS	
Notes: For rainfall hyetographs derived from more than one rain gauge the arithmetic average of the rain gauges was computed			

1.3 FLOW MONITORING

Flow and level data were obtained from the City's internal Hach flow monitoring program (2013-current), from the LRWRP (2008-current), from a flow monitoring program managed by Dillon Consulting Ltd. (2013), from OCWA's LaSalle Pumping Station No.1 (2017), and from the Phase 1 PCP Study (1992-1993).

Figure 1.3 presents the flow monitoring locations.

1.4 MODEL INPUT DEVELOPMENT

Model setup involved incorporating infrastructure, dry weather flows, I/I entering the sanitary sewer system and runoff entering the combined sewer system into the model to represent the existing collection system in operation.

1.4.1 Hydraulic Methods of Analysis Routing

1.4.1.1 Flow Routing

Flow within a conduit was modeled numerically as unsteady flow using Dynamic Wave routing, which solves the complete Saint Venant flow equations. These equations consist of the continuity and momentum equations for conduits and a volume continuity equation at nodes.

Other hydraulic methods of analysis utilized in the model are shown in **Table 1-2**.

Table 1-2: Hydraulic flow routing parameters and methods of analysis

Item	Equation/Parameter
Flow routing	Dynamic wave with keep inertial terms
Normal flow criterion	Slope & Froude
Surcharge method	Slot method
Open channel flow	Manning's equation
Manning's roughness coefficient (n) for pipes	0.014 – smooth interior wall 0.024 – corrugated interior wall
Pressurized pipe flow	Hazen Williams equation
Hazen Williams roughness coefficient (C)	120

1.4.1.2 Hydraulic Structures

Table 1-3 lists parameters and methods of analysis for analyzing flow rates through existing weirs and orifices.

Table 1-3: Hydraulic structure parameters and methods of analysis

Hydraulic structure	**Coefficient**	**Equation**
Orifice	discharge coefficient (C) = 0.65	Refer to SWMM User's Manual V5.0
Weir	discharge coefficient (C_w) = 1.7	Refer to SWMM User's Manual V5.0

1.4.2 Hydrologic Methods of Analysis – Runoff & I/I Computations

Runoff entering combined sewers was computed using the SWMM Runoff Method. The RTK method was used to compute I/I entering the sanitary sewers.

1.4.2.1 SWMM Runoff Method

SWMM Runoff method parameters for each subcatchment are summarized in **Table 1-4**.

Table 1-4: SWMM Runoff method parameters

Parameter	**Value**
Infiltration – Modified Green-Ampt Capillary Suction ψ Sat. Hydraulic Conductivity K_s Initial Moisture Deficit M_d	 180mm 1.2mm/hr 0.21
Depression Storage Impervious surfaces – roads, pavement Pervious surfaces – urban lawns, open space	 2.5mm 6.25mm
Subcatch. Area	Calibrated
Subcatch. Flow Length (m) Subcatc. w/ Storm relief (L, N, O, Q, R, T, U) Subcatch. w/ no Storm relief (others)	 100m Calibrated
Impervious Levels % Impervious	Initially set to the findings in the Windsor PCP Ph.1 Study, 1993. Subcatchments with flow monitors calibrated the impervious levels. A linear relationship between area vs. %imperv. was used to adjust the uncalibrated subcatchment impervious levels.

Parameter	Value
% Zero Imperv. – impervious area with no depressed storage	% of the impervious area that contained building roofs
Subcatchment subarea routing – % of runoff routed from impervious to pervious surface	Route to outlet
Subcatchment slope (%)	1.0%
Manning's roughness coefficient (n) for overland flow	0.011 – pavement 0.24 – grass

1.4.2.2 RTK Method

The RTK method involves developing synthetic triangular unit hydrographs using observed data to relate hydrograph time varying flow to existing sewershed characteristics. Each triangular unit hydrograph is used to compute and represent I/I flow entering sanitary sewers in a specific sewershed. The parameters for the triangular unit hydrographs were initially estimated before calibration, and then the computed model response was compared to the observed monitoring data during model calibration and the hydrologic parameters of the triangular unit hydrographs for slow, medium and fast response were adjusted during calibration if needed.

1.4.3 Infrastructure

1.4.3.1 Collection System Infrastructure Overview

The model developed is a trunk sewer level model which incorporates all dry weather, and wet weather flows from the City's combined and sanitary sewer system which is treated at LRWRP. The model contains the entire the Riverfront service area east of LRWRP which services the original core section of the City, and the service area west of LRWRP which services LaSalle and the South Windsor. The area west of LRWRP includes the Town of LaSalle service area and is serviced by the West Main trunk sewer, 7 Mile trunk sewer, and Bridge Plaza and Nemak industrial area trunk sewer. The Riverfront area east of LRWRP includes the Riverfront Interceptor Sewer, RTB facility with CSO Collector Sewer and five (5) CSO Collector interceptor chambers, twenty-six (26) CSO interceptor chambers along the riverfront, and the CMH Woods Pumping Station.

Wastewater pumping stations in the model are listed in **Table 1-5**. Wastewater in the sewer system is conveyed to the LRWRP Main Pumphouse where it is lifted to the LRWRP headworks for treatment.

Table 1-5: Pumping stations in the hydraulic-hydrologic model

Pumping Station ID	**Firm Pumping Capacity (m^3/s)**
LRWRP Main Pumphouse	9.1 m^3/s
Caron Ave. (C.M.H. Woods) Pumping Station	4.34 m^3/s
RTB Pumping Station (east of Caron Ave.)	7.85 m^3/s

1.4.3.2 Storm Relief Sewers

Subcatchments L, N, O, R, Q, T, U and Eastern Utilities were modeled with storm relief sewers that outfall to the Detroit River. The remaining subcatchments in the Riverfront area were not modeled with storm relief sewers.

To reflect flow attenuation conveyed from upstream sewers and sewer system storage before the HGL reaches the storm relief overflow elevation, the trunk inlet sewer length in these eight (8) subcatchments were adjusted. The trunk inlet sewer lengths in the subcatchments with flow monitors were calibrated (L, O, R, U). A linear relationship was computed between subcatchment impervious area and sewer storage for adjusting the remaining trunk inlet sewer lengths (N, Q, T, EU) to reflect the attenuation and storage within the sewer system. Storm relief from the model was computed directly via weir to an outfall.

1.4.3.3 Interceptor Chambers

Twenty-three (23) of the twenty-six (26) riverfront interceptor chambers have plant sewer sluice gates that remain in a fixed position designed to capture and divert 2.5 to 4 times DWF from the combined sewers to the Riverfront Interceptor Sewer. The twenty-three (23) interceptor chamber's with fixed plant sewer gates were modeled using an orifice with dia. equivalent to the opening reported in the LCBA Windsor Riverfront Interceptor Sewer Chamber Inspection Report, 1994. The remaining three (3) automated interceptor chambers are discussed in the following section.

1.4.3.4 Automated Infrastructure

Control rules for automated sluice gates within the collection system were developed in the model for three (3) Interceptor Chambers, the LRWRP Inlet Chamber, and the RTB Facility. **Table 1-6** lists the process control narrative for the programming of the automated infrastructure.

Table 1-6: Description of automated flow controls (control rules)

Facility	Process Control Narrative
Interceptor Chambers F (Bridge), H (Elm) and L (Dougall)	These Interceptor Chambers have automated plant and river sluice gates that regulate flow captured and diverted to the Riverfront Interceptor Sewer. Generally, once the level in each Interceptor Chamber reaches a level setpoint the plant gate modulates to close to restrict flow to the Riverfront Interceptor Sewer and the river gates modulates open to divert CSO to the River.
LRWRP Inlet Chamber	Two (2) automated sluice gates in the LRWRP Inlet Chamber modulate closed to restrict the level in the LRWRP Main Pumphouse to less than 5.84m to avoid flooding the Main Pumphouse lower level. Modulating these sluice gate positions closed restricts flow to the plant causing a backwater effect on the sewer system.
RTB Facility (east of Caron Ave.)	The RTB basin drains via gravity when two or less pumps are running at CMH Woods Pumping Station, and the RTB Screw Pumps are not running. The RTB's CSO Collector sewers are set to be dewatered into the RTB basin and drain to the riverfront interceptor sewer when the RTB Screw Pumps are not running.

1.5 CALIBRATION EVENTS

Table 1-7 presents the rainfall statistics for the selected rainfall events used for model calibration. Rainfall event start and stop dates were selected so that flows before and after storm events returned to dry weather flow conditions. The calibration events selected include a range in events, including the most significant rainfall events observed during the monitoring period and some moderate size rainfall events with less than 2 year return period.

Table 1-7: Rainfall events selected for model calibration

Event No.	Year	Simulated Rainfall Event (Start – End)	Duration (hr)	Total Rainfall Volume (mm)	Peak Rainfall Intensity (mm/hr)
1	2013	August 12-13	16	23	10
2		August 30	2	25	40
3		September 20-21	10	30	26
4	2014	Aug-11 0:00 -Aug-16 0:00, 2014	9	91	52
5		Sept-10 0:00 -Sept-16 0:00, 2014	6	39	27
6	2015	Sept-3 0:00 – Sept-10 0:00	12	43	36
7	2016	Sept-27 0:00 – Oct-10 0:00	24 (72)*	68 (98)*	21
8	2017	Aug-27 0:00 – Sept-4 0:00	23	92	43

Notes:
* Data for entire storm event during selected dates
Rainfall data recorded by City's private gauge at LRWRP

Data collected for these rainfall events were compared against the IDF-curve for Windsor Airport Station No. 6139525 to determine the return period of each rainfall event based on event volume and peak intensity in order to quantify the significance or rarity of these storm events. **Table 1-8** presents a summary of the results. Rainfall events exceeding 25 year and 50 year return periods occurred on Aug 11/14 and Aug 28/17 respectively. All other rainfall events had return periods of a 5 year design storm event or less.

Model calibration was completed in 2013 when the Windsor Riverfront area sewer model was developed for federal reporting of CSO volumes using three (3) rainfall events in 2013. Further calibration was completed for the current assignment using three (3) rainfall events from 2014 to 2017. Each catchment with flow monitoring data was calibrated. The rainfall events selected for each calibrated catchment are shown in **Table 1-8**.

Table 1-8: Estimated calibration rainfall event return periods

Event No.	Year	Rainfall Event Start Date	Estimated Return Period (yrs)	Calibrated Subcatchments
1	2013	Aug-12, 2013 8:15am	< 2yr	D, F, L, O, R, U, EU, Riverfront Interceptor (5S724)
2		Aug-30, 2013 10:15pm	< 2yr	
3		Sept-20, 2013 3:30pm	< 2yr	
4	2014	Aug-11, 2014 10:30am	**> 50yr (<100yr)**	West Main trunk, F, H, South St trunk, Riverfront Interceptor (5S724), LRWRP
5		Sept-10, 2014 10:30am	**2yr**	West Main trunk, F, H
6	2015	Sept-3, 2015 2:30pm	**2yr**	
7	2016	Sept 28, 2016 11:15am	**5yr**	South St trunk, Riverfront Interceptor (5S724), LRWRP
8	2017	Aug-28, 2017 7:00pm	**> 25yr (<50yr)**	

1.6 ASSESSMENT METHODOLOGY

1.6.1 Pollution Control F-5-5 Assessment

The calibrated hydraulic-hydrologic model was used to evaluate alternatives for improvements to meet the MECP F-5-5 guidelines for the Windsor Riverfront area west of Caron Ave. The MECP F-5-5 guidelines specifies that for an average year 90% of the volume resulting from wet weather flow that is above the dry weather flow be captured and treated to a primary level of treatment during a seven-month period (April 1 to Oct. 31).

The volumetric capture rate is defined below in equation **1.6.1**:

(1.6.1)

$$\text{Volumetric Capture Rate (\%)} = \frac{(\text{Storm Runoff - Storm Relief}) - (\text{CSO Volume})}{\text{Storm Runoff - Storm Relief}}$$

Table 1-9 shows the rainfall statistics from the selected average year used to complete the analysis. The RTB east of Caron Ave. was sized using the average rainfall year of 1967 for the City of Windsor. This was determined in the Windsor Riverfront Phase 1 PCP Study which analyzed rainfall data from 1960 to 1991. The average rainfall year of 1967 is determined to be suitable to meet the MECP's F-5-5 guidelines for CSO control. It should be further noted that the ongoing Crawford Ave Basement Flooding Study by Stantec and the City-Wide Basement Flooding study by Dillon Consulting Ltd. both are recommending sewer separation. Over time as sewer separation projects are implemented throughout areas of the City serviced by combined sewer systems, CSO volumes will decrease even further to that computed in this modeling assignment.

Table 1-9: City of Windsor average year rainfall hyetograph

Hyetograph Description	Annual Rainfall Volume (mm)	Rainfall Volume (April 1 – Oct. 31) (mm)	Peak Rainfall Intensity (mm/hr)
1967	793	562	26

1.6.2 Sewer System HGL Assessment

The hydraulic grade line analysis was performed with the design storms shown in **Table 1-10** , which are consistent with those in the Essex Region Conservation Authority Standards Manual for conveyance assessments.

Table 1-10: Design storms for sewer system hydraulic grade line assessment

Description	Design Storm	Purpose	Rainfall Volume (mm)
5yr	5yr-4hr Chicago	Conveyance	81
100yr	100yr-4hr Chicago	Conveyance	108

2.0 RESULTS

2.1 RTB & RIVERFRONT TUNNEL SEWER

2.1.1 Pollution Control F-5-5 Assessment

The RTB option at the proposed site identified in the ESR adjacent to the LRWRP was analyzed to determine system-wide volumetric capture rate for the study area. The preferred design identified in the Windsor Riverfront West CSO Control West of Caron Ave ESR involves the following new work (see the ESR for further details):

- Increase interception rates at Interceptor Chambers A, D, F
- Construct new Riverfront Tunnel Sewer adjacent to the Riverfront Interceptor sewer from Chamber A (Hill St) to LRWRP
- Construct new RTB adjacent to LRWRP on the west side of Ojibway Pkwy to reduce CSO at LRWRP. This design will essentially increase the LRWRP Main Pumphouse and primary treatment hydraulic capacity using a new RTB.

Table 2-1 summarizes the LRWRP preliminary treatment ultimate hydraulic capacity. As shown in **Table 2-1** the grit removal system is the process unit with lowest hydraulic capacity, giving the plant an ultimate preliminary treatment firm capacity of 593MLD (6.9cms). The analysis was performed with the RTB Pump Station designed to start operating before the preliminary treatment capacity at LRWRP is exceeded (593MLD = 6.9 cms, or roughly before the fifth RSP is in operation) under 100year with climate change resiliency design storm. This will ensure all flow received preliminary treatment minimizing operational issues with grit deposition in downstream unit processes, while still maintaining 90% volumetric capture during the average year and providing a robust system to handle extreme rainfall events.

Table 2-1: LRWRP Preliminary Treatment Ultimate Hydraulic Capacities

Process Unit	Total Capacity (MLD)	Firm Capacity	
		(MLD)	(cms)
Coarse Bar Screens	1580	790	9.1
Raw Sewage Pumps	953	784	9.1
Fine Bar Screens	1030	685	7.9
Grit Removal	736	593	6.9
Prelim. Treatment	736	593	6.9

Table 2-2 shows the volumetric captures rates under existing conditions (PRE) and with proposed improvements (POST). The existing system-wide capture rate was 74%. Following the proposed improvements, the system-wide volumetric capture rate exceeded 90%. The proposed improvements therefore exceed the MECP F-5-5 guidelines.

Table 2-2: CSO volumetric capture rates under existing and proposed improvement conditions

			Existing Condition (PRE)			Proposed Improvements (POST)		
No.	Subcatchment	Storm Runoff Volume (ML)	Storm Relief Sewer Flow Volume (ML)	CSO Volume (ML)	Volumetric Capture Rate (%)	Storm Relief Sewer Flow Volume (ML)	CSO Volume (ML)	Volumetric Capture Rate (%)
1	A (Hill)	172.37	n/a	51.1	70%	n/a	22.9	87%
2	B1 (Brock) ^	1.05	n/a	n/a	n/a	n/a	n/a	n/a
3	B2 (Brock)	1.92	n/a	0.031	98%	n/a	0.031	98%
4	C (Mill)	3.29	n/a	0	100%	n/a	0	100%
5	Caron	26.27	n/a	0	100%	n/a	0	100%
6	D (Detroit)	79.24	n/a	19.8	75%	n/a	8.13	90%
7	E (Askin)	88.7	n/a	3	97%	n/a	3.21	96%
8	F (Bridge)	184.49	n/a	57.4	69%	n/a	15.1	92%
9	G (Curry)	16.96	n/a	0.827	95%	n/a	0.825	95%
10	H (Elm)	76.85	n/a	11.2	85%	n/a	12	84%
11	Huron	30.21	n/a	2.79	91%	n/a	2.84	91%
12	I (Crawford)	14.46	n/a	0.175	99%	n/a	0.177	99%
13	South	389.23	389.23	n/a		389.23	n/a	
14	LRWRP *	n/a	n/a	36.84		n/a	0.07	
	Sum:	**1085**	**389**	**183**		**389**	**65**	
System-wide Volumetric Capture Rate =				Existing	**73.7%**		Proposed	**90.6%**

Notes:
* CSO volume exceeding LRWRP Primary Treatment Hydraulic Capacity = 550MLD (6.36cms) and bypassed at flow sharing chamber
^ Chamber B1 has been replaced with a maintenance hole and no longer functions as an interceptor chamber

2.1.2 Sewer System HGL Analysis

The existing Riverfront Interceptor sewer will be utilized to convey increased CSO flows from Interceptor Chambers A, D and F. To ensure no adverse impacts to downstream sewers a hydraulic analysis was completed for all storms.

Figure 3.1 shows a comparison of the hydraulic grade line (HGL) from PRE conditions (no improvements) and POST conditions (preferred design identified in the ESR) for major (100yr-4hr Chicago) and minor (5yr-4hr-Chicago) storms in the Riverfront Interceptor sewer from Caron Ave to LRWRP and the Western trunk sewer from Ojibway Pkwy to LRWRP. The HGL analysis shows there are no adverse impacts to the interceptor and trunk sewer's HGL under minor and major storms.

2.2 RTB DESIGN BASIS

The alternative design possibilities that have been considered for the RTB Facility are summarized as follows:

- Size the RTB in accordance with MECP F-5-5 guidelines for CSO control. This would involve sizing the facility for peak flow generated during the average year 1967.
- Size the RTB for peak flow from the 100-year storm plus some additional resiliency to the system for potential climate change.

Table 2-3 shows the peak flow generated from the average year, from the 100-year storm and from the 100-year with climate change resiliency storm. The table shows that the RTB firm capacity required is much higher if sizing for 100yr with climate change resiliency as compared to the average year. Refer to the ESR for discussion between the design alternatives.

Table 2-3: Peak flow generated from design alternatives for sizing RTB

Description	**Design Storm**		
	1967 Avg. Yr. (cms)	**100yr (cms)**	**100yr + Climate Change Resiliency (cms)**
Sewer System Peak Flow	8.6	11.9	15.6
LRWRP Desired Peak Flow	6.4 * (550MLD)	6.9 ^ (736MLD)	6.9 ^ (736MLD)
RTB Firm Capacity ($Q_{SYSTEM} - Q_{LRWRP}$)	2.2	5.0	8.7

Notes:
* Selected based on meeting MECP's F-5-5 guidelines for 90% capture and treatment
^ Selected based on treating all flow at LRWRP to preliminary level of treatment

2.3 POLLUTION CONTROL F-5-5 ASSESSMENT: TUNNEL STORAGE

Table 2-2 shows that 1,085ML of runoff and 389ML of storm sewer relief was computed during the average year. Therefore, to achieve a 90% system-wide capture rate the total CSO volume overflowed to the River must be less than 70ML using equation **1.6.1**. **Table 2-2** also shows that the total CSO volume under existing conditions (PRE) was 183ML, for a 74% capture rate. In order to capture 90% system-wide the tunnel storage shall capture 113ML of CSO (183ML minus 70ML).

CSO locations that contribute the most significant CSO volumes were considered for increasing system-wide capture rate. These include chamber A, D, F, H and the LRWRP. Chamber A needs to capture an additional 31ML, 14ML at D, 26ML at F, 5ML at H, and 37ML at LRWRP for a total of 113ML. The captured flow rate at the site's outfall sewers were varied to obtain an additional 113ML of captured CSO volume. The tunnel was sized for the rainfall event which generates the peak CSO volume required to capture the additional 106ML over the 7 month period. The peak CSO volume occurred October 15-17, 1967. The results of the analysis are shown in

Table 2-4. The required volume for tunnel storage is 47,100m^3. The majority of the storage requirement is from CSO at LRWRP. Refer to the ESR for discussion between the planning level alternatives.

Table 2-4: Tunnel Storage Volume

No.	Subcatchment	Total CSO in Avg. Yr. Captured by Tunnel (ML)	Peak CSO Flow Rate Captured (cms)	CSO Volume on Oct. 15-17, 1967 (m^3)		Tunnel Volume Req'd (m^3)
				Existing Condition (PRE)	Proposed Improvements (POST)	
1	A (Hill)	31	0.28	7413	1024	6,389
6	D (Detroit)	14	0.19	2595	45	2,550
8	F (Bridge)	26	0.14	11810	4565	7,245
10	H (Elm)	5	0.12	887	52	835
14	LRWRP *	37		30070 *	0	30,070
Total Captured CSO (ML) =		113		Total Tunnel Storage Volume (m^3) =		47,100
Notes: * CSO volume exceeding LRWRP Primary Treatment Hydraulic Capacity = 550MLD (6.36cms) and bypassed at flow sharing chamber						

APPENDICES

Appendix A FIGURES

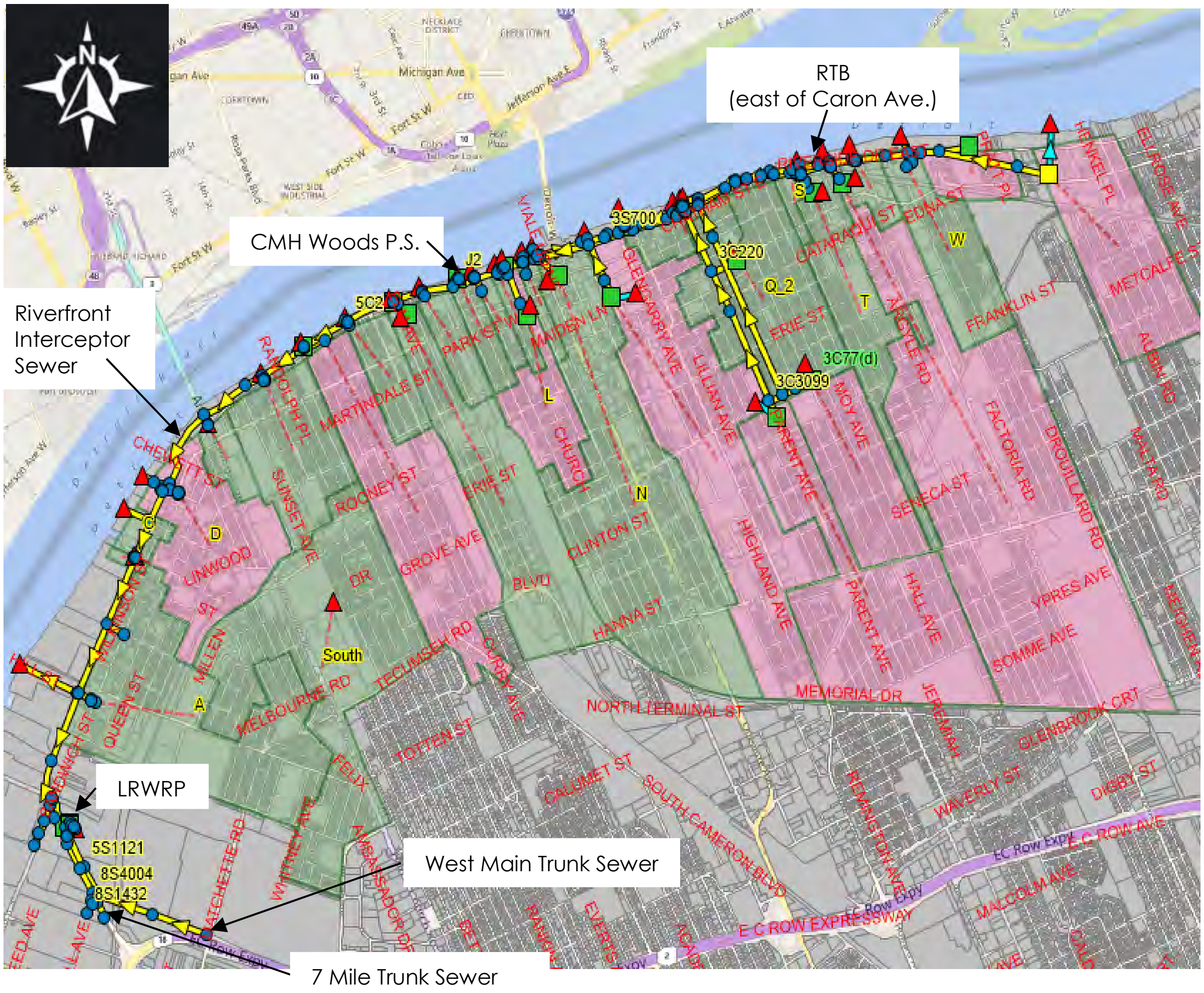

Figure 1.1: Model site plan of City of Windsor sanitary and combined sewer system

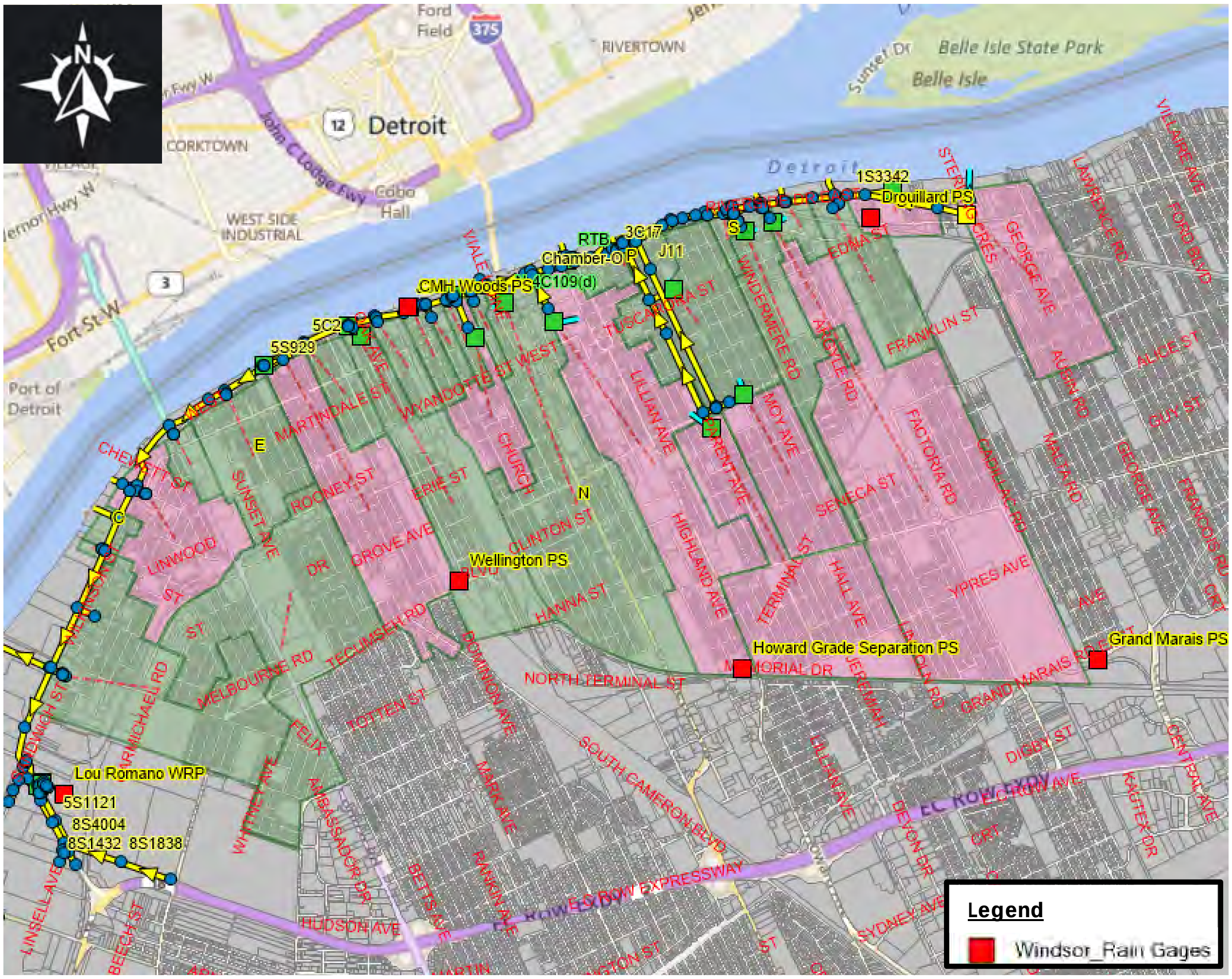

Figure 1.2: Site plan of City of Windsor rain gauge locations

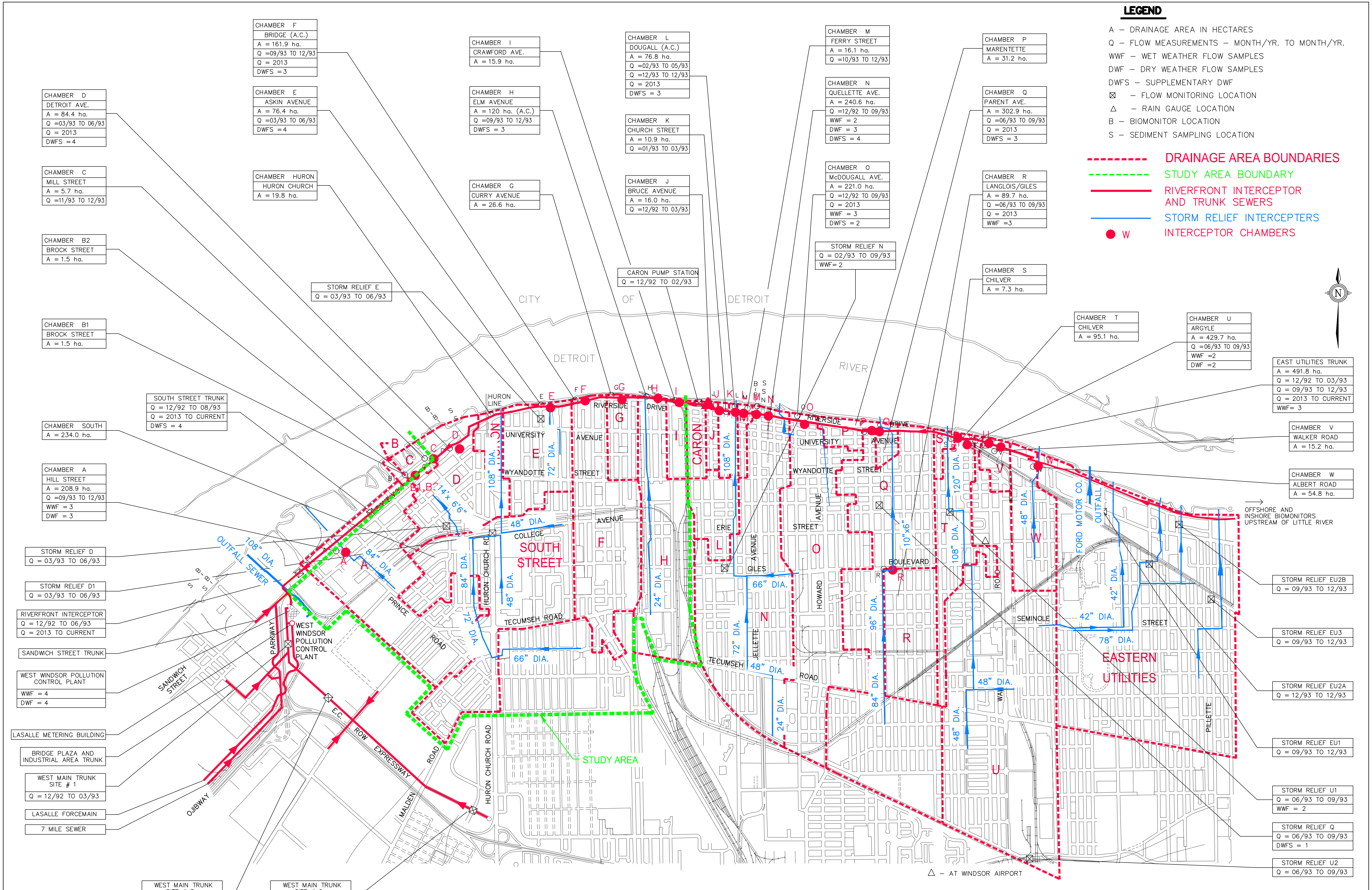

FIGURE 1-3 - Site Plan of City's Trunk Wastewater Collection System and Flow Monitor Locations

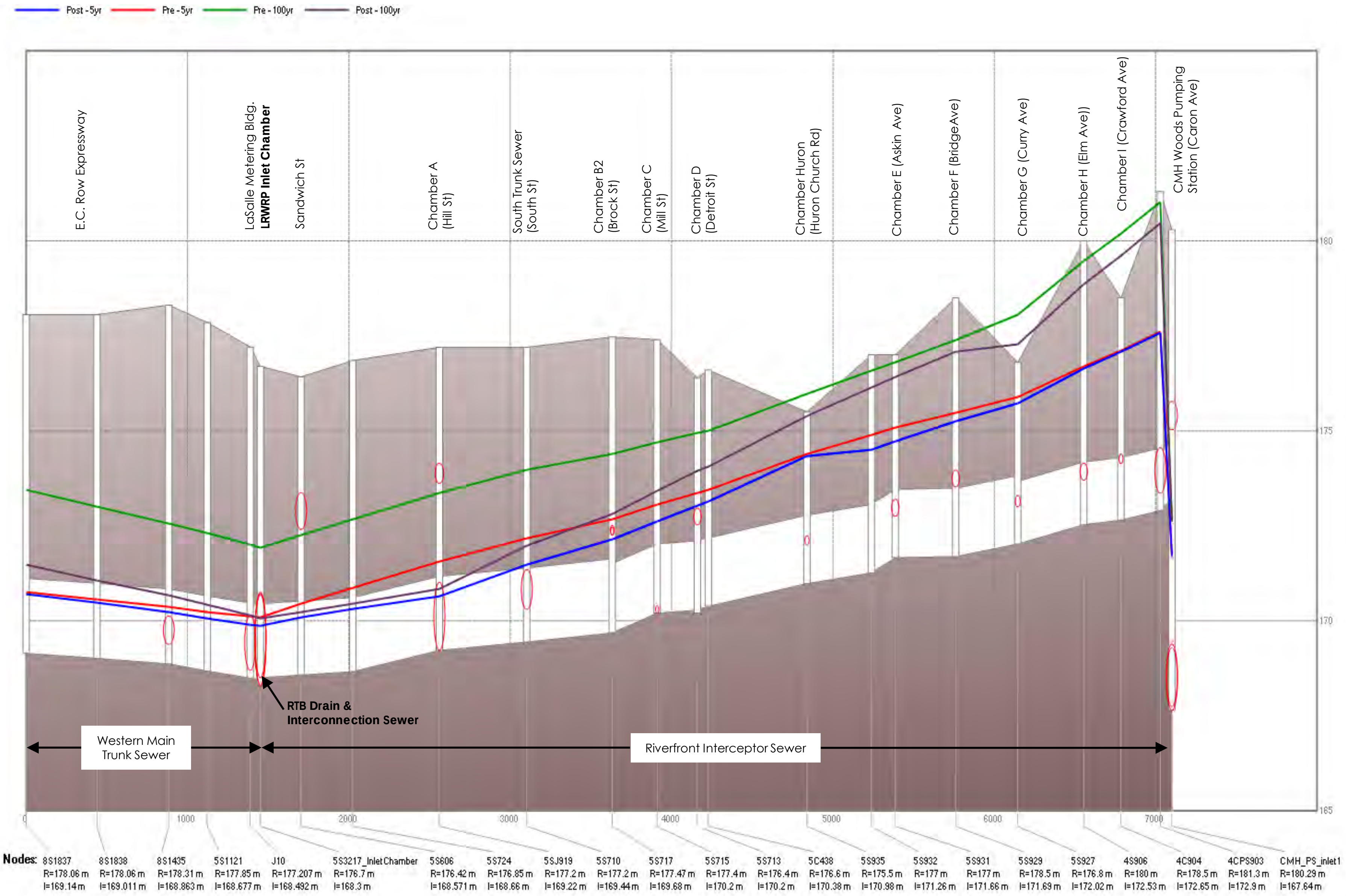

Figure 3.1: Hydraulic grade line analysis of the Riverfront Interceptor Sewer and Western Main Trunk Sewer