Improvements to Essex Ward 1 Southwest Storm Sewer System Phases 1 & 2 (Schedule B) Class Environmental Assessment - Environmental Study Report

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Prepared for:
Town of Essex

Prepared by:
Stantec Consulting Ltd.

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IMPROVEMENTS TO ESSEX WARD 1 SOUTHWEST STORM SEWER SYSTEM PHASES 1 & 2 (SCHEDULE B) CLASS ENVIRONMENTAL ASSESSMENT - ENVIRONMENTAL STUDY REPORT

Introduction
June 27, 2023

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EXECUTIVE SUMMARY

GENERAL

The South Talbot catchment is situated in the southern portion of Essex within the upper limits of the Canard River Subwatershed. Runoff from the South Talbot is conveyed via storm sewers that outfall to receiving municipal drains that outlet to the Canard River where it is conveyed through adjoining townships to the Detroit River.

Given the length of time since the previous evaluation of the South Talbot Catchment's storm system, changes in the system's layout since its original design, and concerns regarding flooding risk, the Town decided it was prudent to perform a capacity assessment of the South Talbot catchment, one of the most developed areas within the Township, to evaluate the existing system's level of service, identify areas where improvements could enhance the level of service, and evaluate full future development on the storm infrastructure.

The project objective is to reduce the risk and extent of flooding and property damage through storm system improvements and evaluate the storm system to ensure adequate infrastructure is in place for future development in the South Talbot catchment.

This Environmental Assessment report is the documentation of the Class Environmental Assessment (Class EA) process outlined by the Municipal Engineers Association (MEA) for the South Talbot stormwater system.

This report comprises **Sections 1 to 12** inclusive and **Appendices A to F** 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 and 2 of the Class EA process.

SECTION 2: EXISTING STUDY AREA CONDITIONS

Projects identified through this Class EA process must be evaluated on the basis of 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, and the existing stormwater drainage system and future land uses in the Town of Essex Ward 1 Southwest area.

SECTION 3: PROBLEM IDENTIFICATION

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

SECTION 4: DEVELOPEMNT AND SELECTION OF ALTERNATIVES FOR IMPROVEMENTS TO STORM SEWER SYSTEM

This section involves the identification 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 following broad planning level alternative solutions have been considered and evaluated for providing improvements to the study area's storm system:

1. Do nothing
2. Runoff reduction through Low Impact development (LID) and green infrastructure
3. Field inspection and maintenance of existing storm sewers
4. Increasing hydraulic capacity of existing storm sewers
5. Construction of stormwater management ponds
6. A Combination of the Above Alternatives

SECTION 5: PREFERRED ALTERNATIVE CONCEPTUAL DESIGN COMPONENTS AND RECOMMENDATIONS

This section provides a general description, design and construction considerations of the preferred alternative to reduce the risk and extent of surface flooding and property damage and prepare for full future development in the study area.

SECTION 6: ENVIRONMENTAL IMPACTS OF PREFERRED ALTERNATIVE

In this section, preferred alternatives identified through this Class EA process were evaluated based on the potential impact on the existing environmental conditions of the study area.

SECTION 7: PROPERTY REQUIREMENTS

This section describes the property requirements for the preferred alternative solution. The Town is recommended to acquire property and easement for the proposed improvements.

SECTION 8: PUBLIC PARTICIPATION

Public and review agency consultations are ongoing on the evaluation of the proposed solution. This section includes documentation of consultation with the public and review agencies. This

report will be made available to 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 capital budget probable costs (in 2018 dollars), and anticipated phasing.

Table E-1: Summary of Preferred Solution Probable Cost

Phase	*Item*	*Probable Cost*	*Class EA Schedule*
1A	**Sewer - Brien Ave W & Sewer Cleaning**	4,100,000	A+, A
1B	**Canaan Pond Expansion, dewatering pumping station & Drain repair**	1,200,000	*
2	**Woodview SWMF expansion & Tulley Meadows Improvements** **Woodview development sewer cleaning**	500,000	B A
3	**Essex Outlet Pond, dewatering pumping station, Drain improvement** **Sewer cleaning near outfall**	1,100,000	*
	Essex PCP bridge replacement	400,000	A
4	**Sewer - Centre St**	1,700,000	A+
	Sewer - Iler Ave (Optimist Park)	580,000	A+
Sub-total Construction Cost		9,580,000	
Engineering Allowance (15%)		1,400,000	
TOTAL CAPITAL COST (excluded taxes)		10,980,000	

Notes:
*** Canaan Pond was constructed, and Essex Outlet Pond is proposed to be constructed under the Drainage Act R.S.O. 1990, c. D.17, which are exempt from the Ontario EPA R.S.O. 1990, c. E.19.**

SECTION 10: SUMMARY

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

SECTION 11: REFERENCES

This section presents a list of previous studies and documents that have been referred to for background information and are referenced in this study.

ABBREVIATIONS

AES	Atmospheric Environmental Service – a branch of Environment Canada which has been renamed Meteorological Service of Canada.
DWF	Dry weather flow
IDF curve	Intensity duration frequency curve
H&H Model	Hydrologic-hydraulic model
HGL	Hydraulic grade line
HVA	Highly Vulnerable Aquifers
HWL	High water level
LID	Low infrastructure development
PS	Pumping station
SGRA	Significant Groundwater Recharge Areas
SWM	Stormwater management
SWMF	Stormwater management facility
SWMM	Stormwater management model developed by the USEPA
WERSM	Windsor Essex Stormwater Management Standards Manual, 2018
WWF	Wet weather flow

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Return Period	The term 'return period' is an estimate of the probability of a given rainfall event to occur. The storm return period is the reciprocal of the exceedance probability, which is the probability that a storm event is equaled or exceeded in any given year. As the storm return period increases the magnitude or rarity of the storm increases as well. For example, storms with 2-year and 25-year return periods have a probability of 50% and 4% of occurring with a given year respectively.
1:5 year storm event	A rainfall event with 1:5year return period or 20% probability of occurring with a given year.
Atmospheric Environmental Service (AES)	Atmospheric Environmental Service – a branch of Environment Canada which has been renamed Meteorological Service of Canada. This branch of government maintains a Canada-wide observation network that monitors changes in weather, climate, water, ice and air used to produce IDF curves used for sizing stormwater infrastructure.
IDF curve	Graphical representation of the probability that a given average rainfall intensity will occur. IDF curves are used to size storm infrastructure and are unique to the climate conditions of the area in which it was developed.
Rational Method	Method used to estimate peak discharge from a drainage basin given its area, intensity of design storm and runoff coefficient
Runoff coefficient (C)	A dimensionless coefficient used in the Rational Method that relates the amount of runoff to the amount of precipitation received and selected based on the land use.
Freeboard	The height from the top of the designed water level to the top of the stormwater management pond berm. Industry standard is to maintain at least 0.3m freeboard during 100yr design storms. The freeboard conservatively adds a factor of safety into the design by including additional volume above and beyond the 100yr design storage volume.
Chicago storm distribution	High intensity thunderstorm type design storm used for designing stormwater infrastructure. It is commonly used to assess conveyance capacity of urban systems
SCS storm	Lower intensity thunderstorm type design storm used for designing stormwater

distribution	management infrastructure. It is commonly used to evaluate volumetric capacity of storage facilities.
Hydraulic grade line (HGL)	Hydraulic Grade Line (HGL) is the surface or profile of water flowing in an open channel or a pipe flowing partially full
Major drainage system	Runoff that is conveyed and stored in sewers and open channels.
Minor drainage system	Runoff that is conveyed and stored in roadways and frontal portion of lots in urban areas, and the ground surface in rural areas.

1.0 INTRODUCTION

1.1 BACKGROUND

The Town of Essex, population 19,600, comprises four urban communities - Essex Centre (Essex Ward 1 area), Harrow, Colchester and McGregor. The Town of Essex was created on January 1, 1999 when the former towns of Essex and Harrow, and the former townships of Colchester North and Colchester South were amalgamated. With a population of close to 20,000, the Town covers approximately 278 square kilometers and is situated in southwestern Ontario in Essex County. The Town extends southward from the shores of Lake Erie generally between County Road 11/County Road 41 on the west and County Road 23 on the east and is bound to the north by County Road No. 8.

The topography of the area is a comparatively flat and smooth plain with scattered sandy and gravely knolls. The land rises very gently from Lake Erie. The area along Lake Erie is generally quite low lying and has been subject to flooding from high water levels in Lake Erie and its tributaries over the past few decades.

The Essex Ward 1 area is located in the centre of the county at the intersection of several drain systems, which outlet to waterbodies that bound the county along the northern, western, and southern limits.

This EA study is focused on improvements to the storm sewer system in the southwest area of Essex Ward 1 area within the upper limits of the Canard River Subwatershed as shown in **Figure 1.1** in **Appendix A**. Runoff from Ward 1 southwest storm sewer system is conveyed in drain systems through the adjoining Towns to the Detroit River (roughly 35km downstream). The Ward 1 southwest drainage system consists of storm trunk sewers primarily along north-south streets in the middle and western portion of Ward 1 southwest drainage area, and two separately serviced residential developments in the eastern portion of the drainage area.

This report represents the beginning of the planning process to plan for full future development and to evaluate options to improve flood protection and reduce the associated risk of flooding and property damage within the the South Talbot catchment.

This Environmental Assessment report is intended to satisfy the legislative requirements of the Ontario Environmental Assessment Act. This report follows the planning process set out in a document prepared by the Municipal Engineers Association (MEA) entitled "Municipal Class Environmental Assessment" dated October 2000, as amended in 2007, 2011 and 2015.

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 a number of 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 three approval mechanisms available to the proponent under the Class EA:

- **Eligible for Screening to Exempt** (Previously known as **Schedule A** or **Schedule A+**) projects are limited in scale, have minimal adverse environmental affects, and include several normal or emergency municipal maintenance and operational objectives. Projects listed in these schedules are now exempt from the Act.
- **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.

Examples of relevant projects in Appendix 1 of the Municipal Class EA document include the following activities:

- Drainage works under the Drainage Act are exempt from Ontario EA Act
- Culvert repair and replacement where the capacity of the culvert is not increased beyond the minimum municipal standard or the capacity required to adequately drain the area, whichever is greater, and where there is no change in drainage area
- Enlarge stormwater retention/detention ponds/ tanks or sanitary or combined sewage detention tanks by addition or replacement, at substantially the same location where additional property is required.
- Cleaning, relining, repairs, and renovations to existing sewage collection system
- Establish, extend, or enlarge a sewage collection system and all necessary works to connect the system to an existing sewage or natural drainage outlet, provided all such facilities are in either an existing road allowance or an existing utility corridor, including the use of Trenchless Technology for water crossings.

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 B** activity, which is the highest identified schedule. Upon completion of Phase 1 and Phase 2 for Schedule B projects, the Owner may proceed directly to Phase 5 and implement the preferred solution.

1.2.2 Phases in Municipal Class EA Process

Figure 1.2 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 Eligible for Screening as Exempt, Schedule B or Schedule 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 EXISTING STUDY AREA CONDITIONS

Projects identified through this Class EA process must be evaluated on the basis of the potential impact on the existing environmental conditions of the study area. The following sections provide a general description of the existing natural, social, and economic environmental conditions in the Town of Essex Ward 1 Southwest area.

2.1 DESCRIPTION OF STUDY AREA

The Town of Essex was formed on January 1, 1999 through the amalgamation of the former , towns of Essex and Harrow and the former townships of Colchester North and Colchester South. The amalgamated Town of Essex is comprised of four urban communities - Essex Centre (Ward 1 area), Harrow, Colchester and McGregor. The Town is located in the southwest corner of Essex County bordered by the Town of Amherstburg to the west, the Town of Lakeshore and Town of Tecumseh to the north, the Town of Kingsville to the east and Lake Erie to the south.

Figure 2.1 in **Appendix A** shows Ward 1 southwest drainage area (also called South Talbot Catchment area), which contains 250ha of developed area and 1,300ha of rural agricultural land in the Canard River watershed. The Ward 1 southwest drainage area consists of seven (7) urbanized subcatchments generally bound between County Road 34 (Talbot Street North) to the north, the Greenway trail to the west, and roughly County Road 23 (Gosfield Townline) to the east, and one rural subcatchment as shown in **Figure 2.1** in **Appendix A**.

Figure 2.2 shows the storm sewer system in the urbanized area of the study area. The storm sewer system in the developed area consists of trunk sewers primarily along north-south streets intercepted via two interceptor storm sewers over the seven (7) subcatchments. The Hanlan Street interceptor sewer splits flows to downstream trunk sewers, and the South Talbot Road interceptor sewer conveys flow to the receiving municipal drains. Subcatchments No.1 and No.2 outlet to the Essex Outlet Drain, and subcatchments No.5, No.6 and No.7 outlet to the Canaan Drain. Runoff from subcatchment No.4 and a portion of 3 is split between the Canaan and Essex Outlet Drains.

Runoff collected in the Essex Outlet Drain flows freely downstream to Canard River with overflow to John's Creek Drain which outlets to Craig's Creek Drain and ultimately Canard River. Runoff collected in the Canaan Drain was designed to be diverted to the Canaan Pond for treatment with excess runoff overflowing downstream. All runoff from the South Talbot catchment is conveyed to the Canard River through adjoining Towns to the Detroit River (roughly 35km downstream).

Figure 2.3 shows existing land uses in the study area, which consists of 250 ha of urban land, mostly residential with commercial lands concentrated in the downtown core, and 1,300 ha of

rural agricultural land. The study area is well serviced with an adequate road system and a full range of utilities including electrical, water, natural gas and communications.

2.2 NATURAL ENVIRONMENT

2.2.1 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°C and +28°C respectively and the mean daily temperature is above 6°C which tends to increase temperatures in surface waters. The extremes in weather, especially the summer storms in conjunction with the shallow nature of Lake Erie, cause wide variations in lake levels. Water levels have been known to rise significantly on the leeward shoreline during some extreme storm conditions.

2.2.2 Geology and Physiography

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 drift 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.

Figure 2.4 shows a site plan of the general topography in Essex produced from SWOOP 2015 LIDAR, which was created from the Ministry of Natural Resources and Forestry (MNRF) showing the surface elevation throughout southwestern Ontario with a 2m grid spacing. The topography of the area is a comparatively flat and smooth plain with scattered sandy and gravely knolls. The land rises very gently from Lake Erie. The area along Lake Erie is generally quite low lying and has been subject to flooding from high water levels in Lake Erie and its tributaries over the past few decades.

The Ward 1 Southwest drainage area is located roughly in the centre of the County of Essex at the height of land between Lake St. Clair and Lake Erie. Grade is highest at the northern limits of the drainage area along Talbot Street North and the grade slopes gently away from Talbot Street North in the southerly direction.

2.2.3 Soils

Soils within the study area 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 smooth clay plain and the predominant soil types are Perth and Brookston clays and their associated clay loams in Essex County. Developed from dolomitic limestone intermixed with shale, the imperfectly drained member is the Perth clays and the poorly drained member is the Brookston clays. According to the Essex County Soil Map, the soils in the Ward 1 Southwest drainage area are predominantly Brookston Clay, and a small portion of the soil is Fox Sandy Loam.

Throughout the region, good quality topsoil tends to support an extensive gardening market, cash crops and other agricultural uses throughout the Township. The Ward 1 Southwest drainage area generally has a topsoil stratum of approximately one foot overlaying clay which is the dominant soil strata.

2.2.4 Water Resources

The Essex Region watershed is comprised of approximately 29 smaller sub-watersheds, flowing generally either northward into Lake St. Clair, westward into the Detroit River, or southward into Lake Erie; (or entirely into Lake Erie in the case of Pelee Island). The Lower Thames Valley Conservation Authority (part of the Thames-Sydenham and Region Source Protection Region) shares the eastern boundary of the Essex Region watershed.

Figure 2.1 in **Appendix A** shows the network of municipal drains around the study area. The Essex Outlet Drain and Canaan Drain convey storm water from the urban portion of the South Talbot catchment to Canard River which outlets to the Detroit River.

2.2.5 Source Water Protection

Source water protection vulnerability is determined through a regional groundwater vulnerability assessment which identifies Highly Vulnerable Aquifers (HVAs) and Significant Groundwater Recharge Areas (SGRAs).

There are no HVA's in the project catchment. A portion of the land in the northern portion of the catchment is identified as a SGRA with low vulnerability (score=2). The area of the SGRA is primarily residential with some commercial development. **Figure 2.5** in **Appendix A** shows the SGRA within South Talbot catchment project area. The project activities do not pose a drinking water threat as the improvements work includes storm sewer, pump station and/or engineered storage of stormwater runoff during extreme storm events.

2.2.6 Natural Vegetation

The County of Essex 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 remnant broadleaf forests in Essex County are a resource of national importance. A number of trees with sporadic occurrence on specialized sites reach their northern limits in the area. In addition to rare tree varieties, there are southern herbs and prairie vegetation found in specific areas.

The Town of Essex comprises a large agricultural hinterland with field crop production, horse farms and vineyards. Most of the area was cleared many years ago to allow for agricultural land uses. There are, therefore, comparatively few stands of trees or wood lots.

2.2.7 Terrestrial and Aquatic Animal Life

The agricultural land uses support generally small animals including rabbits, raccoons, skunks, fox, muskrat, etc. As long as the existing land uses are maintained, these animals would be expected to remain as they can effectively adapt to man's activity.

2.3 CULTURAL HERITAGE ENVIRONMENT

This section describes the cultural heritage component of the environment, which includes archaeological resources, built heritage resources, and cultural heritage landscapes.

2.3.1 Archaeological Resources

The screening checklist, Criteria for Evaluation Archaeological Potential, developed by the Ministry of Tourism, Culture and Sport (MTCS) (now Ministry of Citizenship and Multiculturalism (MCM)), was completed as part of the project file. The potential for archaeological resources was assessed for the works outlined in the following sections. This evaluation included six (6) sites: three (3) sewer replacement projects (like-for-like sewer replacement projects within the existing roadway) and three (3) pond upgrade projects (open space / agricultural land). See **Figure 6.1** for more details regarding the locations of these proposed upgrades.

For the three (3) sewer replacement projects (like-for-like sewer replacement projects within the existing roadway) the checklist was completed and determined that recent extensive and intensive disturbances have occurred within the project area due to infrastructure development. Infrastructure development within the project areas include sanitary sewer lines, water lines, stormwater lines, gas lines, and roads. Therefore, no Archaeological Assessments were undertaken as a part of this Class EA nor are they recommended for the sewer replacement projects.

For the three (3) pond upgrade projects, no extensive or intensive disturbances nor archaeological assessments have been completed for the proposed sites. The exact location, size, and layout of the three proposed pond upgrades has not been confirmed and may change during the detailed design process. Therefore, it is recommended for a Stage 1 Archaeological Assessment to be undertaken during the detailed design phase and prior to the start of construction.

2.3.2 Built Heritage Resources and Cultural Heritage Landscape

The screening checklist, Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes, developed by the MTCS (now MCM), was completed as part of the project file and is available in **Appendix G.1**. The potential for built heritage resources and cultural heritage landscapes was assessed for the works outlined in the following sections. This evaluation included six (6) sites: three (3) sewer replacement projects (like-for-like sewer replacement projects within the existing roadway) and three (3) pond upgrade projects (open space / agricultural land). See **Figure 6.1** for more details regarding the locations of these proposed upgrades.

The Town of Essex's Planning Department has indicated that there are no Built and/or Cultural Heritage Landscapes designated under the *Ontario Heritage Act* within or adjacent to the area of the proposed upgrades. Through the Evaluation Checklist, the study areas were determined to have low potential for built heritage resources and cultural heritage landscapes. Therefore, no technical cultural heritage studies have been undertaken as part of this Class EA.

2.4 FUTURE DEVELOPMENT

2.4.1 Official Plan

The Town of Essex *Official Plan* and *Zoning By-law* were adopted in 2009 and 2010 to guide development and to set Council priorities and policies on land use for the following 20 years. It follows the guidelines and principals of the County of Essex Official Plan and incorporates the mandates of the *Planning Act* of Ontario and other legislated requirements.

The adopted *Official Plan* and *Zoning By-law* regulates and controls development and planning policies in the study area and will be updated from time to time as necessary to take into account physical and social changes affecting the community. **Figure 2.6** in **Appendix A** shows the property zoning in the Town's *Zoning By-law No. 1037*.

2.4.2 Future Land Use

Future land uses in the study are illustrated in **Figure 2.7.** Details of the future land uses and assumed hydrologic-hydraulic modelling parameters are summarized in **Table F-1** in **Appendix F**.

The following future development is planned in the study area and is summarized below:

- Residential development in the current open space in Kimball, Jakana and Woodview Estates subdivisions. Some of this development has already begun at the time this report was being prepared.
- Splash pad at Arena with an area of approximately 210m^2; runoff from splash pad drains to a 7,570 liters (2,000 USgal) underground retention holding tank for watering vegetation, with overflow to storm sewer (refer to **Appendix E** for details).

- Outdoor sports facility and park in the current agricultural land at the lot on the southwest corner of Highway 3 and North Malden Road. Design of the facility has not been finalized, but the report to council shows a conceptual design with football field surrounded by a running track, baseball diamonds, soccer fields as well as a splash pad, tennis courts and canteen (refer to **Appendix E** for details).
- Hwy 3 Culvert extensions and replacements, and additional impervious area from the future widening of Highway 3 from two to four lanes (refer to **Appendix E** for details).

Current and future land use in the catchment are shown in **Table 2-1**. The table shows approximately 14ha of open space planned for residential development and 28ha of agricultural land in the rural portion of the catchment to be developed into parkland/sports facilities.

Table 2-1: Existing and future land uses in the South Talbot catchment

	Land Use	Current Area (ha)	Future Area (ha)
Urban (subcatchments 1-7)	Industrial	1.7	1.7
	Commercial	10.6	10.6
	Institutional	11.7	11.7
	Residential	**157.7**	**171.6**
	Mobile Homes	17.8	17.8
	Apartments & Hotels	0.2	0.2
	Parkland	9.5	9.5
	Open Space or Agricultural	**40.7**	**26.8**
Rural (subcatchment 8)	Parkland	**0**	**28**
	Open Space or Agricultural	**1300**	**1272**
	Hwy 3 pavement	2.5	5

2.5 STORMWATER DRAINAGE SYSTEM

2.5.1 Conveyance

2.5.1.1 Storm Sewer Inventory

The plan of existing storm drainage system is shown in **Figure 2.2** of **Appendix A**. **Table 2-2** summarizes the inventory of the existing storm sewers in the Essex Ward 1 southwest area. The majority of storm sewer pipes are PVC, concrete and clay. Approximately 10% of the storm sewers in the Essex Ward 1 southwest area are clay pipe.

Details of the existing storm sewer system in the study area were obtained from the as-constructed drawings and field investigations. Rural drainage area boundaries were developed

based on the Essex Outlet Drain drainage plan prepared by C.G. Russell Armstrong Ltd. dated Aug. 1975 and field investigations.

Table 2-2: Storm Sewer Inventory for Ward 1 Southwest Area

Pipe Size (mm)	*Length (km)*	*Pipe Material*	*Length (km)*
Gravity Sewers			
150	0.8	HDPE	0.5
200	1.6	PVC	7.2
250	1.8		
300	8.1	Material unknown	0.3
375	2.9	Cast Iron	0.9
450	3.2	Asbestos Cement	0.01
525	1.4	CSP	0.5
600	1.3	Clay	3.1
675	0.7		
750	3.1	Reinforced Concrete	17.6
900	2.3		
1050	1.5		
1200	1.1		
1350	0.1		
1650	0.2		
1800	0.01		
Sub-total	**30.1**	**Sub-total**	**30.1**

2.5.1.2 Storm Sewer Design Basis

The Ward 1 southwest stormwater drainage area and trunk sewer layout were established in previous drainage studies (CG Armstrong Russel 1968, L.C.B.A. Ltd. 1975). Since then, the storm sewer system has been constructed over many contracts.

Table 2-3 summarizes the storm sewer design criteria used to design the storm sewers in Ward 1 Southwest drainage area. The table shows that storm sewer design capacity has increased over the years as SWM standards have evolved.

Table 2-3: Storm sewer design criteria for Ward 1 Southwest Area

Date	Guideline or Standard	Return Period	Inlet Time	Design Method	Residential C-value (typ)
2018 – Present	WERSM Standards Manual, 2018	5-year WERSMSM	-	Rational or H&H Modeling	0.6-0.7
2003 – 2018	Town of Essex Development Standards Manual, 2003	5-year AES Sta. No. 6139525	-	Rational	0.4-0.5
1975 – 2003	LCBA Stormwater Drainage Study	2 or 5-year Yarnell	30min (avg.)	Rational	0.3-0.4

2.5.1.3 Watercourse Design Basis

The watercourses within the Ward 1 southwest stormwater drainage area have historically been designed with OMAFRA agricultural drainage curves or using the Rational or SCS method with 2-year return period.

2.5.2 Stormwater Management Facilities

2.5.2.1 Flow Control Structures

There is one (1) flow control orifice in the Essex Ward 1 southwest drainage area installed in the Tulley Meadows storm sewer system (subcatch. 7). The Tulley Meadows storm sewer design is a superpipe storage with orifice restricting the release rate to the downstream receiver. The location of the flow control structure is shown in subcatchment 7 in **Figure 2.2** of **Appendix A**.

2.5.2.2 End-of-Pipe Stormwater Management Facilities

The Ward 1 southwest drainage area has two stormwater management ponds: Canaan Pond and Woodview Estates Pond. The locations of the stormwater management facilities are shown in **Figure 2.2** in **Appendix A**. The stormwater management pond design parameters are shown in **Table 2-4**.

Canaan Pond was designed as an off-site dry pond system sized to treat the first flush (6mm) from Kimball & Jakana subdivisions. The first flush was designed to be diverted to the pond with runoff exceeding the quality volume overflowing to the downstream Canaan Drain. The SWMF outlet structure is equipped with an orifice to restrict the pond drawdown to the Canaan Drain. However, field investigations revealed the outlet structure does not drain the pond completely

and as a result the pond currently does not function as intended. This causes standing water upstream of the pond (channel weir) approximately at the bypass level (quality level). The Canaan Pond was originally constructed under Section 78 of the Drainage Act R.S.O. 1990 c. D17 and covered by the current MOE Certificate of Approval No. 3364-6SNQNA. A copy of the current Certificate of Approval is included in **Appendix B**. Access to the Canaan Pond parcel, owned by the Town, is through an easement along the west limit of 2964 County Rd 12.

The Woodview SWM Facility consists of a Forebay sized to treat the first flush (13mm) with infiltration drawdown and forebay bypass to an oversized meadow for quantity control to service Woodview Estates subdivision. The first flush was designed to be diverted to the Forebay and runoff exceeding this quality volume bypass to the meadow. The SWMF outlet structure is equipped with an orifice to restrict the release rate from the meadow to pre-development flows, with provision for principal overflow (193.65m) and auxiliary overflow (193.95m). The Woodview storm system design operates such that the Forebay, meadow and sewers provide storage while the outlet structure controls the release rate and HGL in Woodview Estates subdivision. An exert of the current Certificate of Approval and SWM Report is included in **Appendix B**.

Table 2-4 – SWM Facility's in Ward 1 Southwest Area

SWMF	SWMF Type	Service Area	Quantity or Quality	Level	Active Storage Volume (m^3)
Woodview Estates (1)	Dry Forebay with Meadow	Woodview Estates (25 ha)	Quality & Quantity	Forebay bypass	700
				Aux. Spillway	4,500
Canaan (2)	Dry pond – single bay	Regional; Subcath. 9 – 12 (14.9 ha)	Quality	Pond bypass	1,600
				Spillway	7,100

Notes:
(1) Storage volume from SWM Report
(2) Storage volume approximated from footprint of as-constructed infrastructure

3.0 PROBLEM STATEMENT

3.1 LIMITATIONS OF EXISTING STORM SEWER SYSTEM

3.1.1 Existing Sewer Capacity Limited Compared to Current Design Standards

Existing trunk storm sewers were designed and constructed to service drainage areas as defined in the 1975 LCBA drainage study. However, due to changes in development and storm sewer layout over the years, some of the existing trunk sewers currently service drainage areas that differ from their original design in the 1975 LCBA drainage study. Since 1975, no Municipal Class EA Storm Sewer Servicing Master Plan or comprehensive stormwater drainage study in the Ward 1 drainage area has been undertaken to reflect changes in development and/or storm sewer layout that have occurred over time.

Trunk storm sewers and drain infrastructure, which were sized according to standards then in use, are undersized compared to current design standards and have not yet been improved to handle newer storm sewers recently constructed using current design criteria. The existing storm sewer system was originally designed to convey flows from a two-year storm as described in the 1975 drainage study. Since 2003, storm sewers constructed as part of land developments have generally been designed to handle flows from a 5-year storm with varying levels of land imperviousness.

3.1.2 Limited Resilience to Climate Change Impacts

Climate changes related to increasing rainfall in the region have a significant impact on municipal sewer systems. In recent years, the amount of rain and intensity of storm events is increasing. It appears that the currently designated 10-year, 25-year and 100-year storm events occur more frequently due to the climate changes, which may have the following impacts to people and property, including:

(1) increased occurrences of localized flooding

(2) more flooding damages

(3) Increased stress on the Town's drainage and storm sewer systems.

The Town's storm sewer system was designed to convey flows from 2-year or 5-year storms which was consistent with development in other municipalities. However, existing storm sewer and drain systems cannot handle extreme rainfall events that have been experienced in recent years. During heavy rainfall events, significant amounts of stormwater pooling on Town streets and runoff from urban areas significantly increase the volume of stormwater entering the Town's storm sewer system, causing flooding.

3.2 PROBLEM IDENTIFICATION

In recent years, the Town experienced street and basement flooding during extreme storm events. On August 11, 2014 and September 3, 2015, the Town received a record amount of rainfall. Many houses, mostly located in Ward 1 Southwest drainage area, were flooded during the two heavy rainfall events.

Flood damage appeared to be caused by excessive runoff which the storm infrastructure is not designed to convey. Local drainage systems and storm sewers were designed for less extreme rainfall events. During extreme rainfall events significant amounts of stormwater pooling on Town streets and significant runoff from roof structures can drastically increase the volume of stormwater entering the Town's storm sewer system.

To continue with future development, the existing storm sewer system needs to be evaluated to identify areas where improvements can be implemented to mitigate the risk of flooding and property damage and prepare the Ward 1 southwest drainage area for full future development.

3.3 PROJECT OBJECTIVE

The project objective is to evaluate the existing storm system, identify improvements required to reduce the risk and extent of surface flooding and property damage, and accommodate future development through improvements to the storm sewer system in the Ward 1 Southwest drainage area.

This study requires hydrologic-hydraulic (H&H) model development, calibration and confirmation of hydraulic capacity of the existing storm infrastructure. Possible improvements to the storm sewer system include replacing and/or twinning sewers, construction of storm relief sewers and/or stormwater pumping stations, and stormwater storage facilities to store runoff during severe storm events.

4.0 DEVELOPMENT AND SELECTION OF ALTERNATIVES FOR IMPROVEMENTS TO STORM SEWER SYSTEM

4.1 INTRODUCTION

The previous section described the problem statement of the Ward 1 Southwest Storm Sewer System 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 criteria used to develop the alternatives were based on generally accepted principles and previous experience. The criteria included the following:

- Application of current engineering practices and standards;
- Adherence to applicable laws and regulations;
- Economic considerations;
- Operation and maintenance issues;
- Health and safety;
- Acceptability to concerned stakeholders; and
- Feasibility of implementation.

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 thus not discussed in detail in this report.

4.2 STORMWATER SYSTEM ASSESSMENT

4.2.1 Hydrologic-Hydraulic Modelling Analysis

The approach used in this undertaking was to develop and calibrate a hydrologic-hydraulic (H&H) model for the Ward 1 Southwest storm sewer and municipal drainage system in the River Canard Subwatershed to evaluate which Planning Level Alternatives significantly reduce the risk and extent of surface flooding and property damage, and accommodate future development.

The site plan of the Ward 1 Southwest drainage system is shown in **Figure 2.1** and a site plan of the Town of Essex's stormwater drainage system in the H&H model is shown in **Figure 5.1** of **Appendix A**. Further details of the H&H modeling analysis are provided in **Appendix F**.

The H&H modeling results are described in the following sections to evaluate alternative solutions. The results are also used for conceptual design of the preferred alternative solution.

4.2.2 Criteria for Evaluating Planning Level Alternatives

Design criteria for evaluating the planning level alternatives under full future development conditions are shown in **Table 4-1**. This evaluation was completed to determine the preferred alternative. Each subcatchment is evaluated against the evaluation criteria based on the storm infrastructure installed within the subcatchment. The criteria were used to evaluate the storm system under full future development to mitigate flood risk and property damage within the South Talbot catchment.

The criteria were developed from industry standard practice in Essex County. Criteria are more stringent for subcatchments serviced with end-of-pipe restricted storm infrastructure because under extreme rainfall events the release rate of these subcatchments is restricted which can cause the hydraulic grade line to rise excessively upstream.

Table 4-1: Design criteria for assessment of storm system under full future development

	Subcatchments with Min. 2-Yr Outlet Capacity	**Subcatchments with End-of-Pipe Restricted Outlet**
Criteria	5yr-12hr AES no surface flooding (peak HGL below grade)	100yr-4hr Chicago distribution and 100yr-24hr SCS-Type II distribution with surface flooding <0.3m on roadway & >0.3m SWMF freeboard
Purpose	Eliminate bottlenecks so that the HGL within the catchment will not rise excessively in any one area	No excessive surface flooding caused by outlet sewer flow restriction under 100yr storm

4.3 PLANNING LEVEL CONCEPTUAL ALTERNATIVE SOLUTIONS

Several conceptual alternative solutions may be proposed to address the identified problems and needs of the Ward 1 Southwest Storm Sewer System. The following broad planning level alternative solutions have been considered for providing adequate service for the stormwater system in the Ward 1 Southwest area of the Town of Essex:

1. Do nothing
2. Runoff reduction through Low Impact development (LID) and green infrastructure
3. Field inspection and maintenance of existing storm sewers
4. Increasing hydraulic capacity of existing storm sewers
5. Construction of stormwater management ponds
6. A Combination of the Above Alternatives

The advantages and disadvantages of each alternative together with their effects on the socio-economic and natural environment are discussed in the following sections.

4.3.1 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 to prepare for future development, the catchment will not have sufficient stormwater infrastructure in place to service future development. Further, if nothing is done to reduce current areas of limited hydraulic capacity in the stormwater system, the risk of flooding, and property damage will not be effectively controlled, particularly during periods of heavy rain events.

4.3.2 Alternative 2: Runoff Reduction through LID & Green Infrastructure

Alternative 2 is to reduce the volume and rate of runoff entering the storm sewer system, thereby mitigating the risks of sewer backup, flooding and property damage. Runoff reduction to the storm sewer system has been reduced by low impact development (LID) and green infrastructure alternatives in other areas of the world. These technologies manage runoff as close to possible at the source and many reduce runoff volume and/or runoff rates. These technologies rely primarily on infiltration to reduce the volume of runoff in the water cycle. This is not practical in the South Talbot catchment where the predominant soil stratum is one foot of topsoil overlying poorly draining Brookston Clay, so this is not considered a solution to the problem statement.

4.3.3 Alternative 3: Field Inspection and Maintenance of Existing Storm Sewers

Alternative 3 is to clean debris and/or sediment accumulation from existing infrastructure. Field investigations and CCTV inspections of targeted storms sewers were undertaken to assess the condition of the storm system. Areas where maintenance could be considered are summarized below:

1. **Western portion of Catchment** – Clean the Victoria Ave sewer near the outfall and the Essex Outlet Drain to restore the channel bottom elevation below the sewer outfall inverts. Currently all three sewers that outfall to the drain have approximately 350-500mm standing water at the outfall during dry weather.
2. **Woodview subcatchment (subcatchment 6)** – Remove accumulated sediment from the Woodview Forebay and meadow, and rehabilitate the Forebay outlet structure. The

sewer upstream of the Woodview SWMF weir will likely have accumulated sediment and require cleaning once the pond is draining properly.

3. **Eastern portion of Catchment** – Rehabilitate the Canaan Pond outlet structure so the pond can drain between storm events. The open channel upstream of the Canaan pond weir will likely be filled with sediment and require cleaning once the pond is draining.

A H&H analysis indicated that cleaning of these areas is not expected to significantly improve the storm system's level of service. As a result, they are considered maintenance items and not a solution to the problem statement. However, whichever preferred alternative is identified, Alternative No.3 Field Inspection and Maintenance of Existing Storm Sewers could be included in the preferred alternative.

4.3.4 Alternative 4: Increasing Hydraulic Capacity of Existing Storm Sewers

Alternative 4 is to improve the conveyance system thereby improving the storm system's level of service. The study area consists of the following four (4) service areas (refer to **Figure 2.2** in **Appendix A**): Viscount Estates (Subcatchment No.1), Town Centre (Subcatchments No.2 to No.5), Woodview Estates (Subcatchment No.6), and Tulley Meadows (Subcatchment No.7).

The level of service in each of these areas is largely dependent on the storm infrastructure installed within each service area. The H&H model analysis identified areas of limited hydraulic capacity in the Town Centre (**4.3.4.1**) and Tulley Meadows (**4.3.4.2**).

4.3.4.1 Town Centre Conveyance System Improvements

The following two (2) areas were identified as limiting the capacity of the storm system in the Town Centre:

1. **Victoria and Laird service area:**

The Victoria and Laird trunk sewers receive runoff from the Brien, Iler, and Centre St drainage areas via the Hanlan St interceptor sewer. The Victoria and Laird trunk sewers were not designed to convey runoff from these areas. Runoff conveyed by the Hanlan St sewer causes limited hydraulic capacity at the Hanlan-Victoria intersection, and along the Laird trunk sewer. Storm sewer improvements along Centre Street and Iler Ave within Optimist Park would improve the level of service.

Trunk sewers along Centre St and Iler Ave (through Optimist Park) would provide more even flow distribution to the north-south trunks sewers and reduce runoff diverted from the Hanlan interceptor sewer to the Victoria and Laird trunk sewers. Currently neither of the Iler or Centre St. service areas have trunks sewers designed to convey runoff at the upper limit of their service areas. The Centre and Iler infrastructure would service the current level of development as no future development within their drainage area is proposed. An opportunity would exist when improving the storm sewer within Optimist Park to reduce inflow into the sanitary manholes

located within the park. These manholes were identified in a previous study (Essex MH Report, 2015) as sources of high Inflow/Infiltration to the sanitary sewer system. This can be remedied by adjusting grading within the park.

2. **Brien and Fairview service area:**

The Brien trunk sewer receives runoff from the Iler Ave drainage area and Kimball subdivision which it was not originally designed to service (refer to Drawing No. LA-2555). The Brien trunk sewer's invert rise at the Brien-Hanlan intersection and additional runoff causes limited capacity in the network at the Brien-Hanlan intersection. The result is the area from Hanlan to Talbot St N and Iler to Fairview has a low level of service and it is common for sewer backup to occur in this area. Storm sewer improvements along Brien Ave would improve the level of service.

The preferred option for Brien sewer upgrades is shown in **Figure 6.1**. Upgrading the Brien sewer from Kimball to Talbot Rd. S. Drain will provide a proper outlet to service full future development of the Brien Ave drainage area which includes the Kimball and Iler Ave drainage areas not originally designed to be serviced from the existing Brien sewer north of Hanlan.

4.3.4.2 Tulley Meadows Conveyance System Improvements

The Tulley Meadows storm system was designed to operate such that the sewers provide storage while the outlet sewer orifice controls the release rate and HGL in Tulley Meadows subdivision (referred to as a superpipe design).

The results of the storm sewer H&H modeling indicated that the superpipe system did not have sufficient storage volume to maintain surface flooding below 0.3m during the 100yr storm. It has been reported that a few houses in Tulley Meadows Estates experienced flooding during severe storm events.

Without mass storm sewer replacement in Tulley Meadows subdivision (Subcatchment no.7), which is not economically feasible, the modeling analysis concluded that maintaining surface flooding below 0.3m could not be achieved throughout this development. However, to reduce flood risk in this subdivision the orifice plate (shown in **Figure 2.2** in **Appendix A** in Subcatchment No.7) on the outlet sewer could be removed. This would improve the level of service in this development, and the Canaan Pond could be expanded to accommodate the additional volume due to the increased release rate from Tulley Meadows.

4.3.5 Alternative 5: Construction of Stormwater Management Ponds

This alternative is to construct stormwater management pond to store and releases runoff at a controlled rate. A stormwater management pond, which is an engineered structure constructed to store runoff, can provide erosion and flooding control while enhancing water quality. Areas where stormwater management ponds can improve the storm system's level of service discussed below:

4.3.5.1 Town Centre SWM Pond

The Town Centre area does not have sufficient land available for the construction of a stormwater management pond onsite. An alternative to onsite storage would be to construct offsite storage pond(s) where sufficient land is available and pump stormwater flow from the Town Centre to the offsite pond. Based on the results of the hydraulic-hydrologic analysis, this alternative would require a high capacity low-lift pump station with a capacity exceeding 1000L/s.

This alternative is not considered economical as it would require significant length and cost to install the large diameter forcemain (±900mm dia.), and significant costs to construct the large capacity pumping station. Thus, this alternative is not considered further.

4.3.5.2 Woodview SWMF Expansion

The Woodview SWMF and sewers provide storage while the SWMF's outlet structure controls the release rate and water level in the Woodview Estates subdivision. However, the results of H&H modeling showed that the existing Woodview SWMF does not have sufficient volume to maintain surface flooding below 0.3m and pond freeboard above 0.3m during the 100yr storm. These are widely accepted standards in stormwater management which limit the amount of surface flooding permitted during design and provide a factor of safety in the design of SWMFs. It has been reported that a few houses in Woodview Estates experienced flooding during severe storm events.

Storage improvements at the Woodview SWMF can improve the level of service in Woodview Estates. The proposed work would involve the expansion of the Woodview SWMF for quantity and quality control to accommodate 100yr storm events per current design standards and service full future development.

4.3.5.3 Regional Stormwater Management Ponds

Improvements to existing storm sewers will increase the release rate to the downstream Canaan Drain and the Essex Outlet Drain receiving channels. As a result, a new pond is proposed to service the Essex Outlet Drain outlet, and the Canaan Pond is proposed to be expanded to service the Canaan Drain outlet.

The hydraulic capacity of the receiving watercourses was analyzed for all storms up to and including the 100yr storm to evaluate the potential for adverse effects on the receiving drain's HGL from the preferred alternative in **Section 5.2.2**.

4.3.6 Alternative 6: A Combination of the Above Alternatives

In addition to the above alternatives, there are additional possibilities which combine storm infrastructure improvement alternatives.

The improvements to existing storm sewer system can achieved by combining "Alternative No.3: Field Inspection and Maintenance of Existing Storm Sewer System", "Alternative No.4: Increasing Hydraulic Capacities of Storm Sewer System" and "Alternative No.5: Construction of Stormwater Management Ponds".

4.4 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.4.1 Socio-Economic Environment

The Do-Nothing planning alternative involves retaining the existing storm water 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 the storm sewer system in the study area. The Do Nothing alternative, as discussed above is therefore not considered a viable option and is not considered.

The remaining alternative planning solutions represent a viable solution to the identified problems from a socio-economic perspective and shall be considered further in this study.

4.4.2 Natural Environment Impacts and Mitigating Measures

Table 4-2 provides a summary of potential environmental impacts and proposed mitigating measures for alternative solutions. As a group, the alternative planning solutions (except the "Do Nothing" alternative) 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 4-2**, it is anticipated that improvements to the stormwater sewer system 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 stormwater sewer improvements 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. Improvements to the stormwater conveyance and management system will have a very significant socio-economic beneficial effect by reducing the risk of flooding and property damage.

With respect to other socio-economic impacts, it is anticipated that the preferred alternative will not have any significant 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 4-2: 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 storm water storage facility	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
	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

Table 4-2: Environmental Effects and Mitigating Measures

OPERATION	*EFFECT*	*MITIGATING MEASURES*
	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
	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
	Agricultural disruption of field 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

Table 4-2: Environmental Effects and Mitigating Measures

OPERATION	*EFFECT*	*MITIGATING MEASURES*
	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.
	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.	➢ Storm water sewers 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.

Table 4-2: Environmental Effects and Mitigating Measures

OPERATION	*EFFECT*	*MITIGATING MEASURES*
	Potential impacts to archaeological resources and areas of archaeological potential (e.g., disturbance or destruction; and potential impacts to built heritage resources and cultural heritage landscapes; and displacement of resources by demolition or removal; disruption of resources by the introduction of physical, visual, audible, or atmospheric elements that are not in keeping with the character and setting of the resource).	➢ Assess archaeological significance in areas undisturbed by previous activities such as farmland. ➢ As a minimum complete a Stage 1 Archaeological Assessment during the detailed design stage and prior to construction (proceed with Stage 2 Archaeological Assessments as required). ➢ Follow mitigative measures outlined in **Table 4-2** and **Section 6.3**. ➢ Follow mitigative measures outlined by applicable environmental standards and regulations or as outlined by regulatory agencies.
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.
	Introduction of non-native vegetation, including opportunistic species.	➢ Clean heavy machinery and equipment prior to transporting to new location.

Table 4-2: Environmental Effects and Mitigating Measures

OPERATION	*EFFECT*	*MITIGATING MEASURES*
	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.

4.5 SCREENING SUMMARY AND RECOMMENDED ALTERNATIVE SOLUTIONS

A comparative summary of the six (6) conceptual planning level alternative solutions and their ability to address the problem statement is presented in **Table 4-3**.

Other than the environmental effects listed in **Table 4-2**, it is anticipated that the recommended conceptual planning alternatives are not considered to have any significant effect on natural environment. In fact, it is anticipated that the provision of a greater degree of flow control and pollution control will enhance the hydraulics and 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 preferred conceptual planning alternatives are also not considered to have any significant 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 envisioned in planning documents which have positive impacts on the socio-economic environments.

The results of the preliminary screening in **Table 4-3** indicate that the preferred alternative solutions which address the identified problems and study objectives to allow for full future development is Alternative No.6 which is a combination of Alternatives No.3, 4 and 5, including:

- Field Inspection and General Maintenance
- Increasing hydraulic capacity of specific existing storm sewers
- Construction of stormwater management ponds

The following sections describes details of the preferred alternative improvements to the Ward 1 Southwest Storm Sewer System.

Table 4-3: Comparative Summary of Conceptual Planning Alternatives

No.	Conceptual Planning Alternative Solutions	Advantages	Disadvantages	R / NR *
1	**Do Nothing**	• Eliminates need for large capital expenditures	• No sufficient storm sewer in place to service current & future development. • In areas with low level of service, the risk of flooding, and property damage will not be effectively controlled, particularly during periods of heavy rain event	NR
2	**Runoff Reduction through LID & Green Infrastructure**	• Reduce the volume and rate of runoff entering the storm sewer system, thereby mitigating the risks of sewer backup, flooding and property damage	• Study area with low infiltration soil (clays) and limited land is not suitable for LID and green infrastructures.	NR
3	**Cleaning Infrastructure from Debris/Sediment Accumulation**	• Lower capital cost than installation of new infrastructure • Could form part of preferred short-term solutions	• Not expected to significantly improve the storm system's level of service if cleaned	R
4	**Sewer construction – Centre St and Iler Ave**	• Provide more even flow distribution to the north-south trunks sewers and reduce runoff diverted from the Hanlan interceptor sewer to the Victoria and Laird trunk sewers • Prevents hydraulic bottleneck at the Hanlan-Victoria intersection during infrequent storms • Provide proper outlet for servicing Iler and Centre St drainage (currently these areas do not contain trunks sewers designed to convey runoff at the upper limit of their service areas) • Significantly reduces flood risk and property damage in Town centre - west. • Could form part of preferred short-term solutions	• Involves greater community disruption • Involves capital expenditures	R

Table 4-3: Comparative Summary of Conceptual Planning Alternatives

No.	Conceptual Planning Alternative Solutions	Advantages	Disadvantages	R / NR *
4	**Sewer construction – Brien Ave W**	• Provides proper outlet for servicing full future development of the Brien Ave drainage area including Kimball and Iler drainage areas not designed to be serviced by existing Brien sewer • Allow for use of the full sewer hydraulic cross-section for conveyance • Prevents hydraulic bottleneck at the Hanlan-Brien intersection during infrequent storms • Significantly reduces flood risk and property damage in Town centre - east. • Could form part of preferred short-term solutions	• Involves greater community disruption • Involves capital expenditures	R
	Tulley Meadows – remove outlet sewer orifice	• Provides improved level of service and reduces the HGL in the Tulley Meadows development • Significantly reduces flood risk and property damage in Tulley Meadows development. • Could form part of preferred short-term solutions	• Involves greater community disruption • Involves capital expenditures	R
5	**Woodview SWMF Expansion & Sewer Cleaning**	• Significantly reduces flood risk and property damage in Woodview Estates (subcatchment 11) • Could form part of preferred short-term solutions	• Involves greater community disruption • Involves capital expenditures	R
	Canaan Pond Expansion & Drain Repair	• Significantly reduces flood risk and property damage in Tulley Meadows (subcatchment 12) • Mitigate adverse impacts to downstream receiver's HGL • Could form part of preferred short-term solutions	• Involves greater community disruption • Involves capital expenditures	R
	Essex Outlet Pond & Drain Improvement	• Mitigate adverse impacts to downstream receiver's HGL • Could form part of preferred short-term solutions	• Involves greater community disruption • Involves capital expenditures	R

Table 4-3: Comparative Summary of Conceptual Planning Alternatives

No.	Conceptual Planning Alternative Solutions	Advantages	Disadvantages	R / NR *
6	**Combination of Alternative 3&4&5**	• Same Advantages as noted for alternatives 3,4, and 5	• Involves greater community disruption • Involves capital expenditures	R

Notes:
*** R = Recommended** **NR = Not Recommended**

5.0 PREFERRED ALTERNATIVE CONCEPTUAL DESIGN

Figure 6.1 in **Appendix A** shows the preferred alternative to reduce the risk and extent of surface flooding and property damage and prepare for full future development in the catchment.

Improvements to the Ward 1 Southwest Storm Sewer system include the following:

- Increasing Hydraulic Capacity of Storm Sewers (Alt. 4)
    - Replace storm sewer along Centre Street between Hanlan Street and South Talbot Road to a provide proper outlet for service the Centre Street drainage area
    - Replace storm sewer in Optimist Park between Hanlan Street and Milne Street to provide a proper outlet for servicing the Iler Ave drainage area
    - Replace storm sewer along Brien Ave West between Kimball Dr and South Talbot Rd and along South Talbot Rd from Brien Ave West to Fairview Ave West at the outfall
- Construction of Stormwater Management Ponds (Alt. 5)
    - Woodview SWMF expansion
    - Canaan Pond expansion
    - New Essex Outlet Pond on the west side of the Essex Pollution Control Plant

5.1 STORM SEWER IMPROVEMENTS (ALT. 4)

Figure 6.1 in **Appendix A** shows the storm sewer improvements for the preferred alternative. The preferred alternative's storm sewer improvements are along Centre St from South Talbot Rd to Hanlan, along Iler Ave (in Optimist Park) from Hanlan to Milne St, and along Brien Ave W from Kimball Dr to South Talbot Rd, and South Talbot Rd to the outfall at Fairview Ave W. The Brien Ave sewer upstream of Kimball is proposed to be cleaned as far upstream as required, once the new sewer is draining properly following the construction of the new works (refer to **Figure 6.1**). Furthermore, to reduce flood risk in Tulley Meadows subdivision the orifice plate on the outlet sewer is proposed to be removed as shown in **Figure 6.1** in **Appendix A**.

The proposed storm sewers would be constructed in existing road allowances, and municipally owned parks. The sewers are proposed to be constructed using the open cut method of installation. Sewers were sized using Manning's equation from SWMM runoff method computed peak flows that were routed with SWMM dynamic wave hydraulic routing so no flooding at the design criteria's 5yr-12hr-AES storm occurred (refer to **Table 4-1**).

The sewer improvements in the preferred alternative are to accommodate full future development in the catchment and improve the level of service. Regional Ponds are proposed

to accommodate the additional runoff due to the increased release rate from the sewer systems. This is discussed in **Section 5.2.2**.

5.2 STORMWATER MANAGEMENT FACILITIES (ALT. 5)

5.2.1 Woodview SWMF

The proposed Woodview SWMF expansion is shown in **Figure 6.1**. The exact size and shape of the proposed pond should be determined during detailed design and consider input from the Town of Essex, County of Essex, Essex Regional Conservation Authority, and other applicable parties. In addition, the detailed design of the proposed pond should take into the Natural Heritage Resources outlined in the Natural Heritage Review (**Appendix G.2**). The Woodview SWMF is proposed to be expanded around the existing ERCA workshop with new outlet channel constructed to the existing outlet structure.

Preliminary design criteria for the Woodview SWMF is shown in **Table 5-1**. The SWMF expansion is computed to maintain surface flooding to less than 0.3 m on roadways during the 100yr major design storms (refer to the criteria in **Section 4.2.2**).

Table 5-1: Woodview SWMF Expansion Preliminary Design Criteria

Design Parameter	**Woodview SWMF**
Pond Design	Wet Pond
Permanent pool El.	192.24m
Pond top bank El.	194.3m
Req'd Active Quantity Storage Volume (m^3) & HWL **100yr-4hr Chic. (15min time step)** **100yr-24hr SCS TII (2hr time step)**	 11,700 m^3 HWL=193.73m 11,300m^3 ; HWL=193.68m
Req'd Quality Storage Volume (m^3) * **Permanent Pool (m^3)** **Extended Detention (m^3)**	 1,295 m^3 740 m^3
Inlet Structure	1200mm dia. pipe (sized based on ex. inlet sewer capacity)
Outlet Structure	300mm dia. orifice with overflow weirs
Notes: * A=18.5ha full future development with normal protection (50% imperv., 40m^3/ha ext. detention, 70m^3/ha perm. Pool from MECP SWM Manual, 2003)	

Table 5-2 shows a comparison of release rates between PRE conditions (full future development with no improvements) and POST conditions (full future development with proposed improvements) from the subdivision's outlet structure. The POST does not exceed PRE release rates to the receiving Canaan Drain because the pond expansion lowers the peak HGL in this subdivision utilizing the same sized outlet orifice design. The lower POST release rates ultimately reduces the size of the Canaan Pond expansion which has limited footprint to expand on Town owned property.

Table 5-2: Woodview SWMF proposed peak flow rates

Design Storm Return Period	**PRE (full future development with no improvements) Peak Release Rate (m^3/s)**	**POST (full future development with improvements) Peak Release Rate (m^3/s)**
5yr-4hr Chic. (15min time step)	0.9	0.2
100yr-4hr Chic. (15min time step)	1.1	0.3

5.2.2 Regional SWMFs (Canaan and Essex Outlet Drain)

5.2.2.1 Pond Design and Hydraulic-Hydrologic Analysis

One new stormwater management pond (denoted Essex Outlet Pond) and an expansion to the existing Canaan management pond are proposed to ensure no adverse impacts to the carrying capacity of the receiving watercourses. The new and expanded regional stormwater management ponds are shown in **Figure 6.1**. Flow diversion weirs are proposed to regulate the release rates to the downstream receiving watercourses. Dewatering pumping stations are proposed to dewater the storm systems completely from the weir crest down to the pond bottom.

Preliminary design criteria are shown in **Table 5-3**. The regional ponds are a retrofit to an existing storm system intended to improve the system, and reduce flood risk and property damage within the catchment. The Essex Outlet Pond is sized for quantity control. The expansion to the Canaan Pond is sized for quantity control and to contain the existing design quality volume. For the 100-year major design storm the pond HWL is computed to be greater than 0.3 m below the top of bank elevation.

Table 5-3: Regional Ponds preliminary design criteria

Design Parameter	Essex Outlet Pond	Canaan Pond
Pond Design	Dry Pond	Dry Pond
Bottom Pond EL.	190.75m	191.414m
Pond Top Bank EL.	193.8m	194.0m
Req'd Active Quantity Storage Volume (m^3) & HWL **Weir crest** **100yr-4hr Chic. (15min time step)** **100yr-24hr SCS TII (2hr time step)**	 18,500m^3 : Crest=192.6m 29,000m^3; HWL=193.47m 28,300m^3; HWL=193.41m	 3,900m^3 ; Crest=192.014m 14,200m^3; HWL=193.25m 12,800m^3; HWL=193.1m
Req'd Quality Storage Volume (m^3) **Permanent Pool (m^3)** **Extended Detention (m^3)**	 - -	 0 * 1,260 m^3 *
Min. Provided Active Storage Volume (m^3) **	33,500m^3	22,300m^3
Inlet Structure	Open channel	Open channel
Outlet Structure **During storm – Gravity Outlet**	Weir	Weir
Following storm – Pumped Outlet	Dewatering Pumping Station Q, TDH, drawdown = TBD in detailed design	Dewatering Pumping Station Q, TDH, drawdown = TBD in detailed design

Notes:
* Designed quality volume from Canaan Drainage Report prepared by NJ Peralta, Jan. 2001 & Dec. 2004 to service Kimball and Jakana developments
** Provided maximum storage volume includes the volume within the 0.3 m freeboard.

The allowable release rates to the downstream receiving drains were determined based on an evaluation of the carrying capacity of the receiving drains from the upper limits of the Ward 1 Southwest area to the Essex Outlet Drain's outlet to Canard River at the culvert crossing over Mole Rd, and John's Creek's outlet to Craig's Creek just upstream of Canard River. At these two locations in the receiving drains, there is defined floodline mapping to assess the impact the

100yr storm has on the Canard River and Craig's Creek watercourses and surrounding land as discussed previously (refer to **Section 4.2.1**). The outfall boundary conditions and catchment area are shown in **Figure 2.1** in **Appendix A**.

Table 5-4 shows a comparison of release rates from PRE conditions (full future development with no improvements) and POST conditions (full future development with proposed improvements) for major (100yr) and minor (5yr) storms in the Essex Outlet and Canaan Drain outlets. **Table 5-4** shows the proposed regional ponds provide sufficient storage volume to ensure the PRE condition peak flow rate does not exceed the POST condition peak flow rate under minor and majors storms.

The proposed regional ponds also provide sufficient storage volume to ensure no adverse impacts to the receiving drain HGL under minor and majors storms as shown in the hydraulic profiles in **Figure 6.2** and **Figure 6.3** in **Appendix A.** The hydraulic profiles show that the peak HGL was below the top of bank of the receiving drains.

Table 5-4: Current (PRE) and POST peak flow rates in the receiving drains

	Essex Outlet Drain (Conduit C1421 in Figure 6.2(a))		**Canaan Drain (Conduit C1412 in Figure 6.2(a))**	
Return Period	**PRE Peak Flow (m^3/s)**	**POST Peak Flow (m^3/s)**	**PRE Peak Flow (m^3/s)**	**POST Peak Flow (m^3/s)**
5yr-4hr-Chic. (15min time step)	4.5	1.4	2.5	1.7
100yr-4hr Chic. (15min time step)	5.3	3.8	4.2	3.8

5.2.2.2 Regional Stormwater Pumping Stations

Each pond has a stormwater pumping station drawdown the ponds once the level is below the weir crest and when there is sufficient capacity in the receiving watercourse. **Figure 6.4** in **Appendix A** shows the process flow schematic for each regional pond's pumping station.

The initial portion of runoff is designed to be diverted to the pond which is sized to ensure no, and runoff exceeding this volume overflows the weir to the downstream receiver. The pumped outlet structure is designed for dewatering the Ward 1 Southwest's storm system and is controlled via two level sensing elements which sense (1) pond level (LE1 in **Figure 6.4**), and (2) drain level on the downstream side of weir (LE2 in **Figure 6.4**). The dewatering pumping station either operates at the beginning of the rainfall event to dewater the system immediately from small

frequent storms that produce release rates which do not adversely impact the receiver's HGL or following infrequent storms to dewater the storm system and prepare it for future rainfall events. The stormwater pumping station is not in operation during the middle of storm events and thus power outages during rainfall events do not affect the performance the Ward 1 Southwest storm system's preferred solution.

Details of the pumping station's control are discussed further in **Appendix F.3**.

5.3 POTENTIAL IMPACTS OF CLIMATE CHANGE

The improvements were proposed based on current standards with a conservative design method that provides a safety margin for extreme rainfall events above and beyond the 100-year design storms.

The rural system hydraulic analysis considered the agricultural lands as "lumped" subcatchments assigned to each drain node which does not account for the attenuation of peak flow to the receiving drain via roadside ditches and inherently produces greater peak flows. Furthermore, the pond freeboard for the stormwater management ponds provides an additional 30%, 13% and 36% additional storage volume in addition to the 100-year storage volume required for the Woodview SWMF, Essex Outlet Pond and Canaan Pond respectively.

Thus, the modeled peak flows and storage volume requirements are greater than expected values to mitigate the impact of climate changes.

5.4 CONSTRUCTION CONSIDERATIONS

5.4.1 Proposed Constructions Site Conditions

Underground utility locates, topographic surveys and geotechnical investigations are to be completed during detailed design.

5.4.2 Essex Outlet Pond

The construction of the Essex Outlet Pond and expansion of Canaan Pond will require specific construction sequencing so that the outlets remain operational during construction and works are coordinated with the preliminary design of MTO's Highway 3 improvements. MTO's preliminary design drawings and Culvert Hydrology Report are included in **Appendix E**.

MTO's preliminary design proposes to change the alignment of the Essex Outlet Drain and install a new culvert across Highway 3 north of the existing culvert crossing's location (refer to **Figure 6.1** in **Appendix A**). The Essex Outlet Drain grading and inverts between the sewer outfall and the proposed Essex Outlet Pond location are critical to the overall design of the preferred alternative and must be coordinated with MTO during detailed design.

The proposed Essex Outlet Pond construction sequencing is shown in **Table 5-5**.

Table 5-5: Essex Outlet Pond construction sequencing

Sequencing Step No.	Item	Responsible Party	ROW
1	Construct pond and pump station. Construct portion of pond inlet and with a temporary dyke to prevent flow from entering the new Essex Outlet pond.	Town	Town
2	Replace bridge to Essex PCP & install temporary dykes and bypass pumping system around work area as required.	Town	Town
3	Deepen drain on south side of Hwy3 and remove temp. dyke on pond inlet (pond/PS will now be in operation). Commission pump station (during wet weather events).	Town	Town
4*	Construct box culvert and new channel. Dyke off both ends of new channel. Once new channel and culvert are constructed remove the temporary dykes and put the new channel into operation.	MTO	MTO
5*	Remove temp. dykes so new box culvert and drain are in operation and sewers can drain freely. Remove or abandon old Hwy3 culverts	MTO	MTO
6	Deepen drain on north side of Hwy3 between outfall and newly constructed channel in MTO ROW. Hydrovac and clean out sewers near outfall as well, so new box culvert and drain are in operation and sewers can drain freely.	Town	Town
Notes: * Sequencing of culvert replacement is in line with MTO's proposed construction sequencing (refer to the Culvert Hydrology Report pg. 26- 27 in **Appendix E**).			

5.4.2.1 Canaan Pond Expansion

The proposed Canaan Pond construction sequencing is shown in **Table 5-6**.

MTO's preliminary design proposes to extend the existing Highway 3 culvert over Canaan Drain (refer to **Figure 6.1** in **Appendix A**). However, it should be noted that the bottom ±450mm of the Highway 3 culvert over Canaan Drain is filled with sediment and in Sequencing Step No.2 when the culvert is repaired, the condition of the buried portion of the metal culvert will need to be structurally assessed. The structural assessment will determine whether it can be extended as described in MTO's Hydrology Report or replaced.

Table 5-6: Canaan Pond expansion construction sequencing

Sequencing Step No.	Item	Responsible Party	ROW
1	Excavate for pond expansion and temp. dyke off new portion of pond. Construct pump station (old pond and outlet/inlet structures will remain in service)	Town	Town
2	Repair (remove sediment) in Canaan Drain, pond and Hwy 3 culvert crossing so pond drains completely. Document condition of Hwy 3 culvert crossing as the portion of the metal culvert buried in sediment could be in poor condition.	Town	Town & MTO
3	Replace pond inlet structure. Remove temp. dyke in pond and old outlet structure (pond/PS will now be in operation).	Town	Town
4	Commission pump station (during wet weather events).	Town	Town
5	Construct temp. flow bypass system with dykes on both ends of new channel/culvert, and install culvert crossing and drain across Hwy3.	MTO*	MTO & easement
6	Remove temp. dykes so new box culvert and drain are in operation	MTO*	MTO & easement

6.0 ENVIRONMENTAL IMPACTS OF PREFERRED ALTERNATIVE AND MITIGATION MEASURES

6.1 STORM SEWERS

The preferred alternative for improvements to storm sewers are illustrated in **Figure 6.1** in **Appendix A**. The following criteria were used to evaluate the suitability of the proposed pond site:

Official Plan & Zoning By-Law

Proposed sewer construction is within the ROW and will not require amendments to the Town's *Zoning By-law*. The proposed Essex Outlet Pond and retrofitted Canaan Pond are located on land zoned Green District which can be used for SWMF's under Subsection 23.4, G1.3 of the Town's *Zoning By-law*.

Strength Resilience to Extreme Storm Impacts

The proposed improvements to the storm sewer system for the Ward 1 Southwest area will convey runoff from developed areas to the proposed stormwater management ponds which will retain sand, dirt, silt and other sediments, and release to the watercourse at a controlled rate.

It will reduce the risk and extent of flooding and property damage. This is the most important beneficial environmental impact of the proposed improvements to storm sewer system.

Development of Vacant Land

Vacant tracts of land that would otherwise remain vacant without storm sewer service could be developed for residential, commercial, industrial or recreational uses subject to appropriate land use designations in the Official Plan.

The proposed improvements are to ensure adequate infrastructure is in place for future development in the study area.

Cultural Heritage Resources

A licensed archaeologist should undertake a Stage 1 Archaeological Assessment as early as possible during detailed design and prior to construction.

Where archaeological resources are impacted by EA project work, MCM will be notified by contacting archaeology@ontario.ca. 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.

Should previously undocumented archaeological resources be discovered, there may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. 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*.

The Funeral, Burial and *Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

Permits to Take Water

Any areas with sandy subsoils and high water tables are encountered where well point dewatering systems will be required to facilitate sewer construction. The use of these dewatering systems will require the acquisition of a Permit to Take Water from the MECP.

Trees in the Sewer Alignment

Small healthy trees interfering with the sewer alignments would be relocated. For larger healthy trees that cannot be easily relocated, directional drilling procedures would be specified for installation of pipes under the large trees. Trees interfering with alignment of sewers that are assessed in poor condition will be removed during construction.

Disruption of Traffic

Construction of the proposed storm sewers 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 must 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.

Inconvenience During Sewer Construction

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

6.2 STORMWATER MANAGEMENT PONDS

Several factors must be considered in siting a stormwater management pond including technical, environmental and economic aspects. Technical considerations include proximity of the site to the area being serviced, proximity to a receiving water body or watercourse, geotechnical conditions and suitability for future expansion. Environmental considerations include impacts on both the natural and social environments. Economic impacts relate primarily to the cost to construct the stormwater management pond on one site compared to another. Typically, these costs include costs for land purchase, conveyance of stormwater runoff to the pond, construction of the pond itself, and conveyance of runoff from the pond to a receiving water body or watercourse.

The proposed pond sites are illustrated in **Figure 6.1**. The following criteria were used to evaluate the suitability of the proposed pond site:

Official Plan & Zoning By-Law

The proposed expansion to the Woodview SWMF is on 360 Fairview Ave W which is zoned Institutional. According to the Town's *Zoning By-law*, land zoned Institutional is not permitted to be used for a SWMF. However, according to the *Official Plan* because a portion of the parcel's existing land use is for a SWMF such existing land uses may be zoned as conforming uses in the *Zoning By-law* provided the following conditions are met:

- the pond expansion is not expected to constitute a danger/nuisance,
- the enlargement of the land use is not expected to be detrimental to the adjacent neighbourhood,
- the operation of the land use will not cease over time as it is required to service the Woodview Estates subdivision's storm system, and
- the land use is deemed as sensitive (as defined in the Ministry's *Procedure D-1-3, "Land Use Compatibility: Definitions*") and is part of a viable larger group of similar land uses.

Therefore, land for the Woodview SWMF expansion can remain zoned Institutional and an amendment to the Town's *Zoning By-law* is not expected because the above conditions are met in accordance with the *Official Plan*.

The proposed Essex Outlet Pond and expanded Canaan Pond are located on land zoned Green District which can be used for SWMF's under Subsection 23.4, G1.3 of the Town's *Zoning By-law*.

Cultural Heritage Resources

A licensed archaeologist should undertake a Stage 1 Archaeological Assessment as early as possible during detailed design and prior to construction.

Where archaeological resources are impacted by EA project work, MCM will be notified by contacting archaeology@ontario.ca. 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.

Should previously undocumented archaeological resources be discovered, there may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. 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*.

The Funeral, Burial and *Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

Proximity to Receiving Water Body

The proposed sites for the new Essex Outlet Pond is located adjacent to the Essex Outlet Drain. The expansions to the Canaan Pond and Woodview SWMF are located adjacent to the Canaan Drain.

Natural Environment

The Woodview SWMF expansion would require trees and vegetation to be removed in the proposed pond excavation area. During construction there would expected to be some disturbance due to construction activities. Post construction, the Woodview SWMF expansion is anticipated to have little impact on terrestrial animal life as the existing lands would remain largely forest area with a pond that could foster terrestrial animal life natural vegetation.

The Canaan Pond expansion and new Essex Outlet Pond are expected to have insignificant effects on the natural vegetation.

Proximity to Arterial Roadway

Highway 3 is a major arterial roadway that provides direct access to the Essex Ward 1 Communities and neighbouring areas. There is expected to be some traffic disruption when repairing the Canaan Drain and improving the Essex Outlet Drain near Highway 3. It is not

expected that there will be any significant traffic disruption during the expansion of the Woodview SWMF.

Availability of Land

The proponent for this project currently owns the land required to construct the Essex Outlet Pond and expand the Canaan Pond. However, hydro and SWMF easements are required to be negotiated with land owners and the hydro utility for the construction of Canaan Pond pumping station and expansion of the Woodview SWMF as discussed in **Section 8.0**.

Requirements of Pond Storage Volume

The proposed ponds are sized based on hydraulic-hydrologic modelling. The proposed pond sites are under the jurisdiction of the Essex Region Conservation Authority (ERCA). The ERCA was contacted to verify allowable discharge rates for the proposed stormwater management ponds.

In the final design phase, an application for construction and/or alteration to waterways under S.28 of the Conservation Authorities Act to the ERCA for review and approval.

Cost of Stormwater Runoff Conveyance

To minimize the cost of the storm sewers and pumping stations, it is desirable to locate a stormwater management pond in proximity to the areas being serviced. The proposed stormwater management pond sites are located within the study area and therefore the cost of conveyance is not considered to be a critical issue.

Suitability of Pond Expansion

The Canaan Pond and Woodview SWMF expansions, and new Essex Outlet Pond site is sized to service ultimate development of the Ward 1 Southwest Communities with the planned future development described in **Section 2.4.2**.

6.3 MITIGATION MEASURES

In addition to the Environmental Effects and Mitigating Measures outlined in **Table 4-2**, Stantec would propose the following mitigation measures for consideration. These have been developed based on the conceptual design and should be further refined during the detailed design phase.

6.3.1 Natural Environmental Impacts and Mitigating Measures

6.3.1.1 Aquatic and Terrestrial Habitat

The proposed work area may contain natural features that support habitats of endangered species and threatened species. As per Section 2.1.7 of the PPS – "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. If the proponent believes that their proposed activities are going to have an impact on Species at Risk or are uncertain about the impacts, they should contact SAROntario@ontario.ca to undergo a formal review under the ESA. It is the responsibility of the proponent to ensure that Species at Risk are not killed, harmed, or harassed, and that their habitat is not damaged or destroyed through the proposed activities to be carried out on the site.

The Woodview SWMF expansion would require trees and vegetation to be removed in the proposed pond excavation area. During construction there would be expectation for some disturbance due to construction activities. Post construction, the Woodview SWMF expansion is anticipated to have little impact on terrestrial animal life as the existing lands would remain largely forest area with a pond that could foster terrestrial animal life and natural vegetation. Stantec completed a site investigation, to document existing natural heritage conditions in the site area. The results and recommendations provided in this Natural Heritage Review are intended to inform the Town's assessment during the detailed design phase of the Woodview Pond expansion.

6.3.1.2 Protection of Migratory Birds

The Migratory Birds Convention Act, 1995 (MBCA) provides legal protection of migratory birds and their active nests in Canada. The loss of migratory bird nests, eggs and/or nestlings due to tree cutting or other vegetation clearing can be avoided by limiting clearing of vegetation to outside of the general nesting period for migratory birds in this region (C2) as identified by Environment and Climate Change Canada (ECCC) (i.e., between April 1 and August 31). If work must be performed within this window, a survey for active nests or breeding activity should be conducted by a qualified biologist before work commences and additional mitigation measures (e.g., implementation of avoidance distances during construction) implemented, if required.

6.3.1.3 Wildlife Protection

The installation of silt fencing around the work area will reduce the likelihood of reptiles entering the work area. In addition, a visual search of the construction area (including machinery) is recommended each day to locate and avoid reptiles, amphibians, and other wildlife. If wildlife is encountered, they will be given reasonable time to flee the area on their own. If a wildlife species must be moved, a person knowledgeable in handling techniques may relocate it to a location that is both safe and suitable.

6.3.1.4 Erosion and Sediment Control

Appropriate erosion and sediment controls should be employed during all phases of construction to reduce erosion and sediment transport to the extent possible. Mitigation measures to reduce the risk of negative effects:

- Silt fence will be installed around the perimeter of the work area.
- Materials requiring stockpiling (fill, topsoil, etc.) will be stabilized.
- Disturbed areas are to be restored with erosion protection/vegetative cover following disturbance.
- Erosion and sediment control materials (silt fence, straw bales, clear stone) are to be kept on site for emergencies and repairs.
- Erosion and sediment controls should be monitored and maintained, as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected until cover is re-established.
- Conditions of the anticipated Essex Regional Conservation Authority (ERCA) permit under Ontario Regulation (O. Reg.) 158/06 will be followed during these activities.

6.3.1.5 Excess Soil Materials and Waste

In 2019, the MECP introduced O. Reg. 406/19 entitled 'On-site and Excess Soil Management' under the *Environmental Protection Act*. All excess soil materials and waste generated during the construction process must be disposed of in accordance with O. Reg. 406/19.

6.3.1.6 Archaeological Resources

During the Implementation of this project, should previously undocumented archaeological resources be discovered, there may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. 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*. If any further archaeological field investigation is required, as identified above, the Town will engage with all indigenous communities and facilitate the participation in archaeological field work (if applicable).

The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

7.0 PROPERTY REQUIREMENTS

The Canaan Pond and Woodview SWMF expansions both require acquiring easements. Property requirements are outlined in **Table 7-1** and depicted in **Figure 6.1** in **Appendix A**. Proposed easements are preliminary and based on available information at this time; they are subject to change once a legal survey has been completed.

The Canaan Pond dewatering pumping station requires a hydro easement to service the pumping station. Following discussions with the Town it is preferred to have the hydro service fed from North Malden Rd through the properties owned by the Corporation of the Town of Essex (currently no designated mun. address) and Delmar Holdings (currently no designated mun. address) and across the Canaan Drain to service the pumping station. Woodview SWMF expansion requires a property easement for the expanded SWM Facility. There is an existing registered easement for the existing Woodview SWM Facility. The Town is in the process of changing/increasing the easement.

Table 7-1: Property requirements for the preferred solution

No.	Type of Easement	Mun. Address. No.	Property Owner	SWMF
1	SWM Facility	360 Fairview Avenue West Essex, ON N8M 1Y6	County of Essex	Expand Woodview SWMF
2	Hydro	Currently no municipal address	Delmar Holdings	Canaan Pond Dewatering Pump Station

The Town will acquire property 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 Town may obtain the services of an accredited appraiser to assist in establishing the fair Market value and related compensation for the '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 Town will pay for all costs of acquiring the property for its purposes, including the cost of the appraisal of the property, compensation related to the land, survey costs, and reasonable closing fees.

8.0 CONSULTATION

8.1 NOTICE OF STUDY COMMENCEMENT

As part of the Class EA process, a Notice of Study Commencement was published in local newspapers and posted on the Town's website in July 2017 to notify the public of the planning process. In addition to a brief description of the study to be undertaken, this Notice invited comments from the public with respect to the project. A copy of this Notice is in **Appendix D.1**.

A copy of the Notice was also sent to Review Agencies and Mandatory Contacts together with a drawing showing the proposed service areas and an Introductory Brief which provided a description of the existing storm drainage system, the problems being addressed by the Class EA, project objectives and a general outline of the work plan and timetable. The complete list of review agencies and major stakeholders within the study area that were contacted during the course of the Environmental Assessment Process is located in **Appendix D.1**.

8.2 RESPONSE TO NOTICE OF STUDY COMMENCEMENT

Written comments were received from the following:

1. ERCA

   Review comments received from ERCA are in **Appendix D.3**. A meeting was also held on November 10, 2017, with ERCA to discuss the project in more detail. The minutes of the meeting are also summarized in **Appendix D.3**.

2. MECP

   Review comments received from MECP are in **Appendix D.3**. A section on Source Water Protection is included in **Section 2.2.5** per the request of MECP.

3. MNRF

   Review comments received from MNRF are in **Appendix D.3**.

4. MTO

   Review comments received from MTO are in **Appendix D.3**.

5. MTCS (now MCM)

   Review comments received from MTCS are in **Appendix D.3**.

All written comments were acknowledged in writing with appropriate responses.

8.3 PUBLIC INFORMATION CENTRE NO. 1 AND DRAFT ENVIRONMENTAL STUDY REPORT

Due to the COVID-19 pandemic, the Town hosted the Public Information Centre (PIC) virtually from April 6 to May 6, 2021. The purpose of the PIC was to present project information and gather feedback from the public. The virtual PIC included an online display and draft Environmental Study Report providing information about the EA, findings from the evaluation of alternative solutions, an assessment of the potential environmental effects of the proposed works, and identification of reasonable measures to mitigate any adverse impacts that may result. All content and instructions on how to submit questions or comments was made available on the project webpage, www.essex.ca/Ward1StormSewerPIC.

Written Comments were received from the following:

1. Windsor-Essex Student Transportation Services

   Indicated in an email on April 8th, 2021, that they wish to be informed ahead of construction such that they can coordinate bus stops accordingly. This request and the Town's response is in **Appendix D.4**.

2. MTCS (now MCM)

   Provided comments in a letter on June 10th, 2022. This letter is in **Appendix D.4**.

3. MECP

   Indicated in an email on April 22nd, 2021, that they do not have any comments or concerns. This email is in **Appendix D.4**.

4. ERCA

   Review comments received from ERCA are in **Appendix D.4**.

5. County of Essex

   Review comments received from the County of Essex are in **Appendix D.4**.

In response to the comments received from ERCA and the County of Essex a project review meeting was held on February 16th, 2022. The minutes of the meeting are summarized in **Appendix D.4**.

Further to this meeting a Natural Heritage Review within an area bounded by Fairview Avenue West, Woodview Drive, Oak Drive, and the Essex Bypass (Highway 3) in Essex, Ontario was completed by Stantec Consulting Ltd. The Natural Heritage Review is available in **Appendix G.2**. The scope of the Natural Heritage Review at the Site was developed based on comments received from the above parties. The results and recommendations provided below in this Natural Heritage Review are intended to inform the Town's assessment of the Project's preferred

design (i.e., expansion of the Woodview Pond) at the Site. The conceptual design for the Woodview Pond should be further reviewed and refined during the detailed design process.

The County of Essex provided additional comments on the Draft ESR on April 12th, 2023, via email. A response was provided by Stantec Consulting on May 10th, 2023, both of which are available in **Appendix D.4**. Following this response, the Town of Essex and the County of Essex agreed to proceed to the Notice of Completion and further to the Implementation Phase of this Project.

8.4 INDIGENOUS CONSULTATION

Consultation with Indigenous Communities is ongoing in accordance with the Municipal Class EA Consultation requirements. As part of this Environmental Assessment, communications with Indigenous agencies and communities is being undertaken in parallel with the other stakeholder communications and consultations. This report will be sent to the Indigenous groups and organizations.

Documentation of consultation with Indigenous communities during the Environmental Assessment Process is located in **Appendix D.2**. Review comments were received from the Caldwell First Nation and correspondence is shown in **Appendix D.2**.

9.0 OPINION OF PROBABLE COST

This section discusses the engineer's 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 DESCRIPTION OF PREFERRED SSOLUTION

The recommended alternatives that form the preferred solution are summarized in **Table 9-1**.

Table 9-1: Summary of preferred solution and phases of work

Phase	Item	Class EA Schedule
1A	**Sewer - Brien Ave W & Sewer Cleaning**	A+, A
1B	**Canaan Pond Expansion, dewatering pumping station & Drain repair**	*
2	**Woodview SWMF expansion & Tulley Meadows Improvements** **Woodview and Tulley Meadows sewer cleaning**	B A
3	**Essex Outlet Pond, dewatering pumping station, Drain improvement** **Sewer cleaning near outfall**	* A
	Essex PCP bridge replacement	A
4	**Sewer - Centre St & Iler Ave (Optimist Park)**	A+
Notes: * Canaan Pond was constructed, and Essex Outlet Pond is proposed to be constructed under the Drainage Act R.S.O. 1990, c. D.17, which are exempt from the Ontario EPA R.S.O. 1990, c. E.19.		

9.2 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 9-2 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 9-2: 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.

9.3 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 1097 for Toronto (January 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 7:00 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.

- Fees associated with applications for approvals or permits are not included.
- Land costs are not included.
- HST is excluded.
- Allowances for engineering and contingencies (15% and 15% 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 would be encountered in the areas proposed for the sewers and pond expansions. The potential impact cannot reasonably be determined at this point and no allowance is included in the estimate for this possible eventuality.

Capital budget estimates (in 2019 dollars) and Class EA Schedule are summarized in **Table 9-3**.

Table 9-3: Opinion of Probable Capital Cost for Preferred Solution

Phase	*Item*	*Probable Cost*	*Class EA Schedule*
1A	**Canaan Pond Expansion, dewatering pumping station & Drain repair**	1,200,000	*
1B	**Sewer - Brien Ave W & Sewer Cleaning**	4,100,000	A+, A
2	**Woodview SWMF expansion & Tulley Meadows Improvements** **Woodview development sewer cleaning**	500,000	B A
3	**Essex Outlet Pond, dewatering pumping station, Drain improvement** **Sewer cleaning near outfall**	1,100,000	*
	Essex PCP bridge replacement	400,000	A
4	**Sewer - Centre St**	1,700,000	A+
	Sewer - Iler Ave (Optimist Park)	580,000	A+
Sub-total Construction Cost		9,580,000	
Engineering Allowance (15%)		1,400,000	
TOTAL CAPITAL COST (excluded taxes)		10,980,000	
Notes: *** Canaan Pond was constructed, and Essex Outlet Pond is proposed to be constructed under the Drainage Act R.S.O. 1990, c. D.17, which are exempt from the Ontario EPA R.S.O. 1990, c. E.19.**			

10.0 SUMMARY

10.1 RECOMMENDATIONS

The recommended alternatives that form the preferred solution are summarized in **Table 9-1**.

The work described in **Table 9-1** is proposed to be implemented in multiple phases since sufficient funds are not available to undertake the entire work at one time. The work may begin with Cannan Pond Expansion and Brien Ave sewer improvements, followed by Woodview SWMF expansion and Tulley Meadows improvements, and then the Essex Outlet Pond construction with the subsequent Centre St and Iler Ave (Optimist Park) sewer improvements being the final phase.

All of the work described in **Table 9-1** have been identified in this study as Schedule "A" or "A+" activities for sewer and bridge initiatives and Schedule "B" activities for expanding Woodview SWMF under the Municipal Engineers Association (MEA) Class Environmental Assessment (Class EA) to comply with the *Environmental Assessment Act*. Schedule "A", "A+" and "B" projects will not require further planning under the Class EA process and may proceed to Phase 5 with detailed design and construction.

10.2 PERMITS AND APPROVALS

Table 10-1 shows the permit and approval requirements for constructing the preferred solution. 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.

We are not aware of any other regulatory permits and approvals that are necessary with respect to the proposed works.

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

Phase	Item	Class EA Schedule
1	**Canaan Pond Expansion & Drain Repair**	Stage 1 Archaeological Assessment ERCA Permit Amendment to MECP ECA Drainage Report in accordance w/ S.74 (repair) and S.78 (improvements) Drainage Act R.S.O. 1990 c.D17 MTO Encroachment Permit (for cleaning drain w/n MTO ROW) Negotiations with Delmar Holdings and local hydro utility for acquiring hydro easement
	Sewer - Brien Ave W	ERCA Permit MECP ECA
2	**Woodview SWMF Expansion & Cleaning & Tulley Meadows Improvements**	Stage 1 Archaeological Assessment ERCA Permit MECP ECA MECP SWM Report Negotiations with County of Essex for acquiring SWMF easement
3	**Essex Outlet Pond & Drain Improvement, & Essex PCP Bridge Replacement**	Stage 1 Archaeological Assessment ERCA Permit MECP ECA Drainage Report in accordance w/ S.78 (improvements) Drainage Act R.S.O. 1990 c.D17 MTO Encroachment Permit (for cleaning drain w/n MTO ROW)
4	**Sewer - Centre St & Iler Ave (Optimist Park)**	ERCA Permit MECP ECA
Notes: * Canaan Pond was constructed, and Essex Outlet Pond is proposed to be constructed under the Drainage Act R.S.O. 1990, c. D.17, which are exempt from the Ontario EPA R.S.O. 1990, c. E.19.		

10.3 PROJECT AND CONSTRUCTION SCHEDULE

A portion of the work described in **Table 10-1** has been completed. When capital budget funding becomes available, it is recommended that the other work described in the ESR proceed to Phase 5 with final design and construction. It is anticipated that Phase 5 for the remaining works will commence in Fall of 2023.

11.0 REFERENCES

The following previous studies and documents have been referred to for background reference information:

1. Canadian Historic Places, http://www.historicplaces.ca/en/home-accueil.aspx
2. Environment Canada, Canadian Climate Normals Data, 1971 to 2000
3. Ontario Ministry of Tourism, Culture and Sport, Heritage Conservation Districts http://www.mtc.gov.on.ca/en/heritage/heritage_conserving_list.shtml
4. Ontario Ministry of Tourism, Culture and Sport, Archaeological Assessments http://www.mtc.gov.on.ca/en/archaeology/archaeology_assessments.shtml#a1
5. Town of Essex, Official Plan of the Town of Essex, 2009
6. Town of Essex, Interactive Mapping, http://maps.essex.ca/
7. Municipal Engineers Association, Municipal Class Environmental Assessment, October 2000 (as amended in 2007, 2011, and 2015)
8. Sewage Design Guidelines for Sewage Works. OMOE. 2008.
9. Stormwater Management Planning and Design Manual. OMOE. 2003.
10. Sewer Maintenance Services, Sanitary/Storm Sewer Investigation, June 2015, Sept. 2016 & Oct. 2016.
11. Stantec Consulting Ltd., Town of Essex Improvements to Ward 1 Sanitary Sewer System Phases 1 & 2 (Schedule B) Class Environmental Assessment Report, December 2015
12. Stantec Consulting Ltd., Essex Storm Sewer System Hydrologic-Hydraulic Model Development, Calibration and Capacity Assessment, June 2018
13. Stantec Consulting Ltd., Essex Sanitary Sewer Maintenance Hole Condition Assessment, May 2015
14. Kimball development on-site SW detention calculations, storm sewer design sheets and application for ERCA permit. Dillon. 2006.
15. Essex Crossing Stormwater Management Report – Final Report. Glos Engineering Ltd. Aug. 2003.
16. Galos Development Stormwater Management Report – Final Report. Dillon Consulting Ltd. Dec. 2006.
17. Canaan Drain Regional Storm Quality Pond Report. NJ Peralta. Jan. 2001.
18. Expansion of Canaan Drain Regional Storm Quality Pond Report. NJ Peralta. Dec. 2004.
19. Report on Storm Water Drainage in the Town of Essex. Lafontaine Cowie Buratto (LCBA) Ltd. 1975.

APPENDICES

Appendix A FIGURES

TOWN OF ESSEX
SOUTH TALBOT CATCHMENT STORM SYSTEM IMPROVEMENTS
CLASS ENVIRONMENTAL ASSESSMENT

KEY PLAN OF ESSEX COUNTY

PROJECT NO: 165620098
DATE: 2016.11.28
0 1 km 5 km
DRAWING NO: FIGURE 1.1

PHASE 1 | PHASE 2 | PHASE 3 | PHASE 4 | PHASE 5

PROBLEM OR OPPORTUNITY → ALTERNATIVE SOLUTIONS → ALTERNATIVE DESIGN CONCEPTS FOR PREFERRED SOLUTION → ENVIRONMENTAL STUDY REPORT → IMPLEMENTATION

PHASE 1

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

1. IDENTIFY ALTERNATIVE SOLUTIONS TO PROBLEM OR OPPORTUNITY
2. SELECT SCHEDULE (APPENDIX 1)
3. INVENTORY NATURAL, SOCIAL, ECONOMIC ENVIRONMENT
4. IDENTIFY IMPACT OF ALTERNATIVE SOLUTIONS ON THE ENVIRONMENT, AND MITIGATING MEASURES
5. EVALUATE ALTERNATIVE SOLUTIONS; IDENTIFY RECOMMENDED SOLUTIONS
6. CONSULT REVIEW AGENCIES AND PUBLIC re: PROBLEM OR OPPORTUNITY AND ALTERNATIVE SOLUTIONS
7. SELECT PREFERRED SOLUTION
8. REVIEW & CONFIRM CHOICE OF SCHEDULE

SCHEDULE A

APPROVED – MAY PROCEED

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

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
7. REVIEW ENVIRONMENTAL SIGNIFICANCE & CHOICE OF SCHEDULE
8. PRELIMINARY FINALIZATION OF PREFERRED DESIGN

DISCRETIONARY PUBLIC CONSULTATION TO REVIEW PREFERRED DESIGN

PHASE 4

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

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)

W:\active\165620098\preliminary\report\Appendix_A_Figures\Figures in AutoCAD\FIGURE 1.2.dwg
2018-12-17 02:49pm BY: qkho

essex

Stantec

TOWN OF ESSEX
SOUTH TALBOT CATCHMENT STORM SEWER IMPROVEMENTS CLASS EA

MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

PROJECT NO: 165620098
DATE: 2018.07.12
DRAWING NO: FIGURE 1.2

SOUTH TALBOT CATCHMENT (STUDY AREA BOUNDARY)

SUBCATCHMENT 1 (S TALBOT)

SUBCATCHMENT 2 (S TALBOT)

SUBCATCHMENT 3 (S TALBOT)

SUBCATCHMENT 4 (S TALBOT)

SUBCATCHMENT 5 (S TALBOT)

SUBCATCHMENT 6 (S TALBOT)

SUBCATCHMENT 7 (S TALBOT)

SUBCATCHMENT 8 (S TALBOT)

OUTFALL BOUNDARY CONDITION No. 1 (JOHN'S CREEK OUTLET TO CRAIG'S CREEK DRAIN)

OUTFALL BOUNDARY CONDITION No. 2 (ESSEX OUTLET DRAIN OUTLET TO RIVER CANARD)

Concession Rd 14
Concession Rd 13
North Malden Rd
Malden Rd
South Malden Rd
Gesto Rd (County Rd 12)
Hyland Side Rd
Gesto Side Road
Pinkerton Rd
Mole Road
Batten Side Road
County Rd 23
Talbot Trail
14th Conc. E Drain Branch
Pinkerton Drain
Dooley Drain
Essex Outlet Drain
Canaan Drain
Batten Drain
John's Creek Drain
Craig's Creek Drain
River Canard
Rush Drain
Greenway Trail
McInteer Drain
Burshyn Drain
Kukovai Drain
Chelsey Barnes Drain
Sweet Wigle Drain
Townline
Talbot Rd Drain
Thompson Drain
Barlow Drain
S Talbot Rd Drain
ESSEX POLLUTION CONTROL PLANT

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LAND USE	CATCHMENT	SYMBOL	SUBCATCHMENT No.'s
1 URBAN	SOUTH TALBOT	SUBCATCHMENT 1	1-7
2 RURAL	SOUTH TALBOT	SUBCATCHMENT 1	8

INFRASTRUCTURE LEGEND

- STORM CONDUIT - IN SERVICE (SEWER, BRIDGE OR CULVERT)
- MANHOLE
- MAINLINE CATCHBASIN
- PRIMARY OUTLET - FLOW DIRECTION
- SECONDARY OUTLET - OVERFLOW DIRECTION
- CLAY TILES (FLOW DIRECTION ASSUMED)
- STORMWATER MANAGEMENT POND
- STORM CONDUIT - OUT-OF-SERVICE
- MUNICIPAL DRAIN
- DITCH OR SWALE
- OVERFLOW SWALE
- SEWER OUTFALL

TOWN OF ESSEX - ESSEX

FIGURE 2.1: SITE PLAN OF URBAN AND RURAL LAND IN THE SOUTH TALBOT CATCHMENT

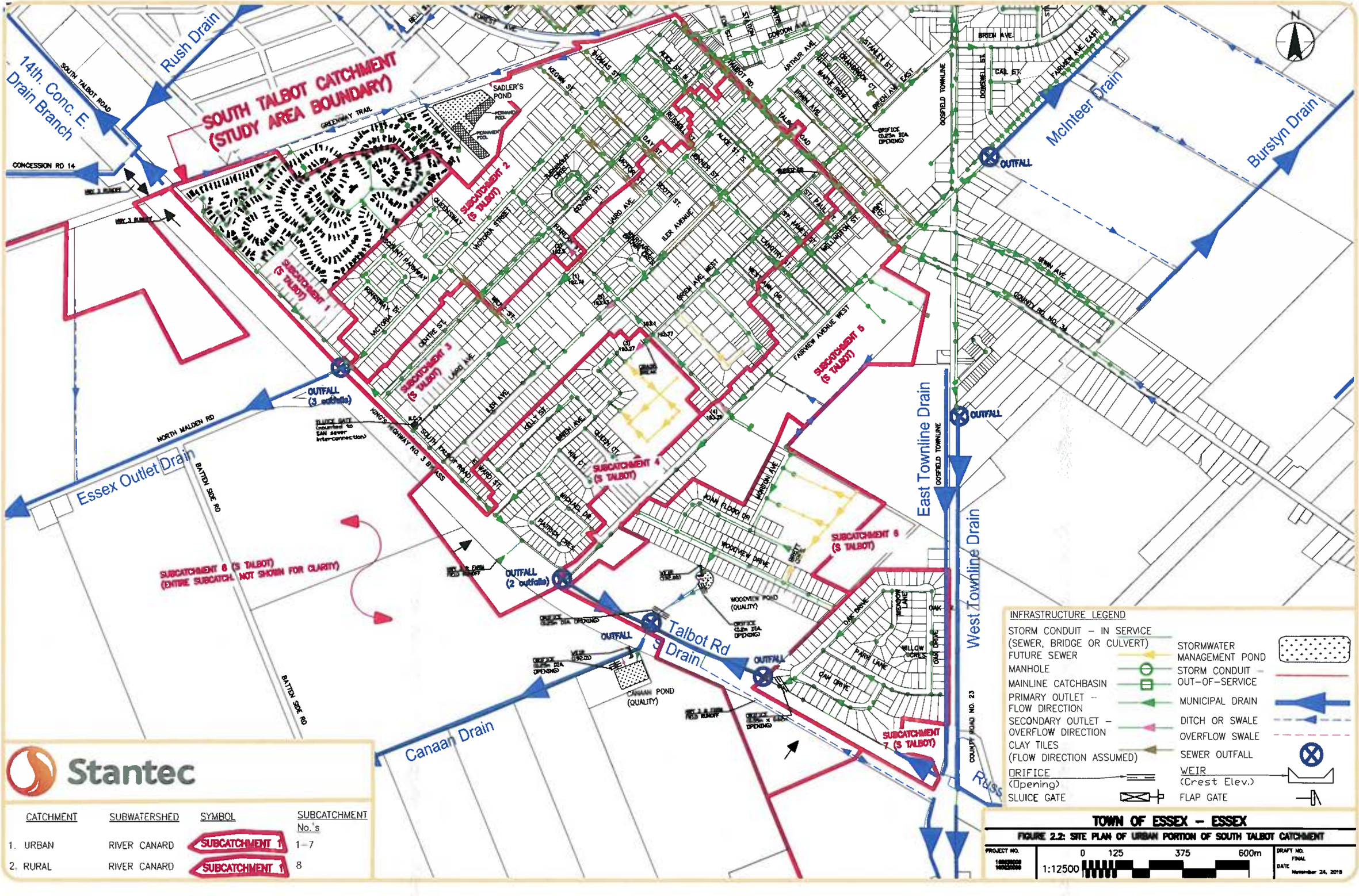
PROJECT NO. 165420000 165420093

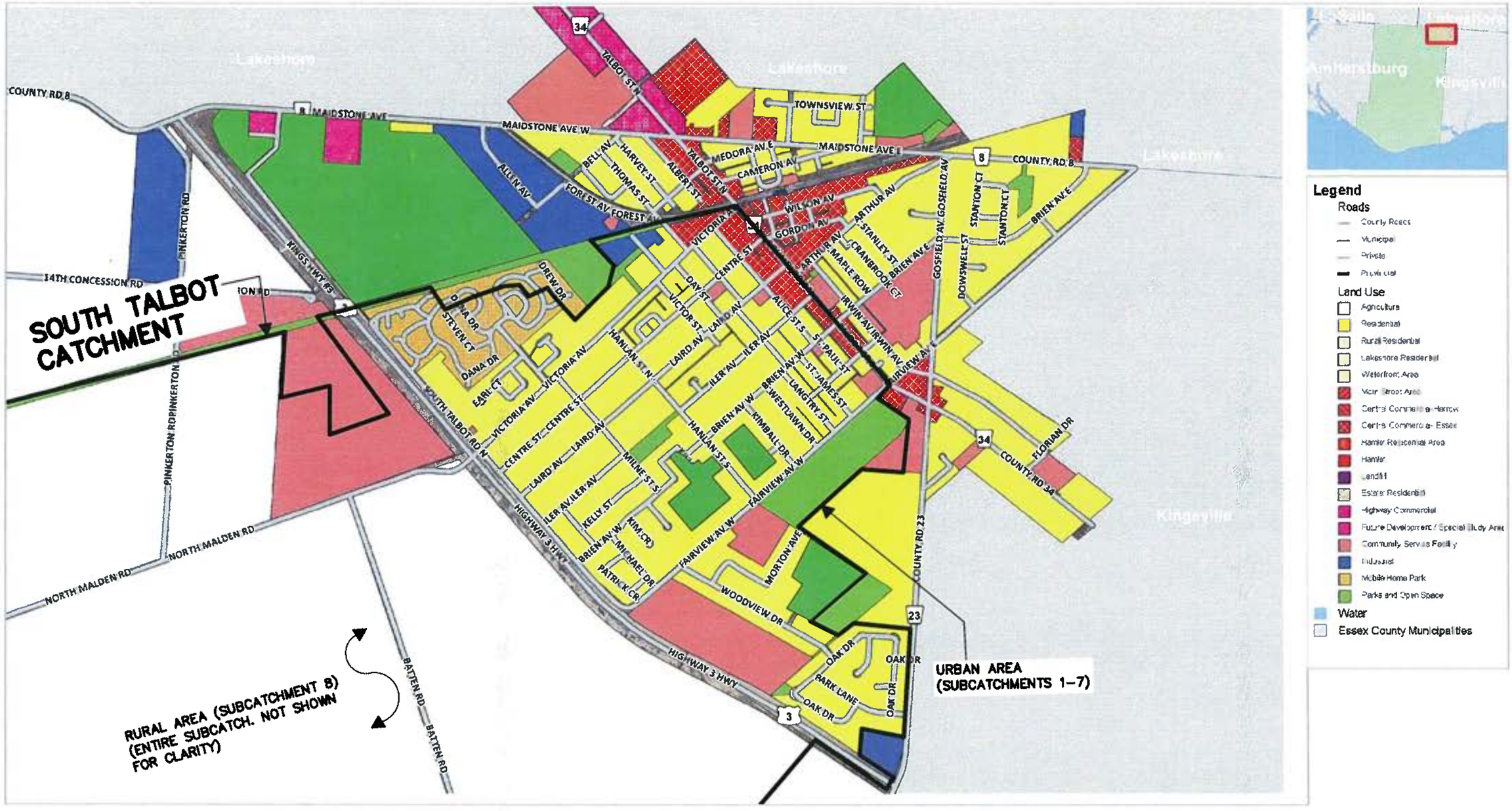
0 125 375 600m

1:12500

DRAFT NO. FINAL

DATE November 24, 2016


SOUTH TALBOT CATCHMENT
(STUDY AREA BOUNDARY)
Rush Drain
14th. Conc. E. Drain Branch
SOUTH TALBOT ROAD
CONCESSION RD 14
GREENWAY TRAIL
SADLER'S POND
PERMANENT POOL
SUBCATCHMENT 1 (S TALBOT)
SUBCATCHMENT 2 (S TALBOT)
SUBCATCHMENT 3 (S TALBOT)
SUBCATCHMENT 4 (S TALBOT)
SUBCATCHMENT 5 (S TALBOT)
SUBCATCHMENT 6 (S TALBOT)
SUBCATCHMENT 7 (S TALBOT)
SUBCATCHMENT 8 (S TALBOT)
(ENTIRE SUBCATCH. NOT SHOWN FOR CLARITY)
OUTFALL
(3 outfalls)
OUTFALL
(2 outfalls)
OUTFALL
SLUICE GATE
(mounted to SAN sewer interconnection)
NORTH MALDEN RD
KING'S HIGHWAY NO. 3 BYPASS
Essex Outlet Drain
BATTEN SIDE RD
Talbot Rd S Drain
Canaan Drain
CANAAN POND
(QUALITY)
WOODVIEW POND
(QUALITY)
ORIFICE 0.625m DIA. OPENING
McInteer Drain
Burstyn Drain
East Townline Drain
West Townline Drain
COUNTY ROAD NO. 23
GOSFIELD TOWNLINE
BRIEN AVE.
FAIRVIEW AVENUE WEST
FAIRVIEW AVE EAST
ALICE ST.
VICTORIA STREET
LAIRD AVE.
ILER AVENUE
CENTRE ST.
KELLY ST.
QUEEN ST.
MICHAEL DR.
WOODVIEW DRIVE
JOHN FLOOD DR.
OAK DRIVE
PARK LANE
WILLOW CRES.
WELLINGTON ST.
COUNTY RD. NO. 34
N
INFRASTRUCTURE LEGEND
STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
FUTURE SEWER
MANHOLE
MAINLINE CATCHBASIN
PRIMARY OUTLET – FLOW DIRECTION
SECONDARY OUTLET – OVERFLOW DIRECTION
CLAY TILES (FLOW DIRECTION ASSUMED)
ORIFICE (Opening)
SLUICE GATE
STORMWATER MANAGEMENT POND
STORM CONDUIT – OUT-OF-SERVICE
MUNICIPAL DRAIN
DITCH OR SWALE
OVERFLOW SWALE
SEWER OUTFALL
WEIR (Crest Elev.)
FLAP GATE
Stantec
CATCHMENT
SUBWATERSHED
SYMBOL
SUBCATCHMENT No.'s
1. URBAN
RIVER CANARD
SUBCATCHMENT 1
1–7
2. RURAL
RIVER CANARD
SUBCATCHMENT 1
8
TOWN OF ESSEX – ESSEX
FIGURE 2.2: SITE PLAN OF URBAN PORTION OF SOUTH TALBOT CATCHMENT
PROJECT NO.
0 125 375 600m
1:12500
DRAFT NO.
FINAL
DATE
November 24, 2015



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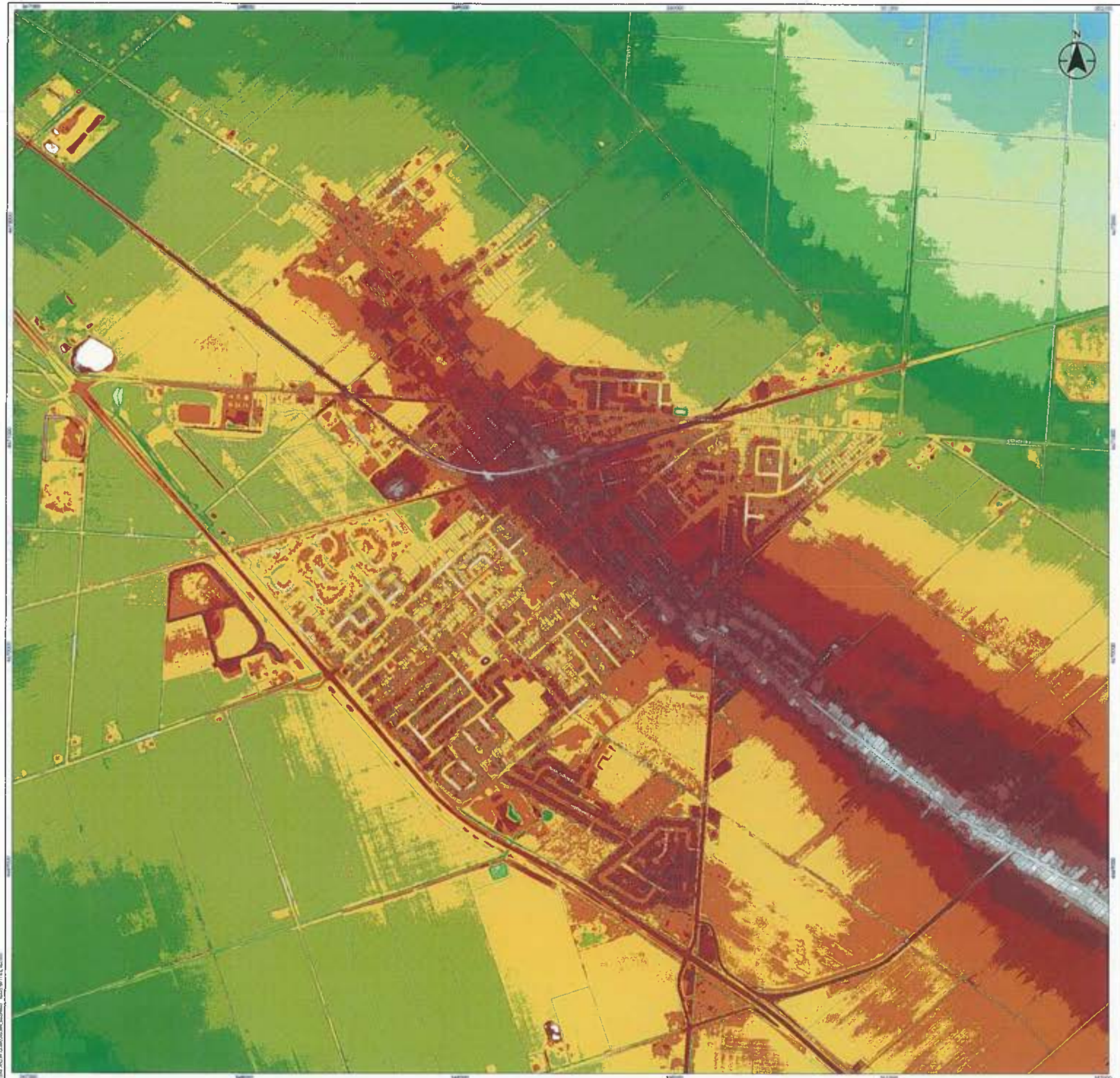
IMPROVEMENTS TO SOUTH TALBOT CATCHMENT STORM SEWER SYSTEM
CLASS ENVIRONMENTAL ASSESSMENT

EXISTING LAND USE PLAN IN THE SOUTH TALBOT CATCHMENT

PROJECT NO. 160900000
DATE: 2016.11.12
DRAWING NO. FIGURE 2.3



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Legend

Elevation (m)

- > 198
- 197.51 - 198
- 197.1 - 197.5
- 196.5 - 197
- 196 - 196.5
- 195.5 - 196
- 195 - 195.5
- 194.5 - 195
- 194 - 194.5
- 193.5 - 194
- 193 - 193.5
- 192.5 - 193
- 192 - 192.5
- 191.5 - 192
- 191 - 191.5
- 190.5 - 191
- < 190.5

0 500 1,000 metres

1:6,000 (A1 original document size of 24x44)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under licence with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2017

Project Location
Town of Essex

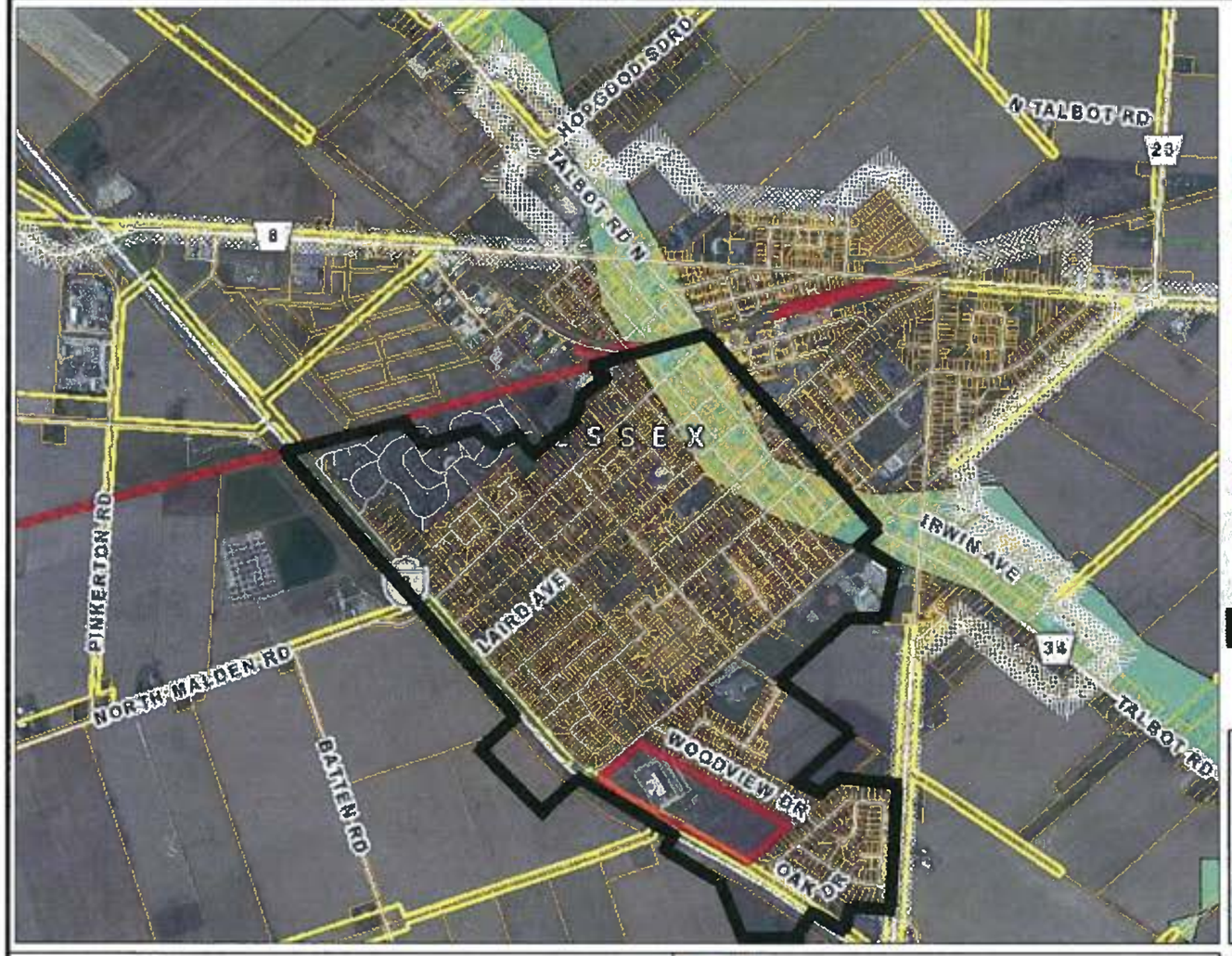
185620098
Prepared by KDB on 2017-01-19

Client/Project
TOWN OF ESSEX

Figure No
2.4

Title
Town of Essex
Topography

Study area features

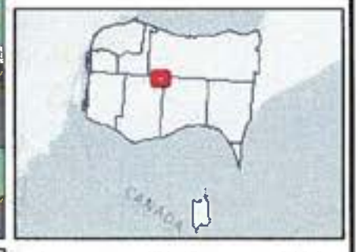


Essex Region Conservation Authority

Legend

- ERCA Property
- City Assessment
- Regional Assessment (ARN) Ownersh
- Regional Assessment (ARN) Basic
- Ownership Parcels (PIN)
- 1:100 yr Flood Line
- Maximum Observed Flooding
- Limit of Regulated Area
- Surface Water Intake
  - A
  - B
  - D
- Highly Vulnerable Aquifer (HVA)
- Significant Groundwater Recharge Ar
  - 2
  - 4
  - 6
- South Talbot Catchment Project Area

Location



0 471.45 942.9

Meters

1: 21,213 8/23/2017

Notes

ERCA Geomatics

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Data herein is provided on an 'as is' basis and is for visual reference only. Map not to be used for navigation or plan of survey.

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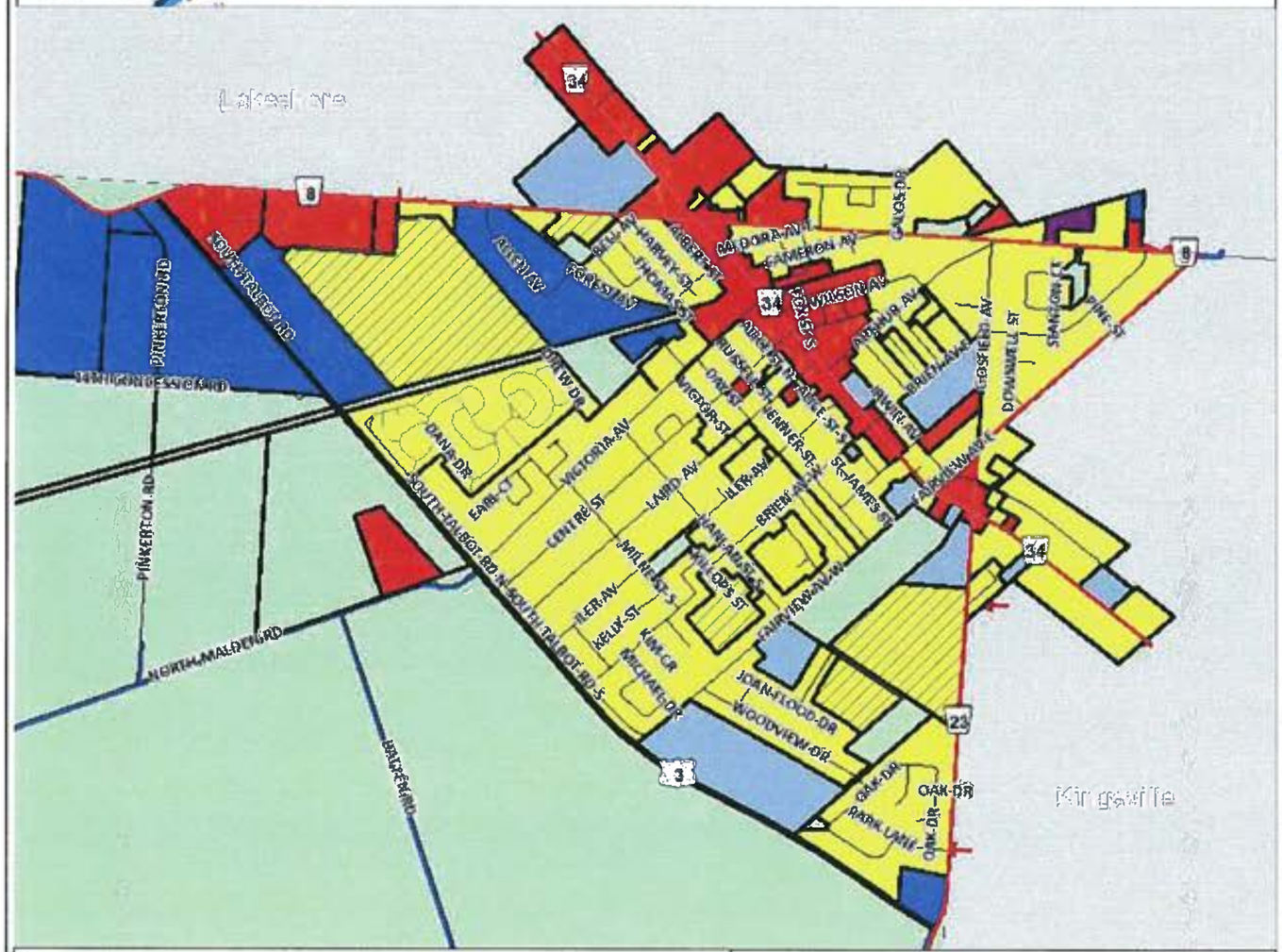
TOWN OF ESSEX
SOUTH TALBOT CATCHMENT STORM SEWER IMPROVEMENTS
CLASS EA

SIGNIFICANT GROUNDWATER RECHARGE AREAS IN THE TOWN OF ESSEX

PROJECT NO. 165620098
DATE 2018.07.12
DRAWING NO. FIGURE 2.5

W:\active\165620098\preliminary\report\Appendix_A_Figures\Figures in AutoCAD\FIGURE 2.5.dwg
2019-1-18 09:51am BY: qkha

Town of Essex Mapping



Legend

Roads
- County Roads
- Municipal
- Private
- Provincial

Zoning Bylaw (No.1037)
- Agricultural
- Commercial
- Development Reserve
- Green District
- Holding Residential
- Institutional
- Landfill
- Manufacturing
- Natural Environment
- Residential
- Wetland

1: 21,454 7/19/2018

Notes

Enter Map Description

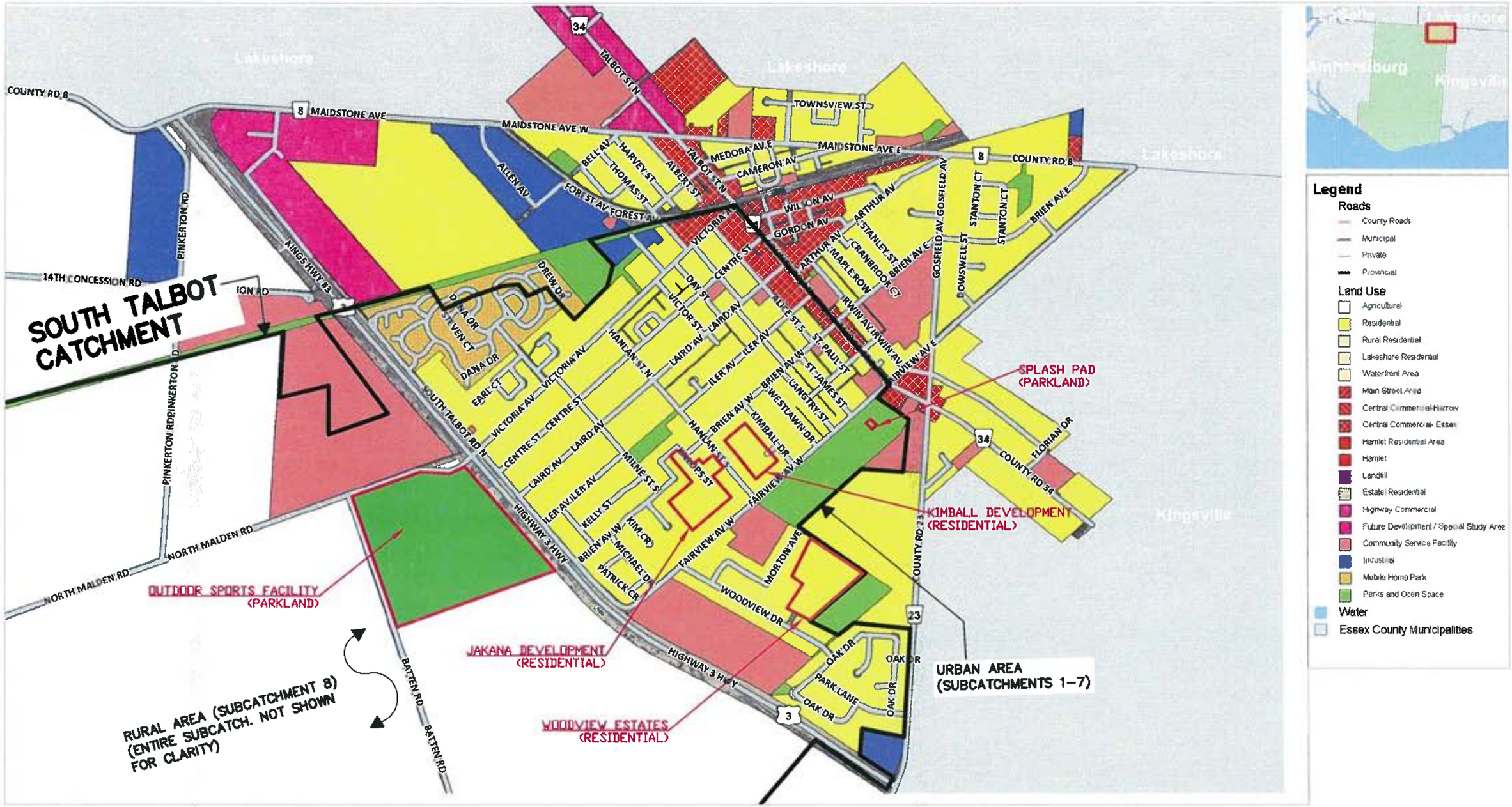
THIS MAP IS NOT TO BE USED FOR NAVIGATION
Copyright the Corporation of the Town of Essex, 2014. Data herein is provided by the Corporation of the Town of Essex on an 'as is' basis. Assessment parcel provided by Teranet Enterprises Inc. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

TOWN OF ESSEX
SOUTH TALBOT CATCHMENT STORM SEWER IMPROVEMENTS
CLASS EA

TOWN OF ESSEX'S ZONING BY-LAW

PROJECT NO: 165620098
DATE: 2018.07.12
DRAWING NO: FIGURE 2.6

W:\active\165620098\preliminary\report\Appendix_A_Figures\Figures in AutoCAD\FIGURE 2.6.dwg
2019-1-18 11:35am BY: qkha



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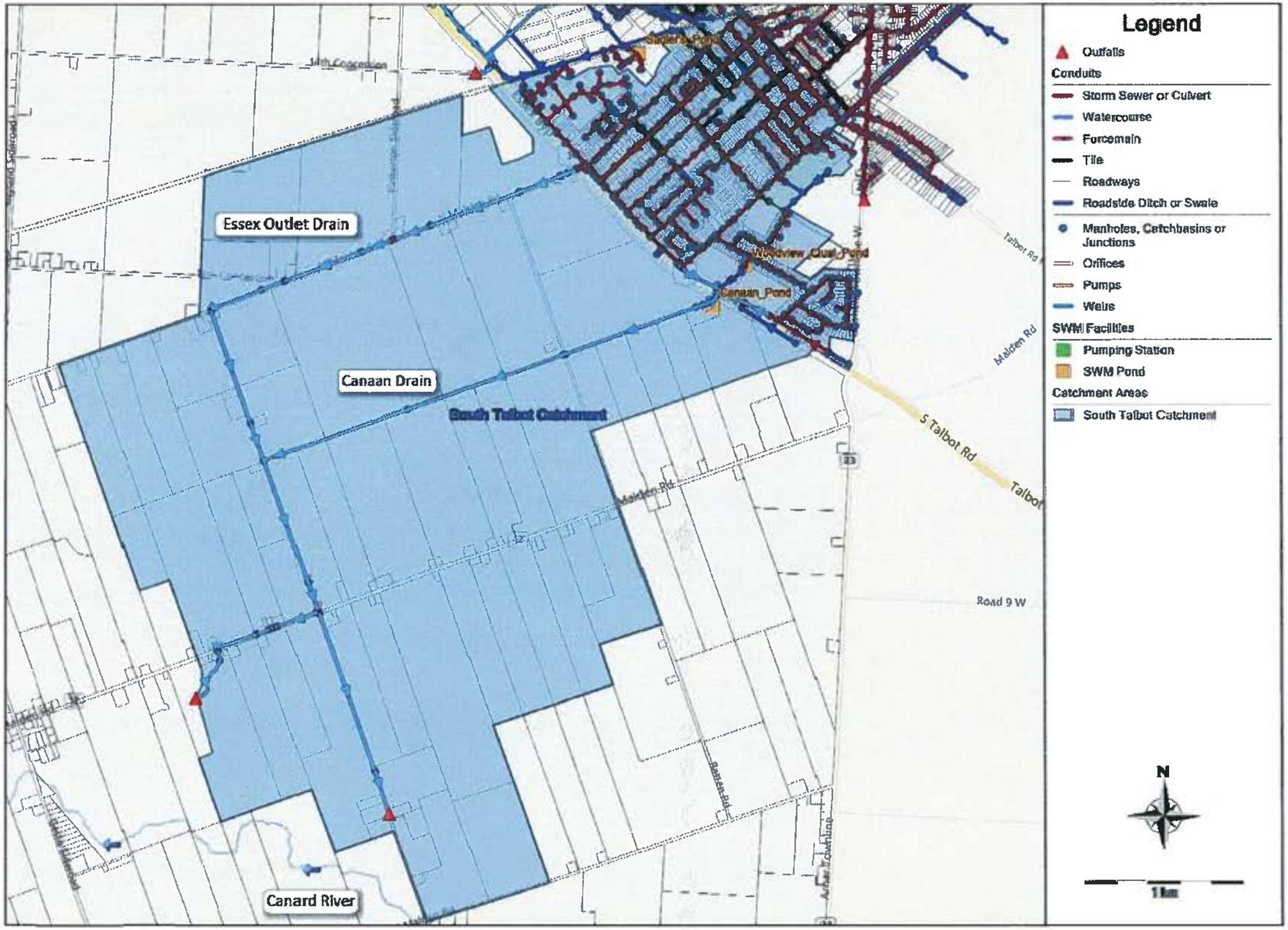
IMPROVEMENTS TO SOUTH TALBOT CATCHMENT STORM SEWER SYSTEM
CLASS ENVIRONMENTAL ASSESSMENT

FUTURE LAND USE PLAN IN THE SOUTH TALBOT CATCHMENT

PROJECT NO. 160955000
DATE 2018.11.12

DRAWING NO. FIGURE 2.7



W:\active\165620098\preliminary\report\Appendix_A_Figures\Figures in AutoCAD\FIGURE 5.1.dwg
2019-1-28 04:26pm BY: akha

essex

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TOWN OF ESSEX
SOUTH TALBOT CATCHMENT STORM SEWER IMPROVEMENTS
CLASS EA

SITE PLAN OF THE SOUTH TALBOT CATCHMENT'S HYDROLOGIC-HYDRAULIC MODEL

PROJECT NO. 165620098
DATE: 2018.07.12
DRAWING NO.
FIGURE 5.1

N

Beattie Drain

Hyland Drain

6th Conc. Drain

Puce Drain

Maidstone Ave Drain

Puce Drain

Rush Drain

14th. Conc. E. Drain Branch

14th. Conc. E. Drain Branch

McInteer Drain

Burstyn Drain

Kokoval Drain

Chelsey Sarnes Drain

Dooley Drain

Essex Outlet Drain

Canaan Drain

Talbot Rd S Drain

East Townline Drain

West Townline Drain

Russell Drain

N.T.R. CONCESSION

MAIDSTONE AVE. WEST

MAIDSTONE AVE. EAST

MAIDSTONE COLCHESTER TOWNLINE

CONCESSION RD 14

SOUTH TALBOT ROAD

NORTH MALDEN RD

PINKERTON RD

COUNTY ROAD NO. 23

GOSFIELD TOWNLINE

KING'S HIGHWAY NO. 3 BYPASS

BATTEN SIDE RD

CANADA SOUTHERN RAILWAY CO.

GREENWAY TRAIL

ESSEX CROSSING POND (QUANTITY & QUALITY)

ESSEX CROSSING P.S.

WEIR (192.07)

ORIFICE (0.2m DIA. OPENING)

OUTFALL

SADLER'S POND

PERMANENT POOL

GALOS POND (QUALITY)

ORIFICE (0.075m x 0.075m OPENING)

GALOS P.S.

SLUICE GATE (mounted on SAN P.S. No. 4-Emergency Overflow Structure)

WOODVIEW POND

ORIFICE (0.25m DIA. OPENING)

WEIR (192.01)

CANAAN POND

ORIFICE (0.55m x 0.62m OPENING)

HWY 3 & FARM FIELD RUNOFF

SLUICE GATE (mounted to SAN sewer interconnection)

REPLACE EX. 750-1200 DIA. SEWER WITH SEWER SPEC'D

REPLACE EX. 375 DIA. SEWER WITH 900 DIA. SEWER

REPLACE EX. 450 DIA. SEWER WITH 1050-1200 DIA. SEWER

MTO PROPOSED DRAIN REALIGNMENT & NE W CULVERT CROSSING

IMPROVE DRAIN & CLEAN SEWERS AS FAR U/S AS REQ'D

REPLACE BRIDGE TO ESSEX PCP

WEIR

PROPOSED ESSEX OUTLET POND (QUANTITY) & DEWATERING PUMP STATION

ABANDON PORTION OF CHANNEL AND FILL WITH FILL FROM POND EXCAVATION

HYDRO EASEMENT

MTO PROPOSED CULVERT EXTENSION

REPAIR DRAIN

PROPOSED CANAAN POND EXPANSION. & DEWATERING PUMP STATION (QUANTITY) REMOVE OUTLET STRUCTURE & REPLACE INLET STRUCTURE

CLEAN SEWERS AS FAR U/S AS REQ'D

ABANDON PORTION OF OLD CHANNEL AND FILL WITH FILL FROM POND & OUTLET CHANNEL EXCAVATION

PROPOSED WOODVIEW POND EXPANSION, RETROFIT INLET & OUTLET STRUCTURES (QUANTITY & QUALITY) EXCAVATE CHANNEL FROM POND TO OUTLET STRUCTURE

REMOVE OUTLET SEWER ORIFICE

INFRASTRUCTURE LEGEND

STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
FUTURE SEWER
STORM CONDUIT – OUT–OF–SERVICE
PRIMARY OUTLET – FLOW DIRECTION
SECONDARY OUTLET – OVERFLOW DIRECTION
CLAY TILES (FLOW DIRECTION ASSUMED)
ORIFICE (Opening)
SLUICE GATE

STORMWATER MANAGEMENT POND
MANHOLE
MAINLINE CATCHBASIN
MUNICIPAL DRAIN
DITCH OR SWALE
OVERFLOW SWALE
SEWER OUTFALL
WEIR (Crest Elev.)
FLAP GATE

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CATCHMENT	SUBWATERSHED	SYMBOL
SOUTH TALBOT	RIVER CANARD	SUBCATCHMENT 1

TOWN OF ESSEX – ESSEX

FIGURE 6.1: SITE PLAN STORMWATER SYSTEM PREFERRED SOLUTION

PROJECT NO.		DRAFT NO.
165620098	0 125 375 600m 1:12500	FINAL DATE JUNE 24, 2018

V:\01656\active\165620098\preliminary\report\Storm Sewer EA Report\Appendix_A_Figures\Figures in AutoCAD\FIGURE 6.1.dwg
2023-7-04 10:31am BY: jholmes

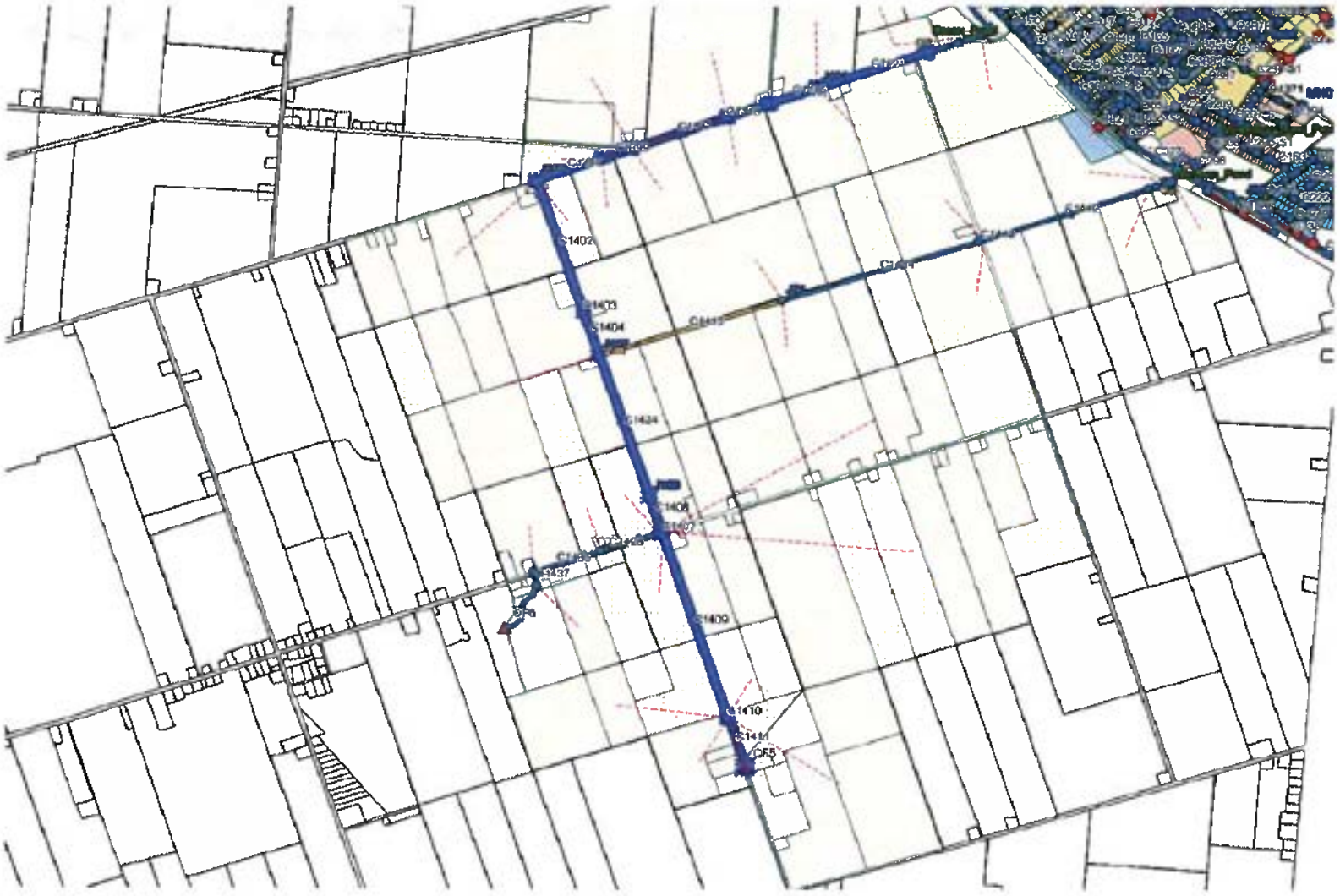


Figure 6.2(a): Plan view of H&H model with conduits and junctions labelled for viewing highlighted hydraulic profile of Essex Outlet Drain

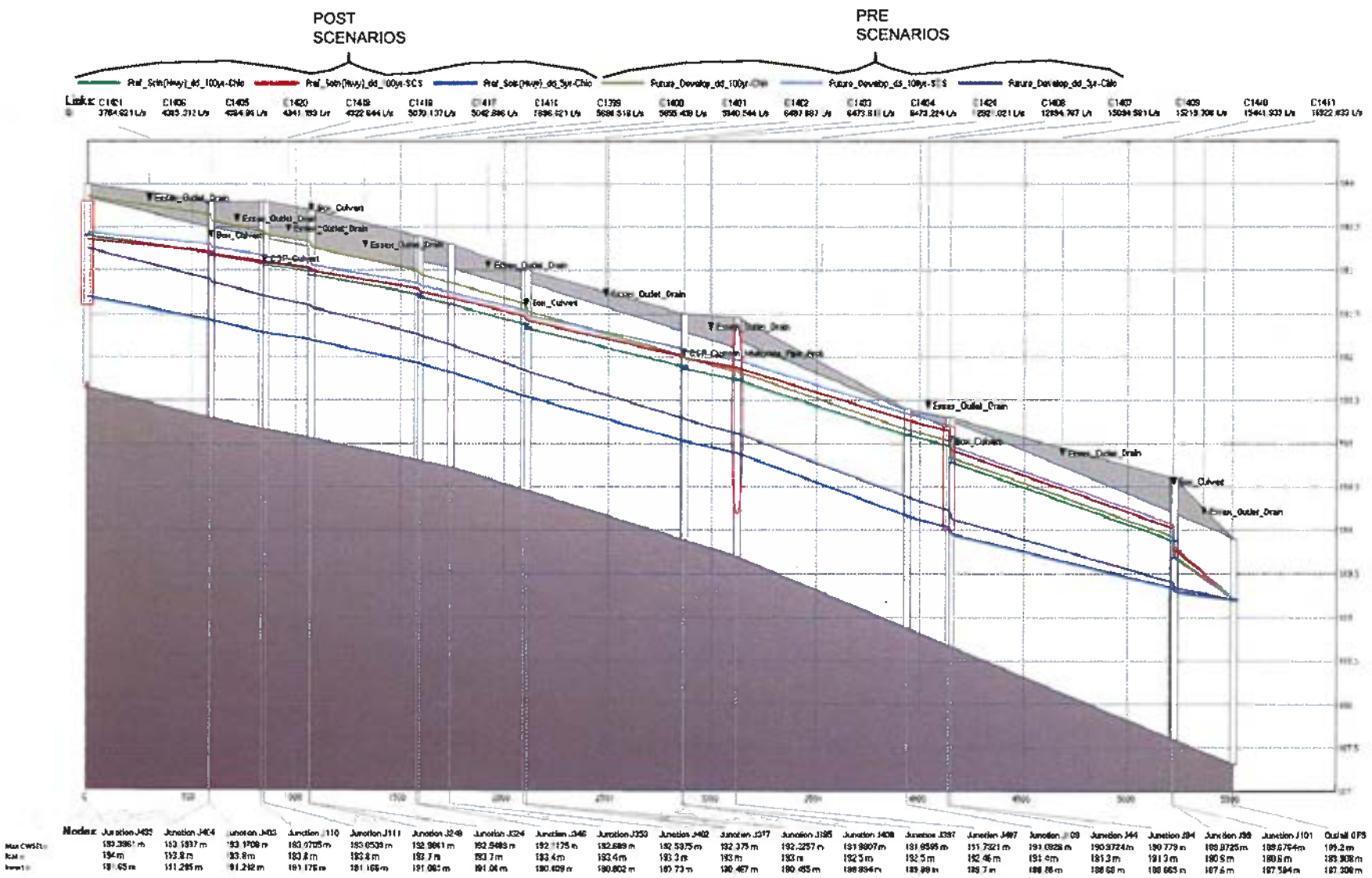


Figure 6.2(b): Hydraulic profile of Essex Outlet Drain from proposed new Essex Outlet Pond to Essex Outlet Drain's outlet to Canard River at the culvert crossing over Mole Rd (outfall tag 'OF5') during minor (5yr-4hr Chicago) and major (100yr-4hr-Chicago and 100yr-24hr-SCS TII) storm events

Figure 6.3(a): Plan view of H&H model with conduits and junctions labelled for viewing highlighted hydraulic profile of Canaan Drain, Essex Outlet Drain and John's Creek Drain

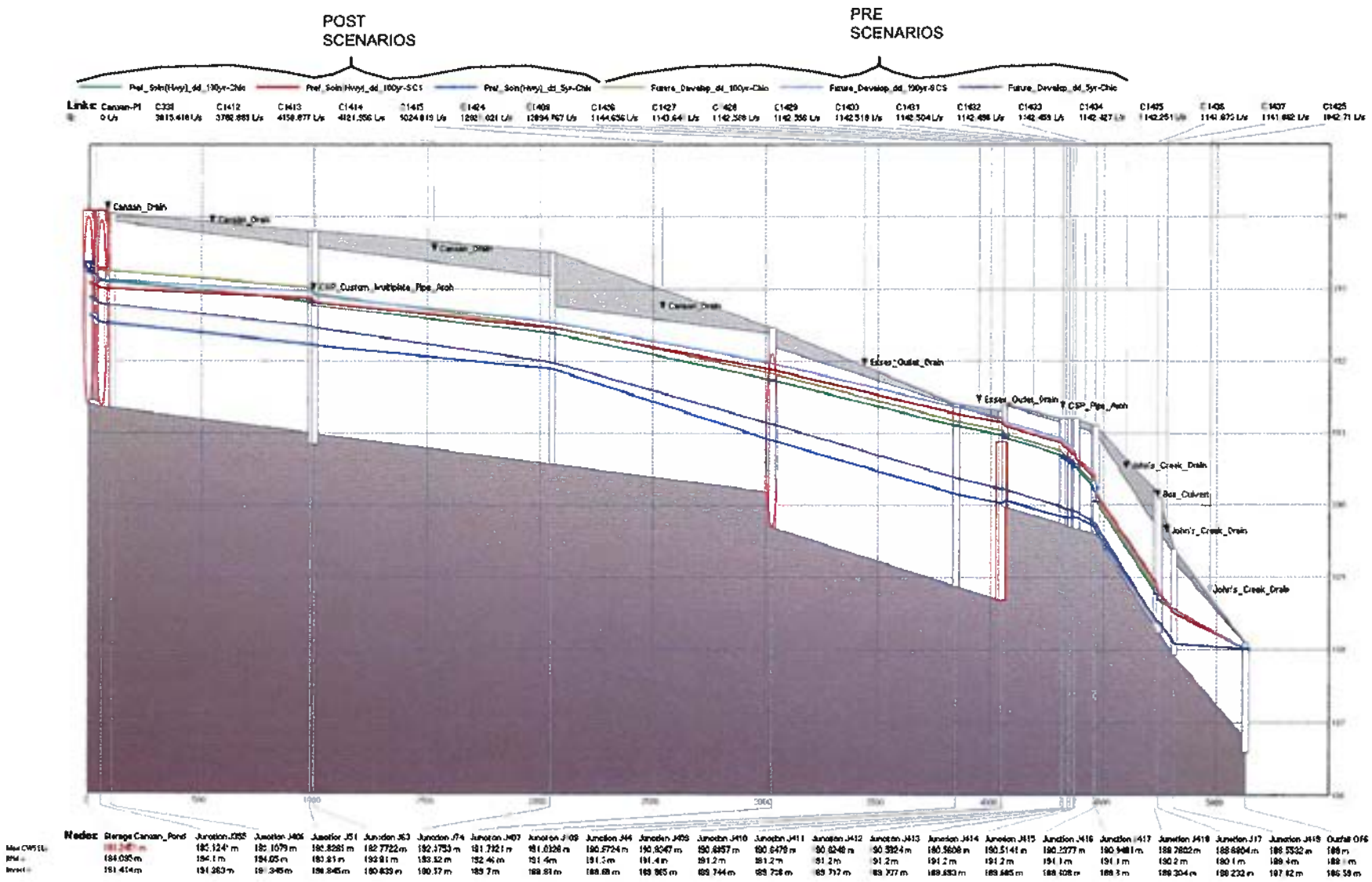
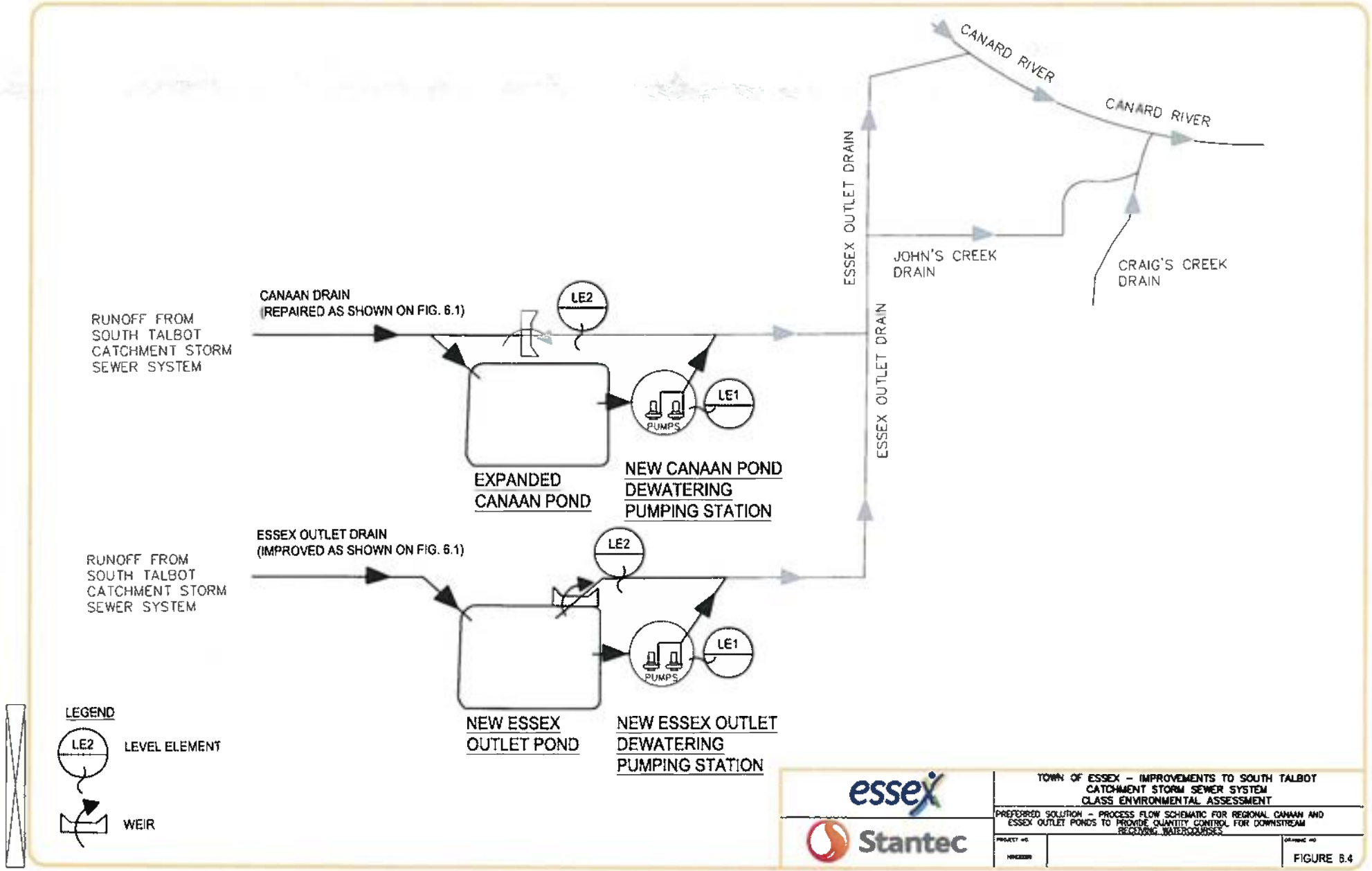


Figure 6.3(b): Hydraulic profile of Canaan Drain, Essex Outlet Drain and John's Creek Drain from Canaan Pond to John Creek's outlet to Craig's Creek just upstream of Canard River (outfall tag 'OF6') during minor (5yr-4hr Chicago) and major (100yr-4hr-Chicago and 100yr-24hr-SCS TII) storm events



essex

Stantec

TOWN OF ESSEX – IMPROVEMENTS TO SOUTH TALBOT CATCHMENT STORM SEWER SYSTEM
CLASS ENVIRONMENTAL ASSESSMENT

PREFERRED SOLUTION – PROCESS FLOW SCHEMATIC FOR REGIONAL CANAAN AND ESSEX OUTLET PONDS TO PROVIDE QUANTITY CONTROL FOR DOWNSTREAM RECEIVING WATERCOURSES

FIGURE 6.4

Appendix B MECP CERTIFICATES OF APPROVAL & SWM REPORTS

1. Canaan Regional Pond Certificate of Approval
2. Woodview Estates SWMF Certificate of Approval (exert)
3. Woodview Estates SWM Report (exert)

CONTENT COPY OF ORIGINAL

Ontario

Ministry of the Environment **Ministère de l'Environnement**

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3364-6SNQNA
Issue Date: August 26, 2006

The Corporation of the Town of Essex
33 Talbot Street South
Essex, Ontario
N8M 1A8

Site Location: Canaan Drain Regional Storm Quality Pond
Part of Lot 33, Concession North of Malden Road
Town of Essex, County of Essex

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the expansion of the existing Canaan Drain Regional Storm Quality Pond for the treatment of stormwater runoff from a catchment area of 14.9 hectares by diverting approx. a 600 mm depth of flow from the Canaan Drain into the existing Canaan Drain Regional Storm Quality Pond for the first flows coming through the system and to provide Basic Level water quality protection and erosion control, discharging to the Canaan Drain then to the Essex Outlet Drain and ultimately to the Canard River, for the 13 mm (first flush) of runoff from the development areas, consisting of the following:

the existing Canaan Drain Regional Storm Quality Pond serving the Jakana Development (9.0 ha) and the Kimball Development (5.9 ha), located along the Canaan Drain near its' upper end just west of King's Highway No. 3, having a total active storage volume of 1,614 m^3 complete with one (1) weir diverter located in the Canaan Drain, diverting approx. the 600 mm depth of flow from the Canaan Drain into the Canaan Drain Regional Storm Quality Pond, one (1) inlet structure consisting of a 1,050 mm by 740 mm CSP inlet pipe and rip-rapped inlet, one (1) - 5 m by 4.3 m by 1 m sedimentation trap, a serpentine channel through the pond bottom, a 4 m wide rip-rapped emergency spillway and one (1) outlet structure consisting of a 200 mm diameter Hickenbottom pipe and a 150 mm diameter outlet pipe allowing a maximum discharge of 0.021 m^3/s (100-year storm event) the Canaan Drain then to the Essex Outlet Drain and ultimately to the Canard River; including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works*;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works submitted by Gerard Rood, P.Eng., of N.J. Peralta Engineering Ltd., dated May 9, 2006 and received May 15, 2006;

2. Report entitled: "Expansion of Canaan Drain Regional Storm Quality Pond, Town of Essex" dated December 10, 2004 and prepared by N.J. Peralta Engineering Ltd.; and

3. Engineering drawings dated December 10, 2004 and prepared by N.J. Peralta Engineering Ltd.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

2. "*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

3. "*District Manager*" means the District Manager of the Sarnia District Office of the *Ministry*;

4. "*Ministry*" means the Ontario Ministry of the Environment;

5. "*Owner*" means the Corporation of the Town of Essex and includes its successors and assignees;

6 "*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

1.1 Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the *Works* and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

1.2 Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

1.3 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*.

4. OPERATION AND MAINTENANCE

4.1 The *Owner* shall ensure that the design storage volume is maintained at all times.

4.2 The *Owner* shall inspect the *Works* and the portion of the Canaan Drain extending from the sewer outlet at South

CONTENT COPY OF ORIGINAL

Talbot Road and Fairview Avenue downstream to the weir structure at least once a year and, if necessary, clean and maintain the *Works* and the portion of the Canaan Drain to prevent the excessive buildup of sediments and/or vegetation.

4.3 The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site for inspection by the *Ministry*. The logbook shall include the following:

(a) the name of the *Works*; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate*.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included to require that the *Works* and the portion of the Canaan Drain be properly operated and maintained such that the environment is protected.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works*.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;

CONTENT COPY OF ORIGINAL

7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 26th day of August, 2006

Sarah Paul, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

KC/
c: District Manager, MOE Sarnia District Office
Area Supervisor, MOE Windsor Area Office
Gerard Rood, N.J. Peralta Engineering Ltd.

CONTENT COPY OF ORIGINAL

Ontario

Ministry of the Environment **Ministère de l'Environnement**

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3364-6SNQNA
Issue Date: August 26, 2006

The Corporation of the Town of Essex
33 Talbot Street South
Essex, Ontario
N8M 1A8

Site Location: Canaan Drain Regional Storm Quality Pond
Part of Lot 33, Concession North of Malden Road
Town of Essex, County of Essex

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the expansion of the existing Canaan Drain Regional Storm Quality Pond for the treatment of stormwater runoff from a catchment area of 14.9 hectares by diverting approx. a 600 mm depth of flow from the Canaan Drain into the existing Canaan Drain Regional Storm Quality Pond for the first flows coming through the system and to provide Basic Level water quality protection and erosion control, discharging to the Canaan Drain then to the Essex Outlet Drain and ultimately to the Canard River, for the 13 mm (first flush) of runoff from the development areas, consisting of the following:

the existing Canaan Drain Regional Storm Quality Pond serving the Jakana Development (9.0 ha) and the Kimball Development (5.9 ha), located along the Canaan Drain near its' upper end just west of King's Highway No. 3, having a total active storage volume of 1,614 m^3 complete with one (1) weir diverter located in the Canaan Drain, diverting approx. the 600 mm depth of flow from the Canaan Drain into the Canaan Drain Regional Storm Quality Pond, one (1) inlet structure consisting of a 1,050 mm by 740 mm CSP inlet pipe and rip-rapped inlet, one (1) - 5 m by 4.3 m by 1 m sedimentation trap, a serpentine channel through the pond bottom, a 4 m wide rip-rapped emergency spillway and one (1) outlet structure consisting of a 200 mm diameter Hickenbottom pipe and a 150 mm diameter outlet pipe allowing a maximum discharge of 0.021 m^3/s (100-year storm event) the Canaan Drain then to the Essex Outlet Drain and ultimately to the Canard River; including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works*;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works submitted by Gerard Rood, P.Eng., of N.J. Peralta Engineering Ltd., dated May 9, 2006 and received May 15, 2006;

2. Report entitled: "Expansion of Canaan Drain Regional Storm Quality Pond, Town of Essex" dated December 10, 2004 and prepared by N.J. Peralta Engineering Ltd.; and

3. Engineering drawings dated December 10, 2004 and prepared by N.J. Peralta Engineering Ltd.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

2. "*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

3. "*District Manager*" means the District Manager of the Sarnia District Office of the *Ministry*;

4. "*Ministry*" means the Ontario Ministry of the Environment;

5. "*Owner*" means the Corporation of the Town of Essex and includes its successors and assignees;

6 "*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

1.1 Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the *Works* and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

1.2 Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

1.3 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*.

4. OPERATION AND MAINTENANCE

4.1 The *Owner* shall ensure that the design storage volume is maintained at all times.

4.2 The *Owner* shall inspect the *Works* and the portion of the Canaan Drain extending from the sewer outlet at South

CONTENT COPY OF ORIGINAL

Talbot Road and Fairview Avenue downstream to the weir structure at least once a year and, if necessary, clean and maintain the *Works* and the portion of the Canaan Drain to prevent the excessive buildup of sediments and/or vegetation.

4.3 The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site for inspection by the *Ministry*. The logbook shall include the following:

(a) the name of the *Works*; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate*.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included to require that the *Works* and the portion of the Canaan Drain be properly operated and maintained such that the environment is protected.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works*.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;

CONTENT COPY OF ORIGINAL

7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 26th day of August, 2006

Sarah Paul, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

KC/
c: District Manager, MOE Sarnia District Office
Area Supervisor, MOE Windsor Area Office
Gerard Rood, N.J. Peralta Engineering Ltd.

Ontario

Ministry of Environment and Energy

Ministère de l'Environnement et de l'Énergie

CERTIFICATE OF APPROVAL
SEWAGE
NUMBER 3-0491-97-006

Woodview Estates
14 Centre Street
Essex, Ontario
N8M 1N9

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Storm sewers, stormwater management facilities, stub sanitary sewers and appurtenances to be constructed to serve the Woodview Estates Subdivision (37T-92001), located on Part of Lot 281, Concession south of Talbot Road, in the Town of Essex, as follows:

STREET	FROM	TO
STORM SEWERS		
Woodview Drive	Fairview Avenue West	Approx. 15 m W. of Oak Drive
Easement Lot 14/15 off Woodview Drive	Woodview Drive	Approx. 68 m S. of Woodview Drive

STORMWATER MANAGEMENT

Stormwater management facilities located on an easement in the Essex County Civic Centre property, consisting of a by-pass chamber to divert the first flush (13 mm of rainfall) to a detention pond with approximately 700 m^3 storage including hickenbottom inlet/outlet control facility, and a oversized overflow channel providing a total storage volume of 4550 m^3 with an outlet control facility to limit flows into the Canaan Relief Drain to the following peak pre-development flow levels:

	1:5 Year	1:100 Year
peak pre-development flow	163 L/s	761 L/s
peak post-development flow	1026 L/s	1487 L/s
peak post-development flow (attenuated)	163 L/s	761 L/s

including stub storm sewers, stub sanitary sewers on street "A" & "C", catchbasin leads and catchbasins, storm service drains from the main sewer to the street line, all in accordance with the final plans, specifications and stormwater management report prepared by Wolverine Engineering, Consulting Engineers, and all additional stub storm sewers, catchbasin leads and catchbasins, storm service drains from the main sewer to the street line not included in the above final plans and specifications as may be approved by the operating authority in the future in accordance with the conditions of the Certificate of Approval.

The time of concentration was determined by averaging times established by the SCS curve number method for predevelopment and 20 minutes for postdevelopment.

3.4 Meadow Sizing

The sizing of the proposed meadow (Figure 4, 5 and 6) followed modelling of the post development hydrograph from the area and establishing the required storage volumes for various rainfall- return frequencies.

The allowable discharge rate was established from the modelled predevelopment flows using the "MIDUSS" computer model. For the 5 year event, the peak release rate was established to be 163 l/s, requiring a storage volume of 3,000 m^3 (Appendix 'A'). For the 100 year event, the peak release rate was established to be 761 l/s, requiring a storage volume of 3,900 m^3. The meadow storage volume is 4,550 m^3, significantly exceeding the requirements. The following table summarizes the storage requirements:

Storm	Predeveloped Peak Flow (m^3/s)	Developed Peak Flow (m^3/s)	Required Storage (m^3)	Storage Provided by Meadow (m^3)	Water Level Elevation in Meadow (m)
5 Year Phase 1	0.083	0.467	1485	1690	193.075
5 Year Full Dev.	0.163	1.026	3010	3300	193.575
100 Year Phase 1	0.384	0.922	2385	3950	193.750
100 Year Full Dev.	0.761	1.487	3910	4535	193.900

For Phase 1 of the development, the orifice component of the outlet structure will require an orifice plate or restrictor that results in an outlet orifice with a diameter of 240mm (4/5 the diameter of the fully developed discharge pipe requirements).

Removing the water stored in the road depressions following 1:100 rainfall will take approximately 2.5 hours. Analysis of the total system storage did not include the volume available in the storm sewer system. This approach provides an additional margin of safety.

Appendix C FILL & FLOODLINE MAPPING

1. Fill and Floodline maps - Canard River. Essex Region Conservation Authority (ERCA). Map No. ER5-38.

ER5-38

USERS NOTES

ESSEX REGION
CONSERVATION AUTHORITY

CANARD RIVER AND BIG CREEK

FLOODLINE MAPPING STUDY

ONTARIO REGULATION NO. _____

SCHEDULE NO. 5

3+680 CROSS-SECTION
● 176.9 1:100 YEAR FLOOD LEVELS
(177.0) REGIONAL STORM FLOOD LEVELS
——— 1:100 YEAR FLOODLINE
—·— REGIONAL STORM FLOODLINE
- - - - - - - FILL LINE

NOTES:

THIS MAP IS PREPARED FOR USE IN CONJUNCTION WITH THE FLOODLINE MAPPING REPORT DATED **DECEMBER 1982** PREPARED BY PROCTOR & REDFERN LTD. FOR THE ESSEX REGION CONSERVATION AUTHORITY AND FORMS PART THEREOF.

REGISTERED PROFESSIONAL ENGINEER R. W. STEMP PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER S. A. VOKES PROVINCE OF ONTARIO

Proctor & Redfern Limited
Consulting Engineers and Planners
Toronto

MAP NO. ER5-38

Airphoto mapping prepared by Kenting Earth Sciences Ltd. from March 1981 photography
Ref. No. 81021

345000mE 347500mE 4667500mN 4665000mN

CRAIGS CREEK

ESSEX OUTLET DRAIN

MOLE SIDE ROAD

ESSEX COUNTY ROAD 12
GESTO ROAD

FLOODLINE STUDY LIMIT

100yr floodline = approx. 188m

100yr floodline = 189.2m

34 + 030
35 + 000
35+600
36 + 930
36+160

FLOW

187.96 (188.94)
188.63 (189.38)
188.94 (189.56)
188.94 (189.82)
189.22 (189.9)
189.28 (189.97)

Sheet
02 17 3450 46650

Scale 1:5000

250 0 250 500 Metres
250 0 250 500 750 1000 1250 1500 1750 2000 2250 2500 Feet

NOTES

North American Datum 1927.
Universal Transverse Mercator (6°) projection.
Zone 17. Central meridian 81°W.
Grid interval 250 metres.

ADJOINING SHEETS

	05 17 3450 46675	
05 17 3425 46650	05 17 3450 46650	05 17 3475 46650
	05 17 3450 46625	

Appendix D CONSULTATION DOCUMENTATION

D.1 CONSULTATION

Notice of Study Commencement

Sampler letter and response comment form sent to stakeholders

List of eview gencies and takeholders

Open House Attendees List

ESSEX CENTRE SOUTHWEST AREA STORM SEWER IMPROVEMENT

CLASS ENVIRONMENTAL ASSESSMENT

NOTICE OF STUDY COMMENCEMENT

The Town of Essex, through their consultant Stantec Consulting Ltd., has initiated a study to determine the preferred solution to hydraulic capacity issues caused by increasing storm intensity and development pressures on the storm sewer system in Essex Centre Southwest area.

The study is being undertaken in accordance with the planning and design process for 'Schedule B' projects outlined in the Municipal Class Environmental Assessment (Class EA, June 2000, as amended in 2007, 2011 & 2015) under the Ontario Environmental Assessment Act. The Class EA process includes public and review agency consultation, an evaluation of alternatives, an assessment of the potential environmental effects of the proposed works, and identification of reasonable measures to mitigate any adverse impacts that may result.

Public participation will form an integral part of this Class EA study to ensure that the concern's of the public and affected groups within the study area are identified, documented and assessed. A Public Consultation Centre will be scheduled during the study to present the findings to date and to collect community feedback and input before finalizing the preferred solution.

Any parties that wish to provide suggestions or comments about this study at this time should do so, preferably in writing, by contacting the individuals identified below.

Town of Essex

Mr. Chris Nepszy, P. Eng., PE
Director, Infrastructure and Development
(519)776-7336 x1114
cnepszy@essex.ca

Mr. Richard Beausoleil
Manager, Capital Works and Infrastructure
(519) 776-7336 x1113
rbeausoleil@essex.ca

Stantec Consulting Ltd.

Dr. Jian Li, P.Eng., PE
Senior Environmental Engineer
Phone: 519-966-2250 ext 240
jian.li@stantec.com

Mr. Clarence Jubenville, P. Eng.
Senior Civil Engineer
Phone: 519-966-2250 ext 241
clarence.jubenville@stantec.com

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. Subjective to comments received and the receipt of necessary grants and approvals, the Town of Essex intends to proceed with the planning, design and construction of this project, to be completed by late 2018.

Stantec Consulting Ltd.
100-140 Ouellette Place
Windsor ON N8X 1L9
Tel: (519) 966-2250
Fax: (519) 966-5523

June 28, 2017
165620098

Attention: Sir/Madam

SAMPLE LETTER SENT TO STAKEHOLDERS

Dear Sir/Madam,

Reference: Notice of Study Commencement
Class Environmental Assessment – Essex Ward 1 Southeast Area Storm Sewer Improvements
Town of Essex

The Town of Essex has initiated a Municipal Class Environmental Assessment (Class EA) to provide short and long-term improvements to the storm sewer system in the Essex Ward 1 Southeast area. 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 'B' projects outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 & 2015), 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, the preferred improvements to the Essex Ward 1 Southeast area storm sewers will be established in consideration of input received from the public and review agencies.

The purpose of this letter is to introduce the project, to seek your input on the existing environmental conditions (natural, socio/economic or cultural) within the Project Area, and to identify any issues, concerns or approval requirements that your organization may have. A reply by August 18, 2017 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 your organization has 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.

Dr. Jian Li, P.Eng., PE
Senior Environmental Engineer
Phone: (519) 966-2250 x 240
Fax: (519) 966-5523
Jian.li@stantec.com

Attachment: Notice of Study Commencement, Response Form

c. Mr. Chris Nepszy, P. Eng., PE , Director of Infrastructure and Development, Town of Essex

RESPONSE FORM – PLEASE RETURN BY AUGUST 18, 2017

Date: _____

☐ Please remove my group/agency from the study mailing list.

☐ I would like to provide the following comments.

SAMPLE REVIEW COMMENT FORM SENT TO STAKEHOLDERS WITH LETTER

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.

Contact Information on Study Mailing List	*If this information is incorrect please provide updated information or identify the key project contact below.*

Please return the completed form to:

Dr. Jian Li, Senior Environmental Engineer, 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:

Job Title:

Name of Group/Agency:

Mailing Address:

Tel: **Fax:** **E-mail:**

RESPONSE FORM – PLEASE RETURN BY AUGUST 18, 2017

TOWN OF ESSEX
CLASS ENVIRONMENTAL ASSESSMENT
ESSEX CENTRE SOUTHWEST AREA
STORM SEWER IMPROVEMENTS
LIST OF REVIEW AGENCIES & CONTACTS

The following are the identified Review Agencies from the MEA Class EA document and Mandatory Contacts which will be directly contacted at various stages of the Class EA process. Agencies and contacts which indicate no direct interest will be deleted and new ones which express interest will be added to the list.

Title	Surname	First Name	Organization	Department	Job Title	Address	City/Prov	Postal Code	Tel.	Fax	E-Mail
Conservation Authority											
Mr.	Wyma	Richard	Essex Region Conservation Authority		General Manager	360 Fairview Avenue West, Suite 311	Essex, ON	N8M 1Y6	519-776-5209 x 353	519-776-8688	wwyma@erca.org
Mr.	Byrne	Tim	Essex Region Conservation Authority		Director, Watershed Management Services	360 Fairview Avenue West, Suite 311	Essex, ON	N8M 1Y6	519-776-5209 x 350	519-776-8688	tbyrne@erca.org
Mr.	Nelson	Michael	Essex Region Conservation Authority		Watershed Planner	360 Fairview Avenue West, Suite 311	Essex, ON	N8M 1Y6	519-776-5209 x 347		mnelson@erca.org
Interest Groups											
Ms.	Bastien	Carolyn	Conseil Scolaire de District Des Ecoles Catholiques du Sud-ouest		Business Superintendent	7515 Forest Glade Drive	Windsor, ON	N8T 3P5	519-948-9227		
Ms.	Lynd	Cathy	Greater Essex County District School Board		Superintendent of Business	451 Park Street West, P.O. Box 210	Windsor, ON	N9A 6K1	519-255-3200	519-255-7053	cathy.lynd@publicboard.ca
Mr.	Picard	Paul	Windsor-Essex Catholic School Board		Director of Education	1325 California Avenue	Windsor, ON	N9B 1Y8	519-253-2481 x 1201	519-253-8397	
Ms.	Kelly	Megan	Windsor-Essex Catholic School Board	Facility Services		1325 California Avenue	Windsor, ON	N9B 1Y8	519-253-2481		
Ms.	McMillan	Gabrielle	Windsor-Essex Student Transportation Services		General Manager of Student Transportation	360 Fairview Avenue West, Suite 318	Essex, ON	N8M 3G4	519-776-6431 x220	519-776-4457	
Sir/Madam			Municipal Property Assessment Corporation	Windsor-Essex Assessment Office		1695 Manning Road, Unit 195	Tecumseh, ON	N8N 2L9			
Mr.	Marchand	Matt	Windsor-Essex Regional Chamber of Commerce		President & CEO	2575 Ouellette Place	Windsor, ON	N8X 1L9	519-966-3696 x222		
Mr.	Groves	Brent	Essex County Stewardship Network		Coordinator	870 Richmond Street West, PO Box 1168	Windsor, ON	N7M 5L8			
Mr.	Coronardo	Derek	Citizens Environmental Alliance of Southwestern Ontario		Coordinator	1950 Ottawa Street	Windsor, ON	N8Y 1R7	519-973-1116	519-973-8360	ceaadmin@cogeco.net
Mr.	Pratt	Paul	Essex County Field Naturalist's Club		Vice-President	C/O Ojibway Nature Centre 5200 Matchette Road	Windsor, ON	N9C 4E8			naturalist@primus.ca
Utilities											
Mr.	Trepanier	Clifford	Bell Canada			1149 Goyeau Street	Windsor, ON	N9A 1H9			clifford.trepanier@bell.ca
Mr.	Fuerth	Tyson	Bell Canada			1149 Goyeau Street	Windsor, ON	N9A 1H9	519-973-4711		tyson.fuerth@bell.ca
Mr.	Sorrell	Bill	Cogeco Cable Services			2225 Dougall Avenue	Windsor, ON	N8X 5A7	519-972-4023	519-972-6688	
Sir/Madam			ELK Energy Inc.	Environmental Assessment Consultation		172 Forest Ave	Essex, ON	N8M 3E4	519-776-5291	519-776-5640	
Ms.	Brundritt	Shirley	Union Gas	Lands Department	Lands Support Analyst	50 Keil Drive North	Chatham, ON	N7M 5M1			
Mr.	Bulkiewicz	Stan	Hydro One		Operations Manager	125 Irwin Avenue	Essex, ON	N8M 2T3			
Mr.	Dockrill	Paul	Hydro One	Real Estate Services/Land Use Planning		P.O. Box 4300	Markham, ON	L3R 5Z5		905-946-6242	
Sir/Madam			Union Water Supply System	Joint Board of Management	Manager	P.O. Box 340, 1615 Union Ave.	Ruthven, Ontario	N0P 2G0			
Mr.	Tracey	Raymond	Essex Power Corporation	Essex Power Corporation	President & CEO	2199 Blackacre Drive Suite 2	Oldcastle, ON	N0R 1L0			
Mr.	Andy	Valickis	Ontario Clean Water Agency	Ontario Clean Water Agency	Project Development Manager	1 Yonge Street, Suite 1700	Toronto, Ontario	M5E 1E5			
Mr.	Orest	Rojik	C.N. Rail	Support Real Estate Group	Area Manager	P. O. Box 1000, 1 Administration Road	Concord, Ontario	L4K 1B9			
Mr.	Laing	B.	C.P. Rail	Environmental Affairs		910 Peel Street – Rm. 430 – Windsor Stn.	Montreal, Quebec	H3C 3E4			
Federal Agencies											
Mr.	Linder	Stefan	Canadian National Railway	Public Works	Manager	1 Administration Road	Concord, ON	L4K 1B9	905-669-3264 Cell: (416) 529-0167		stefan.linder@cn.ca
Ms.	Eddy	Sara	Fisheries and Oceans Canada - Central and Arctic Region	Fisheries Protection Program	Fish Habitat Biologist	867 Lakeshore Road, PO Box 5050	Burlington, ON	L7R 4A6	(905) 336-4535	(905) 336-4447	Sara.Eddy@dfo-mpo.gc.ca
Provincial Agencies											
Mr.	Muller	Joseph	Ministry of Tourism, Culture and Sport	Culture Services Unit	Heritage Planner	401 Bay Street, Suite 1700	Toronto, ON	M7A 0A7	416-314-7145	416-314-7175	joseph.muller@ontario.ca
Ms.	Barboza	Karla	Ministry of Tourism, Culture and Sport			401 Bay Street, Suite 1700	Toronto, ON	M7A 0A7			karla.barboza@ontario.ca

Title	Surname	First Name	Organization	Department	Job Title	Address	City/Prov	Postal Code	Tel.	Fax	E-Mail
Mr.	Winger	Darren	Ministry of Citizenship, Immigration & International Trade / Ministry of Tourism, Culture & Sport	Windsor Office	Regional Advisor	221 Mill Street	Windsor, ON	N9C 2R1	519-973-1445	519-973-1414	darren.winger@ontario.ca
Mr.	Petersen	Al	Ministry of the Environment and Climate Change	Safe Drinking Water Branch, Sarnia District	Water Inspector	1094 London Road	Sarnia	N7S 1P1	(519) 383-3785	(519) 336-4280	Al.Petersen@ontario.ca
Mr.	Smith	Mark	Ministry of the Environment and Climate Change	Windsor Area Office	Supervisor	4510 Rhodes Drive, Unit 620	Windsor, ON	N8W 5K5	519-948-1464	519-948-2396	mark.smith@ontario.ca
Mr.	Geurts	Hugh	Ministry of the Environment and Climate Change	Southwestern Region, London Office	Surface Water Specialist - Technical Support Section	733 Exeter Road	London, ON	N6E 1L3	519-873-5120		hugh.geurts@ontario.ca
Mr.	Newton	Craig	Ministry of the Environment and Climate Change	Southwestern Region, London Office	Regional Environmental Planner/EA	733 Exeter Road	London, ON	N6E 1L3	519-873-5014		
Ms.	Cabral	Marion-Frances	Ministry of Municipal Affairs and Housing	Municipal Services Office - Western Ontario Region	Planner - Community Planning and Development	659 Exeter Road, 2nd Floor	London, ON	N6E 1L3			marion-frances.cabral@ontario.ca
Ms.	Sherry	Pineo	Ministry of Natural Resources and Forestry	Aylmer District	Aylmer District Planner	615 John Street North	Aylmer, ON	N5H 2S8			sherry.pineo@ontario.ca (need new person name)
Mr.	Douglas	Stephen	Ministry of Natural Resources and Forestry	Aylmer District	District Planner	615 John Street North	Aylmer, ON	N5H 2S8			stephen.douglas@ontario.ca
Mr.	DeVos	Kevin	Ontario Ministry of Transportation	Planning and Design (Transportation)	Senior Project Engineer	659 Exeter Road	London, ON	N6E 1L3	519-873-4602		devin.devos@ontairo.com
Mr.	Lang	Richard	Ontario Ministry of Transportation	Chatham Area Office	Engineering Services Officer	P.O. Box 1168, 870 Richmond Street	Chatham, Ontario	N7M 5L3			
Mr.	Bentley	Kevin	Ontario Ministry of Transportation	Southwestern Region - Planning & Design Section	Planning & Design Head	659 Exeter Road	London, Ontario	N6E 1L3			
	Mahabir	Danuta	Ontario Ministry of Transportation	Planning & Design West Region	Senior Project Engineer	659 Exeter Road	London, Ontario	N6E 1L3	519-873-4555		danuta.mahabir@ontario.ca
Ms.	Lucente	Jodie	Ontario Ministry of Transportation	Corridor Management West Region	Corridor Management Planner	659 Exeter Road	London, Ontario	N6E 1L3	519-873-4129		jodie.lucente@ontario.ca
Mr.	Evans	Dwayne	Ontario Ministry of Agriculture and Food	London Resourse Centre	Rural Planner	667 Exeter Road	London, Ontario	N0P 1A0			
Mr.	Founk	Jim	Ontario Ministry of Agriculture and Food	Ridgetown Resource Centre	Regional Information Coordinator	P.O. Box 400	RidgeTown, Ontario	N1G 4Y2			
Ms.	Mundie	Donna	Ontario Ministry of Agriculture and Food	Agricultural Land Use	Land Use Policy Specialist, Resources	1 Stone Road West	Guelph, Ontario	N1G 4Y2			
Mr.	Turvey	John	Ontario Ministry of Agriculture and Food	Agricultural Land Use	Land Use Policy Specialist, Planning	1 Stone Road West	Guelph, Ontario	N1G 4Y2			
Local Municipalities											
Mr.	Bateman	Tom	County of Essex	County Engineering Department	County Engineer	360 Fairview Avenue West	Essex, Ontario	N8M 1Y6			
Mr.	King	Bill	County of Essex	County Planning Department	County Planning Department	360 Fairview Avenue West	Essex, Ontario	N8M 1Y6			
Mr.	Neufeld	Peter	Municipality of Leamington	Municipality of Leamington	Chief Administrative Officer	111 Erie Street North	Leamington, ON	N8H 2Z9			
Mr.	Touralias	Tom	Town of Lakeshore	Town of Lakeshore	Chief Administrative Officer	419 Notre Dame Street	Belle River, ON	N0R 1A0			
Ms.	Hunter	Donna	Town of Essex	Town of Essex	Chief Administrative Officer	33 Talbot Street South	Essex, ON	N8M 1A8			
Mr.	Colucci	Onorio	City of Windsor	City of Windsor	Chief Administrative Officer	350 City Hall Square West	Windsor, ON	N9A 6S1			
Ms.	Mierlo-West	Peggy	Town of Kingsville	Town of Kingsville	Chief Administrative Officer	2021 Division Road North	Kingsville, ON	N9Y 2Y9			
Mr.	Haddad	Tony	Town of Tecumseh	Town of Tecumseh	Chief Administrative Officer	917 Lesperance Road	Tecumseh, ON	N8N 1W9			
Aboriginal Agencies											
Ms.	Brewer-Palhazi	Leslie	Ministry of Aboriginal Affairs	Consultation Unit		9th Floor, 160 Bloor Street East	Toronto, ON	M7A 2E6			leslie.brewer-palhazi@ontario.ca
Ms.	Whiteye	Jennifer	Southern First Nations Secretariat		Executive Director	22361 Austin Line	Bothwell, ON	N0L 1Y0	519-692-5868 x242	519-692-5976	jenwhiteye@sfns.on.ca
First Nation Communities/Métis Groups											
Mr.	Jacobs	Dean	Walpole Island First Nation / Bkejwanong Territory		Heritage Centre Director	R.R. #3	Wallaceburg, ON	N8A 4K9	519-627-1475	519-627-1530	dean.jacobs@wifn.org
Chief	Miskokomon	Daniel	Walpole Island First Nation / Bkejwanong Territory		Chief	117 Tahgahoning Road,R.R. #3	Wallaceburg, ON	N8A 4K9	519-627-1481	519-627-0440	drskoke@wifn.org
Chief	Hillier	Louise	Caldwell First Nation		Chief	14 Orange Street	Leamington, ON	N8H 1P5	519-326-1766	519-322-1533	cfnchief@live.com
Chief	Rogers	Joanne	Aamjiwnaang First Nation		Chief	978 Tashmoo Avenue	Sarnia, ON	N7T 7H5	519-336-8410	519-336-0382	
Chief	Stonefish	Denise	Moravian of the Thames (Delaware Nation)		Chief	14760 School House Line, RR 3	Thamesville, ON	N0P 2K0	519-692-3936	519-692-5522	
Mr.	Alibhai	Aly	Métis Nation of Ontario		Director, Lands, Resources and Consultations	75 Sherbourne Street, Suite 311	Toronto, ON	M5A 2P9	416-977-9881		alya@metisnation.org

Title	Surname	First Name	Organization	Department	Job Title	Address	City/Prov	Postal Code	Tel.	Fax	E-Mail
Sir/Madam			Métis Nation of Ontario	Métis Consultation Unit		500 Old St. Patrick Street,Unit 3	Ottawa, ON	K1N 9G4	613-798-1488	613-722-4255	consultations@metisnation.org
Chief	Thomas	Bressette	Chippewas of Kettle and Stony Point First Nation		Chief	6247 Indian Lane, RR2 Forest	Forest, ON	N0N 1J1	519-786-2125		thomas.bressette@kettlepoint.org
Chief	Leslie	White-Eye	Chippewas of the Thames First Nation		Chief	320 Chippewa Rd	Muncey, ON	N0L 1Y0	519-289-5555		lwhite-eye@cottfn.com
Chief	Randall	Phillips	Oneida Nation of the Thames		Chief	2212 Elm Ave	Southwold, ON	N0L 2G0	519-652-3244		randall.phillips@oneida.on.ca
Chief	Rogers	Thomas	Munsee-Delware First Nation		Chief	289 Jubilee Rd RR1	Muncey, ON	N0L 1Y0	519-289-5396		chief@munsee.ca

ESSEX CENTRE SOUTHWEST AREA STORM SEWER IMPROVEMENT

CLASS ENVIRONMENTAL ASSESSMENT

NOTICE OF PUBLIC INFORMATION CENTRE

Study Overview

The Town of Essex has initiated a Municipal Class Environmental Assessment (EA) for the storm sewer system in Essex Centre Southwest area. The goal of the storm sewer improvements is to determine the preferred solution to hydraulic capacity issues caused by increasing storm intensity and development pressures on the storm sewer system.

The Process

The EA is being undertaken in accordance with the planning and design process for Schedule "B" projects as outlined in the Municipal Class Environmental Assessment document (October 2000, as amended in 2007, 2011 and 2015), which is approved under the Ontario Environmental Assessment Act. This study will define the problem, identify and evaluate alternative solutions to the problem, and then recommend a preferred solution after assessing potential environmental impacts and identifying mitigation measures associated with the preferred solution.

Virtual Public Information Centre

Due to the COVID-19 pandemic, the Town is hosting the Public Information Centre (PIC) virtually from April 6 to May 6, 2021. The purpose of the PIC will be to present project information and gather feedback from the public. The virtual PIC will include an online display and draft study report providing information about the EA, findings from the evaluation of alternative solutions, an assessment of the potential environmental effects of the proposed works, and identification of reasonable measures to mitigate any adverse impacts that may result. All content and instructions on how to submit questions or comments will be available on the project webpage, www.essex.ca/Ward1StormSewerPIC

Your participation and feedback are important. All comments and questions received from April 6 to May 6, 2021, will be part of the final Class EA. If you wish to submit comments or would like to be added to the project mailing list, please use one of the following methods:

- **By mail -** please mail to Kevin Girard, P.Eng, MBA, Director of Infrastructure Services, Town of Essex, 33 Talbot Street South, Essex, ON, N8M 1A8
- **By Phone** – please contact the Town at 519-776-7336 ext. 1119
- **By E-mail** – please contact the Project Team (kgirard@essex.ca, jian.li@stantec.com)

(This Notice first issued 26 March, 2021)

Town of Essex

Improvements to Essex Ward 1 Southwest Storm Sewer System

Municipal Class Environmental Assessment

Phases 1 & 2 (Schedule B)

Mike Reaume, Jian Li and Clarence Jubenville

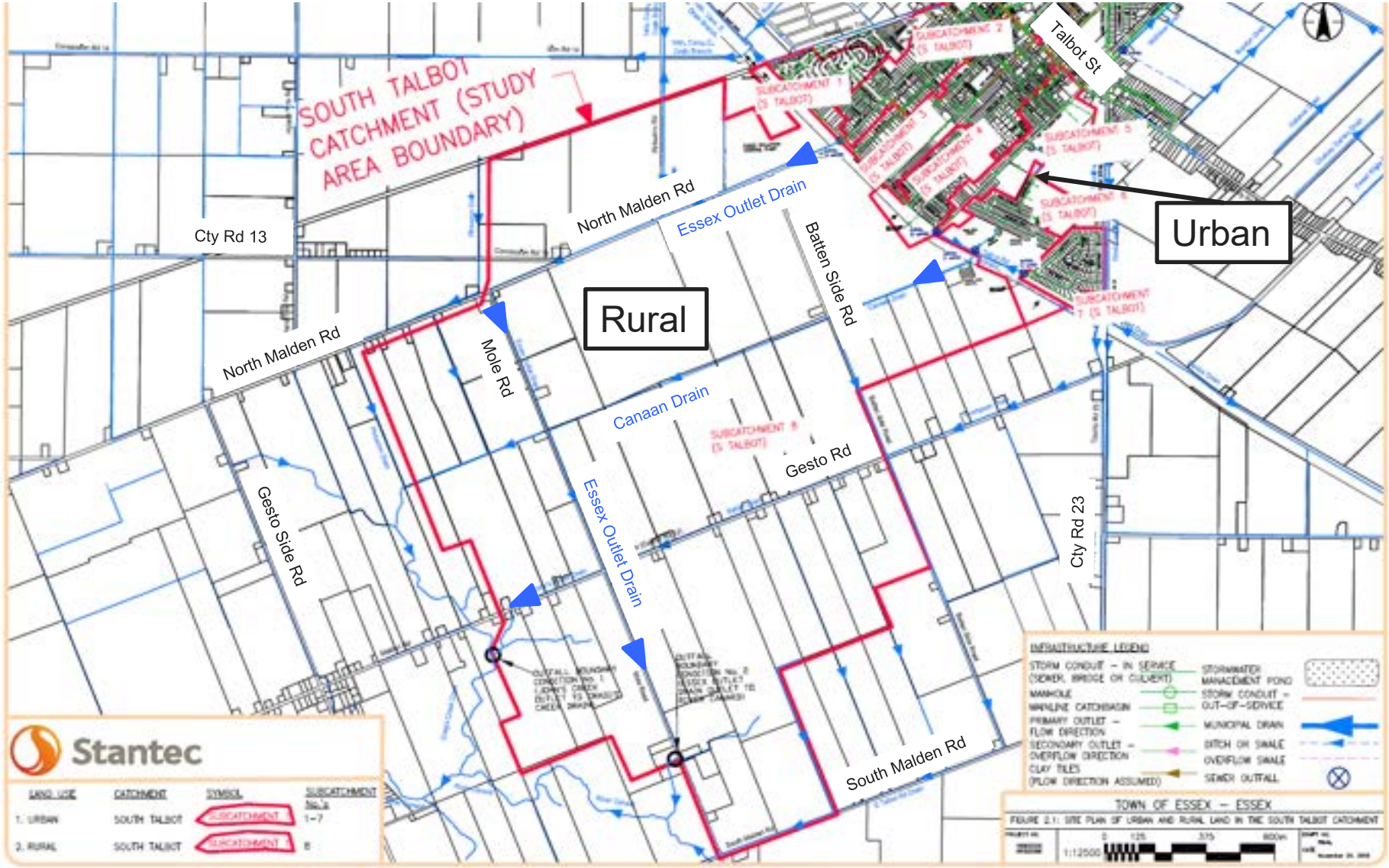
Stantec Consulting Ltd.

Outline

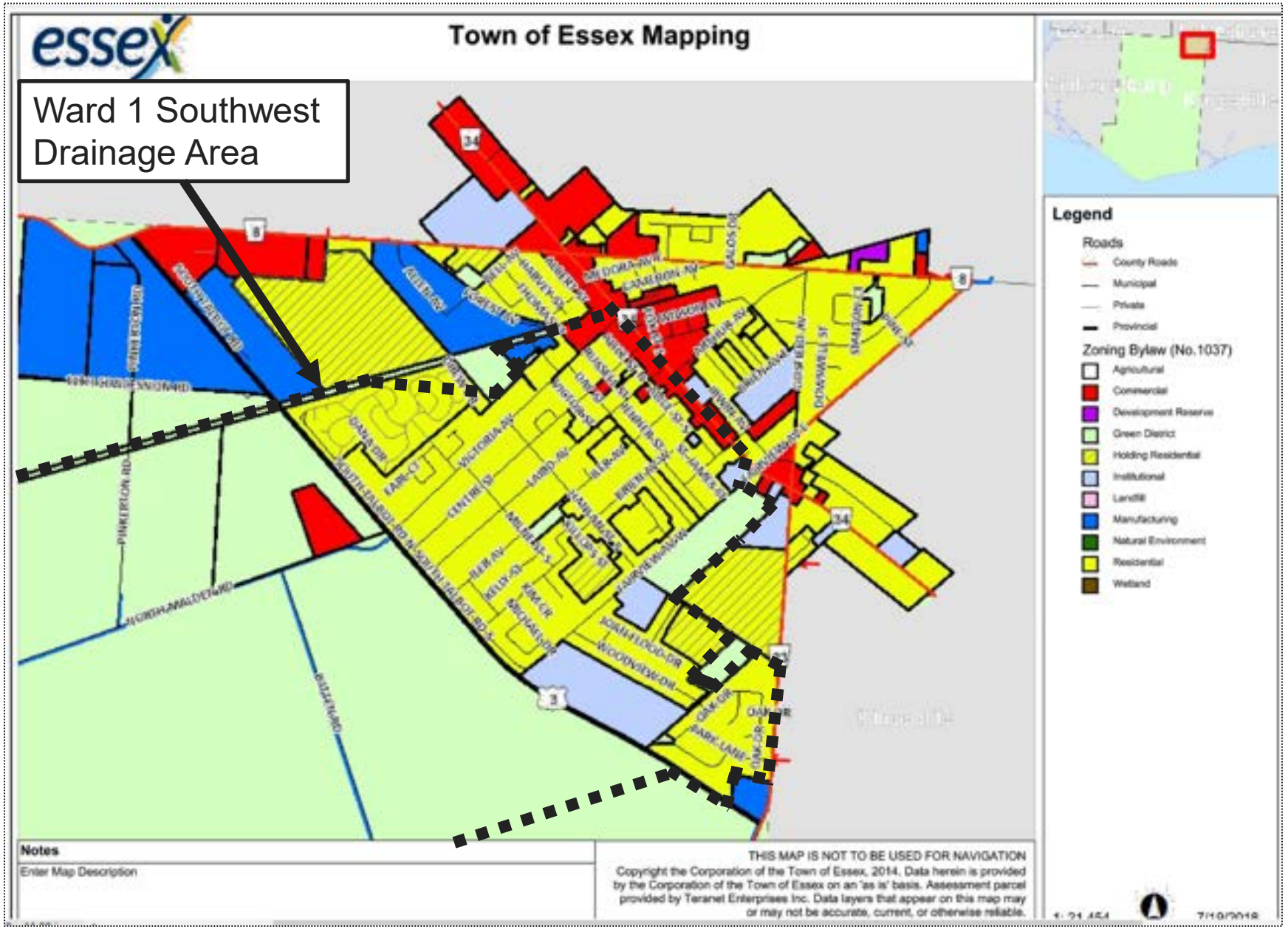
- Background
- Problem Statement
- Study Objective
- Municipal Class Environmental Assessment (EA) Process
- Alternative Solutions
- Preferred Solution & Summary of Improvements
- Opinion of Probable Cost & Phasing
- Recommendations & Next Steps

Background

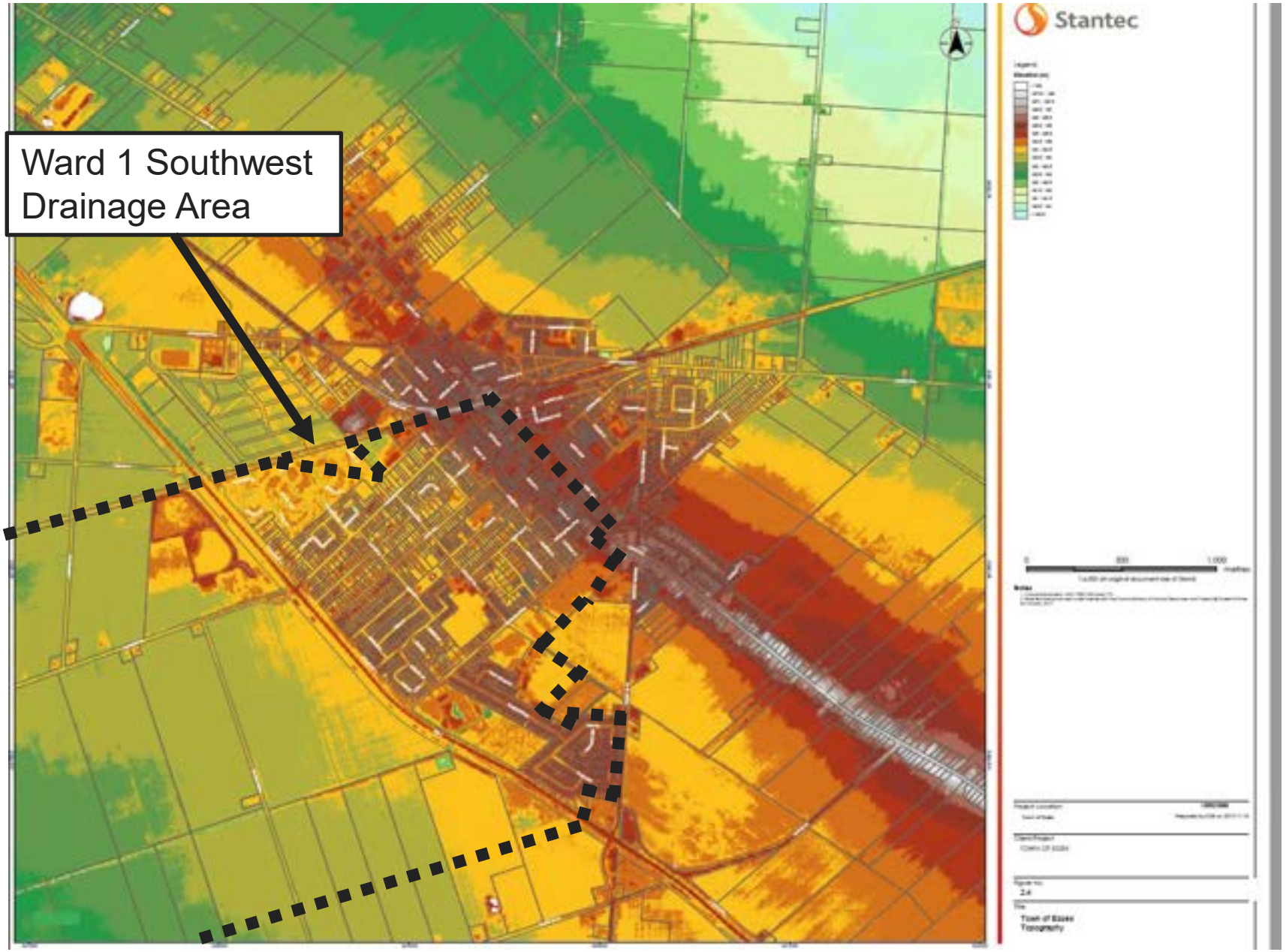
Essex Ward 1 Southwest Storm Drainage Area: Urban & Rural



Background – Zoning By-Law: Urban



Background – Topography: Urban



Problem Statement

- The existing storm sewer system layout was designed in the 1970s. Since then, no comprehensive stormwater drainage study has been undertaken to review the drainage system taking into consideration changes in
    - development and
    - design standards that have occurred over time.
- In recent years, the Town experienced street and basement flooding during extreme storm events. On August 11, 2014 and September 3, 2015, the Town received a record amount of rainfall. Many houses, mostly located in Ward 1 Southwest drainage area, flooded during the two heavy rainfall events.
- During extreme rainfall events significant amounts of runoff can pond on Town streets and drastically increase the volume of stormwater entering the Town's stormwater drainage system.
- To continue with future development, the existing storm sewer system needs to be evaluated to identify areas where improvements can be implemented to mitigate the risk of flooding and property damage and prepare the Ward 1 Southwest drainage area for full future development.

Study Objective

Study Objective:

- **Evaluate the existing storm system,**

- **Identify improvements to:**
  - **Reduce the risk and extent of surface flooding and property damage, and**
  - **Accommodate future development.**

This study requires hydrologic-hydraulic model development, calibration and confirmation of hydraulic capacity of the existing storm infrastructure.

Possible improvements to the storm sewer system include replacing and/or twinning sewers, construction of storm relief sewers and/or stormwater pumping stations, and stormwater storage facilities to store runoff during severe storm events.

KEY FEATURES OF THE CLASS EA PROCESS

The project is being conducted in accordance with the Class EA requirements for Schedule "B projects", which is to be approved subject to completion of Phase 1, 2 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 project is to be completed in accordance with Phases 1 and 2 of the Class EA process.

The above Phases 1 and 2 are to be completed upon the acceptance of the Class EA study report and placed on the public record and issue notice of completion for the mandatory thirty-day review period.

Selection of Alternative Solutions

A comparative summary of the six standalone conceptual planning level alternative solutions and their ability to meet the needs is evaluated.

1. ~~*Do nothing*~~
2. ~~*Runoff reduction through Low Impact development (LID) and green infrastructure*~~
3. *Field Inspection and General Maintenance*
4. *Sewers/Conveyance: Increasing hydraulic capacity of existing storm sewers*
5. *SWM Facilities: Construction of stormwater management ponds*
6. *A Combination of the Above Alternatives*

EA process identified Alternative 6, which is a combination of Alternative No.'s 3, 4 and 5

Summary of Recommended Improvements

Improvements to the Ward 1 Southwest Storm Sewer system include the following:

4. Increasing Hydraulic Capacity of Storm Sewers

A. **Centre St:** Replace storm sewer along Centre St between Hanlan St and South Talbot Rd to a provide proper outlet for service the Centre St drainage area

B. **Iler Ave:** Replace storm sewer in Optimist Park between Hanlan and Milne St to provide a proper outlet for servicing Iler Ave drainage area

C. **Brien Ave W:** Replace storm sewer along Brien Ave West between Kimball Dr and South Talbot Rd and along South Talbot Rd from Brien Ave West to Fairview Ave West at the outfall

D. **Tulley Meadows:** improvements to outlet sewer configuration

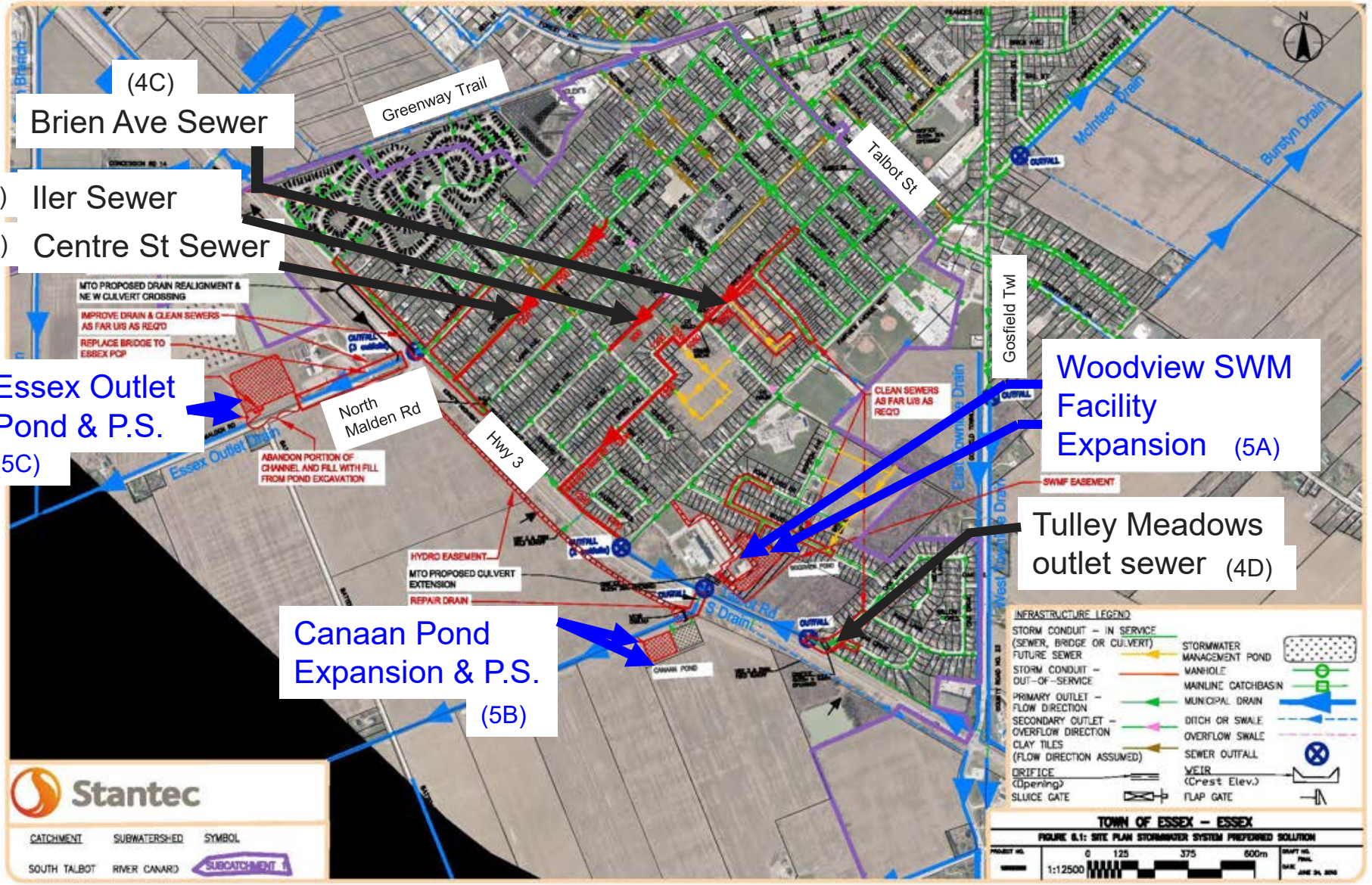
5. Construction of Stormwater Management Ponds

A. **Woodview SWM Facility:** expansion

B. **Canaan Pond:** expansion

C. **Essex Outlet Pond:** new

Summary of Recommended Improvements



OPINION OF PROBABLE COST

Phase	Item	Probable Cost	Class EA Schedule
1A	Sewer - Brien Ave W	4,100,000	A+, A
1B	Canaan Pond Expansion & Dewatering Pumping Station	1,200,000	under the Drainage Act
2	Woodview Pond Expansion & Tulley Meadows Improvements	500,000	B
3	Essex Outlet Pond & Dewatering Pumping Station	1,500,000	under the Drainage Act
4	Sewer - Centre St	1,700,000	A+
	Sewer - Iler Ave (Optimist Park)	580,000	A+
Sub-total Construction Cost		9,580,000	
Engineering Allowance (15%)		1,400,000	
TOTAL CAPITAL COST (excluding taxes)		10,980,000	

Next Steps and Recommendations

- Council endorsement of the Municipal Class Environmental Assessment Phases 1 & 2 (Schedule B) for the Improvements to Essex Ward 1 Southwest Storm Sewer System
- Notify the public and review agencies of completion of the Class EA
    - Virtual Public Open House
- File the EA Report & issue Notice of Completion with the Municipal Clerk to place it on public record for at least 30 calendar days for review by the public and agencies
- Provision to request a Part II Order. If no request for an order is received by the Minister within the review period, then the Town can proceed to Phase 5 and implement the preferred solution.

Upon Completion of Class EA, move forward to Implementation Phase

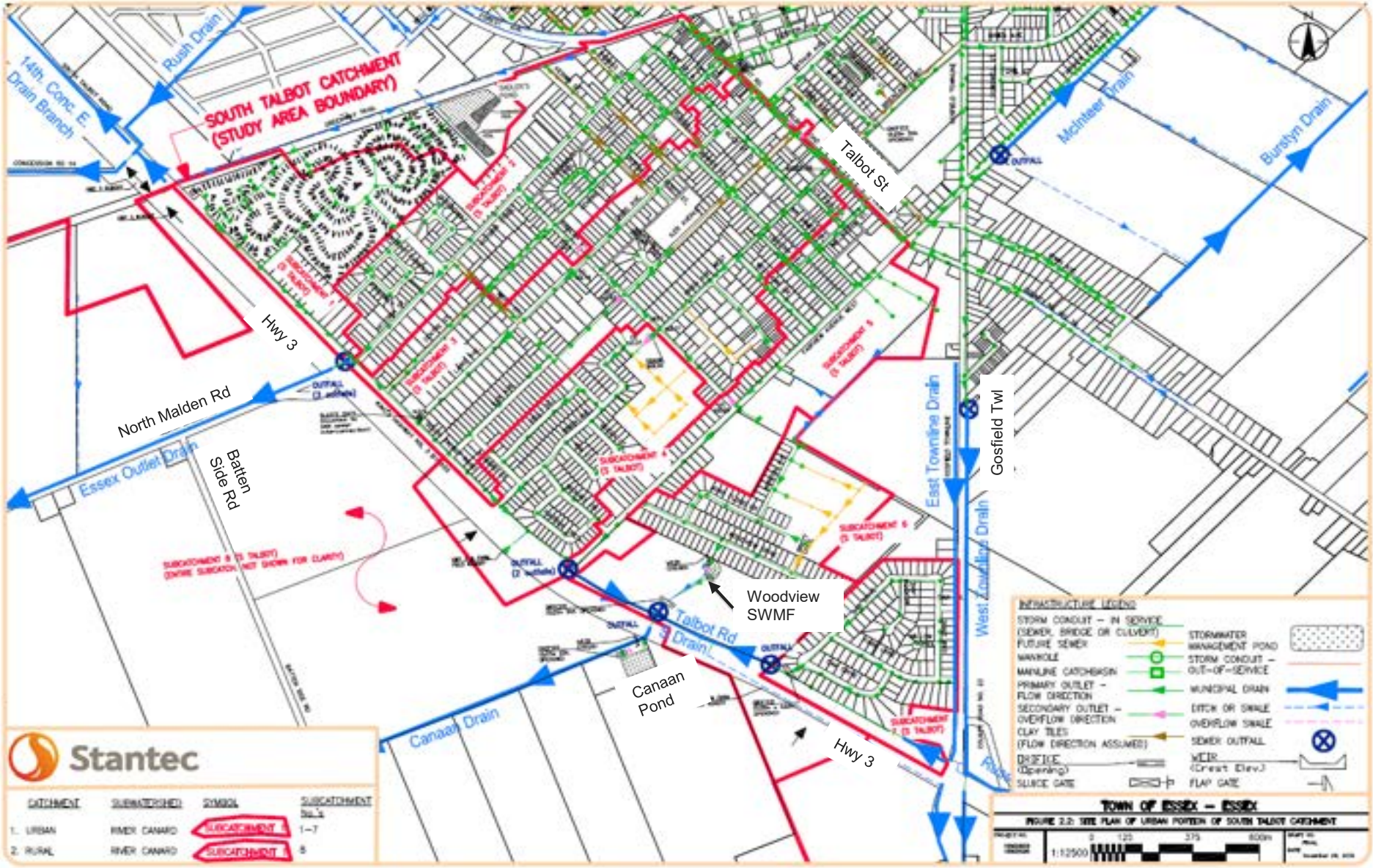
- ***Complete contract drawings and tender documents for Phase 1A - Brien Ave West Sewer Improvements***
- ***Proceed to construction and operation & monitor for environmental provisions and commitments***

Questions

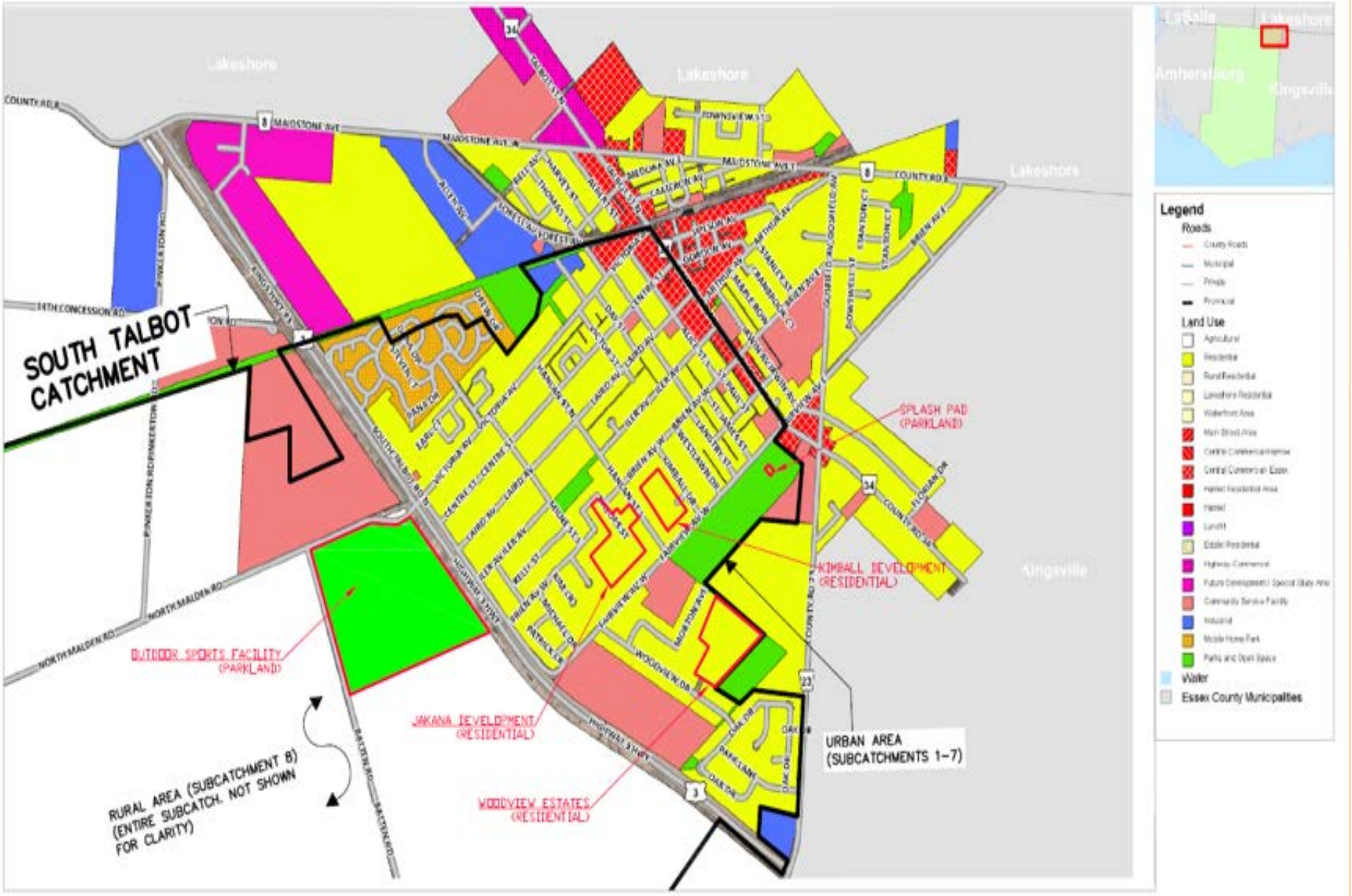
- Thank you for your time

Background

Essex Ward 1 Southwest Storm Drainage Area: <u>Urban</u>



Background – Zoning & Future Land Uses



D.2 CONSULTATION

Documentation of consultation with ommunities

Correspondence with Caldwell First Nations

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Essex Centre Southwest Area Storm Sewer Improvements

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Ministry of Indigenous Affairs 2017 - 2021 Leslie Brewer-Palhazi Consultation Unit 9th Floor, 160 Bloor Street East Toronto, ON 2023 Molly Mann (molly.mann@ontario.ca) Heather Levecque (heather.levecque@ontario.ca)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Southern First Nations Secretariat 2017 - 2023 Jennifer Whiteye 22361 Austin Line Bothwell ON N0P 1C0	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Delaware Nation (Moravian of the Thames) 2017 - 2023 Chief Denise Stonefish (denise.stonefish@delawarenation.on.ca) 14760 School House Line Thamesville ON N0P 2K0	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Aamjiwnaang First Nation 2017 - 2021 Chief Joanne Rogers (jrogers@aamjiwnaang.ca) 978 Tashmoo Avenue Sarnia ON N7T 7H5 2023 Chief Chris Plain (chief.plain@aamjiwnaang.ca) Cathleen O'Brien (cobrien@aamjiwnaang.ca) Courtney Jackson (cjackson@aamjiwnaang.ca)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Caldwell First Nation 2017 - 2021 Chief Louise Hillier (cfnchief@live.com) 14 Orange St	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Chief Louise Hillier on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Essex Centre Southwest Area Storm Sewer Improvements

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
Leamington ON N8H 1P5 2023 Zack Hamm (ecd.manager@caldwellfirstnation.ca)	**Additional Correspondence** Date: June 18, 2018 Method: Email	Chief Louise Hillier provided questions in response to the Notice of Commencement regarding project impacts to groundwater, natural drainage, human and wildlife. Stantec Staff responded via email to impacts during and post-construction.	Chief Hillier's concerns were documented and will become part of the final EA report.
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Bkejwanong Territory (Walpole Island) First Nation 2017 - 2021 Chief Dan Miskokomon (drskoke@wifn.org) Dean Jacobs (dean.jacobs@wifn.org) 117 Tahgahoning Road, RR#3 Wallaceburg ON N8A 4K9 2023 Janet MacBeth (janet.macbeth@wifn.org)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Metis Nation of Ontario 2017 - 2021 Aly Alibhai (alya@metisnation.org) 500 Old St. Patrick Street, Unit 3 Ottawa ON K1N 9G4 75 Sherbourne Street, Unit 311 Toronto ON M5A 2P9 2023 Consultations (mno@metisnation.org)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
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	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Chippewas of Kettle and Stony Point First Nation 2017 - 2021 Chief Tom Bressette (Thomas.bressette@kettlepoint.org) 6247 Indian Lane, R.R. #2 Forest, ON N0N 1J1 2023 Kimberly Bressette (Kimberly.Bressette@kettlepoint.org) Emily Ferguson (consultation@kettlepoint.org)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Chippewas of the Thames First Nation 2017 – 2021 Chief Leslie Whit-Eye (lwhite-eye@cottfn.com)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A

Aboriginal Consultation Log
Municipal Class Environmental Assessment
Essex Centre Southwest Area Storm Sewer Improvements

Contact Information	Date/Method of Communication	Correspondence Received and/or Project Information Distributed	Consultant Response
320 Chippewa Road Muncey ON N0L 1Y0 2023 Jacqueline French (jfrench@cottfn.com) Kelly Riley (kriley@cottfn.com) Fallon Burch (fburch@cottfn.com)	**Public Information Centre and Draft Environmental Study Report** Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD
Oneida Nation of Thames 2017 - 2021 Chief Randall Phillips (randall.phillips@kettlepoint.org) 2212 Elm Ave Southwold, ON N0L 2G0 2023 Jessica Hill (jessica.hill@oneida.on.ca) Catherine Cornelius (catherine.cornelius@oneida.on.ca)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
	Public Information Centre and Draft Environmental Study Report Date: March 26,2021 Method: Newspaper and Canada Post	The Notice of Public Information Centre and Draft Environmental Study Report was sent on April 2, 2021, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on March 26th, 2021.	N/A
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Munsee – Delaware Nation 2017 - 2021 Chief Roger Thomas (chief@munsee.ca) 6247 Indian Lane, R.R. #2 Forest, ON N0N 1J1 2023 Denis Stonefish (denise.stonefish@delawarenation.on.ca)	**Notice of Commencement** Date: June 28, 2017 Method: Canada Post	The Notice of Commencement was sent to Leslie Brewer-Palhazi on June 28, 2017, via Canada Post. It was first published in the Essex Free Press, and the Harrow News on June 14, 2017.	N/A
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	Notice of Completion Date: August 18th, 2023 Method: Newspaper and Email	The Notice of Completion was sent on August 11th, 2023, via email. It was also published in the subsequent issues of the Essex Free Press and Harrow News.	TBD

Reaume, Michael

From: Li, Jian
Sent: Monday, June 18, 2018 8:38 AM
To: Caldwell First Nation
Cc: tammy.jolicoeur@caldwellfirstnation.ca; Reaume, Michael
Subject: RE: Essex Centre Southwest Area Sewer Improvements
Attachments: Descrption of Essex Centre SW Study.pdf

Helllo Chief Hillier,

This email is in regard to Schedule B Environmental Assessment (EA) for Essex Centre Southwest Area Sewer Improvements, Town of Essex. This EA study is in the process of evaluating potential improvements to for Essex Centre Southwest Area Strom Sewer System.

Upon your request, we are providing the following additional information to about the ongoing EA study:

The study area is in the southwest part of Essex and comprises land bound between County Road 34 (Talbot St N) to the north, King's Highway No. 3 to the south, the Greenway to the west and roughly County Rd 23 (Gosfield Twl) to the east, referred to as the South Talbot catchment.

Groundwater resources

Because the existing land use within the study area is largely remaining the same (primarily residential with some commercial land uses) we do not expect an impact on the quantity or quality of groundwater resources in the area post-construction. During construction there will be the use of diesel powered construction equipment and temporary dewatering of excavations for the purpose of installing underground pipe, pump stations and/or storage facilities (eg. pond). Mitigating measures will be in place and include but are not limited to use of containment areas for refueling equipment, cleaning equipment before it travels offsite, inspecting equipment regularly for fuel and oil leaks and providing silt fences and traps for collection of groundwater from temporary dewatered excavations.

Natural Drainage

Rainwater runoff from the study area's existing storm sewer system drains in two watercourses which flow southerly across Highway 3 to River Canard which ultimately outlets to the Detroit River (roughly 35km downstream). The project involves improving the drainage within the Town of Essex South Talbot study area either with construction of storm sewers, pump stations and/or storage (eg. ponds) to store excess rainwater during severe storms to mitigate flooding and property damage within the study area. It is not anticipated that any proposed storm sewer improvement work has any negative impact on the existing natural drainage.

Human and wildlife

The land use within the study area supports generally small animals including rabbits, raccoons, skunks, fox, muskrat, etc. as the study area is primarily developed with residential and some commercial land uses. Because the land use within the study area will largely remain the same there is not expected to be changes/impacts to humans and wildlife within the area post-construction. During the construction activity humans and wildlife can be expected to experience temporary disruption of pedestrian and/or vehicle traffic routes, temporary disruption and inconvenience during construction to adjacent properties, and removal and/or disturbance of tress and ground vegetation. Mitigating measures will be in place and including notifying public agencies and neighbouring land owners of construction activities, providing and maintaining

detours and safe alternate routes, and restoration of areas effected by construction by replacing topsoil, and reinstating subsoil and vegetation.

We are unable to response your comments sooner because the project is behind the schedule. We are expecting the study will be completed this summer and to have an Open House with report made available for the public for receiving comments on the study. We will keep you informed.

Should you have any further questions please contact the undersigned.

Best Regards,

Jian Li, Ph.D., P.Eng., PE
Project Manager
Stantec
100-140 Ouellette Place Windsor ON N8X 1L9
Phone: 519-966-2250 ext 240
Cell: 519-562-7541
Fax: 519-966-5523
jian.li@stantec.com

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Please consider the environment before printing this email.

From: Tammy Jolicoeur <tammy.jolicoeur@caldwellfirstnation.ca>
Sent: Wednesday, July 12, 2017 8:57 AM
To: Li, Jian <jian.li@stantec.com>
Subject: Essex Centre Southwest Area Sewer Improvements

Good morning Dr. Jian Li,

Chief Hillier has concerns about the environment: potential impacts to ground source water resources, to the natural drainage in the area and also human and wildlife in the area.

If you could please respond back on these issues for Chief Hillier, she would greatly appreciate it.

Thank you

--
Miigwech,
Tammy Jolicoeur,
Reception, Membership Clerk
Caldwell First Nation

Ph: 519-322-1766
Fax: 519-322-1533
Email: tammy.jolicoeur@caldwellfirstnation.ca
Website: www.caldwellfirstnation.ca

3 REVIEW AGENCY CONSULTATION

ERCA review comments and meeting minutes

MECP review comments

MNRF review comments

MTO review comments

MTCS review comments & Consultation with Town Planning Department

Li, Jian

From: Mike Nelson <MNelson@erca.org>
Sent: Tuesday, July 18, 2017 9:29 AM
To: cnepszy@essex.ca; Li, Jian; Jubenville, Clarence; Beausoleil, Richard
Cc: John Henderson; Tim Byrne
Subject: FW: Town of Essex - Notice of Study Commencement: Storm Sewer Improvement
Attachments: Essex Class EA - ERCA submission (July-18-2017).pdf

Good morning,

Please see attached correspondence related to the Essex Centre Southwest Area Storm Sewer Improvement Class Environmental Assessment project.

At this time we are continuing to review the notice in order to provide you with more substantial comments. John Henderson and Tim Byrne from our office will be the primary technical staff reviewing the notice and contributing comments. We will provide additional comments in advance of the August 18, 2017 requested deadline.

If you would prefer a face to face meeting to discus the project and gather our feedback directly, please contact me directly and we can coordinate that.

Thank you,

Essex Region Conservation Authority
sustaining the place for life

MICHAEL NELSON
Watershed Planner
Essex Region Conservation Authority (www.erca.org)
360 Fairview Avenue West, Suite 311, Essex, Ontario, N8M 1Y6
Telephone: 519-776-5209 extension 347
Email:
mnelson@erca.org

From: noreply@esolutionsgroup.ca [mailto:noreply@esolutionsgroup.ca]
Sent: Wednesday, June 28, 2017 3:46 PM
To: Mike Nelson <MNelson@erca.org>
Subject: Town of Essex - Notice of Study Commencement: Storm Sewer Improvement

Notice of Study Commencement: Storm Sewer Improvement

Essex Centre Southwest Area Storm Sewer Improvement
Class Environmental Assessment

Notice of Study Commencement

The Town of Essex, through their consultant Stantec Consulting Ltd., has initiated a study to determine the preferred solution to hydraulic capacity issues caused by increasing storm intensity and development pressures on the storm sewer system in Essex Centre Southwest area.

The study is being undertaken in accordance with the planning and design process for 'Schedule B' projects outlined in the Municipal Class Environmental Assessment (Class EA, June 2000, as amended in 2007, 2011 & 2015) under the Ontario Environmental Assessment Act. The Class EA process includes public and review agency consultation, an evaluation of alternatives, an assessment of the potential environmental effects of the proposed works, and identification of reasonable measures to mitigate any adverse impacts that may result.

Public participation will form an integral part of this Class EA study to ensure that the concern's of the public and affected groups within the study area are identified, documented and assessed. A Public Consultation Centre will be scheduled during the study to present the findings to date and to collect community feedback and input before finalizing the preferred solution.

Any parties that wish to provide suggestions or comments about this study at this time should do so, preferably in writing, by contacting the individuals identified below.

Town of Essex
Mr. Chris Nepszy, P. Eng., PE
Director, Infrastructure and Development
(519)776-7336 x1114
cnepszy@essex.ca

Mr. Richard Beausoleil
Manager, Capital Works and Infrastructure
(519) 776-7336 x1113
rbeausoleil@essex.ca

Stantec Consulting Ltd.
Dr. Jian Li, P.Eng., PE
Senior Environmental Engineer
Phone: 519-966-2250 ext 240
jian.li@stantec.com

Mr. Clarence Jubenville, P. Eng.
Senior Civil Engineer
Phone: 519-966-2250 ext 241
clarence.jubenville@stantec.com

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. Subjective to comments received and the receipt of necessary grants and approvals, the Town of Essex intends to proceed with the planning, design and construction of this project, to be completed by late 2018.

(This Notice first issued 8 June, 2017)

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Class Environmental Assessment
Essex Ward 1 Southeast Area Storm Sewer Improvements
The Corporation of the Town of Essex

Stantec

RESPONSE FORM – PLEASE RETURN BY AUGUST 18, 2017

Date: July 18, 2017

☐ Please remove my group/agency from the study mailing list.

☒ I would like to provide the following comments.

Additional comments to be provided under a separate letter.

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.

Contact Information on Study Mailing List	*If this information is incorrect please provide updated information or identify the key project contact below.*
Mr. Michael Nelson Watershed Planner Essex Region Conservation Authority 360 Fairview Avenue West, Suite 311 Essex, ON N8M 1Y6 P; 519-776-5209 x 347 mnelson@erca.org	

Please return the completed form to:

Dr. Jian Li, Senior Environmental Engineer, 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: Michael Nelson

Job Title: Watershed Planner

Name of Group/Agency: Essex Region Conservation Authority

Mailing Address: 360 Fairview Avenue West, Suite 311

Tel: 519-776-5209 ext 347 **Fax:** **E-mail:** mnelson@erca.org

Stantec

RESPONSE FORM – PLEASE RETURN BY AUGUST 18, 2017

regs@erca.org
P.519.776.5209
F.519.776.8688
360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

Stantec Consulting Limited
100-140 Ouellette Place
Windsor, ON N8X 1L9

August 23, 2017

Dear Mr. Li,

RE: Notice of Study Commencement, Class Environmental Assessment - Essex Centre Southwest Area Storm Sewer Improvements, Town of Essex.

Thank you for circulating the Notice of Study Commencement for the Class Environmental Assessment to provide short and long-term improvements to the storm sewer system in the Essex Centre Southwest area. From the circulation, it is understood that the primary purpose of this Class Environmental Assessment is to identify preferred improvements to the Essex Centre Southwest area storm sewers as a result of a consideration of input received.

The specific questions asked in the letter included a request to provide input on the existing environmental conditions (natural, socio-economic or cultural) within the Project Area, and to identify any issues, concerns or approval requirements that our organization may have.

1. Existing environmental conditions

The current extent of the Limit of Regulated Area mapping has been provided to the Town of Essex most recently in 2016. The municipal drains that provide drainage to this area include the East Townline Drain (along Gosfield Town Line West); the Talbot Road South Drain (along Highway 3); the Canaan Drain; the Talbot Road South Drain (along Highway 3 draining westerly from Fairview Avenue West towards North Malden Road).

Natural heritage features are generally identified within the study area within the Town's official plan and zoning by-law schedules. ERCA produced a background study for the County of Essex official plan titled the Essex Region Natural Heritage System Strategy that documents the existing natural heritage features and identified potential restoration opportunities and linkages to these features. This study is available online: http://erca.org/resource-info/resources/ The data used in this report has been shared with the Town of Essex directly.

2. Existing issues or concerns

Some of the potential considerations that could be considered by the Town of Essex and the project team may include the use of publicly owned lands (e.g., Town of Essex, ERCA, County of Essex) as recharge areas as components of stormwater management. As the attached figure shows (ENCL 1) the Town of Essex supports a portion of land which is identified as a Significant Groundwater Recharge Area (SGRA). Further, as the Town of Essex is situated at the interchange of a number of

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headwater systems in the region (Canard River to the west and Pike Creek and Puce River to the north) there may be an opportunity to consider the use of recharge into appropriate areas as a component of stormwater management systems as retrofits or future approvals. The provincial changes to the Stormwater Management Guidelines will require additional consideration for maintaining storm water on site as part of new approvals. There may be an opportunity to consider a scoping exercise within the Town Centre to identify potential suitable areas for this type of a component of a stormwater management system improvements.

3. Approval requirements

Any development or site alteration in the vicinity of the Limit of Regulated Area will require an ERCA permit to be issued. This is under the authority of Ontario Regulation 158/06 of section 28 of the Conservation Authorities Act. We would advise that should any improvements be required for downstream watercourses that ERCA approvals would be required. In particular, we would note that the downstream watercourses would require capacity assessments at a minimum to ensure no downstream adverse impacts as a result of improvements.

The Essex Region Conservation Authority would offer our services and expertise in the areas of stormwater management and watershed management to the Town of Essex as it considers options to address this concern. As the Town of Essex is aware, ERCA has been working on conjunction with the regional municipalities to develop a set of regional stormwater management guidelines. This work is in progress and a draft report is anticipated to be finalized in the near future.

ERCA would appreciate continuing to be kept appraised of the study as it progresses. If you have any questions or require any additional information, please contact the undersigned.

Sincerely,

Mike Nelson

Michael Nelson, *Watershed Planner*

ENCL. Aerial image indicating location of study area features

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Amherstburg / Essex / Kingsville / Lakeshore / LaSalle / Leamington / Pelee Island / Tecumseh / Windsor

Study area features

Essex Region Conservation Authority

Legend

- ERCA Property
- City Assessment
- Regional Assessment (ARN) Ownersh
- Regional Assessment (ARN) Basic
- Ownership Parcels (PIN)
- 1:100 yr Flood Line
- Maximum Observed Flooding
- Limit of Regulated Area
- Surface Water Intake
  - A
  - B
  - D
- Highly Vulnerable Aquifer (HVA)
- Significant Groundwater Recharge Ar
  - 2
  - 4
  - 6

Location

Notes

ERCA Geomatics

THIS MAP IS INTENDED FOR INTERNAL USE ONLY.

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Data herein is provided on an 'as is' basis and is for visual reference only. Map not to be used for navigation or plan of survey.

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0 471.45 942.9

Meters

1: 21,213

8/23/2017

Meeting to discuss South Talbot Catchment Storm Sewer Improvement Class EA

Stantec

Date: Nov. 10, Fri. 2017

Discussion Topics

Subcatch. 6, 7, 8, 9, 10

- Areas w/ invert rises - Brien sewer
- Kimball development - outlet to 50% full sewer
  - flow not routed to pond for quality or quantity control
- new developments - Fortuna, Kimball, Woodview
- Ponds → Caravan Pond - designed to provide quality control for Fortuna + Kimball + does not
  - pond does not drain + 2' standing water in pond
- flow routing → model tomorrow

Subcatch 11

- Woodview pond - sediment, ½ storage, water in sewers
  - pond outlet structure damaged

Subcatch. 12

- orifice to restrict release rate but pipes are not sized as superpipe

Designed by: Checked by:

Stantec

- LCBA Report 1975

- Absolute dog's → see Word doc.
- GPS areas → see Word doc.

- Burdyfarm pond drains back into MTO swale.
- 20% additional flow for climate change - City + Tecumseh → climate change into consideration

Attendees: Alain M., Clarence J., Jian L., Mike R. (Stantec), Dan B. & Chris N. (Essex), Mike N. + John H. (ERCA)

Attendance: 2:30 - 3:30 pm Fri. Nov. 10 2017

Designed by: Checked by:

From:	Nepszy, Chris
To:	Li, Jian
Subject:	FW: MOECC Response To Notice of Commencement Essex Centre SW Area Storm Sewer Improvement Class EA Town of Essex
Date:	Thursday, July 06, 2017 2:35:02 PM
Attachments:	MOECC Response To Notice of Commencement Essex Centre SW Area Storm Sewer Improvment Class EA Town of Essex.pdf

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From: Newton, Craig (MOECC) [mailto:Craig.Newton@ontario.ca]
Sent: Thursday, July 06, 2017 1:53 PM
To: Nepszy, Chris
Cc: Abernethy, Scott (MOECC); Bechard, Marc (MOECC); Smith, Mark (MOECC)
Subject: MOECC Response To Notice of Commencement Essex Centre SW Area Storm Sewer Improvement Class EA Town of Essex

Dear Mr. Nepszy:

Please find attached the MOECC's response to the Notice of Commencement for this Class EA. Please note that this serves as the ministry's formal correspondence and will only be delivered via this e-mail.

Yours truly,

Craig Newton
Regional Environmental Planner / EA Coordinator
Ministry of the Environment & Climate Change
Southwestern Region
(519) 873-5014

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Ministry of the Environment and Climate Change

733 Exeter Road
London ON N6E 1L3
Tel: 519 873-5000
Fax: 519 873-5020

Ministère de l'Environnement et de l'Action en matière de changement climatique

733, rue Exeter
London ON N6E 1L3
Tél.: 519 873-5000
Fax: 519 873-5020

Ontario

July 6th, 2017

Town of Essex
33 Talbot Street South
Essex, Ontario
N8M 1A8

Attention: Mr. Chris Nepszy, P. Eng., Director of Infrastructure and Development

Re: Notice of Commencement Essex Centre Southwest Area Storm Sewer Improvement Class Environmental Assessment, Town of Essex

Dear Mr. Nepszy:

This letter acknowledges receipt of the Notice of Commencement for the above noted project.

It is understood that the Town of Essex has initiated a study to determine the preferred solution to hydraulic capacity issues caused by increasing storm intensity and development pressures on the storm sewer system in Essex Centre Southwest area. The project is reportedly being planned as a Schedule B Project under the Municipal Engineers Association Municipal Class EA..

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

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
Aamjiwnaang First Nation	Aamjiwnaang First Nation 978 Tashmoo Ave. Sarnia, ON N7T 7H5 519-336-8410 Chief Joanne Rogers jrogers@aamjiwnaang.ca Other Contacts: Sharilyn Johnston, Environment Coordinator sjohnston@aamjiwnaang.ca Christine Rogers, Enviroment Worker crogers@aamjiwnaang.ca (same mailing address for all)
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
Chippewas of the Thames First Nation	Chippewas of the Thames First Nation 320 Chippewa Rd., Muncey, ON N0L 1Y0 519-289-5555 Chief Leslee White-Eye lwhite-eye@cottfn.com Other Contacts: Kelly Riley, Acting Director - Lands & Environment kriley@cottfn.com 519-289-2662 ext. 209 Fallon Burch, Consultation Coordinator fburch@cottfn.com 519-289-2662 ext 213
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
Munsee-Delaware Nation	Munsee-Delaware Nation 289 Jubilee Rd R.R.#1 Muncey, ON N0L 1Y0 519-289-5396 Chief Roger Thomas chief@munsee.ca Other Contact: Glenn Forrest, Band Manager glenn@munsee.ca

Delaware Nation	Delaware Nation 14760 School House Line R.R.#3 Thamesville, ON N0P 2K0 519-692-3936 Chief Denise Stonefish (insert new email)
Caldwell First Nation	Caldwell First Nation P.O. Box 388 Leamington, ON N8H 3W3 519-322-1766 or 1-800-206-7522 chief.hillier@caldwellfirstnation.ca and cfnchief@live.com

Steps that you may need to take in relation to Aboriginal consultation for your proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process" which can be found at the following link:

https://www.ontario.ca/document/consultation-ontarios-environmental-assessment-process

Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments.

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;
- a Part II Order request or elevation request is expected.

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:

Email:	EAASIBGen@ontario.ca Subject: Potential Duty to Consult
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.

Conclusion

Thank you for the opportunity to comment on this project. Please keep this 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: Craig Newton, Regional Environmental Planner / Regional EA Coordinator at the address below; email address:craig.newton@ontario.ca; telephone number: 519-873-5014.

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,

Craig Newton
Regional Environmental Planner / Regional EA Coordinator
Ministry of Environment and Climate Change
733 Exeter Road
London ON, N6E 1L3
519 873-5014

Copy: Mr Mark Smith, Supervisor, MOECC Windsor Area Office
Mr. Marc Bechard, Supervisor, Safe Drinking Water Branch, MOECC Sarnia / Windsor
Mr. Scott Abernethy, Group Leader Surface Water, Water Resources Unit, MOECC London

From: MNRF Avl Planners (MNRF)
To: Li, Jian
Subject: MNRF Comments - N. of Commencement - Storm Sewer Improvements
Date: Wednesday, July 05, 2017 11:33:49 AM
Attachments: 2017-04_SAR Screening Process_Technical Bulletin.pdf
2017-05_SAR Reference Material Memo_AylmerDistrict.pdf
2017-05_SAR Ref Guide_Town of Essex.pdf

Ministry of Natural Resources and Forestry

615 John Street
North
Aylmer, ON N5H 2S8
Tel: 519-773-9241
Fax: 519-773-9014

Ministère des Richesses naturelles et des Forêts

615, rue John Nord
Aylmer ON N5H 2S8
Tél: 519-773-9241
Téléc: 519-773-9014

July 5, 2017

Dr. Jian Li, Senior Environmental Engineer
Stantec Consulting Ltd.
100-140 Ouellette Place
Windsor, ON N8X 1L9

Subject: Essex Centre Southwest Area Storm Sewer Improvements – Town of Essex

Dear Dr. Jian Li,

Ministry of Natural Resources and Forestry (MNRF) Aylmer District received the Notice of Study Commencement for the Essex Centre Southwest Area Storm Sewer Improvements on July 4, 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
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Ministry of Natural Resources and Forestry

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Ontario

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

Town of Essex

Municipal Species at Risk Reference Guide

Ontario

Birds

Acadian Flycatcher

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Occupies a broad spectrum of deciduous and mixed woodlands of variable size across its breeding range. Refer to the Provincial Recovery Strategy (2016).

https://www.ontario.ca/page/acadian-flycatcher

Timing Windows

Migratory bird that may be present in Ontario from April through September.

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/defaul

Bank Swallow

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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).

https://www.ontario.ca/page/bank-swallow

Timing Windows

Migratory bird most commonly seen in Ontario from April through September.

Survey Protocol

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.

http://www.ec.gc.ca/reom-mbs/defaul

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/defaul

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/defaul

Chimney Swift

Threatened | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information
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.

https://www.ontario.ca/page/chimney-swift

Timing Windows
Migratory bird most commonly seen in Ontario from mid-April to mid-October.

Survey Protocol
Follow the Ontario Swift Watch Protocol by Bird Studies Canada (2015). Identify habitat according to the general habitat description.

http://www.bsc-eoc.org/volunteer/ai/r

Eastern Meadowlark

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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).

https://www.ontario.ca/page/eastern-meadowlark

Timing Windows

Migratory bird most commonly seen in Ontario from March through October.

Survey Protocol

Contact ESA.Aylmer@ontario.ca to obtain a copy of the MNRF draft Eastern Meadowlark breeding survey protocol (2013) .

King Rail

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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. Habitat use may differ year to year based on water levels. Refer to the Provincial Recovery Strategy (2016).

https://www.ontario.ca/page/king-rail

Timing Windows

Migratory bird most commonly seen in Ontario from April through September.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request advice on conducting adequate surveys for your project.

Least Bittern

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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

Timing Windows

Migratory bird most commonly seen in Ontario from May through September.

Survey Protocol

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.a

Prothonotary Warbler

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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

Timing Windows

Migratory bird most commonly seen in Ontario from May through August.

Survey Protocol

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

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).

Timing Windows

Migratory bird most commonly seen in Ontario from May through August.

Survey Protocol

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

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.

Timing Windows

Survey Protocol

https://www.ontario.ca/environment-and-energy/species-risk-o

http://www.dfo-mpo.gc.ca/species-es

Fishes

Lake Sturgeon (Great Lakes - Upper St. Lawrence population)

Threatened Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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.

Timing Windows
Spawns in the spring,

Survey Protocol
Contact your local CA or DFO.

https://www.ontario.ca/page/lake-sturgeon-species-risk

Silver Chub

Threatened Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
In Ontario the Silver Chub is only found in Lake Erie and Lake St.Clair.

Timing Windows
Believed to spawn in May and June in open water.

Survey Protocol
Contact your local CA or DFO

https://www.ontario.ca/page/silver-chub

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).

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.

https://www.ontario.ca/page/american-ginseng

http://ibis.geog.ubc.ca/biodiversity/ef

Dense Blazing Star

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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).

Timing Windows

Flowers from mid-July to mid-September.

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/dense-blazing-star

Eastern Prairie Fringed-orchid

Endangered

Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information

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.

Timing Windows

The Eastern Prairie Fringed-orchid can lie dormant for several years in between flowering. Flowers occur from late June to late July.

Survey Protocol

Draft Eastern Prairie Fringed-orchid survey protocol (2012) - contact MNRF Aylmer District for more information.

https://www.ontario.ca/page/eastern-prairie-fringed-orchid

Goldenseal

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

Grows in rich, moist semi-open to closed areas of deciduous forests. Found at periodically flooded upland sites and in moist lowlands near floodplains. Associated with Red Oak, Sugar Maple, Hawthorns, Shagbark Hickory, Ironwood and Basswood. Typically grows in disturbed areas where trees have fallen, or next to recreational paths or woodland edges. Prefers sandy loam, loam soils or clay soils depending on whether it is growing in an upland or lowland area. Refer to the provincial recovery strategy (2016).

https://www.ontario.ca/page/goldenseal

Timing Windows

Flowers April - May; fruit ripens July-August.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

Purple Twayblade

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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).

https://www.ontario.ca/page/purple-twayblade

Timing Windows

Flowers between early May and early July.

Survey Protocol

No standardized species protocol available; contact ESA.Aylmer@Ontario.ca to request specific advice on conducting adequate surveys for your project.

Round-leaved Greenbrier

Threatened | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information
Found mainly in the warmer climate of the Carolinian Forest. Prefers open moist to wet woodlands, often growing on sandy soil. Refer to the draft federal recovery strategy (2017).

Timing Windows
Flowers late May to mid-June.

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/round-leaved-greenbrier

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

Lizard

Common Five-lined Skink (Carolinian population)

Endangered | Species Protection ☑ | Regulated Habitat Protection ☑ | General Habitat Protection ☐

Habitat Information
Common Five-lined Skinks habitat includes sand dunes, savannah, forest clearings and edges. They over-winter in crevices among rocks or buried in the soil. Refer to the provincial recovery strategy (2010), Ontario Regulation 242/08, and the habitat protection summary (2012).

Timing Windows
Active from April to early October: Courtship and mating in May, nest site selection in June, Egg-laying and brooding young in July.

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/common-five-lined-skink

Mammals

Eastern Small-footed Myotis

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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.

Timing Windows
Typically over-winter from about October to April.

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/eastern-small-footed-bat

Little Brown Myotis (formerly little brown bat)

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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).

Timing Windows
They feed at night and are most active in the two or three hours after sunset. Typically over-winter from about October to April.

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/little-brown-bat

Northern Myotis (formerly Northern Long-eared Bat)

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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).

Timing Windows
Typically over-winter from about October to April.

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/northern-long-eared-bat

Molluscs

Kidneyshell

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information
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.

Timing Windows
Active year-round.

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).

https://www.ontario.ca/page/kidneyshell

Round Hickorynut

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information
Prefers rivers with steady, moderate flows, and sand and gravel substrates at depths of up to 2 m.

Timing Windows
Active year-round.

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).

https://www.ontario.ca/page/round-hickorynut

Snuffbox

Endangered

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
Lives in silt free, clean clear small to medium sized rivers with gravel, rock or sand substrates. Only found in the East Sydenham River and the Ausable River in Southwestern Ontario.

Timing Windows
Female releases larvae May-June. Spawnning occurs in the summer.

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).

https://www.ontario.ca/page/snuffbox

Wavy-rayed Lampmussel

Threatened

Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information
Lives in clear steady flowing rivers with stable gravel or sand subtrates. It has the highest populations in small or medium sized streams. In Ontario, it can still be found in the Grand, upper Thames, Maitland, Ausable and St. Clair rivers, and the Lake St. Clair delta.

Timing Windows
Spawning occurs in August. The glochidia (larvae) are released the following summer in July or August.

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).

https://www.ontario.ca/page/wavy-rayed-lampmussel

Mosses

Spoon-leaved Moss

Endangered | Species Protection ☑ | Regulated Habitat Protection ☐ | General Habitat Protection ☑

Habitat Information
in Southern Ontario Spoon-leaved Moss grow in soil that is in or near flat, low-lying, seasonally wet areas. In the past in Ontario, it has been found in other locations including cedar swamps, deciduous forests, pine plantations.

Timing Windows
Reproduces during rain or flood water where there is available water for sperm cells from the male plants to swim a maximum distance of 10 cm to eggs borne by the female plants.

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/spoon-leaved-moss

Snakes

Eastern Foxsnake (Carolinian population)

Endangered | Species Protection ☑ | Regulated Habitat Protection ☑ | General Habitat Protection ☐

Habitat Information
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).

Timing Windows
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
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

Trees

American Chestnut

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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).

Timing Windows
Trees typically flower in late May to early July. Nuts mature by mid-October.

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/american-chestnut-species-risk

Butternut

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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).

Timing Windows
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.

Survey Protocol
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

Common Hoptree

Threatened Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
Generally grows in sandy areas, shorelines, hedgerows, thickets, alvars, and drainage ditches. Refer to the provincial recovery strategy (2013).

Timing Windows
Flowering occurs in early summer. Fruiting occurs in July.

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/common-hoptree

Eastern Flowering Dogwood

Endangered Species Protection ☑ Regulated Habitat Protection ☑ General Habitat Protection ☐

Habitat Information
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.

Timing Windows
Flowering occurs from mid-May to early June, as the leaves begin to develop. The fruits mature in August and September.

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/eastern-flowering-dogwood-speci

Kentucky Coffee-tree

Threatened Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
Generally grows in woodlands, floodplains, forest and wetland edges, hedgerows, roadsides and urban areas. Refer to the federal recovery strategy (2014).

Timing Windows
Flowers appear in May and June. Fertilized flowers form seed pods which remain on the tree through 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/kentucky-coffee-tree-species-risk

Red Mulberry

Endangered Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information
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).

Timing Windows
Flowers emerge with leaves in the spring. Fruit matures in mid 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.

https://www.ontario.ca/page/red-mulberry

Turtles

Blanding's Turtle

Threatened

Species Protection ☑ Regulated Habitat Protection ☐ General Habitat Protection ☑

Habitat Information

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

Timing Windows

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

Survey Protocol for Blanding's Turtle (Emydoidea blandingii) in Ontario (August 2015) - contact MNRF Aylmer District for more information.

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.

ONTARIO MINISTRY of NATURAL RESOURCES and FORESTRY | AYLMER DISTRICT OFFICE
615 John Street N. Aylmer ON, N5H 2S8 esa.aylmer@ontario.ca

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.

Li, Jian

From: Mahabir, Danuta (MTO) <Danuta.Mahabir@ontario.ca>
Sent: Friday, July 21, 2017 1:52 PM
To: Li, Jian
Cc: Lucente, Jodie (MTO); Nepszy, Chris
Subject: Essex Center Southwest Area Storm Sewer Improvements in the Town of Essex

Hi Dr. Jian Li,

The Ministry of Transportation (MTO) received a Notice of Study Commencement for the Class Environmental Assessment – Essex Center Southwest Area Storm Sewer Improvements in the Town of Essex.

The ministry is interested in the recommendations that will be generated as part of the study and would need to understand any impacts the plan would have to Highway 3, the ministry's right-of-way or the permit control area.

Please include the following as MTO contacts to the distribution list:

Danuta Mahabir, Senior Project Engineer, Planning and Design – West Region – Danuta.Mahabir@ontario.ca | ph: 519-873-4555
Jodie Lucente, Corridor Management Planner, Corridor Management – West Region – Jodie.Lucente@ontario.ca | ph: 519-873-4129

Thank you,

Danuta

Danuta Mahabir, P.Eng.
Ministry of Transportation
West Region
Planning and Design
519-873-4555
Danuta.Mahabir@Ontario.ca

Li, Jian

From: Herczeg, Brooke (MTCS) <Brooke.Herczeg@ontario.ca>
Sent: Monday, August 14, 2017 4:00 PM
To: Li, Jian
Subject: Town of Essex - Storm Sewer Improvements
Attachments: General Class EA Screening letter.pdf

Dear Jian Li,

Please see attached for MTCSs comments regarding the Essex Centre Southwest Area Storm Sewer Improvements in the Town of Essex. If you have any questions please don't hesitate to contact me.

Kind regards,
Brooke

Brooke Herczeg MPL
Heritage Planner
Heritage Program | Programs and Services Branch | Ministry of Tourism, Culture and Sport
401 Bay Street Suite 1700 Toronto ON M7A 0A7
Tel. 416.314.7133| email: Brooke.Herczeg@ontario.ca

Ministry of Tourism, Culture and Sport

Heritage Program Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel: 416 341 7133
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 7133
Téléc: 416 212 1802

Ontario

August 14, 2017 (EMAIL ONLY)

Jian Li
Stantec Consulting Ltd.
100-140 Ouellette Place
Windsor On, N8X 1L9
E: Jian.li@stantec.com

RE: MTCS file #: 0007023
Proponent: Town of Essex
Subject: Notice of Commencement
Essex Centre Southwest Area Storm Sewer Improvments
Location: Town of Essex, Ontario

Dear 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. Aboriginal communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Aboriginal 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* and 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/s for the Town of Essex 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 and the town of Essex 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,

Brooke Herczeg
Heritage Planner
Brooke.Herczeg@Ontario.ca

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 Cemeteries Regulation Unit of the Ministry of Government and Consumer Services 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.

Reaume, Michael

From: Reaume, Michael
Sent: Tuesday, July 03, 2018 11:33 AM
To: 'Jabbour, Rita'
Subject: RE: Natural Heritage Overlay Layer - Interactive Map

Thank you Rita.

Regards,
Mike

From: Jabbour, Rita <rjabbour@essex.ca>
Sent: Tuesday, July 03, 2018 10:43 AM
To: Reaume, Michael <Mike.Reaume@stantec.com>
Cc: Watson, Jeff <jwatson@essex.ca>
Subject: RE: Natural Heritage Overlay Layer - Interactive Map

Hi Mike.

We don't have any built heritage or cultural heritage landscapes that are *designated* under the Ontario Heritage Act, within the study area. We do have a couple buildings that are *listed* under subsection 27(1.2) of the OHA within the project area, however.

The buildings include:

- 18 Talbot North
- 120 Talbot Street North

Regards,

Rita

From: Reaume, Michael [mailto:Mike.Reaume@stantec.com]
Sent: Tuesday, July 03, 2018 9:29 AM
To: Jabbour, Rita
Cc: Watson, Jeff
Subject: RE: Natural Heritage Overlay Layer - Interactive Map

Hello Rita,

Thank you for your response. The Town of Essex, through their consultant Stantec Consulting Ltd., has initiated a study to determine the preferred solution to hydraulic capacity issues caused by increasing storm intensity and development pressures on the storm sewer system in Essex Centre Southwest area.
The study is being undertaken in accordance with the planning and design process for 'Schedule B' projects outlined in the Municipal Class Environmental Assessment under the *Ontario Environmental Assessment Act*.

Under the EA process, we are required to determine whether there are Built Heritage or Cultural Heritage landscapes designated under the *Ontario Heritage Act* within the study area. A map showing the boundaries of the study area is attached.

Would you know whether there any properties in the Essex Centre designated as such?

Thank you for your time,
Mike

Michael J. Reaume, MASc, P.Eng.
Stantec
100-140 Ouellette Place Windsor ON N8X 1L9
Phone: 519-966-2250 ext 246
Fax: 519-966-5523
michael.reaume@stantec.com

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From: Jabbour, Rita <rjabbour@essex.ca>
Sent: Tuesday, July 03, 2018 8:37 AM
To: Houf, Kevin <khouf@essex.ca>; Reaume, Michael <Mike.Reaume@stantec.com>
Cc: Watson, Jeff <jwatson@essex.ca>
Subject: RE: Natural Heritage Overlay Layer - Interactive Map

Hi Mike.

The Natural Heritage Overlay indicates areas of Natural and Scientific Interest (ANSI), Regionally Significant Woodland, Significant Woodland, Significant Wildlife Habitat or Significant Valley land.

Let me know if you have any further questions.

Regards,

Rita Jabbour | Assistant Planner

Town of Essex | 33 Talbot Street South, Essex, ON N8M 1A8
Phone: 519-776-7336 ext 1112 | Fax: 519-776-8811
essex.ca

From: Houf, Kevin
Sent: Friday, June 29, 2018 4:37 PM
To: Reaume, Michael
Cc: Watson, Jeff; Jabbour, Rita
Subject: Re: Natural Heritage Overlay Layer - Interactive Map

Mike,

I will have to refer you to our planning department as this is part of their designations. Rita Jabbour or Jeff Watson should be able to answer any questions you have regarding the natural heritage overlay.

Sent from my iPad

On Jun 29, 2018, at 4:22 PM, Reaume, Michael <Mike.Reaume@stantec.com> wrote:

Hi Kevin,

I notice there is a layer on the Interactive Map for "natural heritage overlay" and there are a few areas in the Essex Centre that are identified. Is this layer referring to these properties as being designated as heritage landscapes by the Ministry of Tourism and Culture (MTCS).
If these properties are designated as heritage landscapes, is there a way to get more information on these properties? This is for a Storm Sewer Class Environmental Assessment for the Southwest Area in the Town of Essex.

<image002.jpg>

Thank you in advance,
Mike

Michael J. Reaume, MASc, P.Eng.
Stantec
100-140 Ouellette Place Windsor ON N8X 1L9
Phone: 519-966-2250 ext 246
Cell: 519-551-8206
Fax: 519-966-5523
michael.reaume@stantec.com

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Appendix D **Public & Review Agency Consultation Documentation**
, 202

REVIEW AGENCY CONSULTATION

ERCA nt

From: Girard, Kevin
To: Martin Gallant; Li, Jian
Subject: RE: Storm Sewer improvement EA PIC
Date: Thursday, April 8, 2021 9:29:59 AM
Attachments: image004.png
image005.png
image008.png

Thank you for your comments Martin,

We will ensure to send you ample notification of any future works.

Thank you,

Kevin Girard, P.Eng, MBA | Director, Infrastructure Services
Town of Essex | Infrastructure Services
33 Talbot Street South, Essex, ON, N8M 1A8
519-776-7336 ext 1119

Learn more online at the links below:

From: Martin Gallant [mailto:Marty@buskids.ca]
Sent: Thursday, April 8, 2021 8:55 AM
To: Girard, Kevin <kgirard@essex.ca>; jian.li@stantec.com
Subject: Storm Sewer improvement EA PIC

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Hi Kevin,

I'm Martin Gallant, and work for Student Transportation Services. Basically we're in charge of the all the school bussing in the town. My only feedback is to formally request to be a part of any precon meetings so that we may be in formed ahead of time when construction starts, which roads that will be closed, or limited lanes for traffic. We have many bustops for schools that we may need to relocate depending on where construction is, adjust bus routes and schedules, as well as give the local schools a heads up for any information for their walking students.

Thank you,

Martin

---

buskids

Martin Gallant
Planning & Data Services Supervisor
Windsor Essex Student Transportation Services
Service de transport des élèves Windsor-Essex
360 Fairview Av W, Essex, ON N8M 3G4
Tel: 776-6431 ext 204 \ Fax: 776-4457
Email: marty@buskids.ca Web: www.buskids.ca

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From: Li, Jian
To: Badali, Mark (MECP)
Cc: Girard, Kevin; Reaume, Michael
Subject: RE: Essex Centre Southwest Area Storm Sewer Improvement - Class Environmental Assessment
Date: Thursday, April 22, 2021 4:21:00 PM

Hi Mark,

Thank you for the review of the draft study report for the Essex Centre Southwest Area Storm Sewer Improvement (Municipal Class EA, Schedule B).

As per your instruction, when the EA has been finalized, we will submit the Notice of Completion and report to eanotification.swregion@ontario.ca for final review.

Best Regards,

Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
2555 Ouellette Ave
Windsor ON N8X 1L9 CA

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From: Badali, Mark (MECP) <Mark.Badali1@ontario.ca>
Sent: Thursday, April 22, 2021 2:29 PM
To: Li, Jian <jian.li@stantec.com>
Cc: Girard, Kevin <kgirard@essex.ca>; Reaume, Michael <Mike.Reaume@stantec.com>
Subject: RE: Essex Centre Southwest Area Storm Sewer Improvement - Class Environmental Assessment

Hi Jian,

The ministry has reviewed the draft study report for the Essex Centre Southwest Area Storm Sewer Improvement (Municipal Class EA, Schedule B) with respect to our mandate, and we have no concerns and no comments at this time.

Thank you for the opportunity to review and comment. When the project team has finalized the EA, please circulate the Notice of Completion and report to eanotification.swregion@ontario.ca for final agency review.

Best regards,

Mark Badali (he/him)
Environmental Resource Planner & EA Coordinator – Southwest Region
Project Review Unit | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
Mark.Badali1@ontario.ca | (416) 457-2155

From: Li, Jian <jian.li@stantec.com>
Sent: April 14, 2021 8:04 PM
To: EA Notices to SWRegion (MECP) <eanotification.swregion@ontario.ca>
Cc: Badali, Mark (MECP) <Mark.Badali1@ontario.ca>; Awad, Emily (MECP) <Emily.Awad@ontario.ca>; Girard, Kevin <kgirard@essex.ca>; Reaume, Michael <Mike.Reaume@stantec.com>
Subject: Essex Centre Southwest Area Storm Sewer Improvement - Class Environmental Assessment

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Dear MECP Southwest Region EA Review Team,

The Town of Essex has initiated a Municipal Class Environmental Assessment (EA) for the storm sewer system in Essex Centre Southwest area. The goal of the storm sewer improvements is to determine the preferred solution to hydraulic capacity issues caused by increasing storm intensity and development pressures on the storm sewer system.

The EA is being planned as a Schedule "**B**" projects as outlined in the Municipal Class Environmental Assessment document (October 2000, as amended in 2007, 2011 and 2015). A draft study report has been prepared. The report defines the problem, identify and evaluate alternative solutions to the problem, and then recommend a preferred solution after assessing potential environmental impacts and identifying mitigation measures associated with the preferred solution.

For your review and comments, the draft report is being distributed in electronic format as a PDF file on the project webpage, www.essex.ca/Ward1StormSewerPIC . Due to the COVID-19 pandemic, the Town is hosting the Public Information Centre (PIC) virtually from April 6 to May 6, 2021. The notice of the virtual PIC is also attached for your information.

We would appreciate receiving any comments you care to offer on the draft report by May 6, 2021.

Sincerely,

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
2555 Ouellette Ave
Windsor ON N8X 1L9 CA

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Ministry of Heritage, Sport, Tourism and Culture Industries

Programs and Services Branch
400 University Ave, 5th Flr
Toronto, ON M7A 2R9
Tel: 613-242-3743

Ministère des Industries du Patrimoine, du Sport, du Tourisme et de la Culture

Direction des programmes et des services
400, av. University, 5e étage
Toronto, ON M7A 2R9
Tél: 613-242-3743

Ontario

June 10, 2022 EMAIL ONLY

Jian Li, P.Eng.
Project Manager
Stantec Consulting Ltd.
2555 Ouellette Ave
Windsor ON N8X 1L9
jian.li@stantec.com

MHSTCI File	**:**	**0007023**
Proponent	**:**	**Town of Essex**
Subject	**:**	**Draft Project File Report - Schedule B MCEA**
Project	**:**	**Essex Centre Southwest Area Storm Sewer Improvement**
Location	**:**	**Town of Essex**

Dear Jian Li:

Thank you for responding to the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) email (dated May 27, 2022) and providing us with the opportunity to review the Project File Report (final draft - dated February 22, 2021, prepared by Stantec Consulting Ltd.) in support of the above-referenced project. MHSTCI's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- archaeological resources, including land 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 known (previously recognized) and potential cultural heritage resources.

Project Summary
The Town of Essex is undertaking a Municipal Class Environmental Assessment to address potential capacity issues for the storm sewer system in the Essex Centre Southwest area. The EA is being undertake as a schedule B project as outlined in the Municipal Class Environmental Assessment document. (October 2008, as amended in 2007, 2011, and 2015).

Project Comments

We have reviewed the draft Project File Report (PFR) and have the following observations and recommendations to help support fulfillment of the municipality's obligations under Municipal Class Environmental Assessment process. The documentation requirements for schedule B projects are outlined under section A.4.1 of the MCEA.

In order to fulfill the requirements for Schedule B MCEA undertakings the PFR should:

- identify existing baseline environmental conditions,
- identify expected environmental impacts, and
- Include measures to mitigate potential negative impacts.

The following headings correspond to section headings typically used in PFRs:

1. *Description of Existing Conditions: Cultural Heritage Resources (PFR Section 2.3)*

1.1 Archaeological Resources

This section should describe the existing conditions as it relates to archaeology, e.g., if the area has archaeological potential. The Description of Existing Conditions will be based on the archaeological assessment (AA) report(s) completed. It will include the conclusions and recommendations of the archaeological assessment(s) completed in support of this undertaking.

Section 2.3.1 (Archaeology) does not indicate whether the Criteria for Evaluating Archaeological Potential (MHSTCI, 2017) was completed to determine whether an archaeological assessment was required or any archaeological assessments have been completed in support of this undertaking. To assist us in tracking archaeological assessment reports, please provide us with the Project Information Form (PIF) number(s) for any Archaeological Assessments undertaken in support of this EA.

Should the study area have archaeological potential, then a Stage 1 AA shall be undertaken prior to the issuance of the notice of completion.

1.2 Built Heritage Resources and Cultural Heritage Landscapes

This section should describe any known and potential built heritage resources and cultural heritage landscapes within the study area. MHSTCI has developed screening criteria that may assist with this exercise: *Criteria for Evaluating for Potential Built Heritage Resources and Cultural Heritage Landscapes* (MHSTCI, 2017). It seems that an older version of the screening checklist was used.

MHSTCI recommends that a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment be prepared for this undertaking.

2. *Evaluation of a Preferred Alternative - Cultural Heritage Resources (PFR Section 4.4.2)*

   The evaluation of alternatives should consider impacts to the three types of cultural heritage resources; archaeological resources, built heritage resources and cultural heritage landscapes. The preferred solution should be identified by considering public and review agency input as well as the findings of any technical cultural heritage studies.

   The findings and recommendations of technical cultural heritage studies (including archaeological assessments) should inform this section.

3. *Impact Assessment and Mitigation Measures – Cultural Heritage Resources (PFR Section 6.0)*

   This section should include recommendations and mitigation strategies addressing any identified or potential impacts of the preferred alternative on the cultural heritage environment. The findings and recommendations of technical cultural heritage studies will help inform this section.

We have attached a table with detailed comments, and we would be pleased to discuss them further and/or provide additional information.

Thank you for consulting MHSTCI on this project. If you have any questions or require clarification, please do not hesitate to contact me.

Sincerely,

Joseph Harvey
Heritage Planner
joseph.harvey@Ontario.ca

Copied to: Kevin Girard, Infrastructure Services, Town of Essex
Karla Barboza, (A) Team Lead, Heritage Planning Unit, MHSTCI
Mark Badali, Environmental Resource Planner & EA Coordinator, MECP

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. MHSTCI 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 MHSTCI 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 MHSTCI (at archaeology@ontario.ca) 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 and coroner must be contacted. In situations where human remains are associated with archaeological resources, MHSTCI should also be notified (at archaeology@ontario.ca) to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

Item No.	PFR Section	Original Text	Comment
1.	General	"Ministry of Tourism, Culture and Sport"	The *Ontario Heritage Act* is currently administered by Minsitry of Heritage, Sport, Tourism, and Culture Industries. Please ensure that this report refers to the current Ministry name "Minsitry of Heritage, Sport, Tourism and Culture Industries.
2.	2.3 Cultural, Social and Economic Environment Page 2.4 – 2.5 (PDF 30-31)	2.3.1 Archaeology Under the Ontario Heritage Act administered by the Ministry of Citizenship, Culture and Recreation, an archeological assessment is required for any development at or near a registered archeological site. There is no registered archeological site in the study area. 2.3.2 Built Heritage and Landscape The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Build Heritage and Cultural Heritage Landscapes" checklist was reviewed. The Town of Essex's Planning Department has indicated that there are no Built and/or Cultural Heritage Landscapes designated under the Ontario Heritage Act within the study area. Any built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed sewers will be documented and noted in the contract drawings/specifications. If lands within	This section should describe the existing baseline cultural heritage conditions within the study area by identifying all known or potential cultural heritage resources within the study area. . *Archaeological Resources* Normally, the MHSTCI Criteria for Evaluating Archaeological Potential is used to determine if an archaeological assessment is needed. The completed checklist should be appended to this Project File Report (PFR). If the 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 MHSTCI for review. At a minimum, a Stage 1 AA will be undertaken for the entire study area during the planning phase. The results of the Stage 1 AA will inform the EA process and will be summarized in the Environmental Report. If the Stage 1 AA recommends further AA(s), then MHSTCI recommends that further stages of AA be completed as early as possible during the design phase of the project, and prior to the completion of detailed design. Please note that archaeological concerns have not been addressed until reports have been entered into the Ontario Public Register of Archaeological Reports where those reports recommend that: 1. the archaeological assessment of the project area is complete and

		the proposed work areas have the potential to impact built heritage resources and/or cultural heritage landscapes, a Heritage Impact Assessment (HIA) will be implemented, and a copy of the HIA will be sent to the Ministry of Tourism, Culture and Sport for review by a Heritage Planner. The HIA will be forwarded to the local municipality and its municipal heritage committee for their review and comment and will also be available, upon request, for the local heritage organizations with an interest in the project. There are however two (2) buildings listed under subsection 27(1.2) of the OHA within the study at 18 Talbot Street North and 120 Talbot Street North (refer to Appendix D.3). However, as the proposed work includes sewer construction within the road right-of-way and improvements to stormwater ponds located away from these two properties, the storm system improvements are not expected to impact heritage resources in the area.	2. all archaeological sites identified by the assessment are either of no further cultural heritage value or interest (as per Section 48(3) of the Ontario Heritage Act) or that mitigation of impacts has been accomplished through an avoidance and protection strategy *Built Heritage Resources and Cultural Heritage Landscapes* MHSTCI recommends that a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment be prepared for this undertaking. This study will: 1. Describe the existing baseline cultural heritage conditions within the study area by identifying all known or potential built heritage resources and cultural heritage landscapes, including a historical summary of the study area. MHSTCI has developed screening criteria that may assist with this exercise: Criteria for Evaluating for Potential Built Heritage Resources and Cultural Heritage Landscapes. 2. Identify preliminary potential project-specific impacts on the known and potential built heritage resources and cultural heritage landscapes that have been identified. The report should include a description of the anticipated impact to each known or potential built heritage resource or cultural heritage landscape that has been identified. 3. Recommend measures to avoid or mitigate potential negative impacts to known or potential built heritage resources and cultural heritage landscapes. The proposed mitigation measures are to inform the next steps of project planning and design. Cultural Heritage Reports will be undertaken by a qualified person who has expertise, recent experience, and knowledge relevant to the type of cultural heritage resources being considered and the nature of the activity being proposed. Community input should be sought to identify locally recognized and potential cultural heritage resources. Sources include, but are not limited to, municipal heritage committees, historical societies and other local heritage organizations.

			Cultural heritage resources are often of critical importance to Indigenous communities. 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 them. Section 2.3.1 of the PFR should be replaced with the following: **2.3.1 Cultural Heritage Environment:** **Cultural heritage resources include archaeological resources, built heritage resources and cultural heritage landscapes.** 2.3.1.**1 Archaeological Resources** ~~Under the Ontario Heritage Act administered by the Ministry of Citizenship, Culture and Recreation, an archeological assessment is required for any development at or near a registered archeological site. There is no registered archeological site in the study area.~~ This section should include a brief overview of all the stages of archaeological assessment undertaken (e.g. Stage 1, 2, 3, 4). • The objective of that stage of assessment (e.g., A Stage 1 AA is a background study to determine area(s) of archaeological potential, a Stage 2 AA is a property assessment to determine whether archaeological resources might be present etc.) • The outcomes (conclusions and recommendations) of the AA are to be articulated in the PFR. If archaeological potential or resources are present, the AA would recommend further archaeological assessment to be undertaken (up to a Stage 4). If there is no archaeological potential or resources present the AA would clearly state that the area specified (and mapped) has no further archaeological concerns. NOTE: The conclusions/recommendations are typically included in the Executive Summary of the AA and should be reiterated (cut and paste) in the PFR. MHSTCI may have additional comments on this section once the Stage 1 archaeological assessment report has been accepted into the Ontario Public Register of Archaeological Reports and offers the following suggestion of how the description of existing conditions could be articulated: A Stage 1 archaeological assessment (Project Information Form number) was undertaken on [date] by [consultant archaeologist] for [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,

			and contacting MHSTCI to find out whether, or not, 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] See also comments in the cover letter. 2.3.~~2~~.**1.2** Built Heritage **Resources and Cultural Heritage** Landscapes ~~The Ministry of Tourism, Culture and Sport (MTCS)'s "Screening for Impacts to Built Heritage and Cultural Heritage Landscapes" checklist was reviewed. The Town of Essex's Planning Department has indicated that there are no Built and/or Cultural Heritage Landscapes designated under the Ontario Heritage Act within the study area.~~ ~~Any built heritage resources and/or cultural heritage landscapes in proximity to the locations of proposed sewers will be documented and noted in the contract drawings/specifications. If lands within the proposed work areas have the potential to impact built heritage resources and/or cultural heritage landscapes, a Heritage Impact Assessment (HIA) will be implemented, and a copy of the HIA will be sent to the Ministry of Tourism, Culture and Sport for review by a Heritage Planner. The HIA will be forwarded to the local municipality and its municipal heritage committee for their review and comment and will also be available, upon request, for the local heritage organizations with an interest in the project.~~ ~~There are however two (2) buildings listed under subsection 27(1.2) of the OHA within the study at 18 Talbot Street North and 120 Talbot Street North (refer to Appendix D.3). However, as the proposed work includes sewer construction within the road right-of-way and improvements to stormwater ponds located away from these two properties, the storm system improvements are not expected to impact heritage resources in the area~~ A Cultural Heritage Report- Existing Conditions and Preliminary Impact~~s~~ Assessment was undertaken on [**date**] by [**heritage consultant**] for [**name of project or study area**]. The assessment for this report consisted of data collection, background historic research, review of secondary source material and field review. A total of # (known and potential) cultural heritage landscapes and built heritage resources were identified within or adjacent to the project area.

<table>
<tr><td></td><td></td><td></td><td>Cultural Heritage Evaluation Reports were recommended for the # properties that could be directly impacted. All CHERs were undertaken on [date] by [heritage consultant]. The Cultural Heritage Report- Existing Conditions and Preliminary Impacts Assessment and CHERs are included in Appendix X.

See also comments in the cover letter

MHSTCI may have additional comments on Section 2.3.1 pending the completion of any arcaheolgical assessments or technical cultural heritage studies.</td></tr>
<tr><td>3.</td><td>4.4.2 Natural Environment Impacts and Mitigating Measures

Table 4-2: Environmental Effects and Mitigation Measures

Page 4.11

(PDF 49)</td><td>Archaeological and heritage resources are included as a single item under the category ‘Effect’.</td><td>Cultural heritage resources include archaeological resources, built heritage resources and cultural heritage landscapes. Table 4-2 should account for potential impacts to archaeological resources and areas of archaeological potential e.g., disturbance or destruction; and potential impacts to built heritage resources and cultural heritage landscapes e.g., displacement of resources by demolition or removal; disruption of resources by the introduction of physical, visual, audible, or atmospheric elements that are not in keeping with the character and setting of the resource.

Included below is an example of how identified or potential impacts the cultural heritage resources could be included as part of the Evaluation of a Preferred Alternative.

<table>
<tr><th>Aspect of the Environment</th><th>Sub-Component</th><th>Design Alternative 1</th><th>Design Alternative 2</th><th>Design Alternative 3</th></tr>
<tr><td rowspan="2">Cultural Environment</td><td>Impacts to Archaeological Resources</td><td>…</td><td>…</td><td>…</td></tr>
<tr><td>Impacts to Built Heritage Resources and Cultural Heritage Landscapes</td><td>…</td><td>…</td><td>…</td></tr>
</table>
</td></tr>
</table>

4.	6.0 Environmental Impacts of Preffered Alternative 6.1-6.4 (PDF 63-66)	Heritage Resources The proposed work will be implemented within existing street and facility footprints which will have a low potential for the discovery of archaeological resources. During the final design and construction phase, if any new property is required outside of the existing footprints, archaeologists will be consulted to determine whether a Stage 1 archaeological work and further Stage 2 surveys need to be implemented prior to proceeding with construction. Results of these archaeological assessments will be forwarded to the Ministry of Tourism, Culture and Sport prior to construction of the proposed work. Should buried archaeological remains be found during construction activities, the Ministry of Tourism, Culture and Sport should be notified immediately. These requirements will be included in the contract documents.	MHSTCI recommends revising the text provided in subsection 6.1 and 6.2 under the "Heritage Resources" heading to include the following. **Cultural** Heritage Resources ~~The proposed work will be implemented within existing street and facility footprints which will have a low potential for the discovery of archaeological resources.~~ **A licensed archaeologist should undertake any recommended archaeological assessments as early as possible during detailed design prior to construction.** ~~During the final design and construction phase, if any new property is required outside of the existing footprints, archaeologists will be consulted to determine whether a Stage 1 archaeological work and further Stage 2 surveys need to be implemented prior to proceeding with construction. Results of these archaeological assessments will be forwarded to the Ministry of Tourism, Culture and Sport prior to construction of the proposed work.~~ **Where archaeological resources are impacted by EA project work, MHSTCI will be notified by contacting archaeology@ontario.ca. 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**. ~~Should buried archaeological remains be found during construction activities, the Ministry of Tourism, Culture and Sport should be notified immediately. These requirements will be included in the contract documents.~~ **If human remains are encountered, all activities must cease immediately, and the local police and coroner must be contacted. In situations where human remains are associated with archaeological resources, MHSTCI should also be notified (at archaeology@ontario.ca) to ensure that the site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.** **Any recommended technical cultural heritage studies should be completed as early as possible during detailed design and prior to construction.** MHSTCI may have additional comments on Section 6.0 pending the completion of any technical cultural heritage studies.

5.	10.2 Permits and Approvals (PDF 76)	Table 10-1 shows the permit and approval requirements for constructing the preferred solution. 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. We are not aware of any other regulatory permits and approvals that are necessary with respect to the proposed works.	Section 10.2 may need to be revised to reflect the recommendations of any technical cultural heritage studies (including archaeological assessments) completed for this undertaking, e.g., a Stage 1 archaeological assessment may recommend further assessments (e.g., Stage 2,3,4 Archaeological Assessment) be undertaken prior to construction. (See Comment 2)

June 16, 2021

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360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

Kevin Girard, P.Eng.
Director, Infrastructure Services
33 Talbot Street South,
Essex, ON N8M 1A8

Dear Mr. Girard:

Re: Improvements to Essex Ward 1 Southwest Storm Sewer System: Phases 1 & 2 (Schedule B) Class Environmental Assessment Report – Draft Final Report

The Essex Region Conservation Authority (ERCA) has completed a review of the Draft Final Report regarding the above noted Class Environmental Assessment. Through our office's review of the available documents, there are some potential issues and concerns that are related to the ERCA as an agency/reviewer as well as potential issues/concerns related to ERCA operations on affected lands. This letter has made an attempt to separate these two issues accordingly.

Comments as an Agency

A. *Section 2.2.6 Natural Vegetation*

1. This section of the report is intended to detail the existing conditions specific to the natural environment and natural vegetation that is present within the study area. The report indicates that there are "comparatively few stands of trees or wood lots". While this may be true in comparing the percentage of canopy cover to "bare" lands, the statement does not adequately present the existing conditions in terms of baseline data for use when evaluating alternative solutions. As a specific example, the woodlot located just south of Woodview Drive, which is approximately 7.2 hectares in size, does not appear to have been discussed under "Existing Conditions", and therefore, no future mitigation measures are considered. ERCA recommends that a proper inventory of the natural environment be include as part of this EA as some of the recommended preferred alternatives have direct impacts on some natural features.

B. *Section 4.4.2 Natural Environment Impacts and Mitigation Measures*

1. Further to the above comments related to *Section 2.2.6*, the draft report does not provide information regarding all of the significant natural features present within the study area, which therefore impacts the Mitigation Measures outlined in *Table 4-2*. The Mitigation Measures do not reflect any concerns regarding impacts to terrestrial wildlife habitat or impacts to unique vegetation features. With the recommended solution

including a significant expansion to the Woodview Pond, impacts related to the existing woodlot have not been adequately evaluated and therefore mitigated. ERCA recommends that the woodlot feature be evaluated in terms of species and habitat, and that the potential effects of the alternatives be properly documented and addressed/mitigated where appropriate. Should there be a need, ERCA is prepared to discuss mitigation strategies related to any potential impacts to natural features.

C. *Section 7.0 Property Requirements*

1. It is currently recommended that property will be acquired or that easements will be registered to accommodate the stormwater management facility expansions. ERCA recommends that any property acquisition and easements be large enough that they account for future necessary maintenance activities. Note that lands included to facilitate maintenance operations should be included in the impact assessments as these areas are to remain clear of vegetation to enable equipment access.

2. Further to the above comment, potential property acquisition should also consider land required for sediment drying areas where appropriate. This is not required of all stormwater management facilities as there are situations where trucking offsite is preferred; however, should there be a need for the additional property, ERCA recommends addressing this at the earliest possible stage.

D. *Additional general comments*

1. ERCA is concerned about the potential impacts to adjacent lands and structures in close proximity to the stormwater management facility expansions. It is unclear if the preferred alternative and associated pond footprint has taken into consideration the pre-existing lowest opening elevations so as to avoid an increase in flood risk to these already existing structures.

2. Further to the above, it is unclear if a deeper pond complete with an appropriately sized pumping scheme was considered as an alternative to the recommended gravity system. Through other alternative solutions, there may be an opportunity to reduce the impacts to adjacent private lands, the existing woodlot, and the potential land acquisition or easement registration. It is recommended that other alternatives be explored to reduce and/or avoid significant impacts to adjacent lands and natural features.

Comments related to ERCA as a Tenant at 360 Fairview Avenue West

The ERCA has concerns specifically with respect to the expansion of the Woodview Pond and the potential impacts associated with ERCA Operations deployed from the warehouse located at 360 Fairview Avenue West. The currently proposed expansion

flanks the ERCA Operations Warehouse which can pose additional risks of contamination. Various field operations are conducted from this site including but not limited to forestry, summer and winter maintenance, and fleet maintenance. The expansion of the pond to such a close proximity and surrounding the site increases the risk of contamination with oils, grits, and salt laden runoff.

ERCA is generally not supportive of the potential loss of a significant portion of vegetation located south of Woodview Drive. It should be noted that ERCA coordinated significant tree planting activities with the Town of Essex within the County of Essex owned lands to offset impacts related to the original phases of the Woodview Estates Subdivision. This was completed at a time prior to the implementation of Environmental Impact Assessment (EIA) studies being completed in association with subdivision planning processes. However, this coordinated effort led by the Conservation Authority staff was considered a significant advancement in how natural features are protected and/or enhanced in order to offset potential impacts associated with development activities. Had this been completed under current legislation and processes, the compensation that was coordinated on this land would have remained designated as a "Compensation Area" and would therefore be required to be protected in perpetuity. The ERCA recommends that further consideration be given to the potential impacts to the woodlot south of Woodview Estates so as to avoid the degradation of this important natural feature. Our office again remains available to discuss further.

Thank you for considering the comments outlined within this letter. We look forward to your response and/or further collaborative consultation on these matters.

Sincerely,

James Bryant, P.Eng.
Director, Watershed Management Services

Cc: Jian Li – Project Manager (Stantec)

June 29, 2021

Kevin Girard, P.Eng.
Director of Infrastructure Services
33 Talbot Street South
Essex, ON N8M 1A8

Dear Mr. Girard,

Re: Improvements to Essex Ward 1 Southwest Storm Sewer System: Phase 1 & 2 (Schedule B) Class Environmental Assessment Report

The County of Essex has completed a review of the Draft Final Report and has the following comments.

Maintenance of Existing Pond and Area.
The County would like an understanding of any agreements made regarding the ownership and maintenance responsibility for the existing pond and the surrounding area. Also, information on the current maintenance practice for the pond and surrounding area.

Land Requirements and Use of Space on County Owned Property.
The County is concerned with the proposed loss of land, including areas of vegetation and trees which where planted by ERCA and the Town. The County has been notified of this significant expansion of the existing stormwater management pond through the Environmental Assessment process. As the land owner a formal request should be made for the land required for the stormwater pond expansion and easements. A better understanding of the purpose of land acquisition, the timing of land acquisition (Pond Expansion, Flood Mitigation Area), the amount of land required, value of property, requirements of easements, etc. is required.

Alternative solutions
The County would like to know details of other alternatives that were analysed, including but not limited to:

- Infrastructure in other locations.
- Alternatives at this location such as a deeper pond to limit the property impact.

If alternative solutions were not considered we ask that these be considered now.

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Impact on existing Essex Region Conservation Authority Building.
The proposed expansion of the existing stormwater pond will have an impact on the existing ERCA maintenance building and yard operations including:

- Increased risk of flooding of the building and storage area.
- Contamination risk from materials, including salt which is stored at the site.
- Limiting expansion or changes in operation of the ERCA maintenance building.

Environmental Mitigation commitments
The Impact of removing the successional forest that was planted as a Compensation Area to support the neighbouring development is unknown and approval from MECP may be required in accordance with the Endangered Species Act. The draft final report provided a very limited assessment of the natural heritage value which should include the required floral and fauna inventories and determination of associated negative impact and mitigating measures.

The County is supportive of the comments made by Essex Regional Conservation Authority in their letter dated June 16, 2021 which is attached.

We look forward to your response. County staff are available to discuss the above points with the Town.

Regards,

J. Behl.

Jerry Behl
Manager, Transportation Planning & Development

attachment

cc Jane Mustac
Rebecca Belanger

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Stantec

Meeting Notes

Town of Essex – Southwest Ward 1 Stormwater System EA
Review Meeting for Comments from County and ERCA

Project No. 165620098

Date/Time:	February 16, 2022 / 1:00 PM
Place:	Stantec Consulting Ltd. – Virtual Meeting (Microsoft Teams)
Next Meeting:	TBD
Attendees:	Kevin Girard, Town of Essex Norman Nussio, Town of Essex Allan Botham, County of Essex Jerry Behl, County of Essex Rebecca Belanger, County of Essex James Bryant, ERCA Tian Martin, ERCA Sean Spisani, Stantec Clarence Jubenville, Stantec Chrissy Jung, Stantec Jian Li, Stantec
Absentees:	N.A.
Distribution:	Attendees & Absentees

Item:	Action:
1.1: Introduction	
At the onset of the meeting staff from the Town of Essex (Town), County of Essex (County), Essex Regional Conservation Authority (ERCA), and Stantec introduced themselves and identified their respective roles within their organizations.	Info
The objective of the meeting is to briefly introduce background information related to the Essex Southwest Stormwater Class EA; review comments from the County of Essex and ERCA; and review the proposed approach to address comments related to natural heritage features.	Info
1.2: Essex Ward 1 – Southwest Storm Drainage Area	
Stantec presented two figures outlining the urban and rural zones of the Town of Essex southwest storm drainage area. In this drainage area the storm sewers generally slope from the northeast to the southwest with two main outlets: (1) the Essex Outlet Drain and (2) the Canaan Drain.	Info

1.3: Problem Statement and Study Objective

The Problem Statement is as follows: Info

- The existing storm sewer system layout was designed in the 1970s. Since then, no comprehensive stormwater drainage study has been undertaken to review the drainage system taking into consideration changes in development or design standards.
- The Town experienced street and basement flooding during extreme storm events. On August 11, 2014, and September 3, 2015, the Town received a record amount of rainfall. Many houses, mostly located in Ward 1 Southwest drainage area, flooded during these two heavy rainfall events.
- During extreme rainfall events significant amounts of runoff can pond on Town streets and drastically increase the volume of stormwater entering the Town's stormwater drainage system.
- To continue with future development, the existing storm sewer system needs to be evaluated to identify areas where improvements can be implemented to mitigate the risk of flooding and property damage and prepare the Ward 1 Southwest drainage area for full future development.

The study objective was determined to be evaluating the existing storm system and identifying improvements to reduce the risk and extent of surface level flooding and property damage as well as accommodate future development. Info

1.4: The Class EA Process

This project is being conducted in accordance with the Class EA requirements for Schedule "B projects", which is to be approved subject to completion of Phase 1, 2 and 5 of the Municipal Class EA process, including: Info

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

1.5: Selection of Alternative Solutions and Summary of Recommended Design

A comparative evaluation of the following six conceptual alternative solutions was carried out based on their ability to address the problem statement: Info

1. Do Nothing

2. Runoff reduction through Low Impact Developments (LIDs) and green infrastructure
3. Field Inspection and General Maintenance
4. Sewer/Conveyance: Increasing hydraulic capacity of the existing storm sewers
5. SWM Facilities: Construction of stormwater management ponds
6. A combination of Alternative No.'s 3, 4, and 5

The EA process identified Alternative No. 6 as the most preferred alternative.

Improvements to the Ward 1 Southwest Storm Sewer system include the following: Info

Increasing Hydraulic Capacity of Storm Sewers

A. Centre St: Replace storm sewer along Centre St between Hanlan St and South Talbot Rd to a provide proper outlet for service the Centre St drainage area
B. Iler Ave: Replace storm sewer in Optimist Park between Hanlan and Milne St to provide a proper outlet for servicing Iler Ave drainage area
C. Brien Ave W: Replace storm sewer along Brien Ave West between Kimball Dr and South Talbot Rd and along South Talbot Rd from Brien Ave West to Fairview Ave West at the outfall
D. Tulley Meadows: improvements to outlet sewer configuration

Construction of Stormwater Management Ponds

A. Woodview SWM Facility: Expansion
B. Canaan Pond: Expansion
C. Essex Outlet Pond: New

Projects related to increasing the hydraulic capacity of the Brien Ave storm sewers are currently underway and are set to begin construction shortly. Info

Multiple comments have been submitted by the County of Essex and ERCA regarding the Woodview SWM pond expansion and are outlined in Section 1.7 of these meeting minutes. Info

1.6: Proposed Approach for Natural Heritage Assessment

The goal of the natural heritage assessment plan is to: Info

- Document existing natural heritage features associated with the Study Area, including the existing woodlot and an area that was planted to compensate for the neighboring development
- Identify potential impacts and mitigation strategies associated with the expansion of the existing stormwater pond
- Document requirements under the Endangered Species Act, 2007 (ESA)

The proposed approach for the Natural Heritage assessment includes three main stages: (1) undertaking a desktop study of available background information, (2) conducting a site visit to confirm and update background data, and (3) delivering a technical memorandum. Info

The desktop study will include: Info

- Submit an information request to ERCA for natural heritage data, including compensation planting records
- Conduct a review of available background information including the Ministry of Natural Resources and Forestry's (MNRF) Land Information Ontario (LIO) database, the Natural Heritage Information Centre (NHIC) database, the Species at Risk in Ontario (SARO) List, Fisheries and Oceans Canada (DFO) Aquatic Species at Risk mapping, ERCA online mapping, various wildlife atlases, and Official Plans.

The site visit will include: Info

- Vegetation community mapping using Ecological Land Classification for southern Ontario (Lee et al. 1998)
- Flora inventory including searches for potential species at risk and provincially rare species
- Significant wildlife habitat assessment using the Ecoregion (7E) Criteria Schedule
- Habitat assessment for potential species at risk
- Documentation of surface water features if present, such as drainage features and vernal pools

- Documentation of incidental wildlife observations

The assessment deliverable will be a technical memorandum to: Info

- Document the methods and results of the background review and site investigations, including mapping and photographs of vegetation communities and sensitive features such as significant wildlife habitat and habitat for species at risk.
- Provide mitigation recommendations to avoid and protect natural heritage features and species during construction, and to restore features after construction is complete.
- Identify requirements for under the ESA such surveys to determine presence/absence of species at risk, and steps to authorize the project under the Act.

1.7: Comments from the County of Essex and ERCA

Comment No. 1: *Maintenance of Existing Pond and Area* Info

The County would like an understanding of any agreements made regarding the ownership and maintenance responsibility for the existing pond and the surrounding area. In addition, the County would like to know the current maintenance practices for the pond and surrounding area.

Discussion / Next Steps:

- The Town of Essex noted that there is currently a registered easement for the property containing the Woodview pond. This easement would likely be updated when/if the pond expansion occurs.
- The pond is considered a naturalized pond and has not required frequent maintenance since its implementation. The Town recently visited the site and identified some needs for repairs and maintenance. These maintenance needs have not been scheduled as they are dependent on the results of the pond expansion proposed as part of this EA process. The Town has a plan to develop a standard maintenance plan and work will likely occur as a part of the expansion project.

Comment No. 2: *Land Requirements and Use of Space on County Owned Property* Town / County

The County is concerned with the proposed loss of land, including areas of vegetation and trees which were planted by ERCA and the Town.

The County has been notified of this significant expansion of the existing stormwater management pond through the Environmental Assessment process. As the landowner a formal request should be made for the land required for the stormwater

pond expansion and easements.

A better understanding of the purpose of land acquisition, the timing of land acquisition (Pond Expansion, Flood Mitigation Area), the amount of land required, value of property, requirements of easements, etc. is required.

Discussion / Next Steps:

- This meeting is being held as an opportunity for the County to ask additional question and gain a better understanding of the proposed works.
- If the County is receptive to the proposed works, the Town is willing to undertake additional investigations and provide additional details regarding the purpose of land acquisition, the timing of land acquisition (Pond Expansion, Flood Mitigation Area), the amount of land required, value of property, requirements of easements, etc.
- The Town proposed holding a meeting to itemize the details required for a formal request.

Comment No. 3: *Alternative Solutions* Info

The County would like to know details of other alternatives that were analyzed, including but not limited to: locating the infrastructure at different locations or design alternatives at this location such as a deeper pond to limit the property impact.

If alternative solutions were not considered, the County ask that these be considered now.

The County identified that it appears the technical and engineering factors drove the location selection for the stormwater pond and proposed social and ecological factors be considered for the layout and configuration at the site.

Discussion / Next Steps:

- As a part of the Class EA Stantec completed detailed evaluation of alternative site locations. However, due to the hydraulic profiles of the sewer system and the level of development in the Town there are limited options for the location of the stormwater facilities. More specifically, the service area of the proposed Woodview stormwater pond is either fully developed or slotted for future development; therefore, expansion of the existing pond is considered the only viable solution.
- As a part of the Class EA Stantec completed detailed evaluation of alternative design solutions. Designing for a deeper pond would require an onsite pumping station with structure for electrical equipment and pumping instrumentation/controls, emergency power generator, on-site power transformer, vehicle access points for maintenance, etc. In addition, this pumping station would result in negative environmental, social, and economic impacts such as noise and vibrations, emissions, and

capital/operational costs. As a result, expansion of the existing pond with gravity outlet is considered the most viable solution.

- Stantec noted that the natural heritage assessment can be used to assess social and ecological factors and determine the most preferred location and configuration of the stormwater pond within the site.

Comment No. 4: *Impact to ERCA Building* Info

The proposed expansion of the existing stormwater pond will have an impact on the existing ERCA maintenance building and yard operations including:

- Increased risk of flooding of the building and storage area.
- Contamination risk from materials, including salt which is stored at the site.
- Limiting expansion or changes in operation of the ERCA maintenance building.

Discussion / Next Steps:

- Impacts to the ERCA building are expected to be minimal; however, these concerns will be addressed during the detailed design process through the design, layout, and location of the stormwater pond.
- There are no planned expansions of the ERCA facilities at this time; however, ERCA will confirm if any future expansions would be required. ERCA

Comment No. 5: *Environmental Mitigation Considerations* Info

The Impact of removing the successional forest that was planted as a Compensation Area to support the neighboring development is unknown and approval from MECP may be required in accordance with the Endangered Species Act.

The draft final report provided a very limited assessment of the natural heritage value which should include the required flora and fauna inventories and determination of associated negative impact and mitigating measures.

Discussion / Next Steps:

- The impacts of removing the successional forest will be determined through a detailed natural heritage assessment and mitigation methods will be included in the technical memorandum.
- The natural heritage assessment will indicate the need for registration of endangered species in accordance with the Endangered Species Act, MECP permits/approvals, and other steps to authorize this project. These permits and habitat compensation (if required) will be completed in collaboration with all parties.

The comments received from ERCA were contained within the above discussions or will be addressed as a part of the natural heritage assessment and detailed design process. Info

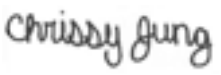
1.8: Other Business

The next steps for this project will be for the Town of Essex and the County of Essex to meet and discuss the viability of the County land being used for the Woodview SWM pond expansion. Upon the Town's approval, Stantec will begin assessment of Natural Heritage features within the study area and identify potential impacts and mitigation strategies associated with the expansion of the existing stormwater pond. Town / County

The meeting adjourned at 3:00 PM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.



Chrissy Jung M.A.Sc., E.I.T.
Process Engineer In Training

Phone: (519) 966-2250
Fax: (519) 96-5523
Chrissy.Jung@stantec.com

From:	Girard, Kevin
To:	Li, Jian
Cc:	Jung, Chrissy; McBeth, David
Subject:	FW: 165620098: Town of Essex - Southwest Ward 1 Stormwater System EA - Stantec Response to County of Essex"s review Comments
Date:	Monday, June 26, 2023 9:59:50 AM
Attachments:	image001.png image002.png image003.png image004.png image005.png image006.png image007.png image008.png essex_logo_colour_b40d5cc2-d5ad-4f11-86ac-a0d486819e52.png 058_line_9bae9502-1e3a-48a3-ba5e-34ed9cd44185.png 003_sm_fb_a1669113-305d-4ecf-bbc8-c006dd7ddaf7.png 003_sm_in_610e655e-a302-4d87-ae26-377ce3e93934.png 003_sm_twitter_ac632f2d-acfa-45dc-872a-d62866a18eee.png 003_sm_y2_e868968d-ddeb-43d2-9d96-466d86bfd691.png 003_sm_insta_f5d67e1c-f986-446b-a9ce-327354141ccb.png Ward 1 Southwest Area Stormwater Improvements EA - Infrastructure Services-2021-03(1).pdf

---

Good Morning Jian,

I have spoken to Allan at the County and we have agreed to proceed to notice of completion. Can you please make the necessary arrangements? This has already been presented to Council (see attached).

Let me know if you need anything else from me. We will also need a final copy of the EA once Notice of Completion has passed the 30 days.

Thanks,

Kevin Girard, P.Eng, MBA
Director, Infrastructure Services | Office of the CAO
P: 519.776.7336 ext. 1119 | F: 519.776.8811
E kgirard@essex.ca | www.essex.ca
33 Talbot Street S. Essex, ON N8M 1A8

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From: Girard, Kevin
Sent: Monday, May 15, 2023 3:56 PM
To: Allan Botham <ABotham@countyofessex.ca>
Cc: Jian Li (jian.li@stantec.com) <jian.li@stantec.com>; Jung, Chrissy <Chrissy.Jung@stantec.com>; McBeth, David <dmcbeth@essex.ca>
Subject: FW: 165620098: Town of Essex - Southwest Ward 1 Stormwater System EA - Stantec Response to County of Essex's review Comments

Hi Allan,

Stantec has prepared a response to your questions below. It's a very thorough response that I believe address your concerns.

The only question is with regards to the note under #5. I've had the 'compensation area' mentioned to me in the past by ERCA, however, the Town has no record of that. I did ask ERCA for it, but it was never provided. Does the County have a plan in your records that you can share with the Town? If none of us have this compensation area plan, do you have a recommendation on where to head next?

Thanks,

From: Li, Jian <jian.li@stantec.com>
Sent: Wednesday, May 10, 2023 1:30 PM
To: Girard, Kevin <kgirard@essex.ca>
Cc: Jung, Chrissy <Chrissy.Jung@stantec.com>
Subject: FW: 165620098: Town of Essex - Southwest Ward 1 Stormwater System EA - Stantec Response to County of Essex's review Comments

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Hi Kevin,

We have carefully reviewed the County of Essex's Comments on the expansion of the Woodview Stormwater Management Pond on the Civic Centre site, which is proposed in Southwest Ward 1 Stormwater System EA for the Town.

Please see the responses to the County's comments in Chrissy's email below.

Hope this satisfies the County's concerns regarding the proposed expansion of the Woodview Stormwater Management Pond on the Civic Centre site.

Please let us know if you have any questions or require additional information.

Thanks,
Jian

Jian Li, Ph.D., P.Eng., PE
Project Manager

Direct: 519 966-2250
Mobile: 519 562-7541

Stantec
2555 Ouellette Ave
Windsor ON N8X 1L9 CA

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From: Jung, Chrissy <Chrissy.Jung@stantec.com>
Sent: Wednesday, May 10, 2023 12:04 PM
To: Li, Jian <jian.li@stantec.com>
Subject: RE: 165620098: Town of Essex - Southwest Ward 1 Stormwater System EA

Hello Jian,

Please see the proposed responses for the County of Essex's list of concerns and suggestions:

1. Some of the possible alternatives were either overlooked, or discounted without comment (i.e., increase size of the Canaan Pond and size of culvert under Hwy 3). Some of these alternatives may be more preferred but would have to be confirmed as technically feasible. During our discussions to date, we received no impression that Stantec or the Town considered other alternatives. If a pond is proven to be the preferred alternative, every attempt should be made to minimize the impact to the Civic Centre land and woodlot.

   The Final Draft Environmental Study Report (ESR) entitled 'Improvements to Essex Ward 1 Southwest Storm Sewer System' outlines six (6) alternative planning level conceptual solutions which were considered to address the stormwater management needs. These solutions included: (1) do nothing, (2) runoff reduction through Low Impact development (LID) and green infrastructure, (3) field inspection and maintenance of existing storm sewers, (4) increasing hydraulic capacity of existing storm sewers, (5) construction/expansion of stormwater management ponds, and (6) a combination of the above alternatives.

   (1) The 'Do Nothing' alternative provided a benchmark for evaluation and is a required component of the environmental assessment process. If nothing is done to prepare for future development, the catchment will not have sufficient stormwater infrastructure in place to service future development. In addition, the risk of flooding and property damage would not be effectively controlled and therefore this was not considered a viable long-term solution.

   (2) The 'runoff reduction through LIDs and green infrastructure' alternative would work to reduce the volume and rate of runoff entering the storm sewer system, thereby mitigating the risks of sewer backup, flooding and property damage. These technologies manage runoff as close to the source as possible and many reduce runoff volume and/or runoff rates. Underground detention or infiltration systems (as indicated by the County of Essex) are a form of LID technology. These technologies rely primarily on infiltration to reduce the volume of runoff in the water cycle and reduce the footprint required for stormwater storage. However, the predominant soil stratum in the South Talbot catchment is one foot of topsoil overlying poorly draining Brookston Clay, which will result in poor infiltration and inability to reduce the volume of runoff. The implementation of an infiltration system is not considered feasible or justifiable from an engineering perspective and would require a significantly larger footprint and capital cost investment than a stormwater pond system. Therefore, this is not considered a practical solution.

   (3) The 'field inspection and maintenance of existing storm sewers' alternative would work to clean debris and/or sediment accumulation from existing infrastructure thereby increasing the hydraulic capacity of the system. A Hydraulic and Hydrological (H&H) analysis indicated that cleaning of these areas is not expected to significantly improve the storm system's level of service. As a result, they are considered maintenance items and not a solution to the

problem statement. It is our understanding that maintenance has been completed on a portion of the stormwater collection system and ponds.

(4) The 'increasing hydraulic capacity of existing storm sewers' alternative would work to improve the conveyance system thereby improving the storm system's level of service. Through the H&H evaluation, no improvements were identified in the Woodview Estates subcatchment area.

(5) The 'construction/expansion of stormwater management ponds' alternative would include the construction or expansion of stormwater management pond to store and release runoff at a controlled rate. A stormwater management pond, which is an engineered structure constructed to store runoff, can provide erosion and flooding control while enhancing water quality. This alternative includes the expansion of the Woodview Pond and improvements to existing storm sewers that will increase the release rate to the downstream Canaan Drain and the Essex Outlet Drain receiving channels. As a result, a new pond is proposed to service the Essex Outlet Drain outlet, and the Canaan Pond is proposed to be expanded to service the Canaan Drain outlet. This alternative is a viable solution to the identified capacity issues in the stormwater system and is therefore considered the most preferred (in combination with Alterative No.'s 3, 4, and 5). In an effort to reduce the impact to the natural environment a Natural Heritage Review was carried out and focused on identifying natural heritage features, SAR, and/or SOCC observed in the three predominant vegetation communities at the proposed site. During the implementation phase of the Class EA process (detailed design) the findings and recommendations of this Natural Heritage Review should be reviewed and considered to determine the precise location of the pond expansion and mitigate potential impacts to the natural environment.

(6) The 'combination of the above alternatives' would include a combination of Alternative No.'s 3, 4, and 5.

Please note that the suggested alternative 'increase the size of the Canaan Pond and size of culvert under Highway 3', is a part of the recommended solution outlined in the ESR. The Canaan Pond will be expanded to the maximum footprint available on the owned land parcel, a pumping station will be constructed, and the culvert under Highway 3 will be upgraded to the required service level. However, the release rate from the Woodview Pond (to the Canaan Pond) is limited by the Ministry of Environment, Conservation, and Parks Environmental Compliance Approval (No. 3-0491-97-006) which indicates the Woodview Pond must limit the flow to pre-development conditions.

2. Evaluation of alternatives.
    a. A deeper pond with a pump station may not be that bad a scenario. A pump may be required, and if required, a generator will not be used very often.

    The implementation of a deeper pond with a pumping station was reviewed and a conceptual layout is presented in Figure 1 (attached). The general layout would include an emergency generator, pumping station with a capacity of 761 L/s, and a deeper pond with a depth of 4.0 m and a side slope of 1.2, the footprint of the pond expansion at grade level would be approximately 2,800 m^2. An access road would be required to access the pumping station and emergency generator. The total footprint for the implementation of this design is smaller than that for the traditional pond system (see updated traditional pond layout below ->2. c.). However, this solution would also have a higher potential for noise and vibration impacts to the natural environment and society due to the implementation of a pumping station and emergency generator. Further, this design would require significantly higher capital cost investment, higher annual operation cost, and higher operation and maintenance

requirements. In our opinion, the reduction in the pond footprint would not outweigh the negative impacts of implementing a pumping station; therefore, it would not be considered a preferred alternative.

3. Stantec could comment on the use of underground detention/infiltration systems as show below. I'm not sure if the grades would support an infiltration gallery.

   The predominant soil stratum in the South Talbot catchment is one foot of topsoil overlying poorly draining Brookston Clay, which will result in poor infiltration and inability to reduce the volume of runoff. The implementation of an infiltration system is not considered feasible or justifiable from an engineering perspective and would require a significantly larger footprint and capital cost investment than a stormwater pond system. (Response from Item #1. (2))

4. Are you sure of the pond size proposed by Stantec? A more detailed analysis is required to accurately show the extent of property requirements… including a note about setbacks from Hwy 3.

   In an effort to reduce the impact to the Civic Centre land, Stantec would propose reducing the level of service from the '100-year storm with no ponding' to the '100-year storm with 0.3 m ponding'. This service level is acceptable based on the Windsor/Essex Region Stormwater Management Standards Manual. For a traditional pond system with a depth of 2.0 m and a side slope of 1.2, the footprint of the expansion at grade level would be approximately 5,700 m^2. An example showing the approximate size and scale of the proposed pond is shown in Figure 2 (attached). The exact size and shape of the proposed pond should be determined during detailed design and consider input from the Town of Essex, County of Essex, Essex Regional Conservation Authority, and other applicable parties.

   The Ministry of Transportation (MTO) *Public Transportation and Highway Improvement Act* indicates that a permit would be required to 'place, erect or alter any building, fence, gasoline pump or other structure or any road, or perform any grading upon or within 45 metres of any limit of the King's Highway or upon or within 180 metres of the centre point of an intersection'. The proposed pond is located at a distance greater than 45 metres (if it is found preferable during detailed design a permit may be acquired to locate the pond closer to Highway 3).

5. The Natural Heritage memo notes several recommendations for further investigation, but not mitigation. It is important to comprehend the impact of the existing "Compensation Area" that was stipulated as a requirement during the original Woodview construction from years ago. The attached proposed pond may be undermining the integrity of the compensation plan and purpose. Additional discussion with MECP seems in order. Stantec and the Town of Essex should discuss considerations to meet the obligations of the Endangered Species Act in the context of loss of this natural heritage feature.

   Stantec is unable to speak to the 'Compensation Area' plan and purpose stipulated as a requirement during the Woodview construction activities. The Town of Essex may be able to provide more details regarding this item.

In addition to the Environmental Effects and Mitigating Measures outlined in Table 4-2 of the ESR,

Stantec would propose the following mitigation measures for consideration. These have been developed based on the conceptual design and should be further refined during the detailed design phase.

Natural Environmental Impacts and Mitigating Measures

Aquatic and Terrestrial Habitat

The proposed work area may contain natural features that support habitats of endangered species and threatened species. As per Section 2.1.7 of the PPS – "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. If the proponent believes that their proposed activities are going to have an impact on Species at Risk or are uncertain about the impacts, they should contact SAROntario@ontario.ca to undergo a formal review under the ESA. It is the responsibility of the proponent to ensure that Species at Risk are not killed, harmed, or harassed, and that their habitat is not damaged or destroyed through the proposed activities to be carried out on the site.

The Woodview SWMF expansion would require trees and vegetation to be removed in the proposed pond excavation area. During construction there would be expectation for some disturbance due to construction activities. Post construction, the Woodview SWMF expansion is anticipated to have little impact on terrestrial animal life as the existing lands would remain largely forest area with a pond that could foster terrestrial animal life and natural vegetation. Stantec completed a site investigation, to document existing natural heritage conditions in the site area. The results and recommendations provided in this Natural Heritage Review are intended to inform the Town's assessment during the detailed design phase of the Woodview Pond expansion.

Protection of Migratory Birds

The Migratory Birds Convention Act, 1995 (MBCA) provides legal protection of migratory birds and their active nests in Canada. The loss of migratory bird nests, eggs and/or nestlings due to tree cutting or other vegetation clearing can be avoided by limiting clearing of vegetation to outside of the general nesting period for migratory birds in this region (C2) as identified by Environment and Climate Change Canada (ECCC) (i.e., between April 1 and August 31). If work must be performed within this window, a survey for active nests or breeding activity should be conducted by a qualified biologist before work commences and additional mitigation measures (e.g., implementation of avoidance distances during construction) implemented, if required.

Wildlife Protection

The installation of silt fencing around the work area will reduce the likelihood of reptiles entering the work area. In addition, a visual search of the construction area (including machinery) is recommended each day to locate and avoid reptiles, amphibians, and other wildlife. If wildlife is encountered, they will be given reasonable time to flee the area on their own. If a wildlife species must be moved, a person knowledgeable in handling techniques may relocate it to a location that is both safe and suitable.

Erosion and Sediment Control

Appropriate erosion and sediment controls should be employed during all phases of construction to reduce erosion and sediment transport to the extent possible. Mitigation measures to reduce the risk of negative effects:

- Silt fence will be installed around the perimeter of the work area.
- Materials requiring stockpiling (fill, topsoil, etc.) will be stabilized.
- Disturbed areas are to be restored with erosion protection/vegetative cover following disturbance.
- Erosion and sediment control materials (silt fence, straw bales, clear stone) are to be kept on site for emergencies and repairs.
- Erosion and sediment controls should be monitored and maintained, as required. Controls are to be removed only after the soils of the construction area have been stabilized and adequately protected until cover is re-established.
- Conditions of the anticipated Essex Regional Conservation Authority (ERCA) permit under Ontario Regulation (O. Reg.) 158/06 will be followed during these activities.

Excess Soil Materials and Waste

In 2019, the MECP introduced O. Reg. 406/19 entitled 'On-site and Excess Soil Management' under the *Environmental Protection Act*. All excess soil materials and waste generated during the construction process must be disposed of in accordance with O. Reg. 406/19.

Archaeological Resources

During the Implementation of this project, should previously undocumented archaeological resources be discovered, there may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. 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*. If any further archaeological field investigation is required, as identified above, the Town will engage with all indigenous communities and facilitate the participation in archaeological field work (if applicable).

The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

If you have any questions or concerns, please let me know.

Thanks,

Chrissy Jung M.A.Sc., P.Eng.
Environmental Engineer

Direct: 519 966-2250 ext 322

chrissy.jung@stantec.com

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Windsor ON N8X 1L9

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From: Girard, Kevin <kgirard@essex.ca>
Sent: Thursday, April 13, 2023 1:26 PM
To: Rindlisbacher, Hannah <Hannah.Rindlisbacher@stantec.com>
Subject: Fwd: 165620098: Town of Essex - Southwest Ward 1 Stormwater System EA

Kevin Girard, P.Eng, MBA
Director, Infrastructure Services | Office of the CAO
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Begin forwarded message:

From: Allan Botham <ABotham@countyofessex.ca>
Date: April 12, 2023 at 11:00:16 AM EDT
To: "Girard, Kevin" <kgirard@essex.ca>
Subject: 165620098: Town of Essex - Southwest Ward 1 Stormwater System EA

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Good morning,

I met this morning with our team to catch up on the subject project and the proposal to expand the SWM facility on the Civic Centre site.

Since the February 16, 2022 meeting, the Town of Essex has completed three things directly related to the Woodview SWM Facility portion of the EA.

1. Performed maintenance on the pond and drain running through the Civic Centre property
2. Competed a Natural Heritage Review memo dated December 1, 2022 (attached)
3. Provided an email from Jian Li (Stantec) which included an updated layout of a pond expansion dated January 3, 2023.

Unless I am mistaken, this work is intended to complete the subject EA and file with the Ministry. Further discussion would occur when and if the Town wants to proceed with a final design and construction.

With that, I am not convinced that the Town has addressed all of our concerns/suggestions, and I'm certain that the process would benefit from County Council's approval to support the preferred alternative. Consider that the proposed pond isn't an open lawn area or a farmed field, but "compensation" areas from previous constructions.

The concerns/suggestions are:

1. Some of the possible alternatives were either overlooked, or discounted without comment (i.e. increase size of the Canaan Pond and size of culvert under Hwy 3). Some of these alternatives may be more preferred, but would have to be confirmed as technically feasible. During our discussions to date, we received no impression that Stantec or the Town considered other alternatives. If a pond is proven to be the preferred alternative, every attempt should be made to minimize the impact to the Civic Centre land and woodlot.
2. Evaluation of alternatives.
    1. A deeper pond with a pump station may not be that bad a scenario. A pump may be required, and if required, a generator will not be used very often.
    2. Stantec could comment on the use of underground detention/infiltration systems as show below. I'm not sure if the grades would support an infiltration gallery. (see Figure 1)
    3. Are you sure of the pond size proposed by Stantec? A more detailed analysis is required to accurately show the extent of property requirements… including a note about setbacks from Hwy 3.

Figure 1

3. The Natural Heritage memo notes several recommendations for further

investigation, but not mitigation. It is important to comprehend the impact of the existing “Compensation Area” that was stipulated as a requirement during the original Woodview construction from years ago. The attached proposed pond may be undermining the integrity of the compensation plan and purpose. Additional discussion with MECP seems in order. Stantec and the Town of Essex should discuss considerations to meet the obligations of the Endangered Species Act in the context of loss of this natural heritage feature.

We are looking for confidence that this is the right solution as we make recommendations and demonstrate good stewardship of County lands.
I look forward to you setting up our next meeting and hearing your strategy to address our concerns.

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Appendix E FUTURE DEVELOPMENT DOCUMENTS

1. Highway 3 Widening

    a. Hwy 3 Improvements Culvert Hydrology Report, Draft, March 2014

    b. Hwy 3 Preliminary Design Drawings, July 2017

2. Splash Pad Essex Arena – Correspondence for Preliminary Design

3. Outdoor sports facility at lot on SW corner of Hwy 3 & North Malden Rd – Windsor Star newspaper article, Sept. 2016.

Ontario

MINISTRY OF TRANSPORTATION
MINISTÈRE DES TRANSPORTS

Highway 3 Improvements
Town of Essex

GWP 317-98-00

Culvert Hydrology and Condition Report (Draft)

March 2014

DILLON
CONSULTING

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Appendix B CulvertMaster Existing Conditions Hydraulic Assessment
Appendix C CulvertMaster Proposed Conditions Hydraulic Assessment

1. BACKGROUND INFORMATION SUMMARY

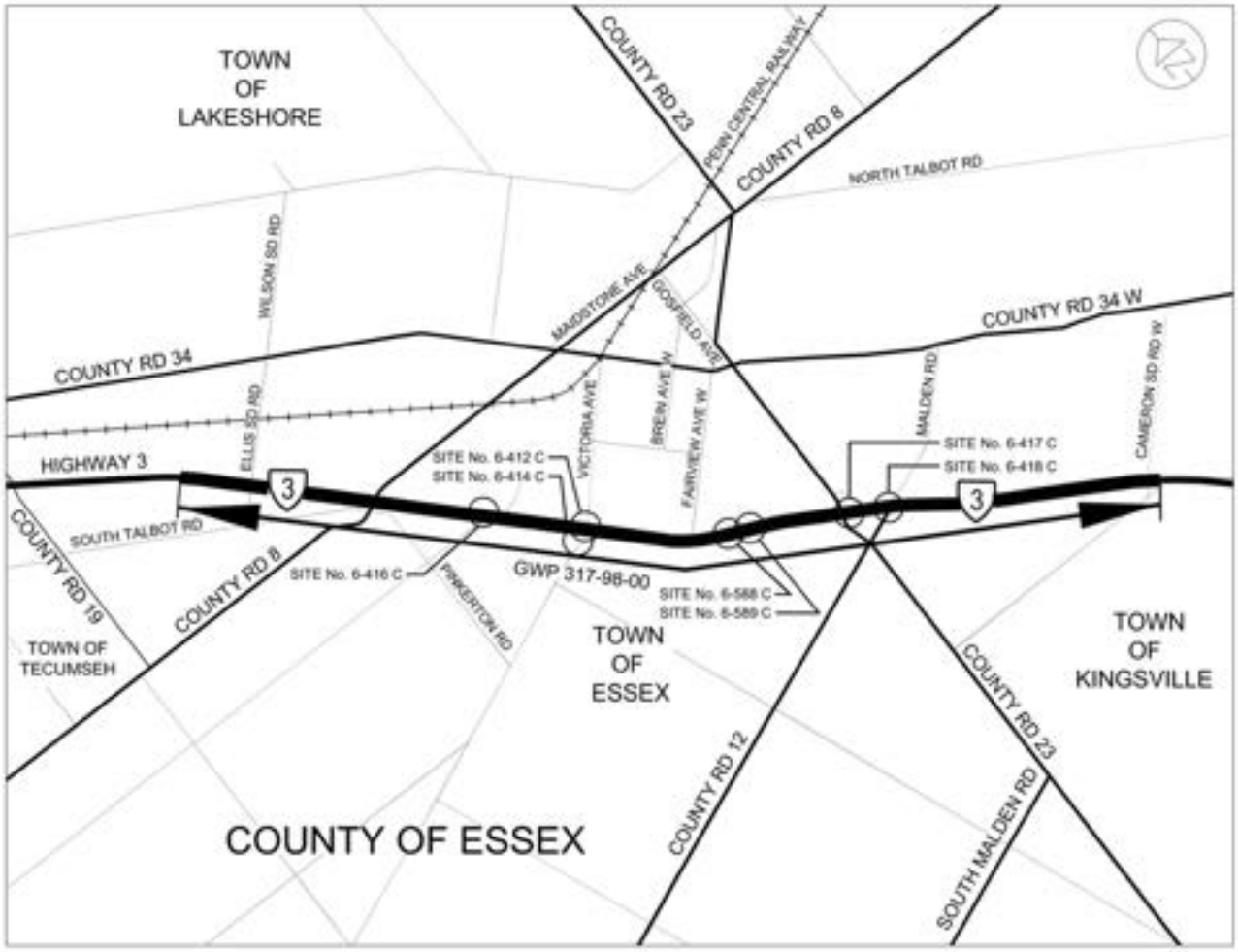
In January 2006, the Ministry of Transportation, Ontario (MTO) completed the Highway 3 Planning and Preliminary Design Study from Outer Drive in Windsor easterly 33.5 km to the east junction of Essex County Road 34 in Leamington (GWP 315-98-00). The Transportation Environmental Study Report (TESR) prepared for the project recommended widening the highway to four lanes with a 15 m grassed median and improving all at-grade intersections. It also recommended that a more comprehensive study be undertaken to address safety, traffic and operational issues through the Town of Essex.

The more detailed study recommended by the TESR was completed in 2010 and is documented in a Transportation Needs Assessment Report, Town of Essex Transportation Study, covering Highway 3 from 3.1 km west of Essex County Road 8 (Maidstone Avenue) to 1.3 km east of Essex County Road 23 (GWP 3008-06-00). To address future safety, traffic and operations issues, the 2010 study recommended a southerly shift of the highway alignment through the Town of Essex and modifications to highway intersections and the local municipal road network. The 2010 study was not completed as an environmental assessment (EA).

Some of the improvements included in the 2006 TESR, such as the widening of Highway 3 to four lanes from Windsor to Leamington, received environmental clearance under the *Environmental Assessment Act* in August 2006. The purpose of the current Class EA, Preliminary Design and initial Detailed Design Study is to revisit the alternatives developed in the 2010 study, building on the preferred alternatives identified in the 2006 TESR and 2010 study, and to assess the alternatives according to the requirements of MTO's Class EA for Provincial Transportation Facilities (2006). The TESR Addendum documents the decision-making process leading to the selection of the updated preferred Preliminary Design of improvements to Highway 3 through the Town of Essex.

The Study Area for the project extends along Highway 3 for 7.4 km from 0.5 km west of Ellis Sideroad easterly to 2 km east of Essex County Road 23. The location of the Highway 3 Improvement project is illustrated on **Figure 1**.

Figure 1: Highway 3 Project Limits



1.1 Previous Drainage Studies

In 2006, Earth Tech completed the Preliminary Design and Environmental Assessment of Highway 3 from Outer Drive 33.5 km easterly to the junction of County Road 34 under GWP 315-98-00. As part of the Preliminary Design, Earth Tech prepared a Drainage Report with recommendations for replacement and sizing of existing and proposed drainage infrastructure. In general, the report recommended that all existing CSP culverts be replaced based on the observed conditions of the culverts and the installation dates of the drainage infrastructure. A hydraulic analysis completed for the structural culverts concluded that several have deficient capacity. The condition of the existing drainage infrastructure and the hydraulic capacity of the key structural and non-structural culverts have been evaluated as part of this study.

1.2 Project Scope and Data Collection

The 2006 TESR recommended that Highway 3, through the project limits, be widened to four lanes with a 15 m wide grassed median. Improved at-grade intersections with turning lanes were recommended at all intersections. The recommended widening of Highway 3 requires the extension of structural and non-structural culverts that convey Municipal drain system flows from the north side of Highway 3, through the corridor, to the south. The proposed grade separation at Victoria Avenue also requires the construction of a new culvert through the Highway 3 corridor to convey stormwater discharge from the Essex Outlet Drain to the downstream receiving watercourse. Specifically, the highway improvements recommended as part of the current Preliminary Design study include:

- Southerly shift of the Highway 3 alignment through the Town of Essex
- Partial closure of Highway 3/Ellis Sideroad intersection and construction of a cul-de-sac on the south side of the Highway corridor
- Realignment of South Talbot Road, Essex County Road 8 and Pinkerton Sideroad
- Overpass grade separation at Highway 3 and Victoria Avenue, combined with a multi-use trail constructed north of the proposed overpass embankment
- Municipal improvements at various intersections throughout the Study Area.

The primary purpose of Dillon's Culvert Hydrology and Condition Report is to document the drainage and hydrology engineering component of the Preliminary Design process. Specifically, this report covers:

- Physical condition of the existing structural and non-structural culvert impacted by the highway improvements
- Field investigations and background review of historic flooding or erosion issues at the existing culvert locations
- Hydraulic performance of the existing culverts impacted by the proposed highway improvements compared to MTO Drainage Design Standards
- Hydraulic performance of the proposed culvert configurations compared to MTO Drainage Design Standards
- Summary of recommended mitigation/improvement works for the proposed culvert configurations. These will be included in the Detailed Design of the structural and non-structural culverts.

To complete the condition assessment and hydraulic performance evaluation, several field investigations were completed by the drainage and structural design teams. The structural design team focused on the structural culvert condition assessments, while members of the drainage team undertook the non-structural culvert condition assessment, making note of any signs of flooding and erosion/scour in the watercourses. To complete the required hydrologic and hydraulic assessment of the existing and proposed culvert configurations, the following mapping and data sources were used:

- GIS base mapping from Ministry of Natural Resources (MNR), MTO and the County of Essex
- Ground survey data produced as part of the Preliminary Design
- Municipal Drain reports obtained from the local municipalities and County of Essex
- 2006 Earth Tech Preliminary Design/TESR Drainage Report.

1.3 Existing Condition Summary

As shown on **Figure 2**, six structural and three non-structural culverts cross Highway 3 within the project limits. The structural culverts consist of a group of five open-footing concrete non-rigid frame culverts and one horizontal elliptical corrugated steel structural plate culvert. The non-structural culverts consist of a group of two small diameter corrugated steel pipe culverts and one 2.44 m span open-footing concrete non-rigid frame culvert. In addition, there are several non-structural culverts located within the Study Area at Pinkerton Sideroad and an existing storm sewer outfall structure at the intersection of Victoria Avenue and South Talbot Road that form key components of the surface water drainage system within the Highway 3 corridor. Several other non-structural small diameter corrugated steel pipe culverts that also facilitate highway drainage will be eliminated or reconfigured as part of the Highway 3 improvements.

Figure 2: Structural and Non-Structural Culvert Locations within Project Limits

2. CONDITION ASSESSMENT

As indicated in the 2006 Preliminary Design study completed by Earth Tech, the general condition of all corrugated steel pipes (CSP) culverts within the project limits were found to be moderate to poor. Due to the proposed widening of Highway 3 and reconfiguration of side-roads, most of the non-structural CSP culverts will be eliminated or significantly impacted, therefore necessitating replacement. The non-structural CSP culverts impacted by the proposed improvements were not assessed in detail as part of the Preliminary Design update. The final location, configuration and size of the drainage ditch, side-road and entrance culverts (if necessary) will be determined during Detailed Design.

2.1 Non-Structural CSP and Concrete Culverts

There are two non-structural CSP culverts and one non-structural open-footing non-rigid-frame concrete culverts crossing the existing lanes of Highway 3 within the project limits. **Table 2** summarizes the physical configuration and condition of the existing non-structural culverts.

Table 2: Condition Assessment of Non-Structural Culverts Crossing Highway 3

Drain Name/ Classification	Existing Size	Location (Station)	Inlet	Outlet	Barrel	Condition Assessment
Unnamed Drain	750 mm x 29.67 m	14+018 Hwy 3				General condition – Poor, rusted spring line, damaged inlet/outlet Less than minimum acceptable (800 mm) size
Talbot Road South Drain A	750 mm x 22.31 m	15+489 Hwy 3				General condition – Poor, rusted spring line, damaged inlet/outlet Less than minimum acceptable (800 mm) size
Barlow Drain	2400 mm x 1830 mm x 28.58 m	11+623 Hwy 3			Not available	General Condition – Good, some minor surface scaling and leaking construction joints - Well vegetated channel and minimal channel degradation due to erosion and scour - No signs of capacity related deficiencies, including flooding or local erosion

The two CSP culverts crossing the existing lanes of Highway 3 are in poor condition and have reached the end of their useful lifespan. Both 750 mm CSP culverts require replacement and upsizing to meet current MTO Design Criteria for minimum size. The Barlow Drain culvert, a 2400 x 1830 mm concrete culvert, is in generally good condition and will provide an opportunity for an interim extension to the south to accommodate the proposed lane transitions at the easterly end of the project, as well as the ultimate culvert extension required for the twinning of Highway 3 to the east. Several other roadside ditch drainage culverts located within the project limits require replacement or modification due to the proposed local municipal road improvements. The final configuration and sizing of these roadside ditch culverts will be addressed during Detailed DesignStructural Culverts.

Six additional structural culverts cross the existing lanes of Highway 3 within the project limits. The condition assessment of these culverts was completed as part of the preparation of the Structural Design Reports (SDRs). **Table 3** summarizes the condition assessment, including the condition of the channel embankment and watercourse within the culvert barrels.

Table 3: Condition Assessment of Structural Culverts Crossing Highway 3

Drain Name/ Classification	Existing Size (Width x Height x Length)	Site Number	Location (Highway 3 Station)	Inlet/Outlet	Culvert Barrel	Embankment and Watercourse
14th Concession East Drain	3050 mm x 1524 mm x 26.95 m	6-416C	13+892	No existing headwalls	Inside of culvert in good condition. Minor surface scaling and narrow and medium width shrinkage cracks. Efflorescence and rust staining at crack locations	Approximately 350 mm of silt and sediment measured over top of footings. Embankments are in good condition
Essex Outlet Drain	3600 mm x 1830 mm x 36.79 m and 1830 mm x 1220 mm x 40.16 m	6-412C	14+750	Grouted natural stone retaining walls in fair to poor condition	Inside of culvert is in good condition. Isolated transverse shrinkage cracking and small areas of spalling and delamination. Area of delamination of the soffit with exposed corroded reinforcing steel in soffit. CSP overflow culvert in generally good condition	Silt aggradation along east side of stream inside culvert. Some accumulated sediments and standing water within culvert. Embankment slopes are steep and irregular at inlet and outlet of culvert. No significant erosion observed
Canaan Drain	3350 mm x 2070 mm x 26.28 m	6-588/C	15+954	Concrete end walls in good condition with isolated narrow to wide cracking	Inside of culvert in good condition, with widespread loss of galvanization and light corrosion along the spring line	Approximately 400 mm to 460 mm of standing water inside culvert limiting visual inspection below spring line. No signs of settlement or defects in streambed or embankment

Drain Name/ Classification	Existing Size (Width x Height x Length)	Site Number	Location (Highway 3 Station)	Inlet/Outlet	Culvert Barrel	Embankment and Watercourse
Talbot Road South Drain B	3050 mm x 1220 mm x 22.76 m	6-589/C	16+137	Concrete wingwalls in good condition but isolated severe spalling near culvert side walls. Appears to be some movement of walls causing stresses and spalling at joints	Inside of culvert in good condition but shrinkage cracks in side wall and soffit. Cracks at side wall drain locations. A wide crack was noted near inlet with an area of delamination	Approximately 150 mm of silt and sediment measured over tops of footings. No standing water or flow within culvert at time of inspection. Embankments in good condition with cinder blocks stacked at southwest wingwall indicating a historical erosion problem
East Townline/ West Townline Drain	3660 mm x 2100 mm x 41.63 m	6-417/C	10+017	Concrete wingwalls at south end of culvert are in good condition	Inside of culvert in good condition but several shrinkage cracks in side walls and soffit ranging from narrow to wide. A narrow crack in the soffit was noted near the inlet with an area of soffit delamination	Approximately 300 mm of silt and sediment measured over top of footings. No standing water or flow within culvert at time of inspection. Existing rip-rap protection appears to be functioning but appears excessively steep in northwest corner
Russell Drain	3050 mm x 1650 mm x 25.66 m	6-419/C	10+331	Concrete wingwalls at north end are in generally good condition	Inside of culvert is in very good condition with minor transverse shrinkage cracking	Approximately 300 mm of silt and sediment measured over top of footings. No standing water or flow within culvert at time of inspection. No embankment or erosion issues noted

In general, all of the structural culverts are in good condition. All of the culverts, with exception of the Canaan Drain, will require minor concrete repairs and rehabilitation. A number of crossings with wingwalls at the inlet/outlet require rehabilitation. These culverts will be considered for extension to eliminate the need for costly wingwall repairs and the need to install guardrail systems along Highway 3 to protect motorists from roadside hazards.

2.2 Design Criteria for Watercourse Crossing

This section includes the required hydrologic and hydraulic design criteria for use in the design and rehabilitation of highway drainage infrastructure under MTO's jurisdiction. The MTO 2008 Drainage Design Standard was used to define the relevant design criteria for each crossing and represents a consolidation of hydraulic performance indicators considered as part of the evaluation of the culverts impacted by the proposed highway improvements.

Table 4 contains design criteria for the group of structural and non-structural culverts crossing Highway 3 that are directly impacted by the highway widening from two lanes undivided to a four lane divided configuration. The table also presents the relevant design criteria for a new culvert required to accommodate the extension of South Talbot Road over 14th Concession Drain, west of Victoria Avenue.

Since Talbot Road South Drain crosses the Highway 3 corridor in two separate locations, the two branches have been designated as Branch 'A' and Branch 'B'. This designation applies to this culvert hydrology study only and should not be misinterpreted as part of the official Municipal Drain designation.

Table 4: Culvert Design Criteria

Drain Name/Classification	Location	Classification and Type	Design Flow Return Period	Check Flow Return Period	Freeboard Requirement	Clearance Requirement	Max Headwater/Depth Ratio or 1.5 Max Depth
14th Concession Drain	13+892 Highway 3	Structural – Open-Footing	50-Year	130% of 100-Year	1.0 m	0.3 m	n/a
14th Concession Drain – South Talbot Road Extension	9+108 South Talbot Road	Structural – Open-Footing	25-Year	115% of 100-Year	1.0 m	0.3 m	n/a
Unnamed Drain	14+018 Highway 3	Non-Structural Closed Footing	50-Year	130% of 100-Year	1.0 m	n/a	1.5
Essex Outlet Drain	14+742 Highway 3	Structural – Open-Footing	50-Year	130% of 100-Year	1.0 m	0.3 m	n/a
Talbot Road South Drain A	15+489 Highway 3	Non-Structural Closed Footing	50-Year	130% of 100-Year	1.0 m	n/a	1.5
Canaan Drain	15+954 Highway 3	Structural – Closed Footing	50-Year	130% of 100-Year	1.0 m	n/a	4.5 m
Talbot Road South Drain B	16+138 Highway 3	Structural – Open-Footing	50-Year	130% of 100-Year	1.0 m	0.3 m	n/a
East Townline/West Townline Drain	10+016 Highway 3	Structural – Open-Footing	50-Year	130% of 100-Year	1.0 m	0.3 m	n/a
Russell Drain	10+331 Highway 3	Structural – Open-Footing	50-Year	130% of 100-Year	1.0 m	0.3 m	n/a
Barlow Drain	11+623 Highway 3	Non-Structural Open-Footing	50-Year	130% of 100-Year	1.0 m	0.3 m	n/a

3. HYDROLOGIC/HYDRAULIC PERFORMANCE ASSESSMENT

3.1 Hydrologic Analysis

The hydrologic analysis was completed in accordance with accepted methods outlined in the MTO Drainage Design Manual. The hydrologic drainage area characteristics presented in the following sections were obtained from the previously completed Preliminary Design drainage study, official Municipal Drain mapping obtained from the local municipalities and County of Essex, and topographic mapping from MNR.

Figure 3 illustrates the individual drainage areas consolidated from all sources of municipal drain information available for the Study Area. The Municipal Drains fall within the Canard River subwatershed area and generally flow in a north to south direction through the study area and an east to west direction downstream of the Highway 3 corridor. The Canard River is a significant tributary to the Detroit River, terminating in the Town of Amherstburg. The drainage areas associated with this section of Highway 3 are comprised of a combination of rural agricultural and low density rural residential land use. The Essex Outlet Drain drainage area comprises primarily urbanized lands within the Town of Essex.

All of the municipal drains within the Study Area are artificially created watercourses that convey characteristically peaky flows from frequent low-intensity rainfall events based on the configuration of the conveyance system, lack of definable floodplain area and minimal detention storage within the subcatchment areas. Infrequent high-intensity rainfall events (25-Year Return Period and above) characteristically use up available storage within the conveyance systems and result in the municipal drains overtopping their natural banks and spilling out into adjacent low-lying areas or the agricultural fields that they drain. Due to the surrounding topography, once the conveyance systems spill to adjacent lands, runoff is stored and attenuated to a high degree, controlling peak flows through the system and generally significantly reducing peak flows discharged to the lower reaches of the drainage systems. For the purpose of the assessment and design of the proposed highway improvement works, a conservative approach was taken to applying peak flow reductions due to storage and attenuation. In general, only minor storage reduction factors were incorporated into the hydrologic modeling of the drainage areas.

Figure 3: Study Area Municipal Drain Drainage Boundaries

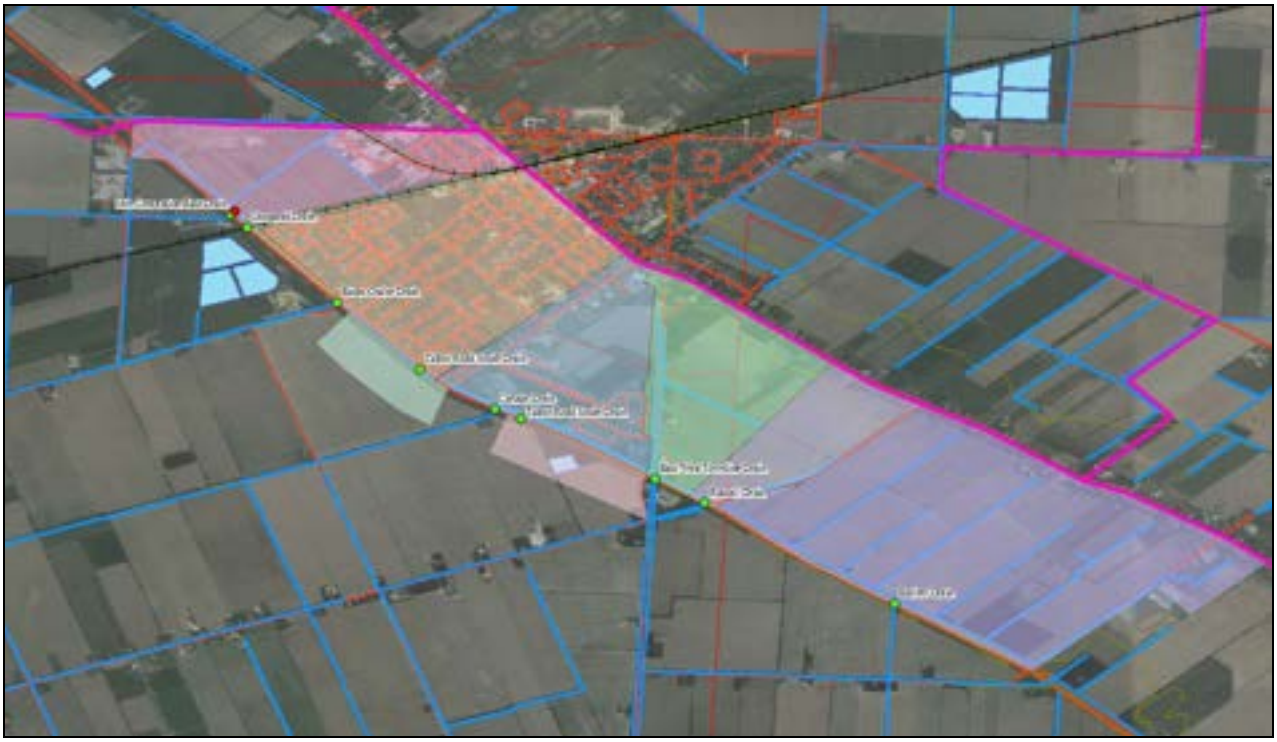


Table 5 summarizes hydrologic characteristic data based on existing land use mapping, topographic mapping and aerial photo interpretation. The hydrologic characteristics reflect the existing land use characteristics within the drainage area and do not consider future urbanization of the lands north of the Highway 3 corridor. Future development north and south of the Highway 3 corridor will require site stormwater management plans based on the objective of maintaining existing flows to each municipal drain system.

Table 5: Drainage Area Hydrologic Characteristics Summary

Crossing Location	Watershed Area (ha)	Watershed Length (m)	Watershed Slope (%)	Estimated Runoff Coefficient
14th Concession Drain	99.03	1200	0.07	0.35
14th Concession Drain – South Talbot Road Extension	99.03	1200	0.07	0.35
Unnamed Drain	11.09	1600	0.01	0.35
Essex Outlet Drain	186.85	1800	0.12	0.60
Talbot Road South Drain A	24.84	600	0.10	0.35
Canaan Drain	129.56	1300	0.15	0.40
Talbot Road South Drain B	27.63	600	0.10	0.35
East Townline/West Townline Drain	97.77	1400	0.11	0.35
Russell Drain	54.82	1350	0.06	0.35
Barlow Drain	284.79	2250	0.04	0.35

Tables 6 and **7** summarize the calculated peak flow data determined by the hydrologic analysis completed for this assignment. The MTO Modified Rational Method and peak flows generated by a Visual Otthymo model of the drainage area are presented in the summary tables. Typically, the peak flow data generated by the MTO Modified Rational Method is suitable for small watershed areas up to a maximum of 50 ha to 75 ha. The Modified Rational Method tends to over-estimate peak runoff flow rates for drainage areas exceeding this size. **Table 8** summarizes the consolidated design flows applicable to each crossing location based on watershed characteristics and size. Annual maximum rainfall intensities for each return period design storm were obtained from the MTO IDF curve lookup web-based application. The detailed Visual Otthymo hydrologic modeling output summaries are included in **Appendix A**.

Table 6: MTO Modified Rational Method Peak Flow Summary

Crossing Location	2-Year Design Flow (cms)	5-Year Design Flow (cms)	10-Year Design Flow (cms)	25-Year Design Flow (cms)	50-Year Design Flow (cms)	100-Year Design Flow (cms)
14th Concession Drain	1.0	1.3	1.7	2.1	2.6	3.3
14th Concession Drain – South Talbot Road Extension	1.0	1.3	1.7	2.1	2.6	3.3
Unnamed Drain	0.1	0.1	0.1	0.1	0.2	0.2
Essex Outlet Drain	6.1	7.8	10.0	12.2	15.3	19.9
Talbot Road South Drain A	0.4	0.5	0.6	0.7	0.9	1.2
Canaan Drain	1.9	2.4	3.1	3.8	4.8	6.3
Talbot Road South Drain B	0.4	0.5	0.7	0.8	1.0	1.3
East Townline/West Townline Drain	1.1	1.3	1.8	2.1	2.7	3.5
Russell Drain	0.5	0.6	0.9	1.0	1.3	1.7
Barlow Drain	1.6	1.9	2.6	3.9	4.9	6.4

Table 7: Visual Otthymo Peak Flow Summary

Crossing Location	2-Year Design Flow (cms)	5-Year Design Flow (cms)	10-Year Design Flow (cms)	25-Year Design Flow (cms)	50-Year Design Flow (cms)	100-Year Design Flow (cms)
14th Concession Drain	0.8	1.2	1.8	2.5	3.0	3.5
14th Concession Drain – South Talbot Road Extension	0.8	1.2	1.8	2.5	3.0	3.5
Unnamed Drain	0.1	0.1	0.1	0.1	0.2	0.2
Essex Outlet Drain	3.1	4.6	6.9	9.2	11.0	12.7
Talbot Road South Drain A	0.3	0.4	0.7	0.9	1.1	1.3
Canaan Drain	1.3	1.9	3.0	4.1	4.9	5.7
Talbot Road South Drain B	0.3	0.5	0.7	1.0	1.2	1.4

Crossing Location	2-Year Design Flow (cms)	5-Year Design Flow (cms)	10-Year Design Flow (cms)	25-Year Design Flow (cms)	50-Year Design Flow (cms)	100-Year Design Flow (cms)
East Townline/West Townline Drain	0.8	1.2	1.9	2.6	3.1	3.7
Russell Drain	0.4	0.6	0.9	1.3	1.5	1.8
Barlow Drain	1.2	1.8	2.8	3.8	4.5	5.2

Table 8: Consolidated Design Flows

Crossing Location	Return Period of Design Flow	Design Flow – Freeboard and Clearance Assessment (cms)	Check Flow – Erosion Potential Assessment (cms)
14th Concession Drain	50-Year	3.0	4.5
14th Concession Drain – South Talbot Road Extension	25-Year	2.5	4.0
Unnamed Drain	50-Year	0.2	0.3
Essex Outlet Drain	50-Year	11.0	16.5
Talbot Road South Drain A	50-Year	1.1	1.7
Canaan Drain	50-Year	4.9	7.4
Talbot Road South Drain B	50-Year	1.2	1.8
East Townline/West Townline Drain	50-Year	3.1	4.8
Russell Drain	50-Year	1.5	2.3
Barlow Drain	50-Year	4.5	6.8

3.2 Hydraulic Performance Assessment

The following sections summarize the hydraulic performance assessment completed on the existing structural and non-structural culverts directly impacted by the proposed highway widening and side-road realignments. The purpose of the existing conditions performance assessment was to provide a baseline condition to assess the performance of the proposed culverts required to accommodate the improvements. **Section 3.2.1** summarizes the hydraulic assessment completed for the existing culvert configurations, **Section 3.2.2** summarizes the hydraulic assessment completed for the proposed culvert arrangements and **Section 3.2.3** compares existing versus proposed hydraulic conditions.

3.2.1 Existing Conditions Hydraulic Performance Assessment

The existing municipal drain culverts were evaluated to assess the hydraulic performance of the structures and establish the baseline conditions against which the new culvert arrangements required to accommodate the proposed highway improvements will be compared. The hydraulic

performance of the existing culverts was also evaluated against the required design criteria for each culvert location, as shown in **Table 4**.

Table 9 summarizes the hydraulic performance indicators resulting from applying the design and check flows to the existing culvert geometry.

Table 9: Existing Culvert Hydraulic Performance Assessment Summary

Crossing Location	Existing Culvert Configuration (Width x Height x Length)	Design Storm Computed Headwater Elevation	Headwater Depth/ Height Ratio	Flow Regime	Check Storm Outlet Velocity (m/s)	Resultant Freeboard (m)	Resultant Clearance (m)
14th Concession East Drain	3050 mm x 1524 mm x 26.95 m	192.920	73%	Subcritical	1.18	1.04	0.41
Unnamed Drain	750 mm x 29.67 m	193.790	63%	Subcritical	1.51	1.12	n/a
Essex Outlet Drain	3600 mm x 1830 mm x 36.79 m and 1830 mm x 1220 mm x 40.16 m	193.670	113%	Surcharged	2.08	1.26	-0.24
Talbot Road South Drain A	750 mm x 22.31 m	195.150	252%	Surcharged	3.68	0.10	n/a
Canaan Drain	3350 mm x 2070 mm x 26.28 m	192.700	71%	Subcritical	1.57	2.56	n/a
Talbot Road South Drain B	3050 mm x 1220 mm x 22.76 m	193.700	34%	Subcritical	1.81	1.58	0.80
East Townline/ West Townline Drain	3660 mm x 2100 mm x 41.63 m	193.340	66%	Subcritical	1.06	2.12	0.71
Russell Drain	3050 mm x 1650 mm x 25.66 m	192.960	36%	Subcritical	1.61	2.49	1.06
Barlow Drain	2400 mm x 1830 mm x 28.58 m	194.210	105%	Surcharged	1.52	1.24	-0.10

In existing condition, 14th Concession East, Unnamed Drain, Canaan Drain, Talbot Road South Drain B, East Townline/West Townline and Russell Drain all meet or exceed the required performance targets based on the existing culvert configuration, type and location within the Highway 3 corridor. Currently, Essex Outlet Drain, Talbot Road South Drain A and Barlow

Drain are all operating below the expected level of service based on the existing culvert configuration, type and location. Notably, the Branch 'A' crossing of the Talbot Road South Drain, an existing 750 mm CSP culvert, is operating with a project headwater depth to diameter ratio of 252%. Typically, surcharging of a small diameter CSP of this configuration would be limited to approximately 150%. The projected design flow freeboard depth is also deficient at this location, leading to the possibility of overtopping of Highway 3 during extreme precipitation events. Essex Outlet Drain and Barlow Drain are both operating below ideal levels of service and experience minor surcharging for the design storm flows at each crossing location. At both locations, the structures are submerged and the required clearance between the projected headwater elevation and the underside of the culvert soffit are not achieved. However, both locations have sufficient freeboard depths based on the required design criteria for the structures. Based on the existing hydraulic performance of the Essex Outlet Drain, Talbot Road South Branch 'A' Drain, and Barlow Drain, consideration should be given to upsizing the structures to compensate for excessive headwater to depth ratios, lack of freeboard or deficient clearance at the structure inlets.

For all locations, the calculated freeboard depth for the existing culvert, referenced from the lowest edge of pavement elevation at the culvert crossing location, was established based on the existing profile of Highway 3. The projected downstream channel velocities for the check storm flows are projected to exceed the scour protection qualities of natural vegetation at Essex Outlet and Talbot Road South Branch 'A' Drain. Additional erosion protection or channel hardening should be considered at these locations to guard against future erosion and scour at the culvert inlet and outlet locations.

The detailed CulvertMaster Hydraulic output data for the existing condition assessment is included in **Appendix B**.

3.2.2 Proposed Conditions Hydraulic Performance Assessment

The proposed municipal drain culverts were assessed to evaluate the resultant hydraulic performance of the culvert arrangements required to accommodate the proposed highway improvements. The hydraulic performance of the proposed culvert arrangements were also evaluated against the required design criteria summarized in **Table 4** for each crossing location.

Table 10 summarizes the proposed modifications to the existing municipal drain culvert arrangements that are required to accommodate the proposed highway improvements.

Table 10: Proposed Culvert Hydraulic Performance Assessment Summary

Crossing Location	Summary of Proposed Highway 3 Improvement Works	Site/Culvert Design Considerations	Proposed Culvert Configuration
Extended 14th Concession East Drain	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• 33.34 m right extension required to accommodate new EBL of Highway 3 and proposed 15 m open-ditch median	3050 mm x 1524 mm x 60.29 m
New Proposed 14th Concession East Drain (South Talbot Road Extension)	• Construction of South Talbot Road Extension	• The South Talbot Road Extension creates the need for a new crossing of 14th Concession East Drain approximately 8 m upstream of the existing Highway 3, 14th Concession East Drain culvert • Establish culvert sizing based on freeboard and clearance requirements of future South Talbot Road Extension profile	Determine based on Hydraulic Assessment
Unnamed Drain	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• Existing CSP culvert is in poor condition requiring replacement • Existing CSP culvert does not meet MTO minimum diameter requirements based on location within Highway 3 corridor • Establish culvert sizing based on 800 mm minimum diameter and required headwater/freeboard	Determine based on Hydraulic Assessment
Proposed Essex Outlet Drain (Victoria Avenue)	• Intersection improvements at South Talbot Road and Victoria Avenue • Pavement and radii improvements in southwest quadrant and proposed multi-use trail system require a modified outlet to be constructed	• Existing outlet consists of two drainage enclosures that join together in one common headwall arrangement • Existing drainage enclosures are non-structural modified box sections	Determine based on Hydraulic Assessment

Crossing Location	Summary of Proposed Highway 3 Improvement Works	Site/Culvert Design Considerations	Proposed Culvert Configuration
Proposed Essex Outlet Drain	• Widening of Highway 3 from 2-lane undivided to 4-lane divided configuration • Construction of Victoria Avenue overpass structure • Addition of a multi-use trail system within Highway 3 corridor • Minor reconfiguration of intersection of Victoria Avenue and South Talbot Road	• Existing culvert arrangement to be replaced with single span culvert crossing proposed (shifted) lanes of Highway 3 and overpass embankment • Consider construction staging and geotechnical requirements for placement of final culvert crossing Highway 3 • Establish culvert sizing based on existing headwater elevation, freeboard and clearance requirements	Determine based on Hydraulic Assessment
Talbot Road South Drain A	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• Existing CSP culvert is in poor condition requiring replacement • Existing CSP culvert does not meet MTO minimum diameter requirements based on location within the Highway 3 corridor • Establish culvert sizing based on 800 mm minimum diameter and required headwater/freeboard	Determine based on Hydraulic Assessment
Canaan Drain	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• 34.00 m right extension required to accommodate new EBL of Highway 3 and proposed 15 m open-ditch median • 8.14 m left extension required to accommodate 4:1 side-slopes, grading detail, and no guiderail for WBL	3350 mm x 2070 mm x 68.45 m
Talbot Road South Drain B	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• 29.21 m right extension required to accommodate new EBL of Highway 3 and proposed 15 m open-ditch median	3050 mm x 1220 mm x 51.99 m
East Townline/West Townline Drain	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• 32.79 m right extension required to accommodate new EBL of Highway 3 and proposed 15 m open-ditch median	

Crossing Location	Summary of Proposed Highway 3 Improvement Works	Site/Culvert Design Considerations	Proposed Culvert Configuration
Russell Drain	• Widening of Highway 3 from 2-lane undivided to 4-lane divided	• 29.52 m right extension required to accommodate new EBL of Highway 3 and proposed 15 m open-ditch median • 7.45 m left extension required to accommodate 4:1 side-slopes, grading detail, and no guiderail for WBL	3050 mm x 1650 mm x 55.18 m
Barlow Drain	• Construction of a 4-lane divided to 2-lane undivided cross-over lane transition	• 36.87 m right extension required to accommodate new EBL of Highway 3 and proposed 15 m open-ditch median • 16.38 m right interim extension required to accommodate proposed 4-lane to 2-lane transition at the east end of the project • 8.86 m left extension required to accommodate 4:1 side-slopes, grading detail, and no guiderail for WBL	2400 mm x 1830 mm x 71.39 m (Ultimate 4-Lane Divided Highway) 2400 mm x 1830 mm x 50.90 m (Interim Lane Transition to 2-Lane Undivided)

Table 11 summarizes the hydraulic performance indicators resulting from applying the design and check flows to the proposed culvert geometry at each culvert site. The hydraulic sizing of the 14th Concession East Drain at South Talbot Road Extension, the unnamed drain at Sta. 14+018, Essex Outlet Drain and Talbot Road South Drain Branch 'A' were established based on the design criteria in **Table 4**. Key design considerations included achieving the required clearance and/or freeboard depths and maintaining existing headwater elevations at the crossing to avoid impacts on drainage infrastructure upstream of the Highway 3 corridor, notably at Essex Outlet Drain. **Table 11** summarizes the final hydraulic sizing based on an iterative design process for each of the four 'new' culvert locations.

The proposed new culvert crossing 14th Concession Drain has been sized based on the future profile of South Talbot Road. Currently the existing profile of the service road located west of the crossing results in deficient freeboard for the new culvert. Under future conditions, it is expected that the existing service road profile will be improved and required freeboard depths are achieved. The proposed culvert configuration has been established based on freeboard and minimum cover for the structure at the proposed 14th Concession East Drain crossing location.

Complex geotechnical and construction staging requirements for the proposed Highway 3/Victoria Avenue overpass structure/embankment required that culvert options be developed for Essex Outlet Drain. The following describes the layout characteristics of three crossing options:

Option 1 – On-line Culvert Replacement

Option 1 includes the construction of a new 'on-line' culvert oriented along the existing Essex Outlet Drain channel. With this option, the existing Essex Outlet Drain culverts crossing existing Highway 3 would be replaced within a single span structure to convey flow from the north side of the proposed overpass embankment to the south side the right-of-way. The location and skew of the proposed culvert would result in an overall required length of approximately 95 m from north toe of slope to south toe of slope. There will be a net 60 m reduction in the length of open-channel resulting from the removal of the existing multi-cell culvert arrangement and construction of the proposed on-line culvert.

The on-line replacement strategy for the Essex Outlet Drain would require that the culvert be constructed prior to the construction of the Highway 3 overpass embankment. The use of light-weight fill will, therefore, likely be required to minimize the negative impacts of settlement

on the newly constructed culvert. The on-line requirement of the Essex Outlet Drain culvert will minimize the length of open channel required to be maintained in the future but would introduce a lengthy culvert that would be both complicated and costly to maintain. To maintain a consistent configuration with the downstream channel, the Essex Outlet Drain channel will have a trapezoidal cross-section with a 3 m to 4 m bottom width. Erosion and scour protection for the culvert and channel will be minimal due to the aligned nature of the crossing. Inlet and outlet erosion protection will include a rip-rap apron protecting the side slopes of the channel to the top of banks. Rip-rap protection will consist of Type I rock protection with geotextile. Based on the hydraulic characteristics of the existing drain (a wide flat bottom and low gradient profile), it is expected that future maintenance will primarily involve removal of accumulated sediments discharged from the enclosed portion of the municipal drain within the Town of Essex.

In addition to the main Essex Outlet Drain culvert under Highway 3, an additional culvert or modified storm sewer outlet arrangement is required to accommodate the proposed municipal road improvements at the intersection of South Talbot Road and Victoria Avenue. The proposed improvements include 2.0 m wide on-street parking bays, the use of 15 m radius curves at all four quadrants of the intersection and the addition of a multi-use trail paralleling the roadway. For the on-line replacement strategy, the additional culvert or modified storm sewer outlet system will be aligned with the existing Essex Outlet Drain and have to include a headwall arrangement to accommodate the adjacent fill slopes from South Talbot Road and Victoria Avenue. The proposed outlet arrangement will extend approximately 20 m in a southerly direction. The downstream end of the outlet arrangement will be located close to the inlet of the Essex Outlet Drain Highway 3 culvert, further complicating future maintenance of both the outlet arrangement and municipal drain culvert.

Option 2 – Municipal Drain Diversion to westerly crossing outside of Highway 3/Victoria Avenue Overpass Embankment

Option 2 includes the construction of a new ‘off-line’ municipal drain diversion to relocate the Essex Outlet Drain culvert under Highway 3, approximately 300 m west of its current location. This location would require the construction of approximately 600 m of municipal drain channel along the north and south side of the Highway 3 right-of-way and a 94.6 m long culvert to convey flows through the proposed overpass embankment. The location and configuration of the proposed culvert requires an overall length of approximately 95 m from the north side of the existing Highway 3 highway embankment to the toe of slope of the new embankment. There will be a net 540 m increase in the length of open-channel resulting from the removal of the

existing multi-cell culvert arrangement and construction of the proposed culvert and a 55 m increase in the length of culvert compared to existing conditions.

The drain diversion replacement strategy for the Essex Outlet Drain will allow the culvert to be constructed prior to the construction of the Highway 3 overpass embankment in an area of low fill height. The low fill height will minimize the negative effects of settlement on the newly constructed culvert and allow a standard pre-cast concrete box culvert section to be used. To construct the drain diversion while maintaining the existing Highway 3 roadway configuration, the drain will have to be temporarily realigned between existing Highway 3 and South Talbot Road. The temporary alignment of the channel requires the use of a trapezoidal channel with a 4.0 m bottom width and 2:1 side slopes to fit between the existing Highway 3 and South Talbot Road alignments. After existing Highway 3 is decommissioned, drainage channel enhancements, including modification of the alignment and integration with the proposed multi-use trail system, could be completed.

In addition to the main Essex Outlet Drain culvert under Highway 3, an additional culvert or modified storm sewer outlet arrangement is required to accommodate the proposed municipal road improvements at the intersection of South Talbot Road and Victoria Avenue. The proposed improvements include 2.0 m wide on-street parking bays, the use of 15 m radius curves at all four quadrants of the intersection and a new multi-use trail paralleling the roadway. For the municipal drain diversion strategy, the additional culvert or modified storm sewer outlet system will be aligned to direct flows in a westerly direction along the north side of existing Highway 3. The proposed outlet arrangement will extend approximately 25 m in a westerly direction.

The hydraulic performance assessments of the remaining culverts to be extended as part of the Highway 3 improvements are also summarized in **Table 11**. With the exception of the Barlow Drain, all of the proposed culvert modifications result in acceptable levels of performance when compared to existing conditions and required design criteria for the crossing locations. As mentioned, although the existing Barlow Drain culvert surcharges under design flow conditions and does not provide the required 0.3 m of clearance from the calculated headwater elevation to the underside of soffit, it does achieve the required freeboard depth at the crossing location. Under proposed conditions, the Barlow Drain culvert continues to operate with deficient clearance, surcharging to a depth of approximately 0.3 m above the soffit of the culvert inlet, but does achieve the required freeboard depth of 1.0 m measured from the projected headwater elevation to the Highway 3 low edge of pavement near the culvert. The structure's hydraulic

performance is only marginally reduced, compared to existing conditions, for the interim 50.9 m length required to accommodate the Highway 3 4-lane divided to 2-lane undivided lane transition at the east project limit. Since there is no history of flooding at this location and the existing open-footing concrete culvert is in good condition, it is recommended that this culvert not be replaced because it has insufficient clearance. Consideration should be given to future municipal drain maintenance to improve the gradient of the existing channel, improve the cross-sectional area of the channel and lower tail-water conditions at the culvert outlet. Municipal Drain improvements to lower the existing channel by approximately 0.3 m will result in approximately 0.2 m of clearance at the inlet of the culvert.

Table 11 includes a range of hydraulic performance indicators, such as headwater depth to height ratio, flow regime, outlet velocities and freeboard/clearance values, for each of the culvert sites impacted by improvements to the Highway 3 corridor.

Table 11: Proposed Culvert Hydraulic Performance Assessment Summary

Crossing Location	Proposed Culvert Configuration (Width x Height x Length)	Design Storm Computed Headwater Elevation	Headwater Depth/ Height Ratio	Flow Regime	Check Storm Outlet Velocity (m/s)	Resultant Freeboard (m)	Resultant Clearance (m)
Extended 14th Concession East Drain	3050 mm x 1524 mm x 60.29 m	192.940	75%	Subcritical	1.13	1.13	0.37
New Proposed 14th Concession East Drain (South Talbot Road Extension)	3050mm x 1524 mm x 29.74 m	192.930	66%	Subcritical	1.13	0.47 (Reference from Existing Service Road Profile Sag)	0.51
Proposed Unnamed Drain	825 mm x 54.84 m	193.560	48%	Subcritical	1.47	1.35	n/a
Proposed Essex Outlet Drain	4260 mm x 2440 mm x 97.95 m	193.650	88%	Subcritical	1.59	1.28	0.30
Proposed Talbot Road South Drain A	1200 mm x 50.15 m	194.230	66%	Subcritical	2.38	1.02	n/a
Canaan Drain	3350 mm x 2070 mm x 68.45 m	192.750	73%	Subcritical	1.59	2.51	n/a

Crossing Location	Proposed Culvert Configuration (Width x Height x Length)	Design Storm Computed Headwater Elevation	Headwater Depth/ Height Ratio	Flow Regime	Check Storm Outlet Velocity (m/s)	Resultant Freeboard (m)	Resultant Clearance (m)
Talbot Road South Drain B	3050 mm x 1220 mm x 51.99 m	193.700	34%	Subcritical	1.81	1.58	0.80
East Townline/West Townline Drain	3660 mm x 2100 mm x 74.42 m	193.350	67%	Subcritical	1.06	2.11	0.70
Russell Drain	3050 mm x 1650 mm x 55.18 m	193.000	38%	Subcritical	1.61	2.45	1.02
Barlow Drain (Interim 4-Lane to 2-Lane Transition Length)	2400 mm x 1830 mm x 50.9 m	194.250	108%	Surcharged	1.52	1.20	-0.14

The detailed CulvertMaster Hydraulic output data for the proposed condition assessment is included in **Appendix C**.

3.2.3 Site Specific Impact Summary and Mitigation Strategy

14th Concession East Drain – Highway 3

The proposed 33.34 m culvert extension will be oriented parallel to the existing culvert. The existing 14th Concession East Drain channel is aligned with the existing culvert and will not require alignment modifications beyond the right-of-way. The proposed culvert extension results in a small decrease in outlet velocities and a small decrease in resultant clearance. The projected flow velocities will be mitigated by using standard R50 rip-rap apron at the inlet and outlet of the proposed culvert. The rip-rap apron will extend from the bottom of ditch to an elevation of 192.930 or to the top of bank of the channel immediately up and downstream of the crossing. The low projected velocities will allow the bottom of the drain channel to remain natural and allow for vegetation to re-establish following the completion of construction. In total, 33.34 m of existing open-channel will be replaced with concrete box culvert. The configuration of the erosion protection system is illustrated on Sheet NC6 of the preliminary new construction drawings.

14th Concession East Drain – South Talbot Road Extension

The new proposed 29.74 m long culvert will be oriented perpendicular to the proposed extension of South Talbot Road. The existing 14th Concession East Drain, referred to as Rush Drain north of the Highway 3 corridor, will enter the proposed culvert by making a 90 degree turn immediately upstream of the new culvert. The dramatic change in the alignment will require the addition of erosion/scour protection on the outside of the bend in the channel. The close proximity of the bend to the inlet of the culvert will result in a 10 m section of the outside of the drain channel being lined with rip-rap to an elevation of 192.940 or the top of bank. Based on the configuration of channel and culvert inlet, it is recommended that Type I rock protection be used on the outside of the channel bend immediately upstream of the proposed new culvert crossing South Talbot Road. A standard R50 rip-rap apron will be used at the culvert to mitigate potential erosion of the channel side slopes at the culvert outlet. The configuration of the erosion protection system is illustrated on Sheet NC6 of the preliminary new construction drawings.

Unnamed Drain

The existing Unnamed Drain 750 mm CSP culvert crossing Highway 3 at Sta. 14+019 will be replaced with a 825 mm concrete pipe or a circular culvert of an equivalent material to meet the MTO's required 75-year Design Service Life. The proposed culvert hydraulics result in moderate to low projected inlet and outlet velocities requiring a standard R50 rip-rap apron to control potential scour and erosion. The configuration of the erosion protection system is illustrated on Sheet NC7 of the preliminary new construction drawings.

Essex Outlet Drain

The proposed location of the Essex Outlet Drain crossing of Highway 3 requires the construction of approximately 600 m of municipal drain channel along the north and south side of the highway right-of-way and a 94.6 m long culvert to convey flows through the proposed overpass embankment. It is anticipated that the drainage works will be constructed in the following sequence:

- Construction of the permanent Essex Outlet Drain culvert approximately 300 m west of Victoria Avenue (Sta 14+485) will be completed off-line from the existing drainage system. Installation of the culvert crossing existing Highway 3 will require construction staging with temporary lane restrictions to facilitate installation of the northerly portion of the new culvert

- Following completion of the culvert, the diversion channel along the north and south side of the Highway 3 right-of-way will be constructed off-line from the existing drainage system. Flows will be maintained through the existing culvert until grading works are completed and erosion protection measures have been constructed
- When the municipal drain diversion works are completed, flows from the existing drain will be directed to the new diversion channel and culvert. At this time, the existing culvert and channel crossing the highway right-of-way can be abandoned and construction of the preload/overpass embankment can begin
- Following the preloading/consolidation stage of the Highway 3 overpass embankment construction, traffic will be shifted to the eastbound lanes of new Highway 3 and existing Highway 3 will be removed, including the existing Essex Outlet Drain culverts.

Since the existing Essex Outlet Drain culverts and channel will be maintained during construction of Highway 3 and the new Essex Outlet Drain diversion, a temporary flow passage system at Essex Outlet Drain will not be required. Following the decommissioning and removal of the existing Highway 3 roadway embankment, the 300 m channel along the north side of the right-of-way could be modified to include additional environmental enhancements, such as a widened floodplain, benched side-slopes for enhanced landscaping and a meandering low-flow channel. A widened floodplain and benched side-slopes would dramatically improve the conveyance capacity of the channel and provide enhanced storage of runoff volume and subsequent attenuation/reduction of flows conveyed to the downstream municipal drain channel. Following removal of the existing Highway 3 roadway embankment, there will be an opportunity to shorten the Essex Outlet Drain culvert by removing the northerly section of the culvert (27 m) that was installed to accommodate existing Highway 3. These enhancements are over and above the basic design requirements for the crossing but would serve to enhance the natural system within the right-of-way and downstream of the Highway 3 corridor.

The proposed Essex Outlet Drain alignment utilizes a curvilinear alignment with smooth transitions in the open-channel portion of the drain to minimize long-term erosion potential. To avoid dramatic bends in the open-channel at the inlet and outlet of the Essex Outlet Drain culvert, 45 degree bends have been incorporated into the up and downstream ends of the culvert. Erosion potential resulting from the bends will be mitigated by using a closed footing pre-cast culvert arrangement and 1.2 m cut-off walls at the inlet and outlet of the proposed culvert. Erosion protection measures, in the form of rip-rap channel lining, have been incorporated into the Essex Outlet Drain channel design at critical locations, such as bends along the channel

alignment and transitions at the inlets and outlets of critical culvert locations. The channel lining will consist of 300 mm thick Type I rock protection with geotextile and include a 600 mm key at the toe of slope to mitigate potential degradation of the channel side-slopes. The channel lining will be extended from the toe of slope to an elevation of 193.650. The channel itself will incorporate a 4 m bottom width and 2:1 side-slopes. Side-slopes not protected with rip-rap or rock protection will incorporate the use of erosion control blanket to protect slopes prior to the re-establishment of vegetation within the channel. Erosion control blanket will extend from the toe to the top of channel bank along the entire length of the Essex Outlet Drain realignment.

Essex Outlet Drain represents the ultimate outlet for a large urban storm drainage system within the Town of Essex. In existing conditions, the urban storm drainage system delivers a significant amount of sediment from road maintenance activities within the upstream drainage area. Much of the urban drainage system consists of small diameter storm sewers and drainage tiles connected to front and rear yard catch basins. Surface drainage is facilitated by shallow grass swales which effectively reduce the volume of sediments conveyed to the main drainage system. As urban intensification occurs within the upstream drainage area, it is anticipated that the existing grass swales will be replaced by traditional curb and gutter and more formal storm drainage systems which will inherently deliver increased amounts of sediment from paved surfaces within the drainage area. Total suspended solids (TSS) originating from the urban portion of the drainage area are a concern for two reasons. First, TSS carries with it pollutants, heavy metals and hydrocarbons and is often the cause of degraded water quality within municipal drain systems. Second, TSS is generally the source of most of the sediment within a municipal drain system. Deposition of TSS by way of sedimentation often leads to channel and culvert infilling and a reduction in hydraulic conveyance capacity.

To mitigate water quality and future maintenance (sediment removal) issues for the urban drainage system, the Essex Outlet Drain channel incorporates the following features to promote sedimentation prior to surface flow reaching the proposed Essex Outlet Drain culvert:

- The curvilinear design of the channel alignment maximizes the overall length of open channel prior to flow entering the proposed culvert under Highway 3
- The channel gradient and bottom width have been widened and flattened to further promote TSS settlement and the additional surface area maximizes potential for vegetative uptake

- Incorporation of two OPSD 219.211 permanent rock flow check dams into the northerly portion of the channel, further promoting TSS settlement in an area that can be easily accessed for future maintenance (by the municipality) via the multi-use trail system. Sediment removal in the area upstream of the proposed Highway 3 culvert will reduce future maintenance requirements for MTO's drainage infrastructure at the crossing and within the southerly portion of the drain channel.

The proposed Essex Outlet Drain alignment, culvert and channel enhancements are illustrated on Sheets NC8 and NC9 of the preliminary new construction drawings.

Talbot Road South Drain Branch 'A'

The existing Talbot Road South Drain Branch 'A' consists of a 750 mm CSP culvert crossing Highway 3 at Sta. 15+490 which will be replaced with a 1200 mm concrete pipe or a circular culvert of an equivalent material to meet MTO's required 75-year Design Service Life. The proposed culvert hydraulics result in moderate projected inlet and outlet velocities that will require a standard R50 rip-rap apron to control potential scour and erosion. To minimize the length of the culvert, a 25 m channel realignment is required at the downstream end of the culvert. To protect against future erosion, the portion of the channel within the Highway 3 right-of-way will be lined with standard R50 rip-rap. The configuration of the erosion protection system is illustrated on Sheet NC11 of the preliminary new construction drawings.

Canaan Drain

The existing Canaan Drain culvert will be extended to the north and south 42.14 m. The proposed culvert extension will be oriented parallel to the existing culvert and eliminate the need for the existing concrete retaining wall system at the inlet and outlet of the culvert. At the downstream end of the culvert, the Canaan Drain will require a 32 m realignment to direct flows from the extended culvert to the existing drain channel south of the Highway 3 right-of-way. The proposed culvert extension results in a small increase in outlet velocities and a small decrease in resultant clearance. The existing culvert inlet is protected by an extensive rip-rap apron which will be modified to suit the upstream culvert extension. The projected flow velocities will be mitigated by the use of a standard R50 rip-rap apron at the outlet of the proposed culvert and extended to include the bend in the channel near the south right-of-way limit. The rip-rap apron will extend from the bottom of ditch to an elevation of 192.750. The low projected velocities will allow the bottom of the drain channel to remain natural and for vegetation to re-establish following the completion of construction. The configuration of the

erosion protection system is illustrated on Sheet NC12 of the preliminary new construction drawings.

Talbot Road South Drain Branch 'B'

The existing Talbot Road South Drain culvert will be extended to the south 32.79 m. The proposed culvert extension will be oriented parallel to the existing culvert. There is no formal drain channel south of the Highway 3 right-of-way so the existing roadside ditches that intercept overland flow from the drainage area to the south will be reconstructed along the new eastbound lanes. Flow from the roadside ditches will be directed to the upstream (south) end of the culvert extension. The proposed culvert extension results in a negligible change in outlet velocities and resultant clearance. The projected flow velocities will be mitigated by standard R50 rip-rap apron at the inlet and outlet of the proposed culvert. The rip-rap apron will extend from the bottom of ditch to an elevation of 193.700. The low projected velocities will allow the bottom of the drain channel on the north side of the right-of-way to remain natural and for vegetation to re-establish following the completion of construction. A continuous rip-rap apron will be used on the upstream end of the culvert since there is no formal channel to protect from erosion and scour. The configuration of the erosion protection system is illustrated on Sheet NC13 of the preliminary new construction drawings.

East Townline/West Townline Drain

The existing East Townline/West Townline Drain culvert will be extended to the south 32.79 m. The proposed culvert extension will be oriented parallel to the existing culvert. The existing drain channel extends parallel with the existing culvert in the northerly and southerly direction outside the Highway 3 corridor. No additional channelization or channel improvements are necessary at the inlet and outlet of the proposed culvert. The proposed culvert extension results in a negligible change in outlet velocities and resultant clearance. The projected flow velocities will be mitigated by standard R50 rip-rap apron at the inlet and outlet of the proposed culvert. The rip-rap apron will extend from the bottom of ditch to an elevation of 193.350. The low projected velocities will allow the bottom of the drain channel on the north side of the right-of-way to remain natural and for vegetation to re-establish following the completion of construction. The configuration of the erosion protection system is illustrated on Sheet NC15 of the preliminary new construction drawings.

Russell Drain

The existing Russell Drain culvert will be extended to the north and south 29.52 m. The proposed culvert extension will be oriented parallel to the existing culvert and eliminate the need for the existing concrete retaining wall system at the inlet and outlet of the culvert. At the downstream end of the culvert, the Russell Drain will require a 20 m realignment to direct flows from the extended culvert to the existing drain channel south of the Highway 3 right-of-way. The proposed culvert extension results in a small increase in outlet velocities and a small decrease in resultant clearance. The projected flow velocities will be mitigated by the use of a standard R50 rip-rap apron at the outlet of the proposed culvert and extended to include the bend in the proposed channel near the south right-of-way limit. The upstream end of the proposed culvert extension requires an irregularly shaped rip-rap apron based on the configuration of the ditches. The rip-rap apron will extend from the bottom of ditch to an elevation of 193.000. The low projected velocities will allow the bottom of the drain channel to remain natural and for vegetation to re-establish following the completion of construction. The configuration of the erosion protection system is illustrated on Sheet NC16 of the preliminary new construction drawings.

Barlow Drain

The existing Barlow Drain culvert will be extended to the north and south 22.32 m. The required culvert extension at the Barlow Drain accommodates the proposed 4-lane to 2-lane transition back to the existing highway cross-section. In the future, the Barlow Drain culvert will require an additional extension to the south to accommodate the ultimate 4-lane divided highway configuration. Based on the hydraulic assessment completed for the drain, additional downstream improvements to the municipal drain will be required when the ultimate highway configuration is constructed. The proposed culvert extension will be oriented parallel to the existing culvert and eliminate the need for the existing concrete retaining wall system at the inlet of the culvert. At the upstream end of the culvert, the Barlow Drain will require a 10 m realignment to direct flows from the existing drain channel north of the Highway 3 right-of-way to the extended culvert inlet. The proposed culvert extension results in a small increase in outlet velocities and a small decrease in resultant clearance for the interim Highway 3 configuration. The projected flow velocities will be mitigated by the use of a standard R50 rip-rap apron at the outlet of the proposed culvert. The proposed rip-rap apron at the upstream end of the proposed culvert extension will tie into rip-rap protection located downstream of the culvert crossing South Talbot Road immediately north of the Highway 3 corridor. The rip-rap apron will extend from the bottom of ditch to an elevation of 194.250. The low projected velocities will allow the

bottom of the drain channel to remain natural and for vegetation to re-establish following the completion of construction. The configuration of the erosion protection system is illustrated on Sheet NC20 of the preliminary new construction drawings.

3.3 Design Considerations for Regulatory Storm and Floodplain Mapping Elevations

The results of the hydraulic analysis of the existing and proposed culvert hydraulic performance were also compared against Essex Region Conservation Authority (ERCA) Regulatory Floodplain mapping for the area impacted by highway improvements within the Highway 3 corridor. **Figure 4** illustrates the regulated watercourses within the Highway 3 corridor. The regulatory limits shown in **Figure 4** were established based on generic regulations and standard watercourse/drain offsets. None of the watercourses/drains within the study limits have been hydraulically modeled to establish floodwater elevations.

Figure 4: ERCA Regulatory Mapping along Highway 3 Corridor

To assess the impacts that the proposed culvert modifications will have on the regulated areas associated with each of the municipal drains crossing the Highway 3 right-of-way, the 100-year (Regulatory Event) design flows were applied to the existing and proposed culvert

configurations. The headwater elevations resulting from the proposed culvert geometry at each of the crossing locations were compared with the headwater elevations generated in existing condition. **Table 12** summarizes the existing and proposed condition headwater elevations resulting from the 100-year design flows at each culvert crossing location. In the locations that the crossing culvert is being replaced, the proposed headwater elevations have either been maintained or improved. The extensions required to accommodate improvements to Highway 3 result in headwater increases between 0.02 m and 0.06 m for the 100-year design flows. Mitigation for the noted increase in headwater elevations at 14th Concession East, Canaan, Talbot Road South, East/West Townline, Russell and Barlow Drain is not anticipated at this time. Confirmation of the final culvert geometry and hydraulic impacts on the regulated lands will be assessed during the final detailed design of the crossings.

Table 12: Summary of Impacts for the Regulatory (100-Year) Storm Event

Crossing Location	Existing Culvert Configuration (Width x Height x Length)	Existing Design Storm Computed Headwater Elevation	Proposed Culvert Configuration (Width x Height x Length)	Proposed Design Storm Computed Headwater Elevation	Change in Projected Headwater Elevation (m)
Extended 14th Concession East Drain	3050 mm x 1524 mm x 26.95 m	192.990	3050 mm x 1524 mm x 60.29 m	193.020	+0.030
New Proposed 14th Concession East Drain (South Talbot Road Extension)	NEW	NEW	3050 mm x 1524 mm x 29.74 m	193.080	N/A
Proposed Unnamed Drain	750 mm x 29.67 m	193.830	825 mm x 54.84 m	193.600	-0.230
Proposed Essex Outlet Drain	3600 mm x 1830 mm x 36.79 m and 1830 mm x 1220 mm x 40.16 m	193.880	4260 mm x 2440 mm x 97.95 m	193.810	-0.070
Proposed Talbot Road South Drain A	750 mm x 22.31 m	195.690	1200 mm x 50.15 m	194.330	-1.360
Canaan Drain	3350 mm x 2070 mm x 26.28 m	192.830	3350 mm x 2070 mm x 68.45 m	192.890	+0.060
Talbot Road South Drain B	3050 mm x 1220 mm x 22.76 m	193.740	3050 mm x 1220 mm 51.99 m	193.760	+0.020

Crossing Location	Existing Culvert Configuration (Width x Height x Length)	Existing Design Storm Computed Headwater Elevation	Proposed Culvert Configuration (Width x Height x Length)	Proposed Design Storm Computed Headwater Elevation	Change in Projected Headwater Elevation (m)
East Townline/West Townline Drain	3660 mm x 2100 mm x 41.63 m	193.430	3660 mm x 2100 mm x 74.42 m	193.450	+0.020
Russell Drain	3050 mm x 1650 mm x 25.66 m	193.000	3050 mm x 1650 mm x 55.18 m	193.050	+0.050
Barlow Drain (Interim 4-Lane to 2-Lane Transition Length)	2400 mm x 1830 mm x 28.58 m	194.210	2400 mm x 1830 mm x 50.9 m	194.250	+0.040

4. IMPACT MITIGATION

4.1 General Erosion and Scour Protection

As described in the previous sections of this report, it is anticipated that standard erosion and scour protection systems will be adequate to protect receiving water systems within the project limits. To guard against future channel down-cutting and potential undermining of the proposed new culverts and culvert extensions, it is recommended that cut-off walls with a standard depth of 1.2 m be integrated into the proposed culvert arrangements.

In general, disturbance of existing well-vegetated roadway embankment and channel slopes should be avoided where possible. Where disturbance of vegetative slopes is unavoidable and point-discharge from spillways and storm sewers will be directed along slopes and ditches, it is recommended that standard R50 rip-rap aprons be installed with underlying geotextile to control the migration of fine-grained soils from under the rip-rap. Rip-rap protection should be installed to an elevation matching the proposed/existing ditch grades to avoid creating barriers for surface water runoff.

For newly graded roadway embankment slopes, erosion control blanket should be placed on all slopes exceeding 3:1, particularly those slopes located directly adjacent to the Essex Outlet Drain. Standard silt fence should be placed at the base of disturbed slopes parallel with the drain channel to guard against sediment entering the drain channel during construction. For newly graded “v” and flat-bottom ditches, temporary straw bale flow checks should be placed at critical

junctions with undisturbed ditches, in locations of grade changes, and immediately upstream of receiving watercourses. The proposed permanent sediment and erosion control systems are illustrated on Sheets NC1 to NC24 of the preliminary new construction drawings.

4.2 Fisheries Mitigation

Although the municipal drain culverts within the study area do not present sensitive fish habitat, where feasible a low flow channel will be constructed within the base of the drain throughout the length of the proposed culvert extensions. With exception to the Canaan Drain culvert the proposed culvert configurations provide approximately 300 mm of embedment depth to accommodate the low flow channel design and to facilitate fish passage through the culvert. For all major drains, erosion protection in the form of rip-rap or rock-protection channel lining has been limited to the side slopes of the channels. Continuous rip-rap aprons have only been used where fisheries resources will not be compromised. The proposed Essex Outlet Drain channel represents a significant increase in fish habitat within the Highway 3 right-of-way. Approximately 600 m of new open channel will be introduced within the right-of-way. The channel will consist of a trapezoidal section with a 4 m bottom width and 2:1 side slopes. Critical bends in the channel alignment will be protected from local erosion with rip-rap. The full length of the channel will also be protected with erosion control blanket on all 2:1 channel side slopes. OPSD 219.211 rock flow check dams will also be incorporated into the Essex Outlet Drain channel along the north side of the Highway 3 right-of-way to promote sedimentation and improve water quality in an area of the drain that can easily be maintained in the future.

4.3 Preliminary Temporary Flow Passage System Design

The new and proposed culvert extensions included as part of the Highway 3 improvements will require a temporary flow passage system to provide a dry work area for material, equipment and personnel involved with the improvement works. The return period for the design of drainage measures during construction was assessed based on site specific information including the length of anticipated construction, construction methodology, public safety, worker safety, flooding potential and environmental impacts. Based on the requirements of TW-1 Section 1.2, the minimum return period for temporary drainage work at the municipal drain culverts within the project limits is the 2-Year return period storm. **Table 13** summarizes the relevant flow data for the full range of design storms and highlights the 2-Year flows for the structural and non-structural culverts.

Table 13: Temporary Flow Passage Requirements

Return Period (years)	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
14th Concession Drain	1.0	1.3	1.7	2.1	2.6	3.3
14th Concession Drain – South Talbot Road Extension	1.0	1.3	1.7	2.1	2.6	3.3
Unnamed Drain	0.1	0.1	0.1	0.1	0.2	0.2
Essex Outlet Drain	6.1	7.8	10.0	12.2	15.3	19.9
Talbot Road South Drain A	0.4	0.5	0.6	0.7	0.9	1.2
Canaan Drain	1.9	2.4	3.1	3.8	4.8	6.3
Talbot Road South Drain B	0.4	0.5	0.7	0.8	1.0	1.3
East Townline/West Townline Drain	1.1	1.3	1.8	2.1	2.7	3.5
Russell Drain	0.5	0.6	0.9	1.0	1.3	1.7
Barlow Drain	1.6	1.9	2.6	3.9	4.9	6.4

Based on the unique characteristics of the municipal drain crossing locations, the following temporary flow passage methods are considered feasible:

- Dam and divert
- Dam and pump.

The feasibility of the dam and divert or dam and pump system depends on the volume of water flow at the site. These options involve damming the waterway upstream and redirecting the water either across the roadway, through the existing culvert or through a temporary culvert installed adjacent to the existing culvert. The diversion through the existing culvert or through a temporary culvert could be accomplished using by-pass pipe(s), sandbags to separate flows or using small diameter discharge pipe(s) from a pumping operation. The dam and divert or dam and pump system can provide feasible solutions for providing a dry working space for short duration works but the expectation is the critical work which is to be completed in the dry is completed during periods of low-flows.

For the municipal drain culverts within the study limits, both systems are considered feasible. The dam and divert method is best suited for the cast-in-place culvert option where excavation adjacent to the existing culvert, installation of a temporary pipe, and backfilling in order to accommodate construction staging is possible. The dam and pump method is being considered for the pre-cast concrete box culvert option in order to facilitate installation of the new culvert with minimal impact on the roadway above. For both systems, the waterway upstream of the culvert would be dammed and the water redirected through the pipe. The diversion pipe would

be a gravity pipe (small diameter HDPE pipe) or a small diameter discharge pipe constituent of the pumping operation. The site specific temporary flow passage system design for each crossing location is detailed in the individual Culvert Structural Design Reports.

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LONDON, ONTARIO

APPENDIX A

Visual Otthymo Hydrologic Modeling Output

Appendix A will be included with the Final Report.

APPENDIX B

CulvertMaster Existing Conditions

Hydraulic Assessment

Appendix B will be included with the Final Report.

APPENDIX C

CulvertMaster Proposed Conditions

Hydraulic Assessment

Appendix C will be included with the Final Report.

SUPPLEMENTARY LEGEND

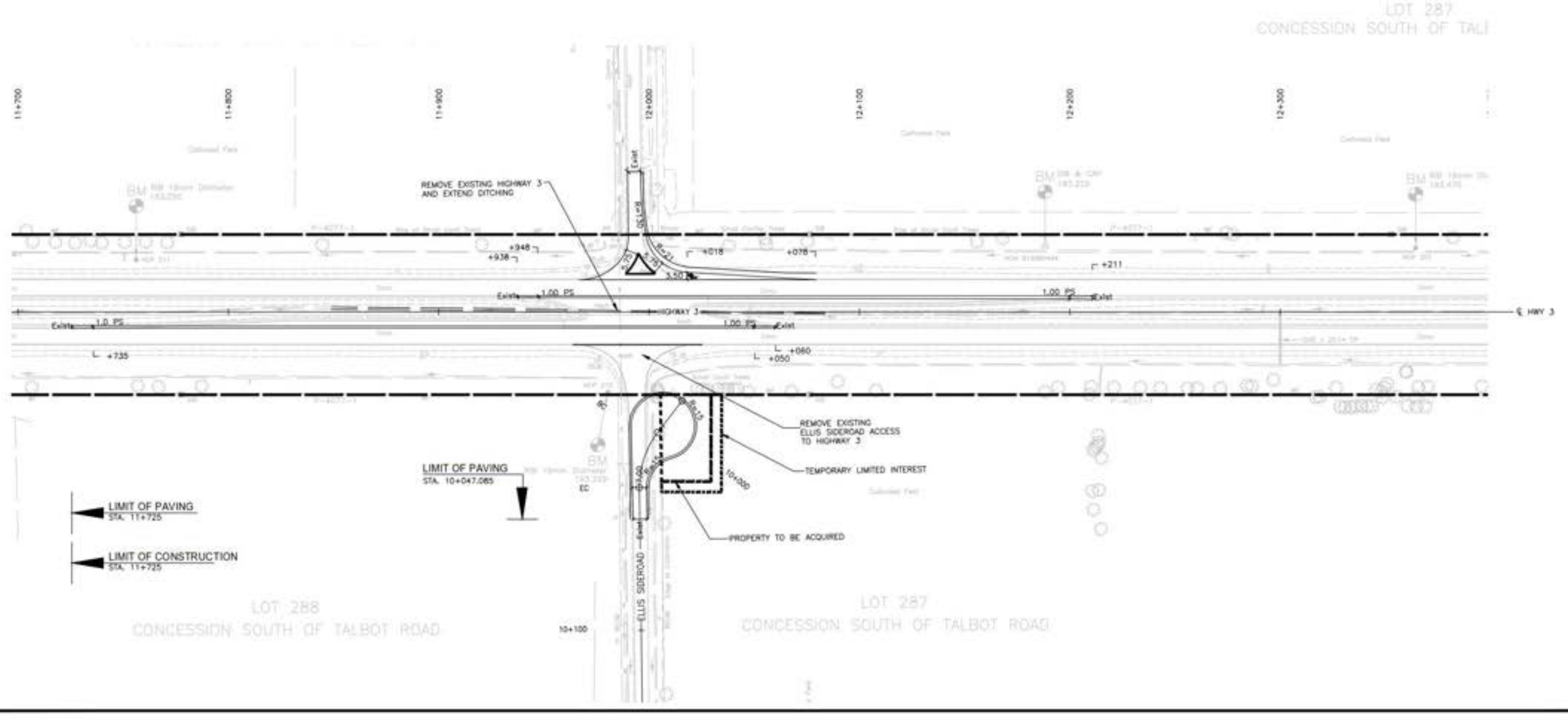
- ENVIRONMENTALLY SENSITIVE AREA
- SEED AND EROSION CONTROL BLANKET
- R — ROCK FLOW CHECK DAM OPSD 219.211
- RIP RAP (300mm THICK WITH GEOTEXTILE)

SUPPLEMENTARY ABBREVIATIONS

SH – SHOULDER
PS – PAVED SHOULDER
PPS – PARTIAL PAVED SHOULDER
SBEAT – STEEL BEAM ENERGY ATTENUATING TERMINAL

NOTES:

1. ALL SEWER AND CULVERT OUTLETS TO HAVE RIP RAP TREATMENT AS PER OPSD 810.010 TYPE 'B' UNLESS OTHERWISE NOTED.
2. ALL DITCH INLETS TO HAVE RIP RAP TREATMENT AS PER OPSD 810.020.
3. ALL CURB & GUTTER TERMINATION TREATMENTS AS PER OPSD 608.010 UNLESS OTHERWISE NOTED.
4. SEED AND EROSION CONTROL BLANKET ON ALL SLOPES STEEPER THAN 3:1.



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

THE DETAILS SHOWN ON THIS DRAWING ARE PRELIMINARY AND ARE PROVIDED FOR INFORMATION ONLY

10m 0 20m
Horizontal

CREATED BY: ACR
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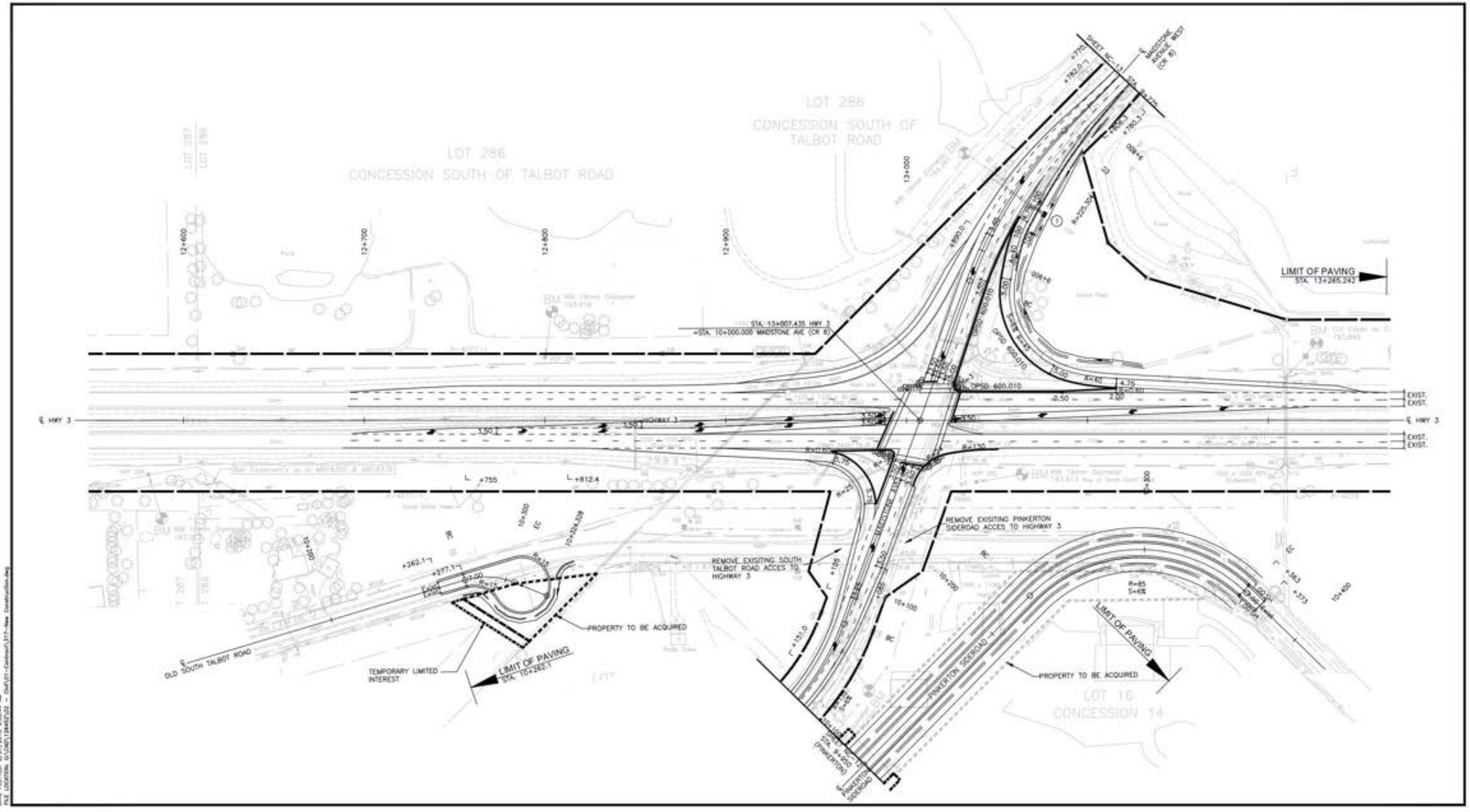
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

NEW CONSTRUCTION
HIGHWAY 3
STA. 11+700 TO STA. 12+400
NC-1


LOT 286
CONCESSION SOUTH OF TALBOT ROAD
LOT 286
CONCESSION SOUTH OF TALBOT ROAD
LOT 285
LOT 286
12+600
12+700
12+800
12+900
13+000
SHEET NO. 13
STA. 13+007.435 HWY 3
=STA. 10+000.000 MAIDSTONE AVE. (CR 8)
MAIDSTONE AVENUE WEST (CR 8)
LIMIT OF PAVING
STA. 13+265.242
OPSD 600.010
E HWY 3
HIGHWAY 3
EXIST.
EXIST.
REMOVE EXISITING PINKERTON SIDEROAD ACCES TO HIGHWAY 3
REMOVE EXISITING SOUTH TALBOT ROAD ACCES TO HIGHWAY 3
MAIDSTONE AVENUE WEST
PINKERTON SIDEROAD
OLD SOUTH TALBOT ROAD
PROPERTY TO BE ACQUIRED
TEMPORARY LIMITED INTEREST
LIMIT OF PAVING
STA. 10+282.1
LIMIT OF PAVING
PROPERTY TO BE ACQUIRED
LOT 15
CONCESSION 14
10+200
10+250
10+300
10+350
10+400
+755
+812.4
+262.1
+277.1
+780.0
+780.3
+890.0
+151.0
+105
+363
+373
R=85
S=6%
R=135
R=205.304
R=40
R=25
R=15
R=20
R=12
R=17
R=30
R=45
R=60
R=90
R=120
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R=270
R=300
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R=480
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R=570
R=600
R=630
R=660
R=690
R=720
R=750
R=780
R=810
R=840
R=870
R=900
R=930
R=960
R=990
R=1020
R=1050
R=1080
R=1110
R=1140
R=1170
R=1200
R=1230

LIMIT OF PAVING
STA. 8+522

TEMPORARY LIMITED INTEREST

NEW CATCHBASIN, SEWER & OUTLET LOCATIONS TO BE DETERMINED DURING DETAIL DESIGN

PROPERTY TO BE ACQUIRED

LIMIT OF PAVING
STA. 8+655

LIMIT OF PAVING
STA. 8+870

NEW CATCHBASIN, SEWER & OUTLET LOCATIONS TO BE DETERMINED DURING DETAIL DESIGN

14TH CONCESSION EAST DRAIN EXTENSION
SITE NO. 6-416/C
SEE DETAILS PROVIDED ELSEWHERE

LIMIT OF PAVING
STA. 13+574.837

TEMPORARY LIMITED INTEREST

PROPERTY TO BE ACQUIRED

LIMIT OF PAVING
STA. 13+359.651

LOT 285
CONCESSION SOUTH OF TALBOT ROAD

LOT 17
CONCESSION 14

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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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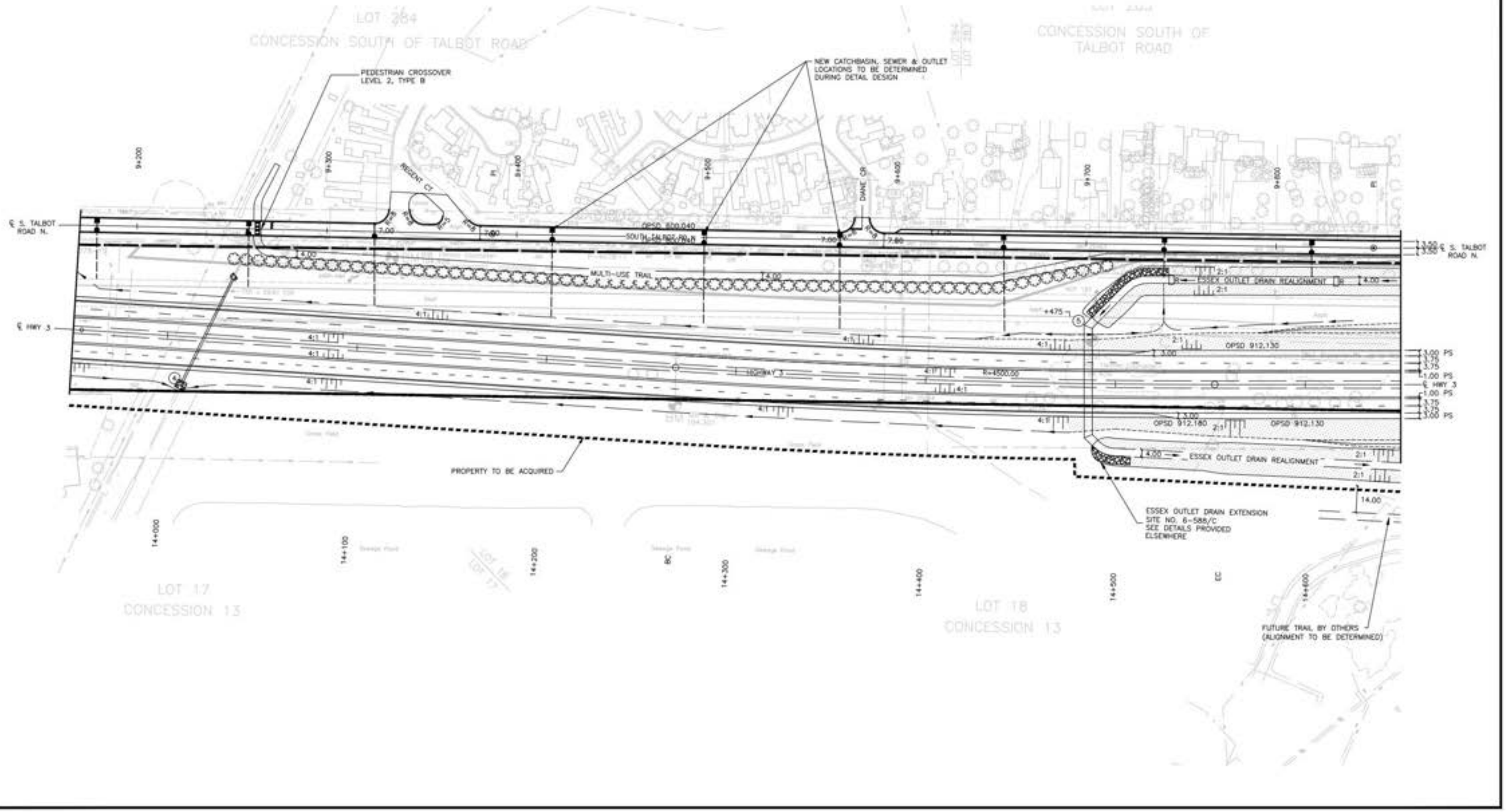
DATE: JULY 2017

DILLON CONSULTING

NEW CONSTRUCTION
HIGHWAY 3
STA. 13+550 TO STA.13+950
NC-3



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
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Ontario

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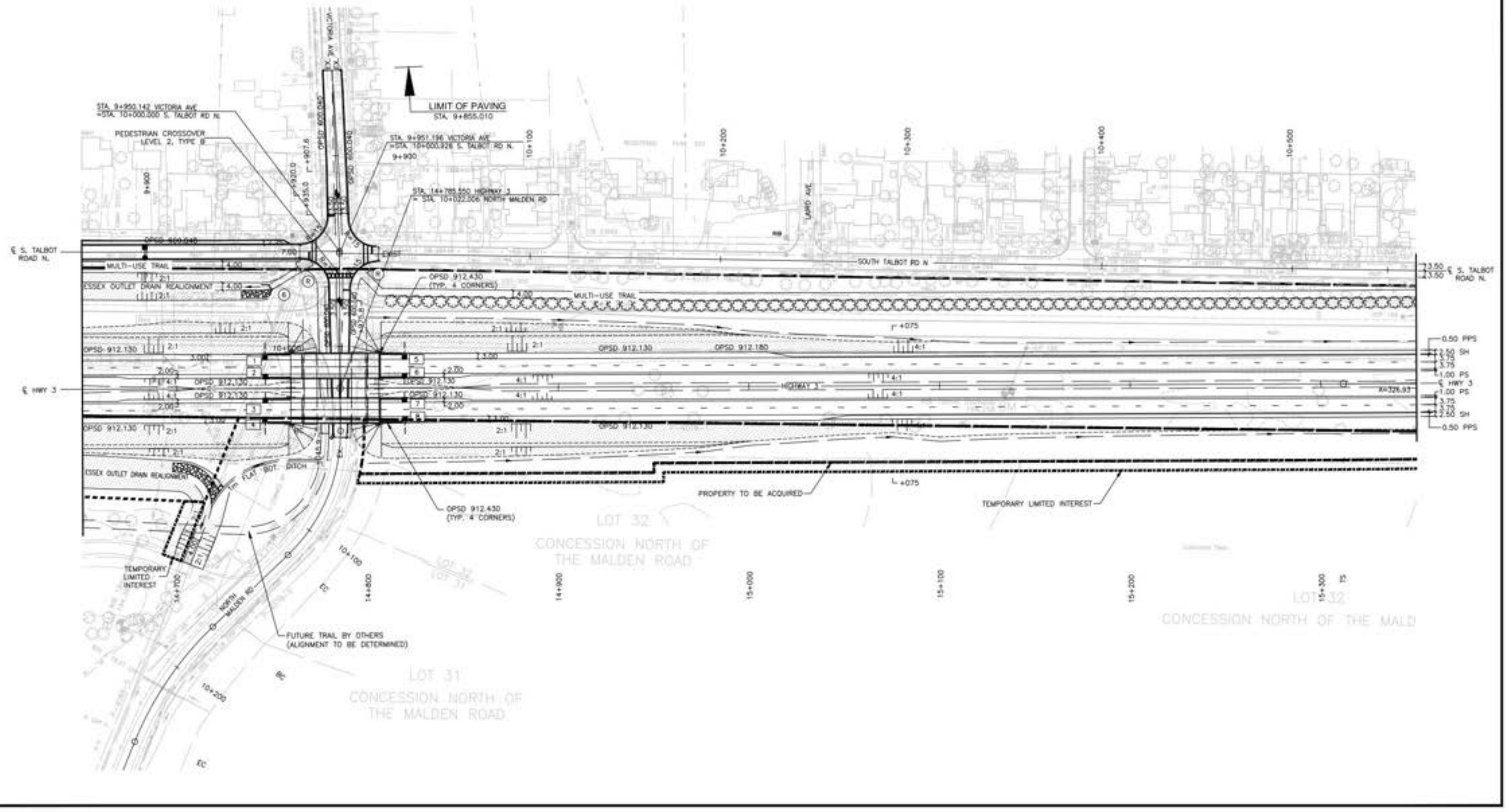
NEW CONSTRUCTION
HIGHWAY 3
STA. 13+950 TO STA. 14+650
NC-4



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
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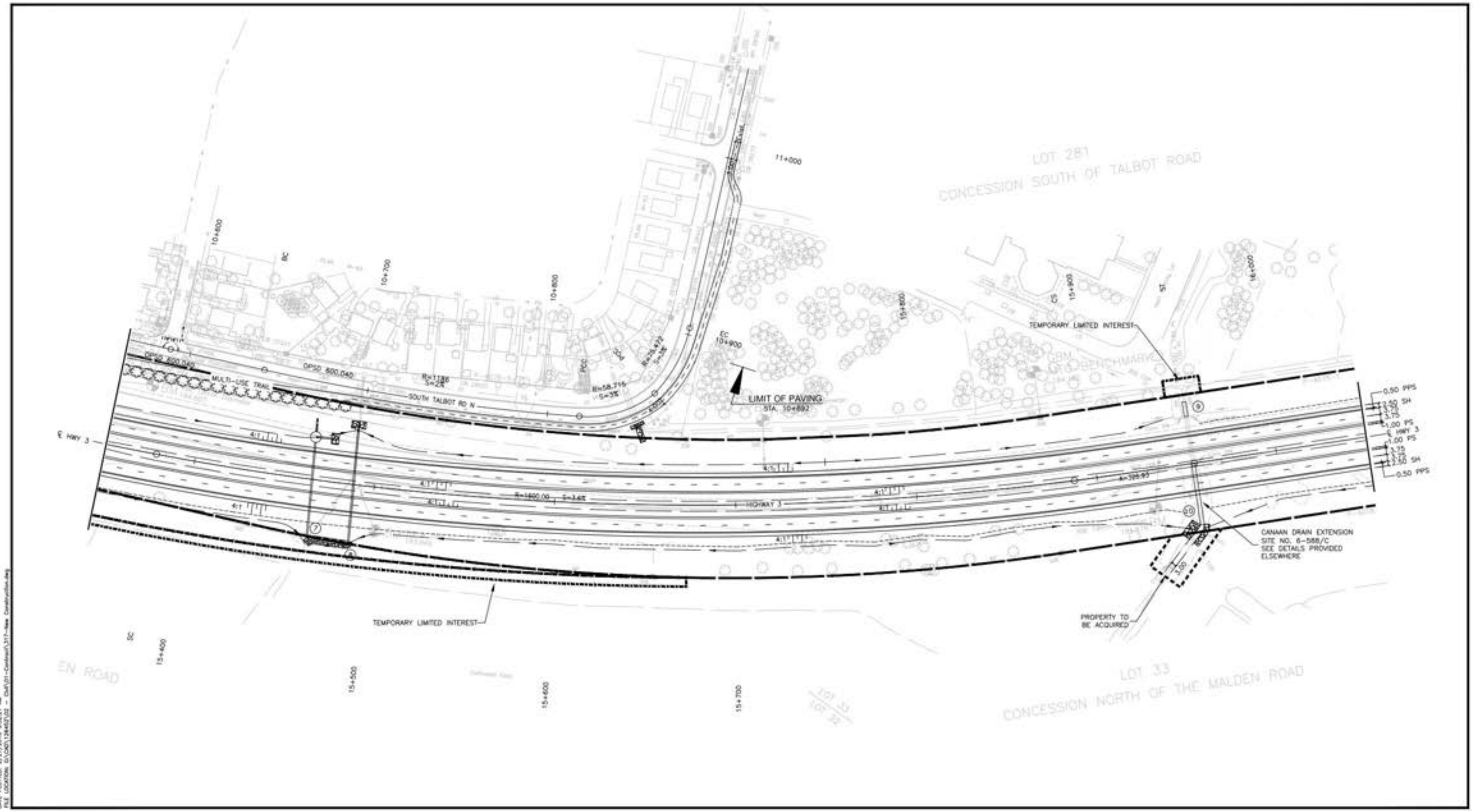
NEW CONSTRUCTION
HIGHWAY 3
STA. 14+650 TO STA. 15+350
NC-5



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
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GWP 317-98-00

Ontario

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NEW CONSTRUCTION
HIGHWAY 3
STA. 15+350 TO STA. 16+050
NC-6

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HIGHWAY 3 IMPROVEMENTS
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GWP 317-98-00

Ontario

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DATE: JULY 2017

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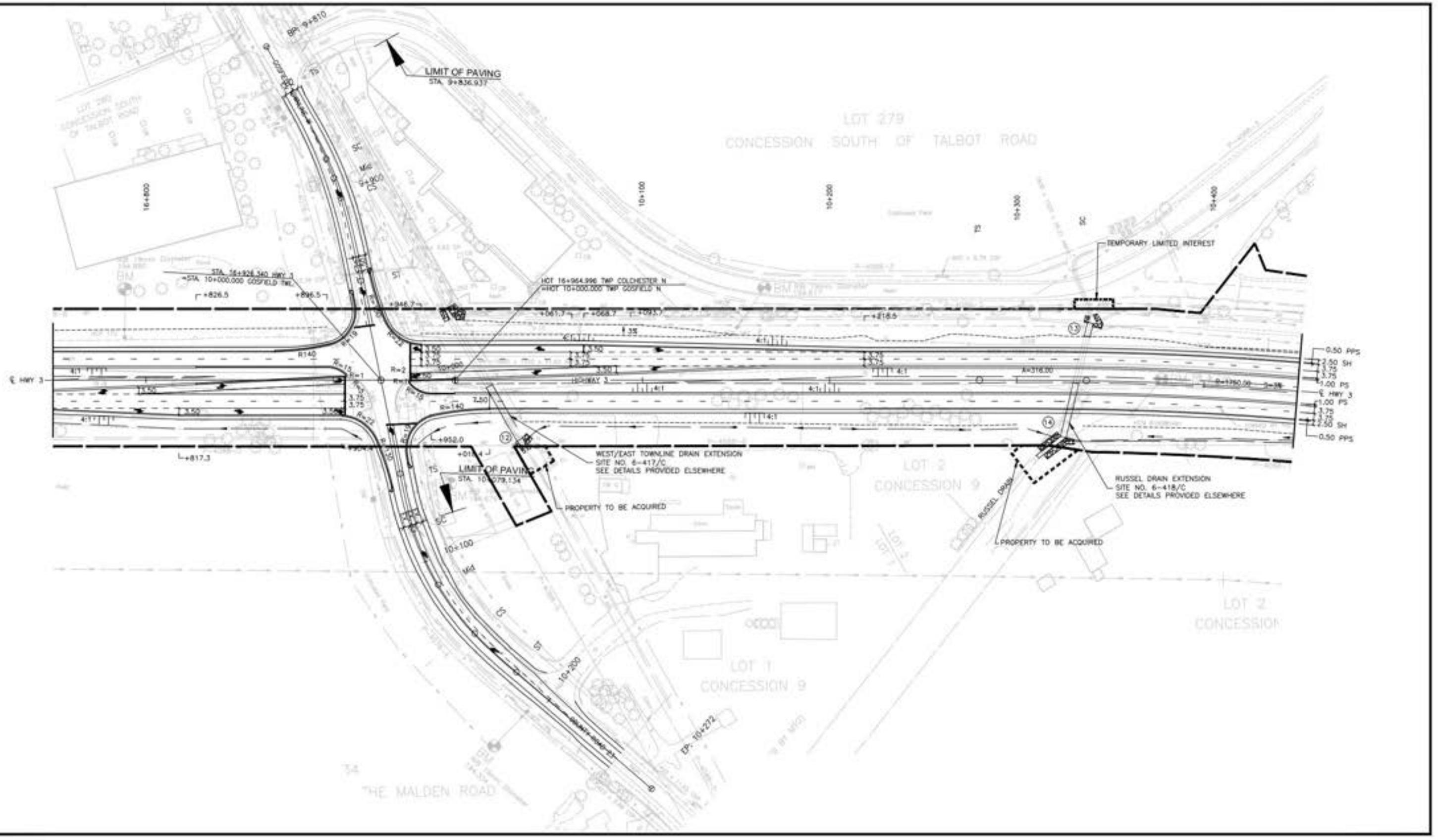
NEW CONSTRUCTION
HIGHWAY 3
STA. 16+050 TO STA. 16+750
NC-7



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TOWN OF ESSEX
GWP 317-98-00

Ontario

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DATE: JULY 2017

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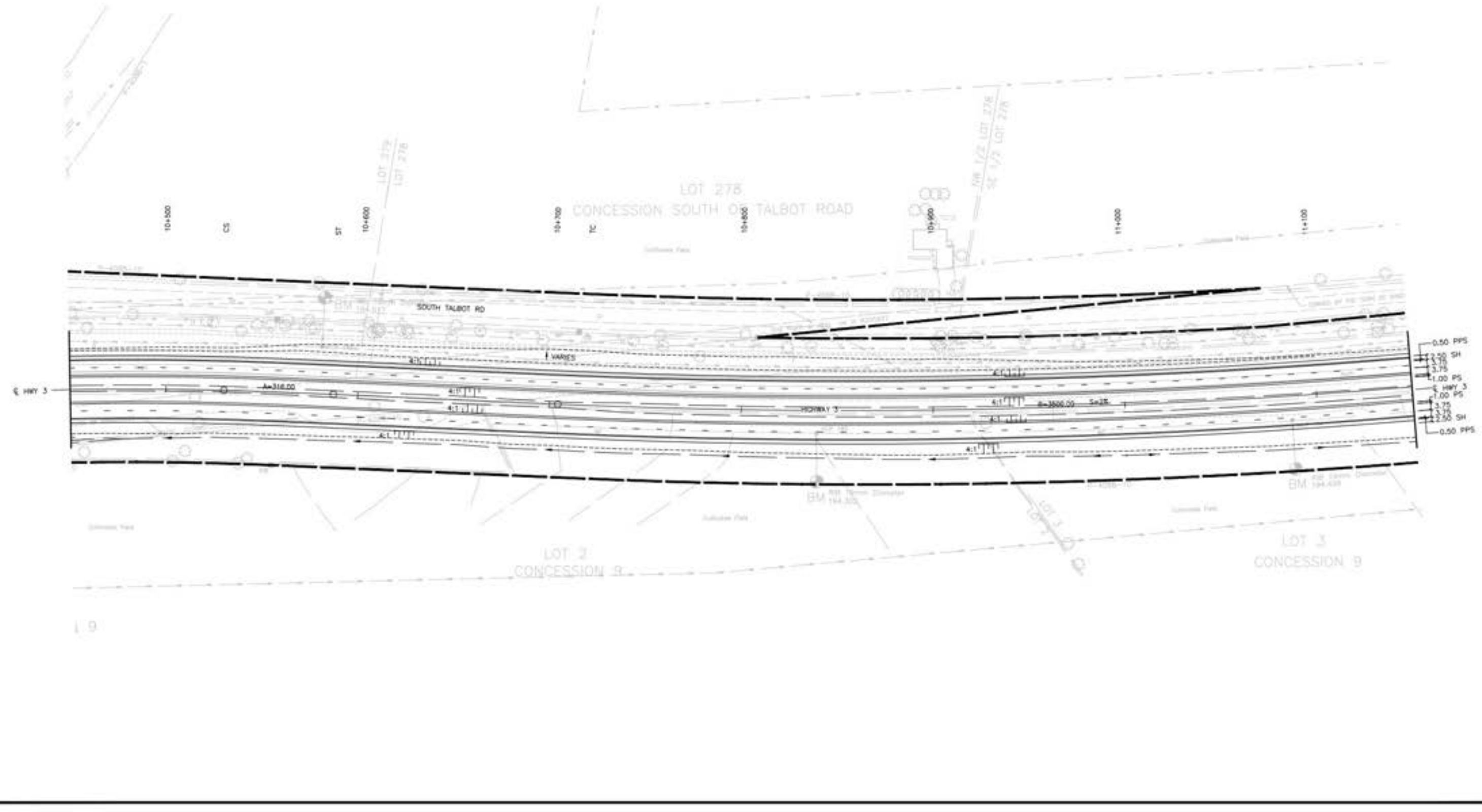
NEW CONSTRUCTION
HIGHWAY 3
STA. 16+750 TO STA. 10+450
NC-8



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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DATE: JULY 2017

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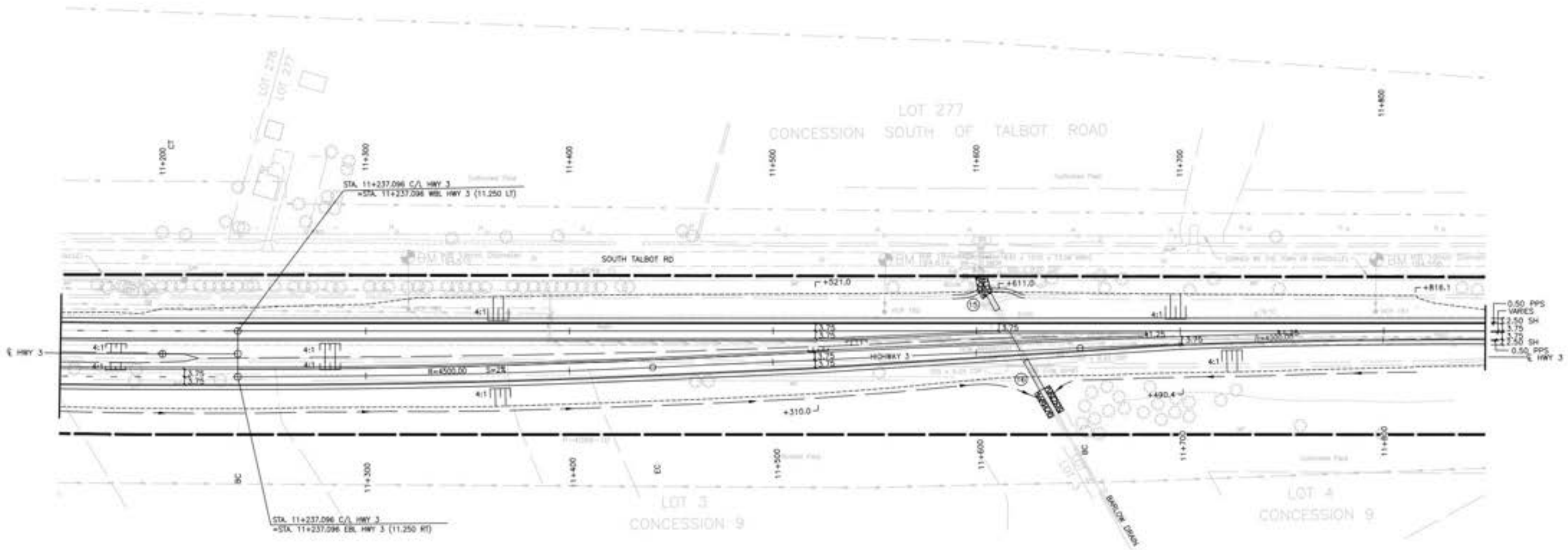
NEW CONSTRUCTION
HIGHWAY 3
STA. 10+450 TO STA. 11+150
NC-9



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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DILLON CONSULTING

NEW CONSTRUCTION
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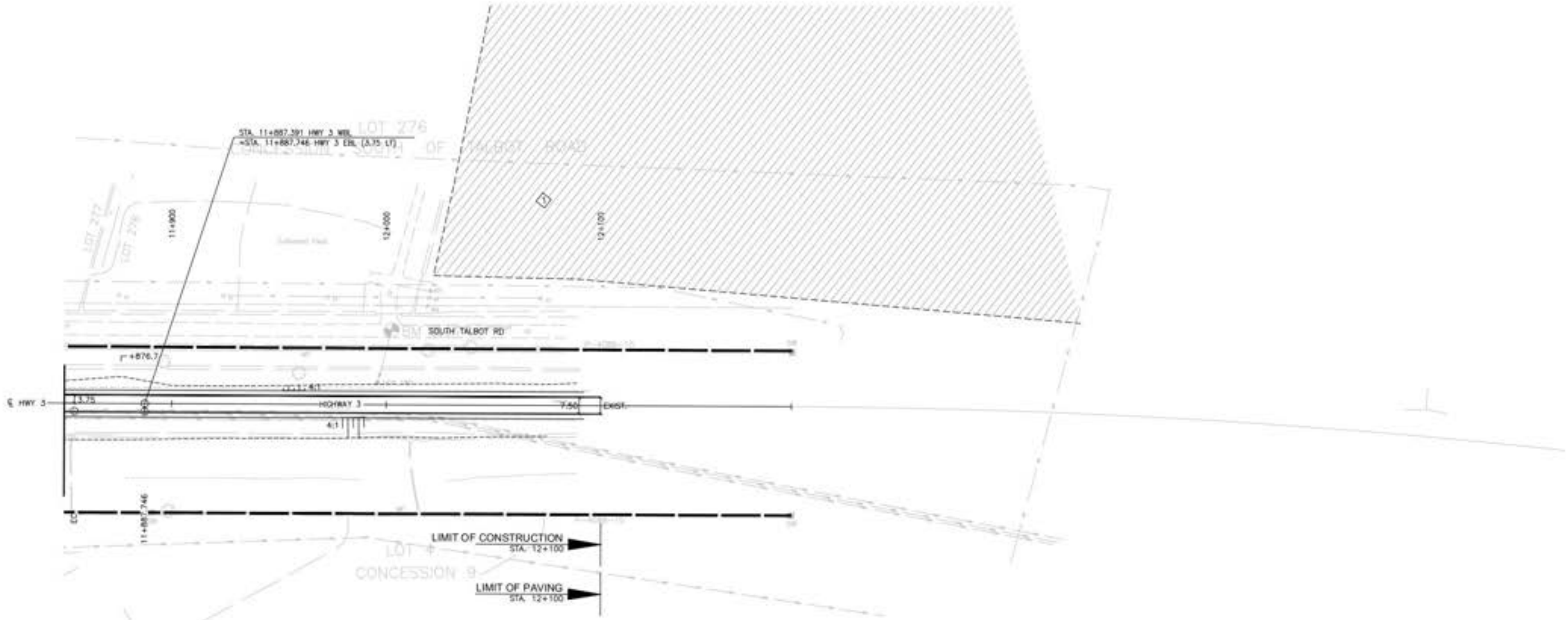
STA. 11+150 TO STA. 11+850
NC-10



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

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NEW CONSTRUCTION
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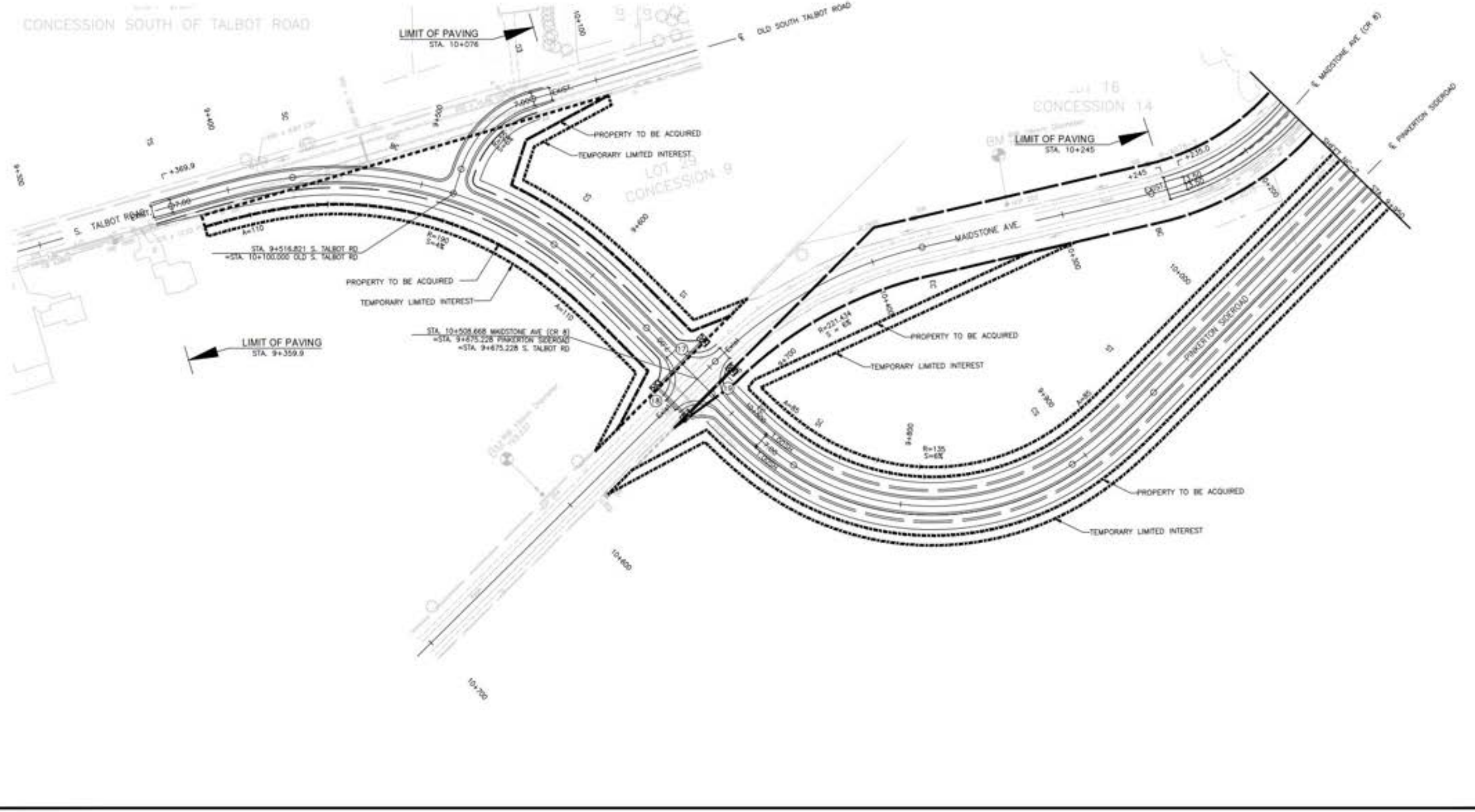
STA. 11+850 TO 13+550
NC-11



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GWP 317-98-00

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Horizontal

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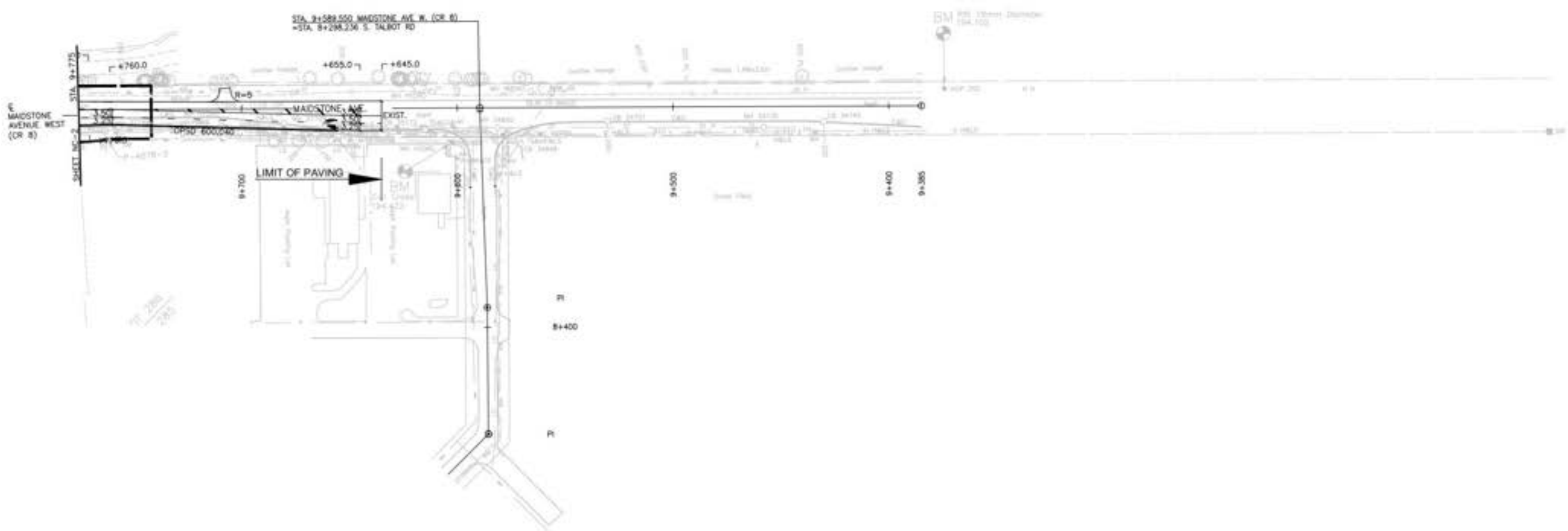
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

NEW CONSTRUCTION

OLD SOUTH TALBOT ROAD &
PINKERTON ROAD

NC-12



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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10m 0 20m
Horizontal

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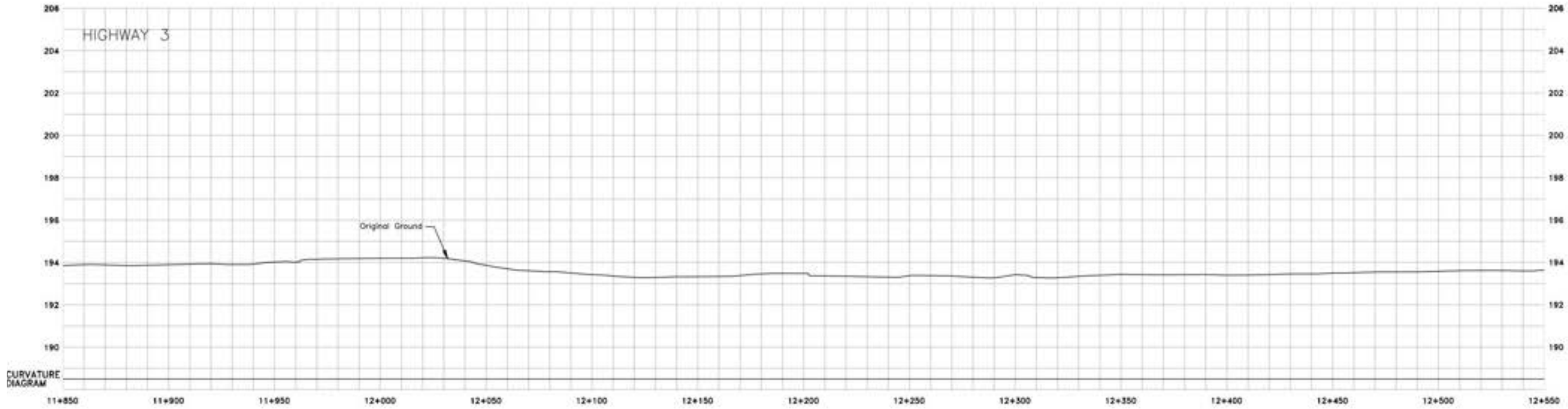
PROJECT No. 12-6452
DATE: JULY 2017

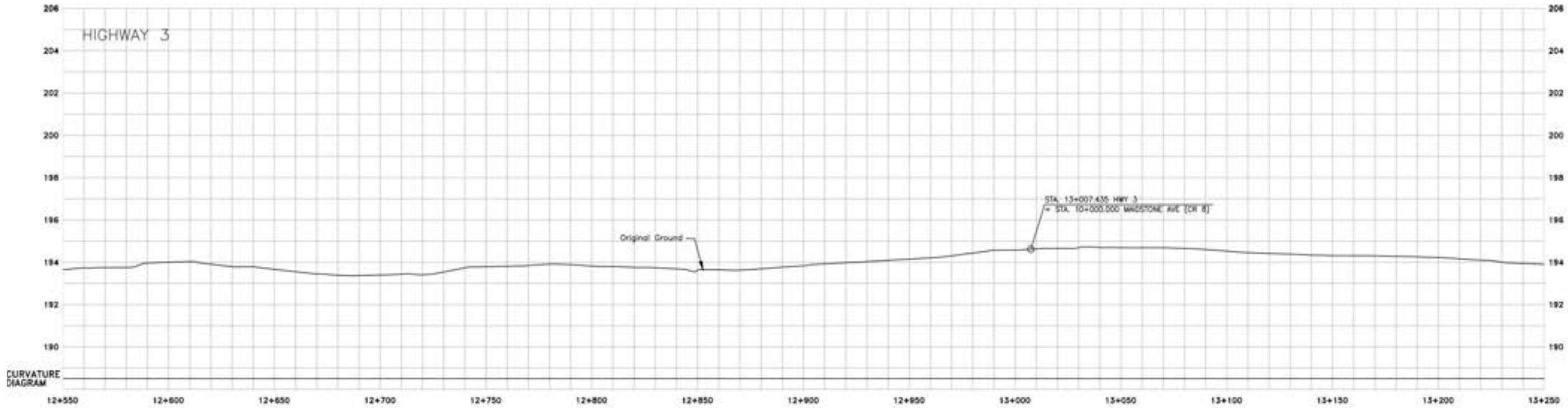
DILLON CONSULTING

NEW CONSTRUCTION

MAIDSTONE AVENUE WEST

NC-13





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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0.5m 0 1m Vertical

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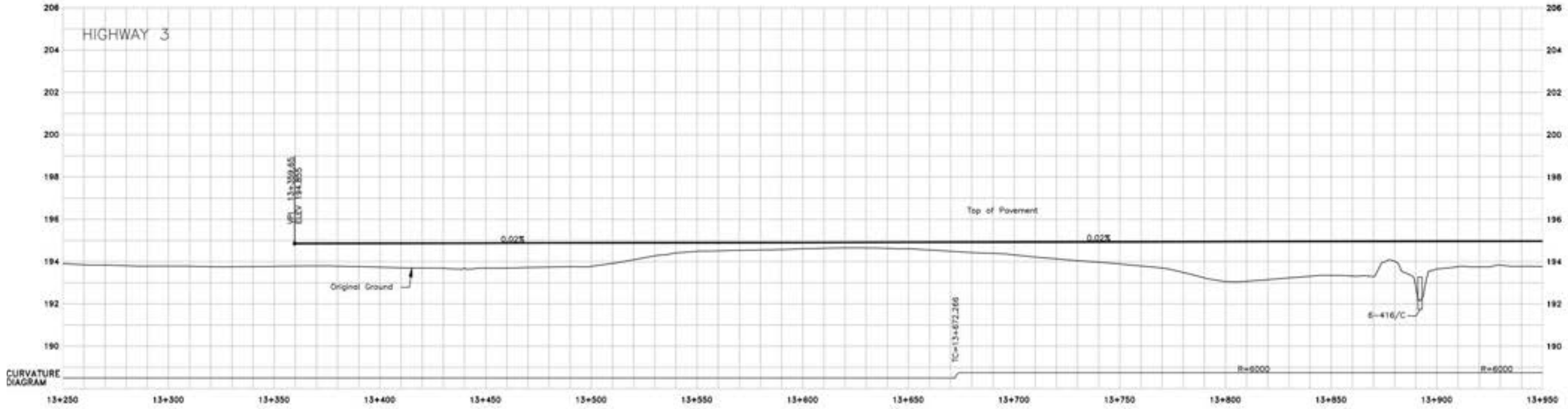
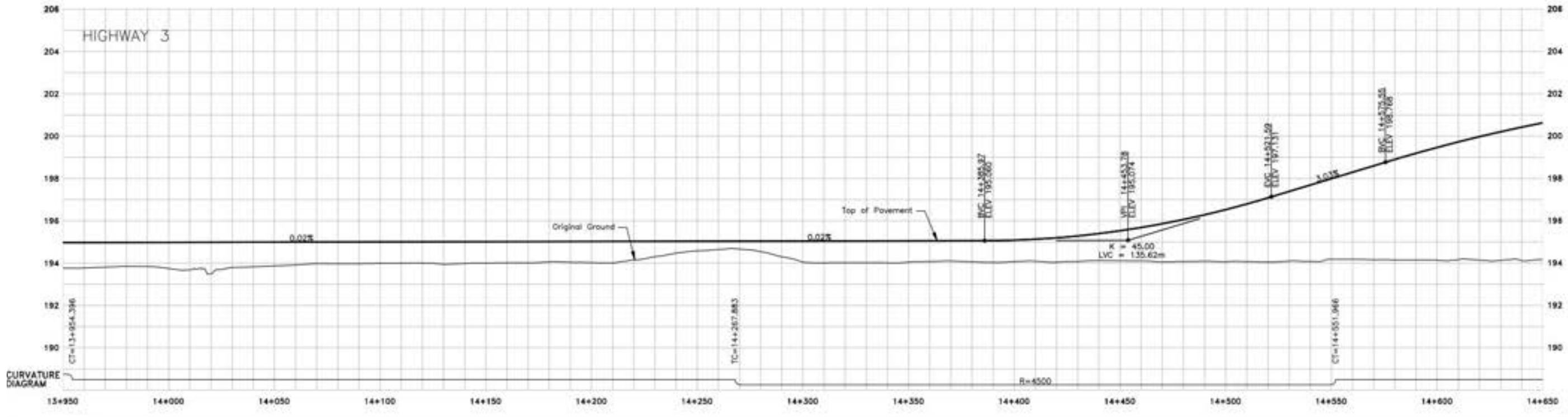
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
HIGHWAY 3
STA. 11+850 TO STA. 13+250
P-1





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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0.5m 0 1m Vertical

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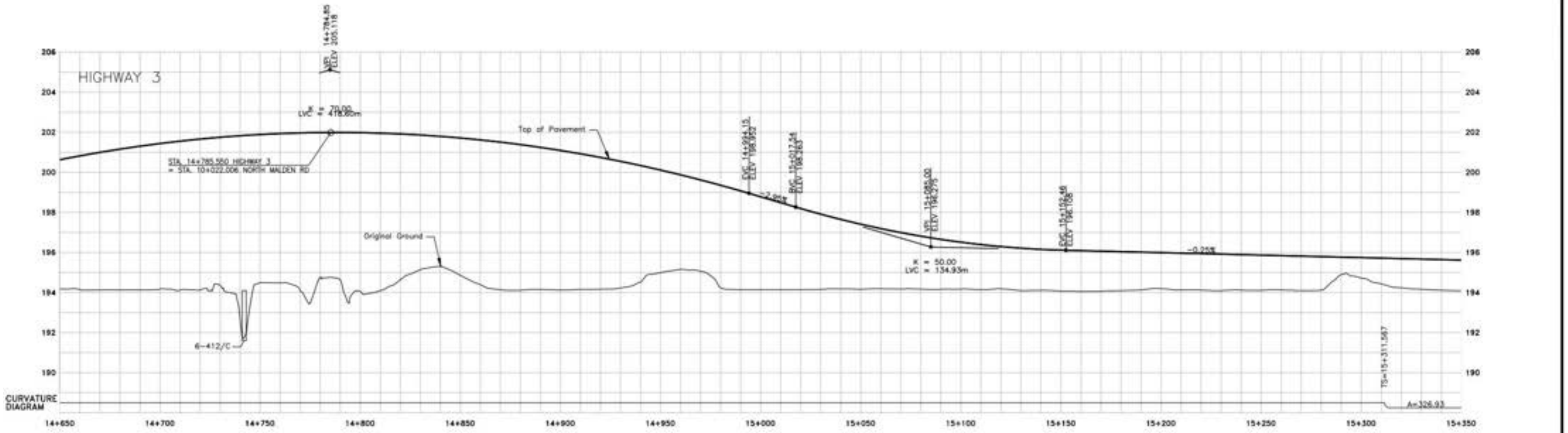
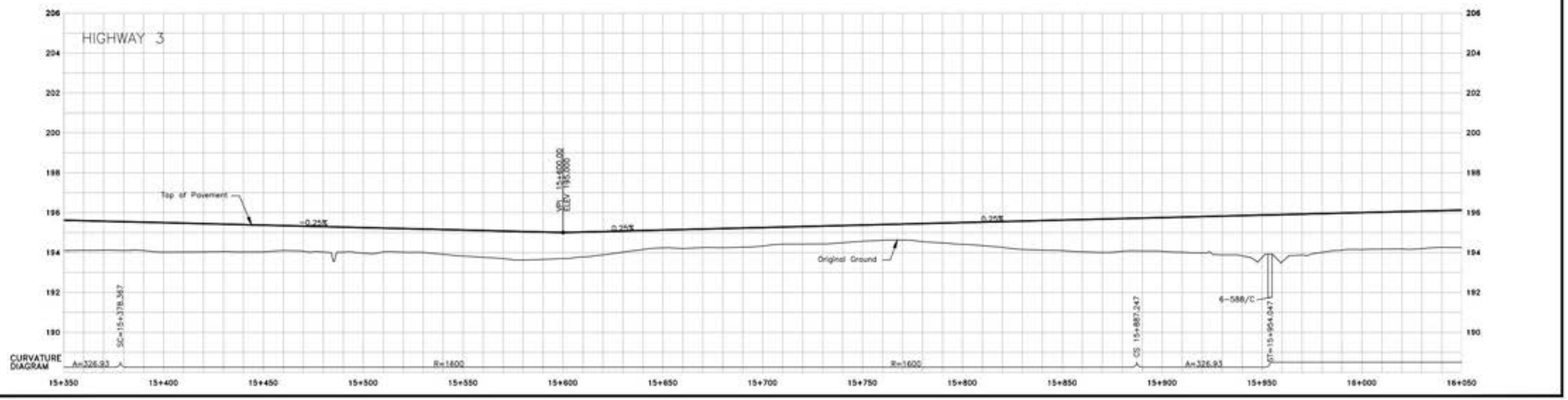
DATE: JULY 2017

DILLON CONSULTING

PROFILES
HIGHWAY 3
STA. 13+250 TO STA. 14+650
P-2





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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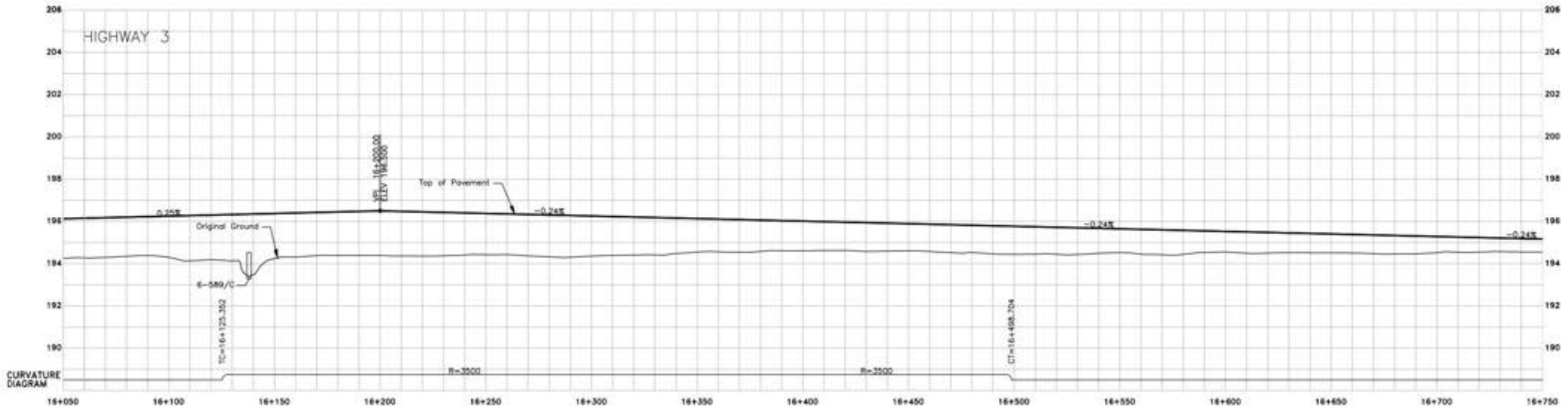
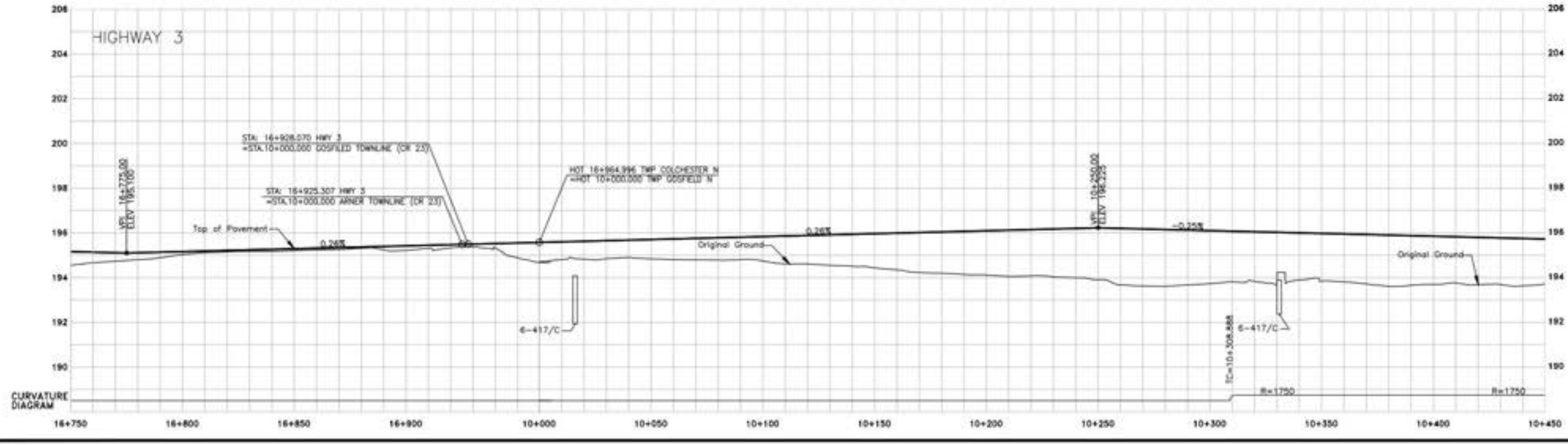
DATE: JULY 2017

DILLON CONSULTING

PROFILES
HIGHWAY 3
STA. 14+650 TO STA. 16+050
P-3





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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5m 0 10m Horizontal
0.5m 0 1m Vertical

CREATED BY: ACR
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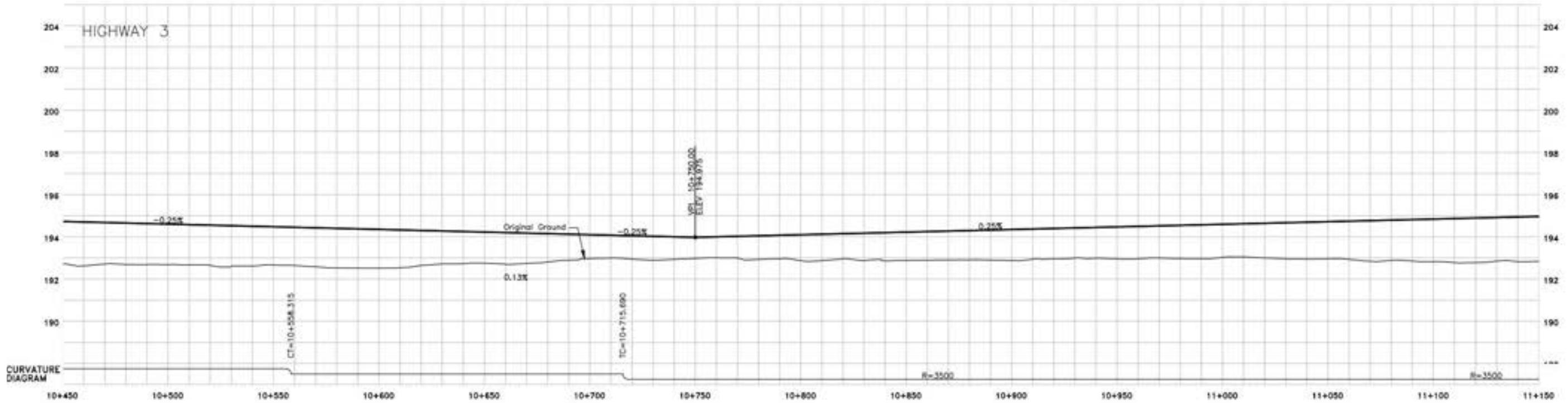
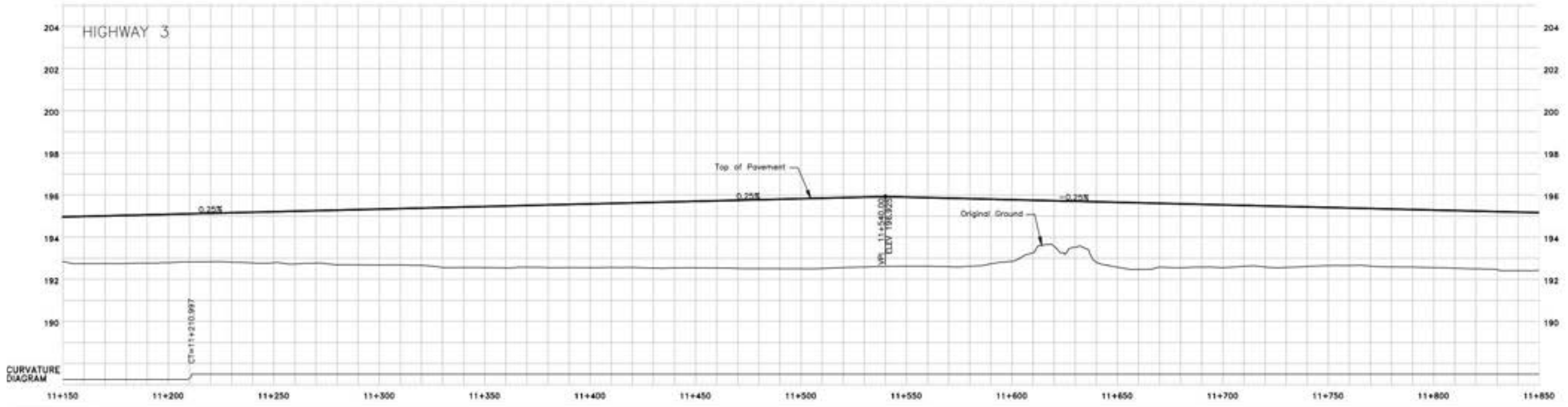
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
HIGHWAY 3
STA. 16+050 TO STA. 10+450
P-4





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

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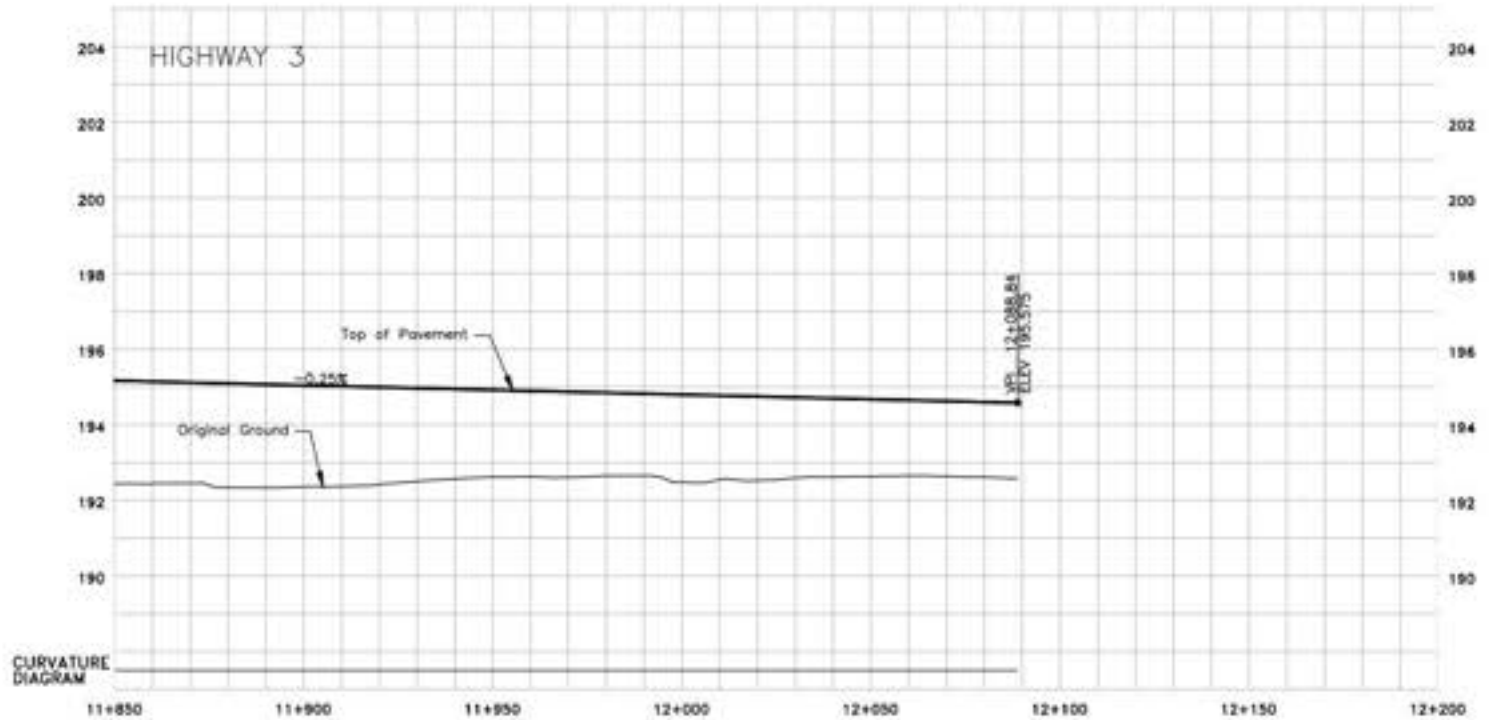
DATE: JULY 2017

DILLON CONSULTING

PROFILES
HIGHWAY 3
STA. 10+450 TO STA. 11+850
P-5



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
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0.5m 0 1m Vertical

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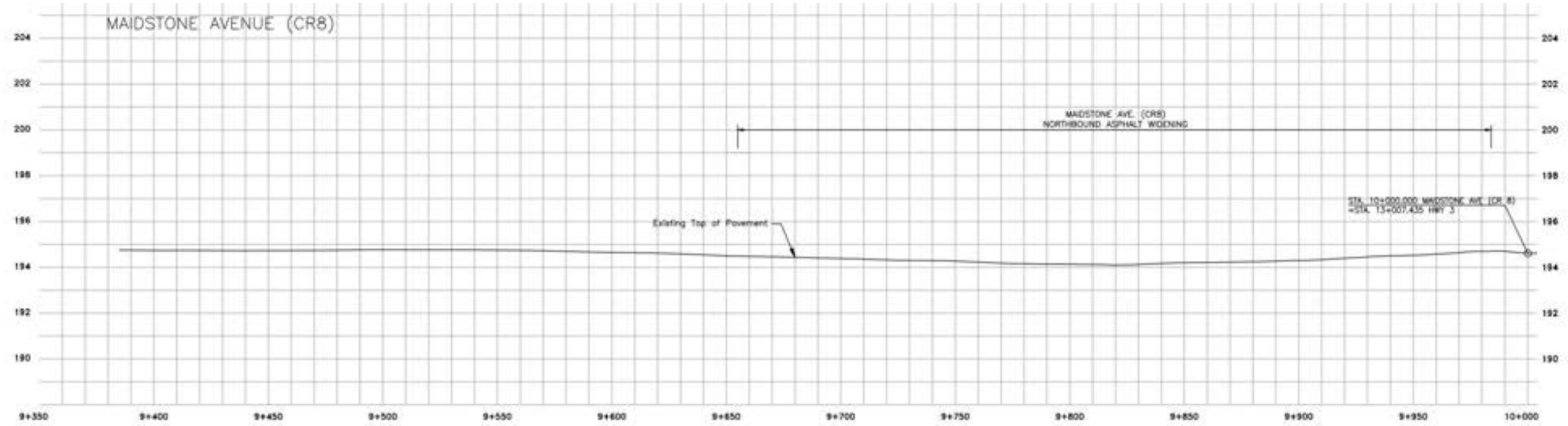
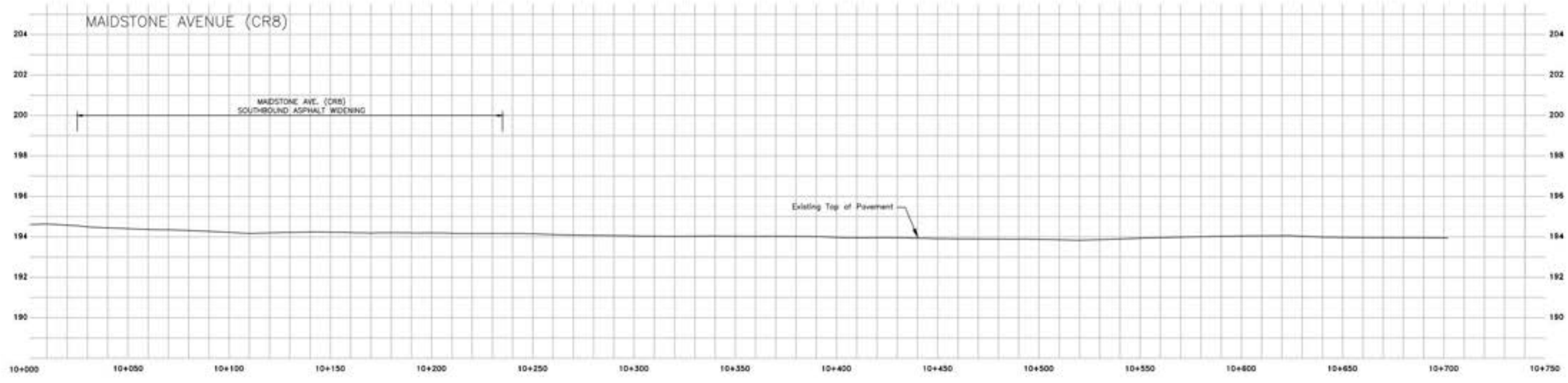
DATE: JULY 2017

DILLON CONSULTING

PROFILES
HIGHWAY 3
STA. 11+850 TO STA. 12+200
P-6





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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5m 0 10m
Horizontal

0.5m 0 1m
Vertical

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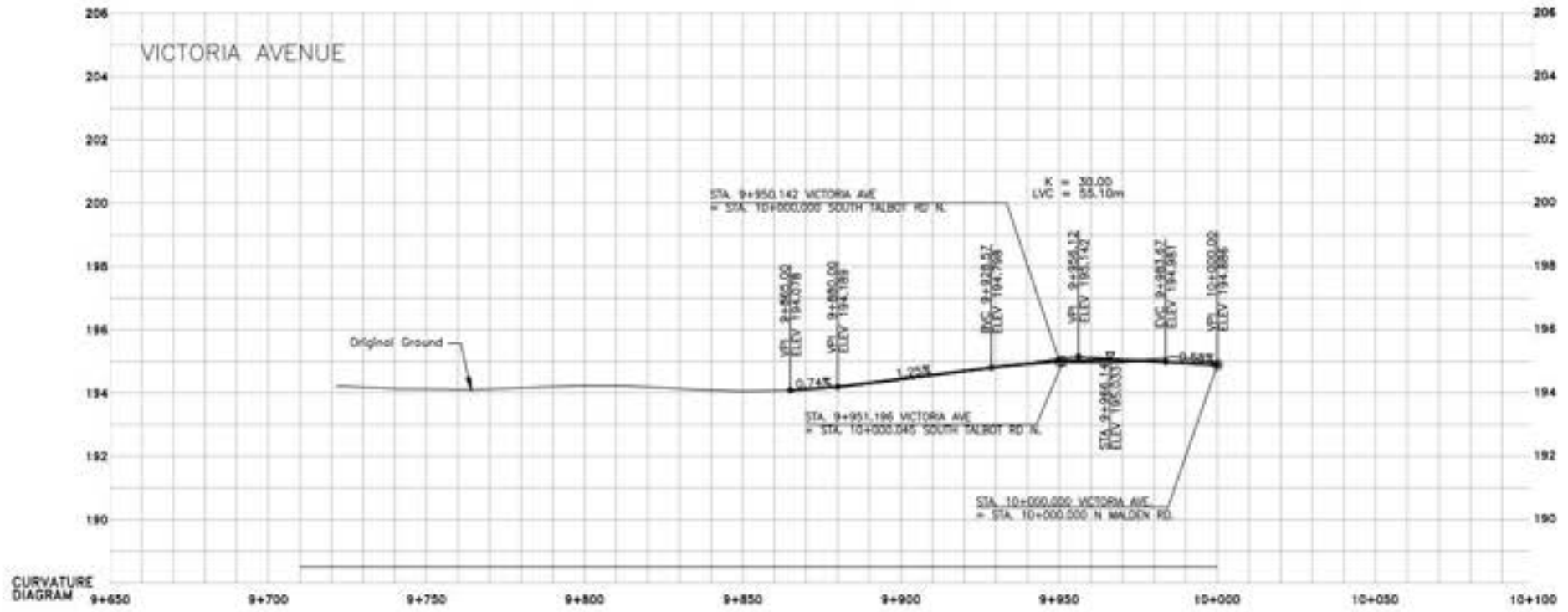
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
MAIDSTONE AVENUE (CR8)
STA. 9+350 TO STA. 10+750
P-7



MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
VICTORIA AVENUE &
NORTH MALDEN ROAD
P-8

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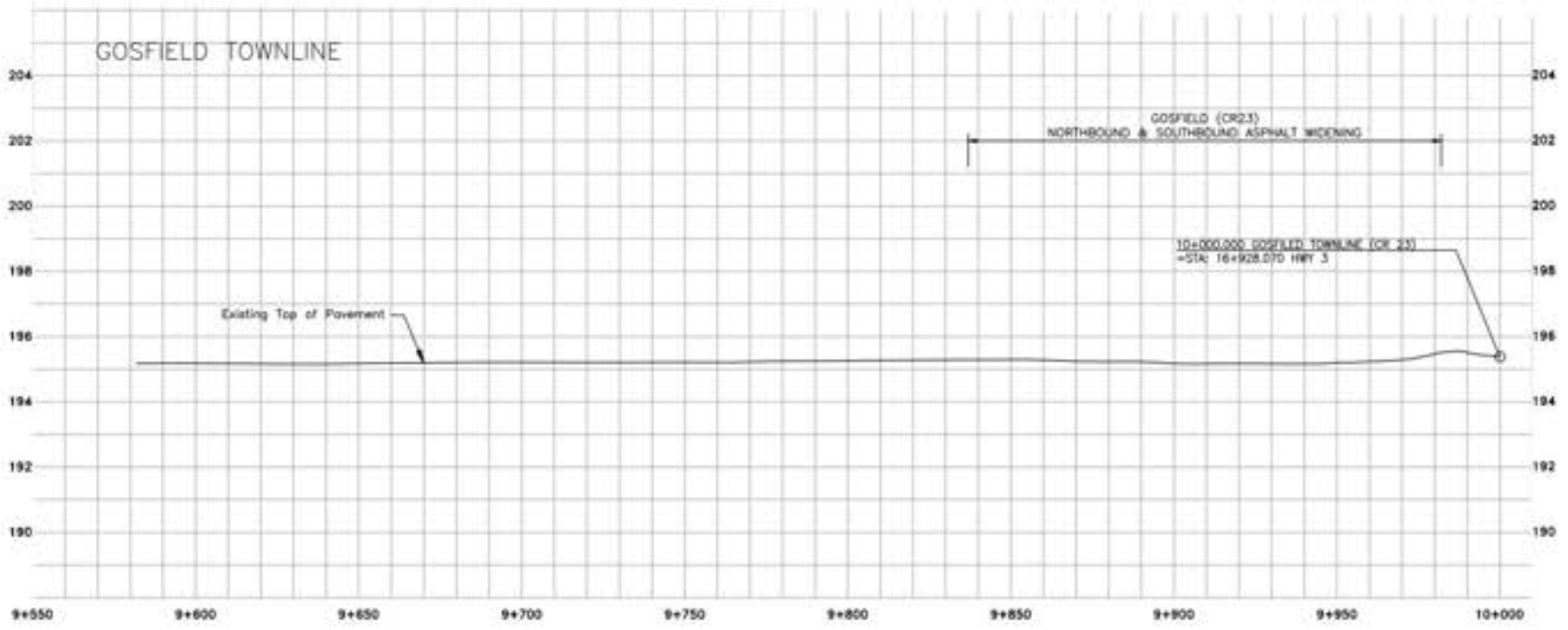

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HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

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5m 0 10m
Horizontal

0.5m 0 1m
Vertical

CREATED BY: ACR
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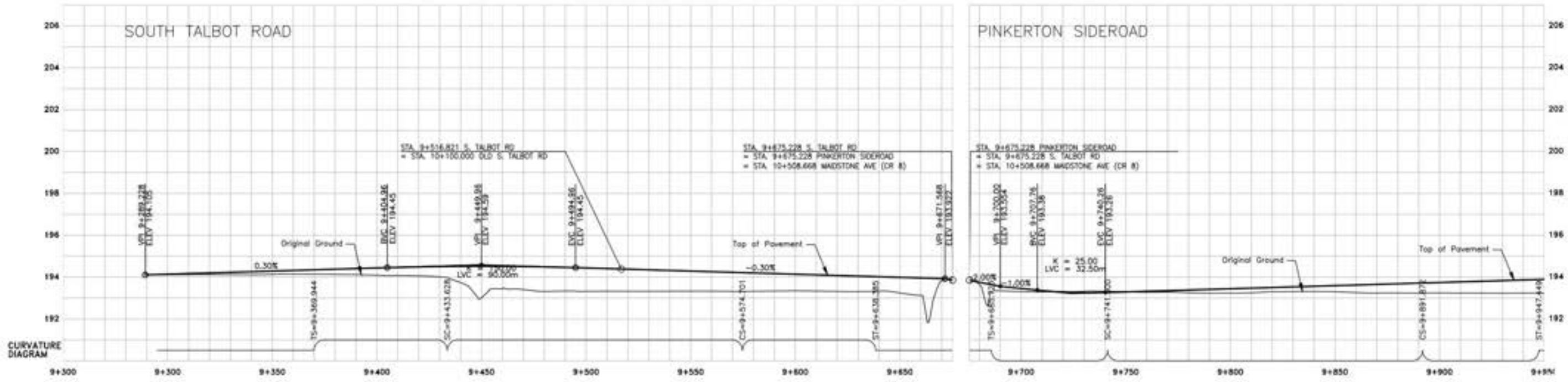
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
GOSFIELD TOWNLINE
STA. 9+550 TO STA. 10+000
P-9



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HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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5m 0 10m Horizontal
0.5m 0 1m Vertical

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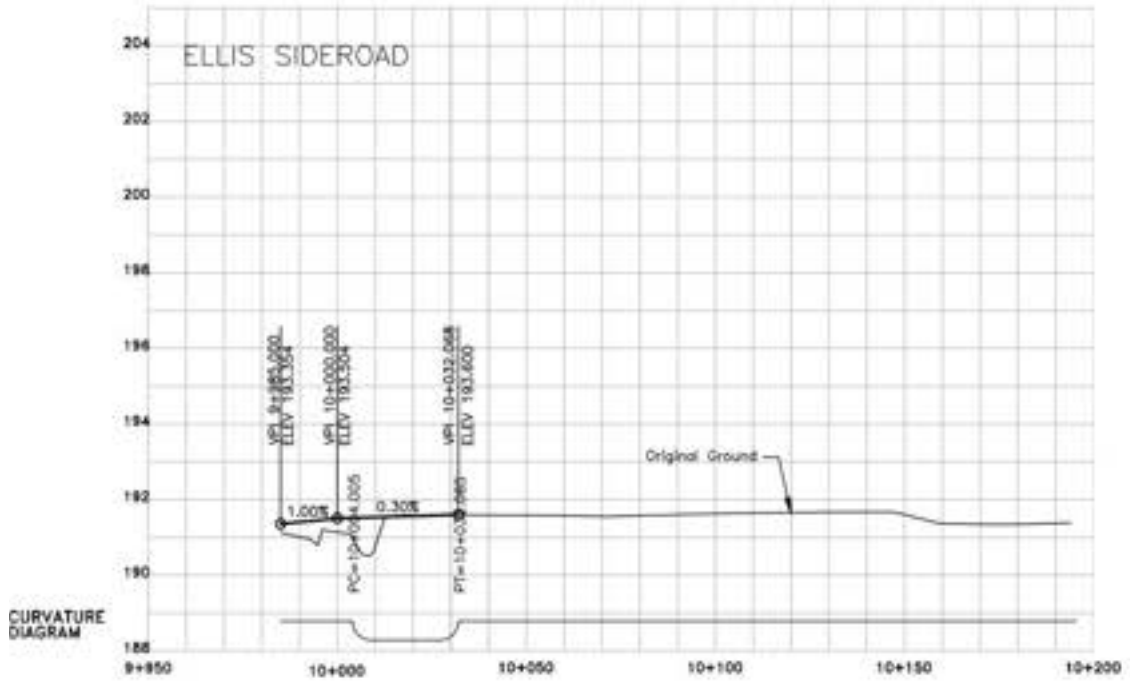
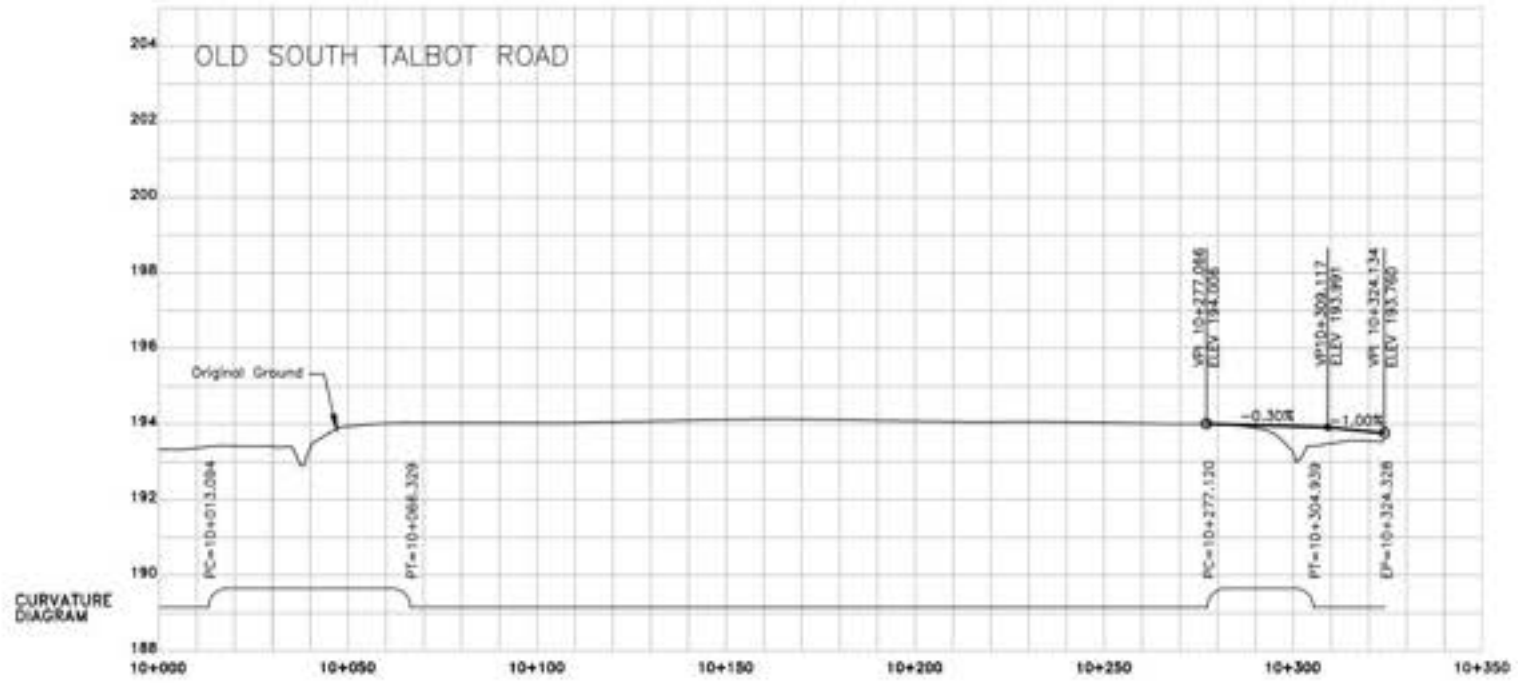
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
SOUTH TALBOT ROAD & PINKERTON SIDEROAD
P-10





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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5m 0 10m Horizontal
0.5m 0 1m Vertical

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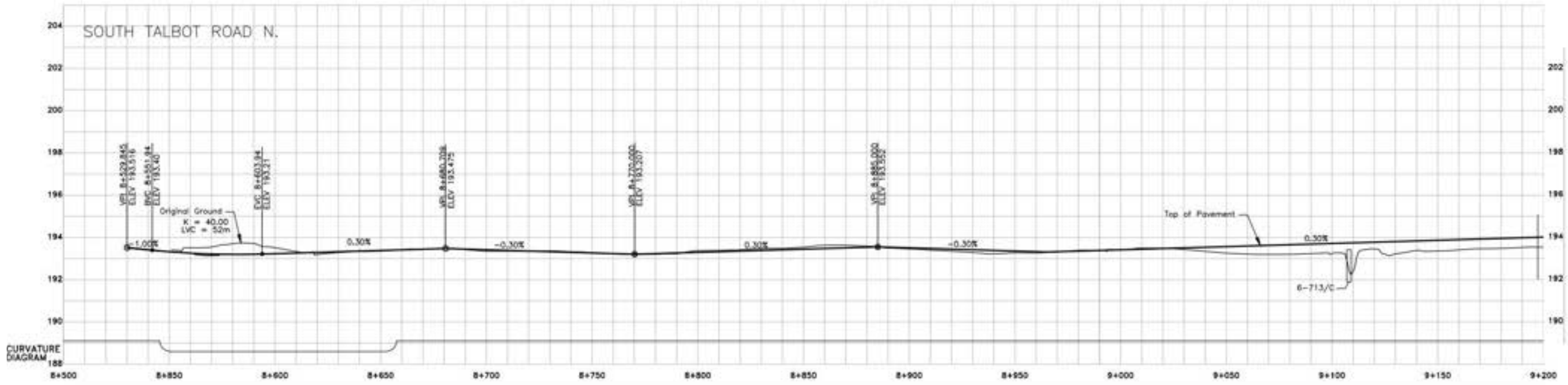
PROJECT No. 12-6452
DATE: JULY 2017

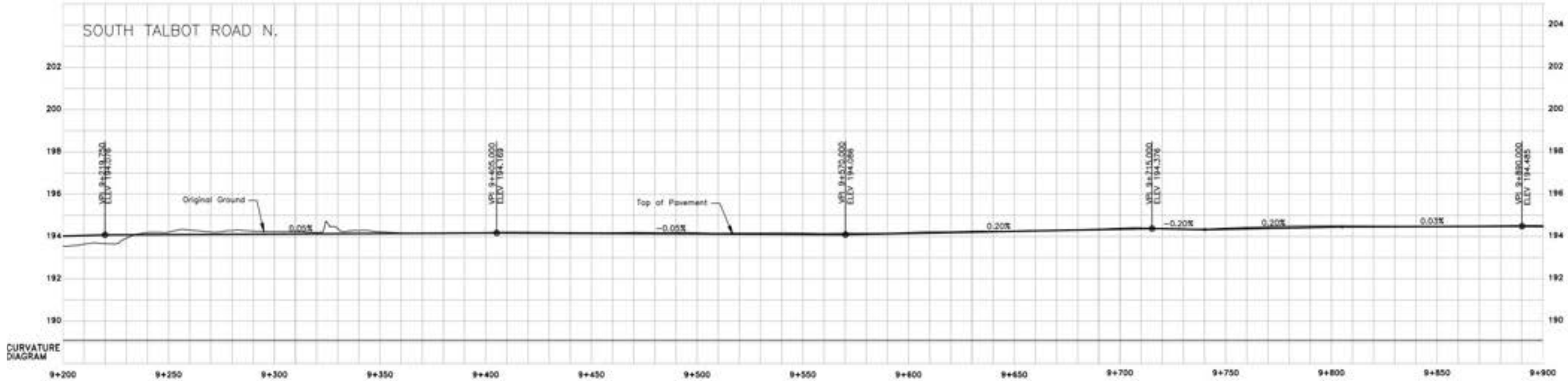
DILLON CONSULTING

PROFILES

ELLIS SIDEROAD &
OLD SOUTH TALBOT ROAD

P-11





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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
GWP 317-98-00

Ontario

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5m 0 10m Horizontal
0.5m 0 1m Vertical

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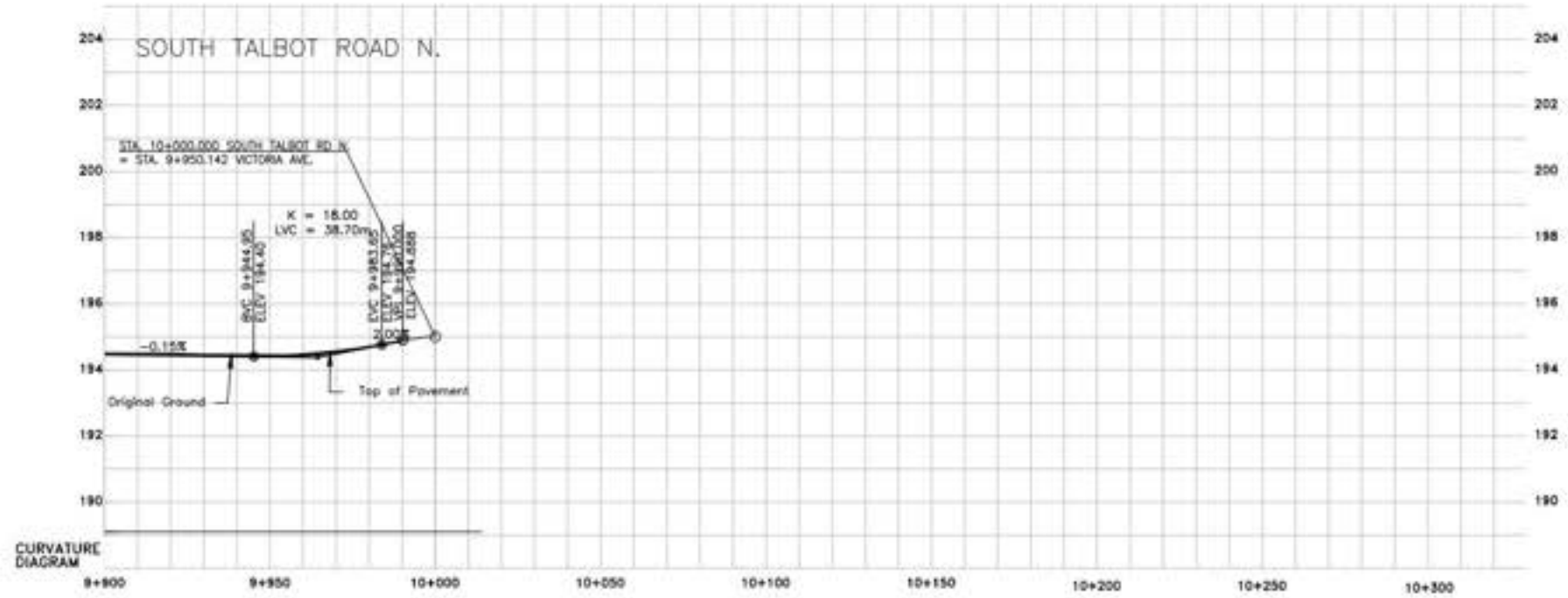
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

PROFILES
SOUTH TALBOT ROAD N.
STA. 8+500 TO STA. 9+900
P-12



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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
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5m 0 10m Horizontal
0.5m 0 1m Vertical

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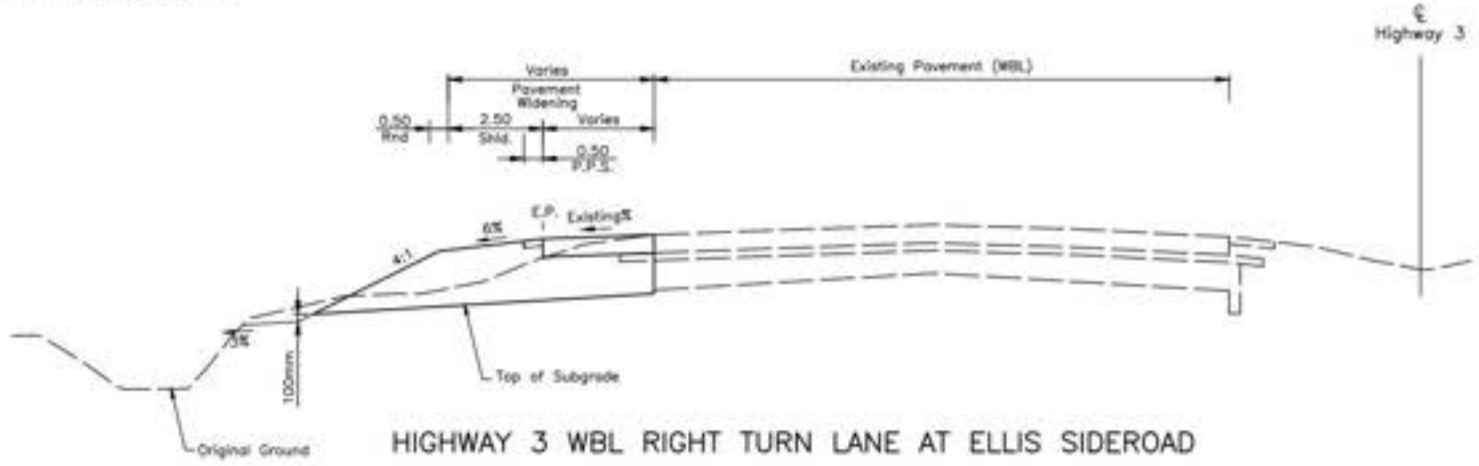
PROJECT No. 12-6452
DATE: JULY 2017

DILLON CONSULTING

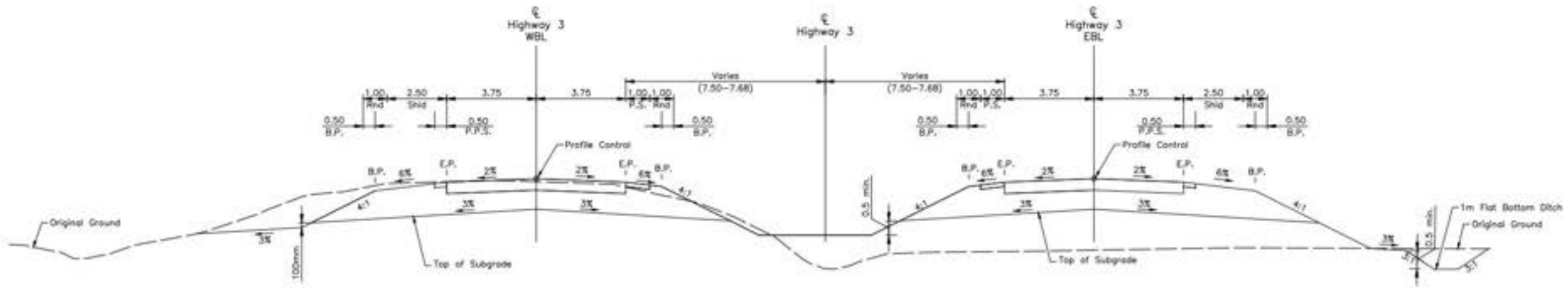
PROFILES
SOUTH TALBOT ROAD N.
STA. 9+900 TO STA 10+600
P-13

GENERAL NOTES:

1. E.P. Denotes Edge of Pavement
   P.S. Denotes Paved Shoulder
   Rnd Denotes Rounding
   Shld Denotes Shoulder
   B.P. Denotes Break Point
   'S' Denotes Rate of Superelevation
   SCL Denotes Speed Change Lane
2. Guiderail to be added as required.
3. All areas to be covered by fill widening shall be stripped of topsoil.
4. Seed and erosion control blanket on slopes steeper than 3:1.
5. Minimum ditch depth 0.5m.



HIGHWAY 3 WBL RIGHT TURN LANE AT ELLIS SIDEROAD



HWY 3 – TANGENT

Shoulder Crossfall varies with Rate of Superelevation (%)

SUPERELEVATION RATE Shoulder crossfall to be as shown in this table													
Pav't.	+6	+5	+4	+3	+2	+1	0	−1	−2	−3	−4	−5	−6
Shld.	−2	−2	−2	−3	−3	−3	−4	−5	−6	−6	−6	−6	−6

N.T.S.

DATE PLOTTED: 2/27/2018 9:56:59 AM
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HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
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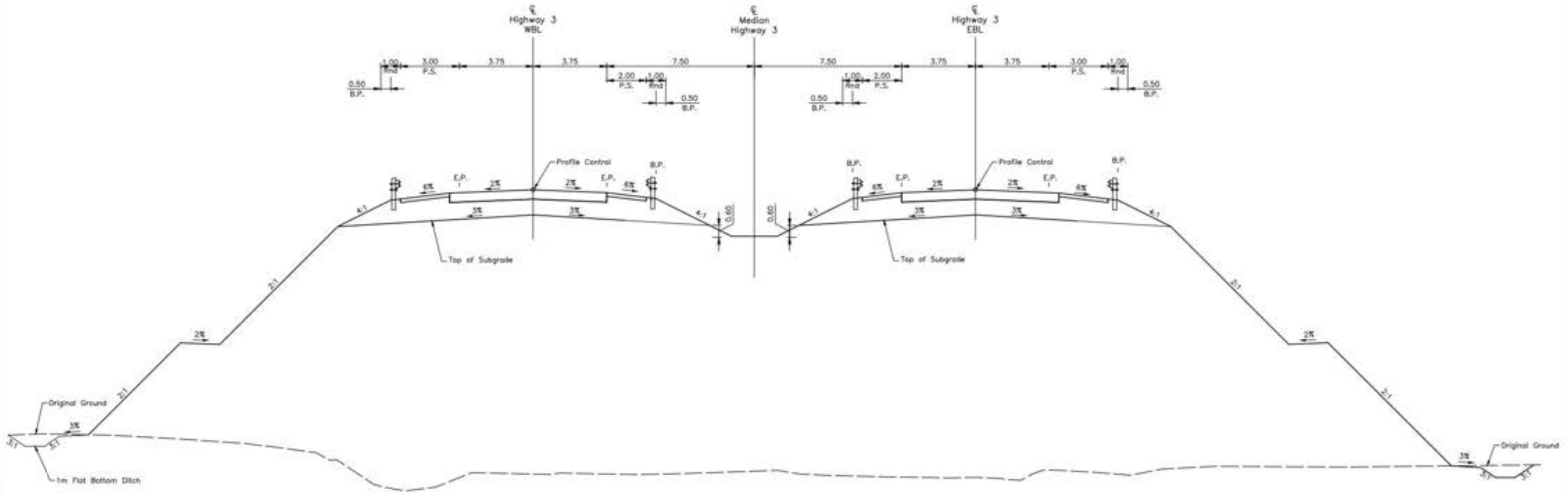
TYPICALS
HIGHWAY 3

T-1



HIGHWAY 3 – OVERPASS APPROACH

N.T.S.

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HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
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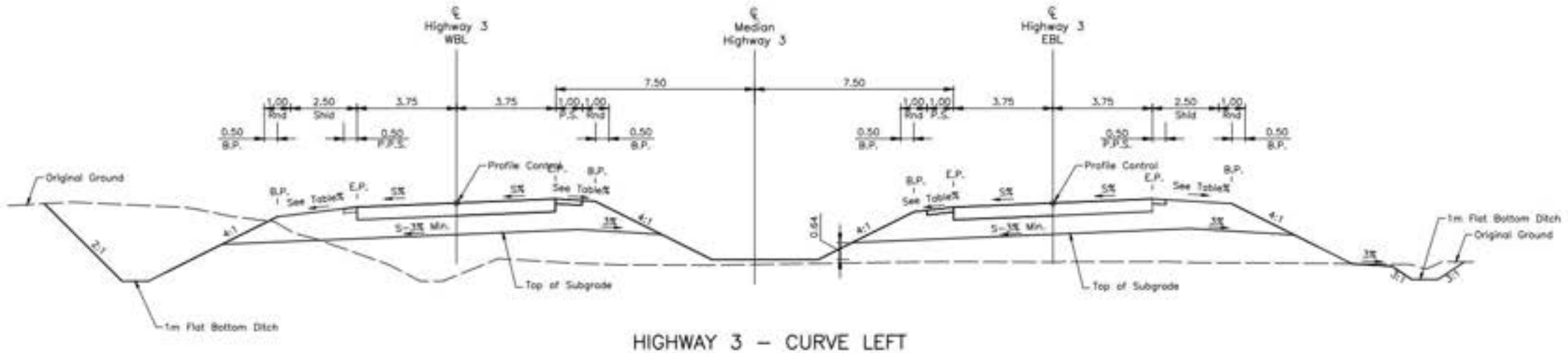
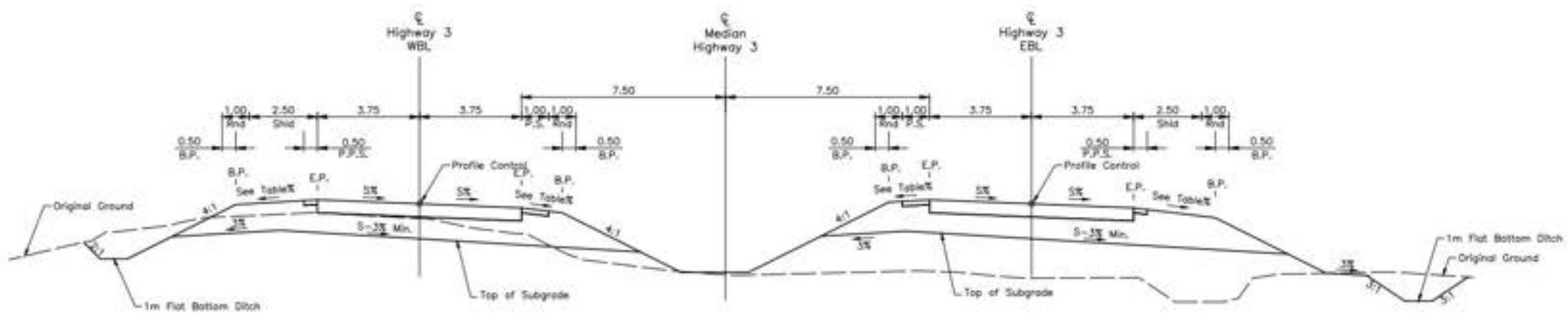
TYPICALS
HIGHWAY 3

T-2



HIGHWAY 3 – CURVE LEFT



HIGHWAY 3 – CURVE RIGHT

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HIGHWAY 3 IMPROVEMENTS
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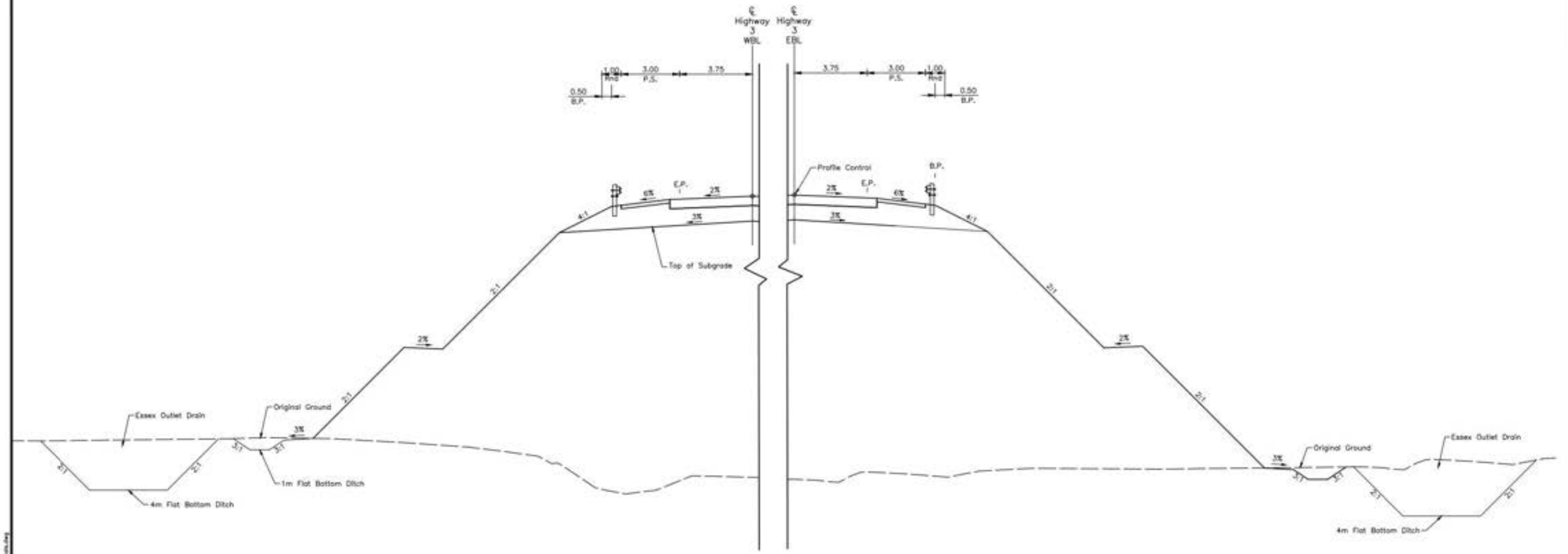
TYPICALS
HIGHWAY 3
T-3



ESSEX OUTLET DRAIN RE-ALIGNMENT

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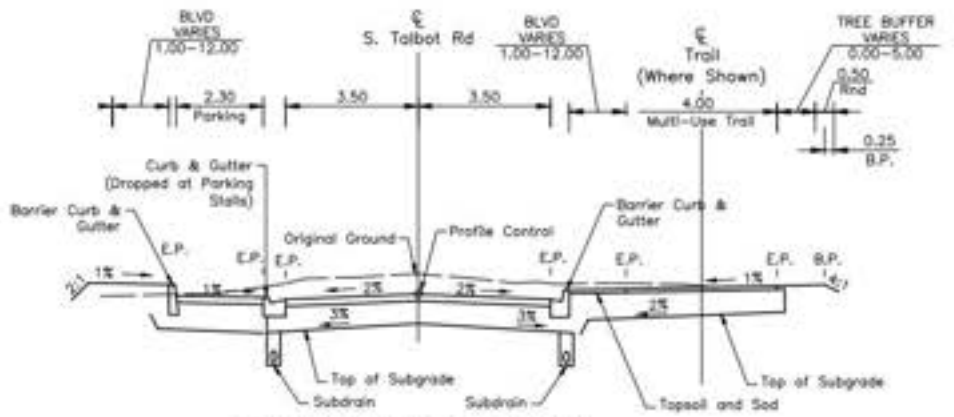
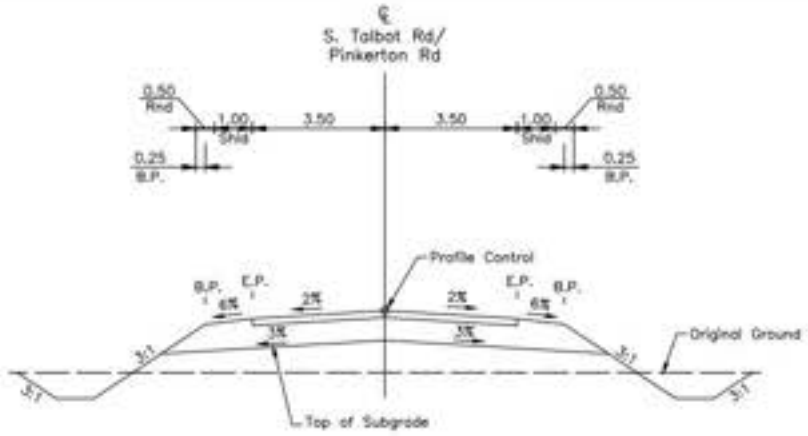
TYPICALS
HIGHWAY 3

T-4



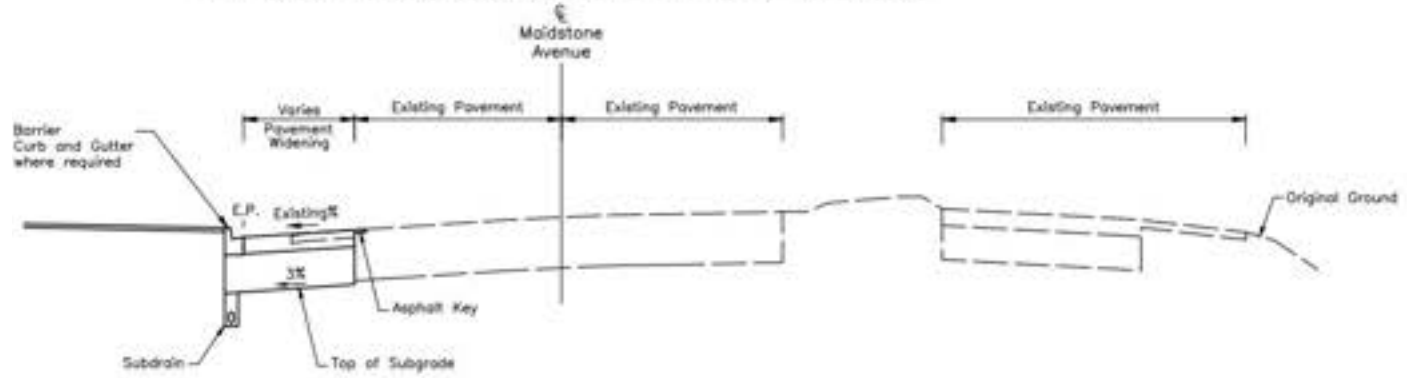
SOUTH TALBOT ROAD N.
SEE NEW CONSTRUCTION FOR LIMITS OF PARKING



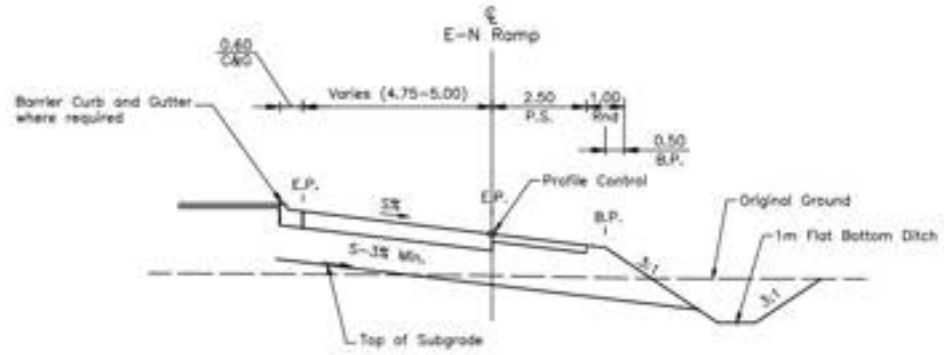
SOUTH TALBOT ROAD &
PINKERTON SIDEROAD

NOTES:

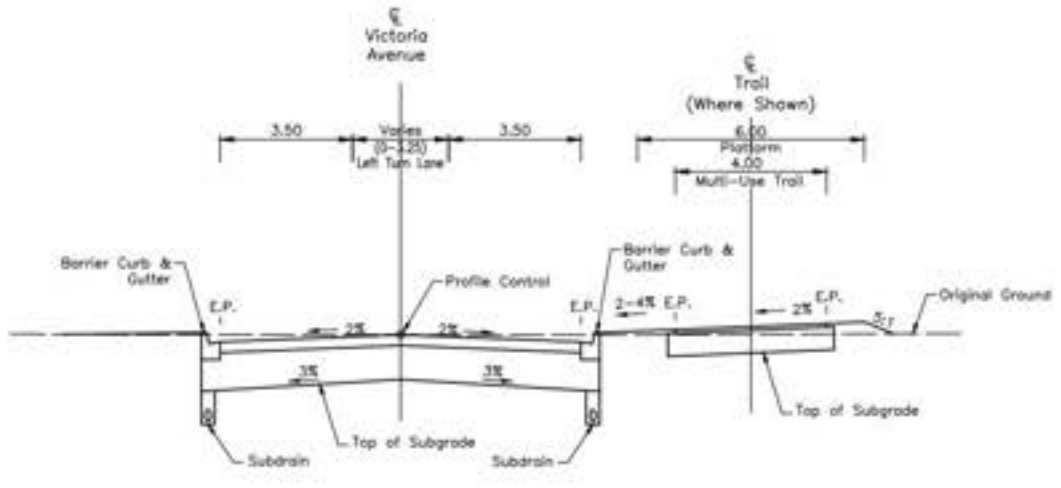
1. SOUTH TALBOT ROAD (NORTH OF HIGJWAY 3) PARKING LIMITS DEFINED IN NEW CONSTRUCTION DRAWING.



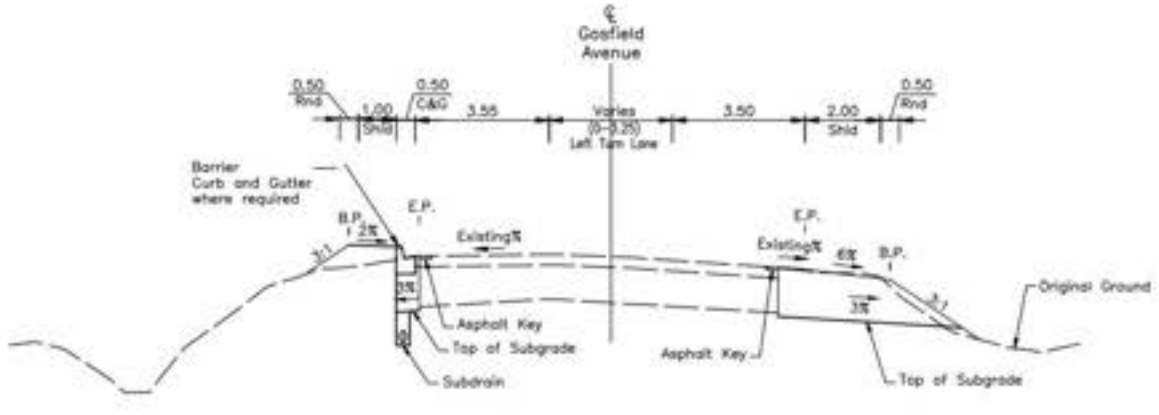
MAIDSTONE AVENUE (CR 8) WIDENING



MAIDSTONE AVE (CR 8) E–N RAMP



VICTORIA AVENUE



GOSFIELD TOWNLINE (CR 23) WIDENING

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MINISTRY OF TRANSPORTATION
HIGHWAY 3 IMPROVEMENTS
TOWN OF ESSEX
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DATE: JULY 2017

DILLON CONSULTING

TYPICALS
SIDE ROADS
T-5

Essex looks to expand its playing fields

DAN TAEKEMA Updated: September 19, 2018

The area of Highway 3 and Victoria Street in Essex on Sept. 18, 2018. JASON KRYK / WINDSOR STAR

SHARE

ADJUST

COMMENT

PRINT

The Town of Essex is trying to make it easier for residents to play the field.

On Aug. 30 the town closed a deal to buy 70 acres at the corner of Highway 3 and North Malden Road with the hopes of addressing a sports field shortage.

Director of community services Doug Sweet briefed council on the newly acquired piece of property and the potential it holds Monday evening.

"We've had a dire need for more ball diamonds in this town for a number of years," said Mayor Ron McDermott, a self-proclaimed "sports nut." "I've got great-grandkids playing now and then they have to go someplace else to play a ball game that kind of sucks."

A report to council reveals that in past years the town has received requests to host adult slo-pitch leagues, a minor football program and more soccer leagues, but has been unable to because of a lack of facilities.

According to Essex Centre Coun. Steve Bjorkman, local sports associations have been begging for fields so they can include more teams and hold tournaments.

"It's not just something that's out there on a wish list," he said. "It's something we know we need to get done we will get done."

Bjorkman explained that hosting tournaments will bring tourism dollars to the town and also allow for organizations including Essex Minor Baseball and Essex Minor Soccer to collect entry fees that will help cover league costs.

A conceptual drawing of the area included in the report shows enough space for a football field surrounded by a running track, seven baseball diamonds, two T-ball diamonds, four senior soccer fields and two intermediate soccer fields as well as a splash pad, tennis courts and canteen.

Work is expected to be carried out in phases once it's decided what would best meet the community's needs.

Essex council has been searching for property that could be transformed into recreational space since 2015.

McDermott said a piece of property was first located in town, but because it was zoned residential the owners wanted "two arms and half a leg from the town to sell it."

Bjorkman described the newly purchased site as a great location where "there's a lot more room and it's a lot less expensive."

He said he was excited to see the project moving forward, but added there are still plenty of steps that need to be taken before the fields finally are rolled out.

Bjorkman said the first step is learning what the town now has. "The next step is to go to the sports associations and ask them what will best meet their needs."

dtaekema@postmedia.com

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FCA's Windsor Assembly Plant helps needy kids get back to school

WEATHER ›

A FEW CLOUDS 31°C CURRENTLY 40°C FEELS LIKE

Reaume, Michael

From: Nepszy, Chris <cnepszy@essex.ca>
Sent: Tuesday, March 13, 2018 3:47 PM
To: Reaume, Michael
Cc: Boudreau, Dan; Nussio, Norman
Subject: Stanton Park adn Essex Splash Pad
Attachments: Stanton_Proposed.pdf; Stanton_Existing.pdf

Hi Michael,
Have a couple of issues that I would like your opinion and thoughts on:

1. STANTON COURT PARK

We are looking to redo the drainage in this park, but wanted your opinion on how you have this on the model, and will some sort of retention or swm really help in this area? I thought we should practice what we preach!

Existing:

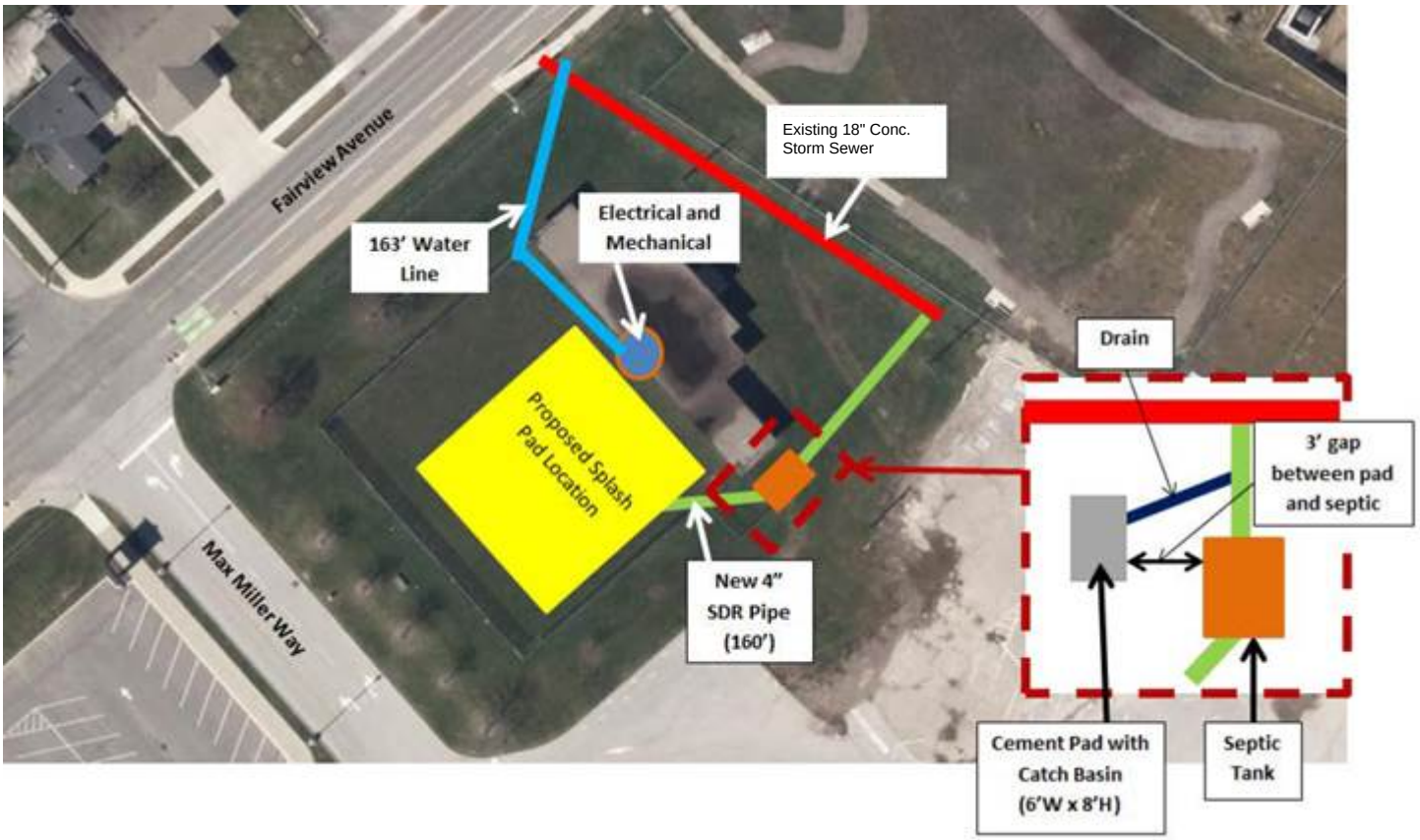
The existing drainage system will remain in place along the rear of the homes on Stanton Drive, the existing CB will be removed and disposed of, the existing storm pipe will be cut and capped.

Proposed:

Replace the existing CB with a new 600mm x 600mm, place a new 600mm x 600mm CB at the lowest point (to be determine in the field) connect the two CB's with @50m of 100mm SRD pipe. Install @120m of 150mm SDR from the field determine CB to the existing CB at the play centre.

1. SPLASH PAD AT ESSEX PCP (209 m^2)

Community Services are installing a splash pad at the Essex Arena. They are proposing a dechlorinated system and want to connect to storm (so they don't have to pay for sewage). It is 209 m^2. I am not concerned of the use during summer, as typically it would only be used when it is hot and sunny and dry. I am thinking of the concrete pad and how it would add to the storm sewer on Fairview during rainy events. Thoughts?
They are installing a holding tank to be able to utilize and water flowers with. I will provide the size of that tank shortly. The map is mislabeled. They would be tying into a 6" storm…not sanitary.



Thanks,
Chris

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Appendix F TECHNICAL DETAILS FOR H&H MODELING ANALYSIS

F.1 TABLES

Table F-1 shows the SWMM subcatchment parameters which were selected for the land within the Ward 1 southwest area that is designated for future development. These parameters are used for computing stormwater runoff and assessing the stormwater drainage system.

Table F-1: SWMM runoff method subcatchment parameters for the areas designated for future development

Future Developed Area	Future Land Use / Description	Impervious (%)	Flow Length (m)	Area (ha)	Other parameters
Woodview Estates	Residential	50	50	7	*
Jakana	Residential	50	50	4.8	*
Kimball	Residential	65	50	2.2	*
Splash Pad at Essex Arena	Parkland	100	5	0.02	*
Outdoor sports facility & splash pad at lot on SW corner of Hwy 3 – North Malden Rd	Parkland	15	150	28	*
Hwy#3 culverts – 4 culverts and some drain construction in study area	Culvert & Roadway	100% of paved area	10m / lane	2500mL x10mW = 2.5ha	**

Notes:
* Refer to Essex Storm Sewer System Hydrologic-Hydraulic Model Development, Calibration and Capacity Assessment, 2018
** Refer to Highway 3 Improvements – Culvert Hydrology and Condition Report (Draft), 2014 in **Appendix E**

F.2 HYDROLOGIC-HYDRAULIC MODEL DEVELOPMENT – BRIEF SUMMARY

The hydrologic and hydraulic (H&H) model was developed using PCSWMM 2017 Professional 2D software version 7.1.2480. PCSWMM utilizes the U.S. EPA SWMM5 engine (currently 5.1.012). Field investigations and field measurements were conducted based on review of construction record drawings to develop the model, and CCTV testing of targeted storms sewers was undertaken to assess the existing condition of the catchment's storm system.

The study area was modeled as 1D dual drainage with the sub-drainage system (represented by sewers and open channels) developed based on construction record drawings and the main drainage system (surface profiles) developed using SWOOP 2015 LIDAR, the 2015 aerial photograph and construction record drawings. The main drainage system was connected to the sub-drainage system with 1m diameter bottom orifices at catch basins in the road profile.

Flow within a conduit was computed numerically as unsteady state flow using Dynamic Wave routing with keep inertial terms. Runoff was computed using the SWMM runoff method and infiltration was computed with the Modified Green-Ampt method. Aquifer computations were computed for agricultural lands located outside the urban town limits to simulate tile drainage with a two-zone groundwater routine based on Gagliardo's (1986) Master's thesis with SWMM5 modifications. Details of the model development, calibration and capacity assessment can be found elsewhere (Essex Storm Sewer System Hydrologic-Hydraulic Model Development, Calibration, and Capacity Assessment, 2019).

Outfall boundary conditions for the analysis were the 100yr floodline at the Essex Outlet Drain culvert crossing under Mole Rd (189.2m) and at the John's Creek Drain outlet to Craig's Creek Drain (188.0m). The locations of the two (2) outfall boundary conditions are shown in **Figure 2.1** of **Appendix A**.

F.3 PROCESS CONTROL NARRATIVE FOR REGIONAL DEWATERING PUMPING STATIONS

The pumping station controls are to be designed for the process control narrative (PCN) below.

PCN: Storms that produce HGL_P weir crest elev.

1. The rainfall event starts, and runoff in the drain is diverted to the regional dry pond.
2. The pond level (LE1) rises readying the pumping station for operation provided water level in the drain (LE2) is suitable.
3. The dewatering pumping station's duty pump STARTS and STOPS based on level in the drain (LE2) until the pond and Essex storm system are dewatered.

PCN: Storms that produce HGL_P > weir crest elev.

1. The rainfall event starts, and runoff in the drain is diverted to the regional dry pond.
2. The pond level (LE1) rises readying the pumping station for operation provided water level in the drain (LE2) is suitable.
3. The dewatering pump STARTS and STOPS based on level in the drain (LE2) at the beginning of the storm.
4. The HGL continues to rise during the storm event and when level in drain exceeds the Pump STOP level the pump shuts off and remains off. Runoff from Essex's storm system at this point outlets via gravity overflowing the weir. The storm event continues to increase the HGL in the drain and pond until the peak HGL is produced from the storm event.
5. Once the peak HGL is produced the level in the pond and drain will begin to decrease via gravity overflowing the weir. The pond level and level in the storm sewer system (LE1) will decease to the weir crest elev. The drain level on the downstream side of the weir (LE2) will decrease until it reaches the Pump START level.
6. The dewatering pumping station's duty pump STARTS and STOPS based on level in the drain (LE2) until the pond and Essex storm system are dewatered. At this point the storm system is ready to service the next storm event.

Prepared for:
Town of Essex

Prepared by:
Stantec Consulting Ltd.

Town of Essex

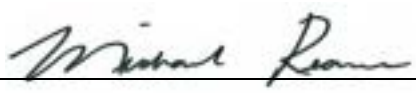
Essex Storm Sewer System Hydrologic-Hydraulic Model Development, Calibration and Capacity Assessment

Project No. 165620006

January 31, 2019

Sign-off Sheet

This document entitled Essex Storm Sewer System Hydrologic-Hydraulic Model Development, Calibration and Capacity Assessment was prepared by Stantec Consulting Ltd. ("Stantec") for the account of the Town of Essex (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
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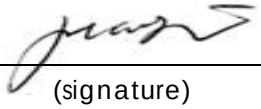
Michael Reaume, MASc, P.Eng., Environmental Engineer

Reviewed by 
(signature)

Jian Li, P. Eng. PE, PhD, Senior Environmental Engineer

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Abbreviations

WWF	Wet weather flow
DWF	Dry weather flow
IDF curve	Intensity duration frequency curve
PS	Pumping station
HGL	Hydraulic grade line
SWM	Stormwater management

Glossary

Flooding	Occurs when the liquid level rises above grade elevation and ponds onto the ground surface.
Surcharge	Occurs when the liquid level rises above pipe crown (top of pipe).
Hydraulic grade line (HGL)	The liquid level elevation in the storm sewer network.
Pipe Capacity	Ratio of maximum flow to the pipe capacity calculated by the Manning equation (Qmax/Qcap). Ratio's exceeding 1.0 exceeds pipe design capacity. Ratio's between 0.7 to 1.0 have marginal pipe capacity remaining. Ratio's between 0.0 to 0.7 have adequate pipe capacity remaining.
Minor drainage system	Runoff that is conveyed and stored in sewers and open channels.
Major drainage system	Runoff that is conveyed and stored in roadways and frontal portion of lots in urban areas, and the ground surface in rural areas.
Dual drainage system	The dual drainage concept models two conduit systems to route and store runoff: a minor system and a major system.
Return period	Used to quantify the magnitude or rarity of a storm event. As the storm return period increases the magnitude or rarity of the storm increases as well. For example, storms with 2-year and 25-year return periods have a probability of 50% and 4% of being equaled to or exceeded in any given year respectively.

1.0 INTRODUCTION

1.1 BACKGROUND

The Town of Essex is located in the centre of the County of Essex and as such is situated at the intersection of several headwater systems that outlet to waterbodies that bound the county along the northern, western and southern limits. Stormwater runoff from Essex is conveyed through the Town's storm drainage system to receiving municipal drains in two (2) subwatersheds. The northern portion of the Town is located within the upper limits of the Puce River subwatershed and the southern portion of the Town is located within the upper limits of the Canard River subwatershed. Runoff from Puce River and Canard River subwatersheds is conveyed in watercourses through adjoining towns to Lake St. Clair (roughly 15km downstream) and the Detroit River (roughly 35km downstream).

This report represents the development and calibration of the Town of Essex's stormwater drainage system's hydrological-hydraulic model. The report is intended to document the approach and methodology used in model development, model calibration, and subsequently perform a capacity assessment to locate areas with limited hydraulic capacity and recommend preliminary storm sewer improvements.

1.2 OBJECTIVE & SCOPE

To develop a hydrologic-hydraulic model of the stormwater drainage system within the limits of the Town of Essex, calibrate the model and subsequently perform a capacity assessment on the existing drainage system.

1.3 DATA SOURCE

The sources of information referred to in this study included construction record drawings, field investigations, previous reports, codes, standards and guidelines. The list of references includes:

- Town of Essex Interactive Mapping Service.
- Sewage Design Guidelines for Sewage Works. OMOE. 2008.
- Stormwater Management Planning and Design Manual. OMOE. 2003.
- Storm Water Management Model User's Manual V5.0. USEPA. 2010.
- Storm Water Management Model Reference Manual Volume I – Hydrology (Revised). USEPA. 2016

- Storm Water Management Model Reference Manual Volume II – Hydraulics. USEPA. 2017
- Frequently Asked Questions About Tile Drainage, AE1690 (Revised). NDSU. 2015.
- 10 Things You Didn't Know about Subsurface (Tile) Drainage, A.D. Latornell Conservation Symposium. OMAFRA. 2011.
- Design and Construction Guidelines for work under the Drainage Act, 1975. OMAFRA, MNR & the Conservation Authorities. 1986
- Drainage Guide for Ontario. Publication 29. OMAFRA. 2007.
- Hydraulic Engineering Circular No. 22, 3E – Urban
- Drainage Design Manual. FHWA. Rev 2013.
- Sanitary sewer system hydraulic model development, calibration and capacity assessment. Stantec. 2015.
- Kimball development on-site SW detention calculations, storm sewer design sheets and application for ERCA permit. Dillon. 2006.
- Essex Crossing Stormwater Management Report – Final Report. Glos Engineering Ltd. Aug. 2003.
- Galos Development Stormwater Management Report – Final Report. Dillon Consulting Ltd. Dec. 2006.
- Canaan Drain Regional Storm Quality Pond Report. NJ Peralta. Jan. 2001.
- Expansion of Canaan Drain Regional Storm Quality Pond Report. NJ Peralta. Dec. 2004.
- Fill and Floodline maps. Essex Region Conservation Authority (ERCA). Map No.'s ER3-32, ER5-38.
- Report on Storm Water Drainage in the Town of Essex. Lafontaine Cowie Buratto (LCBA) Ltd. 1975.

2.0 EXISTING CONDITIONS

2.1 STORMWATER SERVICING STUDIES/MASTER PLAN & HISTORY OF CONSTRUCTION

The earliest available storm sewer records date back to the 1960's. Construction record drawings before this period are scarce. Prior to 1960, the stormwater drainage system was constructed primarily of ditches, small diameter sewers and clay tiles which were shallow in depth and outlet into municipal drains in the adjoining towns. Many of the sewers and tiles were hydraulically inadequate and many were silted up and partially plugged.

Stormwater drainage studies were undertaken in 1968 (C.G. Russel Armstrong Associates Ltd.) and 1975 (LCBA Ltd.) with the purpose to undergo a systematic storm sewer construction program in order to improve stormwater drainage in the Town of Essex.

The LCBA study proposed a conceptual layout of the storm sewer system based on 2yr return period, average 30min inlet time, and rational method design. Some of the Town's storm sewer system has been upgraded to meet or exceed this design criteria over many contracts since the 1975 LCBA study. Many storm sewers were installed when open ditches and drains were filled, or when clay tiles were replaced.

Some of the recommendations in the LCBA study have been completed by the Town to date, and some have not. No Municipal Class EA Storm Sewer Servicing Master Plan has been undertaken.

2.2 STORMWATER INFRASTRUCTURE – SITE PLAN

A full site plan of the Town of Essex's stormwater drainage system in the model is shown in **Figure 2.1(a)** and a partial site plan showing the urban portion of Essex's model is shown in **Figure 2.1(b)** in **Appendix E**. The catchment boundaries represent the boundary limits of the stormwater model that was developed. The site plan was developed through field investigations and field measurements, review of record drawings, and CCTV testing of targeted storms sewers. The site plan represents the Town of Essex's drainage system as of April 2016, and was used to populate the model with infrastructure. The areas that were CCTV inspected are shown in **Figure 2.2** in **Appendix E**.

Essex's drainage basin consists of five (5) urban catchments shown in **Table 2-1**. The model was developed for Essex's five urban catchments and the rural portion of the South Talbot Catchment.

Table 2-1: Catchments in the Town of Essex

Catchment	Area (ha)	Subwatershed	Outlet
Rush	115	Canard River	Rush Drain & 14th Conc. E Drain (Munch Drain)
Arner Townline	21	Canard River	West Townline Drain & East Townline Drain
South Talbot Urban Rural	 250 1300	 Canard River Canard River	 Essex Outlet Drain & Canaan Drain Essex Outlet Drain & John's Creek Drain
Hopgood	40	Puce River	Hopgood Drain
Maidstone	155	Puce River	Maidstone Ave Drain

2.2.1 Infrastructure with no Record Drawings

No construction record drawings were available for clay tiles, and for some of the sewers installed in Essex. Stormwater infrastructure with missing record drawings are shown in **Figure 2.3**.

2.2.2 Infrastructure with Errors on Record Drawings

Where field investigations and field measurements were undertaken it was found that storm sewers on construction record drawings and/or the Town Interactive Map were not accurate in the following areas:

- Talbot St N, particularly between Iler Ave and Gordon Ave. LCBA dwg. no. LB-870.
- Wellington, St. James, Langtry, and St. Paul streets. Infrastructure was not installed in locations shown on record drawings and many CB's and MH' are either missing or buried. Crozier Engineering dwg. no. BC-08-050.
- Golfway subdivision sewer invert elevations are incorrect. The drawings appear to be preliminary and not construction record drawings. RC Spencer dwg. no. 91-141.
- Hanlan St between 80m easterly of Laird to Fairview Ave W. Missing some MH's and sewer invert elevations are incorrect. Setterington Ltd. dwg. no. D-259.

In these areas, where field measurements were possible the results of the field investigation were used for model input development.

The following old storm sewers not shown on the Interactive Map are still in service:

1. Field tile on north side of Brien Ave E between Talbot St N and Gosfield Twl. Many catchbasins on the north side of Brien Ave E are connected to this tile sewer which is significantly plugged with roots and silt.

The following old abandoned storm sewers shown on the Town's Interactive Map do not appear to be in service:

1. Maidstone Ave E sewer on the north side of road between Talbot St N and the old CN railroad tracks.
2. Wilson Ave sewer on north side of road.
3. A portion of Gordon Ave sewer on north side of road

2.3 STORM SEWER & OPEN CHANNEL INVENTORY

Table 2-2 summarizes the urban portion of the Town of Essex's storm sewer and open channel inventory. The majority of sewer pipe materials are PVC, concrete and clay. Approximately 17% of the sewers in the Town of Essex are clay.

Table 2-2: Storm sewer and open channel Inventory in the urban portion of the Town of Essex

Pipe Size (mm)	*Length (km)*	*Pipe Material*	*Length (km)*
Gravity Sewers			
150	2.0	HDPE	2.6
200	4.7	PVC	10.6
250	6.6		
300	12.5	Material unknown	0.4
375	5.4	Cast Iron	1.2
450	5.4	Asbestos Cement	0.05
525	2.7	CSP	1.7
600	5.0	CSP pipe arch	0.7
675	1.1	Clay	9.7
750	4.7		
825	0.03	Reinforced Concrete	31.2
900	4.3		
1050	1.9		
1200	1.1		
1350	0.4		
1500	0.04		
1800	0.2		
Open channels or culverts			
Ditches or Culverts	7.9	Ditches or Culverts	7.9
Sub-total	**66.0**	**Sub-total**	**66.0**
Forcemains			
150	0.005	D.I.	0.007
300	0.002		
Sub-total	**0.07**	**Sub-total**	**0.07**

2.4 SOIL CONDITIONS

Essex generally has a topsoil stratum of approximately one foot overlaying clay which is the dominant soil strata. According to the Essex County Soil Map, the soils in this area are predominantly Brookston Clay, and a small portion of the soil is Fox Sandy Loam.

2.5 TOPOGRAPHY

The Town of Essex is located in the centre of the County at the height of land between Lake St. Clair and Lake Erie. Grade is highest along Talbot St N and the grade slopes gently away from Talbot St N on either side. **Figure 2.4** shows a site plan of the general topography in Essex produced from SWOOP 2015 LIDAR.

2.6 EXISTING SEWER DESIGN CRITERIA

Storm sewer design criteria used to design the Town's existing storm sewer system over the years are shown in **Table 2-3**. The storm sewer conveyance system was designed primarily using rational method with 2-year Yarnell IDF-curve intensity and C=0.3 for most residential land uses. Some of the newer developments were designed using rational method with 5-year AES Windsor Airport Station No. 6139525 IDF-curve intensity (commonly with C=0.3-0.4 for residential land uses). However, these new developments all outlet to a 2-year sewer which ultimately renders their level of service.

Table 2-3: Storm sewer design criteria used in Essex

	Reference	Return Period	Urban Inlet Time	Method of Design
After 2003	Town of Essex Development Standards Manual, 2003	5-year AES	Not specified (typical is 10 – 20min)	Rational
1975 – 2003	LCBA Stormwater Drainage Study	2-year Yarnell's formula	30min avg.	Rational
Prior to 1975	-	Unknown	Unknown	Unknown

3.0 STORMWATER CATCHMENTS & INFRASTRUCTURE

3.1 MAIDSTONE CATCHMENT

The Maidstone catchment's minor system contains sewers and open channels that ultimately outlet to the Maidstone Ave Drain over two (2) subcatchments in the Puce River Subwatershed. Subcatchment 15 contains trunk sewers constructed primarily along north-south streets intercepted via the Maidstone Ave interceptor sewer before it outlets to the Maidstone Ave Drain. Subcatchment 14 contains side street sewer mains that discharge to the Fairview Ave E trunk sewer before discharging to the McInteer Drain, which outlets to the Maidstone Ave Drain.

The catchment's sewer system is hydraulically connected to the South Talbot Catchment via an overflow sewer at Iler Ave and Talbot St N, and is connected to the NE Lagoon sanitary sewer system via a normally closed sluice gate at sanitary Pumping Station No. 4.

3.1.1 Land Use

The Maidstone Catchment consists of 155 ha of mostly residential land with commercial lands concentrated in the downtown core and agricultural and open space towards the extents of the catchment. The existing land uses in the catchment are shown in **Table 3-1** and **Figure 3.1** in **Appendix E**.

Table 3-1: Existing land uses in the Maidstone catchment

Land Use	Area (ha)	Fraction of Total Area (%)
Industrial	2.2	1%
Commercial	14.7	9%
Institutional	5.9	4%
Residential	87.7	56%
Apartments & Hotels	0.5	0.3%
Parkland	1.1	1%
Open Space or Agricultural	43.5	28%

3.1.2 Areas with MH Invert Rises & Outfalls in Poor Condition

Table 3-2 shows sewers that have downstream sewers/channels installed at higher elevations than the upstream sewers, causing standing water in the sewer system. The two locations of manhole invert rises are along the Maidstone Ave E interceptor sewer, which considerably reduces the hydraulic capacity of subcatchment 15.

Table 3-2: Manhole invert rises in Maidstone Catchment

Road Intersection	Sewer with Standing Water	Manhole No.	Fraction of Reduced Sewer Cross-section $\frac{Water\ Depth\ (mm)}{Sewer\ Dia.(mm)}$ (%)	Sewer Dia. (mm)
Maidstone Ave E & Gosfield Twl	Maidstone Ave E, Arthur Ave, Wilson Ave	M.H.39	50 %	1350
Outfall (Maidstone Ave E & Fairview Ave E)	Maidstone Ave E (outfall sewer inv. below inv. of drain)	J52	50 %	1500

3.1.3 SWM Controls & Pumping Stations

3.1.3.1 Conveyance Controls & Hydraulic Structures

Conveyance controls and hydraulic structures installed within the catchment are shown in **Table 3-3**.

Table 3-3: Conveyance controls in the Maidstone Catchment

Hydraulic Structure	Location	Purpose
Orifice – Superpipe Storage	Cranbrook Ct & Arthur Ave	Quantity - Restrict release rate to receiving channel
Flap gate	Galos PS bypass sewer	Mitigate backflow
Flap gate	322 Maidstone Ave E	Mitigate backflow

3.1.3.2 End-of Pipe SW Management Facilities

One (1) stormwater management pond is constructed in this catchment in the Galos subdivision. The Galos Pond ultimate design consists of a dual bay dry pond system with one (1) bay for basic level quality control and one (1) quantity bay. The first flush is diverted to the quality bay. Runoff exceeding the quality level (HGL=192.80m) is then split between the quality and quantity bays. The outlet structure of the quality bay contains approx. a 63x63mm orifice (based on field inspection, not 75mm dia. in ECA) restricting the quality bay peak release rate to approx. 10L/s over a 36hr drawdown at the quality water level (192.80m or 2.0m water depth) to the Galos Pumping Station. Runoff entering the quantity bay is directed around the perimeter of the bay to the Galos Pumping Station.

Storage for the Galos dual bay pond system was sized based on not exceeding 2-year pre-development release rate with 100-year AES Windsor Airport Station No. 6139525 IDF curve using the Modified Rational Method (C=0.4), and quality bay sized per MOECC design guidelines. The stormwater management pond design parameters are shown in **Table 3-4**.

Table 3-4 – Stormwater management pond design parameters in the Maidstone Catchment

Pond	Service Area	Pond Design	Quantity or Quality Control	Liquid Level	Active Storage Volume (m^3)
Galos	Galos subdivision	Dry pond – dual bay system	Quality & Quantity	Quality level (2.0m)	1,250[1]
				Quantity level (2.7m)	2,960[1]
Notes: [1] Volume from Galos Development SWM Report prepared by Dillon Consulting Ltd., amended June 2006 & record drawings					

The Galos Pumping Station contains one (1) submersible pump rated with firm capacity of 47.3L/s at 5.5m total dynamic head controlled via level sensor capable of discharging the allowable release rate of 134L/s (at the 100-yr storm event) via a 150mm dia. forcemain and 300mm dia. gravity overflow pipe to the Maidstone Ave trunk sewer. The pumping station has provision for bypassing flow when the hydraulic grade line reaches 193.05m. A copy of the Galos SWM Report and pump station pump curve is included in **Appendix D**.

3.2 SOUTH TALBOT CATCHMENT

The South Talbot catchment's minor system contains trunk sewers constructed primarily along north-south streets intercepted via two interceptor sewers over seven (7) subcatchments in the Canard River Subwatershed. The Hanlan St interceptor sewer splits flows to downstream trunk sewers, and the South Talbot Rd interceptor sewer conveys flow to receiving municipal drains. Subcatchments 6 and 7 outlet to Essex Outlet Drain, and subcatchments 10, 11 and 12 outlet to Canaan Drain. Runoff from subcatchment 9 and a portion of 8 is split between the Canaan and Essex Outlet Drain. Runoff in the Essex Outlet Drain flows freely downstream to Canard River with overflow to John's Creek Drain which outlets to Craig's Creek Drain and ultimately Canard River. The first flush from a portion of the catchment serviced by the Canaan Drain is designed to be diverted to the Canaan Pond for treatment and the remainder is designed to overflow to the downstream Canaan Drain (however, the Canaan diversion weir and pond do not currently function as designed). Runoff from the South Talbot catchment is conveyed in Canard River through adjoining towns to the Detroit River (roughly 35km downstream).

The catchment's sewer system is hydraulically connected to the Maidstone catchment via an overflow sewer at Iler Ave and Talbot St N, and connected to the Essex PCP sanitary sewer system via a normally closed sluice gate at Laird Ave and South Talbot Rd.

3.2.1 Land Use

The South Talbot Catchment consists of 250 ha of urban land that is mostly residential with commercial lands concentrated in the downtown core, and 1300ha of rural agricultural land. The existing land uses in the catchment are shown in **Table 3-5** and **Figure 3.1** in **Appendix E**. Urban subcatchment boundaries were developed based on the as-constructed storm sewer system, and the rural subcatchment boundaries in the South Talbot catchment were developed from the Essex Outlet Drain drainage plan prepared by C.G. Russell Armstrong Ltd. dated Aug. 1975.

Table 3-5: Existing land uses in the South Talbot catchment

Land Location	Land Use	Area (ha)	Fraction of Total Area (%)
Urban (within Essex's urban limits)	Industrial	1.7	1%
	Commercial	10.6	4%
	Institutional	11.7	5%
	Residential	157.7	62%
	Mobile Homes	17.8	7%
	Apartments & Hotels	0.2	0%
	Parkland	9.5	4%
	Open Space or Agricultural	41.8	16%
Rural (outside Essex's urban limits)	Primarily Agricultural	1300	

3.2.2 Areas with MH Invert Rises

Table 3-6 shows the sewers that have manhole invert rises. An invert rise is where the downstream sewer is installed at a higher elevation than the upstream sewer. These sewers have standing water in them, which reduces conveyance capacity. Trunk sewers that service a larger area have more of an impact on the level of service of the drainage system.

Table 3-6: Manhole invert rises in South Talbot Catchment

Road Intersection	Sewer with Standing Water	Manhole No.	Fraction of Reduced Sewer Cross-section $\frac{Water\ Depth\ (mm)}{Sewer\ Dia.(mm)}$ (%)	Sewer Dia. (mm)
Brien Ave W & Hanlan St	Brien Ave W	MH014	45 %	750
Talbot St N & Laird Ave	Talbot St N – south side of road	CB15s_c; CB14S_c	100 % 100 %	375; 300
Talbot St N & Iler Ave	Talbot St N – south side of road	MH04e	90 %	300
Talbot St N & Brien Ave W	Talbot St N – south side of road	MH02e	90 %	300
Talbot St N & Wellington Ave	Talbot St N – south side of road	MH01e	100 %	300
S Talbot Rd & Victoria Ave sewer outfalls	3 outfall sewers at Victoria Ave & South Talbot Rd	-	28-35%	1050 – Victoria Ave 1050 – S Talbot Rd west of Victoria Ave 1800 – S Talbot Rd east of Victoria Ave

3.2.3 SWM & Pumping Stations

3.2.3.1 Conveyance Controls

Conveyance controls in the catchment are shown in **Table 3-7**. Conveyance controls are installed in Subcatchment 11 (Woodview Estates) and Subcatchment 12 (Tulley Meadows). The locations of the conveyance controls are shown in **Figure 2.1(b)** in **Appendix E**.

Table 3-7: Conveyance controls in the South Talbot Catchment

Hydraulic Structure	Location	Purpose
Orifice	Woodview Estates channel outlet	Quantity - Restrict release rate to receiving channel
Orifice – Superpipe Storage	MH_1 173 Oak Dr	Quantity - Restrict release rate to receiving channel

3.2.3.2 End-of Pipe Stormwater Management Facilities

There are no pumping stations and two stormwater management ponds in the South Talbot catchment: Canaan Pond and Woodview Estates Pond. The locations of the stormwater management ponds are shown in **Figure 2.1(b)** in **Appendix E**.

Canaan Pond was designed as an off-site dry pond system and was sized to service the first flush (runoff=6mm) from Kimball & Jakana Development (14.9ha) for basic level quality control according to the Drainage Report and ECA prepared by NJ Peralta. The first flush is designed to be diverted to the pond and runoff exceeding this quality volume overflows to the downstream receiving channel. The outlet structure was designed to restrict the pond release rate over a 24hr drawdown period at the quality water level (HGL=192.01m) via a 150mm dia. orifice to the Canaan Drain with provision for spillway overflow when the hydraulic grade line reaches 193.29m. Field investigations showed currently the pond does not operate as intended in the design. The Canaan Pond has a permanent pool depth of approx. 500mm because the outlet structure does not drain the pond. This causes standing water upstream of the pond (channel weir) at approx. the weir crest elevation (quality water level), and the first flush in practice flows primarily to the receiving channel. In its current condition, the pond provides minimal quality and quantity control to benefit the South Talbot catchment's storm sewer system. The Canaan Pond is constructed under Section 78 of the Drainage Act R.S.O. 1990 c. D17 and covered by the current MOE Certificate of Approval No. 3364-6SNQNA, issued on August 26, 2006. A copy of the current Certificate of Approval and Drainage Reports are included in **Appendix B** and **Appendix D.2** respectively. Access to the Canaan Pond parcel owned by the Town is through a 6m wide easement along the west limit of 2964 County Rd 12 (owned by Jeffery Shepley).

The Woodview Pond design consists of a dry pond system for quality control of Woodview Estates subdivision. The first flush is designed to be diverted to the quality pond and runoff exceeding this quality volume overflows to the downstream receiving channel. The outlet structure is designed to restrict the pond release rate at the quality water level (HGL=192.80m) via a 150mm dia. orifice to the downstream receiving channel with provision for spillway overflow when the hydraulic grade line reaches 193.20m. Field investigations showed currently the pond does not operate as intended in the design. The Woodview Pond has approx. 300mm

of accumulated sediment, and the outlet structures were laying loose on the ground and damaged, and do not appear to drain the pond. This causes standing water in the sewers upstream of the pond at approx. the weir crest elevation (quality water level) and the first flush in practice flows primarily to the receiving channel. Downstream of the Woodview Pond the channel outlet orifice controls the release rate from Woodview Estates subdivision with provision for emergency overflow at 193.65m. The Woodview storm system design operates such that the Woodview pond, channel and sewers (which are sized above 2-year return period) provide storage while the channel outlet orifice controls the release rate and HGL in Woodview Estates subdivision. No Stormwater Management Report or ECA that Stantec is aware of is available for the Woodview Pond SWM Facility. The land where the pond was constructed is owned by the County of Essex. Stantec is not aware of a registered easement for the existing Woodview SWM Facility.

The stormwater management pond as-built design parameters are shown in **Table 3-8**.

Table 3-8 – Stormwater management pond design parameters

Pond	Service Area	Pond Design	Quantity or Quality Control	Liquid Level	Active Storage Volume (m^3)
Woodview Estates	Woodview Estates subdivision	Dry pond – single bay	Quality (first flush)	Quality level	430[1]
				Spillway level	850[1]
Canaan	Regional – Subcatchments No.'s 9 – 12	Dry pond – single bay	Quality (first flush)	Quality level	1,600[2]
				Spillway level	7,100[2]

Notes:
[1] Calculated from record drawings
[2] Calculated from Canaan Drainage Report dwg. prepared by NJ Peralta, Jan. 2001 & Dec. 2004

Results from the field investigations below were incorporated into the model:

- Canaan Pond has a permanent pool depth of approx. 500mm because the outlet structure does not drain the pond.
- Woodview Estates Pond has approx. 300mm of accumulated sediment, and the outlet structures were damaged and laying loose on the ground.

3.3 RUSH CATCHMENT

The Rush catchment's minor system contains trunk sewers constructed along Talbot St N over four (4) subcatchments in the Canard River Subwatershed. Subcatchment 1 outlets to the Essex

Crossing Pond which is then pumped to the 14th Concession Drain Branch (also referred to as Munch Drain). Subcatchments 2, 3 and 4 outlet to Rush Drain.

3.3.1 Land Use

The Rush Catchment consists of 115 ha of mostly agricultural or open space land with industrial land concentrated along Forest Ave, and residential lands in the southeastern portion of the catchment. The existing land uses in the catchment are shown in **Table 3-9** and **Figure 3.1** in **Appendix E**.

Table 3-9: Existing land uses in the Rush catchment

Land Use	Area (ha)	Fraction of Total Area (%)
Industrial	14.9	13%
Commercial	7.2	6%
Institutional	4.7	4%
Residential	14	12%
Mobile Homes	5.2	5%
Apartments & Hotels	0	0%
Parkland	4.5	4%
Open Space or Agricultural	64.5	56%

3.3.2 Areas with MH Invert Rises

Table 3-10 shows the sewers that have manhole invert rises. An invert rise is where the downstream sewer is installed at a higher elevation than the upstream sewer. These sewers have standing water in them, which reduces conveyance capacity.

Table 3-10: Manhole invert rises in Rush Catchment

Road Intersection	Sewer with Standing Water	Manhole No.	Fraction of Reduced Sewer Cross-section $\frac{Water\ Depth\ (mm)}{Sewer\ Dia.(mm)}$ (%)	Sewer Dia. (mm)
Bell Ave & Harvey St *	Bell Ave	CB-MH5	45 %	600
Bell Ave & Maidstone Ave E *	Bell Ave	CB-MH6	23 %	675
Albert St & Maidstone Ave E	Albert St	M.H.4	50 %	600
Notes: * Two consecutive MH invert rises				

3.3.3 SWM Controls & Pumping Stations

3.3.3.1 Conveyance controls

No conveyance controls are installed in this catchment.

3.3.3.2 End-of Pipe SW Management Facilities

Two (2) ponds are constructed in this catchment: Sadler's Pond and Essex Crossing Pond. The locations of the ponds are shown in **Figure 2.1(b)** in **Appendix E**.

Sadler's Pond receives runoff from Sadler's park and a portion of Viscount Estates in Subcatchment No. 3. Because the pond bottom is not flat some runoff is stored within a permanent pool while the remainder outlets to a ditch. Sadler's Pond was not designed to be used for stormwater management. In practice it provides an outlet for a portion of Viscount Estates and flood control storage when water backs up in the Rush Drain for subcatch 2,3,4.

The Essex Crossing Pond design consists of a dual bay dry pond system with one (1) bay for normal level quality control and one (1) quantity bay for servicing Subcatchment No. 1 according to the ECA. The first flush was designed to be diverted to the quality bay via a flow diversion weir. However, field investigations showed the first flush is diverted primarily to the quantity bay because the flow diversion weir is not watertight. As a result, to best represent the existing system the flow diversion weir was not inputted into the model. The outlet structure of

the quality bay contains a 100mm orifice restricting the release rate to the quantity bay at the quality water level 192.07m (peak release rate, and drawdown time were not provided in SWM Report). Field investigations showed the quality bay drains to the quantity bay through the orifice, and backflow through the inlet ditch and inlet storm sewer. Runoff entering the quantity bay is directed to the Essex Crossing Pumping Station.

Storage for the Essex Crossing dual bay pond system was sized based on not exceeding pre-development release rates with AES Windsor Airport Station No. 6139525 IDF curve, and 6-hour Chicago distribution design storms using PCSWMM 2002 with SWMM4 engine. Details of the quality bay sizing, pond and pump station design are not indicated in the SWM Report prepared by Glos Engineering Ltd., March 2004. A copy of the ECA and SWM Report are in **Appendix B** and **Appendix D.2** respectively. The stormwater management pond design parameters are shown in **Table 3-11.**

Table 3-11: Stormwater management pond design parameters

Pond	Service Area	Pond Design	Quantity or Quality Control	Liquid Level	Active Storage Volume (m^3)
Sadler's Pond	Portion of Subcatchment No. 3	N/A	NIL	NIL	NIL
Essex Crossing Pond	Subcatchment No. 1	Dry Pond – dual bay system	Quality & Quantity	Quality level (in quantity bay)	1,100[1]
				Mid-bay berm level (in quantity & quality bay)	3,330[1]
Notes: [1] Volume calculated from aerial photograph surface area and depth of bay					

The Essex Crossing Pumping Station contains two (2) submersible pumps (one duty, one standby) – not one vertical pump specified in the ECA) with firm capacity of 140 L/s at 2.35m total dynamic head (not one pump rated at 180L/s at 2.35m total dynamic head specified in ECA) controlled via float switches with total maximum capacity of 280L/s via two 300mm dia. forcemains to the 14th Concession East Branch Drain (also referred to as Munch Drain).

Results from the field investigations below were incorporated into the model:

- Much Drain has a permanent pool depth of approx. 250mm near the pump station CSP outlet structure.

- The Essex Crossing Pond does not have the emergency spillway constructed that is shown on the construction record drawings.

3.4 HOPGOOD CATCHMENT

Hopgood catchment's minor system contains twin sewer mains constructed along either side of Talbot St N that discharge to the Hopgood trunk sewer which outlets to Hopgood Drain in the Puce Subwatershed. The catchment's sewer system is hydraulically connected to the Pike Creek Subwatershed via an overflow pipe at 358 Talbot St N (junction MH534 in the model).

During small storm events the Hopgood Drain serves as the primary receiver, however during significant storm events most flow outlets to the Hopgood Drain and a portion overflows to the South Talbot Rd Drain.

3.4.1 Land Use

The Hopgood Catchment consists of 40 ha of mostly commercial lands located along Talbot St N and residential lands along Hopgood Side Rd with some agricultural and open space land that drains into the catchment's sewer system. The existing land uses in the catchment are shown in **Table 3-12** and **Figure 3.1** in **Appendix E**.

Table 3-12: Existing land uses in the Hopgood catchment

Land Use	Area (ha)	Fraction of Total Area (%)
Industrial	0	0%
Commercial	10	25%
Institutional	2.1	5%
Residential	15.5	39%
Apartments & Hotels	1	2%
Parkland	1.6	4%
Open Space or Agricultural	10	25%

3.4.2 Areas with MH Invert Rises

Table 3-13 shows the outfall sewer invert along Hopgood St is below the bottom of the receiving drain. As a result, the Hopgood trunk sewer has some standing water near the sewer outfall.

Table 3-13: Manhole invert rises in Rush Catchment

Road Intersection	Sewer with Standing Water	Manhole No.	Fraction of Reduced Sewer Cross-section $\frac{Water\ Depth\ (mm)}{Sewer\ Dia.(mm)}$ (%)	Sewer Dia. (mm)
Hopgood St outfall sewers	Hopgood sewer outfalls on either side Hopgood St	-	38 %	600

3.4.3 SWM Controls & Pumping Stations

No conveyance controls, stormwater management ponds or municipal pumping stations are installed in this catchment.

3.5 ARNER TWL CATCHMENT

The Arner Townline catchment's minor system contains a combination of twinned roadside ditches and sewers constructed along either side of Talbot St N that discharge to the Gosfield Twl trunk sewer which outlets to West Townline Drain in the Canard River subwatershed.

3.5.1 Land Use

The Arner Twl Catchment consists of 21 ha of mostly residential land. The existing land uses in the catchment are shown in **Table 3-14** and **Figure 3.1** in **Appendix E**.

Table 3-14: Existing land uses in the Arner Twl catchment

Land Use	Area (ha)	Fraction of Total Area (%)
Commercial	1.5	7%
Institutional	1	5%
Residential	15	71%
Open Space or Agricultural	3.6	17%

3.5.2 SWM Controls & Pumping Stations

No conveyance controls, stormwater management ponds or municipal pumping stations are installed in this catchment.

4.0 APPROACH AND METHODOLOGY

4.1 MODEL APPROACH

The approach was to populate the model with the stormwater drainage infrastructure from the site plan that was developed in **Section 2.2**, compute responses throughout the network, and then calibrate and assess the existing system's capacity.

The 1D minor system (represented by sewers and open channels) was modelled throughout the majority of the Town, except in some areas which were modeled as 1D dual drainage. The minor system was developed from construction record drawings. For the areas that were modeled as dual drainage the major system (surface profiles) were developed using SWOOP 2015 LIDAR, the 2015 aerial photograph on the Town's Interactive map and construction record drawings. For areas that were modeled as dual drainage, the major system was connected to the minor system with 1m dia. bottom orifices at catch basins in the road profile. The analysis was performed using PCSWMM 2017 Professional 2D software version 7.1.2480. PCSWMM utilizes the U.S. EPA SWMM5 engine (currently 5.1.012).

A full site plan of the Town of Essex's stormwater drainage system in the model is shown in **Figure 4.1(a)** and a partial site plan showing the urban portion of Essex's model is shown in **Figure 4.1(b)** in **Appendix E**. The model was developed for Essex's five urban catchments and the rural portion of the South Talbot Catchment.

4.2 RAINFALL MONITORING

Rainfall data was collected at Essex Sewage Pumping Station No.4 during the periods of flow monitoring. The location of the rain gauge is shown in **Figure 4.2**. Gauged rainfall data was reviewed against the ERCA rain gauge at the Essex Civic Centre and NEXRAD radar rainfall data and adjusted if required.

4.3 FLOW MONITORING

Flows were monitored at a total of ten (10) sites and selected based on location and review of past resident flooding incidences. Flow monitoring occurred from April to October 2016. The rainfall and flow monitoring data was used to calibrate the stormwater drainage system model. Subcatchment no.'s 1, 3, 5, 6, 10 and 14 were not calibrated due to the locations of the flow monitors.

Figure 4.2 presents the flow monitoring locations and shows those locations that were not monitored and calibrated. Specific information on each monitoring location is presented in **Table 4-1**.

Table 4-1: Flow monitoring locations

Flow Monitor No.	Location	Catchment being Monitored
1	MH_1 173 Oak Dr	South Talbot
2	MH003 225 Woodview Dr	South Talbot
3	MH02b Brien Ave E & Maidstone Ave E	Maidstone
4	Chamber_C1 322 Maidstone Ave E	Maidstone
5	M.H.37 166 Arthur Ave	Maidstone
6	Chamber_2 Allen Ave & Maidstone Ave W	Rush (Subcatchments 2, 4)
7	MH_02 323 Victoria Ave	South Talbot
8	MH00015 South Talbot Rd & Laird Ave	South Talbot
9	MH27 Brien Ave E & Edward St	South Talbot
10	CB028 2036 Hopgood Side Rd	Hopgood

4.4 MODEL INPUT DEVELOPMENT

4.4.1 Hydrologic Methods of Analysis – Runoff Computations

Runoff was computed using the SWMM method. Each subcatchment is treated as a reservoir where inflows are from rainfall and any upstream subcatchments, and outflows are rainfall losses and runoff. Surface runoff occurs only when the depth of water in the subcatchment exceeds the rainfall losses in which case the outflow is calculated by the Manning's equation, and routed as overland flow to the minor system.

4.4.1.1 Rainfall Losses

Infiltration and depression storage were deducted from rainfall to compute the runoff entering the minor system. Infiltration capacity depends largely on soil type, initial moisture content and surface vegetation. The Modified Green-Ampt method was selected to predict infiltration loss, with defined soil parameters as summarized in **Table 4-2**.

Table 4-2: Modified Green-Ampt infiltration parameters

Capillary Suction (mm)	Sat. Hydraulic Conductivity (mm/hr) K_s	Initial Moisture Deficit M_d
180	1.3	0.21
Notes: * Infiltration parameters were calibrated. Refer to final calibrated parameters in **Appendix A.2**.		

Depression storage is the surface storage provided by ponding, and interception. **Table 4-3** summarizes values for estimating depression storage.

Table 4-3: Depression storage parameters

Surface	Depression Storage Depth (mm)
Impervious surfaces – roads, pavement	2.5
Pervious surfaces – urban lawns, open space	6.3
Pervious surfaces – rural farmland	10.0
Notes: * Depression storage parameters was calibrated. Refer to final calibrated parameters in **Appendix A.2**.	

4.4.1.2 Impervious Levels

Subcatchment impervious levels were measured from the 2015 aerial photograph on the Town's Interactive Map.

4.4.2 Hydrologic Methods of Analysis – Aquifer Computations

SWMM's aquifer computations produce hydrographs with a time-delayed peak and shallow recession curve that is prevalent in rural watersheds. Aquifer computations were used for agricultural lands in the South Talbot Catchment located outside the town's urban limits to simulate field tile drainage.

Aquifer computations were computed with a two-zone groundwater routine based on Gagliardo's (1986) Master's thesis with SWMM5 modifications. The method consists of a

subsurface with an upper unsaturated zone that lies above a lower saturated zone. Infiltration from subcatchments percolate the upper zone into the lower zone where it is released as groundwater into the conveyance system.

Table 4-4 summarizes values for the aquifer computations. Typical values of parameters were selected based on past experience calibrating agricultural lands, since there is no streamflow monitoring station available nearby for calibrating the ag-lands in this application. The parameters produce a peak unit subsurface flow of approx. 12L/s/ha (which corresponds to a drainage coefficient of 100mm/d from the OMAFRA agricultural drainage curves) during 100yr-4hr Chicago and 100yr-24hr SCS-Type II storms. This unit flow from the agricultural lands is considered an acceptable value during 100yr extreme rainfall events.

Table 4-4: Aquifer computation parameters for simulating agricultural tile drainage

Item	Equation/Parameter
Aquifer (topsoil)	
Aquifer depth	0.3m
Wilting point (Θ_{WP})	0.085
Unsaturated zone initial moisture content (Θi)	0.085
Field capacity (Θ_{FC})	0.19
Porosity (ϕ)	0.45
Infiltration (topsoil)	
Capillary Suction	110mm
Sat. Hydraulic Conductivity (K_s)	10.9mm/hr
Initial Moisture Deficit (M_d)	0.33
Shallow Percolation (btwn. unsaturated to saturated zone)	
Conductivity slope (HCO)	10
Saturated hydraulic conductivity (K_s)	10.9mm/hr
Tension slope (d /dΘ)	15
Deep Percolation Losses	
DP (loss rate)	0.5mm/hr
Groundwater flow	
A1	0.08
B1, A2, B2, A3	0
Evaporation	
Lower Evap. Depth	0.3m
Upper Evap. Fraction	0.35

4.4.3 Hydraulic Methods of Analysis

4.4.3.1 Flow Routing

Flow within a conduit was computed numerically as unsteady state 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 and hydraulic parameters are shown in **Table 4-5**.

Table 4-5: Hydraulic flow routing parameters and methods of analysis

Item	Equation/Parameter
Flow routing	Dynamic wave with keep inertial terms
Open channel flow	Manning's equation
Manning's roughness coefficient (n) for pipes	0.013 – smooth interior wall 0.024 – corrugated interior wall
Manning's roughness coefficient (n) for open channels	0.013 – concrete lined 0.035 – lined with vegetation 0.1 – unmaintained
Subcatchment slope (%) *	0.3% - agricultural, open space, parkland 1.0% - urban developed
Manning's roughness coefficient (n) for overland flow	0.011 – pavement 0.06 – cultivated soils 0.24 – grass
Subcatchment subarea routing – % of runoff routed from impervious to pervious surface (to account for nDCIA & DCIA) *	Residential & apartments – 50% Institutional, commercial, industrial – 25% Downtown (imperv. > 70%) – 10% Open space, agricultural – 90% Parkland – 100% Pavement – route to outlet
Pressurized pipe flow	Hazen Williams equation
Hazen Williams roughness coefficient (C)	120
Notes: * Indicates parameter was calibrated. Refer to final calibrated parameters in **Appendix A.2**.	

4.4.3.2 Hydraulic Structures

Table 4-6 lists parameters and methods of analysis for analyzing flow rates through existing weirs and orifices, and head loss across flap gates.

Table 4-6: 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) = 1.6	Refer to SWMM User's Manual V5.0
Flap gate	minor loss coefficient ($K_{L\ exit}$) = 0.5	$h_L = K_L v^2/2g$

4.4.4 Outfall Conditions

With the relatively flat topography in Essex County, it is common that drain levels will create a backwater condition on storm sewer system's that reduce the sewer outflow to some undetermined amount and for some undetermined period of time. Near the Essex County shoreline there are records of historical lake levels and near major inland watercourses Ministry of Natural Resources and Forestry (MNRF) floodline maps can be used as reliable outfall boundary conditions to simulate a backwater effect on stormwater drainage systems. In other areas of the County that outlet to smaller watercourses, there is no available gauged data or agreed upon standard for setting backwater conditions for a drainage system hydraulic analysis.

The historical lake levels and the floodline maps, which have floodlines at lower elevations than Essex's outfall sewer inverts, were too far downstream from Essex's sewer system to be used as outfall boundary conditions for the Rush, Maidstone, Hopgood and Arner Twl catchments (a copy of the floodline maps are shown in **Appendix D.1**).

Where backwater conditions are expected, a prudent and practical approach is to assume a constant high backwater level which effectively reduces sewer system release rates and/or raises HGL. With the exception of the South Talbot catchment, the criteria for setting the fixed outfall boundary condition was to set the fixed stage 0.3m (1') below the soffit or overt of the culvert crossing nearest the sewer outfall (similar to MTO culvert clearance standard WC-7), or where no nearby open channel culvert crossing exists, the fixed outfall stage was set at the outfall sewer overt.

Table 4-7 show the outfall boundary conditions for performing the capacity assessment. The location of the outfall boundary conditions are shown in **Figure 2.1(a)** in **Appendix E.**

Table 4-7: Outfall boundary conditions for capacity assessment

No.	Catchment	Receiving Watercourse	Outfall Fixed Stage Boundary Condition (culvert crossing or outfall sewer overt)	Outfall Fixed Stage (m)
1	Hopgood	Hopgood Drain	Outfall sewer overt	192.67
2		South Talbot Rd Drain	Culvert crossing at 478 Talbot Rd, Lakeshore	194.1
3	Maidstone	Maidstone Ave Drain	Culvert crossing over Maidstone Drain at N Talbot Rd	192.80
4	South Talbot	Essex Outlet Drain at Mole Rd culvert crossing to Canard River outlet	100yr floodline (Dwg. ER5-38 in **Appendix D.1**)	189.2
5		John's Creek Drain at outlet to Craig's Creek	100yr floodline (Dwg. ER5-38 in **Appendix D.1**)	188.0
6	Rush	14th Concession E Branch Drain (Munch Drain)	Outfall pipe (900mm dia.) overt from Essex Crossing P.S.	193.60
7		Rush Drain	Hwy 3 Culvert crossing	192.76
8	Arner	West Townline Drain	Outfall sewer overt	194.04

4.4.5 Infrastructure with no Record Drawings

Appendix C discusses the assumptions made for model input development for infrastructure shown in **Figure 2.3** with no construction record drawings.

4.5 CALIBRATION EVENTS

Five (5) rainfall events in 2016 were selected for use in the calibration process. 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 event observed during the monitoring period and some more moderate sized rainfall events with 2 year return period.

Table 4-8 presents the rainfall statistics for the selected rainfall events.

Table 4-8 Rainfall events selected for model calibration

Event No.	Simulated Rainfall Event (Start – End)	Duration (hr)	Total Rainfall Volume (mm)
1	July-13 0:00 -July-15 0:00	1.5	33
2	Aug-15 0:00 - Aug-18 0:00	3.5	34
3	Aug-20 0:00 - Aug-25 0:00	1.5	39
4	Aug-27 0:00 -Sept-1 0:00	1.5	33
5	Sept-28 0:00 -Oct-4 0:00	18	66

Data collected for these rainfall events were compared against IDF curves for the Windsor Airport to determine the return period of each rainfall event based on event volume and peak intensity in order to quantify the magnitude of these storm events. **Table 4-9** presents a summary of the results.

Rainfall events exceeding a 5-year return period occurred on August 20/16. All other rainfall events had approx. 2-year return periods.

Table 4-9 Estimated rainfall event return periods

Event No.	Rainfall Event Start Date	Estimated Return Period (yrs)
1	July-13 7:25pm	**> 2 yr (<5yr)**
2	August-16 1:30am	**> 2 yr (<5yr)**
3	August-20 5:40pm	**> 5 yr (<10yr)**
4	August-27 2:50pm	**> 2 yr (<5yr)**
5	September-28 6:30pm	**> 2 yr (<5yr)**

4.6 CAPACITY ASSESSMENT METHODOLOGY

The existing stormwater drainage system was assessed with storms ranging in return periods from 2-years to 100-years to identify capacity constraints under current conditions and land uses. **Table 4-10** summarizes the storms selected with storm duration, rainfall amounts and rainfall distribution. The design storm total rainfall amounts are based on Atmospheric Environment Services (AES) rainfall data for Windsor Airport Station No. 6139525.

The design storms used to evaluate the capacity of the existing system included:

- Minor storm event hydraulic grade line: 2-year and 5-year synthetic and historical rainfall events
- Moderate storm event hydraulic grade line: 10-year and 25-year synthetic and historical rainfall events
- Extreme storm event hydraulic grade line: 100-year rainfall events with a 12 hour AES distribution.

Based on results of the analysis, there is potential for surface flooding if the surcharge level in the storm sewer exceeded ground level elevation.

Table 4-10: Design storms utilized for simulating wet weather capacity of the existing system

Storm Frequency	Duration	Total Rainfall	Distribution	Source
2 Year	12 hour	46.2 mm	AES	Synthetic
5 Year	4 hour	49.1 mm	Chicago	Synthetic
5 Year	12 hour	60.1 mm	AES	Synthetic
10 Year	12 hour	69.4 mm	AES	Synthetic
> 25 Year (< 50 Year)	24 hour	94 mm	Historical (May 30 2015)	Flow monitoring
50 Year	6 hour	82.2 mm	Historical (Sept. 10 2014)	ERCA Essex Civic Centre
50 Year	5 hour	78.9 mm	Historical (Sept. 3 2015)	ERCA Essex Civic Centre
100 Year	12 hour	99.1 mm	AES	Synthetic

5.0 MODEL CALIBRATION & VERIFICATION

5.1 MODEL CALIBRATION

During model calibration, rainfall from the selected calibration events (**Table 4-8**) were used as model input, and the observed flow and depth data at the locations listed in **Table 4-1** were compared with the model simulation results. The following calibration metrics in order of precedence were used to calibrate simulated against observed data:

- Liquid depth hydrograph shape
- Peak liquid depth
- Flow rate hydrograph shape
- Peak flow rates
- Volume

Subcatchment infiltration, slope, depression storage and subarea routing were adjusted if required until the simulated results reasonably matched. Calibrated hydrographs are shown graphically in **Appendix A.1**. Calibrated parameters are shown in **Appendix A.2**. **Table 5-1** summarizes the adjustments made during model calibration.

Table 5-1: Summary of adjustments made during model calibration

Flow Monitor	Catchment	Initial Calibration Comments	Action (Parameters that were adjusted)
1[1]	South Talbot	- Peak flow, peak depth & volume overestimated	- Outlet orifice invert elev. adjusted to suit depth of standing water in sewer - Infiltration – k = 1.9mm/hr, M_d=0.21, =200mm - Subarea routing refer to **Appendix A.2**
2	South Talbot	- Peak flow, peak depth & volume overestimated	- Quality pond outlet structure orifice invert elev. adjusted to suit depth of standing water in sewer - Quality pond outlet structure orifice dia. adjusted to suit obs depth hydrograph recession limb (pond draining) & field investigation results - Infiltration – k = 1.5mm/hr - Subarea routing refer to **Appendix A.2**
7	South Talbot	- Peak flow, depth and volume overestimated	- Fixed Essex Outlet Drain outfall water elev. to suit depth of standing water in sewer - Subcatch. 7 Infiltration – k = 2.0mm/hr - Subarea routing refer to **Appendix A.2**
8	South Talbot	- Peak flow overestimated	- Subcatch. 8 Infiltration – k = 1.3mm/hr - Subarea routing refer to **Appendix A.2**
9	South Talbot	- Peak flow, depth and volume overestimated	- Subcatch. 9 Infiltration – k = 2.6mm/hr, =225mm - Subarea routing refer to **Appendix A.2**
3 & Galos Development	Maidstone (areas w/ rear-yard drainage)	- Peak flow, peak depth & volume overestimated	- D_{store}-perv=8mm, D_{store}-imperv=3.5mm - Infiltration – k = 2.6mm/hr, M_d=0.25, =270mm - Subarea routing refer to **Appendix A.2**
4, 5[1]	Maidstone (areas w/o rear-yard drainage)	- Peak flow & peak depth overestimated	- D_{store}-perv=9mm, D_{store}-imperv=5mm - Infiltration – k = 3.9mm/hr, M_d=0.25, =270mm - Subarea routing refer to **Appendix A.2**
6[2]	Rush	- Peak flow and volume overestimated - Depth hydrograph acceptable	- Subcatch. 2,4 Infiltration – k = 1.0mm/hr, M_d = 0.15, =180mm - Subcatch. 1,3 Infiltration – k = 1.3mm/hr, M_d = 0.21, =180mm
10	Hopgood	- Peak flow, peak depth & volume overestimated	- D_{store}-perv=8.5mm, D_{store}-imperv=3.5mm - Infiltration – k = 2.3mm/hr, M_d=0.22, =225mm - Subcatchment slope = 0.15% - agricultural, open space, parkland - Subcatchment slope = 0.5% - urban developed land - Subarea routing refer to **Appendix A.2** - Fixed outfall HGL to suit depth of standing water in sewer

Notes:
[1] Observed flow data overestimated Q & V because the flow monitor does not take into account depth of standing water in sewer
[2] Observed flow data underestimated Q & V because flow monitor setup used incorrect pipe cross-section

It is noted that many of the observed depth hydrographs have long-shallow recession limbs, while the calibrated depth hydrographs have steeper recession limbs. This is believed to be due to the slowly draining agricultural lands within the subwatershed that outlet downstream of Essex into the same receiving channels creating a backwater condition on the sewer system. Nevertheless, the model is believed to be suitable for the capacity assessment because the primary objective is computing peak HGL.

5.2 MODEL VERIFICATION

The model was not verified following calibration. It was deemed more important to calibrate the model accurately over a variety of storm events during the 2016 monitoring campaign, then to calibrate over a single event or small number of events and then subsequently use the others for model verification.

6.0 CAPACITY ASSESSMENT OF EXISTING STORM SYSTEM

The capacity assessment was conducted on Essex's existing storm sewer system and areas that were identified as having limited hydraulic capacity are discussed below.

6.1 SOUTH TALBOT CATCHMENT

The following areas were identified as having limited hydraulic capacity in the South Talbot catchment:

1. Victoria Ave trunk sewer at the Victoria Ave and Hanlan St intersection
2. Brien Ave W trunk sewer at the Brien Ave W and Hanlan St intersection
3. Tulley Meadows subdivision (referred to as subcatchment no.12 in **Figure 2.1(b)**)
4. Woodview Estates subdivision (referred to as subcatchment no.11 in **Figure 2.1(b)**)

These areas in the South Talbot Catchment are discussed below.

6.1.1 Victoria Trunk Sewer – Victoria Ave & Hanlan St intersection

Figure 6.1 in **Appendix E** shows the sewer profile along Victoria Ave from Talbot St N to the sewer outfall at the Essex Outlet Drain.

For 2-year return period storms the Victoria trunk sewer at the Victoria-Hanlan St intersection had limited hydraulic capacity (refer to MH_07 in **Figure 6.1**). As a result of the limited hydraulic capacity at the Victoria-Hanlan intersection sewer back-ups upstream of this manhole were predicted in the model. The Victoria sewer had limited hydraulic capacity because it was designed to service properties along Victoria Ave only, however it is conveying additional flows from the drainage areas conveyed by the Hanlan St sewer (refer to construction record dwg. no.'s LA-2192 and LA-2256). A review of the hydrographs show loading to the Victoria trunk sewer at the Victoria-Hanlan intersection is approximately 60% from the Hanlan sewer and 40% from the upstream Victoria trunk sewer.

6.1.2 Brien Trunk Sewer – Brien Ave W & Hanlan St intersection

Figure 6.2 in **Appendix E** shows the sewer profile along Brien Ave W from Talbot St N to South Talbot Rd.

For 2-year return period storms the Brien trunk sewer at the Brien-Hanlan intersection had limited hydraulic capacity (see MH014 in **Figure 6.2**). The Brien trunk sewer capacity is limited at Hanlan St from the sewer invert rise at the Brien-Hanlan intersection (refer to **Table 3-6**) and from receiving additional flows from Kimball development and the adjacent Iler Ave drainage area. Brien trunk sewer north of Hanlan St was not designed to convey flows from these drainage areas (refer to record dwg. no. LA-2555).

For storms exceeding 5-year return period Brien trunk sewer back-ups caused surface flooding on Kimball Dr, Westlawn Dr, Langtry St and a portion of Brien Ave. The locations of surface flooding are shown on **Figure 6.3**.

6.1.3 Tulley Meadows Subdivision

Figure 6.4 in **Appendix E** shows the sewer profile from Tulley Meadows subdivision to the upper limits of Canaan Drain.

The Tulley Meadows drainage system design has the sewers provide storage while the outlet sewer orifice controls the release rate and HGL in Tulley Meadows subdivision. **Figure 6.4** shows that street flooding exceeding 0.3m in depth during the 50yr storm event, which does not meet the industry design standard in Essex County. Modeling showed street flooding above the industry accepted standard occurred during extreme storm events due to the capacity of the outlet sewer orifice.

6.1.4 Woodview Estates Subdivision

Figure 6.5 in **Appendix E** shows the sewer profile from Woodview Estates subdivision to the upper limits of Canaan Drain.

The Woodview drainage system design has the Woodview pond, channel and sewers provide storage while the channel outlet orifice controls the release rate and HGL in Woodview Estates subdivision. The subdivision is approx. 60% developed under current conditions. **Figure 6.5** shows that the existing Woodview Pond did not have sufficient storage volume to maintain pond freeboard above 0.3m during the 50yr storm event. The minimum pond freeboard of 0.3m is a widely accepted industry standard in stormwater management which provides a factor of safety in the design of stormwater management ponds. Modeling showed during extreme storm events the Woodview Pond did not have sufficient freeboard because of limited storage volume in the pond.

6.2 RUSH CATCHMENT

The following areas were identified as having limited hydraulic capacity in the Rush Catchment:

1. Bell Ave trunk sewer at the Maidstone Ave and Bell Ave intersection
2. Albert St trunk sewer at the Maidstone Ave and Albert St intersection

These areas in the Rush Catchment are discussed below.

6.2.1 Bell trunk sewer at the Maidstone Ave and Bell Ave intersection

Figure 6.6 in **Appendix E** shows the sewer profile along Bell Ave and Maidstone Ave W to Rush Drain.

For storms exceeding 2-year return periods the Bell Ave trunk sewer had limited hydraulic capacity at the Maidstone-Bell intersection (see CB-MH4 in **Figure 6.6**). The Bell sewer hydraulic capacity is limited at the outlet to the Maidstone Ave trunk sewer because of the sewer invert rises at the Maidstone-Bell Ave intersection (refer to CB-MH6 and CB-MH5 in **Table 3-10**).

6.2.2 Albert St Sewer at the Maidstone Ave and Albert St intersection

Figure 6.7 in **Appendix E** shows the sewer profile along Albert St and Maidstone Ave W to Rush Drain.

For 2-year return period storms the Albert trunk sewer at the Maidstone-Albert St intersection had limited hydraulic capacity (see M.H.4 in **Figure 6.7**). The Albert trunk sewer capacity is limited at the outlet to the Maidstone Ave trunk sewer because of the sewer invert rise at the Maidstone-Albert intersection (refer to **Table 3-10**).

6.3 MAIDSTONE CATCHMENT

The following areas were identified as having limited hydraulic capacity in the Maidstone Catchment:

1. Maidstone Ave E interceptor sewer outfall
2. Maidstone Ave E interceptor sewer at the Gosfield-Maidstone Ave intersection

These areas in the Maidstone Catchment are discussed below.

6.3.1 Maidstone Ave E Interceptor Sewer – Outfall

Figure 6.8 in **Appendix E** shows the sewer profile along Maidstone Ave E from Talbot St N to North Talbot Rd. The hydraulic profile is similar along Gordon, and Arthur Ave.

For 2-year return period storms the Maidstone interceptor sewer at the outfall had limited hydraulic capacity (refer to junction J252 in **Figure 6.8**). This resulted in sewer back-ups upstream of the outfall. The outfall sewer capacity is limited because the receiving drain invert is significantly higher than the outfall sewer invert (refer to **Table 3-2**).

6.3.2 Maidstone Ave E Interceptor Sewer – Gosfield-Miadstone Ave Intersection

Figure 6.9 in **Appendix E** shows the sewer profile along Brien Ave E from Talbot St N to Gosfield Twl to Maidstone Ave E and finally to North Talbot Rd.

For 2-year return period storms the Maidstone interceptor sewer at Gosfield Twl had limited hydraulic capacity, causing a second location of limited capacity in the sewer system (refer to junction J39 in **Figure 6.8**). This resulted in sewer back-ups upstream of the Gosifeld-Maidstone intersection. The Maidstone interceptor sewer capacity is limited at Gosfield Twl due to the reduction in sewer dia. and sewer invert rise at the Gosfield-Maidstone intersection (refer to

Table 3-2). The area most affected from both areas of limited hydraulic capacity was the Gosfield-Brien intersection where significant surface flooding occurred from the backwater effects when storms exceeded 10-year return period (refer to **Figure 6.9**).

6.4 HOPGOOD CATCHMENT

No areas in the network were identified as having limited hydraulic capacity in the Hopgood catchment's storm sewer system.

6.5 ARNER TWL CATCHMENT

No areas in the network were identified as having limited hydraulic capacity in the Arner Twl catchment's storm sewer system.

7.0 CONCLUSIONS & RECOMMENDATIONS

The findings concluded from the hydraulic capacity assessment on Essex's existing storm sewer system are discussed below. **Figure 7.1** in **Appendix E** shows the locations of the proposed preliminary storm sewer improvements.

7.1.1 South Talbot Catchment

- Victoria trunk sewer receives additional flow from the Brien, Iler, and Centre St drainage areas via the Hanlan St interceptor sewer which the Victoria sewer is not designed to convey. The runoff from drainage areas conveyed by the Hanlan St sewer causes limited hydraulic capacity in the Victoria trunk sewer at the Hanlan-Victoria intersection.

- Brien trunk sewer at the Brien-Hanlan intersection has limited hydraulic capacity for 2-year return period storms. The reduction in hydraulic cross-section from the invert rise at the Brien-Hanlan intersection and additional flows from Kimball development and the adjacent Iler Ave drainage area limits hydraulic capacity at the Brien-Hanlan intersection.

- Tulley Meadows storm sewer system was computed to have street flooding above the 0.3m industry accepted standard under extreme storm events due to the capacity of the outlet sewer orifice.

- Woodview Estates Pond freeboard was less than 0.3m during extreme storm events. Modeling showed the peak HGL did not meet the industry accepted pond freeboard standard during extreme storm events because of limited storage volume in the Woodview Estates Pond.

Storm sewer system improvements in the South Talbot Catchment are being addressed under the Municipal Class EA titled "Improvements to Essex Ward 1 Southwest Storm Sewer System Class EA." The Class EA was currently being undertaken at the time this report was prepared.

7.1.2 Rush Catchment

- The Maidstone-Bell Ave intersection and the Maidstone-Albert St intersection have limited hydraulic capacity. The storm sewer invert rises at both intersections causes significant surcharging in upstream storm sewers during storms equivalent to or exceeding 2-year return period.

- Preliminary storm sewer improvements require replacing the Maidstone Ave trunk storm sewer so the Bell and Albert St storm sewers drain completely and use their full hydraulic cross-section for conveyance.

7.1.3 Maidstone Catchment

- Limited hydraulic capacity at the Gosfield-Maidstone intersection, and at the Maidstone interceptor sewer outfall was observed. The Gosfield-Maidstone intersection had limited hydraulic capacity because of the reduction in storm sewer dia. and the storm sewer invert rise. The Maidstone interceptor sewer outfall had limited capacity because the outfall sewer invert is significantly lower than the receiving Maidstone Ave Drain. This resulted in significant surcharging in upstream storm sewers from storms equivalent to or exceeding 2-year return period.

- Preliminary storm sewer improvements require the Maidstone Ave storm sewer from Gosfield Twl to the outfall to be replaced and the Maidstone Ave Drain deepened as required to ensure the Maidstone interceptor sewer drains completely and can use its full hydraulic cross-section for conveyance.

7.1.4 Hopgood Catchment

- For storms equivalent to or exceeding 2-year return periods the Hopgood trunk sewer operates near-capacity. Capacity of the outlet is marginal for the area presently serviced.

- No storm sewer improvements are recommended for the area presently serviced.

7.1.5 Arner Twl Catchment

- For storms equivalent to or exceeding 2-year return periods the Gosfield Twl trunk sewer operates near-capacity. Capacity of the outlet is marginal for the area presently serviced.

- No storm sewer improvements are recommended for the area presently serviced.

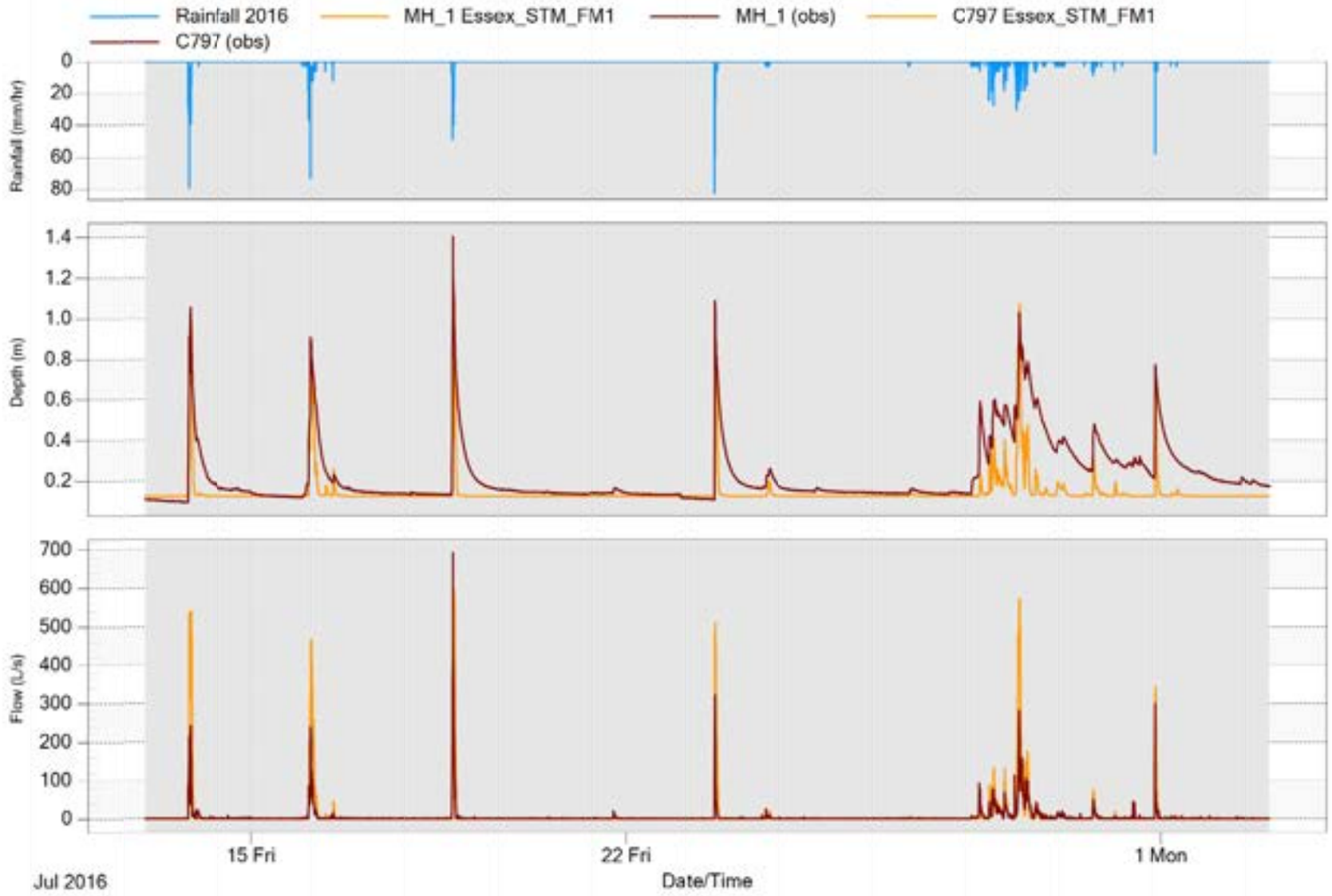
APPENDICES

Appendix A CALIBRATION RESULTS

A.1 DEPTH & FLOW HYDROGRAPHS

Appendix A.1.1: FM1 Flow & Depth Calibration

South Talbot Catchment (Tulley Meadows)



A.1.1 Flow Monitor No. 1 – South Talbot (Tulley Meadows)

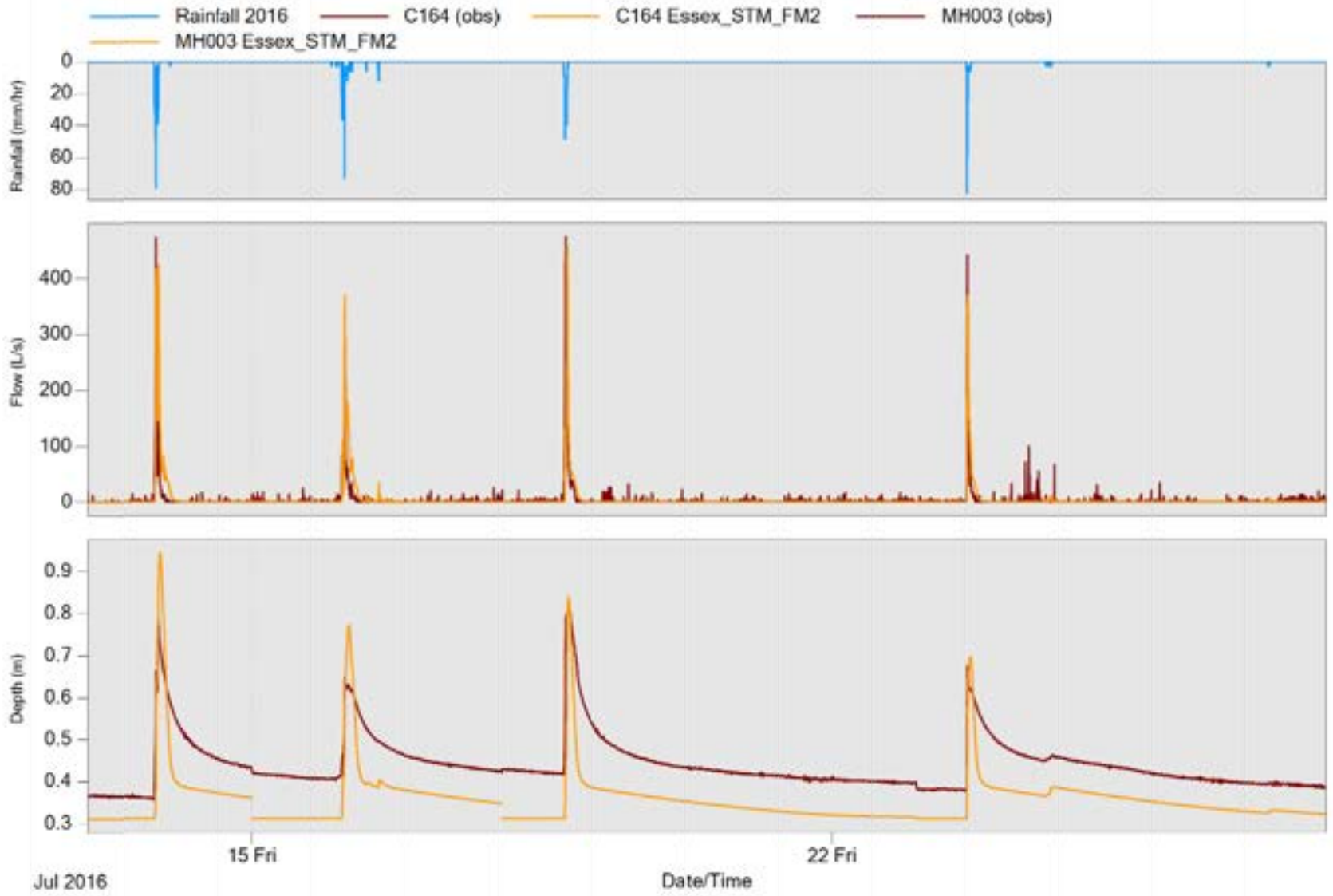
Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	869.1	2334	169%
2	August-16 1:30am	846	2249	166%
3	August-20 5:40pm	1487	1840	24%
4	August-27 2:50pm	576.1	1659	188%
5	September-28 6:30pm	4188	6637	58%
		7966.2	14719	85%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	1.055	0.988	-6%
2	August-16 1:30am	0.9087	0.7966	-12%
3	August-20 5:40pm	1.406	1.113	-21%
4	August-27 2:50pm	1.089	0.9303	-15%
5	September-28 6:30pm	1.031	1.075	4%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	242.4	539	122%
2	August-16 1:30am	238.9	465.7	95%
3	August-20 5:40pm	692.7	595.7	-14%
4	August-27 2:50pm	322.2	510.5	58%
5	September-28 6:30pm	299.5	572.3	91%

Appendix A.1.2: FM2 Flow & Depth Calibration

South Talbot Catchment (Woodview Estates)



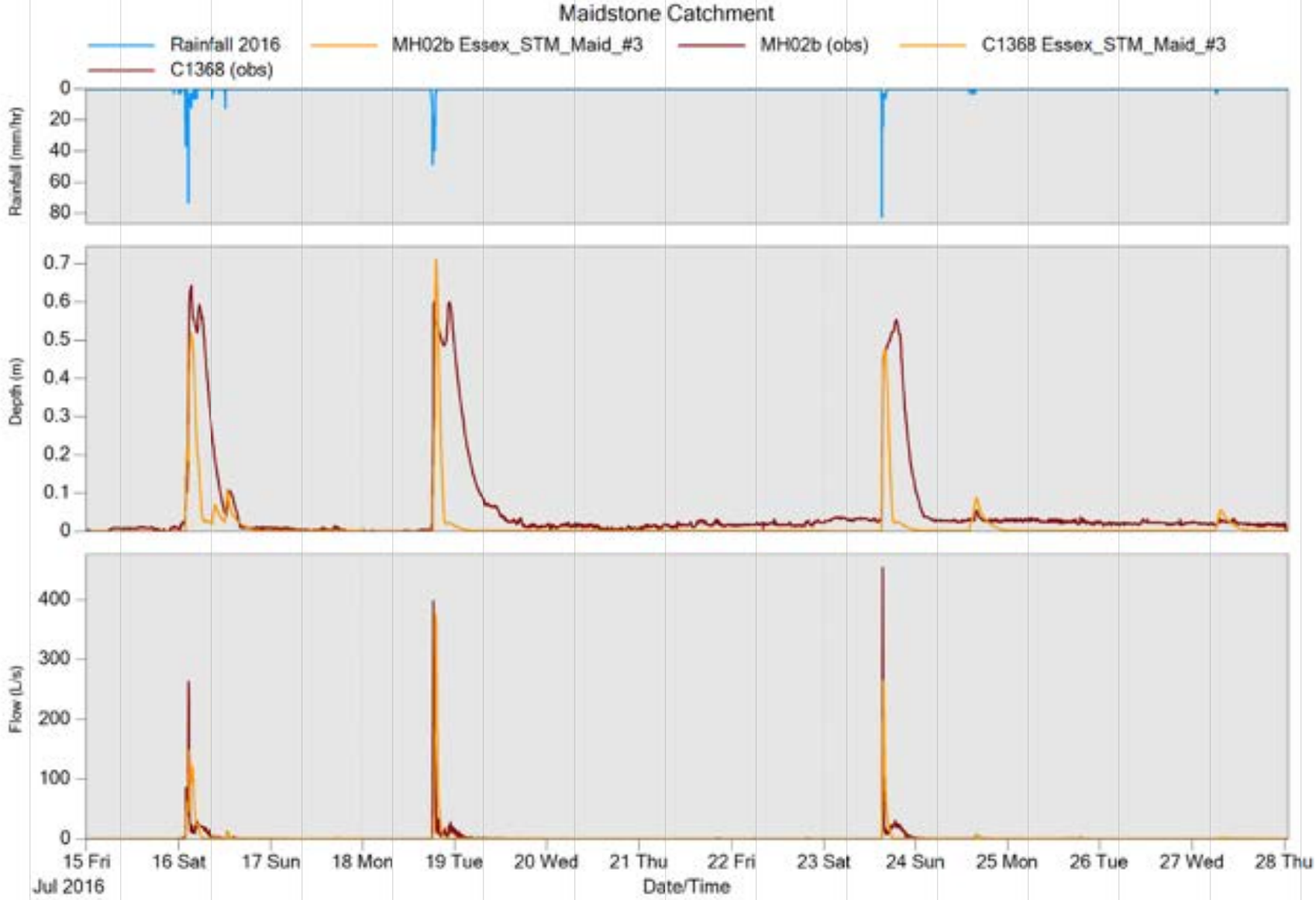
A.1.2 Flow Monitor No. 2 – South Talbot (Woodview Estates)

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	1122	1760	57%
2	August-16 1:30am	916.5	1625	77%
3	August-20 5:40pm	1828	1369	-25%
4	August-27 2:50pm	1354	1168	-14%
5	September-28 6:30pm			
		5220.5	5922	13%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	0.7908	0.9393	19%
2	August-16 1:30am	0.6485	0.7711	19%
3	August-20 5:40pm	0.8053	0.8362	4%
4	August-27 2:50pm	0.6743	0.6941	3%
5	September-28 6:30pm			

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	473.2	421.9	-11%
2	August-16 1:30am	279.5	369.3	32%
3	August-20 5:40pm	475	454.1	-4%
4	August-27 2:50pm	441.9	368.2	-17%
5	September-28 6:30pm			

Appendix A.1.3: FM3 Flow & Depth Calibration



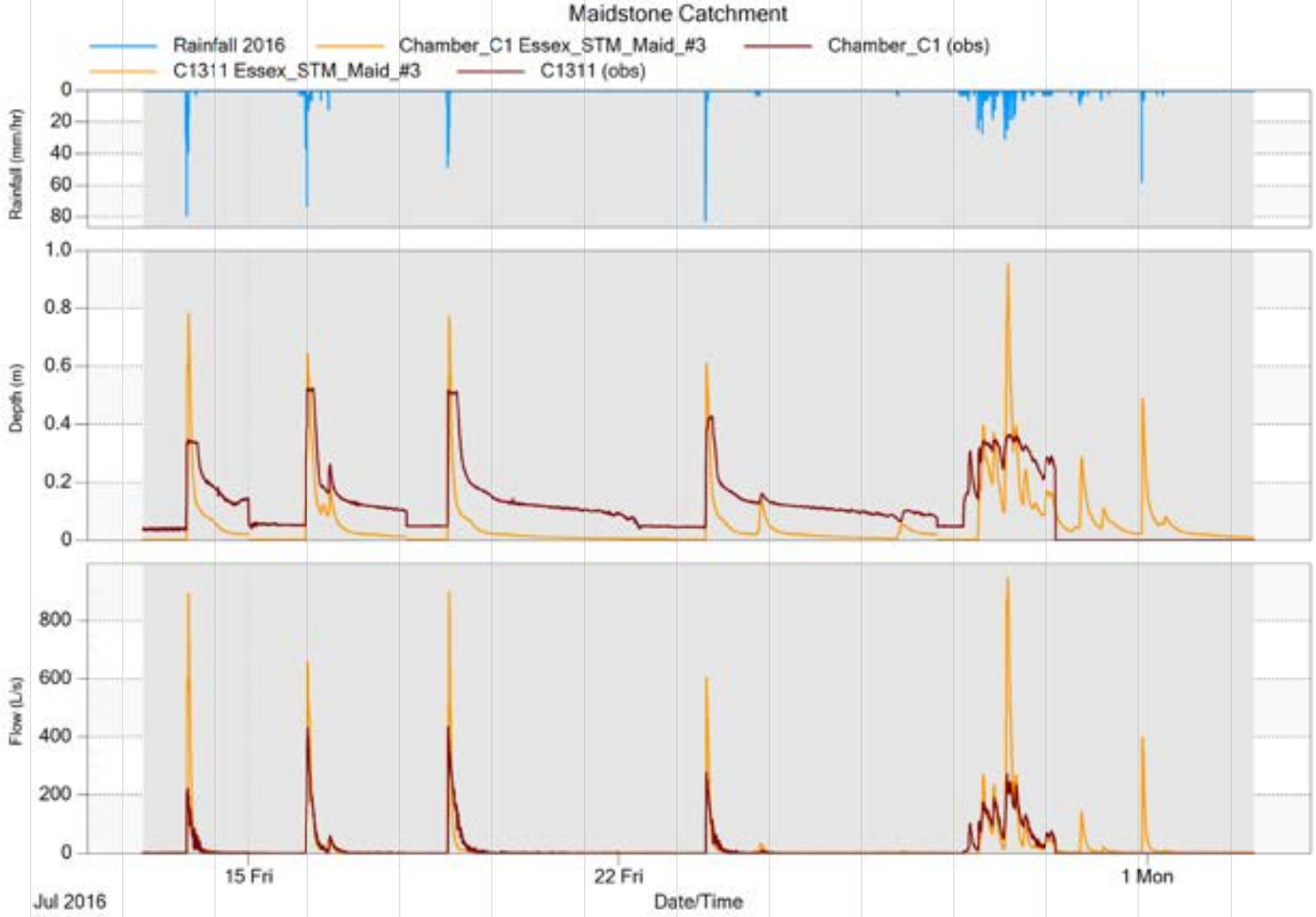
A.1.3 Flow Monitor No. 3 – Maidstone

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm			
2	August-16 1:30am	768.1	870.6	13%
3	August-20 5:40pm	872.4	913.1	5%
4	August-27 2:50pm	750.1	650.3	-13%
5	September-28 6:30pm			
		2390.6	2434	2%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm			
2	August-16 1:30am	0.643	0.5139	-20%
3	August-20 5:40pm	0.6008	0.6899	15%
4	August-27 2:50pm	0.5527	0.4642	-16%
5	September-28 6:30pm			

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm			
2	August-16 1:30am	262.5	139.8	-47%
3	August-20 5:40pm	398.7	346.9	-13%
4	August-27 2:50pm	454	239.7	-47%
5	September-28 6:30pm			

Appendix A.1.4: FM4 Flow & Depth Calibration



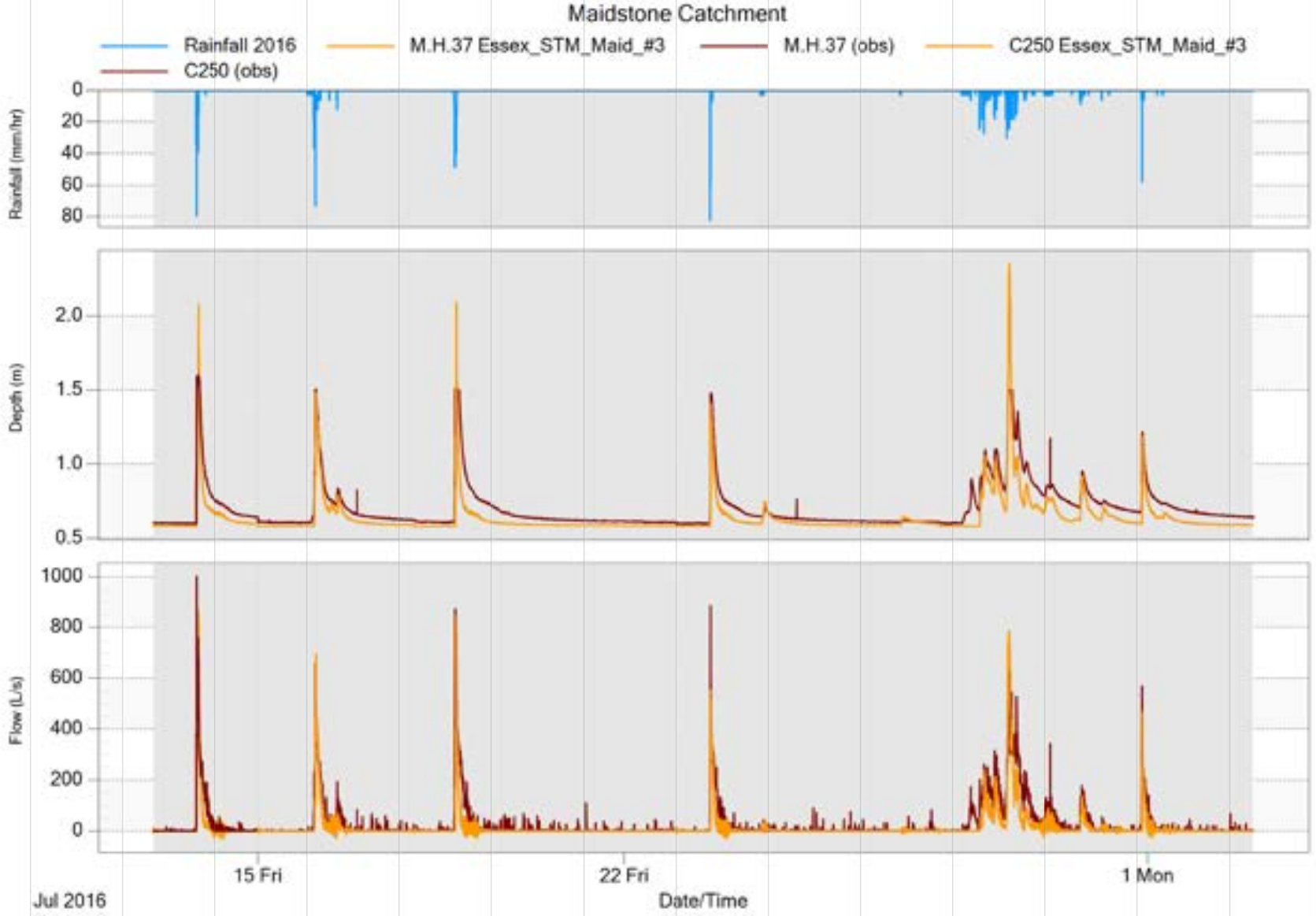
A.1.4 Flow Monitor No. 4 – Maidstone

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	2014	4785	138%
2	August-16 1:30am	4596	5254	14%
3	August-20 5:40pm	5013	3846	-23%
4	August-27 2:50pm	2649	3618	37%
5	September-28 6:30pm			
		14272	17503	23%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	0.3458	0.776	124%
2	August-16 1:30am	0.5244	0.6407	22%
3	August-20 5:40pm	0.5161	0.769	49%
4	August-27 2:50pm	0.4272	0.6064	42%
5	September-28 6:30pm	0.3628	0.9365	158%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	222.9	889.8	299%
2	August-16 1:30am	431.6	656.9	52%
3	August-20 5:40pm	433.9	894.1	106%
4	August-27 2:50pm	277.9	596	114%
5	September-28 6:30pm	271.3	951.2	251%

Appendix A.1.5: FM5 Flow & Depth Calibration



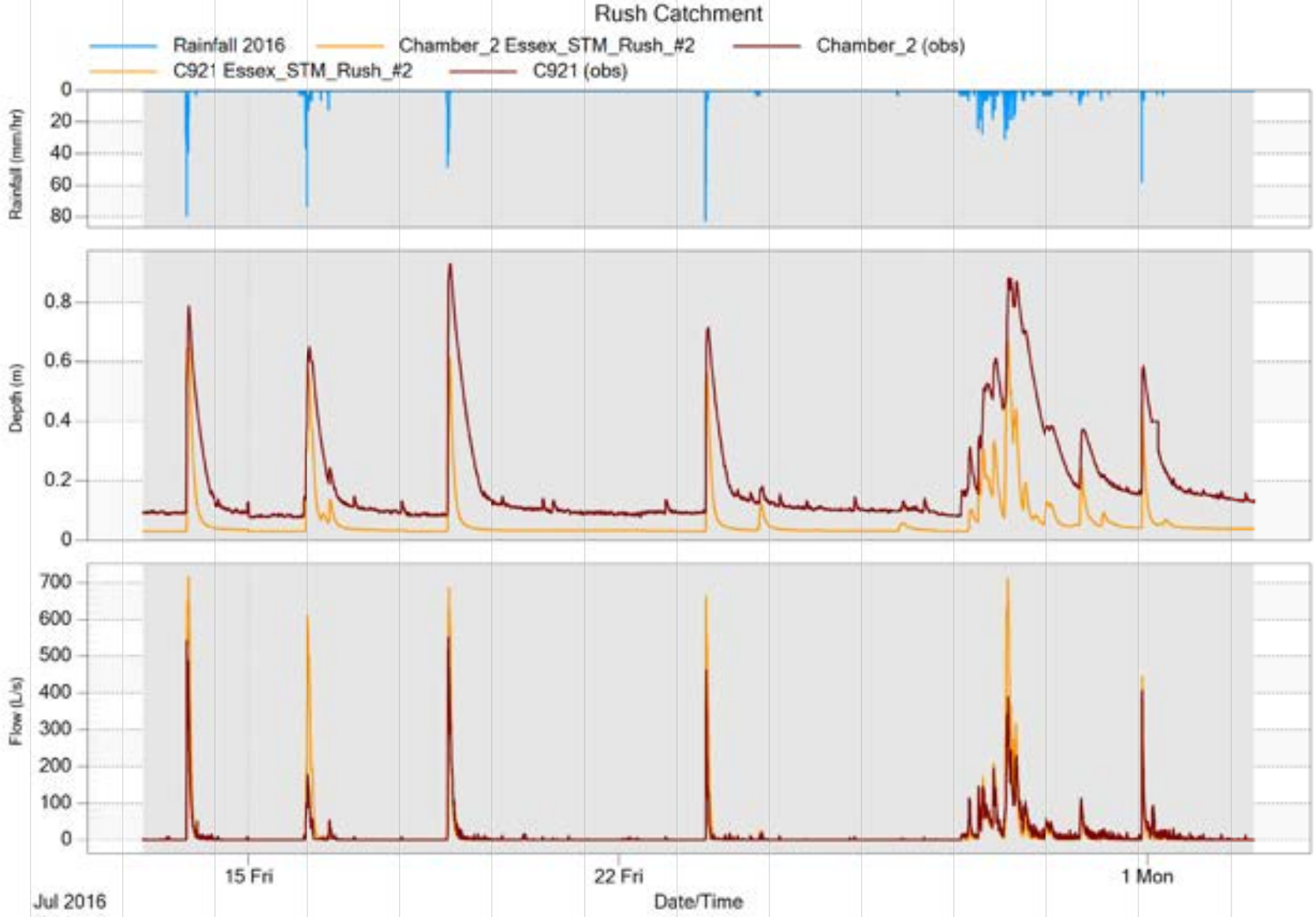
A.1.5 Flow Monitor No. 5 – Maidstone

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	6320	3759	-41%
2	August-16 1:30am	5662	3989	-30%
3	August-20 5:40pm	7413	3020	-59%
4	August-27 2:50pm	5020	2764	-45%
5	September-28 6:30pm	25950	14470	-44%
		50365	28002	-44%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	1.602	2.07	29%
2	August-16 1:30am	1.507	1.482	-2%
3	August-20 5:40pm	1.519	2.076	37%
4	August-27 2:50pm	1.478	1.396	-6%
5	September-28 6:30pm	1.5	2.333	56%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	1002	873.6	-13%
2	August-16 1:30am	658.4	678.1	3%
3	August-20 5:40pm	873.2	856.5	-2%
4	August-27 2:50pm	885	550.6	-38%
5	September-28 6:30pm	629.8	791	26%

Appendix A.1.6: FM6 Flow & Depth Calibration



A.1.6 Flow Monitor No. 6 – Rush

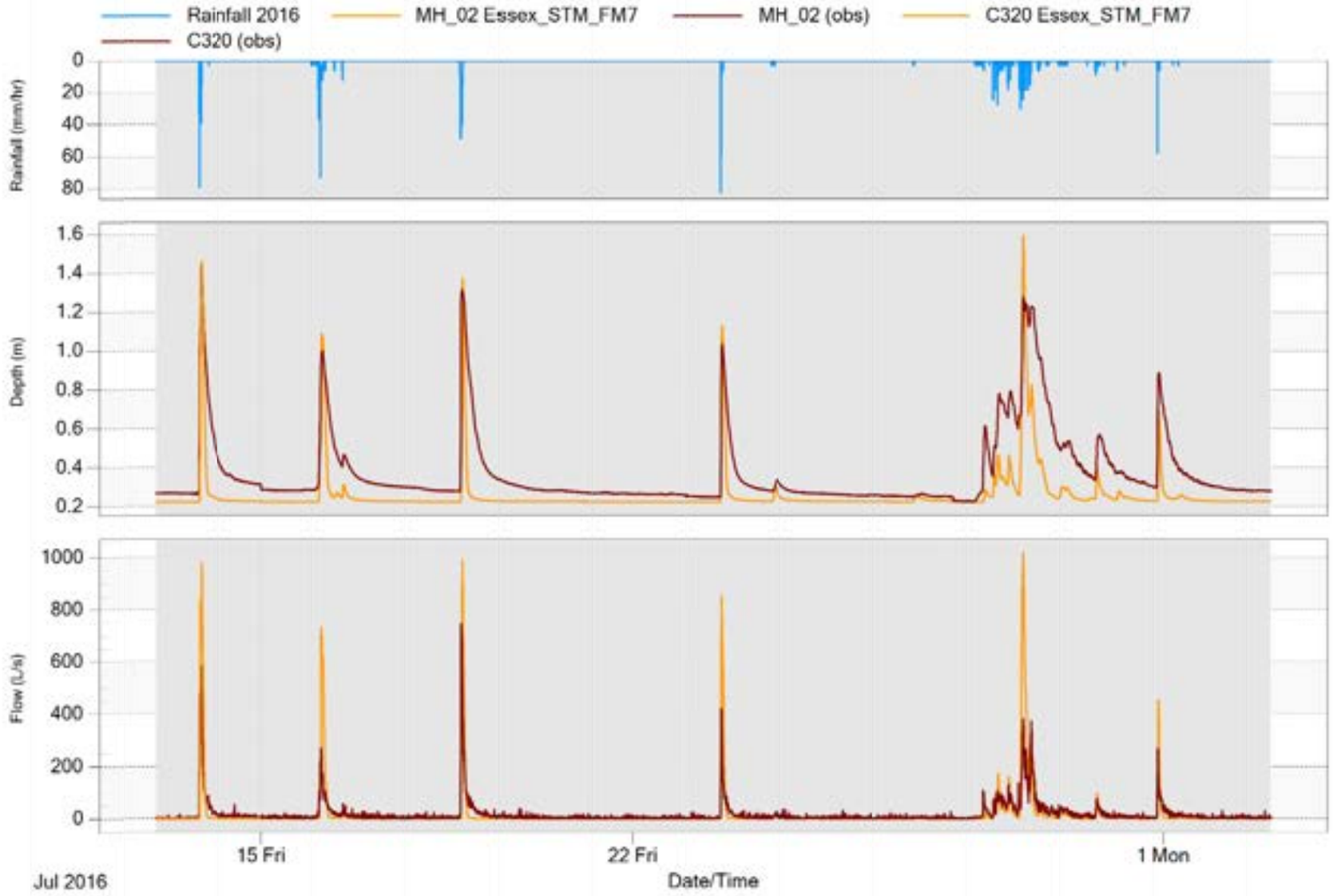
Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	2920	4223	45%
2	August-16 1:30am	1492	4446	198%
3	August-20 5:40pm	3719	3285	-12%
4	August-27 2:50pm	1571	3007	91%
5	September-28 6:30pm	14050	12570	-11%
		23752	27531	16%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	0.7873	0.634	-19%
2	August-16 1:30am	0.6515	0.5623	-14%
3	August-20 5:40pm	0.9303	0.6089	-35%
4	August-27 2:50pm	0.7161	0.553	-23%
5	September-28 6:30pm	0.8835	0.6621	-25%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	543.5	697.7	28%
2	August-16 1:30am	177.5	589.8	232%
3	August-20 5:40pm	551.5	677.9	23%
4	August-27 2:50pm	461.6	642.8	39%
5	September-28 6:30pm	407.7	698	71%

Appendix A.1.7: FM7 Flow & Depth Calibration

South Talbot Catchment



A.1.7 Flow Monitor No. 7 – South Talbot

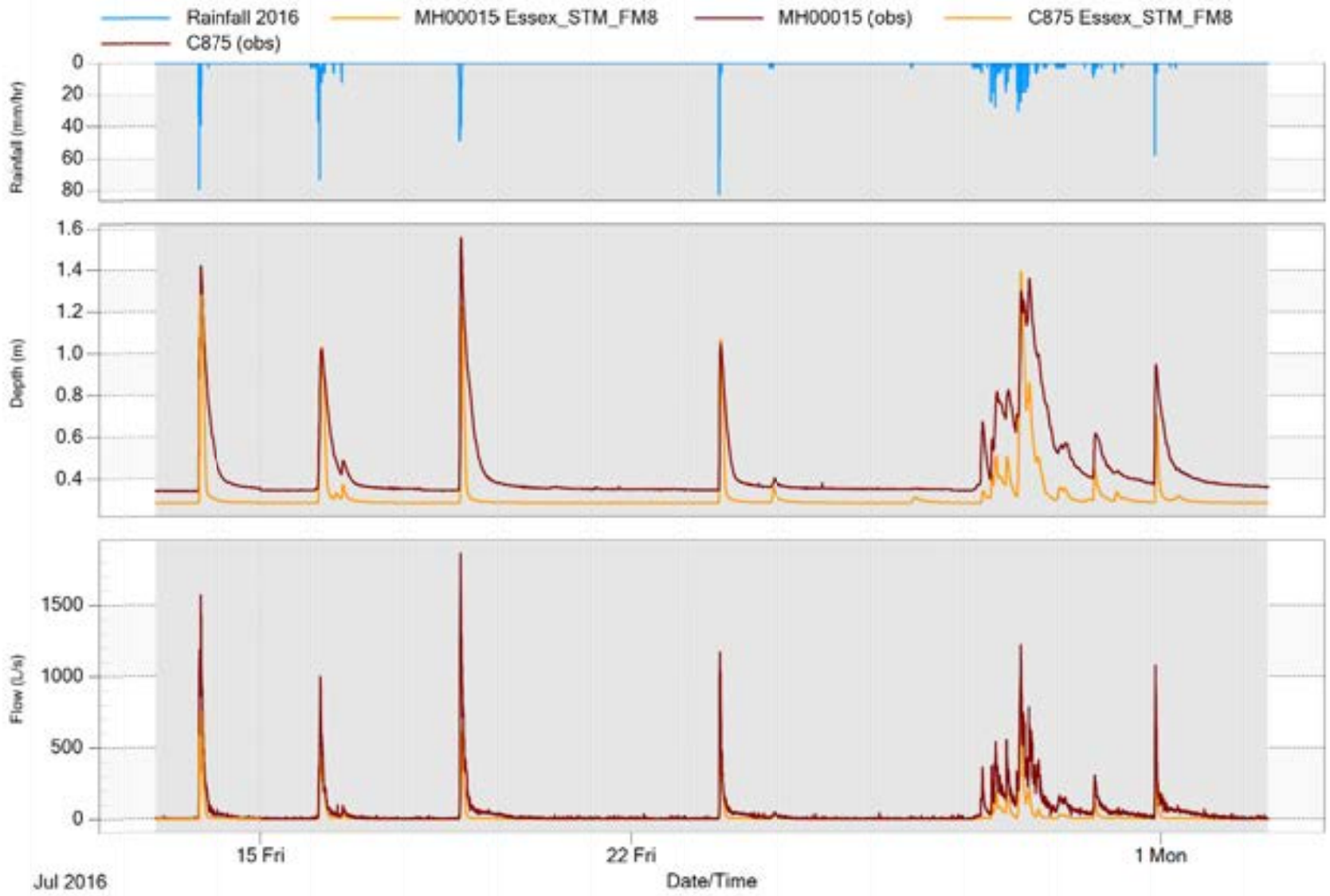
Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	4193	5114	22%
2	August-16 1:30am	3473	4768	37%
3	August-20 5:40pm	5678	3901	-31%
4	August-27 2:50pm	3413	3503	3%
5	September-28 6:30pm	13660	13380	-2%
		30417	30666	1%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	1.437	1.459	2%
2	August-16 1:30am	1.001	1.091	9%
3	August-20 5:40pm	1.315	1.373	4%
4	August-27 2:50pm	1.035	1.127	9%
5	September-28 6:30pm	1.277	1.593	25%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	585.2	980.9	68%
2	August-16 1:30am	269.8	731.1	171%
3	August-20 5:40pm	746.3	990.3	33%
4	August-27 2:50pm	420.7	851	102%
5	September-28 6:30pm	381.6	1020	167%

Appendix A.1.8: FM8 Flow & Depth Calibration

South Talbot Catchment



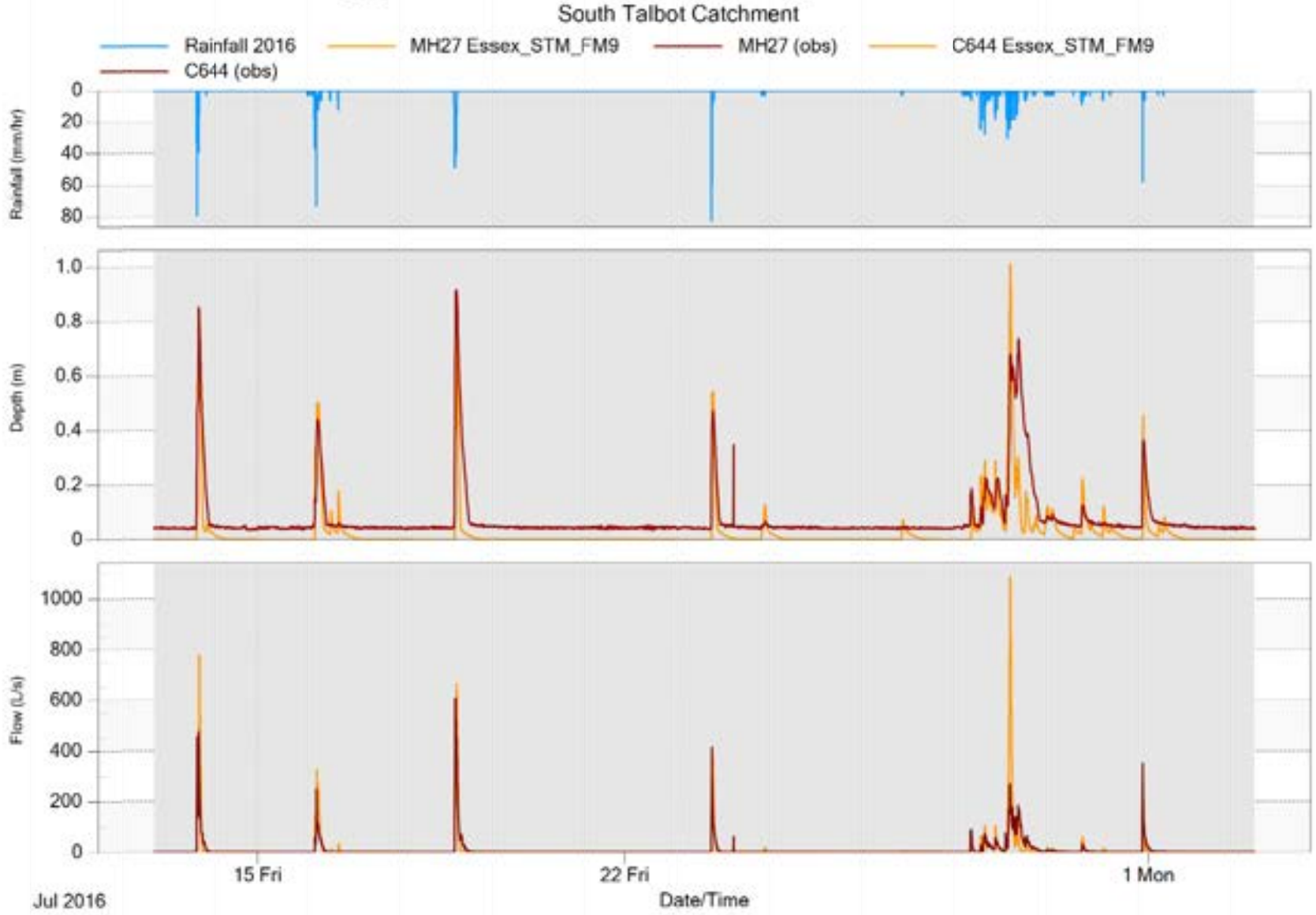
A.1.8 Flow Monitor No. 8 – South Talbot

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	10100	3837	-62%
2	August-16 1:30am	7188	3713	-48%
3	August-20 5:40pm	13150	3029	-77%
4	August-27 2:50pm	7441	2698	-64%
5	September-28 6:30pm	49350	12830	-74%
		87229	26107	-70%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	1.421	1.281	-10%
2	August-16 1:30am	1.02	1.035	1%
3	August-20 5:40pm	1.559	1.224	-21%
4	August-27 2:50pm	1.049	1.069	2%
5	September-28 6:30pm	1.363	1.397	2%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	1568	745.5	-52%
2	August-16 1:30am	996.2	452.5	-55%
3	August-20 5:40pm	1863	611.4	-67%
4	August-27 2:50pm	1168	597.2	-49%
5	September-28 6:30pm	1216	988.2	-19%

Appendix A.1.9: FM9 Flow & Depth Calibration



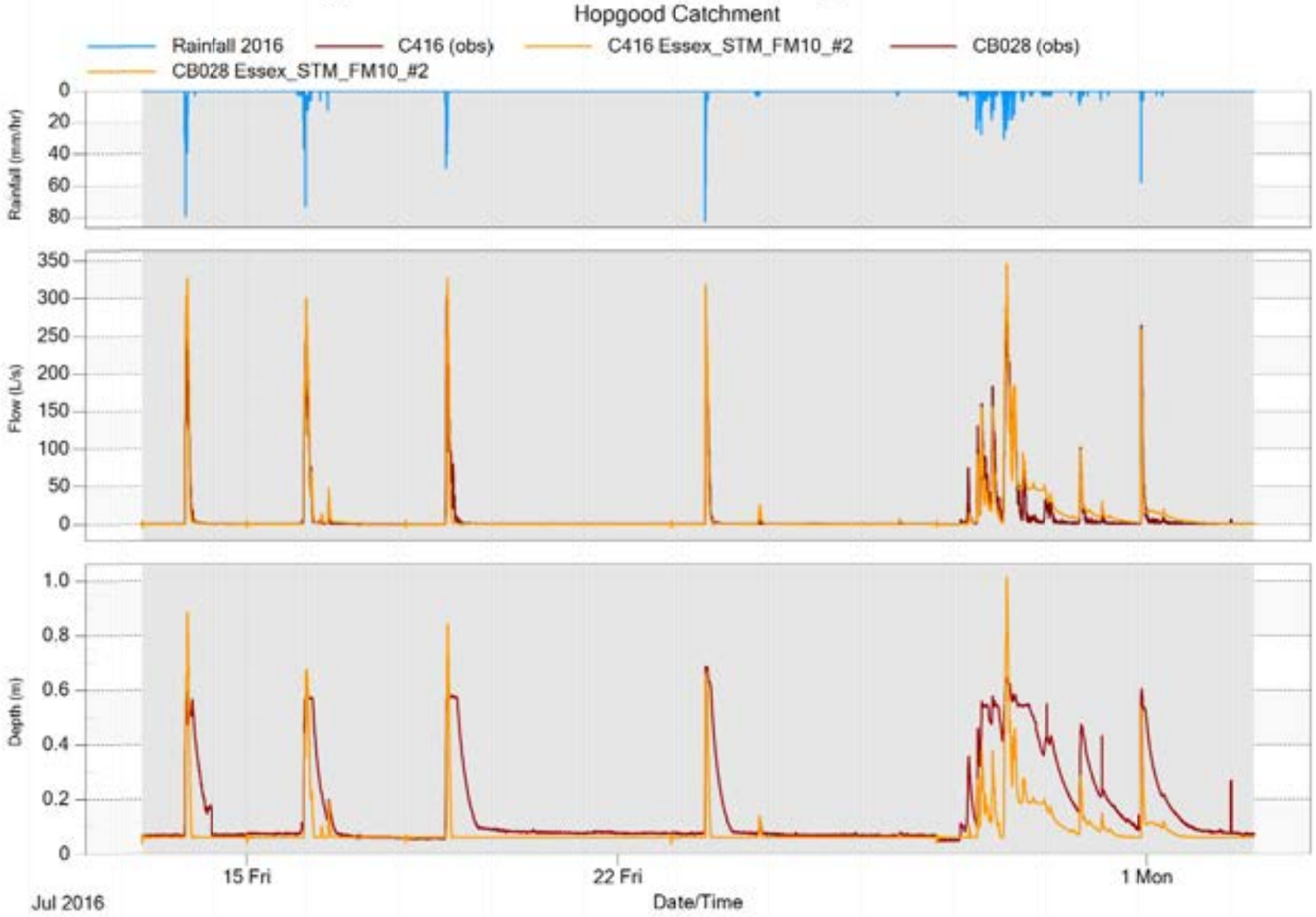
A.1.9 Flow Monitor No. 9 – South Talbot

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	2186	2878	32%
2	August-16 1:30am	1021	1836	80%
3	August-20 5:40pm	2839	2131	-25%
4	August-27 2:50pm	1036	1492	44%
5	September-28 6:30pm	6231	7268	17%
			15605	17%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	0.8506	0.8462	-1%
2	August-16 1:30am	0.4387	0.5061	15%
3	August-20 5:40pm	0.9146	0.7592	-17%
4	August-27 2:50pm	0.4697	0.5428	16%
5	September-28 6:30pm	0.736	1.011	37%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	475	778.5	64%
2	August-16 1:30am	247.6	323.8	31%
3	August-20 5:40pm	606.8	664.2	9%
4	August-27 2:50pm	412.3	385.5	-7%
5	September-28 6:30pm	349.2	1088	212%

Appendix A.1.10: FM10 Flow & Depth Calibration



A.1.10 Flow Monitor No. 10 – Hopgood

Event	Event Start Date	Volume (m^3) (obs)	Volume (m^3)	Rel. Diff. (%)
1	July-13 7:25pm	1501	1598	6%
2	August-16 1:30am	1632	1971	21%
3	August-20 5:40pm	1794	1296	-28%
4	August-27 2:50pm	1232	1248	1%
5	September-28 6:30pm	8447	11190	32%
		14606	17303	18%

Event	Event Start Date	Peak Depth (m) (obs)	Peak Depth (m)	Rel. Diff. (%)
1	July-13 7:25pm	0.5972	0.8864	48%
2	August-16 1:30am	0.5748	0.6755	18%
3	August-20 5:40pm	0.581	0.8433	45%
4	August-27 2:50pm	0.6864	0.6661	-3%
5	September-28 6:30pm	0.6443	1.014	57%

Event	Event Start Date	Peak Flow (l/s) (obs)	Peak Flow (l/s)	Rel. Diff. (%)
1	July-13 7:25pm	273.6	327	20%
2	August-16 1:30am	241.9	300.2	24%
3	August-20 5:40pm	301	327.6	9%
4	August-27 2:50pm	247.9	318.9	29%
5	September-28 6:30pm	269.5	346.2	28%

A.2 CALIBRATED PARAMETERS

Table A.1: Hydrologic-hydraulic model calibrated parameters

			Subcatchment Slope		Infiltration			Depression Storage		Subarea routing (%)						
Flow Monitor	Subcatchment #	Catchment	S - urban developed (%)	S - agricultural, open space, parkland (%)	Ks (mm/hr)	Md	ψ (mm)	D_{store} - perv (mm)	D_{store} - imperv (mm)	Residential	Institutional, commercial	Industrial	Downtown (imperv>70%)	Open space, agricultural	Parkland	Pavement
-	1, 3	Rush (subcatch. 1, 3)	1	0.3	1.3	0.21	180	6.3	2.5	50	N/A	N/A	10	90	100	0
6	2, 4	Rush (subcatch. 2, 4)	1	0.3	1	0.15	180	6.3	2.5	50	15	15	10	0	100	0
-	5	Arner	1	0.3	1.3	0.21	180	6.3	2.5	50	15	N/A	10	90	N/A	0
-	6	South Talbot	1	0.3	1.3	0.21	180	6.3	2.5	50	N/A	N/A	N/A	90	N/A	0
7	7	South Talbot	1	0.3	2.2	0.21	180	7.5	3.5	75	25	40	10	90	100	0
8	8	South Talbot	1	0.3	2.2	0.21	180	7.5	3.5	75	25	N/A	10	90	100	0
9	9	South Talbot	1	0.3	2.3	0.21	225	7.5	3.5	50	N/A	N/A	N/A	90	100	0
-	10	South Talbot	1	0.3	1.3	0.21	180	6.3	2.5	50	25	N/A	10	90	90	0
2	11	South Talbot	1	0.3	1.5	0.21	180	6.3	2.5	60	25	N/A	N/A	90	N/A	0
1	12	South Talbot	1	0.3	1.9	0.21	200	6.3	2.5	50	N/A	N/A	N/A	90	60	0
10	13	Hopgood	0.5	0.15	2.3	0.22	225	8.5	3.5	80-85	35	N/A	10	90	90	0
4, 5	14, 15(a), 15(b)	Maidstone (areas w/o rear-yard drainage)	1	0.3	3.9	0.25	270	9	5	75	25	25	10	90	100	0
3 & Galos	15(a), 15(c).	Maidstone (areas w/ rear-yard drainage)	1	0.3	2.6	0.25	270	8	3.5	75	25	25	10	90	100	0
NIL	Rural area outside Town urban limits	South Talbot	1	0.3	10.9	0.33	110	10	2.5	N/A	N/A	95	N/A	50-100	15	N/A

Appendix B MOECC CERTIFICATES OF APPROVAL

Canaan Pond ECA

Essex Crossing SWM Pond and Pump Station ECA

Galos SWM Pond and Pump Station ECA

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Ontario

Ministry of the Environment **Ministère de l'Environnement**

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 3364-6SNQNA
Issue Date: August 26, 2006

The Corporation of the Town of Essex
33 Talbot Street South
Essex, Ontario
N8M 1A8

Site Location: Canaan Drain Regional Storm Quality Pond
Part of Lot 33, Concession North of Malden Road
Town of Essex, County of Essex

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the expansion of the existing Canaan Drain Regional Storm Quality Pond for the treatment of stormwater runoff from a catchment area of 14.9 hectares by diverting approx. a 600 mm depth of flow from the Canaan Drain into the existing Canaan Drain Regional Storm Quality Pond for the first flows coming through the system and to provide Basic Level water quality protection and erosion control, discharging to the Canaan Drain then to the Essex Outlet Drain and ultimately to the Canard River, for the 13 mm (first flush) of runoff from the development areas, consisting of the following:

the existing Canaan Drain Regional Storm Quality Pond serving the Jakana Development (9.0 ha) and the Kimball Development (5.9 ha), located along the Canaan Drain near its' upper end just west of King's Highway No. 3, having a total active storage volume of 1,614 m^3 complete with one (1) weir diverter located in the Canaan Drain, diverting approx. the 600 mm depth of flow from the Canaan Drain into the Canaan Drain Regional Storm Quality Pond, one (1) inlet structure consisting of a 1,050 mm by 740 mm CSP inlet pipe and rip-rapped inlet, one (1) - 5 m by 4.3 m by 1 m sedimentation trap, a serpentine channel through the pond bottom, a 4 m wide rip-rapped emergency spillway and one (1) outlet structure consisting of a 200 mm diameter Hickenbottom pipe and a 150 mm diameter outlet pipe allowing a maximum discharge of 0.021 m^3/s (100-year storm event) the Canaan Drain then to the Essex Outlet Drain and ultimately to the Canard River; including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works*;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works submitted by Gerard Rood, P.Eng., of N.J. Peralta Engineering Ltd., dated May 9, 2006 and received May 15, 2006;

2. Report entitled: "Expansion of Canaan Drain Regional Storm Quality Pond, Town of Essex" dated December 10, 2004 and prepared by N.J. Peralta Engineering Ltd.; and

3. Engineering drawings dated December 10, 2004 and prepared by N.J. Peralta Engineering Ltd.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

2. "*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

3. "*District Manager*" means the District Manager of the Sarnia District Office of the *Ministry*;

4. "*Ministry*" means the Ontario Ministry of the Environment;

5. "*Owner*" means the Corporation of the Town of Essex and includes its successors and assignees;

6 "*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

1.1 Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the *Works* and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

1.2 Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

1.3 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*.

4. OPERATION AND MAINTENANCE

4.1 The *Owner* shall ensure that the design storage volume is maintained at all times.

4.2 The *Owner* shall inspect the *Works* and the portion of the Canaan Drain extending from the sewer outlet at South

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Talbot Road and Fairview Avenue downstream to the weir structure at least once a year and, if necessary, clean and maintain the *Works* and the portion of the Canaan Drain to prevent the excessive buildup of sediments and/or vegetation.

4.3 The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site for inspection by the *Ministry*. The logbook shall include the following:

(a) the name of the *Works*; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate*.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included to require that the *Works* and the portion of the Canaan Drain be properly operated and maintained such that the environment is protected.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works*.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;

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7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 26th day of August, 2006

Sarah Paul, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

KC/
c: District Manager, MOE Sarnia District Office
Area Supervisor, MOE Windsor Area Office
Gerard Rood, N.J. Peralta Engineering Ltd.

Essex
Storm water Sth

HEARN
Subdivision

Ministry of the Environment / Ministère de l'Environnement

Ontario

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 5379-5W4L9H

Essex 143 Joint Venture Ltd.
500 Ouellette Avenue, No. 800
Windsor, Ontario
N9A 1B3

RECEIVED
MAR 17 2004
By

Site Location: Essex Crossing
Lot 284-286, Concession South of Talbot Road
Essex Town, County of Essex
400 MAINSTORE AVE. WEST

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the establishment of stormwater management works for the collection, transmission, treatment and disposal of stormwater run-off, to provide Level 2 (Normal) water quality protection and to attenuate post-development peak flows to pre-development levels, for all storm events up to and including the 100 year return storm, consisting of the following:

Stormwater Management Facility

A fenced dry pond will be constructed to serve approximately 26.26 ha. commercial subdivision, to provide quantity control for all design storm events up to and including the 100-year storm. The pond will have a flow splitter at the inlet, a forebay, and have a total storage volume of approximately 3334.3 cu.m. to attenuate the peak run-off to a maximum release rate of 190 litres per second through a Birdcage Grate Inlet Catchbasin and from this catchbasin a 375 mm (15 inch) diameter pipe is connected to a pumping system, housed in a manhole having one (1) self-primed vertical pump rated at 180 litres per second (6.24 cfs) at total dynamic head of 2.35 - m discharging into the Munch/Rush Drain system, tributaries of River Canard;

- all other controls, electrical equipment, instrumentation, piping, valves and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works, including final design drawings and stormwater management report submitted by Gloss Engineering Limited of Windsor dated September 25, 2003, received on February 6, 2004.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

(1) "Certificate" means this entire Certificate of Approval document, issued in accordance with Section 53 of the *Ontario Water Resources Act*, and includes any schedules;

(2) "Director" means any Ministry employee appointed by the Minister pursuant to Section 5 of the *Ontario Water Resources Act*;

(3) "Ministry" means the Ontario Ministry of Environment;

(4) "Regional Director" means the Regional Director of the Southwestern Region of the Ministry;

(5) "District Manager" means the District Manager of the Windsor District Office of the Ministry's Southwestern Regional Office;

(6) "Owner" means Essex 143 Joint Venture Ltd., and includes its successors and assignees;

(7) "Municipality" means the Town of Essex; and,

(8) "works" means the sewage works described in the Owner's application, this Certificate and in the supporting documentation referred to herein, to the extent approved by this Certificate.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. The Owner shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the stormwater works do not constitute a safety or health hazard to the general public.

2. The Owner shall ensure that sediment and excessive decaying vegetation are removed from the above noted stormwater management system at such a frequency as to prevent the excessive buildup and potential overflow of sediment and/or decaying vegetation into the receiving watercourse.

3. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the works in accordance with the description given in this Certificate, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this Certificate.

4. Where there is a conflict between a provision of any submitted document referred to in this Certificate and

the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed because it is not in the public interest for the Director to approve facilities which, by reason of potential health and safety hazards do not generally comply with legal standards or approval requirements falling outside the purview of this Ministry.

2. Condition 2 is included as regular removal of sediment and excessive decaying vegetation from this approved stormwater management system are required to mitigate the impact of sediment and/or decaying vegetation on the downstream receiving watercourse. It is also required to ensure that adequate storage is maintained in the stormwater management facilities at all times as required by the design.

3. Conditions 3 and 4 are imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. These conditions are also included to emphasize the precedence of Conditions in the Certificate and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal

The Director
Section 53, *Ontario Water Resources Act*

2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 8th day of March, 2004

Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

AM/

c: District Manager, MOE Windsor
Timothy M. Glos, P.Eng., Glos Engineering Limited

Essex - Storm water stn.

GALOS Development

Ministry of the Environment / Ministère de l'Environnement

Ontario

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 7846-6VKQJN
Issue Date: December 8, 2006

1552906 Ontario Limited
2985 Dougall Avenue
Windsor, Ontario
N9E 1S1

Site Location: Galos Residential Development
Part of Block 36 and Blocks 37, 38 and 39
(also known as Part of Lot 283, Concession North Talbot Road)
Town of Essex, County of Essex

181 MAIDSTONE AVE EAST

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the establishment of stormwater management *Works* for the treatment and disposal of stormwater runoff from a catchment area of 11.7 hectares to provide Basic Level water quality protection and erosion control, and to attenuate post-development peak flows to pre-development levels, discharging to an existing 900 mm diameter storm sewer on Maidstone Avenue and ultimately to the Puce River, for all storm events up to and including the 100-year return storm, consisting of the following:

a stormwater management system located along the south central boundary of the site, adjacent to Maidstone Avenue, consisting of:

- a flow splitting manhole located at the intersection of Street 'A' and 'Street C' directing all storm events up to the 25 mm storm event (first flush) to a quality bay (sediment forebay) and all storm events above the 25 mm storm event (first flush) to a quantity bay;

- one (1) quality bay (sediment forebay) having a total active storage volume of 1,251 m^3 complete with one (1) inlet structure consisting of an 825 mm diameter inflow storm sewer and a rip-rap lined stilling basin surrounded by an energy dissipating containment berm; a sand filter consisting of loosely placed topsoil, a 500 mm deep layer of granular 'B' sand and a 300 mm deep layer of 50 mm clear stone drained by a 150 mm perforated drainage tile to an outlet structure; an emergency overflow weir located in a berm between the quality bay and the quantity bay; and one (1) outlet structure consisting of an 800 mm diameter perforated CSP surrounded by 75 mm diameter stone, housing a 200 mm diameter perforated riser equipped with a 75 mm diameter orifice plate allowing a maximum discharge of 9.7 L/s (25 mm storm event) via a 200 mm diameter outlet pipe to an effluent stormwater pumping station;

- one (1) quantity bay having a total active storage volume of 2,962 m^3 complete with one (1) inlet structure consisting of a 600 mm diameter inflow storm sewer and a stone mat; a mid-pond diversion berm directing flow from around the perimeter towards an outlet structure; and one (1) outlet structure consisting of a ditch

inlet catch basin discharging via a 400 mm diameter outlet pipe to an effluent stormwater pumping station;

- one (1) effluent stormwater pumping station controlling post-development peak flows to pre-development levels, consisting of a 3 m diameter precast concrete manhole equipped with one (1) submersible pump capable of handling 47.3 L/s against a total dynamic head of 5.5 m; complete with a 200 mm diameter inlet storm sewer and a 400 mm diameter inlet storm sewer; milltronics transducer level control with backup alarm float control and a high water level alarm connected to a Pro-Talk Auto-dialer; and all other appurtenances necessary to have a complete and operable pumping station; allowing a maximum discharge of 134 L/s (100-year storm event) via a 375 mm diameter overflow pipe and a 250 mm diameter forcemain to a manhole located on Maidstone Avenue and via a 375 mm diameter storm sewer to an existing 900 mm diameter storm sewer on Maidstone Avenue and ultimately to the Puce River;

- including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works*,

all in accordance with the application dated February 15, 2006 and received February 22, 2006, including final plans and specifications prepared by Dillon Consulting Limited.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Certificate* " means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

2. "*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

3. "*District Manager* " means the District Manager of the Sarnia District Office of the *Ministry* ;

4. "*Ministry* " means the Ontario Ministry of the Environment;

5. "*Owner* " means 1552906 Ontario Limited and includes its successors and assignees;

6 "*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* .

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below.

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

1.1 Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate* , the application for approval of the *Works* and the submitted supporting documents and plans and specifications as listed in this *Certificate* .

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 8th day of December, 2006

THIS CERTIFICATE ... ISSUED
ON Dec. 12, 2006
DC
(Seal)

Sarah Paul

Sarah Paul, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

KC/

c: District Manager, MOE Sarnia District Office
Area Supervisor, MOE Windsor Area Office
Robert Molliconi, P.Eng., Dillon Consulting Limited
Richard Beausoliel, Director of Public Works, Town of Essex ✓

1.2 Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate* , the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

1.3 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate* .

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director* , in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner* ;

(b) change of address of the *Owner* ;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager* ; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager* .

4. OPERATION AND MAINTENANCE

4.1 The *Owner* shall ensure that the design storage volumes are maintained at all times.

4.2 The *Owner* shall inspect the *Works* at least once a year and, if necessary, clean and maintain the *Works* to prevent the excessive buildup of sediments and/or vegetation.

4.3 The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site for inspection by the *Ministry* . The logbook shall include the following:

(a) the name of the *Works* ; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. **RECORD KEEPING**

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate* .

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the *Works* are made aware of the *Certificate* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected.

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works* .

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

Appendix C MODEL INPUT DEVELOPMENT

C.1 INFRASTRUCTURE WITH NO RECORD DRAWINGS – ASSUMPTIONS FOR MODEL INPUT DEVELOPMENT

Clay tiles and some sewers did not have record drawings. **Table C.1** shows the assumed parameters for model input development.

Table C.1: Assumed hydraulic parameters for model input development for clay drainage tile & sewers with missing record drawings

Parameter	Value
Clay tiles	
Diameter	As specified on as-built drawings showing existing clay tiles or on Town's Interactive Map
Slope (FAQ about Field Tile Drainage, 2015)	0.1% (1.2" per 100 ft)
Reference invert elev. for calculating tile invert elevations	One of the following in order of precedence: • Known invert at known MH/CB location OR • Known invert at trunk pipe connection OR • 2' min. depth of cover
Direction of flow	Split evenly to receiving trunk sewers
Sewers missing record drawings	
Diameter	One of the following in order of precedence: • As specified on u/g utility (other than stm sewer) record drawings OR • As specified on Interactive Map
Slope	Minimum pipe slope specified in MOE Design Guidelines for Sewage Works, 2008

C.2 SWMM STANDARD DATA FLAGS

Table C.2A shows the SWMM standard data flags used in model input development in order to provide consistent input of SWMM objects.

Table C.2.A: SWMM standard data flags

SWMM Object	Description	Tag
Subcatchments	Subcatchment name	Land use
Conduits	• Record dwg. - Subcatchment No. OR • No Record dwg – standard data flag acronym in **Table C.2B**	Pipe material
Junctions	Construction record drawing no.	Optional Junction description (eg. connection, deflected_pipe, buried_MH)
Orifices, Weirs, Outfalls, Storages & Pumps	Description	--

Figure C.2.A: Screen shot of attributes for SWMM conduit object. The conduit "Description" and "tag" attribute are highlighted in orange.

Table C.2B shows the standard data flags inputted into the "Description" tab in conduits with missing construction record drawings

Table C.2.B: SWMM standard data flags for conduits with missing record drawings

Data Flag (input into 'Description')	Description of Data Flag
No As-builts. Code: AIE	Assumed both inlet and outlet invert elevation because as-built drawings do not exist
No As-builts. Code: AIEO	Assumed invert elevation at conduit outlet because as-built drawings do not exist
No As-builts. Code: AIEI	Assumed invert elevation at conduit inlet because as-built drawings do not exist
No As-builts. Code: AE	Assumed both RIM and invert elevations because as-built drawings do not exist, or as-built drawings do not give geodetic elevations
No As-builts. Code: AEP	Assumed both RIM and invert elevations, and pipe diameter because as-built drawings do not exist
No As-builts. Code: AIEP	Assumed both invert elevations and pipe diameter because as-built drawings do not show these parameters. RIM's are only shown on the as-built drawings.
No As-builts. Code: AEC	Assumed both RIM and invert elevations, and cross-section because as-built drawings do not exist (for open channels).
Field Measured	Took field measurements to obtain pipe sizes and rough invert elevations
As-builts. Code: IEM	As-built drawings exist. But invert elevations do not match (IEM - invert elevations do not match) when connecting sewers from one contract to sewers in another separate contract., or because bottom of channel elev increased

Appendix D REFERENCE DOCUMENTS

D.1 FLOODLINE MAPPING

Puce Subwatershed – Map No. ER3-32

Canard River Subwatershed – Map No. ER5-38

ER5-38

USERS NOTES

ESSEX REGION
CONSERVATION AUTHORITY

CANARD RIVER AND BIG CREEK

FLOODLINE MAPPING STUDY

ONTARIO REGULATION NO. _____

SCHEDULE NO. 5

3+680 CROSS-SECTION
● 176.9 1:100 YEAR FLOOD LEVELS
(177.0) REGIONAL STORM FLOOD LEVELS
——— 1:100 YEAR FLOODLINE
—·— REGIONAL STORM FLOODLINE
- - - - - - - FILL LINE

NOTES:

THIS MAP IS PREPARED FOR USE IN CONJUNCTION WITH THE FLOODLINE MAPPING REPORT DATED **DECEMBER 1982** PREPARED BY PROCTOR & REDFERN LTD. FOR THE ESSEX REGION CONSERVATION AUTHORITY AND FORMS PART THEREOF.

REGISTERED PROFESSIONAL ENGINEER R. W. STEMP PROVINCE OF ONTARIO

REGISTERED PROFESSIONAL ENGINEER S. A. VOKES PROVINCE OF ONTARIO

Proctor & Redfern Limited
Consulting Engineers and Planners
Toronto

MAP NO. ER5-38

Airphoto mapping prepared by Kenting Earth Sciences Ltd. from March 1981 photography
Ref. No. 81021

345000mE 347500mE 4667500mN 4665000mN

CRAIGS CREEK

ESSEX OUTLET DRAIN

MOLE SIDE ROAD

ESSEX COUNTY ROAD 12
GESTO ROAD

FLOODLINE STUDY LIMIT

100yr floodline = approx. 188m

100yr floodline = 189.2m

34 + 030
35 + 000
35+600
36 + 930
36+160

FLOW

187.96 (188.94)
188.63 (189.38)
188.94 (189.56)
188.94 (189.82)
189.22 (189.9)
189.28 (189.97)

Sheet
02 17 3450 46650

Scale 1:5000

250 0 250 500 Metres
250 0 250 500 750 1000 1250 1500 1750 2000 2250 2500 Feet

NOTES

North American Datum 1927.
Universal Transverse Mercator (6°) projection.
Zone 17. Central meridian 81°W.
Grid interval 250 metres.

ADJOINING SHEETS

	05 17 3450 46675	
05 17 3425 46650	05 17 3450 46650	05 17 3475 46650
	05 17 3450 46625	

Scale 1:5000

250 0 250 500 Metres

0 500 1000 1500 2000 2500 Feet

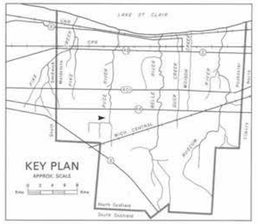
ESSEX REGION CONSERVATION AUTHORITY FILL & FLOOD LINE MAPPING

32

PUCE RIVER

REGULATION MADE UNDER
THE CONSERVATION AUTHORITIES ACT
FILL, CONSTRUCTION AND ALTERATION
TO WATERWAYS

ONTARIO REGULATION NO._____
SCHEDULE NO._____



NO.	REVISIONS	DATE	BY

FLOOD LINE BASED ON 100 YEAR STORM
FLOOD LINE BASED ON REGIONAL STORM
FILL LINE
(●) FLOOD LEVELS FOR REGIONAL STORM
● FLOOD LEVELS FOR 100 YEAR STORM
582.5 SURVEYED VERTICAL CONTROL POINT.
CANADIAN GEODETIC DATUM

THIS MAP IS PREPARED FOR USE IN CONJUNCTION WITH THE FLOOD PLAIN MAPPING REPORT DATED JAN. 1981 PREPARED BY ESSEX REGION CONSERVATION AUTHORITY AND FORMS PART THEREOF.

PHOTO MAPPING COMPILED AND DRAWN BY
KENTING EARTH SCIENCES LIMITED.
FROM AERIAL PHOTOGRAPHS
TAKEN MAY 1979.

REGISTERED PROFESSIONAL ENGINEER
S. R. TAYLOR
PROVINCE OF ONTARIO

ESSEX REGION
CONSERVATION AUTHORITY

KENTING EARTH SCIENCES LIMITED
OTTAWA, TORONTO, CALGARY

MAP NO. ER3-32

D.2 SWM REPORTS

Essex Crossing SWM Report

Galos SWM Report

Canaan Pond Drainage Report 2001

Canaan Pond Drainage Report

Stormwater Management Study

Final Report

Essex Crossing Project – Phase 1
Town of Essex, Ontario

August 22, 2003

Prepared for:

Town of Essex, Ontario
Essex Region Conservation Authority
Ministry of Transportation (MTO)

Prepared by:

Glos Engineering Ltd.
Project No. 02072

RECEIVED

AUG 2 6 A.M.

TOWN OF ESSEX

Per

Copyright © Glos Engineering Ltd

1.0 INTRODUCTION

Glos Engineering Ltd. was engaged by Essex 143 Joint Venture Ltd. to undertake the civil engineering study of Phase 1 of the proposed Essex Crossing development. This study includes the preparation of drawings and specifications to permit competitive tendering. As part of the defined scope of work, stormwater management studies of the commercial (64.9 acres) and residential (82.7 acres) development sites are to be carried out. The proposed sites are located on the southeast corner of Highway No 3 By-Pass and Maidstone Avenue West, Town of Essex. This site is a Part of Lots 284, 285 and 286 of the concession South of Talbot Road, Essex County, Ontario.

A new development will increase the runoff volume that occurs from each storm event, overloading the natural drainage systems that had adapted themselves to the pre-existing conditions. The stream attempts to enlarge its cross section to reach a new equilibrium with the increased runoff volumes and discharge rates. The erosive force of the increased channel flows can significantly upset the sediment-load equilibrium that has established itself over time, and may result in the stream meandering or forming new channels. Therefore, stormwater system design needs to consider to control volume, discharge rate and erosive force.

The purpose of this final report is to address the storm water management techniques to be implemented to reduce the impact of storm water runoff from the 64.9-acre commercial development site (identified by Phases 1 and 2 in the Figure 1: Site Plan) of the proposed Essex Crossing Development.

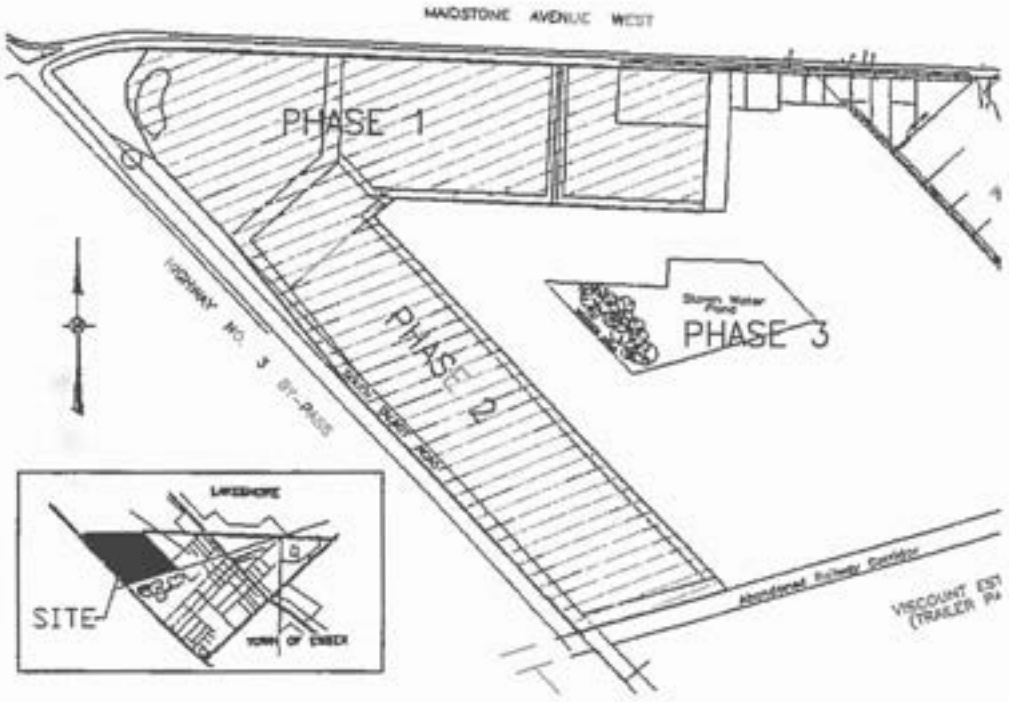


Figure 1: Site Plan

This report will discuss the master drainage system for the commercial development of Essex Crossing Development Project. This system will include conveyance controls (sewer and ditch) and end-of-pipe facilities (dry detention, pumping system, erosion control) that will be used. However stormwater conveyance controls in each commercial lot as well as end-of-pipe facilities within the development will be the responsibility of the individual owner and therefore are not included in this report. This condition will be formalized in the Development Agreement between the owner and the Town of Essex.

A preliminary report was issued for approval on March 14, 2003 identifying and showing the preferred solution/design to reduce the impact of the post-development runoff on the receiving drain. The Ministry of Transportation of Ontario (MTO) sent back to Glos some comments (refer to Appendix A); one meeting was held on July 11, 2003 with representatives of MTO, Essex Region Conservation Authority (ERCA), of the Town of Essex, of the owner and of Glos Engineering Ltd. to address some issues (refer to Appendix B); these comments are addressed in this final report

A listing of background documents is in Appendix C. Softcopies of detailed drawings in Acrobat Reader file format (*.pdf) are included in a CD in Appendix D and hardcopies are in the accompanying set of drawings.

2.0 DESCRIPTION OF THE EXISTING DRAINAGE AREA

2.1 Existing Drainage

The existing drainage area consists of a relatively flat parcel of un-developed farmland. The highest elevation, 636.62 feet, is located at the northeast corner of the site and the lowest, 634.35 feet, near the northwest corner of the site.

Two watercourses drain the future site for the commercial development of this project. The first watercourse draws off 74.98-acre land, follows the natural slope of the land, downstream from north to south with an average slope of 0.06% (Figure 2), and discharges run-off into a concrete culvert (Culvert 'A') located 650 feet southeast of the intersection of Highway No 3 and Maidstone Avenue West. This watercourse consists of sub-catchments 200 to 204. The second watercourse (sub-catchment 300) drains 16.20-acre land and directs run-off to a second culvert (Culvert 'B') located northwest of the abandoned railways.

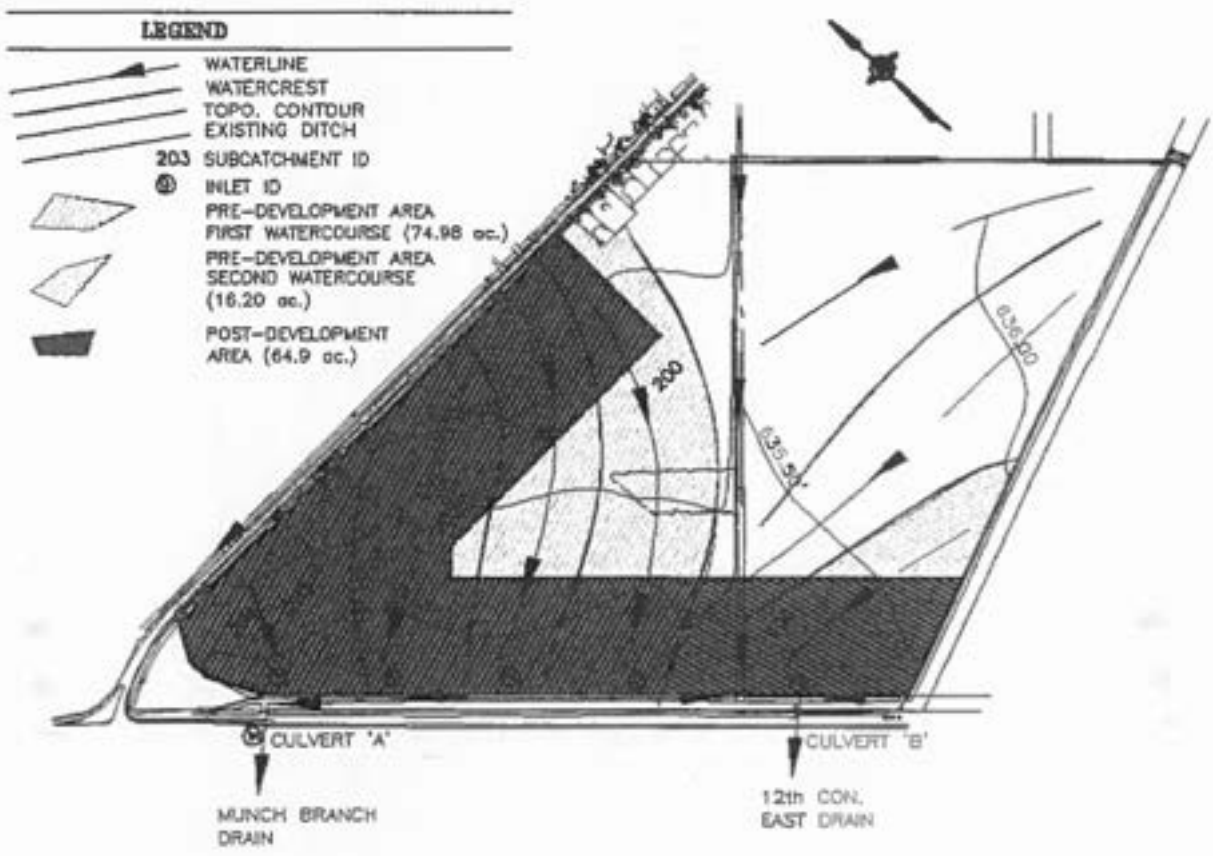


Figure 2: Existing Drainage Area

Culvert 'A' is located at Station 13+200 (metres) on MTO Drawing/Plate No 108-3/15-0 and consists of a concrete box of 5 feet x 5 feet. Its invert elevation is 629.53 feet. This invert elevation is the design invert elevation taken from the MTO Drawings/Plate mentioned above. However the actual current invert elevation is almost one [1] foot higher. The Town of Essex plans to clean the two municipal drains before the fall of this year. Culvert 'A' conveys runoff from the pre-development site to Munch Branch Drain. As agricultural drain Munch Branch Drain was designed to carry the one-in-five (1:5)-year storm event (pre-development) runoff and the culvert was designed to direct the one-in-fifty (1:50)-year storm event runoff. Munch Drain has no-permanent water-flow.

Culvert 'B' is located at the Station 13+900 (metres) on MTO Drawing/Plate No 108-3/17-0. Its invert elevation is 628.46 feet. This culvert 'B' directs run-off from its tributary watershed to the 14th Con. East Drain. 14th Con. East Drain receives the Munch Drain a few miles downstream.

The watersheds drained by the two municipal drains are both tributaries of River Canard. The elevation of one-in-one hundred (1:100)-year flood line of River Canard is 623.36 feet while the average elevation in the commercial development site is 635.50 feet

2.2 Weather/Precipitation

The winters in the project area are usually mild while the summers are hot and often humid. The lowest average monthly minimum temperature is about -7°C and the highest average monthly temperature is 28°C.

The average annual precipitation is 29 in., (13-43 in.), which includes 37 in. of snow (12-57 in.). The Rainfall Intensity-Duration-Frequency (IDF) data (refer to Appendix E) used in this report is from the Atmospheric Environment Service (AES) and represents the conditions at the Windsor Airport, Canada. Storm (synthetic) hyetographs (refer to Figure 3 and Figure 4) were generated using the IDF data to represent a 6-hour rainfall in the Town of Essex.

2.3 Geotechnical Study

Agra Earth and Environmental Ltd carried out a preliminary geotechnical study of the site to explore the subsurface conditions in order to prepare a geotechnical evaluation of the site, along with general guidelines for the geotechnical aspects of design. A report was issued April 19, 2000. It is noted a surficial deposit (from 6- to 13-inch thick) of black organic silty clay topsoil. Underlying the surface layer is a major deposit of silty clay with embedded sand and gravel. The groundwater elevation at the site is estimated to be at 625.00 feet (as encountered in the boreholes).

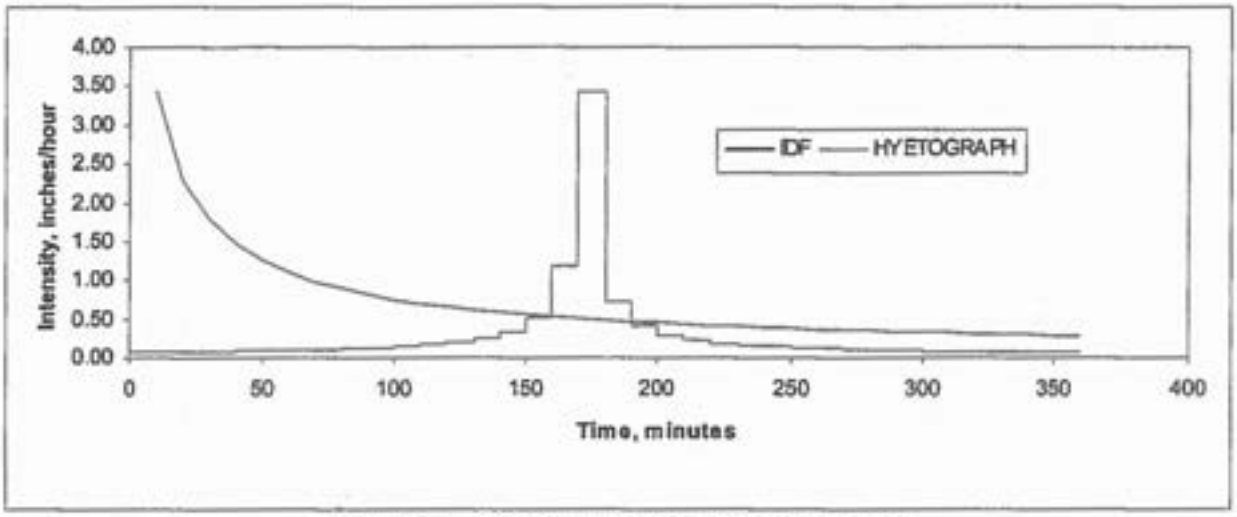


Figure 3a – IDF & Hyetograph: 1:2-year event

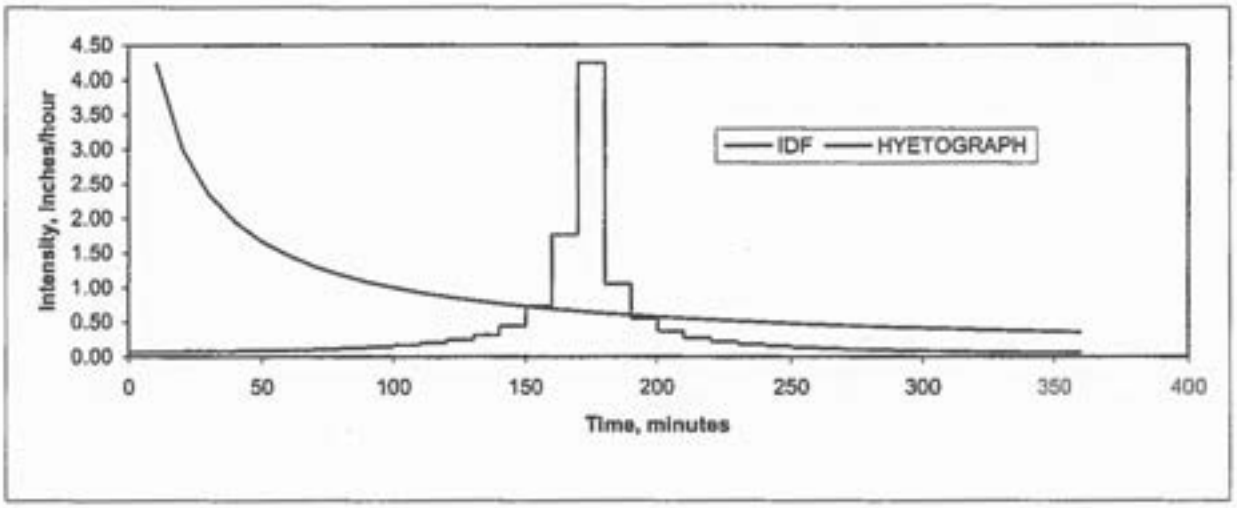


Figure 3b – IDF & Hyetograph: 1:5-year event

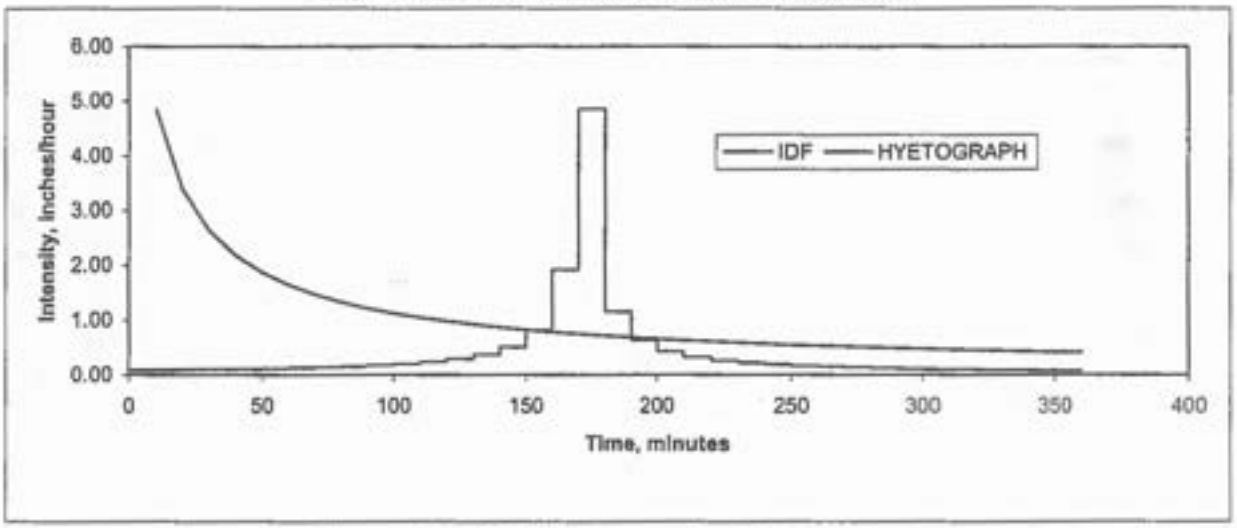


Figure 3c – IDF & Hyetograph: 1:10-year event

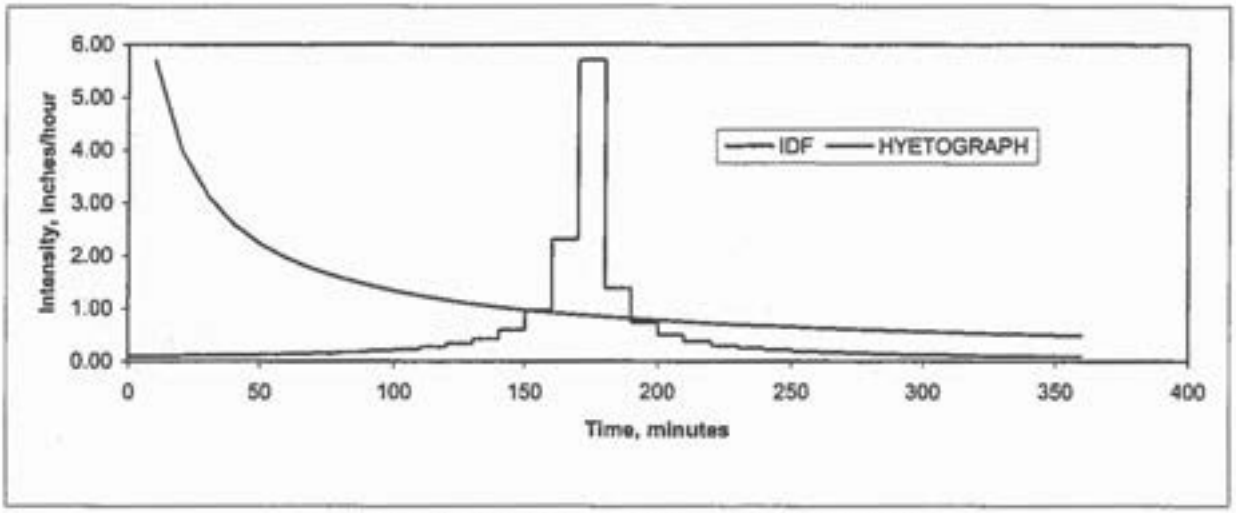


Figure 4a – IDF & Hyetograph: 1:25-year event

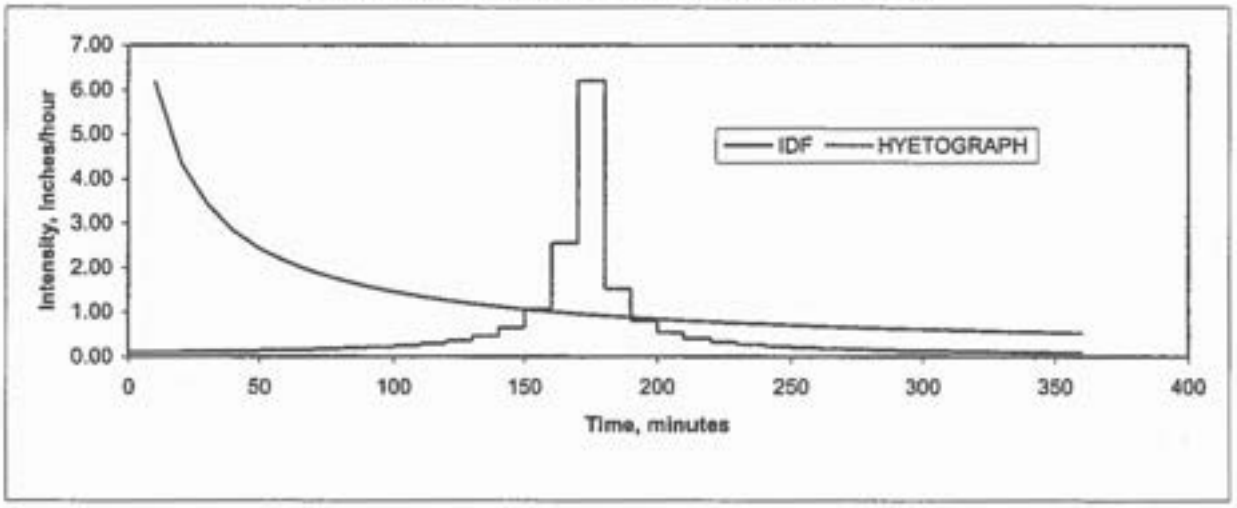


Figure 4b – IDF & Hyetograph: 1:50-year event

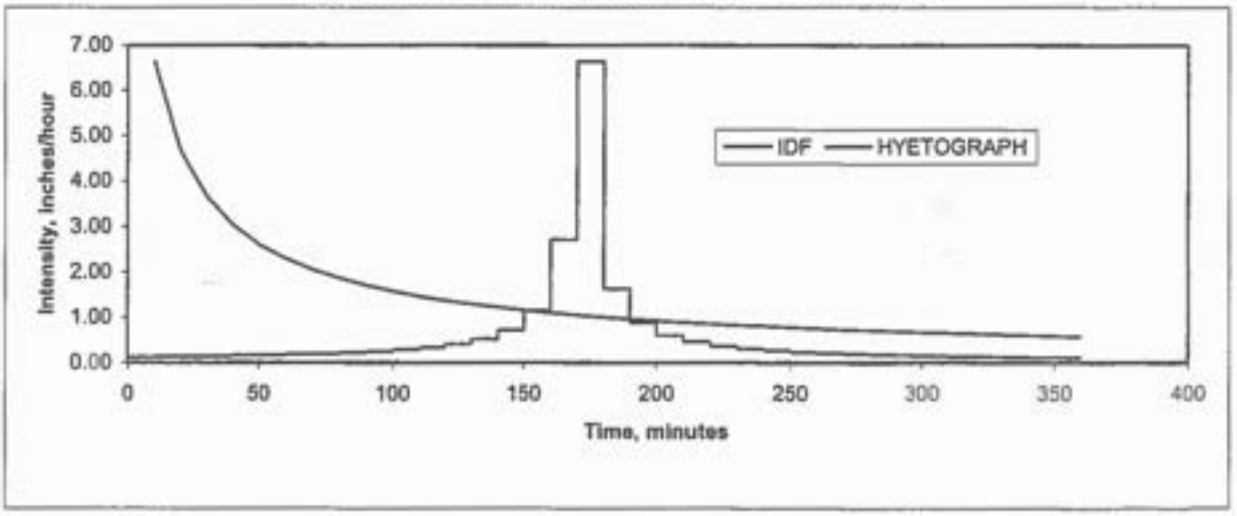


Figure 4c – IDF & Hyetograph: 1:100-year event

3.0 SUMMARY OF THE PROPOSED CONDITIONS

3.1 Receiver

The commercial development stormwater management study, this report, is being treated separately from the residential stormwater management study, due to the fact that:

a. By coincidence, the receiver of the pre-development runoff from the area subjected to commercial development site is Munch Branch Drain while the receiver of the pre-development runoff from the area subjected to residential development site is 14Th Con. East Drain by Culvert 'B'. To respect these pre-development conditions the future receiver of the post-development runoff from the commercial development site, subjected to this study, would be Munch Branch Drain.

b. The runoff quality from any commercial development site is not similar to the runoff quality from a residential development site; there are relatively more pollutants (particles, oil/grease, etc.) within the runoff from the commercial development site. Therefore the commercial development site has been designed with its own end-of-pipe system to facilitate any appropriate treatment facility.

c. Finally, the construction of the site services for the commercial development is planned for this year, 2003, while the residential phase is not schedule for at least 2 to 5 years.

As stated above, the Munch Branch Drain will be the receiver of runoff from the commercial development site; there is not any another alternative receiver.

The commercial development stormwater management system will be composed of conveyance controls and end-of-pipe facilities.

3.2 Conveyance Controls

The proposed conveyance control system will be comprised of catch basins, grassed ditch, and storm sewer system (refer to Figure 5). The proposed grassed ditch will be installed along South Talbot Road, draining southeast to northwest, to collect run-off from the south side of the commercial development site. The proposed storm sewer will be installed along Maidstone Avenue West to collect run-off from this roadway and the north side of the commercial development site. Additionally new catch basins will be installed along roadways to collect and direct the runoff to the proposed ditch and sewer system. The two conveyance controls (ditch and sewer) will convey the collected runoff to a proposed dry detention pond to be located near the northwest corner of the site. These conveyance controls will be designed and oversized to convey the runoff of a 1:100-year event runoff; therefore they will provide also a supplementary water storage augmenting the volume of the detention pond.

Lot level and conveyance controls for each commercial lot will be the responsibility of the lot owner. They will include rooftop storage, parking lot storage (i.e. up to five [5] inches) and a pretreatment system (i.e. sedimentation and oil/grease separation units) as specified in the 'Development Standards Manual' of the Town of Essex. The function of these controls is to retard the peak runoff flow time at the pond by increasing the time of concentration of the runoff

in each lot. It will not affect or decrease the quantity or the total runoff from the system. It will also decrease the peak runoff from each lot. These controls will be made the responsibility of the land owners/developers as part of their development agreement.

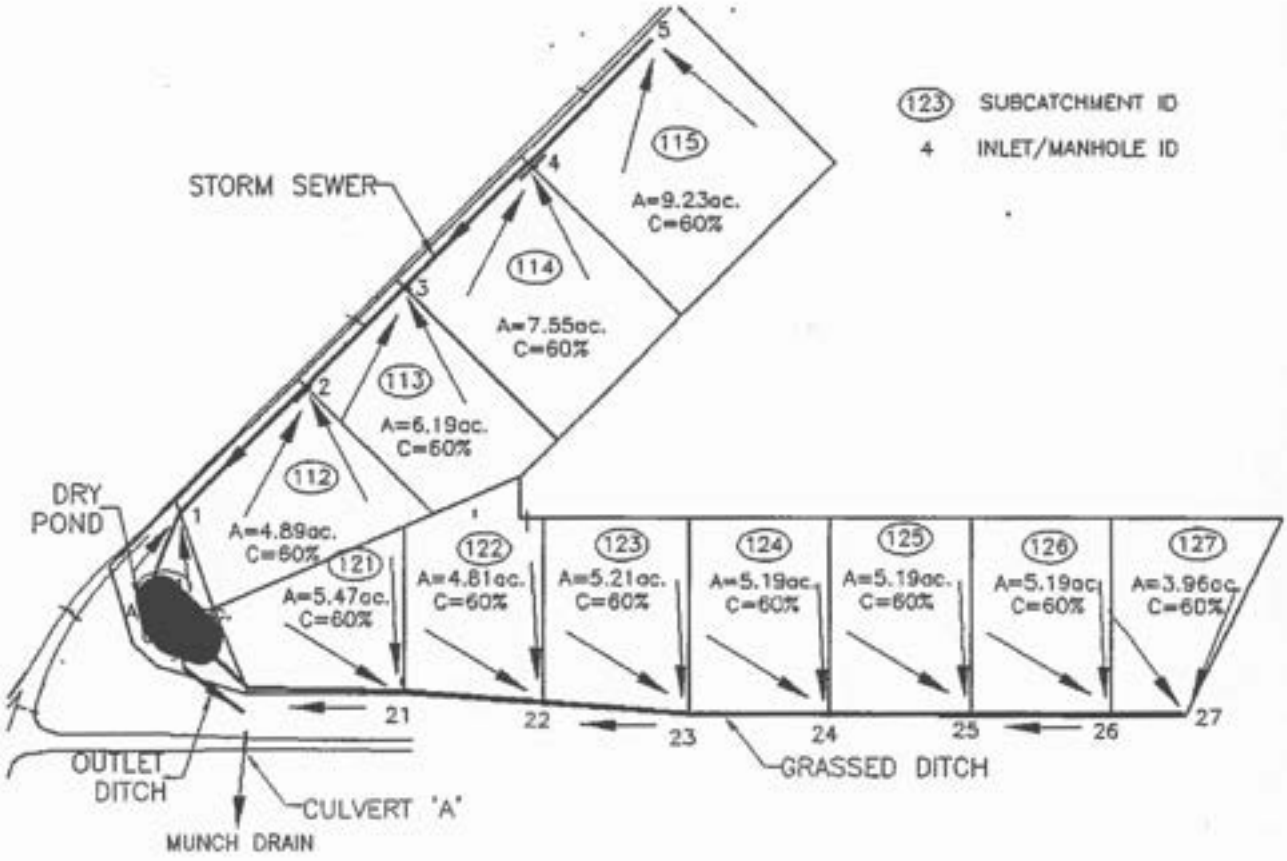


Figure 5: Conveyance Control System

3.3 End-of-pipe Facilities

The end-of-pipe facilities (refer to Figure 6) will be comprised of ditch and storm splitter outlets, dry detention pond (forebay and downstream pond), pumping system, outlet ditch and spillway. The facilities will receive runoff from conveyance controls (ditches, sewers), will treat it (quantity and quality) and will discharge the treated water to the receiver. The objective is to limit the levels of the quantity and quality of the runoff to be discharge into the receiver to the pre-development levels.

The outlet quantities will be controlled by an outlet device to less than or equal to the pre-development quantity for the same area for the 2, 10, 25, 50 and 50-year events. In addition the outlet quantities will be less than the designed capacity of the receiver (Munch Drain). A dry pond system will store the excess over the limits required.

The invert of Culvert 'A' is 629.53 feet and the invert of the 36" storm sewer would be lower than 628.00 feet (635.50' the proposed average elevation of property line, 3.5-foot cover and storm sewer 36-inch diameter, sewer slope, etc.) Therefore it is not possible to use an outlet device

working by gravity to convey the runoff from the storm sewer to Culvert 'A'. A mechanical device such as a pumping system to lift the runoff to the receiver will be used as the outlet device.

The pumping system and a grassed ditch outlet will control the rate of the stormwater to less than or equal to the pre-development rate. A spillway from the pond to the grassed outlet ditch will be added to prevent any backflow of the stormwater to the development in case of failure of the pumping system.

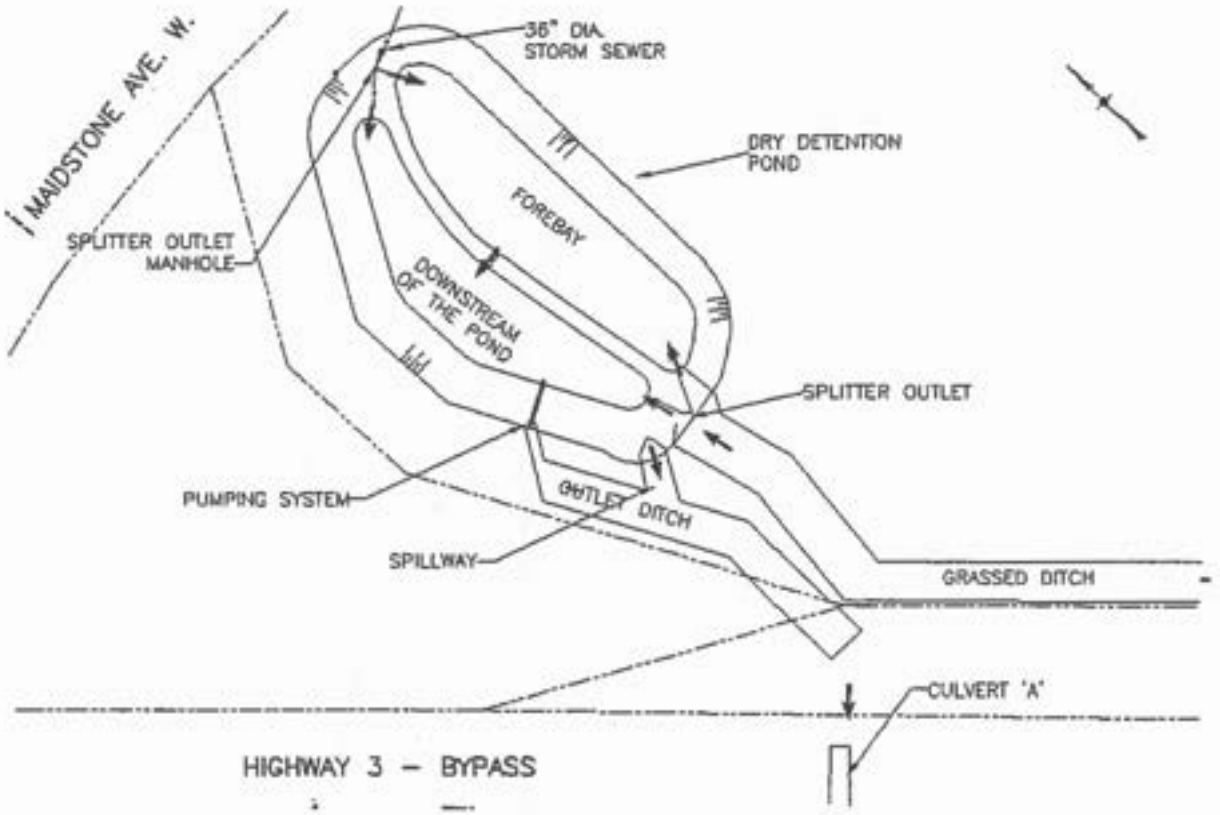


Figure 6: End-of-Pipe Facilities

The 0.5" (13 mm) first flush rain, equivalent to 1:2 year rainfall, will wash the roads and parking areas bringing pollutants to the stormwater system. It will be necessary to limit the quantity of these pollutants to the receiver. The recommended controls installed by the lot owner, as previously stated, will retain a maximum of pollutants from each lot. The grassed ditch along South Talbot Road will also reduce the pollutant level. A forebay will be designed to retain up to 24 hours of the first flush of rain where the balanced of the pollutants, suspended solids, will settle out to the bottom. To prevent any re-suspension of solids from the bottom, a flow splitter structure will be installed at each pond inlet to direct the excess runoff to the downstream of the pond. A 4-inch diameter reversed-slope pipe will control the outflow to the downstream pond thereby retaining the water in the forebay for 24 hours.

3.4 Rush Drain Diversion

Since the Rush Drain will cross the commercial development site, South Talbot Road extension and the grassed ditch, it will be necessary to reroute the Rush Drain by means of storm sewers, ditch and culvert (refer to Figure 7 and Drawing SS33). These temporary conveyance controls will be designed to accommodate the 1:100-year storm event runoff (47 cfs) from its tributary area. The stormwater management study of this upstream tributary watershed with the future residential development runoff will be dealt with separately.

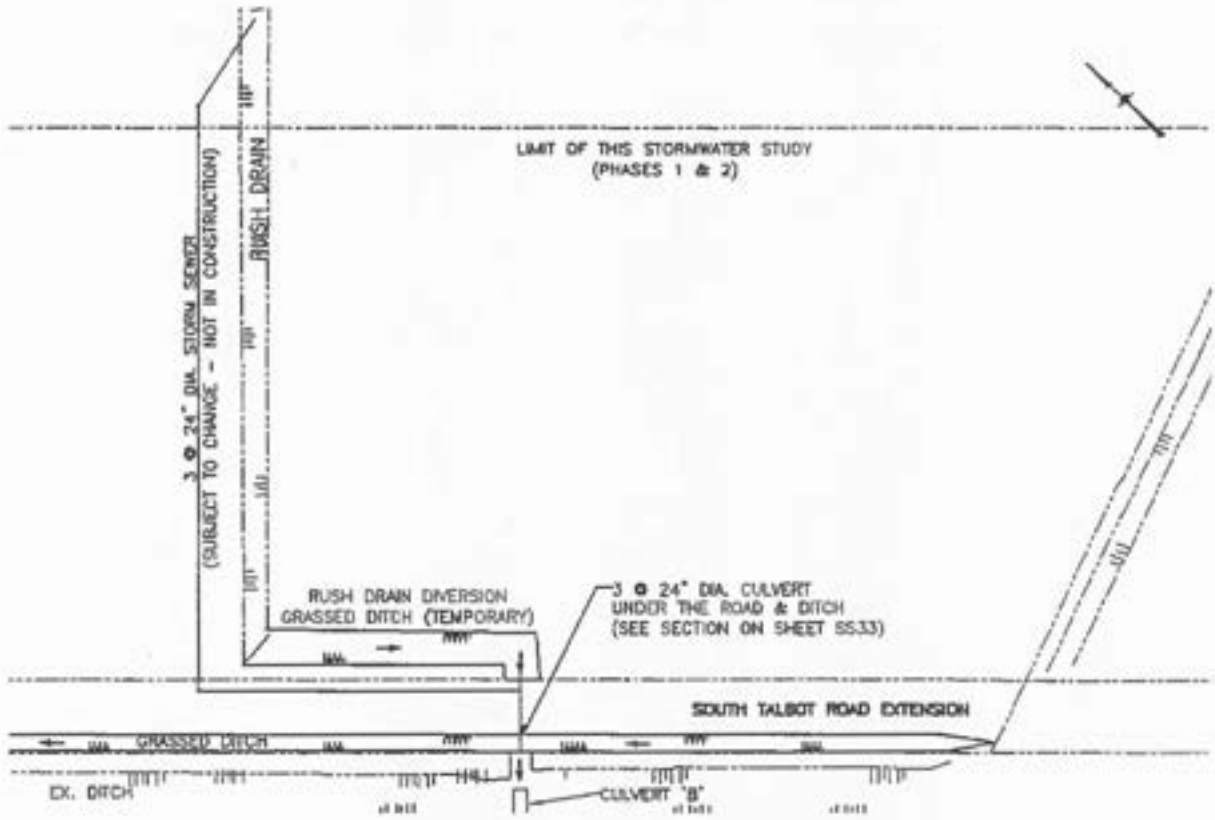


Figure 7: Rush Drain Diversion

A temporary grassed ditch will reroute the lower portion of the Rush Drain that will be filled up by the extension of South Talbot Road; it will still be a temporary facility until the construction of the permanent stormwater system outlet of the upstream development, the residential program. A culvert will redirect the stormwater from the Rush Drain below the proposed grassed ditch of this stormwater system to the existing Culvert 'B'. If the stormwater management system of the future residential development is not started before the grading work of the south side of the commercial development, a temporary storm sewer system will redirect the upstream runoff to the culvert.

3.5 Erosion control

A proposed light sediment barrier system will be installed along property lines beside roadways to control and limit transport of sediments from graded surfaces to the proposed stormwater system.

4.0 ANALYSIS AND CONCLUSION

4.1 Scenarios

The following three scenarios were considered for the 1:2-year, 1:5-year, 1:10-year, 1:25-year, 1:50-year and 1:100-year storm events:

1. Uncontrolled discharge (no collection system and no pond system).

2. Collection of the run-off using a storm sewer & ditch system and its discharge to a retention pond.

3. Collection of the run-off using a storm ditch system and its discharge to a retention pond

The third scenario would be the most economical for the project, however is not feasible because a part of the ditch system would lie in Maidstone Avenue West right-of-way. This road is not in the Town of Essex jurisdiction. The second scenario is the recommended solution.

4.2 Methodology

PCSWMM 2002, an application software model designed by CHI (Computational Hydraulics Inc.) and based upon EPA Storm Water Management Model (SWMM v.4), is used in this investigation to evaluate the pre-development and the post-development run-off flows. SWMM v.4 is a continuous event hydrographic computer model used for storm water management studies. It is the most widely applied stormwater and wastewater model in North America, with universal acceptance in the North American regulatory community including the Ministry of Transportation of Ontario (MTO).

The RUNOFF module of PCSWMM was used to evaluate the quantity of runoff from sub-catchments. The EXTRAN module was used to evaluate the flow conditions within the proposed storm water system (ditches, sewers, pond, pumps) before discharge into the receiver. The EXTRAN module has the ability to perform dynamic routing of stormwater flows through the storm drainage system from the drainage areas to the receiving water system (including channels, pond, pump, outlet, etc.) The program simulates branched or looped networks, backwater due to tidal or nontidal conditions, free-surface flow, pressure flow or surcharge, flow reversals, flow transfer by weirs, orifices and pumping facilities, and storage at on- or off-line facilities.

4.3 Simulations

13 simulations with Runoff and Extran modules were carried out as follows:

- 6 simulations (one per storm event) to predict the pre-development conditions
- 6 simulations (one per storm event) to predict the post-development condition with the pond system and the pumping system
- 1 simulation to predict the 1:100-year storm event post-development condition with a power failure: the spillway system will replace the inoperative pumping system.

The Input and Output files (in Adobe Acrobat PDF format) from the Runoff and Extran simulation modules are included on the CD in Appendix D.

4.4 Results

Table 1 summarizes the stormwater data used as input in the simulation of the project. Table 2, Figure 8 and Figure 9 show the results of the simulation. Table 3 compares the peak flow-rates for each storm event. In general the flowrate of the outlet of the system for each year event is less than the minimum of the year event predevelopment runoff and the 1:5-year predevelopment runoff (8.21 cfs) which is the design capacity of the Munch Drain.

Table 1: Input Data into Runoff Module

Subcatchment Name	Area, acres	Width, ft	Slope, ft/ft	Area Storage, in.		Maning Coeff.	
				Pervious	Impervious	Pervious	Impervious
PRE-DEVELOPMENT							
200	21.74	470	0.0006	0.5	0.5	0.12	0.01
201	24.2	468.48	0.0006	0.5	0.5	0.12	0.01
202	15.9	506.97	0.0006	0.5	0.5	0.12	0.01
203	9.14	362.24	0.0006	0.5	0.5	0.12	0.01
204	4	283.72	0.0006	0.5	0.5	0.12	0.01
POST-DEVELOPMENT							
116	5.06	335	0.0045	2	5	0.08	0.014
115	4.23	276	0.0045	2	5	0.08	0.014
114	7.55	498	0.0045	2	5	0.08	0.014
113	6.19	420	0.0045	2	5	0.08	0.014
112	4.89	490	0.0045	2	5	0.08	0.014
111	1.99	192	0.0045	2	5	0.08	0.014
127	3.96	400	0.0045	2	5	0.08	0.014
126	5.19	400	0.0045	2	5	0.08	0.014
125	5.19	400	0.0045	2	5	0.08	0.014
124	5.19	400	0.0045	2	5	0.08	0.014
123	5.21	413	0.0045	2	5	0.08	0.014
122	4.81	395	0.0045	2	5	0.08	0.014
121	5.47	450	0.0045	2	5	0.08	0.014

Table 2: Time of Concentration (Tc); Post-Development Conditions

Tc: Time of Concentration, min; To: Time of Occurrence, (Hrs:Min); Peak Intensity starts at 2:50

	Year Event											
	1:2-year		1:5-year		1:10-year		1:25-year		1:50-year		1:100-year	
Junction	To	Tc	To	Tc	To	Tc	To	Tc	To	Tc	To	Tc
5	3:01	11	2:54	4	2:56	6	3:00	10	3:00	10	2:59	10
4	3:02	12	3:01	11	3:01	11	3:01	11	3:01	11	2:59	11
3	3:02	12	3:01	11	3:01	11	3:01	11	3:01	11	2:59	11
2	3:02	12	3:01	11	3:01	11	3:01	11	3:01	11	2:59	11
1	3:03	13	3:02	12	3:02	12	3:02	12	3:02	12	3:00	12
27	3:00	10	3:00	10	3:00	10	3:00	10	3:00	10	3:00	10
26	3:03	13	3:02	12	3:02	12	3:02	12	3:02	12	3:03	12
25	3:07	17	3:06	16	3:05	15	3:05	15	3:06	16	3:08	15
24	3:12	22	3:10	20	3:09	19	3:11	21	3:13	23	3:13	21
23	3:17	27	3:14	24	3:13	23	3:16	26	3:17	27	3:17	26
22	3:27	37	3:18	28	3:17	27	3:19	29	3:44	54	3:19	29
21	3:31	41	3:27	37	3:25	35	4:00	70	3:48	58	4:00	70
20	3:05	15	3:04	14	3:04	14	3:19	29	3:14	24	3:19	29

Table 3: Flowrates (cfs)

	1:2	*1:5*	*1:10*	*1:25*	*1:50*	*1:100*
Pre-Dev.	5.48	**8.2**	10.23	12.96	14.85	17.02
Post-Dev.	13.28	18.02	21.11	25.98	35.21	46.67
OutFall	3.56	4.07	4.75	5.86	6.39	6.81

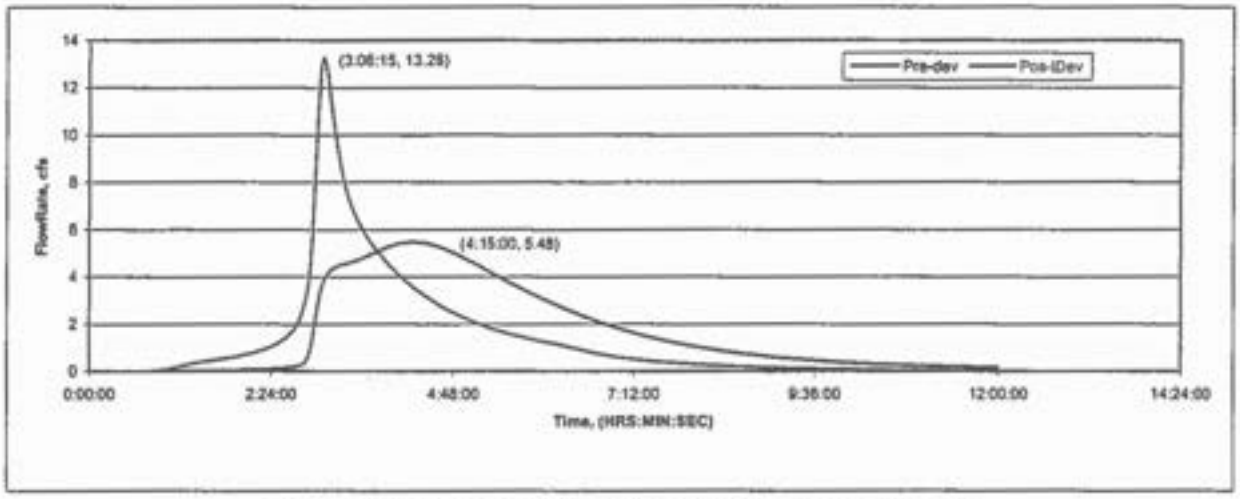


Figure 8a: Hydrographs for the 1:2-year Storm Event

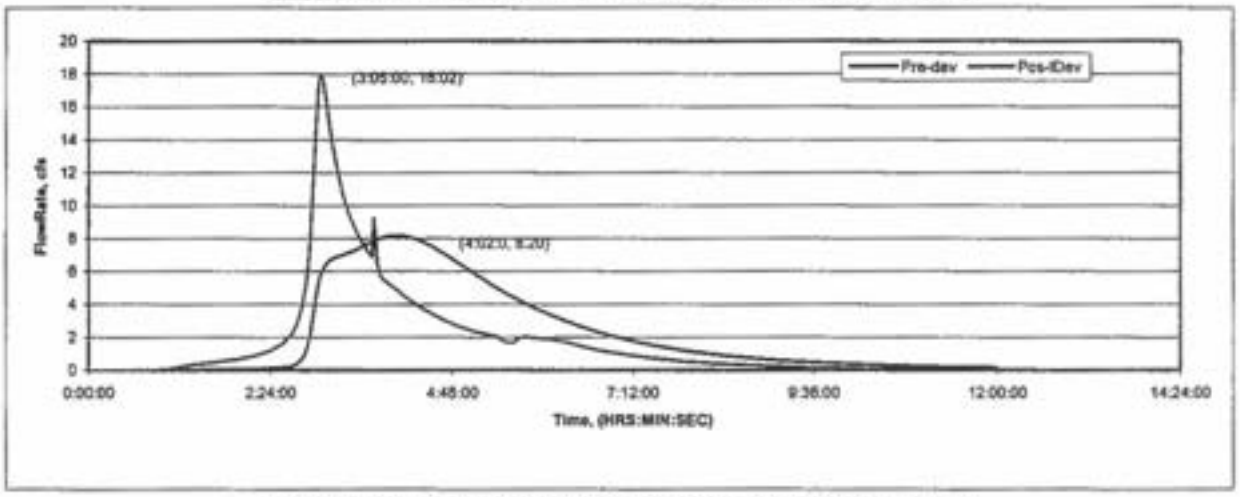


Figure 8b: Hydrographs for the 1:5-year Storm Event

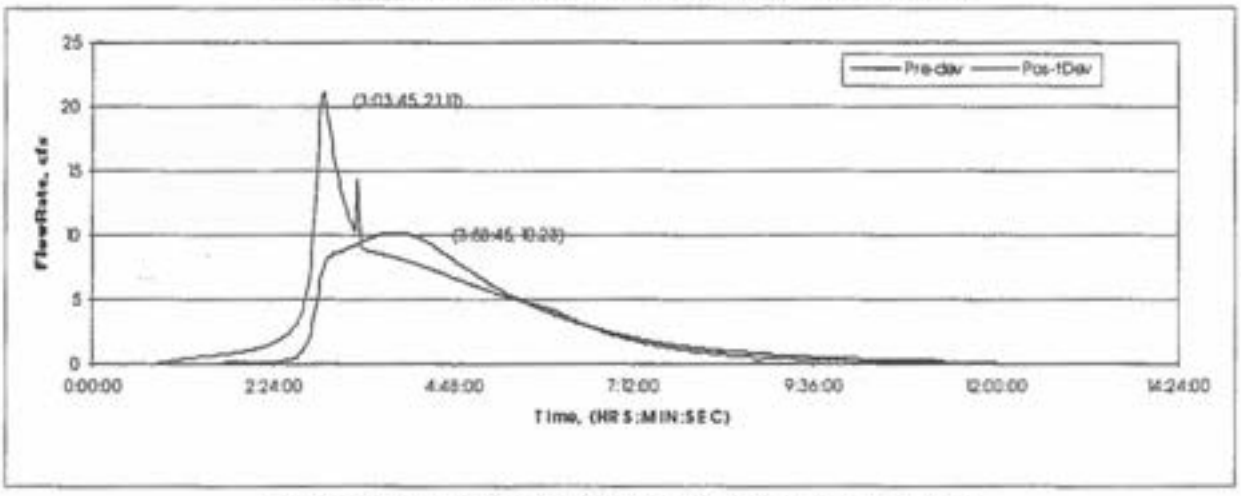


Figure 8c: Hydrographs for the 1:10-year Storm Event

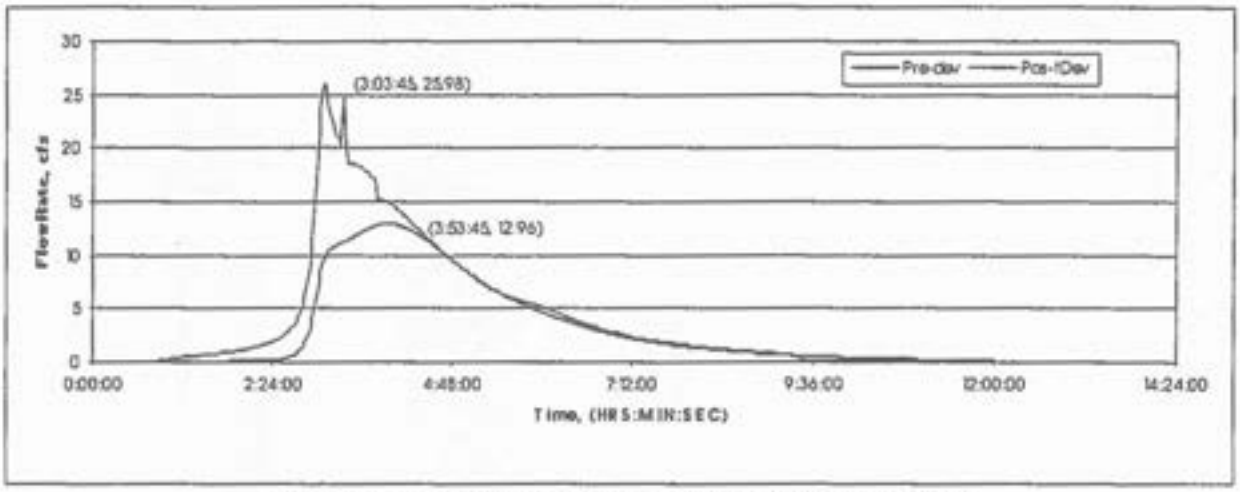


Figure 9a: Hydrographs for the 1:25-year Storm Event

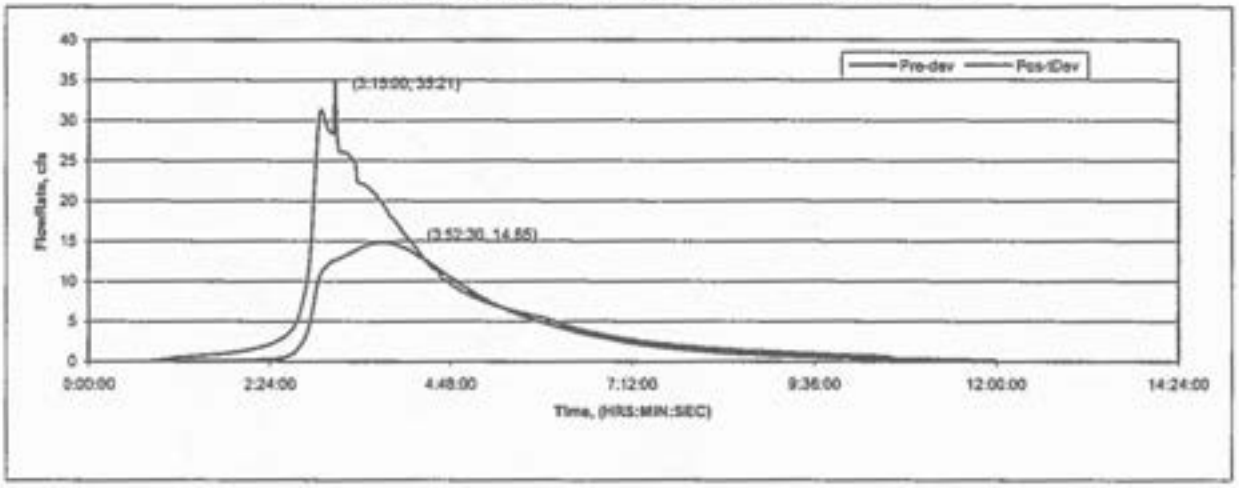


Figure 9b: Hydrographs for the 1:50-year Storm Event

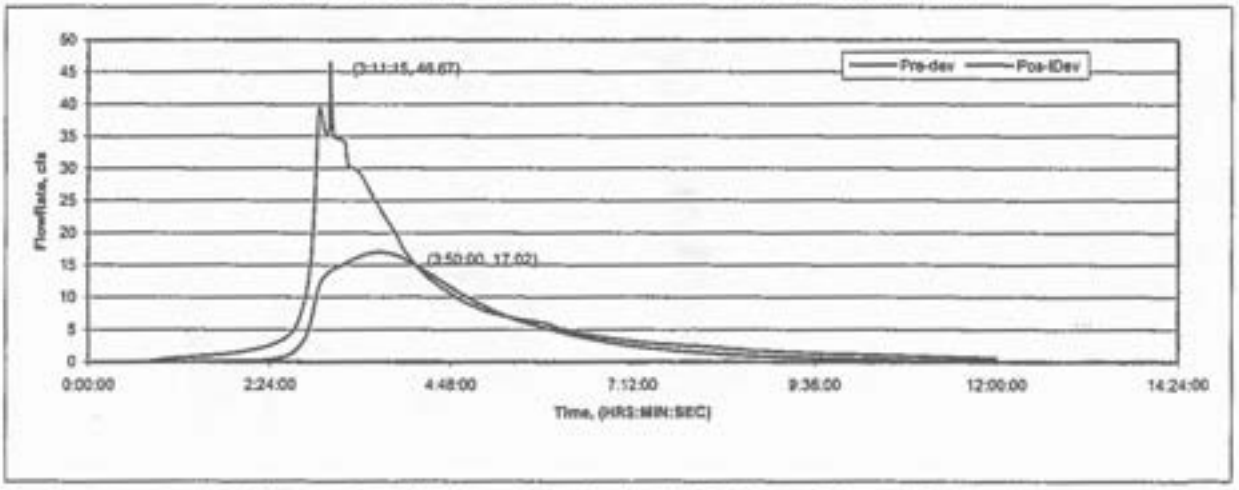


Figure 9c: Hydrographs for the 1:100-year Storm Event

APPENDIX A

MTO COMMENTS

Ministry of Transportation
Ministère des Transports

Ontario

Ministry of Transportation
Corridor Control Office
659 Exeter Road
London, ONT
N6E 1L3
Telephone: (519) 873-4596
Fax: (519) 873-4600

April 7, 2003

Moses Ratiarson, M.A.Sc., P.Eng.
Glos Engineering Limited
3155 Huron Church Road
Windsor, Ontario
N9E 4H6

RE: Preliminary Report
Stormwater Management Study
Essex Crossing – Phase 1
Town of Essex – Highway 3

The ministry has reviewed the noted report for the proposed development at Highway 3 and Essex County Road 8 (Maidstone Avenue West). Out comments include but are not limited to the following.

- The ministry requires an analysis of various storm events to determine the most critical occurrence. In addition to the 5 and 100 year events, an analysis of the 2, 10, 25 and 50 year events is required.
- The stormwater outlet quantity from the site following development must be controlled to less than or equal to the pre development quantity for the same area.
- What benefit is there from directing the two watercourses from the development into one municipal drain?
- Time of Concentration calculations are required for a range of points in the development.
- The study mentions individual lot control for stormwater. It is not mentioned what type of storage will be used but the ministry does not allow the use of orifice controls as a means of stormwater attenuation.
- Any storage capacity in the stormwater system should be in excess of the conveyance capacity of the system at the design flow rate. Should storage volumes be calculated in addition to the conveyance capacity of the system, this method utilizes the sewer capacity twice and is not an accepted design practice. i.e., Any storage capacity calculated into the sewer system would have to oversized above the conveyance capacity required of that sewer. This is not clear in your study.
- The ministry does not acknowledge the benefit of storage or pumping of stormwater using a mechanical device, such as a pump. The sewer system/drainage system may be designed using these devices however, an impact assessment must be done assuming no such devices are in place. Any

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P.: 02072

failure of a mechanical device should not cause flooding or other impacts should they fail.

- An oil/grit separator is a requirement for any site where the ministry deems it will be necessary, i.e. automotive repair, major truck traffic etc. A maintenance program and ownership of any such separator is a requirement.
- A statement clearly stating who would own and maintain the system following construction of the development is necessary.
- A sediment/erosion control plan must be in place during any site construction. Details of this plan must be shown on site drawings.
- The ministry requires the proponent to secure approvals of this stormwater management report by all other applicable agencies including the municipality, MOE, MNR and the local conservation authority.
- The report must include a clear statement ensuring there will not be any negative impacts to the Highway 3 drainage system as a result of failure of this stormwater management system.

Further ministry drainage information for developers can be found at www.mto.gov.on.ca/english/engineering/drainage/index.html.

I trust this information is of assistance for you to complete your detailed design. Please contact me should you require further information.

Yours truly,

Aden Corcoran, C.E.T.
Corridor Control Technician
Planning and Design Section
Southwestern Region, London

c. M. Swim, MTO Planning and Design
J. Hitchcock, MTO Chatham Operational Services

APPENDIX B

MEETING MINUTE

TOWN OF ESSEX
ESSEX 143 JOINT VENTURE STORMWATER MANAGEMENT MEETING
MEETING NOTES

FRIDAY, JULY 11, 2003
2:00 P.M.

In Attendance:

Jeff Belanger, MDC
Carl Glos, Glos Engineering
Mosas Ratiarson, Glos Engineering
Tim Byrne, ERCA
Wayne Miller, CAO
Gary Hillier, Drainage Superintendent
Chad Jeffery, Planner
Rocco Lucente, Town's Engineering Consultant
Jack Hitchcock, MTO
Aiden Corcoran, MTO

Mosas Ratarison reviewed the scope of work involved in Phase 1 which included Commercial Areas 1 to 3. He noted that stormwater facilities will be conveyed to the Town. He explained that, initially, all the runoff from the commercial development will be directed to the Munch Drain. Once Phase 2 of the commercial development is completed, part of the stormwater flows will be routed to the 13th Concession Drain. Flows will be through storm sewers in Phase 1 with a grassed open drain being used for Phase 2. He noted that the pond is designed to be dry.

Aiden Corcoran questioned the benefit of redirecting the flows to the Munch.

Carl Glos stated that a spillway was to be used for 1:100 with this spillway discharging to the Munch.

Tim Byrne noted that the Munch Drain inlet has only a 5-year capacity. He also questioned whether stormwater had been addressed for features other than roads. Mr. Byrne argued that a fully developed scenario was necessary.

Mr. Glos noted that as a condition in the site plan control agreements, the owners of the commercial lots will be required to control runoff.

Mr. Byrne expressed concerns with this approach noting that it effectively gives future owners a two-inch connection. He also questioned some of the other figures being used by Glos.

Mr. Ratiarson explained that the calculations were based on the commercial lands fully developing. He noted that the storm sewer is to be oversized for both conveyance and capacity.

Mr. Lucente stated that if it is used for conveyance it can't be used for storage.

Mr. Ratiarson reiterated that the pipe is oversized for storage as well.

Mr. Byrne explained that conveyance into the outlet would have to be restricted because there is limited capacity in the Munch Drain.

Mr. Glos stated that if the pump fails, the proposed spillway will temporarily handle the stormwater

Mr. Byrne argued that the elevation of the spillway should account for the 1:100 year storm.

Mr. Ratiarson stated that there should never be back-up from the spillway.

Mr. Corcoran noted that MTO does not acknowledge the benefit of mechanical devices.

Mr. Lucente noted that it will be important to have firm capacity as MOE will require it.

Mr. Ratiarson stated that he had not yet heard from MOE.

Mr. Lucente noted that two identical pumps will be required in the event that one goes down.

Mr. Glos stated that if a wet pond was acceptable, pumps would not be required. He noted that a second pump would be costly (approx. $70,000) and he doesn't know of a stormwater management system with a second pump. He further noted that only the lower portion of the pond is being pumped.

Mr. Byrne stated that, fundamentally, the pond is too small and with the current design, the MTO right-of-way would be at risk of flooding. He further noted that the outlets are only able to handle the 1:5 year storm events.

Mr. Glos promised to review the sizing and design parameters and respond.

Mr. Byrne asked how the 13th Concession Drain watershed is being rerouted.

Mr. Ratiarson explained that an open ditch will be used until the second phase commercial property is developed.

Mr. Hillier noted that when the drain is closed, a drainage report will be required because it is a municipal drain.

Mr. Lucente noted that a drainage report will be required for both the initial works and for the works involving the closure of the drain.

Mr. Byrne estimated that there will be cover and elevation problems associated with the closure of this drain.

Mr. Lucente noted that lot grading plans would be necessary.

Mr. Ratiarson stated that they would be included in the final report.

Mr. Byrne stated concerns over on-site stormwater controls noting that every one inch event would result in parking lots being flooded. He noted that the Town would be responsible for conveyance within right-of-way as well as drainage for individual lots. He also stressed that stormwater quality issued had not been addressed during the meeting. Mr. Byrne indicated that at the end of the pipe, a municipally maintained sediment forebay is required. He also noted that a 13 mm rainfall event must be held for 24 hours to allow for polishing.

Mr. Ratiarson noted that the inlet for the pump has a catch for sediment and then demonstrated its filtering technique.

Mr. Lucente suggested the use of a Hickenbottom (graduated stand pipe) be used as well as Goss Gully traps.

It was decided that Mr. Byrne and Mr. Lucente would review the draft copy of the Town's Development Standards Manual to ensure that stormwater management is properly addressed.

It was further decided that Mr. Byrne and Mr. Ratiarson would meet to discuss hydrographs prior to the report being finalized.

APPENDIX C

LISTING OF BACKGROUND DOCUMENTS

Background Documents

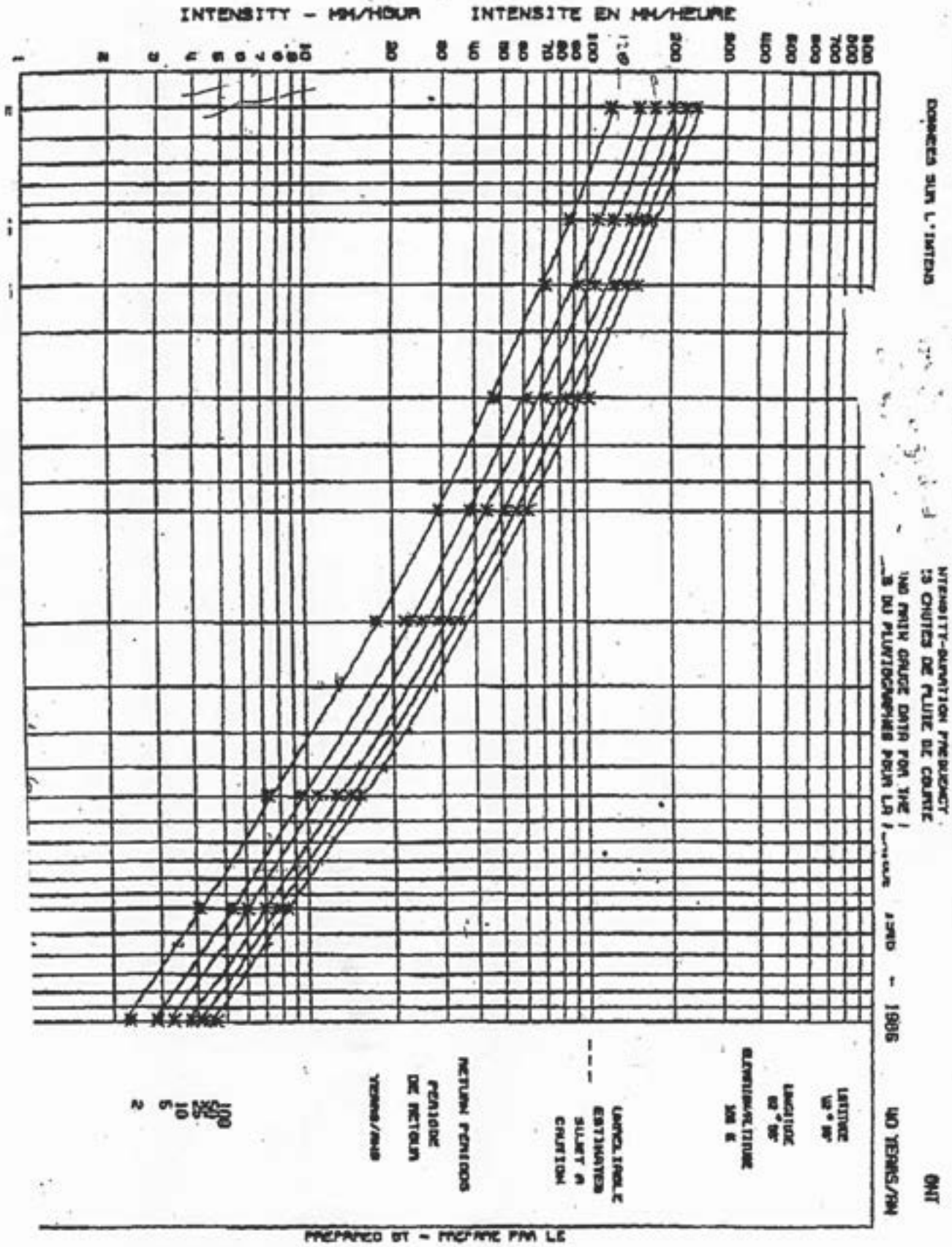
- Aerial Photographs of the site (Phases 1, 2 and 3) from ERCA at scale of 1:6500.
- Concept Plan of the Essex Crossing Project dated April 03, 2002, prepared by Essex 143 Joint Venture Limited.
- Draft Plan of Survey of Parts of Lots 284, 285 & 286, Con. S.T.R. dated May 17, 2002, prepared by Clarke Surveyors Incorporated.
- Geotechnical Investigation dated April 19, 2000, prepared by Agra Earth and Environmental Limited.
- Legal Survey of Parts of Lots 284, 285 & 286, Con. S.T.R. dated June 5, 1974, prepared by Koester & Verhaegen Ltd.
- MTO drawings (Plate No 108-3/15-0 and Plate No 108-3/16-0) showing the intersection of Highway No 3 (By-Pass) and Maidstone Avenue West.
- MTO Stormwater Management Requirements for Land Development Proposals, 1999.
- Ontario Drainage Act.
- Ontario Resources Act.
- Plan & Profile of the 14th Concession East Dr. in the Township of Colchester North dated Oct. 26, 1976, prepared by C.G. Russel Armstrong Limited.
- Preliminary Report, Storm Water Management Study for Essex Crossing – Phase 1, Town of Essex, Ontario, dated March 10, 2003, prepared by Glos Engineering Ltd
- Rainfall Data from (Canada) Atmospheric Environment Service (AES).
- Revised Draft Plan of Survey of Parts of Lots 284, 285 & 286, Con. S.T.R. dated December 2002, prepared by Clarke Surveyors Incorporated.
- Revised Draft Plan of Survey of Parts of Lots 284, 285 & 286, Con. S.T.R. dated February 03, 2003, prepared by Essex 143 Joint Venture Ltd.
- Stormwater Management Practices, Planning and Design Manual, June 1994, MOEE.
- Storm Management Planning and Design Manual, March 2003, MOE
- SWMM4, Stormwater Management Model, Version 4, User's Manual, 1988, US EPA.

- Topographic Survey of Maidstone Avenue West dated 2002, prepared by Dillon Consulting.

- Topographic Survey of the site (Phases 1, 2 and 3) dated 2002, prepared by Essex 143 Joint Venture Limited.

APPENDIX E

RAINFALL DATA


INTENSITY - MM/HOUR
INTENSITE EN MM/HEURE
DONNEES SUR L'INTENS
INTENSITY-DURATION FREQUENCY
ING RAIN GRUGE DATA FOR THE
ONT
10 YEARS/AN
PREPARED BY - PREPARE PAR LE
ATMOSPHERIC ENVIRONMENT SERVICE - ENVIRONMENT CANADA
SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE - ENVIRONNEMENT CANADA

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

PREPARED BY / PREPARE PAR
THE HYDROMETEOROLOGY AND MARINE DIVISION
LA DIVISION DE L"HYDROMETEOROLOGIE ET DU CLIMAT MARITIME

****

TABLE 1 WINDSOR AIRPORT ONT 6139525

LATITUDE 4216 LONGITUDE 8258 ELEVATION/ALTITUDE 188 M

****

YEAR ANNEE	5 MIN	10 MIN	15 MIN	30 MIN	1 H	2 H	6 H	12 H	24 H
1946	10.7	14.2	15.0	22.6	29.0	42.7	46.2	49.3	54.9
1947	9.7	18.8	23.4	27.9	37.8	38.1	54.4	61.0	71.4
1948	7.1	7.9	9.9	11.7	15.0	16.0	30.7	40.1	44.2
1949	11.9	19.3	22.4	29.0	47.0	51.8	54.1	57.9	71.6
1951	5.8	8.9	13.2	18.5	26.9	34.3	38.1	44.7	53.8
1952	7.4	13.2	15.0	19.0	30.7	37.1	43.9	46.7	47.0
1953	20.1	20.8	21.1	32.5	40.6	51.1	52.3	54.9	55.1
1954	8.9	13.7	16.0	20.6	24.6	27.4	52.1	66.3	67.3
1955	8.4	9.4	12.4	18.8	21.3	34.0	41.7	41.9	60.2
1956	8.4	11.7	12.2	15.5	23.4	30.7	35.6	39.9	44.2
1957	10.9	19.8	26.7	46.5	52.8	57.4	96.8	100.3	100.3
1958	7.9	11.7	11.9	15.0	23.1	29.5	35.1	38.9	40.4
1959	11.7	16.3	17.5	21.3	21.6	34.0	40.6	60.5	65.5
1960	7.6	10.7	12.4	16.8	29.5	34.5	36.6	43.9	54.4
1961	11.7	17.3	22.6	35.8	38.1	43.2	43.2	43.2	45.7
1962	14.0	21.8	24.4	34.0	54.6	64.3	64.8	64.8	64.8
1963	13.0	20.1	27.2	40.9	43.9	45.0	45.0	45.0	56.9
1964	13.2	17.5	22.4	27.2	27.2	28.7	33.5	36.6	39.4
1965	7.9	12.7	13.7	15.7	22.6	27.2	32.8	55.1	58.9
1966	14.5	18.8	23.1	32.5	33.0	47.0	57.1	64.5	67.3
1967	13.7	20.1	21.8	24.9	26.4	26.4	41.1	62.2	72.6
1968	10.2	15.2	17.5	25.9	36.8	38.1	60.2	77.2	78.2
1969	11.2	19.0	20.8	27.7	27.7	36.1	57.1	57.1	57.1
1970	9.4	12.2	16.5	17.0	22.6	29.5	29.7	36.6	39.6
1971	9.4	17.8	25.7	35.1	35.1	35.1	43.9	43.9	43.9
1972	9.9	12.2	14.5	19.6	25.9	28.7	31.0	31.2	39.1
1973	12.7	18.0	22.6	27.9	30.0	30.2	33.5	37.8	40.4
1974	15.0	26.2	39.4	41.1	45.0	49.5	49.8	49.8	49.8
1975	8.4	14.2	21.1	24.9	25.1	31.7	40.6	44.7	52.8
1976	9.1	13.2	14.0	16.5	22.9	27.4	34.3	35.3	40.4
1977	7.1	10.9	14.0	16.5	25.4	29.2	29.2	31.7	41.4
1978	8.8	10.5	11.8	20.4	21.1	21.1	22.5	28.6	31.0
1979	10.4	16.6	24.9	32.0	48.3	52.6	55.3	60.8	61.2
1980	14.1	17.2	25.0	35.6	45.3	45.6	46.3	79.8	80.0
1981	-99.9	16.7	23.3	26.0	32.0	45.6	77.3	81.7	92.3
1982	7.7	10.7	13.2	18.9	27.3	28.3	28.3	40.4	49.9
1983	15.0	16.5	22.1	32.3	38.7	45.4	62.1	62.1	82.0
1984	6.0	8.8	11.3	17.5	17.7	21.0	32.6	34.9	37.2
1985	11.2	13.3	13.9	18.7	24.6	39.6	58.4	59.2	59.2
1986	8.0	12.7	18.0	19.4	20.7	32.0	58.1	66.3	88.6

NOTE:-99.9 INDICATES MSG DATA
DONNEES MANQUANTES

# YRS. ANNEES	39	40	40	40	40	40	40	40	40
MEAN MOYENNE	10.5	15.2	18.8	25.0	31.0	36.7	45.6	51.9	57.5
STD. DEV. ECART-TYPE	3.0	4.2	6.1	8.4	10.0	10.6	14.7	15.7	16.6
SKEW DISSYMETRIE	0.92	0.31	0.90	0.67	0.77	0.54	1.23	0.92	0.73
KURTOSIS KURTOSIS	4.35	2.88	4.70	2.88	2.91	3.19	5.64	4.06	3.16

WARNING / AVERTISSEMENT
YEAR 1953 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1953 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 20.1 100 YEAR/ANNEE = 19.9

WARNING / AVERTISSEMENT
YEAR 1957 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1957 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 96.8 100 YEAR/ANNEE = 91.7

WARNING / AVERTISSEMENT
YEAR 1974 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1974 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 39.4 100 YEAR/ANNEE = 37.9

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

****

TABLE 3 WINDSOR AIRPORT ONT 6139525

LATITUDE 4216 LONGITUDE 8258 ELEVATION/ALTITUDE 188 M

****

INTERPOLATION EQUATION / EQUATION D"INTERPOLATION: R = A * T ** B
R = RAINFALL RATE / INTENSITE DE LA PLUIE (MM /HR)
T = TIME IN HOURS / TEMPS EN HEURES

STATISTICS STATISTIQUES	2 YR ANS	5 YR ANS	10 YR ANS	25 YR ANS	50 YR ANS	100 YR ANS
MEAN OF R MOYENNE DE R	42.8	54.8	62.7	72.7	80.1	87.5
STD. DEV. R ECART-TYPE	41.7	52.8	60.2	69.6	76.5	83.4
STD. ERROR ERREUR STANDARD	11.5	15.8	18.6	22.2	24.9	27.6
COEFF. (A) COEFFICIENT (A)	25.3	32.5	37.3	43.3	47.7	52.2
EXPONENT (B) EXPOSANT (B)	-0.712	-0.712	-0.712	-0.712	-0.711	-0.711
MEAN % ERROR % D'ERREUR	10.3	11.4	12.0	12.4	12.7	12.9

Stormwater Management Plan for the Galos Development in the Town of Essex, County of Essex

Final Report

April 2004

Amended February 2005
Amended May 2005
Amended July 2005
Amended June 2006

1552906 Ontario Limited

03-2064-2000

Submitted by

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Appendix A - Stormwater Calculations
Appendix B - Storm Sewer Calculation Sheet

1.0 INTRODUCTION

A new residential subdivision consisting of 126 single family lots is proposed to be constructed on a vacant parcel of land, 11.7 hectares in size. The study area is located in the Town of Essex as shown on Figure 1.1. The site is bound on the west and south by existing residential developments, and on the north and east by agricultural land, as shown on Figure 1.2.

The proposed development would be serviced by constructing a new storm sewer system and a dry stormwater management facility with separate quality and quantity control bays within the south central portion of the subdivision that would outlet to an existing trunk storm sewer on Maidstone Avenue (Highway 8). The proposed minor storm drainage system will consist of an underground pipe system carrying the runoff from the site to the stormwater management facility (refer to Figure 1.2). The major system includes overland conveyance routes routing runoff from extreme events to the pond.

This Stormwater Management Plan was prepared to satisfy the requirements of the Town of Essex, the Essex Region Conservation Authority, and the Ministry of Environment with respect to quality and quantity of stormwater runoff, which will result from the proposed development.

1.1 TOPOGRAPHY

Typical to the lands in Essex County, the lands adjacent to the development site have topography that is essentially flat and is intensively cultivated with few wood lots. The combination of flat topography and extensive agricultural land use which incorporate tiled fields makes much of the study area susceptible to flash flooding and high sediment loading during rainfall events. In order to provide surface drainage for flat tablelands and avoid flood damage a complex network of municipal drains exist throughout the region.

1.2 LAND USE

The area proposed for development is zoned residential, and is currently devoid of any major permanent vegetation. Lands surrounding the study area are also residential, or zoned residential and agricultural. Extensive clearing for agriculture has resulted in an average forest cover of less than 5 % throughout this area and the rest of Essex County. Patterns of development along with historic changes to land use have contributed to a highly degraded natural environment.

Throughout the region degraded surface water quality can be linked to intense agricultural activity and lack of conservative farming methodology. Urban development has also contributed to the loss of natural environment, incorporation of Best Management Practices (BMPs) and conservative land development techniques ensure further degradation will not occur in the future.

1.3 SOIL CONDITIONS

The development site lies within the physiographic region of Southern Ontario mapped as the St Clair Clay Plains (Chapman and Putnam, 1984). The region is typified by clay plains, smoothed by shallow deposits of lacustrine clay. The soil type for the entire site is classified as Brookston Clay. This soil type is characterized by poor permeability and will allow only limited surface water infiltration and horizontal movement of water within the soil mass. Over 60% of the particle mass of Brookston Clay is less than 20 micrometers in diameter. See Figure 1.3, adopted from the Soils Map of Essex County, Soil Survey Report No. 11.

1.4 SITE DRAINAGE

At present, runoff from the site is achieved by overland flow towards a shallow swale that outlets to the municipal trunk storm sewer on Maidstone Avenue (See Figure 1.4). The trunk sewer on Maidstone Avenue forms part of an existing drainage network that discharges into an open drainage ditch which flows in an easterly direction along the Maidstone Avenue corridor. The open drainage ditch carries stormwater runoff to east of Naylor Sideroad where the unnamed drainage ditch crosses Maidstone Avenue and discharges into the Puce River Drain. The Puce River Drain is located directly between Naylor Sideroad and 5th Concession Road and flows northerly and eventually discharges into the Puce River. The Puce River flows northerly, ultimately discharging into Lake St. Clair. Elements of the drainage system fall within the Puce River Sub-watershed under the jurisdiction of Essex Region Conservation Authority. The Puce River sub-watershed includes lands well south of County Road 46 north to Lake St. Clair and covers approximately 6 000 ha. The new residential subdivision consisting of 126 single-family lots is proposed to be constructed on a vacant parcel of land 11.7 ha in size. The development accounts for less than 0.2% of the total sub-watershed area, but is part of the drainage network which forms the headwaters of the Puce River. Significant environmental features within Puce River subwatershed include Maidstone Conservation Area and Dunn's Woods.

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FIGURE 1.1
Location Map
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TOWN OF LAKESHORE

TOWN OF LAKESHORE

TOWN OF ESSEX

Direction of Flow

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FIGURE 1.2
Site Plan and Site Services
Scale: 1:1000

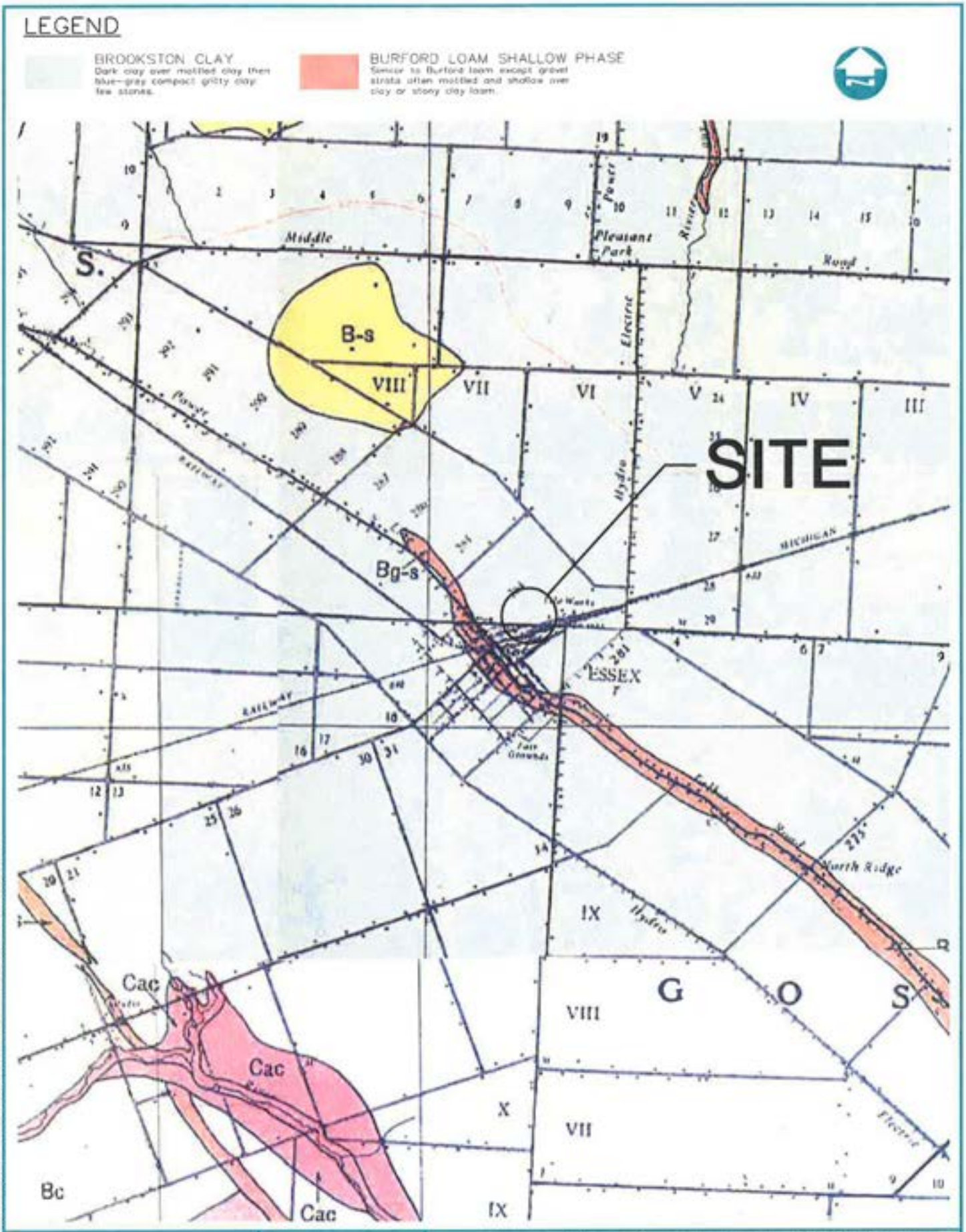

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FIGURE 1.3
Soils Map
N.T.S.

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N.M.R.
S.M.R.
N.T.R.
S.T.R.
SITE
ESSEX
Wilton Relief
West Part of 14th Con. East Drain
Fourteenth Concession East Drain
Branch of 14th
Rose Drain
N.Branch
S.Branch
Wright Drain
Wilton Relief Drain
Holland Sideroad Drain
Pekarton Drain
Cooley Drain
Barrette Drain
Essex Outlet Drain
Talbot Sideroad Drain
KINGS HIGHWAY NO. 401
NORTH REAR ROAD
COUNTY ROAD NO. 46
MIDDLE ROAD
SOUTH MIDDLE ROAD
COUNTY ROAD NO. 34
COUNTY ROAD NO. 8
MARSH DR.
LAWSON DR.
MALDEN RD. DR.
BRADY OUTLET DR.
THOMAS PLANT DR.
PLANT DR.
PUCE RIVER DR.
MARSH CREEK DR.
LITTLE RIVER DR.
SWITZER DR.
ELLIOTT DR.
ALLEN DR.
ROSE DR.
RIVER DR.
WESTLAND DR.
EASTLAND DR.
MAPLEWOOD DR.
ELMWOOD DR.
ELMRIDGE DR.
LAFAYETTE DR.
SOUTHLAND DR.
NORTHLAND DR.
HIGHLAND DR.
MEADOW DR.
DAWSON DR.
MARKHAM DR.
CHRISTIE DR.
HEDGEROW LA.
ELM CRES.
ELM CRT.
ELM DR.
ELM CRES.
ELM CRT.
ELM DR.
ELM CRES.
ELM CRT.
ELM DR

1.5 RECEIVING WATERS

The proposed development would only have a marginal impact on the watercourse flow quantity and water quality, as the contribution of damaging suspended solids from the agricultural lands upstream of the proposed subdivision will remain significantly higher than from residential lands after the implementation of on-site stormwater management techniques.

2.0 PHYSICAL LAND ALTERATIONS RESULTING FROM DEVELOPMENT

The proposed development does not require any significant changes to land topography. The only re-grading required is to provide surface drainage for the proposed lots and to create local road depressions to retain runoff from large storm events for a short period of time.

3.0 STORMWATER FLOW RATE MANAGEMENT

This site is part of the overall drainage area for the existing 900 mm diameter municipal trunk sewer located on Maidstone Avenue. The storm sewer was designed to accept the 2 year post-development flows from this development of 134 L/s, assuming a runoff coefficient of 0.30. The storm outlet from the stormwater management pond would to the municipal trunk sewer via a manhole on Maidstone Avenue.

3.1 RUNOFF QUANTITY

The proposed stormwater management facility (dry) is located along the south central boundary of the site, adjacent to the active Penn Central railway right-of-way.

A typical section from the development was analysed, and a weighted runoff coefficient was determined. Post-development flows for the entire drainage area for the 2 and 100-year rainfall events were calculated using the Rational Method utilizing a runoff coefficient of 0.40.

The minor stormwater drainage system will convey flows resulting from storms of a return period of up to 2 years without surface ponding. Runoff resulting from higher storm events (up to 1 in 100 years) will be stored at roadside catchbasins, until it is conveyed by surcharged sewers and overland flow routes to the stormwater management facility. Generally the roads within the development will be graded in order to direct the overland flow from storms greater than the 2 year event towards the pond (refer to Figure 3.1 for routing and Appendix A for stormwater calculations). In the areas where this is not possible because of topographic constraints, some temporary surface water storage will be allowed. Increasing the number of catch basins by approximately 20% will increase surface storage. Since ultimately the conveyance of runoff is limited by storm sewer pipe capacity during infrequent high-intensity rainfall events.

The high water level (HWL) in the pond of 193.5 m was calculated based on a release rate of 90 l/s (refer to Appendix A). A high water level of 193.5 results in surcharging of the conveyance system but is limited to approximately 0.3m below the lowest manhole lid surface elevation. Providing 0.3m of freeboard will allow the roadways to drain adequately after the storm event occurs except in some specific areas. In general surface storage in these locations will not impede access of local traffic and emergency vehicles except during the initial stages of draw-down within the stormwater management facility.

3.2 MODELLING METHOD

The design of the underground pipe system was based on conventional Rational Method utilizing the Manning flow equation and Atmospheric Environment Service (AES) Rainfall IDF (Intensity, Duration, Frequency) curves for the Windsor Area. The conveyance system (pipe system) was designed to operate under non-surcharging conditions during the 2-year rainfall event. Peak flows and storage volume requirements for the stormwater management facility were developed based on the Modified Rational Method.

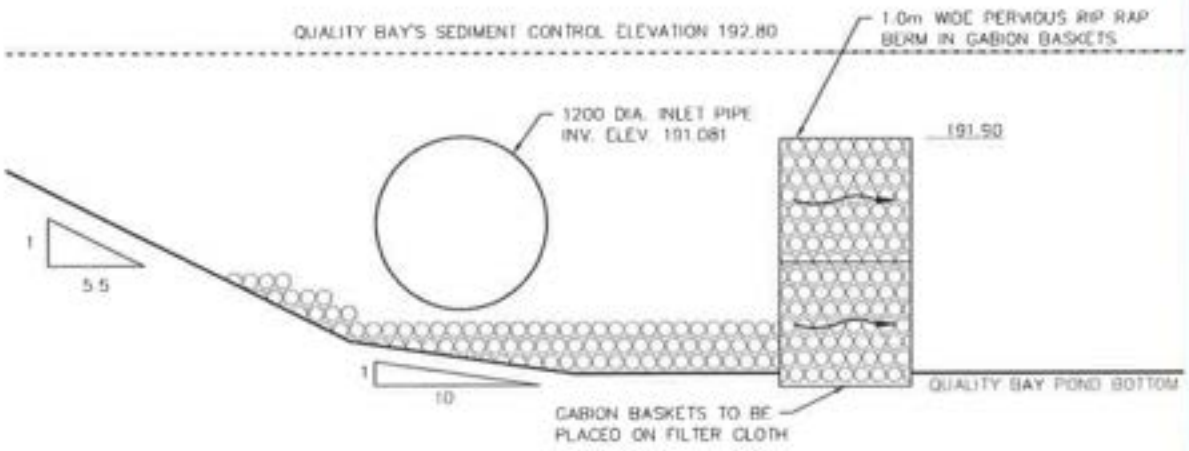

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FIGURE 2.0
Stilling Basin and Velocity Dispersion Berm Detail

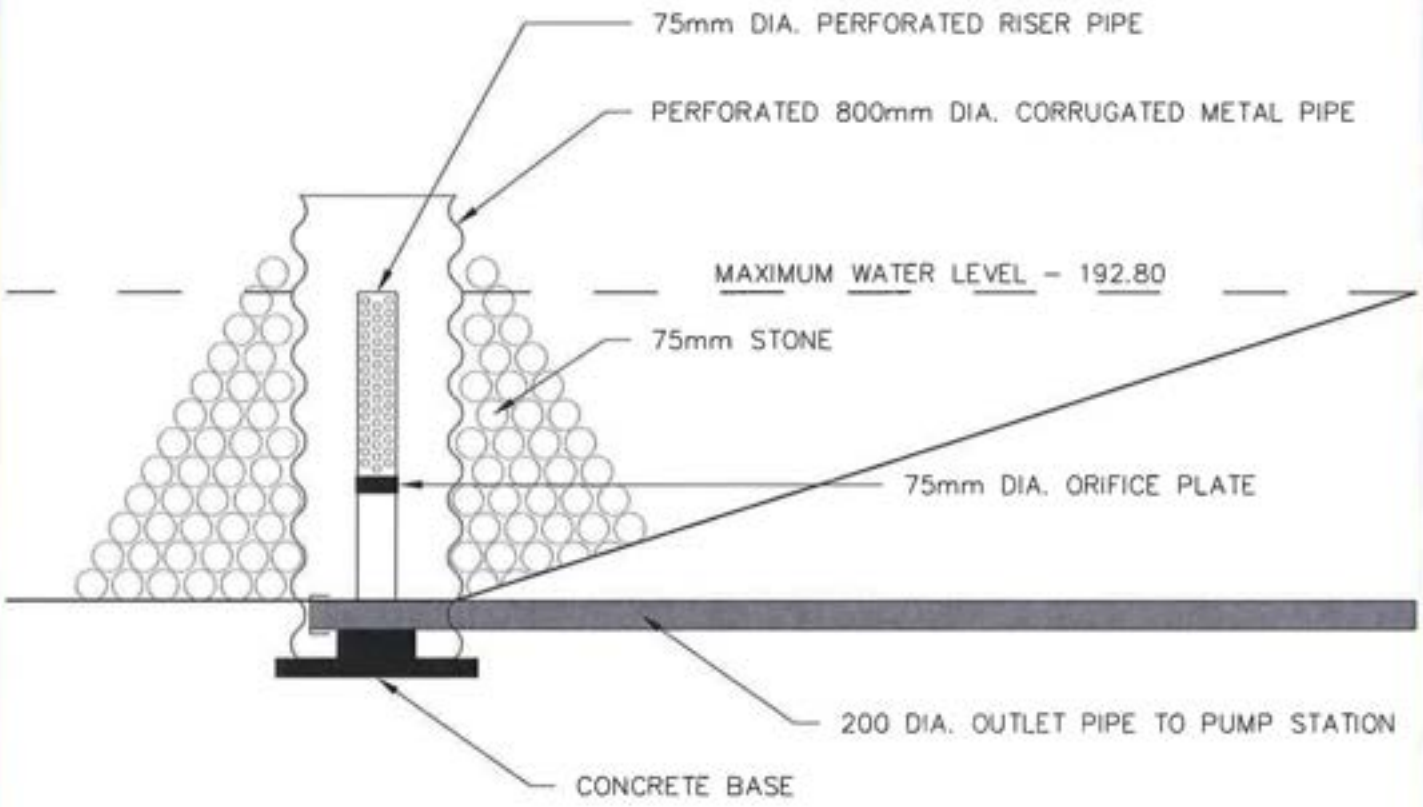

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FIGURE 3.0
Perforated Riser Pipe Pond Outlet Configuration

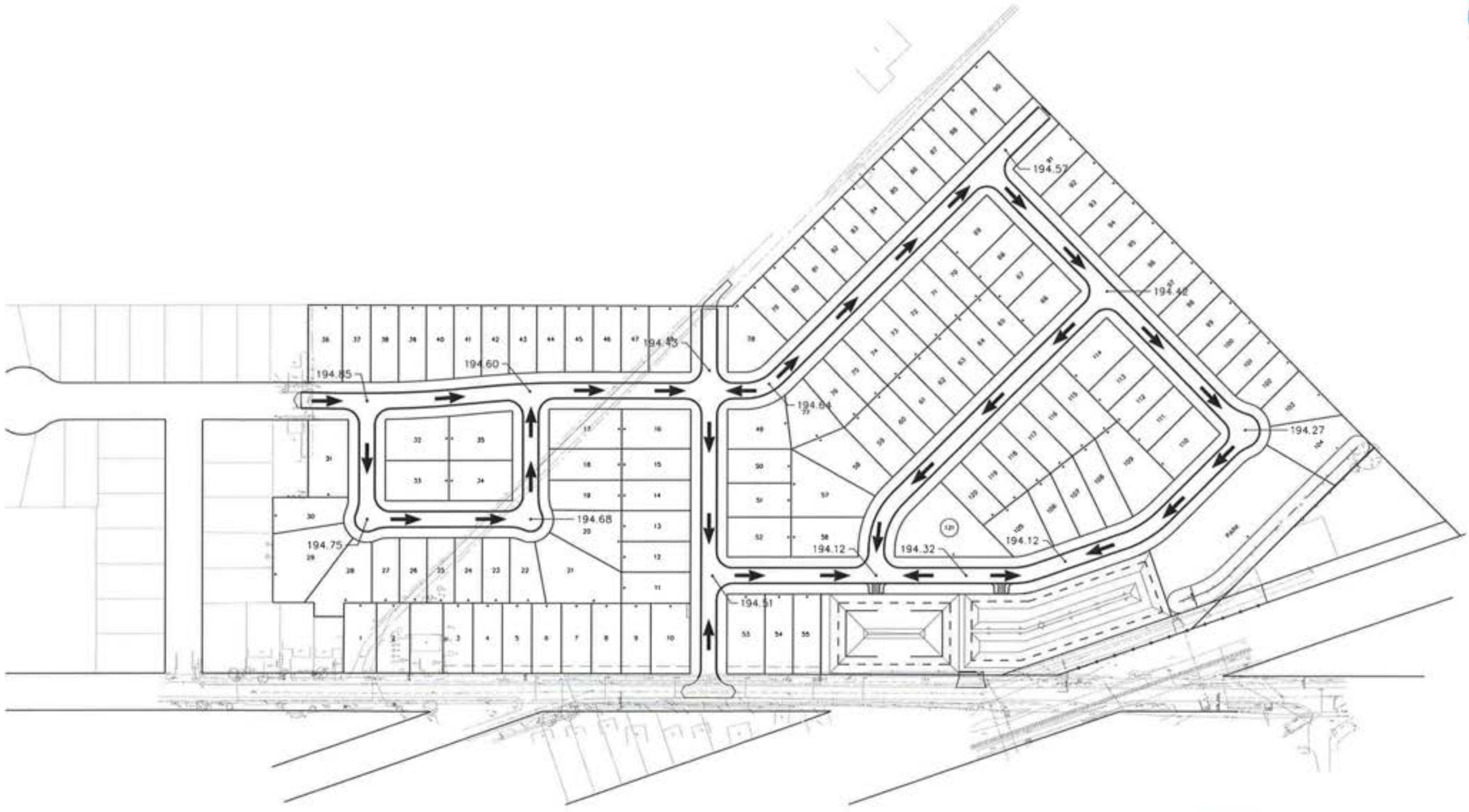

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FIGURE 3.1
Overland Flow Route
Scale: 1:1000

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4.0 STORMWATER POLLUTION ABATEMENT

The control and/or removal of pollution at the source is the most effective way of protecting the quality of receiving waters. However, due to the specific characteristics of the site and the current municipal standards and policies in the Town of Essex, only a certain number of Best Management Practice methods recommended by the Ministry of Environment (MOE) can be implemented. The stormwater pollution abatement measures proposed for this development minimizes the influence of the proposed urbanization on the receiving waters.

Table 4.1 presents a matrix of various (generic) applicable alternatives of stormwater management methods for this development and their effect on stormwater quality. Those measures not applicable for these developments are marked with an N in the last column of the table.

Based on the available alternatives, the plan proposed for this development includes both the "on-site" and "end-of-pipe" measures.

4.1 ON-SITE POLLUTION CONTROL

i) Splash Pads

Discharging roof leaders to splash pads and directing the surface flow to rear yard ponding areas, will provide for attenuation of flows and removal of pollutants by partial infiltration of runoff into soil.

ii) Lot Grading

Local lot depressions, through lot grading, at the back of each individual lot will be created to assure attenuation of peak flow and allow partial removal of suspended solids during flow over grassed areas. These depressions would allow for some measure of detention at the rear of private lots if ever required. Specification of reduced lot grading provides depression storage in pervious areas, increasing potential surface water infiltration into the upper soil mass. Due to the type of soil within the study area, rear yard depression storage will <u>not</u> be relied on to provide any of the peak flow attenuation for stormwater runoff.

TABLE 4.1
STORMWATER MANAGEMENT PRACTICE POTENTIAL

			Effect on Runoff Caused				
Method			**Water Quality**	**Erosion**	**Temp.**	**Special Requirements and Limitations**	**Applicability**
"ON SITE" MEASURES	1	Lot Grading	L	L	L	$ Lot Size	Y
	2	Roof Leader Discharge Into Lot Surface and Local Ponding Areas Within Subdivision Right-of-Way	L	L	L	$ Lot Size $ Permeable Soils $ Municipal By-Laws	Y
	3	Roof Leader Soakaway Pits	L	L	H	$ Permeable Soils	N
	4	Pervious Pipes	H*, **	L	H	$ Permeable Soils $ Municipal Policies	N
	5	Pervious Catchbasins	H*, **	L	H	$ Permeable Soils $ Municipal Policies	N
"END OF PIPE" MEASURES	6	Sand Filter	H	L	N/A	$ Permeable Soils $ Size of Development $ Municipal By-Law	Y
	7	Infiltration Trench	L**	L	H	$ Permeable Soils $ Size of Development $ Municipal By-Law	N
	8	Infiltration Basin	L**	L	H	$ Permeable Soils $ Size of Development $ Municipal By-Law	N
	9	Vegetated Filter Strip	H	L	L	$ Location	N
	10	Buffer Strip	L	L	L	$ Location	N
	11	Wet Pond	H	H	*	$ Maintenance $ Public Perception $ Municipal Acceptance $ Property Limitation	N
	12	Dry Pond	L	H	N/A	$ Maintenance $ Public Perception $ Municipal Acceptance $ Property Limitation	Y

Effect on Runoff Caused							
Method			**Water Quality**	**Erosion**	**Temp.**	**Special Requirements and Limitations**	**Applicability**
"END OF PIPE" MEASURES	13	Dry Pond with Forebay	H	H	N/A	$ Maintenance $ Public Perception $ Municipal Acceptance $ Property Limitation	Y
	14	Wetland	H	H	*	$ Area Size $ Municipal Acceptance	N
	15	Wetland with Forebay	H	H	*	$ Area Size $ Municipal Acceptance	N
		Oil/Grit/Fine Particles Separator (offline or bypass)	Varies	L	N/A	$ Municipal Policies	N

(Adopted from MOE - Stormwater Management Practices, Planning and Design Manual 1994)

L - Limited Effect on Stormwater Quality Improvements
H - High Effect on Stormwater Quality Improvements
* - Possible Adverse Effects
** - Limited Longevity
NA - Not Applicable (No Effect)
A - Applicable for this Development
N - Not applicable for this Development

iii) Extended Detention Time

The outlet orifice of the quality pond has been designed to release at a rate of 9.65 l/s. This release rate will result in a total drawdown time of 36 hours. Therefore a larger volume of sediment will be allowed to settle and reduce the amount of suspended solids in the effluent.

iv) Velocity Dispersion Berm

A velocity dispersion berm constructed of 200mm rip-rap at the inlet to the quality bay will act to reduce the incoming velocities and limit the re-suspension of sediment. The velocity dispersion berm and stilling basin will be constructed using interlocking gabion basket to protect against vandalism.

v) Increased Number of Catchbasins

An increased number of catchbasins with goss gully traps will increase the initial removal of sediment and allows a greater area for temporary road storage during high volume storm events. These road grades will be designed in such a way to incorporate an additional 20% more catchbasins than normal municipal standards would require.

vi) Other

A system of subdrains (refer to Figure 4.1) intended to collect and convey water from the road subgrade will intercept runoff infiltrating from boulevards and front yard areas. The subdrains will be installed behind the curb and backfilled with permeable granular material.

In addition to increasing the number of catchbasins, each catchbasin will be constructed with a goss-gully trap and sumps to aid in settling out sediment before it enters the sewer system.

4.2 STORMWATER MANAGEMENT FACILITY

Based on the classification of the receiving waters, it is proposed to intercept suspended solids and associated pollutants by directing the first flush runoff from rainfalls of up to 25 mm depth to the stormwater management facility, and discharging it over an extended period of time. The first flush volume will be directed to an inlet forebay or quality bay via a gravity sewer. A secondary quantity bay will provide storage of stormwater runoff that exceeds first flush volumes. The restricted inlet of the quality bay will essentially separate flows from storms up to the 25 mm event while runoff from lower frequency design storms will be directed to a separate bay. This would serve to keep the runoff from various types of events, high frequency-low volume vs. low frequency-high volume, separate allowing varying degrees of treatment to occur within the same pond complex.

The dual bay design will enable utilization of a smaller portion of the pond facility for extended detention of frequent storm events, minimizing re-suspension of settled sediments during extreme low-frequency storms such as the 100-year event. A specially design flow splitting manhole will control the conveyance of stormwater runoff to each bay of the facility. Once the water level in the quality bay reaches the design storage elevation for the quality volume (based on the 25 mm storm event), storm water will then be directed to the quantity bay through an elevated, large diameter pipe. The quantity bay of the facility will provide short term storage of runoff and be released at pre-development flow rates.

The outlet structure of the quality bay will consist of a small diameter orifice protected from clogging by a perforated corrugated steel pipe surrounded by poorly graded rip-rap. The small diameter pipe located at the bottom of the outlet structure will discharge the quality volume to a pumping station over a period of 36 hours, keeping the quality pond dry between storm events. Both bays will drain simultaneously, but due to the difference in hydraulic (elevation) head between the two storage bays of the facility and the chosen outlet configuration (pumping station) the quantity bay of the pond will complete its emptying cycle first. In addition to the flow-restricting orifice within the quality bay outlet structure a sand filter will be utilized in order to provide additional quality enhancement of stormwater runoff. Infiltration of runoff into a matrix of loosely placed topsoil, sand, and 50mm clear stone drained by a perforated drainage tile (Figure 4.2) will allow for additional filtering of runoff to take place within the quality bay. Infiltrated

runoff will be conveyed to the quality bay outlet structure by a 150 mm diameter perforated drainage tile. As with other infiltration facilities, clogging and ineffectiveness during winter operation are concerns. Minimal treatment or by-passing is likely to occur when ground conditions are either fully saturated or frozen. For this reason, the sand filter will not be relied on to provide control of the release rate from the quantity bay, the restricting orifice within the outlet structure will provide appropriate draw-down times during summer and winter operation.

Refer to Figures 4.3 and 4.4 for the Stormwater Management Facility details. Guidance provided by the MOEE SWMP manual was used in order to design the dry pond facility. Dry ponds have a number of advantages over facilities that incorporate a permanent pool. The overall water quality and quantity benefits provided by the facility are summarized below.

- Peak flow attention, reduction of post development flows to acceptable pre developments rates, controlling downstream erosion control in sensitive receiving water-courses.
- Minimizes changes in receiving water stream morphology, causing alteration of fish habitat.
- Minimizes thermal impacts within receiving water-courses benefiting fisheries resources and other riparian habitat.
- Total suspended solids removal based on a 36 hour detention time within the quality bay of the facility.
- Filtration of stormwater runoff through the sand filter medium, providing quality enhancement of volumes produced from very low intensity, high frequency storm events.
- Lesser risk to public safety because of the lack of a permanent pool and relatively short duration of standing water within the quality bay of the facility.
- Two bay design and extensive energy dissipation at inlet structures minimizing turbulence and re-suspension of previously settled sediments.

4.3 SPECIFIC DESIGN ELEMENTS

The stormwater management pond system will function as follows:

- The runoff from the subdivision will be initially directed to the stormwater management facility via a gravity storm sewer. Flows generated by the 25mm storm event will be directed to the sediment foreday or quality bay while flows in excess of the 25mm storm event will be directed to the quantity control bay of the pond. Splitting of flows will be achieved with a custom manhole, which incorporates a pair of storm pipes of specified diameter and invert elevations.

- The sediment forebay will incorporate an energy dissipating inlet structure consisting of a rip-rap lined stilling basin surrounded by a slightly elevated containment berm. The berm will be constructed of highly pervious, poorly graded riprap, which will allow low velocity flow from intermediate storm events to percolate though and enter the forebay in a non-turbulent manner, while also providing energy dissipation of higher velocity flow from the 25mm storm event.

- The sediment forebay will intercept suspended solids and associated pollutants by retaining the first flush runoff from rainfalls of up to 25mm depth for a period of 36 hours. This first flush will then discharge to the sump of the outlet structure pumping station. The sediment forebay has been configured in order to maximize the length to width ratio, providing optimum length for sedimentation. Because flow will be separated at the inlet structure, re-suspension of sediments will be minimized during storms which exceed the 25mm event. High velocity, turbulent flow, split at the inlet structure will be directed to the quantity bay and conveyed to the existing storm sewer system and a release rate matching the 2-year pre-development flow-rate.

- The quality and quantity bays of the pond will provide a total volume which meets or exceeds the storage requirement to reduce 100-yr post-development flow-rates to the 2-yr pre-development rates. The constant flow rate outlet pump station and 300mm overflow pipe will ensure that pre-development flow rates are not exceeded, therefore minimizing peak flow increases and erosion in receiving watercourses.

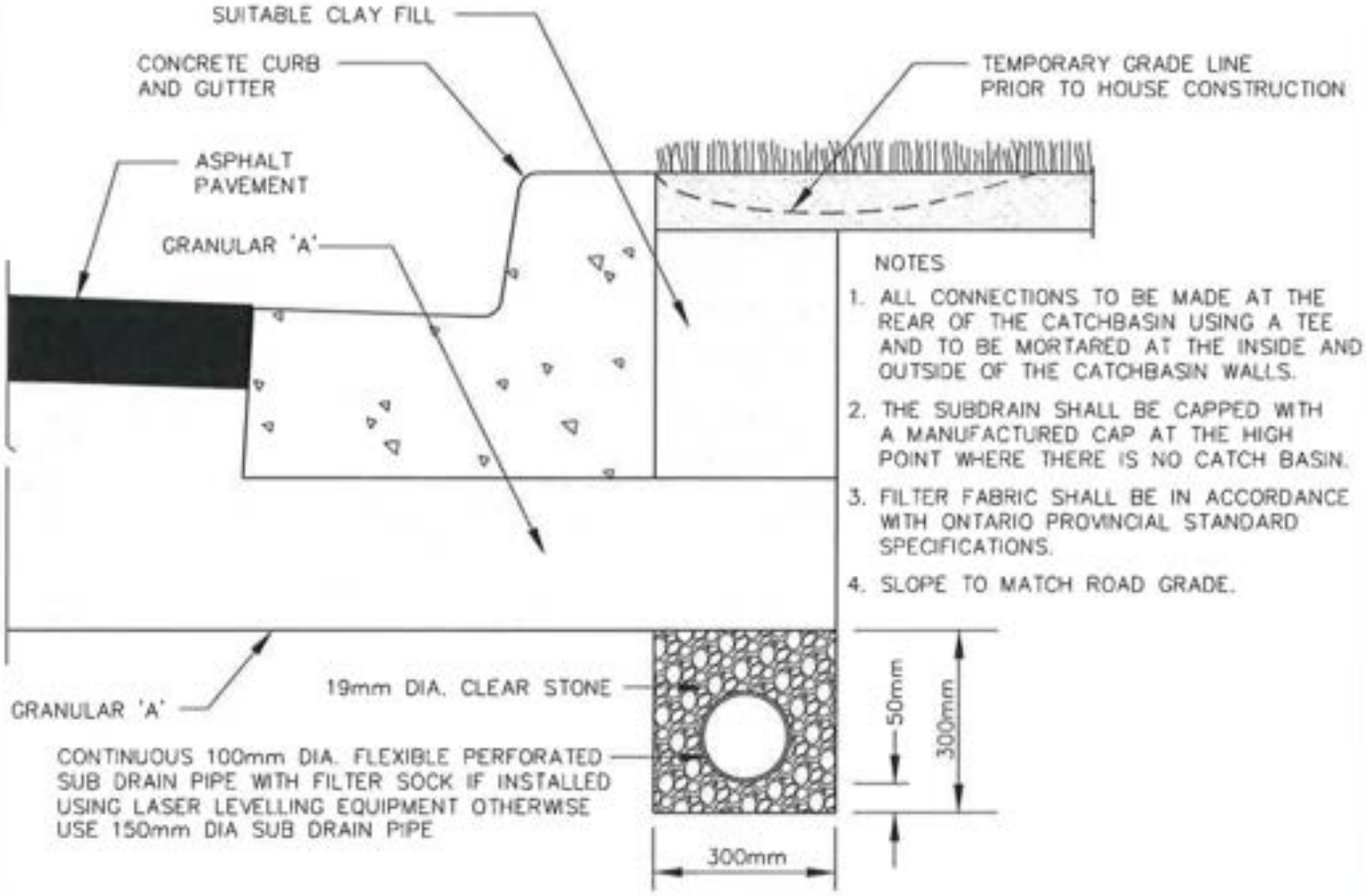
- The outlet flow rate will be influenced by the water level within the stormwater management facility. The pump station is equipped with a constant flow rate pump and an overflow pipe. The pump will discharge a constant flow rate of 47.3 L/s to an elevation of 193.048m. When the water level of the facility has reached 193.048 the runoff will begin to discharge through the overflow pipe as well as the pump. The flow rate through the overflow pipe will increase as the water level of the facility increases. The combined flow rate will remain less then the allowable discharge of 134 L/s (LaFontaine, Cowie, Burrato, 1983).

- The quantity bay of the facility provides a maximized flow path for runoff which exceeds the quality volume. This is achieved by the placement of a mid-pond berm directing flow from around the perimeter of the facility towards the outlet structure.

4.4 OTHER REQUIREMENTS

To assure proper functioning of the stormwater management facility after construction, a schedule of regular bi-monthly inspections will be carried out by the owner for a period of at least one year or until assumption of services by the Town of Essex.

In addition, inspections will also be carried out following every significant storm (greater than 1 in 2 year event). The inspection observations will be entered in a log book available for review by approving authorities upon request. Each inspection will review the quantities of sediment accumulated, impairments, erosion and improvement requirements.



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0 10m

N.T.S.

Galos Property Residential Development
Stormwater Management Report
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FIGURE 4.1
Perforated Subdrain Detail
N.T.S.

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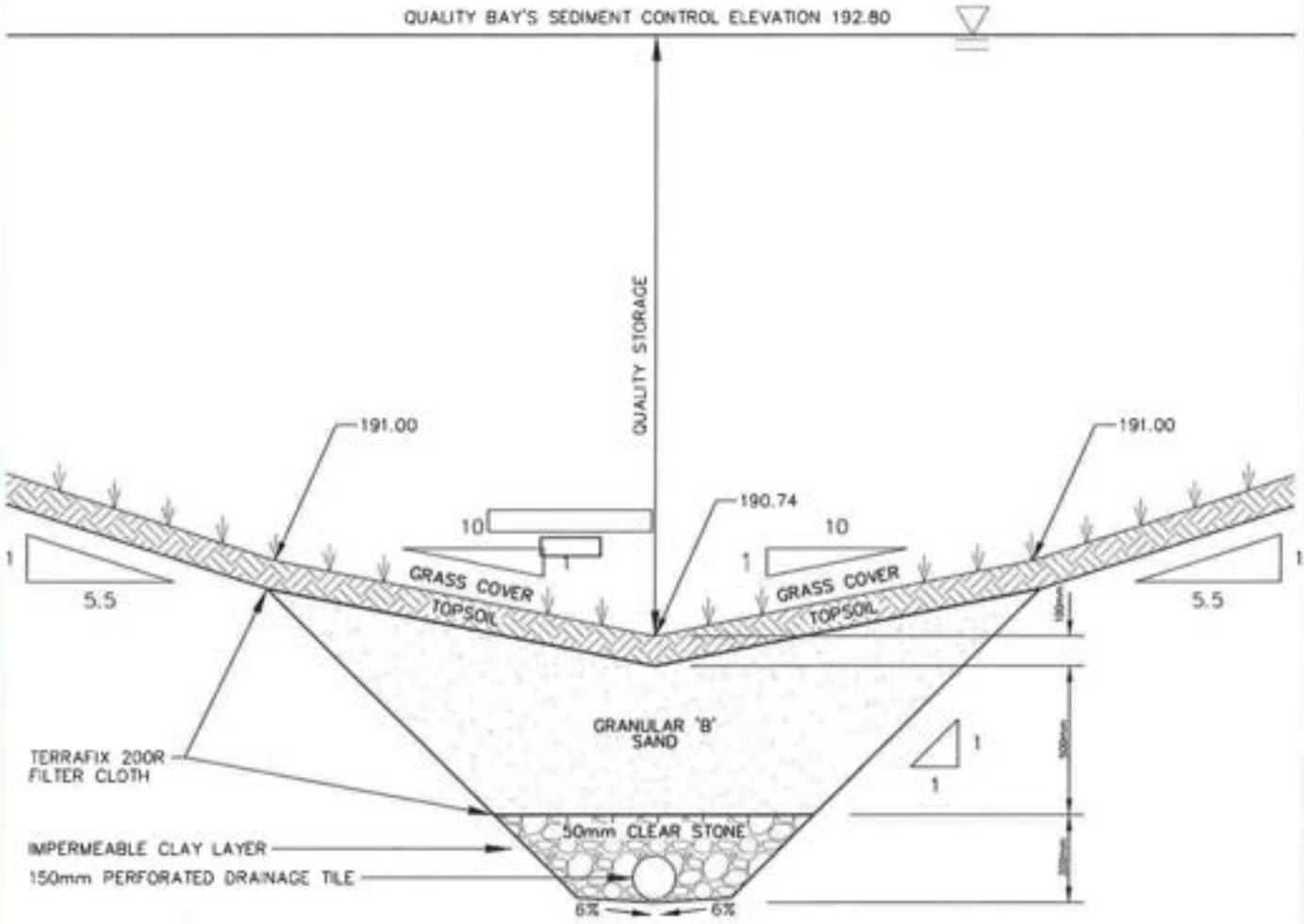

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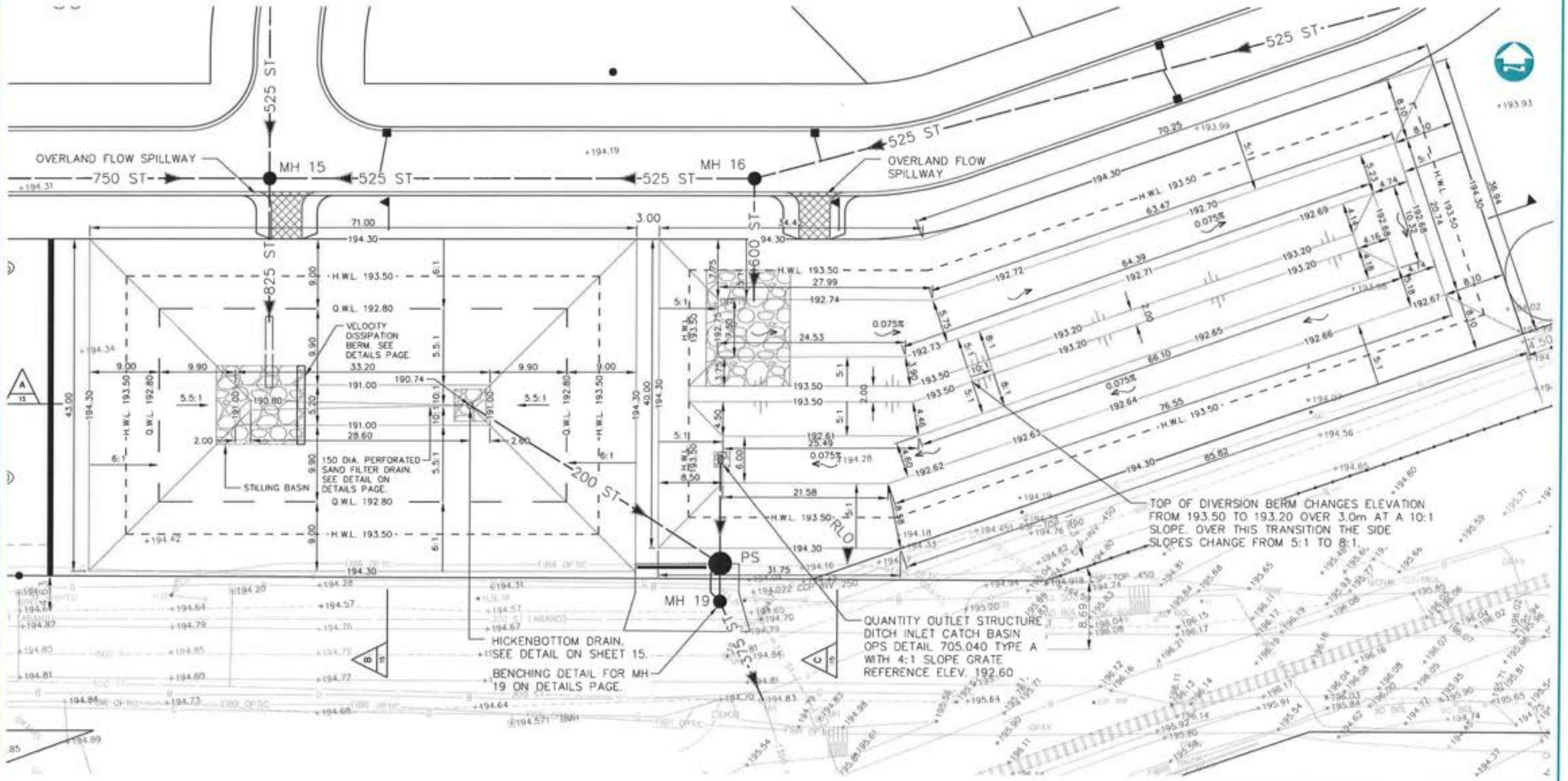
in the Town of Essex

FIGURE 4.2
Sand Filter Cross Section
N.T.S.



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June 2006
Project No. 03-2064-2000

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Stormwater Management Report
in the Town of Essex

FIGURE 4.3
Stormwater Management Facility Plan

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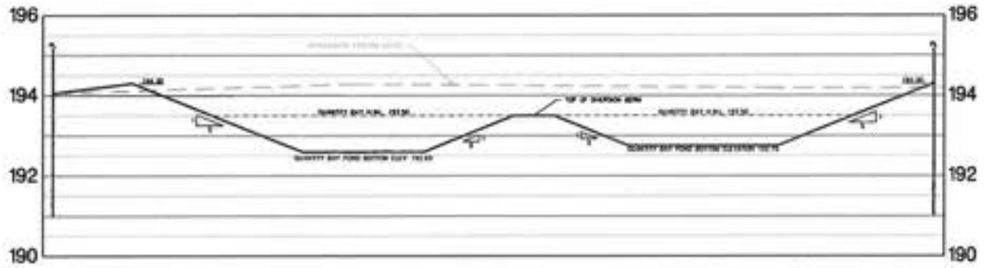
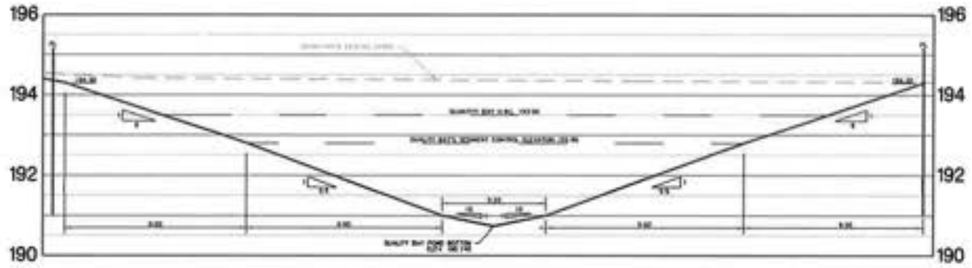


SECTION C

SCALE: 1:300 HORIZONTAL
1:150 VERTICAL



SECTION B

SCALE: 1:300 HORIZONTAL
1:150 VERTICAL

SECTION THRU POND

SCALE: 1:300 HORIZONTAL
1:150 VERTICAL

SECTION THRU POND

SCALE: 1:300 HORIZONTAL
1:150 VERTICAL

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June 2006
Project No. 03-2064-2000

Galos Property Residential Development
Stormwater Management Report
in the Town of Essex

FIGURE 4.4
Stormwater Management Facility Cross Sections

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5.0 CONSTRUCTION PERIOD MEASURES

The traditional methods employed to install services in newly developed areas can create large quantities of suspended solids which, if transported uninterrupted to drainage outlets, can impair the quality of existing water courses and receiving waters. To minimize the potential for impairment of the quality of receiving waters during construction, a comprehensive erosion abatement control plan will be implemented during construction. The plan will consist of the following:

i) Prior to commencing with the subdivision construction, shallow swales with sediment traps formed by rock or straw bale barriers will be cut to take the surface runoff from the entire disturbed area to the stormwater management facility or to the existing storm drainage system.

ii) Topsoil will be stripped only from the right-of-way areas necessary for installation of services and construction of roads.

iii) The sumps in all of the storm manholes (minimum 300 mm deep to a maximum 450 mm deep) will catch the initial sediment runoff.

iv) The catchbasins will be protected with filter cloth during construction to partially block sediment from reaching the stormwater management facility. The accumulated sediment will be periodically removed from the roads.

v) The quantity of sediment accumulated in the stormwater management facility during subdivision construction will be evaluated and, if required, the sediment will be removed.

vi) Construction/development staging allows control of the following elements of design:

- Sediment control for road right of way during construction grading procedures
- Sediment control for interim major flow routes
- Minimized disturbance of vegetated soils until final grading is required
- Existing vegetated buffers left in place until final grading
- Development of sediment/erosion control plan during detailed design.

6.0 STORMWATER MANAGEMENT FACILITY AESTHETICS

To provide an aesthetically pleasing natural appearance, the following measures will be undertaken in cooperation with the Essex Region Conservation Authority:

- The berm along the north side of the stormwater management facility will be planted with a low growth grass mixture and native tree species.
- The side slopes and bottom of the stormwater facility will be seeded with a low growth grass mixture.

7.0 SUMMARY

To satisfy the requirements of stormwater management for this subdivision, it is proposed to implement qualitative protection measures, to protect the quality of surface and groundwater resources.

i) Construction Period Runoff Quality Protection

- Surface runoff filtration and solids retention by screens and barriers in drainage swales and sedimentation in the stormwater management facility.
- Maintenance of vegetative cover where possible.
- Temporary grade depression behind the back of curb to provide overland flow over grassed areas.
- Silt intercepting screens to be installed in catchbasins to retain suspended solids.

ii) On-Site Controls

- Following construction of houses, side yard and back of each lot to be graded towards a catchbasin in a depression in the rear yard.
- Roof downspouts to discharge directly on the ground.

iii) Conveyance System Controls

- Sumps in manholes and catchbasins will retain large solid particles carried by surface runoff.
- Roadside catchbasins will be equipped with goss-gully traps to separate oil, grease and floatables from entering the sewer system.
- Subdrains along the road (outside the pavement) will collect and convey runoff from the boulevard and road subgrades.

iv) End-of-Pipe Controls

- The proposed stormwater management facility will provide runoff quality control as outlined by the Ministry of Environment.

v) Limitations

- Due to the limited thickness of the pervious soil layer, implementation of methods and devices relying on the infiltration and/or exfiltration of groundwater through perforations and filters is not feasible at this location.

Robert Molliconi, P. Eng.
Project Manager

APPENDIX A

STORAGE VOLUME CALCULATIONS

APPENDIX A

STORAGE VOLUME CALCULATIONS

Site Area: 11.70 ha
Average: Gradient 0.24%, 0.13%

Time/Concentration → Using Airport Drainage Method

T_{c1} = $3.26 [(1.1 - 0.20) (310)^{1/2}/(0.24)^{1/3}]$
= 83.13 minutes

T_{c2} = $3.26 [(1.1 - 0.20) (195)^{1/2}/(0.13)^{1/3}]$
= 80.88 minutes

Total T_C = Tc = <u>164.01</u> minutes

2 Year Rainfall Intensity, i = $889.764/(T_c + 6.758)^{+0.811}$
= $889.764/(163.06 + 6.758)^{+0.811}$
= <u>13.83</u> mm/hr

$Q_{PRE\text{-}DEV}$ = 0.0028 CiA (2 Year)
= 0.0028 x 0.20 x 13.83 mm/hr x 11.7 ha
= <u>0.090</u> m^3/s

Q_{POST} = 0.0028 CiA (100 Year)
= 0.0028 x 0.4 x $4981.156/(27.12 \text{ min.} + 15.061)^{+0.996}$ x 11.7 ha
= <u>1.56</u> m^3/s

Using Table 3.2 from the MOE Stormwater Management & Design Manual and interpolating between 35% and 55% impervious for a Dry Pond. It was found that a required pond storage of 1230 m^3 is needed.

$$\frac{(x - 90)}{(0.4 - 0.35)} = \frac{(150 - 90)}{(0.55 - 0.35)}$$

$$x = 105 \text{ m}^3/\text{ha}$$

Therefore the quality storage volume of the pond has to be equal or greater than:

$$11.7 \text{ ha} \times 105 \text{ m}^3/\text{ha} = 1230 \text{ m}^3$$

Orifice Plate

Required discharge rate

$Q = 9.65$ L/s or 0.00965 m^3/s

$A = Q / C_d \times (2 \times g \times HW)^{0.5}$

$A = 0.00965$ m^3/s / $(0.61 \times (2 \times 9.81$ m/s/s $\times 2.06)^{0.5})$

$A = 0.00249$ m^2

$D = 0.056$ m or 56 mm

A 56 mm orifice is smaller than the recommended minimum (MOEE SWMP), additional protection from clogging provided by perforated CSP riser, rip rap and filter cloth.

Stormwater Management Pond

Site Conditions: Clayey Silt Soil

Pre-Developed Area = 11.7 ha

Stormwater Management Pond Site Area → 0.631 ha Gross

∴ Net Post-Development Area → (11.07 ha)

Storage Volume Required for 100 Yr Rainfall Event

V = 5,110 m^3 → **Assumes no release.**

V = 2,910 m^3 → **With pre-developed release.**

Quality Pond: Volume @ Quality HWL Elevation of 192.80

V = 1,251 m^3

Quantity Pond: Volume @ Quantity HWL Elevation of 193.50

V = 1,711 m^3

Total V = 2,962 m^3

Quality Pond: Stage-Storage

Water Depth (m)	Surface Area (sq m)	Quality Storage Volume (cu m)
0.00	35.04	0.00
0.10	99.84	7.26
0.20	172.64	20.81
0.30	216.09	40.23
0.40	261.96	64.11
0.50	310.25	92.70
0.60	360.96	126.24
0.70	414.09	164.98
0.80	469.64	209.14
0.90	527.61	258.99
1.00	588.00	314.75
1.10	650.81	376.67
1.20	716.04	444.99
1.30	783.69	519.95
1.40	853.76	601.81
1.50	926.25	690.79
1.60	1001.16	787.14
1.70	1078.49	891.80
1.80	1158.24	1002.92
1.90	1240.41	1122.83
2.00	1325.00	1251.08

Quantity Pond: Stage-Storage

Water Depth (m)	Surface Area (sq m)	Quality Storage Volume (cu m)
0.05	1281.08	60.98
0.20	1405.21	128.11
0.30	1650.70	280.85
0.40	1897.66	458.26
0.50	2145.06	660.40
0.60	2495.66	887.29
0.70	2661.82	1145.12
0.80	2830.38	1420.04
0.90	3000.85	1711.70

Inlet Sediment Forebay (Quality Pond)

Peak Outflow Rate: Q_p = 0.00965 m^3/s

Inlet Forebay Geometry: Width = 26.0 m
Length = 54.0 m

Dist = $(r \times Q_p / V_s)^{1/2}$

Where:
- Dist = Forebay Length (m)
- r = Length to width ratio of forebay
- Q_p = Peak flow rate from pond during the design storm (m^3/s)
- V_s = Settling velocity (m/s).

$$V_s = \frac{2.08 \times 0.00965}{(54)^2}$$
$$= 6.88 \times 10^{-7} \text{ m/s}$$

Average Settling Velocity = 0.02478 m/hr

MOEE (1994) Urban Stormwater Settling Velocities

Size Fraction	% of Particle Mass in Urban Runoff	% of Particle Mass in Brookston Clay	Average Settling Velocity (m/hr)
< 20 um	20	64	0.00914
20-40 um	10	5	0.04680
40-60 um	10	4	0.09140
60 um - 0.13 mm	20	4	0.45700
0.13 - 0.40 mm	20	16	2.134
> 0.40 mm	20	7	19.812

Based on an average settling velocity of 0.02478 m/hr we can expect approximately 80% of the particle mass of typical urban runoff to settle within the quality bay of the stormwater management pond.

The pre-development site consists of semi-vegetated Brookston Clay soil. Brookston Clay is made up of significantly higher percentages of fine particle mass. If the post-development site consisted of exposed Broookston clay soil we might expect approximately 39.5% of particle mass to settle withing the quality bay.

Given the pre-development site conditions it appears as though it is actually beneficial for the receiving watercourse to accept treated stormwater runoff from the urban development.

Project No.: 03-2064-2000
Designed By: KNE
Date: 05-Jun-06

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ON-SITE STORMWATER DETENTION CALCULATIONS
GALOS RESIDENTIAL DEVLEOPMENT

A. Background Information:

Site Area:	117000 sq. m	=	11.7 ha

B. Pre-development Conditions:

- Vacant field with an existing drain development to the west

C. Proposed Site Conditions:

	117000 sq. m	=	11.7 ha

D. Runoff Coefficents:

EXISTING:	C_{pre} =	0.20
PROPOSED:	C_{dev} =	0.40

E. Pre-development (Allowable) Discharge for 1:2 Year (AES) Frequency Storm:

Average Runoff Coefficient, C C_{pre} = 0.20

$Q_{pre} = 2.78CiA$

$6.51 * i$ L/s

Time of Concentration = 164.0 min. ***(Airport Drainage Method)***
Intensity, i = 13.8 mm/hr

Where Intensity, $i = 889.764 / (t + 6.758)^{0.811}$, based on a 1:2 year frequency storm for the Windsor (AES) 1:5 year frequency storm

$\mathbf{Q_{pre}}$ = $6.51 * i$ L/s
89.55 L/s

F. Post Development Discharge for 1:2 Year (AES) Frequency Storm:

Average Runoff Coefficient, C C_{dev} = 0.40

$Q_{dev} = 2.78CiA$

$13.01 * i$ L/s

Time of Concentration = 27.1 min.
Intensity, i = 51.1 mm/hr

Where Intensity, $i = 889.764 / (t + 6.758)^{0.811}$, based on a 1:2 year frequency storm for the Windsor (AES) 1:5 year frequency storm

$\mathbf{Q_{dev}}$ = $51.11 * i$ L/s
664.97 L/s

G. Storm Volume Calculations for 1:5 Year Frequency Storm

Duration (min), t	Intensity* (mm/hr), i	$Q_d = 2.78CiA$ (L/s)**	Storm Volume (m^3) $V_1 = Q_d$*t*60	Release Volume*** (m^3) $V_2 = Q_u$*t*60**	Storage Volume (m^3) $V_1 - V_2$
0	188.93	0.00	0.00	0.00	0.00
10	90.45	433.94	260.37	53.73	206.63
15	73.19	526.69	474.02	80.60	393.43
20	61.89	593.80	712.56	107.46	605.10
25	53.86	700.75	1051.12	134.33	916.80
30	47.84	622.39	1120.31	161.19	959.12
35	43.14	561.24	1178.60	188.06	990.54
40	39.36	512.05	1228.92	214.92	1014.00
45	36.24	471.55	1273.19	241.79	1031.40
50	33.63	437.57	1312.72	268.66	1044.06
55	31.41	408.61	1348.43	295.52	1052.91
60	29.49	383.61	1381.01	322.39	1058.62
65	27.81	361.79	1410.97	349.25	1061.72
70	26.33	342.55	1438.73	376.12	1062.61 ****
75	25.02	325.46	1464.59	402.98	1061.61
80	23.84	310.17	1488.80	429.85	1058.96
85	22.78	296.39	1511.58	456.71	1054.87
90	21.82	283.91	1533.09	483.58	1049.51
95	20.95	272.54	1553.47	510.45	1043.02
100	20.15	262.14	1572.84	537.31	1035.53
105	19.41	252.59	1591.30	564.18	1027.12
110	18.74	243.78	1608.94	591.04	1017.90
115	18.11	235.63	1625.83	617.91	1007.93
120	17.53	228.06	1642.04	644.77	997.27

*Where Intensity, $i = 889.764 / (t + 6.758)^{0.811}$, based on a 1:2 year frequency storm
**Where Q_d is reducded by (t / t_c) for the time t = 0 to $t = t_c$
***Q_{pre} = 10.00 L/s Quality Bay Release Rate
****Max Volume to be Stored = **1062.61 m^3** 1:2 Year Storm Event
41908 ft^3

E. Pre-development Discharge for 1:100 Year (AES) Frequency Storm:
Average Runoff Coefficient, C C_{pre} = 0.20

$Q_{pre} = 2.78CiA$
6.51 *i L/s

Time of Concentration = 164.0 min. ***(Airport Drainage Method)***
Intensity, i = 28.4 mm/hr

Where Intensity, $i = 4981.156 / (t + 15.061)^{0.996}$, based on a 1:100 year frequency storm for the Windsor (AES) 1:100 year frequency storm

Q_{pre} = 6.51 *i L/s
184.76 L/s

F. Post Development Discharge for 1:100 Year (AES) Frequency Storm:

Average Runoff Coefficient, C C_{dev} = 0.40

$Q_{dev} = 2.78CiA$

13.01 *i L/s

Time of Concentration = 27.1 min.

Intensity, i = 119.9 mm/hr

Where Intensity, $i = 4981.156 / (t + 15.061)^{0.996}$, based on a 1:100 year frequency storm for the Windsor (AES) 1:100 year frequency storm

Q_{dev} = 13.01 *i L/s

1559.57 L/s

G. Storm Volume Calculations for 1:100 Year Frequency Storm

Duration (min), t	Intensity* (mm/hr), i	$Q_d = 2.78CiA$ (L/s)**	Storm Volume (m^3) $V_1 = Q_d$*t*60	Release Volume*** (m^3) $V_2 = Q_u$*t*60**	Storage Volume (m^3) $V_1 - V_2$
0	334.34	0.00	0.00	0.00	0.00
10	201.34	965.89	579.54	6.00	573.54
15	167.97	1208.73	1087.86	9.00	1078.86
20	144.11	1382.66	1659.19	22.65	1636.54
25	126.19	1641.76	2462.64	37.80	2424.84
30	112.24	1460.28	2628.50	54.45	2574.05
35	101.07	1314.98	2761.46	72.60	2688.86
40	91.93	1196.02	2870.46	92.25	2778.21
45	84.30	1096.84	2961.46	113.40	2848.06
50	77.85	1012.87	3038.61	136.05	2902.56
55	72.32	940.86	3104.85	160.20	2944.65
60	67.52	878.43	3162.35	185.85	2976.50
65	63.32	823.78	3212.76	213.00	2999.76
70	59.61	775.55	3257.31	241.65	3015.66
75	56.31	732.66	3296.97	271.80	3025.17
80	53.36	694.27	3332.51	303.45	3029.06 ****
85	50.71	659.72	3364.55	336.60	3027.95
90	48.30	628.44	3393.59	371.25	3022.34
95	46.12	600.00	3420.02	407.40	3012.62
100	44.12	574.03	3444.19	445.05	2999.14
105	42.29	550.22	3466.39	484.20	2982.19
110	40.61	528.31	3486.83	516.30	2970.53
115	39.05	508.08	3505.74	543.00	2962.74
120	37.61	489.34	3523.27	569.70	2953.57

*Where Intensity, $i = 4981.156 / (t + 15.061)^{0.996}$, based on a 1:100 year frequency storm

**Where Q_d is reducded by (t / t_c) for the time $t = 0$ to $t = t_c$

***Q_{pre} ranges from 10 L/s to 130 L/s

****Max Volume to be Stored = **3029.06 m^3** 1:100 Year Storm Event

41908 ft^3

GALOS RESIDENTIAL DEVELOPMENT
STORMWATER MANAGEMENT FACILITY
03-2064-2000

COMBINED DISCHARGE FLOWRATE FROM PUMPING STATION

n =	0.013
slope =	0.001

Water Depth (m) [1]	Overflow Pipe Diameter (mm)	Theta (rads)	Area (m^2)	Wetted Perimeter (m)	Hydraulic Radius (m)	Water Level	Flowrate (m^3/s)	Flowrate (l/s)	Combined Flowrate (l/s) [2]
0.00	0.300	0.00	0.00	0.00	-	0.000	-	-	-
0.05	0.300	1.68	0.01	0.25	0.03	0.050	0.00	1.85	49.15
0.10	0.300	2.46	0.02	0.37	0.06	0.100	0.01	7.33	54.63
0.15	0.300	3.14	0.04	0.47	0.08	0.150	0.02	15.29	62.59
0.20	0.300	3.82	0.05	0.57	0.09	0.200	0.02	23.97	71.27
0.25	0.300	4.60	0.06	0.69	0.09	0.250	0.03	31.02	78.32
0.30	0.300	6.28	0.07	0.94	0.08	0.300	0.03	30.58	77.88
0.35	0.300	6.28	0.07	0.94	0.08	0.350	0.04	42.71	90.01
0.40	0.300	6.28	0.07	0.94	0.08	0.400	0.06	60.40	107.70
0.45	0.300	6.28	0.07	0.94	0.08	0.450	0.07	73.97	121.27
0.50	0.300	6.28	0.07	0.94	0.08	0.500	0.09	85.41	132.71

Notes:

(1) Water depth is measured from the invert of the overflow pipe (193.043)

(2) Combined flow rate is a the sum of the overflow pipe rate and the constant pump rate of 47.3 L/s

APPENDIX B

STORM SEWER CALCULATION SHEET

GALOS SUBDIVISION
STORM SEWER DESIGN SHEET

Project Name: Galos Subdivision
Project Number: 03-2064-2000

Intensity Option # 1

1) Intensity (i) = a/(t+b)^c 2) Intensity (i) = a*t^b 3) Insert Intensity

Based on 1:5 Year Storm Event
Town of Essex

a= 3175.000
b= 20.000
c= 1.000

a=
b=

i=

Total Area (ha)= 10.5576 Outlet Invert Elevation= 191.250 Ground Elevation @ Outlet = 194.30 High Water Level at Outlet= 193.50

Location			Area (ha)	Run. Coef.	2.78AC	Accum. 2.78AC	T of In (min)	T of F (min)	T of Conc. (min)	Intensity (mm/hr)	Exp. Flow (L/s)	Sewer Design / Profile: Capacity (L/s)	Velocity (m/s)	Wall Thickness (mm)	Length (m)	Pipe Dia. (mm)	Slope (%)	Invert Up MH	Invert Low MH	Fall (m)	Drop Across Low MH	Cover: Ground Elev Up MH	Cover @ Up MH (m)	Cover @ Low MH (m)	Hydraulic Grade Line: HGL Elevation at Upstream MH	HGL Elev vs. Grnd Elev @ Up MH	HGL Elev vs. Obvert @ Up MH
Road /Stations	From MH	To MH																									
Townsview	1	2	0.31	0.40	0.34	0.34	20.0	0.60	20.00	79.38	**27.36**	**53.84**	0.76	9	27.6	300	0.31	192.943	192.857	0.09	0.075	194.740	1.49	1.61	194.59	Check HGL Elev	Okay
Street 'B'	3	2	0.46	0.40	0.51	0.51	20.0	1.51	20.00	79.38	**40.60**	**53.84**	0.76	9	66.9	300	0.31	193.071	192.857	0.21	0.075	194.760	1.38	1.61	194.69	Check HGL Elev	Okay
Townsview	2	5	0.54	0.40	0.60	1.46		1.55	21.51	76.49	**111.43**	**112.27**	1.02	11	94.8	375	0.41	192.782	192.394	0.39	0.150	194.780	1.61	1.57	194.56	Okay	Okay
Street 'B'	3	4	0.72	0.40	0.80	0.80	20.0	1.99	20.00	79.38	**63.55**	**87.67**	0.79	11	94.6	375	0.25	192.749	192.512	0.24	0.075	194.760	1.63	1.54	194.42	Okay	Okay
Street 'B'	4	5	0.59	0.40	0.66	1.46		1.72	21.99	75.62	**110.16**	**114.04**	0.72	64	74.1	450	0.16	192.437	192.319	0.12	0.075	194.440	1.49	1.52	194.29	Check HGL Elev	Okay
Townsview	5	6	0.52	0.40	0.58	3.49		1.38	23.71	72.64	**253.64**	**254.43**	1.18	70	97.1	525	0.35	192.244	191.904	0.34	0.225	194.350	1.51	2.03	194.18	Check HGL Elev	Okay
Townsview	10	9	0.46	0.40	0.51	0.51	20.0	1.89	20.00	79.38	**40.60**	**53.84**	0.76	9	86.5	300	0.31	192.601	192.333	0.27	0.150	194.440	1.53	1.46	194.18	Okay	Okay
Townsview	9	8	0.90	0.40	1.00	1.51		1.90	21.89	75.79	**114.62**	**120.96**	0.76	64	86.5	450	0.18	192.183	192.027	0.16	0.000	194.100	1.40	1.91	194.03	Check HGL Elev	Okay
Townsview	8	6	0.08	0.40	0.09	1.60		0.59	23.79	72.51	**116.11**	**120.96**	0.76	64	26.8	450	0.18	192.027	191.979	0.05	0.300	194.450	1.91	2.04	193.89	Okay	Okay
Galos Drive	6	7	0.89	0.40	0.99	6.08		1.79	25.09	70.42	**428.35**	**431.17**	0.98	108	104.9	750	0.15	191.679	191.522	0.16	0.000	194.530	1.99	2.07	193.84	Okay	Okay
Street 'A'	7	15	0.14	0.40	0.16	6.24		1.50	26.88	67.73	**422.52**	**431.17**	0.98	108	87.6	750	0.15	191.522	191.390	0.13	0.075	194.450	2.07	2.00	193.69	Okay	Okay
Townsview	11	10	0.25	0.40	0.31	0.31	20.0	0.91	20.00	79.38	**24.71**	**53.84**	0.76	9	41.4	300	0.31	192.623	192.495	0.13	0.075	194.600	1.67	1.64	194.23	Okay	Okay
Street 'A'	10	12	0.72	0.40	0.80	1.11		1.96	20.91	77.62	**86.31**	**87.67**	0.79	11	93.4	375	0.25	192.420	192.186	0.23	0.075	194.440	1.63	2.06	194.20	Okay	Okay
Street 'C'	12	13	0.45	0.40	0.50	1.61		1.97	22.87	74.07	**119.42**	**120.96**	0.76	64	89.8	450	0.18	192.111	191.950	0.16	0.075	194.630	2.00	1.84	193.97	Okay	Okay
Street 'C'	13	14	1.01	0.40	1.12	2.74		1.64	24.83	70.82	**193.72**	**197.08**	0.91	76	89.8	525	0.21	191.875	191.686	0.19	0.000	194.300	1.82	2.11	193.81	Okay	Okay
Street 'C'	14	15	0.11	0.40	0.12	2.86		0.62	26.48	68.31	**195.22**	**197.08**	0.91	76	33.8	525	0.21	191.686	191.615	0.07	0.300	194.400	2.11	2.03	193.83	Okay	Okay
Street 'A'	12	18	0.97	0.40	1.08	1.08	20.0	2.38	20.00	79.38	**85.62**	**87.67**	0.79	11	113.3	375	0.25	192.554	192.271	0.28	0.075	194.630	1.69	1.84	194.32	Okay	Okay
Street 'A'	18	17	0.83	0.40	0.92	2.00		1.40	22.38	74.92	**149.76**	**150.86**	0.95	64	79.7	450	0.28	192.196	191.973	0.22	0.075	194.500	1.79	1.83	194.05	Okay	Okay
Street 'A'	16	15	0.17	0.40	0.19	2.64		1.22	25.57	69.67	**184.21**	**187.46**	0.87	76	63.2	525	0.19	191.735	191.615	0.12	0.300	194.250	1.91	2.03	193.68	Okay	Okay
	15	Quality		0.40		11.74		0.25	26.37	65.64	**770.57**	**786.22**	1.47	121	21.7	825	0.30	191.315	191.250	0.07	0.000	194.250	1.99	2.10	193.56	Okay	Okay
	16	Quantity		0.40				0.16				**336.31**	1.19	76	10.5	600	0.30	192.782	192.750	0.03	1.500	194.250	0.79	-193.43	#VALUE!	#VALUE!	#VALUE!
Street 'A'	17	16	0.41	0.40	0.46	2.45		1.79	23.78	72.52	**178.03**	**182.46**	0.84	76	90.5	525	0.18	191.898	191.735	0.16	0.000	194.320	1.82	1.91	193.83	Okay	Okay

CANAAN DRAIN REGIONAL STORM QUALITY POND

TOWN OF ESSEX

N. J. PERALTA ENGINEERING LTD.
Consulting Engineers
45 Division St. N., Kingsville, Ontario N9Y 1E1
Tel. (519) 733-6587

Project No: D-01-001

January 29th, 2001

Mayor and Municipal Council
Corporation of the Town of Essex
33 Talbot Street South
ESSEX, Ontario
N8M 1A8

Mayor Flood and Members of Council:

SUBJECT: CANAAN DRAIN REGIONAL STORM QUALITY POND
Town of Essex, County of Essex
Project No. D-01-001

I. INTRODUCTION

In accordance with instructions provided by you at your January 8th, 2001 meeting and confirmed by letter of January 11th, 2001 from your Clerk, Mr. Jerry Marion, we have prepared the following report. This report provides for improvement of the Canaan Drain near its' upper end just west of King's Highway No. 3 by the construction of a stormwater quality pond and appurtenances.

The Canaan Drain is an open municipal drain extending from its' upper end near the intersection of Fairview Avenue West and South Talbot Road within the former limits of the Town of Essex, southerly to a point where it turns westerly and passes under King's Highway No. 3; it then continues westerly along the blindline of Concession North of Malden Road to its' outlet in the Essex Outlet Drain at Mole Sideroad, all within the former Town of Essex and the former Township of Colchester North.

It is understood that this work is proceeding pursuant to Section 78 of the "Drainage Act, R.S.O. 1990, Chapter D.17". Based on the above, we have performed all of the necessary survey, investigations, etc. of the Canaan Drain Regional Storm Quality Pond and we report thereon as follows.

II. BACKGROUND

The Canaan Drain has been recently repaired and improved in accordance with an Engineer's Report dated January 19th, 1999 prepared by Mr. Don Joudrey, P.Eng. The drain acts as an outlet for the urban portion of the Town of Essex known as Ward 1. The Town is working with landowners in the urban portion of the watershed area of the Canaan Drain to allow for in-filling development. The Town and the Essex Region Conservation Authority have concerns with addressing Stormwater Management for this in-filling development. Discussions with Town Staff and the Essex Region Conservation Authority have established that a Regional Storm Quality Pond would best address the required Stormwater Management for these areas.

It is intended that the developers of these vacant urban lands bear the initial cost for the construction of a Regional Stormwater Management Facility, and then turn same over to the Town. It is expected that the Town may eventually expand the proposed Stormwater Management Facility to serve existing areas of the Town that are already developed and utilize the Canaan Drain as their outlet.

The proposed Regional Stormwater Management Facility avoids the need for several smaller facilities to serve each individual development proposal that may come forward. In this way the following drawbacks of smaller facilities are avoided including:

a) acceptance by the Town of the small land parcels and facility appurtenances
b) maintenance and upkeep by the Town
c) cleaning of the facilities
d) grass cutting and maintenance of the small land parcels
e) garbage pick up on the site
f) complaints and concerns that may be expressed by neighbours
g) aesthetics for the adjacent area

The need for a Stormwater Management facility and the preparation of this report was sparked by the Jakana Development which is generally located between Hanlan Street and Milne Street just north of Fairview Avenue West. The Jakana Development outlets through an existing storm sewer on Brien Avenue and South Talbot Road that discharges to the Canaan Drain. Although the development utilizes an existing storm sewer designed for its' use, the development was required to provide stormwater management particularly addressing the stormwater quality.

Since the Jakana Development utilizes an existing storm sewer designed to handle its' flows, increased flows downstream are not an issue for these lands. The storm sewer design for the development was checked to confirm that flooding from a 1:100 year storm event did not exceed 300mm (12") in depth on the roadways. This level of protection was achieved through in-pipe and on-site storage.

The Town and Conservation Authority are aware that there are other lands that will require stormwater management when they are developed and are using the same existing storm sewer outlet. This generally led to the development of the proposed Regional Storm Quality Pond proposal to serve all of these future development lands.

A previous development south of Fairview Avenue West and east of King's Highway No. 3 established a storm quality pond and management system just southeast of the Essex County Civic Centre located at Fairview Avenue West and South Talbot Road. This storm management facility has provided excellent results for storm discharge from that portion of the Town.

Based on this previous installation, it was established that a Regional type Storm Quality Pond would provide the following improvements downstream when installed near the upper end of a drain:

a) higher water quality
b) reduced sediment transport and silting in of downstream reaches

In consultation with the developer, Mr. Randy Russell, Town Staff, and the Essex Region Conservation Authority, several pond sites were considered. The sites considered included the following:

a) near the lagoon area at Highway 3 and Victoria Street
b) on the Jakana development site
c) on the northwest corner of the Essex County Civic Centre property
d) the selected location on Part of Lot 33, Concession North of Malden Road

The Developer and Town worked together to arrange for a site and construction of the facility in a cost effective manner. The site also allows for future expansion when required. The design requirements for the facility were carefully reviewed with the Essex Region Conservation Authority.

III. FIELD SURVEY AND DETAILED INVESTIGATIONS

We worked closely with the Developer, the Essex Region Conservation Authority and the Town to establish a site for the Pond. The Town confirmed, after checking with the Ontario Clean Water Agency, that the lagoon site was unacceptable to the operating authority as an alternative for the Stormwater Management Pond. Preliminary Designs and Estimates were then completed for the Jakana Development on-site and Essex County Civic Centre proposed locations. Work included some field survey to confirm details for the designs. The Jakana Development on-site location had all of the drawbacks previously noted above for smaller facilities. The proposal at the Essex County Civic Centre was found to be too costly.

As a result of discussions between the Town and the Developer, it was established that the Town would accept a pond site west of Highway No. 3 adjacent to the south side of the Canaan Drain on the Jeffery Shepley (470-00305) property. Arrangements were made for the required land purchase through co-operation between the Developer for the Jakana Development and the Town.

Once the site for the Regional Storm Quality Pond had been established, a thorough topographic field survey of the chosen site was completed. Preliminary plans and calculations were prepared and reviewed with the Essex Region Conservation Authority to ensure that the design requirements for stormwater quality were being met. It should be noted that a Ministry of Environment Certificate of Approval was given for the Jakana Development Phase 2 based on the fact that a regional stormwater management pond would be provided as part of the work, and that it would be designed in consultation with the Essex Region Conservation Authority.

Once the design parameters and approximate details had been established, we consulted with Town Administration and the Drainage Superintendent to establish the best procedure for implementation of the Storm Quality Pond as part of the municipal Canaan Drain. It was established that the Engineer's Report for the work should address:

a) incorporation of all pond elements as part of the drainage works to facilitate maintenance work
b) future excavation and material disposal from the pond and the adjacent portion of the Canaan Drain
c) impact on the existing access and work area for the drain
d) Town ownership of the pond property
e) an access easement in order to get to the site to carry out any construction or future maintenance to the pond
f) procedures for the future expansion of the pond including:
    i) all cost by proponent as negotiated with the Town
    ii) preparation of an Engineer's Report under the Drainage Act to outline the new limits of the expanded pond and incorporating same as part of the drainage system
g) allocation of maintenance costs in the future

IV. FINDINGS AND RECOMMENDATIONS

The selected site on Part of Lot 33, Concession North of Malden Road was acceptable to the Town, the Developer and the Essex Region Conservation Authority, and we recommend that same be used for the current work and future needs of the Town and the developments that outlet their water through the Canaan Drain. The Town has taken ownership of the property and we recommend that the Town be responsible for the upkeep and maintenance of the property in the future.

In order to keep the site accessible and to minimize the impact to the site, we recommend that all deleterious materials and excavated fill from new construction and future maintenance work be trucked away to a site to be obtained by the Contractor at his cost. This will keep the Storm Quality Pond site in a tidy condition and suitable for future maintenance access and expansion as the need arises.

The Storm Quality Pond and future expansions are to be designed for the first flush from the proposed development areas, comprising the first 6mm (1/4") of runoff from the affected areas, and shall use a 600mm (24") depth of storage with a detention time of 24 hours in the proposed Storm Quality Pond, unless otherwise established in the future by the governing authorities. The Pond as designed and shown on the Plans, forming part of this report, provides capacity for the full development of the Jakana Development Site comprising of approximately 117 lots between Hanlan Street and Milne Street.

We recommend that the Town establish with each Developer that outlets stormwater to the Canaan Drain, the extent of enlargement of the Pond required to address the stormwater quality volume for each new development proposal. We further recommend that the Town shall be responsible to establish the proper carrying out of the enlargement work and the preparation of an Engineer's Report under the Drainage Act to address the changes required to the Canaan Drain Regional Storm Quality Pond by each development proposal.

As only the lower 600mm of the Storm Quality Pond is designed to address the storm quality volume and detention requirements for the proposed developments, we find that the upper portion will serve to provide off-line retention of excessive storm events. This will improve conditions within the drain both upstream and downstream and accordingly we recommend that the pond be made part of the municipal Canaan Drain. The pond operation and maintenance may then be carried out in accordance with the provisions of the Drainage Act and any Owner assessed to the Drain may put the Town on notice to maintain the system if they believe work is required on the Drain or the Storm Quality Pond and it's appurtenances.

To facilitate maintenance of the proposed pond, we recommend and have provided for a silt trap to be constructed as part of the Storm Quality Pond entrance. We further recommend that the Town carry out regular maintenance of the silt trap to remove accumulated materials to minimize maintenance work in the Pond bottom, so that the Pond continues to function as intended.

Calculations have been carried out on flows in the Canaan Drain and have been reviewed with the Essex Region Conservation Authority and provided to the Ministry of Transportation Ontario. Based on the calculations, we find that the construction of the proposed concrete weir will not significantly affect flows in the drain for storm events above the 1:2 year storm event. We recommend that the diversion weir as shown on the Plans be constructed within the drain to deflect the first flush into the Storm Quality Pond and that it be made part of the drainage works for the purposes of future maintenance and repair.

The construction of the diversion weir in the drain cross-section will impact low flows in the upstream portion of the drain and may affect the sedimentation in the upstream portions of the Canaan Drain. We recommend that the Town Staff and Road Authorities regularly monitor this portion of the Drain and take steps to maintain the Drain to its' design parameters, when necessary, in accordance with the provisions of the Drainage Act. Although there may be more frequent maintenance of the Canaan Drain, in the form of cleanouts upstream of the Storm Quality Pond, we expect that less work will be required downstream of the Pond. Accordingly, we recommend that the lands and roads upstream of the Storm Quality Pond continue to share the costs of maintenance for the portion of the Drain upstream of the Pond in the proportions as established in the January 19th, 1999 Canaan Drain Report prepared by Mr. Don Joudrey, P.Eng. We further recommend that these maintenance costs be shared by all of the lands and roads in Ward 1 of the Town of Essex and by the Ministry of Transportation for King's Highway No. 3, as set out in said report.

As part of the land purchase arrangements, the Town has included an access easement and this shall be the required access for all construction and future maintenance and expansion of the Storm Quality Pond. The access shall comprise of a strip of land 6.096 metres (20') in perpendicular width measured parallel to and adjacent to the east side of the west limit of Parcel 470-00305 owned by Jeffery Shepley, and along the north side of Parcel 470-004, extending from the Town lands adjacent to the southerly side of the Canaan Drain, southerly to Malden Road (County Road 12). We further recommend that whenever this access is used by the Town for future maintenance or expansion of the Pond, that it be restored to its' pre-access conditions to the full satisfaction of the Town Drainage Superintendent and the Landowner.

The current report for the Canaan Drain provides a 20 metre wide work and access area adjacent to the southerly side of the Drain; however, we recommend that when the portion of the Canaan Drain adjacent to the Town property and Storm Quality Pond in Lot 33 Concession North Malden Road is repaired or maintained in the future, all material along that portion of the Drain shall be hauled away and disposed of to a site to be obtained by the Contractor completing the repair or maintenance work. If the Pond Site or access is damaged in any way, we recommend that it shall be fully restored to its' pre-construction condition to the full satisfaction of the Drainage Superintendent or Engineer in charge of the work.

V. ALLOWANCES AND COMPENSATION

The Canaan Drain Regional Storm Quality Pond currently being constructed for the Jakana Development and all future expansions will be carried out on the Town lands purchased for the purpose. The nominal value included herein shall allow access to and use of the entire parcel site for any future construction or maintenance works required to the Storm Quality Pond or Canaan Drain. Compensation for the use of the land for future expansion of the Storm Quality Pond shall be negotiated between the Town and the Developer requiring same.

The Town and Developer for the Jakana Development have established a cost sharing for the work provided for in this report. No compensation provisions are required within this report for the work provided for within the plans forming part of this report, other than the nominal value provided herein to confirm the right to use the Town lands for the intended purpose.

An access easement to the site has already been established by the Town with the owner of Parcel 470-00305, Jeffery Shepley.

Accordingly, no compensation other than the nominal value provided herein is required under this report to provide for access to the site for work to be completed in accordance with the Plans forming part of this report, or for any future maintenance or expansion of the Storm Quality Pond.

We further find that each of the following owners are entitled to and should receive the following amounts as compensation for the value of the land to be taken for construction of the Storm Quality Pond and to serve as an access for construction and future maintenance of same, namely:

1)	Jeffery Shepley (470-00305),	Owner,	Pt. Lot 33, Concession North of Malden Road,	$ 1.00
2)	Town of Essex,	Owner,	Pt. Lot 33, Concession North of Malden Road,	$ 1.00
	TOTAL FOR LAND TAKEN			**$ 2.00**

We have provided for this in our estimate as is provided for under Section 29 of the "Drainage Act, R.S.O. 1990, Chapter D.17".

As it is intended that all excavation and disposal material be trucked away, and that the full access area is to be restored to its' pre-construction condition, there has been no provision made for damages under Section 30 of the "Drainage Act, R.S.O. 1990, Chapter D.17".

VI. ESTIMATE OF COST

Our estimate of the Total Cost of this work, including all incidental expenses, is the sum of **NINETY SEVEN THOUSAND NINE HUNDRED TWENTY EIGHT DOLLARS AND SIXTY CENTS ($97,928.60)**, made up as follows:

CONSTRUCTION

Item 1)	Construct pond area between existing grade and elevation 191.414 metres for a north-south bottom width of 30.0 metres including shaping of berms, excavation of sediment trap, all pond excavation, hauling and disposal, approximately 8,200 cubic metres @ $4.10 per cubic metre, complete.	$ 33,620.00
Item 2)	Construct overflow channel between the proposed pond and the Canaan Drain including all excavation, hauling and disposal, approximately 300 cubic metres @ $4.50 per cubic metre, complete.	$ 1,350.00
Item 3)	Supply and install quarried limestone on filter cloth erosion protection at pond inlet pipe from the Canaan Drain, inlet pipe to the pond, and concrete weir in the Canaan Drain, including all excavation, hauling, disposal and placing, complete.	
	a) approximately 128 tonnes of rip rap @ $28.00 per tonne.	$ 3,584.00
	b) approximately 239 square metres of Mirafi P150 filter cloth @ $1.35 per square metre.	$ 322.65

Item 4)	Supply and install quarried limestone on filter cloth erosion protection at pond outlet pipe to the Canaan Drain and the overflow channel to the Canaan Drain including all excavation, hauling, disposal and placing, complete.		
	a) approximately 104 tonnes quarried limestone rip rap @ $28.00 per tonne.		$ 2,912.00
	b) Approximately 187 square metres of Mirafi P150 filter cloth @ $1.35 per square metre.		$ 252.45
Item 5)	Supply and install 1,030mm span X 740mm rise, 2.0mm thick corrugated steel pipe arch, including all excavation, placing, granular bedding to springline, backfill and compaction, approximately 36 lineal metres @ $162.00 per lineal metre, complete.		$ 5,832.00
Item 6)	Supply and install 25 MPa concrete weir including 300mm thick X 900mm wide X 6,400mm long footing, 300mm wide X 1,205mm high X 6,400mm long wall with 15M reinforcing bar @ 300mm on centre, including all excavation, hauling, forming, placing, finishing, backfilling and compaction, complete.	Lump Sum	$ 3,500.00
Item 7)	Supply and install 150mm diameter HDPE perforated smooth wall pipe for pond outlet including, excavation, placing, backfill and compaction, approximately 2 lineal metres @ $100.00 per metre, complete.		$ 200.00
Item 8)	Supply and install 150mm diameter HDPE smooth wall pipe for pond outlet including excavation, placing, backfill and compaction, approximately 32.5 lineal metres @ $45.00 per metre, complete.		$ 1,462.50
Item 9)	Supply and install Hickenbottom outlet 1.0 metres high including fittings, connections, T-bar support post with stainless steel pipe clamps, excavation, backfill and compaction, complete.	Lump Sum	$ 1,000.00
Item 10)	Supply and place approximately 50mm thickness of black loam topsoil on all excavated and disturbed areas including harrowing and preparation for seeding and mulching in accordance with OPSS Form 570, approximately 490 cubic metres @ $4.00 per cubic metre, complete.		$ 1,960.00
Item 11)	Supply and place seed and mulch on all areas that have been disturbed and covered with topsoil in accordance with OPSS Form 572 approximately 6,908 square metres @ $1.00 per square metre, complete.		$ 6,908.00
	TOTAL FOR CONSTRUCTION		**$ 62,903.60**

INCIDENTALS

1)	Survey, Design, Tenders and Plans	$ 4,000.00
2)	Research and Preparation of Report	$ 1,000.00
3)	Assistants, Expenses, and Drawings	$ 700.00
4)	Duplication Cost of Report and Drawings	$ 200.00
5)	Estimated Cost of Layout and Periodic Inspections and Supervision during Construction	$ 2,000.00
6)	Estimated Net G.S.T. (3%) on Items Above	$ 2,123.00
7)	Estimated Land Acquistion Cost	$ 25,000.00
	TOTAL FOR INCIDENTALS	**$ 35,023.00**
	TOTAL FOR LAND TAKEN (brought forward)	**$ 2.00**
	TOTAL FOR CONSTRUCTION (brought forward)	**$ 62,903.60**
	TOTAL ESTIMATE	**$ 97,928.60**

VII. ASSESSMENT OF COSTS

All costs for construction of the works as provided for within the Plans forming part of this report shall be paid for by the Developer of the Jakana Development as established in the Developer's Agreement with the Town of Essex. Absolutely no cost shall be charged to the Canaan Drain for the work required to construct the Canaan Drain Regional Storm Quality Pond.

Likewise, any construction costs or drainage report costs for future expansion of the pond shall be borne by the Town of Essex or the Developer requiring the expansion of the Pond, and absolutely no costs shall be assessed to any part of the Canaan Drain for said works.

The Town of Essex has advised that under the Developer's Agreement, the Developer is responsible for all costs associated with addressing the Stormwater Management for the Development Proposal, and this will include the costs for the preparation of an Engineer's Report. Accordingly, all the incidental costs as outlined above for completion of the work and preparation of this report, shall be assessed completely to the Developer for the Jakana Development and no cost shall be assessed to the Canaan Drain.

VIII. FUTURE MAINTENANCE

All future repairs and maintenance of the Storm Quality Pond and appurtenances as constructed under this report including the deflection weir, inlet pipe, silt trap, outlet pipe, pond sideslopes and bottom, and all erosion protection shall only be assessed to all of the lands and roads within Ward 1 of the Town of Essex in the proportions as set out in the January 19th, 1999 Report on the Canaan Drain, prepared by Mr. Don Joudrey, P.Eng.

All future repairs and maintenance to the open portion of the Canaan Drain from the proposed Storm Quality Pond deflection weir upstream to the upper end of the drain at the southerly side of Fairview Avenue West shall only be assessed, in accordance with the provisions of the Drainage Act, to all of the lands and roads within Ward 1 of the Town of Essex and to the Ministry of Transportation for King's Highway No. 3, in the proportions as set out in the January 19th, 1999 Report on the Canaan Drain, prepared by Mr. Don Joudrey, P.Eng.

We recommend that the proportions of said charges for future maintenance shall remain as aforesaid until otherwise determined under the provisions of the "Drainage Act, R.S.O. 1990, Chapter D.17".

All of which is respectfully submitted.

N. J. PERALTA ENGINEERING LTD.

_____
Gerard Rood, P.Eng.

GR/lg

Att.

N. J. PERALTA ENGINEERING LTD.
Consulting Engineers
45 Division Street North
KINGSVILLE, Ontario
N9Y 1E1

SPECIFICATIONS

CANAAN DRAIN REGIONAL STORM QUALITY POND

TOWN OF ESSEX

I. GENERAL

The Canaan Drain comprises an open municipal drain located along the easterly side of King's Highway No. 3 extending from the south limit of Fairview Avenue West in the Town of Essex southerly to a point where it turns westerly and crosses under King's Highway No. 3. The Drain then proceeds in a westerly direction along the blindline of the Concession North of Malden Road to its' outlet in the Essex Outlet Drain at Mole Sideroad. The work under this Report comprises the installation of a Storm Quality Pond on Part of Lot 33, Concession North of Malden Road immediately west of King's Highway No. 3 and adjacent to the south side of the Canaan Drain. The Pond shall be of the size, type, depth, etc. as shown on the accompanying drawings, as determined from the Bench Marks and as may be further laid out at the site at the time of construction. The work shall comprise of all excavation, hauling and disposal of fill, installation of general erosion protection, pipes, tiles and concrete deflection weir, brushing and grubbing, (including disposal of rubbish, trees, and brush) seeding and mulching, control of silt and sedimentation, restoration, and other ancillary work to provide a complete and satisfactory job.

The Contractor will be required to implement stringent erosion and sedimentation controls during the course of the work to minimize the amount of silt and sediment being carried downstream into the Essex Outlet Drain and the Canard River. It is intended that work on this project be carried out in relatively dry conditions to ensure a minimum amount of sediment being transported and deposited into the downstream outlets. Further details of the silt and sediment control are specified in the following sections.

II. ACCESS TO WORK

The Contractor may utilize the full site area of the land owned by the Town of Essex for the purpose of constructing the Storm Quality Pond adjacent to the south side of the Canaan Drain. The Contractor shall have access to the site through a 6.0 metre (20') wide easement located through the Jeffery Shepley (470-00305) property. This access easement shall extend along the westerly limits of the parcel from Malden Road (County Road 12) northerly along the west limit of the Parcel including the north side of 470-004, to its' connection point with the lands owned by the Town of Essex adjacent to the south side of the Canaan Drain. For all of the above accesses, the Contractor will be required to maintain during construction, and restore after construction, all roadways, ditches, shoulders, municipal drains, laneways and accesses to their pre-construction condition. Said restoration shall include but not be limited to: loosening compacted cropland, necessary fill placement, grading and compaction, 50mm thick topsoil and seeding, and additional Granular "A" materials, where required. When requested by the Engineer, the Contractor shall provide dust control measures on driveways to reduce the dust nuisance to adjacent properties.

It is imperative that the Contractor protect as much vegetation as possible when accessing to the Drain through any non-cultivated areas with preservation of trees, bushes, and herbaceous vegetation being a primary concern.

The Contractor shall note that any deviation from the above mentioned accesses to the Canaan Drain Regional Storm Quality Pond, without the explicit approval by the landowner or the Town Drainage Superintendent or Engineer, could result in the Contractor being liable for damages sustained. The value of such damages shall be determined by the Engineer and the Town Drainage Superintendent and subsequently deducted from the Contract price.

III. REMOVAL OF BRUSH, TREES AND RUBBISH

Where there is any brush or rubbish in the course of the drain, including both side slopes of the drain, all such brush or rubbish shall be close cut and grubbed out. Where there is any brush or rubbish where the pond is to be excavated, or on that strip of land between the pond and the drain, all such brush or rubbish shall be close cut and grubbed out. The whole is to be burned or otherwise satisfactorily disposed of by the Contractor.

Brush and trees removed from the drain and banks thereof, and from the other areas, are to be put into piles by the Contractor, in locations where they can be safely burned, and are to be burned by him. If, in the opinion of the Municipal Drainage Superintendent, any of the piles are too wet or green to be burned, he will so advise the Contractor. The Contractor may then arrange to the Drainage Superintendent's satisfaction, an agreement in writing with the owners where the piles are located, for them to burn the material when dry enough. Prior to and during the course of burning operations, the Contractor shall comply with the guidelines prepared by the Air Quality Branch of the Ministry of the Environment, and shall ensure that the Environmental Protection Act is not violated.

IV. FENCING

Where it is necessary to take down any fence in order to proceed with the work, the same shall be done by the Contractor across or along that portion of the work where such fence is. The Contractor will be required to exercise extreme care in the removal of any fence so as to cause a minimum of damage to the same. The Contractor will be required to replace any fence that is taken down in order to proceed with the work and the fence shall be replaced in a neat and workmanlike manner. The Contractor will not be required to procure any new materials for rebuilding the fence provided he has used reasonable care in the removing and replacing of the same. Where any fence is removed by the Contractor, and the owner thereof deems it advisable and procures new material for replacing the fence so removed, the Contractor shall replace the fence using the new materials, and the materials from the present fence shall remain the property of the owner.

V. EXCAVATION

The pond shall be excavated to the lines, levels, grades and cross-sections as shown on the accompanying drawings, or as may be further established by the Municipal Drainage Superintendent or the Engineer at the time of the work. The pond shall be carefully excavated so as not to disturb the existing banks, rock protection and vegetation, except for those portions of the pond where widening or restoration of a stable drain bank configuration is required. The bottom width of the pond and the sideslopes of the excavation shall conform to the dimensions given on the drawings. In no case shall the pond bottom project above the grade line as shown on the accompanying drawings and as

determined from the Bench Mark. The finished sideslopes of the pond shall be 4 horizontal to 1 vertical, unless otherwise noted.

Prior to commencing excavation work, the Contractor shall arrange to meet on-site with the Municipal Drainage Superintendent to mark and accurately determine the number and location of any lateral and main tiles requiring repair.

The Contractor, when doing his excavation or any other portion of the work, shall be very careful not to interfere with, plug up or damage, any existing surface drains, swales and lateral or main tile ends. If it is found that said existing drains are interfered with in any way, the Contractor will be required to unplug or repair said drains immediately, at no extra cost to the project. If it is found that any existing lateral tiles or main tile drains or tile ends have been cut off or damaged in any way during the course of the work, the Contractor will be required to either repair or replace them. All work shall be completed to the full satisfaction of the Municipal Drainage Superintendent at no extra cost to the project.

All excavation material shall be hauled away by the Contractor and disposed of at a site to be obtained by the Contractor at his cost.

In all cases, the disposal of any trucked material will be the responsibility of the Contractor and any work at the disposal site shall be established between the Contractor and the site owner. The Contractor shall ensure that any permits required for fill disposal are obtained from the appropriate authority. The Contractor will be responsible for keeping all private and public roadways free and clear of mud and debris resulting from his use of same for access and hauling purposes.

VI. GENERAL EROSION PROTECTION

Once the excavation of the pond has been completed and all of the necessary pipes and appurtenances installed, the Contractor shall install the general erosion protection as shown on the Plans. The erosion protection shall be embedded into the sideslopes of the banks and have a minimum thickness of 300mm and shall be underlaid in all cases with a synthetic filter mat. The filter mat shall not only be laid along the flat portion of the rock protection, but also contoured to the exterior limits between the quarried limestone and the unprotected slope areas. The Contractor in placing the erosion protection, shall carefully tamp quarried limestone pieces into place with the use of a shovel bucket so that the erosion protection, when completed, will be consistent and tightly laid, and in no instance shall the quarried limestone protrude beyond the exterior contour of the unprotected sideslopes along either side of the rock protection. The general erosion protection shall match the natural contour of the spillways where applicable, so that the surface water can freely discharge through same. The synthetic filter mat to be used shall be non-woven Trevira Spun-bond Type 1120, conforming to OPSS 1860, Class II, as available from Armtec Construction Products, or equal. The quarried limestone to be used shall be graded in size from a minimum of 100mm to a maximum of 250mm and is available from Amherst Quarries Limited, in Amherstburg, Ontario, or equal.

VII. PIPES AND APPURTENANCES

The Contractor shall install the concrete diversion weir as shown and noted on the Plans. The weir shall be constructed as set out in the Schedule of Items. Immediately upstream of the concrete

weir, the Contractor shall install a corrugated steel pipe arch extending from the Canaan Drain into the northeasterly corner of the Storm Quality Pond. The pipe material shall conform to the requirements as set out in the Schedule of Items. The pipe shall be set to the lines and levels as shown on the Plans. The pipe arch shall be bedded with minimum Granular "B" material from the invert to the springline of the pipe, well compacted under the haunches to adequately support the pipe and avoid any deflection of the pipe shape.

At the northwesterly corner of the Storm Quality Pond, the Contractor shall install tile outlets as noted and detailed in the Schedule of Items. The outlet shall include a Hickenbottom inlet at the position and location shown on the Plans. The Hickenbottom inlet shall be supported with a tee-bar fence post set firmly in the pond bottom. The Hickenbottom shall be strapped to the support post utilizing a minimum of 2 stainless steel bands to adequately support the Hickenbottom in an upright position.

VIII. TOPSOILING, SEEDING AND MULCHING

The Contractor is advised that control of erosion and sedimentation is a major requirement of this project. The Contractor will be expected to implement control measures including, but not limited to, utilizing silt fences and straw bales in the drain bottom to reduce the amount of sediment escaping downstream into the Essex Outlet Drain. Said work shall be carried out in general conformance with Ontario Provincial Standard Specifications Form 577, dated February 1996, or as subsequently amended, or as amended by these Specifications. As an integral part of the erosion and sedimentation control, the Contractor will be required to carry out seeding and mulching on a timely basis so that no portion of the excavated drain or fill placed is left exposed for any extended length of time. The newly excavated sideslopes and fill areas shall be seeded and mulched in accordance with the Ministry of Transportation Specifications for same. The Contractor shall be required, as part of the preparation for seeding and mulching, to spread the scavenged topsoil and harrow the sideslopes and fill areas and to include said cost in his lump sum price bid.

Where required by the work, all disturbed and newly filled areas and surfaces of newly graded berms shall be covered with approximately 50mm of topsoil fine graded. All grass boulevard areas and drain banks shall be restored by utilizing a seed and mulch mix and shall be thoroughly restored to their pre-construction conditions. The placing and grading of all topsoil shall be carefully and meticulously carried out according to Ontario Provincial Standard Specifications, Form 570, dated August 1990, or as subsequently amended or as amended by these specifications.

The seeding and mulching operation shall be carried out according to Ontario Provincial Standard Specifications Form 572, dated August 1990 or as subsequently amended or as amended by these Specifications. The seeding mixture and rate of application per hectare shall be as follows: Creeping Red Fesque 54 kg. (120 lbs.); Kentucky Blue Grass 22 kg. (49 lbs.); Perennial Rye Grass 13 kg. (30 lbs.); Crown Vetch 11 kg. (25 lbs.); Wild White (Dutch) Clover 6 kg. (12 lbs.); and Oats or Rye 62 kg. (135 lbs.).

If the seeding and mulching operation is carried out in the spring, the seeding mixture shall contain Oats, and if the seeding and mulching operation is carried out in the fall, the mixture shall contain Rye. The seeding and mulching operations shall only

be carried out as weather conditions permit in either the months of May or June in the spring, or during the months of September and October in the fall, unless written permission is obtained from either the Engineer or the Municipal Drainage Superintendent. If the excavation work is carried out during the months of May and June or September and October, the Contractor has the option of hand seeding. He must contact the Municipal Drainage Superintendent or the Engineer, and if the Contractor receives their written permission, the seed mixture as above specified, may be placed by hand, daily, at the completion of his daily excavation operation. If the Contractor has been given permission by the Municipal Drainage Superintendent to place the seeding mixture by hand daily, at the completion of his daily excavation operation, the Contractor shall be responsible to give the areas to be seeded a rough, harrowed texture prior to placing the seed mixture.

The Contractor shall provide watering of sod and seed areas in accordance with O.P.S.S. requirements. As part of the work, the Contractor must provide a full one (1) year guarantee on all sod, seeding and mulching work, and will be required to repair all areas that erode or where the grass cover fails to catch. All work shall be meticulously done and completed in a good and workmanlike fashion to the full satisfaction of the Municipal Drainage Superintendent or the Engineer.

IX. GENERAL CONDITIONS

a) The Municipal Drainage Superintendent or Engineer shall have authority to carry out minor changes to the work where such changes do not lessen the efficiency of the work.

b) The Contractor shall satisfy himself as to the exact location, nature and extent of any existing structure, utility or other object that he may encounter during the course of the work. The Contractor shall indemnify and save harmless the Municipality, the County of Essex and the Engineer for any damages which he may cause or sustain during the progress of the work. He shall not hold the Municipality, the County of Essex or the Engineer liable for any legal action arising out of any claims brought about by such damage caused by him.

c) The Contractor will be responsible for any damage caused by him to any portion of the municipal road system, especially to the traveled portion. When excavation work is being carried out and the excavation equipment is placed on the traveled portion of a road, the traveled portion shall be protected by having the excavation equipment placed on satisfactory timber planks or timber pads. If any part of the traveled portion of the road is damaged by the Contractor, the Municipality shall have the right to have the necessary repair work done by its' employees. The cost of all labour and materials used to carry out the repair work shall be deducted from the Contractor's contract and credited to the Municipality. Upon completing the works the Contractor shall clean all debris and junk, etc., from the roadside of the drain, and leave the site in a neat and workmanlike manner. The Contractor shall be responsible for keeping all public roadways utilized for hauling materials free and clear of mud and debris.

d) The Contractor shall provide all necessary lights, signs, and barricades to protect the public. All work shall be carried out in accordance with the requirements of the Occupational Health and Safety Act, and latest amendments thereto.

e) Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain standing, and he shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition.

f) The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no portion shall be left in any untidy or incomplete state before subsequent portions are undertaken.

g) All driveways and access bridges, or any other means of access onto the job site and all other damaged items shall be fully restored to their former condition at the Contractor's expense. Before authorizing Final Payment, the Municipal Drainage Superintendent and the Engineer shall inspect the work in order to be sure that the proper restoration has been performed. In the event that the Contractor fails to satisfactorily clean up any portion of these accesses or repair any damage done, the Engineer shall order such cleanup or repairs to be carried out by others and the cost of same to be deducted from any monies owing to the Contractor.

h) The Contractor will be required to submit to the Municipality a Certificate of Good Standing from the Workplace Safety and Insurance Board prior to the commencement of the work. The Contractor will also be required to submit to the Municipality a Certificate of Clearance for the project from the Workplace Safety and Insurance Board before Final Payment is made to the Contractor.

i) The Contractor shall be required on this project, as part of this Contract, to provide Comprehensive Liability Insurance coverage for not less than $2,000,000.00. He shall name the Municipality and its' officials, the County of Essex and its' officials, and the Consulting Engineer and his staff as equally insured under the policy. It shall also contain a cross liability and a save harmless clause for said Municipality, the County of Essex, and said Consulting Engineer. The Contractor must submit a copy of this policy to both the Municipal Clerk and the Consulting Engineer prior to the commencement of work.

j) Monthly progress orders for payment shall be furnished the Contractor by the Municipal Drainage Superintendent. Said orders shall be for not more than 90% of the value of the work done and the materials furnished on the site. The paying of the full 90% does not imply that any portion of the work has been accepted. The remaining 10% will be paid 45 days after the final acceptance and completion of the work and payment shall not be authorized until the Contractor provides the following:

   (i) a Certificate of Clearance for the project from the Workplace Safety and Insurance Board

   (ii) proof of advertising

   (iii) a Statutory Declaration, in a form satisfactory to the Engineer and the Municipality, that all liabilities incurred by the Contractor and his Sub-Contractors in carrying out the Contract have been discharged and that all liens in respect of the Contract and Sub-Contracts thereunder have expired or have been satisfied, discharged or provided for by payment into Court.

The Contractor shall satisfy the Engineer or Municipality that there are no liens or claims against the work and that all of the requirements as per the Construction Lien Act, 1983 and its' subsequent amendments have been adhered to by the Contractor.

k) Should the Specifications, Information to Tenderers, or the Form of Agreement not apply to a specific condition or circumstance with respect to this project, the applicable section or sections from the Canadian Construction Documents Committee CCDC2 shall govern and be used to establish the requirements of the work.

PLAN, DETAIL AND SECTIONS

SHOWING THE

CANAAN DRAIN REGIONAL STORM QUALITY POND

IN THE

TOWN OF ESSEX

IN THE

COUNTY OF ESSEX • ONTARIO

REGISTERED PROFESSIONAL ENGINEER
G.ROOD
PROVINCE OF ONTARIO

GERARD ROOD, P.ENG.

N. J. PERALTA ENGINEERING LTD.

45 DIVISION STREET NORTH
KINGSVILLE, ONTARIO
N9Y 1E1

DATE: JANUARY 29th, 2001

ADDENDUM: MARCH 15th, 2001

TOWN OF ESSEX

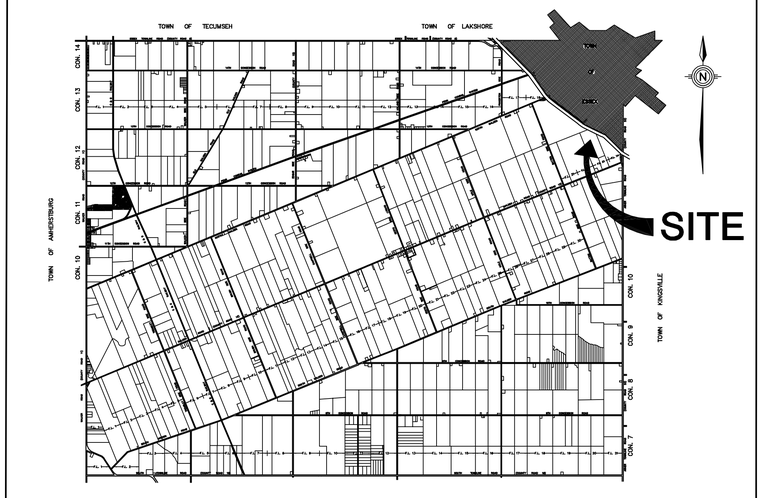
MAYOR: JOAN FLOOD
CLERK: JERRY MARION
DRAINAGE
SUPERINTENDENT: TONY DICIOCCO

BENCHMARK:

TOP CENTRE, SOUTH END OF CONCRETE HEADWALL OF THE CANAAN DRAIN CULVERT CROSSING KING'S HIGHWAY NO. 3

ELEV. 194.014m

KEY PLAN



PLAN

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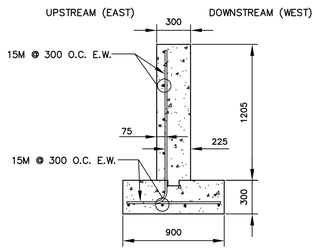
D01-001	1 OF 2



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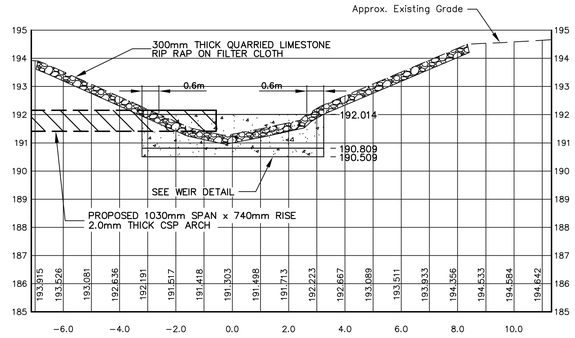
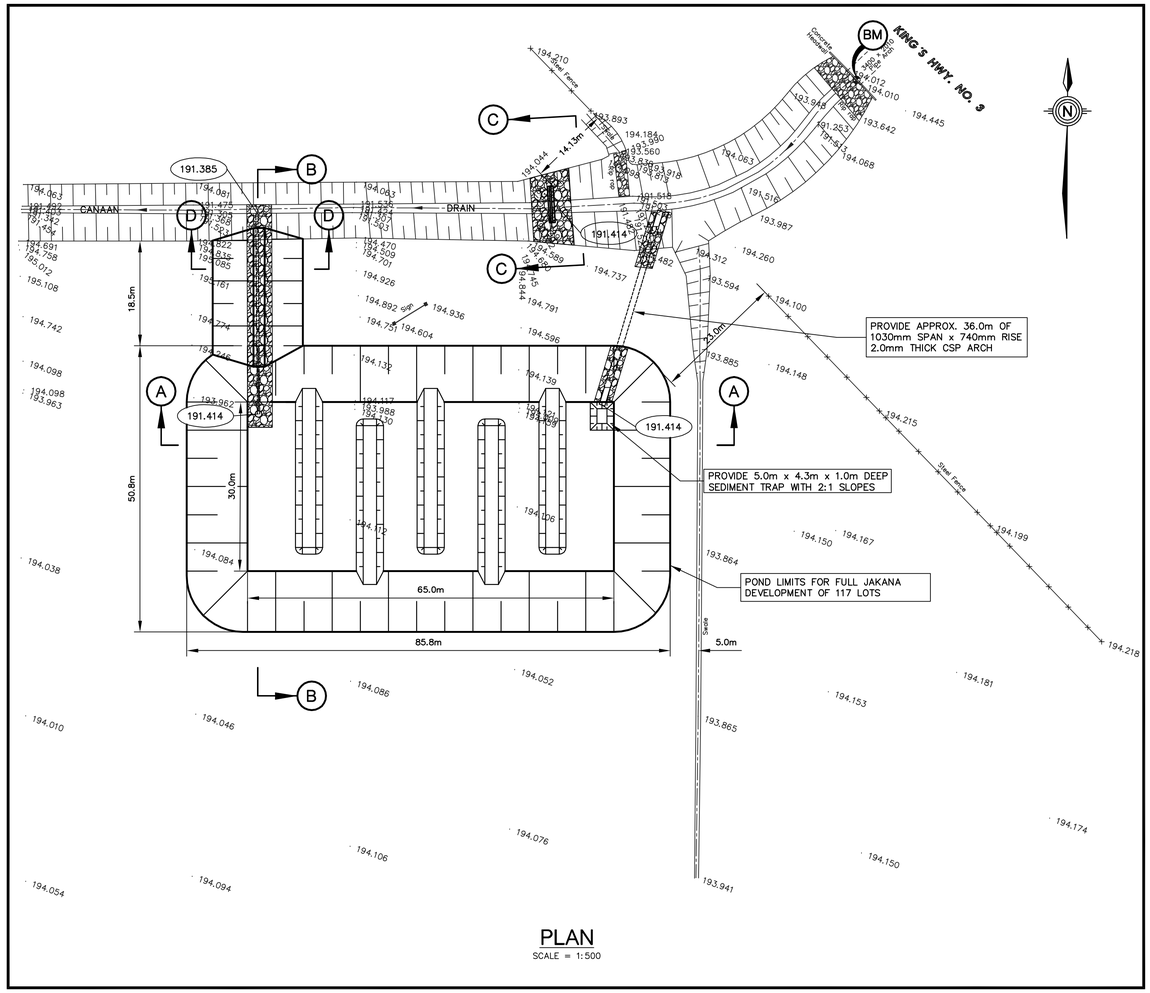


WEIR SECTION C-C
SCALE = 1:100

BENCHMARK:
TOP CENTRE, SOUTH END OF CONCRETE HEADWALL OF THE CANAAN DRAIN CULVERT CROSSING KING'S HIGHWAY NO. 3.

ELEV. 194.014m

NOTES:
1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL DISTURBED AREAS TO BE RESTORED WITH TOPSOIL, SEED AND MULCH.
3. (191.414) DENOTES PROPOSED INVERT ELEVATION
4. 194.010 DENOTES EXISTING SPOT ELEVATION
5. CONCRETE: 25 MPa AT 28 DAYS WITH 6%± 1% AIR ENTRAINMENT.



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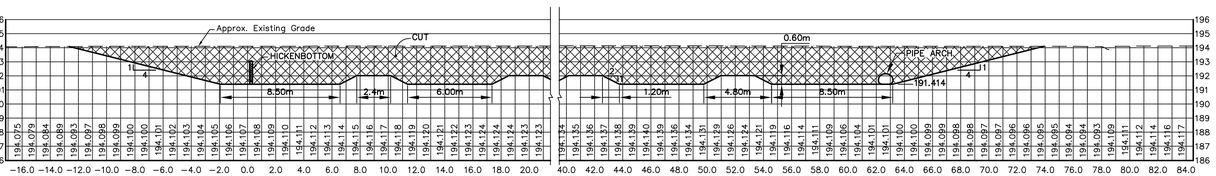

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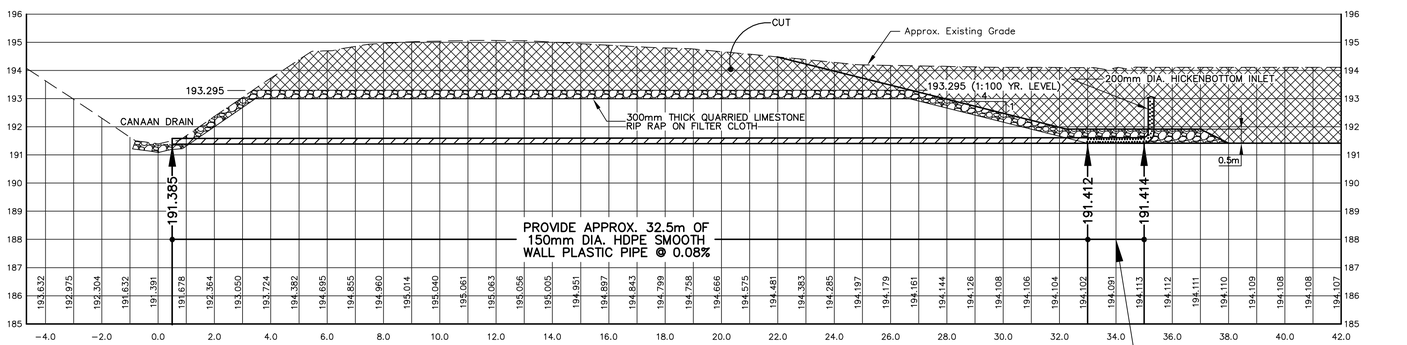

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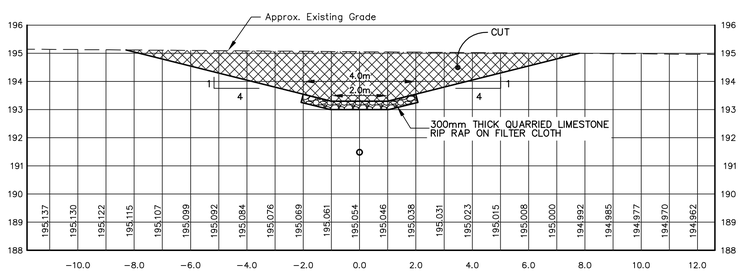

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ADDENDUM: MARCH 15th, 2001

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FILE No.: D01-001	SHEET No.: 2 OF 2

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EXPANSION OF CANAAN DRAIN REGIONAL

STORM QUALITY POND

TOWN OF ESSEX

N. J. PERALTA ENGINEERING LTD.
Consulting Engineers
45 Division St. N., Kingsville, Ontario N9Y 1E1
Tel. (519) 733-6587

Project No. D-04-015

December 10th, 2004

Mayor and Municipal Council
Corporation of the Town of Essex
33 Talbot Street South
ESSEX, Ontario
N8M 1A8

Mayor McDermott and Members of Council:

SUBJECT: EXPANSION OF CANAAN DRAIN REGIONAL STORM QUALITY POND
Town of Essex, County of Essex
Project No. D-04-015

I. INTRODUCTION

In accordance with instructions provided by you at your May 3rd, 2004 meeting and confirmed by letter of May 4th, 2004 from your Clerk, Mr. Jerry Marion, we have prepared the following report. This report provides for improvements to the Canaan Drain Regional Storm Quality Pond. This pond is located along the Canaan Drain near its' upper end just west of King's Highway No. 3. This report provides for enlargement of the storm quality pond to provide for additional development within Ward 1 of the Town of Essex.

The Canaan Drain is an open municipal drain extending from its' upper end near the intersection of Fairview Avenue West and South Talbot Road within the former limits of the Town of Essex, southerly to a point where it turns westerly and passes under King's Highway No. 3; it then continues westerly along the blindline of Concession North of Malden Road to its' outlet in the Essex Outlet Drain at Mole Sideroad, all within the former Town of Essex and the former Township of Colchester North.

It is understood that this work is proceeding pursuant to Section 78 of the “Drainage Act, R.S.O. 1990, Chapter D.17". Based on the above, we have performed all of the necessary survey, investigations, etc. of the Canaan Drain Regional Storm Quality Pond and we report thereon as follows.

II. BACKGROUND

The Canaan Drain was repaired and improved in accordance with an Engineer's Report dated January 19th, 1999 prepared by Mr. Don Joudrey, P.Eng. The drain acts as an outlet for the urban portion of the Town of Essex known as Ward 1. The Town is working with landowners in the urban portion of the watershed area of the Canaan Drain to allow for in-filling development. The Town and the Essex Region Conservation Authority have concerns with addressing Stormwater Management for this in-

filling development. Discussions with Town Staff and the Essex Region Conservation Authority have established that a Regional Storm Quality Pond would best address the required Stormwater Management for these infill areas.

It is intended that the developers of these vacant urban lands bear the initial cost for the construction of a Regional Stormwater Management Facility, and then turn same over to the Town. It is expected that the Town may eventually expand the proposed Stormwater Management Facility to serve existing areas of the Town that are already developed and utilize the Canaan Drain as their outlet.

The proposed Regional Stormwater Management Facility avoids the need for several smaller facilities to serve each individual development proposal that may come forward. In this way the following drawbacks of smaller facilities are avoided including:

a) acceptance by the Town of the small land parcels and facility appurtenances
b) maintenance and upkeep of the small parcels by the Town
c) cleaning of the small facilities
d) grass cutting and other maintenance of the small land parcels
e) garbage pick up on the sites
f) complaints and concerns that may be expressed by neighbours
g) aesthetics for the adjacent area

The need for a Stormwater Management facility and the construction of the initial pond was sparked by the Jakana Development which is generally located between Hanlan Street and Milne Street just north of Fairview Avenue West. The Jakana Development outlets through an existing storm sewer on Brien Avenue West and South Talbot Road that discharges to the Canaan Drain. Although the development utilizes an existing storm sewer designed for its' use, the development was required to provide stormwater management particularly addressing the stormwater quality. The Canaan Drain Regional Storm Quality Pond was initially constructed pursuant to a report dated January 29th, 2001 and a March 15, 2001 Addendum to the report, both prepared by our office.

The Town and Conservation Authority are aware that other lands using the same existing storm sewer outlet would require stormwater management when they are developed. This generally led to the development of the proposed Regional Storm Quality Pond proposal to serve all of these future development lands.

Based on previous pond installations, it has been established that a Regional Storm Quality Pond provides the following

improvements downstream when installed near the upper end of a drain:

a) higher water quality
b) reduced sediment transport and silting in of downstream reaches

The selected location on Part of Lot 33, Concession North of Malden Road, was established in consultation with the Town, the Essex Region Conservation Authority and the Developer of the Jakana Development. The Developer and the Town worked together to arrange for a site and construction of the facility in a cost effective manner. The site allows for future expansion of the pond when required. The original design requirements for the facility were carefully reviewed with the Essex Region Conservation Authority. Arrangements were made for the required land purchase through cooperation between the Developer for the Jakana Development and the Town of Essex, and the Town now owns the site together with an easement for access across the Jeffery Shepley (Parcel 470-00305) property.

The Town is currently working with the owner of the property known as the Kimball Development, comprising Parcels 170-031, 170-037, and 170-042 for development of said lands. These lands are generally located east of Hanlan Street, between Fairview Avenue West and Brien Avenue West, and comprise approximately 14.69 acres owned by Kimball Estates Inc.

III. ON-SITE MEETING AND INVESTIGATIONS

After reviewing the past report and design information for the Canaan Drain Regional Storm Quality Pond, we arranged with the Town to schedule an on-site meeting for June 21st, 2004. The following people were in attendance at said meeting: Rob Molliconi (Dillon Consulting for Kimball Estates Inc.), Krystal Kalboz (Dillon Consulting for Kimball Estates Inc.), Richard Beausoleil (Town Director of Works), Jeff Shepley, John Bissonnette (M.T.O. Chatham), Gary Hillier (Town Drainage Superintendent), and Gerard Rood (N.J. Peralta Engineering Ltd.).

The people in attendance were advised that the purpose of the meeting was to advise interested parties of the proposed expansion of the storm quality pond. The need for the expansion arises from the proposed development of the Kimball Estates Inc. properties within Ward 1 of the former Town of Essex. The attendees were advised that the original pond was constructed to serve the entire Jakana Development, comprising approximately 22 acres. It is estimated that the Kimball property of approximately 14.7 acres will require the pond size to increase

by approximately 2/3, or approximately 166% of it's current size. The goal is to expand the pond to the south if sufficient room on Town lands is available, and otherwise expand the pond westerly as necessary to provide the required storage. Pond volume is based on a 600mm (2 ft.) storage depth to detain the first flush through the drain. It was discussed that it may be necessary to clean out the sediment basin and pond inlet structure to restore operating conditions.

Mr. Molliconi advised everyone that Dillon Consulting has just started on the design of the Kimball development. It is expected that the stormwater from the development will be discharged through the existing storm sewer on Brien Avenue West, and ultimately through the Canaan Drain, thereby necessitating the need for improvements to the storm quality pond to service the lands being newly developed. It was confirmed that all cost of construction is to be assessed to the development lands requiring the expansion of the pond facility, including all incidental costs associated with preparation of an engineer's report under the Drainage Act. It was advised that materials excavated from the pond site have to be hauled away and disposed of by the Contractor as established in the previous report. This will ensure that the site remains clear for any further expansion of the pond for additional infill development that may occur in the future.

IV. FINDINGS AND RECOMMENDATIONS

The development of the Kimball Estates Inc. lands will result in additional flows being discharged to the Canaan Drain. In accordance with the report establishing the Regional Storm Quality Pond, we recommend that the Kimball Estates Inc. property be responsible to enlarge the pond to provide the necessary storage capacity for addressing water quality relating to their stormwater discharge.

The storm quality pond expansion will be designed as previously for the first flush from the proposed development area. This comprises the first 6mm (1/4") of runoff from the affected area, and the pond expansion shall use a 600mm (24") depth of storage with a detention time of approximately 24 hours in the proposed storm quality pond expansion, unless otherwise established in the future by the governing authorities. The pond expansion is designed and shown on the plans forming part of this report and provides capacity for the full development of the Kimball Estates Inc. site comprising approximately 14.7 acres of development north of Hanlan Street, between Fairview Avenue West and Brien Avenue West.

As only the lower 600mm depth of the storm quality pond is designed to address the storm quality volume and detention requirements for the proposed development, we find that the upper portion will serve to provide offline detention of excessive storm events. This will improve conditions within the drain, both upstream and downstream, and accordingly we recommend that the pond expansion be made part of the Municipal Canaan Drain and Canaan Drain Regional Storm Quality Pond. The pond operation and maintenance may then be carried out in accordance with the provisions of the Drainage Act and any owner assessed to the drain may put the Town on notice to maintain the system if they believe work is required on the drain, or the storm quality pond and it's appurtenances.

In order to keep the site accessible and to minimize the impact on the site, we recommend that all deleterious materials and excavated fill from new construction and any future maintenance work be trucked away to a site to be obtained by the Contractor at his cost. This will keep the Storm Quality Pond site in a tidy condition and suitable for future maintenance access and expansion as the need arises.

To facilitate maintenance of the pond, we recommend that the provided silt trap be cleaned out as part of the work. We further recommend that the Town carry out regular maintenance of the silt trap to remove accumulated materials to minimize maintenance work in the pond bottom, so that the pond continues to function as intended.

As part of the land purchase arrangements for the original pond, the Town included an access easement and this shall be the required access for all construction and future maintenance and expansion of the Storm Quality Pond. This access comprises a strip of land 6.096 metres (20 ft.) in perpendicular width measured parallel to and adjacent to the east side of the west limit of Parcel 470-00305 owned by Jeffery Shepley, and along the north side of Parcel 470-004, extending from the Town lands adjacent to the southerly side of the Canaan Drain, southerly to Malden Road (County Road 12). We further recommend that after it's use for expansion of the pond, that this access be restored to it's pre-access condition to the full satisfaction of the Town Drainage Superintendent and the Landowner.

V. ALLOWANCES AND COMPENSATION

The Expansion of the Canaan Drain Regional Storm Quality Pond being provided for under this report will be carried out on the Town lands purchased for the purpose. An access easement to the site has already been established by the Town. Allowances for the use of the land for the pond expansion and the access across

the easement has already been provided and paid for under the previous report. As it is intended that all excavation and disposal of material is to be trucked away, and that the full work and access areas are to be restored to their pre-construction conditions, there is no provision made for any allowances or damages pursuant to Section 29 and Section 30 of the "Drainage Act, R.S.O. 1990, Chapter D.17".

VI. ESTIMATE OF COST

Our estimate of the Total Cost of this work, including all incidental expenses, is the sum of **THIRTY THREE THOUSAND NINE HUNDRED AND THIRTY FIVE DOLLARS ($33,935.00)**, made up as follows:

CONSTRUCTION

Item 1)	Construct pond expansion between existing grade and elevation 191.414 metres for a north-south bottom width extension of 19.0 metres including shaping of berms in pond bottom, all pond excavation, hauling and disposal, approximately 3,990 cubic metres @ $4.50 per cubic metre, complete.	$ 17,955.00
Item 2)	Clean out sediment basin and pond bottom at south end of existing 1030mm x 740mm C.S.P. arch including all excavation, hauling and disposal, complete. Lump Sum	$ 200.00
Item 3)	Supply and place 50mm thickness of salvaged black loam topsoil on all excavated and disturbed areas including harrowing and preparation for seeding and mulching in accordance with OPSS Form 570, approximately 145 cubic metres @ $4.00 per cubic metre, complete.	$ 580.00
Item 4)	Supply and place seed and mulch on all areas that have been disturbed and covered with topsoil in accordance with OPSS Form 572, approximately 2,900 square metres @ $1.00 per square metre, complete.	$ 2,900.00
Item 5)	Clean up and restore all areas affected by the work, including pond perimeter and site access, complete. Lump Sum	$ 600.00

TOTAL FOR CONSTRUCTION	**$ 22,235.00**

INCIDENTALS

1)	Survey, Report, Estimate & Specifications	$ 2,500.00
2)	Assistants, Expenses, and Drawings	$ 1,900.00
3)	Duplication Cost of Report and Drawings	$ 300.00
4)	Estimated Cost of Layout and Periodic Inspections and Supervision during Construction	$ 2,000.00
5)	Estimated Land Acquisition Cost	$ 5,000.00
	TOTAL FOR INCIDENTALS	**$ 11,700.00**
	TOTAL FOR CONSTRUCTION (brought forward)	**$ 22,235.00**
	TOTAL ESTIMATE	**$ 33,935.00**

VII. DRAWINGS AND SPECIFICATIONS

As part of this report, we have attached design drawings for the proposed Expansion of the Canaan Drain Regional Storm Quality Pond. The design drawings show the subject drain and pond location and the details of the work necessary to be completed to provide for the proper construction of same.

Also attached, we have prepared Specifications which set out the required construction details for the proposed Expansion of the Canaan Drain Regional Storm Quality Pond.

VIII. ASSESSMENT OF COSTS

All costs for construction of the works as provided for within the Plans and Specifications forming part of this report shall be paid for by the owner of the lands of the Kimball Development as established in the Developer's Agreement with the Town of Essex. Absolutely no cost shall be charged to the Canaan Drain for the work required to construct the Expansion of the Canaan Drain Regional Storm Quality Pond. The Developer shall also pay for a proportional share of any land costs necessary to accommodate the expansion of the pond on Town lands, as established between the Town and the Developer.

The Town of Essex has advised that under the Developer's Agreement, the Developer is responsible for all costs associated with addressing the Stormwater Management for the Development Proposal, and this will include the costs for the preparation of an Engineer's Report. Accordingly, all the incidental costs as outlined above for completion of the work and preparation of this report, shall be assessed completely to the Developer for the Kimball Development and no cost shall be assessed to the Canaan Drain. Based on the information provided, all construction and incidental costs will be assessed to Kimball Estates Inc. for Parcels 170-031, 170-037 and 170-042 owned by them, all within Ward 1 of the Town of Essex.

IX. FUTURE MAINTENANCE

All future repairs and maintenance of the Canaan Drain Regional Storm Quality Pond and appurtenances, including the portion constructed under this report, shall only be assessed to the lands and roads within Ward 1 of the Town of Essex in the proportions as set out in the January 19th, 1999 Report on the Canaan Drain, prepared by Mr. Don Joudrey, P.Eng.

We recommend that the proportions of said charges for future maintenance shall remain as aforesaid until otherwise determined under the provisions of the “Drainage Act, R.S.O. 1990, Chapter D.17".

All of which is respectfully submitted.

N. J. PERALTA ENGINEERING LTD.

Gerard Rood, P.Eng.

GR/kb

Att.

N. J. PERALTA ENGINEERING LTD.
Consulting Engineers
45 Division Street North
KINGSVILLE, Ontario
N9Y 1E1

SPECIFICATIONS

EXPANSION OF THE CANAAN DRAIN REGIONAL

STORM QUALITY POND

TOWN OF ESSEX

I. GENERAL

The Canaan Drain comprises an open Municipal drain located along the easterly side of King's Highway No. 3, extending from the south limit of Fairview Avenue West in the Town of Essex southerly to the point where it turns westerly and crosses under King's Highway No. 3. The Drain then proceeds in a westerly direction along the blindline of the Concession North of Malden Road to its' outlet in the Essex Outlet Drain at Mole Sideroad. The work under this Report comprises the expansion of the existing Storm Quality Pond on Part of Lot 33, Concession North of Malden Road, immediately west of King's Highway No. 3 and adjacent to the south side of the Canaan Drain. The Pond expansion shall be of the size, type, depth, etc. as shown on the accompanying drawings, as determined from the Bench Marks and as may be further laid out at the site at the time of construction. The work shall comprise of all excavation, hauling and disposal of fill, seeding and mulching, control of silt and sedimentation, restoration, and other ancillary work to provide a complete and satisfactory job.

The Contractor will be required to implement stringent erosion and sedimentation controls during the course of the work to minimize the amount of silt and sediment being carried downstream into the Essex Outlet Drain and the Canard River. It is intended that work on this project be carried out in relatively dry conditions to ensure a minimum amount of sediment being transported and deposited into the downstream outlets. Further details of the silt and sediment control are specified in the following sections.

II. ACCESS TO WORK

The Contractor may utilize the full site area of the land owned by the Town of Essex for the purpose of constructing the expansion of the Storm Quality Pond adjacent to the south side of the Canaan Drain. The Contractor shall have access to the site through a 6.1 metre (20') wide easement located through the Jeffery Shepley (470-00305) property. This access easement extends along the westerly limits of the parcel from Malden Road (County Road 12) northerly along the west limit of the Parcel including the north side of Parcel 470-004, to its' connection point with the lands owned by the Town of Essex adjacent to the south side of the Canaan Drain. For all of the above accesses, the Contractor will be required to maintain during construction,

and restore after construction, all roadways, ditches, shoulders, municipal drains, laneways and accesses to their pre-construction condition. Said restoration shall include but not be limited to: loosening compacted cropland, necessary fill placement, grading and compaction, 50mm thick topsoil and seeding, and additional Granular "A" materials, where required. When requested by the Engineer, the Contractor shall provide dust control measures on driveways to reduce the dust nuisance to adjacent properties.

It is imperative that the Contractor protect as much vegetation as possible when accessing to the Drain through any non-cultivated areas with preservation of trees, bushes, and herbaceous vegetation being a primary concern.

The Contractor shall note that any deviation from the above mentioned accesses to the Canaan Drain Regional Storm Quality Pond, without the explicit approval by the landowner or the Municipal Drainage Superintendent or Engineer, could result in the Contractor being liable for damages sustained. The value of such damages shall be determined by the Engineer and the Municipal Drainage Superintendent and subsequently deducted from the Contract price.

III. REMOVAL OF BRUSH, TREES AND RUBBISH

Where there is any brush or rubbish in the work area, including the side slopes of the pond, all such brush or rubbish shall be close cut and grubbed out. Where there is any brush or rubbish where the pond is to be excavated, or on that strip of land between the pond and the limits of the Town property, all such brush or rubbish shall be close cut and grubbed out. The whole is to be burned or otherwise satisfactorily disposed of by the Contractor.

Brush and trees removed from the pond and banks thereof, and from the other areas, are to be put into piles by the Contractor, in locations where they can be safely burned, and are to be burned by him. Prior to and during the course of burning operations, the Contractor shall comply with the guidelines prepared by the Air Quality Branch of the Ministry of the Environment, and shall ensure that the Environmental Protection Act is not violated.

IV. FENCING

Where it is necessary to take down any fence in order to proceed with the work, the same shall be done by the Contractor across or

along that portion of the work where such fence is. The Contractor will be required to exercise extreme care in the removal of any fence so as to cause a minimum of damage to the same. The Contractor will be required to replace any fence that is taken down in order to proceed with the work and the fence shall be replaced in a neat and workmanlike manner. The Contractor will not be required to procure any new materials for rebuilding the fence provided he has used reasonable care in the removing and replacing of the same. Where any fence is removed by the Contractor, and the owner thereof deems it advisable and procures new material for replacing the fence so removed, the Contractor shall replace the fence using the new materials, and the materials from the present fence shall remain the property of the owner.

V. EXCAVATION

The pond shall be excavated to the lines, levels, grades and cross-sections as shown on the accompanying drawings, or as may be further established by the Municipal Drainage Superintendent or the Engineer at the time of the work. The pond shall be carefully excavated so as not to disturb the existing banks, rock protection and vegetation, except for those portions of the pond where widening or restoration of a stable drain bank configuration is required. The bottom width of the pond and the sideslopes of the excavation shall conform to the dimensions given on the drawings. In no case shall the pond bottom project above the grade line as shown on the accompanying drawings and as determined from the Bench Mark. The finished sideslopes of the pond shall be 4 horizontal to 1 vertical, unless otherwise noted.

As part of his work, the Contractor will be required to dip out and clean the sediment collection basin located at the pipe arch inlet to the pond at it’s northeast corner. The sediment basin is approximately 5.0 x 4.3 metres x 1.0 metres deep with 2:1 sideslopes, and the Contractor shall carefully excavate same to avoid any damage to the existing slopes, pipe, and the rock protection around the pipe end projecting into the pond.

When carrying out his excavation work on the pond bottom, the Contractor will be required to extend the existing berms on the bottom to provide the serpentine channel through the pond bottom, as shown and indicated on the Plans. On the most easterly berm, and every alternate one, the Contractor will be required to extend the berm across the existing open channel to the new south limit of the proposed berm. Where the Contractor has to close the existing channel, he will place well compacted clay fill material

on undisturbed native materials to ensure that the extended berm will be stable and there will be minimal risk of flows through the pond causing any erosion or problems with the stability of the extended berm. The construction of all berms will allow for the placement of topsoil, and seed and mulch as outlined further in these Specifications. All pond excavation shall be carried out to the dimensions and sideslopes as shown on the plans, and as detailed on the cross-section. The Contractor shall arrange for meticulous layout of the pond bottom and in particular the berm locations and sideslopes, so that insofar as practical the berms will be constructed of undisturbed native materials that will be covered with topsoil, seed and mulch.

The Contractor, when doing his excavation or any other portion of the work, shall be very careful not to interfere with, plug up or damage, any existing surface drains, swales and lateral or main tile ends. If it is found that said existing drains are interfered with in any way, the Contractor will be required to unplug or repair said drains immediately, at no extra cost to the project. If it is found that any existing lateral tiles or main tile drains or tile ends have been cut off or damaged in any way during the course of the work, the Contractor will be required to either repair or replace them. All work shall be completed to the full satisfaction of the Municipal Drainage Superintendent at no extra cost to the project.

All excavation material shall be hauled away by the Contractor and disposed of at a site to be obtained by the Contractor at his cost.

In all cases, the disposal of any trucked material will be the responsibility of the Contractor and any work at the disposal site shall be established between the Contractor and the site owner. The Contractor shall ensure that any permits required for fill disposal are obtained from the appropriate authority. The Contractor will be responsible for keeping all private and public roadways free and clear of mud and debris resulting from his use of same for access and hauling purposes.

VI. GENERAL EROSION PROTECTION

During the course of the work, the Contractor will be required to protect the existing general erosion protection as shown on the Plans. Should the Contractor damage any of the erosion protection works, he shall restore same as follows: the erosion protection shall be embedded into the sideslopes of the bank and have a minimum thickness of 300mm and shall be underlaid in all cases with a synthetic filter mat. The filter mat shall not

only be laid along the flat portion of the rock protection, but also contoured to the exterior limits between the quarried limestone and the unprotected slope areas. The Contractor in placing the erosion protection, shall carefully tamp quarried limestone pieces into place with the use of a shovel bucket so that the erosion protection, when completed, will be consistent and tightly laid, and in no instance shall the quarried limestone protrude beyond the exterior contour of the unprotected sideslopes along either side of the rock protection. The general erosion protection shall match the natural contour of the spillways where applicable, so that the surface water can freely discharge through same. The synthetic filter mat to be used shall be non-woven Trevira Spun-bond Type 1120, conforming to OPSS 1860, Class II, as available from Armtec Construction Products, or equal. The quarried limestone to be used shall be graded in size from a minimum of 100mm to a maximum of 250mm and is available from Amherst Quarries Limited, in Amherstburg, Ontario, or equal.

VII. PIPES AND APPURTENANCES

The Contractor shall protect all of the existing pipes and appurtenances forming part of the Storm Quality Pond. The Contractor shall protect the existing corrugated steel pipe arch extending from the Canaan Drain into the northeasterly corner of the Storm Quality Pond. If any damage is caused to same, the Contractor shall repair same to the full satisfaction of the Municipal Drainage Superintendent.

At the northwesterly corner of the Storm Quality Pond, the Contractor shall note that there is an existing tile outlet that includes a Hickenbottom inlet at the position and location shown on the Plans. The Contractor shall protect same from damage and if the tile outlet or Hickenbottom inlet to the tile is disturbed in any way, the Contractor shall repair and restore same to the full satisfaction of the Municipal Drainage Superintendent.

VIII. TOPSOIL PLACEMENT, SEEDING AND MULCHING

The Contractor is advised that control of erosion and sedimentation is a major requirement of this project. The Contractor will be expected to implement control measures including, but not limited to, utilizing silt fences and straw bales in the drain or pond bottom to reduce the amount of sediment escaping downstream into the Essex Outlet Drain. Said work shall be carried out in general conformance with Ontario

Specifications – Expansion of the Canaan Drain
Regional Storm Quality Pond
Town of Essex - D-04-015

Provincial Standard Specifications Form 577, dated February 1996, or as subsequently amended, or as amended by these Specifications. As an integral part of the erosion and sedimentation control, the Contractor will be required to carry out seeding and mulching on a timely basis so that no portion of the excavated drain or fill placed is left exposed for any extended length of time. The newly excavated sideslopes and fill areas shall be seeded and mulched in accordance with the Ministry of Transportation Specifications for same. The Contractor shall be required, as part of the preparation for seeding and mulching, to spread the scavenged topsoil and harrow the sideslopes and fill areas and to include said cost in his lump sum price bid.

Where required by the work, all disturbed and newly filled areas and surfaces of newly graded berms shall be covered with approximately 50mm of topsoil fine graded. All grass boulevard areas and drain banks shall be restored by utilizing a seed and mulch mix and shall be thoroughly restored to their pre-construction conditions. The placing and grading of all topsoil shall be carefully and meticulously carried out according to Ontario Provincial Standard Specifications, Form 570, dated August 1990, or as subsequently amended or as amended by these specifications.

The seeding and mulching operation shall be carried out according to Ontario Provincial Standard Specifications Form 572, dated August 1990 or as subsequently amended or as amended by these Specifications. The seeding mixture and rate of application per hectare shall be as follows: Creeping Red Fesque 54 kg. (120 lbs.); Kentucky Blue Grass 22 kg. (49 lbs.); Perennial Rye Grass 13 kg. (30 lbs.); Crown Vetch 11 kg. (25 lbs.); Wild White (Dutch) Clover 6 kg. (12 lbs.); and Oats or Rye 62 kg. (135 lbs.).

If the seeding and mulching operation is carried out in the spring, the seeding mixture shall contain Oats, and if the seeding and mulching operation is carried out in the fall, the mixture shall contain Rye. The seeding and mulching operations shall only be carried out as weather conditions permit in either the months of May or June in the spring, or during the months of September and October in the fall, unless written permission is obtained from either the Engineer or the Municipal Drainage Superintendent. If the excavation work is carried out during the months of May and June or September and October, the Contractor has the option of hand seeding. He must contact the Municipal Drainage Superintendent or the Engineer, and if the Contractor receives their written permission, the seed mixture as above specified, may be placed by hand, daily, at the completion of his daily

excavation operation. If the Contractor has been given permission by the Municipal Drainage Superintendent to place the seeding mixture by hand daily, at the completion of his daily excavation operation, the Contractor shall be responsible to give the areas to be seeded a rough, harrowed texture prior to placing the seed mixture.

The Contractor shall provide watering of sod and seed areas in accordance with O.P.S.S. requirements. As part of the work, the Contractor must provide a full one (1) year guarantee on all sod, seeding and mulching work, and will be required to repair all areas that erode or where the grass cover fails to catch. All work shall be meticulously done and completed in a good and workmanlike fashion to the full satisfaction of the Municipal Drainage Superintendent or the Engineer.

IX. GENERAL CONDITIONS

a) The Town Drainage Superintendent or Engineer shall have authority to carry out minor changes to the work where such changes do not lessen the efficiency of the work.

b) The Contractor shall satisfy himself as to the exact location, nature and extent of any existing structure, utility or other object which he may encounter during the course of the work. The Contractor shall indemnify and save harmless, the Town of Essex and the Engineer and its' representatives for any damages which he may cause or sustain during the progress of the work. He shall not hold the Town of Essex or the Engineer liable for any legal action arising out of any claims brought about by such damage caused by him.

c) The Contractor will be responsible for any damage caused by him to any portion of the Municipal road system, especially to the travelled portion. When excavation work is being carried out and the excavation equipment is placed on the travelled portion of the road, the travelled portion shall be protected by having the excavation equipment placed on satisfactory timber planks or timber pads. If any part of the travelled portion of the road is damaged by the Contractor, the Municipality shall have the right to have the necessary repair work done by its' employees and the cost of all labour and materials used to carry out the repair work shall be deducted from the Contractor's contract and credited to the Municipality. The Contractor, upon completing the works, shall clean all debris and junk, etc., from the roadside of the drain, and leave the site in a neat and workmanlike manner. The Contractor shall be responsible for

keeping all public roadways utilized for hauling materials free and clear of mud and debris.

d) The Contractor shall provide all necessary lights, signs, and barricades to protect the public. All work shall be carried out in accordance with the requirements of the Occupational Health and Safety Act, and latest amendments thereto. If traffic control is required on this project, signing is to comply with the M.T.O. Manual of Uniform Traffic Control Devices (MUTCD) for Roadway Work Operations.

The Contractor shall also be required to have a cell phone available at the site for emergency purposes and shall also provide same for use by the Municipal Drainage Superintendent, the Engineer or their representatives as necessary for carrying out communications related to the project.

e) Following the completion of the work, the Contractor is to trim up any broken or damaged limbs on trees which are to remain standing, and he shall dispose of said branches along with other brush, thus leaving the trees in a neat and tidy condition.

f) The whole of the work shall be satisfactorily cleaned up, and during the course of the construction, no work shall be left in any untidy or incomplete state before subsequent portions are undertaken.

g) All driveways, laneways and access bridges, or any other means of access on to the job site shall be fully restored to their former condition at the Contractor's expense. Before authorizing Final Payment, the Municipal Drainage Superintendent and the Engineer shall inspect the work in order to be sure that the proper restoration has been performed. In the event that the Contractor fails to satisfactorily clean up any portion of these accesses, the Engineer shall order such cleanup to be carried out by others and the cost of same be deducted from any monies owing to the Contractor.

h) The Contractor will be required to submit to the Municipality, a Certificate of Good Standing from the Workplace Safety and Insurance Board prior to the commencement of the work and the Contractor will be required to submit to the Municipality, a Certificate of Clearance for the project from the Workplace Safety and Insurance Board before Final Payment is made to the Contractor.

i) The Contractor shall furnish a Performance and Maintenance Bond along with a separate Labour and Material Payment Bond within ten (10) days after notification of the execution of the Agreement by the Owner. One copy of said bonds shall be bound into each of the executed sets of the Contract. Each Performance and Maintenance Bond and Labour and Material Payment Bond shall be in the amount of 100% of the total Tender Price. All Bonds shall be executed under corporate seal by the Contractor and a surety company, authorized by law to carry out business in the Province of Ontario. The Bonds shall be acceptable to the Owner in every way and shall guarantee faithful performance of the contract during the period of the contract, including the period of guaranteed maintenance which will be in effect for twelve (12) months after substantial completion of the works.

The Tenderer shall include the cost of bonds in the unit price of the Tender items as no additional payment will be made in this regard.

j) The Contractor shall be required, as part of this Contract, to provide Comprehensive Liability Insurance coverage for not less than $2,000,000.00 on this project, and shall name the Town of Essex and its' officials, and the Consulting Engineer and his staff as additional insured under the policy. The Contractor must submit a copy of this policy to both the Town Clerk and the Consulting Engineer prior to the commencement of work.

k) Monthly progress orders for payment shall be furnished the Contractor by the Municipal Drainage Superintendent. Said orders shall be for not more than 90% of the value of the work done and the materials furnished on the site. The paying of the full 90% does not imply that any portion of the work has been accepted. The remaining 10% will be paid 45 days after the final acceptance and completion of the work and payment shall not be authorized until the Contractor provides the following:

i) a Certificate of Clearance for the project from the Workplace Safety and Insurance Board

ii) proof of advertising

iii) a Statutory Declaration, in a form satisfactory to the Engineer and the Municipality, that all liabilities incurred by the Contractor and his Sub-Contractors in carrying out the Contract have been discharged and that all liens in respect of the Contract and Sub-Contracts

thereunder have expired or have been satisfied, discharged or provided for by payment into Court.

The Contractor shall satisfy the Engineer or Municipality that there are no liens or claims against the work and that all of the requirements as per the Construction Lien Act, 1983 and its' subsequent amendments have been adhered to by the Contractor.

l) In the event that the Specifications, Information to Tenderers, or the Form of Agreement do not apply to a specific condition or circumstance with respect to this project, the applicable section or sections from the Canadian Construction Documents Committee CCDC2 shall govern and be used to establish the requirements of the work.

PLAN, DETAIL AND SECTIONS

SHOWING THE

EXPANSION

OF THE

CANAAN DRAIN REGIONAL STORM QUALITY POND

IN THE

TOWN OF ESSEX

IN THE

COUNTY OF ESSEX • ONTARIO

GERARD ROOD, P.ENG.

N. J. PERALTA ENGINEERING LTD.

45 DIVISION STREET NORTH
KINGSVILLE, ONTARIO
N9Y 1E1

DATE: DECEMBER 10th, 2004

TOWN OF ESSEX

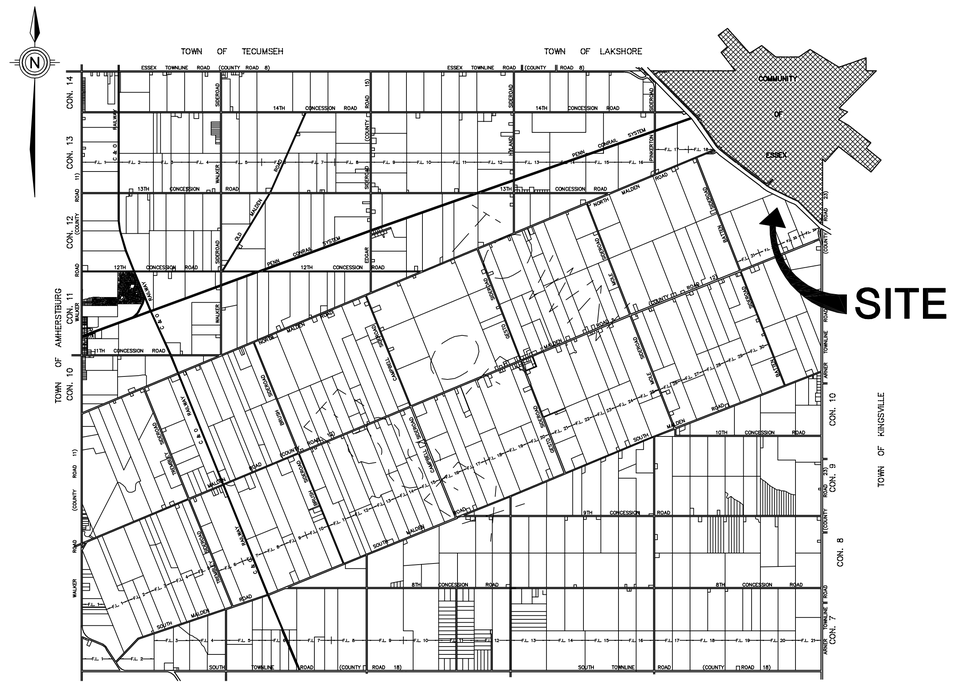
MAYOR: RON McDERMOTT
CLERK: JERRY MARION
DRAINAGE
SUPERINTENDENT: GARY HILLIER

BENCHMARK:

TOP CENTRE, SOUTH END OF CONCRETE HEADWALL OF THE CANAAN DRAIN CULVERT CROSSING KING'S HIGHWAY NO. 3

ELEV. 194.014m

KEY PLAN



PLAN

SCALE = 1:15000

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES.
FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.

DRAWN BY: F.T.	DESIGN BY: G.R.
PLOT CODE: 1:1	
COMPUTER FILE: D04015D1.DWG	
FILE No.: D04-015	SHEET No.: 1 OF 2

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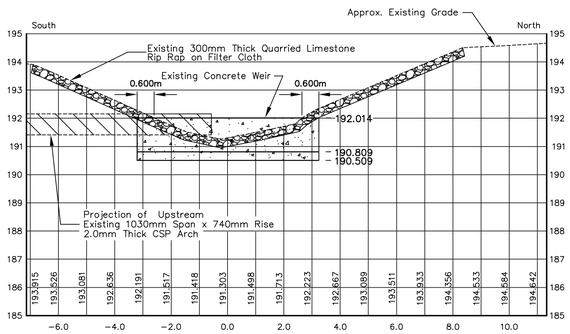
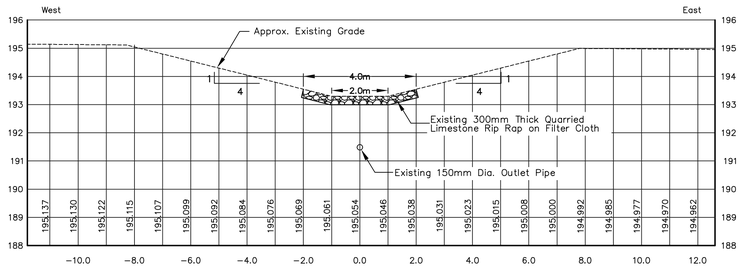


WEIR SECTION A-A

SCALE = 1:100



OVERFLOW CHANNEL SECTION B-B

SCALE = 1:100

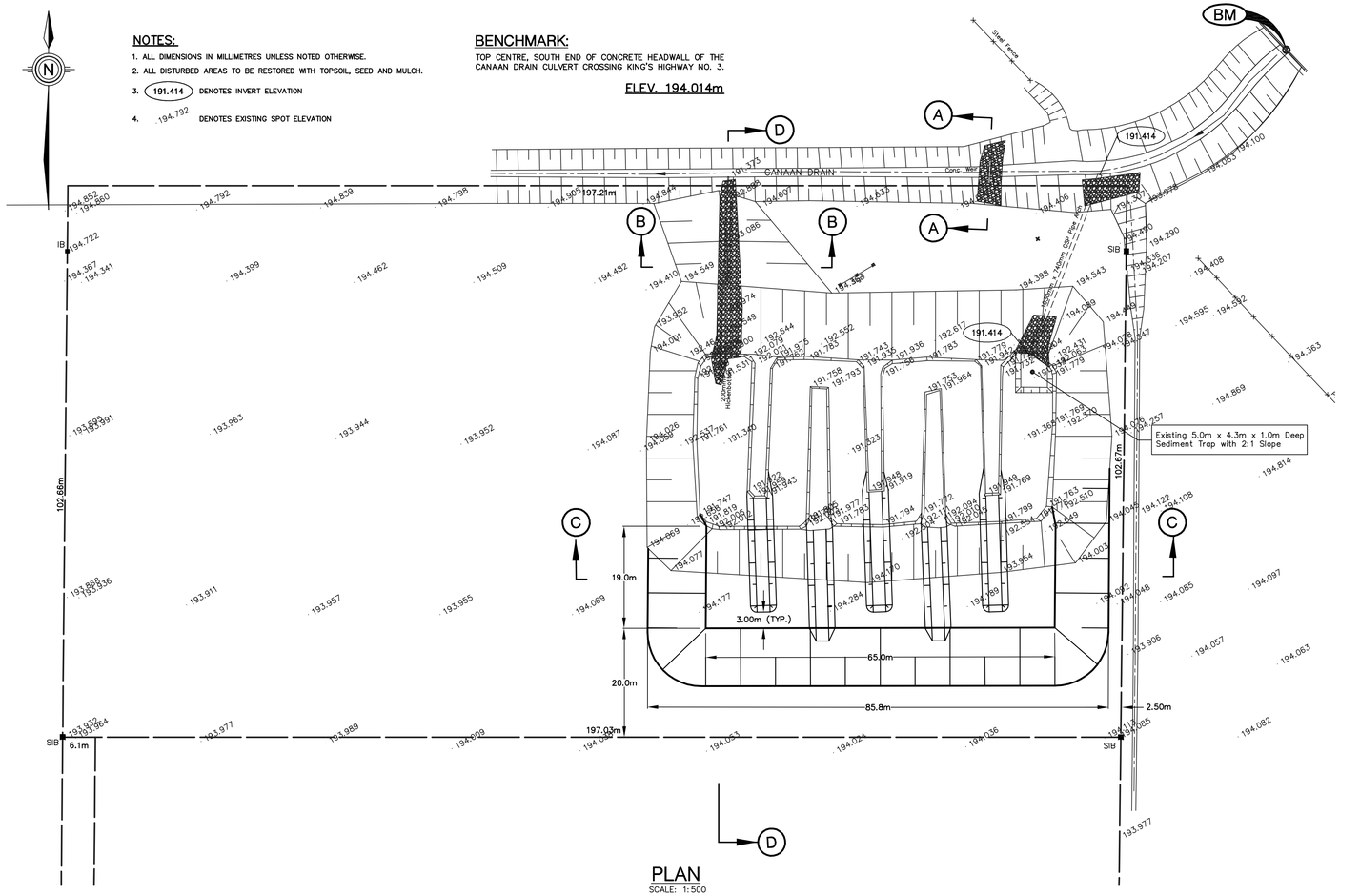
NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL DISTURBED AREAS TO BE RESTORED WITH TOPSOIL, SEED AND MULCH.
3. 191.414 DENOTES INVERT ELEVATION
4. 194.792 DENOTES EXISTING SPOT ELEVATION

BENCHMARK:

TOP CENTRE, SOUTH END OF CONCRETE HEADWALL OF THE CANAAN DRAIN CULVERT CROSSING KING'S HIGHWAY NO. 3.

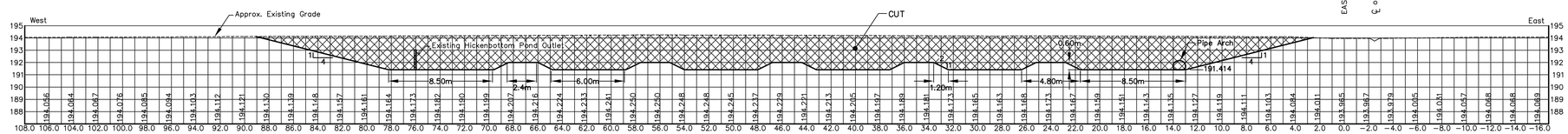
ELEV. 194.014m



PLAN

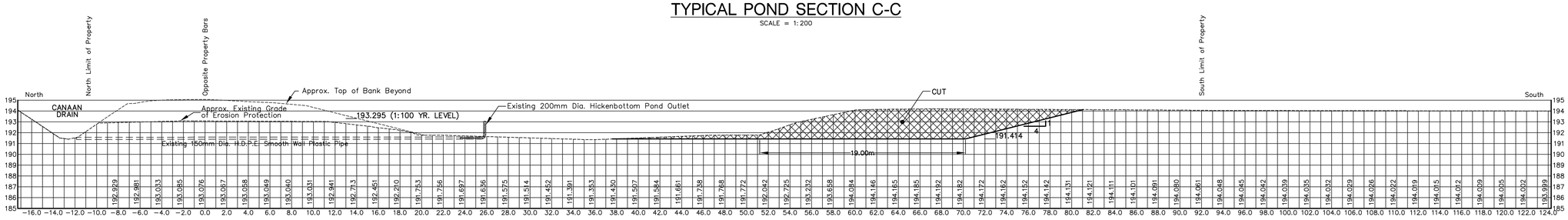
SCALE: 1:500

THESE DRAWINGS HAVE BEEN REDUCED IN SIZE AND THE SCALE THEREFORE VARIES.
FULL SCALE DRAWINGS CAN BE VIEWED AT THE MUNICIPAL OFFICES IF REQUIRED.



TYPICAL POND SECTION C-C

SCALE = 1:200



SECTION D-D

SCALE = 1:200

DRAWN BY: F.T. & T.P.
PLOT CODE: 1:1
COMPUTER FILE: D04015D1.DWG

FILE No.: D04-015

SHEET No.: 2 OF 2

\\Athlon24\Drive D\LandProjects#2\D04015\dwg\D04015D1.dwg 12/15/2004 03:46:38 PM EST

D.3 STORM PUMPING STATION PUMP CURVES

Galos pump curve

Essex crossing pump curve

Essex Crossing Pump Station - Pump Curve

FLYGT

Performance Curve

Product	Type
NP3153.181	LT

Date	Project	Curve No	Issue
2017-11-24		63-415-00-3010	12

	1/1-Load	3/4-Load	1/2-Load
Power Factor	0.75	0.67	0.54
Efficiency	88.0 %	88.0 %	86.0 %
Motor Data	---	---	---

Comments

Inlet/Outlet	Imp. Throughlet
-/200 mm	---

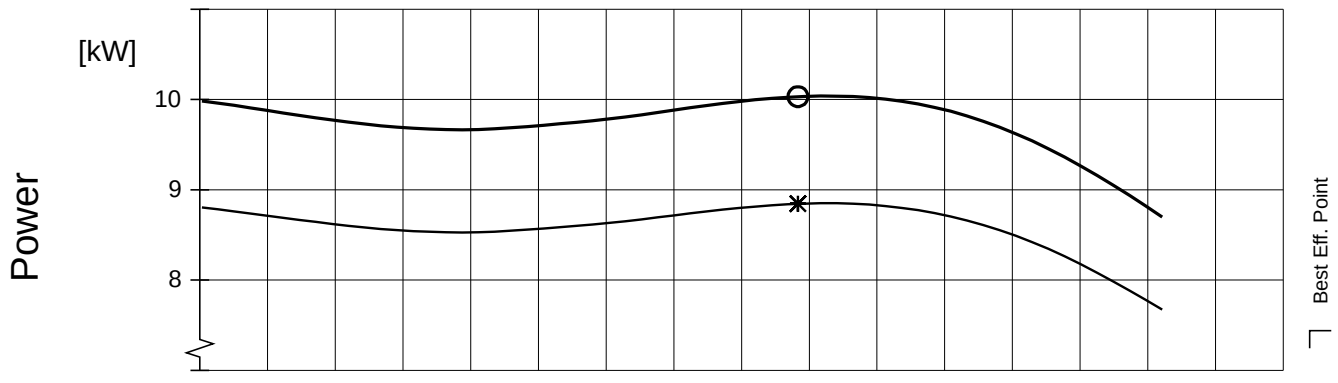
Rated Power ...	12 (8.95 kW)	hp
Starting Current ...	95	A
Rated Current ...	13	A
Rated Speed ...	1770	rpm
Tot. Mom. of Inertia ...	0.061	kgm2
No. of Blades	2	

Impeller Diameter: 193 mm

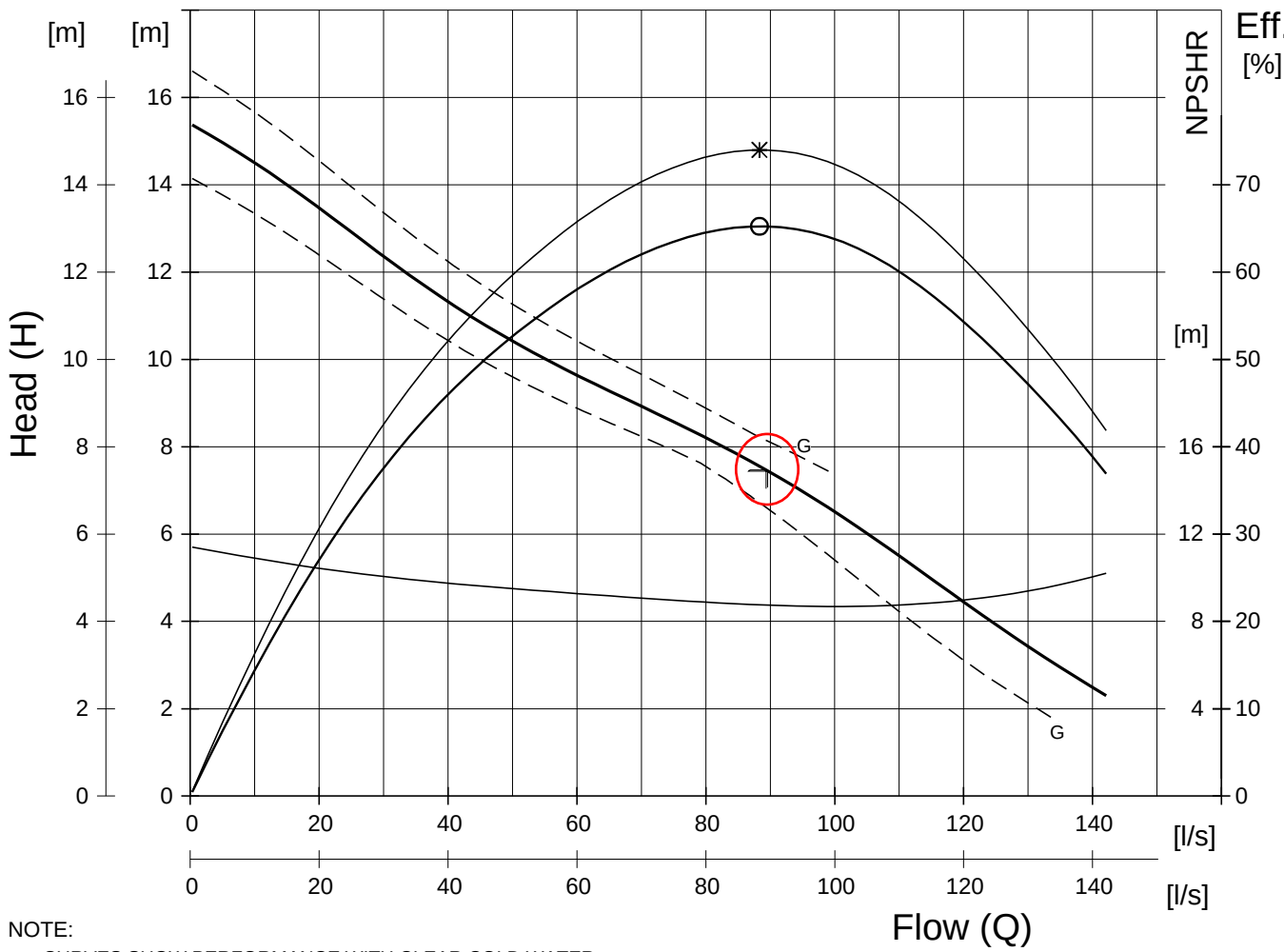
Motor #	Stator	Rev
21-15-4AA	08D	11

Freq.	Phases	Voltage	Poles
60 Hz	3	600 V	4

Geartype	Ratio
---	---



Duty-Point	Flow [l/s]	Head [m]	Power [kW]	Eff. [%]	NPSHR[m]
B.E.P.	88.3	7.55	10.1 (8.85) *	65.2 (74.0) *	8.8



NOTE:
CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER
* : Pump EFFICIENCY/Shaft POWER
O : Overall EFFICIENCY/Input POWER
NPSHR = NPSH3 + min. operational margin

Guarantee between limits (G) acc. to
ISO 9906:2012 & ANSI/HI 11.6:2012 / <10kW

unix AUTHOR: NRESHET SACU (rev:8.1)

Galos Pump Station - Pump Curve

FLYGT

Performance Curve

Product	Type
NP3102.181	LT

Date	Project	Curve No	Issue
2017-11-24		63-422-00-3702	4

	1/1-Load	3/4-Load	1/2-Load
Power Factor	0.83	0.78	0.67
Efficiency	84.5 %	85.5 %	84.0 %
Motor Data	---	---	---

Comments

Inlet/Outlet: -/100 mm

Imp. Throughlet: ---

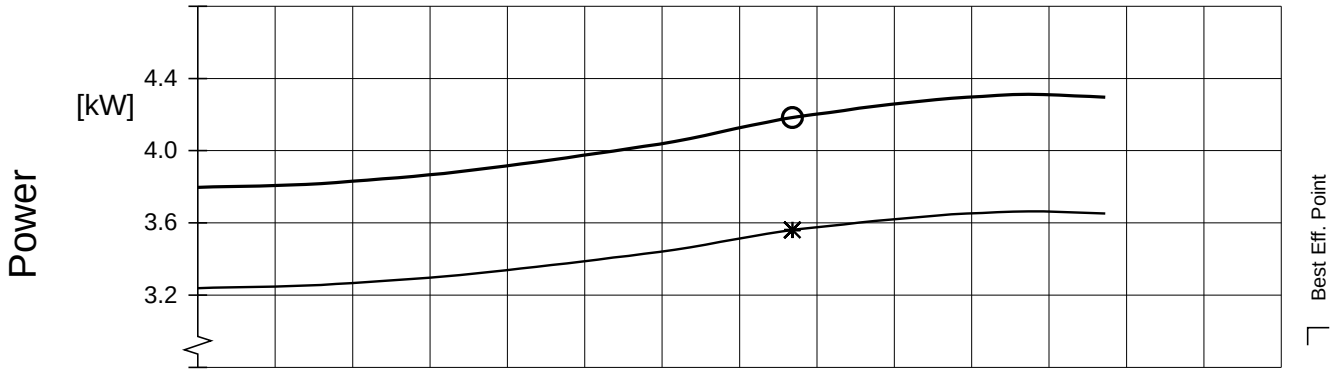
Rated Power ...	5 (3.73 kW)	hp
Starting Current ...	30	A
Rated Current ...	5.1	A
Rated Speed ...	1745	rpm
Tot. Mom. of Inertia ...	0.031	kgm2
No. of Blades	2	

Impeller Diameter: 165 mm

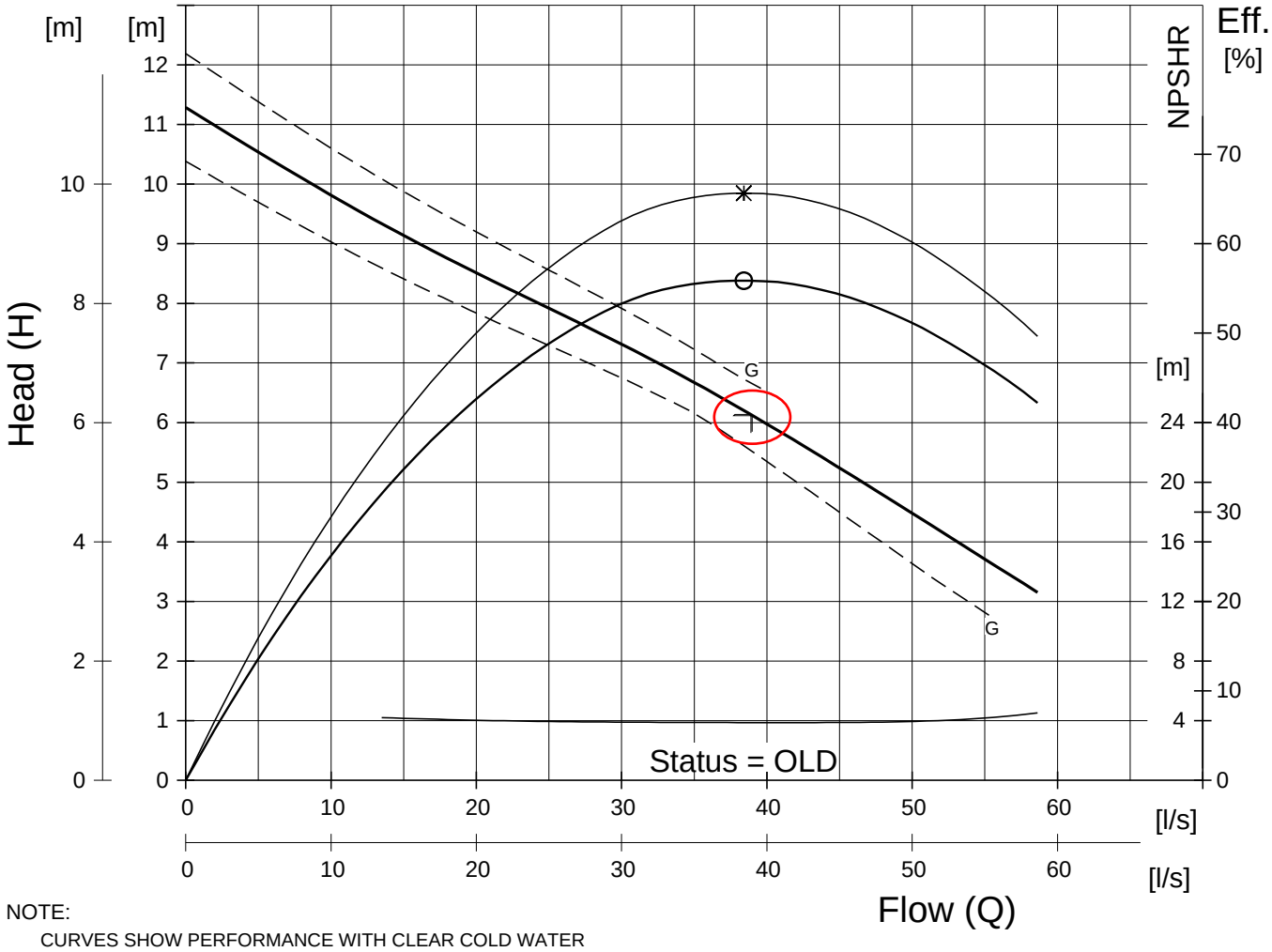
Motor #	Stator	Rev
18-11-4AL	11D	11

Freq.	Phases	Voltage	Poles
60 Hz	3	600 V	4

Geartype	Ratio
---	---



Duty-Point	Flow [l/s]	Head [m]	Power [kW]	Eff. [%]	NPSHR[m]
B.E.P.	38.4	6.20	4.19 (3.57) *	55.9 (65.6) *	3.9



NOTE:
CURVES SHOW PERFORMANCE WITH CLEAR COLD WATER
* : Pump EFFICIENCY/Shaft POWER
O : Overall EFFICIENCY/Input POWER
NPSHR = NPSH3 + min. operational margin

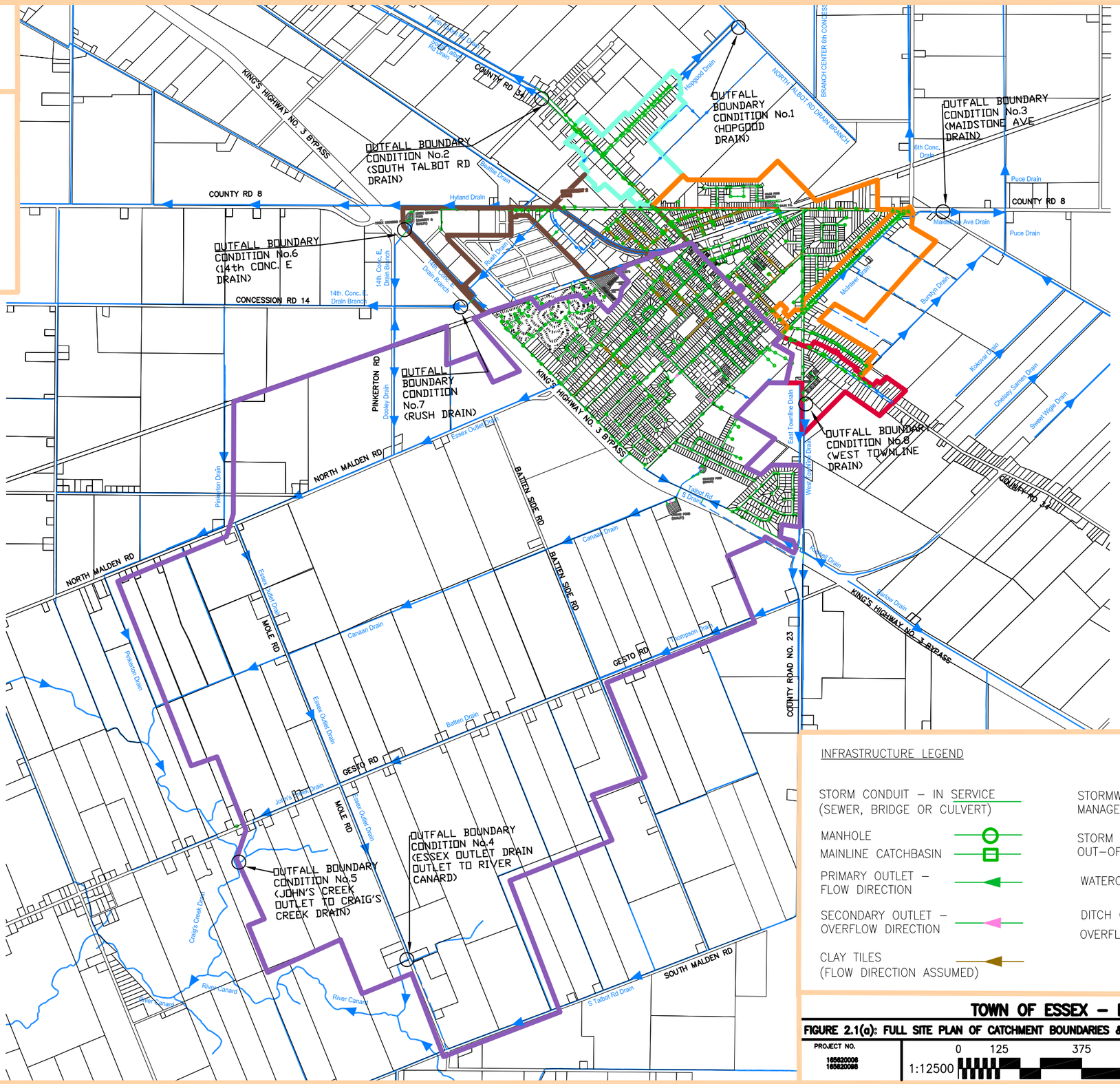
Guarantee between limits (G) acc. to
ISO 9906:2012 & ANSI/HI 11.6:2012 / <10kW

unix AUTHOR: NRESHET SACU (rev:8.1)

Appendix E FIGURES

Stantec

CATCHMENT	SUBWATERSHED	SYMBOL
1. RUSH	RIVER CANARD	SUBCATCHMENT 1
2. ARNER TWL	RIVER CANARD	SUBCATCHMENT 1
3. SOUTH TALBOT	RIVER CANARD	SUBCATCHMENT 1
4. HOPGOOD	PUCE RIVER	SUBCATCHMENT 1
5. MAIDSTONE AVE	PUCE RIVER	SUBCATCHMENT 1



INFRASTRUCTURE LEGEND

- STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
- MANHOLE
- MAINLINE CATCHBASIN
- PRIMARY OUTLET – FLOW DIRECTION
- SECONDARY OUTLET – OVERFLOW DIRECTION
- CLAY TILES (FLOW DIRECTION ASSUMED)
- STORMWATER MANAGEMENT POND
- STORM CONDUIT – OUT–OF–SERVICE
- WATERCOURSE
- DITCH OR SWALE
- OVERFLOW SWALE

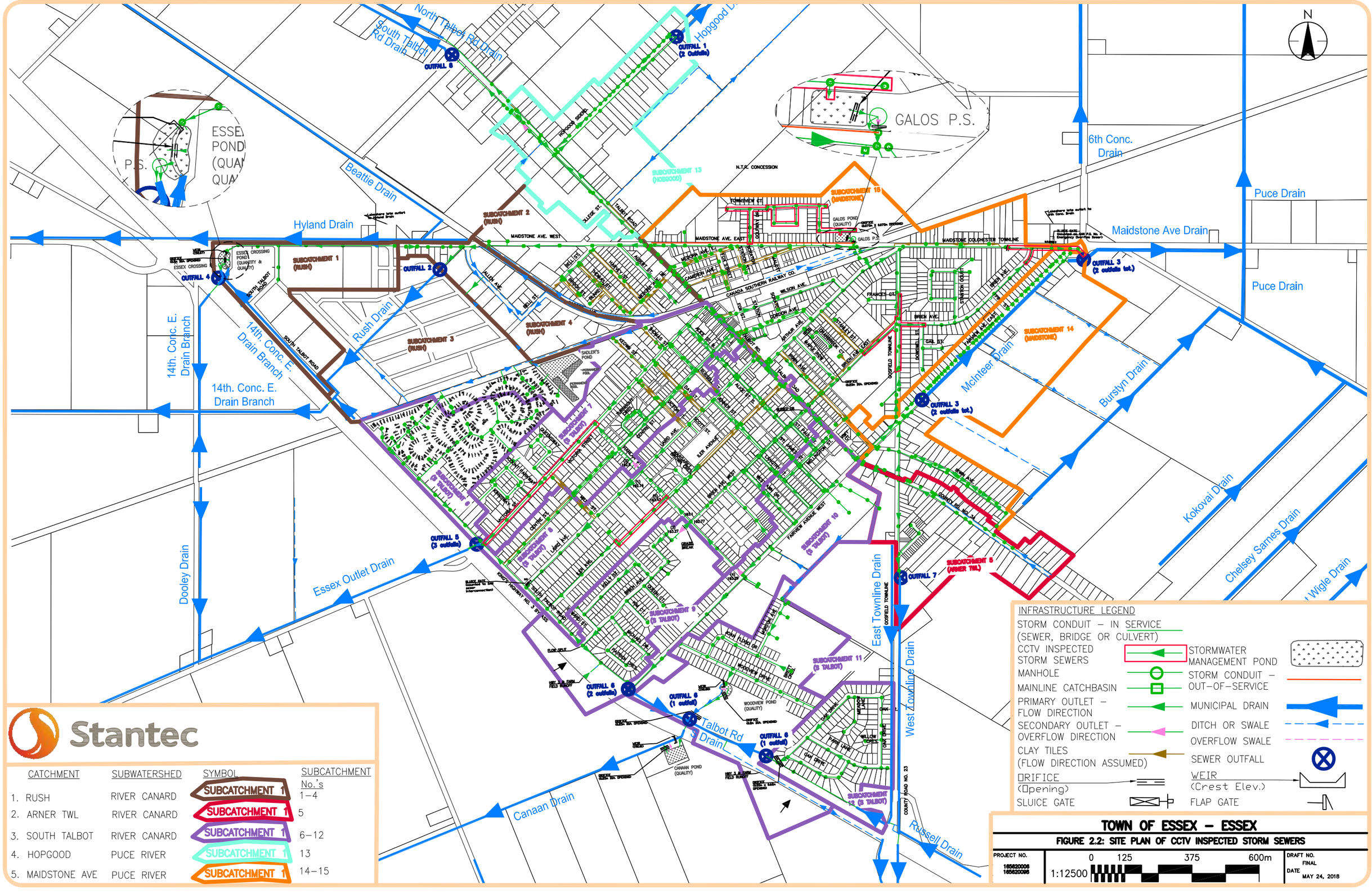
TOWN OF ESSEX – ESSEX

FIGURE 2.1(a): FULL SITE PLAN OF CATCHMENT BOUNDARIES & OUTFALL BOUNDARY CONDITIONS

PROJECT NO. 165620006 165620096

DRAFT NO. FINAL

DATE MAY 24, 2018


N
GALOS P.S.
ESSEX POND (QUANTITY & QUALITY)
P.S.
North Talbot Rd Drain
South Talbot Rd Drain
Hopgood Drain
Beattie Drain
Hyland Drain
Rush Drain
14th. Conc. E. Drain Branch
14th. Conc. E. Drain Branch
14th. Conc. E. Drain Branch
6th Conc. Drain
Puce Drain
Maidstone Ave Drain
Puce Drain
McIntee Drain
Burstyn Drain
Kokovai Drain
Chelsey Sarnes Drain
Wigle Drain
Dooley Drain
Essex Outlet Drain
Talbot Rd S Drain
Canaan Drain
East Townline Drain
West Townline Drain
Russell Drain
Stantec
CATCHMENT
SUBWATERSHED
SYMBOL
SUBCATCHMENT No.'s
1. RUSH — RIVER CANARD — SUBCATCHMENT 1 — 1–4
2. ARNER TWL — RIVER CANARD — SUBCATCHMENT 1 — 5
3. SOUTH TALBOT — RIVER CANARD — SUBCATCHMENT 1 — 6–12
4. HOPGOOD — PUCE RIVER — SUBCATCHMENT 1 — 13
5. MAIDSTONE AVE — PUCE RIVER — SUBCATCHMENT 1 — 14–15
INFRASTRUCTURE LEGEND
STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
CCTV INSPECTED STORM SEWERS
MANHOLE
MAINLINE CATCHBASIN
PRIMARY OUTLET – FLOW DIRECTION
SECONDARY OUTLET – OVERFLOW DIRECTION
CLAY TILES (FLOW DIRECTION ASSUMED)
ORIFICE (Opening)
SLUICE GATE
STORMWATER MANAGEMENT POND
STORM CONDUIT – OUT-OF-SERVICE
MUNICIPAL DRAIN
DITCH OR SWALE
OVERFLOW SWALE
SEWER OUTFALL
WEIR (Crest Elev.)
FLAP GATE
TOWN OF ESSEX – ESSEX
FIGURE 2.2: SITE PLAN OF CCTV INSPECTED STORM SEWERS
PROJECT NO. 165620006 165620096
1:12500
0 125 375 600m
DRAFT NO. FINAL
DATE MAY 24, 2018

N

South Talbot Rd Drain

Talbot Rd Drain

OUTFALL 8

OUTFALL 1 (2 Outfalls)

HDPE 250-600 Dia. 2001-2004

HOPGOOD SWDRD

SUBCATCHMENT 13 (HOBGOOD)

GALOS P.S.

N.T.R. CONCESSION

6th Conc. Drain

Puce Drain

Beattie Drain

SUBCATCHMENT 15 (MAIDSTONE)

TOWNSVIEW CT.

GALOS POND (QUALITY)

ORIFICE 1500m x 0.275m OPENING

Lakeshore late outlet to 6th Conc. Drain

SLUICE GATE (Mounted on SAN P.S. No. 4 Emergency Overflow Sewer)

Maidstone Ave Drain

Hyland Drain

SUBCATCHMENT 2 (RUSH)

RC 750 Dia. 1975-1985

MAIDSTONE AVE. WEST

MAIDSTONE AVE. EAST

MAIDSTONE COLCHESTER TOWNLINE

RC 900 Dia. Before 1975

OUTFALL 3 (2 outfalls tot.)

Lakeshore late outlet

ESSEX CROSSING POND (QUANTITY & QUALITY)

ORIFICE 0.62m DIA OPENING

WEIR 1192.077

OUTFALL 4

SUBCATCHMENT 1 (RUSH)

OUTFALL 2

SOUTH TALBOT ROAD

BELL ST.

THOMAS ST.

HARLEY ST.

ALBERT ST.

MEDORA AVE.

FOX STREET

CAMERON AVE.

CANADA SOUTHERN RAILWAY CO.

WILSON AVE.

SUTTON ST.

GLENWAY DR.

ALLEN AVE.

BLOCK ST.

GRACE ST.

SUBCATCHMENT 4 (RUSH)

SUBCATCHMENT 3 (RUSH)

Rush Drain

14th. Conc. E. Drain Branch

14th. Conc. E. Drain Branch

14th. Conc. E. Drain Branch

SADLER'S POND

PERMANENT POOL

SUBCATCHMENT 7 (S TALBOT)

SUBCATCHMENT 8 (S TALBOT)

PVC 300 Dia. Unknown Yr

Unknown Material 300 Dia. 1970's

QUEENSWAY

VICTORIA STREET

KENTRE ST.

LAIRD AVE.

IRWIN AVE.

CENTRE ST.

RC 450 Dia. Before 1982

RC 375 Dia. After 1978

PVC 200-250 Dia. 2003

PVC 300 Dia. Unknown Yr

BRADSTREET CRESCENT

ILER AVENUE

ST. PAUL ST.

ST. JAMES ST.

CHURCH ST.

WELLINGTON ST.

HWY 3

BRIEN AVE.

FAIRVIEW AVENUE WEST

SUBCATCHMENT 10 (S TALBOT)

PVC 450 Dia. 2008-2010

COUNTY RD. NO. 34

RC 300 Dia. Unknown Yr

OUTFALL 5 (3 outfalls)

Dooley Drain

Essex Outlet Drain

SLUICE GATE (mounted to SAN sewer interconnection)

KING'S HIGHWAY NO. 3 BYPASS

SOUTH TALBOT ROAD

RC 1650 Dia. Before 1975

SUBCATCHMENT 6 (S TALBOT)

SUBCATCHMENT 9 (S TALBOT)

WARREN ST.

KELLY ST.

GREEN CT.

MICHAEL DR.

FLOW SPLIT

HWY 3 & FARM FIELD RUNOFF

OUTFALL 6 (2 outfalls)

RC 750 Dia. Btwn. 1975-1986

OUTFALL 6 (1 outfall)

WEIR 1192.080

WOODVIEW POND (QUALITY)

WOODVIEW DRIVE

JOHN FLOOD DR.

MARLATT AVE.

SUBCATCHMENT 11 (S TALBOT)

Talbot Rd Drain

Canaan Drain

CANAAN POND (QUALITY)

ORIFICE 0.62m DIA OPENING

WEIR 1192.083

OUTFALL 6 (1 outfall)

HWY 3 & FARM FIELD RUNOFF

ORIFICE VESON x 0.62m OPENING

SUBCATCHMENT 12 (S TALBOT)

RC 450 Dia. 1997

West & East Twl Drains Unknown Yr

East Townline Drain

West Townline Drain

COSFIELD TOWNLINE

COUNTY ROAD NO. 23

OUTFALL 7

SUBCATCHMENT 5 (ARNER TWL)

Russell Drain

FRANCES CT.

STANTON COURT

BRIEN AVE.

FAIRVIEW AVE. EAST

GAIL ST.

DOWSWELL ST.

RC 300 Dia. Before 1975

PVC 600-650 Dia. Before 1975

RC 300 Dia. Before 1987

ORIFICE 0.62m DIA OPENING

RC 450-600 Dia. Before 1975

McInteer Drain Unknown Yr

SUBCATCHMENT 14 (MAIDSTONE)

PVC 300 Dia. Unknown Yr

CSP 300 Dia. Unknown Yr

McInteer Drain

OUTFALL 3 (2 outfalls tot.)

RC 250-900 Dia. Before 1977

Bursztyn Drain

Kokovai Drain

Chelsey Sarnes Drain

Sweet Wigle Drain

INFRASTRUCTURE LEGEND

- STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
- SEWERS MISSING RECORD DWG'S
- MANHOLE
- MAINLINE CATCHBASIN
- PRIMARY OUTLET – FLOW DIRECTION
- SECONDARY OUTLET – OVERFLOW DIRECTION
- CLAY TILES (FLOW DIRECTION ASSUMED)
- ORIFICE (Opening)
- SLUICE GATE
- STORMWATER MANAGEMENT POND
- STORM CONDUIT – OUT-OF-SERVICE
- MUNICIPAL DRAIN
- DITCH OR SWALE
- OVERFLOW SWALE
- SEWER OUTFALL
- WEIR (Crest Elev.)
- FLAP GATE

Stantec

CATCHMENT	SUBWATERSHED	SYMBOL	SUBCATCHMENT No.'s
1. RUSH	RIVER CANARD	SUBCATCHMENT 1	1–4
2. ARNER TWL	RIVER CANARD	SUBCATCHMENT 1	5
3. SOUTH TALBOT	RIVER CANARD	SUBCATCHMENT 1	6–12
4. HOPGOOD	PUCE RIVER	SUBCATCHMENT 1	13
5. MAIDSTONE AVE	PUCE RIVER	SUBCATCHMENT 1	14–15

TOWN OF ESSEX – ESSEX CENTRE

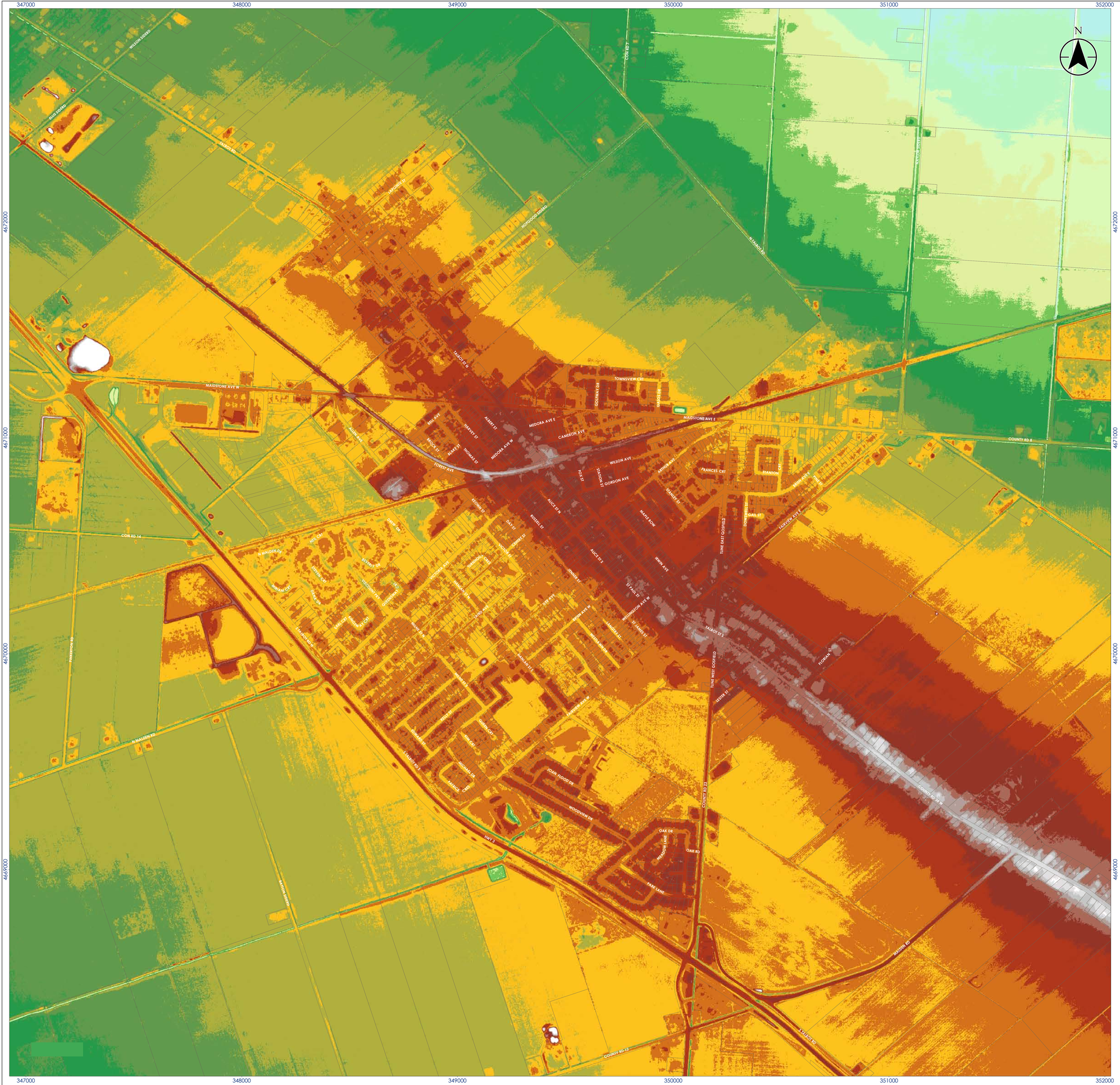
FIGURE 2.3: STORMWATER INFRASTRUCTURE WITH NO CONSTRUCTION RECORD DRAWINGS

PROJECT NO. 165620006 165620098

1:12500 (0, 125, 375, 600m)

DRAFT NO. FINAL

DATE MAY 24, 2018



Stantec

Legend

Elevation (m)

- > 198
- 197.51 - 198
- 1971 - 197.5
- 196.5 - 197
- 196 - 196.5
- 195.5 - 196
- 195 - 195.5
- 194.5 - 195
- 194 - 194.5
- 193.5 - 194
- 193 - 193.5
- 192.5 - 193
- 192 - 192.5
- 191.5 - 192
- 191 - 191.5
- 190.5 - 191
- < 190.5

0 500 1,000 metres

1:6,000 (At original document size of 34x44)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2017.

Project Location
Town of Essex

165620006
Prepared by KDB on 2017-11-10

Client/Project
TOWN OF ESSEX

Figure No.
2.4

Title
Town of Essex
Topography

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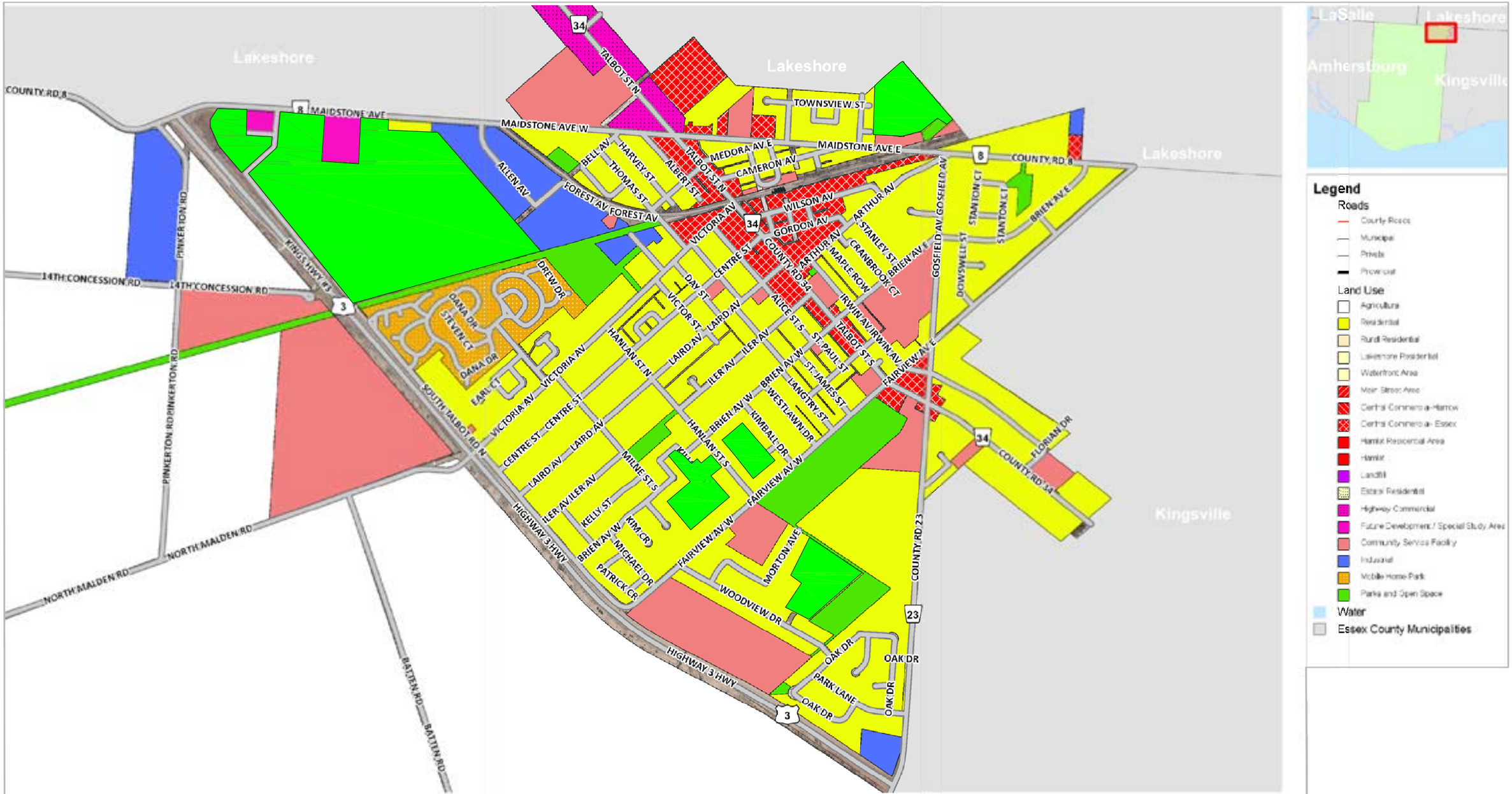


essex

Stantec

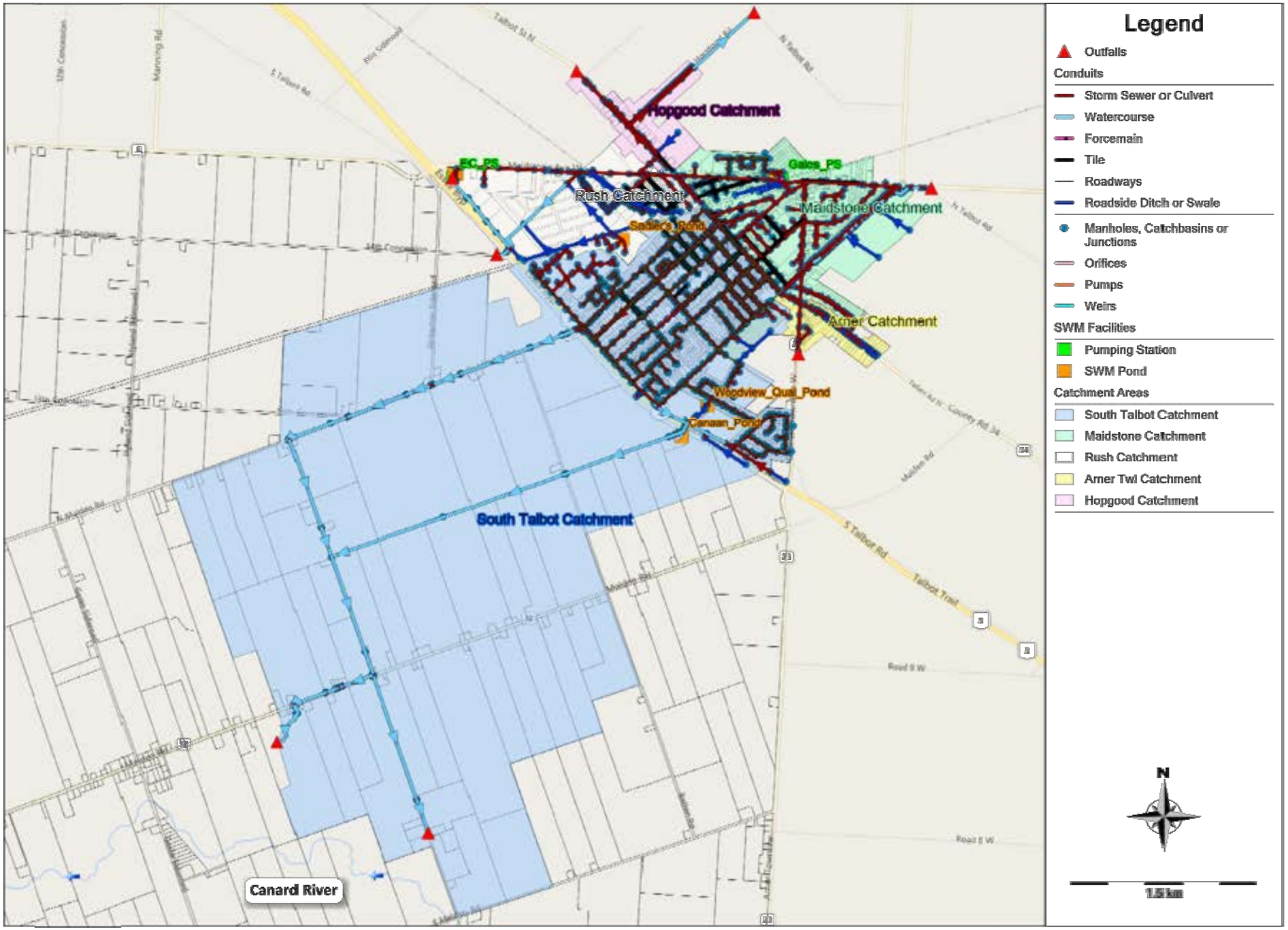
TOWN OF ESSEX

EXISTING LAND USE PLAN IN ESSEX WARD 1 AREA

PROJECT NO. 165620006

DATE: 2018.11.12

DRAWING NO. FIGURE 3.1



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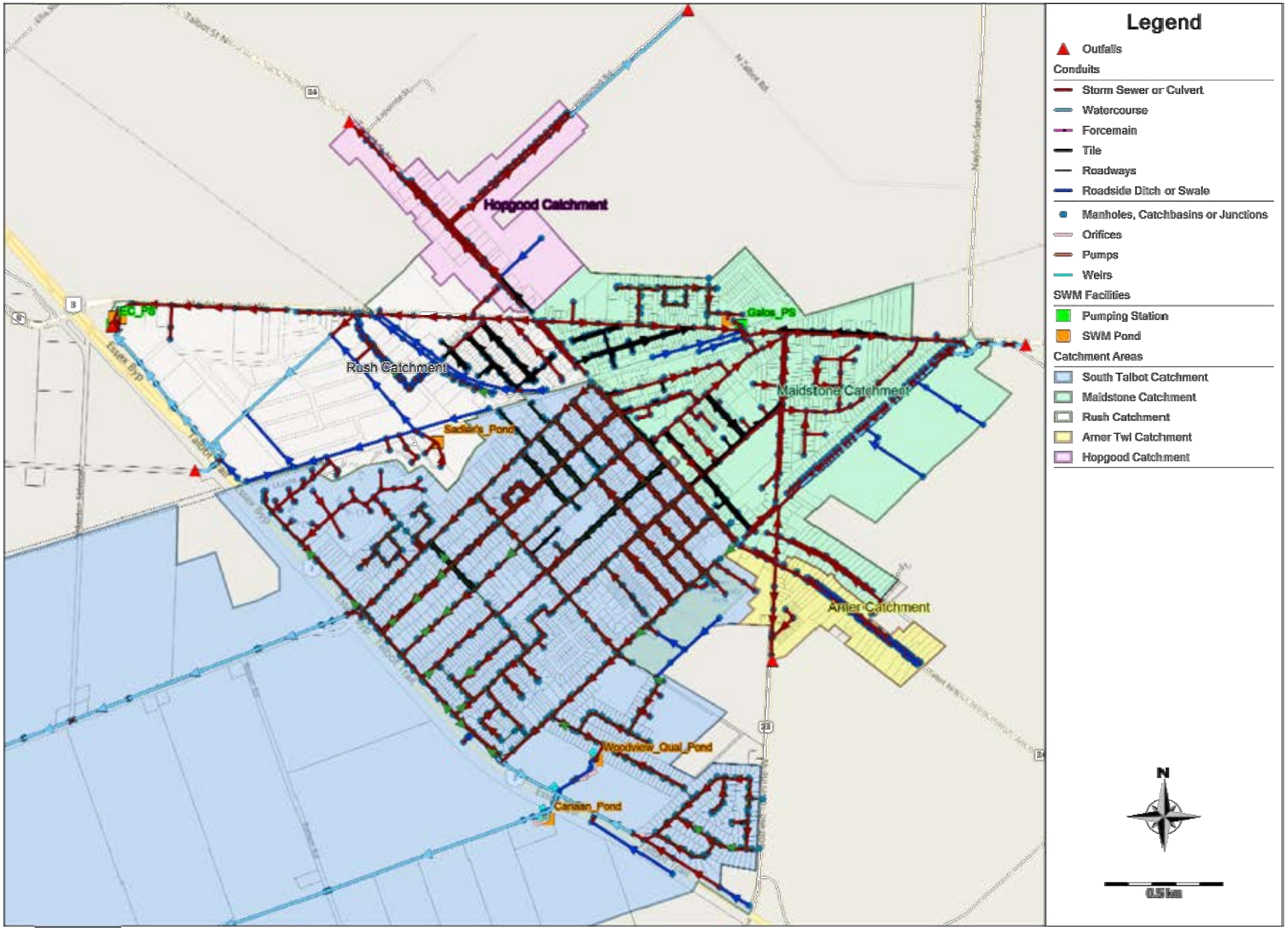
TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006	FULL SITE PLAN OF STORMWATER MODEL	DRAWING NO. FIGURE 4.1(a)
DATE: 2019.01.30		

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 4.1a.dwg
2019-2-05 04:54pm BY: qkha



Stantec

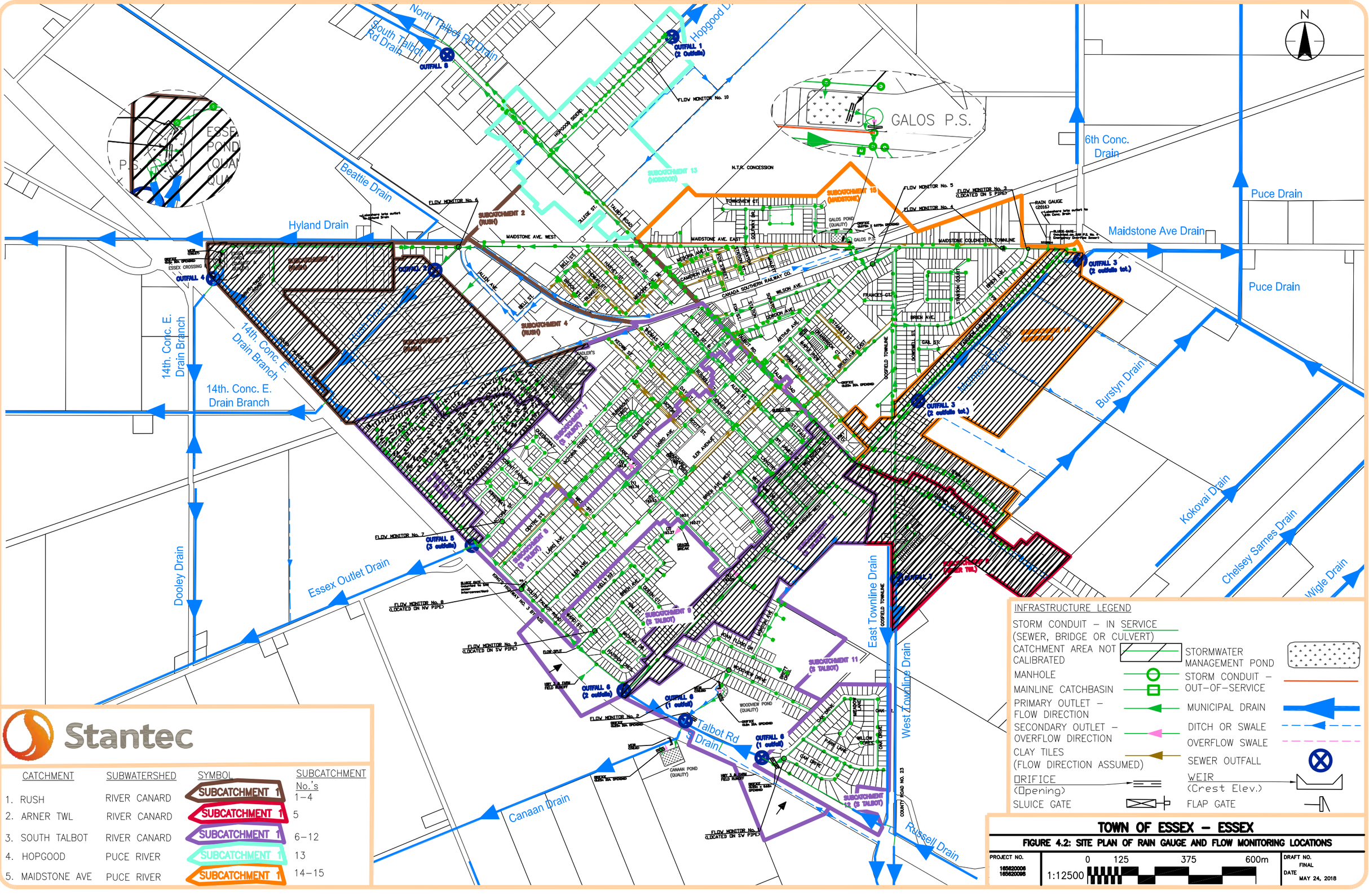
TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006
DATE: 2019.01.30

PARTIAL SITE PLAN OF URBAN PORTION OF STORMWATER MODEL

DRAWING NO.
FIGURE 4.1(b)

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 4.1b.dwg
2019-2-05 04:54pm BY: qkha


N
GALOS P.S.
ESSEX POND (QUALITY)
North Talbot Rd Drain
South Talbot Rd Drain
Hopgood Drain
OUTFALL 1 (2 outfalls)
OUTFALL 8
FLOW MONITOR No. 10
HOPGOOD SWDM
SUBCATCHMENT 13 (HOPGOOD)
N.T.R. CONCESSION
SUBCATCHMENT 15 (MAIDSTONE)
FLOW MONITOR No. 5
FLOW MONITOR No. 3 (LOCATED ON S PIPE)
FLOW MONITOR No. 4
RAIN GAUGE (2016)
6th Conc. Drain
Puce Drain
Maidstone Ave Drain
Beattie Drain
Hyland Drain
FLOW MONITOR No. 6
SUBCATCHMENT 2 (RUSH)
MAIDSTONE AVE. WEST
MAIDSTONE AVE. EAST
TOWNSHEND CT.
GALOS POND (QUALITY)
MAIDSTONE COLCHESTER TOWNLINE
OUTFALL 4
OUTFALL 2
ESSEX CROSSING
SUBCATCHMENT 1 (RUSH)
SUBCATCHMENT 3 (RUSH)
SUBCATCHMENT 4 (RUSH)
14th. Conc. E. Drain Branch
Hyland Drain
CANADA SOUTHERN RAILWAY CO.
WILSON AVE.
FRANCES CT.
BRIEN AVE.
GAIL ST.
STANTON COURT
OUTFALL 3 (2 outfalls tot.)
SUBCATCHMENT 14 (MAIDSTONE)
Kokovai Drain
Burstyn Drain
Chelsey Sarnes Drain
Wigle Drain
Dooley Drain
Essex Outlet Drain
FLOW MONITOR No. 7
OUTFALL 5 (3 outfalls)
SUBCATCHMENT 6 (3 TALBOT)
SUBCATCHMENT 7 (3 TALBOT)
SUBCATCHMENT 8 (3 TALBOT)
SUBCATCHMENT 9 (3 TALBOT)
SUBCATCHMENT 10 (3 TALBOT)
SUBCATCHMENT 11 (3 TALBOT)
SUBCATCHMENT 12 (3 TALBOT)
FLOW MONITOR No. 8 (LOCATED ON NV PIPE)
FLOW MONITOR No. 9 (LOCATED ON SV PIPE)
FLOW MONITOR No. 1 (LOCATED ON SV PIPE)
OUTFALL 6 (2 outfalls)
OUTFALL 9 (1 outfall)
OUTFALL 8 (1 outfall)
WOODVIEW POND (QUALITY)
CANAAN POND (QUALITY)
Talbot Rd S Drain
Canaan Drain
East Townline Drain
West Townline Drain
COUNTY ROAD NO. 23
Russell Drain
Stantec
CATCHMENT
SUBWATERSHED
SYMBOL
SUBCATCHMENT No.'s
1. RUSH — RIVER CANARD — SUBCATCHMENT 1 — 1–4
2. ARNER TWL — RIVER CANARD — SUBCATCHMENT 1 — 5
3. SOUTH TALBOT — RIVER CANARD — SUBCATCHMENT 1 — 6–12
4. HOPGOOD — PUCE RIVER — SUBCATCHMENT 1 — 13
5. MAIDSTONE AVE — PUCE RIVER — SUBCATCHMENT 1 — 14–15
INFRASTRUCTURE LEGEND
STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
CATCHMENT AREA NOT CALIBRATED
MANHOLE
MAINLINE CATCHBASIN
PRIMARY OUTLET – FLOW DIRECTION
SECONDARY OUTLET – OVERFLOW DIRECTION
CLAY TILES (FLOW DIRECTION ASSUMED)
ORIFICE (Opening)
SLUICE GATE
STORMWATER MANAGEMENT POND
STORM CONDUIT – OUT-OF-SERVICE
MUNICIPAL DRAIN
DITCH OR SWALE
OVERFLOW SWALE
SEWER OUTFALL
WEIR (Crest Elev.)
FLAP GATE
TOWN OF ESSEX – ESSEX
FIGURE 4.2: SITE PLAN OF RAIN GAUGE AND FLOW MONITORING LOCATIONS
PROJECT NO. 165620096 165620096
0 125 375 600m
1:12500
DRAFT NO. FINAL
DATE MAY 24, 2018

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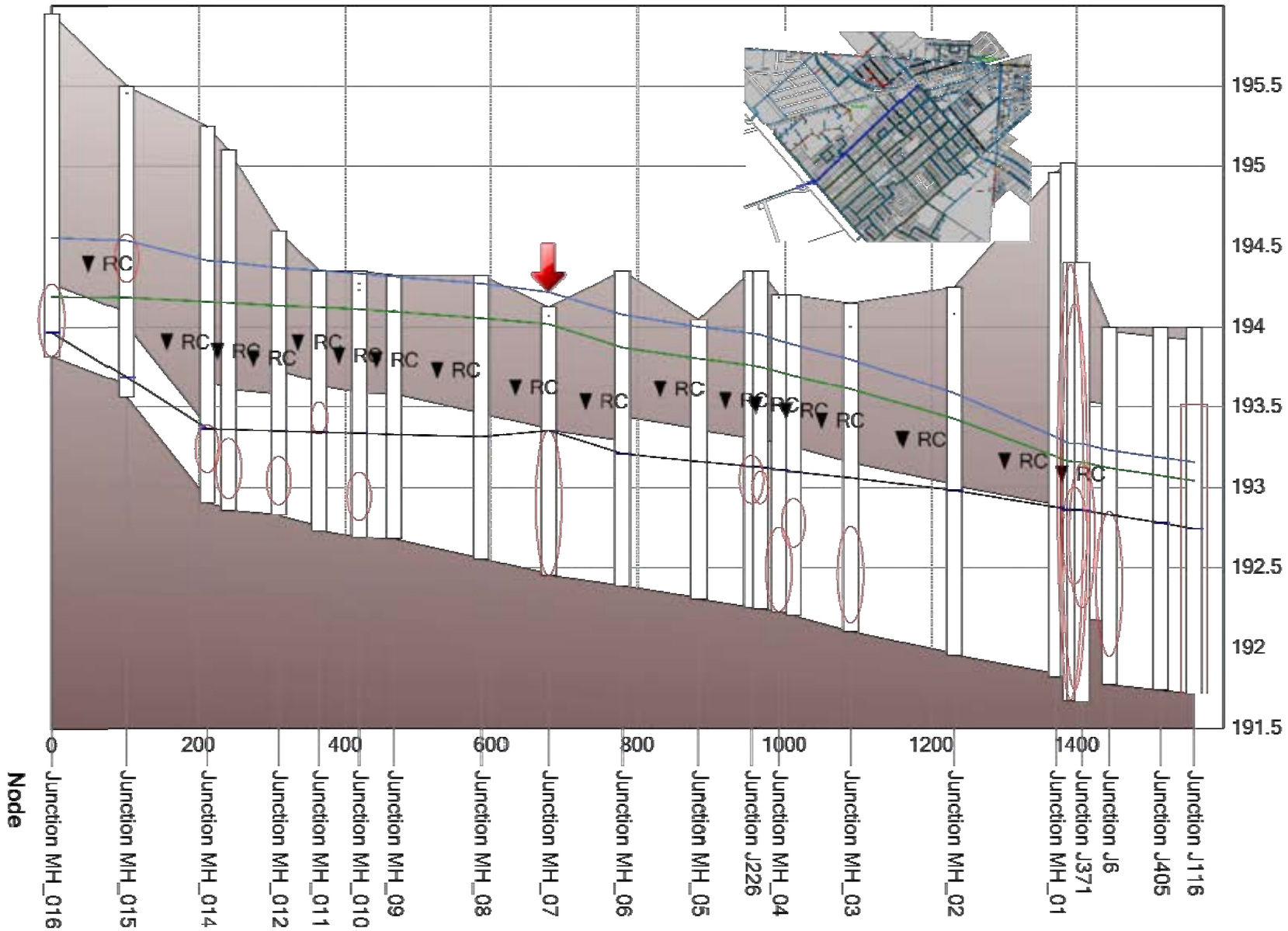


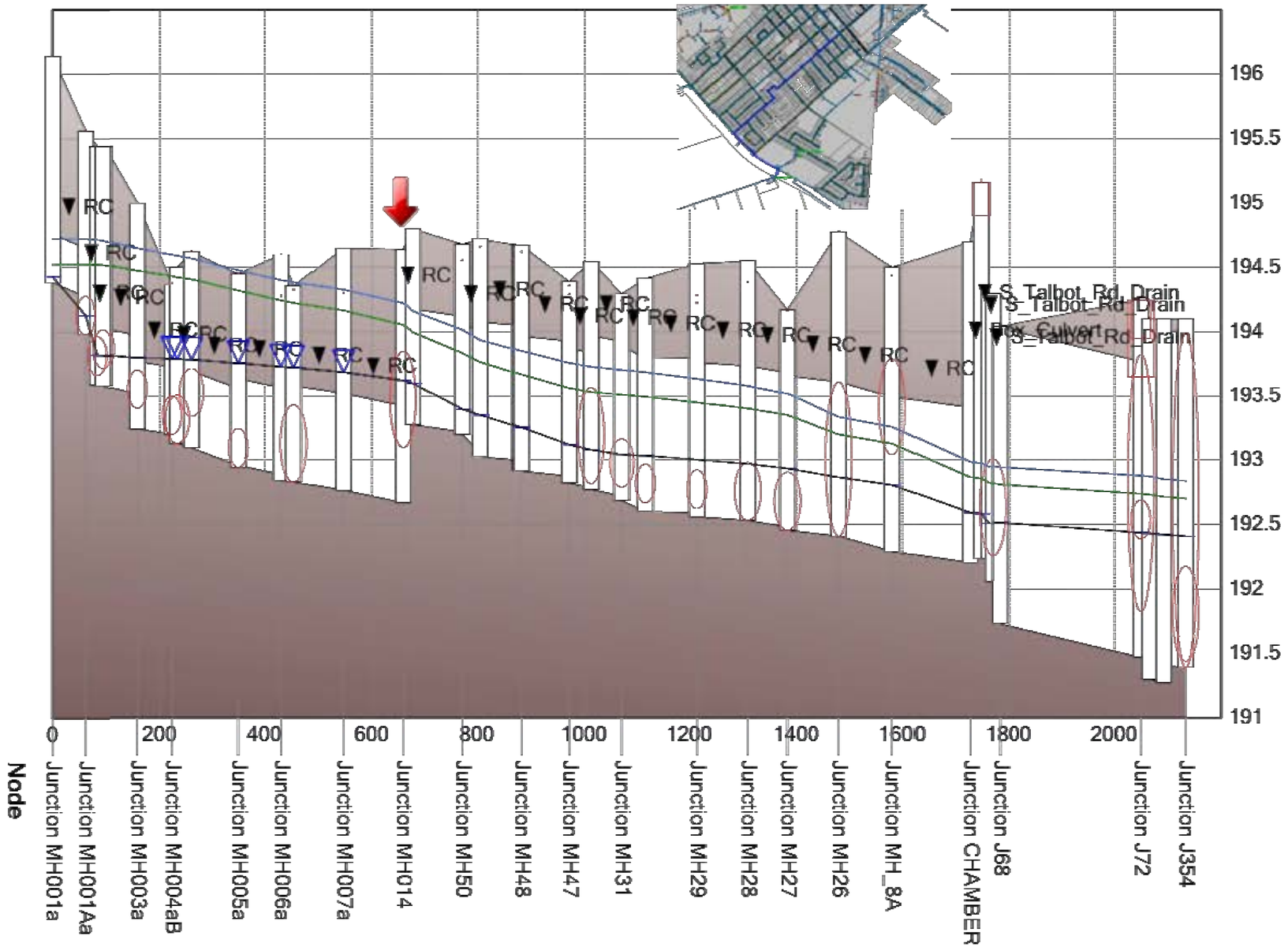
Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006
DATE: 2019.01.30

HYDRAULIC PROFILE ALONG THE VICTORIA AVE TRUNK SEWER

DRAWING NO. FIGURE 6.1



Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006	HYDRAULIC PROFILE ALONG THE BRIEN AVE W TRUNK SEWER	DRAWING NO. FIGURE 6.2
DATE: 2019.01.30		

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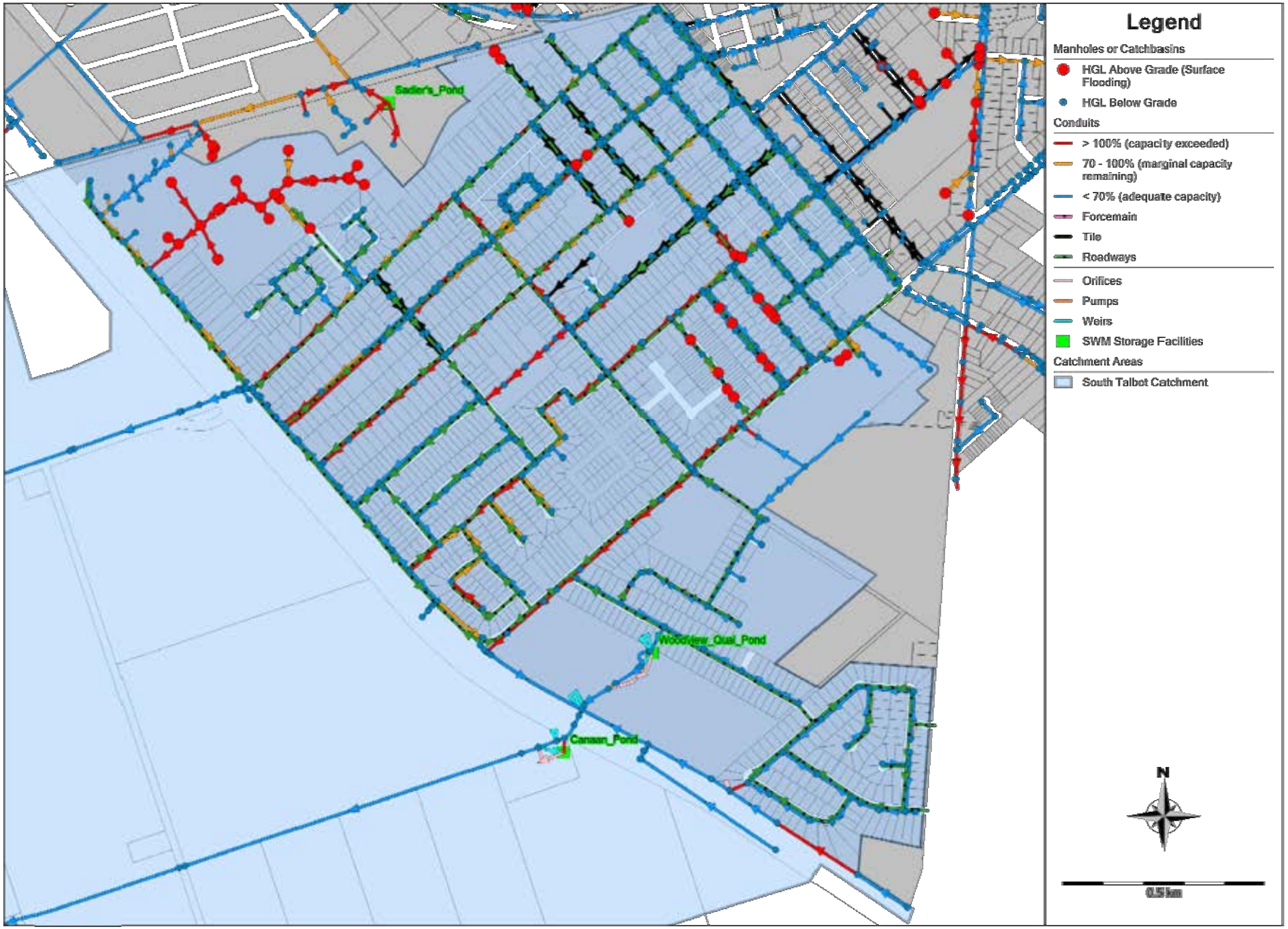

Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006	EFFECT OF 5–YEAR AES STORM IN SOUTH TALBOT CATCHMENT	DRAWING NO. FIGURE 6.3
DATE: 2019.01.30		

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.3.dwg
2019-2-05 05:22pm BY: qkha

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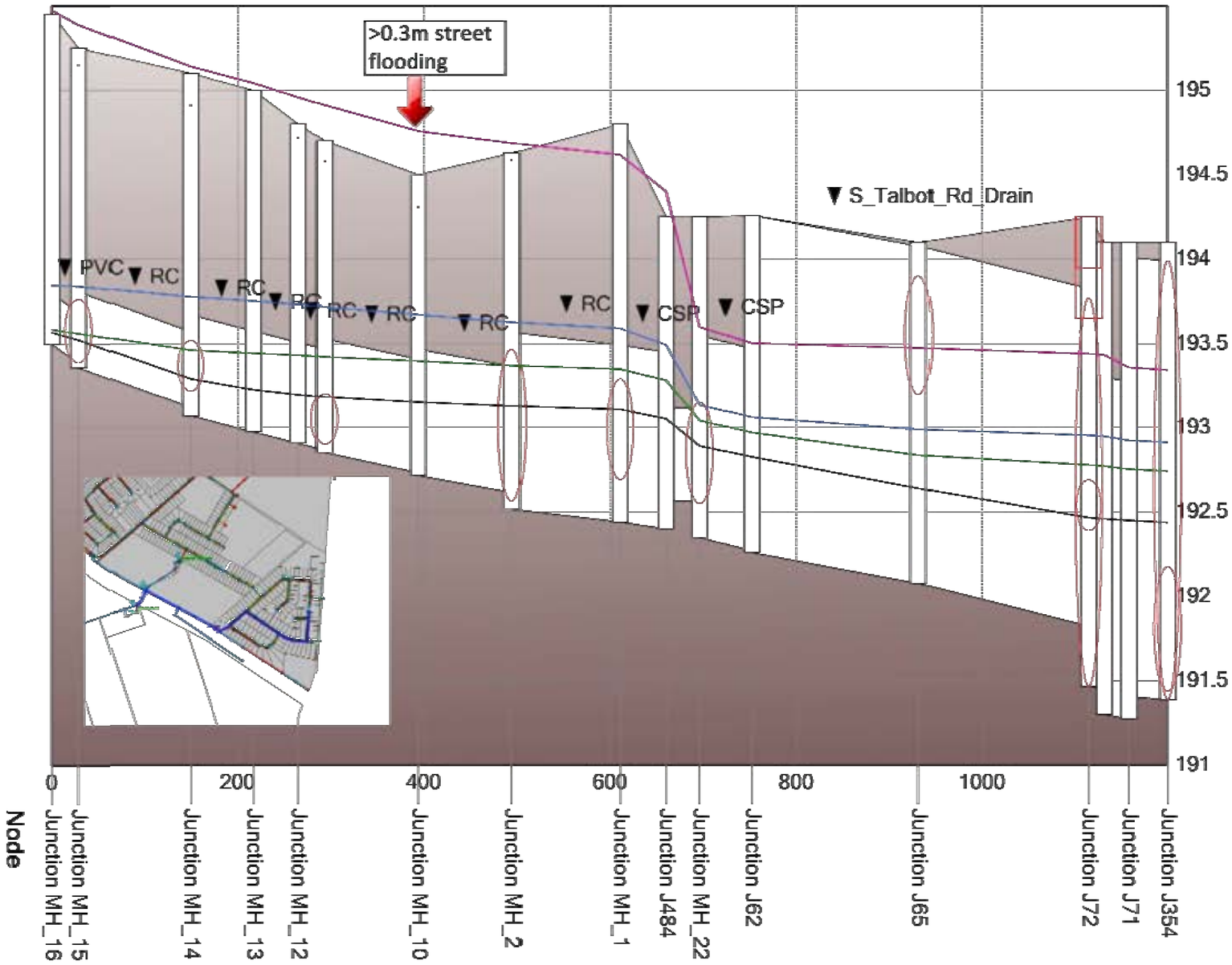
Peak values



Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006
DATE: 2019.01.30

HYDRAULIC PROFILE IN TULLEY MEADOWS

DRAWING NO.
FIGURE 6.4

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.4.dwg
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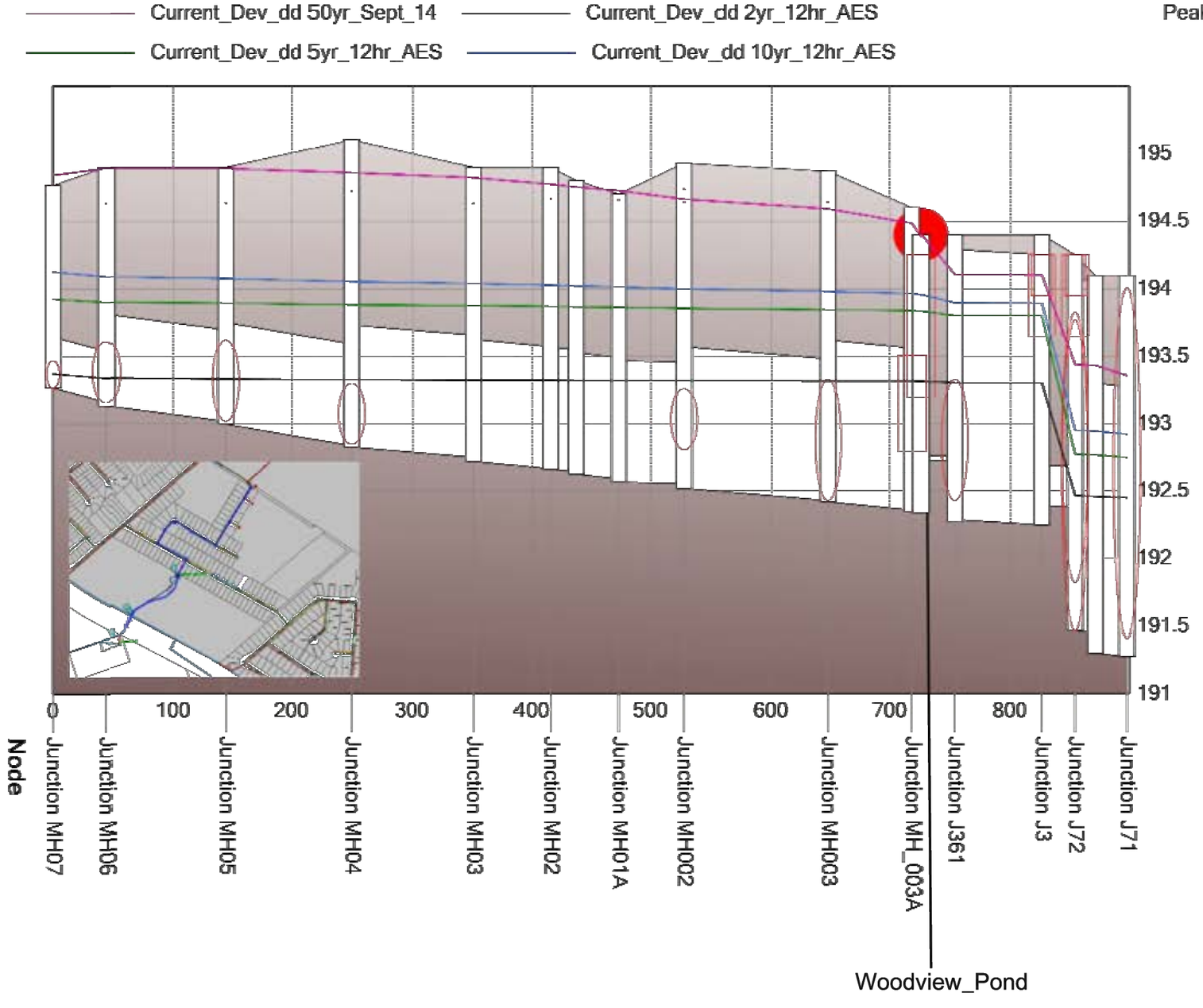

Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006	HYDRAULIC PROFILE IN WOODVIEW ESTATES	DRAWING NO. FIGURE 6.5
DATE: 2019.01.30		

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.5.dwg
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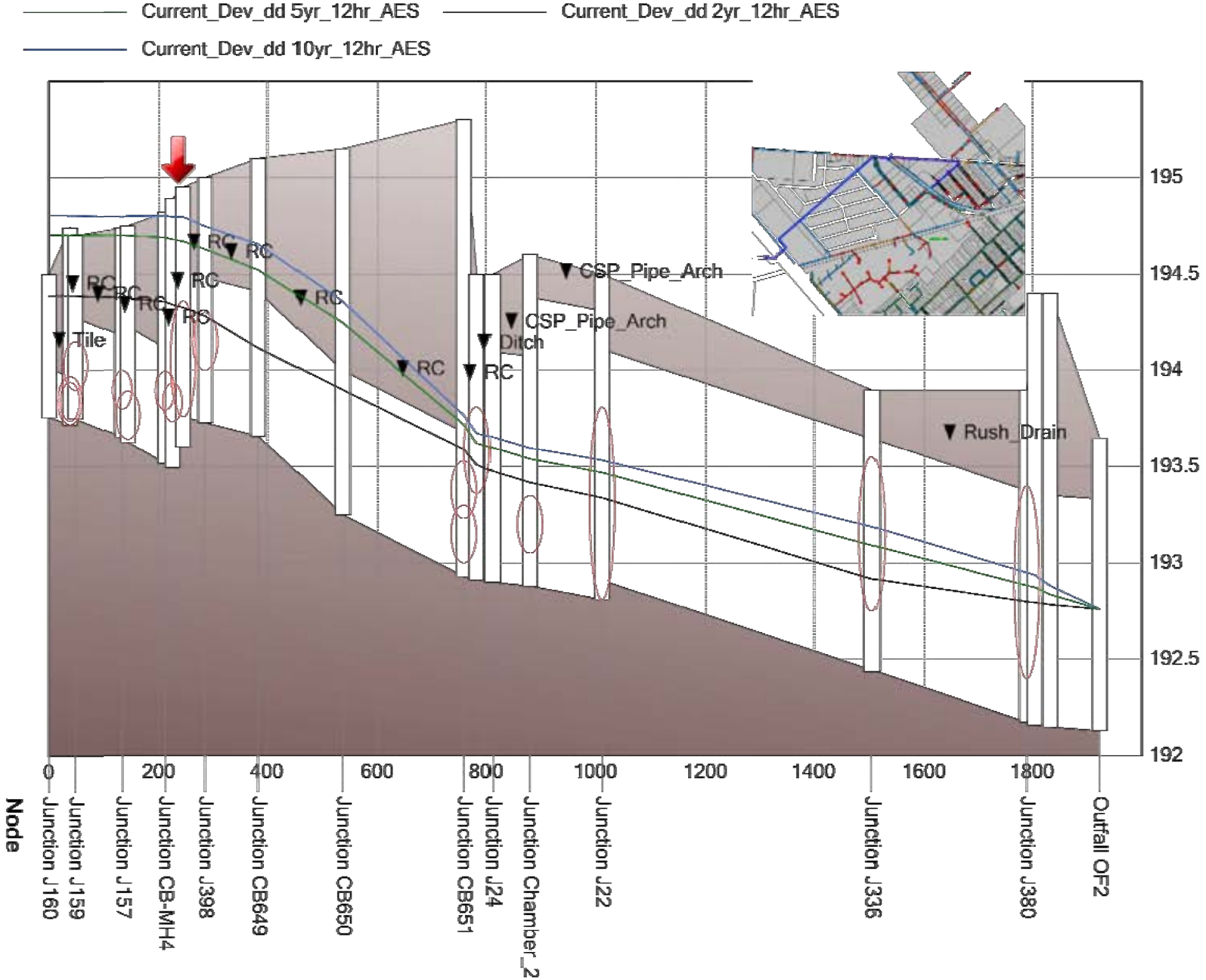

Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006
DATE: 2019.01.30

HYDRAULIC PROFILE ALONG
BELL AVE AND MAIDSTONE AVE

DRAWING NO.
FIGURE 6.6

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.6.dwg
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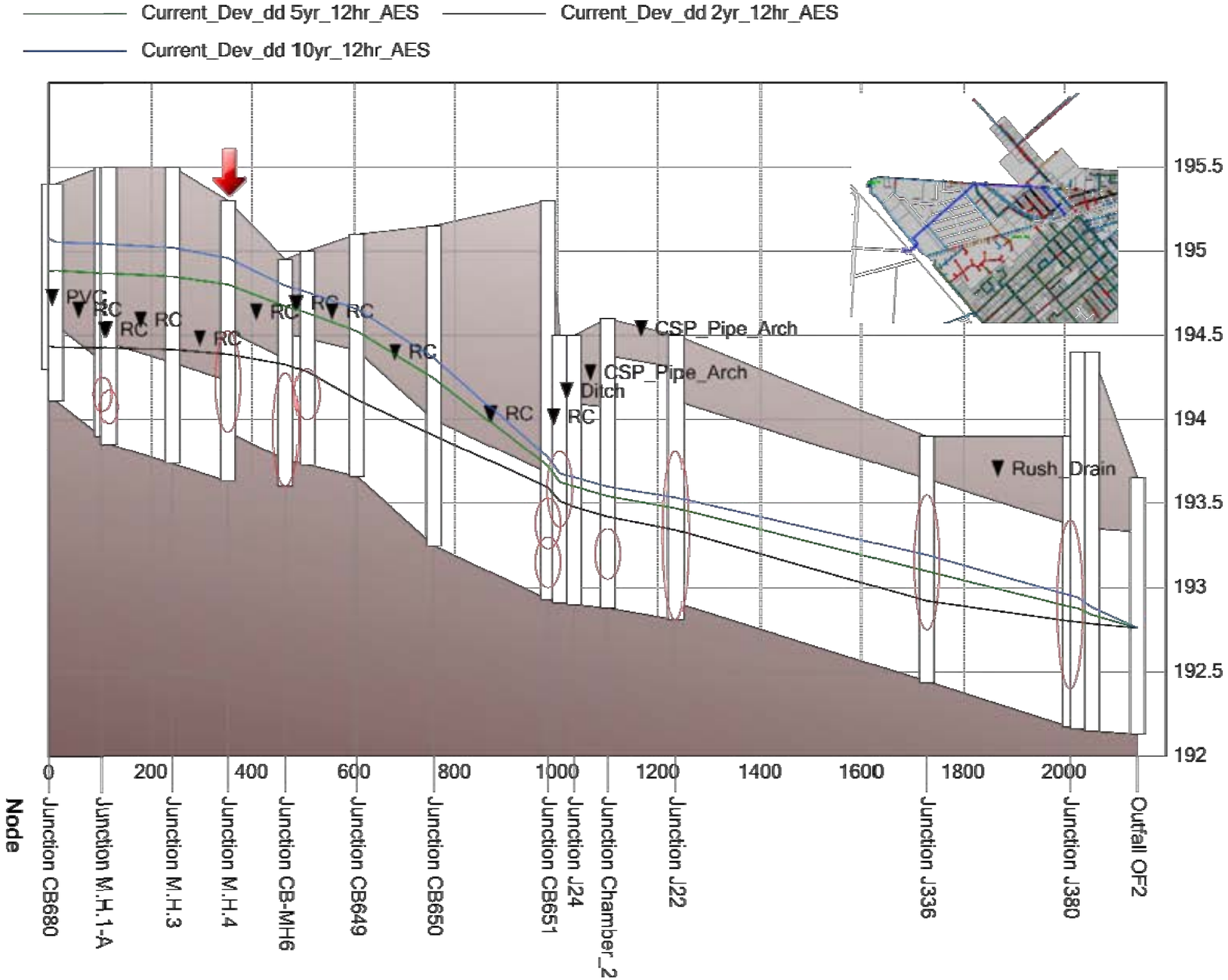

Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006	HYDRAULIC PROFILE ALONG ALBERT ST AND MAIDSTONE AVE	DRAWING NO. FIGURE 6.7
DATE: 2019.01.30		

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.7.dwg
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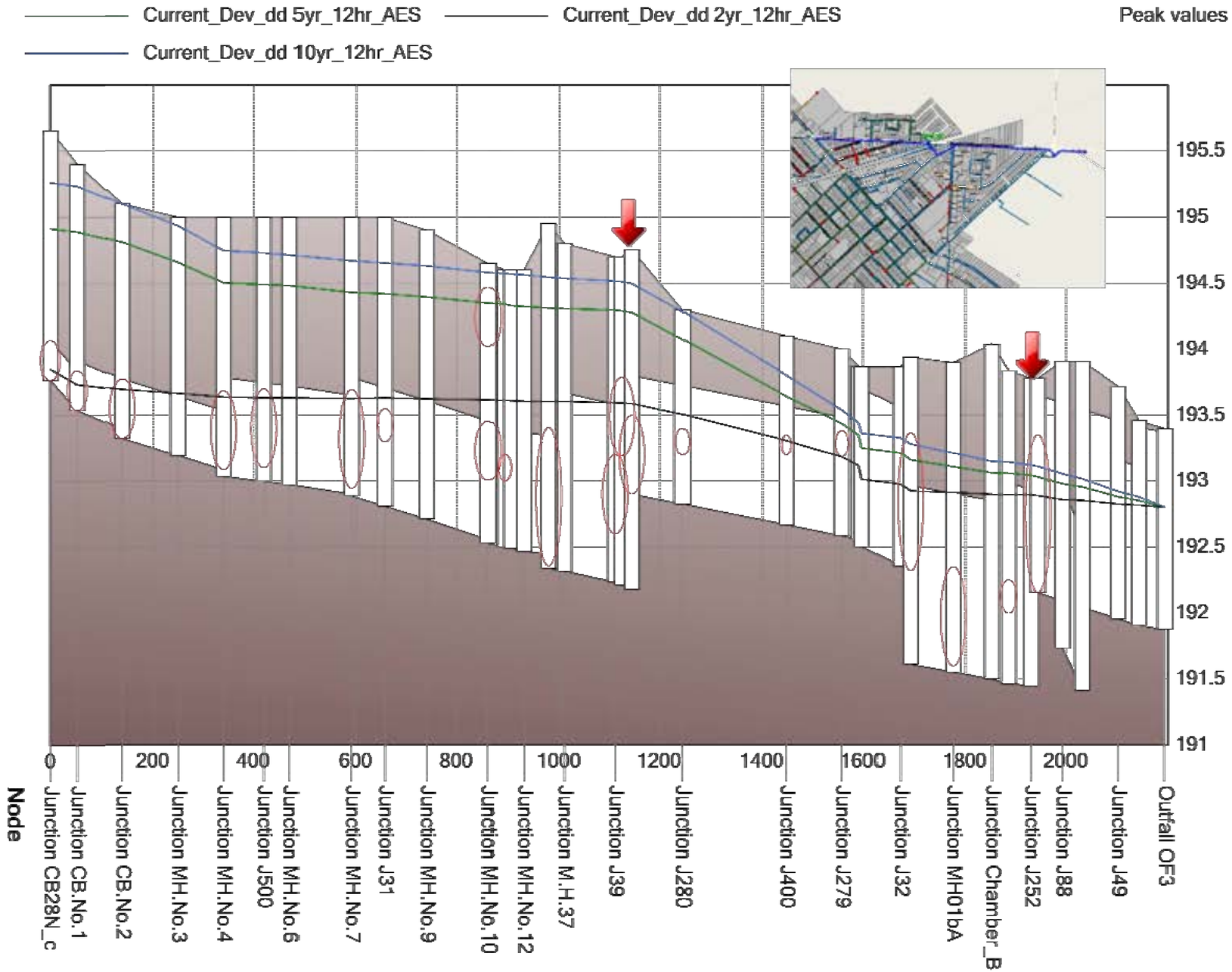

Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006
DATE: 2019.01.30

HYDRAULIC PROFILE ALONG MAIDSTONE AVE E IN MAIDSTONE CATCHMENT

DRAWING NO.
FIGURE 6.8

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.8.dwg
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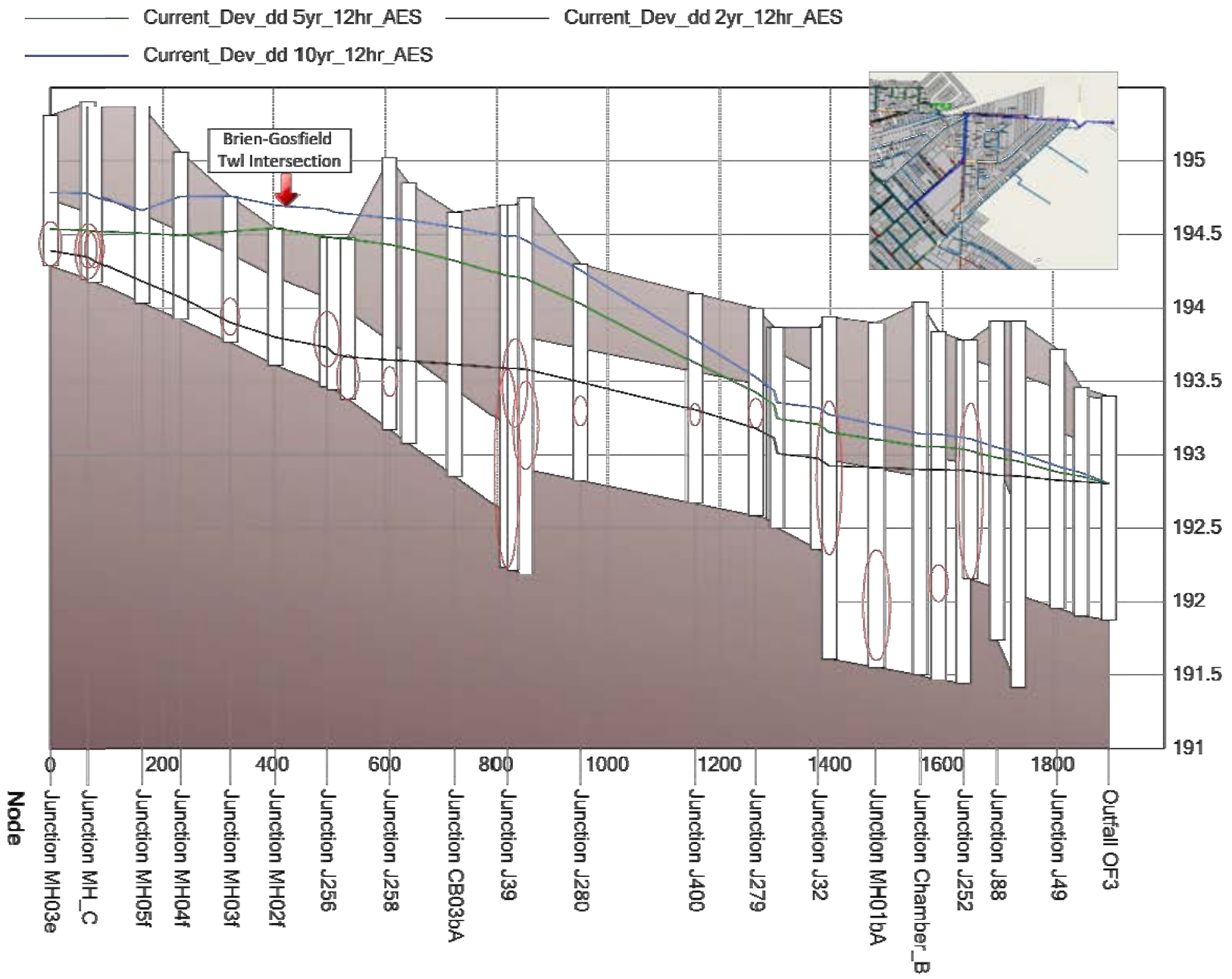

Stantec

TOWN OF ESSEX
STORM SEWER HYDRAULIC–HYDROLOGIC MODEL
& CAPACITY ASSESSMENT

PROJECT NO. 165620006
DATE: 2019.01.30

HYDRAULIC PROFILE AT
BRIEN–GOSFIELD INTERSECTION

DRAWING NO.
FIGURE 6.9

\\Cd1223-f01\01656\active\165620006_ward_one_flow_opt_&_long_range_planning_san_study\preliminary\report\Hydraulic Model Report 2015, 2018\Storm Sewer System\Appendix\Appendix E\AutoCAD\165620006_figure 6.9.dwg
2019-1-30 05:53pm BY: qkha

REPLACE MAIDSTONE AVE W SEWER

REPLACE MAIDSTONE AVE E SEWER AND DEEPEN MAIDSTONE AVE DRAIN

REFER TO MUNICIPAL CLASS EA FOR PROPOSED IMPROVEMENTS IN THE SOUTH TALBOT CATCHMENT

Stantec

CATCHMENT	SUBWATERSHED	SYMBOL
1. RUSH	RIVER CANARD	SUBCATCHMENT 1
2. ARNER TWL	RIVER CANARD	SUBCATCHMENT 1
3. SOUTH TALBOT	RIVER CANARD	SUBCATCHMENT 1
4. HOPGOOD	PUCE RIVER	SUBCATCHMENT 1
5. MAIDSTONE AVE	PUCE RIVER	SUBCATCHMENT 1

INFRASTRUCTURE LEGEND

- STORM CONDUIT – IN SERVICE (SEWER, BRIDGE OR CULVERT)
- SEWERS MISSING RECORD DWG'S
- MANHOLE
- MAINLINE CATCHBASIN
- PRIMARY OUTLET – FLOW DIRECTION
- SECONDARY OUTLET – OVERFLOW DIRECTION
- CLAY TILES (FLOW DIRECTION ASSUMED)
- ORIFICE (Opening)
- SLUICE GATE
- STORMWATER MANAGEMENT POND
- STORM CONDUIT – OUT-OF-SERVICE
- MUNICIPAL DRAIN
- DITCH OR SWALE
- OVERFLOW SWALE
- SEWER OUTFALL
- WEIR (Crest Elev.)
- FLAP GATE

TOWN OF ESSEX – ESSEX CENTRE

FIGURE 7.1: SITE PLAN OF PRELIMINARY STORM SEWER IMPROVEMENTS IN ESSEX WARD 1

PROJECT NO. 165620006

1:12500 (0, 125, 375, 600m)

DRAFT NO. FINAL

DATE MAY 24, 2018

Appendix 2 , 202 **Site Assessments and Reviews**

SITE ASSESSMENTS AND S

BUILT HERITAGE AND CULTURAL HERITAGE LANDSCAPES CHECKLIST

G.2

Clear Form Print Form

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.

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Project or Property Name

Essex Ward 1 - Southwest Storm Sewer System Phases 1 & 2 (Schedule B) Class Environmental Assessment

Project or Property Location (upper and lower or single tier municipality)

Town of Essex, Ontario (Refer to Figure 6.1 for the location of proposed upgrades.)

Proponent Name

Town of Essex

Proponent Contact Information

Kevin Girard (kgirard@essex.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 Consulting Ltd.
300-1331 Clyde Avenue
Ottawa ON K2C 3G4

December 1, 2022

160925146

Kevin Girard, P. Eng., MBA
Director, Infrastructure Ontario
33 Talbot Street South
Essex, Ontario
N8M 1A8

Dear Kevin Girard,

Reference: Town of Essex - Southwest Area Storm Sewer Improvement - Natural Heritage Review

1 Introduction

In support of the Town of Essex's (the Town) Southwest Area Storm Sewer Improvement Municipal Class Environmental Assessment (the Project), Stantec Consulting Ltd. (Stantec) completed a Natural Heritage Review within an area bounded by Fairview Avenue West, Woodview Drive, Oak Drive and the Essex Bypass (Highway 3) in Essex, Ontario (17T 349460E, 4669147N; the Site) (**Attachment A, Figure 1**). As part of the Project, the Town is assessing the Site to determine if there is a feasible option for the improvement of the Southwest Area Storm Sewer.

The scope of Stantec's Natural Heritage Review at the Site was developed based on comments received by the Town from the Essex Region Conservation Authority (ERCA) on June 16, 2021 (**Attachment B**) and the County of Essex (the County) on June 29, 2021 (**Attachment C**).

The results and recommendations provided below in this Natural Heritage Review are intended to inform the Town's assessment of the Project's preferred design (i.e., expansion of the Woodview Pond) at the Site.

2 Methods

2.1 Background Data Collection

As part of Stantec's Natural Heritage Review, the following background documentation and data collection sources were reviewed to identify natural heritage features within, and adjacent to (120 metres [m]), the Site; herein referred to as the Study Area:

- Ontario's Natural Heritage Information Centre (NHIC; Ministry of Natural Resources and Forestry [MNRF] 2022a)
- Land Information Ontario (LIO; MNRF 2022b)
- AgMaps (Ontario Ministry of Agriculture, Food and Rural Affairs [OMAFRA] 2020)
- County of Essex – Official Plan (County of Essex 2014)
- Town of Essex – Official Plan (Town of Essex 2009)
- Essex Region Conservation Authority (ERCA) Public Interactive Mapping Viewer (ERCA 2022)
- Satellite imagery (Google Earth Pro 2022)

Natural heritage information gathered during the background documentation and data collection task has been used to identify potentially significant natural heritage features (e.g., vegetation communities, wetlands, woodlands) in the Study Area.

Additionally, a list of species at risk (SAR) and species of conservation concern (SOCC) with the potential to occur in the Study Area has been developed by reviewing the following publicly available sources:

- Ontario's NHIC (MNRF 2022a)
- Species at Risk Public Registry (ECCC 2022)
- Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Mapping (DFO 2022)
- Species at Risk in Ontario List (MNRF 2022c)
- Ontario Breeding Bird Atlas (OBBA; Cadman et al. 2007)
- Atlas of Mammals in Ontario (AMO; Dobbyn 1994)
- Ontario Reptile and Amphibian Atlas (ORAA; Ontario Nature 2020)
- Ontario Butterfly Atlas Online (OBAO; Macnaughton et al. 2022)
- iNaturalist Canada (iNaturalist 2020)
- eBird Canada (eBird 2020)

Several of the sources referenced above supply data at a scale as large as 10-kilometre (km) x 10 km, therefore, results provided were screened to assess their relevance to the Study Area based on available habitat and/or natural heritage features present.

2.1.1 DEFINITIONS FOR SPECIES AT RISK

The federal *Species at Risk Act* (SARA) provides a framework across Canada to prevent the extinction of wildlife species and support actions for their recovery. Tenants on federal lands are responsible for preventing the disappearance of endangered and threatened species on their properties and to implement management plans to comply with provisions of the SARA. The provincial *Endangered Species Act, 2007* (ESA) was created to protect SAR and their habitats in Ontario. Work on public or private land (excluding federal lands) that may harm or harass designated threatened and endangered species, or impact their habitat, requires approval from the Ministry of the Environment, Conservation and Parks' (MECP) Species at Risk Branch.

For the purpose of this Natural Heritage Review, SAR are species defined as:

- Endangered and threatened species that are on the Species at Risk in Ontario (SARO) list and protected by the ESA
- Endangered and threatened migratory birds or fish species that are listed on Schedule 1 of the SARA and protected by the SARA

2.1.2 DEFINITIONS FOR SPECIES OF CONSERVATION CONCERN

Species of conservation concern (SOCC) include species that are listed as special concern on the province's SARO list and/or the SARA. Typically, SOCC do not receive the same protection provisions (specifically related to habitat) that endangered and/or threatened species receive under the SARA and/or ESA; however, they are tracked and assessed for management purposes.

For the purpose of this Natural Heritage Review, SOCC are defined as:

- Special concern species on the SARO list
- Species with provincial ranks of S1 to S3

Provincial sub-national ranks (S-ranks) are used by the NHIC to set protection priorities for SOCC and vegetation communities. They are based on a number of factors such as abundance, distribution, population trends and threats in Ontario and are not legal designations. Provincial S-ranks are defined as:

- S1: Critically imperiled; usually fewer than 5 occurrences
- S2: Imperiled; usually fewer than 20 occurrences
- S3: Vulnerable; usually fewer than 100 occurrences
- S4: Apparently secure; uncommon but not rare, usually more than 100 occurrences
- S5: Secure, common, widespread and abundant

2.2 Agency Consultation

Agency consultation has largely moved to a proponent driven process for both the federal and provincial agencies responsible for SAR (e.g., DFO, MECP) and proponents are directed to review the background documentation and related information sources listed above. As such, specific information request packages were not submitted by Stantec to responsible agencies for provincially designated natural heritage features, SAR, and/or SOCC.

2.2.1 TERMS OF REFERENCE

Through email correspondence, a Terms of Reference (ToR) outlining Stantec's scope of work to complete the Natural Heritage Review within the Study Area (described below) was provided to both the County and the ERCA for review and comment. The County and the ERCA responded to Stantec on October 18, 2022, and November 9, 2022, respectively, and did not provide further comments related to the proposed scope of work provided in the ToR.

2.3 Field Investigation

As part of the Natural Heritage Review, Stantec completed a field investigation of the Site on September 11, 2022, to identify and classify the existing conditions (e.g., vegetation communities), as well as confirming the natural heritage features in the Study Area identified during the background data collection process. Stantec's field investigation was completed during the wildlife and vegetation growing season, which is typically defined as the period between April and September in any given year.

Table 2-1 provides a summary of environmental conditions during Stantec's field investigation.

Table 2-1 Environmental Conditions during Stantec's Field Investigation within the Study Area

Purpose of Investigation	Date	Start/End Time (24 hour)	Weather Conditions	Biologist
• Ecological Land Classification • Natural Features Identification • Species at Risk Search and Habitat Suitability Assessment	September 11, 2020	1100 – 1600	Temperature: 26°C Wind (Beaufort scale): 2, SE Cloud Cover: 60% Precipitation: None 24/hr. Precipitation: None	Brian Miller

2.3.1 ECOLOGICAL LAND CLASSIFICATION

Initial characterization of existing vegetation communities was completed by interpreting available aerial imagery. Vegetation was identified, and communities were verified and assessed in the field within the Study Area following a meandering transect. Community characterizations (ecosites and vegetation types) were based on the Ontario Ecological Land Classification (ELC) system (Lee et. al., 2008). Dominant vegetation species within each community were recorded and used to determine ecosites and vegetation types. Provincial significance of vegetation communities and plant species was based on the rankings assigned by the NHIC.

See **Table 2-1** for environmental conditions observed during Stantec's ELC survey.

2.3.2 SPECIES AT RISK HABITAT SUITABILITY ASSESSMENT

SAR wildlife habitat suitability assessments were completed for ESA protected species that may occur in the area (e.g., willowleaf aster [*Symphyotrichum praealtum*]) including species identified in the NHIC database and Ontario wildlife atlases during the literature review process (e.g., eastern foxsnake [*Pantherophis gloydi*]).

See **Table 2-1** for environmental conditions observed during Stantec's SAR habitat suitability assessment survey.

3 Results

3.1 Background Data Collection

3.1.1 NATURAL HERITAGE FEATURES

Stantec's review of the background documentation and data collection sources listed above have identified the following mapped natural heritage features within the Study Area:

- Waterbody (NHIC)
- Watercourses
  - Permanent Unnamed Watercourse (NHIC)
  - Canaan Drain, DFO Class F Municipal Drain (OMAFRA)
  - Talbot Road South Drain, DFO Class F Municipal Drain (OMAFRA)
- Wooded Area (NHIC)
- Existing Natural Feature (ERCA)
- Natural Environment Overlay (County of Essex)
- Natural Heritage Overlay (Town of Essex)

3.1.2 SPECIES AT RISK

Stantec's review of the background documentation and data collection sources listed above have produced the following table (**Table 3-1**) of SAR that have been identified and/or have the potential to occur within the Study Area:

Table 3-1 Species at Risk with Potential to Occur within the Study Area

Common Name	Scientific Name	Status			Source	Potential Habitat and/or Species Observed within Site (Y/N)	Potential Habitat and/or Species Observed within 120 m of Site (Y/N)
		SARO List (ESA)	SARA	Provincial S-Rank			
Herptiles							
Blanding's Turtle	*Emydoidea blandingii*	THR	THR	S3	NHIC, ORAA	Y	N
Eastern Foxsnake (Carolinian Population)	*Pantherophis gloydi*	END	END	S2	ORAA	Y	Y
Birds							
Chimney Swift	*Chaetura pelagica*	THR	THR	S3B	OBBA	N	N
Common Nighthawk	*Chordeiles minor*	SC	THR	S4B	OBBA	N	N
Red-headed Woodpecker	*Melanerpes erythrocephalus*	END	END	S3	OBBA	Y	Y
Bank Swallow	*Riparia riparia*	THR	THR	S4B	OBBA	N	N
Barn Swallow	*Hirundo rustica*	THR	THR	S4B	OBBA	N	N
Yellow-breasted Chat	*Icteria virens*	END	END	S1B	OBBA	Y	N
Eastern Meadowlark	*Sturnella magna*	THR	THR	S4B, S3N	NHIC, OBBA	N	N
Bobolink	*Dolichonyx oryzivorus*	THR	THR	S4B	NHIC, OBBA	N	N
Least Bittern	*Ixobrychus exilis*	THR	THR	S4B	NHIC, OBBA	N	N
Mammals							
Eastern Small-footed Myotis	*Myotis leibii*	END	NAR	S2S3	AMO	N	N
Little Brown Myotis	*Myotis lucifugus*	END	END	S3	AMO	Y	Y
Northern Myotis	*Myotis septentrionalis*	END	END	S3	AMO	Y	Y
Tri-colored Bat	*Perimyotis subflavus*	END	END	S3?	AMO	Y	Y
Other							
Restricted Species	n/a	n/a	n/a	n/a	NHIC	n/a	n/a
Restricted Species	n/a	END	n/a	n/a	NHIC	n/a	n/a

Restricted Species are typically those species that are subject to either overharvesting, the illegal trade market and/or are considered close to being extirpated in Ontario. As such, they are not identified by the NHIC to the species level and remain as a Restricted Species to the public to assist with their management objectives. If required, Restricted Species can be determined by proponents and/or consultants with the necessary data sensitivity training by requesting this data directly from the NHIC.

A discussion on the suitability of habitat for species identified as potentially occurring within the Site, or within 120m of the Site, in **Table 3-2** is provided below in **Section 3.2.2**.

3.1.3 SPECIES OF CONSERVATION CONCERN

Stantec's review of the background documentation and data collection sources listed above have produced the following list of SOCC that have been identified and/or have the potential to occur within the Study Area:

- Bald Eagle (*Haliaeetus leucocephalus*), Special Concern (SARO), S4B, S2N (OBBA)
- Differential Grasshopper (*Melanoplus differentialis*), S3 (NHIC)
- Eastern Wood-Pewee (*Contopus virens*), Special Concern (SARA, SARO), S4B (OBBA)
- Monarch (*Danaus plexippus*), Special Concern (SARO), S4B, S2N (OBAO)
- Northern Map Turtle (*Graptemys geographica*), Special Concern (SARO), S3 (NHIC, ORAA)
- Round-fruited St. John's-wort (*Hypericum sphaerocarpum*), S1 (NHIC)
- Schweinitz's Flatsedge (*Cyperus schweinitzii*), S3 (NHIC)
- Snapping Turtle (*Chelydra serpentina*), Special Concern (SARO), S4 (NHIC, ORAA)
- Yellow Fringed Orchid (*Platanthera ciliaris*), SX (NHIC)

3.2 Field Investigation

3.2.1 ECOLOGICAL LAND CLASSIFICATION

Vegetation communities located within the Study Area were delineated into ELC units (**Attachment A, Figure 2**). Eleven naturalized community types were identified within the Study Area. Descriptions of these communities are found in **Table 3-2** below. Adjacent land uses (e.g., transportation, residential) and anthropogenically influenced communities within the Study Area (e.g., agriculture) were identified by air photo interpretation and confirmed during a roadside reconnaissance and are not described further in **Table 3-1**.

Table 3-2 Ecological Land Classification Descriptions

ELC TYPE	Community Description
Meadow (ME)	
Mixed Meadow (MEM)	
MEMM3 – Dry-Fresh Mixed Meadow	This community, associated with the Highway 3 right-of-way, is a regenerating meadow that is trending towards a THDM4 community. Red ash, nannyberry and grey dogwood are the most common woody trees and shrubs observed in this location. The ground layer is dominated by a mixture of old field grasses and forbs such as New England aster, Kentucky bluegrass, common teasel, old field aster and redtop grass.
Thicket (TH)	
Mixed Thicket (THM)	
THMM2 – Fresh-Moist Mixed Thicket Ecosite	This dense thicket area is dominated by a mixture of regenerating trees that are in the 2-6 m height range. The common species include eastern white cedar, red ash, swamp pin oak, staghorn sumac and rough-leaved dogwood.
Deciduous Thicket (THD)	
THDM4 – Dry-Fresh Deciduous Regeneration Thicket Ecosite	This dense thicket area is dominated by a mixture of mature shrubs and young regenerating trees, as well as semi-mature trees that reach above the shrub layer. The shrub layer is dominated by rough-leaved dogwood, green ash and Norway maple. Semi-mature trees of little-leaved linden, black walnut and honey locust (S2) occur occasionally throughout the thicket.
THDM4 – Dry-Fresh Deciduous Regeneration Thicket Ecosite / MEMM3 – Dry-Fresh Mixed Meadow	This area is a mixture of thicket and meadow. Red ash, nannyberry and grey dogwood are the most common woody trees and shrubs in this area. The ground layer is dominated by a mixture of old field grasses and forbs such as New England aster, Kentucky bluegrass, common teasel, old field aster and redtop grass. The provincially rare and endangered butternut tree has been planted sporadically throughout this community.
THDM5 – Fresh-Moist Deciduous Thicket Ecosite	This large thicket area is dominated by rough-leaved dogwood and occasional saplings of white elm and red ash. The ground layer is dominated by poison ivy. *Carex* sedges, devil's beggarticks and American water-horehound are also common in the ground layer. A large patch (~ 8 m x 8 m) of the provincially rare and threatened willowleaf aster occurs in this community and the Special Concern climbing prairie rose occurs sparsely throughout this community. The provincially rare Missouri ironweed (S3?) occurs sparsely throughout this community.
Agriculture (AG)	
Treed Agriculture (TAG)	
TAGM2 – Mixed Plantation	This disturbed area is dominated by planted trees and shrubs such as black walnut, staghorn sumac, white spruce, and red cedar. The ground layer contains Canada thistle, great ragweed, common teasel, common Timothy, New England aster and grass-leaved goldenrod.
TAGM3a – Deciduous Plantation	This small area is dominated by various planted trees of Japanese tree lilac, red ash, Kentucky coffee-tree, honey locust and little-leaved linden.
TAGM3b – Deciduous Plantation	This small plantation is dominated by young Freeman (swamp) maple and/or silver maple. The ground layer is dominated by Kentucky bluegrass.

Table 3-2 Ecological Land Classification Descriptions

ELC TYPE	Community Description
TAGM5 – Fencerow	These small fencerow features dominated by closely planted semi-mature eastern white cedar and white spruce.
Swamp (SW)	
Deciduous Swamp (SWD)	
SWDM1-3a – Pin Oak Mineral Deciduous Swamp Type	This swamp area is dominated by regenerating swamp pin oak that range from immature to semi-mature in age/size. Regenerating Freeman's (swamp) maple and red ash are also common throughout. The ground layer is dominated by poison ivy, various *Carex* sedges, devil's beggarticks and American water-horehound. The provincially rare and Special Concern climbing prairie rose occurs sparsely throughout this community. The provincially rare Missouri ironweed (S3?) occurs sparsely throughout this community.
SWDM1-3b – Pin Oak Mineral Deciduous Swamp Type	This swamp area is dominated by mature swamp pin oak trees with occasional white elm and basswood in the canopy. The understory contains occasional white elm and red ash saplings. The ground layer is dominated by shoreline sedge, thicket creeper and poison ivy. The provincially rare shellbark hickory (S3) tree occurs sparsely in this community in the understory.
Thicket Swamp (SWT)	
SWTM3 – Willow Mineral Deciduous Thicket Swamp Ecosite	This moist thicket area is dominated by sandbar willow and grey dogwood. Occasional saplings of white elm also occur here. The ground layer is dominated by dense shoreline sedge.
Marsh (MA)	
Meadow Marsh (MAM)	
MAMM1-2 – Cattail Graminoid Mineral Meadow Marsh Type	This narrow band of wetland vegetation occurs along the drainage feature. Dense cattails are dominant. European reed (*Phragmites*), seaside goldenrod and purple loosestrife are also common.
Shallow Marsh (MAS)	
MASM1-1 – Cattail Mineral Shallow Marsh Type	The open shallow water area contains cattails at the perimeter of the shallow water. Sandbar willow and staghorn sumac also occur on the small slopes into the wet area.

The following is a floristic summary based of the botanical survey completed in conjunction with ELC in the Study Area:

- A total of 79 species of vascular plants were recorded. This total includes taxa identified to species, subspecies (ssp.) and variation (var.) levels
- 61 of the 79 recorded species are native to Ontario, while 18 are exotic species not native to Ontario. This is a high percentage of native species and reflects the relatively undisturbed nature of the natural features surveyed within the Study Area
- 42 native species have a provincial rank of S5, indicating they are common with a secure population in Ontario

- 12 native species have a provincial rank of S4, indicating they are uncommon, but not rare in the province and populations are apparently secure
- 7 provincially rare Ontario species (S1, S2 or S3) were observed in the Study Area. Their locations are outlined below in **Table 3-3** and shown on **Figure 2**

Table 3-3 – Locations of Provincially Rare Plant Species

Provincially Rare Species		Provincial S-Rank	ELC Community	Comments
Carya laciniosa	Shellbark Hickory	S3	SWDM1-3b	n/a
Gleditsia triacanthos	Honey Locust	S2?	SWDM3-3 SWDM2	• Planted
Gymnocladus dioicus	Kentucky Coffee-tree	S2	THDM4 TAGM2 TAGM3a SWDM1-3a CVC	• Planted • Provincially Threatened
Juglans cinerea	Butternut	S2?	THDM4/MEMM3	• Planted • Provincially Endangered
Rosa setigera	Climbing Prairie Rose	S2S3	SWDM1-3a THDM5	• Provincially Special Concern
Symphyotrichum praealtum	Willow-leaved Aster	S2	THDM5	• Provincially Threatened
Vernonia missurica	Missouri Ironweed	S3?	SWDM1-3a THDM5	n/a

- 4 SAR were observed in the Study Area.
  - Two of these species (Kentucky coffee-tree and butternut) do not occur naturally at the site. They are present because they were planted as part of landscaping and/or naturalization efforts.
  - The willow-leaved aster (Threatened) and climbing prairie rose (Special Concern) do occur naturally in the Study Area. Their locations are outlined above in **Table 3-3** and shown on **Figure 2**
- 5 highly sensitive, regionally rare plant species (coefficient of conservatism (CC) 8 or 9) were observed in the Study Area. The locations of these species are outlined below in **Table 3-4**.

Table 3-4 – Locations of Sensitive Plant Species with High CC Value

Regionally Rare Species		Provincial S-Rank	Coefficient of Conservatism Value	ELC Community
Carya laciniosa	Shellbark Hickory	S3	9	SWDM1-3b
Celtis occidentalis	Common Hackberry	S4	8	THDM4
Carex grayi	Gray's Sedge	S4	8	SWDM1-3a SWDM1-3b
Quercus palustris	Swamp Pin Oak	S4	9	SWDM1-3a SWDM1-3b THDM5
Symphyotrichum praealtum	Willow-leaved Aster	S2	8	THDM5

A detailed plant list with all scientific plant names and species statuses is provided in **Appendix D**.

3.2.2 SPECIES AT RISK HABITAT SUITABILITY ASSESSMENT

Further to the vegetation SAR observed within ELC communities discussed above in **Section 3.2.1** (i.e., butternut, Kentucky coffee-tree and willowleaf aster), wildlife SAR listed in **Table 3-1** with the potential to occur in the Study Area based on habitat and natural heritage features present are described below. If habitat features were not observed for the remaining wildlife SAR listed in **Table 3-1**, they are not described below.

Blanding's Turtle – Inhabits shallow lakes, ponds, and wetlands with soft organic substrates with abundant submergent vegetation. Blanding's Turtles will nest in open sand and/or gravel substrate above the waterline in natural (e.g., eroded shorelines, beaches) and developed habitats (e.g., gravel shoulders, gravel parking lots). They can migrate several kilometres (km) between summer habitat, nesting sites, and overwintering habitat (ORAA 2019). Blanding's turtle and/or specific habitat features (e.g., nesting sites) were not observed within the Site, however, there is an NHIC occurrence record (date unknown) approximately 2 km northwest of the Study Area.

The substrate within both the MASM1-1 and MAMM1-2 communities are considered to be mineral (not organic) and are anticipated to completely freeze during the winter months, therefore, the potential for overwintering Blanding's turtle to be encountered at the Site is low. If present, Blanding's turtle may use the marsh (MA) and/or swamp (SW) communities on the Site for thermoregulation, summer inactivity and/or movement habitat.

Eastern Foxsnake (Carolinian Population) – The Carolinian population of eastern foxsnakes have shown a strong preference for marsh and natural and semi-natural open habitats and avoid agricultural fields. Open natural and semi-natural habitats include restored prairie habitat to semi-maintained grass and fields wider than 15 m along drainage ditches, creeks, roads and railway corridors. Radio-tracked eastern foxsnakes in the Essex County region were found to use anthropogenic structures such as old wells, canal dikes, septic tile beds and building foundations as hibernacula features and have been observed using active building and houses (ECCC 2020). Eastern foxsnake and/or specific habitat features (e.g., shedding or oviposition sites) were not observed within the Site, however, there is an NHIC occurrence record (date unknown) of an endangered Restricted Species within the 1 km x 1 km NHIC square overlapping the Study Area. Eastern foxsnake is one of the species that the NHIC identifies as a Restricted Species. Furthermore,

iNaturalist (2022) provides many recent records (albeit obscured) of eastern foxsnake surrounding the Study Area.

The naturalized open thicket (TH) habitats observed within the Site are considered to be potentially suitable to support eastern foxsnake, therefore, the potential to encounter this species within the Study Area is considered moderate.

Red-headed Woodpecker – Breeding habitat consists of lowland and upland deciduous woodlands characterized by open canopies and understories with large, tall trees (typically beech or oak). Ideal habitat in Ontario is oak savannah but they can be found in other sparsely treed habitats such as dead and dying woodlots, orchards, municipal parks, golf courses and agricultural landscapes but rarely in urbanized areas (ECCC 2021). Stantec's field investigations occurred outside of the core breeding bird season (i.e., April through August) and no red-headed woodpeckers were observed. Woodland habitats within the Study Area, specifically the SWDM1-3 community in the northeast corner of the Site, is considered to provide potentially suitable breeding habitat. Therefore, the potential to encounter nesting red-headed woodpeckers at the Site is considered moderate.

Yellow-breasted Chat – As a species of transitioning habitats, the yellow-breasted chat is an open-canopy obligate species that nests in early successional shrub habitats with low, dense deciduous or coniferous vegetation communities. Early successional habitats include abandoned agricultural fields, utility corridors, fencerows, woodland edges and openings as well as riparian areas adjacent to streams, ponds and swamps (ECCC 2019). Stantec's field investigations occurred outside of the core breeding bird season (i.e., April through August) and no yellow-breasted chats were observed. Many of the vegetation communities in the Site, specifically thicket (TH) communities, were observed to be potentially suitable to support nesting yellow-breasted chat. Therefore, the potential to encounter nesting yellow-breasted chats at the Site is considered moderate.

Little Brown Myotis, Northern Myotis & Tri-colored Bat – These bat species share similar habitat preferences during their active season and are described together. They have been observed using trees as small as 10 cm DBH, but typically exhibiting early stages of decay, with cavities (usually >10 m high), loose bark, and/or leaves within forested habitats for maternity roosting purposes. Additionally, these species are known to use anthropogenic structures (e.g., houses, barns) for roosting as well (COSEWIC 2013, ECCC 2018). With the combination of buildings and wooded communities (e.g., SWDM1-3) in the Study Area, little brown myotis, northern myotis & tri-colored bat have a moderate potential of occurring during their active season (April – September). Suitable natural hibernacula habitats (e.g., mine shafts, caves) have not been identified and were not observed in the Study Area during Stantec's field investigation, therefore, hibernating bats are not considered to be present.

4 Assessment of the Project's Preferred Design Options

Currently, Stantec is considering three separate design options as part of the Southwest Area Storm Sewer Improvement project within the boundaries of the Site. At this time, design drawings have not been created for any of the three options, as such, this assessment will focus on the natural heritage features, SAR and/or SOCC observed in the following three predominant vegetation communities at the Site proposed to be impacted.

4.1 SWDM1-3 – Pin Oak Mineral Deciduous Swamp Type

This forested, swamp is the largest vegetation community located in the northeast corner of the Site and is a tracked vegetation community (S2S3) in Ontario by the NHIC. Though assessed as a swamp community through ELC interpretation, a wetland feature is not mapped within the Site (e.g., NHIC, ERCA) and does not overlap the SWDM1-3 vegetation community.

Split into two distinct ecotypes, the western extent of the community (SWDM1-3a) is defined by regenerating, small (≤10 cm) DBH swamp pin oak, Freeman's maple and red maple with occasional observations of the provincially endangered Kentucky coffee-tree, climbing prairie rose (special concern), honey locust (S2?) and Missouri ironweed (S3?). Several trees within this distinct ecotype were observed to be planted specimens with rodent guards still visible, including the endangered Kentucky coffee-tree. The eastern extent of the community (SWDM1-3b) is dominated by mature, large diameter (≥25 cm) swamp pin oak trees with associates of white elm and basswood. The provincially rare shellbark hickory (S3) tree was observed occasionally in this community within the understory.

As outlined above, the following wildlife SAR have the potential to occur within the SWDM1-3 (a & b) vegetation community:

- Eastern foxsnake (Carolinian Population)
- Red-headed woodpecker
- Little brown myotis, northern myotis & tri-colored bat

The following recommendations are provided for consideration prior to proposed impacts to the SWDM1-3 (a & b) vegetation community:

1. Complete a dedicated search for additional SAR vegetation, including Kentucky coffee-tree, within the vegetation community
2. As eastern foxsnake has been identified by NHIC as occurring within the 1 x 1 km square overlapping the Study Area and potentially suitable habitat was observed within the Site, a survey following the guidance outlined in the MNRF's *Survey Protocol for Ontario's Species at Risk Snakes* (2016) is recommended to determine if eastern Foxsnake are using the Site
3. Complete a breeding bird survey following methods consistent with previously approved methods by the Canadian Wildlife Service (CWS) (i.e., 10-minute point count) and the Ontario Breeding Bird Atlas: *Instructions for Point Counts* (2021), to determine if species protected under the ESA, such as red-headed woodpecker, are breeding within the Site
4. Due to the potential presence of SAR bats, complete a SAR bat leaf-off habitat assessment within the vegetation community following recent guidance provided by the MECP to determine the potential suitability to support roosting SAR bats

5. Correspond with the MECP's Species at Risk Branch (SARB) through the submission of an Information Gathering Form (IGF) to illicit a formal response from the MECP to understand the Town's requirements under the ESA

4.2 THDM4 – Dry-Fresh Deciduous Regeneration Thicket Ecosite/MEMM3 – Dry-Fresh Mixed Meadow

The THDM4 and THDM4/MEMM3 vegetation communities within the Site are relatively small, isolated communities along the western border of the Site and are not a tracked community in Ontario by the NHIC.

Several trees within this community were observed to be planted specimens with rodent guards still visible, including the provincially endangered Kentucky coffee-tree and butternut, and include occasional observations of the provincially tracked honey locust (S2).

As outlined above, the following wildlife SAR have the potential to occur within the THDM4 vegetation community:

- Eastern foxsnake (Carolinian Population)
- Red-headed woodpecker
- Yellow-breasted chat
- Little brown myotis, northern myotis & tri-colored bat

The following recommendations are provided for consideration prior to proposed impacts to the THDM4 vegetation community:

1. Complete a dedicated search for additional SAR vegetation, including Kentucky coffee-tree and butternut, within the vegetation community
2. Complete a butternut health assessment on observed butternut following Ontario's *Butternut Assessment Guidelines: Assessment of Butternut Tree Health for the Purposes of the Endangered Species Act, 2007* (2021).
3. As eastern foxsnake has been identified by NHIC as occurring within the 1 x 1 km square overlapping the Study Area and potentially suitable habitat was observed within the Site, a survey following the guidance outlined in the MNRF's *Survey Protocol for Ontario's Species at Risk Snakes* (2016) is recommended to determine if eastern Foxsnake are using the Site
4. Complete a breeding bird survey following methods consistent with previously approved methods by the Canadian Wildlife Service (CWS) (i.e., 10-minute point count) and the Ontario Breeding Bird Atlas: *Instructions for Point Counts* (2021), to determine if species protected under the ESA, like red-headed woodpecker, are breeding within the Site
5. Due to the potential presence of SAR bats, complete a SAR bat leaf-off habitat assessment within the vegetation community following recent guidance provided by the MECP to determine the potential suitability to support roosting SAR bats
6. Correspond with the MECP's SARB through the submission of an IGF to illicit a formal response from the MECP to understand the Town's requirements under the ESA

4.3 THDM5 – Fresh-Moist Deciduous Thicket Ecosite

The fresh-moist deciduous thicket ecosite (THDM5) is a large, linear community defined by shrub species (e.g., rough-leaved dogwood) and tree saplings of white elm and red ash. THDM5 communities are not tracked in Ontario by the NHIC.

Similar to other communities within the Site, several trees within this community were observed to be planted specimens and included a large patch (~ 8 m x 8 m) of the provincially threatened willowleaf aster and occasional observations of climbing prairie rose (special concern).

As outlined above, the following wildlife SAR have the potential to occur within the THDM5 vegetation community:

- Eastern foxsnake (Carolinian Population)
- Red-headed woodpecker
- Yellow-breasted chat
- Little brown myotis, northern myotis & tri-colored bat

The following recommendations are provided for consideration prior to proposed impacts to the THDM5 vegetation community:

1. Complete a dedicated search for additional SAR vegetation, including willowleaf aster, within the vegetation community
2. As eastern foxsnake has been identified by NHIC as occurring within the 1 x 1 km square overlapping the Study Area and potentially suitable habitat was observed within the Site, a survey following the guidance outlined in the MNRF's *Survey Protocol for Ontario's Species at Risk Snakes* (2016) is recommended to determine if eastern Foxsnake are using the Site
3. Complete a breeding bird survey following methods consistent with previously approved methods by the Canadian Wildlife Service (CWS) (i.e., 10-minute point count) and the Ontario Breeding Bird Atlas: *Instructions for Point Counts* (2021), to determine if species protected under the ESA, like red-headed woodpecker, are breeding within the Site
4. Due to the potential presence of SAR bats, complete a SAR bat leaf-off habitat assessment within the vegetation community following recent guidance provided by the MECP to determine the potential suitability to support roosting SAR bats
5. Correspond with the MECP's SARB through the submission of an IGF to illicit a formal response from the MECP to understand the Town's requirements under the ESA

5 References

Alan Macnaughton, Ross Layberry, Rick Cavasin, Bev Edwards and Colin Jones. Ontario Butterfly Atlas. Toronto Entomologists' Association, Ontario. Available: https://www.ontarioinsects.org/moth/index.html; Accessed: November 9, 2022.

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Environment and Climate Change Canada (ECCC). 2019. Recovery Strategy for the Yellow-breasted Chat virens subspecies (Icteria virens virens) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xi + 43 pp.

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Reference: Town of Essex - Southwest Area Storm Sewer Improvement - Natural Heritage Review

Respectively,

Stantec Consulting Ltd.

Josh Mansell OCAD, Can-CISEC
Senior Biologist, Technical Area Coordinator
(Terrestrial Ecosystems)
Mobile: (613) 355-5493
Josh.Mansell@Stantec.com

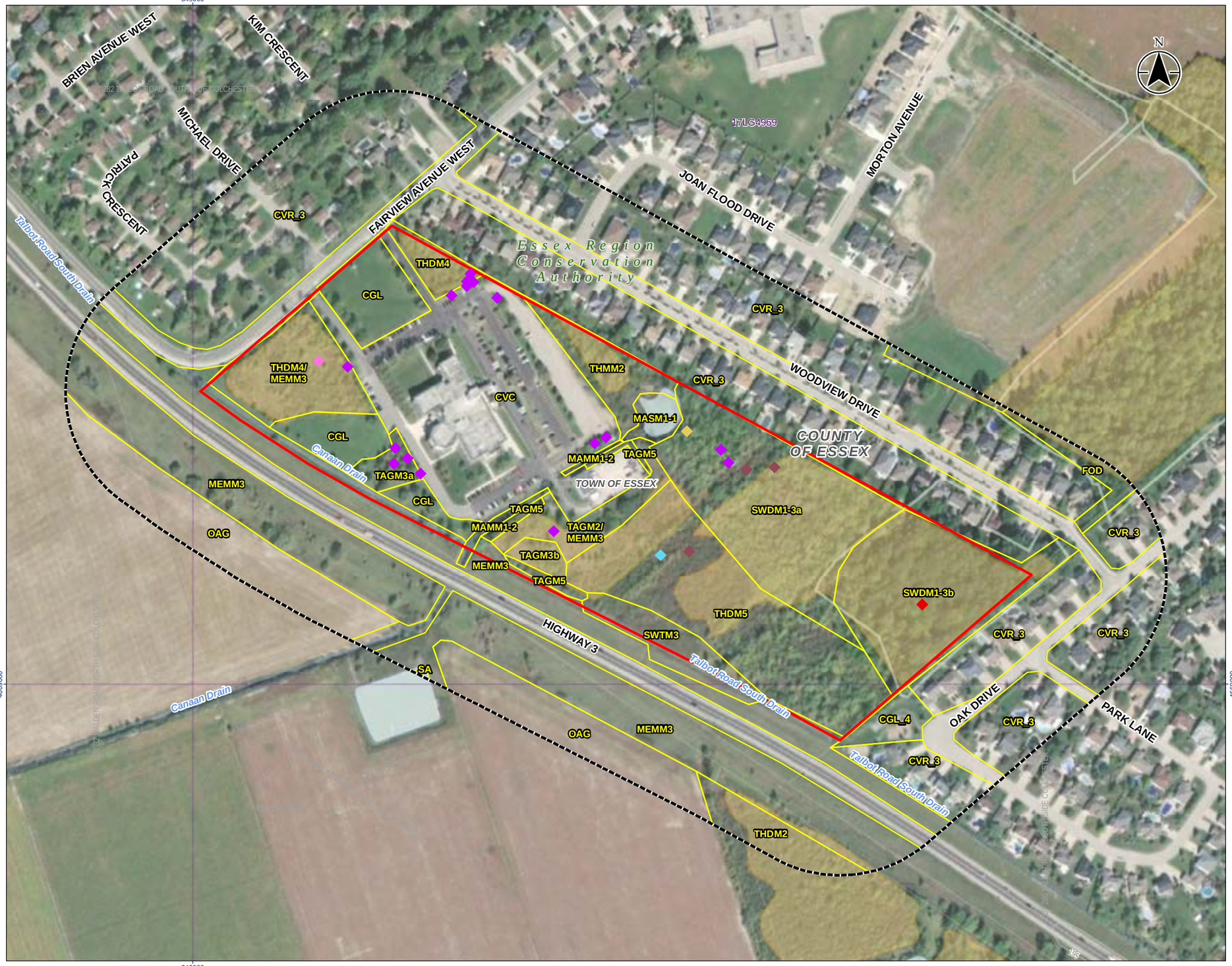
Attachments: Attachment A – Figures
Attachment B – Essex Region Conservation Authority Comments (dated June 16, 2021)
Attachment C – County of Essex Comments (dated June 29, 2021)
Attachment D – Stantec's 2022 Natural Heritage Review Vascular Plant List

cc. Jian Li (Stantec)

Reference: **Town of Essex - Southwest Area Storm Sewer Improvement - Natural Heritage Review**

Attachment A Figures

349000
4669000
N
ERIEN AVENUE WEST
LOT 282 TALBOT ROAD SOUTH SIDE COLCHESTER
MICHAEL DRIVE
PATRICK CRESCENT
SOUTH TALBOT ROAD SOUTH
FAIRVIEW AVENUE WEST
17LG4969
JOAN FLOOD DRIVE
MORTON AVENUE
WOODVIEW DRIVE
Talbot Road South Drain
Essex Region Conservation Authority
TOWN OF ESSEX
COUNTY OF ESSEX
Canaan Drain
Talbot Road South Drain
HIGHWAY 3
Canaan Drain
Talbot Road South Drain
OAK DRIVE
PARK LANE
PARK LANE SOUTH
ERIEN AVENUE WEST
LOT 282 TALBOT ROAD SOUTH SIDE COLCHESTER



Stantec

Legend

- Constructed Drain
- Watercourse (Permanent)
- Study Area (120 m)
- Site Boundary
- Conservation Authority Administrative Boundary
- Waterbody
- Wooded Area
- Lot
- Municipal Boundary, Upper
- Municipal Boundary, Lower
- 1 km UTM Grid
- ELC Communities
- Natural Heritage Overlay (County of Essex 2020)

SAR and SOCC Observations

- Butternut (END)
- Kentucky Coffee Tree (END)
- Willowleaf Aster (END)
- Climbing Prairie Rose (SC)
- Shellbark Hickory (S3)
- Honey Locust (S2?)

ELC Legend

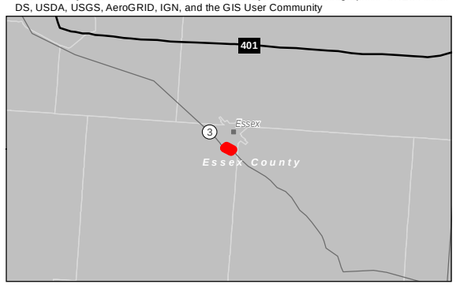
CGL - Green Lands
CGL_4 - Recreational
CVC - Business Sector
CVR_3 - Single Family Residential
FOD - Deciduous Forest
MAMM1-2 - Cattail Graminoid Mineral Meadow Marsh Type
MASM1-1 - Cattail Mineral Shallow Marsh Type
MEMM3 - Dry - Fresh Mixed Meadow Ecosite
OAG - Open Agriculture
SA - Shallow Water
SWDM1-3a - Pin Oak Mineral Deciduous Swamp Type (S2S3)
SWDM1-3b - Pin Oak Mineral Deciduous Swamp Type (S2S3)
SWTM3 - Willow Mineral Deciduous Thicket Swamp Ecosite
TAGM2/MEMM3 - Mixed Plantation/Dry - Fresh Mixed Meadow Ecosite
TAGM3a - Deciduous Plantation
TAGM3b - Deciduous Plantation
TAGM5 - Fencerow
THDM2 - Dry - Fresh Deciduous Shrub Thicket Ecosite
THDM4/MEMM3 - Dry - Fresh Deciduous Regeneration Thicket Ecosite/Dry - Fresh Mixed Meadow Ecosite
THDM4 - Dry-Fresh Deciduous Regeneration Thicket Ecosite
THDM5 - Fresh-Moist Deciduous Thicket Ecosite
THMM2 - Fresh-Moist Mixed Thicket Ecosite

0 100 200 m

1:3,500 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2022.
3. Natural Heritage System as designated by an ERCA Study. Includes Windsor (2006), Lakeshore (2006), LaSalle (2008). County of Essex Open Data.
4. Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Project Location
Town of Essex

160925146 REV4
Prepared by BF on 2022-11-23
Technical Review by DH on 2022-11-15

Client/Project
TOWN OF ESSEX, ON
SWMP NATURAL HERITAGE REVIEW

Figure No.
2

Title
Ecological Land Classification

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

\\ca0218-prfs-d01\work_group\01609\active\160925146\03_data\gis_cad\gis\mxd\escosys\mxd\report_figures\natural_heritage\160925146_Fig02_ELC.mxd Revised: 2022-11-23 By: bfonseca

Reference: **Town of Essex - Southwest Area Storm Sewer Improvement - Natural Heritage Review**

Attachment B Essex Region Conservation Authority Comments (dated June 16, 2021)

June 16, 2021

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360 Fairview Avenue West
Suite 311, Essex, ON N8M 1Y6

Kevin Girard, P.Eng.
Director, Infrastructure Services
33 Talbot Street South,
Essex, ON N8M 1A8

Dear Mr. Girard:

Re: Improvements to Essex Ward 1 Southwest Storm Sewer System: Phases 1 & 2 (Schedule B) Class Environmental Assessment Report – Draft Final Report

The Essex Region Conservation Authority (ERCA) has completed a review of the Draft Final Report regarding the above noted Class Environmental Assessment. Through our office's review of the available documents, there are some potential issues and concerns that are related to the ERCA as an agency/reviewer as well as potential issues/concerns related to ERCA operations on affected lands. This letter has made an attempt to separate these two issues accordingly.

Comments as an Agency

A. *Section 2.2.6 Natural Vegetation*

1. This section of the report is intended to detail the existing conditions specific to the natural environment and natural vegetation that is present within the study area. The report indicates that there are "comparatively few stands of trees or wood lots". While this may be true in comparing the percentage of canopy cover to "bare" lands, the statement does not adequately present the existing conditions in terms of baseline data for use when evaluating alternative solutions. As a specific example, the woodlot located just south of Woodview Drive, which is approximately 7.2 hectares in size, does not appear to have been discussed under "Existing Conditions", and therefore, no future mitigation measures are considered. ERCA recommends that a proper inventory of the natural environment be include as part of this EA as some of the recommended preferred alternatives have direct impacts on some natural features.

B. *Section 4.4.2 Natural Environment Impacts and Mitigation Measures*

1. Further to the above comments related to *Section 2.2.6*, the draft report does not provide information regarding all of the significant natural features present within the study area, which therefore impacts the Mitigation Measures outlined in *Table 4-2*. The Mitigation Measures do not reflect any concerns regarding impacts to terrestrial wildlife habitat or impacts to unique vegetation features. With the recommended solution

including a significant expansion to the Woodview Pond, impacts related to the existing woodlot have not been adequately evaluated and therefore mitigated. ERCA recommends that the woodlot feature be evaluated in terms of species and habitat, and that the potential effects of the alternatives be properly documented and addressed/mitigated where appropriate. Should there be a need, ERCA is prepared to discuss mitigation strategies related to any potential impacts to natural features.

C. *Section 7.0 Property Requirements*

1. It is currently recommended that property will be acquired or that easements will be registered to accommodate the stormwater management facility expansions. ERCA recommends that any property acquisition and easements be large enough that they account for future necessary maintenance activities. Note that lands included to facilitate maintenance operations should be included in the impact assessments as these areas are to remain clear of vegetation to enable equipment access.

2. Further to the above comment, potential property acquisition should also consider land required for sediment drying areas where appropriate. This is not required of all stormwater management facilities as there are situations where trucking offsite is preferred; however, should there be a need for the additional property, ERCA recommends addressing this at the earliest possible stage.

D. *Additional general comments*

1. ERCA is concerned about the potential impacts to adjacent lands and structures in close proximity to the stormwater management facility expansions. It is unclear if the preferred alternative and associated pond footprint has taken into consideration the pre-existing lowest opening elevations so as to avoid an increase in flood risk to these already existing structures.

2. Further to the above, it is unclear if a deeper pond complete with an appropriately sized pumping scheme was considered as an alternative to the recommended gravity system. Through other alternative solutions, there may be an opportunity to reduce the impacts to adjacent private lands, the existing woodlot, and the potential land acquisition or easement registration. It is recommended that other alternatives be explored to reduce and/or avoid significant impacts to adjacent lands and natural features.

Comments related to ERCA as a Tenant at 360 Fairview Avenue West

The ERCA has concerns specifically with respect to the expansion of the Woodview Pond and the potential impacts associated with ERCA Operations deployed from the warehouse located at 360 Fairview Avenue West. The currently proposed expansion

flanks the ERCA Operations Warehouse which can pose additional risks of contamination. Various field operations are conducted from this site including but not limited to forestry, summer and winter maintenance, and fleet maintenance. The expansion of the pond to such a close proximity and surrounding the site increases the risk of contamination with oils, grits, and salt laden runoff.

ERCA is generally not supportive of the potential loss of a significant portion of vegetation located south of Woodview Drive. It should be noted that ERCA coordinated significant tree planting activities with the Town of Essex within the County of Essex owned lands to offset impacts related to the original phases of the Woodview Estates Subdivision. This was completed at a time prior to the implementation of Environmental Impact Assessment (EIA) studies being completed in association with subdivision planning processes. However, this coordinated effort led by the Conservation Authority staff was considered a significant advancement in how natural features are protected and/or enhanced in order to offset potential impacts associated with development activities. Had this been completed under current legislation and processes, the compensation that was coordinated on this land would have remained designated as a "Compensation Area" and would therefore be required to be protected in perpetuity. The ERCA recommends that further consideration be given to the potential impacts to the woodlot south of Woodview Estates so as to avoid the degradation of this important natural feature. Our office again remains available to discuss further.

Thank you for considering the comments outlined within this letter. We look forward to your response and/or further collaborative consultation on these matters.

Sincerely,

James Bryant, P.Eng.
Director, Watershed Management Services

Cc: Jian Li – Project Manager (Stantec)

Reference: **Town of Essex - Southwest Area Storm Sewer Improvement - Natural Heritage Review**

Attachment C County of Essex Comments (dated June 29, 2021

June 29, 2021

Kevin Girard, P.Eng.
Director of Infrastructure Services
33 Talbot Street South
Essex, ON N8M 1A8

Dear Mr. Girard,

Re: Improvements to Essex Ward 1 Southwest Storm Sewer System: Phase 1 & 2 (Schedule B) Class Environmental Assessment Report

The County of Essex has completed a review of the Draft Final Report and has the following comments.

Maintenance of Existing Pond and Area.
The County would like an understanding of any agreements made regarding the ownership and maintenance responsibility for the existing pond and the surrounding area. Also, information on the current maintenance practice for the pond and surrounding area.

Land Requirements and Use of Space on County Owned Property.
The County is concerned with the proposed loss of land, including areas of vegetation and trees which where planted by ERCA and the Town. The County has been notified of this significant expansion of the existing stormwater management pond through the Environmental Assessment process. As the land owner a formal request should be made for the land required for the stormwater pond expansion and easements. A better understanding of the purpose of land acquisition, the timing of land acquisition (Pond Expansion, Flood Mitigation Area), the amount of land required, value of property, requirements of easements, etc. is required.

Alternative solutions
The County would like to know details of other alternatives that were analysed, including but not limited to:

- Infrastructure in other locations.
- Alternatives at this location such as a deeper pond to limit the property impact.

If alternative solutions were not considered we ask that these be considered now.

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countyofessex.ca

Impact on existing Essex Region Conservation Authority Building.
The proposed expansion of the existing stormwater pond will have an impact on the existing ERCA maintenance building and yard operations including:

- Increased risk of flooding of the building and storage area.
- Contamination risk from materials, including salt which is stored at the site.
- Limiting expansion or changes in operation of the ERCA maintenance building.

Environmental Mitigation commitments
The Impact of removing the successional forest that was planted as a Compensation Area to support the neighbouring development is unknown and approval from MECP may be required in accordance with the Endangered Species Act. The draft final report provided a very limited assessment of the natural heritage value which should include the required floral and fauna inventories and determination of associated negative impact and mitigating measures.

The County is supportive of the comments made by Essex Regional Conservation Authority in their letter dated June 16, 2021 which is attached.

We look forward to your response. County staff are available to discuss the above points with the Town.

Regards,

J. Behl.

Jerry Behl
Manager, Transportation Planning & Development

attachment

cc Jane Mustac
Rebecca Belanger

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Attachment D Stantec's 2022 Natural Heritage Review Vascular Plant List

June 16, 2021

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Suite 311, Essex, ON N8M 1Y6

Kevin Girard, P.Eng.
Director, Infrastructure Services
33 Talbot Street South,
Essex, ON N8M 1A8

Dear Mr. Girard:

Re: Improvements to Essex Ward 1 Southwest Storm Sewer System: Phases 1 & 2 (Schedule B) Class Environmental Assessment Report – Draft Final Report

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B. *Section 4.4.2 Natural Environment Impacts and Mitigation Measures*

1. Further to the above comments related to *Section 2.2.6*, the draft report does not provide information regarding all of the significant natural features present within the study area, which therefore impacts the Mitigation Measures outlined in *Table 4-2*. The Mitigation Measures do not reflect any concerns regarding impacts to terrestrial wildlife habitat or impacts to unique vegetation features. With the recommended solution

including a significant expansion to the Woodview Pond, impacts related to the existing woodlot have not been adequately evaluated and therefore mitigated. ERCA recommends that the woodlot feature be evaluated in terms of species and habitat, and that the potential effects of the alternatives be properly documented and addressed/mitigated where appropriate. Should there be a need, ERCA is prepared to discuss mitigation strategies related to any potential impacts to natural features.

C. *Section 7.0 Property Requirements*

1. It is currently recommended that property will be acquired or that easements will be registered to accommodate the stormwater management facility expansions. ERCA recommends that any property acquisition and easements be large enough that they account for future necessary maintenance activities. Note that lands included to facilitate maintenance operations should be included in the impact assessments as these areas are to remain clear of vegetation to enable equipment access.

2. Further to the above comment, potential property acquisition should also consider land required for sediment drying areas where appropriate. This is not required of all stormwater management facilities as there are situations where trucking offsite is preferred; however, should there be a need for the additional property, ERCA recommends addressing this at the earliest possible stage.

D. *Additional general comments*

1. ERCA is concerned about the potential impacts to adjacent lands and structures in close proximity to the stormwater management facility expansions. It is unclear if the preferred alternative and associated pond footprint has taken into consideration the pre-existing lowest opening elevations so as to avoid an increase in flood risk to these already existing structures.

2. Further to the above, it is unclear if a deeper pond complete with an appropriately sized pumping scheme was considered as an alternative to the recommended gravity system. Through other alternative solutions, there may be an opportunity to reduce the impacts to adjacent private lands, the existing woodlot, and the potential land acquisition or easement registration. It is recommended that other alternatives be explored to reduce and/or avoid significant impacts to adjacent lands and natural features.

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Thank you for considering the comments outlined within this letter. We look forward to your response and/or further collaborative consultation on these matters.

Sincerely,

James Bryant, P.Eng.
Director, Watershed Management Services

Cc: Jian Li – Project Manager (Stantec)

VASCULAR PLANT LIST - Town of Essex, Southwest Area SWMP

Plant species observed in September 2022

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
GYMNOSPERMS (Conifers)						
Juniperus virginiana	Eastern Red Cedar	S5			4	3
Picea glauca	White Spruce (PLANTED)	S5			n/a	3
Thuja occidentalis	Eastern White Cedar (PLANTED)	S5			n/a	-3
ANGIOSPERMS (DICOTS)						
Acer saccharinum	Silver Maple	S5			5	-3
Acer x freemanii	Freeman's (Swamp) Maple	S5			6	-5
Ambrosia artemisiifolia	Common Ragweed	S5			0	3
Ambrosia trifida	Great Ragweed	S5			0	0
Apocynum cannabinum	Hemp Dogbane	S5			3	0
Asclepias syriaca	Common Milkweed	S5			0	5
Bidens frondosa	Devil's Beggarticks	S5			3	-3
Carya laciniosa	Shellbark Hickory	S3			9	-3
Carya ovata	Shagbark Hickory	S5			6	3
Celtis occidentalis	Common Hackberry	S4			8	0
Cirsium arvense	Canada Thistle	SE5				3
Cornus drummondii	Rough-leaved Dogwood	S4			4	0
Cornus racemosa	Grey Dogwood	S5			2	0
Daucus carota	Wild Carrot	SE5				5
Dipsacus fullonum	Common Teasel	SE5				3
Elaeagnus umbellata	Autumn Olive	SE3				3
Epilobium sp.	Willowherb Species					
Erechtites hieraciifolius	Eastern Burnweed	S5			2	3
Erigeron annuus	Annual Fleabane	S5			0	3
Euonymus obovatus	Running Strawberry-bush	S4			6	5
Euthamia graminifolia	Grass-leaved Goldenrod	S5			2	0
Fallopia scandens	Climbing False Buckwheat	S4S5			3	0
Fragaria virginiana	Wild Strawberry	S5			2	3
Fraxinus pennsylvanica	Red Ash	S4			3	-3
Gleditsia triacanthos	Honey Locust (PLANTED)	S2?			n/a	0
Gymnocladus dioicus	Kentucky Coffee-tree (PLANTED)	S2	THR	THR	n/a	3
Juglans cinerea	Butternut (PLANTED)	S2?	END	END	n/a	3

VASCULAR PLANT LIST - Town of Essex, Southwest Area SWMP

Plant species observed in September 2022

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
Juglans nigra	Black Walnut	S4?			5	3
Lotus corniculatus	Garden Bird's-foot Trefoil	SE5				3
Lycopus americanus	American Water-horehound	S5			4	-5
Lythrum salicaria	Purple Loosestrife	SE5				-5
Menispermum canadense	Canada Moonseed	S4			7	0
Parthenocissus vitacea	Thicket Creeper	S5			4	3
Pastinaca sativa	Wild Parsnip	SE5				5
Persicaria pensylvanica	Pennsylvania Smartweed	S5			3	-3
Populus deltoides ssp. deltoides	Eastern Cottonwood	S5			4	0
Prunella vulgaris	Common Self-heal	S5			0	0
Quercus alba	White Oak	S5			6	3
Quercus macrocarpa	Bur Oak	S5			5	3
Quercus palustris	Swamp Pin Oak	S4			9	-3
Ribes americanum	American Black Currant	S5			4	-3
Rosa setigera	Climbing Prairie Rose	S2S3	SC	SC	5	3
Salix interior	Sandbar Willow	S5			1	-3
Salix nigra	Black Willow	S4			6	-5
Solidago sempervirens	Seaside Goldenrod	SE2				-3
Symphyotrichum lanceolatum	Panicled Aster	S5			3	-3
Symphyotrichum novae-angliae	New England Aster	S5			2	-3
Symphyotrichum pilosum var. pilosu	Old Field Aster	S5			1	3
Symphyotrichum praealtum	Willow-leaved Aster	S2	THR	THR	8	-3
Tilia americana	Basswood	S5			4	3
Tilia cordata	Little-leaved Linden	SE1				5
Toxicodendron radicans	Poison Ivy	S5			2	0
Trifolium hybridum	Alsike Clover	SE5				3
Ulmus americana	White Elm	S5			3	-3
Verbascum blattaria	Moth Mullein	SE5				3
Vernonia missurica	Missouri Ironweed	S3?			4	0
Viburnum lentago	Nannyberry	S5			4	0
Viburnum opulus	Cranberry Viburnum	S5			5	-3
Vitis riparia	Riverbank Grape	S5			0	0
Xanthium strumarium	Rough Cockleburr	S5			2	0

VASCULAR PLANT LIST - Town of Essex, Southwest Area SWMP

Plant species observed in September 2022

SCIENTIFIC NAME	COMMON NAME	PROVINCIAL STATUS (S-RANK)	SARO STATUS	COSEWIC STATUS	COEFFICIENT OF CONSERVATISM	COEFFICIENT OF WETNESS
ANGIOSPERMS (MONOCOTS)						
Agrostis gigantea	Redtop	SE5				-3
Arisaema triphyllum	Jack-in-the-pulpit	S5			5	-3
Carex grayi	Gray's Sedge	S4			8	-3
Carex hyalinolepis	Shoreline Sedge	S4			4	-5
Carex tribuloides	Blunt Broom Sedge	S4			5	-3
Carex vulpinoidea	Fox Sedge	S5			3	-5
Echinochloa crus-galli	Large Barnyard Grass	SE5				-3
Glyceria striata	Fowl Mannagrass	S5			3	-5
Juncus effusus	Soft Rush	S5			4	-5
Panicum capillare	Common Panicgrass	S5			0	0
Panicum dichotomiflorum	Fall Panicgrass	SE5				-3
Phalaris arundinacea	Reed Canarygrass	S5			0	-3
Phleum pratense	Common Timothy	SE5				3
Phragmites australis ssp. australis	European Reed	SE5				-3
Poa compressa	Canada Bluegrass	SE5				3
Poa pratensis	Kentucky Bluegrass	S5			0	3
Typha angustifolia	Narrow-leaved Cattail	SE5				-5

FLORISTIC SUMMARY	TOTAL
Total Species	79
Native Species	61
Introduced (exotic) species	18
Species at Risk in Ontario (END, THR or SC)	4
Species at Risk in Canada (END, THR or SC)	4
Rare in Ontario (S1, S2 or S3)	7
Uncommon to common in Ontario (S4)	12
Common to very common in Ontario (S5)	42
Highly sensitive plant species with C value of 8, 9 or 10	5
Wetland Plant Species (-5, -4 or -3)	32