June 2024

Stormwater Management Report

1140 Goyeau St, Windsor, Ontario

By: Ambashi Engineering and Management Inc.
1080 Tapscott Road, Unit 24,
Scarborough, ON M1X 1E7
Tel: 416-609-9102
www.ambashiengineering.ca

Table of Content

List of Figures

List of tables

1.0 INTRODUCTION

We propose redeveloping the **1140 Goyeau St, Windsor**, east of Goyeau Street directly west of Windsor Avenue Intersection. In the existing condition, the site has a Paved Parking Lot.

This property, **1140 Goyeau St,** is proposed for renovations and modifications in the existing paved parking Lot. The Parking Lot is proposed to be developed into an Apartment Complex.

The stormwater management is designed in accordance with The Windsor/Essex Region Stormwater Management Standards Manual, the MOE SWM Planning and Design Manual and the Low Impact Development.

Ambashi Engineering is retained to prepare the Site Stormwater Management Report to support the Lot Grading Plan approval for the proposed development.

The scope of this report specifically includes:

- Identification of existing drainage from the site.
- Identification of Stormwater management criteria for the development of the site.
- Calculations of existing peak discharge rates to municipal storm sewers.
- Calculations of proposed post-development peak discharge rates to municipal storm sewers.
- Proposal of appropriate method to address Stormwater quality requirements.
- Recommendation and description of the proposed overall Stormwater management system for the site.
- Recommendation for sediment and erosion control.

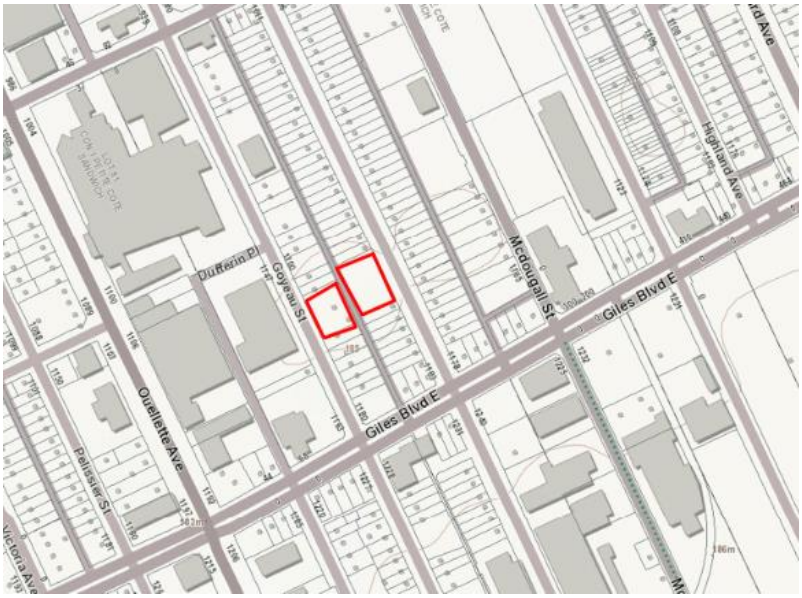


Figure 1 (Key Plan)

2.0 BACKGROUND

2.1 SITE LOCATION

The property spans 1,728 m^2 (equivalent to 0.173 hectares) and is located east of Windsor Avenue

(Refer to Figure 1 for the general site location.)

2.2 EXISTING CONDITION

The designated site encompasses an area of approximately 1728.00 square meters.

An assessment of the former land use's topographic survey reveals that the stormwater flows Towards the series of Catch Basins, which is connected to the City stormwater facility running Along Goyeau Street. (Refer to Appendix D for the Pre-Development Drainage Conditions.)

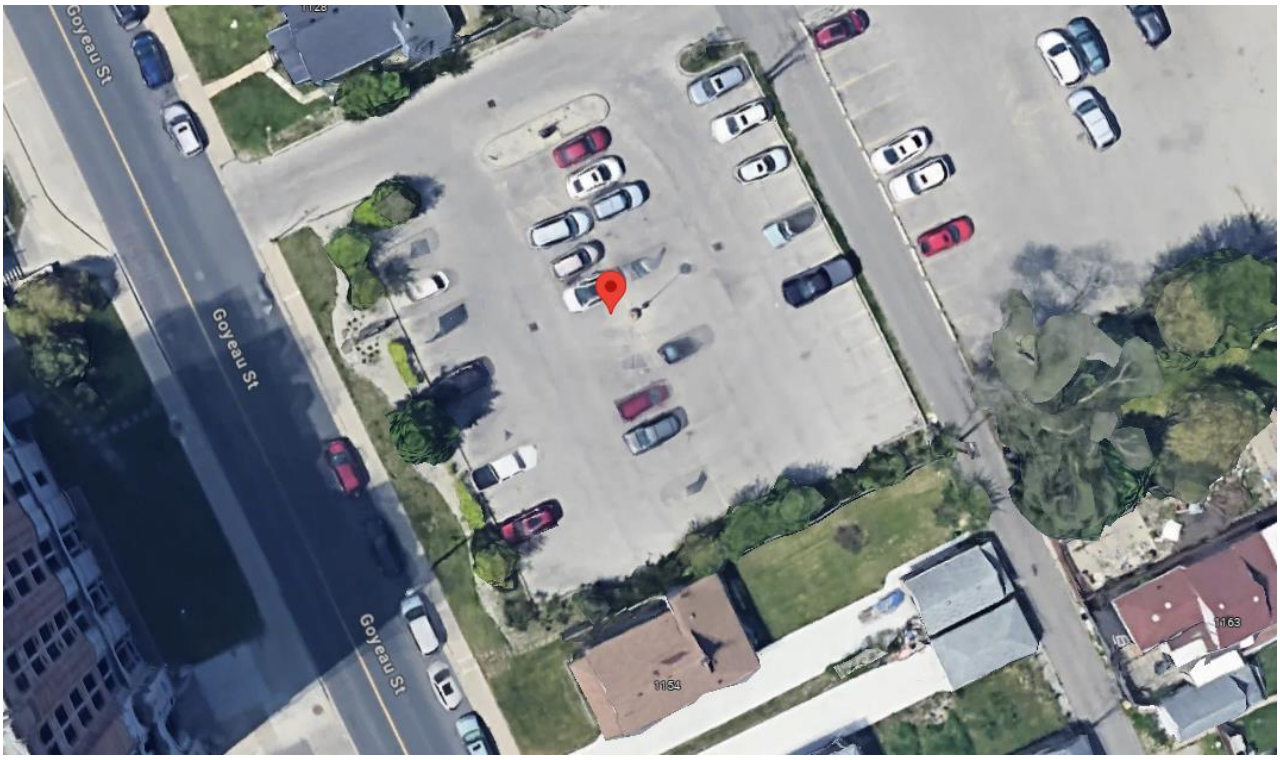


Figure 2 (Pre-Development Drainage Conditions)

For Stormwater management calculations, the pre-development or existing condition is considered.

The site comprises a Paved parking lot in existing condition. **The allowable release rate for this site is to be restricted to a C value of 0.35.**

Refer to Appendix C for Detailed instructions for C Value.

2.3 PROPOSED CONDITION

The proposed development is to pave the parking lot with asphalt. The Ponding at the Parking lot will collect and convey the stormwater drainage to the municipal drainage system.

Refer to Figure 3 (Post-Development Layout)

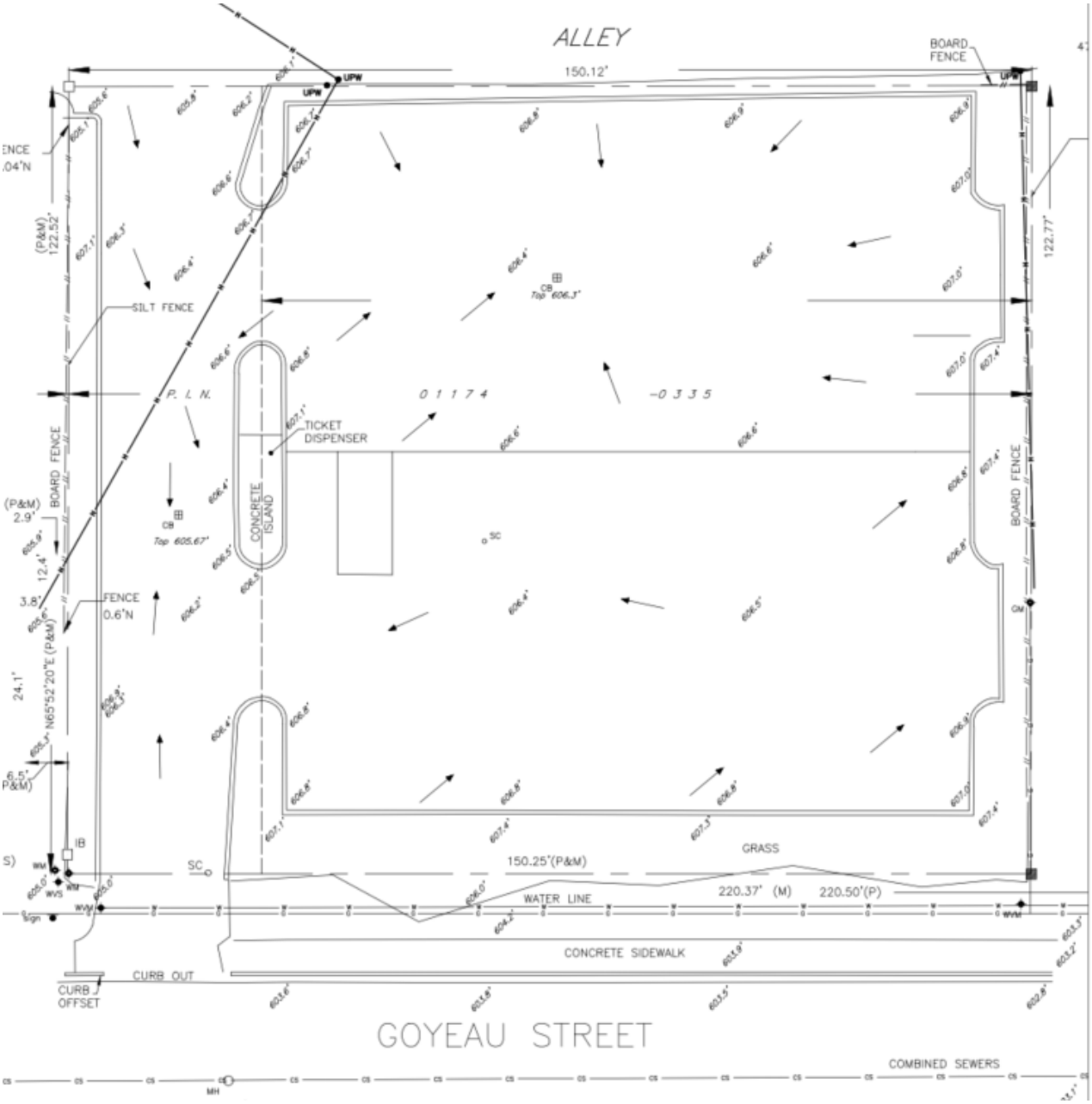


Figure 3 (Post-Development Layout)

As per the manual, the Run-Off Coefficient is mentioned in Figure 4 (Runoff Coefficient).

Land Use	C value
Asphalt, concrete, roof areas	0.95
Gravel	0.70
Grass – sandy soil	0.15
Grass – clay soil	0.20
Residential – Single family	0.60
Residential – Single family (lot size 500 m² or less)	0.70
Residential – Semi-detached	0.70
Residential – Townhouse / Row housing	0.80
Industrial / Commercial	0.90

Figure 4 (Runoff Coefficient)

Table 1 indicates the area and run-off coefficient to calculate the total run-off for the proposed condition. The coefficient {Provided by the City ".35"} is used in the stormwater flow calculations.

Location	m^2	ha	C
Proposed Landscaping green area	425.00	0.043	0.20
Proposed Gravel Parking Lot	0.00	0.000	0.95
Proposed Asphalt Driveway, Sidewalks, Concrete and Building area	1302.67	0.130	0.95
Total Area	**1727.67**	**0.173**	**0.35**

Table 1 (Proposed Runoff Coefficient)

3.0 STORMWATER MANAGEMENT PLAN

3.1 STORM DESIGN CRITERIA

The project site is situated within the City of Windsor. In accordance with the Windsor/Essex Region Stormwater Management Standards Manual, the following Stormwater Management (SWM) criteria are recommended for implementation on the subject site:

- The storm sewer is designed considering storm runoff from the property.
- Water Quality - Provide long-term average removal of a minimum required of 70% of Total Suspended Solids on an annual loading basis from the post-development site.

The rainfall intensity duration frequency (IDF) curve parameters (a, b, c) based on 61 years (1946-2007) of historical rainfall data from Windsor Airport (Station No. 6139525) are tabulated in Table 3.

As noted from Windsor/Essex Region **Stormwater Management Standards Manual Section 3.7.8.3 Climate Change Adaptation**, the stormwater infrastructure is not evaluated based on a 'stress test' event defined as 150 mm of rainfall- representing a 39% increase compared to Windsor Airport's 100-year 24-hour rainfall of 108 mm (as per City's Instructions).

The rainfall intensity for the 'stress test' event is tabulated in Table 4.

3.2 PROPOSED STORMWATER MANAGEMENT PLAN

The comprehensive runoff from the premises is directed towards the storm sewer on Goyeau Street via a designated stormwater pipe. While doing so, the runoff originating from the entire lot undergoes treatment through the oil-grit separator (OGS) unit on the parking lot's **West side**. The refined discharge from this OGS unit is seamlessly integrated into the **Manhole (MH4R456)** of the Municipal storm sewer system at Goyeau Street.

Two catch basins are proposed at the property to collect the stormwater from the lot.

Furthermore, an Oil and Girt Separator (FD-4HC) unit is proposed, which has a 91.0% TSS removal capacity (which is 30% more than the requirements) and >90% volume treated capability and effectively removes nutrients, pathogens, and metals from runoff.

This oil/grit separator (OGS) will trap and retain oil and sediment in detention chambers below the ground. This unit is based on the principles of gravity-based sedimentation for the grit and phase separation for the oil.

There is minimal flow attenuation in oil/grit separators since they are not designed with extended detention storage. Like filters, they have no infiltration capability. The unit will be installed at the west end of the parking lot.

The proposed ponding has adequate capacity for the required storage during the governing 1:5-year storm event. The total capacity of ponding at the parking lot is 41.75 cum, which is significantly more than the required storage of 6.63 cum.

3.3 Flood Protection

The storm sewer is designed considering storm runoff from the entire lot. Considering this location's 100-year storm event ('stress test' event), the storm sewer is adequately sized. A 4.00" diameter orifice is provided at the outlet to control water release to the municipal drain. Refer to Section 4.4 Orifice Calculations.

4.0 PROPOSED STORMWATER MANAGEMENT CALCULATIONS

Refer to Section 2.2 for information about the surface conditions, corresponding areas and runoff coefficient for the site at the pre-and post-development stages.

4.1 IDF Curve Parameters (Windsor/Essex Stormwater Management Standards Manual, Table 3.2.1.1):

Parameters	Return Period (Years)					
	2	5	10	25	50	100
a	854	1259	1511	1851	2114	2375
b	7.0	8.8	9.5	10.2	10.6	11.0
c	0.818	0.838	0.845	0.852	0.858	0.861

Table 2 (IDF Curve Parameters)

4.2 Rainfall Intensity Calculations

The Intensity of rainfall is calculated by equation 3.2.1.1 of the Windsor/Essex Stormwater Management Standard Manual, which is-

$$\textbf{Intensity}\ (\frac{\textbf{mm}}{\textbf{hr}}) = \frac{\boldsymbol{a}}{(\boldsymbol{t}+\boldsymbol{b})^{\boldsymbol{c}}}$$

The Intensity of Rainfall without Stress Event is Calculated in Table 3

Duration	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
5	111.86	139.57	157.73	182.17	200.17	218.23
10	84.13	107.72	122.80	142.97	157.69	172.68
15	68.13	88.40	101.26	118.42	130.87	143.67
30	44.53	58.69	67.63	79.54	88.10	97.06
60	27.40	36.32	41.96	49.47	54.81	60.50
120	16.24	21.47	24.80	29.23	32.33	35.70
360	6.82	8.89	10.22	12.00	13.21	14.57
720	3.90	5.03	5.75	6.73	7.38	8.13
1440	2.22	2.83	3.22	3.75	4.10	4.50

Table 3 (Rainfall Intensity)

Per the City of Windsor Requirements, for the Post-Development, the Climate Change Adaptation, which is Stormwater infrastructure, should be evaluated based on a “stress test” event representing a 39% increase compared to Windsor Airport’s.

Duration	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
5	155.49	194.01	219.24	253.22	278.24	303.34
10	116.94	149.73	170.69	198.73	219.19	240.02
15	94.70	122.88	140.75	164.60	181.91	199.70
30	61.90	81.58	94.01	110.57	122.46	134.92
60	38.08	50.48	58.32	68.76	76.18	84.09
120	22.57	29.85	34.47	40.62	44.94	49.63
360	9.47	12.36	14.21	16.68	18.37	20.25
720	5.42	6.99	8.00	9.35	10.26	11.29
1440	3.08	3.93	4.48	5.21	5.70	6.26

Table 4 (Rainfall Intensity: increased by 39%)

4.3 Run-off and Storage Volume Calculations

$$\textbf{Flow}\left(\frac{\textbf{l}}{\textbf{s}}\right) = \boldsymbol{Time}\ (in\ Sec) * \boldsymbol{Intensity} * \boldsymbol{Runoff\ Coefficient}$$

4.3.1 Pre-Development Runoff Calculations

One in Five Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr	C	ha	L/S
5	139.57	0.35	0.173	23.45
10	107.72	0.35	0.173	18.10
15	88.40	0.35	0.173	14.85
30	58.69	0.35	0.173	9.86
60	36.32	0.35	0.173	6.10
120	21.47	0.35	0.173	3.61
360	8.89	0.35	0.173	1.49
720	5.03	0.35	0.173	0.84
1440	2.83	0.35	0.173	0.47
One in Hundred Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr	C	ha	L/S
5	218.23	0.35	0.173	36.66
10	172.68	0.35	0.173	29.01
15	143.67	0.35	0.173	24.14
30	97.06	0.35	0.173	16.31
60	60.50	0.35	0.173	10.16
120	35.70	0.35	0.173	6.00
360	14.57	0.35	0.173	2.45
720	8.13	0.35	0.173	1.37
1440	4.50	0.35	0.173	0.76

Table 5 (Pre-Development Runoff Calculations)

Refer to Appendix B for complete Calculations

4.3.2 Post-Development Runoff and Storage Calculations

$$\textbf{Flow}\left(\frac{\textbf{l}}{\textbf{s}}\right) = \boldsymbol{Time}\ (in\ Sec) * \boldsymbol{Intensity} * \boldsymbol{Runoff\ Coefficient}$$

$$\textbf{Storage Flow}\left(\frac{\textbf{l}}{\textbf{s}}\right) = \boldsymbol{Discharge} - \boldsymbol{Flow}$$

$$\textbf{Storage}\ (\boldsymbol{cum}) = \boldsymbol{Storage\ Flow} * \boldsymbol{Time}$$

One in Five Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr	C	ha	L/S	L/S	L/S	m3
5	194.01	0.35	0.173	32.63	14.13	18.497	5.55
10	149.73	0.35	0.173	25.18	14.13	11.049	6.63
15	122.88	0.35	0.173	20.67	14.13	6.533	5.88
30	81.58	0.35	0.173	13.72	14.13	0.000	0.00
60	50.48	0.35	0.173	8.49	14.13	0.000	0.000
120	29.85	0.35	0.173	5.02	14.13	0.000	0.000
360	12.36	0.35	0.173	2.08	14.13	0.000	0.000
720	6.99	0.35	0.173	1.17	14.13	0.000	0.000
1440	3.93	0.35	0.173	0.66	14.13	0.000	0.000
One in Hundred Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr	C	ha	L/S	L/S	L/S	m3
5	303.34	0.35	0.173	51.02	14.13	36.886	11.07
10	240.02	0.35	0.173	40.37	14.13	26.236	15.74
15	199.70	0.35	0.173	33.59	14.13	19.455	17.51
30	134.92	0.35	0.173	22.69	14.13	8.559	15.41
60	84.09	0.35	0.173	14.14	14.13	0.010	0.035
120	49.63	0.35	0.173	8.35	14.13	0.000	0.000
360	20.25	0.35	0.173	3.41	14.13	0.000	0.000
720	11.29	0.35	0.173	1.90	14.13	0.000	0.000
1440	6.26	0.35	0.173	1.05	14.13	0.000	0.000

Table 6 (Post-Development Runoff and Storage Calculations)

Refer to Appendix B for complete Calculations

Note- For Section 4.3.2
Flow means Post-Development Runoff
Discharge means Maximum Discharge allowed in Municipal Sewer and is Restricted to 1:2 Year Event at 10 minutes
Storage Flow means the amount of flow which is needed to be stored.

4.3.3 Comparison Between Pre- and Post-Development Storm Runoff

Comparison Between Pre- and Post-Development Storm Runoff			
	Pre Dev-Runoff	**Post Dev Runoff**	**Storage Volume**
	L/S	**L/S**	**m^3**
One in Two Year	14.13	19.67	3.32
One in Five Year	**18.10**	**25.18**	**6.63**
One in Ten Year	20.63	28.71	8.74
One in Twenty-Five Year	24.02	33.43	12.20
One in Fifty Year	26.49	36.87	14.82
One in a Hundred Year	29.01	40.37	17.51

Table 7 (Comparison Between Pre- and Post-Development Storm Runoff)

The Maximum Runoff and Storage Volume for each event is tabulated in

Comparison Between Pre- and Post-Development Storm Runoff			
	Pre Dev-Runoff	**Post Dev Runoff**	**Storage Volume**
	L/S	**L/S**	**m^3**
One in Two Year	14.13	19.67	3.32
One in Five Year	**18.10**	**25.18**	**6.63**
One in Ten Year	20.63	28.71	8.74
One in Twenty-Five Year	24.02	33.43	12.20
One in Fifty Year	26.49	36.87	14.82
One in a Hundred Year	29.01	40.37	17.51

Table 7 (Comparison Between Pre- and Post-Development Storm Runoff)

Summary (One in Five Years)	
Maximum Pre-Development Runoff	**18.10 L/S**
Maximum Post-Development Runoff	**25.18 L/S**
Storage Volume Required	**6.63 Cubic Meter**
Summary (One in 100 Years)	
Maximum Pre-Development Runoff	**29.01 L/S**
Maximum Post-Development Runoff	**40.37 L/S**
Storage Volume Required	**17.51 Cubic Meter**

Table 8 (Summary)

4.4 Orifice Calculations

$$Q_0 = C_0 \times A_0 \times (2gh_0)^{½} \quad \text{Or} \quad A_0 = Q_0/(C_0*(2gh_0)^{½})$$

$$\text{Diameter } (D) = \sqrt{\frac{A_o * 4}{\pi}}$$

- Q_0 = Orifice discharge
- C_0 = Flow Coefficient
- A_0 = Cross-sectional area of the orifice (sqm)
- g = acceleration due to gravity (m/s2)
- h_0 = head above orifice (m)

Q_0	25.18	L/s
C_0	0.61	
A_0	$\pi/4\ D^2$	L/s

g	9.81	m/s^2
h_0	1.82	m
A_0	0.00691	m^2
Diameter D	0.0938	m
	94.00	mm

Table 9 (Orifice Calculations)

4.5 WATER QUALITY CONTROL

According to the technical standards, Stormwater quality control must be implemented on-site. An Oil and Girt Separator (FD-4HC) is proposed to remove oil and grit from the runoff asphalt area, and building roof runoff.

Oil and Girt Separator System (FD-4HC) is Engineered to exhibit a remarkable 91.3% Total Suspended Solids (TSS) removal capacity and an impressive >90% Volume Treated capability; this innovative system is specifically designed to capture sediment, suspended solids, and oil effectively.

The model Oil and Girt Separator (FD-4HC) best suits the site condition. The Oil and Girt Separator (FD-4HC) will remove 91.3% of total suspended solids (TSS), which meets the 70% TSS removal requirement as per Section 3.4.1.4 of the Windsor Essex Region Stormwater Management Standards Manual.

Refer to the Appendix E Oil and Girt Separator (FD-4HC) Sizing sheet.

4.6 WATER QUANTITY CONTROL

Stormwater management is important to avoid flooding in the urban area. Therefore, storm sewer control is paramount to the City of Windsor. Stormwater quantity control design as per Windsor/Essex Region Stormwater Management Standards Manual.

4.7 HEIGHT OF PONDING CALCULATIONS

Stormwater Storage Requirements (1:5 Year)	=	**6.63**	m^3
Storage Parking Area	=	274.96	m^2
Ht. of Ponding	=	48.22	mm
Ht. of Ponding	=	1.90	Inch
Maximum Ponding Elevation	=	606.158	Ft.

Stormwater Storage Requirements (1:100 Year)	=	**17.51**	m^3
Storage Parking Area	=	274.96	m^2
Ht. of Ponding	=	127.36	mm
Ht. of Ponding	=	5.01	Inch
Maximum Ponding Elevation	=	606.417	Ft.

Note- Building FFE to be a minimum of 0.30m above the 1:100-year surface ponding level on the site

5.0 SEDIMENT AND EROSION CONTROLS

To ensure effective stormwater management and minimize the environmental impact during construction at 1140 Goyeau Street, Windsor, the following best management practices (BMPs).

The site consists of gentle downward slopes from the Property lines towards the Catchbasin, it is considered fairly stable for sediment and erosion control due to the existing asphalt parking lot. Lot Grading considers the existing topography in surrounding lots and is matched with elevations in surrounding lots. Where site grading is required, exposure of the soil during the parking lot area construction should be minimized to avoid erosion and sedimentation.

Similar to the construction of other developments, this project will occur in stages. The first and most important stage of construction concerning sediment and erosion control is the stripping of material from within the proposed right-of-way. The material from these areas will be excavated and spread over the individual lots or stockpiled in a common location with proper sediment control.

5.1 SILT FENCE

A silt fence should be placed along the downslope of all excavated material to prevent sediment transport. Periodic inspections and repairs to the silt fence should be performed regularly, as well as after every rainfall event.

Silt sacks shall be placed at catch basins near the property to restrict sediment flow inside the catch basins.

5.2 SITE GRADING

The site's existing topography shows a slope from the Property lines towards the Catchbasin on the property. A minimum slope of at least 2.0% from the asphalt area towards the catch basin is proposed.

5.3 CONSTRUCTION INSTRUCTIONS

5.3.1 Good Housekeeping Practices:

All fueling and equipment cleaning activities will be conducted away from catch basins to prevent contamination.

5.3.2 Silt Fence Barriers:

Silt fence barriers have been installed around the perimeter of all material stockpiles. Should it be necessary, the stockpiles will be seeded to establish a temporary vegetative cover to further reduce erosion.

5.3.3 Catch Basin Donuts (CBD):

High and medium flow rates will be managed using catch basin donuts. These devices will prevent water pooling during heavy rain events and allow for a slower, controlled flow rate. The CBDs are easy to install and maintain; once silt and soil build up around them, a simple sweep will restore their full effectiveness.

5.3.4 Perimeter Silt Fence:

A silt fence has been installed along the property boundary before the commencement of construction activities to control sediment runoff.

5.3.5 Flow Check Dams:

Rock flow check dams or straw bale flow check dams will be installed within swales or drainage channels following Ontario Provincial Standard guidelines. These structures will reduce the velocity of water flow and capture sediments.

5.3.6 Construction Road Entrances:

Mud mats will be constructed at all construction road entrances to minimize the tracking of sediment onto public roads.

5.3.7 Inspection and Maintenance Schedule:

A regular inspection and maintenance schedule for all erosion and sediment control measures will be established. The contractor is responsible for removing any sediment build-up from the barriers and disposing of the material properly.

5.3.8 Dewatering Operations:

Water from all dewatering operations will be discharged upstream of sediment and erosion control measures to ensure proper filtration and sediment capture.

5.3.9 Stabilization of Disturbed Areas:

All disturbed areas will be stabilized as soon as possible to prevent erosion. This may include temporary or permanent seeding, mulching, or other stabilization methods.

5.3.10 Silt Sacks in Catch Basins:

Silt sacks will be installed in catch basins to trap sediments and prevent them from entering the storm sewer system.

6.0 MAINTENANCE

The stormwater management and drainage system for **1140 Goyeau Street** is designed to be low maintenance while ensuring effective handling of runoff. The key components of the system and their maintenance requirements are detailed below:

6.1 Oil and Grit Separator

An Oil and Grit Separator (FD-4HC) is proposed for the site, which offers a 91.3% Total Suspended Solids (TSS) removal capacity and treats over 90% of the runoff volume. This unit is specifically designed to capture sediment, suspended solids, and oil from the parking area, thus enhancing the quality of stormwater discharged from the site.

Maintenance Requirements:

Inspection: The FD-4HC unit should be inspected annually.

Cleaning: Cleaning should be performed when sediment reaches the manufacturer's recommended clean-out levels. It is advisable to establish a regular cleaning schedule similar to standard catch basin sump cleaning programs to maintain optimal performance.

6.2 Catch Basins

The site includes several catch basins, culverts, and area drains that are integral to the stormwater management system. These components are designed to collect and convey stormwater efficiently, preventing ponding and localized flooding.

Maintenance Requirements:

Inspection: Catch basins, culverts, and area drains should be inspected semiannually to ensure they are free of debris and other obstructions that may cause clogging.

Cleaning: Any debris or sediment that is identified during inspections should be removed promptly to maintain the proper function of the drainage system.

By adhering to these maintenance guidelines, the longevity and performance of the stormwater infrastructure can be sustained, contributing to the overall environmental sustainability and operational efficiency of the development.

7.0 CONCLUSION

Concerning the development of the property (1140 Goyeau Street) within the Town of Windsor, the proposed Stormwater drainage system will address the Stormwater management requirements of the city of Windsor in that:

- The proposed storm sewer system is adequate for the peak discharge rate from the site directly discharging to the Walker Road storm sewer.
- Maximum site allowable stormwater release rate: 25.18 L/s (based on a 0.078 Ha site).
- For a one-in-five-year storm, the maximum runoff rate increases from 18.10 L/s (pre-development) to 25.18 L/s (post-development), a 39.2% increase.
- For a one-in-100-year storm, the maximum runoff rate increases from 29.01 L/s (pre-development) to 40.37 L/s (post-development), a 39.1% increase.
- A maximum volume of 6.63 cubic meters is required during the governing 1:5-year event.
- Employing an Oil-Grit Separator will provide the removal of 91.3% Total Suspended Solids (TSS) and >90% Volume Treatment for the site which will discharge to the Calderwood Avenue storm sewer.
- The total capacity of ponding at the parking lot is 41.75 cum, which is significantly more than the required storage of 6.63 cum for a 1:5 Year Storm Event as well as a Required 17.51 cum for a 1:100 Year Storm Event. The proposed Ponding has adequate capacity for the required storage during the governing 1:5-year as well as 1:100-year storm events.
- The report also covers erosion and sediment control measures to be taken by sections B and C of Guidelines on Erosion and Sedimentation Control for Urban Construction Sites, published by the Government of Ontario.

For Ambashi Engineering,

Mahendra Pandya, P.Eng. PMP

Principal Engineer

THIRD-PARTY DISCLAIMER

Appendix A

Topography Survey

LEGEND

○ MHH DENOTES HYDRO MANHOLE	FH DENOTES FIRE HYDRANT
○ MHS DENOTES SEWER MANHOLE	WM DENOTES WATER METER
○ MHT DENOTES TELEPHONE MANHOLE	WVS DENOTES WATER VALVE (Service)
○ MHTR DENOTES TRAFFIC MANHOLE	WVM DENOTES WATER VALVE (Main)
○ MHW DENOTES WATER MANHOLE	GM DENOTES GAS METER
CB DENOTES CATCH BASIN	GV DENOTES GAS VALVE
DCB DENOTES DOUBLE CATCH BASIN	HM DENOTES HYDRO METER
LSc DENOTES LIGHT STANDARD CONCRETE	PedT DENOTES TELEPHONE PEDESTAL
LSs DENOTES LIGHT STANDARD STEEL	PedCTV DENOTES CABLE TV PEDESTAL
LSw DENOTES LIGHT STANDARD WOOD	TRs DENOTES TRAFFIC SIGN
UPc DENOTES UTILITY POLE CONCRETE	TRsg DENOTES TRAFFIC SIGNAL
UPs DENOTES UTILITY POLE STEEL	TRsb DENOTES TRAFFIC SIGNAL BOX
UPw DENOTES UTILITY POLE WOOD	TH DENOTES TESTHOLE
GP DENOTES GUY POLE	BM DENOTES BENCH MARK
GW DENOTES GUY WIRE	HCP DENOTES HORIZONTAL CONTROL POINT
Bol DENOTES BOLLARD	VCP DENOTES VERTICAL CONTROL POINT
PM DENOTES PARKING METER	DENOTES SHRUB
	SC DENOTES SEWER CLEANOUT
TOC DENOTES TOP OF CURB	
BOC DENOTES BOTTOM OF CURB	INV DENOTES INVERT

DECIDUOUS AND CONIFEROUS TREES ARE DENOTED DT AND CT RESPECTIVELY. A PREFIX TO THE DESCRIPTION DESIGNATES THE NUMBER OF TREE TRUNKS WHEN TREES ARE CLUMPED TOGETHER AND A SUFFIX DENOTES THE TREE DIAMETER OR (NTS) NOT TO SCALE.

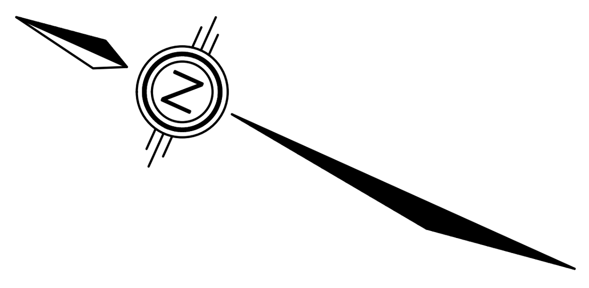
C — C — C	DENOTES OVERHEAD CABLE TV LINE
G — (pipe size) — G	DENOTES GAS LINE
H — H — H	DENOTES OVERHEAD HYDRO LINE
CS — (pipe size) — CS	DENOTES COMBINED SEWER
SA — (pipe size) — SA	DENOTES SANITARY SEWER
ST — (pipe size) — ST	DENOTES STORM SEWER
T — T — T	DENOTES OVERHEAD TELEPHONE LINE
W — (pipe size) — W	DENOTES WATER LINE

UNDERGROUND CABLE, HYDRO OR TELEPHONE LINES ARE PREFIXED WITH THE LETTER "u" (CABLE = uC HYDRO = uH TELEPHONE = uT)

CAUTION

UNDERGROUND UTILITIES AND SERVICES SHOWN ON THIS PLAN ARE APPROXIMATE AND MUST BE VERIFIED BEFORE CONSTRUCTION

INVERTS INVERTS ARE DERIVED FROM CITY OF WINDSOR SEWER ATLAS (PLATE I6) AND SHOULD BE VERIFIED BEFORE CONSTRUCTION.



ELEVATIONS

ELEVATIONS SHOWN ON THIS PLAN ARE IN FEET TO CANADIAN GEODETIC VERTICAL DATUM (1928)

BENCH MARK

BENCH MARK 869 — ELEVATION 597.86'

CHILDERN'S ACHIEVEMENT CENTRE, M. B. 437 ERIE STREET; THE PLATE IS LOCATED ON THE NORTH WALL, 3.5' THE EAST WALL AND 1.8' ABOVE GRADE.

SITE BENCH MARK

TOP OF FIRE HYDRANT AT 1162 GOYEAU STREET — ELEVATION 604.64'

AREA

0.423 ACRES

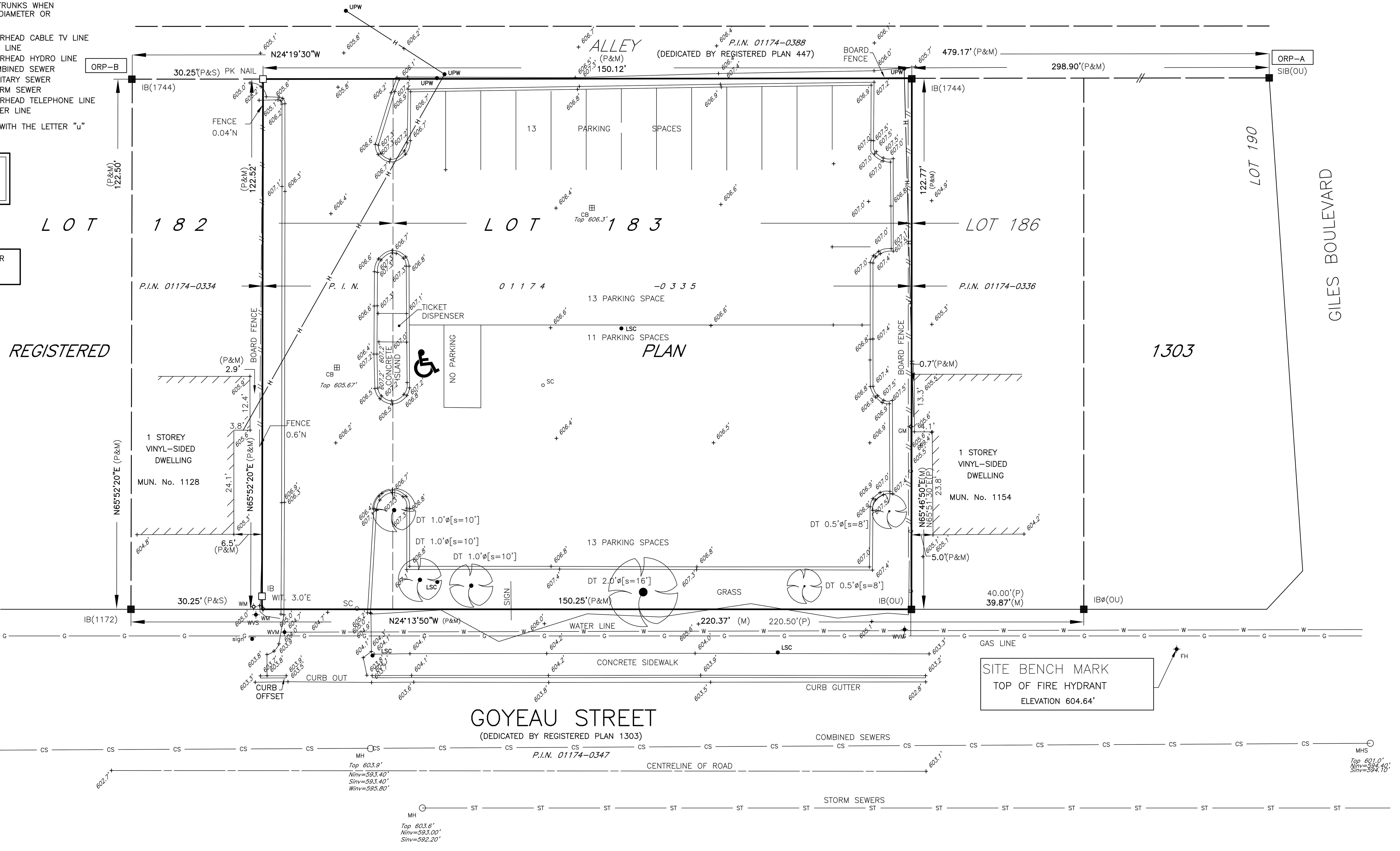
TOPOGRAPHIC SURVEY
OF
LOT 183, PART OF LOT 182 REGISTERED PLAN 1303
IN THE
CITY OF WINDSOR COUNTY OF ESSEX, ONTARIO

SCALE : 1"=15'

0 7.5 15.0 30.0 45.0 75.0 FEET

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2204885

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR
In accordance with Regulation 1026, Section 29 (3)



LEGEND AND NOTES

BEARINGS ARE UTM GRID DERIVED FROM OBSERVED REFERENCE POINTS 'A' AND 'B' BY REAL TIME NETWORK OBSERVATIONS AND ARE REFERRED TO UTM ZONE 17 (81° WEST LONGITUDE) NAD83 (CSRS) (2010.0).

DISTANCES ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999920.

ALL SET SSIB AND PB MONUMENTS WERE USED DUE TO LACK OF OVERBURDEN AND/OR PROXIMITY OF UNDERGROUND UTILITIES IN ACCORDANCE WITH SECTION 11 (4) OF O.REG. 525/91.

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
SSIB	DENOTES	SHORT STANDARD IRON BAR
IB	DENOTES	IRON BAR
PB	DENOTES	PLASTIC BAR
WIT	DENOTES	WITNESS
M	DENOTES	MEASURED
S	DENOTES	SET
⊥	DENOTES	PERPENDICULAR
D	DENOTES	DEED
OU	DENOTES	ORIGIN UNKNOWN
ORP	DENOTES	OBSERVED REFERENCE POINT
(P)	DENOTES	PLAN OF SURVEY BY (1744), DATED: JULY 4, 2006
(JDB)	DENOTES	J.D. BARNES LIMITED
(1744)	DENOTES	VERHAEGEN LAND SURVEYORS

INTEGRATION DATA

COORDINATES ARE DERIVED FROM GRID OBSERVATIONS USING THE CAN-NET NETWORK SERVICE AND ARE REFERRED TO UTM ZONE 17 (81° WEST LONGITUDE) NAD83 (CSRS) (2010.0). COORDINATE VALUES ARE TO AN URBAN ACCURACY IN ACCORDANCE WITH SECTION 14(2) O.REG 216/10

POINT ID	NORTHING	EASTING
ORP-A	N15373330.04	E1091775.25
ORP-B	N15373766.72	E1091577.85

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

FOR BEARING COMPARSION, A ROTATION OF 1° 27' 10" CLOCKWISE WAS APPLIED TO P TO CONVERT TO GRID BEARINGS.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THIS SURVEY WAS COMPLETED ON THE 2nd DAY OF MARCH, 2023.

DATE MARCH 13, 2023.

ROY A. SIMONE
ONTARIO LAND SURVEYOR

VERHAEGEN LAND SURVEYORS
SURVEYING MAPPING GIS
A DIVISION OF J.D. BARNES LTD.
944 OTTAWA STREET, WINDSOR, ON, N8X 2E1
T: (519) 258-1772 F: (519) 258-1791 www.jdbarnes.com

DRAWN BY: A.J.M.	CHECKED BY: K.H./R.A.S.	REFERENCE NO.: 23-47-039-00
FILE: 23-47-039-00.dwg	E-1303-18	CAD Date: March 13, 2023 1:18 PM CAD File: 23-47-039-00.dwg

Appendix B

Additional Calculations

Pre-Development Peak Discharge Rate

One in Two Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr.	C	ha	L/S
5	111.86	0.35	0.173	18.79
10	84.13	0.35	0.173	14.13
15	68.13	0.35	0.173	11.45
30	44.53	0.35	0.173	7.48
60	27.40	0.35	0.173	4.60
120	16.24	0.35	0.173	2.73
360	6.82	0.35	0.173	1.15
720	3.90	0.35	0.173	0.65
1440	2.22	0.35	0.173	0.37
One in Five Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr.	C	ha	L/S
5	139.57	0.35	0.173	23.45
10	107.72	0.35	0.173	18.10
15	88.40	0.35	0.173	14.85
30	58.69	0.35	0.173	9.86
60	36.32	0.35	0.173	6.10
120	21.47	0.35	0.173	3.61
360	8.89	0.35	0.173	1.49
720	5.03	0.35	0.173	0.84
1440	2.83	0.35	0.173	0.47
One in Ten Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr.	C	ha	L/S
5	157.73	0.35	0.173	26.50
10	122.80	0.35	0.173	20.63
15	101.26	0.35	0.173	17.01
30	67.63	0.35	0.173	11.36
60	41.96	0.35	0.173	7.05
120	24.80	0.35	0.173	4.17
360	10.22	0.35	0.173	1.72
720	5.75	0.35	0.173	0.97
1440	3.22	0.35	0.173	0.54
One in Twenty-Five Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr.	C	ha	L/S
5	182.17	0.35	0.173	30.60
10	142.97	0.35	0.173	24.02
15	118.42	0.35	0.173	19.89
30	79.54	0.35	0.173	13.36
60	49.47	0.35	0.173	8.31
120	29.23	0.35	0.173	4.91
360	12.00	0.35	0.173	2.02
720	6.73	0.35	0.173	1.13
1440	3.75	0.35	0.173	0.63

One in Fifty Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr.	C	ha	L/S
5	200.17	0.35	0.173	33.63
10	157.69	0.35	0.173	26.49
15	130.87	0.35	0.173	21.99
30	88.10	0.35	0.173	14.80
60	54.81	0.35	0.173	9.21
120	32.33	0.35	0.173	5.43
360	13.21	0.35	0.173	2.22
720	7.38	0.35	0.173	1.24
1440	4.10	0.35	0.173	0.69
One in Hundred Year Storm Event				
Time	**Intensity**	**Runoff Coefficient**	**Area**	**Flow**
min	mm/hr.	C	ha	L/S
5	218.23	0.35	0.173	36.66
10	172.68	0.35	0.173	29.01
15	143.67	0.35	0.173	24.14
30	97.06	0.35	0.173	16.31
60	60.50	0.35	0.173	10.16
120	35.70	0.35	0.173	6.00
360	14.57	0.35	0.173	2.45
720	8.13	0.35	0.173	1.37
1440	4.50	0.35	0.173	0.76

Post-Development Peak Discharge Rate and Storage Calculations (Including Stress Event)

One in Two Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr.	C	ha	L/S	L/S	L/S	m3
5	155.49	0.35	0.173	26.15	14.13	12.019	3.61
10	116.94	0.35	0.173	19.67	14.13	5.535	3.32
15	94.70	0.35	0.173	15.93	14.13	1.795	1.62
30	61.90	0.35	0.173	10.41	14.13	0.000	0.00
60	38.08	0.35	0.173	6.41	14.13	0.000	0.000
120	22.57	0.35	0.173	3.80	14.13	0.000	0.000
360	9.47	0.35	0.173	1.59	14.13	0.000	0.000
720	5.42	0.35	0.173	0.91	14.13	0.000	0.000
1440	3.08	0.35	0.173	0.52	14.13	0.000	0.000
One in Five Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr.	C	ha	L/S	L/S	L/S	m3
5	194.01	0.35	0.173	32.63	14.13	18.497	5.55
10	149.73	0.35	0.173	25.18	14.13	11.049	6.63
15	122.88	0.35	0.173	20.67	14.13	6.533	5.88
30	81.58	0.35	0.173	13.72	14.13	0.000	0.00
60	50.48	0.35	0.173	8.49	14.13	0.000	0.000
120	29.85	0.35	0.173	5.02	14.13	0.000	0.000
360	12.36	0.35	0.173	2.08	14.13	0.000	0.000
720	6.99	0.35	0.173	1.17	14.13	0.000	0.000
1440	3.93	0.35	0.173	0.66	14.13	0.000	0.000
One in Ten Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr.	C	ha	L/S	L/S	L/S	m3
5	219.24	0.35	0.173	36.88	14.13	22.741	6.82
10	170.69	0.35	0.173	28.71	14.13	14.575	8.74
15	140.75	0.35	0.173	23.67	14.13	9.539	8.58
30	94.01	0.35	0.173	15.81	14.13	1.677	3.02
60	58.32	0.35	0.173	9.81	14.13	0.000	0.000
120	34.47	0.35	0.173	5.80	14.13	0.000	0.000
360	14.21	0.35	0.173	2.39	14.13	0.000	0.000
720	8.00	0.35	0.173	1.35	14.13	0.000	0.000
1440	4.48	0.35	0.173	0.75	14.13	0.000	0.000
One in Twenty-Five Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr.	C	ha	L/S	L/S	L/S	m3
5	253.22	0.35	0.173	42.59	14.13	28.456	8.54
10	198.73	0.35	0.173	33.43	14.13	19.291	11.57
15	164.60	0.35	0.173	27.68	14.13	13.551	12.20
30	110.57	0.35	0.173	18.60	14.13	4.463	8.03
60	68.76	0.35	0.173	11.57	14.13	0.000	0.000
120	40.62	0.35	0.173	6.83	14.13	0.000	0.000
360	16.68	0.35	0.173	2.80	14.13	0.000	0.000
720	9.35	0.35	0.173	1.57	14.13	0.000	0.000
1440	5.21	0.35	0.173	0.88	14.13	0.000	0.000

One in Fifty Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr.	C	ha	L/S	L/S	L/S	m3
5	278.24	0.35	0.173	46.80	14.13	32.665	9.80
10	219.19	0.35	0.173	36.87	14.13	22.733	13.64
15	181.91	0.35	0.173	30.60	14.13	16.462	14.82
30	122.46	0.35	0.173	20.60	14.13	6.464	11.63
60	76.18	0.35	0.173	12.81	14.13	0.000	0.000
120	44.94	0.35	0.173	7.56	14.13	0.000	0.000
360	18.37	0.35	0.173	3.09	14.13	0.000	0.000
720	10.26	0.35	0.173	1.73	14.13	0.000	0.000
1440	5.70	0.35	0.173	0.96	14.13	0.000	0.000
One in Hundred Year Storm Event for Post-Development							
Time	**Intensity**	**Runoff Coeff**	**Area**	**Flow**	**Discharge**	**Storage Flow**	**Storage**
min	mm/hr.	C	ha	L/S	L/S	L/S	m3
5	303.34	0.35	0.173	51.02	14.13	36.886	11.07
10	240.02	0.35	0.173	40.37	14.13	26.236	15.74
15	199.70	0.35	0.173	33.59	14.13	19.455	17.51
30	134.92	0.35	0.173	22.69	14.13	8.559	15.41
60	84.09	0.35	0.173	14.14	14.13	0.010	0.035
120	49.63	0.35	0.173	8.35	14.13	0.000	0.000
360	20.25	0.35	0.173	3.41	14.13	0.000	0.000
720	11.29	0.35	0.173	1.90	14.13	0.000	0.000
1440	6.26	0.35	0.173	1.05	14.13	0.000	0.000

Appendix C

City Instruction

RE: STAGE 2 PLANNING CONSULTATION LETTER: PC 006/24 - 1140 GOYEAU ST & 0 WINDSOR AVE. URGENT . Adam ple

Reply | Reply A

PJ

Paramo, Juan <jparamo@citywindsor.ca>
To 'sarthi@ambashiengineering.ca'
Cc mpandya@ambashiengineering.ca

Hello Sarthi,
The direction on the composite C value remains the same. Use a "weighted C value" of 0.35 for your pre-development calculations.
Thanks,

Juan Paramo, P.Eng. | Development Engineer
Engineering Department - Development Division
350 City Hall Square West | Suite 210 | Windsor, ON | N9A 6S1
519-255-6267 Ext. 6353
www.citywindsor.ca

From: sarthi@ambashiengineering.ca <sarthi@ambashiengineering.ca>
Sent: May 31, 2024 3:33 PM
To: Paramo, Juan <jparamo@citywindsor.ca>
Cc: mpandya@ambashiengineering.ca
Subject: RE: STAGE 2 PLANNING CONSULTATION LETTER: PC 006/24 - 1140 GOYEAU ST & 0 WINDSOR AVE. URGENT . Adam please see our email below

Hello Juan,

I hope you are fine,

Juan, You mentioned Earlier "The allowable release rate should be limited to a composite C value of 0.35."

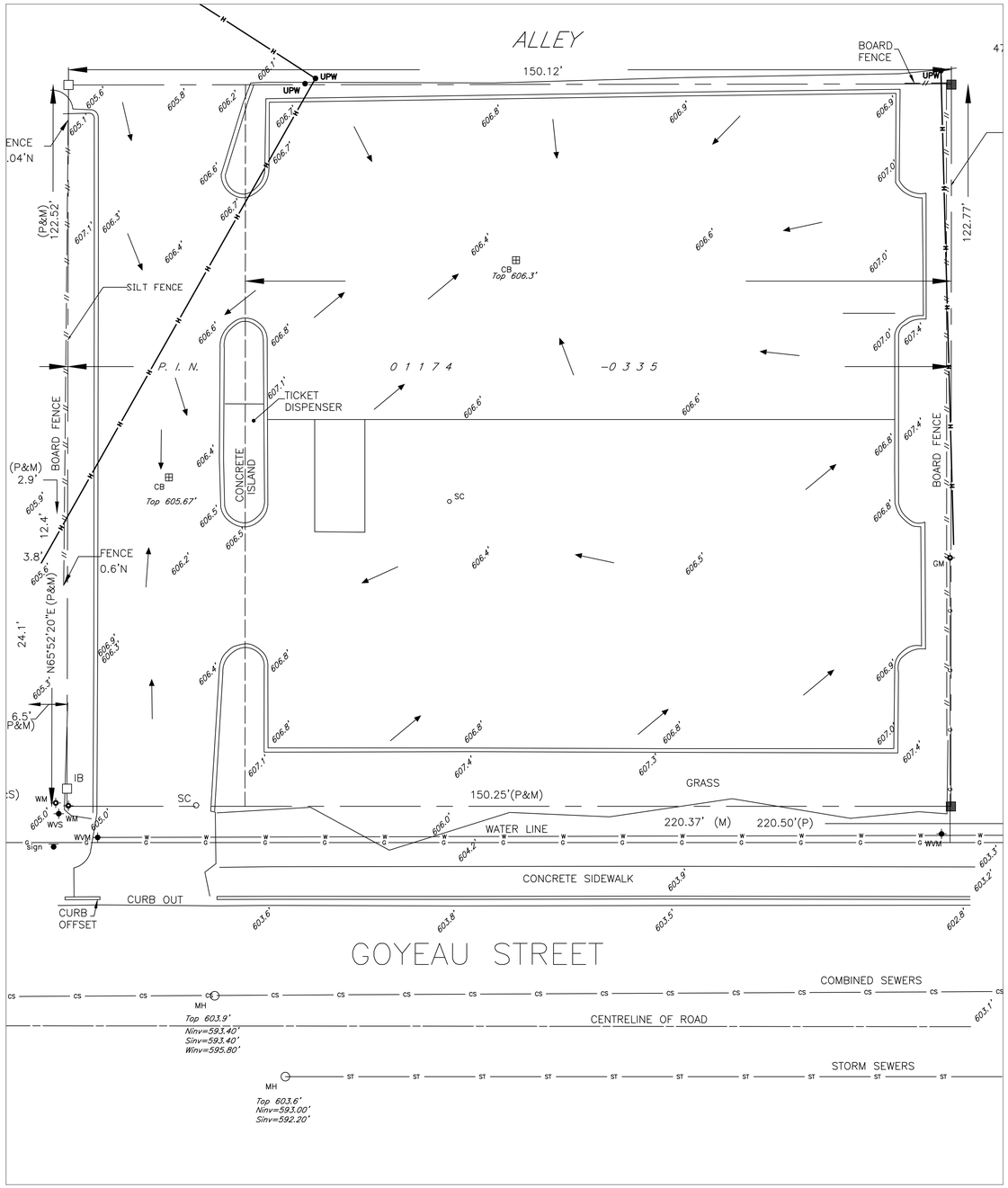
Is that Still Applicable, or do we have to consider the weighted C value?

Please Clarify.

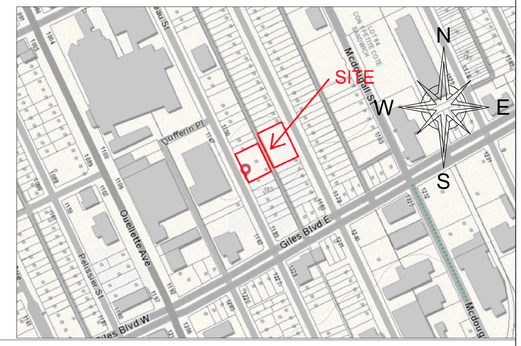
Regards
Sarthi Goyal

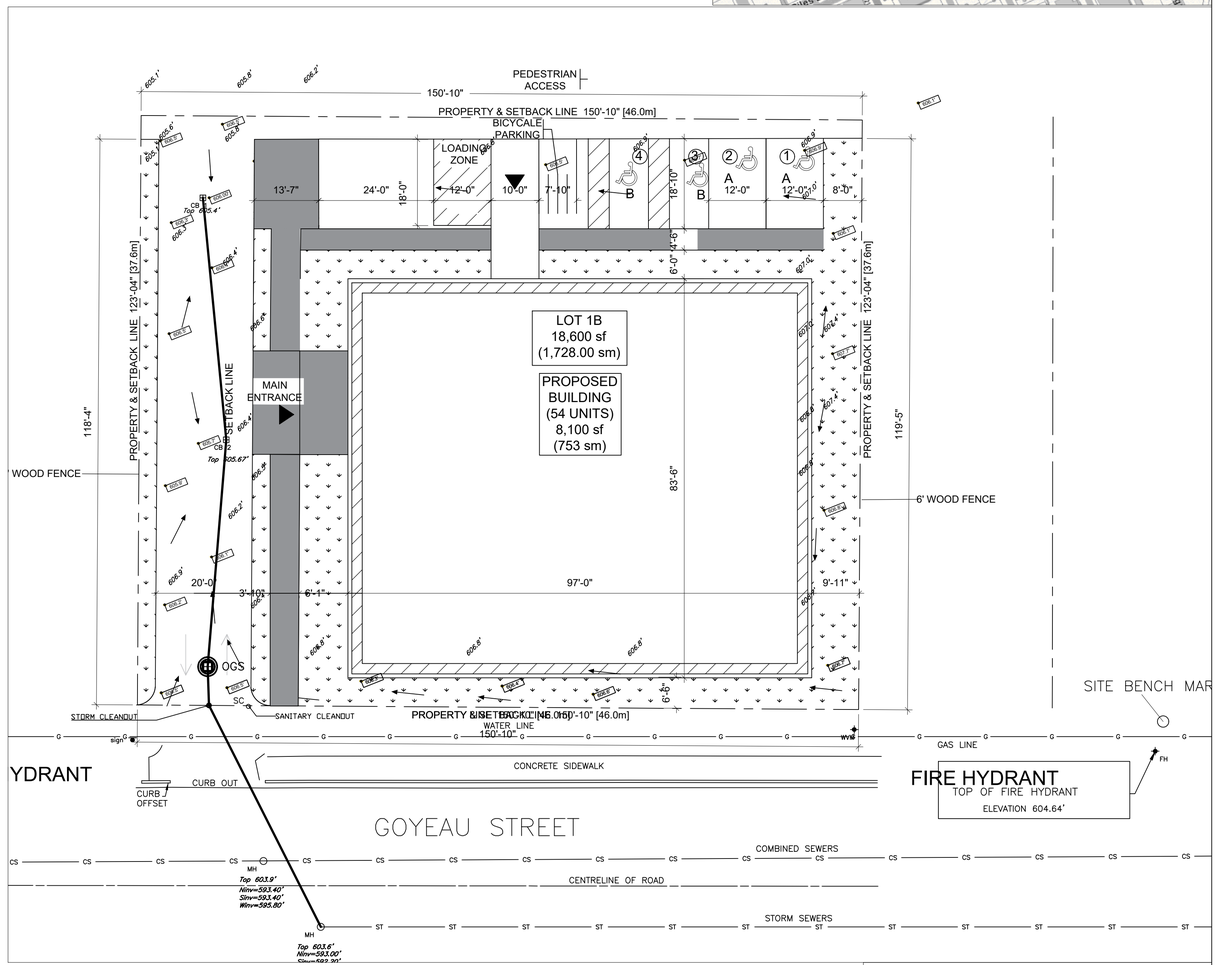
Appendix D

Pre & post-development Drainage Plan



POST DEVELOPMENT DRAINAGE PLAN





PRE DEVELOPMENT DRAINAGE PLAN

LEGEND

590.00	PROPOSED ELEVATION
590.0'	EXISTING ELEVATION
	OVERLAND FLOW ON LOTS

DETAIL NUMBERS
01 — 01
DETAIL NUMBER / LOCATION SHEET / DETAIL SHEET
DETAIL SYMBOL

DATE	ISSUED FOR	
07-JUNE-24	FOR-SUBMISSION	SUBMISSION-2
12-12-2023	FOR-SUBMISSION	SUBMISSION-1

LICENSED PROFESSIONAL ENGINEER
M.PANDYA
100088405
07-June-2024
PROVINCE OF ONTARIO

IN CHARGE	INT.
DESIGNED	MAHENDRA.P
DRAWN	SARTHI_GOYAL
CHECKED	MAHENDRA.P
DATE	12-12-2023
APPROVED	07-06-2023

CLIENT	1140_GOYEAU_ST_WINDSOR
PROJECT TITLE	1140_GOYEAU_ST_WINDSOR
DWG. TITLE	STORM-WATER-PROPOSAL

PROJECT No. 1140
DWG. No. D.NO.1140

AMBASHI ENGINEERING LTD.
consulting engineers
Toronto,ontario

Appendix E

Oil-Grit Separator Sizing

ADS OGS Sizing Summary

Project Name: 1140 Goyeau St

Consulting Engineer: Ambashi Engineering

Location: Windsor, ON

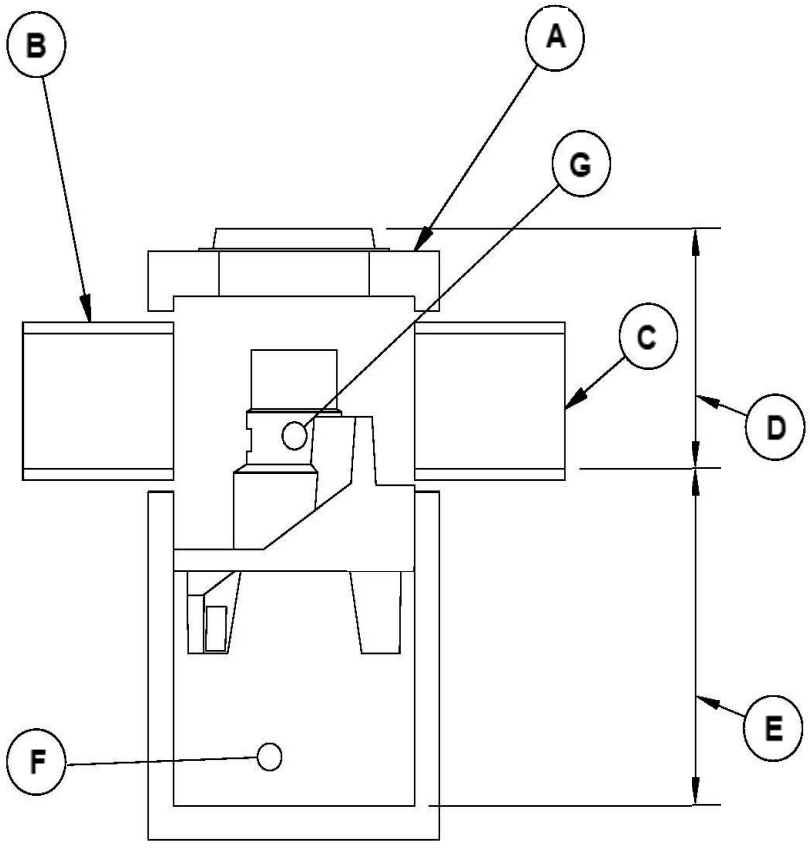
Sizing Completed By: C. Neath **Email:** cody.neath@adspipe.com

Treatment Requirements		
Treatment Goal:	Normal (MOE)	
Selected Parameters:	70% TSS	90% Volume
Selected Unit:	**FD-4HC**	

Site Details	
Site Area:	0.1728 ha
% Impervious:	75%
Rational C:	0.75
Rainfall Station:	Windsor, ONT
Particle Size Distribution:	Fine
Peak Flowrate:	---

Summary of Results		
Model	**TSS Removal**	**Volume Treated**
FD-4HC	91.0%	>90%
FD-5HC	94.0%	>90%
FD-6HC	96.0%	>90%
FD-8HC	98.0%	>90%
FD-10HC	99.0%	>90%

FD-4HC Specification	
Unit Diameter (A):	1,200 mm
Inlet Pipe Diameter (B):	150 mm
Outlet Pipe Diameter (C):	150 mm
Height, T/G to Outlet Invert (D):	1787 mm
Height, Outlet Invert to Sump (E):	1515 mm
Sediment Storage Capacity (F):	0.78 m³
Oil Storage Capacity (G):	723 L
Recommended Sediment Depth for Maintenance:	440 mm
Max. Pipe Diameter:	600 mm
Peak Flow Capacity:	510 L/s



Site Elevations:	
Rim Elevation:	184.76
Inlet Pipe Elevation:	183.09
Outlet Pipe Elevation:	182.97

Notes:

Removal efficiencies are based on NJDEP Test Protocols and independently verified.

All units supplied by ADS have numerous local, provincial, and international certifications (copies of which can be provided upon request). The design engineer is responsible for ensuring compliance with applicable regulations.

Project Name:	1140 Goyeau St
Consulting Engineer:	Ambashi Engineering
Location:	Windsor, ON

Net Annual Removal Efficiency Summary: FD-4HC

Rainfall Intensity[(1)]	Rational Equation Flowrate	Surface Loading Rate	Fraction of Rainfall[(1)]	FD-4HC Removal Efficiency	Weighted Net-Annual Removal Efficiency
mm/hr	L/s	L/min/m^2	%	%	%
3.00	1.1	57	13.2%	100%	13.2%
4.00	1.4	76	9.6%	100%	9.6%
5.00	1.8	95	7.5%	98%	7.4%
6.00	2.2	115	6.0%	97%	5.8%
7.00	2.5	134	4.8%	95%	4.6%
8.00	2.9	153	4.1%	94%	3.9%
9.00	3.2	172	3.6%	93%	3.4%
10.00	3.6	191	3.2%	92%	3.0%
11.00	4.0	210	2.8%	91%	2.6%
12.00	4.3	229	2.5%	91%	2.3%
15.00	5.4	286	6.6%	89%	5.9%
20.00	7.2	382	8.3%	87%	7.2%
25.00	9.0	477	5.8%	85%	4.9%
30.00	10.8	573	4.6%	83%	3.8%
35.00	12.6	668	3.8%	82%	3.1%
40.00	14.4	764	2.9%	81%	2.4%
45.00	16.2	859	2.4%	80%	1.9%
50.00	18.0	955	1.8%	79%	1.4%
65.00	23.4	1241	6.6%	78%	5.1%
Total Net Annual Removal Efficiency:					91.3%
Total Runoff Volume Treated:					>90%

Notes:

(1) Based on Windsor/Essex Region Stormwater Manual 2018, Table 3.4.1.5

(2) Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution

Appendix G

Site Photos

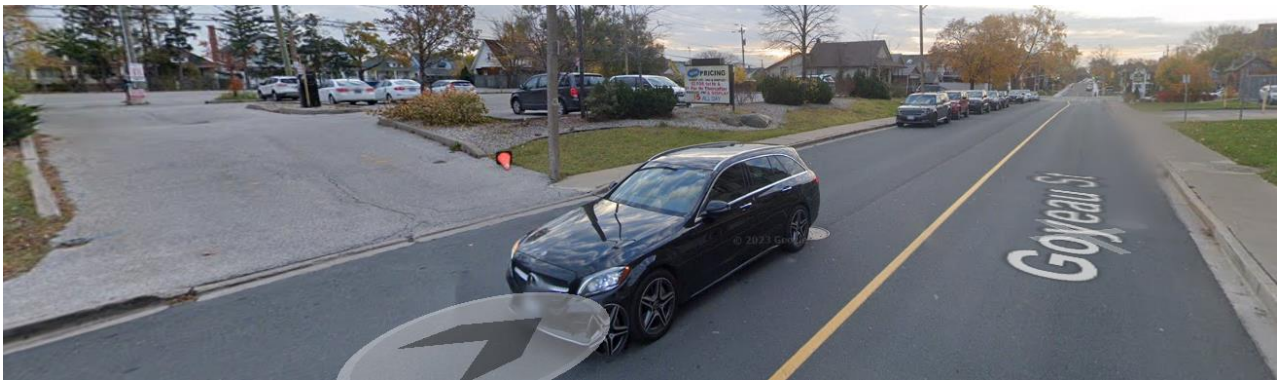


Figure 5 (Property View from west on Goyeau Street)

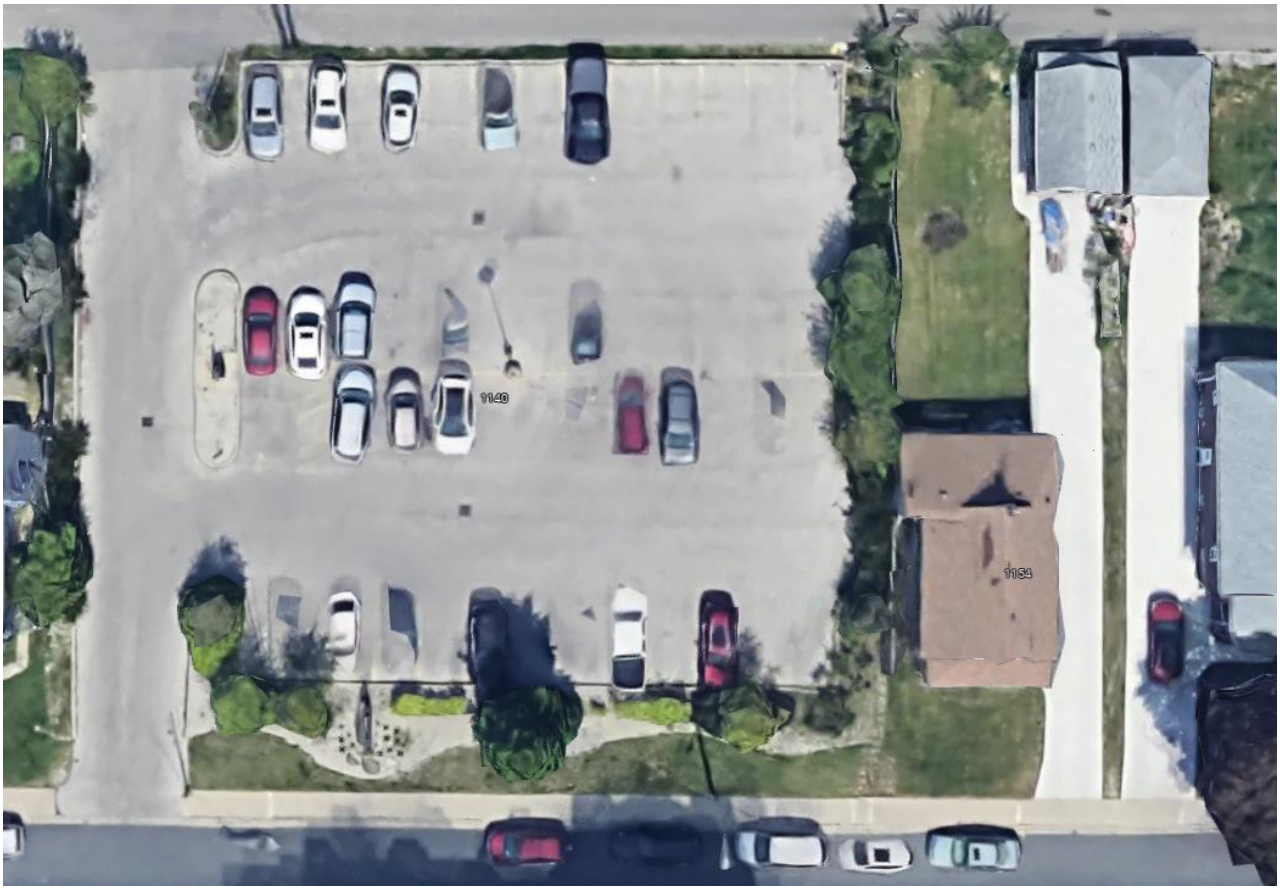


Figure 6 (Property View from Top)