2742 DUNROBIN ROAD
CITY OF OTTAWA

STORM WATER MANAGEMENT BRIEF

Project No. NTE201202

Prepared for:

Mr. Omar Nader

Prepared by:

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February 2021

1.0 INTRODUCTION

NorthTown Engineering Inc. was appointed by Mr. Omar Nader to provide Architectural & engineering services for the proposed Car Dealership at 2742 Dunrobin Road. The site is located near the Intersection of Dunrobin Road and Thomas A. Dolan Parkway in the City of Ottawa, Ontario.

This report should be read in conjunction with the Site Plan, Grading Plan and other design drawings prepared by NorthTown Engineering Inc.

2.0 SITE OVERVIEW

The majority of the site consists of native vegetation. The proposed development is approximately 0.1 ha in area and it is mainly on the west side of the property at Dunrobin Road. A trailer on wheels 9m x 3m will be used as an office for 1 attendant on the site. A gravel lot (439 sq.m) will be used for car display and customer parking. Landscaping and other improvements are detailed on the Site Plan.

3.0 STORMWATER MANAGEMENT

Drainage Criteria

The site consists of native vegetation and naturally draining East, away from the Municipal ditch on Dunrobin Road. The total site area is 4020 sq.m (0.402 ha) with proposed development area of 1070 sq.m (0.107 ha) on the west side of the property at Dunrobin Road.

Stormwater from the site will be conveyed via sheet flow to the existing field within the property. A proposed shallow drainage ditch is designed to intercept the surface drainage from the improved area. The ditch will control the flow to the pre-development level and store the additional water quantity.

Pre-Development Release Rate

The maximum release rate is calculated for the site as follows:

$Q = 2.78\ CIA$

Where,
Q = Peak Runoff (L/s)
2.78 = Unit conversion factor (from ha-mm/hr to L/s)
C = Runoff Coefficient (unitless)
I = Rainfall Intensity (mm/hr) (from Ottawa IDF Curve Equations below)
A = Drainage Area (ha)

A = Total Developed Area = 1,070 m^2 (0.107 Ha)
Runoff Coefficient for the 5-Year for Grass Area: **C = 0.2**

IDF Equations
The following Intensity Duration Frequency Curve equations were used in order to correctly model the storm events common to the City of Ottawa.

$I_{(5\text{-}yr)} = 998.071 / (Tc + 6.053)^{0.814}$

$I_{(100\ year)} = 1735.688 / (Tc + 6.014)^{0.820}$
Tc = 20min

$I_{(5\text{-}yr,\ 20min)}$ = 70.25mm/hr
$I_{(100\ year,\ 20min)}$ = 119.95 mm/hr

Allowable release rate for the 5-Year Storm Event:
$Q_{(5\text{-}year)}$ = 2.78 CiA = 2.78 x 0.2 x 70.25 x 0.107 = **4.2 L/s**
Allowable release rate for the 100-year Storm Event :
$Q_{(100\text{-}year)}$ = 2.78 CiA = 2.78 x 0.2 x 119.95 x 0.107 = **7.1 L/s**

Post Development Release Rate

Total Developed Area = 1,070 m^2 (0.107 Ha)

Post Development runoff coefficient:

	Area (m^2)	**'C'**
Landscaped Areas	604	0.20
Trailer Roof	27	0.90
Gravel	439	0.50

$$C_{avg} = \frac{[(0{,}0604 \times 0.2)+(0{,}0027 \times 0.90)+(0.0439 \times 0.5)]}{[0{,}0604+0{,}0027+0.0439]}$$

C_{avg} = 0.34

Time of concentration = Tc = 20 min

5 year release rate, at intensity I = 70.25 mm/hr.
Q_5 = 2.78CiA = 2.78 x 0.34 x I x 0.107 **= 7.1 L/s**

100 year release rate, at intensity $I_{(100\ year,\ 24.3min)}$ = 119.95 mm/hr
Q_{100} = 2.78CiA = 2.78 x 0.34 x I x 0.107 = **12.1 L/s**

Storage Requirements and Allocation

The storage requirements for the five and one hundred year design storms for various rainfall intensities and times of concentration are included in the attached sheet.
The following table summarizes the five and one hundred year design storm flows and storage requirements for the development:

Design Storm (return period)	Pre-development flow rate (L/s)	Post-Development flow rate (L/s)	Approximate Storage Required (m3)
5 year	4.2	7.1	4.2
100 year	7.1	12.1	7.2

See Storage Volume Calculation Attached

To provide control of the post-development peak flow, a drainage ditch is proposed to receive the flow by intercepting the surface drainage from the improved area. The ditch will provide a minimum of 9.5m^3 of quantity storage (quality storage requirements are determined in the next section). The outlet of the ditch will be sized to control the peak flow to the pre-development flow. Any flows in excess of the 5-year event will be stored in a drainage ditch. The retained flow will be in turn infiltrated from the ditch toward the existing field within the property.

In order to control flow to the 5-year storm release rate.
Restriction is achieved with the use of a 0.2m rip-rap weir located at the east outlet of the shallow detention ditch.

Flow Restriction Sizing

A low profile rip-rap weir outlet is required in order to control the release of stormwater to a maximum of 4.2 L/s from the proposed drainage ditch. The weir has been sized to control the 5-year storm event.

Using Manning's equation for a trapezoidal channel the following is determined:

Bottom width = b = 0.20
Side slope = z = 2:1
Depth of flow = y = 0.05
Manning's "n" = 0.04 (for rip-rap lined channel)
A = flow area =b (y) + z(y)^2 = 0.015
Wetted perimeter = P = b + 2y(1+z^2)^0.5 = 0.424
Hydraulic Radius (A/P) = R = 0.0354

$Q = VA = (C/n) \times A \times R^{2/3} \times S^{1/2} = 0.0042\ m^3/s = 4.2\ L/s$

Quality Control Measures

Quality considerations of the stormwater were analyzed according to *"Stormwater Management Practices Planning and Design Manual"*, Ontario Ministry of Environment and Energy. Water Quality Storage Requirements based on Receiving Waters defines storage volumes based on an Enhanced Level Protection status is suitable for the development.

Protection Level	SWMP Type	Storage Volume (m3/ha) for Impervious Level)			
		35%	55%	70%	85%
Enhanced Level	Infiltration	25	30	35	40
80% long-term	Wetlands	80	105	120	140
S.S. removal	Hybrid Wet Pond/ Wetland	110	150	175	195
	Wet Pond	140	190	225	250

SWMPPDM excerpt

By interpolation the storage volume required is **40 m^3/ha** for the Infiltration category.
Using the catchment area of 0.107 hectares the total storage volume required is **4.3m^3**.
The drainage ditch storage volume is **9.5m^3** which meets the storage required for quality control measures.

4.0 EROSION AND SEDIMENT CONTROL

The following best management practices for erosion and sediment control will be employed in the proposed development:

1- The extent of exposed soils shall be kept to a minimum at all times to achieve re-vegetation of exposed areas as soon as possible.
2- Controls shall be installed during construction in accordance with the erosion and sediment controls indicated on the Erosion and Sediment Control Plan.
3- Stockpiles shall be located away from the Municipal Ditch and stabilized against erosion as soon as possible.
4- Construction entrances shall be constructed of gravel to prevent erosion of the entrance and sediment migration offsite.

5- Disturbed areas should be stabilized against erosion as soon as possible.
6- Runoff should be diverted around disturbed areas whenever possible.
7- Runoff should be directed to existing grassed areas where possible.

5.0 CONCLUSION

The development has been designed to be serviced with the proposed drainage swales and dry pond facilities outlined in Section 5.3.

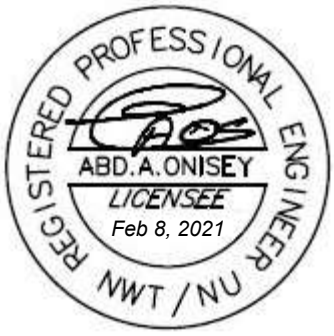
- Stormwater up to and including the 5-year storm events, for the revised site areas, will be stored within proposed dry grassed detention areas;

- The stormwater release rate from the site is 39.4 L/s for the 5-year storm event from Phase 2 (controlled via a 0.28m weir) and 71.7 L/s for the 5-year storm event from Phase 3/4 using a circular 198mmϕ orifice control device placed in a 300mmϕ culvert;

- An overland flow route out to the existing Thomas Argue Road and March Road ditching is provided for major storm events in excess of the 5 year event;

- Sediment control measures will be implemented and maintained during construction.

Abed Oniesy, P.Eng.



Storage Volume Calculations

Area = 0.107 ha

Cavg. = 0.34 Storage provided ;

Return Period	Time (min)	Intensity (mm/hr)	Total Flow Q in l/s	Allowable Runoff in l/s	Net Runoff To Be Stored in l/s	Storage Req'd m3
5 Year	12	98	10.0	4.2	5.8	4.1
	14	**90**	**9.1**	**4.2**	**4.9**	**4.2**
	16	84	8.5	4.2	4.3	4.1
	18	78	7.9	4.2	3.7	4.0
	20	73	7.4	4.2	3.2	3.8
100 Year	10	186	18.8	7.1	11.7	7.0
	15	**149**	**15.1**	**7.1**	**8.0**	**7.2**
	20	125	12.7	7.1	5.6	6.7
	22	118	11.9	7.1	4.8	6.4
	24	111	11.3	7.1	4.2	6.0