DYMON GROUP OF COMPANIES

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

3915 Dundas Street East

Project No. 2018-0067

COLE

COLE ENGINEERING GROUP LTD.

HEAD OFFICE
70 Valleywood Drive Markham, ON L3R 4T5
T. 905 940 6161 | 416 987 6161 **F.** 905 940 2064
www.coleengineering.ca

NOVEMBER 2018

PREPARED BY:

COLE ENGINEERING GROUP LTD.

Zilol Karim
Designer
Urban Development (ICI)

COLE ENGINEERING GROUP LTD.

Jonathan Edwards
Project Analyst
Municipal Systems

CHECKED BY:

COLE ENGINEERING GROUP LTD.

LICENSED PROFESSIONAL ENGINEER
S. K. LEE
100212879
Nov 23, 2018
PROVINCE OF ONTARIO

Jacky Lee, P.Eng., ME.Sc.
Project Engineer
Urban Development (ICI)

COLE ENGINEERING GROUP LTD.

LICENSED PROFESSIONAL ENGINEER
T L NG
100188083
11/23/2018
PROVINCE OF ONTARIO

Timothy Louis Ng, P.Eng
Water Resources Engineer
Water Management

AUTHORIZED FOR ISSUE BY:

COLE ENGINEERING GROUP LTD.

For Neil :

Neil Short
Business Unit Leader
Urban Development (ICI)

Issues and Revisions Registry

Identification	Date	Description of issued and/or revision
Final Report	November 2018	For Zoning By-Law Amendment

Statement of Conditions

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1 Introduction

1.1 Background

Cole Engineering Group Ltd. (Cole Engineering) was retained by Dymon Group of Companies to prepare a Functional Servicing and Stormwater Management (FSR/SWM) Report in support of a Zoning By-law amendment for a proposed development, in the City of Mississauga. The purpose of this report is to provide site-specific information for the City and Region to review with respect to the infrastructure required to support the proposed development regarding storm drainage, water supply, and sanitary discharge.

We have obtained information from the City, Town and Region regarding existing storm, sanitary and water services on Dundas Street West and Ninth Line for where it is anticipated the proposed development will connect to.

The following documents were also reviewed:

- Plan and profile Drawing No. 84 and 86, prepared by Region of Halton., dated October, 02 2015;
- Topographic survey prepared by Speight, Van Nostrand and Gibson Ltd., dated April 25, 2018; and,
- Site plan and site statistics prepared by Nicholas Caragianis Architect, dated September 15, 2018.
- City of Mississauga, Regional Municipality of Peel, Regional Municipality of Halton and Town of Oakville Design Criteria's

1.2 Site Description

The subject site is bounded by Dundas Street East to the south and Ninth Line to west in the City of Mississauga and Regional Municipality of Peel. Beyond Ninth Line and Dundas are Halton Region and Town of Oakville. The existing site is approximately 2.39ha in size. The legal description is as follows: Part of Lot 9, City of Mississauga.

The site is bound by a vacant area to the east, Sports Park to the north, Ninth Line to the west and Dundas Street East to the South. A 20.0m limit of hydro easement is located east side of the development. Refer to **Figures FIG 1** and **Figure FIG 2** following the report for location plan and aerial map of the site location.

2 Site Proposal

The 2.39ha proposed development will include five-storey self-storage building (GFA=1.536ha) and three (3) one-storey retail buildings (GFA=0.250ha, 0.0669ha and 0.0669ha) with two driveways connected to Dundas Street East and Ninth Line. The proposed parking lots at grade are around and in between buildings. Refer to the Site Plan in **Appendix A**.

3 Terms of Reference and Methodology

3.1 Terms of Reference

The Terms of Reference used for the scope of this report were based on current Region of Peel Transportation and Works Department Water and Wastewater Branch Standards and the City of Mississauga, Town of Oakville and Region of Halton Standards and Specifications Manual.

3.2 Methodology: Stormwater Drainage and Management

The following report provides a review of the pre- and post-development site conditions and comments on opportunities to reduce post-development peak flows. Requirements set by the City of Mississauga, Ministry of the Environment Conservation and Parks (MOECP) were reviewed. The following SWM criteria are to be applied:

Water Quantity

Post-development peak flows for all storms up to and including the 100-year event should be controlled to 2 year pre-development rates.

Water Quality

Enhanced Level 1 Protection, with a long-term average removal of 80% of the Total Suspended Solids (TSS) must be achieved on an annual loading basis.

Water Balance

Runoff resulting from a 5 mm rainfall event or best efforts shall be retained on-site through the use of Low Impact Development (LID) practices including infiltration, evapotranspiration and/or water reuse measures.

3.3 Methodology: Sanitary Discharge

The sanitary sewage flows will be determined using sanitary sewer design calculations that consider the land use and building statistics as supplied by the design team. The calculated values provide peak sanitary flow discharge with infiltration considerations.

The estimated sanitary flows in the proposed site will be calculated based on the Peel Region criteria shown in **Table 3.1** below.

Table 3.1 Sanitary Flows

Usage	Design Flow	Units	Persons Per Area
Commercial	302.8	Litres / Person / Day	50 Persons/ha

Based on the calculated peak flows, the adequacy of the loading infrastructure to support the proposed development will be discussed.

3.4 Methodology: Water Usage

The proposed development is connected to the existing 300mm diameter watermain located on west side of the Ninth line. The existing 300mm diameter watermain belongs to the Region which requires council approval for cross boundary connections. The domestic water usage will be calculated based on Region's standards.

Specifically, the proposed water system will be designed to satisfy the following demand conditions:

- Average consumption rate;
- Max day factor; and,
- Peak hour factor.

The domestic water usage was based on the Region of Halton design criteria for water demand and is summarized in **Table 3.2** below.

Table 3.2 Water Usage

Usage	Water Demand	Units
Commercial	24,750	Litres / ha / Day

Fire suppression flow calculations were undertaken in accordance with the Region of Halton fire suppression standards. Pressure and flow testing to determine the adequacy of the existing watermain to support the proposed development with fire suppression in accordance with the Fire Underwriters Survey (FUS) Guidelines will be discussed in the subsequent **Section 6 Water Supply System**.

4 Stormwater Management and Drainage

4.1 Design Criteria

- Quantity Control – 100 Year Post development flows will be controlled to 2 Year pre-development levels;
- Quality Control – 80 % TSS removal will be provided; and,
- Water Balance – 5 mm retention or best efforts.

4.2 Existing Conditions

Under existing conditions A1 Pre drains to Dundas Street East to the South East. This flow drains to an existing ditch and then to Region of Halton existing 450 mm diameter culvert that drains to the 450 mm diameter storm sewer under Dundas Street East. A2 Pre drains to Ninth Line to the South West to an existing ditch and then to a ditch inlet catch basin that drains to a 600mm diameter storm sewer under Ninth Line. Ultimately, A1 Pre and A2 Pre drain South West along Dundas Street East.

Table 4.1 and **Table 4.2** below summarize the existing conditions drainage parameters and flows. It should be noted that the rainfall intensity used is based upon the City's criteria and not the Region's as it is more representative of the flows. Refer to **Appendix B** for calculations and **Figure DAP 1** for existing drainage areas.

Table 4.1 Existing Condition Drainage Parameters

Catchment	Drainage Area (ha)	C	Tc(min.)
A1 Pre	1.73	0.25	38
A2 Pre	0.66	0.25	15

Table 4.2 Existing Conditions Peak Flow Rates

Storm Event	Pre-Development Flow (L/s)		
	A1 Pre	A2 Pre	TOTAL
2-year	39.2	27.5	66.6

4.3 Proposed Conditions

4.3.1 General

A1 Post is controlled using an orifice and underground storage and drains to Ninth Line and then to Dundas Street East. A2 Post uses rooftop controls and drains to Dundas Street East. Similarly, A3 Post and A4 Post ultimately drain to Dundas Street East, but are uncontrolled areas.

B1 Post is controlled using an orifice and underground storage and drains to Dundas Street East. B2 Post uses rooftop controls and drains to Dundas Street East. Similarly, B3 Post drains ultimately drains to Dundas Street East, but is an uncontrolled area.

Table 4.3 below summaries the proposed conditions drainage parameters. The time of concentration for the post development conditions is 15 minutes as per the City's design criteria. Refer to **Appendix B** for calculations and **Figure DAP 2** for proposed drainage areas.

Table 4.3 Proposed Condition Drainage Parameters

Catchment	Drainage Area (ha)	C	Tc(min.)
A1 Post	0.64	0.95	15
A2 Post	0.13	0.95	15
A3 Post	0.04	0.25	15
A4 Post	0.01	0.25	15
B1 Post	1.33	0.95	15
B2 Post	0.19	0.95	15
B3 Post	0.06	0.25	15

4.3.2 Quantity Control

For catchments A1 Post and A2 Post Roof top controls, an underground storage system in combination with an orifice control will be utilized to control post-development flows to pre-development levels. Preliminary calculations show that the maximum underground storage required is 516 m^3 and rooftop storage is 28m^3 for the 100 year storm event. For catchments B1 Post and B2 Post Roof top controls, an underground storage system in combination with an orifice control will be utilized to control post-development flows to pre-development levels. Preliminary calculations show that the maximum underground storage required is 885 m^3 and rooftop storage is 43m^3 for the 100 year storm event. Refer to **Appendix B** for calculations and conceptual sizing of the underground storage system. Refer to **DWG SS-01** for a conceptual area for the underground storage system. Orifice calculations will be provided at detailed design. A summary of the post development flows is shown below in **Table 4.4**.

Table 4.4 Post Development Flows

Storm Event	Catchment	Target Flow (L/s)	Post Development Flow (L/s)
100-year	A1 Post – A4 Post	27.5	27.3
100-year	B1 Post – B3 Post	39.2	39.1

4.3.3 Stormwater Quality Control

A Jellyfish Filter will provide an overall TSS removal of 80%. Preliminary Jellyfish Filter sizing is shown in **Appendix B**. Conceptually a JF10-12-3 Offline Jellyfish unit was sized.

4.3.4 Water Balance

As best efforts, 5 mm retention will be provided via infiltration in the open bottom of the underground storage chambers. The storage utilized for retention via infiltration will be storage below the outlet of the underground storage system. The storage required is 119.5 m^3 (2.39 ha x 5mm). The water draining to the infiltration system is clean rooftop water. Preliminary sizing of the chambers is provided in **Appendix B**. A hydro geotechnical investigation that includes monitored groundwater levels and an infiltration test will be required at detailed design to determine the feasibility of implementing infiltration on-site. Refer to **DWG SS-01** for a conceptual area for the underground storage system.

4.3.5 Proposed Storm Connection

The proposed storm connection will discharge to the existing double catch basin manhole on Ninth Street via a 375 mm diameter storm sewer at 2.0% grade. Refer to **Drawing SS-01** in **Appendix E**.

5 Sanitary Drainage System

5.1 Existing Sanitary Drainage System

According to the information collected and outlined under **Section 1.1**, existing sanitary infrastructure is not available at the frontage along Dundas Street West and Ninth Line.

It was identified by Peel Region that extending the existing sanitary sewer on Ridgeway Drive through Highway 403 to service the site was not a viable option due to the existing inverts being too shallow to allow for a gravity connection.

5.2 Existing Sanitary Flows

According to the reviewed information, the current land is vacant and there is no Regional sanitary service connection for the existing site.

5.3 Proposed Sanitary Flows

The anticipated sanitary discharge flows for the proposed site were calculated based on the Region's design criteria outlined in **Table 3.1**, along with the proposed site statistics found in **Appendix A**. The GFA of the commercial area along with peaking factors were considered in the analysis in order to evaluate the adequacy of the existing municipal infrastructure. The design inputs for the site is shown in **Table 5.1** below.

Table 5.1 Equivalent Population Calculations

Land Use	Area (ha)	Total Population (Capita)
Commercial	2.56	128

The sanitary discharge flow was calculated using the Peel Region guidelines of 302.8 litres/capita/day, and an infiltration rate of 0.2 L/s/ha was also incorporated into the calculation in accordance with the Region's standards. Based on the above criteria, a net peak design flow of 2.43 L/s was calculated for the subject property. Refer to **Appendix C** for detailed calculations.

5.4 Proposed Sanitary Connection

It was investigated to have interim and alternative solutions for the sanitary flows. The interim solution is to retain proposed flows in a sanitary holding tank. As an alternative utilizing Region of Halton Infrastructure by extending the existing sanitary sewer from Region of Halton to service the subject site.

According to the reviewed information (Plan and profile drawings from Region of Halton), two alternatives have been presented.

5.4.1 Interim Solution – Sanitary Holding Tank

The proposed interim solution is to hold the sanitary flow within a temporary holding tank on site. One (1) tank is proposed to service all buildings. The total required storage volume required is presented in **Table 5.2** below. The flows contributing to the sanitary holding tank was calculated using the assumed population, and the average daily design flow of 302.8 L/cap/day. No infiltration rate was applied. Supporting Calculations are provided in **Appendix C**.

Table 5.2 Interim Solution – Sanitary Holding Tank Volume

Holding Tank	Serviced Buildings	Total Population (Capita)	Average Wastewater Flow (L/s)	Daily Volume (L)
Sanitary Tank	Five-storey Building One-Storey Building #1 One-Storey Building #2 One-Storey Building #3	128	0.45	38,758 x 1.5 = 58,137

The sizing of the tank will be based on the expected daily volume presented above plus a safety factor of 1.5. At this size, the tank will require pumping out each day; however, due to the nature of the development site and it's actual land use, it is expected that this daily flow volume is an overestimation. The tank will be installed with a float switch system and will be cleaned as needed based on the actual sanitary flow generation.

5.4.2 Alternative 1

Connecting the subject site to the existing 200 mm diameter sanitary sewer on Lyndhurst Drive, located approximately 500 m west of the subject site via existing maintenance hole (MH26599). The proposed sanitary extension will drain westerly along Dundas Street West from Ninth Line to Lyndhurst Drive. The proposed layout of Alternative 1 can be found in **Appendix C**.

5.4.3 Alternative 2

Connecting the subject site to the existing 500 mm diameter sanitary sewer on Upper Middle Road located approximately 2,000 m (2 km) south of the subject site via existing MH6. The proposed sanitary extension will drain southerly along Ninth Line from Dundas Street West to Upper Middle Road. The invert of the existing 500 mm diameter sanitary sewer is approximately 9 m below ground surface. Based on the depth of the invert there would be opportunity to extend the sanitary sewer to the subject site and beyond to service additional parcels. Further investigation would be required to determine the extent of the servicing potential. The proposed layout of Alternative 2 can be found in **Appendix C**.

Both alternatives 1 and 2 will require council approval for cross border connection.

6 Water Supply System

6.1 Existing System

According to the information reviewed as stated within **Section 1.1**, there is an existing 300 mm PVC watermain located adjacent to the site along Ninth Line that belongs to Region of Halton. An existing fire

hydrant is located on Ninth Line across the proposed development. A hydrant flow test was completed on September 04, 2018, and the results were compared against the domestic and fire flow demands from proposed development in order to assess the adequacy of the existing water infrastructure.

6.2 Proposed Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown in **Table 3.2** in **Section 3.4**, based on the Region of Halton Engineering Design Criteria. It is anticipated that an average daily consumption of approximately 47,666 L/day (0.55 L/s), a max daily demand of 107,248 L/day (74 L/min) and a peak hourly demand of 4,469 L/hr (1.24 L/s) will be required to service this development with domestic water. Detailed calculations are found in **Appendix D**.

According to our calculations, a minimum fire suppression flow of approximately 8,000 L/min (2,113 USGPM) at a pressure of 150 kPa (20 PSI) will be required for the proposed site. Refer to the detailed calculations found in **Appendix D**.

The results from hydrant test conducted on Ninth Line adjacent to the proposed development shows that approximately 13,330 L/min (3,521 USGPM) is available at a pressure of 20 PSI. Based on the results of this test, it is anticipated that the existing 300mm watermain infrastructure on Ninth Line will meet sufficient fire suppression capacity to service the proposed development.

6.3 Proposed Watermain Connection

A proposed 200 mm watermain (fire) and 150mm watermain (domestic) will be running through the site in order to service the proposed development, both in terms of fire and domestic demands. The watermain will ultimately connect to the existing 300 mm diameter watermain adjacent to the site on Ninth Line. Refer to **Drawing SS-01** in **Appendix E**.

7 Site Grading

7.1 Existing Grades

The existing site topography generally has many drainage patterns. Majority of the site drainage drains to the existing ditch in the center of the site towards east side of the site. Northwest corner of the site drains towards the existing ditch adjacent to the property line. Southwest corner of the site drains towards the existing ditch along the Ninth Line.

7.2 Proposed Grades

The proposed grading of the site will match existing grades where possible. The site has been graded in accordance with City and the proposed site grades are at an average grade of 0.5 – 5.0% with connectivity to Ninth Line and Dundas Street East. It has been designed such that as much drainage as possible from the site are able to be controlled and conveyed to the existing sewers on Ninth Line. Some areas along the north, west and south property limit of the site will be uncontrolled and still be conveyed to the existing sewers on Ninth Line. Flow will be contained onsite with an underground storage chambers. Refer to **Drawings SG-01** in **Appendix E**.

8 Conclusions and Recommendations

Based on our investigation, we conclude and recommend the following:

Storm Drainage

To meet the stormwater management design criteria the proposed development will implement the following:

- The proposed site will utilize rooftop controls and underground storage in combination with an orifice for quantity control;
- An underground storage system will be open bottom to allow for infiltration of clean rooftop water that will be used for water balance, and;
- An Offline Jellyfish Filter will be used for water quality treatment.

Sanitary Sewers

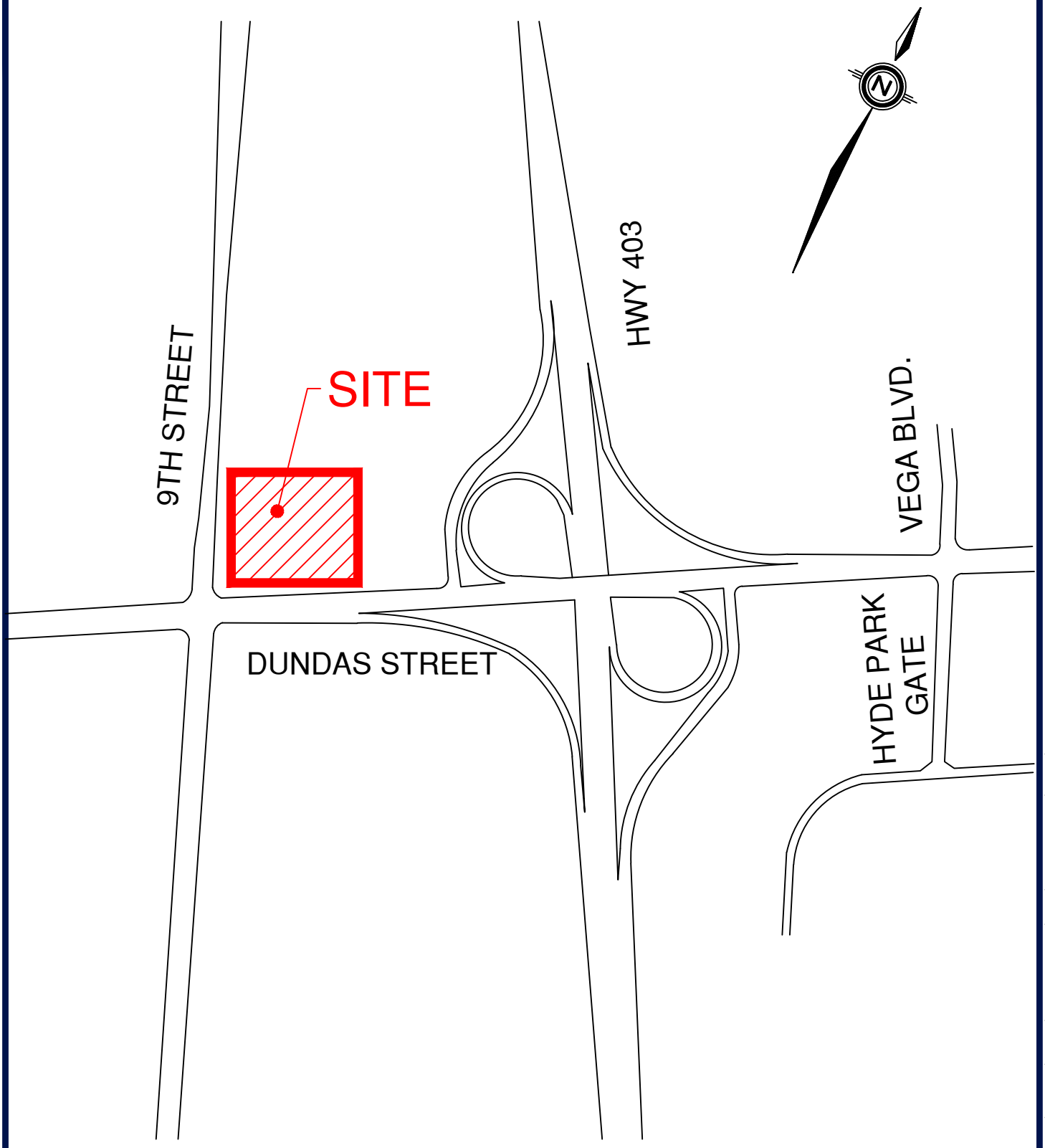
According to the available records, existing sanitary infrastructure is not immediately available at the site frontage along Dundas Street West and Ninth Line. Based on the Peel Region standards, a net peak design flow of 2.43 L/s was calculated for the subject property. The proposed development will to be serviced by a sanitary holding tank during the interim condition. In the ultimate condition, the proposed development can be either serviced by sewer extension along Dundas Street West from Lyndhurst Drive (Alternative 1) or sewer extension along Ninth Line from Upper Middle Road (Alternative 2).

Water Supply

Water supply will be provided by a connection to the existing 300 mm diameter watermain along Ninth Line at the southwest of the proposed property. An average daily consumption of approximately 47,666 L/d will be required to service this development with domestic water, and a minimum flow of 8,000 L/min (2,113 USGPM) at a pressure of 150 kPa (20 PSI) will be required to service this development with fire suppression. The results from the hydrant test conducted on Ninth Line adjacent to the proposed development shows that approximately 13,330 L/min (3,521 USGPM) is available at a pressure of 20 PSI. Based on the results of this test, it is anticipated that the existing 300mm watermain infrastructure on Ninth Line will meet sufficient fire suppression capacity to service the proposed development.

Site Grading

The proposed grading of the site will match the existing grades where possible. To the extent practical, the site flows will be accommodated by the SWM system up to and including the 100-year storm event. Emergency overland flow will be directed to the adjacent Ninth Line and Dundas Street right of way (ROW) on the southwest side.



LOCATION PLAN

NINTH LINE AND DUNDAS
3915 DUNDAS STREET EAST
MISSISSAUGA, ONTARIO

COLE ENGINEERING GROUP LTD.
70 Valleywood Drive,
Markham, ON L3R 4T5
T. 416 987 6161 | 905 940 6161
www.coleengineering.ca

DATE:	SEPTEMBER 2018	PROJECT No.	2018-0067
SCALE:	N.T.S.	FIGURE No.	FIG 1

COLE

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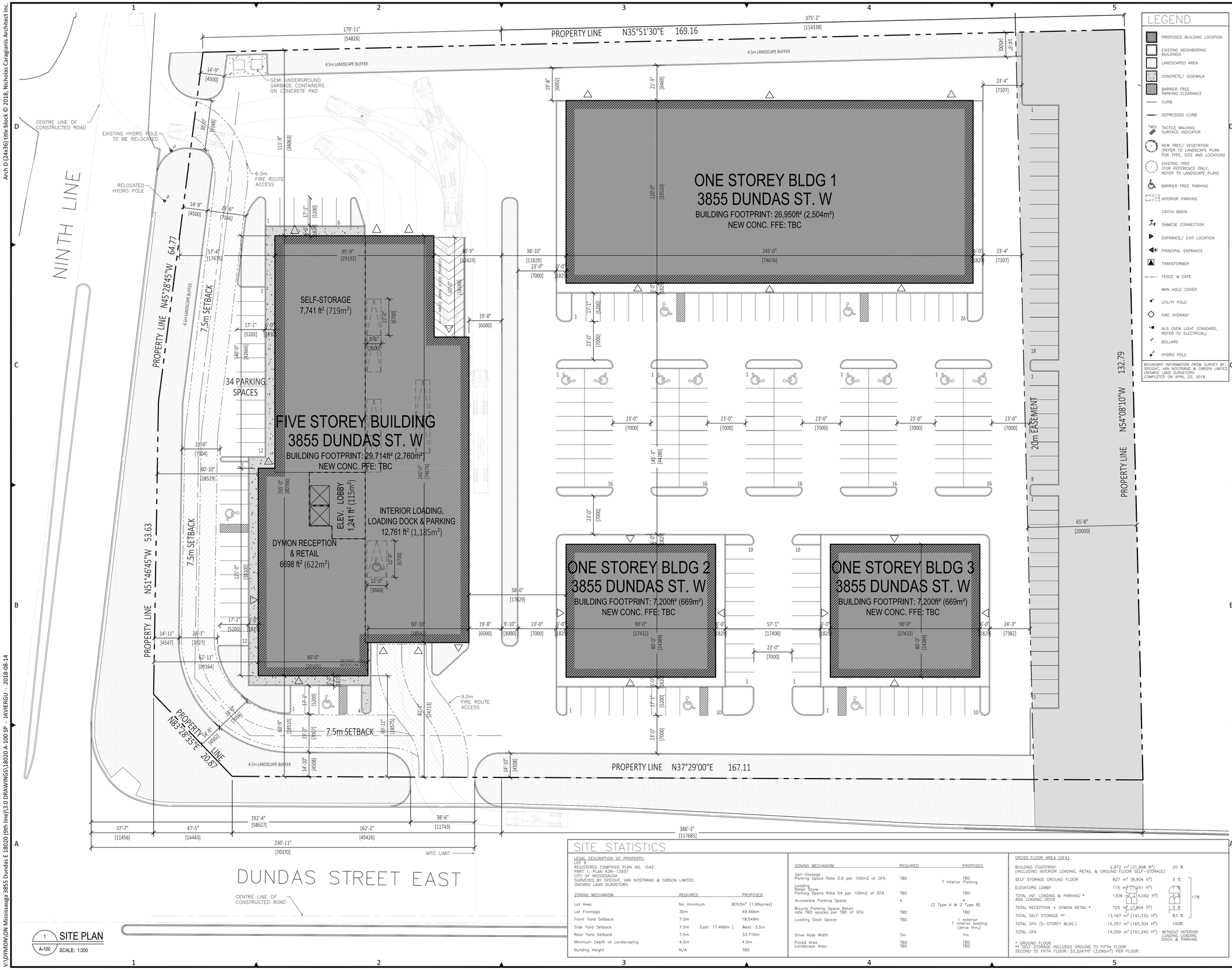
AERIAL PLAN

NINTH LINE AND DUNDAS
3915 DUNDAS STREET EAST
MISSISSAUGA, ONTARIO

DATE:	SEPTEMBER 2018	PROJECT No.	2018-0067
SCALE:	N.T.S.	FIGURE No.	FIG 2

APPENDIX A
Background Information



LEGEND

- PROPOSED BUILDING LOCATION
- EXISTING NEIGHBORING BUILDINGS
- LANDSCAPED AREA
- CONCRETE/ SIDEWALK
- BARRIER FREE PARKING CLEARANCE
- CURB
- DEPRESSED CURB
- TWSI TACTILE WALKING SURFACE INDICATOR
- NEW TREE/ VEGETATION (REFER TO LANDSCAPE PLAN FOR TYPE, SIZE AND LOCATION)
- EXISTING TREE (FOR REFERENCE ONLY, REFER TO LANDSCAPE PLAN)
- BARRIER FREE PARKING
- INTERIOR PARKING
- CATCH BASIN
- SIAMESE CONNECTION
- ENTRANCE/ EXIT LOCATION
- PRINCIPAL ENTRANCE
- TRANSFORMER
- FENCE & GATE
- MAN HOLE COVER
- UTILITY POLE
- FIRE HYDRANT
- NLS (NEW LIGHT STANDARD, REFER TO ELECTRICAL)
- BOLLARD
- HYDRO POLE

BOUNDARY INFORMATION FROM SURVEY BY: SPEIGHT, VAN NOSTRAND & GIBSON LIMITED ONTARIO LAND SURVEYORS COMPLETED ON APRIL 22, 2018

SITE STATISTICS

LEGAL DESCRIPTION OF PROPERTY:
LOT 9
REGISTERED COMPIKED PLAN NO. 1542
PART 1, PLAN 43R-13937
CITY OF MISSISSAUGA
SURVEYED BY SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS

ZONING MECHANISM	REQUIRED	PROPOSED
Lot Area	No minimum	8053m² (1.99acres)
Lot Frontage	30m	49.466m
Front Yard Setback	7.5m	18.549m
Side Yard Setback	7.5m	East: 17.466m | West: 3.5m
Rear Yard Setback	7.5m	33.716m
Minimum Depth of Landscaping	4.5m	4.5m
Building Height	N/A	TBD

ZONING MECHANISM	REQUIRED	PROPOSED
Self-Storage Parking Space Rate 0.6 per 100m2 of GFA	TBD	TBD 7 Interior Parking
Loading Retail Store Parking Space Rate 54 per 100m2 of GFA	TBD	TBD
Accessible Parking Space	4	4 (2 Type A & 2 Type B)
Bicycle Parking Space Retail rate TBD spaces per TBD of GFA	TBD	TBD
Loading Dock Space:	TBD	1 exterior 1 interior loading (drive thru)
Drive Aisle Width	7m	7m
Paved Area Landscape Area	TBD TBD	TBD TBD

GROSS FLOOR AREA (GFA)

BUILDING FOOTPRINT (INCLUDING INTERIOR LOADING, RETAIL & GROUND FLOOR SELF-STORAGE)	2,972 m² (31,998 ft²)	20 %
SELF STORAGE GROUND FLOOR	827 m² (8,904 ft²)	3 %
ELEVATORS LOBBY	115 m² (1,241 ft²)	1 %
TOTAL INT. LOADING & PARKING * AND LOADING DOCK	1306 m² (14,062 ft²)	5 % 9 % 3 % 17%
TOTAL RECEPTION + DYMON RETAIL *	725 m² (7,804 ft²)	3 %
TOTAL SELF STORAGE **	13,167 m² (141,732 ft²)	83 %
TOTAL GFA (5-STOREY BLDG.)	15,357 m² (165,304 ft²)	100%
TOTAL GFA	14,050 m² (151,242 ft²)	WITHOUT INTERIOR LOADING LOADING DOCK & PARKING

* GROUND FLOOR
** SELF STORAGE INCLUDES GROUND TO FIFTH FLOOR
SECOND TO FIFTH FLOOR: 33,3247ft² (3,095m²) PER FLOOR

1 SITE PLAN
A-100 SCALE: 1:300

nicholas caragianis architect inc.
137 Pamilla Street
Ottawa ON K1S 3K9
613 237 6801 ncarchitect.ca

PROJECT NORTH
TRUE NORTH

ARCHITECT'S SEAL:

Notes: Contractor must verify all drawings, dimensions, details and specifications and report any discrepancies to the architect before proceeding with work. All drawings and specifications are instruments of service and the property of the architect, and these must be returned at the completion of the project, and may not be reproduced without the architect's written permission. All drawings are to be read in conjunction with specifications and consultants' documents. Do not scale drawings. Do not use for construction unless both indicated as "For Construction" and bearing the architect's stamp and signature. All construction to meet local, provincial and federal requirements.

PLANNING & URBAN DESIGN
MHBC Planning, Urban Design & Landscape Architecture
7050 Weston Road, Suite 230, Woodbridge ON. L4L 8G7
tel: (905) 761-5588 fax: (905) 761-5589
www.mhbcplan.com

CIVIL ENGINEER
Cole Engineering
70 Valleywood Drive, Markham ON. L3R 4T5
tel: (416) 987-6161 / (905) 940-6161 fax: (905) 940-2064
info@coleengineering.ca

DESIGN ARCHITECT
TACT Architecture Inc
660R College Street (Rear Lane) Toronto ON. M6G 1B8
tel: (416) 516-1949
email: info@tactdesign.ca

STRUCTURAL ENGINEER
Cleland Jardine Engineering Ltd.
200-580 Terry Fox Drive, Kanata ON. K2L 4B9
tel: (613) 591-1533 fax: (613) 591-1703
E-MAIL AND/OR URL

MECHANICAL AND ELECTRICAL ENGINEER

ISSUE	YYYYMMDD	ISSUES DESCRIPTION
13	2018-08-14	FOR COORDINATION
12	2018-08-13	FOR COORDINATION
11	2018-07-27	FOR COORDINATION
10	2018-07-24	FOR COORDINATION
9	2018-07-17	FOR DISCUSSION
8	2018-07-06	FOR COORDINATION
7	2018-07-03	FOR COORDINATION
6	2018-05-11	FOR DISCUSSION
5	2018-03-25	REVISED FOR DISCUSSION
4	2018-03-22	REVISED FOR DISCUSSION
3	2018-03-20	REVISED FOR DISCUSSION
2	2018-03-19	REVISED FOR DISCUSSION
1	2018-03-08	PRELIM FOR CLIENT REVIEW

DYMON STORAGE

CLIENT NAME AND ADDRESS:
DYM. CAPITAL CORP
2-1830 WALKLEY ROAD
OTTAWA, ON. K1H 8K3

PROJECT NAME & LOCATION:
9th LINE & DUNDAS
3855 DUNDAS ST. E
MISSISSAUGA

NCA PROJECT NUMBER: 2018.0020	FILE NUMBER: ---
OWNER'S CONTRACT NUMBER: ---	OWNER'S PROJECT NUMBER: ---

CAD FILE NAME: 18020 A-100 SP

SHEET TITLE:
SITE PLAN

SCALE: 1:300	SHEET ID: A-100
DRAWN BY: CLW/TH	
DATE CREATED: 18-03-07	

TOPOGRAPHIC SURVEY OF

PART OF LOT 9
REGISTRAR'S COMPILED PLAN 1542
CITY OF MISSISSAUGA

REGIONAL MUNICIPALITY OF PEEL

SCALE 1 : 500

10 5 0 10 20 30 40 50 metres

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
2018

ELEVATION NOTE

ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM THE CITY OF MISSISSAUGA BENCHMARK No. 075023031.

LOCATION :

BRASS CAP SET AT TOP OF CONCRETE CYLINDER LOCATED AT THE NORTH-EAST CORNER OF THE INTERSECTION OF DUNDAS STREET WEST AND VEGA BOULEVARD, 16M EAST OF THE CENTRELINE OF VEGA BOULEVARD AND 27M NORTH OF CENTRELINE OF DUNDAS STREET WEST.

ELEVATION:

PUBLISHED ELEVATION = 169.073 metres.

TO OBTAIN GEODETIC ELEVATIONS (1978 G.S.C. RE-ADJUSTMENT) SUBTRACT (0.121 metres) FROM VALUES SHOWN HEREIN.

BEARING NOTE

BEARINGS SHOWN HEREON ARE GRID AND ARE REFERRED TO THE EASTERLY LIMIT OF PART 9, AS SHOWN ON PLAN 43R-32759, HAVING A BEARING OF N54°08'10"W.

METRIC

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND

■	DENOTES	SURVEY MONUMENT FOUND
□	"	SURVEY MONUMENT PLANTED
WIT	"	WITNESS MONUMENT
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
IB	"	IRON BAR
CC	"	CUT CROSS
N,S,E,W	"	NORTH, SOUTH, EAST, WEST
OU	"	ORIGIN UNKNOWN
950	"	CUNNINGHAM McCONNELL LIMITED, O.L.S.
JDB	"	J. D. BARNES LIMITED, O.L.S.
P1	"	PLAN 43R-32759
MH	"	MANHOLE
GUY	"	GUY WIRE
WMH	"	WATER MANHOLE
HMH	"	HYDRO MANHOLE
BMH	"	BELL MANHOLE
CB	"	CATCH BASIN
FH	"	FIRE HYDRANT
WV	"	WATER VALVE
GV	"	GAS VALVE
HW	"	HAND WELL
ATS	"	AUTOMATIC TRAFFIC SIGNAL
WHP	"	WOODEN HYDRO POLE
CLS	"	CONCRETE LIGHT STANDARD
MLS	"	METAL LIGHT STANDARD
HB	"	HYDRO BOX
WELL	"	MONITORING WELL
B	"	BOLLARD
	"	DECIDUOUS TREE
	"	CONIFEROUS TREE
	"	CONCRETE
	"	GRAVEL

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. THE SURVEY WAS COMPLETED ON APRIL 22, 2018.

DATE : ____ ____ ____

D. A. WILTON
ONTARIO LAND SURVEYOR

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
750 OAKDALE ROAD, Units 65 & 66
TORONTO, ONTARIO M3N 2Z4
TEL. 416 749-SVNG(7864) FAX 416 749-7866
E-MAIL: toronto@svng.on.ca

DRAWN : E. D./F. P. B.	FILE NAME : A1800104.DWG
CHECKED : D. A. W.	PLOT SCALE : MET.1=0.50
JOB No. : 180-0104	PLOTTED : APRIL 25, 2018
REF. No. : 1-RCP 1542 PEEL	UPDATED :

1-RCP 1542 PEEL

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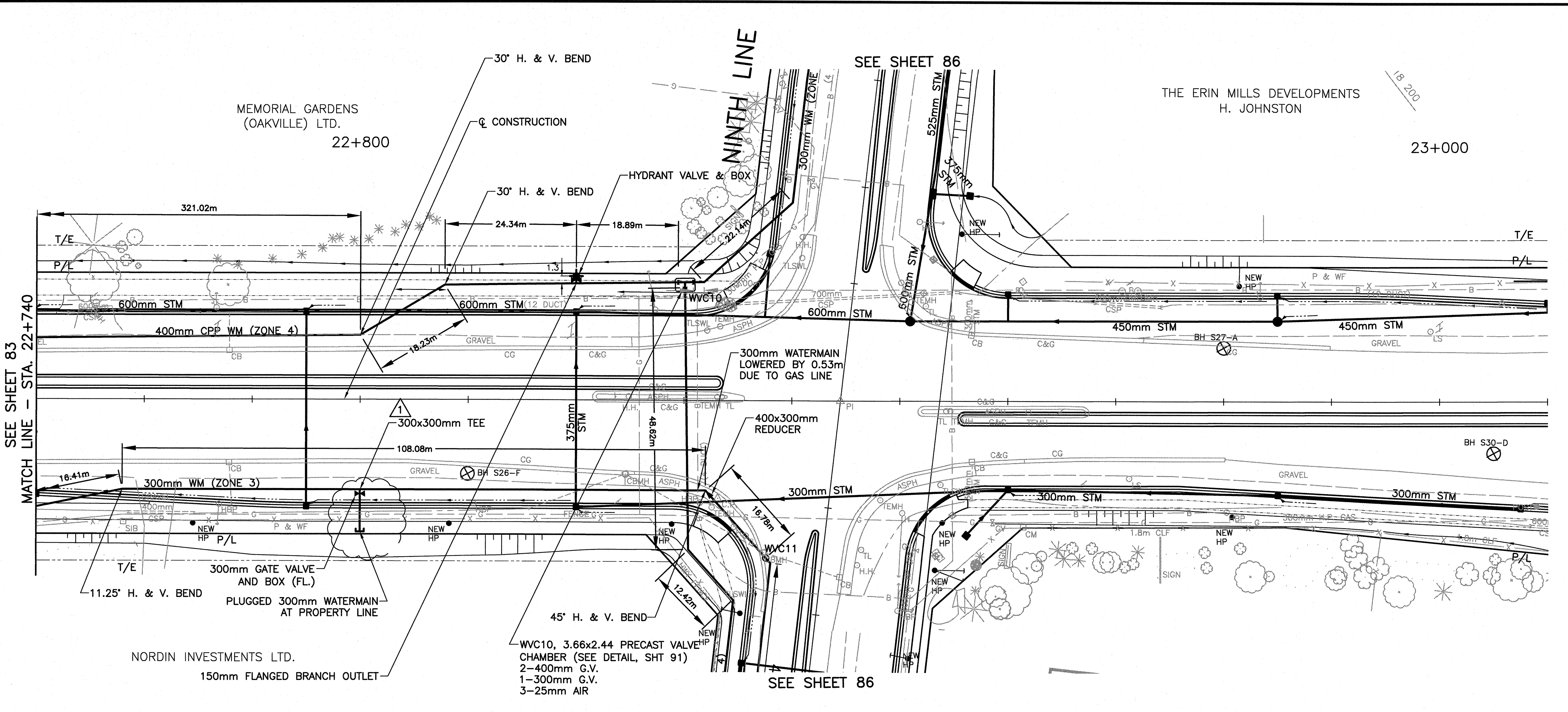


CAUTION: HIGH PRESSURE GAS MAINS

DUNDAS STREET

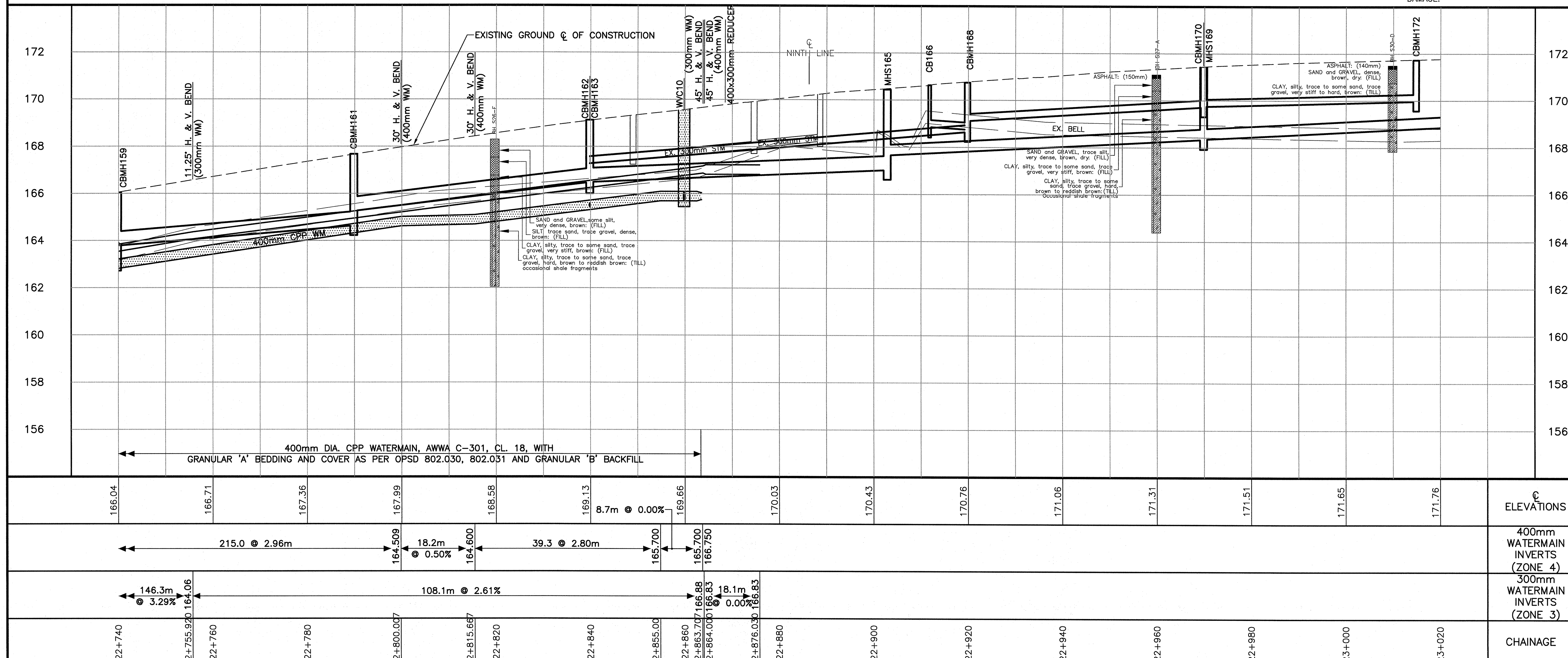
AS-CONSTRUCTED DRAWING

AS CONSTRUCTED PREPARED BY: MMM GROUP

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED.

THE LOCATION OF UTILITIES IS APPROXIMATE ONLY AND THE EXACT LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED. THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

THESE DESIGN DOCUMENTS ARE PREPARED SOLELY FOR THE USE BY THE PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS ENTERED INTO A CONTRACT AND THERE ARE NO REPRESENTATIONS OF ANY KIND MADE BY THE DESIGN PROFESSIONAL TO ANY PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS NOT ENTERED INTO A CONTRACT.



Nº	Date	By	REVISIONS	MANU	CAD
	10/02/15		AS-CONSTRUCTED	CT	S.J.
	10/12/11		ISSUED FOR CONSTRUCTION		
1	08/06/11		ADDED WM, TEE & VALVE AT 22+800		S.J.
	06/28/11		ISSUED FOR TENDER		

Design	D.S.W.	Ch'kd	D.S.W.
Drawn	S.J.	Ch'kd	D.S.W.

Date: JUNE, 2011

Scale 1:500 Horiz. 1:100 Vert.

References

Regional

ACCEPTED FOR CONSTRUCTION OF REGIONAL INFRASTRUCTURE

Reviewed For Compliance With Regional Standards Only.

Field Notes

Stamp

Director, Engineering & Construction

Manager, Capital Engineering & Construction

McCORMICK RANKIN CORPORATION
A member of MMM GROUP

Halton REGION

O-21570

TITLE
WATERMAIN, SANITARY SEWER AND FORCEMAIN
DUNDAS STREET (REG. RD. 5)
150m W. OF NINTH LINE TO 130m E. OF NINTH LINE
TOWN OF OAKVILLE

Consultant File Nº

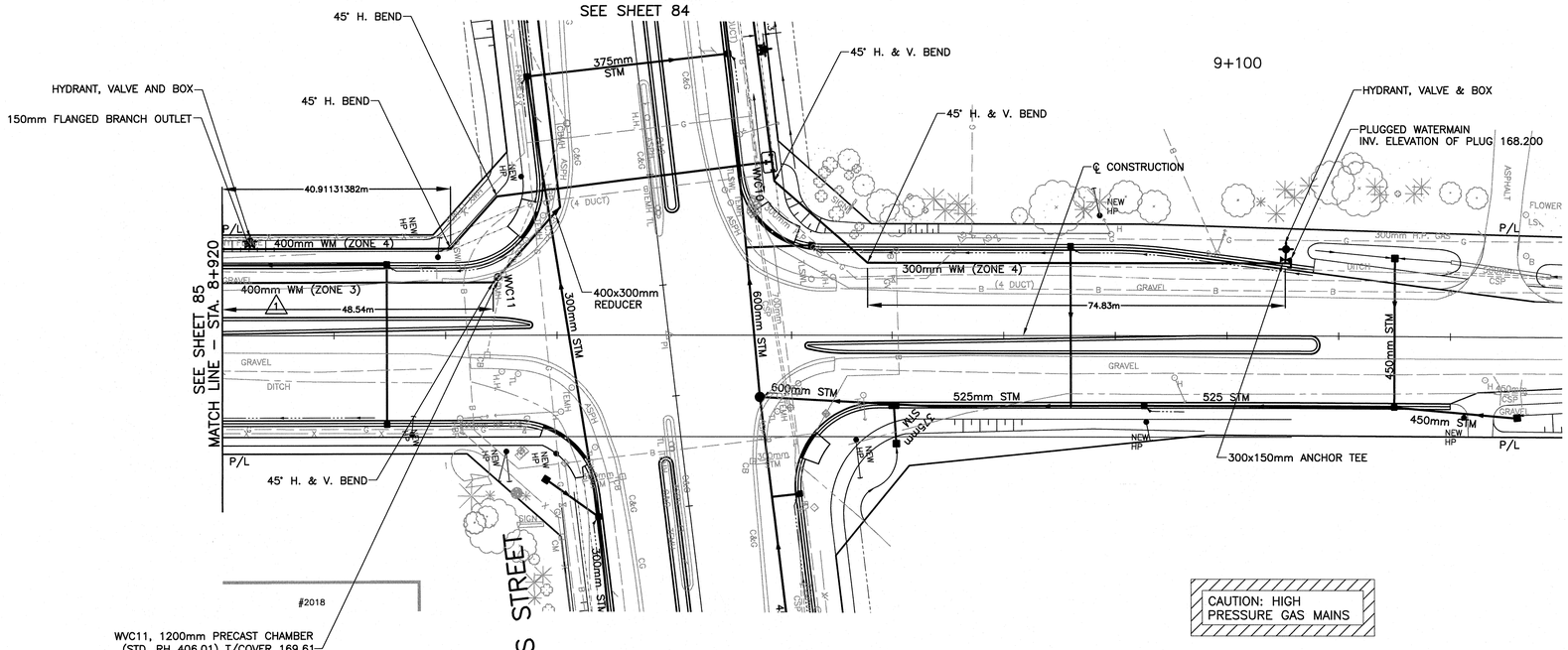
Regional Drawing Nº

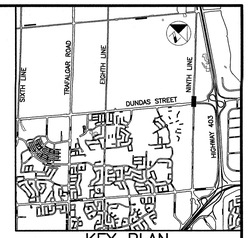
CONTRACT Nº R-2045B-2011

Drawing Nº SHEET 84 OF 112

R-2045B-2011 84 of 112

DRAWING: C:\TEMP\ACPUBLISH_1704\PR-2045B_AS CONSTRUCTED.DWG
LAYOUT TAB: SHT 84
MODIFIED: 12/01/2016 Time: 09:58:25 AM





KEY PLAN

AS-CONSTRUCTED DRAWING

AS CONSTRUCTED PREPARED BY: MMM GROUP

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED.

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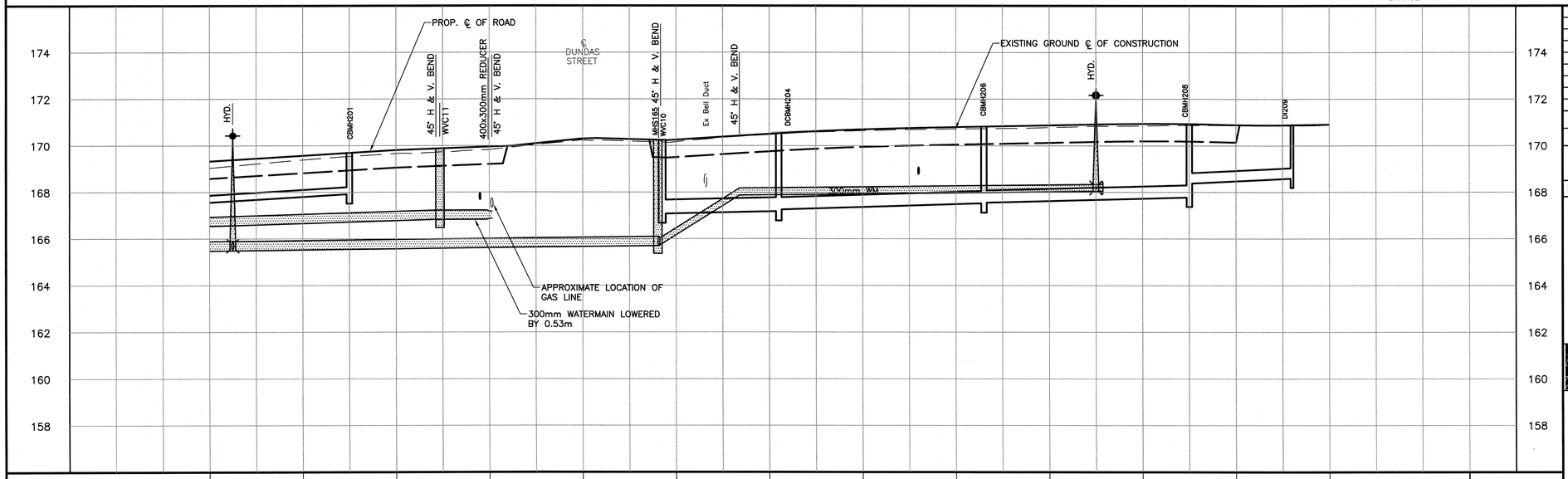


	160.04 / 169.335	160.39 / 169.572	160.66 / 169.810	160.83 / 169.958	170.24 / 170.301
℄ ELEVATIONS	170.17 / 170.255	170.47 / 170.506	170.64 / 170.700	170.72 / 170.799	170.78 / 170.879
	170.86 / 170.947	170.87 / 170.894	170.87 / 170.913		
400mm & 300mm WATERMAIN INVERTS (ZONE 4)	179.6m @ 0.20%	165.70 / 165.75	22.1m @ 9.95%	167.87	75.9m @ 0.24%
	168.05				
400mm WATERMAIN INVERTS (ZONE 3)	88.6m @ 0.60%	166.83	18.1m @ 0.00%	166.83	
CHAINAGE	8+920	8+940	8+960	8+968.552	8+980 / 8+980.583
	9+000	9+016.537 / 9+016.990	9+020	9+033.607	9+040
	9+060	9+080	9+100	9+111.461	9+120
	9+140	9+160			

NO	Date	By	REVISIONS	MANU	CAD
	10/02/15		AS-CONSTRUCTED	CT	S.J.
	10/12/11		ISSUED FOR CONSTRUCTION		
1	08/06/11	D.S.W.	400mm ZONE 3 WATERMAIN SIZE		S.J.
	06/28/11		ISSUED FOR TENDER		

Design D.S.W. | Ch'kd D.S.W. | Date JUNE, 2011

Drawn S.J. | Ch'kd D.S.W.

Scale 1:500 Horiz. 10 5 0 10; 1:100 Vert. 2.0 1.0 0 2.0

References

Regional

Field Notes

ACCEPTED FOR CONSTRUCTION OF REGIONAL INFRASTRUCTURE

Reviewed For Compliance With Regional Standards Only.

Director, Engineering & Construction

Manager, Capital Engineering & Construction

Stamp

McCORMICK RANKIN CORPORATION
A member of MMM GROUP

Halton REGION
O-21572

TITLE
WATERMAIN, SANITARY SEWER AND FORCEMAIN
NINTH LINE (REG. RD. 13)
FROM
80m S. OF DUNDAS ST. TO 160m N. OF DUNDAS ST.
TOWN OF OAKVILLE

Consultant File NO

Regional Drawing NO

CONTRACT NO
R-2045B-2011

Drawing NO
SHEET 86 OF 112

R-2045B-2011 86 of 112

DRAWING: C:\TEMP\ACPUBLISH_1704\PR-2045B_AS CONSTRUCTED.DWG
LAYOUT TAB: SHT 86
MODIFIED: 12/01/2016 Time: 09:58:42 AM

APPENDIX B
Stormwater Data Analysis

COLE ENGINEERING

70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

A1 Post / 0.02 ha / 0.90 — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); COMPOSITE RUNOFF COEFFICIENT

PRE-DEVELOPMENT STORM DRAINAGE AREA

EXISTING PROPERTY LINE

OVERLAND FLOW

PRE-DEVELOPMENT STORM DRAINAGE AREA

PROPOSED DEVELOPMENT
DUNDAS STREET EAST AND NINTH LINE
MISSISSAUGA, ONTARIO

DATE:	SEPTEMBER 2018	PROJECT No.	2018-0067
SCALE:	1 : 1250	FIGURE No.	DAP-1

File: \\coleengineering.ca\prj\mrk\2018\2018-0067\400_Tchncl\70_Rprts\FSRSWM August 2018\Figures\2018-0067_DAP.dwg (DAP1)> Sep 06, 2018-4:26pm

COLE

Prepared by: Fizza Anwar

Pre Development Composite Runoff Coefficient

Dundas Street East and Ninth Line
2018-0067
01/08/2018

Drainage Area A1 Pre

	(ha)			
Total Area:	1.73			
Impervious:	0.00			
Landscaping:	1.73	**Coefficient:**	0.25	
Composite C:	**0.25**			
Percent Impervious	**0.00%**			

Drainage Area A2 Pre

	(ha)			
Total Area:	0.66			
Impervious:	0.00			
Landscaping:	0.66	**Coefficient:**	0.25	
Composite C:	**0.25**			
Percent Impervious	**0.00%**			

COLE ENGINEERING

Prepared by: Fizza Anwar

Time of Concentration Calculation

Dundas Street East and Ninth Line
2018-0067
Aug-18

Time of Concentration Calculation						
Area Number	**Area**	**Cpre**	**L**	**Elevation Change**	**Sw**	**Tc (Airport)**
	(ha)		(m)	(m)	(%)	(min)
A1 PRE	1.73	0.25	190	1.91	1.0	38

Airport Equation

Used if **Rational Method** runoff coefficient is less than 0.40.

$$tc = \frac{3.26\,(1.1 - C)\,L^{0.5}}{Sw^{0.33}}$$

Where:
tc = time of concentration, minutes
C = Rational method runoff coefficient
L = catchment or watershed length, m
Sw = catchment or watershed slope, %
A = catchment or watershed area, ha

COLE

Prepared by: Fizza Anwar

Rational Method
Pre-Development Flow Calculation
Dundas Street East and Ninth Line
2018-0067
01/08/2018

Input Parameters

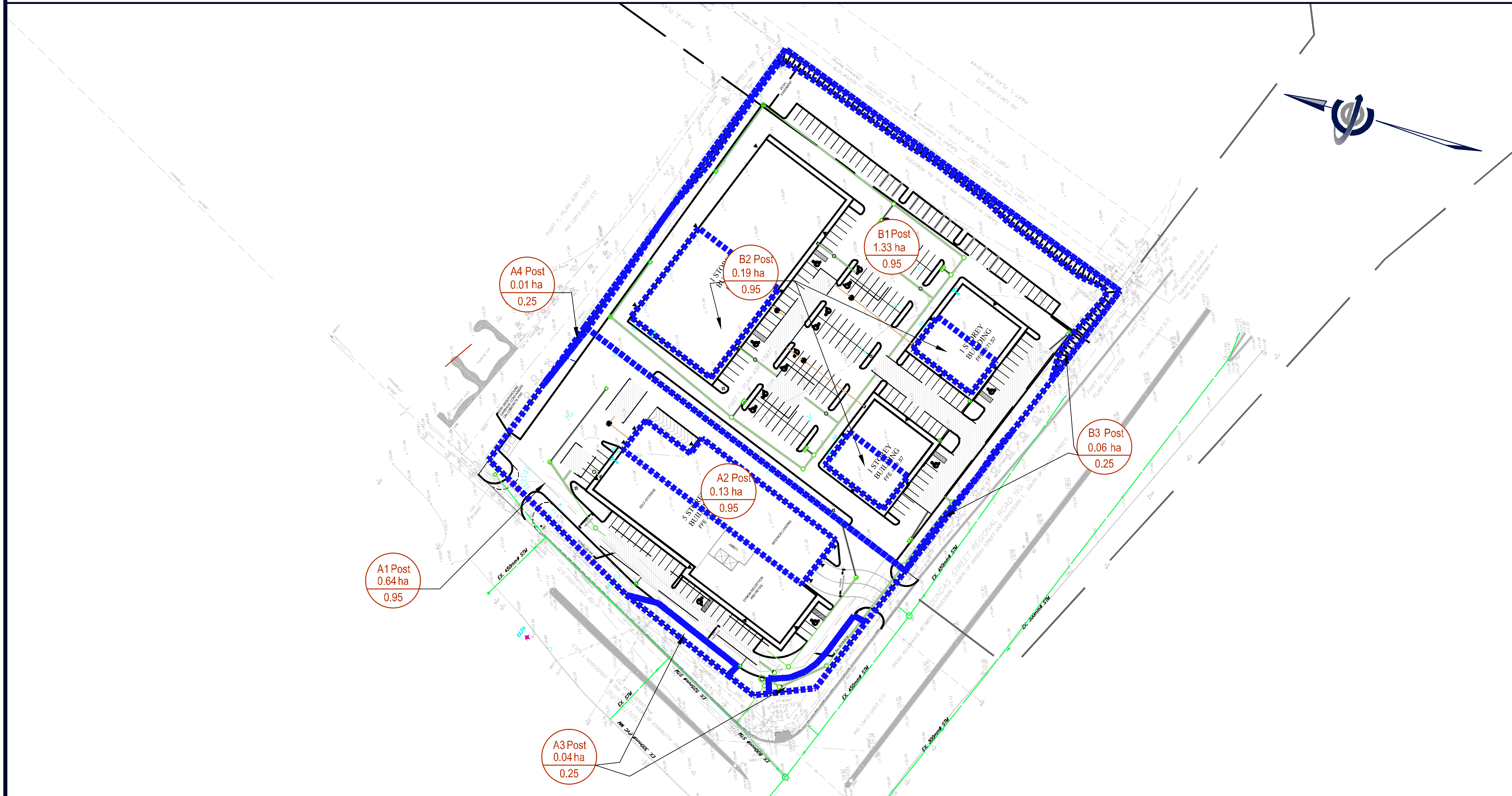
Area Number	Area	C	Tc
	(ha)		(min.)
A1 Pre	1.73	0.25	38
A2 Pre	0.66	0.25	15

Formula	$I = a(T+b)^c$	
	a,b,c	Constants
	T	Time of concentration
	I	Rainfall intensity

Rational Method Calculations

IDF Data Set: City of Mississauga
Event 2-Year
a = 610.00
b = 4.60
c = -0.7800

Area Number	A	C	AC	Tc	I	Q	Q
	(ha)			(min.)	(mm/h)	(m^3/s)	(L/s)
A1 Pre	1.73	0.25	0.43	38	32.6	0.039	39.2
A2 Pre	0.66	0.25	0.17	15	59.9	0.027	27.5



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

Symbol	Description
A1 Post / 0.02 ha / 0.90	STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); COMPOSITE RUNOFF COEFFICIENT
Blue dashed line	POST-DEVELOPMENT STORM DRAINAGE AREA
Red line	EXISTING PROPERTY LINE
Arrow	OVERLAND FLOW

POST-DEVELOPMENT STORM DRAINAGE AREA

PROPOSED DEVELOPMENT
DUNDAS STREET EAST AND NINTH LINE
MISSISSAUGA, ONTARIO

DATE:	SEPTEMBER 2018	PROJECT No.	2018-0067
SCALE:	1 : 1250	FIGURE No.	DAP-2

COLE

Prepared by: Fizza Anwar

Post Development Composite Runoff Coefficient

Dundas Street East and Ninth Line
2018-0067
01/08/2018

A1 Post Controlled

	(ha)			
Total Area:	0.640			
Impervious:	0.64	**Coefficient:**	0.95	
Landscaping:	0.00	**Coefficient:**	0.25	
Composite C:	**0.95**			
Percent Impervious	**100.00%**			

A2 Post Rooftop Controlled

	(ha)			
Total Area:	0.13			
Impervious:	0.13	**Coefficient:**	0.95	
Landscaping:	0.00	**Coefficient:**	0.25	
Composite C:	**0.95**			
Percent Impervious	**100.00%**			

A3 Post Unontrolled

	(ha)			
Total Area:	0.04			
Impervious:	0.00	**Coefficient:**	0.95	
Landscaping:	0.04	**Coefficient:**	0.25	
Composite C:	**0.25**			
Percent Impervious	**0.00%**			

A4 Post Uncontrolled

	(ha)			
Total Area:	0.01			
Impervious:	0.00	**Coefficient:**	0.95	
Landscaping:	0.01	**Coefficient:**	0.25	
Composite C:	**0.25**			
Percent Impervious	**0.00%**			

B1 Post Controlled

	(ha)			
Total Area:	1.33			
Impervious:	1.33	**Coefficient:**	0.95	
Landscaping:	0.00	**Coefficient:**	0.25	
Composite C:	**0.95**			
Percent Impervious	**100.00%**			

B2 Post Rooftop Controlled

	(ha)			
Total Area:	0.19			
Impervious:	0.19	**Coefficient:**	0.95	
Landscaping:	0.00	**Coefficient:**	0.25	
Composite C:	**0.95**			
Percent Impervious	**100.00%**			

B3 Post Unontrolled

	(ha)			
Total Area:	0.06			
Impervious:	0.00	**Coefficient:**	0.95	
Landscaping:	0.06	**Coefficient:**	0.25	
Composite C:	**0.25**			
Percent Impervious	**0.00%**			

COLE

Prepared by: Fizza Anwar

Modified Rational Method - One Hundred Year Storm
West Area Site Flow and Storage Summary
Dundas Street East and Ninth Line
2018-0067
01/08/2018

A1 Post Controlled

Area= **0.64** ha
"C" = **0.95**
AC1= **0.61**
Tc = **15.0** min
Time Increment = **10.0** min
Orifice Release Rate = **19.5** L/s
Max. Required Storage = **515.8** m^3

*Note Roof Controls Drain Through A1 Post

One Hundred Year Design Storm
a= 1450.00
b= 4.90
c= -0.78
I= A/(T+b)^c

A2 Post Rooftop Controlled

Area= **0.13** ha
"C" = **0.95**
AC1= **0.12**
Tc = **15.0** min
Time Increment = **10.0** min
Release Rate = **16.9** L/s
Max. Required Storage = **28.2** m^3

$$V = k \times h^3$$

Ponding Area Volume Equation
k = **19259**
Ponding Volume Available (at 0.15 m ponding depth) = **65.0** m^3
Max Ponding Depth = 0.11 m

A3 Post Unontrolled

Area= **0.040** ha
"C" = **0.25**
AC1= **0.010**
Tc = **15.0** min
Time Increment = **10.0** min
Release Rate = **3.9** L/s

A4 Post Uncontrolled

Area= **0.01** ha
"C" = **0.25**
AC1= **0.003**
Tc = **15.0** min
Time Increment = **10.0** min
Release Rate = **3.9** L/s

Flow Summary

Target Flow **27.5** L/s
Total Design Flow **27.3** L/s

Time	Rainfall Intensity	Storm Runoff	Runoff Volume	Target Released Volume	Total Required Storage Volume	Storm Runoff	Runoff Volume	Target Released Volume	Total Required Storage Volume	Storage Depth	Storm Runoff	Runoff Volume	Storm Runoff	Runoff Volume
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m)	(m^3/s)	(m^3)	(m^3/s)	(m^3)
15.0	140.7	0.255	229.10	17.55	211.55	0.048	43.44	15.25	28.19	0.11	0.004	3.52	0.004	3.52
25.0	102.4	0.190	284.86	29.25	255.61	0.035	52.70	25.42	27.28	0.11	0.003	4.27	0.003	4.27
35.0	81.8	0.155	325.60	40.95	284.65	0.028	58.91	35.58	23.33	0.11	0.002	4.77	0.002	4.77
45.0	68.7	0.133	358.94	52.65	306.29	0.024	63.62	45.75	17.87	0.10	0.002	5.15	0.002	5.15
55.0	59.6	0.118	387.88	64.35	323.53	0.020	67.43	55.92	11.51	0.08	0.002	5.46	0.002	5.46
65.0	52.8	0.106	413.89	76.05	337.84	0.018	70.65	66.08	4.57	0.06	0.001	5.72	0.001	5.72
75.0	47.6	0.097	437.82	87.75	350.07	0.016	73.44	76.25	0.00	0.00	0.001	5.95	0.001	5.95
85.0	43.4	0.090	460.19	99.45	360.74	0.015	75.92	86.42	0.00	0.00	0.001	6.15	0.001	6.15
95.0	40.0	0.084	481.34	111.15	370.19	0.014	78.15	96.58	0.00	0.00	0.001	6.33	0.001	6.33
105.0	37.1	0.080	501.51	122.85	378.66	0.013	80.19	106.75	0.00	0.00	0.001	6.49	0.001	6.49
115.0	34.7	0.075	520.88	134.55	386.33	0.012	82.05	116.92	0.00	0.00	0.001	6.64	0.001	6.64
125.0	32.6	0.072	539.58	146.25	393.33	0.011	83.79	127.08	0.00	0.00	0.001	6.78	0.001	6.78
135.0	30.7	0.069	557.70	157.95	399.75	0.011	85.40	137.25	0.00	0.00	0.001	6.92	0.001	6.92
145.0	29.1	0.066	575.34	169.65	405.69	0.010	86.92	147.42	0.00	0.00	0.001	7.04	0.001	7.04
155.0	27.7	0.064	592.54	181.35	411.19	0.010	88.35	157.58	0.00	0.00	0.001	7.15	0.001	7.15
165.0	26.4	0.062	609.38	193.05	416.33	0.009	89.71	167.75	0.00	0.00	0.001	7.26	0.001	7.26
175.0	25.3	0.060	625.87	204.75	421.12	0.009	90.99	177.92	0.00	0.00	0.001	7.37	0.001	7.37
185.0	24.2	0.058	642.07	216.45	425.62	0.008	92.22	188.08	0.00	0.00	0.001	7.47	0.001	7.47
195.0	23.3	0.056	658.00	228.15	429.85	0.008	93.39	198.25	0.00	0.00	0.001	7.56	0.001	7.56
205.0	22.4	0.055	673.69	239.85	433.84	0.008	94.51	208.42	0.00	0.00	0.001	7.65	0.001	7.65
215.0	21.6	0.053	689.15	251.55	437.60	0.007	95.58	218.58	0.00	0.00	0.001	7.74	0.001	7.74
225.0	20.9	0.052	704.42	263.25	441.17	0.007	96.62	228.75	0.00	0.00	0.001	7.82	0.001	7.82
235.0	20.2	0.051	719.50	274.95	444.55	0.007	97.62	238.92	0.00	0.00	0.001	7.90	0.001	7.90
245.0	19.5	0.050	734.41	286.65	447.76	0.007	98.58	249.08	0.00	0.00	0.001	7.98	0.001	7.98
255.0	19.0	0.049	749.16	298.35	450.81	0.007	99.51	259.25	0.00	0.00	0.001	8.06	0.001	8.06
265.0	18.4	0.048	763.76	310.05	453.71	0.006	100.41	269.42	0.00	0.00	0.001	8.13	0.001	8.13
275.0	17.9	0.047	778.23	321.75	456.48	0.006	101.29	279.58	0.00	0.00	0.000	8.20	0.000	8.20
285.0	17.4	0.046	792.57	333.45	459.12	0.006	102.14	289.75	0.00	0.00	0.000	8.27	0.000	8.27
295.0	17.0	0.046	806.79	345.15	461.64	0.006	102.96	299.92	0.00	0.00	0.000	8.34	0.000	8.34
305.0	16.5	0.045	820.90	356.85	464.05	0.006	103.76	310.08	0.00	0.00	0.000	8.40	0.000	8.40
315.0	16.1	0.044	834.91	368.55	466.36	0.006	104.54	320.25	0.00	0.00	0.000	8.46	0.000	8.46
325.0	15.7	0.044	848.82	380.25	468.57	0.005	105.30	330.42	0.00	0.00	0.000	8.53	0.000	8.53
335.0	15.4	0.043	862.63	391.95	470.68	0.005	106.04	340.58	0.00	0.00	0.000	8.59	0.000	8.59
345.0	15.0	0.042	876.36	403.65	472.71	0.005	106.76	350.75	0.00	0.00	0.000	8.64	0.000	8.64
355.0	14.7	0.042	890.00	415.35	474.65	0.005	107.47	360.92	0.00	0.00	0.000	8.70	0.000	8.70
365.0	14.4	0.041	903.57	427.05	476.52	0.005	108.16	371.08	0.00	0.00	0.000	8.76	0.000	8.76
375.0	14.1	0.041	917.06	438.75	478.31	0.005	108.84	381.25	0.00	0.00	0.000	8.81	0.000	8.81
385.0	13.8	0.040	930.48	450.45	480.03	0.005	109.50	391.42	0.00	0.00	0.000	8.87	0.000	8.87
395.0	13.5	0.040	943.83	462.15	481.68	0.005	110.14	401.59	0.00	0.00	0.000	8.92	0.000	8.92
405.0	13.3	0.039	957.12	473.85	483.27	0.005	110.78	411.75	0.00	0.00	0.000	8.97	0.000	8.97
415.0	13.0	0.039	970.34	485.55	484.79	0.004	111.40	421.92	0.00	0.00	0.000	9.02	0.000	9.02
425.0	12.8	0.039	983.51	497.25	486.26	0.004	112.01	432.09	0.00	0.00	0.000	9.07	0.000	9.07
435.0	12.6	0.038	996.61	508.95	487.66	0.004	112.60	442.25	0.00	0.00	0.000	9.12	0.000	9.12
445.0	12.4	0.038	1009.67	520.65	489.02	0.004	113.19	452.42	0.00	0.00	0.000	9.17	0.000	9.17
455.0	12.1	0.037	1022.67	532.35	490.32	0.004	113.77	462.59	0.00	0.00	0.000	9.21	0.000	9.21
465.0	11.9	0.037	1035.62	544.05	491.57	0.004	114.33	472.75	0.00	0.00	0.000	9.26	0.000	9.26
475.0	11.8	0.037	1048.53	555.75	492.78	0.004	114.89	482.92	0.00	0.00	0.000	9.30	0.000	9.30
485.0	11.6	0.036	1061.39	567.45	493.94	0.004	115.44	493.09	0.00	0.00	0.000	9.35	0.000	9.35
495.0	11.4	0.036	1074.20	579.15	495.05	0.004	115.97	503.25	0.00	0.00	0.000	9.39	0.000	9.39
505.0	11.2	0.036	1086.97	590.85	496.12	0.004	116.50	513.42	0.00	0.00	0.000	9.43	0.000	9.43
515.0	11.0	0.036	1099.70	602.55	497.15	0.004	117.02	523.59	0.00	0.00	0.000	9.48	0.000	9.48
525.0	10.9	0.035	1112.39	614.25	498.14	0.004	117.54	533.75	0.00	0.00	0.000	9.52	0.000	9.52
535.0	10.7	0.035	1125.04	625.95	499.09	0.004	118.04	543.92	0.00	0.00	0.000	9.56	0.000	9.56
545.0	10.6	0.035	1137.66	637.65	500.01	0.004	118.54	554.09	0.00	0.00	0.000	9.60	0.000	9.60
555.0	10.4	0.035	1150.24	649.35	500.89	0.004	119.03	564.25	0.00	0.00	0.000	9.64	0.000	9.64
565.0	10.3	0.034	1162.78	661.05	501.73	0.004	119.51	574.42	0.00	0.00	0.000	9.68	0.000	9.68
575.0	10.1	0.034	1175.29	672.75	502.54	0.003	119.99	584.59	0.00	0.00	0.000	9.72	0.000	9.72
585.0	10.0	0.034	1187.77	684.45	503.32	0.003	120.46	594.75	0.00	0.00	0.000	9.75	0.000	9.75
595.0	9.9	0.034	1200.22	696.15	504.07	0.003	120.92	604.92	0.00	0.00	0.000	9.79	0.000	9.79
605.0	9.7	0.033	1212.64	707.85	504.79	0.003	121.38	615.09	0.00	0.00	0.000	9.83	0.000	9.83
615.0	9.6	0.033	1225.02	719.55	505.47	0.003	121.83	625.25	0.00	0.00	0.000	9.86	0.000	9.86
625.0	9.5	0.033	1237.38	731.25	506.13	0.003	122.27	635.42	0.00	0.00	0.000	9.90	0.000	9.90
635.0	9.4	0.033	1249.71	742.95	506.76	0.003	122.71	645.59	0.00	0.00	0.000	9.94	0.000	9.94
645.0	9.3	0.033	1262.01	754.65	507.36	0.003	123.15	655.75	0.00	0.00	0.000	9.97	0.000	9.97
655.0	9.2	0.032	1274.29	766.35	507.94	0.003	123.58	665.92	0.00	0.00	0.000	10.01	0.000	10.01
665.0	9.1	0.032	1286.54	778.05	508.49	0.003	124.00	676.09	0.00	0.00	0.000	10.04	0.000	10.04
675.0	9.0	0.032	1298.77	789.75	509.02	0.003	124.42	686.25	0.00	0.00	0.000	10.07	0.000	10.07
685.0	8.9	0.032	1310.97	801.45	509.52	0.003	124.83	696.42	0.00	0.00	0.000	10.11	0.000	10.11
695.0	8.8	0.032	1323.15	813.15	510.00	0.003	125.24	706.59	0.00	0.00	0.000	10.14	0.000	10.14
705.0	8.7	0.032	1335.30	824.85	510.45	0.003	125.64	716.75	0.00	0.00	0.000	10.17	0.000	10.17
715.0	8.6	0.031	1347.44	836.55	510.89	0.003	126.04	726.92	0.00	0.00	0.000	10.21	0.000	10.21
725.0	8.5	0.031	1359.55	848.25	511.30	0.003	126.44	737.09	0.00	0.00	0.000	10.24	0.000	10.24
735.0	8.4	0.031	1371.64	859.95	511.69	0.003	126.83	747.25	0.00	0.00	0.000	10.27	0.000	10.27
745.0	8.3	0.031	1383.71	871.65	512.06	0.003	127.21	757.42	0.00	0.00	0.000	10.30	0.000	10.30
755.0	8.2	0.031	1395.76	883.35	512.41	0.003	127.60	767.59	0.00	0.00	0.000	10.33	0.000	10.33
765.0	8.1	0.031	1407.79	895.05	512.74	0.003	127.98	777.75	0.00	0.00	0.000	10.36	0.000	10.36
775.0	8.0	0.031	1419.80	906.75	513.05	0.003	128.35	787.92	0.00	0.00	0.000	10.39	0.000	10.39
785.0	8.0	0.030	1431.79	918.45	513.34	0.003	128.72	798.09	0.00	0.00	0.000	10.42	0.000	10.42
795.0	7.9	0.030	1443.76	930.15	513.61	0.003	129.09	808.25	0.00	0.00	0.000	10.45	0.000	10.45
805.0	7.8	0.030	1455.71	941.85	513.86	0.003	129.45	818.42	0.00	0.00	0.000	10.48	0.000	10.48
815.0	7.7	0.030	1467.65	953.55	514.10	0.003	129.81	828.59	0.00	0.00	0.000	10.51	0.000	10.51
825.0	7.7	0.030	1479.57	965.25	514.32	0.003	130.17	838.75	0.00	0.00	0.000	10.54	0.000	10.54
835.0	7.6	0.030	1491.47	976.95	514.52	0.003	130.52	848.92	0.00	0.00	0.000	10.57	0.000	10.57
845.0	7.5	0.030	1503.36	988.65	514.71	0.003	130.87	859.09	0.00	0.00	0.000	10.60	0.000	10.60
855.0	7.5	0.030	1515.23	1000.35	514.88	0.003	131.21	869.25	0.00	0.00	0.000	10.62	0.000	10.62
865.0	7.4	0.029	1527.09	1012.05	515.04	0.003	131.56	879.42	0.00	0.00	0.000	10.65	0.000	10.65
875.0	7.3	0.029	1538.92	1023.75	515.17	0.003	131.90	889.59	0.00	0.00	0.000	10.68	0.000	10.68
885.0	7.3	0.029	1550.75	1035.45	515.30	0.002	132.23	899.75	0.00	0.00	0.000	10.71	0.000	10.71
895.0	7.2	0.029	1562.56	1047.15	515.41	0.002	132.57	909.92	0.00	0.00	0.000	10.73	0.000	10.73
905.0	7.1	0.029	1574.35	1058.85	515.50	0.002	132.90	920.09	0.00	0.00	0.000	10.76	0.000	10.76
915.0	7.1	0.029	1586.13	1070.55	515.58	0.002	133.23	930.25	0.00	0.00	0.000	10.79	0.000	10.79
925.0	7.0	0.029	1597.90	1082.25	515.65	0.002	133.55	940.42	0.00	0.00	0.000	10.81	0.000	10.81
935.0	7.0	0.029	1609.65	1093.95	515.70	0.002	133.87	950.59	0.00	0.00	0.000	10.84	0.000	10.84
945.0	6.9	0.029	1621.39	1105.65	515.74	0.002	134.19	960.75	0.00	0.00	0.000	10.87	0.000	10.87
955.0	6.8	0.029	1633.12	1117.35	515.77	0.002	134.51	970.92	0.00	0.00	0.000	10.89	0.000	10.89
965.0	6.8	0.028	1644.83	1129.05	515.78	0.002	134.82	981.09	0.00	0.00	0.000	10.92	0.000	10.92
975.0	6.7	0.028	1656.53	1140.75	515.78	0.002	135.13	991.25	0.00	0.00	0.000	10.94	0.000	10.94
985.0	6.7	0.028	1668.22	1152.45	515.77	0.002	135.44	1001.42	0.00	0.00	0.000	10.97	0.000	10.97
995.0	6.6	0.028	1679.90	1164.15	515.75	0.002	135.75	1011.59	0.00	0.00	0.000	10.99	0.000	10.99
1005.0	6.6	0.028	1691.56	1175.85	515.71	0.002	136.05	1021.75	0.00	0.00	0.000	11.02	0.000	11.02
1015.0	6.5	0.028	1703.21	1187.55	515.66	0.002	136.36	1031.92	0.00	0.00	0.000	11.04	0.000	11.04
1025.0	6.5	0.028	1714.85	1199.25	515.60	0.002	136.66	1042.09	0.00	0.00	0.000	11.07	0.000	11.07

Project:

Chamber Model -	MC-3500			
Units -	**Metric**	Click Here for Imperial		
Number of Chambers -	110			
Number of End Caps -	6			
Voids in the stone (porosity) -	40	%		
Base of Stone Elevation -	100.00	m	☑ Include Perimeter Stone in Calculations	
Amount of Stone Above Chambers -	305	mm		
Amount of Stone Below Chambers -	230	mm		
Area of system -	560	sq.meters	Min. Area -	535.478 sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1676	0.00	0.00	0.00	0.00	5.687	5.69	582.33	101.68
1651	0.00	0.00	0.00	0.00	5.687	5.69	576.65	101.65
1626	0.00	0.00	0.00	0.00	5.687	5.69	570.96	101.63
1600	0.00	0.00	0.00	0.00	5.687	5.69	565.27	101.60
1575	0.00	0.00	0.00	0.00	5.687	5.69	559.59	101.57
1549	0.00	0.00	0.00	0.00	5.687	5.69	553.90	101.55
1524	0.00	0.00	0.00	0.00	5.687	5.69	548.21	101.52
1499	0.00	0.00	0.00	0.00	5.687	5.69	542.53	101.50
1473	0.00	0.00	0.00	0.00	5.687	5.69	536.84	101.47
1448	0.00	0.00	0.00	0.00	5.687	5.69	531.15	101.45
1422	0.00	0.00	0.00	0.00	5.687	5.69	525.47	101.42
1397	0.00	0.00	0.00	0.00	5.687	5.69	519.78	101.40
1372	0.00	0.00	0.18	0.00	5.614	5.80	514.09	101.37
1346	0.01	0.00	0.60	0.00	5.443	6.05	508.30	101.35
1321	0.01	0.00	0.92	0.01	5.318	6.24	502.24	101.32
1295	0.01	0.00	1.26	0.01	5.180	6.45	496.00	101.30
1270	0.02	0.00	2.14	0.01	4.826	6.98	489.56	101.27
1245	0.03	0.00	3.20	0.01	4.400	7.62	482.58	101.24
1219	0.04	0.00	3.89	0.02	4.123	8.03	474.96	101.22
1194	0.04	0.00	4.43	0.02	3.906	8.36	466.93	101.19
1168	0.04	0.00	4.90	0.02	3.717	8.64	458.57	101.17
1143	0.05	0.00	5.32	0.03	3.549	8.89	449.93	101.14
1118	0.05	0.01	5.70	0.03	3.396	9.12	441.04	101.12
1092	0.05	0.01	6.04	0.03	3.259	9.33	431.91	101.09
1067	0.06	0.01	6.36	0.04	3.129	9.52	422.59	101.07
1041	0.06	0.01	6.65	0.04	3.011	9.70	413.06	101.04
1016	0.06	0.01	6.93	0.04	2.898	9.87	403.36	101.02
991	0.07	0.01	7.19	0.05	2.795	10.03	393.49	100.99
965	0.07	0.01	7.43	0.05	2.696	10.17	383.47	100.97
940	0.07	0.01	7.66	0.05	2.603	10.31	373.30	100.94
914	0.07	0.01	7.87	0.05	2.516	10.44	362.98	100.91
889	0.07	0.01	8.08	0.05	2.433	10.57	352.54	100.89
864	0.08	0.01	8.27	0.06	2.355	10.68	341.97	100.86
838	0.08	0.01	8.46	0.06	2.280	10.80	331.29	100.84
813	0.08	0.01	8.63	0.06	2.209	10.90	320.49	100.81
787	0.08	0.01	8.80	0.06	2.142	11.00	309.59	100.79
762	0.08	0.01	8.96	0.07	2.078	11.10	298.59	100.76
737	0.08	0.01	9.11	0.07	2.016	11.19	287.49	100.74
711	0.08	0.01	9.25	0.07	1.959	11.28	276.29	100.71
686	0.09	0.01	9.38	0.07	1.905	11.36	265.01	100.69
660	0.09	0.01	9.51	0.07	1.853	11.44	253.65	100.66
635	0.09	0.01	9.64	0.07	1.801	11.51	242.22	100.64
610	0.09	0.01	9.75	0.08	1.756	11.58	230.70	100.61
584	0.09	0.01	9.86	0.08	1.711	11.65	219.12	100.58
559	0.09	0.01	9.97	0.08	1.668	11.71	207.47	100.56
533	0.09	0.01	10.06	0.08	1.628	11.77	195.76	100.53
508	0.09	0.01	10.16	0.08	1.590	11.83	183.98	100.51
483	0.09	0.01	10.25	0.08	1.553	11.89	172.15	100.48
457	0.09	0.01	10.34	0.09	1.518	11.94	160.26	100.46
432	0.09	0.01	10.42	0.09	1.485	11.99	148.32	100.43
406	0.10	0.01	10.49	0.09	1.454	12.04	136.33	100.41
381	0.10	0.01	10.57	0.09	1.424	12.08	124.30	100.38
356	0.10	0.02	10.64	0.09	1.396	12.12	112.22	100.36
330	0.10	0.02	10.71	0.09	1.367	12.17	100.09	100.33
305	0.10	0.02	10.77	0.09	1.341	12.20	87.93	100.30
279	0.10	0.02	10.84	0.09	1.315	12.24	75.72	100.28
254	0.10	0.02	10.92	0.10	1.279	12.30	63.48	100.25
229	0.00	0.00	0.00	0.00	5.687	5.69	51.18	100.23
203	0.00	0.00	0.00	0.00	5.687	5.69	45.49	100.20
178	0.00	0.00	0.00	0.00	5.687	5.69	39.81	100.18
152	0.00	0.00	0.00	0.00	5.687	5.69	34.12	100.15
127	0.00	0.00	0.00	0.00	5.687	5.69	28.43	100.13
102	0.00	0.00	0.00	0.00	5.687	5.69	22.75	100.10
76	0.00	0.00	0.00	0.00	5.687	5.69	17.06	100.08
51	0.00	0.00	0.00	0.00	5.687	5.69	11.37	100.05
25	0.00	0.00	0.00	0.00	5.687	5.69	5.69	100.03

	Roof Drain Calculation
COLE	Dundas Street East and Ninth Line
	2018-0067
	01/08/2018

Zurn 105 C Roof Drain Weir (0.631 L/s per 25.4mm of head for 1 notch opening)

A2 Post Rooftop Controlled

Storm Event (Year)	Roof	Area (ha.)	Allowable Flow (L/s)	Unit Flow (L/s/ha)	Total Head (m)	# Roof Drain Weirs Needed with 1 notch opening
100	A2 Post Rooftop Controlled	0.130	16.9	130.3	0.11	6.0

Minimum Roof Drains Required as Per Ontario Building Code is 1 every 900 m^2. = **2** **Weirs Minimum**
Also required at least two roof drain minimum.

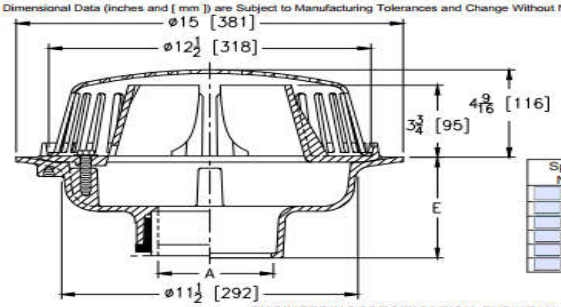
Assume 1 Weir Required per 250.0 m^2

6 #of Weirs Proposed

ZURN **Z105**
CONTROL-FLO ROOF DRAIN
W/ PARABOLIC WEIR

SPECIFICATION SHEET
TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Specify Number of Notches in Weir	
___ -N1	One Notch
___ -N2	Two Notches
___ -N3	Three Notches
___ -N4	Four Notches
___ -N5	Five Notches
___ -N6	Six Notches

A- Pipe Size In.[mm]	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm^2]
2,3,4 [51,76,102]	34 [15]	103 [665]

ENGINEERING SPECIFICATION: ZURN Z105
15" [381mm] Diameter Control-Flo roof drain for dead-level roof construction, Dura-Coated cast iron body, Control-Flo weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates. Each notch will allow 10 GPM [LPM] of flow per 1" [25mm] of rain water build up above the drain.

OPTIONS (Check/specify appropriate options)

PIPE SIZE
3, 4 [76, 102]
2 , 3, 4 [51, 76, 102]
2 , 3, 4 [51, 76, 102]

(Specify size/type) **OUTLET**
___ IC Inside Caulk
___ NH No-Hub
___ NL Neo-Loc

E BODY HT. DIM.
5-1/4 [133]
5-1/4 [133]
4-9/16 [116]

PREFIXES
___ Z D.C.C.I. Body with Poly-Dome*
___ ZA D.C.C.I. Body with Aluminum Dome
___ ZC D.C.C.I. Body with Cast Iron Dome

SUFFIXES
___ -C Underdeck Clamp
___ -DP Top-Set® Deck Plate (Replaces both -C & -R)
___ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
___ -EA Adjustable Extension Assembly 2-1/8 [54] thru 3-1/2 [89]
___ -G Galvanized Cast Iron
___ -R Roof Sump Receiver
___ -TC Neo-Loc Test Cap Gasket (2,3,4 [51,76,102] NL Bottom Outlet Only)
___ -VP Vandal Proof Secured Top
___ -10 6 [152] High Parabolic Weir for Sloped Roof (ZC or ZA)

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | Specification Drainage Operation
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 - Ph. 855-663-9876, Fax 814-454-7929
In Canada | Zurn Industries Limited
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 - Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. K
Date: 09/25/17
C.N. No. 137793
Prod. | Dwg. No. Z105

COLE

Prepared by: Fizza Anwar

Modified Rational Method - One Hundred Year Storm
East Area Site Flow and Storage Summary
Dundas Street East and Ninth Line
2018-0067
01/08/2018

One Hundred Year Design Storm	
a=	1450.00
b=	4.90
c=	-0.78
I=	A(T+b)^c

B1 Post Controlled

Area=	**1.33**	ha
"C" =	**0.95**	
AC1=	**1.26**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Orifice Release Rate =	**33.2**	L/s
Max. Required Storage =	**885.2**	m^3

***Note Roof Controls Drain Through A1 Post**

B2 Post Rooftop Controlled

Area=	**0.19**	ha
"C" =	**0.95**	
AC1=	**0.18**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Release Rate =	**23.0**	L/s
Max. Required Storage =	**42.8**	m^3

$$V = k \times h^3$$

Ponding Area Volume Equation
k = **28148**
Ponding Volume Available (at 0.15 m ponding depth) = **95.0** m^3
Max Ponding Depth = 0.11 m

B3 Post Unontrolled

Area=	**0.060**	ha
"C" =	**0.25**	
AC1=	**0.015**	
Tc =	**15.0**	min
Time Increment =	**10.0**	min
Release Rate =	**5.9**	L/s

Flow Summary

Target Flow	**39.2**	L/s
Total Design Flow	**39.1**	L/s

Time	Rainfall Intensity	Storm Runoff	Runoff Volume	Target Released Volume	Total Required Storage Volume	Storm Runoff	Runoff Volume	Target Released Volume	Total Required Storage Volume	Storage Depth	Storm Runoff	Runoff Volume
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m)	(m^3/s)	(m^3)
15.0	140.7	0.517	465.08	29.88	435.20	0.071	63.49	20.68	42.81	0.11	0.006	5.28
25.0	102.4	0.382	573.61	49.80	523.81	0.051	77.02	34.47	42.56	0.11	0.004	6.40
35.0	81.8	0.310	650.95	69.72	581.23	0.041	86.10	48.25	37.85	0.11	0.003	7.16
45.0	68.7	0.264	712.90	89.64	623.26	0.034	92.98	62.04	30.94	0.10	0.003	7.73
55.0	59.6	0.232	765.68	109.56	656.12	0.030	98.55	75.82	22.73	0.09	0.002	8.19
65.0	52.8	0.208	812.40	129.48	682.92	0.026	103.26	89.61	13.65	0.08	0.002	8.58
75.0	47.6	0.190	854.79	149.40	705.39	0.024	107.34	103.40	3.95	0.05	0.002	8.92
85.0	43.4	0.175	893.93	169.32	724.61	0.022	110.96	117.18	0.00	0.00	0.002	9.22
95.0	40.0	0.163	930.53	189.24	741.29	0.020	114.22	130.97	0.00	0.00	0.002	9.49
105.0	37.1	0.153	965.11	209.16	755.95	0.019	117.19	144.75	0.00	0.00	0.002	9.74
115.0	34.7	0.145	998.02	229.08	768.94	0.017	119.93	158.54	0.00	0.00	0.001	9.97
125.0	32.6	0.137	1029.54	249.00	780.54	0.016	122.46	172.33	0.00	0.00	0.001	10.18
135.0	30.7	0.131	1059.86	268.92	790.94	0.015	124.82	186.11	0.00	0.00	0.001	10.37
145.0	29.1	0.125	1089.17	288.84	800.33	0.015	127.04	199.90	0.00	0.00	0.001	10.56
155.0	27.7	0.120	1117.59	308.76	808.83	0.014	129.13	213.68	0.00	0.00	0.001	10.73
165.0	26.4	0.116	1145.22	328.68	816.54	0.013	131.11	227.47	0.00	0.00	0.001	10.90
175.0	25.3	0.112	1172.16	348.60	823.56	0.013	132.99	241.26	0.00	0.00	0.001	11.05
185.0	24.2	0.108	1198.48	368.52	829.96	0.012	134.78	255.04	0.00	0.00	0.001	11.20
195.0	23.3	0.105	1224.25	388.44	835.81	0.012	136.49	268.83	0.00	0.00	0.001	11.34
205.0	22.4	0.102	1249.50	408.36	841.14	0.011	138.13	282.62	0.00	0.00	0.001	11.48
215.0	21.6	0.099	1274.30	428.28	846.02	0.011	139.70	296.40	0.00	0.00	0.001	11.61
225.0	20.9	0.096	1298.68	448.20	850.48	0.010	141.21	310.19	0.00	0.00	0.001	11.74
235.0	20.2	0.094	1322.68	468.12	854.56	0.010	142.67	323.97	0.00	0.00	0.001	11.86
245.0	19.5	0.092	1346.32	488.04	858.28	0.010	144.08	337.76	0.00	0.00	0.001	11.97
255.0	19.0	0.090	1369.63	507.96	861.67	0.010	145.44	351.55	0.00	0.00	0.001	12.09
265.0	18.4	0.088	1392.64	527.88	864.76	0.009	146.76	365.33	0.00	0.00	0.001	12.20
275.0	17.9	0.086	1415.36	547.80	867.56	0.009	148.03	379.12	0.00	0.00	0.001	12.30
285.0	17.4	0.084	1437.82	567.72	870.10	0.009	149.27	392.90	0.00	0.00	0.001	12.41
295.0	17.0	0.082	1460.04	587.64	872.40	0.009	150.48	406.69	0.00	0.00	0.001	12.51
305.0	16.5	0.081	1482.02	607.56	874.46	0.008	151.65	420.48	0.00	0.00	0.001	12.60
315.0	16.1	0.080	1503.79	627.48	876.31	0.008	152.79	434.26	0.00	0.00	0.001	12.70
325.0	15.7	0.078	1525.35	647.40	877.95	0.008	153.90	448.05	0.00	0.00	0.001	12.79
335.0	15.4	0.077	1546.72	667.32	879.40	0.008	154.98	461.83	0.00	0.00	0.001	12.88
345.0	15.0	0.076	1567.90	687.24	880.66	0.008	156.04	475.62	0.00	0.00	0.001	12.97
355.0	14.7	0.075	1588.91	707.16	881.75	0.007	157.07	489.41	0.00	0.00	0.001	13.05
365.0	14.4	0.074	1609.76	727.08	882.68	0.007	158.08	503.19	0.00	0.00	0.001	13.14
375.0	14.1	0.072	1630.46	747.00	883.46	0.007	159.07	516.98	0.00	0.00	0.001	13.22
385.0	13.8	0.071	1651.00	766.92	884.08	0.007	160.03	530.76	0.00	0.00	0.001	13.30
395.0	13.5	0.071	1671.40	786.84	884.56	0.007	160.98	544.55	0.00	0.00	0.001	13.38
405.0	13.3	0.070	1691.67	806.76	884.91	0.007	161.90	558.34	0.00	0.00	0.001	13.45
415.0	13.0	0.069	1711.81	826.68	885.13	0.007	162.81	572.12	0.00	0.00	0.001	13.53
425.0	12.8	0.068	1731.83	846.60	885.23	0.006	163.70	585.91	0.00	0.00	0.001	13.60
435.0	12.6	0.067	1751.73	866.52	885.21	0.006	164.58	599.70	0.00	0.00	0.001	13.68
445.0	12.4	0.066	1771.52	886.44	885.08	0.006	165.43	613.48	0.00	0.00	0.001	13.75
455.0	12.1	0.066	1791.20	906.36	884.84	0.006	166.28	627.27	0.00	0.00	0.001	13.82
465.0	11.9	0.065	1810.77	926.28	884.49	0.006	167.10	641.05	0.00	0.00	0.000	13.89
475.0	11.8	0.064	1830.25	946.20	884.05	0.006	167.92	654.84	0.00	0.00	0.000	13.95
485.0	11.6	0.064	1849.63	966.12	883.51	0.006	168.71	668.63	0.00	0.00	0.000	14.02
495.0	11.4	0.063	1868.91	986.04	882.87	0.006	169.50	682.41	0.00	0.00	0.000	14.09
505.0	11.2	0.062	1888.11	1005.96	882.15	0.006	170.27	696.20	0.00	0.00	0.000	14.15
515.0	11.0	0.062	1907.23	1025.88	881.35	0.006	171.03	709.98	0.00	0.00	0.000	14.21
525.0	10.9	0.061	1926.26	1045.80	880.46	0.005	171.78	723.77	0.00	0.00	0.000	14.28
535.0	10.7	0.061	1945.21	1065.72	879.49	0.005	172.52	737.56	0.00	0.00	0.000	14.34
545.0	10.6	0.060	1964.08	1085.64	878.44	0.005	173.25	751.34	0.00	0.00	0.000	14.40
555.0	10.4	0.060	1982.88	1105.56	877.32	0.005	173.96	765.13	0.00	0.00	0.000	14.46
565.0	10.3	0.059	2001.61	1125.48	876.13	0.005	174.67	778.91	0.00	0.00	0.000	14.52
575.0	10.1	0.059	2020.27	1145.40	874.87	0.005	175.37	792.70	0.00	0.00	0.000	14.57
585.0	10.0	0.058	2038.86	1165.32	873.54	0.005	176.05	806.49	0.00	0.00	0.000	14.63
595.0	9.9	0.058	2057.38	1185.24	872.14	0.005	176.73	820.27	0.00	0.00	0.000	14.69

COLE

Roof Drain Calculation

Dundas Street East and Ninth Line

2018-0067

01/08/2018

Zurn 105 C Roof Drain Weir (0.631 L/s per 25.4mm of head for 1 notch opening)

B2 Post Rooftop Controlled

Storm Event (Year)	Roof	Area (ha.)	Allowable Flow (L/s)	Unit Flow (L/s/ha)	Total Head (m)	# Roof Drain Weirs Needed with 1 notch opening
100	B2 Post Rooftop Controlled	0.190	23.0	120.9	0.11	8.0

Minimum Roof Drains Required as Per Ontario Building Code is 1 every 900 m^2. = **2** **Weirs Minimum**
Also required at least two roof drain minimum.

Assume 1 Weir Required per 250.0 m^2

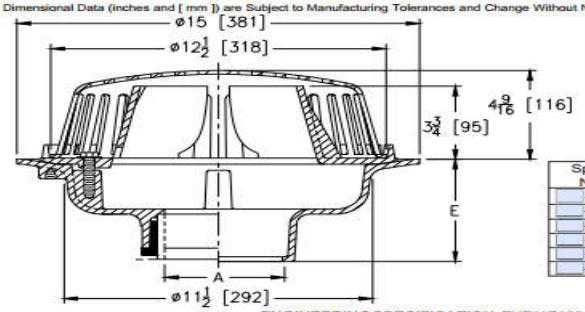
8 #of Weirs Proposed

ZURN

Z105
CONTROL-FLO ROOF DRAIN
W/ PARABOLIC WEIR

SPECIFICATION SHEET
TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Specify Number of Notches in Weir	
-N1	One Notch
-N2	Two Notches
-N3	Three Notches
-N4	Four Notches
-N5	Five Notches
-N6	Six Notches

A- Pipe Size In.[mm]	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm^2]
2,3,4 [51,76,102]	34 [15]	103 [665]

ENGINEERING SPECIFICATION: ZURN Z105
15" [381mm] Diameter Control-Flo roof drain for dead-level roof construction, Dura-Coated cast iron body, Control-Flo weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates. Each notch will allow 10 GPM [LPM] of flow per 1" [25mm] of rain water build up above the drain.

OPTIONS (Check/specify appropriate options)

PIPE SIZE
3, 4 [76, 102]
2 , 3, 4 [51, 76, 102]
2 , 3, 4 [51, 76, 102]

(Specify size/type) **OUTLET**
_____ IC Inside Caulk
_____ NH No-Hub
_____ NL Neo-Loc

E BODY HT. DIM.
5-1/4 [133]
5-1/4 [133]
4-9/16 [116]

PREFIXES
_____ Z D.C.C.I. Body with Poly-Dome*
_____ ZA D.C.C.I. Body with Aluminum Dome
_____ ZC D.C.C.I. Body with Cast Iron Dome

SUFFIXES
_____ -C Underdeck Clamp
_____ -DP Top-Set® Deck Plate (Replaces both -C & -R)
_____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
_____ -EA Adjustable Extension Assembly
2-1/8 [54] thru 3-1/2 [89]
_____ -G Galvanized Cast Iron
_____ -R Roof Sump Receiver
_____ -TC Neo-Loc Test Cap Gasket (2,3,4 [51,76,102] NL Bottom Outlet Only)
_____ -VP Vandal Proof Secured Top
_____ -10 6 [152] High Parabolic Weir for Sloped Roof (ZC or ZA)

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | Specification Drainage Operation
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
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Project:

Chamber Model -	MC-3500			
Units -	**Metric**	Click Here for Imperial		
Number of Chambers -	190			
Number of End Caps -	6			
Voids in the stone (porosity) -	40	%		
Base of Stone Elevation -	100.00	m	☑ Include Perimeter Stone in Calculations	
Amount of Stone Above Chambers -	305	mm		
Amount of Stone Below Chambers -	230	mm		
Area of system -	940	sq.meters	Min. Area -	917.241 sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1676	0.00	0.00	0.00	0.00	9.546	9.55	986.46	101.68
1651	0.00	0.00	0.00	0.00	9.546	9.55	976.91	101.65
1626	0.00	0.00	0.00	0.00	9.546	9.55	967.37	101.63
1600	0.00	0.00	0.00	0.00	9.546	9.55	957.82	101.60
1575	0.00	0.00	0.00	0.00	9.546	9.55	948.28	101.57
1549	0.00	0.00	0.00	0.00	9.546	9.55	938.73	101.55
1524	0.00	0.00	0.00	0.00	9.546	9.55	929.19	101.52
1499	0.00	0.00	0.00	0.00	9.546	9.55	919.64	101.50
1473	0.00	0.00	0.00	0.00	9.546	9.55	910.10	101.47
1448	0.00	0.00	0.00	0.00	9.546	9.55	900.55	101.45
1422	0.00	0.00	0.00	0.00	9.546	9.55	891.00	101.42
1397	0.00	0.00	0.00	0.00	9.546	9.55	881.46	101.40
1372	0.00	0.00	0.31	0.00	9.421	9.73	871.91	101.37
1346	0.01	0.00	1.04	0.00	9.126	10.17	862.18	101.35
1321	0.01	0.00	1.58	0.01	8.910	10.50	852.01	101.32
1295	0.01	0.00	2.17	0.01	8.673	10.85	841.51	101.30
1270	0.02	0.00	3.70	0.01	8.062	11.77	830.65	101.27
1245	0.03	0.00	5.53	0.01	7.327	12.87	818.88	101.24
1219	0.04	0.00	6.72	0.02	6.849	13.59	806.01	101.22
1194	0.04	0.00	7.65	0.02	6.476	14.15	792.42	101.19
1168	0.04	0.00	8.46	0.02	6.150	14.64	778.27	101.17
1143	0.05	0.00	9.18	0.03	5.861	15.07	763.63	101.14
1118	0.05	0.01	9.84	0.03	5.598	15.47	748.56	101.12
1092	0.05	0.01	10.43	0.03	5.362	15.82	733.09	101.09
1067	0.06	0.01	10.98	0.04	5.139	16.16	717.27	101.07
1041	0.06	0.01	11.49	0.04	4.936	16.46	701.11	101.04
1016	0.06	0.01	11.97	0.04	4.742	16.75	684.65	101.02
991	0.07	0.01	12.41	0.05	4.563	17.02	667.90	100.99
965	0.07	0.01	12.83	0.05	4.394	17.27	650.88	100.97
940	0.07	0.01	13.23	0.05	4.233	17.51	633.61	100.94
914	0.07	0.01	13.60	0.05	4.084	17.74	616.09	100.91
889	0.07	0.01	13.95	0.05	3.942	17.95	598.36	100.89
864	0.08	0.01	14.29	0.06	3.807	18.15	580.40	100.86
838	0.08	0.01	14.61	0.06	3.679	18.35	562.25	100.84
813	0.08	0.01	14.91	0.06	3.557	18.53	543.91	100.81
787	0.08	0.01	15.20	0.06	3.441	18.70	525.38	100.79
762	0.08	0.01	15.47	0.07	3.331	18.87	506.67	100.76
737	0.08	0.01	15.73	0.07	3.226	19.03	487.81	100.74
711	0.08	0.01	15.98	0.07	3.126	19.17	468.78	100.71
686	0.09	0.01	16.21	0.07	3.034	19.31	449.61	100.69
660	0.09	0.01	16.43	0.07	2.945	19.45	430.29	100.66
635	0.09	0.01	16.65	0.07	2.856	19.58	410.85	100.64
610	0.09	0.01	16.84	0.08	2.778	19.70	391.27	100.61
584	0.09	0.01	17.03	0.08	2.701	19.81	371.57	100.58
559	0.09	0.01	17.21	0.08	2.628	19.92	351.76	100.56
533	0.09	0.01	17.38	0.08	2.559	20.03	331.84	100.53
508	0.09	0.01	17.55	0.08	2.493	20.12	311.81	100.51
483	0.09	0.01	17.70	0.08	2.431	20.22	291.69	100.48
457	0.09	0.01	17.85	0.09	2.371	20.31	271.47	100.46
432	0.09	0.01	17.99	0.09	2.314	20.39	251.16	100.43
406	0.10	0.01	18.12	0.09	2.261	20.47	230.77	100.41
381	0.10	0.01	18.25	0.09	2.209	20.55	210.30	100.38
356	0.10	0.02	18.37	0.09	2.161	20.62	189.75	100.36
330	0.10	0.02	18.49	0.09	2.112	20.70	169.12	100.33
305	0.10	0.02	18.60	0.09	2.067	20.76	148.43	100.30
279	0.10	0.02	18.72	0.09	2.021	20.83	127.66	100.28
254	0.10	0.02	18.86	0.10	1.962	20.92	106.83	100.25
229	0.00	0.00	0.00	0.00	9.546	9.55	85.91	100.23
203	0.00	0.00	0.00	0.00	9.546	9.55	76.36	100.20
178	0.00	0.00	0.00	0.00	9.546	9.55	66.82	100.18
152	0.00	0.00	0.00	0.00	9.546	9.55	57.27	100.15
127	0.00	0.00	0.00	0.00	9.546	9.55	47.73	100.13
102	0.00	0.00	0.00	0.00	9.546	9.55	38.18	100.10
76	0.00	0.00	0.00	0.00	9.546	9.55	28.64	100.08
51	0.00	0.00	0.00	0.00	9.546	9.55	19.09	100.05
25	0.00	0.00	0.00	0.00	9.546	9.55	9.55	100.03

Water Quality Calculations

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Friday, September 07, 2018
Project Name	Dundas St. E and Ninth Line
Project Number	
Location	Mississauga

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.
Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF10-12-3 is recommended to meet the water quality objective by treating a flow of 68.2 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 768 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF10-12-3	12	3	3.0	68.2	768

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

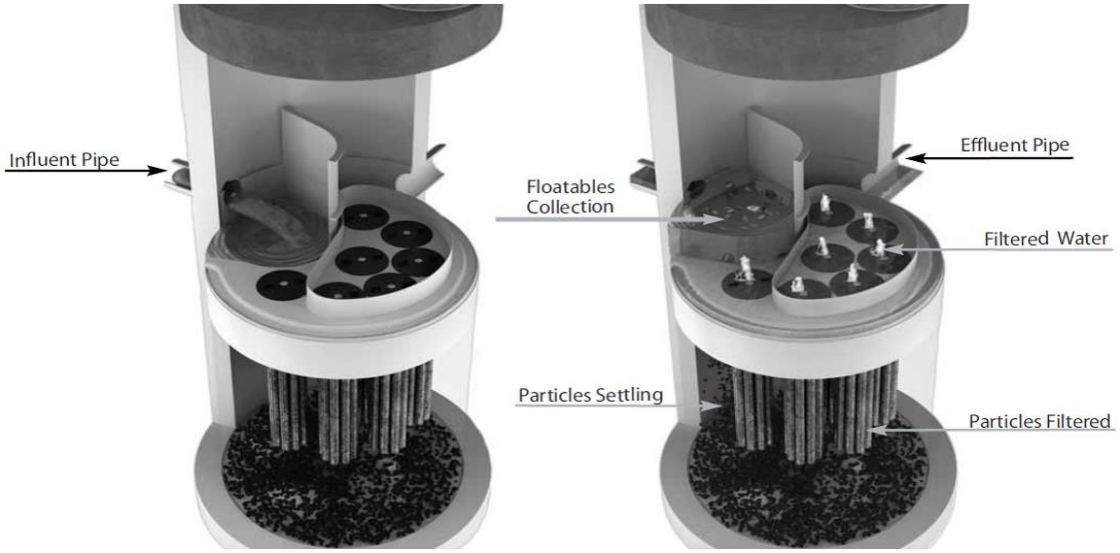
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 59% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 59%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Friday, September 07, 2018
Project Name:	Dundas St. E and Ninth Line
Project Number:	
Location:	Mississauga

Designer Information

Company:	Cole Engineering Group Ltd.
Contact:	Tim Ng
Phone #:	

Notes

Rainfall

Name:	TORONTO CENTRAL
State:	ON
ID:	100
Record:	1982 to 1999
Co-ords:	45°30'N, 90°30'W

Drainage Area

Total Area:	2.3871 ha
Imperviousness:	90%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 18 years of TORONTO CENTRAL rainfall data:	**53.3 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 12728 m³, with a suspended sediment concentration of 60 mg/L.	**764 kg***

** Indicates that sediment loading is the limiting parameter in the sizing of this Jellyfish system*

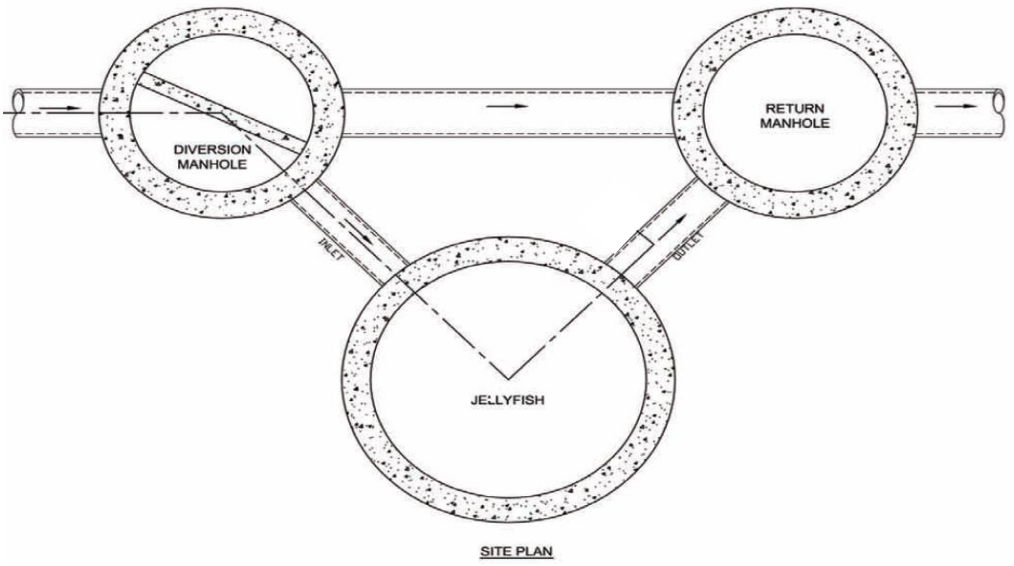
Recommendation

The Jellyfish Filter model JF10-12-3 is recommended to meet the water quality objective by treating a flow of 68.2 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 18 years of TORONTO CENTRAL rainfall data for this site. This model has a sediment capacity of 768 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	2313	0.34	379	7.6	85
JF4-2-1	2	1	1.2	2313	0.34	379	12.6	142
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	5	1	1.8	5205	0.79	848	27.8	313
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	**12**	**3**	**3.0**	**14456**	**2.21**	**2302**	**68.2**	**768**
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	62º	150	200
1.8	59º	200	250
2.4	52º	250	300
3.0	**48º**	**300**	**450**
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

Water Balance Storage Chambers

Project:

Chamber Model -	MC-3500			
Units -	**Metric**	Click Here for Imperial		
Number of Chambers -	10			
Number of End Caps -	4			
Voids in the stone (porosity) -	40	%		
Base of Stone Elevation -	100.00	m	☑ Include Perimeter Stone in Calculations	
Amount of Stone Above Chambers -	305	mm		
Amount of Stone Below Chambers -	230	mm		
Area of system -	70	sq.meters	Min. Area -	54.756 sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1676	0.00	0.00	0.00	0.00	0.711	0.71	66.61	101.68
1651	0.00	0.00	0.00	0.00	0.711	0.71	65.90	101.65
1626	0.00	0.00	0.00	0.00	0.711	0.71	65.19	101.63
1600	0.00	0.00	0.00	0.00	0.711	0.71	64.48	101.60
1575	0.00	0.00	0.00	0.00	0.711	0.71	63.77	101.57
1549	0.00	0.00	0.00	0.00	0.711	0.71	63.06	101.55
1524	0.00	0.00	0.00	0.00	0.711	0.71	62.35	101.52
1499	0.00	0.00	0.00	0.00	0.711	0.71	61.64	101.50
1473	0.00	0.00	0.00	0.00	0.711	0.71	60.93	101.47
1448	0.00	0.00	0.00	0.00	0.711	0.71	60.21	101.45
1422	0.00	0.00	0.00	0.00	0.711	0.71	59.50	101.42
1397	0.00	0.00	0.00	0.00	0.711	0.71	58.79	101.40
1372	0.00	0.00	0.02	0.00	0.704	0.72	58.08	101.37
1346	0.01	0.00	0.05	0.00	0.688	0.75	57.36	101.35
1321	0.01	0.00	0.08	0.00	0.676	0.76	56.62	101.32
1295	0.01	0.00	0.11	0.01	0.663	0.78	55.85	101.30
1270	0.02	0.00	0.19	0.01	0.630	0.83	55.07	101.27
1245	0.03	0.00	0.29	0.01	0.590	0.89	54.24	101.24
1219	0.04	0.00	0.35	0.01	0.564	0.93	53.35	101.22
1194	0.04	0.00	0.40	0.01	0.544	0.96	52.42	101.19
1168	0.04	0.00	0.45	0.02	0.526	0.99	51.45	101.17
1143	0.05	0.00	0.48	0.02	0.510	1.01	50.47	101.14
1118	0.05	0.01	0.52	0.02	0.495	1.03	49.45	101.12
1092	0.05	0.01	0.55	0.02	0.482	1.05	48.42	101.09
1067	0.06	0.01	0.58	0.02	0.470	1.07	47.37	101.07
1041	0.06	0.01	0.60	0.03	0.458	1.09	46.29	101.04
1016	0.06	0.01	0.63	0.03	0.448	1.11	45.21	101.02
991	0.07	0.01	0.65	0.03	0.438	1.12	44.10	100.99
965	0.07	0.01	0.68	0.03	0.428	1.14	42.98	100.97
940	0.07	0.01	0.70	0.03	0.419	1.15	41.84	100.94
914	0.07	0.01	0.72	0.03	0.411	1.16	40.69	100.91
889	0.07	0.01	0.73	0.04	0.403	1.17	39.53	100.89
864	0.08	0.01	0.75	0.04	0.395	1.18	38.36	100.86
838	0.08	0.01	0.77	0.04	0.388	1.20	37.18	100.84
813	0.08	0.01	0.78	0.04	0.381	1.21	35.98	100.81
787	0.08	0.01	0.80	0.04	0.374	1.22	34.77	100.79
762	0.08	0.01	0.81	0.04	0.368	1.23	33.56	100.76
737	0.08	0.01	0.83	0.04	0.362	1.23	32.33	100.74
711	0.08	0.01	0.84	0.05	0.356	1.24	31.10	100.71
686	0.09	0.01	0.85	0.05	0.351	1.25	29.85	100.69
660	0.09	0.01	0.86	0.05	0.346	1.26	28.60	100.66
635	0.09	0.01	0.88	0.05	0.340	1.27	27.34	100.64
610	0.09	0.01	0.89	0.05	0.336	1.27	26.08	100.61
584	0.09	0.01	0.90	0.05	0.331	1.28	24.80	100.58
559	0.09	0.01	0.91	0.05	0.327	1.29	23.52	100.56
533	0.09	0.01	0.91	0.05	0.323	1.29	22.24	100.53
508	0.09	0.01	0.92	0.06	0.319	1.30	20.95	100.51
483	0.09	0.01	0.93	0.06	0.316	1.30	19.65	100.48
457	0.09	0.01	0.94	0.06	0.312	1.31	18.34	100.46
432	0.09	0.01	0.95	0.06	0.309	1.31	17.03	100.43
406	0.10	0.01	0.95	0.06	0.306	1.32	15.72	100.41
381	0.10	0.01	0.96	0.06	0.303	1.32	14.40	100.38
356	0.10	0.02	0.97	0.06	0.300	1.33	13.08	100.36
330	0.10	0.02	0.97	0.06	0.297	1.33	11.75	100.33
305	0.10	0.02	0.98	0.06	0.294	1.34	10.42	100.30
279	0.10	0.02	0.99	0.06	0.292	1.34	9.08	100.28
254	0.10	0.02	0.99	0.07	0.287	1.35	7.74	100.25
229	0.00	0.00	0.00	0.00	0.711	0.71	6.40	100.23
203	0.00	0.00	0.00	0.00	0.711	0.71	5.69	100.20
178	0.00	0.00	0.00	0.00	0.711	0.71	4.98	100.18
152	0.00	0.00	0.00	0.00	0.711	0.71	4.27	100.15
127	0.00	0.00	0.00	0.00	0.711	0.71	3.55	100.13
102	0.00	0.00	0.00	0.00	0.711	0.71	2.84	100.10
76	0.00	0.00	0.00	0.00	0.711	0.71	2.13	100.08
51	0.00	0.00	0.00	0.00	0.711	0.71	1.42	100.05
25	0.00	0.00	0.00	0.00	0.711	0.71	0.71	100.03

Project:

Chamber Model -	MC-3500				
Units -	**Metric**	Click Here for Imperial			
Number of Chambers -	10				
Number of End Caps -	10				
Voids in the stone (porosity) -	40	%			
Base of Stone Elevation -	100.00	m	☑ Include Perimeter Stone in Calculations		
Amount of Stone Above Chambers -	305	mm			
Amount of Stone Below Chambers -	230	mm			
Area of system -	86	sq.meters	Min. Area -	65.31	sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1676	0.00	0.00	0.00	0.00	0.873	0.87	78.86	101.68
1651	0.00	0.00	0.00	0.00	0.873	0.87	77.99	101.65
1626	0.00	0.00	0.00	0.00	0.873	0.87	77.11	101.63
1600	0.00	0.00	0.00	0.00	0.873	0.87	76.24	101.60
1575	0.00	0.00	0.00	0.00	0.873	0.87	75.37	101.57
1549	0.00	0.00	0.00	0.00	0.873	0.87	74.49	101.55
1524	0.00	0.00	0.00	0.00	0.873	0.87	73.62	101.52
1499	0.00	0.00	0.00	0.00	0.873	0.87	72.75	101.50
1473	0.00	0.00	0.00	0.00	0.873	0.87	71.87	101.47
1448	0.00	0.00	0.00	0.00	0.873	0.87	71.00	101.45
1422	0.00	0.00	0.00	0.00	0.873	0.87	70.13	101.42
1397	0.00	0.00	0.00	0.00	0.873	0.87	69.25	101.40
1372	0.00	0.00	0.02	0.00	0.867	0.88	68.38	101.37
1346	0.01	0.00	0.05	0.01	0.849	0.91	67.50	101.35
1321	0.01	0.00	0.08	0.01	0.836	0.93	66.59	101.32
1295	0.01	0.00	0.11	0.01	0.822	0.95	65.66	101.30
1270	0.02	0.00	0.19	0.02	0.788	1.00	64.71	101.27
1245	0.03	0.00	0.29	0.02	0.747	1.06	63.71	101.24
1219	0.04	0.00	0.35	0.03	0.720	1.10	62.64	101.22
1194	0.04	0.00	0.40	0.04	0.698	1.14	61.54	101.19
1168	0.04	0.00	0.45	0.04	0.679	1.17	60.40	101.17
1143	0.05	0.00	0.48	0.05	0.662	1.19	59.24	101.14
1118	0.05	0.01	0.52	0.05	0.646	1.21	58.05	101.12
1092	0.05	0.01	0.55	0.06	0.631	1.24	56.83	101.09
1067	0.06	0.01	0.58	0.06	0.617	1.26	55.59	101.07
1041	0.06	0.01	0.60	0.07	0.605	1.28	54.34	101.04
1016	0.06	0.01	0.63	0.07	0.593	1.29	53.06	101.02
991	0.07	0.01	0.65	0.08	0.582	1.31	51.77	100.99
965	0.07	0.01	0.68	0.08	0.571	1.33	50.46	100.97
940	0.07	0.01	0.70	0.08	0.561	1.34	49.13	100.94
914	0.07	0.01	0.72	0.09	0.552	1.36	47.79	100.91
889	0.07	0.01	0.73	0.09	0.543	1.37	46.43	100.89
864	0.08	0.01	0.75	0.09	0.535	1.38	45.07	100.86
838	0.08	0.01	0.77	0.10	0.526	1.39	43.68	100.84
813	0.08	0.01	0.78	0.10	0.519	1.41	42.29	100.81
787	0.08	0.01	0.80	0.11	0.511	1.42	40.89	100.79
762	0.08	0.01	0.81	0.11	0.504	1.43	39.47	100.76
737	0.08	0.01	0.83	0.11	0.497	1.44	38.04	100.74
711	0.08	0.01	0.84	0.12	0.491	1.45	36.60	100.71
686	0.09	0.01	0.85	0.12	0.485	1.46	35.16	100.69
660	0.09	0.01	0.86	0.12	0.479	1.47	33.70	100.66
635	0.09	0.01	0.88	0.12	0.473	1.47	32.24	100.64
610	0.09	0.01	0.89	0.13	0.468	1.48	30.76	100.61
584	0.09	0.01	0.90	0.13	0.463	1.49	29.28	100.58
559	0.09	0.01	0.91	0.13	0.458	1.50	27.79	100.56
533	0.09	0.01	0.91	0.14	0.453	1.50	26.29	100.53
508	0.09	0.01	0.92	0.14	0.448	1.51	24.79	100.51
483	0.09	0.01	0.93	0.14	0.444	1.52	23.28	100.48
457	0.09	0.01	0.94	0.14	0.440	1.52	21.76	100.46
432	0.09	0.01	0.95	0.15	0.436	1.53	20.24	100.43
406	0.10	0.01	0.95	0.15	0.433	1.53	18.71	100.41
381	0.10	0.01	0.96	0.15	0.429	1.54	17.18	100.38
356	0.10	0.02	0.97	0.15	0.426	1.54	15.64	100.36
330	0.10	0.02	0.97	0.15	0.422	1.55	14.09	100.33
305	0.10	0.02	0.98	0.16	0.419	1.55	12.54	100.30
279	0.10	0.02	0.99	0.16	0.416	1.56	10.99	100.28
254	0.10	0.02	0.99	0.17	0.409	1.57	9.43	100.25
229	0.00	0.00	0.00	0.00	0.873	0.87	7.86	100.23
203	0.00	0.00	0.00	0.00	0.873	0.87	6.99	100.20
178	0.00	0.00	0.00	0.00	0.873	0.87	6.11	100.18
152	0.00	0.00	0.00	0.00	0.873	0.87	5.24	100.15
127	0.00	0.00	0.00	0.00	0.873	0.87	4.37	100.13
102	0.00	0.00	0.00	0.00	0.873	0.87	3.49	100.10
76	0.00	0.00	0.00	0.00	0.873	0.87	2.62	100.08
51	0.00	0.00	0.00	0.00	0.873	0.87	1.75	100.05
25	0.00	0.00	0.00	0.00	0.873	0.87	0.87	100.03

Project:

Chamber Model -	MC-3500				
Units -	**Metric**	Click Here for Imperial			
Number of Chambers -	10				
Number of End Caps -	10				
Voids in the stone (porosity) -	40	%			
Base of Stone Elevation -	100.00	m	☑ Include Perimeter Stone in Calculations		
Amount of Stone Above Chambers -	305	mm			
Amount of Stone Below Chambers -	230	mm			
Area of system -	86	sq.meters	Min. Area -	65.31	sq.meters

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Single End Cap *(cubic meters)*	Incremental Chambers *(cubic meters)*	Incremental End Cap *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Chamber, End Cap and Stone *(cubic meters)*	Cumulative System *(cubic meters)*	Elevation *(meters)*
1676	0.00	0.00	0.00	0.00	0.873	0.87	78.86	101.68
1651	0.00	0.00	0.00	0.00	0.873	0.87	77.99	101.65
1626	0.00	0.00	0.00	0.00	0.873	0.87	77.11	101.63
1600	0.00	0.00	0.00	0.00	0.873	0.87	76.24	101.60
1575	0.00	0.00	0.00	0.00	0.873	0.87	75.37	101.57
1549	0.00	0.00	0.00	0.00	0.873	0.87	74.49	101.55
1524	0.00	0.00	0.00	0.00	0.873	0.87	73.62	101.52
1499	0.00	0.00	0.00	0.00	0.873	0.87	72.75	101.50
1473	0.00	0.00	0.00	0.00	0.873	0.87	71.87	101.47
1448	0.00	0.00	0.00	0.00	0.873	0.87	71.00	101.45
1422	0.00	0.00	0.00	0.00	0.873	0.87	70.13	101.42
1397	0.00	0.00	0.00	0.00	0.873	0.87	69.25	101.40
1372	0.00	0.00	0.02	0.00	0.867	0.88	68.38	101.37
1346	0.01	0.00	0.05	0.01	0.849	0.91	67.50	101.35
1321	0.01	0.00	0.08	0.01	0.836	0.93	66.59	101.32
1295	0.01	0.00	0.11	0.01	0.822	0.95	65.66	101.30
1270	0.02	0.00	0.19	0.02	0.788	1.00	64.71	101.27
1245	0.03	0.00	0.29	0.02	0.747	1.06	63.71	101.24
1219	0.04	0.00	0.35	0.03	0.720	1.10	62.64	101.22
1194	0.04	0.00	0.40	0.04	0.698	1.14	61.54	101.19
1168	0.04	0.00	0.45	0.04	0.679	1.17	60.40	101.17
1143	0.05	0.00	0.48	0.05	0.662	1.19	59.24	101.14
1118	0.05	0.01	0.52	0.05	0.646	1.21	58.05	101.12
1092	0.05	0.01	0.55	0.06	0.631	1.24	56.83	101.09
1067	0.06	0.01	0.58	0.06	0.617	1.26	55.59	101.07
1041	0.06	0.01	0.60	0.07	0.605	1.28	54.34	101.04
1016	0.06	0.01	0.63	0.07	0.593	1.29	53.06	101.02
991	0.07	0.01	0.65	0.08	0.582	1.31	51.77	100.99
965	0.07	0.01	0.68	0.08	0.571	1.33	50.46	100.97
940	0.07	0.01	0.70	0.08	0.561	1.34	49.13	100.94
914	0.07	0.01	0.72	0.09	0.552	1.36	47.79	100.91
889	0.07	0.01	0.73	0.09	0.543	1.37	46.43	100.89
864	0.08	0.01	0.75	0.09	0.535	1.38	45.07	100.86
838	0.08	0.01	0.77	0.10	0.526	1.39	43.68	100.84
813	0.08	0.01	0.78	0.10	0.519	1.41	42.29	100.81
787	0.08	0.01	0.80	0.11	0.511	1.42	40.89	100.79
762	0.08	0.01	0.81	0.11	0.504	1.43	39.47	100.76
737	0.08	0.01	0.83	0.11	0.497	1.44	38.04	100.74
711	0.08	0.01	0.84	0.12	0.491	1.45	36.60	100.71
686	0.09	0.01	0.85	0.12	0.485	1.46	35.16	100.69
660	0.09	0.01	0.86	0.12	0.479	1.47	33.70	100.66
635	0.09	0.01	0.88	0.12	0.473	1.47	32.24	100.64
610	0.09	0.01	0.89	0.13	0.468	1.48	30.76	100.61
584	0.09	0.01	0.90	0.13	0.463	1.49	29.28	100.58
559	0.09	0.01	0.91	0.13	0.458	1.50	27.79	100.56
533	0.09	0.01	0.91	0.14	0.453	1.50	26.29	100.53
508	0.09	0.01	0.92	0.14	0.448	1.51	24.79	100.51
483	0.09	0.01	0.93	0.14	0.444	1.52	23.28	100.48
457	0.09	0.01	0.94	0.14	0.440	1.52	21.76	100.46
432	0.09	0.01	0.95	0.15	0.436	1.53	20.24	100.43
406	0.10	0.01	0.95	0.15	0.433	1.53	18.71	100.41
381	0.10	0.01	0.96	0.15	0.429	1.54	17.18	100.38
356	0.10	0.02	0.97	0.15	0.426	1.54	15.64	100.36
330	0.10	0.02	0.97	0.15	0.422	1.55	14.09	100.33
305	0.10	0.02	0.98	0.16	0.419	1.55	12.54	100.30
279	0.10	0.02	0.99	0.16	0.416	1.56	10.99	100.28
254	0.10	0.02	0.99	0.17	0.409	1.57	9.43	100.25
229	0.00	0.00	0.00	0.00	0.873	0.87	7.86	100.23
203	0.00	0.00	0.00	0.00	0.873	0.87	6.99	100.20
178	0.00	0.00	0.00	0.00	0.873	0.87	6.11	100.18
152	0.00	0.00	0.00	0.00	0.873	0.87	5.24	100.15
127	0.00	0.00	0.00	0.00	0.873	0.87	4.37	100.13
102	0.00	0.00	0.00	0.00	0.873	0.87	3.49	100.10
76	0.00	0.00	0.00	0.00	0.873	0.87	2.62	100.08
51	0.00	0.00	0.00	0.00	0.873	0.87	1.75	100.05
25	0.00	0.00	0.00	0.00	0.873	0.87	0.87	100.03

APPENDIX C
Sanitary Data Analysis

3915 Dundas Street East
Sanitary Flow Calculations

COLE

Proposed Populations

Total Site Area:	2.56	ha	Commercial Pop. Rate:	50	persons/ha
Total Commercial GFA:	17,642	m2	Estimated Total Pop.:	**128**	persons

West Building

Description	Usage	GFA (m2)	% of Total GFA	Equivalent Population
		(m2)	%	(capita)
5 Storey Building	Commercial	13,800	78.2%	100.1
Total:		13,800	Total:	**100.1**

East Buildings

Description	Usage	GFA (m2)	% of Total GFA	Equivalent Population
		(m2)	%	(capita)
One Storey Building 1	Commercial	2,504	14.2%	18.2
One Storey Building 2	Commercial	669	3.8%	4.9
One Storey Building 3	Commercial	669	3.8%	4.9
Total:		3,842	21.8%	**27.9**

Average & Peak Wastewater Flows

Sewage Unit Flow Rate: 302.8 L/cap/day

Building	Average Wastewater Flow	Daily Flow Volume	Peaking Factor	Peaked Wastewater Flow
	(L/s)	(L)	(harmon)	(L/s)
West Building	0.35	30,318	4.24	1.49
East Buildings	0.10	8,441	4.36	0.43
Total:	0.45	38,758		1.91

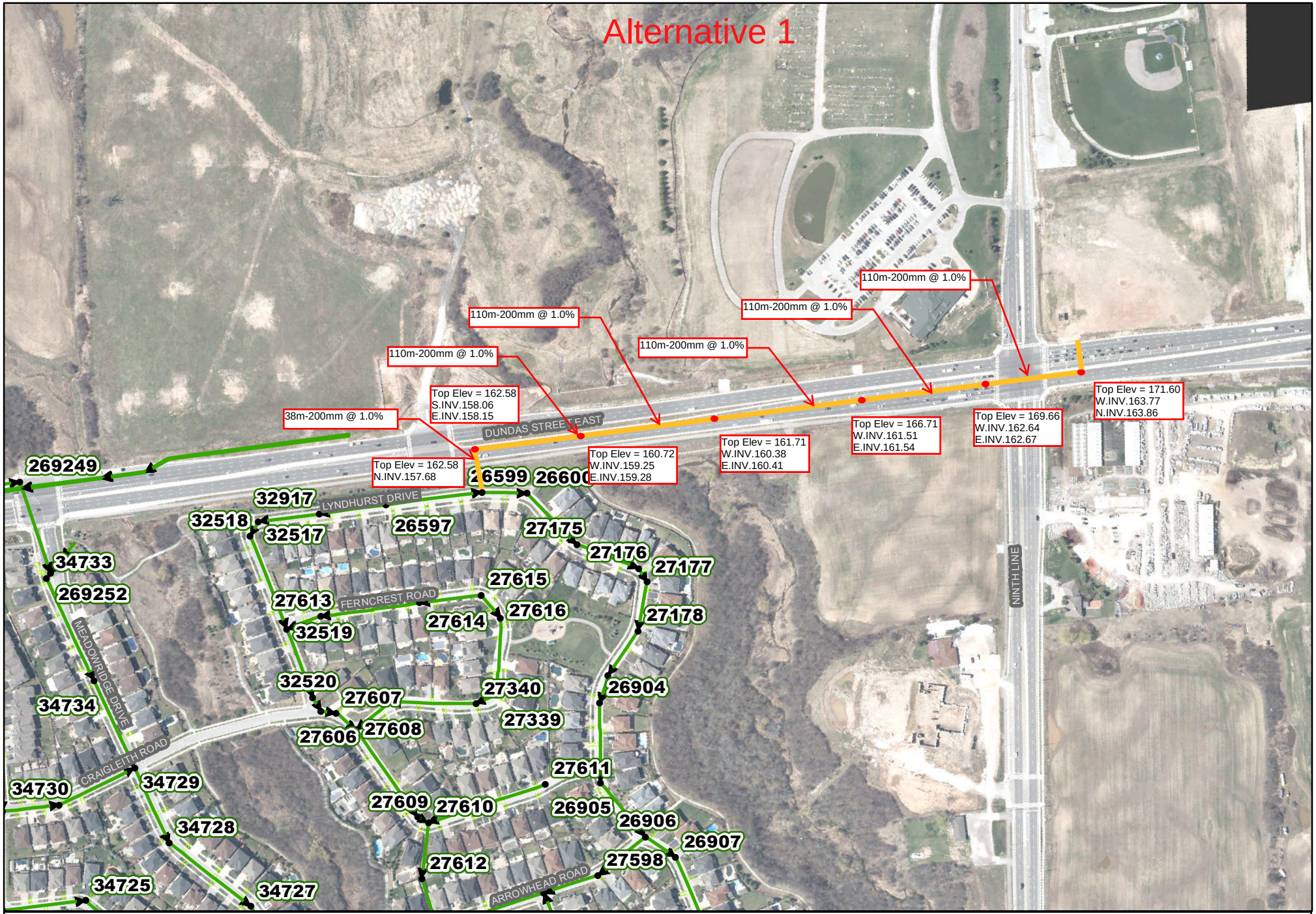
Total Sanitary Sewer Contribution

Site Area: 2.56 ha
Infiltration Allowance Rate: 0.2 L/s/ha
Infiltration Flow = 0.51 L/s

Total Design Flow = Peaked Wastewater Flow + Infiltration Flow
Total Design Flow = 2.43 L/s

Notes:

GFA values are from the Site Plan produced by nicholas caragianis architect inc. dated August 14, 2018



Halton REGION

2015 Orthophoto

- MaintenanceHole
- SewerMain
- ServiceLateral

Dundas/9th Oakville

0 60 120 Meters

Created: May 2018
Public Works Information

Halton REGION

2015 Orthophoto

- MaintenanceHole
- SewerMain
- ServiceLateral

Dundas St
Oakville

0 190 380 Meters

Created: May 2018
Public Works Information

APPENDIX E
Water Data Analysis

DOMESTIC WATER DEMAND

Project:	3855 Dundas Street East	Proj. #	2018-0067
Date:	6-Sep-18		
Calc'ed by:	Zilol Karim		

Note:
Based on the Region of Halton Standards and the Ontario Building Code, Part 8 "Sewage Systems", OBC Table 8.2.1.3.A and 8.2.1.3.B

	Site Component	5-Storey BLDG	Building 1	Building 2	Building 3		
Residential Occupancy Data	Units						
	People per unit						
Commercial Occupancy Data	Retail GFA (ha)	1.5357	0.2504	0.0699	0.0699		
	Office (m2)						
	Nursing Homes						

Unit Quantity by Site Component	Water Demand	Units	Equivalent Population (persons)					
Residential Occupancies								
Apartments, Condominiums, Other Multi-family Dwellings	300	L/person/day	-	0.0	0.0	0.0	-	-
Hotels and Motels (excluding bars and restaurants), a) Regular	250	L/room/day	-	0.0	0.0	0.0	-	-
Not used	-	-	-	-	-	-	-	-
Other Occupancies			**Flow Rates (L/d)**					
Commercial or Retail	24,750	L/hectare/day	38,008.58	6,197.40	1,730.03	1,730.03	-	-
Office Building	75	L/9.3m2 of floor area/day	-	-	-	-	-	-
Nursing Homes, Rest Homes, etc.	300	L/bed/day	0.0	-	-	-	-	-

Daily Flow Rate (L/d)								
Residential Occupancies								
Apartments, Condominiums, Other Multi-family Dwellings		0	0	0.00	0.00	0.00	0	0
Hotels and Motels (excluding bars and restaurants), a) Regular		0	0	0.00	0.00	0.00	0	0
Not used		0	0	0	0	0	0	0
Other Occupancies								
Commercial or Retail		47,666.03	38,008.58	6,197.40	1,730.03	1,730.03	0	0
Office Building		0	0	0	0	0	0	0
Nursing Homes, Rest Homes, etc.		0	0.00	0	0	0	0	0
		Total Flow						
Average day (L/d)		**47,666.03**	38,009	6,197.40	1,730.03	1,730.03	0.00	0.00
Average day (L/s)		**0.55**	0.44	0.07	0.02	0.02	0.00	0.00
Max. day (L/d)		**107,248.56**	85,519.29	13,944.15	3,892.56	3,892.56	0.00	0.00
Peak hour (L/hr)		**4,468.69**	3,563.30	581.01	162.19	162.19	0.00	0.00
Peak hour (L/s)		**1.24**	0.99	0.16	0.05	0.05	0.00	0.00

Peaking Factors		
Land Use	Peak Hour	Maximum Day
Residential	-	-
Commercial / Retail	2.25	2.25

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FIRE FLOW CALCULATION

Project:	3588 Dundas Street East	Project #	2018-0067
Date:	6-Sep-18		
Calc'ed by:	Zilol Karim		

Fire Resistive Construction:	YES	Site Component:	5-Storey BLDG	Building 1	Building 2	Building 3		
The following calculations are for the proposed development and are based on the largest floorplate area. The FUS requires that a minimum water supply source 'F' be provided at 150KPa. The minimum flow 'F' can be calculated as such:	**Total Floor Area**	Largest Floor Area (m2)	2760	2,504	669	699		
		Area Above (m2)	2760					
		Area Below (m2)	2760					
		Total Floor Area (m2)	4140	2,504	669	699		
$F = 220C\sqrt{A}$	**Flow (F)**	C (dimensionless)	0.6	0.6	1.0	1.0		
		A (m2)	4140	2504	669	699		
		F (L/min)	8000	7000	6000	6000		
F = Required fire flow L/min	**Reduction Factor**	F (L/min)	8000	7000	6000	6000		
C = Coefficient related to construction		f_1 (dimensionless)	1.00	1.00	1.00	1.00		
A = Total area in m^2		F' = F x f_f (L/min)	8000	7000	6000	6000		
		f_1 = occupancy factor; ie, Residential, f_1 = 0.85; for Retail or Commercial, f_1 = 1.00						
'Calculations, formulas and factors are as per Fire Underwriter's Survey (FUS) Water Supply for Public Fire Protection	**Sprinkler and Exposure Increase or Decrease**	f_2 (sprinkler factor)	30%	30%	0%	0%		
		North Side	0%	0%	0%	0%		
		East Side	15%	15%	10%	0%		
		South Side	0%	0%	0%	0%		
		West Side	0%	0%	15%	10%		
		f_3	15%	15%	25%	10%		
		f_3 = Exposure factor not to exceed 75%, determined as per FUS Guide Item 4, page 18)						

F' (L/min)	**8000**	**7000**	**6000**	**6000**		
S = F' * f_2 *(L/min)*	**2400**	**2100**	**0**	**0**		
E = F' * f_3 *(L/min)*	**1200**	**1050**	**1500**	**600**		

F''=F'-S+E (L/min) rounded to nearest 1,000	**7000**	**6000**	**8000**	**7000**		
F''(L/s)	**117**	**100**	**133**	**117**		
F''(USGPM)	**1850**	**1590**	**2120**	**1850**		

Table 1

Sprinkler Reduction Factor (f_2)		
No Sprkinkler System	Sprinklered	Sprink. + Supervised
0%	30%	50%

Table 2

Construction Type "C" Factor			
Wood Frame	Ordinary Construction	Non-Combustible	Fire Resistive
1.5	1	0.80	0.60

Table 3

Occupancy Factor (f_1)				
Rapid Burning	Free Burning	Combustible	Limited Combustible	Non-Combust.
25%	15%	0%	-15%	-25%

Table 4

Exposure Charge					
0 to 3m	3.1 to 10m	10.1 to 20m	20.1 to 30m	30.1 to 45m	> 45m
25%	20%	15%	10%	5%	0

HYDRANT FLOW TEST FORM

CO E

Project No: 2018-0067 **Date:** Sep-17-2018

Site Location: Dundas and 9th Line **Hydrants Opened by:** Halton Water

3164 **Tested By:** Glen.R, Mark.B

1) Required photos:

- [x] Site Id & Date
- [x] Condition of Flow Hydrant
- [x] Location Overview
- [x] Condition of Residual Hydrant
- [x] Other

2) Test Data

Time of Test: 9:00 AM

Location of Test: (Flow) 3164 Ninth Line, Oakville west side of Ninth Line

(Residual) North of Dundas, west of Ninth Line.

Main Size: 300

Static Pressure: 88 PSI

	Number of Outlets & Orifice Size	Pitot Pressure	Flow (USGPM)	Residual Pressure
1	1 x 2"	35	990	75
2	1 x 2"	20	1500	74
3				
4				

3) Calculations

$Q = 29.83\ cd^2\sqrt{p}$

$Q = (29.83)(0.9)(2.5")^2\sqrt{35}$

$= 992.68$

$Q = \sim 990$ USGPM

$QT = 2(29.83)(0.9)(2.5")^2\sqrt{20}$

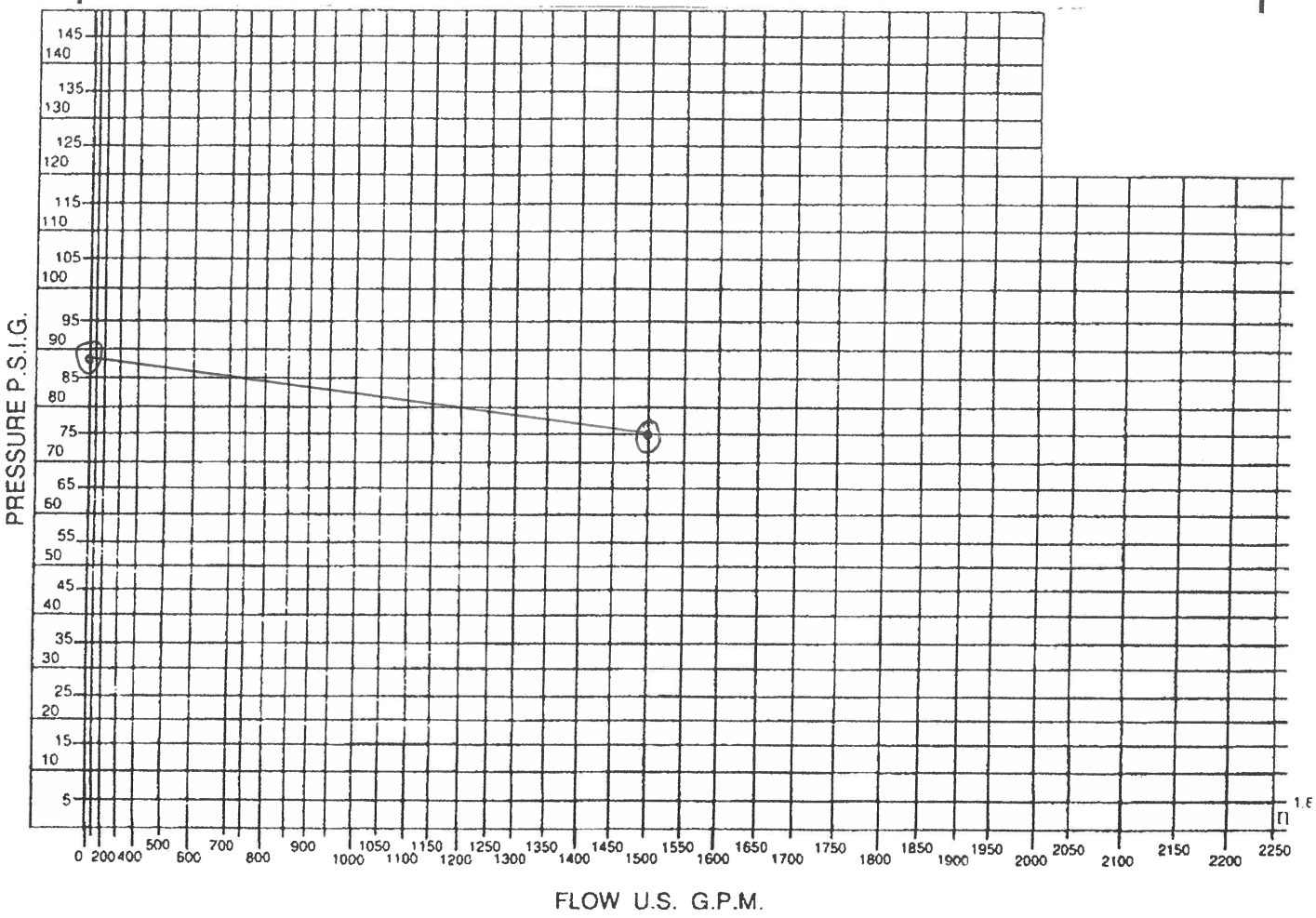
$= 1500.79$

$QT = \sim 1500$ USGPM

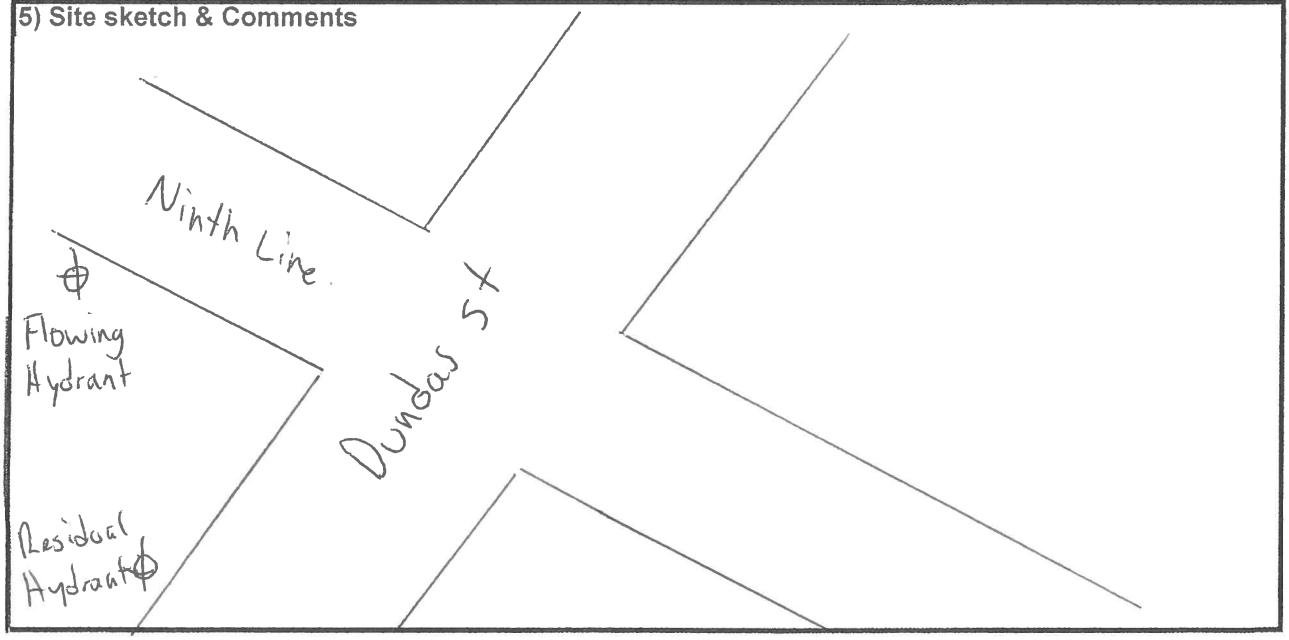
Where c- cofficient of discharge (1 in smooth pipe)
d- pipe diameter (inches)
p- pitot reading (psi)
Q- flow (USGPM)

Note: Hydrants tested according to NFPA 291: Recommended Practice for Fire Flow Testing and Marking of Hydrants

4) Plot



5) Site sketch & Comments



Water System Pressure Calculation Worksheet

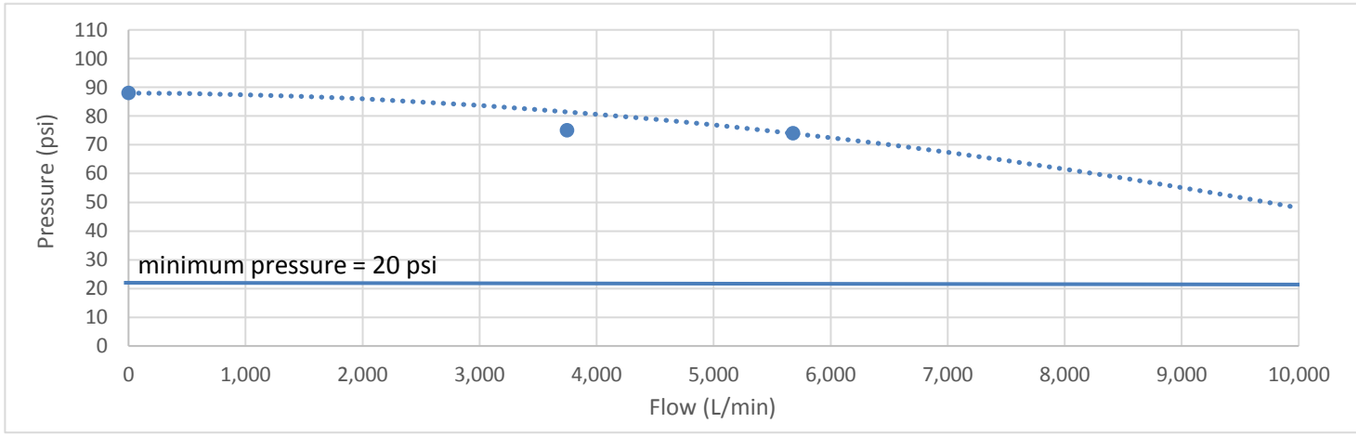
Dundas and 9th Line

Prepared by: Zilol Karim

Hydrant Flow Test Results

Flow Test Location: 3164 Ninth Line
Residual Test Location:
Main Size: 300mm Dia.
Test Date: Sep 17, 2018
Tested By: Glen Robbins

Number of Outlets & Orifice Size	Pilot Pressure (psi)	Flow (US GPM)	Flow (L/min)	Residual Pressure (psi)
0	0	0	0	88
1 x 2.5"	35	990	3,748	75
2 x 2.5"	20	1,500	5,678	74



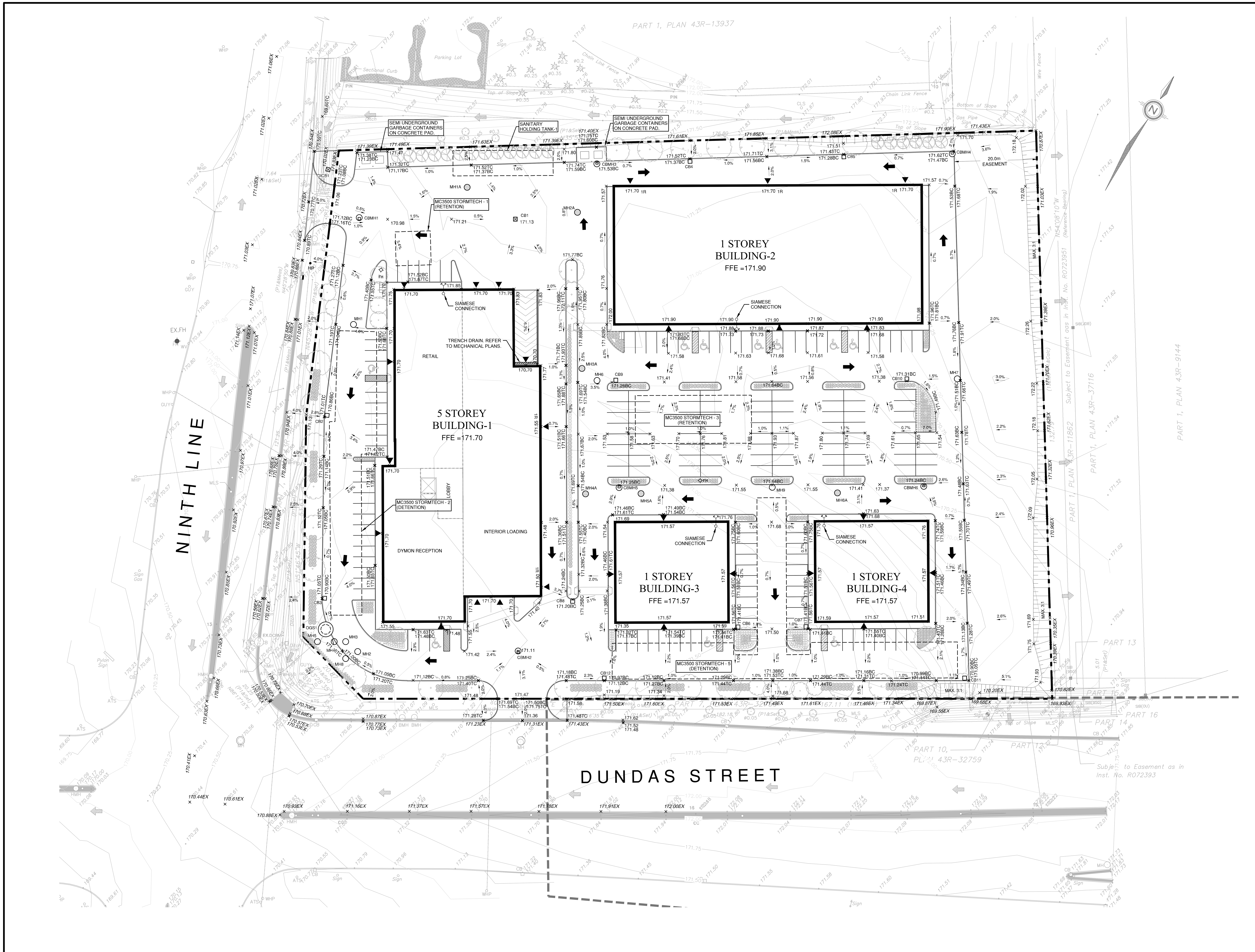
$$Q_R = \mathrm{Q_T}\left(\frac{\mathrm{P_S} - \mathrm{Pr}}{\mathrm{P_S} - \mathrm{Pt}}\right) \text{^0.54}$$

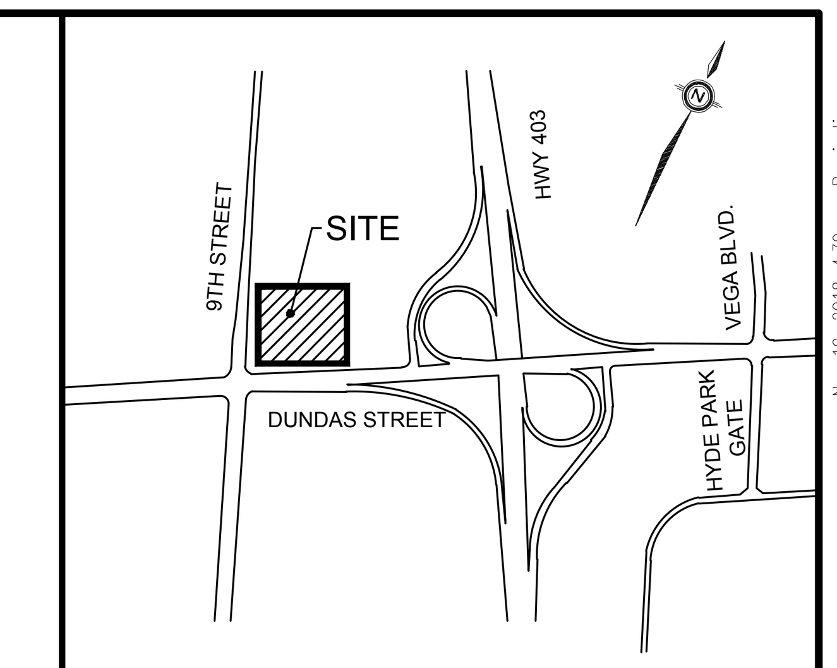
Where,

Q_r = Projected Flow Rate
Q_t = Flow Rate from Flow Test = 5678 L/min
P_s = Static Pressure = 88 psi
P_r = Desired System Pressure
P_t = Residual Presure inTest = 74 psi

Pressure Under Fire Suppression (P_{r1}) =	20.0	psi
Calculated Flow Rate (Q_{r1}) =	13,330	L/min
Pressure Under Normal Operation (P_{r2}) =	35.0	psi
Calculated Flow Rate (Q_{r2}) =	11,652	L/min

APPENDIX F
Preliminary Engineering Plans





LOCATION PLAN
N.T.S.

LEGEND

- PROPERTY LINE
- MTO LIMIT
- OUTLINE OF BUILDING AT GROUND LEVEL
- PROP. DEPRESSED CURB
- PROP. MAIN ENTRANCE / DOOR / O/H DOOR
- EX. ELEVATION — ×165.50EX
- PROP. ELEVATION — ×149.50
- PROP. TOP OF CURB ELEVATION — ×137.52TC
- PROP. BOTTOM OF CURB ELEVATION — ×137.52BC
- PROP. TOP OF WALL ELEVATION — ×137.29TW
- PROP. BOTTOM OF WALL ELEVATION — ×135.85BW
- PROP. SLOPE (MAX 3:1)
- PROP. OVERLAND FLOW ROUTE
- EX. OVERLAND FLOW ROUTE
- PROP. HEAVY DUTY PAVEMENT
- PROP. STORM MAINTENANCE HOLE
- PROP. STORM CATCHBASIN MAINTENANCE HOLE
- PROP. OIL-GRIT SEPARATOR
- PROP. SANITARY MAINTENANCE HOLE
- PROP. CATCHBASIN / DOUBLE CATCHBASIN
- EX. STORM MANHOLE
- EX. DOUBLE CATCH BASIN STORM MANHOLE
- EX. SANITARY MANHOLE
- EX. CATCHBASIN / DOUBLE CATCHBASIN
- PROP. VALVE AND BOX — V&B
- PROP. FIRE HYDRANT AND VALVE — FH&V
- PROP. SIAMESE CONNECTION
- EX. FIRE HYDRANT AND VALVE — EX.FH&V

LIST OF DRAWINGS

SG-01 - SITE GRADING PLAN
SS-01 - SITE SERVICING PLAN

SITE PLAN INFORMATION

NICHOLAS CARAGIANIS ARCHITECT INC.
137 PAMILLA STREET
OTTAWA ON, K1S 3K9
PHONE: (613) 237-6801
FAX: (613) 237-8289
E-MAIL: info@ncarchitec.ca

SURVEYOR INFORMATION

SPEIGHT, VAN NOSTRAND & GIBSON LTD.
750 OAKDALE ROAD, UNITS 65 & 66
TORONTO ON, M3N 2Z4
PHONE: (416) 749-7864
FAX: (416) 749-7866
E-MAIL: toronto@svng.on.ca

BENCHMARK INFORMATION:
ELEVATIONS ARE GEODETIC AND ARE DERIVED FROM THE CITY OF TORONTO MISSISSAUGA BENCHMARK No. 075023031.

NO.	REVISION	DATE	BY
1	ISSUED FOR ZBA APPLICATION	NOV 19, 2018	JAY

CITY OF MISSISSAUGA
REGION OF PEEL

9TH LINE & DUNDAS
3915 DUNDAS STREET EAST
MISSISSAUGA, ONTARIO

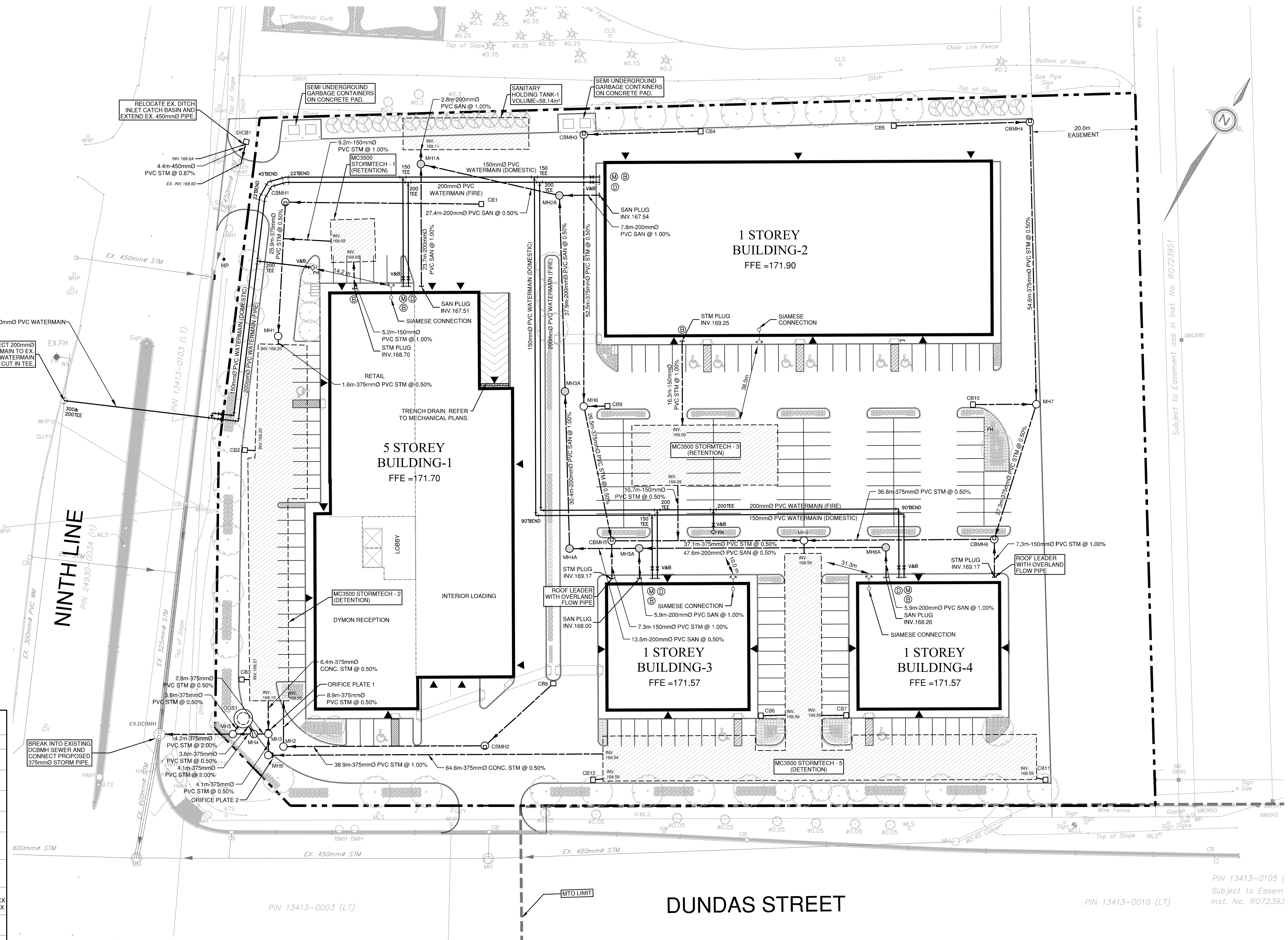
PRELIMINARY SITE GRADING PLAN

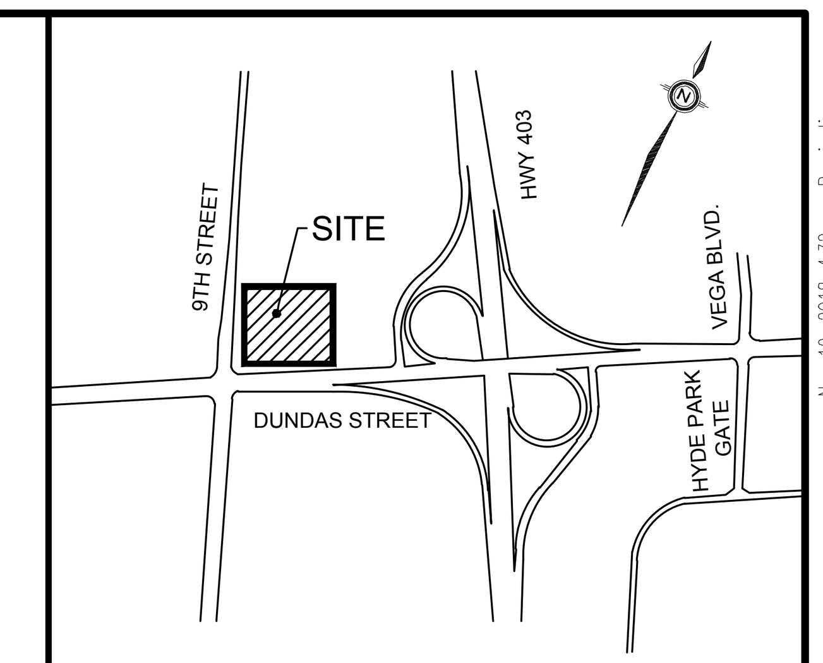
COLE ENGINEERING GROUP LTD.
70 Valleywood Drive,
Markham, ON L3R 4T5
T. 416 987 6161 | 905 940 6161
www.coleengineering.ca

DESIGNED BY: ZK	DATE: AUGUST 2018	CHECKED BY:
DRAWN BY: ZK	PROJECT No. 2018-0067	DRAWING No. SG-01
SCALE: 1:400		

5.0 0 5.0m 10.0m 15.0m 20.0m 25.0m

\\coleengineering.ca\prj\mrk\2018\2018-0067\500_CAD\30_SHT\01_CIV\H_SBDV\2018-0067-SHT-GRAD-01.dwg (SG-01)





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N.T.S.

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- PROPERTY LINE
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- PROP. SANITARY MAINTENANCE HOLE
- PROP. CATCHBASIN / DOUBLE CATCHBASIN
- EX. STORM MANHOLE
- EX. DOUBLE CATCH BASIN STORM MANHOLE
- EX. SANITARY MANHOLE
- EX. CATCHBASIN / DOUBLE CATCHBASIN
- PROP. STORM SEWER
- PROP. SANITARY SEWER
- PROP. WATERMAIN
- EX. STORM SEWER
- EX. SANITARY SEWER
- EX. WATERMAIN
- PROP. VALVE AND BOX — V&B
- PROP. FIRE HYDRANT AND VALVE — FH&V
- PROP. SIAMESE CONNECTION
- EX. FIRE HYDRANT AND VALVE — EX.FH&V
- PROP. WATER METER — M
- PROP. BACKFLOW PREVENTER — B
- PROP. DOUBLE CHECK DETECTOR — D

STORM SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME OPSD	TOP ELEV.	INVERTS
CBMH1	1200mmØ	701.010	OPSD 401.010	171.04	NE 168.49 (250mmØ) SE 168.37 (375mmØ)
CBMH2	1200mmØ	701.010	OPSD 401.010	171.11	N 168.76 (375mmØ) SW 168.71 (375mmØ)
CBMH3	1200mmØ	701.010	OPSD 401.010	171.54	NE 169.49 (250mmØ) SE 169.37 (375mmØ)
CBMH4	1200mmØ	701.010	OPSD 401.010	171.47	SW 169.50 (250mmØ) SE 169.38 (375mmØ)
CBMH5	1200mmØ	701.010	701.010	171.27	NW 168.92 (375mmØ) SE 169.10 (150mmØ) NE 168.87 (375mmØ)
CBMH6	1200mmØ	701.010	701.010	171.26	NW 168.92 (375mmØ) SE 169.10 (150mmØ) SW 168.87 (375mmØ)
EX.DCBMH	1800mmØ	701.012	OPSD 401.010	170.64	NE 167.42 (375mmØ) NW 167.45 (525mmØ) EX SE 167.20 (600mmØ) EX
MH1	1200mmØ	701.010	OPSD 401.010	171.21	NW 168.24 (375mmØ) SE 168.21 (375mmØ)
MH2	1200mmØ	701.010	OPSD 401.010	171.11	NE 168.32 (375mmØ) NW 168.25 (375mmØ)
MH3	1200mmØ	701.010	OPSD 401.010	171.06	NW 168.12 (375mmØ) SE 168.12 (375mmØ) SW 168.04 (375mmØ)
MH4	1200mmØ	701.010	OPSD 401.010	171.11	NE 168.02 (375mmØ) W 167.95 (375mmØ) SW 167.82 (375mmØ)
MH5	1200mmØ	701.010	OPSD 401.010	171.01	N 167.76 (375mmØ) NE 167.74 (375mmØ) SW 167.71 (375mmØ)
MH6	1200mmØ	701.010	OPSD 401.010	171.41	NW 169.10 (375mmØ) NE 169.18 (250mmØ) SE 169.05 (375mmØ)
MH7	1200mmØ	701.010	OPSD 401.010	171.51	NW 169.11 (375mmØ) SW 169.11 (300mmØ) SE 169.06 (375mmØ)
MH8	1200mmØ	701.010	OPSD 401.010	171.13	NE 168.22 (375mmØ) NW 168.14 (375mmØ)
MH9	1200mmØ	701.010	701.010	171.64	SW 168.69 (375mmØ) NE 168.69 (375mmØ) SE 168.61 (375mmØ)
OGS1	1800mmØ	701.012	JF10-12-3	171.06	E 167.93 (375mmØ) S 167.78 (375mmØ)

CATCHBASIN STRUCTURE INVENTORY

CB #	CB STD.	FRAME OPSD	TOP ELEV.	INVERTS
CB1	OPSD 400.020		171.13	168.87 (250mmØ)
CB2	OPSD 400.020		170.89	168.22 (250mmØ)
CB3	OPSD 400.020		170.92	168.22 (250mmØ)
CB4	OPSD 400.020		171.38	169.72 (250mmØ)
CB5	OPSD 400.020		171.29	169.77 (250mmØ)
CB6	OPSD 400.020		171.48	168.64 (250mmØ)
CB7	OPSD 400.020		171.48	168.64 (250mmØ)
CB8	OPSD 400.020		171.23	168.94 (375mmØ)
CB9	OPSD 400.020		171.28	169.23 (250mmØ)
CB10	OPSD 400.020		171.34	169.23 (300mmØ)
CB11	OPSD 400.020		170.92	168.61 (300mmØ)
CB12	OPSD 400.020		170.98	168.61 (300mmØ)
DICB1	OPSD 400.020		170.02	168.64 (450mmØ)

SANITARY SEWER STRUCTURE INVENTORY

MH #	MH DIAMETER	MH OPSD	FRAME OPSD	TOP ELEV.	INVERTS
MH1A	1200mmØ	701.010	OPSD 401.010	171.30	SE 167.28 (200mmØ) NE 167.30 (200mmØ) NW 167.25 (200mmØ)
MH2A	1200mmØ	701.010	OPSD 401.010	171.67	SE 167.52 (200mmØ) NE 167.46 (200mmØ) SW 167.44 (200mmØ)
MH3A	1200mmØ	701.010	OPSD 401.010	171.72	SE 168.75 (200mmØ) NW 167.70 (200mmØ)
MH4A	1200mmØ	701.010	OPSD 401.010	171.53	NE 167.78 (200mmØ) NW 169.06 (200mmØ)
MH5A	1200mmØ	701.010	OPSD 401.010	171.34	SE 167.94 (200mmØ) NE 167.88 (200mmØ) SW 167.85 (200mmØ)
MH6A	1200mmØ	701.010	OPSD 401.010	171.53	SE 168.20 (200mmØ) SW 168.12 (200mmØ)

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DESIGNED BY: ZK	DATE: AUGUST 2018	CHECKED BY:
DRAWN BY: ZK	PROJECT No. 2018-0067	DRAWING No. SS-01
SCALE: 1:400		

5.0 0 5.0m 10.0m 15.0m 20.0m 25.0m

\\coleengineering.ca\prj\mrk\2018\2018-0067\500_CAD\30_SHT\01_CIV\H_SBDV\2018-0067-SHT-SERV-01.dwg (SS-01)

Nov 19, 2018 - 4:32pm By: justin.dupeng